Long-lived Anatexis in the Exhumed Middle Crust from the Torngat Orogen and Eastern Core Zone: Constraints from Geochronology, Petrochronology, and Phase Equilibria Modeling

by

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A thesis
presented to the University of Waterloo
in fulfilment of the
thesis requirement for the degree of
Master of Science
in
Earth Sciences

Waterloo, Ontario, Canada, 2016

AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

The Torngat Orogen (southeastern Churchill Province, Canada) is a transpressional Paleoproterozoic orogen resulting from the collision between the North Atlantic Craton and the Core Zone (an Archean micro-continent) during the larger-scale Trans-Hudson Orogeny. The doubly-vergent Torngat Orogen is mainly exposed as granulite-facies metamorphic rocks and migmatites within a narrow (~150 km) belt. High-T metamorphic mineral assemblages (sillimanite stability field) are regionally overprinted by amphibolite-facies, high-strain, strike-slip shear zones. The development of granulite-facies metamorphic conditions, extensive anatexis, and intense shear deformation in such a narrow region is anomalous even for transpressional and hot orogens (such as Paleoproterozoic orogens during the "Archean-type" to "modern-type" tectonic transition). Recent field observations indicate that anatexis also occurred in the adjacent eastern Core Zone, thus shedding doubt on the true spatial extent of Torngat metamorphism and therefore on the dimensions and shape of the orogen.

Here, thermobarometry, phase equilibria modeling, and geochronology were used to investigate the timing, extent, and significance of metamorphism in the western Torngat Orogen and eastern Core Zone. The results reveal that the Torngat Orogen is larger, older, and longer-lived than previously thought. Multi-equilibria thermobarometry and phase equilibria modeling highlight a continuous increase in metamorphic conditions from the Core Zone to the Torngat granulites with no evidence of a major metamorphic break. Close-to-peak metamorphic conditions, constrained from mafic samples, gradually increases from 8.7 kbars-814°C to 10.8 kbars-914°C from west to east. Melt crystallization conditions, defined from metasedimentary rock samples, are estimated at 5.4 kbars-709°C to 8.1 kbars-823°C from west to east. Rocks from the Core Zone and Torngat Orogen appear to have followed hairpin P-T paths in the sillimanite stability field.

Metamorphic zircon U-Pb ages, monazite U-Pb ages, and garnet Lu-Hf and Sm-Nd ages are consistent in both domains, confirming that the eastern Core Zone was significantly reworked during the Torngat Orogeny. Zircon and monazite ages suggest protracted metamorphic crystallization from *c.* 1885 to 1780 Ma.

Crystallization events at *c.* 1860-1840 Ma and *c.* 1820-1800 Ma are interpreted as indicators of transpressional deformation (limited to the Torngat granulitic domains) and melt crystallization that was contemporaneous over the study area, respectively. Lu-Hf garnet geochronology reveals that garnet growth had begun by 1955-1885 Ma, potentially making the orogen at least 15 Myr older than previously thought. P-T-t-D paths support a peak-to-retrograde evolution characterized by a medium dP/dT slope (geotherm-parallel) without isothermal decompression. After peak metamorphic conditions were reached by 1885-1840 Ma, both domains stayed at suprasolidus conditions until 1820-1800 Ma.

In light of these results, we suggest that the Torngat Orogeny produced a large mid-pressure, high-temperature terrain with crustal-scale partial melting. The entire area represents a down-to-the-east mid-crustal section that was mainly exhumed through denudation. The long duration of mid-pressure and high-temperature metamorphism in this region may be explained by its position on the eastern flank of the Ungava indentor (oblique convergence) and by the high thermal state of the lithospheric mantle. The Torngat Orogen may be intermediate between ultra-hot orogens and hot orogens, where decoupling between the hot lithosphere and crust is responsible for large-scale penetrative deformation (vise model).

ACKNOWLEDGEMENTS

I would like to thank my friends, family and colleagues that have provided me with support and inspiration over the years. Thank you to my office mates at the University of Waterloo, Tyler Ambrose, Sudip Shrestha and Nathan Cleven for making my staying in Waterloo so enjoyable. It is important to me to acknowledge the help and support of professionals, especially Marc Choquette and Dany Savard, that made themselves available to answer my questions during the data acquisition and reduction process. I would like to extend a kind thank you to Professor Jeffrey D. Vervoort and to Diane Wilford for welcoming me at the Peter Hooper GeoAnalytical lab of Washington State University and for making my visit very instructive. Thanks to Isabelle Lafrance and Daniel Bandyayera for their support during field works and for sharing their knowledge on the Southeastern Churchill Province. I would like to acknowledge the dedication and patience shown by my committee members over the years, Drs. Shoufa Lin and Chris Yakymchuk, and especially by my co-supervisors, Drs. Carl Guilmette and Brian Kendall, who shared their passion and helped me to evolve professionally.

This contribution was financially supported by the Natural Science and Engineering Research Council of Canada (NSERC) graduate master's scholarship, the Ontario Graduate Scholarship (OGS), the NSERC Discovery grant awarded to Carl Guilmette, the Geological Society of America (GSA) research grant, and the "Ministère de l'Énergie et des Ressources Naturelles du Québec".

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CHAPTER 1: INTRODUCTION

The Paleoproterozoic Torngat Orogen (TO) in northeastern Canada (Southeastern Churchill Province; SECP) is an example of a high temperature orogen and part of the larger scale Trans-Hudson Orogen (THO). The metamorphic evolution of the TO was studied using regional thermobarometry, structural geology, and seismic surveys in the 1980s-1990s (summarized in Wardle & Hall, 2002, and Wardle *et al.*, 2002). These methods highlighted that granulite-facies rocks are constrained to a 150 km wide belt, which was overprinted by amphibolite-facies transpressional deformation. However, the narrow width of the TO granulitic belt distinguishes it from much wider granulitic belts of other Paleoproterozoic orogens worldwide (Zhao *et al.*, 2002). The development of high-grade metamorphic conditions and extensive shear deformation in such a narrow region is not expected for LHOs where such granulite grade anatexis is common (*e.g.*, Jamieson & Beaumont, 2013). An integrated tectonometamorphic study of the TO was undertaken for this project to determine the orogenic processes that enabled the development of high T conditions in such a narrow orogenic belt.

Earlier tectonometamorphic studies in this region focused on the TO, and described it as a narrow, doubly-vergent, transpressional orogen that developed through the collision of two Archean blocks (the North Atlantic Craton and the Core Zone), resulting in a doubling of the crustal thickness (*e.g.*, Van Kranendonk, 1996; Wardle *et al.*, 2002). Recent mapping (Verpaelst *et al.*, 2000; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015) revealed that the granulite facies rocks of the TO are in sharp contact with migmatitic rocks of the Core Zone (CZ). It is not clear whether the

CZ experienced partial melting during the Archean, as initially thought (Nunn *et al.*, 1990; Ryan, 1990; Wardle *et al.*, 1990; Isnard *et al.*, 1998), or if the metamorphic character of this Archean block was acquired during the Torngat Orogeny, thus making at least the eastern CZ a part of the TO.

Recent improvements in analytical methods and in thermodynamic data have opened new horizons for Lu-Hf garnet geochronology and monazite petrochronology (*e.g.*, Blichert-Toft, 2001; Catlos *et al.*, 2002; Gibson *et al.*, 2004), thus enabling more precise reconstructions of metamorphic phase equilibria in natural systems (*e.g.*, White *et al.*, 2014). Integrating these methods enables tectonometamorphic studies to determine important metamorphic reactions and Pressure-Temperature-time-Deformation (P-T-t-D) paths. In particular, for studies of Large Hot Orogens (LHOs) where high-grade peak metamorphic conditions often obliterate prograde microstructures and mineral zoning, Lu-Hf garnet geochronology is a valuable tool for understanding orogenic evolution because this method can better constrain the prograde metamorphic path, including peak metamorphic conditions, compared with other radioactive isotope systems such as Sm-Nd in garnets and U-Pb in zircons and monazites (*e.g.*, Roberts & Finger, 1997; Smit *et al.*, 2013). Therefore, orogenic processes in LHOs can now be inferred more accurately.

This thesis aims to: 1) define the thermal state (T) and variation in crustal levels (P) of exposed rocks across the traditionally defined contact between the CZ and TO; 2) temporally constrain the timing of metamorphism in the Torngat Orogen and eastern CZ; 3) define important metamorphic events in both areas; and 4) infer tectonic processes that dominated during the different metamorphic events. In order to

address these objectives, this study combines: 1) a regional petrographic and thermobarometry survey that traverses the CZ-TO contact; 2) geochronology of multiple metamorphic minerals, including Lu-Hf and Sm-Nd dating of garnets, and U-Pb dating of zircons and monazites; and 3) phase equilibria modeling to produce P-T-t-D paths for the different metamorphic domains.

1.1. Thesis organisation

This thesis is organized into four chapters. This first chapter introduced the thesis by presenting the research questions, objectives, and overall strategy. Chapter two reviews current knowledge of the TO and CZ in terms of petrographic characteristics, origins, ages, and metamorphic and geodynamic interpretations. The results and interpretations from this thesis are presented in chapter three in the format of a journal manuscript. U-Pb zircon and monazite geochronology was undertaken in collaboration with Don W. Davis (University of Toronto, Canada). Lu-Hf and Sm-Nd isotope analyses of garnets were acquired under the supervision of Jeffrey Vervoort and Diane Wilford (Washington State University, USA). Chapter four contains a summary and the conclusions of the thesis. Data and detailed analytical procedures for geochronology are available in the appendices. The reader may also refer to Charette & Guilmette (2014) for a full petrographic description and interpretation of more than 100 samples collected from a transect across the TO and CZ contact, and from which 20 samples were selected for this thesis. Mineral abbreviations used in this contribution come from Whitney & Evans (2010).

CHAPTER 2: GEOLOGICAL BACKGROUND

2.1. Regional geology

The SECP consists of an Archean-Paleoproterozoic CZ that is bordered by orogens on its eastern and western sides. The TO represents the eastern portion of the SECP and is located at the border between the provinces of Quebec and Labrador where it juxtaposes the CZ against the North Atlantic Craton (NAC; also known as the Nain Province in Labrador) (Fig. 2-1). To the west, the CZ is separated from the Superior Province by the New-Quebec Orogen (NQO). These two sutures are part of a wider orogenic system ─ the THO ─ that includes the Ungava Trough in northern Quebec, the Baffin and Soper River sutures on Baffin Island, and the Nagssugtoqidian suture in southern Greenland. These sutures are associated with the closure of the Manikewan Ocean (*e.g.*, Corrigan *et al.*, 2009; St-Onge *et al.*, 2009). The northern extension of the TO is thought to be the Nagssugtoqidan Orogen, in southern Greenland, which juxtaposes a microcontinent, possibly associated with the Meta Incognita Microcontinent (Baffin Island), against the NAC (*e.g.*, St-Onge *et al.*, 2009; Wardle *et al.*, 2002; Van Gool *et al.*, 2002). Post-orogenic alkaline plutons (1481-1410 Ma from U-Pb zircon geochronology; Hammouche *et al.*, 2012) mask the southern extension of this orogen, which is truncated by the *c.* 1000 Ma Grenville Orogen.

The TO exposes granulite-to-amphibolite facies, migmatitic, and highly-strained rocks over more than 600 km along strike. This Paleoproterozoic assemblage has been subdivided into five principal domains that include (from east to west) the Foreland domain, Tasiuyak domain, Burwell domain, Lomier Complex, and Sukaliuk

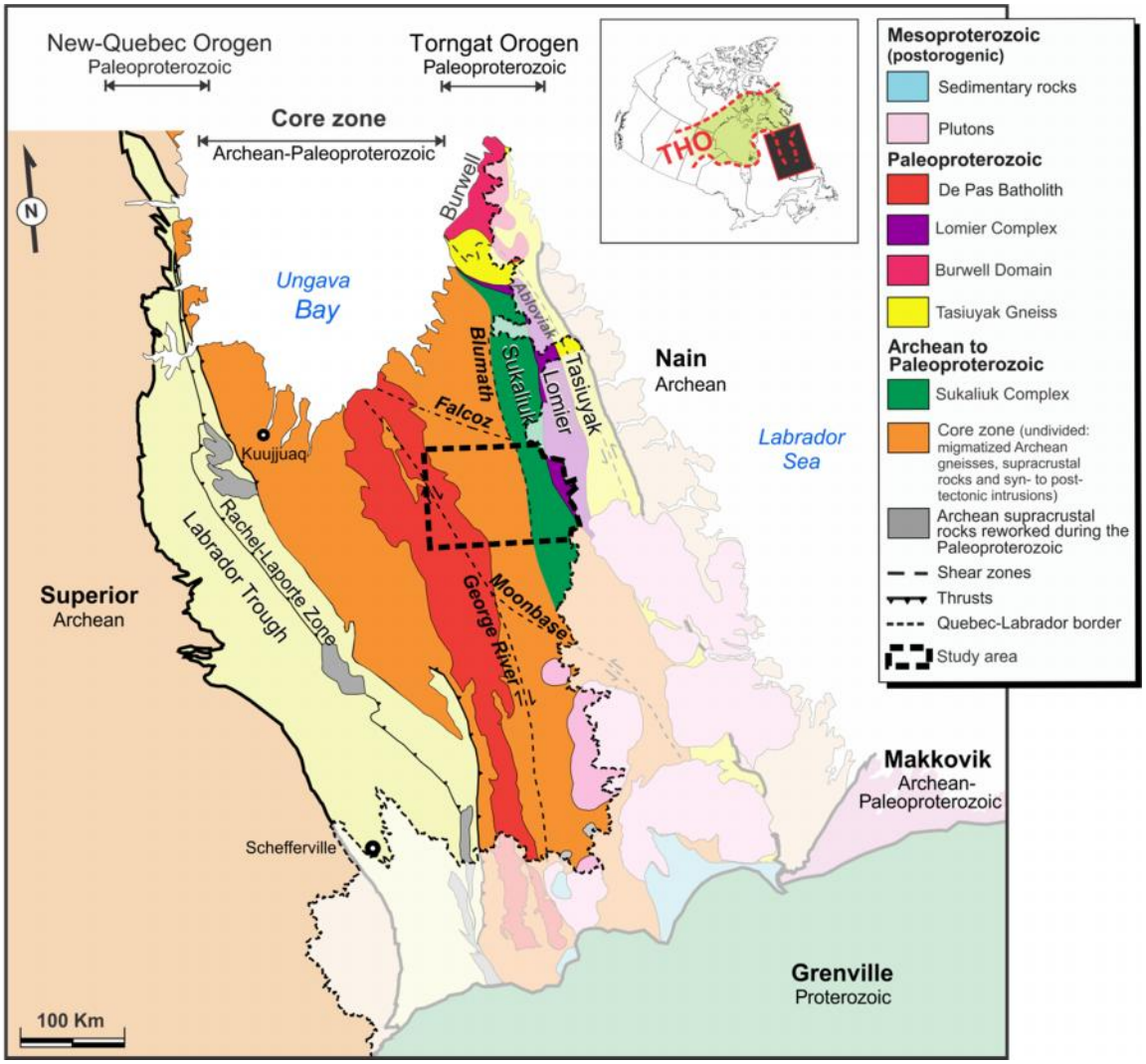

Figure 2-1: Geological setting of the Southeastern Churchill Province

This figure shows its tripartite structure (New-Quebec Orogen – Core zone – Torngat Orogen) and the main domains and shear zones. The inset map shows the position of this geological province (black square) in the Trans-Hudson Orogen (THO). The study area is delimited by a bold dashed line. Modified from Wardle *et al.* (2002) after the works of Lafrance *et al.* (2015).

Complex. These domains are exposed as a doubly-vergent structure with a subvertical axial zone focused within Tasiuyak gneisses (Rivers *et al.*, 1996; Van Kranendonk, 1996; Wardle & Van Kranendonk, 1996).

The Foreland domain represents reworked Nain gneisses that are overlain unconformably by subgreenschist to amphibolite facies metasedimentary rocks of the Ramah and Mugford groups (Wardle *et al.*, 2002). These metasedimentary sequences

both record a change from clastic, shallow-water rocks to deeper-water turbidites. The upper sequence of the Mugford Group differs in that it is dominated by 1.85 Ga continental tholeiites (Hamilton, 1994; Wardle *et al.*, 2002). A north-south trending belt of granitoid plutons (1.76-1.74 Ga; Emslie *et al.*, 1994) masks the contact between the shelf-to-deep marine metasedimentary rocks of the Ramah and Mugford groups and the Tasiuyak domain to the west.

The Tasiuyak domain comprises aluminous quartzo-feldspathic gneisses predominantly derived from metamorphism and partial melting of sedimentary protoliths (as well as subordinate igneous protoliths). The aluminous to sub-aluminous composition of these straight-layered leucocratic gneisses is reflected by their mineralogy, which often includes garnet, sillimanite, biotite, and graphite (*e.g.*, Van Kranendonk, 1996; Ermanovics & Van Kranendonk, 1998). Quartz-cordierite coronas surrounding garnet and cordierite pseudomorphs after sillimanite have been reported by Van Kranendonk (1996) and Ermanovics & Van Kranendonk (1998), suggesting that this domain recorded decompression during exhumation. These primarily metasedimentary gneisses were interpreted as a pelitic to semi-pelitic accretionary prism whose sediment source was likely exotic from the CZ and NAC based on the more juvenile Nd isotope compositions of Tasiuyak gneisses ($-2.6 < \varepsilon_{Nd} < -1.9$ in general, but ε_{Nd} values of -8.3 have been reported) compared with that of the two surrounding cratons ($-11 < \varepsilon_{Nd} < -3$ and $-31 < \varepsilon_{Nd} < -8$ for the CZ and NAC, respectively) (Campbell, 1997; Thériault & Ermanovics, 1997, and references therein; Scott, 1998; Wardle *et al.*, 2002). Detrital zircon geochronology and crosscutting relationships indicate that the Tasiuyak accretionary prism was deposited after

1940±2 Ma (youngest U-Pb detrital zircon age) and before 1895 Ma (U-Pb zircon geochronology of crosscutting quartz diorite dyke; Scott, 1995b, 1998). Anatectic granites dated at 1857±1 Ma (U-Pb monazite geochronology; Bertrand *et al.*, 1993) suggest that the metasedimentary prism experienced partial melting conditions soon after deposition.

The central and eastern part of the Tasiuyak domain contains multiple plurimetric mylonite corridors that trend north-south and are associated with the Abloviak Shear Zone (ASZ) (Wardle *et al.*, 2002). U-Pb zircon geochronology of dykes crosscutting regional gneissosity and syn-transpression intrusions indicates that sinistral strike-slip movement in the ASZ occurred at *c.* 1845-1825 Ma (Bertrand *et al.*, 1993). To the north, the Tasiuyak gneisses and the ASZ abruptly bend westward due to the sinistral movement of the Komaktorvik Shear Zone (KSZ) (Van Kranendonk & Scott, 1992; Wardle *et al.*, 1992). In this area, the Tasiuyak domain is intruded by the metaplutonic rocks of the Burwell Domain.

The Burwell domain is dominated by metaplutonic rocks and occurs between the ASZ and KSZ in the northern part of the TO. These granodioritic to dioritic plutons intrude the margin of the NAC and the Tasiuyak gneisses, and are divided into an orthopyroxene-absent and an orthopyroxene-bearing suite. Apart from their mineralogy, neither the location nor the crystallization age differ between these suites. Both suites have a calc-alkaline affinity and are associated with arc magmatism that peaked at 1910±2 to 1885±2 Ma (Van Kranendonk *et al.*, 1994; Scott, 1995a, 1995b, 1998; Scott & Machado, 1995; Van Kranendonk & Wardle, 1996; Campbell, 1997).

Located west of the Tasiuyak domain and the ASZ, the Lomier Complex has a characteristic high aeromagnetic susceptibility produced by the magnetite-bearing felsic to mafic intrusive rocks forming this granulitic domain. The majority of these rocks are tonalitic and enderbitic in composition, and vary from homogeneous and weakly foliated metamorphic rocks to gneisses. Girard *et al.* (1990b) interpreted the gneisses as a reworked equivalent of the less foliated rocks. In high-strain corridors, a retrograde amphibolite facies mineral assemblage and pseudo-tachylites are observed. In sharp contact with these meta-igneous rocks are slivers of supracrustal rocks that were affected by partial melting and are concordant to the strong NNW-SSE regional tectonometamorphic foliation. The interpretation of this assemblage of meta-intrusive rocks and slivers of supracrustal rocks is still controversial. The Lomier Complex has been interpreted as an equivalent of the Tasiuyak gneisses, which are intruded by plutonic rocks inferred to have an arc origin (Ermanovics & Van Kranendonk, 1998; Wardle *et al.*, 2002). U-Pb zircon geochronology from an enderbite within the Lomier Complex indicates a crystallization age of 1877±1 Ma (Bertrand *et al.*, 1993). Significant differences between the metaplutonic rocks of the Lomier Complex and Tasiuyak domain suggest two distinct metaplutonic suites that intruded different host rocks (*e.g.*, Van Kranendonk & Wardle, 1994; Wardle & Van Kranendonk, 1996; Thériault & Ermanovics, 1997; Ermanovics & Van Kranendonk, 1998). This interpretation is supported by: 1) higher silica and potassium contents, and more negative ε_{Nd} values of the Lomier Complex metaplutonic rocks (granodiorites-tonalites with ε_{Nd} between -8.5 and -1.5) compared with the Tasiuyak orthogneisses (tonalites-diorites with εNd between -6.7 and +3.8) (Thériault & Ermanovics, 1997);

2) the overlap between the Nd isotope composition of the Lomier Complex metaplutonic rocks and the Archean CZ basement ($-11 < \varepsilon_{Nd} < -3$; Thériault & Ermanovics, 1997, and references therein; Wardle *et al.*, 2002) suggests that the latter is the protolith or a contaminant of the western Lomier metaplutonic suite; and 3) the similarity of Nd isotope composition of Lomier Complex metasedimentary rocks (*i.e.*, $-10.5 < \varepsilon_{Nd} < -2.9$; Thériault & Ermanovics, 1997) with the Archean CZ basement.

The Sukaliuk Complex occurs west of the Lomier Complex and is a granulite-facies domain characterized by kilometric alternations of enderbitic gneisses, garnet-bearing mafic gneisses, and metasedimentary slivers. Recent regional mapping (*e.g.*, Verpaelst *et al.*, 2000; Lafrance *et al.*, 2015) indicates that this domain contains a greater abundance of metamorphic supracrustal rocks compared with the Lomier Complex and is also dominanted by L/S tectonites. In addition, evidence of partial melting is observed in the sillimanite-bearing and orthopyroxene-bearing metasedimentary lenses. Leucosomes are present as melt pods, bands, or small masses in most cases. In the western part of the Lomier Complex near the contact with the CZ, leucosomes are abundant. In this area, garnet- and orthopyroxene-bearing stromatic metatexites and diatexites with flow structures are most common (*e.g.*, Charette & Guilmette, 2014; Lafrance *et al.*, 2015). The age and origin of this complex is still ambiguous (Wardle *et al.*, 2002).

West of the Blumath Deformation Corridor (BDC), the CZ outcrops as tonalitic to granitic gneisses overlain discordantly by lenses of metaigneous, metavolcanic, and metasedimentary rocks. The gneisses represent Archean basement that was variably affected by partial melting, and outcrops as straight gneisses to

stromatic metatexite and raft diatexite. The influence of partial melting is reflected by migration structures observed on outcrop, and more regionally, by the genetic link between the migmatitic gneisses and large felsic masses interpreted as evolved partial melting products (anatectic granite; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015). Geochronological data suggest that these Archean gneisses (c. 3030 to 2600 Ma) were affected by Paleoproterozoic metamorphism, as reflected by *c.* 1850-1760 Ma ages from metamorphic zircon, monazite, amphibole, biotite, and titanite, and by the *c.* 1820-1805 Ma crystallization age of anatectic granites (*e.g.*, Nunn *et al.*, 1990; Ryan *et al.*, 1991; Isnard *et al.*, 1998; James & Dunning, 2000; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015).

Kilometric lenses of supracrustal rocks (now re-assigned to the Lake Harbour Group) in the CZ are dominated by metasedimentary rocks (*i.e.*, quartzite to metapelite) that do not contain sillimanite or orthopyroxene and are variably migmatized (grading from net-structure metatexite to stromatic-structure metatexite). Where observed, the base of the Lake Harbour Group is marked by a discordant and sheared contact in marbles and calc-silicate rocks (Goulet & Ciesielski, 1990; Verpaelst *et al.*, 2000). The Lake Harbour Group has been correlated to similar supracrustal rocks on Baffin Island where the depositional age has been constrained to younger than 1934±2 Ma (U-Pb detrital zircon geochronology; Scott & Gauthier, 1996).

The main Paleoproterozoic intrusion in the CZ is the De Pas Batholith, which crosscuts the region over more than 600 km along a NNW-SSE axis. This batholith consists of granitoids with granitic and charnockitic compositions. Based on its

geometry and geochemistry, this batholith was interpreted as crystallizing in a subduction-related arc that formed by *c.* 1840-1805 Ma (U-Pb zircon geochronology; Krogh, 1986; Dunphy & Skulski, 1996; James *et al.*, 1996; Isnard *et al.*, 1998; Martelain *et al.*, 1998; James & Dunning, 2000). However, the ℇNd values of the De Pas Batholith are similar to the CZ orthogneisses, suggesting that this large batholith is a product of syn-collisional magmatism (Wardle *et al.*, 1990).

2.2. Tectonometamorphic evolution of the Torngat Orogen

Previous geochronology and thermobarometry data suggest that three tectonometamorphic phases are associated with the collision between the CZ and NAC (Van Kranendonk, 1996; Mengel & Rivers, 1997; Ermanovics & Van Kranendonk, 1998; Scott, 1998; Wardle *et al.*, 2002). The first phase represents the culmination of the Torngat Orogeny, which may have occurred by *c.* 1870-1850 Ma (Bertrand *et al.*, 1993; Van Kranendonk, 1996; Ermanovics & Van Kranendonk, 1998; Wardle *et al.*, 2002). This phase was associated with development of the doubly-vergent structure and doubling of the crustal thickness, thus producing metamorphic conditions of 9.0-11.5 kbars and 800-950°C (Mengel & Rivers, 1990, 1991, 1997; Rivers *et al.*, 1996; Van Kranendonk, 1996; Ermanovics & Van Kranendonk, 1998). The oldest metamorphic ages (U-Pb) associated with the Torngat Orogeny were obtained from three monazite fractions from a Tasiuyak paragneiss, interpreted by Scott & Gauthier (1996) to have grown at 1870±3 Ma at high-grade conditions (possibly during local partial melting), and one zircon overgrowth from the Burwell domain dated at 1871±3 Ma (Scott & Machado, 1995). These ages are 25 to 35 Myr younger than the crystallization of Burwell arc magmas (1910-1885 Ma; Van Kranendonk *et al.*, 1994;

Scott, 1995a, 1995b, 1998; Scott & Machado, 1995; Van Kranendonk & Wardle, 1996; Campbell, 1997), which represents a minimum age for the collision between the CZ and NAC.

The second tectonometamorphic phase of the orogeny is associated with the development of regional N-S shear zones (such as the ASZ), folding of the gneissic foliation, and formation of sub-horizontal mineral lineations during the transpressional motion between the CZ and NAC (*e.g.*, Goulet & Ciesielski, 1990; Van Kranendonk & Ermanovics, 1990; Ermanovics & Van Kranendonk, 1998). The timing of the second phase is constrained at *c.* 1845-1825 Ma based on syntectonic intrusions and cross-cutting relationships (U-Pb zircon and monazite geochronology; Bertrand *et al.*, 1993). Van Kranendonk (1996) suggested that this sinistral shearing ─ coeval with a gradual decrease of metamorphic P-T conditions to 5.0-7.3 kbars and 550-750°C (Mengel & Rivers, 1990, 1991; Van Kranendonk, 1996) ─ occurred in two pulses at the beginning and end of this phase.

Exhumation and cooling of the orogen represents the third and final phase, which occurred between *c.* 1800 and 1740 Ma (U-Pb zircon and monazite geochronology; Bertrand *et al.*, 1993; Scott, 1995a). East-vergent mylonites in the northern part of the TO (*e.g.*, the Komaktorvik Shear Zone [KSZ]) and pseudotachylites in regional shear zones are interpreted to have developed during this period (Scott, 1995a, 1995b; Scott & Machado, 1995). Hbl-Pl-Qz and Opx-Pl symplectites after Grt-Cpx record decompression and cooling conditions of approximately 5.0 kbars and 600°C in the North River area (Van Kranendonk, 1996). Cooling ages of *c.* 1790 to 1730 Ma were obtained from Ar-Ar geochronology on

amphiboles and biotites as well as U-Pb geochronology on titanites (*e.g.*, Mengel *et al.*, 1991; Bertrand *et al.*, 1993; Scott, 1995a, 1995b; Scott & Machado, 1995).

2.3. Geodynamic evolution

Geodynamic evolution of the SECP was addressed by Wardle & Van Kranendonk (1996), Scott (1998), and Wardle *et al.* (2002). The latest model proposed for this region is schematized in Fig. 2-2 after Wardle *et al.* (2002) and is summarized below.

Before convergence started, the Superior Craton was separated from the NAC by the Manikewan Ocean. Between those two Archean cratons, a composite block ─ now referred as the CZ ─ may have formed by detachment of the Superior eastern margin (to the west) and an exotic terrane (to the east; stage A, Fig. 2-2). Detachment from the Superior Craton resulted from an intra-cratonic rift that produced a volcano-sedimentary basin containing the protoliths of the rocks forming the NQO. Although the lithological resemblance of the western CZ and the Superior Province was highlighted by Simard *et al.* (2013), the origin of this block is still uncertain given the large amount of translation suggested by the transpression structures observed throughout the region. Previously interpreted as a southern extension of the Rae Craton (*e.g.*, Hoffman, 1990), the eastern block forming the CZ is now thought to be associated with the Meta Incognita microcontinent (Baffin Island), as suggested by the continuity of aeromagnetic lineaments under Ungava Bay (*e.g.*, Scott & St-Onge, 1998; Bourlon *et al.*, 2002; Wardle & Hall, 2002). The proposed boundary between these two blocks is either the Lac Tudor Shear Zone (LTSZ; James & Dunning, 2000) or the George River Shear Zone (GRSZ; Simard *et al.*, 2013). The age of the

detachment from the Superior Craton is constrained at 2169±4 Ma (U-Pb zircon geochronology; Rohon *et al.*, 1993) by the maximum age of the volcano-sedimentary belt.

During the initial stage of closure of the Manikewan Ocean, the Tasiuyak sedimentary prism (an exotic block) was accreted to the western margin of the NAC and intruded by the Burwell magmatic arc (stage B, Fig. 2-2). Accretion is constrained by the intrusion of the Burwell arc magmas into the Tasiuyak Gneisses and the Nain Province gneisses at *c.* 1910 Ma. This *c.* 1910-1885 Ma calc-alkaline magmatism is interpreted as the product of east-dipping subduction beneath the NAC (Van Kranendonk *et al.*, 1994; Scott, 1995b, 1998; Scott & Machado, 1995).

It is not clear if the Lomier intrusions are also related to arc magmatism, or instead represent a western equivalent of the Tasiuyak Gneisses or a product of syn-collisional magmatism. Although Wardle *et al.* (2002) did not address this problem in their geodynamic model, they highlighted the difficulties of a magmatic arc origin for these metaplutonic rocks. Arc magmatism in both the Burwell domain and Lomier Complex would require a complex subduction geometry because magmatism would have affected both the NAC + Tasiuyak accretionary prism and the eastern CZ margin from 1910 to 1877 Ma. Two dominant hypotheses are proposed to reconcile the magmatic arc hypothesis. First, a double subduction polarity or a flip of subduction

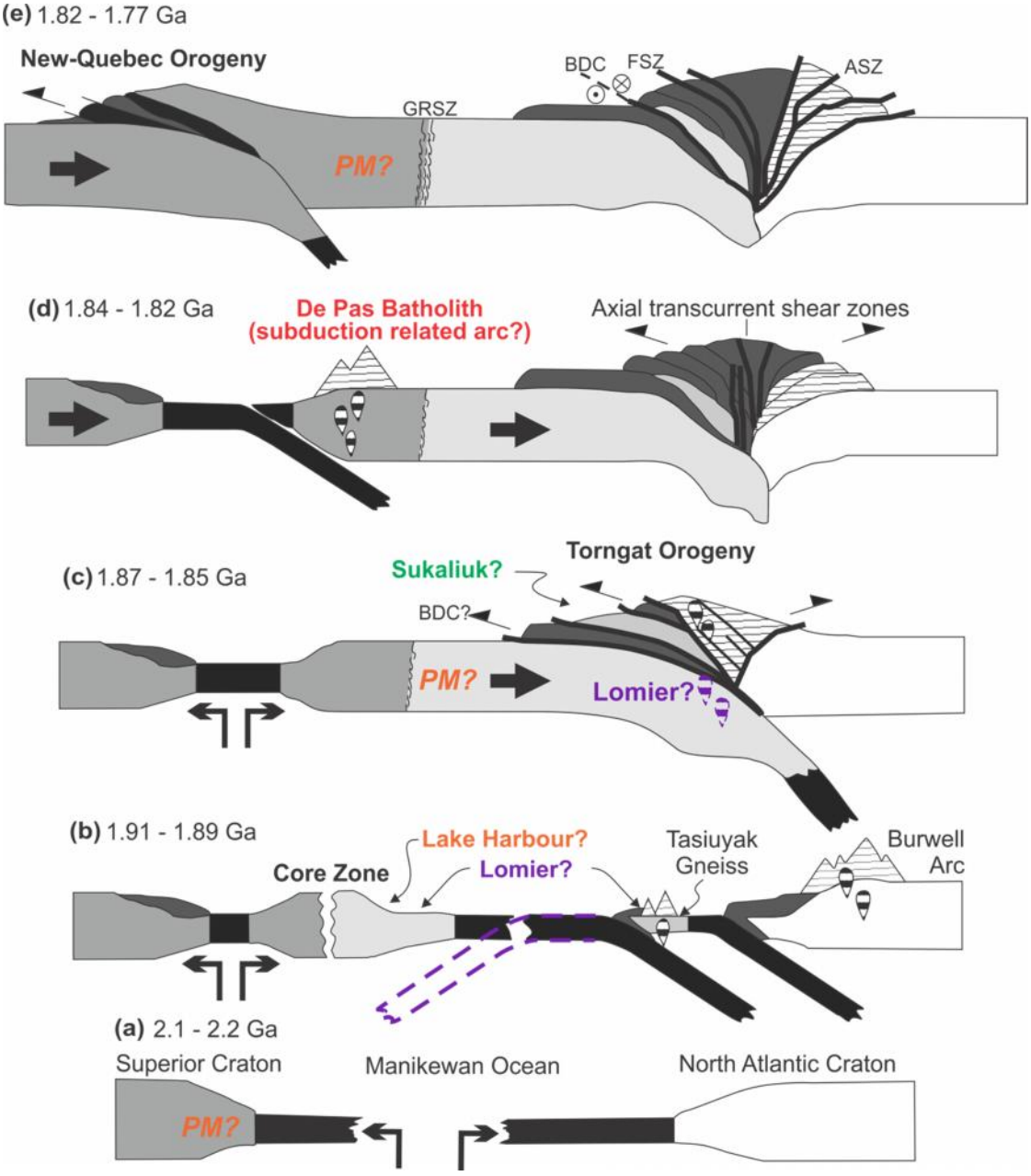

Figure 2-2: Geodynamic evolution of the Southeastern Churchill Province

Figure modified from Wardle *et al.* (2002). Colored labels highlight gaps in our current understanding of the SECP evolution. ASZ = Abloviak Shear Zone; BDC = Blumath Deformation Corridor; FSZ = Falcoz Shear Zone; GRSZ = George River Shear Zone; PM? = possible partial melting event.

polarity was evoked by Van Kranendonk & Wardle (1996) to account for the west-vergent subduction that resulted in Burwell arc magmas intruding the North Atlantic Craton and Tasiuyak Gneiss (*e.g.*, Scott, 1995b), and the east-vergent subduction that

produced the southern metaplutonic rocks intruding the CZ margin (*e.g.*, Van Kranendonk & Ermanovics, 1990; Bertrand *et al.*, 1993). These authors prefer the subduction-flip model because it is consistent with *c.* 1910 to 1885 Ma ages for the Burwell metaplutonic rocks, and the absence of magmatism along the CZ margin prior to 1880 Ma because of strike-slip motion during that time. In the second hypothesis, Thériault & Ermanovics (1997) suggest that northern and southern magmatism developed under a single tectonic regime, and that the eastern metaplutonic suite in the Tasiuyak domain may be associated with forearc magmatism.

Ultimately, convergence between the CZ and NAC led to continental collision around 1870-1860 Ma. This event is thought to have produced the flower structure of the TO and resulted in a doubling of the crustal thickness, thus producing granulite-faces peak metamorphic conditions (stage C, Fig. 2-2; Rivers *et al.*, 1996).

In the TO, high-grade conditions were sustained (or locally lowered to retrograde amphibolite facies) during the transpressional convergence from 1845 to 1820 Ma, which caused the development of axial shear zones such as the ASZ (stage D, Fig. 2-2; Bertrand *et al.*, 1993; Scott, 1998; Mengel & Rivers, 1997). The sinistral component of the convergence is interpreted to reflect northward motion of the NAC relative to the CZ in response to a change in the locus of subduction and the accretion of terranes on the southern margin of the NAC (*e.g.*, Van Kranendonk *et al.*, 1993; Van Kranendonk & Ermanovics, 1990). On the opposite side of the CZ, this time interval roughly corresponds to the emplacement of the De Pas Batholith (1840-1805 Ma; Krogh, 1986; Dunphy & Skulski, 1996; James *et al.*, 1996; Isnard *et al.*, 1998; Martelain *et al.*, 1998; James & Dunning, 2000). Wardle *et al.* (2002) favored a

subduction-related origin for these granitic and charnockitic rocks associated with west-vergent subduction under the CZ. However, the similar Nd isotope compositions of the De Pas Batholith and CZ gneisses also permit a syn-collisional magmatic origin for the De Pas Batholith.

The collision between the Superior Craton and CZ produced the NQO around 1.82-1.77 Ga, and is coeval with exhumation and cooling of the Torngat Orogen (stage E, Fig. 2-2). The closure of the volcano-sedimentary basin that separated the CZ from the Superior Craton produced a duplex fold and thrust belt and greenschist-facies to amphibolite-facies metamorphic conditions. Amphibolite- to granulite-facies metamorphism may have affected the Rachel-Laporte domain, which is considered as an equivalent of either the NQO or the metasedimentary rocks on the western margin of the CZ (Wardle & Van Kranendonk, 1996). Ellis & Beaumont (1999) used numerical modeling and seismic surveys to suggest that stress from the New-Quebec Orogeny may have been propagated through the CZ to the TO if this craton was rheologically weak compared with the Superior Craton, as suggested by high temperature conditions (caused by reworking during the Torngat orogeny) and lack of lithospheric mantle (delamination) in the CZ. The reactivation of regional deformation corridors in the CZ at greenschist-facies conditions and the coeval exhumation of the TO during the New-Quebec Orogeny is consistent with this hypothesis.

Since arc-related lithologies are restricted to the northern and central parts of the TO and NAC, some authors suggest that arc excision occurred late in the history of the orogeny (*e.g.*, Scott, 1995b, 1998; Ellis & Beaumont, 1999; Wardle *et al.*, 2002). Processes producing differential uplift ─ such as retroshearing that progressively

expelled a southern plug (Ellis & Beaumont, 1999), erosion (Scott, 1995b, 1998), and a greater convergence rate to the south (Wardle *et al.*, 2002) ─ have been suggested to account for this lack of arc-related lithologies and the overall narrowing of the orogen its southern part. Alternatively, Wardle *et al.* (2002) suggested that a high-angle oblique convergence could have inhibited arc formation in the southern part of the orogen.

CHAPTER 3: LONG-LIVED ANATEXIS IN THE EXHUMED MIDDLE CRUST FROM THE TORNGAT OROGEN AND EASTERN CORE ZONE: CONSTRAINTS FROM GEOCHRONOLOGY, PETROCHRONOLOGY, AND PHASE EQUILIBRIA MODELING

3.1. Introduction

The Torngat Orogen (TO) is a deeply eroded, transpressional, hot, narrow, and doubly-vergent Paleoproterozoic orogenic belt in northeastern Canada (Wardle *et al.*, 2002, and references therein). It exposes deep orogenic granulitic crust as a narrow (roughly 150 km wide and 600 km long) mountain belt resulting from the collision between the Core Zone (CZ), an Archean microcontinent of uncertain origin, and the North Atlantic Craton (NAC). The narrow width of the TO granulitic belt distinguishes it from much wider granulitic belts of other Paleoproterozoic orogens worldwide (Zhao *et al.*, 2002). The development of high-grade metamorphic conditions and extensive shear deformation in such a narrow region is not expected in Large Hot Orogens (LHOs) where such granulite grade anatexis is common (*e.g.*, Jamieson & Beaumont, 2013). However, it has been suggested that Paleoproterozoic orogens might mark the transition from ultra-hot Archean accretionary orogens involving weak lithospheres and younger orogens involving stiff lithospheres (Chardon *et al.*, 2009; Cagnard *et al.* 2011), introducing new types of orogens like the hot orogen and mixed-hot orogen, which might better represent the TO. In addition, transpressive orogens undergo much slower cooling, and therefore remain at a more uniform and elevated thermal state due to the absence of important tectonic exhumation processes (Thompson *et al.*, 1997). Thus, both the transpressive nature (Van Kranendonk & Ermanovics, 1990; Wardle & Van Kranendonk, 1996) and the

Paleoproterozoic age of the TO might account for its limited width yet intensive high-grade metamorphism.

On the other hand, limited field observations at the TO-CZ boundary (*e.g.*, Taylor, 1979; Girard, 1990b) have so far hindered efforts to reconstruct the tectonic and metamorphic history of the region. Recent field observations suggest that widespread anatexis occurred west of the Torngat granulites (Verpaelst *et al.*, 2000; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015). It is not clear whether the CZ experienced partial melting during the Archean, as initially thought (Nunn *et al.*, 1990; Ryan, 1990; Wardle *et al.*, 1990; Isnard *et al.*, 1998), or if the metamorphic character of this Archean block was acquired during the Torngat Orogeny, thus making at least the eastern CZ a part of the TO.

In this contribution, we present a regional thermobarometry survey across the TO-CZ boundary combined with phase equilibria modeling, U-Pb zircon and monazite geochronology, and Lu-Hf and Sm-Nd garnet petrochronology. The integration of a regional metamorphic survey with P-T-t-D paths provided a robust framework to investigate the extent and nature of Torngat metamorphism, and to infer geological processes in hot transpressional orogenic belts. In particular, the combination of garnet, zircon, and monazite petrochronology coupled with phase equilibria modeling provided constraints on the long duration of anatexis in the TO. Results also suggest that the CZ underwent significant Paleoproterozoic reworking, leaving no obvious reason to exclude it from the TO. Taken as a whole, the TO and CZ may illustrate the evolution from a mixed-hot (Chardon *et al.* 2009) to a hot (Ellis *et al.* 1998) transpressional orogen.

3.2. Geological background

The TO forms the easternmost part of the Southeastern Churchill Province (SECP), which in turn is part of the larger scale Trans-Hudson Orogen (THO; Fig. 3-1). The THO is exposed from the northwestern United States to Southern Greenland as a collage of Archean cratons and Paleoproterozoic supracrustal belts that underwent substantial high-temperature reworking at *c.* 1.92-1.80 Ga (*e.g.*, St-Onge *et al.*, 2006; Corrigan *et al.*, 2009) during the formation of the Nuna Supercontinent (Zhao *et al.*, 2002; Evans & Mitchell, 2011). The SECP represents an eastern branch of the THO and consists of a 250-km-wide N-S trending Archean block, the CZ, bordered to the east and west by two Paleoproterozoic orogens, the TO and New Quebec Orogen (NQO), respectively, and to the south by the Mesoproterozoic Grenville orogen. Whereas the NQO is expressed as a fold-and-thrust belt with greenschist- to amphibolite-facies metamorphism, the TO is characterized by ductile deformation and granulite-facies metamorphism (Wardle *et al.*, 2002, and references therein). The whole SECP is thought to result from a two-stage collision, first between the CZ and NAC, forming the TO around 1.87-1.82 Ga, and second between the Superior Craton and the amalgamated CZ/NAC, forming the NQO around 1.82-1.77 Ga (Wardle *et al.*, 2002).

The TO outcrops as a doubly-vergent structure formed by variably migmatized and highly-strained rocks (Wardle *et al.*, 2002). Mapping (*e.g.*, Ermanovics & Van Kranendonk, 1998) and thermobarometry surveys (*e.g.*, Mengel & Rivers, 1990; Van Kranendonk, 1996; Mengel & Rivers, 1997) indicate that mid-pressure granulite facies conditions were reached, as is expressed by widespread anatexis. Granulite facies

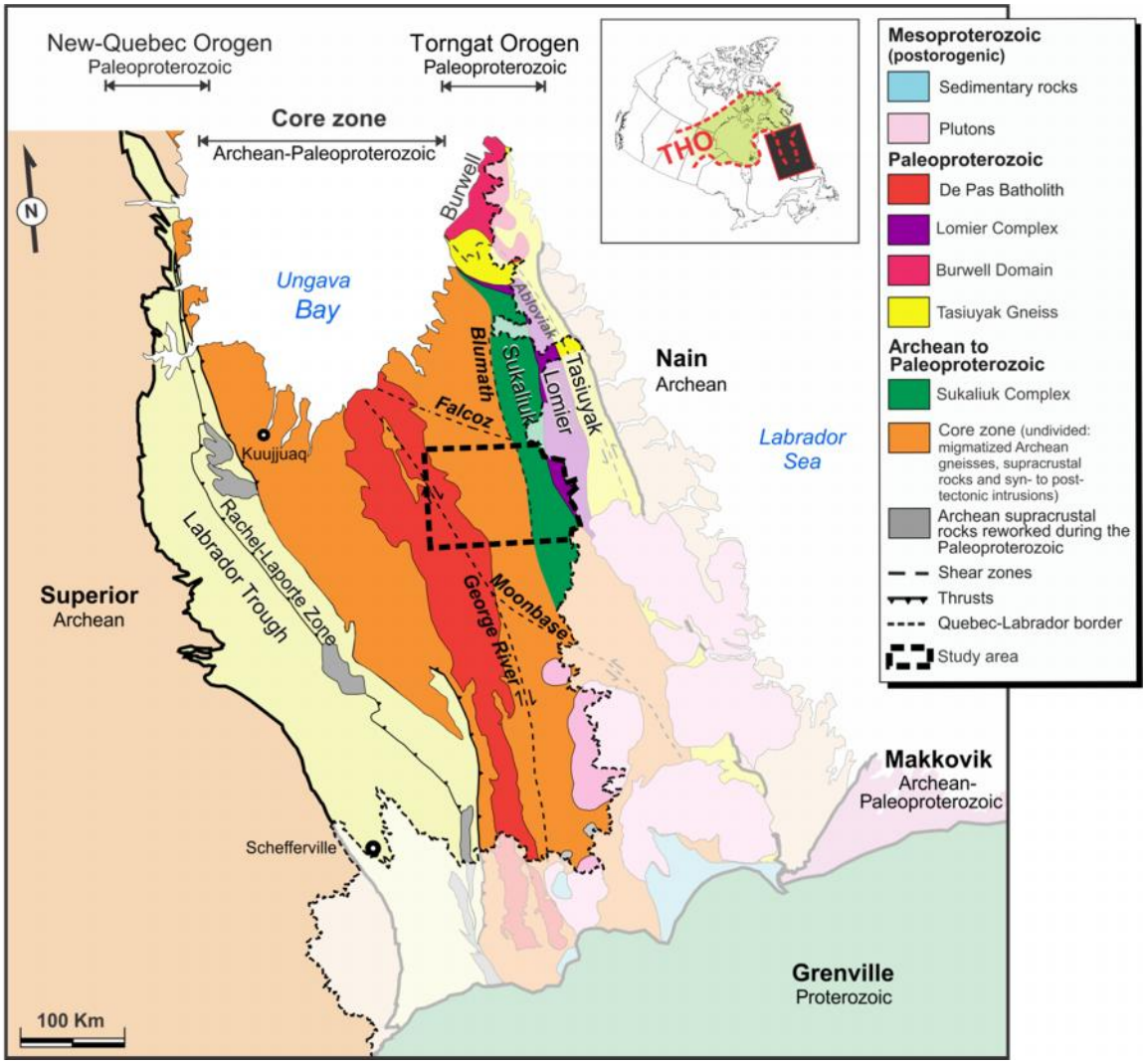

Figure 3-1**:** Geological setting of the Southeastern Churchill Province.

This figure shows its tripartite structure (New-Quebec Orogen – Core zone – Torngat Orogen) and the main domains and shear zones. The inset map shows the position of this geological province (black square) in the Trans-Hudson Orogen (THO). The study area is delimited by a bold dashed line. Modified from Wardle *et al.* (2002) after the works of Lafrance *et al.* (2015).

rocks at the core of this orogenic belt are affected by regional N-S shear zones that are exposed as granulite-facies and retrograde amphibolite- to greenschist-facies mylonites, such as in the Abloviak Shear Zone (ASZ). These shear zones record transpressional convergence between the CZ and Nain Craton (Goulet & Ciesielski, 1990; Van Kranendonk & Ermanovics, 1990; Van Kranendonk & Scott, 1992; Van Kranendonk, 1996; Mengel & Rivers, 1997; Ermanovics & Van Kranendonk, 1998).

The fan-shaped TO can be subdivided into four principal domains: the eastern Torngat foreland, the central Tasiuyak Gneisses and Lomier Complex, and the western Sukaliuk Complex. In addition, the Burwell and Four-Peak domains are present in the northern part of the TO.

The sub-vertical central axis of the orogen comprises partially melted pelitic to semi-pelitic paragneisses and quartzo-feldspathic gneisses (Tasiuyak Gneisses; Wardle, 1983), as well as metaplutonic rocks interpreted as the roots of a magmatic arc emplaced in the CZ margin by *c.* 1877 Ma (Lomier Complex; Bertrand *et al.*, 1993; Ermanovics & Van Kranendonk, 1998). Granulitic and highly-strained rocks of the axial zone contrast markedly with the sub-greenschist to amphibolite facies rocks of the Torngat foreland. The latter is interpreted as the passive margin sequence of the Nain Province (Wardle *et al.*, 2002). On the western flank of the TO are granulitic orthogneisses and paragneisses of the Sukaliuk Complex, which are in sharp tectonic contact with amphibolite-facies orthogneisses and paragneisses of the CZ. The Burwell domain dominates the northern part of the TO and contains Opx-bearing and Opx-absent plutonic suites that were emplaced into the Nain Craton margin and the Tasiuyak Gneisses (Van Kranendonk *et al.*, 1994; Scott, 1995a, 1995b, 1998; Scott & Machado, 1995; Van Kranendonk & Wardle, 1996; Campbell, 1997).

Previous geochronology and thermobarometry studies suggest that the Torngat orogenic belt underwent three distinct tectonometamorphic phases (Van Kranendonk, 1996; Mengel & Rivers, 1997; Ermanovics & Van Kranendonk, 1998; Scott, 1998; Wardle *et al.*, 2002). Following Burwell arc magmatism between *c.* 1910 and 1885 Ma (U-Pb zircon and monazite geochronology; Scott, 1995a, 1995b, 1998; Scott &

Machado, 1995), continental collision between the CZ and Nain Craton occurred at *c.* 1870-1850 Ma (U-Pb zircon and monazite geochronology on granulites and syn-collisional intrusions; Bertrand *et al.*, 1993) and is associated with development of the doubly-vergent structure and peak metamorphic conditions of 9.0-11.5 kbars and 800-950°C (Mengel & Rivers, 1990, 1991, 1997; Bertrand *et al.*, 1993; Rivers *et al.*, 1996; Van Kranendonk, 1996). Following crustal thickening, the second phase of collision occurred at *c.* 1845-1825 Ma (U-Pb dating of monazite and zircon from syntectonic intrusions; Bertrand *et al.*, 1993) and was accompanied by transpressional deformation that produced regional N-S shear zones (such as the ASZ), folding of the gneissic foliation, and subhorizontal mineral lineations (*e.g.*, Goulet & Ciesielski, 1990; Van Kranendonk & Ermanovics, 1990; Ermanovics & Van Kranendonk, 1998). This sinistral shearing was coeval with a gradual decrease of metamorphic P-T conditions to 5.0-7.3 kbars and 550-750°C (Mengel & Rivers, 1990, 1991; Van Kranendonk, 1996), and occurred in two pulses at the beginning and end of the second collisional phase (Van Kranendonk, 1996). Final exhumation and cooling is constrained between *c.* 1800 and 1730 Ma (based on Ar-Ar amphibole and biotite geochronology, U-Pb titanite geochronology, and Sm-Nd garnet geochronology; Mengel *et al.*, 1991; Bertrand *et al.*, 1993; Scott, 1995a, 1995b; Scott & Machado, 1995), and may have produced east-vergent mylonites affecting the northern part of the TO (*e.g.*, the Komaktorvik Shear Zone; Bertrand *et al.*, 1993; Scott, 1995a).

Compared with the high-grade sheared rocks of the TO, the Archean gneissic basement and overlying supracrustal rocks of the CZ are characterized by more pervasive but less intense deformation, and dominantly amphibolite-facies mineral

assemblages (Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015; Charette & Guilmette, 2014). Widespread partial melting of this region is expressed in the field by leucosome-residuum segregation, flow structures, and felsic intrusions interpreted as evolved anatectic products (Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015; Charette & Guilmette, 2014). Syn-tectonic intrusions are present throughout the CZ, the largest being the De Pas Batholith that extends over more than 600 km in a NNW-SSE axis. Most rocks of the CZ are deformed by large kilometric NNW-SSE and NW-SE shear zones outcropping as greenschist to amphibolite facies mylonites, such as the George River Shear Zone (GRSZ). The final phase of deformation in these shear zones may be coeval with oblique convergence during the New Quebec Orogeny (*e.g.*, James & Dunning, 2000; Wardle *et al.*, 2002). Based on numerical modelling, Ellis and Beaumont (1999) suggested that if the CZ behaved in a weakened manner during the New Quebec Orogeny, then deformation may have been transferred pervasively throughout the CZ and thus reactivated structures within the TO.

3.3. Field observations

The present study focuses on the western flank of the TO (Sukaliuk and Lomier complexes) and the eastern CZ, east of the GRSZ (Fig. 3-2). Before 1999, our knowledge of this remote part of the SECP was limited to a regional 1:1,000,000 map by Taylor (1979), a 1:50,000 map by Girard (1990b) in the Lomier Complex, and the coastal reconnaissance around Ungava Bay by Goulet and Ciesielski (1990). Recent mapping by the provincial geological survey highlighted the contrasting features of the hot, partially molten, and pervasively deformed CZ rocks and the granulitic, highly-

strained rocks of the TO (*e.g.*, Verpaelst *et al.*, 2000; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015).

3.3.1. Eastern Core Zone

East of the GRSZ, the CZ consists of Archean gneissic basement overlain unconformably by supracrustal rocks and intruded by Paleoproterozoic plutons. The Archean (c. 3030-2600 Ma) tonalitic to granitic orthogneisses frequently have migmatitic structures. Simard *et al.* (2013) and Lafrance *et al.* (2014, 2015) described the variable degree of partial melting of the Archean basement based on the proportion of leucosomes (10% to > 50%) and outcrop-scale flow structures (net-structure to stromatic migmatites). The large influence of partial melting is also reflected by outcrop-scale melt migration structures, and more regionally, by the genetic link between the migmatitic gneisses and large felsic masses interpreted as evolved partial melting products (anatectic granite; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015). Several *c.* 1850-1760 Ma ages from metamorphic zircons, monazites, amphiboles, biotites, and titanites from the gneisses, as well as crystallization ages of *c.* 1820-1805 Ma for anatectic granites, indicate that Paleoproterozoic metamorphism affected the Archean gneisses (*e.g.*, Nunn *et al.*, 1990; Ryan *et al.*, 1991; Isnard *et al.*, 1998; James & Dunning, 2000; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015). Migmatitic structures (stromatic to diatexite migmatites) are also commonly observed in the metasedimentary rocks assigned to the Lake Harbour Group. In the study area,

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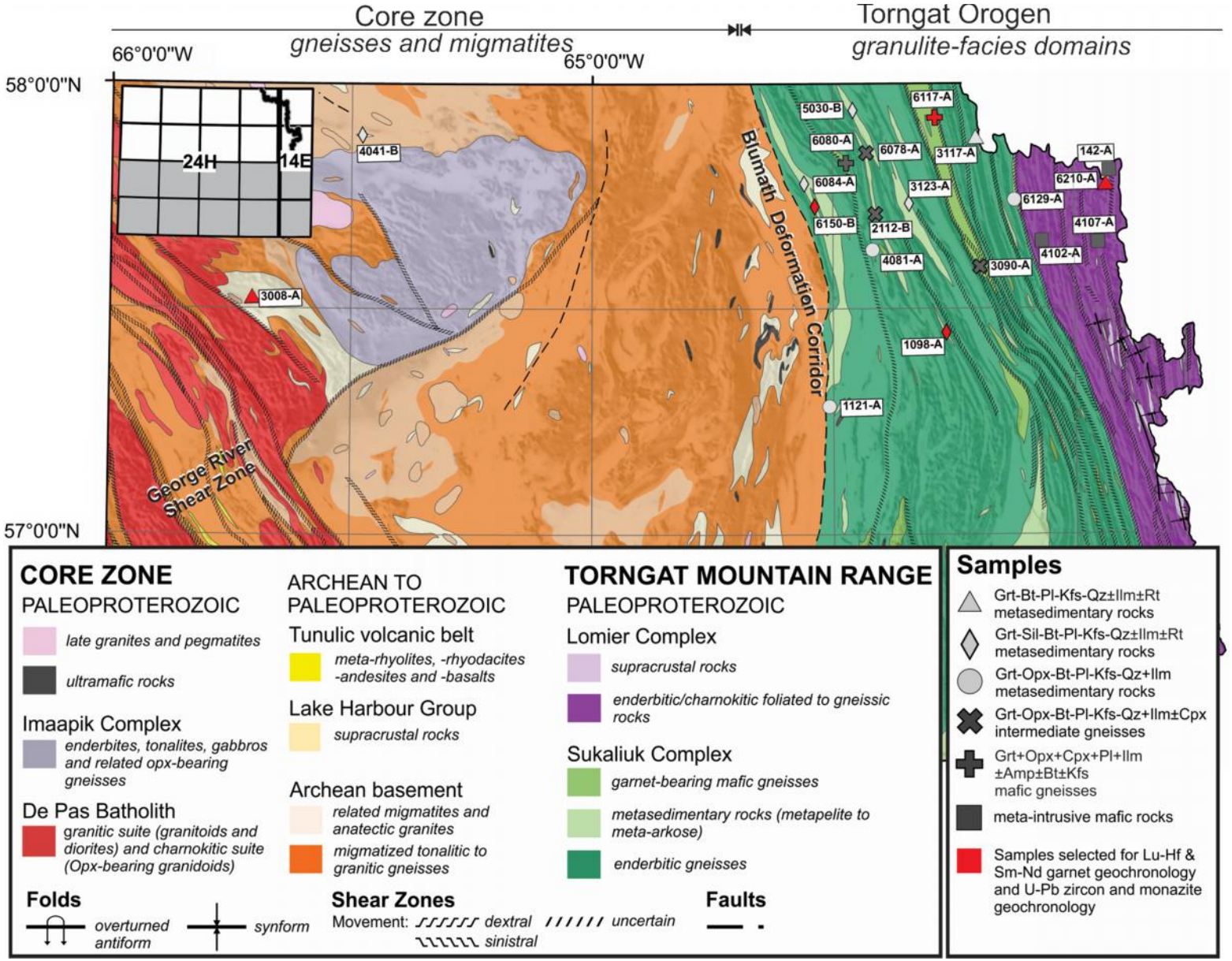
Figure 3-2: Regional geology of the study area and sample location.

To the west, the study area is limited by the George River Shear Zone. Light grey symbols are metasedimentary rock samples, dark grey symbols are intermediate and mafic samples, and red symbols are samples selected for geochronology. Grey hade background is magnetic susceptibility reflecting the regional structures. Simplified geological map after the works of Lafrance *et al.* (2015).


Core zone
gneisses and migmatites
Torngat Orogen
granulite-facies domains
66°0'0"W
65°0'0"W
58°0'0"N
57°0'0"N
24H
14E
4041-B
3008-A
5030-B
6080-A
6078-A
6117-A
3117-A
142-A
6084-A
3123-A
6210-A
6129-A
6150-B
2112-B
4107-A
4081-A
4102-A
3090-A
1098-A
1121-A
Blumath Deformation Corridor
George River Shear Zone
CORE ZONE
PALEOPROTEROZOIC
late granites and pegmatites
ultramafic rocks
Imaapik Complex
enderbites, tonalites, gabbros and related opx-bearing gneisses
De Pas Batholith
granitic suite (granitoids and diorites) and charnokitic suite (Opx-bearing granidoids)
ARCHEAN TO PALEOPROTEROZOIC
Tunulic volcanic belt
meta-rhyolites, -rhyodacites -andesites and -basalts
Lake Harbour Group
supracrustal rocks
Archean basement
related migmatites and anatectic granites
migmatized tonalitic to granitic gneisses
TORNGAT MOUNTAIN RANGE
PALEOPROTEROZOIC
Lomier Complex
supracrustal rocks
enderbitic/charnokitic foliated to gneissic rocks
Sukaliuk Complex
garnet-bearing mafic gneisses
metasedimentary rocks (metapelite to meta-arkose)
enderbitic gneisses
Samples
Grt-Bt-Pl-Kfs-Qz±Ilm±Rt metasedimentary rocks
Grt-Sil-Bt-Pl-Kfs-Qz±Ilm±Rt metasedimentary rocks
Grt-Opx-Bt-Pl-Kfs-Qz+Ilm metasedimentary rocks
Grt-Opx-Bt-Pl-Kfs-Qz+Ilm±Cpx intermediate gneisses
Grt+Opx+Cpx+Pl+Ilm ±Amp±Bt±Kfs mafic gneisses
meta-intrusive mafic rocks
Samples selected for Lu-Hf & Sm-Nd garnet geochronology and U-Pb zircon and monazite geochronology
Folds
overturned antiform
synform
Shear Zones
Movement: dextral
uncertain
sinistral
Faults

supracrustal sequences occur as kilometric slivers in the orthogneisses, and consist mostly of impure quartzite and pelitic to sub-pelitic metasedimentary rocks. Sillimanite is only locally observed and no Opx-bearing metasedimentary rocks are reported in the CZ (*e.g.*, Verpaelst *et al.*, 2000; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015).

The principal rocks intruding the CZ gneissic basement in the study area are part of the De Pas Batholith. These rocks are interpreted as part of a subduction-related or syn-collisional arc that formed by *c.* 1840-1805 Ma (U-Pb zircon geochronology), and which crosscuts the CZ over more than 600 km along a NNW-SSE axis (Krogh, 1986; Dunphy & Skulski, 1996; James *et al.*, 1996; Isnard *et al.*, 1998; James & Dunning, 2000). In addition, the Imaapik Complex, a circular 30-km wide Opx-bearing pluton, was emplaced by *c.* 1875-1851 Ma in the CZ gneisses (U-Pb zircon geochronology; Lafrance *et al.*, 2015). Both intrusions are syn- to post-tectonic and were affected by the GRSZ, which had a dextral strike-slip kinematic motion (Girard, 1990a; Bardoux *et al.*, 1998; Simard *et al.*, 2013; Lafrance *et al.*, 2014, 2015).

A gneissic fabric is developed in all pre-tectonic lithologies, and is frequently affected by partial melting, which produced irregular flow structures. The regional fabric tends to become parallel to the orogenic belt axis as it approaches the Blumath Deformation Corridor (BDC). This N-S corridor outcrops as shear zones with subhorizontal mineral lineations and sinistral kinematic indicators (Verpaelst *et al.*, 2000). In the study area, brittle faults parallel to the shear zones obliterate the ductile structures, and are associated with low-temperature alteration (*e.g.*, hematitization,

epidotization, and chloritization; Lafrance *et al.*, 2015). The BDC may represent the tectonic boundary between the amphibolite facies rocks of the CZ and the granulite facies rocks of the TO (Verpaelst *et al.*, 2000; Charette & Guilmette, 2014).

3.3.2. Western Torngat Orogen

The western flank of the TO consists of orthopyroxene-bearing paragneisses and orthogneisses that are subdivided in two lithodemic domains: the Sukaliuk Complex and the Lomier Complex. In both domains, pervasive transpressive deformation is reflected by steep NNW-SSE to N-S tectonometamorphic foliation and subhorizontal mineral stretching lineations. This pervasive deformation completely obscures stratigraphic and intrusive relationships. Discrete high-strain zones are also present as kilometric mylonite corridors with amphibolite facies mineral assemblages.

The Sukaliuk Complex is characterized by a tight, kilometric imbrication of felsic granulitic orthogneisses, paragneisses, and mafic gneisses parallel to the regional NNW-SSE trend of the orogen. Orthogneisses are dominantly felsic, but characteristically show a banded structure produced by decimetric dioritic layers and ribbons of coarse-grained leucocratic enderbites, which may represent evidence of partial melting (Lafrance *et al.*, 2015). Paragneisses consistently show clear evidence of partial melting and include sillimanite or orthopyroxene in addition to garnet, biotite, feldspar, and quartz. In the western Sukaliuk Complex close to the BDC, the proportion of leucosomes in outcrop increases significantly, and stromatic metatexite to schlieric diatexite and Grt-bearing anatectic granites are frequently observed. These features contrast with the transposed centimetric-to-decimetric Grt- or Opx-bearing leucosome ribbons observed elsewhere in the Sukaliuk Complex. Mafic gneisses are

often subordinate to paragneisses, but also form large kilometric lenses. These lithologies sometimes include garnet and show evidence of partial melting in the form of *in situ* melt pods and felsic ribbons containing large euhedral orthopyroxene crystals.

The Lomier Complex is distinguished from the Sukaliuk Complex by its dominance of magnetic metaplutonic rocks and gneisses, a limited abundance of supracrustal slivers, and strong sinistral deformation associated with the ASZ (Wardle *et al.*, 2002). The metaplutonic character of the Lomier Complex is reflected by an abundance of foliated to gneissic enderbites and charnockites, as well as recrystallized and weakly foliated mafic rocks. Large kilometric deformation corridors completely obliterate the granulitic mineralogy of the country rocks, and are associated with amphibolite facies mineral assemblages. Although intrusive relationships are obscured, Girard (1990b) suggested that gneisses within the Lomier Complex may represent deformed equivalents of foliated metaplutonic rocks. Imbricated within the metaplutonic rocks are kilometric to pluri-kilometric supracrustal slivers that are predominantly comprised of aluminous metasedimentary rocks and metabasalts as well as subordinate iron formations, marbles, calc-silicates, quartzites, and quartzo-feldspathic rocks (Girard, 1990b). The origin and crystallization age of this lithodemic domain is still controversial. Although Bertrand *et al.* (1993) obtained a U-Pb zircon crystallization age of 1877±1 Ma for an enderbite within the Lomier Complex, numerous dates between 1850 and 1820 Ma were also obtained (U-Pb zircon and monazite geochronology; Ermanovics & Van Kranendonk, 1998). Ermanovics & Van

Kranendonk (1998) suggested an arc origin for the Lomier Complex based on its calc-alkaline affinity and negative ƐNd values.

3.4. Sampling methodology

3.4.1. Multi-technique approach to constrain P-T-t-D paths

Undertaking tectonometamorphic studies in high-grade terrains requires extra considerations since initial assumptions for thermobarometry, phase equilibria modeling, and geochronology are unrealistic. To account for the effect of metamorphic processes on phase equilibrium and radioactive isotope systems, our approach for reconstructing the tectonometamorphic evolution of the TO and eastern CZ involves integration of thermobarometry on multiple protoliths with geochronology on different metamorphic minerals (garnets, zircons, and monazites) using multiple radioactive isotope systems (Lu-Hf, Sm-Nd, and U-Pb).

In high-grade terrains, element diffusion is enhanced because of high temperature and the availability of melt as an intercrystalline transport medium, which promotes chemical reactions and the attainment of equilibrium at peak metamorphic conditions. However, melt crystallization during retrograde evolution can affect the equilibrium conditions preserved in anatectic rocks (*e.g.*, White & Powell, 2002; Indares *et al.*, 2008; Guilmette *et al.*, 2011). Although prograde metamorphic microstructures may be preserved in residuum (isolated from melts; *e.g.*, Kriegsman, 2001), most melt-bearing rocks are re-equilibrated during melt crystallization (*e.g.*, Brown, 2002). Also, as highlighted by Florence & Spear (1991), Spear (1991, 1992), and Spear & Florence (1992), intracrystalline diffusion as well as exchange and net transfer reactions during cooling may severely alter the growth zoning and

composition of minerals, which may cause thermobarometry to yield erroneous P-T estimates even when using minerals in textural equilibrium.

In order to retrieve the largest spectrum of preserved metamorphic conditions, our sampling methodology focused on rocks with different solidus conditions, including metasedimentary rocks and intermediate to mafic gneisses. The higher vapor-free solidus conditions of mafic rocks results in lower melt production compared with metasedimentary rocks at equivalent metamorphic conditions. Hence, metamafic rocks will preferentially preserve near-peak metamorphic conditions, whereas metasedimentary rocks are more likely to preserve retrograde conditions in high-grade terrains (Fig. 3-3).

The effect of high-grade metamorphic conditions on zircon and monazite behavior in anatectic rocks has been demonstrated by case studies and modelling (*e.g.*, Roberts & Finger, 1997; Bea & Montero, 1999; Schaltegger *et al.*, 1999; Williams, 2001; Kelsey *et al.*, 2008; Yakymchuk & Brown, 2014). As predicted by phase equilibria modeling, zircons and monazites in high-grade terrains rarely yield ages corresponding to prograde metamorphism. Whereas protolith zircons are more resistant and may be preserved during prograde evolution, forward modeling of melt-bearing metasedimentary rocks predicts that, in most cases, monazites are more reactive and are preferentially dissolved prior to peak metamorphism. A small fraction of monazites may survive peak metamorphic conditions depending on the protolith composition, melt extraction processes, and P-T path (Kelsey *et al.*, 2008; Yakymchuk & Brown, 2014). In many case studies (*e.g.*, Roberts & Finger, 1997; Williams, 2001), zircon and monazite from anatectic rocks and granulites primarily record post-peak

metamorphic ages. Consistent with these observations, forward modeling predicts that new crystals will grow along the retrograde path, primarily when close to solidus conditions (Fig. 3-3). The proportion of inherited versus new metamorphic crystals depends in part on the REE concentration of the protolith and on melt extraction.

To obtain good time constraints for the different metamorphic stages of the Torngat Orogeny, we used Lu-Hf and Sm-Nd garnet geochronology as well as U-Pb zircon and monazite geochronology on multiple rock types. The U-Pb zircon and monazite dates are more likely to reflect retrograde crystal growth in anatectic rocks.

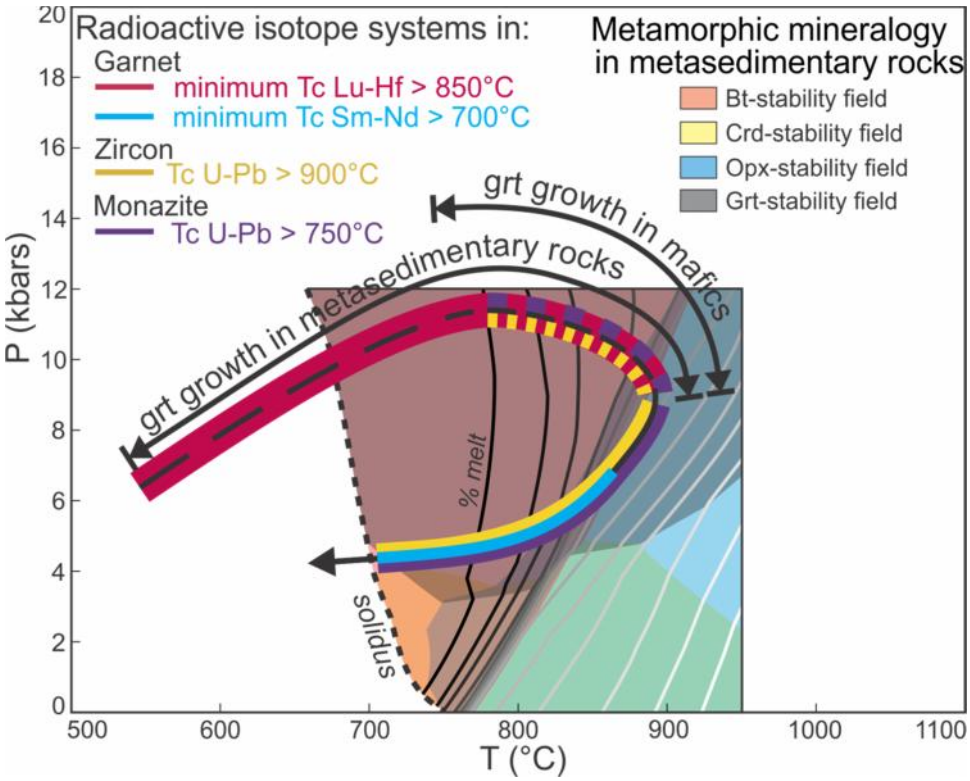


Figure 3-3: Schematic P-T path illustrating behavior of radioactive isotope systems in suprasolidus rocks at high-grade conditions.

Effective closure temperature for Lu-Hf and Sm-Nd in garnet are from Smit *et al.* (2013) and for U-Pb in zircon and in monazite are from Lee *et al.* (1997) and Spear and Parrish (1996), respectively. Mineral stability fields are taken from Johnson *et al.* (2008) who modeled phase equilibria for metagreywacke. Crd (yellow) + Opx (bleu) stability field is in green. Crd (yellow) + Bt (red) stability field is in orange light orange. Crd (yellow) + Bt (red) + Grt (grey) stability field is in dark orange.

In contrast, the Lu-Hf system in garnet can preserve the time of prograde garnet growth because of a high effective closure temperature (minimum $T_c > 850°C$ for a slow cooling rate, *i.e.*, 2-5°C/Ma; Smit *et al.*, 2013). On the one hand, garnets grow in metasedimentary rocks during a large segment of the prograde evolution, and henceLu-Hf garnet dates should reflect prograde metamorphism. On the other hand, garnets crystallize in metamafic rocks during the high-P segment of the prograde metamorphic path, resulting in Lu-Hf garnet dates that are weighted toward the age of peak metamorphism. Because of its lower effective closure temperature (minimum $T_c > 700°C$ for a slow cooling rate, *i.e.*, 2-5°C/Ma; Smith *et al.*, 2013), the Sm-Nd isotope system in garnets is expected to preserve cooling ages for upper amphibolite and granulite facies rocks, such as those preserved in the study area.

3.4.2. Samples

The lithologies sampled for this study are quartzo-feldspathic gneisses and intermediate to mafic meta-igneous rocks collected along a cross-section (> 100 km long) from the Lomier Complex (east) to the eastern CZ (west) (Fig. 3-2). Twenty samples were studied – 12 quartzo-feldspathic gneisses (CZ = 2, Sukaliuk Complex = 9, Lomier Complex = 1) and 8 intermediate and mafic rocks (Sukaliuk Complex = 5, Lomier Complex = 3). The two samples studied from the CZ were selected from petrographic analysis of 13 samples (see Charette & Guilmette, 2014). These selected samples had larger mineral assemblages and were homogeneous. No mafic samples were studied from the CZ because of their low abundance in the area

and because of their limited number of mineral phases (producing high degrees of freedom).

The quartzo-feldspathic samples are interpreted as metasedimentary rocks because of their abundant Al-rich minerals (*e.g.*, garnet and sillimanite), outcrop-scale compositional layering, and extensively developed migmatitic structures that range from stromatic metatexites to schlieric migmatites (*e.g.*, Figs. 3-4a-b). These lithologies are exposed as layered gneisses, where banding is produced by alternating layers of leucosomes, mesosomes/residuum, and sometimes paleosomes. In some cases (*e.g.*, sites 3008-A, 6150-A, 6084-A, 1098-A, and 6129-A), decimetric to metric layering is produced by a combination of differences in mineralogy, degree of partial melting, and rheological behavior, which suggests variations in protolith compositions. Only Lomier Complex sample 6210-A comes from a homogeneous outcrop where no clear evidence of partial melting was observed (Fig. 3-4f). Core Zone samples have no more than a few sillimanite crystals (<1%) and no orthopyroxene. By contrast, samples from the Lomier and Sukaliuk complexes generally include either sillimanite or orthopyroxene in addition to garnet and abundant biotite, feldspar, and quartz.

The intermediate and mafic samples from the Sukaliuk and Lomier complexes exhibit contrasting characteristics. In the Sukaliuk Complex, the samples are from garnet-bearing straight gneisses that are intermediate to mafic in composition (Fig. 3-4g). In the Lomier Complex, samples were collected from homogeneous, granoblastic, and garnet-free mafic rocks. In mafic lithologies, only limited evidence of partial melting was observed, such as centimetric melt pods with large orthopyroxene

crystals (Fig. 3-4h), with the exception of sample 6117-A where large Opx-bearing and Grt-bearing leucosomes were observed on outcrop (Fig. 3-4g).

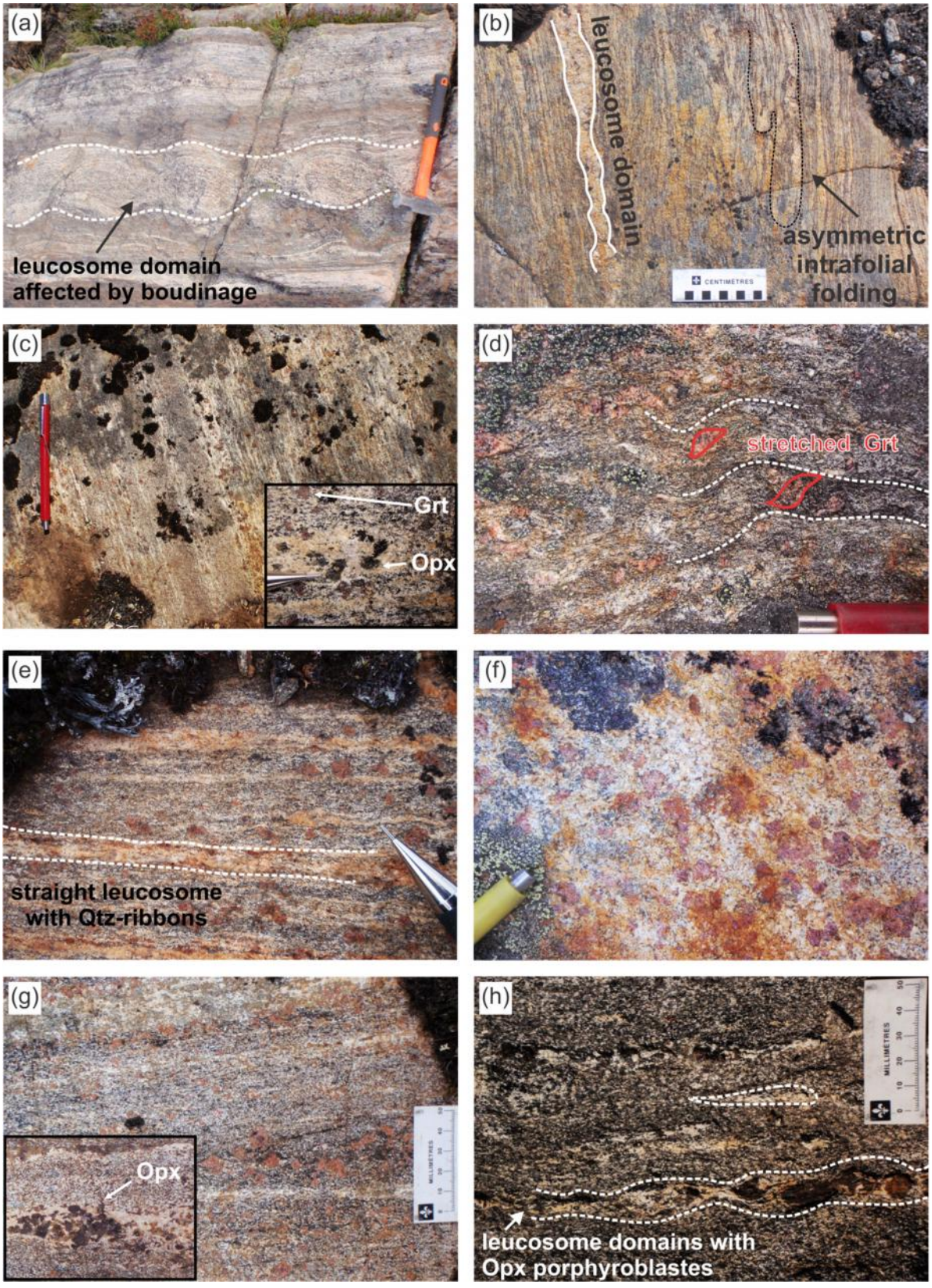
3.5. Petrographic analysis and mineral chemistry

3.5.1. Analytical methods

For partially melted rocks, samples were collected from mesosomes that form homogeneous layers. At the hand-sample scale, homogeneity and absence of melt migration structures suggest a closed system (except for the vapor phase). Leucosomes were avoided because prograde and peak metamorphic microstructures and mineralogical assemblages are more likely to be preserved in mesosomes and residuums (*e.g.*, Kriegsman, 2001; Brown, 2002; White & Powell, 2002).

For each sample, polished thin sections were studied using an optical microscope and SEM imaging (Appendix 1; Fig. S1). Energy Dispersive X-ray Spectroscopy – Scanning Electron Microscopy – Mineral Liberation Analysis (EDS-SEM-MLA) was conducted at the Memorial University of Newfoundland.

Figure 3-4: Representative structures of lithologies sampled for thermobarometry and geochronology. **a)-b)** partially molten metasedimentary rock (Grt+Bt+Pl+Kps+Qz+Ilm) influenced by melt segregation, melt migration, asymmetric folding and boudinage (Core Zone; panel a shows site where sample 3008-A was obtained); **c)** Grt+Sil+Bt+Pl+Kps+Qz+Ilm metasedimentary rocks with straight layering produced by melt segregation (Grt-Opx-bearing leucosomes are shown in inset; Sukaliuk Complex; site where sample 1098-A was obtained); **d)-e)** Grt+Opx+Bt+Pl+Kfs+Qz+Ilm±Opx migmatized metasedimentary rocks with straight layering and stretched garnets (Sukaliuk Complex); **f)** homogenous metasedimentary rocks with abundant large poikilitic garnets (Lomier Complex; site where sample 6210-A was obtained); **g)** Grt-Opx-Cpx-bearing mafic gneiss with Opx-bearing leucosomes (Sukaliuk Complex; site where sample 6117-A was obtained); **h)** granoblastic metagabbro with limited evidence for partial melting evidence (Opx-bearing melt pods).


(a)
leucosome domain
affected by boudinage
(b)
leucosome domain
asymmetric
intrafolial
folding
(c)
Grt
Opx
(d)
stretched Grt
(e)
straight leucosome
with Qtz-ribbons
(f)
(g)
Opx
(h)
leucosome domains with
Opx porphyroblastes

Mineral chemistry was investigated through spot analyses of major and trace element contents of solid solution minerals as well as garnet compositional maps (presented in Appendix 2; Table S1 and Fig. S2, respectively). Analyses were conducted on a CAMECASX-100 five-spectrometer electron microprobe located at Université Laval. For spot analyses, analytical conditions were set to 15.0 kV and 20.0 nA. Counts on the principal energy peak of each element were acquired during 15 to 20 seconds of analysis and were preceded by measurement of background counts for half this time. Calibration standards were minerals (GEO standard block of P&H Developments), oxides (Smithsonian microbeam standards), and metals (mineral standard mount MINM25-53 of Astimex Scientific Limited; reference samples from Jarosewich *et al.*, 1980). Data were reduced following procedures from Pouchou & Pichoir (1991; PAP model). All analyses with total major oxide contents below 98.5% and over 101.5% were rejected. Uncertainties on analyses are below 0.5 wt% (1σ). For Fe, Mn, Ca, and Mg garnet maps, analytical conditions were set to 15.0 kV and 100.0 nA. The map resolution is typically 512 by 512 pixels and the elements of interest were analyzed at 20 ms per pixel.

3.5.1. Results

Throughout the study area, a common feature of both metasedimentary rocks and intermediate-mafic rocks is their general textural equilibrium. Typical outcrop-scale structures and microstructures are presented in Figs. 3-4 and 3-5, respectively. Mineral chemistry diagrams and representative mineral analyses are presented in Fig. 3-6 and Table 3-1, respectively. Location of spot analyses and modal abundances

of minerals are reported with MLA imaging in Fig. S1 (Appendix 1). Mineral abbreviations used in this contribution come from Whitney and Evans (2010).

3.5.1.1. Metasedimentary rock samples

Metasedimentary rocks sampled from the Sukaliuk and Lomier complexes are composed of Grt-Bt-Pl-Kfs-Qz±Sil±Opx±Ilm±Rt, whereas those collected from the eastern CZ never include orthopyroxene, and sillimanite is only found as inclusions in garnets. In most cases, the samples have a gneissic structure produced by alternating ferromagnesian-rich layers (*i.e.*, including garnet, sillimanite, orthopyroxene, and biotite) and quartzo-feldspathic layers (*e.g.*, Figs. 3-4a-e). The partially melted character of metasedimentary rocks is reflected at the microscopic scale by the preservation of melt pseudomorphs trapped in garnet crystal lattices (Fig. 3-5a).

In ferromagnesian layers, garnet typically has a modal abundance of 1-13% (locally reaching up to 27%, *e.g.*, sample 6210-A). Garnet occurs as small (*i.e.*, < 1-2 mm) inclusion-free euhedral-to-subhedral porphyroblasts (type I; Fig. 3-5b), millimeter-scale (*i.e.*, 5-15 mm) subhedral porphyroblasts with an internal foliation parallel or slightly oblique to the external foliation (type II; Fig. 3-5c), and large centimeter-scale (*i.e.*, 1-4 cm) subhedral poikiloblasts (type III; Fig. 3-5d). Orthopyroxene ($En_{0.43-0.48}$, $Fs_{0.51-0.56}$, $Wo_{0.01}$) is sparsely present in three samples (1-2%) as fractured and fragmented crystals in ferromagnesian-rich layers, and less frequently as euhedral crystals in leucosomes. In other samples, sillimanite (1-7%) is present in ferromagnesian layers as tabular crystals that are parallel to the subhorizontal mineral lineation. Biotite is present in all samples (6-16%) and usually

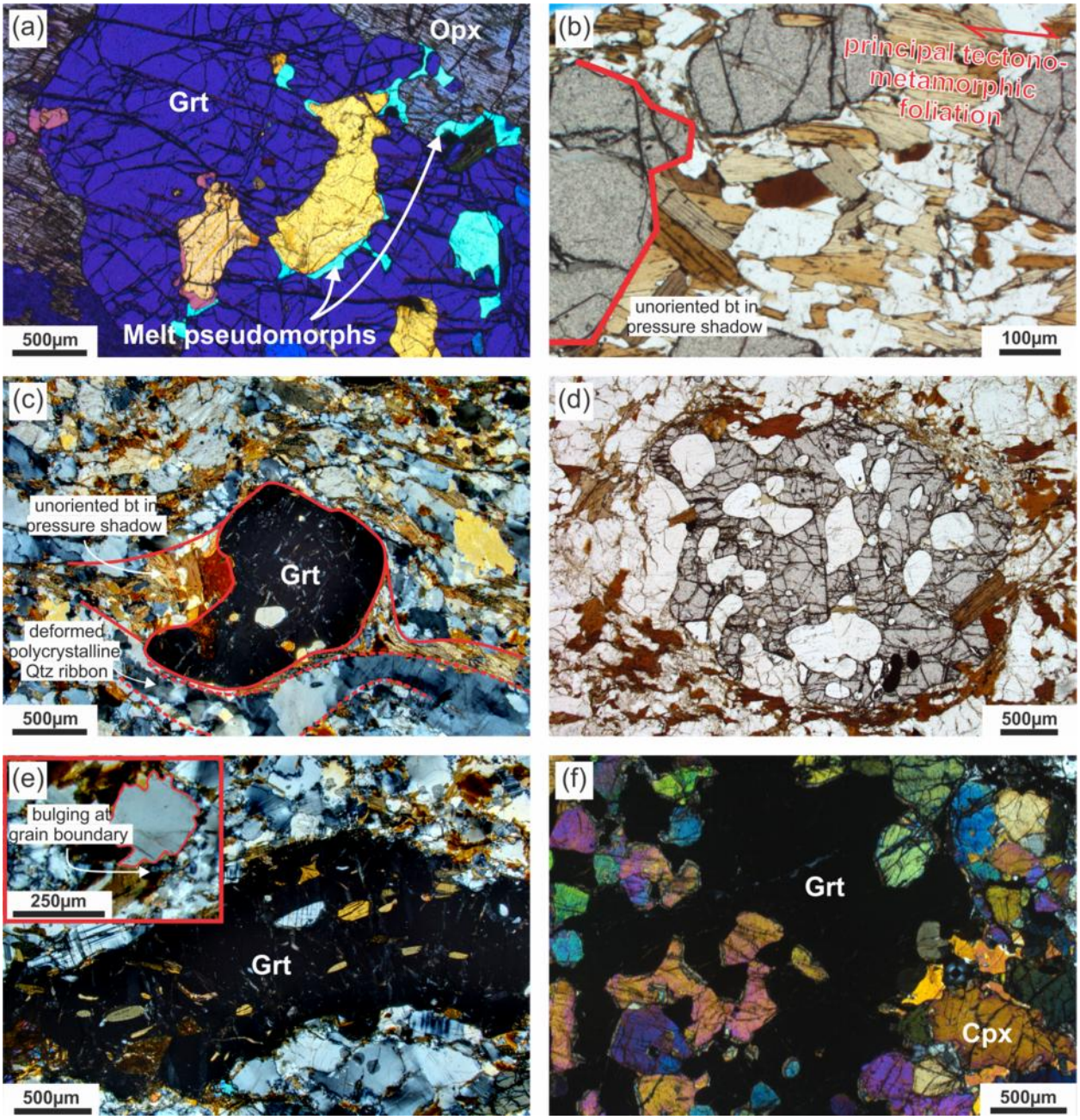


Figure 3-5: Representative microstructures.

a) melt pseudomorph trapped in garnet crystal lattice, picture from a Opx-bearing metasedimentary rock in the Sukaliuk Complex); **b)** euhedral type I garnet overprinting the external foliation, picture from a metasedimentary rock in the Core Zone; **c)** type II sigmoidal garnet crystal, picture from a metasedimentary rock in the Sukaliuk Complex; **d)** large Type III poikilitic garnet with quartz inclusions, picture from a migmatized metasedimentary rock in the Sukaliuk Complex; **e)** stretched type IV garnet crystal with an internal foliation parallel to the external foliation, picture from an intermediate gneiss in the Sukaliuk Complex; **f)** Intergrown Grt-Cpx producing the irregular crystal habits of type V garnets that mold the euhedral to subhedral pyroxene crystals, picture from a mafic gneiss in the Sukaliuk Complex.

has a tabular, euhedral to subhedral crystal habit, but sometimes has a skeletal microstructure, is kinked, or exhibits ductile deformation. Biotite crystals are oriented parallel to the regional tectonometamorphic foliation or to an oblique secondary foliation. In some samples, biotite crystals are not oriented in garnet pressure shadows (Fig. 3-5c).

Type I garnets are primarily from the CZ and have well-developed crystal faces that overprint the tectonometamorphic foliation (Fig. 3-5b), suggesting a late- to post-kinematic origin. Type II garnets are exclusively present in Torngat samples east of the BDC, and are often flattened parallel to the foliation or form sigmoidal shapes and pressure shadows where biotite crystallized (Fig. 3-5c), suggesting an early to syn-kinematic origin. Type III poikilitic garnets are locally observed in samples east of the BDC (*e.g.*, samples 6150-A and 6210-A), and have abundant quartz inclusions defining an internal foliation that is generally parallel to the external foliation (Fig. 3-5d), suggesting a syn-kinematic origin. There is no correlation between garnet composition and morphology. Instead, garnet chemistry is largely homogeneous between cores and mantles, and chemical zoning is limited to the rims (Fig. 3-6).

In samples containing Grt-Bt-Pl-Kfs-Qz±Ilm±Rt±Sil, garnets are almandine-rich ($Grs_{0.00-0.05}$, $Alm_{0.53-0.79}$, $Prp_{0.15-0.42}$, $Sps_{0.01-0.04}$, $Adr_{0.00-0.07}$) with only a minor increase in X_{Alm} and decrease in X_{Prp} at the rim (*i.e.*, < 5% variation; Fig. 3-6a). The proportion of spessartine and grossular end-members are homogeneous from core to rim (generally < 1% variation; Fig. 3-6a). Such flat patterns are characteristic of the obliteration of prograde zonation by intracrystalline diffusion at high temperature

(*e.g.*, Caddick *et al.* ,2010). The Fe-Mg variations at the garnet rims suggest chemical exchange with the surrounding matrix during retrograde metamorphism (Spear, 1991; Kohn, 2014). This local interaction is even more important when biotite crystals are in contact with garnets, producing Mg-depleted garnet rims (Fig. 3-6a).

By comparison, samples containing Grt-Opx-Bt-Pl-Kfs-Qz-Ilm include garnet that is more Ca-rich (*i.e.*, $Grs_{0.03\text{-}0.14}$, $Alm_{0.65\text{-}0.73}$, $Prp_{0.12\text{-}0.23}$, $Sps_{0.02\text{-}0.05}$, $Adr_{0.00\text{-}0.04}$). These garnets show a characteristic increase of X_{Grs} from 3.0-11.0% in the core to 8.0-14.0% in the rim (*i.e.*, 1.0-6.0% variation from core to rim; Fig. 3-6a), suggesting preservation of growth zoning. In general, Ca zoning is preferentially preserved because Ca diffusion is slow (Spear & Florence, 1992). However, in contrast to the bell-shaped Mn profiles typically produced during garnet growth (Hollister, 1966, 1969), the flat spessartine profiles of these garnets indicate intracrystalline high-T homogenization.

The Ti content and Fe/(Mg+Fe) ratio (Fe#) of biotites show two distinctive trends with respect to textural position (*i.e.*, in the matrix or shielded as inclusions in garnets) and location in the study area. Biotite crystals in the matrix usually have a slightly higher Fe# and Ti content compared to biotite inclusions in garnets (Fig. 3-6b). Because Ti substitution at the hydroxyl site of biotite is proportional to temperature when at or above amphibolite facies conditions (White *et al.*, 2007), higher-grade conditions are inferred to be preserved in the garnet core mineralogy. Only biotite inclusions in Opx-bearing metasedimentary rocks and some Sil-bearing metasedimentary rock samples of the Sukaliuk Complex have lower or similar Ti

Table 3-1: Representative mineral chemistry.

Analyses are classified by lithologies sampled from the different domains. Formula proportions of cations are based on: 6 oxygens for Opx; 8 oxygens for Pl, Kfs and Cpx; 22 oxygens for biotite; 23 oxygens for amphibole; and 24 oxygens for garnet. CZ = Core Zone; Suk = Sukaliuk Complex; Lom = Lomier Complex. C = Core; Grt-M = Garnet-Margin; Incl = Inclusion; M = Mantle; Mtx = Matrix; R = Rim.

Lithology	Grt-Bt±Sil metasedimentary rock																		Grt-Bt-Opx metasedimentary rock							
Mineral	Grt									Bt							Pl	Kfs	Grt				Bt	Opx	Pl	Kfs
Location	CZ			Suk			Lom			CZ	Suk			Lom			CZ	CZ	Suk				Suk	Suk	Suk	Suk
Sample	3008-A			6150-A			6210-A			3008-A	6150-A			6210-A			3008-A	3008-A	6129-A				6129-A	6129-A	6129-A	6129-A
Analysis#	7	8	9	10	11	12	4	5	6	11	4	5	6	2	4	5	1	8	1	2	3	4	11	10	10	4
	C	M	R	C	M	R	C	M	R	Mtx	Incl	Grt-M	Mtx	Incl	Mtx.	Grt-M	Mtx	Mtx	C	M-C	M-R	R	Mtx	Mtx	Mtx	Mtx
(wt%)																										
SiO_2	37.91	37.86	37.76	38.29	38.31	37.92	39.46	39.69	39.63	35.55	37.97	37.28	36.60	38.44	37.52	38.33	60.45	63.47	37.50	37.02	37.71	37.78	36.20	50.12	59.75	62.97
Al_2O_3	20.97	20.68	20.81	21.07	20.92	21.01	21.81	21.89	21.74	19.04	17.92	17.98	16.81	15.05	15.17	15.20	24.59	18.36	20.93	20.93	20.92	20.96	15.26	1.65	25.00	18.47
CaO	1.27	1.28	1.26	1.43	1.43	1.41	1.15	1.18	1.23	0.02	0.04	0.01	0.03	0.01	0.05	0.07	6.77	0.04	1.69	1.76	1.79	3.85	0.03	0.33	7.39	0.04
Na_2O	0.01	0.01	0.01	0.02	0.03	0.01	0.02	0.02	0.03	0.05	0.08	0.08	0.06	0.37	0.05	0.06	7.83	0.80	0.00	0.01	0.02	0.01	0.07	0.00	7.52	0.59
K_2O	-	-	-	-	-	-	-	-	-	10.11	9.54	10.08	9.88	9.86	10.23	10.16	0.21	15.23	-	-	-	-	9.40	0.00	0.16	15.49
FeO	33.23	33.32	33.75	30.58	30.86	32.59	25.86	26.00	25.90	17.96	8.88	12.15	15.65	6.77	10.88	8.13	0.06	0.00	33.02	32.83	32.63	31.21	19.61	31.16	0.04	0.15
Fe_2O_3	0.64	0.97	0.77	0.99	1.07	0.68	1.02	0.87	1.04	-	-	-	-	-	-	-	-	-	0.66	0.55	0.68	0.69	-	-	-	-
MgO	4.99	4.93	4.65	7.07	6.71	5.59	11.15	10.89	10.95	9.12	19.77	15.49	12.38	19.30	15.71	18.25	0.01	0.01	5.11	5.25	5.24	4.48	10.15	14.84	0.02	0.05
MnO	1.23	1.20	1.21	0.92	0.92	1.08	0.44	0.42	0.40	0.05	0.00	0.01	0.02	0.00	0.00	0.00	0.10	0.02	1.19	1.26	1.13	1.26	0.00	0.43	0.00	0.02
TiO_2	0.00	0.07	0.00	0.03	0.00	0.01	0.00	0.00	0.04	3.34	0.55	2.39	3.97	5.05	5.50	4.90	0.10	0.02	0.00	0.00	0.04	0.00	4.86	0.07	0.00	0.00
H_2O	-	-	-	-	-	-	-	-	-	3.61	3.35	3.49	3.54	3.22	3.09	3.02	-	-	-	-	-	-	3.77	-	-	-
Total*	100.32	100.33	100.25	100.46	100.40	100.41	100.96	101.04	101.05	99.69	99.11	99.94	99.77	99.57	99.90	99.92	100.19	99.40	100.18	99.62	100.34	100.28	100.34	98.62	99.94	99.66
Cations																										
Si	6.01	6.01	6.01	5.99	6.01	5.99	5.97	6.00	5.99	5.39	5.51	5.47	5.48	5.55	5.52	5.56	2.692	2.977	5.97	5.93	5.98	5.99	5.50	1.98	2.669	2.96
Al	3.92	3.87	3.91	3.88	3.87	3.91	3.89	3.90	3.88	3.40	3.07	3.11	2.97	2.56	2.63	2.60	1.291	1.015	3.93	3.95	3.91	3.91	2.73	0.08	1.316	1.02
Ca	0.22	0.22	0.22	0.24	0.24	0.24	0.19	0.19	0.20	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.323	0.002	0.29	0.30	0.31	0.65	0.01	0.01	0.353	0.00
Na	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.10	0.01	0.02	0.676	0.072	0.00	0.00	0.01	0.00	0.02	0.00	0.651	0.05
K	-	-	-	-	-	-	-	-	-	1.95	1.77	1.89	1.89	1.82	1.92	1.88	0.012	0.911	-	-	-	-	1.82	-	0.009	0.93
Fe^{2+}	4.41	4.43	4.49	4.00	4.05	4.31	3.28	3.29	3.28	2.28	1.08	1.49	1.96	0.82	1.34	0.99	0.002	0	4.39	4.40	4.33	4.14	2.49	1.03	0.002	0.01
Fe^{3+}	0.08	0.12	0.09	0.12	0.13	0.08	0.12	0.10	0.12	-	-	-	-	-	-	-	-	-	0.08	0.07	0.08	0.08	-	0.00	-	-
Mg	1.18	1.17	1.10	1.65	1.57	1.32	2.52	2.46	2.47	2.06	4.28	3.39	2.76	4.15	3.44	3.95	0.001	0	1.21	1.25	1.24	1.06	2.30	0.88	0.001	0.00
Mn	**0.17**	**0.16**	**0.16**	**0.12**	**0.12**	**0.14**	**0.06**	**0.05**	**0.05**	2.06	4.28	3.39	2.76	4.15	3.44	3.95	0.004	0.001	0.16	0.17	0.15	0.17	2.30	0.01	0	0.00
Ti	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.38**	**0.06**	**0.26**	**0.45**	**0.55**	**0.61**	**0.53**	1.291	0.001	0.00	0.00	0.01	0.00	**0.56**	0.00	1.316	0.00
X(Fe)	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.03**	**0.03**	**0.03**	**0.53**	**0.20**	**0.31**	**0.42**	**0.17**	**0.28**	**0.20**	-	-	**0.05**	**0.05**	**0.05**	**0.11**	**0.52**	0.54	-	-
X(Gr)	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.00**	-	-	-	-	-	-	-	-	-	**0.03**	**0.03**	**0.03**	**0.09**	-	-	-	-
X(Ab)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**66.88**	**7.15**	-	-	-	-	-	-	64.18	5.23
X(Or)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1.15**	**90.03**	-	-	-	-	-	-	0.91	91.18

*Totals for Bt and Amp are corrected for Cl-F

Table 3-1 (continued)

Lithology	Grt-Cpx±Opx±Amph±Bt intermediate to mafic gneiss														Metamafic and amphibolite				
Mineral	Grt				Bt			Cpx		Opx	Amp	Pl		Kfs	Cpx		Opx	Amp	Pl
Location	Suk				Suk			Suk		Suk	Suk	Suk	Suk	Suk	Lom		Lom	Lom	Lom
Sample	6080-A				6078-A			6117-A		6080-A	6080-A	6117-A	6078-A	6078-A	4107-A		4107-A	4102-A	4107-A
Analysis#	9	10	11	12	4	5	6	11	12	5	5	1	7	5	7	6	10	7	11
	M-C	C	M-R	R	Incl	Grt-M	Mtx	Mtx (C)	Mtx (R)	Mtx	Mtx	Mtx	Mtx	Mtx	Mtx (C)	Mtx (R)	Mtx	Mtx (C)	Mtx
(wt%)																			
SiO_2	37.66	37.54	37.53	37.81	37.23	36.79	36.61	52.20	52.56	50.38	41.69	56.69	58.89	64.58	52.06	52.63	52.85	43.79	60.242
Al_2O_3	20.53	20.56	20.49	20.71	14.86	13.80	13.95	1.72	1.21	0.84	12.05	27.23	25.62	18.10	2.51	1.97	1.10	10.70	24.864
CaO	7.16	7.17	7.06	7.16	0.00	0.03	0.00	22.49	21.96	0.48	11.64	10.17	8.05	0.02	21.13	22.72	0.57	11.47	7.327
Na_2O	0.02	0.00	0.02	0.01	0.06	0.02	0.05	**0.34**	**0.30**	0.00	1.52	6.03	7.12	0.42	**0.72**	**0.63**	0.01	1.71	7.289
K_2O	-	-	-	-	9.81	10.03	9.97	0.00	0.00	0.00	1.74	0.12	0.25	16.28	0.01	0.00	0.00	0.69	0.511
FeO	28.32	28.20	28.64	29.10	16.19	19.24	19.83	10.83	11.80	32.44	18.10	0.00	0.03	0.30	9.46	8.06	21.68	17.55	0.079
Fe_2O_3	1.41	1.34	1.39	1.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MgO	4.02	4.14	3.89	3.45	13.51	10.93	9.89	11.91	12.40	14.24	8.00	0.00	0.01	0.01	13.49	13.82	21.81	10.07	0.006
MnO	1.07	1.00	1.09	1.17	0.00	0.01	0.00	0.19	0.17	0.42	0.10	0.00	0.00	0.00	0.46	0.42	1.08	0.28	0.003
TiO_2	0.09	0.05	0.08	0.14	4.46	5.46	6.08	0.25	0.18	0.08	2.51	0.00	0.00	0.00	0.32	0.24	0.02	1.70	0.003
H_2O	-	-	-	-	3.64	3.46	3.49	-	-	-	1.84	-	-	-	-	-	-	1.94	
Total*	100.40	100.02	100.27	100.68	100.69	100.82	100.86	99.95	100.58	98.93	99.38	100.31	100.03	100.03	100.17	100.48	99.17	100.07	100.43
Cations																			
Si	5.96	5.95	5.95	5.98	5.55	5.58	5.56	1.97	1.97	2.00	7.90	2.54	2.63	3.00	1.93	1.94	1.99	6.49	2.68
Al	3.83	3.84	3.83	3.86	2.61	2.46	2.49	0.08	0.05	0.04	2.69	1.44	1.35	0.99	0.11	0.09	0.05	1.87	1.304
Ca	1.21	1.22	1.20	1.21	0.00	0.00	0.00	0.91	0.88	0.02	2.36	0.49	0.39	0.00	0.84	0.90	0.02	1.82	0.349
Na	0.01	0.00	0.01	0.00	0.02	0.01	0.02	**0.03**	**0.02**	0.00	0.56	0.52	0.62	0.04	**0.05**	**0.05**	0.00	0.49	0.629
K	-	-	-	-	1.87	1.94	1.93	-	-	-	0.42	0.01	0.01	0.96	-	-	-	0.13	0.029
Fe^{2+}	3.75	3.74	3.80	3.85	2.02	2.44	2.52	0.34	0.35	1.08	0.00	0.00	0.00	0.01	0.24	0.19	0.68	1.69	0.003
Fe^{3+}	0.17	0.16	0.17	0.12	-	-	-	0.00	0.02	0.00	2.87	-	-	-	0.06	0.06	0.00	0.49	-
Mg	0.95	0.98	0.92	0.81	3.00	2.47	2.24	0.67	0.69	0.84	2.26	0.00	0.00	0.00	0.75	0.76	1.22	2.23	0
Mn	**0.14**	**0.14**	**0.15**	**0.16**	3.00	2.47	2.24	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.03	0.03	0
Ti	0.01	0.01	0.01	0.02	**0.50**	**0.62**	**0.69**	0.01	0.00	0.00	0.36	1.44	1.35	0.00	0.01	0.01	0.00	0.19	1.304
X(Fe)	**0.20**	**0.20**	**0.20**	**0.20**	**0.40**	**0.50**	**0.53**	**0.34**	**0.35**	**0.56**	**0.56**	-	-	-	**0.28**	**0.25**	**0.36**	**0.49**	-
X(Gr)	**0.16**	**0.16**	**0.15**	**0.17**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X(Ab)	-	-	-	-	-	-	-	-	-	-	-	**51.39**	**60.68**	**3.72**	-	-	-	-	**62.43**
X(Or)	-	-	-	-	-	-	-	-	-	-	-	**0.69**	**1.39**	**95.61**	-	-	-	-	**2.88**

*Totals for Bt and Amp are corrected for Cl-F

contents compared with matrix crystals. In addition to these textural differences, a spatial increase in the Ti content of biotite is observed from west to east across the study area for both matrix and inclusion crystals. In addition, the Fe# of biotites from the Lomier Complex are significantly lower compared to those of the Sukaliuk Complex and the CZ (Fig. 3-6b). For example, in Grt-Bt-bearing metasedimentary rock samples, the Fe# of biotites increases from 0.16-0.28 to 0.28-0.43 to 0.43-0.54 in the Lomier Complex, Sukaliuk Complex, and CZ, respectively, which may reflect differences in metamorphic conditions and/or protolith compositions.

When present, microlithons generally defined by the lepidoblastic biotite foliation consist of quartz and feldspar. Plagioclase and K-feldspar compositions are constant within each sample and are in general $An_{0.27-0.43}$, $Ab_{0.56-0.72}$ and $Ab_{0.03-0.23}$, $Or_{0.74-0.94}$, respectively (Table S1; Appendix 2). In these quartzo-feldspathic layers, deformation microstructures are well exposed and reveal distinctive deformation and metamorphic crystallization relationships for metasedimentary rocks east and west of the BDC. Samples from the Sukaliuk Complex and Lomier Complex are affected by a pronounced NNW-SSE tectonometamorphic foliation and show dynamic recrystallization microstructures that are expressed in the quartzo-feldspathic matrix as bulging, subgrain rotation (producing core-and-mantle microstructures), grain boundary migration, and deformed polycrystalline quartz ribbons (*e.g.*, Fig. 5c). These microstructures affected the early-kinematic porphyroblasts (*e.g.*, garnet and orthopyroxene), and therefore suggest that dynamic recrystallization occurred after growth of the peak metamorphic mineral assemblage. In contrast, CZ samples collected west of the BDC are characterized by a weakly developed, variably oriented

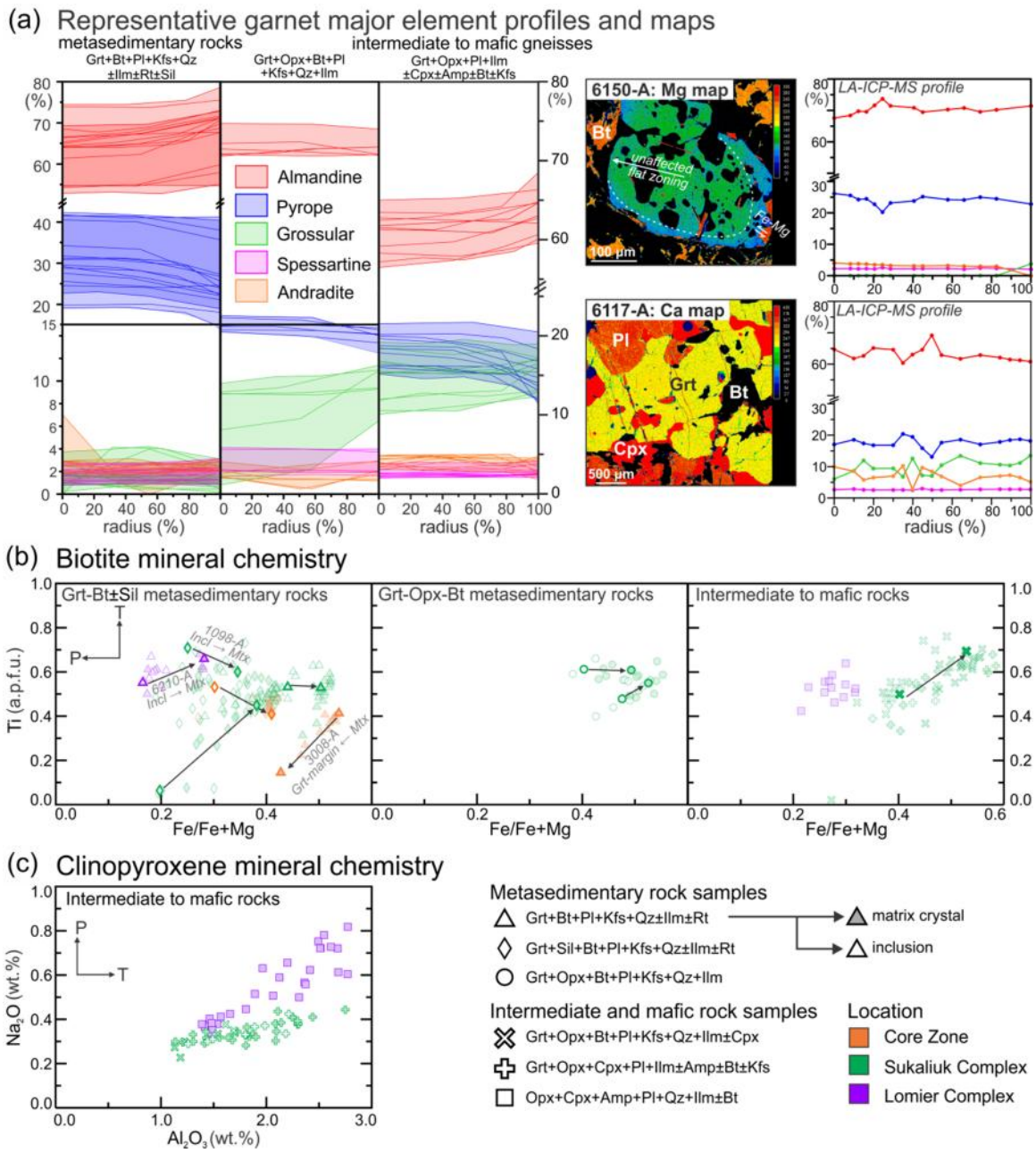


Figure 3-6: Mineral chemistry from microprobe and LA-ICP-MS analyses.

a) representative garnet profiles. 6150-A Mg map and LA-ICP-MS garnet profile illustrate Mg-depletion and Fe-enrichment at garnet rim when in contact with biotite. 6117-A Ca map and LA-ICP-MS garnet profile illustrate the slight increase of Ca from core to rim, but the generally flat profiles of major elements in garnets; **b)** biotite composition. Arrows show the general trends observed in data. Trends in sample selected for advanced metamorphic study are identified by the sample number. **c)** clinopyroxene composition. Variations of mineral composition with P-T conditions are illustrated by schematic P-T graphs. Abbreviations: Mtx = matrix; Incl = inclusions.

tectonometamorphic foliation and have a weakly deformed quartzo-feldspathic matrix with dihedral angles in equilibrium (at ~ 120°) or local bulging at grain boundaries. Hence, the eastern CZ metamorphic mineralogy is late to post-kinematic.

3.5.1.2. Intermediate and mafic rock samples

The intermediate and mafic rocks have a different mineralogy in the Sukaliuk Complex versus the Lomier Complex. In the Sukaliuk Complex, these samples always contain garnet and orthopyroxene, and sometimes clinopyroxene, in addition to the assemblage Pl-Kfs-Ilm±Amp±Bt±Qz. Mafic rocks from the Lomier Complex do not include garnet and always contain both pyroxenes as well as Amp-Pl-Qz-Ilm±Bt. In contrast to the metasedimentary rocks, the intermediate and mafic rocks are characterized by a granoblastic microstructure and are only slightly affected by dynamic recrystallization. Microstructures related to high temperature deformation processes are limited to a very fine-grained fraction at grain boundaries (produced by bulging), and are most commonly observed in samples from the Sukaliuk Complex.

In the Sukaliuk Complex, garnets have a modal abundance of 2-11% in intermediate and mafic rocks. In intermediate samples, garnets are spatially associated with pyroxene and are present as subhedral millimetric-to-centimetric porphyroblasts with polymineralic inclusions (type IV; Fig. 3-5e). These garnets are generally flattened parallel to the principal foliation and have multiple inclusions (dominantly quartz) oriented parallel to the external foliation (*e.g.*, samples 2112-B and 6078-A), suggesting a syn-kinematic origin. In mafic samples, euhedral garnets with few inclusions are intergrown with clinopyroxene, forming centimetric polycrystalline aggregates (type V; Fig. 3-5f).

The chemistry of garnet porphyroblasts in intermediate and mafic rocks is similar for all samples, defining a single pattern in which X_{Alm} and X_{Grs} slightly increase by up to 6% from core to rim (*i.e.*, cores: Grs $_{0.10\text{-}0.18}$, Alm $_{0.58\text{-}0.66}$, Prp $_{0.14\text{-}0.22}$, Sps $_{0.02\text{-}0.03}$, Adr $_{0.02\text{-}0.05}$; rims: Grs $_{0.12\text{-}0.18}$, Alm $_{0.60\text{-}0.68}$, Prp $_{0.11\text{-}0.21}$, Sps $_{0.02\text{-}0.03}$, Adr $_{0.02\text{-}0.07}$; Fig. 3-6a). As for Opx-bearing metasedimentary rocks, the increase of Ca content is inferred to be characteristic of growth zoning. However, flat profiles of X_{Sps} suggest that the growth zoning was partially obliterated by intracrystalline diffusion. There is no evidence for garnet resorption such as higher Mn contents at garnet rims (Kohn, 2014).

In both the Sukaliuk Complex and Lomier Complex, orthopyroxene and clinopyroxene are in textural equilibrium and generally have a euhedral crystal habit. In intermediate rocks from the Sukaliuk Complex, these crystals are flattened parallel to the principal foliation. Within each sample, the composition of orthopyroxene is homogeneous (En $_{0.41\text{-}0.53}$, Fs $_{0.46\text{-}0.58}$, Wo $_{0.01\text{-}0.04}$). However, orthopyroxene crystals from the Lomier Complex are more enstatite-rich (En $_{0.60\text{-}0.64}$, Fs $_{0.35\text{-}0.39}$, Wo $_{0.01\text{-}0.02}$), except for a metagabbro retrogressed to the amphibolite facies (En $_{0.48\text{-}0.49}$, Fs $_{0.50\text{-}0.51}$, Wo $_{0.01}$). Clinopyroxene from both domains have a Na composition that is proportional to the Al composition, which are used as proxies for the high-pressure jadeite component and the high-temperature Al-Al substitution (Tschermak's component). Clinopyroxene from the Sukaliuk Complex have generally lower Na content (0.23-0.42 wt%; En $_{0.31\text{-}0.37}$, Fs $_{0.17\text{-}0.31}$, Wo $_{0.36\text{-}0.48}$) compared with crystals from the Lomier Complex (0.34-0.82 wt%; En $_{0.34\text{-}0.42}$, Fs $_{0.13\text{-}0.20}$, Wo $_{0.40\text{-}0.48}$; Fig. 3-6c).

Amphiboles are classified as hornblende to potassian hornblende (Leake *et al.*, 2004) based on chemical formula calculations, assuming 23 oxygens. The amphiboles are in textural equilibrium with pyroxenes in metagabbros from the Lomier Complex, whereas they are present as hornblende-plagioclase symplectites that locally replace pyroxenes in mafic gneisses from the Sukaliuk Complex.

In intermediate rocks and in mafic samples 6080-A and 6117-A, biotite occurs as subhedral intergranular crystals aligned in one or two orientations, whereas in other mafic samples, anhedral biotite crystals replace pyroxenes. Plagioclase and K-feldspar compositions of matrix crystals and inclusions in garnet are constant and indistinguishable ($An_{0.34-0.49}$, $Ab_{0.51-0.64}$, and $Ab_{0.02-0.11}$, $Or_{0.88-0.96}$, respectively).

3.5.2. Microstructural interpretation

Field observations and petrographic analysis corroborate the granulitic and highly-strained, ductiley-deformed character of the Torngat rocks east of the BDC. In samples from the eastern domains, stretched garnets, dynamic recrystallization microstructures, and subhorizontal mineral lineations comprising ductiley-deformed quartz ribbons and sillimanite crystals together characterize a region of ductile, highly-strained deformation (Torngat mountains) that is most likely related to the transpression phase of the Torngat Orogeny. We suggest that in the Sukaliuk Complex and Lomier Complex, peak metamorphism predated or was early-kinematic compared with the principal transpressional deformation that overprints all prior structures. In contrast, peak metamorphism in the CZ was late-kinematic.

Overall, the textural equilibrium and geochemistry of the studied samples suggest high temperature metamorphic conditions and slow cooling rates during the

Torngat Orogeny. Very few disequilibrium mineral assemblages and sluggish microstructures (*e.g.*, local hornblende-plagioclase symplectites around pyroxenes) are observed, suggesting limited retrograde reactions. The generally flat major element profiles in garnets are consistent with efficient intracrystalline element diffusion at high temperature. In metasedimentary rocks, the limited chemical zonation in garnets and the textural equilibrium with matrix minerals is interpreted to reflect continuous re-equilibration of the suprasolidus mineral assemblage by a combination of high-grade conditions and exsolution of H_2O as a vapor phase during melt crystallization. Only the small Fe-Mg zoning at garnet margins may reflect local disequilibrium, which is interpreted as localized sub-solidus retrograde reactions with adjacent minerals. The only vestiges of prograde metamorphism in metasedimentary rock samples are melt pseudomorphs in garnet cores and garnet-quartz intergrowths, which both indicate that garnet cores are peritectic phases (see Waters, 2001, for further discussion). In Opx-bearing metasedimentary rocks and in intermediate and mafic gneisses, the flat Mn profiles also suggest important intracrystalline diffusion. However, prograde Ca zonation is partially preserved. This relic of prograde growth may have been preferentially preserved in these lithologies because of both smaller melt production (thus limiting element mobility) and the slower diffusion rate of Ca (Spear & Florence, 1992).

In summary, evidence of partial melting was observed on outcrop and in thin section. Overall, chemical and textural homogeneity characterize the samples over the entire study area. Hence, we suggest that the Lomier Complex, the Sukaliuk Complex, and the CZ were all affected by high-grade metamorphic processes. The main

differences between these domains are the absence of orthopyroxene in the CZ samples, and the high-grade intracrystalline deformation and mineral lineations that overprint peak metamorphic mineral assemblages in the Sukaliuk and Lomier complexes. Therefore, the BDC could be regarded as an Opx isograd and the western limit of high-grade transpression deformation. However, no metamorphic geochronology data are available and an obvious break in peak metamorphic P-T conditions has not been recognized so far. Therefore, it remains uncertain whether or not the BDC represents the western limit of the TO.

3.6. Geochronology

3.6.1. Samples

To constrain the timing of metamorphism associated with the Torngat Orogeny, 5 of the 20 studied samples were selected for U-Pb zircon and monazite geochronology and Lu-Hf and Sm-Nd garnet geochronology (Fig. 3-2). The samples include one metasedimentary rock from the eastern CZ, two metasedimentary rocks and one Grt-bearing mafic gneiss from the Sukaliuk Complex, and one metasedimentary rock from the Lomier Complex.

3.6.1.1. Eastern Core Zone

Sample 3008-A is a Grt-Bt-Pl-Kfs-Qz-Rt metasedimentary rock sampled from a pluri-kilometric lense of supracrustal rocks within the Lake Harbour Group. In outcrop, fine-grained homogeneous metasedimentary rocks alternate with decimeter-thick bands of medium-grained quartzo-feldspathic rocks, interpreted as migrated melt (anatectic granite; Fig. 3-4a). Millimetric to centimetric ribbons of leucosome

are also present within the metasedimentary rocks. The sample collected for geochronology is from a homogeneous metasedimentary layer where very few leucosomes were observed. In thin section, type I garnets are observed (*i.e.*, 0.5-2 mm pinhead garnets with few or no inclusions; Fig. 3-5b). Subhedral to subrounded zircon crystals are in the matrix, and monazites often produce pleochroic halos in biotite.

3.6.1.2. Sukaliuk Complex

The two Sukaliuk metasedimentary rocks sampled for geochronology are part of metasedimentary sequences in which compositional variation is expressed by changes in mineral assemblages and the degree of partial melting. Located ~ 2 km east of the BDC, metasedimentary rock sample 6150-A is part of a kilometric band of migmatites and Grt-bearing anatectic granites. In outcrop, pluri-metric bands of diatexite with Grt-Bt-Sil schlierens, interpreted as residuum, alternate with layers of metasedimentary rocks with lower degrees of partial melting (*i.e.*, metatexite). The metasedimentary rock sample chosen for U-Pb geochronology has the assemblage Grt-Sil-Bt-Pl-Kfs-Qz-Rt and includes 10-20% of leucosomes segregated in millimetric-to-centimetric ribbons. In thin section, garnets show intergrowth microstructures with quartz (type III garnet; 2-5 cm; Fig. 3-5d), which indicates inefficient diffusion of Si during crystallization of this peritectic phase, possibly related to melt extraction or segregation as suggested by Waters (2001). Zircon occurs primarily as free crystals in the matrix that are approximately 100 μm in diameter. Monazite is present as free, stubby, or sometimes elongated crystals (~100 μm) in the matrix, or as very small rounded crystals (<100 μm) shielded in garnet.

Metasedimentary rock sample 1098-A was collected farther southeast in a small kilometric supracrustal lense. These supracrustal rocks are characterized by alternating decimetric to metric layers of Sil-bearing migmatized metasedimentary rocks, Opx-bearing metasedimentary rocks, Grt-rich layers (up to 30% garnet), and Grt- or Opx-bearing quartzo-feldspathic bands interpreted as migrated leucosomes (Fig. 3-4b). The selected sample has a Grt-Sil-Bt-Pl-Kfs-Qz-Rt mineral assemblage and includes small leucosomes segregated in thin ribbons parallel to the tectonometamorphic foliation. In thin section, garnet crystals (type II) are flattened parallel to the planar fabric and prismatic sillimanite marks the stretching lineation. Few zircons are observed in thin section and are generally present in the matrix. Monazite is present in the matrix as free, large, and subrounded or stretched crystals (up to 300 μm), or less frequently as small subrounded inclusions (~ 100 μm) within garnets.

Sample 6117-A is a Grt-Opx-Cpx-Bt-Pl-Kfs-Ilm mafic gneiss collected in a pluri-kilometric lenticular band comprising a sequence of meta-mafic gneisses and metasedimentary rocks within the regional enderbitic gneiss. In outcrop, the mafic gneiss sampled dominantly occurs as Grt-Opx-Cpx layers that alternate at a decimeter-to-meter scale with Grt-rich layers and Grt-Opx-bearing leucosomes (Fig. 3-4g). In thin section, type IV garnets are observed (~ 0.5-1 cm; Fig. 3-5f). Zircon crystals are mostly present in the matrix and no monazite crystals were observed.

3.6.1.3. Lomier Complex

Metasedimentary rock sample 6210-A was collected from a hectometric lense of supracrustal rocks within the Lomier Complex enderbitic gneiss. This homogeneous

outcrop is characterized by abundant (20-30%) centimetric garnets (~ 1-4 cm; Fig. 3-4f). Garnet-quartz intergrowth (type III garnets) is observed in thin section. In the quartzo-feldspathic matrix, small and subrounded zircon and monazite crystals (~100 μm) are present as free crystals or as inclusions in feldspars. Monazites are also observed as very small inclusions (50-100 μm) in garnets.

3.6.2. U-Pb zircon geochronology

3.6.2.1. Analytical method

U-Pb isotope analyses were conducted by laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) at the University of Toronto following standard procedures (*e.g.*, Krogh, 1973; Corfu, 1988) that are summarized in Appendix 3. BSE and CL imaging of zircons are available in Fig. S3 (Appendix 4).

Concordia diagrams and probability density histograms (Fig. 3-7) were calculated using *Isoplot V. 4.15* (Ludwig, 2011). Error ellipses illustrated in Fig. 3-7 and uncertainties in the text are reported at the 2σ level. Dates reported are based on $^{207}Pb/^{206}Pb$ ratios to minimize the effect of small amounts of recent Pb loss, which is inferred to be minimal based on the low discordance of U-Pb analyses for < 1.95 Ga zircons (96% of the 103 analyses are below or equal to ±5% discordance; 99% are below ±6% discordance). All analyses that were discordant by more than 6% were rejected. Because of their high U content, 11 zircons for sample 3008-A (CZ) were analysed by measuring ^{235}U instead of ^{238}U and have a large degree of discordance.

Dates from Archean to early Paleoproterozoic fractured, subrounded zircon cores are reported but the main focus of this study is on homogeneous zircons and

zircon overgrowths that can date metamorphic event(s). These old zircons may have underwent multiple Pb loss events, particularly for zircon cores in sample 1098-A that are in most cases highly discordant. When a large number of subrounded zircon cores (> 1.95 Ga) were analysed from a sample (*i.e.*, n > 25), detrital zircon populations were distinguished based on unmixing of multi-component data using Gaussian deconvolution. However, as studies suggest that more than 80-100 detrital zircon dates per sample are needed to be confident that major sedimentary source components have been detected (*e.g.*, Morton *et al.*, 1996; Whitehouse *et al.*, 1997; Fernandez-Suãrez *et al.*, 2000), sedimentary provenances were not identified.

3.6.2.2. Results

U-Pb isotope analyses, $^{207}Pb/^{235}U$, $^{206}Pb/^{238}U$ and $^{207}Pb/^{206}Pb$ dates and degree of discordance are reported in Appendix 4 (Table S2). Concordia diagrams and probability density histograms are presented in Fig. 3-7. In all samples, analyses are scattered along or close to Wetherill's concordia curve.

In metasedimentary rock sample 3008-A from the CZ, zircons are either homogeneous stubby crystals with high U content, or prismatic to rounded crystals characterized by a core and overgrowth structure. Fractured and rounded cores have oscillatory or sector zoning, whereas overgrowths have a higher and uniform U content. Twenty-six analyses of homogeneous zircons and zircon overgrowths, with Th/U ratios typical of metamorphic zircons (in general < 0.1), yield dates between 1879 and 1825 Ma. These dates define a frequency maximum around *c.* 1854 Ma. Ten fractured cores and homogeneous U-rich crystals with higher Th/U ratios (generally ≥ 0.5) yield dates between 2597 and 2019 Ma.

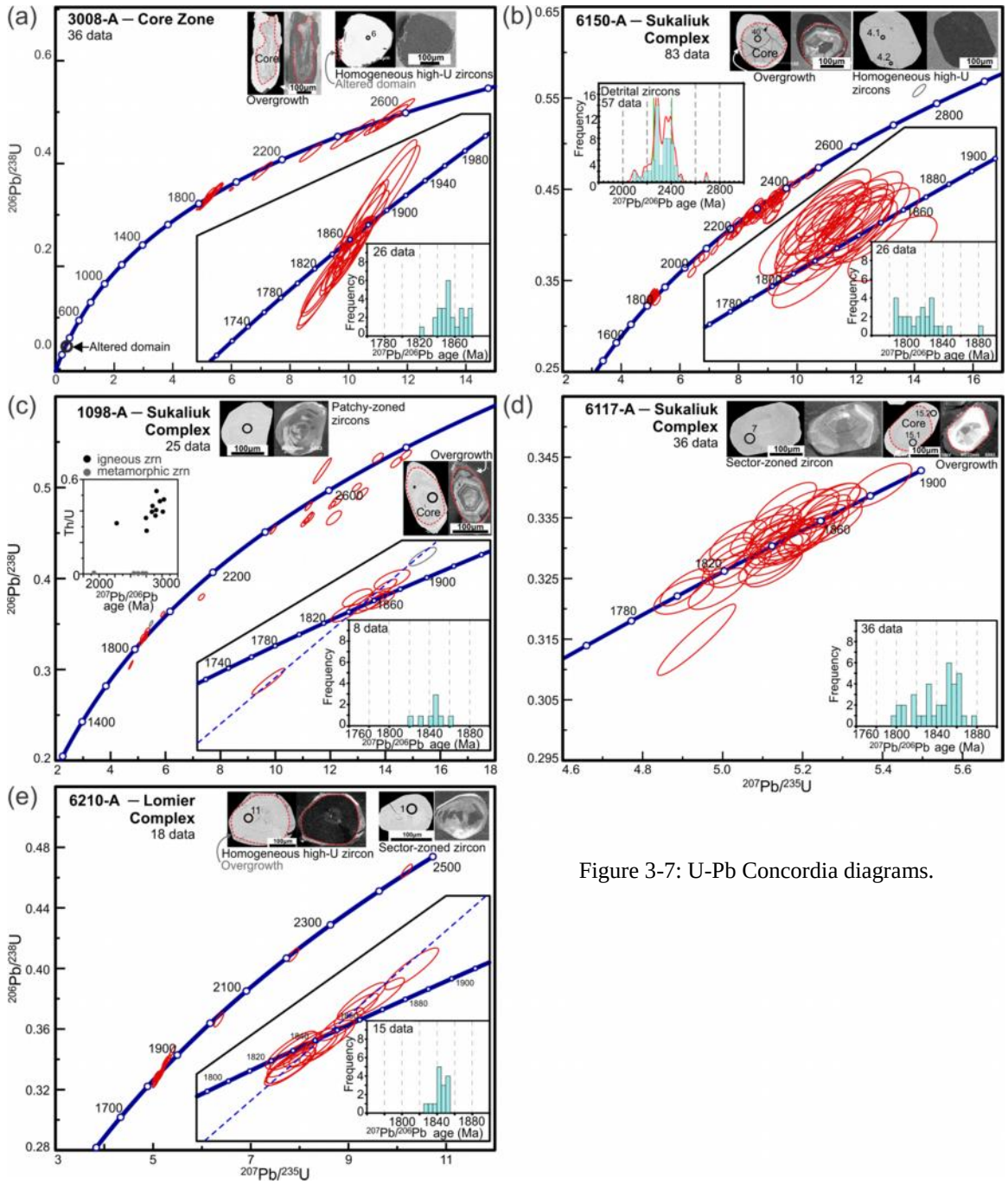


Figure 3-7: U-Pb Concordia diagrams.

Zircons in Grt-Sil-bearing metasedimentary rock 6150-A from the Sukaliuk Complex are either stubby idiomorphic crystals with homogeneous U content, or prismatic crystals with sector zoning that frequently form a mantle around fractured cores. Twenty-six analyses of stubby and prismatic zircons (generally having Th/U < 0.1) yield younger dates between 1884 and 1780 Ma. In general, dates are evenly distributed within the interval 1850-1780 Ma, with only small frequency peaks at *c.* 1825 and 1790 Ma. Analyses of 57 fractured zircon cores with oscillatory or sector zoning and typical igneous Th/U ratios (~ 0.1-1.0) yield dates between 2690 and 1884 Ma, with two principal peaks around *c.* 2400 and 2250 Ma.

Most zircons recovered from the Grt-Sil metasedimentary rock farther east in the Sukaliuk Complex (sample 1098-A) are zircon cores, homogeneous zircons, and zircon overgrowths. Only six zircons with sector zoning and two zircons with homogeneous U contents (typically Th/U < 0.1) yield dates between 1869 and 1826 Ma. Other zircons (16) define older dates between 2824 and 1935 Ma. Zircons with dates of *c.* 2600-1935 Ma can be distinguished from older fractured zircons with oscillatory zoning and higher Th/U ratios (> 0.2) by their different morphologies (*i.e.*, either overgrowths or high-U homogeneous zircons) and their Th/U ratios (in most cases < 0.1).

In mafic gneiss sample 6117-A from the Sukaliuk Complex, most zircons (29) are characterized by sector zoning and only a few crystals (4) have a homogeneous U content. All 36 analyses have igneous Th/U ratios of ~ 0.1-0.6 regardless of morphology and yield dates ranging from 1878 to 1799 Ma. The main frequency peak

in zircon dates occurs at *c.* 1850 Ma, and two smaller peaks occur at *c.* 1835 and 1820-1800 Ma. No zircon cores older than 1.9 Ga were recovered from this sample.

The stubby, subrounded zircon crystals in sample 6210-A from the Lomier Complex dominantly have a homogeneous U content and both igneous and metamorphic Th/U ratios (~ 0.0-0.8). Some zircons show sector zoning and occasionally have a thin overgrowth with lower U content. Fifteen zircons yield a narrow range of dates between 1854 and 1827 Ma, and define a frequency peak at *c.* 1845 Ma. Three homogeneous U-rich zircons yield older dates between 2447 and 2039 Ma.

3.6.2.3. Interpretation of U-Pb zircon dates

With the exception of mafic sample 6117-A, all samples yield two zircon populations. An older Archean to early Paleoproterozoic population (c. 2825 to 2000 Ma) is dominantly defined by fractured cores that often have oscillatory zoning, or by homogeneous U-rich crystals. A younger Paleoproterozoic population (c. 1885 to 1780 Ma) is defined by zircons with various morphologies. Older zircons typically have Th/U ratios indicative of crystallization from felsic melts (~ 0.1-1.0), and are interpreted as detrital. Younger zircons have, in most cases, Th/U ratios typical of metamorphic zircons (< 0.1) and are interpreted to have crystallized over a long period of high-temperature metamorphism. Only in sample 6117-A and 6210-A do metamorphic zircons have higher Th/U ratios (0.2-0.8), possibly due to U partitioning into the melt, a characteristic feature of granulite facies metamorphism (Bea & Montero, 1999). In sample 1098-A, a third population of Neoarchean to early

Paleoproterozoic zircons (2600-1935 Ma) with low Th/U ratios (< 0.1) may represent evidence of early metamorphic events.

The younger zircon population typically defines a metamorphic crystallization interval of 50-80 Myr. The metasedimentary rock sample from the Lomier Complex yields a smaller time interval for this population but a smaller number of zircons were recovered from this sample. The variable zircon morphologies within each sample and the obliteration of zircon microstructures (*e.g.*, relic ghost microstructure, homogenized crystals, and corrosion fronts) suggest a complex history of crystallization and dissolution, changes in crystallization conditions, and post-crystallization alteration of zircons during high-temperature metamorphic processes. In particular, protracted replacement/recrystallization and annealing during the Torngat Orogeny may explain the 50-80 Myr range of concordant metamorphic zircon ages. Therefore, we interpret the time span covered by the younger zircon population as a minimum duration for high-grade Torngat metamorphism. In addition, we interpret frequency peaks in the zircon population as important phases of the Torngat Orogeny.

For most samples, with the exception of 6150-A and 6210-A, the first record of metamorphic zircon crystallization is about 20 to 30 Myr prior to a peak in zircon dates at *c.* 1860-1840 Ma. This peak is coeval with the previously reported age of *c.* 1845 Ma for transpression and development of major N-S shear zones based on U-Pb zircon and monazite geochronology of syntectonic intrusions and cross-cutting relationships (Bertrand *et al.*, 1993). For Torngat samples influenced by transpression and in which this important zircon crystallization event is more clearly defined

(samples 6117-A and 6210-A), the peak in zircon dates is compatible with a lowering of metamorphic conditions to amphibolite facies, an input of fluids, and high element mobility through intracrystalline dislocation pathways. Together, these processes likely enhanced crystallization of new zircons and recrystallization of older zircons (*e.g.*, as observed in the Brevard zone mylonites; Wayne & Sinha, 1988).

A younger metamorphic zircon crystallization event at *c.* 1820-1800 Ma is primarily recorded in Grt-Sil-bearing metatexite 6150-A and mafic gneiss 6117-A. This event could mark final melt crystallization as solidus conditions were approached, as it is frequently observed in melt-bearing rocks (*e.g.*, Rubatto *et al.*, 2001; Williams, 2001) and predicted by phase equilibria modeling (*e.g.*, Kelsey *et al.*, 2008; and Yakymchuk & Brown, 2014). As sample 6150-A is significantly influenced by partial melting, this *c.* 1820-1800 Ma zircon population may have crystallized primarily from the large amount of leucosomes. Although it was not expected that mafic gneiss 6117-A preferentially preserved this retrograde metamorphic event, the youngest zircon subpopulation in mafic gneiss 6117-A may reflect the accumulation of leucosomes (as observed on outcrop) rich in incompatible elements, thus enabling crystallization of zircon at solidus conditions.

3.6.3. U-Pb monazite petrochronology

3.6.3.1. Analytical method

Isotopic analyses of monazites followed the same methodology as for zircons (see Appendix 3 for details). Dates reported are based on $^{207}Pb/^{206}Pb$ ratios in order to minimize the effect of recent Pb loss, which is inferred to be minimal based on the low discordance of U-Pb analyses (91% of the 93 analyses are below or equal to ±5%

discordance; 97% are below ±6% discordance). All analyses with discordance greater than 6% were rejected. Although the ^{206}Pb abundance in monazite is biased upward by excess ^{206}Pb due to the high partitioning of ^{230}Th (an intermediate decay product of ^{238}U) relative to U during crystal growth (Schärer, 1984), this effect should be negligible for Precambrian ages.

Yttrium (Y) profiles and maps as well as chemical spot analyses of different monazite growth domains were conducted on the CAMECASX-100 five-spectrometer electron microprobe located at Université Laval. Analytical conditions were set to 15 kV and 40 nA for Y profiles and maps, and 15 kV and 20 nA for spot analyses. In all cases, the beam diameter was 5 μm. Acquisition and data reduction methodology is the same as detailed for mineral chemistry. Y profiles were acquired with a dwell-time of 500 ms. Y maps of monazites were produced for grains showing typical zoning profiles. The map resolution is either 512x512 pixels or 256x256 pixels, and Y was analyzed at 20 ms per pixel. Spot analyses and maps are available in Appendix 5 (Table S3 and Fig. S5, respectively). All spot analyses below 95% and over 105% were rejected.

3.6.3.2. Results

For the entire study area, $^{207}Pb/^{206}Pb$ monazite dates range from *c.* 1885 to 1760 Ma. Most samples record a crystallization history spanning *c.* 60-80 Myr (Fig. 3-8). The Y content of monazites is generally low (< 800 ppm) and is poorly correlated with $^{207}Pb/^{206}Pb$ dates. U-Pb isotope analyses of monazites and the Y content of the corresponding domain are reported in Appendix 5 (Table S4). No monazites were recovered from mafic gneiss 6117-A (Sukaliuk Complex).

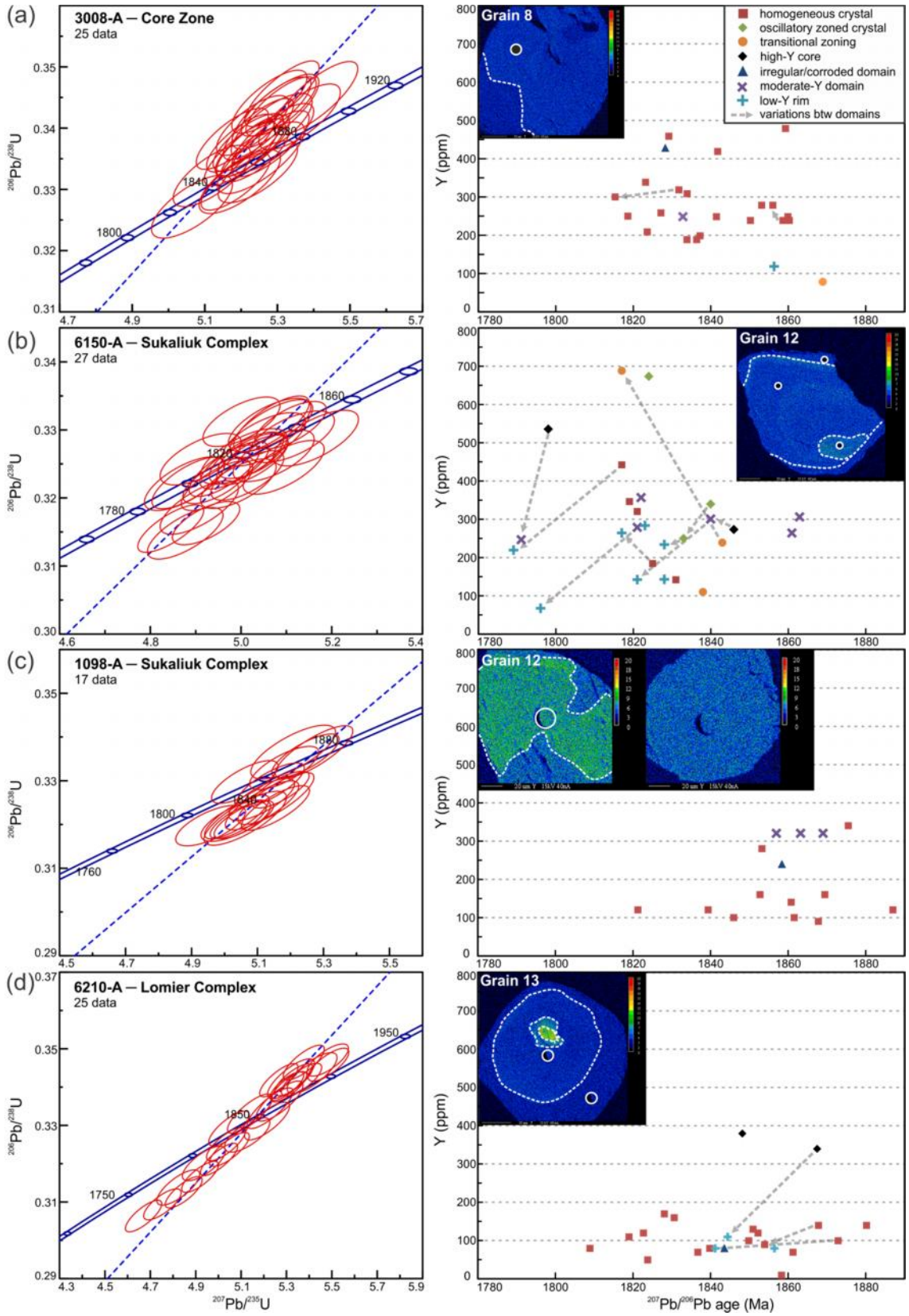


Figure 3-8: U-Pb monazite petrochronology, showing concordia diagrams and associated cross-plot of Y-content versus age of monazite domains.

In sample 3008-A from the CZ, Y profiles and maps revealed that grains are generally homogeneous (except for slightly lower Y content at rims or in irregular domains). Analyses with the lowest Y content (< 150 ppm) are from the oldest domains (c. 1869-1857 Ma). Monazite domains between *c.* 1860 and 1835 Ma have slightly lower Y concentrations (~ 200-300 ppm) compared with 1835-1815 Ma domains (Y > 300 ppm). Only four domains have high Y contents (Y ≥ 400 ppm), which either correspond to homogenous crystals or to a corroded domain.

Monazites from Grt-Sil-bearing metatexite 6150-A in the Sukaliuk Complex have complex morphologies and dates that range from 1863 to 1789 Ma. In most cases, monazite grains contain large homogeneous domains with intermediate Y concentrations (200-350 ppm) and thin low-Y rims (< 200 ppm). Some crystals also include rounded cores, whereas others show oscillatory zoning. Independent of their morphology, large monazite domains yield dates between *c.* 1865 and 1820 Ma, whereas low-Y rims indicate a depletion of the Y reservoir at *c.* 1830-1790 Ma. The highest Y contents (~ 700 ppm) are found in *c.* 1825-1820 Ma monazite domains.

Sample 1098-A includes monazite crystals with two principal domains: 1) an intermediate-Y domain (Y ~ 300 ppm) that sometimes has large embayments suggesting dissolution/chemical corrosion, and 2) a lower-Y domain (Y ~150 ppm) that surrounds the more Y-rich domain. Some monazite grains are homogeneous and have low Y contents. The intermediate-Y domains define a narrow time interval from 1875 to 1850 Ma, whereas low-Y domains crystallized over a longer period (c. 1887-1821 Ma).

In the Lomier Complex, monazites from sample 6210-A are generally homogeneous except for local low-Y rims or small and irregular high-Y domains (up to 350 ppm). The monazites yield dates between 1880 and 1809 Ma.

3.6.3.3. Interpretation of U-Pb monazite dates

In metapelitic rocks, the Y budget is governed by crystallization and dissolution of xenotime and garnet because Y is compatible with these minerals (Bea & Montero, 1999; Foster *et al.*, 2002, and references therein). Since xenotime generally disappears during amphibolite facies via garnet-forming reactions, garnet is the main Y reservoir at granulite facies conditions. Therefore, during prograde metamorphism, monazites crystallizing during garnet growth are Y-poor. Through retrograde garnet breakdown reactions, the Y-matrix reservoir is replenished, and monazites crystallized during this time have higher Y concentrations. Although idealized, this model highlights how *in situ* dating and mineral chemistry may help link dates to important metamorphic reactions.

Melt production and migration also affects monazite ages and REE mass balance. Phase equilibria modeling and geochronology studies (Rubatto *et al.*, 2001; Williams, 2001; Kelsey *et al.*, 2008; Yakymchuk & Brown, 2014) indicate that most or all monazites are dissolved at upper-amphibolite to granulite-facies peak conditions (725-775°C for metapelites and 750-800°C for metapsammite; Kelsey *et al.*, 2008). Most studies agree that, in suprasolidus rocks, monazite is less robust and is typically dissolved completely before zircon except in rare circumstances (Kelsey *et al.*, 2008, Yakymchuk & Brown, 2014). Therefore, most monazites are expected to grow during retrograde metamorphism in high-grade rocks. Moreover, in high-grade suprasolidus

rocks with leucosomes saturated with apatite, zircon and monazite (and thus have increasing P, LREE and Zr content with higher metamorphic grade), melt migration influences rock composition (Bea & Montero, 1999). Hence, granulite-facies samples from the Torngat mountains were not only susceptible to monazite dissolution during peak metamorphism but also had limited monazite crystallization during retrograde metamorphism because of LREE- and P-depletion via melt migration.

Together, U-Pb dates and Y concentrations of monazites can be interpreted in terms of garnet growth-resorption and melt crystallization. In the metasedimentary rock from the eastern CZ (sample 3008-A), the slightly higher Y concentration in younger monazites (c. 1835-1795 Ma) either suggests that younger monazites crystallized from melt or that final monazite crystallization was coeval with garnet resorption. High-Y monazites with dates of *c.* 1825-1820 Ma are also observed in the Grt-Sil-bearing metatexite sample 6150-A (Sukaliuk Complex). Since garnet zonation profiles do not suggest significant resorption, this time range is interpreted as the age of an important melt crystallization event. This interpretation is also compatible with results from U-Pb zircon geochronology. In sample 6150-A, the lower Y concentrations in younger monazites (< 1800 Ma) may reflect the exhaustion of the matrix Y reservoir after this important monazite crystallization event. A decrease in temperature below the solidus, thus limiting the diffusion radius and the availability of elements, is also a possible explanation for the lower Y content of rim domains.

In contrast, monazites from granulitic metasedimentary rocks of the Sukaliuk and Lomier complexes (samples 1098-A and 6210-A, respectively) consistently have low Y contents (< 200 ppm) during the entire monazite crystallization history (1887-

1809 Ma), which suggests crystallization during or after garnet growth. This characteristic of the deformed granulite-facies rocks from the Torngat mountains may also reflect efficient melt extraction in these domains compared with samples farther west. Sample 1098-A represents an exception in that both high-Y and low-Y monazites crystallized coevally in the interval 1875-1850 Ma. This observation may reflect melt-residuum segregation that produced Y-rich leucosome domains and Y-depleted residuum domains where garnet once grew.

3.6.4. Lu-Hf and Sm-Nd garnet geochronology

3.6.4.1. Analytical method

Lu-Hf and Sm-Nd isotope analyses of garnets were carried out by Isotope Dilution Multi-Collector Inductively Coupled Plasma Mass Spectrometry (ID-MC-ICP-MS) at the Peter Hooper GeoAnalytical lab of Washington State University following standard procedures described in Vervoort *et al.* (2004), Cheng *et al.* (2008), and Bouvier *et al.* (2008), which are summarized in Appendix 6.

Isochrons and weighted averages of individual whole rock-garnet dates were calculated using *Isoplot V. 4.15* (Ludwig, 2011) with a ^{176}Lu decay constant of 1.867 x 10^{-11} year^{-1} (Söderlund *et al.*, 2004) and a ^{147}Sm decay constant of 6.54 x 10^{-12} year^{-1} (based on literature reviews by Lugmair & Marti, 1978, and Begemann *et al.*, 2001). Uncertainties reported in the text are at the 2σ level. On Lu-Hf isochrons (Fig. 3-9), error ellipses are smaller than the symbols shown.

REE profiles of garnets in thin section were carried out by Agilent 7700x LA-ICP-MS at the LabMaTer earth material analytical laboratory of the “Université du

Québec à Chicoutimi". Beam size was 55 μm in diameter and was operated at 15 Hz. Count rates were normalized using ^{29}Si as an internal standard and four external standards (NIST-610, NIST-612, GSD [1g], and GSE [1g]). Data reduction was carried out on *Iolite* software package (V. 2.15; Paton *et al.*, 2011) and *IGOR-Pro* (V. 6) by WaveMetrics.

3.6.4.2. Results

Representative garnet REE profiles for each sample analysed for geochronology are presented in Fig. 3-9. Raw data and all profiles are available in Appendix 7 (Table S5 and Fig. S6). Although X-Ray computed tomography could have been used to find the center of garnet crystals, this method would not have identified garnet nucleation site(s). In order to address the problem of obtaining a complete profile that goes through the garnet nucleation center, multiple profiles were acquired for each sample. Profiles with maximum Y content (used as a proxy for HREEs) are interpreted as being the most complete.

Isochron diagrams and weighted average age diagrams are presented in Fig. 3-10. All Lu-Hf and Sm-Nd isotope data are available in Appendix 7 (Tables S6 & S7). Lu-Hf and Sm-Nd isotope analyses yield dates between *c.* 1955 and 1840 Ma, and between *c.* 1880 and 1780 Ma, respectively. Despite high Lu concentrations, low $^{176}Lu/^{177}Hf$ ratios (< 0.6; except for Core Zone sample 3008-A) are observed for these samples compared with other Archean-Paleoproterozoic garnets (*e.g.*, Herwartz *et al.*, 2012; Noack *et al.*, 2013) because of their high Hf content. Larger uncertainties on Sm-Nd dates are observed relative to Lu-Hf dates because of the longer half-life of ^{147}Sm (resulting in a small range of Nd isotope compositions), the larger uncertainties

on Sm-Nd isotope analyses, and the narrow range of low $^{147}Sm/^{144}Nd$ ratios (commonly < 0.4 with the exception of sample 6117-A; Fig. 3-10).

Dissolution of Hf-bearing (*e.g.*, zircon and rutile) and Nd-bearing (*e.g.*, monazite and apatite) mineral inclusions would affect the Lu-Hf and Sm-Nd isotope compositions of garnets, respectively, and prevent meaningful age determinations (Scherer *et al.*, 2000; Smit *et al.*, 2013). The method used for garnet dissolution (tabletop dissolution; see Appendix 6) helps minimize acid attack of zircons. However, dissolution of even small amounts of zircon/rutile and monazite/apatite along with the garnet can cause scatter in isochron regressions (MSWD > 1) because of the small amount of sample used for analysis (Scherer *et al.*, 2000). Sample 1098-A (Sukaliuk Complex) contains metamic and fractured zircons, which are more easily dissolved.

Garnets from sample 3008-A (eastern CZ) typically have a bell-shaped REE profile. Maximum Lu content reaches approximately 20 ppm, and progressively decreases toward the rim. Few zircon and monazite inclusions are present in garnets. Regression of the Lu-Hf data for two whole rock and six garnet fractions yields a date of 1883±26 Ma and an initial $^{176}Hf/^{177}Hf$ ratio of 0.281440±0.000067 (Model 3, MSWD = 47). A high MSWD (19) is still obtained even if only one whole-rock fraction is used because there is appreciable scatter of garnet isotope compositions about the regression line (Fig. 3-10a). This excess scatter may be produced by incorporation of a small amount of zircon during garnet dissolution. The Sm-Nd

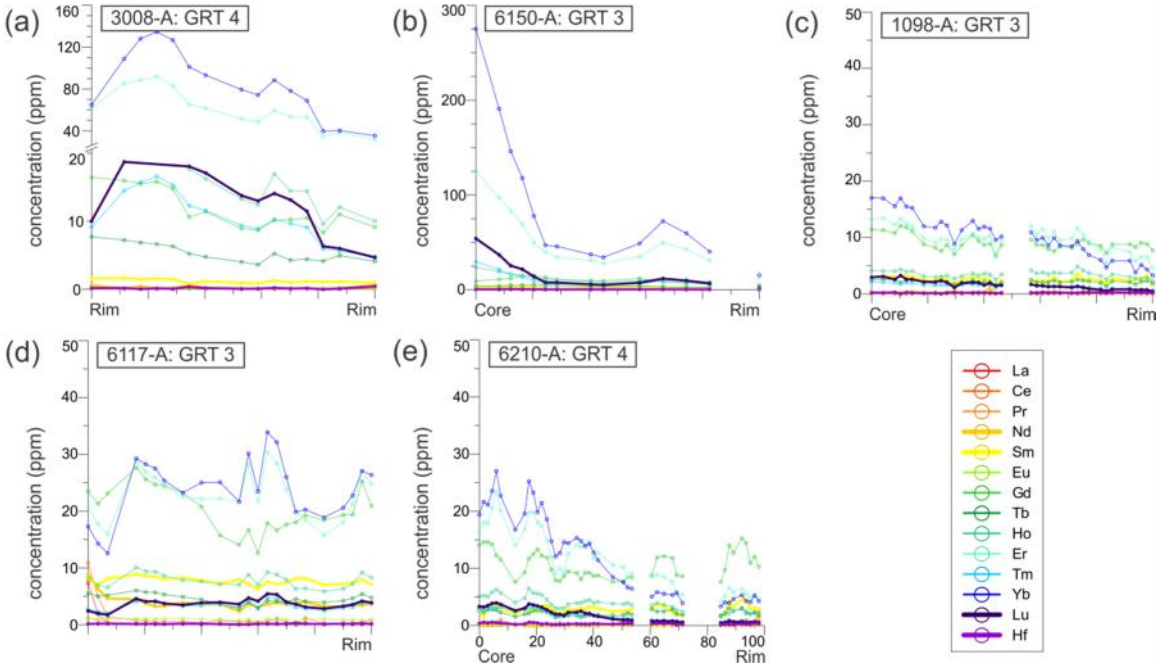


Figure 3-9: Representative REE garnet profiles.

Metasedimentary rock sample 3008-A is from the Core zone. Metasedimentary rock samples 6150-A and 1098-A and mafic gneiss sample 6117-A are from the Sukaliuk Complex. Metasedimentary rock sample 6210-A is from the Lomier Complex.

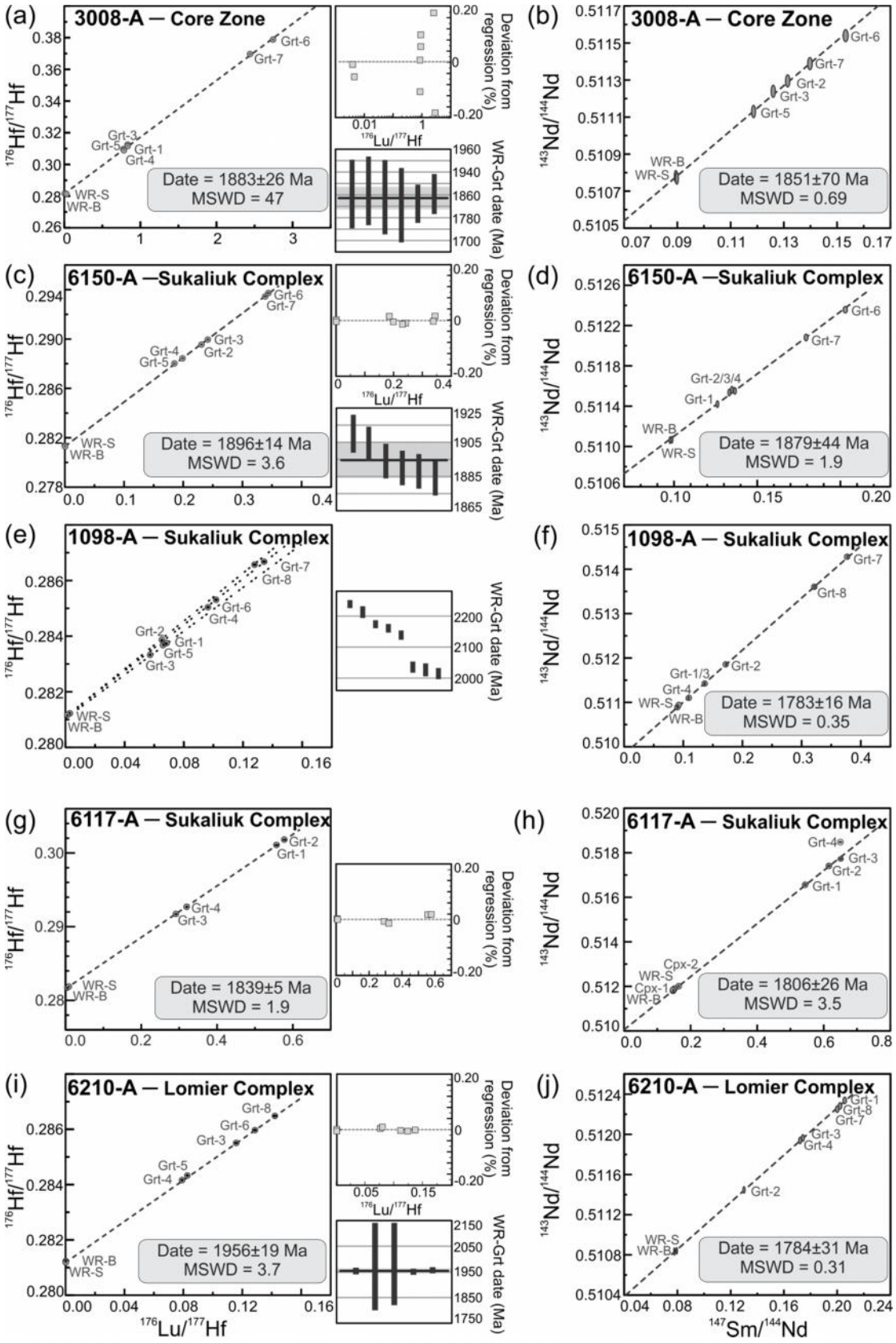
analyses of two whole rock and five garnet fractions from this sample yield an isochron regression date of 1851±70 Ma and an initial $^{143}Nd/^{144}Nd$ ratio of 0.509687±0.000056 (Model 1, MSWD = 0.69).

Sample 6150-A from the Sukaliuk Complex has garnet REE profiles that show a narrow central peak reaching a maximum of ~ 50 ppm Lu, and often a smaller peak near the rim (<10 ppm Lu). Quartz, apatite, and zircon are included in the garnets. The regression of two whole rock and six garnet fractions yields a Lu-Hf date of 1896±14 Ma and an initial $^{176}Hf/^{177}Hf$ ratio of 0.281282±0.000056 (Model 3, MSWD = 3.6). The youngest and oldest individual whole rock-garnet Lu-Hf dates (*c.* 1910 and 1884 Ma) are statistically different, suggesting variable mixing between two garnet populations or protracted garnet crystallization. As multiple garnet populations are not corroborated by the homogeneous garnet microstructure, the

second hypothesis is preferred. Protracted garnet crystallization during a single metamorphic event is supported by the REE profiles, which show important Lu intake during nucleation and continuous decrease in Lu concentration as the garnets crystallized. The small Lu peak near the rim may reflect relaxation of the diffusion radius as metamorphic conditions increased during late garnet crystallization, as suggested by Skora *et al.* (2006). A Sm-Nd isochron date of 1879±44 Ma (Model 1, MSWD = 1.9) was derived from regression of two whole rock and six garnet fractions (initial $^{143}Nd/^{144}Nd$ ratio = 0.509865±0.000041). As for the Lu-Hf analyses, individual whole rock-garnet Sm-Nd dates decrease from *c.* 2067 to 1875 Ma but these dates statistically overlap because of their large uncertainties.

Lu-Hf analyses of garnets from sample 1098-A (Sukaliuk Complex) do not yield a meaningful date because of significantly scattered isotope systematics. This scatter may be caused by variable incorporation and dissolution of inherited metamict/fractured zircons (Hf-rich phase) in the garnet fractions. REE profiles of garnets from sample 1098-A are generally flat, and sometimes show a narrow peak of HREE contents in the garnet cores. Multiple secondary peaks are also present. Since monazite (Nd-rich phase) is more easily dissolved and recrystallized during metamorphism, the Sm-Nd isotope system may not be affected by an inherited component. Regression of two whole rocks and six garnets yields a Sm-Nd isochron date of 1783±16 Ma and an initial $^{143}Nd/^{144}Nd$ ratio of 0.509833±0.000020 (Model 1, MSWD = 0.35).

Figure 3-10: Lu-Hf and Sm-Nd garnet geochronology
Isochron diagrams with percent deviation from regression lines and histograms of individual whole rock-garnet dates.


(a)
3008-A — Core Zone
Grt-6
Grt-7
Grt-3
Grt-5
Grt-1
Grt-4
WR-S
WR-B
Date = 1883±26 Ma
MSWD = 47
Deviation from regression (%)
WR-Grt date (Ma)
(b)
3008-A — Core Zone
Grt-6
Grt-7
Grt-2
Grt-3
Grt-5
WR-B
WR-S
Date = 1851±70 Ma
MSWD = 0.69
(c)
6150-A —Sukaliuk Complex
Grt-6
Grt-7
Grt-4
Grt-5
Grt-3
Grt-2
WR-S
WR-B
Date = 1896±14 Ma
MSWD = 3.6
(d)
6150-A —Sukaliuk Complex
Grt-6
Grt-7
Grt-2/3/4
Grt-1
WR-B
WR-S
Date = 1879±44 Ma
MSWD = 1.9
(e)
1098-A — Sukaliuk Complex
Grt-7
Grt-8
Grt-6
Grt-4
Grt-2
Grt-1
Grt-5
Grt-3
WR-S
WR-B
(f)
1098-A — Sukaliuk Complex
Grt-7
Grt-8
Grt-2
Grt-1/3
Grt-4
WR-S
WR-B
Date = 1783±16 Ma
MSWD = 0.35
(g)
6117-A — Sukaliuk Complex
Grt-2
Grt-1
Grt-4
Grt-3
WR-S
WR-B
Date = 1839±5 Ma
MSWD = 1.9
(h)
6117-A — Sukaliuk Complex
Grt-4
Grt-3
Grt-2
Grt-1
Cpx-2
WR-S
Cpx-1
WR-B
Date = 1806±26 Ma
MSWD = 3.5
(i)
6210-A — Lomier Complex
Grt-8
Grt-6
Grt-3
Grt-5
Grt-4
WR-B
WR-S
Date = 1956±19 Ma
MSWD = 3.7
(j)
6210-A — Lomier Complex
Grt-1
Grt-8
Grt-7
Grt-3
Grt-4
Grt-2
WR-S
WR-B
Date = 1784±31 Ma
MSWD = 0.31

Garnets from sample 6117-A (Sukaliuk Complex) have a central peak in Lu content (~10 ppm) and often show an increase in HREEs close to the rim (Fig. 3-9d). Few zircon and monazite inclusions are present in the garnets. Regression of two whole rock and four garnet fractions from sample 6117-A yields a Lu-Hf date of 1839±5 Ma and an initial $^{176}Hf/^{177}Hf$ ratio of 0.281567±0.000011 (Model 1, MSWD = 1.9). Individual whole rock-garnet dates (1845-1830 Ma) overlap given their uncertainties. The Sm-Nd analyses of two whole rock, two clinopyroxene, and three garnet fractions yield an isochron date of 1806±26 Ma and an initial $^{143}Nd/^{144}Nd$ ratio of 0.510060±0.000067 (Model 3, MSWD = 3.5). Lu-Hf analyses of clinopyroxene were omitted from the Lu-Hf regression because of the higher interference on ^{176}Lu by ^{173}Yb compared with garnet analyses (see Table S6; Appendix 7). The Sm-Nd isotope composition of one garnet fraction represents an obvious outlier and was excluded from date calculations.

Sample 6210-A (Lomier Complex) includes garnets with distinctive central peaks in Lu content, which reaches up to ~ 10 ppm. In general, HREEs slightly increase at the rim (Fig. 3-9e). Multiple inclusions of quartz, biotite, zircon, and monazite are present. Lu-Hf analyses of two whole rock and five garnet fractions from sample 6210-A yield an isochron date of 1956±19 Ma and an initial $^{176}Hf/^{177}Hf$ ratio of 0.281180±0.000034 (Model 3, MSWD = 3.7). The Sm-Nd analyses of these seven fractions yield an isochron date of 1784±31 Ma and an initial $^{143}Nd/^{144}Nd$ ratio of 0.509916±0.000033 (Model 1, MSWD = 0.31).

3.6.4.3. Interpretation of garnet dates

REE profiles inform about the crystallization history of garnets in terms of diffusion rates, growth rates, and element availability. The balance between garnet growth rate and diffusion rate determines the availability of Lu during crystallization, and therefore influences the absolute Lu concentration and distribution in garnet (*e.g.*, Scherer *et al.*, 2000; Lapen *et al.*, 2003; Skora *et al.*, 2006; Kohn, 2009; Smit *et al.*, 2013). In contrast, Sm, which is not preferentially partitioned into garnet, is generally evenly distributed in garnet, or is slightly enriched in rims because of the exhaustion of HREEs and accumulation of LREEs during the late stage of crystallization (Kohn, 2009; Smit *et al.*, 2013). To gain a better insight on Lu incorporation into garnet, Fig. 3-11 shows the cumulative content of Lu as a function of garnet volume from core to rim.

For all samples analysed, only the metasedimentary rock from the CZ (3008-A) has the bell-shaped, cumulative increase in Lu from core to rim that is typical of Rayleigh fractionation. It is thus interpreted that a fast diffusion rate enabled incorporation of Lu throughout garnet crystallization. Preferential incorporation of Lu in garnet cores at the beginning of crystallization is suggested by the presence of approximately 80% of Lu in the inner 20% of the garnet volumes. Although minor zircon dissolution may have affected the Lu-Hf isotope data of sample 3008-A (thus explaining the high MSWD), the date obtained from this sample may be a realistic estimate for the timing of garnet crystallization given that it falls in the time interval defined by Lu-Hf garnet dates of samples from the Sukaliuk Complex (1939-1896 Ma).

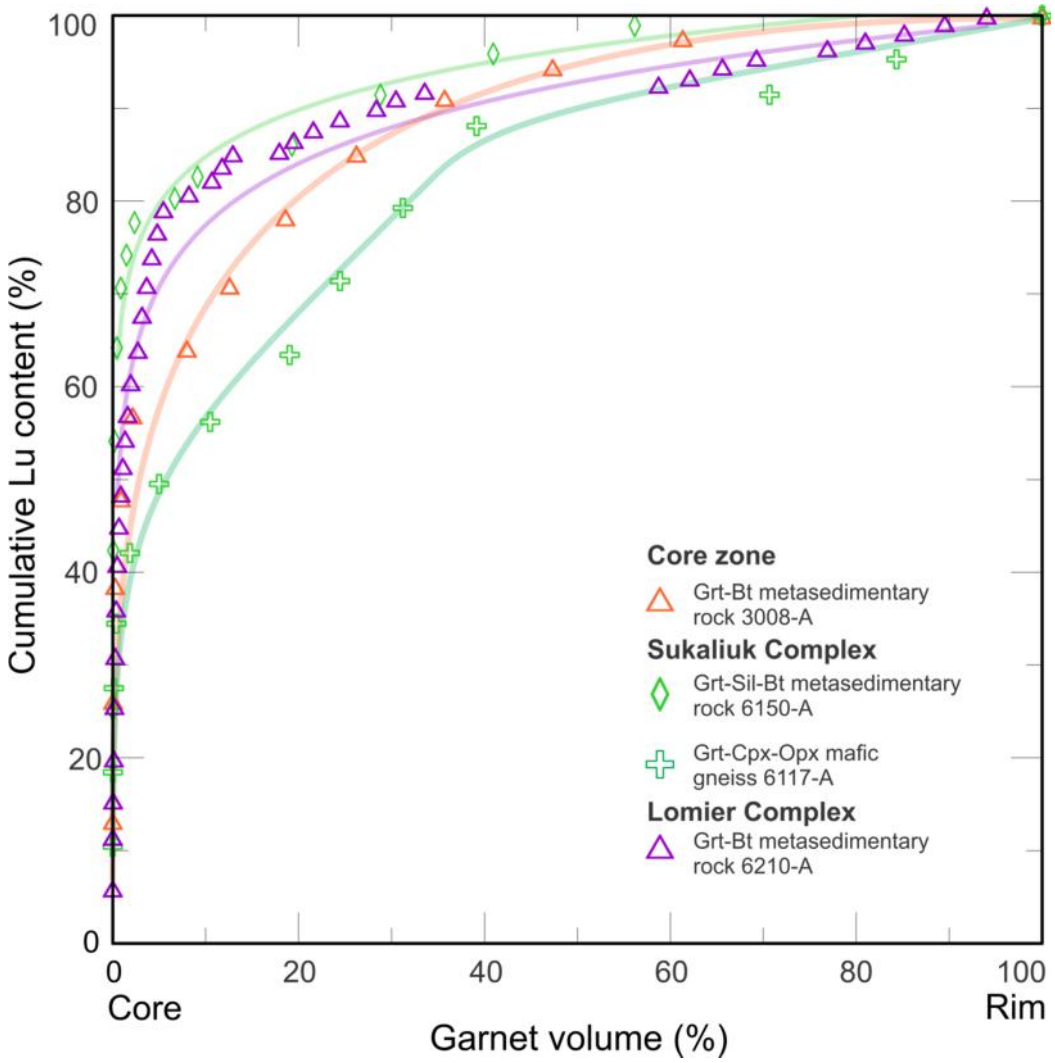


Figure 3-11: Cumulative-Lu contents in representative garnets.

Garnets of metasedimentary rocks from the Torngat mountains (samples 6150-A and 6210-A) are generally characterized by a narrow Lu peak in the core and much lower Lu concentrations in the mantle and rim. These patterns are typical of slow diffusion, with the central peak representing incorporation of Lu proximal to the garnet nucleation site, and the lower mantle/rim Lu concentrations representing subsequent depletion in response to a small diffusion radius and slow diffusion rate (Skora *et al.*, 2006). Also, except for the Grt-Sil-Bt metatexite in the Sukaliuk Complex (6150-A), the overall Lu content of garnets from the Torngat lithologies

(including mafic gneiss sample 6117-A) is much lower compared with CZ sample 3008-A, especially for the cores (Fig. 3-9). Multiple reasons may explain this difference, including protolith composition and more efficient melt extraction in the Sukaliuk and Lomier complexes (compared with the CZ) that could have depleted the Y/REE reservoir during the prograde suprasolidus evolution of the orogen. The limited melt (H_2O-bearing phase) retained in these lithologies may also explain the low diffusion rate during garnet crystallization. These hypotheses likely do not apply for metatexite sample 6150-A that has abundant leucosomes, as observed on outcrop, thus explaining its much higher Lu content.

Because garnets from lithologies in the Torngat mountains contain ~ 80% of Lu within their innermost 10% volumes, the dates of metasedimentary rocks from the Sukaliuk and Lomier complexes are interpreted to be weighted toward the beginning of garnet crystallization. Therefore, the 1956±19 Ma date from sample 6210-A is interpreted to represent the age of ongoing garnet growth. For sample 6150-A, although the 1896±14 Ma date is weighted toward the beginning of garnet crystallization, the incorporation of significant Lu after garnet nucleation (between ~ 20% and 55% of the inner garnet volumes) suggests that garnet crystallization was protracted, with relaxation of diffusion radius as metamorphic conditions increased (following conclusions based on the modeling of Skora *et al.*, 2006). Consequently, the individual whole rock-garnet Lu-Hf dates (1910-1884 Ma) for this sample are interpreted to reflect both the initial garnet nucleation and the continuous crystallization of garnet during subsequent higher-grade metamorphism.

Mafic gneiss 6117-A can be distinguished from other Torngat samples by its flat Lu profile. Only a minor HREE peak is present at the garnet cores. This homogeneity is reflected by a more linear distribution of Lu from core to rim (Fig. 3-11). The small increase in HREEs at rims, observed on garnet profiles and by the slope break on the cumulative Lu graph, may reflect resorption of garnet (accumulation of incompatible elements in garnet at a resorption front), or secondary garnet crystallization coeval with replenishment of the Lu reservoir. Because Mn zoning typical of resorption (Mn increase at rims) was not observed in garnet profiles and maps, the increase in Lu content at rims is more likely associated with a second crystallization event. This younger subpopulation represents 10-15% of the Lu content which is limited to the outermost 60% of the garnet volumes. Since the analyzed garnet fractions represent mixing of two garnet subpopulations, we interpret the 1839 Ma date as the minimum age of garnet core crystallization. This age is likely weighted towards the older subpopulation, which represents the most important Lu incorporation event (*i.e.*, 85-90% Lu is in the inner 40% of the garnet volumes).

In the study area, garnet crystallization ages in metasedimentary rocks vary between 1956±19 Ma and 1883±26 Ma from east to west. The Y and Lu distribution in garnets indicate that all Lu-Hf dates of metasedimentary rocks are weighted heavily toward the beginning of garnet growth. The major implication of the Lu-Hf garnet geochronology is that metamorphism on both sides of the BDC is likely associated with the same tectonometamorphic event. Because garnets grow at higher P-T conditions in mafic protoliths versus sedimentary protoliths, the Lu-Hf date from

mafic gneiss 6117-A may constrain the timing of peak metamorphism to be slightly older than 1839±5 Ma.

The Sm-Nd dates are interpreted as cooling ages because of the lower closure temperature of this isotope system compared with Lu-Hf (*e.g.*, Scherer *et al.*, 2000; Smit *et al.*, 2013) and the high-grade metamorphism that affected most of the study area. Therefore, dates between 1806±26 Ma and 1783±16 Ma may indicate cooling to amphibolite-facies metamorphism. For samples 3008-A and 6150-A, Sm-Nd dates are imprecise (1851±70 Ma and 1879±44 Ma, respectively), but are statistically indistinguishable from other garnet, zircon and monazite cooling ages.

3.7. Thermobarometry

3.7.1. Methodology and strategy

Thermobarometry was conducted by phase multi-equilibria calculations on the 20 samples analyzed for petrography and mineral chemistry. Average P-T estimates were calculated with the computer software programs of AX and THERMOCALC 3.33 developed by Tim Holland, and Powell & Holland (1988, 1994, 2008), respectively. The internally consistent thermodynamic dataset used for the calculation is the file tc-ds55.txt (created in November 2003; Holland & Powell 1998, 2011). Reported 2σ uncertainties on the P-T conditions do not consider the analytical uncertainties from electron microprobe measurements because these are sufficiently small to have minimal impact on phase multi-equilibria calculations.

3.7.1.1. Determination of mineral assemblages

Garnet zonation profiles, inclusion and matrix mineral chemistry, and the extent of microstructural equilibrium were used to determine whether equilibrium conditions were achieved. For metasedimentary samples, garnet cores, which typically crystallized during prograde evolution, no longer represent crystallization conditions, but are interpreted to be in equilibrium with the matrix mineral assemblage. We therefore determined from microstructures and chemistry that the equilibrium mineral assemblage in most metasedimentary rock samples includes garnet cores and matrix minerals. Only when information on previous equilibrium was preserved (*e.g.*, mineral inclusions shielded in garnets without evidence of local interaction with garnet) did we conclude that the equilibrium mineral assemblage consisted of garnet rims and matrix minerals, whereas garnet cores and mineral inclusions were used to retrieve previous equilibrium. However, this latter assemblage cannot be considered as an equilibration volume (because enhanced element mobility at high temperature changed garnet core compositions), but rather is regarded as a semi-quantitative proxy of P-T variations during high-grade metamorphic evolution.

For Opx-bearing metasedimentary rocks, intermediate gneisses and mafic gneisses, a small Ca increase from core to rim in garnets suggests that prograde zonation was partially preserved, and therefore that garnet cores and mineral inclusions (when present and not affected by local interaction with garnet) could represent a previous equilibrium mineral assemblage that can be used as a semi-quantitative proxy to estimate P-T variations. The equilibrium conditions of samples

were determined from garnet rims and matrix mineral assemblages because of their textural equilibrium.

In addition to equilibrium conditions, semi-quantitative estimates of cooling could in some cases be calculated. Local zonation at garnet rims (when in contact with matrix biotite crystals, as observed on garnet maps and from microprobe spot analyses; Fig. 3-6a) and adjacent minerals (corona) were used as proxies to estimate small-scale subsolidus processes.

Chemical equilibrium for inclusion + host or corona + porphyroblast mineral assemblages is not guaranteed, given that these mineral assemblages were frequently incomplete and likely involved limited scale intracrystalline diffusion. When a mineral phase interpreted to be part of the assemblage was absent from the equilibration volume, the composition of matrix crystals was used as a proxy. Accordingly, average P-T estimates for garnet-core + inclusion and garnet-rim + corona mineral assemblages should be regarded as semi-quantitative and only used for comparison with robust quantitative equilibrium P-T conditions.

3.7.1.2. Determination of fluid conditions

Other uncertainties for phase equilibria modeling, particularly in granulite-facies terrains, include changes in water activity and composition of metamorphic fluids. The development of granulite-facies mineral assemblages is still an area of active debate in petrology. Although there seems to be a consensus that limited water activity occurs during granulite-facies metamorphism, it is not clear whether it is a result of melt extraction (absence of fluid; *e.g.*, Valley *et al.*, 1983; Lamb & Valley, 1984, 1988; Valley *et al.*, 1990; Powell & Holland, 2008) or the presence of CO_2-rich

and/or NaCl-saturated fluids (*e.g.*, Johnson, 1991; Newton *et al.*, 2014; Touret *et al.*, 2016). Without any constraints on metamorphic fluid compositions during the Torngat Orogeny from fluid inclusion studies, the water activity (aH_2O) used for phase multi-equilibria calculations was set to 0.35 based on fluid inclusion studies and modeling in other granulitic terrains, which suggest an aH_2O range of 0.01 to 0.7 (see Table 3-1 in Newton *et al.*, 2014; *e.g.*, Bohlen *et al.*, 1980; Phillips, 1980; Valley *et al.*, 1983; Hansen *et al.*, 1984; Lamb & Valley, 1988; Newton *et al.*, 2014). In addition to representing a median value to the suggested range, this empirical value was selected based on the work of Hansen *et al.* (1984) on thermobarometry and fluid inclusions of amphibolite-facies gneisses and charnockites of the Karnataka State Archean terrain in southern India.

3.7.2. Results

P-T estimates for the different mineral assemblages in each sample are presented in Table 3-2 and schematized in Fig. 3-12. Uncertainties in P-T conditions are reported in Table 3-2. Results illustrate that equilibration conditions (calculated with matrix mineral assemblages) significantly depend on the protolith composition of each sample. All samples align in a single P-T trend. Metasedimentary rock samples define the lower part of this array, ranging approximately from 5.0 kbars-700°C to 8.0 kbars-820°C. In contrast, the intermediate to mafic rocks define the higher segment of the P-T trend, ranging from ~ 8.0 kbars-790°C to ~ 12.5 kbars-960°C.

3.7.2.1. Metasedimentary rock samples

The P-T conditions recorded by metasedimentary samples varied according to location and mineralogy. Samples from the CZ equilibrated at generally lower P-T conditions

(matrix assemblages: 5.4-5.6 kbars and 709-730°C) compared with samples from the Sukaliuk and Lomier complexes. In the Sukaliuk Complex, equilibrium P-T conditions reach 6.3-7.4 kbars and 714-797°C for Sil-bearing samples and 8.1-8.5 kbars and 798-819°C for Opx-bearing samples. Sample 3123-A from the Sukaliuk Complex suggests P-T conditions in the kyanite stability field, which is not consistent with the occurrence of sillimanite in garnet cores, and thus this estimate is discarded. The highest T conditions were reached in the Lomier Complex, as indicated by equilibration conditions of 6.3 kbars-823°C from a Grt-Bt-Pl-Kfs-Qz-Ru metasedimentary rock (sample 6210). Together with the equilibrium matrix mineral assemblages, the garnet-core + inclusion and garnet-rim + corona assemblages in metasedimentary rocks define qualitative vectors that suggest decreasing metamorphic conditions in Sil-bearing samples and increasing metamorphic conditions in Opx-bearing samples. As illustrated on Fig. 3-12, decreasing vectors are gently dipping and parallel to the overall P-T trend in the study area, whereas increasing P-T vectors are generally steeper and show greater variability, possibly because of the incomplete mineral assemblage used for phase multi-equilibria calculations.

3.7.2.1. Intermediate and mafic rock samples

Intermediate and mafic samples from the Sukaliuk and Lomier complexes yield higher P-T conditions compared with metasedimentary rocks. In the Sukaliuk Complex, equilibrium P-T conditions of 8.7 kbars-814°C to 10.8 kbars-914°C inferred from Grt-bearing gneisses define the upper segment of the regional P-T trend. The upper and lower limits of this P-T range are constrained by the mafic and intermediate

Table 3-2: Average P-T thermobarometry results.

Sample	Location			Lithology	Assemblage	Analysis #							Excess phases					Average P-T				
	SNRC	East	North			Amp	Bt	Cpx	Kfs	Grt	Opx	Pl	Ilm	Qz	Mt	Rt	Sil	P	sd(P)	T	sd(T)	fit
Core zone																						
Metasedimentary rocks																						
3008-A	24H13	339112	6405503	Grt-Bt-bearing metasedimentary rock (metatexite)	Grt-core+matrix	-	12	-	8	7	-	1		X		X		5.4	1.5	709	52	0.19
					Grt-rim+coronas	-	10	-	4	13	-	2		X		X		5.1	1.5	669	49	0.62
4041-B	24H13	339112	6405503	Grt-Bt-Sil-bearing metasedimentary rock	Grt-core+inclusions*	-	3	-	*2	11	-	*1	X	X			X	6.5	1.5	771	43	0.17
					Grt-rim+matrix	-	9	-	9	17	-	9	X	X				5.6	1.6	730	50	0.33
Sukaliuk Complex																						
Metasedimentary rocks																						
3117-A	24H16	429253	6422516	Grt-Bt-bearing metasedimentary rock	Grt-core+matrix	-	6	-	2	4	-	2		X		X		7.1	1.6	777	54	0.65
					Grt-rim+coronas	-	8	-	10	10	-	3		X		X		6.8	1.6	745	53	0.07
6150-A	24H15	408780	6414480	GR-Bt±Sil-bearing metasedimentary rock (metatexite)	Grt-core+matrix	-	10	-	1	1		8		X		X	X	6.3	1.4	742	41	0.55
					Grt-rim+coronas	-	5	-	4	4	-	7		X		X	X	5.9	1.5	708	42	1.1
6084-A	24H15	407542	6417323	Grt-Bt-Sil-bearing schollen diatexite	Grt-core+matrix	-	9	-	2	5	-	1		X		X	X	7.1	1.4	751	44	0.3
					Grt-rim+coronas	-	10	-	1	4	-	8		X		X	X	6.2	1.3	712	42	0.6
1098-A	24H09	424593	6398611	Grt-Bt-Sil-bearing aluminious felsic gneiss	Grt-core+inclusions*	-	12	-	*5	10	-	6		X		X	X	8.1	1.5	823	40	0.84
					Grt-rim+matrix	-	7	-	7	13	-	5		X		X	X	7.3	1.9	797	53	1.27
3123-A	24H16	420402	6414598	Grt-Bt-Sil-bearing metasedimentary rock	Grt-core+inclusions*	-	8	-	*7	7	-	9	X	X			X	10.9	1.4	684	39	0.21
					Grt-rim+matrix	-	17	-	2	12	-	1	X	X				6.9	1.4	714	52	0.81
5030-B	24H16	413757	6426208	Grt-Bt-Sil-bearing aluminious feldspathic gneiss	Grt-core+matrix	-	12	-	4	5	-	5	X	X			X	7.4	1.4	790	43	0.08
					Grt-rim+coronas	-	7	-	1	9	-	1	X	X			X	6.7	1.4	729	41	0.87
1121-A	24H09	409905	6389829	GR-and OX-bearing metasedimentary rock (metatexite)	Grt-core+inclusions*	-	11	-	*5	1	-	*5	X	X				7.5	1.7	803	85	1.17
					Grt-rim+matrix	-	16	-	5	7	7	8	X	X				8.2	1.1	819	45	0.85
4081-A	24H16	415731	6408958	Grt-Bt-Opx-bearing metasedimentary rock	Grt-core+inclusions*	-	12	-	*4	1	-	3	X	X				8.2	1.2	699	57	0.18
					Grt-rim+matrix	-	5	-	9	3	1	1	X	X				8.5	1.3	798	50	1.13
6129-A	24H16	433366	6414757	Grt-Bt-Opx-bearing metasedimentary rock	Grt-core+inclusions*	-	11	-	*5	13	-	12	X	X				5.5	1.6	778	59	0.29
					Grt-rim+matrix	-	4	-	4	4	10	1	X	X				8.1	1.3	810	45	1.06
Intermediate and mafic gneisses																						
2112-B	24H16	416194	6413388	Grt-Bt-Opx-bearing intermediate gneiss	Grt-core+inclusions*	-	3	-	*1	8	*3	3	X	X				7.9	1.1	786	40	0.65
					Grt-rim+matrix	-	12	-	2	7	6	1	X	X				8.7	1.1	814	47	1.04
3090-A	24H16	428933	6406603	Grt-Cpx-Opx-bearing intermediate gneiss	Grt-core+inclusions	-	11	3	3	5	9	6	X	X				9.4	0.9	842	45	0.88
					Grt-rim+matrix	-	4	1	1	4	8	4	X	X				8.9	0.9	810	45	1.06
6078-A	24H16	415269	6420933	Grt-Bt-Opx-bearing intermediate gneiss	Grt-core+inclusions*	-	8	-	*3	7	-	11	X	X				8.2	1.5	804	77	1.07
					Grt-rim+matrix	-	11	-	5	3	11	7	X	X				8.6	1.2	821	44	0.85
6080-A	24H16	412784	6419742	Grt-Cpx-Opx-bearing mafic gneiss	Grt-core+matrix	2	-	8	-	10	5	4	X					10.8	1.4	914	56	1.03
6117-A	24H16	423886	6425075	Grt-Cpx-Opx-bearing mafic gneiss	Grt-core+matrix	-	2	11	-	10	4	1	X	X				10.0	1.2	847	89	1.05
					Grt-rim+coronas	-	12	6	-	9	2	5	X	X				8.4	1.1	752	80	0.97
Lomier Complex																						
Metasedimentary rocks																						
6210-A	14E13	444786	6416656	Grt-Bt-bearing metasedimentary rock	Grt-core+matrix	-	4	-	8	4	-	2	X	X		X		6.3	1.0	823	42	0.84
Mafic rocks																						
142-A	14E13	445145	6418165	metagabbro	core+matrix	7	-	8	-	-	6	4	X	X	X			11.7	1.8	965	55	0.8
4107-A	14E13	443554	6409350	metagabbronorite	core+matrix	8	4	7	-	-	10	11	X	X				12.4	1.7	956	49	0.70
4102-A	14E13	436654	6409639	amphibolite	core+matrix	7	-	2	-	-	10	6	X	X				7.3	2.2	867	62	1.20

samples, respectively. Except for sample 3090-A, the garnet-core + inclusion assemblages produce poorly defined but consistent vectors indicative of increasing metamorphic conditions. Equilibrium conditions preserved in these intermediate samples are similar to those obtained from Opx-bearing metasedimentary rocks (~8.5-9.0 kbars and 810-820°C). For mafic samples, equilibrium mineral assemblages yield higher P-T estimates (*i.e.*, 10.0-10.8 kbars and 847-914°C). The garnet rim-corona assemblage of sample 6117-A defines a semi-quantitative vector that has a dP/dT slope similar to that of vectors from the metasedimentary rocks.

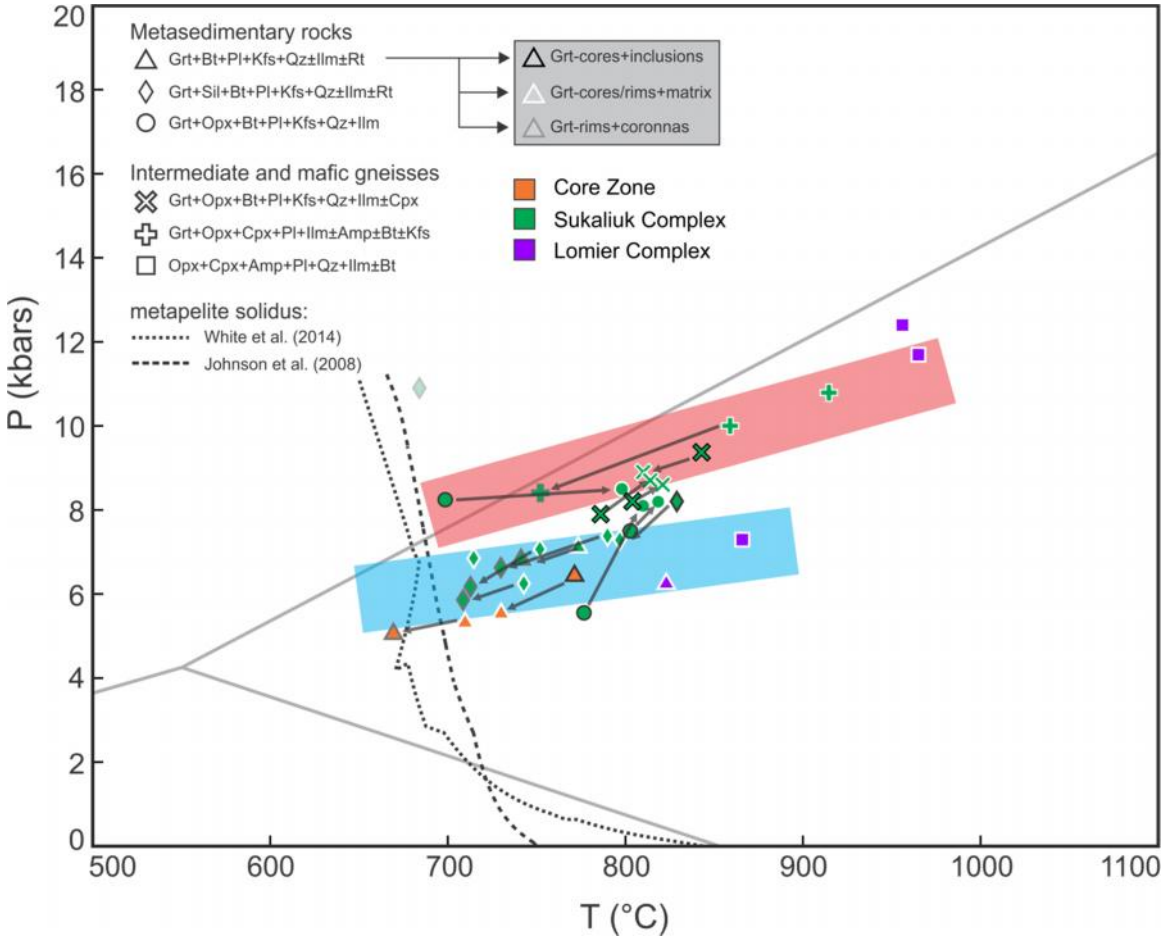


Figure 3-12: Synthesis of thermobarometry P-T conditions of equilibrium.
Semi-quantitative vectors are defined by garnet-rim and corona mineral assemblages or garnet-core and inclusion mineral assemblages.

In the Lomier Complex, mafic samples yield even higher P-T estimates of 7.3 kbars-867°C to 12.4 kbars-956°C. The lower metamorphic conditions are preserved in sample 4102-A, whose mineralogy is dominated by hornblende.

3.7.3. Interpretation of P-T conditions

The large spread of P-T conditions likely reflects preservation of different segments of the P-T path as a result of variable protolith composition. Lower P-T conditions yielded by metasedimentary rocks are interpreted to reflect retrogression of the peak assemblage during melt crystallization, and thus are regarded as being close to solidus conditions. This interpretation is supported by the fit with theoretical solidus conditions for average pelite reported on Fig. 3-12. Conversely, the more anhydrous protolith compositions were less influenced by retrograde reactions, and thus were able to better preserve the true peak metamorphic assemblage. Therefore, average P-T conditions for anhydrous lithologies are interpreted to reflect close-to-peak metamorphic conditions. Only mafic sample 4102-A preserved lower P-T conditions and is interpreted to record retrograde conditions during exhumation and cooling, as suggested by its hydrous mineralogy (Amp-rich).

Thermobarometry results suggest a single, continuous field metamorphic gradient from the CZ to the Torngat mountains. The 12.4 kbars-956°C to 5.1 kbars-669°C array corresponds to the Barrovian-type metamorphism characteristic of orogenic settings at sillimanite-stability conditions. Both peak metamorphic conditions and retrograde conditions suggest a decrease in P-T estimates from the Lomier Complex to the CZ, although there are no constraints on close-to-peak conditions in the CZ since no mafic samples were suitable for thermobarometry. Although the

boundary between the CZ and the Torngat mountains is marked by the appearance of Opx-bearing and pervasively sheared rocks, the P-T estimates point to a gradational change in metamorphic conditions across this boundary rather than a distinctive metamorphic break.

In the Torngat mountains, higher-grade metamorphic conditions were obtained from Lomier Complex samples, which indicates that the thermal state of this domain was higher compared with that of the Sukaliuk Complex. Compared with metamorphic conditions elsewhere in the Torngat mountain range, our thermobarometry results indicate that peak metamorphic conditions in the Sukaliuk and Lomier complexes were similar to those in the Tasiuyak Gneisses. Van Kranendonk (1996) obtained a peak estimate of 9.5±0.5 kbars and 950±50°C for the Grt-core + inclusion assemblage of a Grt-Cpx-Pl-Qz gneiss. Mengel & Rivers (1997) reported P-T estimates of 10.0 to 12.0 kbars and 800°C in mafic rocks interlayered with metapelitic gneisses (6.0-7.0 kbars and 650-750°C) from the northern part of the Tasiuyak domain. The similarity of peak conditions in the Tasiuyak Gneisses and in the Sukaliuk and Lomier complexes in the study area contradicts the conclusion of Van Kranendonk (1996), who inferred that peak metamorphism in the Lomier Complex occurred at lower P-T conditions (6.8-7.7 kbars and < 800°C; amphibolite facies) compared with the Tasiuyak Gneisses (granulite facies), and therefore that metamorphic conditions at the western flank of the TO were decreasing. However, retrogressed amphibolite-facies tonalitic orthogneisses from the Lomier Complex were analysed in previous studies rather than granulite-facies samples (Van Kranendonk, 1996; Ermanovics & Van Kranendonk, 1998). Therefore, the metamorphic portrait of

the Torngat mountains can be described as dominantly granulitic from the Tasiuyak Gneiss to the Sukaliuk Complex, with local retrogression to amphibolite facies generally only observed in the vicinity of deformation corridors.

3.8. Phase equilibria modeling

3.8.1. Methodology

Phase equilibria modeling was undertaken for three homogeneous metasedimentary rocks from different domains (samples 3008-A from the CZ, 1098-A from the Sukaliuk Complex, and 6210-A from the Lomier Complex), and that were studied for Lu-Hf and Sm-Nd garnet geochronology and zircon and monazite U-Pb geochronology. Pseudosections were calculated in the Na_2O-CaO-K_2O-FeO-MgO-Al_2O_3-SiO_2-H_2O-TiO_2-Fe_2O_3 (NCKFMASHTO) system with THERMOCALC 3.40 (Powell & Holland, 1988) using the internally consistent thermodynamic dataset 62 (sigma fit = 1.028) of Holland & Powell (2011) (created on February 6th 2012). A-x models used for calculation include garnet (White *et al.*, 2014), biotite (White *et al.*, 2014), cordierite (White *et al.*, 2014), muscovite (White *et al.*, 2014), plagioclase and K-feldspar (Holland & Powell, 2003; modified by White *et al.*, 2014), orthopyroxene (White *et al.*, 2014), ilmenite (White *et al.*, 2000; modified by White *et al.*, 2014), and melt (White *et al.*, 2007; modified by White *et al.*, 2014). P-T pseudosections were calculated for a P-T range of 4-15 kbars and 600-1000°C and are shown in Fig. 3-13 for each domain.

The bulk compositions (NCKFMASHT) of the three samples were recalculated from mass balance using the typical composition of minerals (from microprobe analyses) and their modal abundance in thin section (from MLA imaging) to better

represent the equilibration volume modeled. Mass balance bulk compositions are similar, within ±1% uncertainty, to bulk compositions obtained from X-ray Fluorescence (XRF) analyses (Actlabs, Ancaster, Ontario, Canada). Only sample 6210-A shows a discrepancy in MgO and FeO between mass balance and XRF bulk compositions, possibly due to the irregular distribution of garnet and biotite in the rock. Additionally, the water content (H_2O) was calculated from the modal abundance of biotite (*i.e.*, the only hydrous mineral observed in thin section), using the Ti-H substitution scheme of White *et al.* (2007). The oxidation states of the modeled systems (reflected by Fe_2O_3 values) are unknown. Since no magnetite is present in the samples, and since recent studies demonstrate that oxidation state has only a minor effect on the predicted P-T paths (mainly affecting the stability of minor phases such as Ilm, Rt and Mt; Mackenzie, 2015), the Fe_2O_3 value was likely low and was empirically set at 0.05. No melt was reintegrated to the bulk composition as: 1) melt reintegration has little influence on the suprasolidus topology (White & Powell, 2002; Powell *et al.*, 2005) or the compositional parameters of solid phases (*e.g.*, Indares *et al.*, 2008; Guilmette *et al.*, 2011); 2) we aim to model suprasolidus evolution; 3) subsolidus prograde information cannot be constrained because of the obliteration of garnet zoning and partial re-equilibration of most inclusions during high-grade peak metamorphism; and 4) zircon geochronology suggests potential polymetamorphism, of which the last phase is the most intense.

All P-T pseudosections showing predicted mineral mode and mineral composition contours are placed in Appendix 8 (Fig. S7).

3.8.2. Results

3.8.2.1. General topologies

Within the sillimanite stability field, pseudosections for all samples are muscovite-free and can be divided into medium-P and low-P areas. Medium-P areas are cordierite-free and extend to the sillimanite-kyanite transition. Low-P areas consist of cordierite-bearing assemblages.

In medium-P areas, the topologies of P-T pseudosections are characterized by moderate to steep dP/dT field boundaries (Fig. 3-13). For all samples, the solidus has a steep negative slope and is closely followed by a subparallel biotite-out phase boundary. The solidus of sample 3008-A (CZ) ranges from 700°C to 750°C and is followed by complete biotite consumption at ~100°C higher (producing up to 8% melt). In contrast, the solidus of samples in the Torngat mountains (1098-A and 6210-A) range from 800°C to 900°C, and complete biotite breakdown (producing < 5% melt) is reached 25°C to 75°C after solidus. For the Sil-rich sample 1098-A, sillimanite is present in all mineral assemblages in the medium-P area and orthopyroxene is not stable for the entire modeled P-T range. For Sil-poor samples, Sil-bearing mineral assemblages are limited to small fields (< 50°C) adjacent to the solidus at suprasolidus conditions. In these pseudosections, the orthopyroxene-in

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Figure 3-13: Pseudosections**.**

a)-d)-g) General topologies; bulk composition used for calculation is reported above each pseudosection; field corresponding to the observed mineral assemblage in each sample is labeled in bold; liquid isomodes are reported with dashed lines; thermobarometry results for each sample are reported in white (matrix mineral assemblage), in black (core mineral assemblage) or in grey (corona mineral assemblage); selected thermobarometry P-T conditions of equilibrium for mafic samples are reported for each domain to constrain close-to-peak metamorphic conditions. **b)-e)-h)** exact isopleth intersection of Ca(Grt), Fe(Grt), and Fe(Bt); uncertainty envelopes are ±1%. **c)-f)-i)** exact isomode intersection (mineral modes are from MLA imaging estimates); uncertainty envelopes are ±1 mode%; garnet isomodes for all P-T ranges are reported in grey dashed lines.

phase boundary generally ranges from 825°C to 875°C and is limited to < 11 kbars. For all pseudosections, K-feldspar is completely consumed at very high T (> 925-950°C).

In low-P areas, topologies are characterized by shallower dP/dT slopes involving cordierite-in and garnet-out phase boundaries with the exception of Sil-rich sample 1098-A for which garnet is stable for all low-P mineral assemblages. In this part of the pseudosections, the dP/dT slope of the solidus is generally shallower and varies from positive to negative. Except for sample 6210-A (Lomier Complex) that has a lower quartz abundance (10.8%), quartz is not completely consumed even at very high T (> 900°C).

3.8.2.1. Inferred P-T conditions of equilibration and melt crystallization

If the bulk composition closely reflects the composition of the equilibration volume and if that equilibration volume is larger than the investigated thin section, then mineral isomodes and isopleths are expected to intersect in the field corresponding to the observed mineral assemblage. Isomodes and isopleths corresponding to measured mineral proportions and compositions are shown in Figs. 3-13b,c,e,f,h,i with a ±1 modal% uncertainty envelope, which is believed to approximate the error on measured values and the mineralogical variation in the rock.

For all investigated samples, isomodes and isopleths intersect at or near solidus conditions in the medium-P part of the pseudosection. Mineral isomodes and isopleths of the core-matrix assemblage of sample 3008-A (CZ) closely intersect at approximately 6.8 kbars and 775°C. Except for sillimanite, the corresponding field predicts the observed mineral assemblage. However, less than 1% of sillimanite is

predicted and the sillimanite-out phase boundary limits this mineral assemblage field to higher T. For sample 1098-A in the Sukaliuk Complex, isopleths of measured composition for the rim-matrix assemblage intersect within their uncertainty on the solidus at approximately 8.0 kbars and 825°C. However, mineral isomodes do not intersect at the solidus, and the exact proportion of biotite and plagioclase could not be predicted by the pseudosection. Nonetheless, K-feldspar, sillimanite, and biotite isomodes nearly intersect on the solidus at the rutile-ilmenite transition. Corresponding fields of the isomode and isopleth intersections closely correspond to the observed mineral assemblage (Grt-Kfs-Pl-Bt-Sil-Rt-Liq±Ilm) and are limited at higher T by the biotite-out phase boundary. For sample 6210-A (Lomier Complex), core-matrix assemblage isopleths intersect within their uncertainty envelopes on the solidus at approximately 7.5 to 9.5 kbars and 825-850°C. These conditions correspond to a narrow field (< 5°C) adjacent to the solidus, where less than 0.5% of sillimanite is produced. However, the exact isopleths intersect at subsolidus conditions in the Grt-Qz-Kfs-Pl-Bt-Sil-Rt field, specifically at 7.3-7.8 kbars and 750-800°C based on the Ca content of garnet, or at lower P-T conditions based on Fe-Mg exchange between garnet and biotite (*i.e.*, 5.5 kbars and 775°C). Also, the isomode intersections are within the stability field of cordierite (6.0 kbars and 850°C), which is not observed in thin section, and the observed plagioclase modal proportion could not be predicted.

3.8.3. Interpretation of compatible P-T paths and comparison with equilibration conditions from thermobarometry

The pseudosections for granulite and upper amphibolite facies samples of the CZ and TO are interpreted to closely represent the high T, near-solidus retrograde

segment of the P-T evolution. The overall shape of the solidus, its position at high temperatures above 750°C, the instability of muscovite in the low P–T part of the pseudosections, and the persistence of peritectic phases like garnet and K-feldspar at suprasolidus conditions are all consistent with the loss of H_2O-bearing melt from the rock during prograde evolution (White *et al.*, 2001; White & Powell, 2002; Indares *et al.* 2008; Guilmette *et al.* 2011). Therefore, the subsolidus portion of the pseudosections may not be applicable to the prograde evolution of the system. Nonetheless, phase equilibria modeling of restitic rocks has been shown to reliably represent near-peak metamorphic conditions and retrograde evolution since, under anisotropic stress, the bulk composition of anatectic rocks should not change following final melt extraction, and the melt proportion trapped in residual rocks should be close to or lower than the melt proportion necessary for interconnected melt films (*i.e.*, the Melt Connectivity Transition (MCT) at ~7-10 melt%; Rosenberg and Handy, 2005).

For samples 1098-A and 6210-A, the isomode intersections are interpreted to be unreliable possibly due to either a) some degree of subsolidus re-equilibration, b) a modeled bulk composition that does not correctly represent the sample, or c) the presence within one thin section of more than one equilibration volume. The stretching lineation marked by garnet and sillimanite in sample 1098-A (which could explain why these minerals are underestimated in the perpendicular-to-the-lineation thin section) and the large, irregularly distributed garnet crystals and K-feldspar in sample 6210-A supports option b) as the main controlling factor. For sample 3008-A, although less than 1% sillimanite is predicted during final melt crystallization (*i.e.*,

within 20-40°C), the reaction kinetics could account for the absence of sillimanite in the observed mineral assemblage. Although these discrepancies reflect a slight difference between the mass balance composition and the actual equilibration volume, all pseudosections presented in Fig. 3-13 are likely representative of the studied systems (*i.e.*, residual rocks through their melt crystallization history). Hence, the pseudosections allow further quantitative interpretation of the retrograde path since mineral isopleths of the matrix mineral assemblage intersect within their uncertainties at the solidus (see Palin *et al.*, 2016, for a discussion).

Peak metamorphic conditions are constrained by the absence of kyanite and the stability of sillimanite in all domains. Kyanite is not observed in matrix assemblages or shielded as inclusions in garnets in any samples from the study area (this study; Charette & Guilmette, 2014). Although no aluminum silicate was observed in sample 3008-A from the CZ and in sample 6210-A from the Lomier Complex, sillimanite in these domains was observed in other samples from this study and in other studies (*e.g.*, Girard, 1990b). Therefore, most of the peak metamorphic evolution is inferred to have occurred in the sillimanite stability field for the entire study area.

In sample 3008-A from the CZ, peak metamorphic conditions were lower than the stability field of orthopyroxene, which was not observed in CZ metasedimentary rock samples from this study and other studies (*e.g.*, Lafrance *et al.*, 2015). In addition, the peak P-T conditions were insufficient for complete consumption of biotite. Euhedral garnet porphyroblasts overprint or only slightly affect the regional foliation marked by biotite crystal alignment, and form small pressure shadows where biotite crystallized. Hence, garnet growth occurred exclusively within the biotite

stability field. This microstructural constraint and the absence of orthopyroxene place a tight limit on peak metamorphic conditions, which is interpreted to be roughly around 825-875°C. However, the peak pressure is poorly constrained because the rutile-ilmenite transition is broadly dependent on the empirical oxidation state selected for phase equilibria modeling, and because no mafic samples (which preferentially preserve closer-to-peak conditions) were studied in this domain. The decrease of Ti content as the Fe/(Fe+Mg) ratio of matrix biotite decreases (Fig. 3-6b) is consistent with crystallization of retrograde biotite as solidus conditions were approached. Melt crystallization conditions are interpreted to be around 6.8 kbars and 750-775°C from isopleth and isomode intersections. The lower P-T estimate yielded by thermobarometry for garnet core-matrix mineral assemblage may reflect enhanced retrogression during fluid influx at subsolidus conditions, possibly sourced from the abundant segregated leucosomes observed on outcrop. During subsolidus evolution, local retrogression occurred between adjacent minerals as illustrated by Mg-depletion halos at garnet rims when in contact with biotite (*e.g.*, Fig. 3-6a). Therefore, the subsolidus P-T evolution is interpreted to mimic the semi-quantitative vector defined by P-T estimates for the garnet rim-corona mineral assemblage. Although the maximum crustal depth (P) to which sample 3008-A was buried is loosely constrained, the compatible P-T path indicates that retrograde evolution from peak metamorphic conditions of 825-875°C followed a moderately dipping dP/dT evolution until melt crystallized around 6.5-7.0 kbars and 750-775°C.

In the Sukaliuk Complex, peak metamorphic conditions preserved by sample 1098-A likely exceeded the biotite stability conditions, and was higher compared with

the CZ (at least in terms of temperature). In this sample, matrix biotites are interpreted to be retrograde based on their small, irregular habit, which contrasts with the large, tabular and undeformed biotite crystals shielded in garnets. Small pods of larger, unoriented biotite crystals in the matrix and around garnets are inferred to reflect melt crystallization back-reactions. The microstructural evidence of complete or near-complete biotite consumption indicates peak metamorphic conditions in excess of 825-850°C. Thermobarometry on a Grt-Opx-Cpx-bearing mafic sample (6080-A) suggests peak metamorphic conditions reached approximately 11 kbars and 900°C. In agreement with the low Ti-content of matrix biotite, phase equilibria modeling predicts that retrograde biotite predominantly crystallizes during the bulk of melt crystallization around 8.0 kbars and 825°C. This P-T estimate from mineral isopleth intersection agrees well with P-T estimates from thermobarometry (8.1±1.5 kbars and 823±40°C). Local subsolidus re-equilibration occurred between adjacent minerals, as suggested by lower Mg contents at garnet rims in contact with biotite.

In sample 6210-A from the Lomier Complex, peak metamorphic conditions probably enabled complete consumption of biotite. The lower Ti content of biotite inclusions compared with matrix biotite (*i.e.*, 0.5-0.6% versus 0.6-0.7%, respectively; Fig. 3-6b) and the bimodal size distribution of matrix biotite are consistent with: a) preservation of prograde biotite as low Ti inclusions shielded in garnet; b) complete consumption of prograde matrix biotite; and c) crystallization of large, retrograde, higher-Ti biotite in the matrix with cooling to solidus conditions. Therefore, peak metamorphic conditions were likely higher than 850-900°C, which is consistent with thermobarometry results from mafic samples in the Lomier Complex that indicate

close-to-peak metamorphic conditions of approximately 12.5 kbars and 950°C. Thermobarometry on metasedimentary rock sample 6210-A yields P-T conditions in the subsolidus area, which are consistent with the intersection of Fe# isopleths of garnet and biotite. Hence, the Fe-Mg composition of garnets and biotites were affected by retrograde re-equilibration, and therefore melt crystallization conditions can only be approximated (most likely between 7.0-8.0 kbars and 800-850°C).

In summary, compatible P-T paths suggest slightly lower melt crystallization conditions in the CZ in terms of P and T compared with the Sukaliuk and Lomier complexes (difference of 0-1 kbar and 50-75°C). Peak metamorphic conditions (defined from the biotite-out phase boundary and, when available, P-T estimates of equilibrium from mafic samples) also suggest an increase of P and T conditions to the east (difference of > 1.5 kbars and > 75°C; note that peak-P in the CZ could not be precisely estimated). The similarity of P-T paths from each domain suggests that the whole study area followed a similar metamorphic evolution, with the eastern rocks from the Torngat mountains representing deeper crustal levels where granulite facies conditions were developed and melt extraction was more efficient. Exhumation of the whole study area may have been slow (erosional), as suggested by the absence of isothermal decompression and the slope of retrograde paths that follow a mature, hot geothermal gradient.

3.9. Interpretations and conclusions

The combination of field evidence, petrographic analysis, thermobarometry, forward phase equilibria modeling, and geochronology using three radioactive isotope systems on multiple metamorphic minerals highlights the continuous metamorphic

overprint of the Torngat Orogeny in two adjacent high-grade metamorphic terrains with distinct characteristics. Although field observations suggest a sharp boundary (*i.e.*, BDC) between the CZ and Sukaliuk Complex, the spatial continuity of equilibrium P-T estimates from thermobarometry and the similarity of P-T paths interpreted from pseudosections indicate that metamorphism associated with collision with the NAC is responsible for reworking of the eastern CZ. Lu-Hf garnet geochronology suggests that metamorphic garnets in metasedimentary rocks throughout the study area started to crystallize as early as *c.* 1955-1885 Ma, and therefore, that the early phase of collision may have started much earlier than previously suggested (c. 1870-1850 Ma; *e.g.*, Van Kranendonk, 1996; Wardle & Van Kranendonk, 1996; Ermanovics & Van Kranendonk, 1998; Wardle *et al.*, 2002). Consequently, we propose that the TO, previously restricted to the Opx-bearing, highly sheared lithologies in the Torngat mountains (*i.e.*, from the Sukaliuk Complex in the west to the Tasiuyak Gneiss and Foreland in the east), should be regarded as a much broader orogenic system that includes the CZ, at least east of the GRSZ. This interpretation can be further supported by illustrating the similarity of compatible P-T-t-D paths between the studied domains and by considering the nature of tectonic processes in Large Hot Orogens (LHOs).

3.9.1. Compatible P-T-t-D paths

Compatible P-T-t-D paths were constructed for the three studied domains in order to compare their similarities in shape and timing, but also their differences in peak metamorphic conditions and their relationship with the main deformation phase (Fig. 3-14a). Although prograde mineralogy and microstructures were completely

obliterated by the prolonged high-grade metamorphic conditions, prograde evolution is believed to have followed a normal Barrovian metamorphic gradient, typical of crustal thickening. The absence of HP-UHP metamorphic rocks in the Torngat mountains and the CZ, and the microstructural evidence in metasedimentary rocks for garnet growth in the sillimanite stability field collectively point to medium pressure (8.0-12.0 kbars) prograde conditions. Lu-Hf garnet geochronology constrains for the first time the prograde evolution of the Torngat Orogeny at *c.* 1955-1885 Ma, and helps link metamorphism of the CZ to the Torngat Orogeny. As predicted from phase equilibrium modeling (*e.g.*, Kelsey *et al.*, 2008; Yakymchuk & Brown, 2014), few zircons and monazites are preserved in this time interval and are interpreted as prograde crystals that were not resorbed during prograde metamorphism. The small number of preserved Archean to early Paleoproterozoic zircons with low Th/U ratios suggest that some metasedimentary rocks recorded older metamorphic events (2600-1950 Ma), and therefore that the region is polymetamorphic. The oldest garnet crystallization age obtained from the Lomier Complex (1956±19 Ma) suggests that garnets crystallized for at least ~ 55 Myr prior to the regional phase of collision (c. 1900-1885 Ma; defined from Lu-Hf garnet geochronology of the Sukaliuk and Core zone metasedimentary rock samples). Garnet compositions suggest that prograde crystallization conditions were different in the eastern and western part of the study area. The low Lu content (in general < 10 ppm, except for sample 6150 in which garnet reaches 50 ppm Lu) and the strong partitioning of Lu in garnet cores of Torngat metasedimentary rocks suggest that these lithologies were already residual at that time

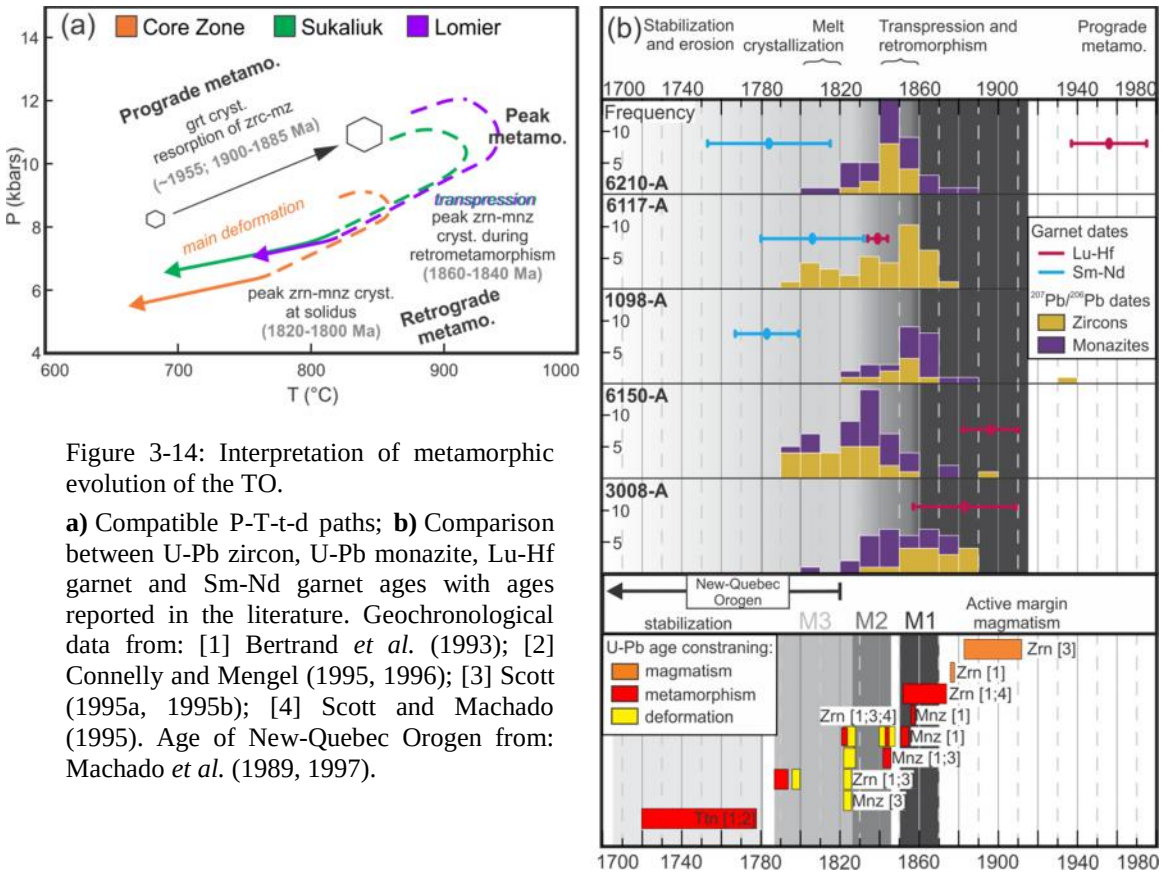

Figure 3-14: Interpretation of metamorphic evolution of the TO.

a) Compatible P-T-t-d paths; **b)** Comparison between U-Pb zircon, U-Pb monazite, Lu-Hf garnet and Sm-Nd garnet ages with ages reported in the literature. Geochronological data from: [1] Bertrand *et al.* (1993); [2] Connelly and Mengel (1995, 1996); [3] Scott (1995a, 1995b); [4] Scott and Machado (1995). Age of New-Quebec Orogen from: Machado *et al.* (1989, 1997).

(possibly because of efficient melt extraction). In contrast, garnets from sample 6150-A and 3008-A have high Lu content (~ 20 ppm), which is interpreted to reflect less efficient melt extraction during garnet growth in the western Sukaliuk Complex and the CZ.

Peak metamorphism occurred at lower P-T conditions in the CZ (*i.e.*, ~ 825-875°C) than in the Sukaliuk and Lomier complexes (~ 11 kbars-900°C and ~ 12.5 kbars-950°C, respectively). Although peak pressures could not be precisely defined from pseudosections, the regional thermobarometry survey indicates higher P-T conditions for mafic samples in the Lomier Complex than in the Sukaliuk Complex (no mafic samples were studied for the CZ). This eastward increase is also observed in

metasedimentary rocks. The trend defined by thermobarometry results of mafic samples fits a Barrovian metamorphic gradient. Consequently, the study area is interpreted as a downward-to-the-east section through a deeply eroded orogen.

The timing of peak metamorphism is not precisely constrained, but likely occurred between 1885 and 1840 Ma. Its minimum age can be approximated from the age of transpression during which P-T conditions decreased. Microstructures in the studied samples also suggest that the peak metamorphic assemblage crystallized prior to or early during the transpressional phase of the Orogen, which was constrained between 1845 and 1820 Ma (U-Pb monazite and zircon geochronology of syntectonic intrusions; Bertrand *et al.*, 1993; Scott, 1998). The Lu-Hf garnet date of 1839±5 Ma from mafic gneiss sample 6117-A from the Sukaliuk Complex is consistent with this minimum age bracket for peak metamorphism. The maximum age of peak metamorphism is not easily constrained, but is likely younger than the garnet crystallization ages in matesedimentary rock samples (< 1885 Ma). This maximum age is also coherent with the oldest $^{207}Pb/^{206}Pb$ metamorphic zircon ages preserved in metasedimentary rock samples.

Retrograde evolution is interpreted to be coeval for all domains. Exhumation seems not to be related to an important tectonic process. Instead, slow erosional exhumation is coherent with the textural and chemical equilibrium that characterizes the study area and with the minimum 60 Myr duration between inferred peak metamorphism and the youngest Sm-Nd cooling age (> 1840 Ma and 1780 Ma, respectively). The retrograde part of the orogenic evolution is tightly constrained by the protracted crystallisation of zircons and monazites during this segment of the

orogenic evolution (as predicted by Kelsey *et al.*, 2008; Yakymchuk & Brown, 2014), and since microstructures, mineral chemistry, and thermobarometry estimates reflect equilibrium at melt crystallization for anatectic rocks (as shown above; *e.g.*, Indares *et al.*, 2008; Guilmette *et al.*, 2011). Two important events can be recognized from zircon and monazite dates (Fig. 3-14b). An earlier crystallization event is limited to samples in the Torngat mountains in which both zircon and monazite dates define high frequency peaks at *c.* 1860-1840 Ma. This event may capture the transition between peak and retrograde metamorphism given that the Lu-Hf garnet date of *c.* 1840 from sample 6117-A is a minimum age for peak metamorphism. In the Grt-Sil-Bt diatexite from the western Sukaliuk Complex (sample 6150-A), zircon and monazite frequency peaks are slightly younger (c. 1840-1820 Ma). This important crystallization event is temporally related to transpressional deformation (1845-1820 Ma; Bertrand *et al.*, 1993; Scott, 1998) during which metamorphic conditions were decreasing (7.0-5.0 kbars and 700-600°C; Mengel *et al.*, 1991; Van Kranendonk, 1996). The transpressional convergence may have provided an efficient mechanism for melt extraction during this period. A minor crystallization event occurred at *c.* 1820-1800 Ma, and is best recorded in samples where *in situ* leucosomes were abundant on outcrop (especially 6150-A). Monazites associated with this event generally have a higher Y content, which was interpreted as reflecting melt crystallization. As predicted from zircon and monazite behavior models in anatectic rocks (Kelsey *et al.*, 2008; Yakymchuk & Brown, 2014), melt crystallization is associated with extensive crystallization of zircons and monazites. Hence, the ages of these minerals constrain the timing of regional melt crystallization. Equilibration conditions at the solidus in

the CZ (*i.e.*, 6.75 kbars-775°C) as well as in the Sukaliuk and Lomier complexes (*i.e.*, 8.0 kbars-825°C and 7.75 kbars-825°C, respectively) are consequently very well constrained at *c.* 1820-1800 Ma. Additionally, Sm-Nd garnet dates suggest cooling to the effective closure temperature of the Sm-Nd isotope system (minimum T_c > 700°C; Smit *et al.*, 2013) may have occurred by *c.* 1780 Ma.

In summary, the integration of all results in compatible P-T-t-D paths, as presented above, highlights the similarity between the metamorphic evolution of the eastern CZ and of domains from the Torngat mountains, initially believed to have significantly different metamorphic histories. Although prograde metamorphism might have occurred earlier to the east in the Lomier Complex, the main prograde evolution towards anatexis over the whole study area was generally coeval at *c.* 1900-1885 Ma. Peak metamorphic P-T conditions were likely higher in the Torngat mountains, and hence the Sukaliuk and Lomier complexes likely represent lower crustal levels. The age of peak metamorphism is not tightly constrained (< 1885 Ma and > 1840 Ma), and may be coeval or diachronous over the study area. Although the high-grade segment of the P-T-t-D evolution is nebulous, the hairpin shape of the P-T path is well constrained from the retrograde evolution, which follows a mature, hot geothermal gradient. Hence, the whole region experienced limited tectonic exhumation. Erosion exposed the deeper, eastern Torngat crustal levels where post-peak transpression was localised. The 20 to 60 Myr interval between inferred peak metamorphism and melt crystallization supports slow exhumation rates, consistent with the microstructural equilibrium and chemical homogenization of minerals observed in the samples.

3.9.2. Tectonic implications

The new petrology, thermobarometry, phase equilibria modeling, and geochronology data support a regional metamorphic event that influenced both the eastern CZ and the Torngat rocks over at least 80 Myr. Previous studies interpreted the TO as a high temperature, narrow orogenic belt that was dominantly influenced by transpressional deformation (*e.g.*, Van Kranendonk, 1996; Wardle & Van Kranendonk, 1996; Ermanovics & Van Kranendonk, 1998; Wardle *et al.*, 2002) and evolved in three distinct tectonometamorphic phases (*i.e.*, M1: crustal thickening; M2: transpression; M3: exhumation and cooling; Fig. 3-14b). In light of our new data, we suggest that crustal thickening was not limited to the Torngat mountains, and that at least the eastern CZ metasedimentary rocks were also buried to middle crustal conditions during the continental collision. The abrupt appearance of orthopyroxene and shear deformation structures at the BDC, previously used to constrain the extent of Torngat metamorphism, is instead interpreted as a combined effect of the lower crustal depth and the higher thermal state of Torngat rocks, the residual composition of those rocks, the efficient melt extraction (as suggested by melt migration structures), and the strain localisation in the Torngat mountains.

3.9.2.1. Implications for the Trans-Hudson orogenic system

Interpretation of the eastern CZ and the Torngat mountains as the roots of a large orogen that underwent slow denudation along a 35°C/km geotherm (starting at middle crustal depths of 30-45 km based on an average density for continental crust of 2.7 g/cm^3) differs from the collisional style dominating other orogens elsewhere in the

THO. This new interpretation has an important impact on our understanding of THO evolution as described below.

Compared with other branches of the THO (*e.g.*, Baffin suture zone and Reindeer zone), the TO is distinguished by its predominantly transpressional character, its high-grade granulite-facies and migmatitic rocks, and its long metamorphic history. In other branches of the THO, continental collision (principal crustal thickening event) is preceded by accretion and magmatism as in Baffin Island (St-Onge *et al.*, 2009) and in the Reindeer zone (Chakungal, 1999, Corrigan *et al.*, 1999). However, such pre-collisional phases are not recognized in the TO. All metamorphic ages and P-T estimates are part of a single crustal thickening event as suggested by continuous zircon and monazite crystallization over the orogenic cycle (some preserved prograde zircon and monazite crystals, and abundant retrograde crystals) and by the correlation of garnet, zircon, and monazite ages in both the CZ and Torngat mountains. Archean to early Paleoproterozoic metamorphic zircons in sample 1098-A from the Sukaliuk Complex and the *c.* 1956 Ma garnet crystallization age of sample 6210-A from the Lomier Complex suggests that radioactive isotope systems may in rare circumstances preserve pre-continental collision events.

We suggest that the position of the TO on the side of the Ungava indentor (NE Superior Craton) and oblique collision during the orogeny can explain the high-grade and long-lived metamorphic character of this region. In cases where convergence is primarily accommodated by a strike-slip component of deformation, exhumation of orogenic roots is much slower than in close-to-orthogonal convergence where extrusion by isothermal decompression of metamorphic core complexes may occur

(*e.g.*, Thompson *et al.*, 1997). Models suggest that cooling in orthogonal collisional settings is very fast (few Myr), but as the angle of collision decreases, orogenic cooling is much slower since exhumation is limited by the absence of extrusion processes (*e.g.*, isothermal decompression; lateral extrusion, etc.) that brings heated rocks closer to Earth's surface. By varying the obliquity of collision in their numerical modeling, Thompson *et al.* (1997) predicted that orthogonal collisional orogens, such as at the front of a continental indentor, would have a shorter metamorphic evolution as exhumation and cooling are rapid. By contrast, low-angle convergence is associated with slow cooling, such as in the distal zones of an indentor where the orogenic root remains at high-grade conditions over a prolonged period. We suggest that the latter was the case for the TO as also supported by Corrigan (2015). This interpretation is not only consistent with the position of the TO on the flank of the Ungava indentor, but is also supported by the protracted crystallization of retrograde zircon and monazites, the interpreted P-T path that suggests no important tectonic exhumation of the orogen, and the equilibrium state and homogeneity (in terms of microstructures and mineral chemistry) of the metamorphic assemblages throughout the region.

Looking more broadly at the geometry and evolution of the peri-Superior region, we suggest that the transpression in the SECP, and therefore the metamorphic and deformation character of the TO, was greatly influenced by the northward relative motion of the Ungava indentor (modern coordinates). This interpretation is consistent with geochronological data and the metamorphic character of both the Torngat and Baffin orogens. The convergence of the Superior Craton with the Meta-Incognita Microcontinent may have begun by accretion of magmatic arc and supracrustal

terrains around 1845-1842 Ma (St-Onge *et al.*, 2007, 2009), which is not only coherent in terms of motion but also is compatible with the minimum age of sinistral shearing inferred for the Torngat mountains. In addition, the continental collision phase of the Baffin suture is coeval with the final melt crystallization event in the TO (*i.e.*, *c.* 1820-1800 Ma based on our new geochronological data), and the New-Quebec Orogeny. Although further evidence is needed to constrain the final evolution of the eastern THO, we propose that important changes occurred around 1.82-1.80 Ga as suggested by the contemporaneity of the solidification of the SECP, the New-Quebec Orogeny, and culmination of continental collision at the Baffin suture zone.

3.9.2.2. Implications for ancient-modern orogen transition

Multiple studies have highlighted the thermal state of the Moho and the rheological behavior of the lithospheric mantle as first order factors controlling the deformation and metamorphic characteristics of orogens (see reviews in Chardon *et al.*, 2009, and Gapais *et al.*, 2009). Initially hot and weak lithospheric mantle was identified as a principal agent of pervasive deformation, lateral flow of lower crust, limited topography, and the monotonous thermal state of ancient Ultra-Hot Orogens (UHOs). The Paleoproterozoic was identified as a transitional interval during which "Archean-type" and "modern-type" orogens coexisted as a result of the different geodynamic context and the different behavior of the lithospheres involved (*e.g.*, Cagnard *et al.*, 2011). We interpret the TO as an intermediate between UHOs and Hot Orogens (HOs) based on the classification by Chardon *et al.* (2009).

The high thermal state, long metamorphic history, and slow cooling (no tectonic exhumation) of the TO are typical features observed in UHOs. Our results

suggest that upper-amphibolite to granulite-facies metamorphic conditions were developed over more than 200 km and that the study area remained under partial melting conditions over more than 30-50 Myr. Field observations west of the GRSZ also support large-scale Paleoproterozoic anatexis throughout the CZ (*e.g.*, Simard *et al.*, 2011; Lafrance *et al.*, 2014). Although metamorphic conditions have not yet been quantified in the western CZ, these results and observations point toward a large thermally equilibrated metamorphic terrane as observed in UHOs. The slow, erosional exhumation process (suggested by protracted zircon and monazite crystallization and by the geotherm-parallel cooling paths) and the absence of late normal faults observed in gravitational-collapsed orogens (*e.g.*, HOs) suggest that significant topography was not associated with the Torngat continental collision. This inference is further supported by the absence of high- or ultra-high-P metamorphic rocks in the TO (characteristic of colder orogens with high topographic relief and steep subduction angles). Convergence during the Torngat Orogeny was likely accommodated by appreciable lateral flow, as suggested by the steep foliation and subhorizontal mineral lineations characteristic of orogen-parallel "strike-slip" flow (Chardon *et al.*, 2009). Structures related to vertical flow characteristic of UHOs (such as dome-and-basin structures produced by downward motion of supracrustal units due to a hot and weak underlying lithosphere; Cagnard *et al.*, 2011) are not reported in the TO, possibly because of the important transpressional phase of collision that post-dates prograde metamorphism.

However, unlike UHOs that are nearly isobaric regions due to the absence of significant vertical motion between crustal blocks (Chardon *et al.*, 2009), a small and

continuous P-gradient was identified in the study area. This variation in crustal depth may reflect a paleotopography, greater crustal thickening in the Torngat mountains, and/or differential erosion over the study area. The latter hypothesis is probably not the controlling factor as cooling paths and equilibrium P-T estimates are consistent over the study area. Indeed, the continuity of the field metamorphic gradient and the similarity of cooling paths emphasizes that differential displacement along domain boundaries remained limited and that domains shared a significant part of their exhumation history.

The behavior of the TO as a hot and weak block characterized by high-T lithospheric mantle conditions (weakly coupled to the continental lithosphere) is coherent with a vise-model collision interpreted by Ellis and Beaumont (1999) for the SECP. Our results and interpretations point toward a model where continental collision involved a weak continental block between stronger and colder cratons (*i.e.*, the Superior Craton and the NAC) in which deformation was distributed and the gravitational force was strong and/or mantle decoupling was important, thus inhibiting high topography (higher Argand and low Ampferer numbers, respectively; Ellis *et al.*, 1998). Uniformly slow exhumation, large-scale pervasive deformation, and medium-P and high-T metamorphism over the study area are also coherent with predictions from vise-like models.

CHAPTER 4: CONCLUSIONS

In this contribution, the tectonometamorphic evolution of the eastern CZ and the TO was addressed in order quantify and define the extent of the Torngat metamorphism, to address the anomalously high thermal state of this narrow orogenic belt (as defined in Wardle *et al.*, 2002), and to constrain in time the metamorphism that affected the CZ.

For the 20 samples selected from the CZ and the Sukaliuk and Lomier complexes (*i.e.*, granulitic domains from the TO), petrographic analysis and mineral chemistry highlight the textural and chemical homogenisation characterizing the entire study area. No garnet growth zoning and few prograde mineralogy inclusions are preserved. Also, only local zonation at garnet rims is observed and is interpreted as a local-scale subsolidus retrograde reaction. Phase multi-equilibria calculations reflect a continuous increase in equilibration conditions from the CZ (west) to the Lomier Complex (east). Because of their higher solidus P-T conditions, their more anhydrous mineralogy and their lower melt production compared with metasedimentary rocks, mafic rock samples indicate close-to-peak P-T conditions increasing from west to east between 8.7 kbars-814°C and 10.8 kbars-914°C. Metasedimentary rock samples yield lower P-T estimates (5.4 kbars-709°C in the CZ to 8.1 kbars-823°C in the Lomier Complex) that are interpreted as reflecting melt crystallization conditions. Not only do these results indicate that Barrovian-type metamorphism affected both the CZ and the Torngat granulite-facies domains, but they also highlight how a multi-protolith approach may be an asset in retrieving different parts of the P-T evolution of a metamorphic terrain.

The regional petrographic and thermobarometry survey was complemented by an advanced geochronology study of five samples and forward modeling of three samples distributed on both sides of the CZ-TO boundary. Metamorphic U-Pb zircon ages, U-Pb monazite ages, and Lu-Hf and Sm-Nd garnet ages are consistent in both domains. This similarity in metamorphic ages supports that the continuous west-to-east increase of metamorphic conditions represents a regional Torngat overprint that transcends the limit of granulite domains (BDC). Zircon and monazite metamorphic ages suggest protracted metamorphic crystallization from *c.* 1885 to 1780 Ma throughout the study area. Reflected by high-frequency peaks in metamorphic ages, important crystallization events at 1860-1840 Ma and 1820-1800 Ma are interpreted as indicators of cooling under transpressional stress regime and melt crystallization, respectively. For the first time in the SECP, Lu-Hf garnet geochronology was undertaken and reveals that collision was ongoing 15-85 Myr earlier than previously thought (1870 Ma; Wardle *et al.*, 2002). The Sm-Nd isotope system in garnets, which has a much lower effective closure temperature, reveals that cooling occurred at least until *c.* 1780 Ma in the Sukaliuk and Lomier complexes. Forward modeling characterize the peak to retrograde evolution of the study area, but the prograde evolution could not be well constrained because of the absence of preserved prograde metamorphic mineralogy and prograde zonation. P-T-t-D paths for the three studied domains support a similar peak-to-retrograde evolution characterized by a hairpin shape parallel to a 35°C/km geotherm. After peak metamorphic conditions were reached by 1885-1840 Ma, the eastern CZ and the TO stayed under suprasolidus conditions for at least 20 to 60 Myr.

We interpret our results as indicating that the study area represents a downward-to-the-east section through a deeply eroded orogen, which was exhumed by slow denudation (erosion). We suggest that this distinction of the SECP compared with elsewhere in the eastern part of the THO may be explained by its position on the eastern flank of the Ungava indentor (oblique convergence) and by the high thermal state of the lithospheric mantle. The Torngat Orogeny may be intermediate between ultrahot orogens and hot orogens, where decoupling between the hot lithosphere and crust is responsible for large-scale penetrative deformation (vise model). After burial, no efficient uplifting processes enabled fast exhumation and cooling since most of the convergence was accommodated by strike-slip motion.

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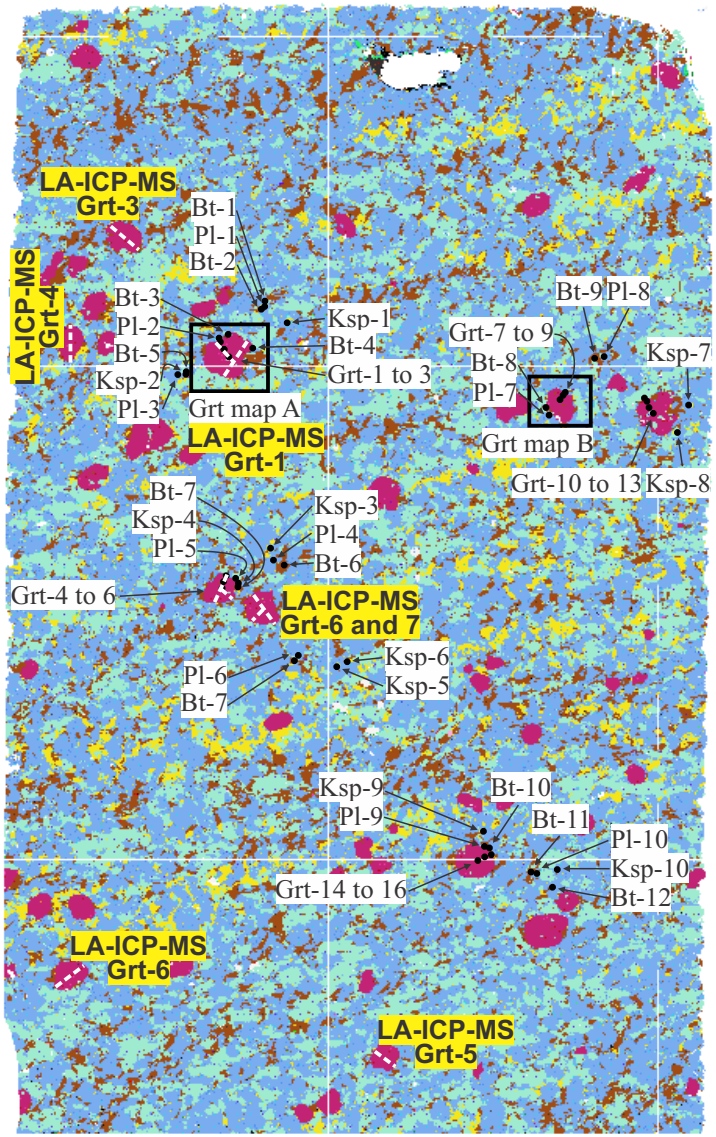
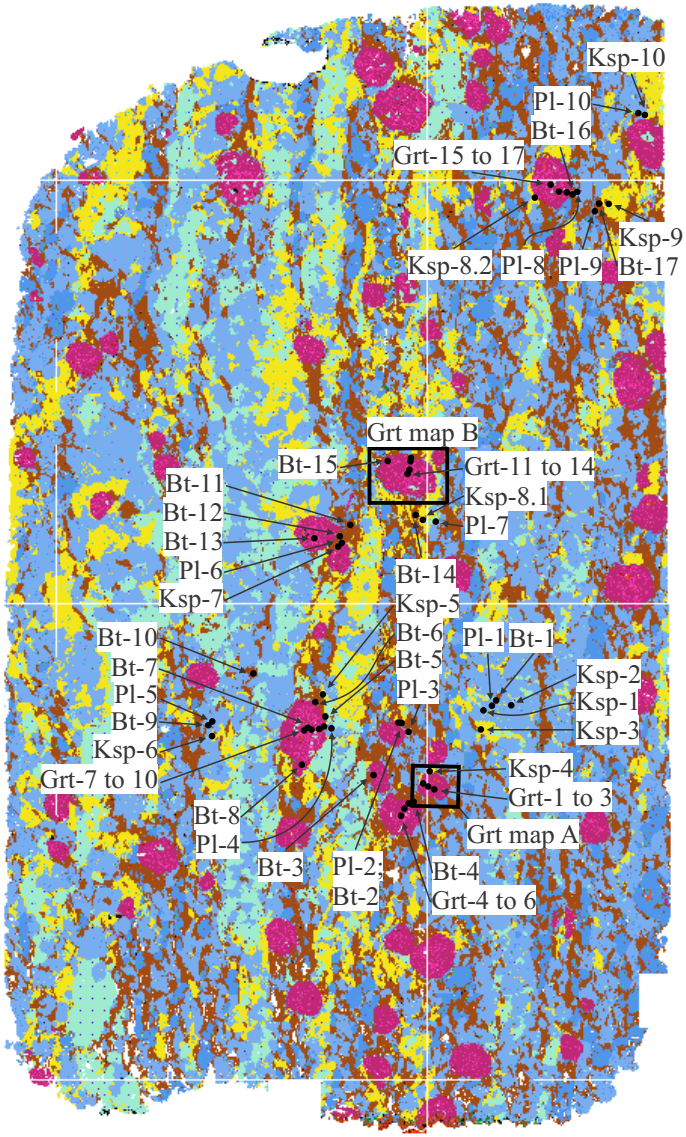
APPENDIX 1: SEM-MLA IMAGING

Figure S1a: MLA imaging and mineral modal proportion for sample 3008-A



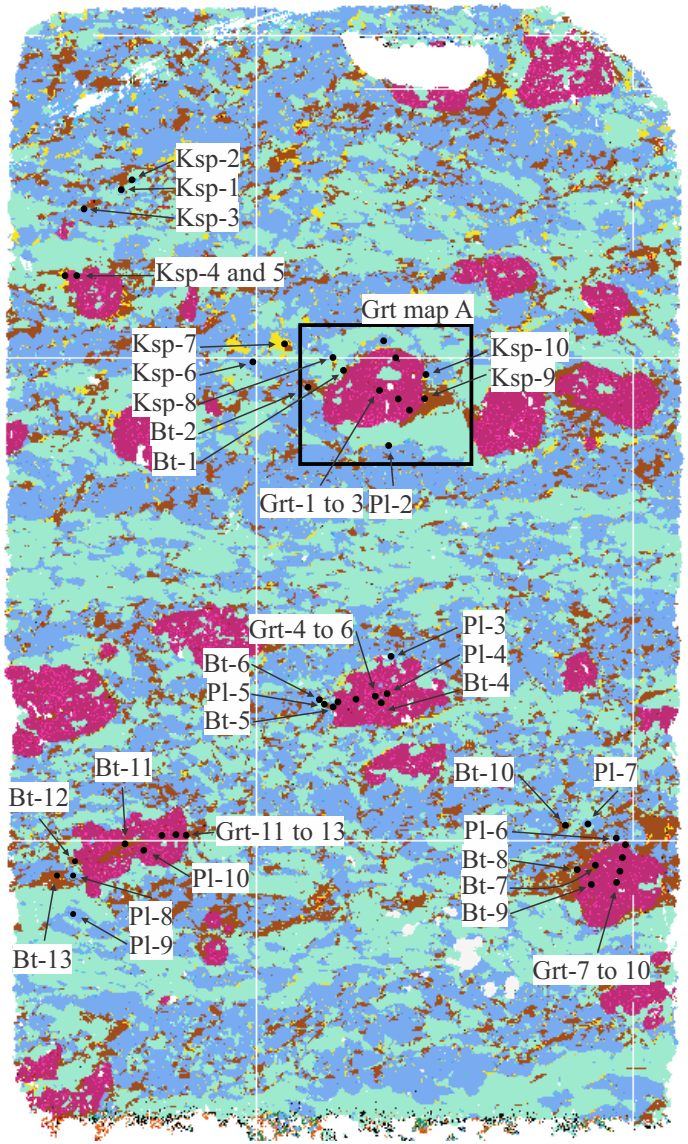
Minerals	Color code	modal proportion (Area%)
Pl (An30)		50.0
Pl (An70)		0.7
Pl (Ab)		0.3
Ksp		5.6
Bt		11.0
Amph		-
Grt (Alm-rich)		3.6
Grt		-
Cpx		-
Cpx (di)		-
Opx		-
Qtz		27.3
Sil		-
Ep		-
Chl		-
Ilm		Tr.
Rt		-
Ttn		-
Ap		-
Zrn		-
Mnz		-
Py/Mag		-

Figure S1b: MLA imaging and mineral modal proportion for sample 4041-B



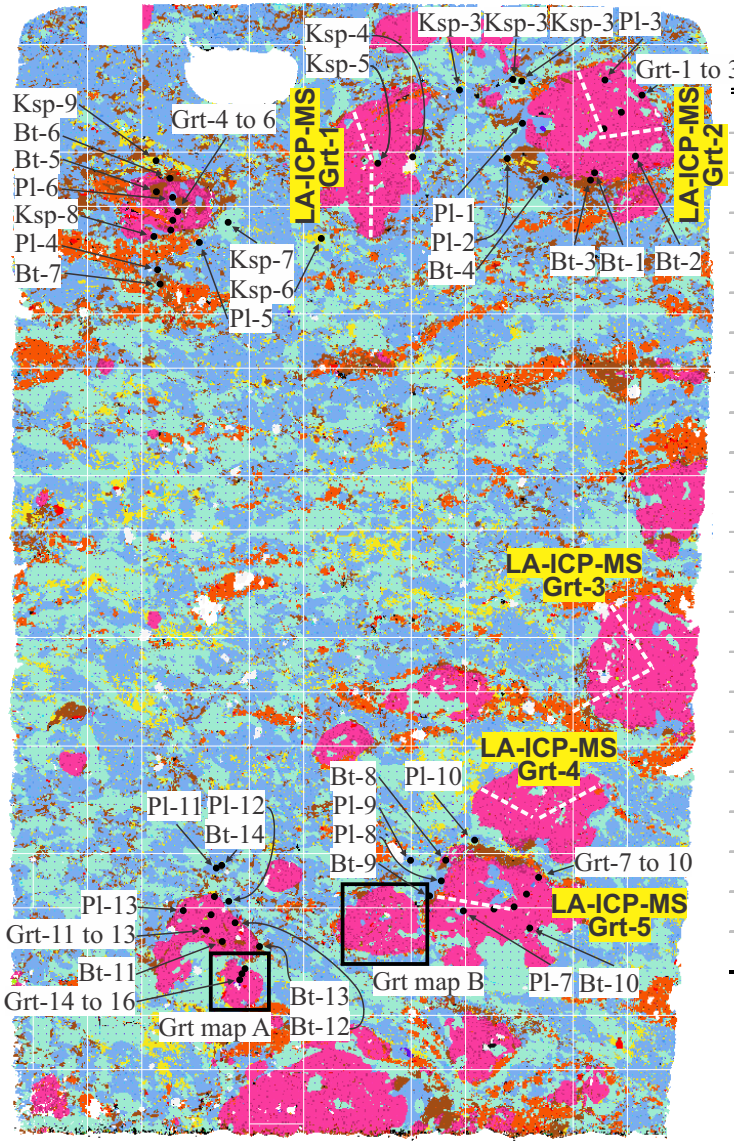
Minerals	Color code	modal proportion (Area%)
Pl (An30)		38.2
Pl (An70)		0.7
Pl (Ab)		0.2
Ksp		14.1
Bt		19.9
Ser		8.1
Amph		-
Grt (Alm-rich)		6.1
Grt		0.9
Cpx		-
Cpx (di)		-
Opx		-
Qtz		11.3
Sil		Tr.
Ep		-
Chl		-
Ilm		0.1
Rt		-
Ttn		-
Ap		-
Zrn		-
Mnz		-
Py/Mag		-

Figure S1c: MLA imaging and mineral modal proportion for sample 3117-A



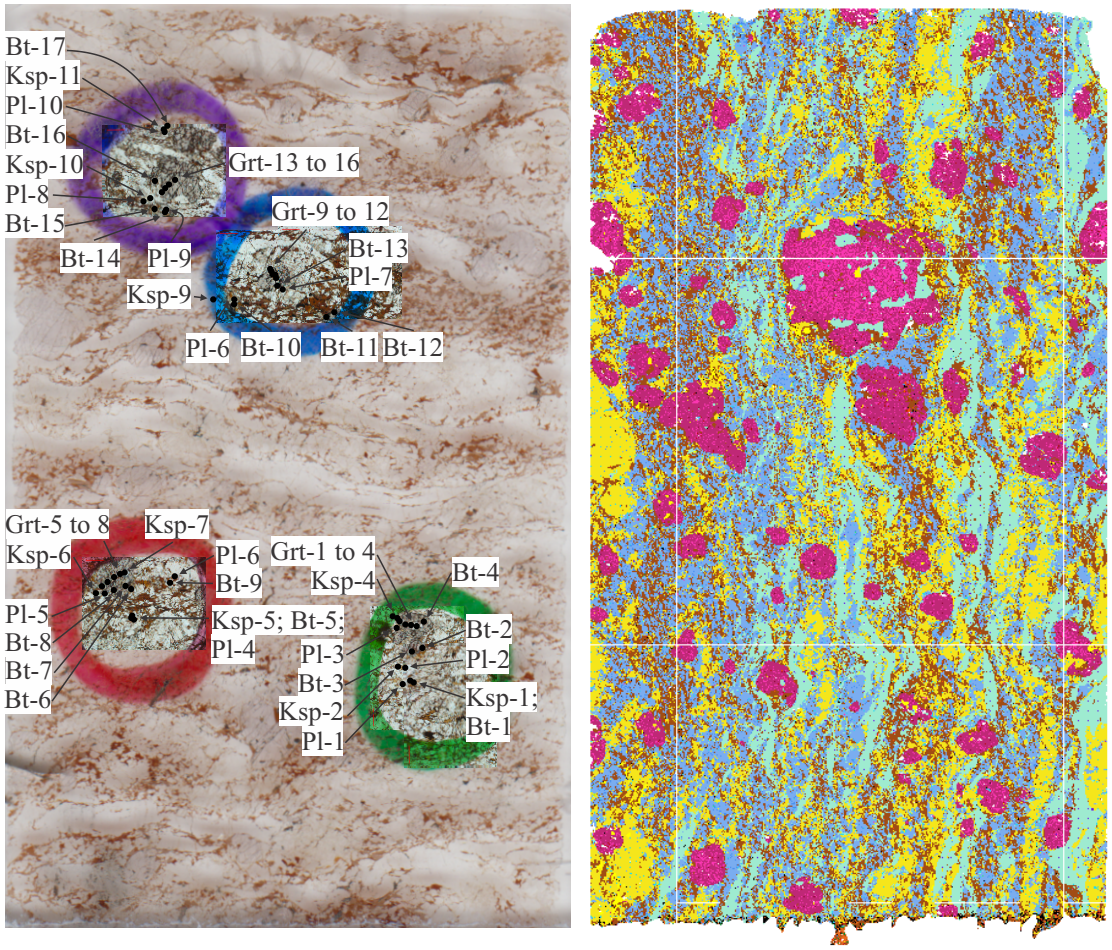
Minerals	Color code	modal proportion (Area%)
Pl (An30)		39.8
Pl (An70)		0.1
Pl (Ab)		0.4
Ksp		2.3
Bt		10.6
Amph		-
Grt (Alm-rich)		8.1
Grt		1
Cpx		-
Cpx (di)		-
Opx		-
Qtz		36.4
Sil		-
Ep		-
Chl		-
Ilm		0.2
Rt		0.1
Ttn		0.2
Ap		-
Zrn		-
Mnz		-
Py/Mag		0.2

Figure S1d: MLA imaging and mineral modal proportion for sample 1098-A



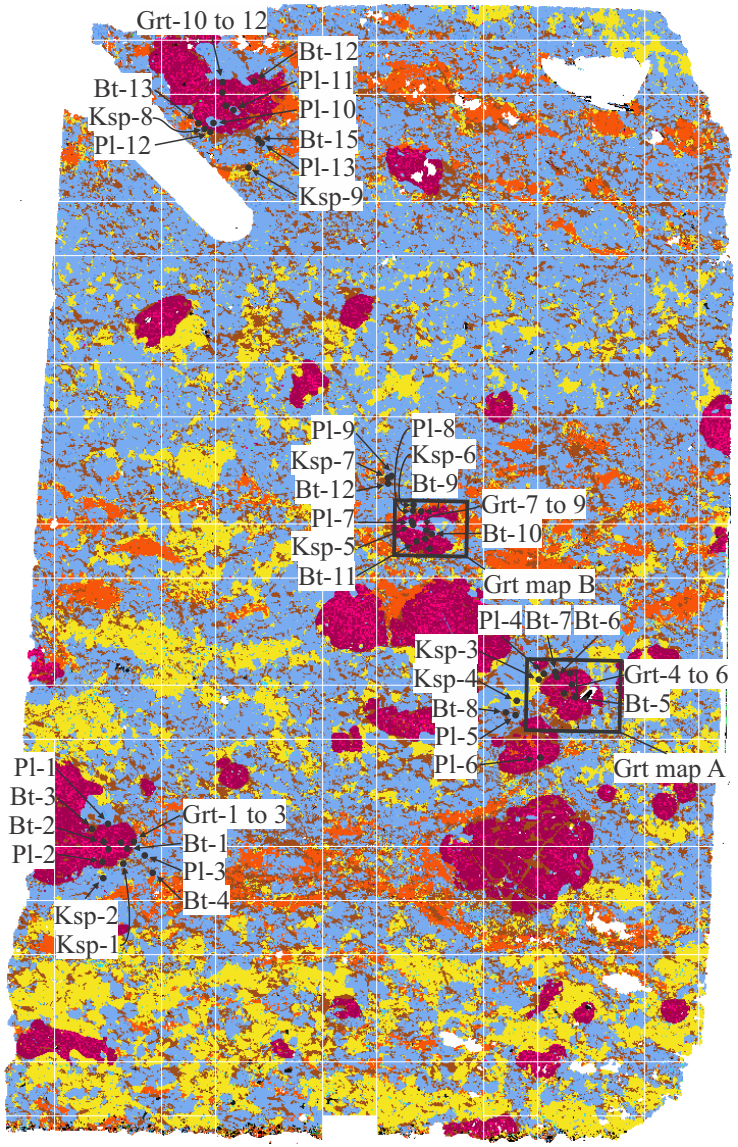
Minerals	Color code	modal proportion (Area%)
Pl (An30)		37.4
Pl (An70)		0.6
Pl (Ab)		0.5
Ksp		4.6
Bt		6.1
Amph		-
Grt (Alm-rich)		1.6
Grt		11.5
Cpx		-
Cpx (di)		-
Opx		-
Qtz		29.0
Sil		6.2
Ep		-
Chl		-
Ilm		0.1
Rt		0.4
Ttn		-
Ap		-
Zrn		-
Mnz		-
Py/Mag		0.3

Figure S1e: MLA imaging and mineral modal proportion for sample 3123-A



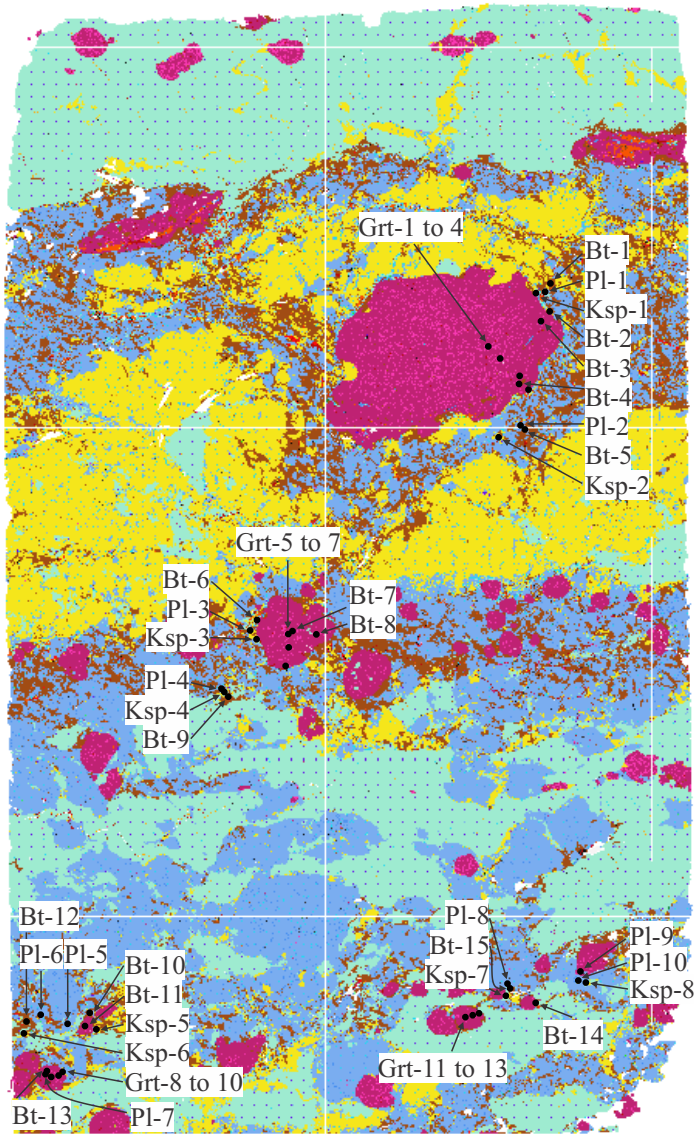
Minerals	Color code	modal proportion (Area%)
Pl (An30)		24.0
Pl (An70)		1.3
Pl (Ab)		1.3
Ksp		21.8
Bt		19.9
Amph		0.1
Grt (Alm-rich)		8.9
Grt		2.5
Cpx		-
Cpx (di)		-
Opx		-
Qtz		17.4
Sil		Tr.
Ep		-
Chl		-
Ilm		0.2
Rt		Tr.
Ttn		0.1
Ap		-
Zrn		-
Mnz		-
Py/Mag		1.5

Figure S1f: MLA imaging and mineral modal proportion for sample 5030-B



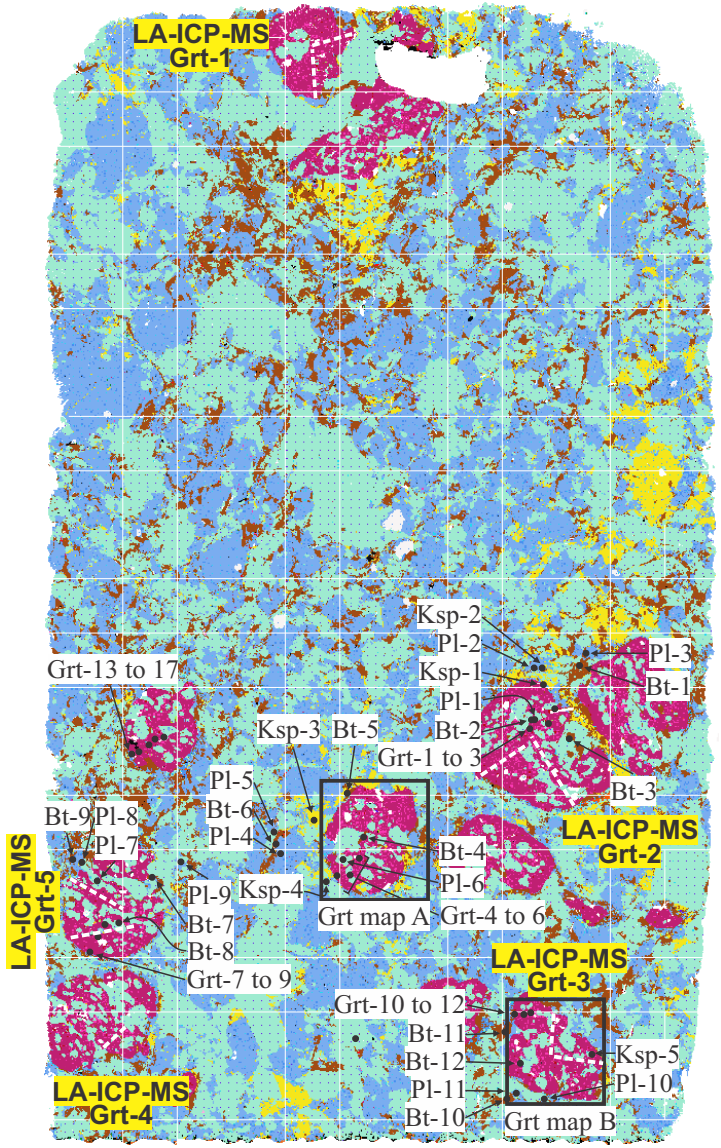
Minerals	Color code	modal proportion (Area%)
Pl (An30)		46.6
Pl (An70)		0.3
Pl (Ab)		0.6
Ksp		18.5
Bt		15.9
Amph		-
Grt (Alm-rich)		1.7
Grt		7.3
Cpx		-
Cpx (di)		-
Opx		-
Qtz		Tr.
Sil		7.0
Ep		-
Chl		-
Ilm		0.2
Rt		-
Ttn		-
Ap		-
Zrn		-
Mnz		-
Py/Mag		0.2

Figure S1g: MLA imaging and mineral modal proportion for sample 6084-A



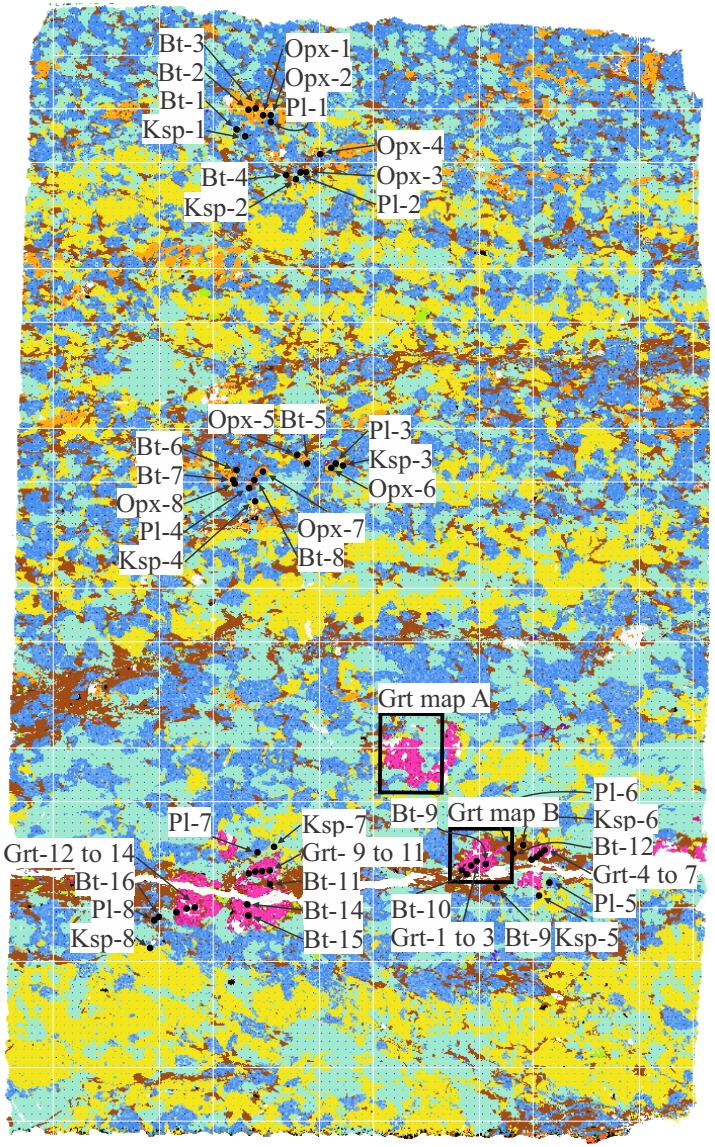
Minerals	Color code	modal proportion (Area%)
Pl (An30)		26.4
Pl (An70)		0.5
Pl (Ab)		0.7
Ksp		20.8
Bt		10.8
Amph		-
Grt (Alm-rich)		1.1
Grt		7.7
Cpx		-
Cpx (di)		-
Opx		0.1
Qtz		30.6
Sil		0.3
Ep		-
Chl		-
Ilm		0.3
Rt		0.1
Ttn		-
Ap		-
Zrn		-
Mnz		-
Py/Mag		-

Figure S1h: MLA imaging and mineral modal proportion for sample 6150-B



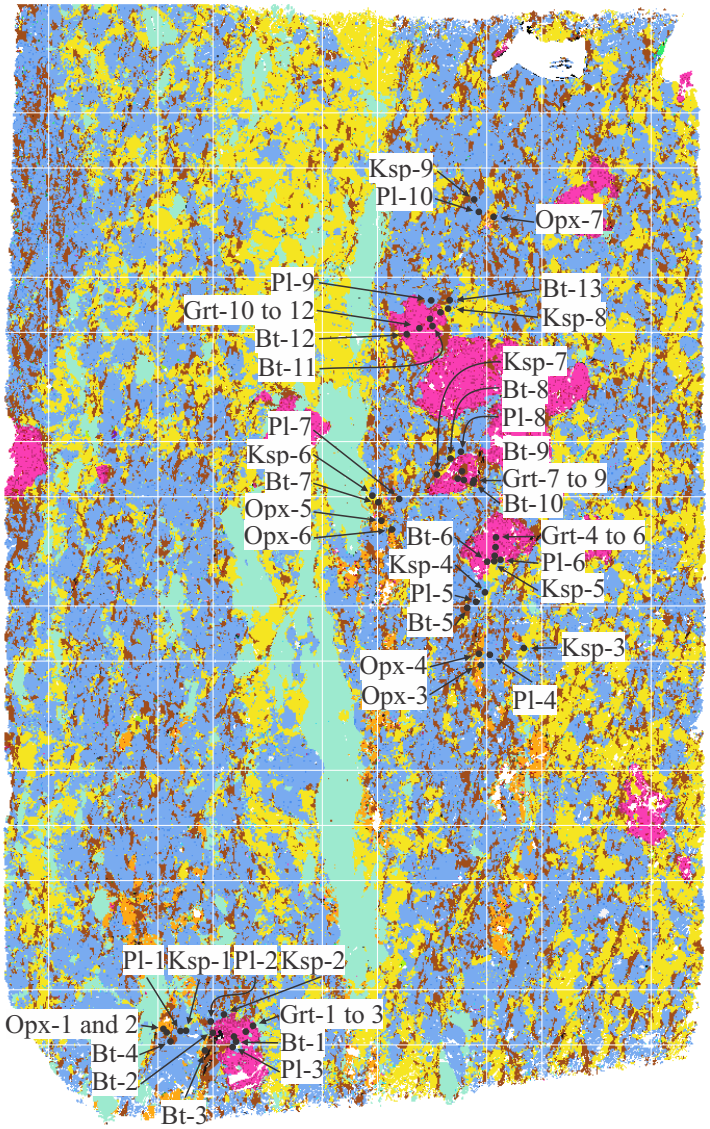
Minerals	Color code	modal proportion (Area%)
Pl (An30)		31.7
Pl (An70)		1.8
Pl (Ab)		0.5
Ksp		4.4
Bt		10.1
Amph		-
Grt (Alm-rich)		1.1
Grt		6.8
Cpx		-
Cpx (di)		-
Opx		-
Qtz		42.2
Sil		Tr.
Ep		-
Chl		-
Ilm		0.1
Rt		-
Ttn		-
Ap		-
Zrn		-
Mnz		-
Py/Mag		0.2

Figure S1i: MLA imaging and mineral modal proportion for sample 1121-A



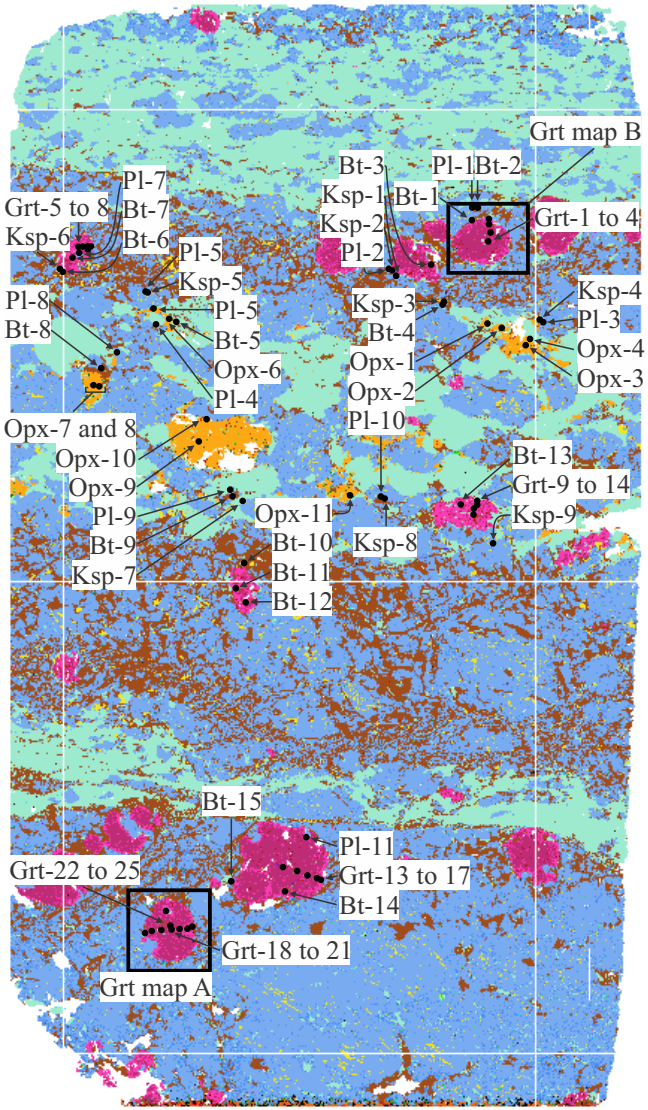
Minerals	Color code	modal proportion (Area%)
Pl (An30)		10.1
Pl (An70)		20.7
Pl (Ab)		0.3
Ksp		23.5
Bt		11.8
Amph		0.1
Grt (Alm-rich)		0.3
Grt		1
Cpx		-
Cpx (di)		-
Opx		-
Qtz		28.6
Sil		-
Ep		-
Chl		-
Ilm		0.1
Rt		-
Ttn		0.1
Ap		0.4
Zrn		-
Mnz		-
Py/Mag		0.2

Figure S1j: MLA imaging and mineral modal proportion for sample 4081-A



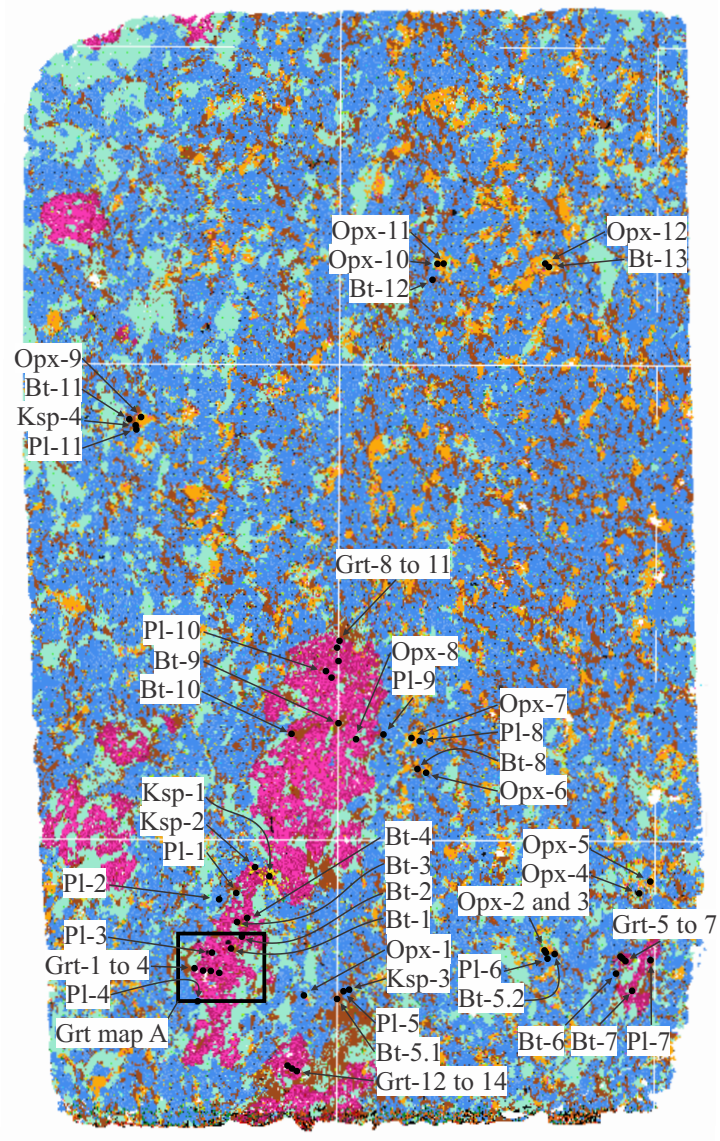
Minerals	Color code	modal proportion (Area%)
Pl (An30)		41.4
Pl (An70)		1.3
Pl (Ab)		0.5
Ksp		26.1
Bt		13.1
Ser		0.6
Amph		<0.1
Grt (Alm-rich)		0.9
Grt		3.2
Cpx		-
Cpx (di)		-
Opx		1.7
Qtz		10.5
Sil		-
Ep		-
Chl		-
Ilm		0.2
Rt		-
Ttn		-
Ap		0.1
Zrn		-
Mnz		-
Py/Mag		0.1

Figure S1k: MLA imaging and mineral modal proportion for sample 6129-A



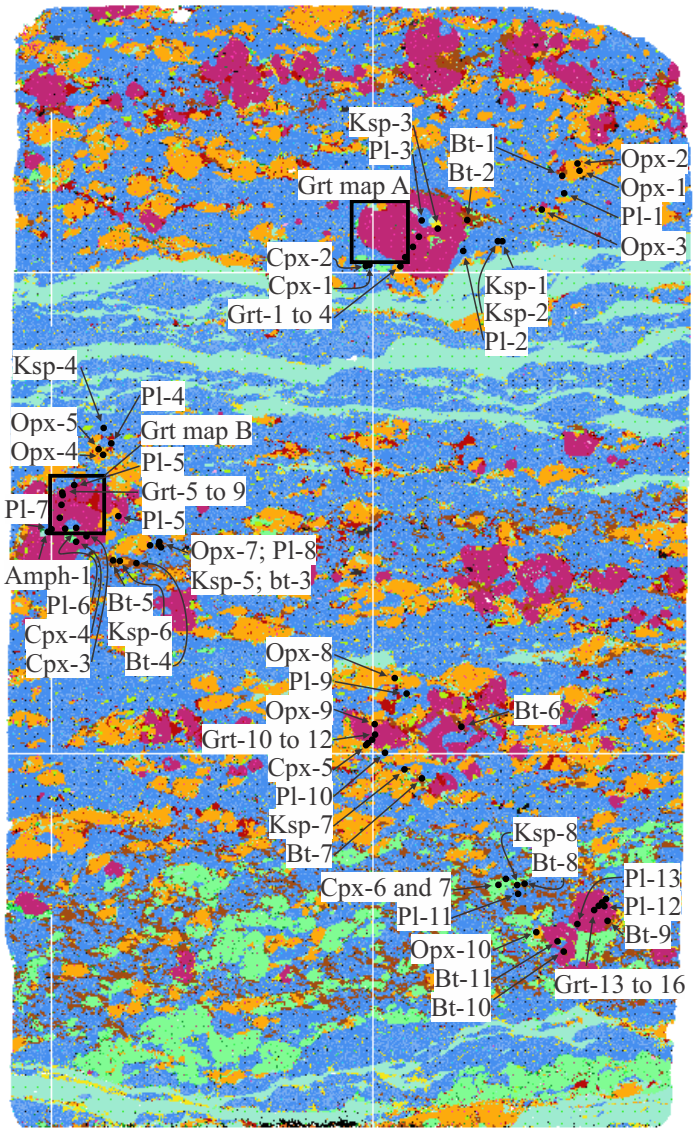
Minerals	Color code	modal proportion (Area%)
Pl (An30)		47.4
Pl (An70)		3.5
Pl (Ab)		0.1
Ksp		1.8
Bt		15.5
Amph		0.2
Grt (Alm-rich)		1.7
Grt		2.7
Cpx		-
Cpx (di)		6.1
Opx		-
Qtz		24.0
Sil		-
Ep		0.1
Chl		-
Ilm		0.2
Rt		-
Ttn		0.2
Ap		-
Zrn		-
Mnz		-
Py/Mag		-

Figure S11: MLA imaging and mineral modal proportion for sample 2112-B



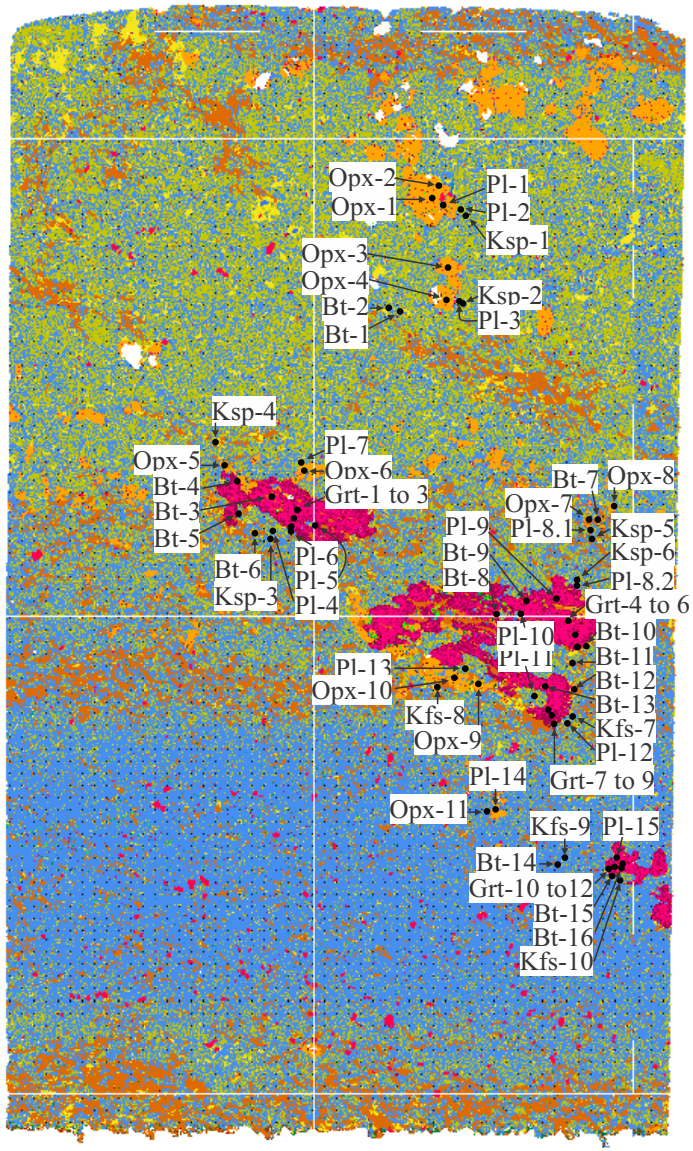
Minerals	Color code	modal proportion (Area%)
Pl (An30)		8.3
Pl (An70)		43.8
Pl (Ab)		0.1
Ksp		0.9
Bt		14.0
Amph		0.5
Grt (Alm-rich)		2.8
Grt		2.7
Cpx		-
Cpx (di)		-
Opx		6.6
Qtz		17.2
Sil		-
Ep		0.1
Chl		-
Ilm		0.2
Rt		-
Ttn		0.1
Ap		0.8
Zrn		-
Mnz		-
Py/Mag		0.2

Figure S1m: MLA imaging and mineral modal proportion for sample 3090-A



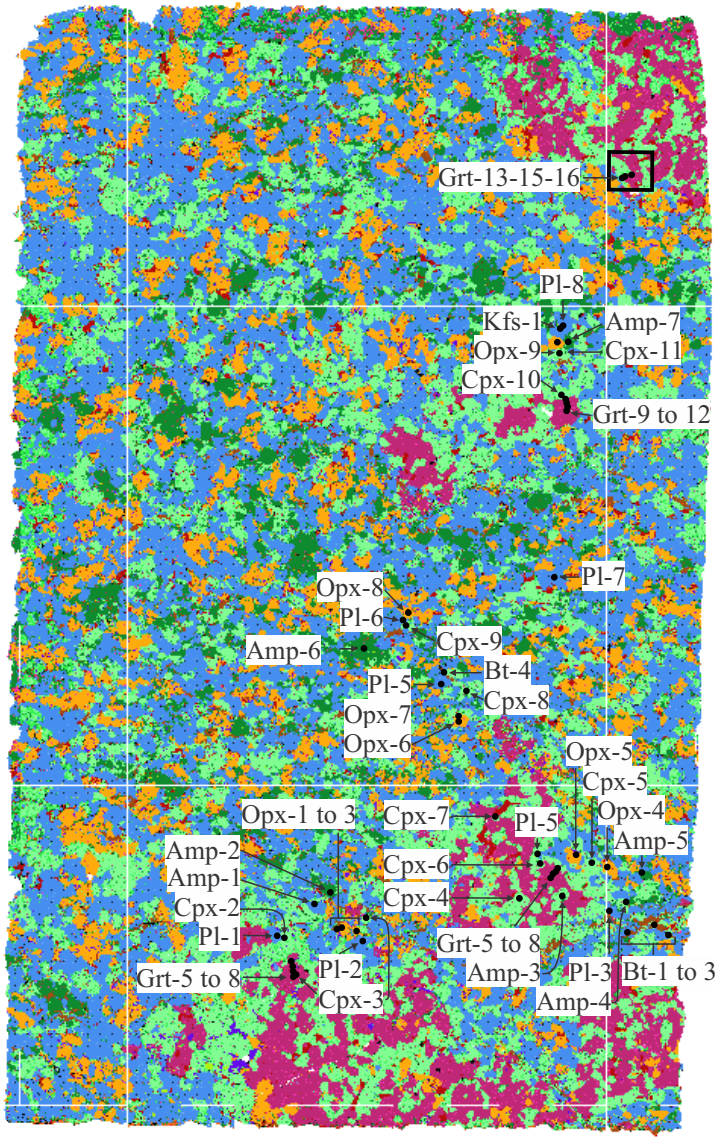
Minerals	Color code	modal proportion (Area%)
Pl (An30)		12.6
Pl (An70)		38.9
Pl (Ab)		-
Ksp		1.7
Bt		5.2
Amph		0.6
Grt (Alm-rich)		0.1
Grt		7.0
Cpx		5.4
Cpx (di)		0.3
Opx		13.4
Qtz		9.9
Sil		-
Ep		Tr.
Chl		-
Ilm		2.1
Rt		-
Ttn		-
Ap		0.9
Zrn		0.1
Mnz		-
Py/Mag		0.3

Figure S1n: MLA imaging and mineral modal proportion for sample 6078-A



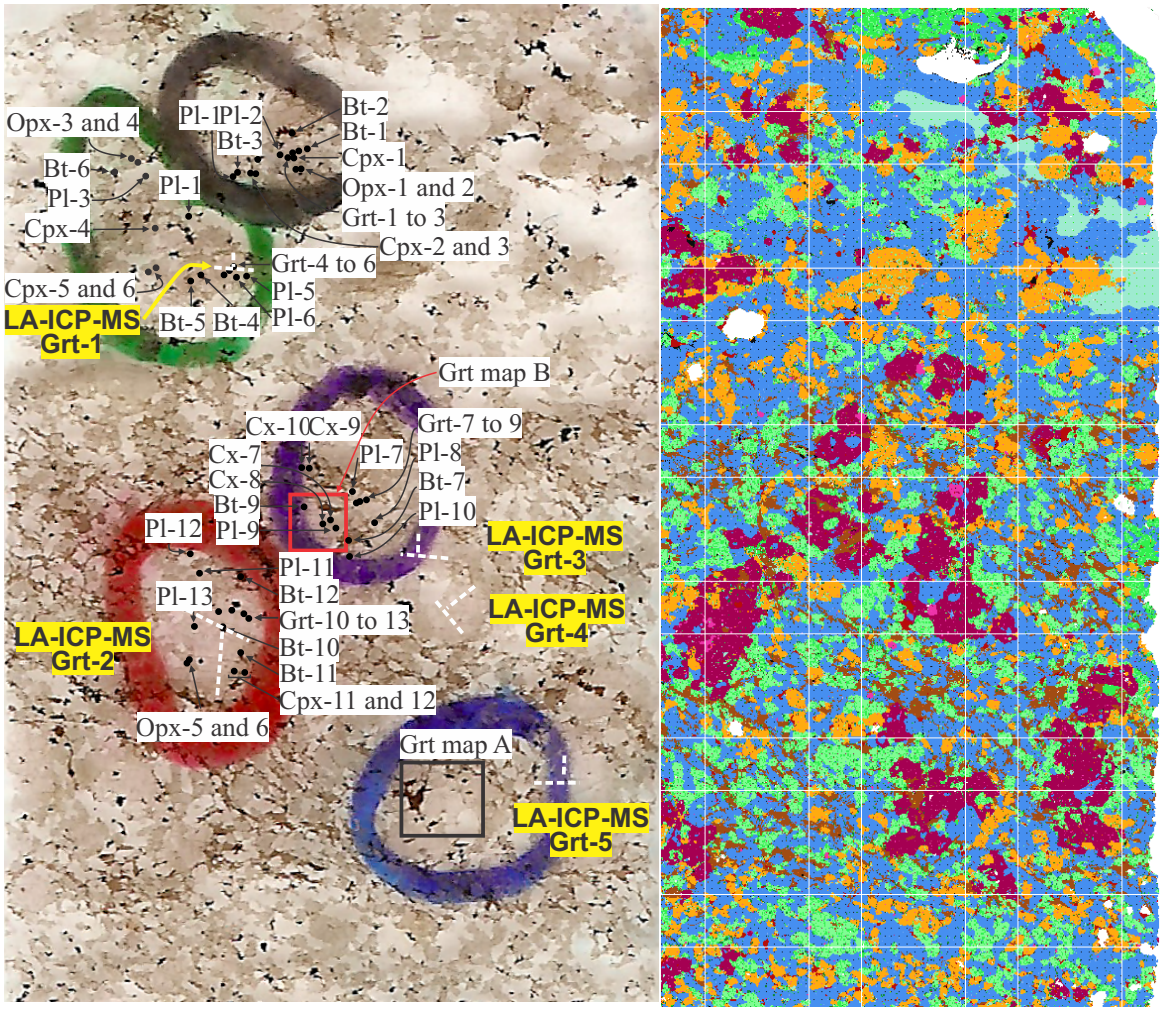
Minerals	Color code	modal proportion (Area%)
Pl (An30)		49.2
Pl (An70)		24.9
Pl (Ab)		-
Ksp		4.4
Bt		11.5
Amph		0.4
Grt (Alm-rich)		1.5
Grt		1.3
Cpx		-
Cpx (di)		-
Opx		3.0
Qtz		0.3
Sil		-
Ep		0.3
Chl		-
Ilm		0.1
Rt		-
Ttn		0.1
Ap		0.8
Zrn		-
Mnz		-
Py/Mag		-

Figure S1o: MLA imaging and mineral modal proportion for sample 6080-A



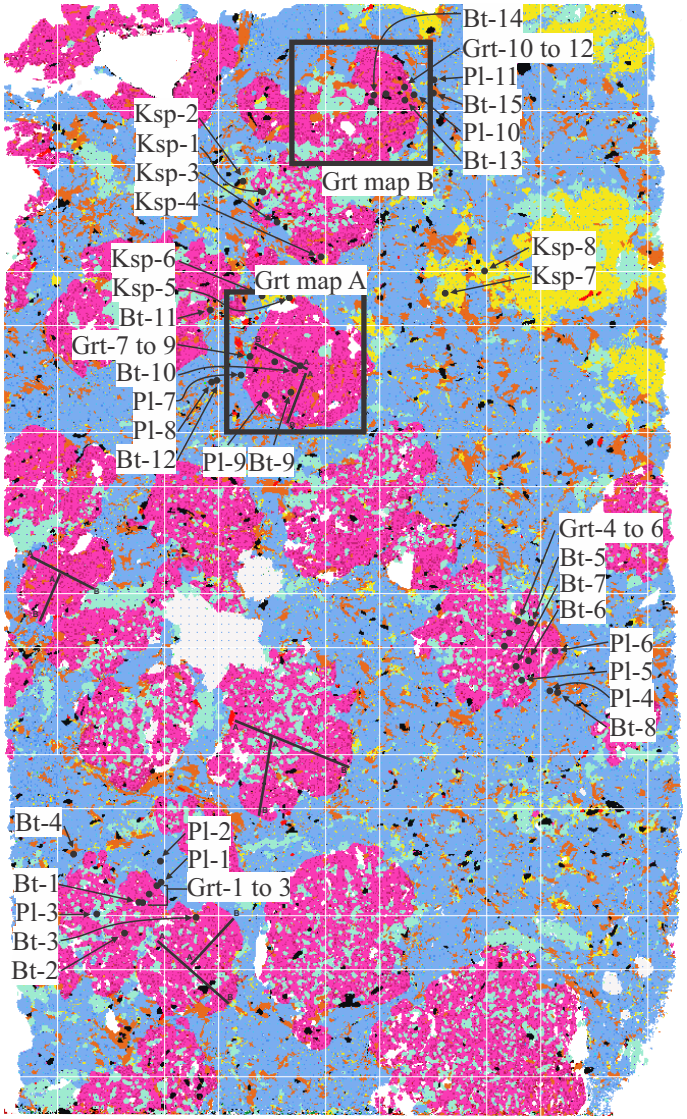
Minerals	Color code	modal proportion (Area%)
Pl (An30)		0.7
Pl (An70)		36.0
Pl (Ab)		-
Ksp		0.1
Bt		1.7
Amph		9.7
Grt (Alm-rich)		0.1
Grt		0.7
Cpx		21.5
Cpx (di)		3.2
Opx		13.2
Qtz		1.0
Sil		-
Ep		0.8
Chl		-
Ilm		2.2
Rt		-
Ttn		0.1
Ap		0.3
Zrn		-
Mnz		-
Py/Mag		0.1

Figure S1p: MLA imaging and mineral modal proportion for sample 6117-A



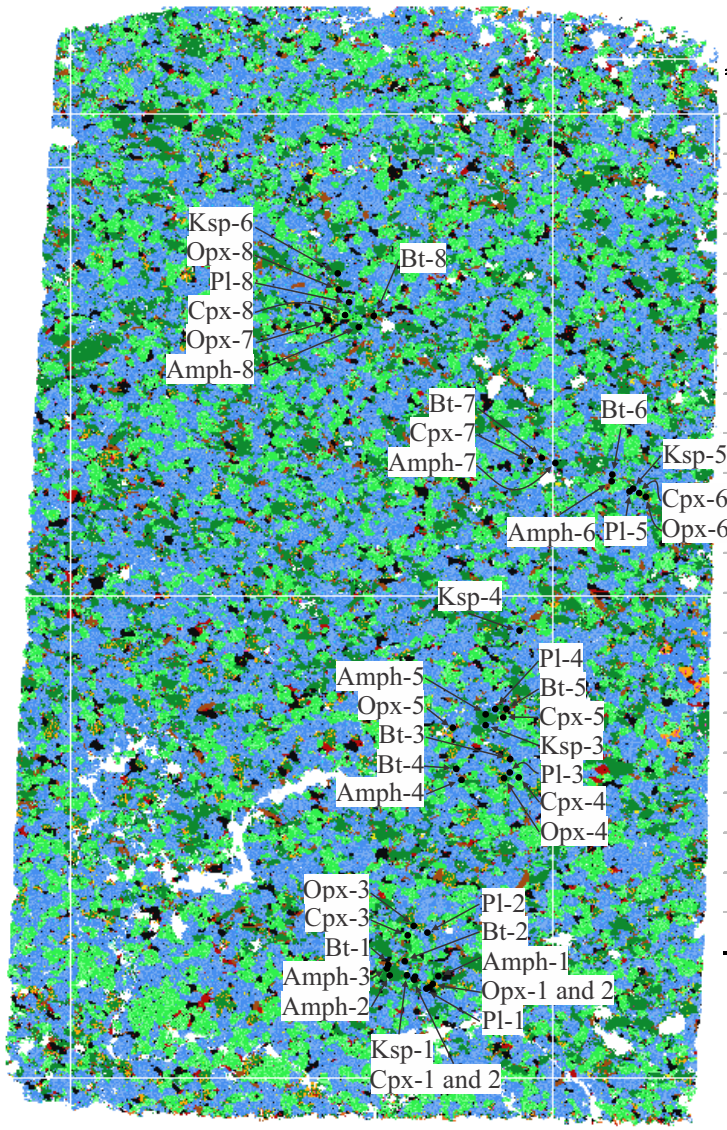
Minerals	Color code	modal proportion (Area%)
Pl (An30)		0.5
Pl (An70)		40.2
Pl (Ab)		-
Ksp		0.1
Bt		7.5
Amph		1.6
Grt (Alm-rich)		0.4
Grt		9.8
Cpx		12.1
Cpx (di)		6.1
Opx		13.9
Qtz		3.1
Sil		-
Ep		0.8
Chl		-
Ilm		1.6
Rt		-
Ttn		-
Ap		0.3
Zrn		-
Mnz		-
Py/Mag		0.3

Figure S1q: MLA imaging and mineral modal proportion for sample 6210-A



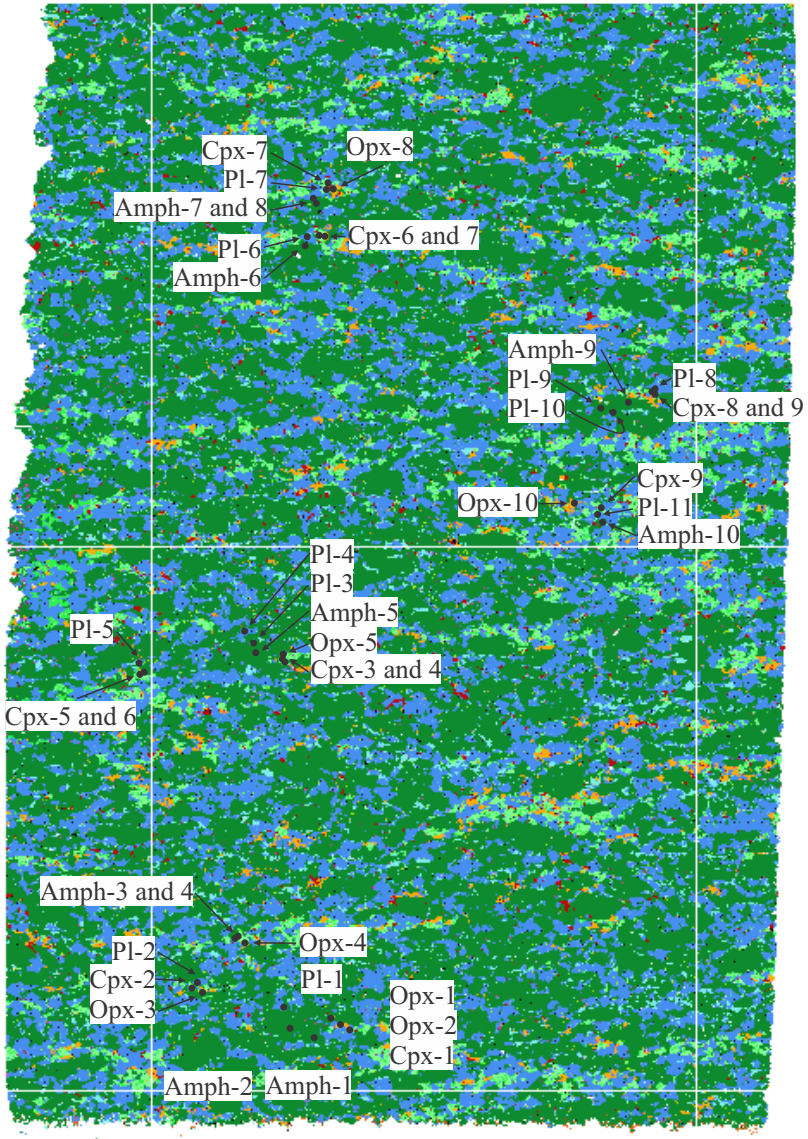
Minerals	Color code	modal proportion (Area%)
Pl (An30)		40.6
Pl (An70)		1.7
Pl (Ab)		2.4
Ksp		5.5
Bt		8.2
Amph		0.1
Grt (Alm-rich)		22.3
Grt		5.1
Cpx		-
Cpx (di)		-
Opx		-
Qtz		10.5
Sil		-
Ep		-
Chl		-
Ilm		0.2
Rt		0.3
Ttn		0.6
Ap		-
Zrn		-
Mnz		-
Py/Mag		1.8

Figure S1r: MLA imaging and mineral modal proportion for sample 142-A



Minerals	Color code	modal proportion (Area%)
Pl (An30)		19.2
Pl (An70)		28.4
Pl (Ab)		-
Ksp		0.4
Bt		2.7
Amph		15.8
Grt (Alm-rich)		-
Grt		-
Cpx		7.3
Cpx (di)		17.5
Opx		1.1
Qtz		0.4
Sil		-
Ep		0.3
Chl		-
Ilm		1.2
Rt		-
Ttn		0.1
Ap		0.3
Zrn		-
Mnz		-
Py/Mag		4.2

Figure S1s: MLA imaging and mineral modal proportion for sample 4102-A



Minerals	Color code	modal proportion (Area%)
Pl (An30)		1.7
Pl (An70)		28.9
Pl (Ab)		0.1
Ksp		-
Bt		-
Ser		0.3
Amph		56.3
Grt (Alm-rich)		-
Grt		-
Cpx		4.6
Cpx (di)		1.7
Opx		1.9
Qtz		2.8
Sil		-
Ep		-
Chl		-
Ilm		0.8
Rt		-
Ttn		0.1
Ap		0.4
Zrn		-
Mnz		-
Py/Mag		0.1

APPENDIX 2: MINERAL CHEMISTRY RESULTS

Garnet maps from Core Zone samples: Grt-Bt metasedimentary rocks 3008-A (a; b) and 4041-B (c; d). Garnet maps from Sukaliuk Complex samples: Grt-Bt metasedimentary rock 3117-A (e); Grt-Sil-Bt metasedimentary rocks 1098-A (f; g), 5030-B (h; i) and 6150-A (j; k); Grt-Opx-Bt metasedimentary rocks 1121-A (l; m) and 6129-A (n; o); Grt-Opx±Cpx±Bt intermediate-mafic gneisses 2112-B (p; q), 3090-A (r; s), 6080-A (t) and 6117-A (u; v). Garnet maps from Lomier Complex sample: Grt-Bt metasedimentary rock 6210-A (w; x).

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	1098A-Pl1	1098A-Pl2	1098A-Pl3	1098A-Pl4	1098A-Pl5	1098A-Pl6	1098A-Pl7	1098A-Pl8
Localisation	Grt-margin	Matrix	Inclusion	Matrix	Matrix	Inclusion	Inclusion	Grt-margin
Oxydes (wt.%)								
SiO2	59.962	60.044	60.237	60.452	60.762	60.439	59.128	60.448
Al2O3	24.270	24.693	24.604	24.585	24.398	24.461	25.354	24.559
CaO	6.567	6.884	6.756	6.816	6.734	6.709	7.920	6.721
Na2O	7.756	7.857	7.695	7.903	7.909	7.805	6.949	7.910
K2O	0.385	0.240	0.479	0.301	0.363	0.323	0.527	0.276
FeO	0.050	0.002	0.282	0.010	0.000	0.053	0.071	0.000
MgO	0.006	0.001	0.000	0.004	0.000	0.000	0.005	0.010
MnO	0.000	0.000	0.065	0.003	0.000	0.000	0.000	0.000
TiO2	0.000	0.061	0.000	0.011	0.000	0.017	0.000	0.033
SrO	0.099	0.043	0.046	0.000	0.056	0.096	0.000	0.036
BaO	0.000	0.029	0.009	0.007	0.029	0.084	0.073	0.036
Total	99.095	99.854	100.173	100.092	100.251	99.987	100.027	100.029
Cations*								
Si	2.699	2.683	2.688	2.693	2.703	2.698	2.647	2.695
Al	1.287	1.301	1.294	1.291	1.279	1.287	1.337	1.290
Ca	0.317	0.330	0.323	0.325	0.321	0.321	0.380	0.321
Na	0.677	0.681	0.666	0.683	0.682	0.675	0.603	0.684
K	0.022	0.014	0.027	0.017	0.021	0.018	0.030	0.016
Fe2+	0.002	0.000	0.011	0.000	0.000	0.002	0.003	0.000
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Mn	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.001
Sr	0.003	0.001	0.001	0.000	0.001	0.002	0.000	0.001
Ba	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.001
End-members (%)								
An	31.2	32.2	31.8	31.7	31.3	31.6	37.5	31.4
Ab	66.6	66.4	65.5	66.6	66.6	66.5	59.5	67.0
Or	2.2	1.3	2.7	1.7	2.0	1.8	3.0	1.5

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	1098A-Pl9	1098A-Pl10	1098A-Pl11	1098A-Pl12	1098A-Pl13	1121A-Pl1	1121A-Pl2	1121A-Pl3
Localisation	Matrix	Matrix	Matrix	Grt-margin	Inclusion	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	60.120	59.163	60.335	59.298	60.511	57.596	57.444	57.693
Al2O3	24.675	25.118	24.756	25.012	24.763	25.999	26.219	25.967
CaO	6.744	7.581	6.968	7.496	6.872	8.853	8.975	8.830
Na2O	7.892	7.303	7.704	7.363	7.760	6.420	6.406	6.500
K2O	0.229	0.247	0.407	0.337	0.377	0.232	0.188	0.223
FeO	0.000	0.006	0.038	0.199	0.131	0.037	0.034	0.080
MgO	0.007	0.000	0.009	0.052	0.017	0.013	0.001	0.061
MnO	0.000	0.000	0.031	0.000	0.000	0.000	0.000	0.019
TiO2	0.039	0.033	0.000	0.050	0.044	0.006	0.017	0.078
SrO	0.030	0.161	0.020	0.086	0.089	0.026	0.017	0.053
BaO	0.064	0.023	0.000	0.046	0.000	0.066	0.000	0.013
Total	99.800	99.635	100.268	99.939	100.564	99.248	99.301	99.517
Cations*								
Si	2.687	2.655	2.686	2.656	2.687	2.602	2.593	2.600
Al	1.300	1.329	1.299	1.321	1.296	1.384	1.395	1.379
Ca	0.323	0.365	0.332	0.360	0.327	0.428	0.434	0.426
Na	0.684	0.636	0.665	0.640	0.668	0.562	0.561	0.568
K	0.013	0.014	0.023	0.019	0.021	0.013	0.011	0.013
Fe2+	0.000	0.000	0.001	0.007	0.005	0.001	0.001	0.003
Mg	0.000	0.000	0.001	0.004	0.001	0.001	0.000	0.004
Mn	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001
Ti	0.001	0.001	0.000	0.002	0.001	0.000	0.001	0.003
Sr	0.001	0.004	0.001	0.002	0.002	0.001	0.000	0.001
Ba	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000
End-members (%)								
An	31.6	35.9	32.6	35.3	32.2	42.6	43.2	42.3
Ab	67.0	62.6	65.2	62.7	65.7	55.9	55.8	56.4
Or	1.3	1.4	2.3	1.9	2.1	1.3	1.1	1.3

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	1121A-Pl4	1121A-Pl5	1121A-Pl6	1121A-Pl7	1121A-Pl8	142A-Pl1	142A-Pl2	142A-Pl3
Localisation	Matrix	Matrix	Grt-margin	Matrix	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	57.669	57.826	58.002	57.994	58.108	58.920	59.029	58.738
Al2O3	26.057	26.334	26.307	26.227	26.395	25.779	25.457	25.511
CaO	8.835	9.028	8.940	9.007	9.058	8.346	8.412	8.390
Na2O	6.586	6.613	6.625	6.557	6.610	6.803	6.752	6.828
K2O	0.206	0.158	0.138	0.210	0.142	0.470	0.508	0.371
FeO	0.017	0.000	0.116	0.040	0.070	0.118	0.103	0.099
MgO	0.000	0.004	0.004	0.006	0.009	0.006	0.000	0.012
MnO	0.012	0.022	0.000	0.012	0.000	0.003	0.016	0.000
TiO2	0.033	0.017	0.000	0.000	0.022	0.000	0.000	0.017
SrO	0.026	0.040	0.103	0.026	0.116	0.000	0.023	0.070
BaO	0.022	0.000	0.000	0.000	0.000	0.000	0.022	0.047
Total	99.463	100.042	100.235	100.079	100.530	100.445	100.322	100.083
Cations*								
Si	2.599	2.592	2.596	2.598	2.593	2.628	2.637	2.631
Al	1.384	1.391	1.388	1.385	1.388	1.355	1.340	1.347
Ca	0.427	0.434	0.429	0.432	0.433	0.399	0.403	0.403
Na	0.576	0.575	0.575	0.570	0.572	0.588	0.585	0.593
K	0.012	0.009	0.008	0.012	0.008	0.027	0.029	0.021
Fe2+	0.001	0.000	0.004	0.002	0.003	0.004	0.004	0.004
Mg	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Mn	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000
Ti	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.001
Sr	0.001	0.001	0.003	0.001	0.003	0.000	0.001	0.002
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
End-members (%)								
An	42.1	42.6	42.4	42.6	42.8	39.3	39.6	39.6
Ab	56.7	56.5	56.8	56.2	56.5	58.0	57.5	58.3
Or	1.2	0.9	0.8	1.2	0.8	2.6	2.9	2.1

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	142A-Pl4	142A-Pl5	142A-Pl6	142A-Pl7	2112B-Pl1	2112B-Pl2	2112B-Pl3	2112B-Pl4
Localisation	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Inclusion	Grt-margin
Oxydes (wt.%)								
SiO2	58.862	59.112	58.589	58.564	57.695	58.000	57.704	57.626
Al2O3	25.806	26.023	25.666	25.871	26.294	26.154	26.437	26.329
CaO	8.547	8.467	8.231	8.440	9.085	8.911	9.021	8.987
Na2O	6.645	6.782	6.847	6.933	6.694	6.669	6.580	6.528
K2O	0.656	0.382	0.422	0.306	0.182	0.220	0.190	0.501
FeO	0.131	0.086	0.105	0.065	0.054	0.024	0.292	0.090
MgO	0.000	0.000	0.012	0.003	0.005	0.014	0.015	0.000
MnO	0.031	0.006	0.038	0.000	0.000	0.050	0.000	0.028
TiO2	0.028	0.017	0.000	0.000	0.000	0.028	0.050	0.006
SrO	0.070	0.070	0.017	0.023	0.203	0.163	0.103	0.120
BaO	0.000	0.000	0.045	0.018	0.041	0.002	0.000	0.121
Total	100.776	100.945	99.972	100.223	100.253	100.235	100.392	100.336
Cations*								
Si	2.622	2.623	2.627	2.619	2.587	2.598	2.583	2.586
Al	1.355	1.361	1.356	1.363	1.390	1.381	1.395	1.392
Ca	0.408	0.403	0.395	0.404	0.436	0.428	0.433	0.432
Na	0.574	0.584	0.595	0.601	0.582	0.579	0.571	0.568
K	0.037	0.022	0.024	0.017	0.010	0.013	0.011	0.029
Fe2+	0.005	0.003	0.004	0.002	0.002	0.001	0.011	0.003
Mg	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000
Mn	0.001	0.000	0.001	0.000	0.000	0.002	0.000	0.001
Ti	0.001	0.001	0.000	0.000	0.000	0.001	0.002	0.000
Sr	0.002	0.002	0.000	0.001	0.005	0.004	0.003	0.003
Ba	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.002
End-members (%)								
An	40.0	40.0	38.9	39.5	42.4	42.0	42.6	41.9
Ab	56.3	57.9	58.6	58.8	56.5	56.8	56.3	55.1
Or	3.7	2.2	2.4	1.7	1.0	1.2	1.1	2.8

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	2112B-Pl5	2112B-Pl6	2112B-Pl7	2112B-Pl8	2112B-Pl9	2112B-Pl10	2112B-Pl11	3008A-Pl1
Localisation	Matrix	Matrix	Inclusion	Matrix	Grt-margin	Inclusion	Matrix	Matrix
Oxydes (wt.%)								
SiO2	57.484	56.886	56.541	57.239	57.111	57.925	57.658	60.452
Al2O3	26.394	25.850	26.392	26.123	26.182	26.084	26.181	24.594
CaO	9.117	9.005	9.048	8.992	9.004	8.825	9.071	6.765
Na2O	6.658	6.552	6.369	6.586	6.667	6.558	6.598	7.833
K2O	0.221	0.213	0.313	0.198	0.225	0.238	0.194	0.205
FeO	0.039	0.031	0.137	0.046	0.050	0.332	0.086	0.060
MgO	0.008	0.003	0.014	0.017	0.007	0.002	0.002	0.011
MnO	0.000	0.028	0.003	0.000	0.000	0.000	0.000	0.103
TiO2	0.011	0.000	0.034	0.028	0.000	0.039	0.000	0.022
SrO	0.087	0.183	0.183	0.130	0.143	0.149	0.153	0.122
BaO	0.029	0.000	0.000	0.013	0.005	0.000	0.023	0.027
Total	100.048	98.751	99.034	99.372	99.394	100.152	99.966	100.194
Cations*								
Si	2.582	2.589	2.569	2.587	2.583	2.598	2.591	2.692
Al	1.397	1.387	1.413	1.392	1.395	1.379	1.387	1.291
Ca	0.439	0.439	0.440	0.435	0.436	0.424	0.437	0.323
Na	0.580	0.578	0.561	0.577	0.585	0.570	0.575	0.676
K	0.013	0.012	0.018	0.011	0.013	0.014	0.011	0.012
Fe2+	0.001	0.001	0.005	0.002	0.002	0.012	0.003	0.002
Mg	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.001
Mn	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.004
Ti	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001
Sr	0.002	0.005	0.005	0.003	0.004	0.004	0.004	0.003
Ba	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
End-members (%)								
An	42.5	42.7	43.2	42.5	42.2	42.1	42.7	31.9
Ab	56.2	56.2	55.0	56.4	56.5	56.6	56.2	66.9
Or	1.2	1.2	1.8	1.1	1.3	1.4	1.1	1.2

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3008A-Pl2	3008A-Pl3	3008A-Pl4	3008A-Pl5	3008A-Pl6	3008A-Pl7	3008A-Pl8	3008A-Pl9
Localisation	Grt-margin	Matrix	Matrix	Grt-margin	Matrix	Grt-margin	Matrix	Grt-margin
Oxydes (wt.%)								
SiO2	60.490	60.509	60.545	60.373	60.275	60.413	60.660	60.738
Al2O3	24.560	24.597	24.479	24.689	24.611	24.792	24.491	24.500
CaO	6.734	6.848	6.677	6.753	6.853	6.968	6.711	6.876
Na2O	7.954	7.836	8.081	7.995	7.833	7.815	7.903	7.950
K2O	0.221	0.278	0.262	0.166	0.320	0.209	0.250	0.198
FeO	0.085	0.007	0.000	0.037	0.013	0.113	0.016	0.171
MgO	0.007	0.008	0.004	0.005	0.001	0.013	0.000	0.000
MnO	0.050	0.006	0.000	0.006	0.025	0.000	0.000	0.000
TiO2	0.061	0.000	0.006	0.033	0.000	0.000	0.000	0.011
SrO	0.102	0.116	0.066	0.066	0.116	0.079	0.059	0.017
BaO	0.057	0.029	0.030	0.007	0.081	0.059	0.000	0.000
Total	100.321	100.234	100.150	100.130	100.128	100.461	100.090	100.461
Cations*								
Si	2.692	2.694	2.697	2.689	2.689	2.685	2.701	2.697
Al	1.288	1.290	1.285	1.296	1.294	1.299	1.285	1.282
Ca	0.321	0.327	0.319	0.322	0.328	0.332	0.320	0.327
Na	0.686	0.676	0.698	0.690	0.678	0.673	0.682	0.684
K	0.013	0.016	0.015	0.009	0.018	0.012	0.014	0.011
Fe2+	0.003	0.000	0.000	0.001	0.000	0.004	0.001	0.006
Mg	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
Mn	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Ti	0.002	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Sr	0.003	0.003	0.002	0.002	0.003	0.002	0.002	0.000
Ba	0.001	0.001	0.001	0.000	0.001	0.001	0.000	0.000
End-members (%)								
An	31.5	32.0	30.9	31.5	32.0	32.6	31.5	32.0
Ab	67.2	66.4	67.6	67.5	66.1	66.1	67.1	66.9
Or	1.2	1.6	1.4	0.9	1.8	1.2	1.4	1.1

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3008A-Pl10	3090A-Pl1	3090A-Pl2	3090A-Pl3	3090A-Pl4	3090A-Pl5	3090A-Pl6	3090A-Pl7
Localisation	Matrix	Matrix	Grt-margin	Matrix	Matrix	Grt-margin	Inclusion	Inclusion
Oxydes (wt.%)								
SiO2	60.736	57.981	57.746	58.172	57.877	57.375	58.128	57.765
Al2O3	24.598	26.072	26.328	25.693	25.812	26.229	25.840	25.929
CaO	6.888	8.751	9.142	8.658	8.729	9.239	8.587	8.865
Na2O	7.920	6.823	6.554	6.605	6.826	6.434	6.707	6.707
K2O	0.233	0.169	0.095	0.414	0.213	0.140	0.226	0.147
FeO	0.037	0.003	0.062	0.022	0.067	0.065	0.057	0.037
MgO	0.017	0.007	0.004	0.009	0.013	0.016	0.000	0.019
MnO	0.003	0.000	0.000	0.000	0.000	0.022	0.016	0.009
TiO2	0.028	0.000	0.000	0.000	0.033	0.000	0.011	0.000
SrO	0.069	0.040	0.073	0.086	0.090	0.123	0.073	0.066
BaO	0.036	0.031	0.000	0.038	0.000	0.023	0.014	0.000
Total	100.565	99.877	100.004	99.697	99.660	99.666	99.659	99.544
Cations*								
Si	2.695	2.603	2.590	2.617	2.606	2.586	2.614	2.602
Al	1.286	1.379	1.392	1.362	1.370	1.393	1.369	1.377
Ca	0.327	0.421	0.439	0.417	0.421	0.446	0.414	0.428
Na	0.681	0.594	0.570	0.576	0.596	0.562	0.585	0.586
K	0.013	0.010	0.005	0.024	0.012	0.008	0.013	0.008
Fe2+	0.001	0.000	0.002	0.001	0.003	0.002	0.002	0.001
Mg	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.001
Mn	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000
Ti	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Sr	0.002	0.001	0.002	0.002	0.002	0.003	0.002	0.002
Ba	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000
End-members (%)								
An	32.0	41.1	43.3	41.0	40.9	43.9	40.9	41.9
Ab	66.6	57.9	56.2	56.6	57.9	55.3	57.8	57.3
Or	1.3	0.9	0.5	2.3	1.2	0.8	1.3	0.8

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3090A-Pl8	3090A-Pl9	3090A-Pl10	3090A-Pl11	3090A-Pl12	3090A-Pl13	3117A-Pl1	3117A-Pl2
Localisation	Matrix	Matrix	Grt-margin	Matrix	Inclusion	Inclusion	Grt-margin	Matrix
Oxydes (wt.%)								
SiO2	57.793	58.347	57.712	57.682	57.927	58.079	61.025	61.437
Al2O3	25.653	26.155	25.846	26.143	26.100	25.987	23.682	23.768
CaO	8.727	8.902	8.854	8.968	8.869	8.807	5.975	6.054
Na2O	6.604	6.804	6.595	6.601	6.701	6.626	8.415	8.445
K2O	0.169	0.184	0.112	0.227	0.224	0.212	0.290	0.216
FeO	0.186	0.033	0.050	0.068	0.202	0.538	0.000	0.034
MgO	0.074	0.003	0.001	0.017	0.004	0.007	0.007	0.006
MnO	0.000	0.063	0.000	0.000	0.000	0.059	0.000	0.000
TiO2	0.000	0.045	0.028	0.000	0.000	0.022	0.000	0.000
SrO	0.163	0.080	0.020	0.057	0.130	0.047	0.063	0.030
BaO	0.022	0.000	0.056	0.000	0.000	0.000	0.052	0.009
Total	99.391	100.616	99.274	99.763	100.157	100.384	99.509	99.999
Cations*								
Si	2.610	2.602	2.606	2.595	2.598	2.601	2.732	2.734
Al	1.365	1.375	1.375	1.386	1.379	1.371	1.249	1.247
Ca	0.422	0.425	0.428	0.432	0.426	0.422	0.287	0.289
Na	0.578	0.588	0.577	0.576	0.583	0.575	0.730	0.729
K	0.010	0.010	0.006	0.013	0.013	0.012	0.017	0.012
Fe2+	0.007	0.001	0.002	0.003	0.008	0.020	0.000	0.001
Mg	0.005	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Mn	0.000	0.002	0.000	0.000	0.000	0.002	0.000	0.000
Ti	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000
Sr	0.004	0.002	0.001	0.001	0.003	0.001	0.002	0.001
Ba	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000
End-members (%)								
An	41.8	41.5	42.3	42.3	41.7	41.8	27.7	28.0
Ab	57.2	57.4	57.0	56.4	57.0	57.0	70.6	70.8
Or	1.0	1.0	0.6	1.3	1.3	1.2	1.6	1.2

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3117A-Pl3	3117A-Pl4	3117A-Pl5	3117A-Pl6	3117A-Pl7	3117A-Pl8	3117A-Pl9	3117A-Pl10
Localisation	Grt-margin	Inclusion	Matrix	Grt-margin	Matrix	Grt-margin	Matrix	Inclusion
Oxydes (wt.%)								
SiO2	61.662	61.694	61.650	61.764	61.739	61.508	62.013	67.486
Al2O3	23.817	23.833	23.844	23.893	23.867	23.842	23.549	20.463
CaO	6.028	5.951	5.860	5.909	5.926	5.942	5.920	1.450
Na2O	8.285	8.383	8.333	8.409	8.306	8.361	8.354	11.262
K2O	0.284	0.143	0.305	0.272	0.343	0.365	0.312	0.039
FeO	0.017	0.192	0.026	0.002	0.015	0.000	0.011	0.597
MgO	0.001	0.012	0.000	0.017	0.012	0.015	0.015	0.007
MnO	0.044	0.016	0.034	0.006	0.000	0.000	0.000	0.031
TiO2	0.000	0.011	0.017	0.000	0.000	0.000	0.000	0.000
SrO	0.086	0.105	0.079	0.063	0.141	0.059	0.003	0.000
BaO	0.000	0.014	0.041	0.000	0.045	0.000	0.030	0.000
Total	100.224	100.354	100.189	100.335	100.394	100.092	100.207	101.335
Cations*								
Si	2.737	2.736	2.738	2.738	2.738	2.735	2.751	2.931
Al	1.246	1.246	1.248	1.248	1.247	1.249	1.231	1.048
Ca	0.287	0.283	0.279	0.281	0.282	0.283	0.281	0.067
Na	0.713	0.721	0.717	0.723	0.714	0.721	0.718	0.948
K	0.016	0.008	0.017	0.015	0.019	0.021	0.018	0.002
Fe2+	0.001	0.007	0.001	0.000	0.001	0.000	0.000	0.022
Mg	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.000
Mn	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.001
Ti	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Sr	0.002	0.003	0.002	0.002	0.004	0.002	0.000	0.000
Ba	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000
End-members (%)								
An	28.2	27.9	27.5	27.6	27.7	27.6	27.6	6.6
Ab	70.2	71.2	70.7	70.9	70.3	70.4	70.6	93.2
Or	1.6	0.8	1.7	1.5	1.9	2.0	1.7	0.2

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3123A-Pl1	3123A-Pl2	3123A-Pl3	3123A-Pl4	3123A-Pl5	3123A-Pl6	3123A-Pl7	3123A-Pl8
Localisation	Matrix	Matrix	Grt-margin	Matrix	Grt-margin	Matrix	Grt-margin	Matrix
Oxydes (wt.%)								
SiO2	59.656	59.664	59.846	60.670	59.634	60.114	59.529	59.577
Al2O3	25.318	25.403	25.123	24.873	25.422	24.686	25.107	25.089
CaO	7.607	7.634	6.879	5.566	7.236	7.352	7.673	7.527
Na2O	7.359	7.379	7.456	7.574	7.191	7.471	7.262	7.404
K2O	0.178	0.214	0.234	0.678	0.213	0.179	0.183	0.133
FeO	0.025	0.029	0.163	0.153	0.068	0.160	0.076	0.182
MgO	0.017	0.007	0.034	0.043	0.022	0.001	0.001	0.003
MnO	0.000	0.044	0.000	0.028	0.000	0.000	0.002	0.000
TiO2	0.000	0.017	0.000	0.000	0.052	0.000	0.000	0.044
SrO	0.069	0.013	0.069	0.017	0.000	0.000	0.000	0.000
BaO	0.052	0.000	0.005	0.004	0.057	0.010	0.027	0.010
Total	100.281	100.404	99.809	99.606	99.895	99.973	99.860	99.969
Cations*								
Si	2.658	2.655	2.673	2.707	2.707	2.683	2.662	2.662
Al	1.329	1.332	1.323	1.308	1.308	1.299	1.323	1.321
Ca	0.363	0.364	0.329	0.266	0.266	0.352	0.368	0.360
Na	0.636	0.637	0.646	0.655	0.655	0.647	0.630	0.641
K	0.010	0.012	0.013	0.039	0.039	0.010	0.010	0.008
Fe2+	0.001	0.001	0.006	0.006	0.006	0.006	0.003	0.007
Mg	0.001	0.000	0.002	0.003	0.003	0.000	0.000	0.000
Mn	0.000	0.002	0.000	0.001	0.001	0.000	0.000	0.000
Ti	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Sr	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Ba	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
End-members (%)								
An	36.0	35.9	33.3	27.7	35.3	34.9	36.5	35.7
Ab	63.0	62.9	65.3	68.3	63.5	64.1	62.5	63.5
Or	1.0	1.2	1.4	4.0	1.2	1.0	1.0	0.8

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3123A-Pl9	3123A-Pl10	4041B-Pl1	4041B-Pl2	4041B-Pl3	4041B-Pl4	4041B-Pl5	4041B-Pl6
Localisation	Inclusion	Matrix	Matrix	Grt-margin	Grt-margin	Grt-margin	Matrix	Grt-margin
Oxydes (wt.%)								
SiO2	64.604	59.437	60.680	60.337	60.250	60.209	60.216	60.475
Al2O3	21.675	25.292	24.421	24.804	24.759	24.541	24.789	24.409
CaO	3.536	7.671	6.696	6.876	6.861	6.933	6.863	6.859
Na2O	9.674	7.287	7.860	7.892	7.941	7.982	7.834	7.917
K2O	0.159	0.194	0.282	0.105	0.137	0.152	0.176	0.126
FeO	0.281	0.000	0.024	0.194	0.067	0.031	0.000	0.128
MgO	0.018	0.000	0.012	0.000	0.007	0.006	0.003	0.000
MnO	0.000	0.003	0.019	0.006	0.000	0.006	0.009	0.003
TiO2	0.014	0.000	0.000	0.061	0.050	0.000	0.000	0.000
SrO	0.000	0.000	0.073	0.132	0.093	0.097	0.110	0.136
BaO	0.000	0.000	0.000	0.036	0.004	0.023	0.047	0.045
Total	99.961	99.884	100.067	100.443	100.169	99.980	100.047	100.098
Cations*								
Si	2.854	2.656	2.703	2.682	2.684	2.688	2.685	2.697
Al	1.129	1.332	1.282	1.300	1.300	1.291	1.303	1.283
Ca	0.167	0.367	0.320	0.328	0.327	0.332	0.328	0.328
Na	0.829	0.631	0.679	0.680	0.686	0.691	0.677	0.684
K	0.009	0.011	0.016	0.006	0.008	0.009	0.010	0.007
Fe2+	0.010	0.000	0.001	0.007	0.002	0.001	0.000	0.005
Mg	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.000	0.000	0.002	0.002	0.000	0.000	0.000
Sr	0.000	0.000	0.002	0.003	0.002	0.002	0.003	0.004
Ba	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
End-members (%)								
An	16.7	36.4	31.5	32.3	32.1	32.2	32.3	32.1
Ab	82.5	62.5	66.9	67.1	67.2	67.0	66.7	67.1
Or	0.9	1.1	1.6	0.6	0.8	0.8	1.0	0.7

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4041B-Pl7	4041B-Pl8	4041B-Pl9	4041B-Pl10	4081A-Pl1	4081A-Pl2	4081A-Pl3	4081A-Pl4
Localisation	Matrix	Matrix	Matrix	Grt-margin	Matrix	Grt-margin	Inclusion	Matrix
Oxydes (wt.%)								
SiO2	60.523	60.217	60.549	60.524	60.234	60.499	60.624	60.771
Al2O3	24.594	24.634	24.646	24.711	24.506	24.739	24.639	24.845
CaO	6.879	6.900	6.915	7.023	6.803	6.872	6.942	6.874
Na2O	7.804	7.823	7.804	7.830	7.904	8.137	7.774	7.814
K2O	0.161	0.222	0.151	0.199	0.306	0.208	0.147	0.340
FeO	0.000	0.016	0.082	0.013	0.012	0.065	0.064	0.063
MgO	0.000	0.007	0.007	0.010	0.000	0.000	0.007	0.009
MnO	0.003	0.000	0.035	0.000	0.000	0.031	0.000	0.000
TiO2	0.022	0.039	0.000	0.000	0.000	0.050	0.000	0.000
SrO	0.067	0.103	0.123	0.140	0.069	0.046	0.036	0.056
BaO	0.130	0.056	0.052	0.031	0.000	0.009	0.000	0.000
Total	100.183	100.017	100.364	100.481	99.834	100.656	100.233	100.772
Cations*								
Si	2.695	2.687	2.692	2.689	2.692	2.684	2.695	2.690
Al	1.290	1.296	1.291	1.294	1.291	1.294	1.291	1.296
Ca	0.328	0.330	0.329	0.334	0.326	0.327	0.331	0.326
Na	0.674	0.677	0.673	0.674	0.685	0.700	0.670	0.671
K	0.009	0.013	0.009	0.011	0.017	0.012	0.008	0.019
Fe2+	0.000	0.001	0.003	0.000	0.000	0.002	0.002	0.002
Mg	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001
Mn	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000
Ti	0.001	0.001	0.000	0.000	0.000	0.002	0.000	0.000
Sr	0.002	0.003	0.003	0.004	0.002	0.001	0.001	0.001
Ba	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000
End-members (%)								
An	32.4	32.3	32.6	32.8	31.7	31.5	32.8	32.1
Ab	66.5	66.3	66.5	66.1	66.6	67.4	66.4	66.0
Or	0.9	1.2	0.9	1.1	1.7	1.1	0.8	1.9

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4081A-Pl5	4081A-Pl6	4081A-Pl7	4081A-Pl8	4081A-Pl9	4081A-Pl10	4102A-Pl1	4102A-Pl2
Localisation	Matrix	Grt-margin	Matrix	Grt-margin	Grt-margin	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	60.543	60.414	60.546	60.434	60.781	60.132	57.218	56.838
Al2O3	24.798	24.631	24.555	24.608	24.640	24.456	26.902	26.998
CaO	6.888	6.950	6.980	6.986	6.892	6.936	9.694	9.830
Na2O	7.871	7.835	7.918	7.725	7.932	7.880	6.393	6.284
K2O	0.205	0.192	0.227	0.218	0.305	0.255	0.126	0.134
FeO	0.024	0.037	0.045	0.057	0.024	0.044	0.084	0.109
MgO	0.003	0.007	0.005	0.000	0.023	0.000	0.000	0.000
MnO	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.050
TiO2	0.055	0.000	0.000	0.000	0.006	0.055	0.000	0.000
SrO	0.063	0.086	0.000	0.099	0.013	0.063	0.000	0.050
BaO	0.016	0.038	0.048	0.000	0.013	0.000	0.000	0.002
Total	100.466	100.190	100.336	100.127	100.629	99.821	100.417	100.295
Cations*								
Si	2.688	2.690	2.693	2.692	2.694	2.689	2.561	2.551
Al	1.297	1.293	1.287	1.292	1.287	1.289	1.419	1.428
Ca	0.328	0.332	0.333	0.333	0.327	0.332	0.465	0.473
Na	0.677	0.677	0.683	0.667	0.682	0.683	0.555	0.547
K	0.012	0.011	0.013	0.012	0.017	0.015	0.007	0.008
Fe2+	0.001	0.001	0.002	0.002	0.001	0.002	0.003	0.004
Mg	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Ti	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000
Sr	0.002	0.002	0.000	0.003	0.000	0.002	0.000	0.001
Ba	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
End-members (%)								
An	32.2	32.5	32.3	32.9	31.9	32.3	45.3	46.0
Ab	66.6	66.3	66.4	65.9	66.4	66.3	54.0	53.2
Or	1.1	1.1	1.3	1.2	1.7	1.4	0.7	0.8

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4102A-Pl3	4102A-Pl4	4102A-Pl5	4102A-Pl6	4102A-Pl7	4102A-Pl8	4102A-Pl9	4102A-Pl10
Localisation	Inclusion	Inclusion	Matrix	Matrix	Matrix	Matrix	Inclusion	Inclusion
Oxydes (wt.%)								
SiO2	57.379	57.275	56.974	56.780	57.190	56.924	57.016	57.602
Al2O3	26.486	26.829	26.712	26.755	26.654	26.858	26.562	26.639
CaO	9.337	9.670	9.605	9.570	9.567	9.721	9.575	9.482
Na2O	6.583	6.411	6.471	6.366	6.379	6.356	6.524	6.557
K2O	0.135	0.122	0.097	0.141	0.136	0.132	0.070	0.104
FeO	0.111	0.128	0.088	0.043	0.124	0.077	0.281	0.343
MgO	0.000	0.010	0.015	0.006	0.004	0.000	0.012	0.012
MnO	0.000	0.019	0.075	0.041	0.000	0.016	0.000	0.016
TiO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SrO	0.066	0.050	0.096	0.037	0.037	0.000	0.096	0.080
BaO	0.000	0.000	0.032	0.000	0.000	0.000	0.013	0.000
Total	100.097	100.514	100.165	99.739	100.091	100.084	100.149	100.835
Cations*								
Si	2.576	2.563	2.560	2.559	2.568	2.557	2.563	2.571
Al	1.402	1.415	1.415	1.421	1.411	1.422	1.408	1.401
Ca	0.449	0.464	0.462	0.462	0.460	0.468	0.461	0.453
Na	0.573	0.556	0.564	0.556	0.555	0.554	0.569	0.567
K	0.008	0.007	0.006	0.008	0.008	0.008	0.004	0.006
Fe2+	0.004	0.005	0.003	0.002	0.005	0.003	0.011	0.013
Mg	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.001
Mn	0.000	0.001	0.003	0.002	0.000	0.001	0.000	0.001
Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sr	0.002	0.001	0.003	0.001	0.001	0.000	0.003	0.002
Ba	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
End-members (%)								
An	43.6	45.2	44.8	45.0	45.0	45.5	44.6	44.2
Ab	55.6	54.2	54.6	54.2	54.3	53.8	55.0	55.3
Or	0.8	0.7	0.5	0.8	0.8	0.7	0.4	0.6

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4102A-Pl11	4107A-Pl1	4107A-Pl2	4107A-Pl3-1	4107A-Pl3-2	4107A-Pl4	4107A-Pl5	4107A-Pl6
Localisation	Matrix	Matrix	Matrix	cx margin	Matrix	Matrix	Inclusion	Matrix
Oxydes (wt.%)								
SiO2	56.923	59.774	59.983	60.500	60.095	60.235	59.852	60.011
Al2O3	26.850	24.700	24.819	24.475	24.808	24.696	24.900	25.014
CaO	9.627	7.299	7.304	7.154	7.271	7.119	7.383	7.228
Na2O	6.276	7.345	7.506	7.429	7.463	7.514	7.280	7.425
K2O	0.123	0.402	0.374	0.418	0.345	0.397	0.448	0.468
FeO	0.095	0.186	0.028	0.143	0.068	0.050	0.262	0.094
MgO	0.001	0.005	0.009	0.010	0.010	0.001	0.021	0.002
MnO	0.050	0.016	0.000	0.000	0.000	0.000	0.000	0.016
TiO2	0.078	0.061	0.000	0.022	0.017	0.039	0.028	0.039
SrO	0.070	0.132	0.132	0.069	0.102	0.112	0.132	0.122
BaO	0.000	0.027	0.048	0.000	0.020	0.027	0.011	0.000
Total	100.093	99.947	100.203	100.220	100.199	100.190	100.317	100.419
Cations*								
Si	2.557	2.675	2.676	2.695	2.679	2.685	2.670	2.671
Al	1.422	1.303	1.305	1.285	1.303	1.297	1.309	1.312
Ca	0.463	0.350	0.349	0.341	0.347	0.340	0.353	0.345
Na	0.547	0.637	0.649	0.642	0.645	0.649	0.630	0.641
K	0.007	0.023	0.021	0.024	0.020	0.023	0.026	0.027
Fe2+	0.004	0.007	0.001	0.005	0.003	0.002	0.010	0.003
Mg	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.000
Mn	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Ti	0.003	0.002	0.000	0.001	0.001	0.001	0.001	0.001
Sr	0.002	0.003	0.003	0.002	0.003	0.003	0.003	0.003
Ba	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
End-members (%)								
An	45.6	34.6	34.2	33.9	34.3	33.6	35.0	34.1
Ab	53.8	63.1	63.6	63.7	63.7	64.1	62.5	63.3
Or	0.7	2.3	2.1	2.4	1.9	2.2	2.5	2.6

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4107A-Pl7	4107A-Pl8	4107A-Pl9	4107A-Pl10	4107A-Pl11	4107A-Pl12	5030B-Pl1	5030B-Pl2
Localisation	Inclusion	Matrix	cx margin	Inclusion	Matrix	Matrix	Grt-margin	Inclusion
Oxydes (wt.%)								
SiO2	59.987	60.116	60.244	59.967	60.242	60.189	61.588	61.446
Al2O3	24.877	24.896	24.891	24.815	24.864	24.814	23.878	23.861
CaO	7.366	7.245	7.251	7.271	7.327	7.312	5.885	6.084
Na2O	7.407	7.418	7.439	7.352	7.289	7.311	8.473	8.463
K2O	0.416	0.491	0.466	0.586	0.511	0.475	0.315	0.279
FeO	0.186	0.058	0.123	0.376	0.079	0.069	0.050	0.228
MgO	0.017	0.014	0.013	0.005	0.006	0.012	0.007	0.014
MnO	0.019	0.000	0.000	0.000	0.003	0.053	0.047	0.000
TiO2	0.000	0.000	0.011	0.017	0.000	0.056	0.033	0.055
SrO	0.046	0.053	0.152	0.063	0.106	0.089	0.046	0.092
BaO	0.016	0.027	0.000	0.039	0.004	0.013	0.041	0.054
Total	100.337	100.318	100.590	100.491	100.431	100.393	100.363	100.576
Cations*								
Si	2.673	2.677	2.678	2.673	2.680	2.679	2.733	2.726
Al	1.307	1.307	1.304	1.304	1.304	1.302	1.249	1.247
Ca	0.352	0.346	0.345	0.347	0.349	0.349	0.280	0.289
Na	0.640	0.641	0.641	0.635	0.629	0.631	0.729	0.728
K	0.024	0.028	0.026	0.033	0.029	0.027	0.018	0.016
Fe2+	0.007	0.002	0.005	0.014	0.003	0.003	0.002	0.008
Mg	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.001
Mn	0.001	0.000	0.000	0.000	0.000	0.002	0.002	0.000
Ti	0.000	0.000	0.000	0.001	0.000	0.002	0.001	0.002
Sr	0.001	0.001	0.004	0.002	0.003	0.002	0.001	0.002
Ba	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
End-members (%)								
An	34.6	34.1	34.1	34.2	34.7	34.6	27.2	28.0
Ab	63.0	63.1	63.3	62.5	62.4	62.7	71.0	70.4
Or	2.3	2.8	2.6	3.3	2.9	2.7	1.7	1.5

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	5030B-Pl3	5030B-Pl4	5030B-Pl5	5030B-Pl6	5030B-Pl7	5030B-Pl8	5030B-Pl9	5030B-Pl10
Localisation	Matrix	Grt-margin	Matrix	Inclusion	Inclusion	Grt-margin	Matrix	Inclusion
Oxydes (wt.%)								
SiO2	61.848	61.749	61.633	60.662	61.157	61.193	60.914	61.249
Al2O3	23.861	23.907	24.003	24.550	23.768	23.817	24.229	23.713
CaO	5.918	5.881	5.958	6.314	5.843	5.971	6.314	5.845
Na2O	8.451	8.394	8.451	7.943	8.323	8.339	8.245	8.319
K2O	0.256	0.269	0.205	0.231	0.262	0.146	0.277	0.332
FeO	0.022	0.071	0.026	0.353	0.078	0.042	0.037	0.035
MgO	0.013	0.021	0.004	0.013	0.015	0.000	0.019	0.005
MnO	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000
TiO2	0.022	0.022	0.000	0.000	0.000	0.033	0.067	0.011
SrO	0.007	0.023	0.026	0.040	0.122	0.069	0.040	0.046
BaO	0.029	0.000	0.002	0.005	0.021	0.000	0.000	0.000
Total	100.427	100.337	100.324	100.111	99.589	99.610	100.142	99.555
Cations*								
Si	2.739	2.737	2.732	2.701	2.733	2.732	2.711	2.737
Al	1.245	1.249	1.254	1.288	1.252	1.253	1.271	1.249
Ca	0.281	0.279	0.283	0.301	0.280	0.286	0.301	0.280
Na	0.726	0.721	0.726	0.686	0.721	0.722	0.711	0.721
K	0.014	0.015	0.012	0.013	0.015	0.008	0.016	0.019
Fe2+	0.001	0.003	0.001	0.013	0.003	0.002	0.001	0.001
Mg	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.000
Mn	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Ti	0.001	0.001	0.000	0.000	0.000	0.001	0.002	0.000
Sr	0.000	0.001	0.001	0.001	0.003	0.002	0.001	0.001
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
End-members (%)								
An	27.5	27.5	27.7	30.1	27.5	28.1	29.3	27.5
Ab	71.0	71.0	71.1	68.6	71.0	71.1	69.2	70.7
Or	1.4	1.5	1.1	1.3	1.5	0.8	1.5	1.9

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	5030B-Pl11	5030B-Pl12	5030B-Pl13	6078A-Pl1	6078A-Pl2	6078A-Pl3	6078A-Pl5	6078A-Pl6
Localisation	Inclusion	Grt-margin	Matrix	Matrix	Inclusion	Grt-margin	Inclusion	Grt-margin
Oxydes (wt.%)								
SiO2	61.388	61.160	61.316	58.913	59.073	59.270	58.136	58.914
Al2O3	23.975	23.778	24.101	25.746	25.499	25.578	25.678	25.621
CaO	5.874	5.957	5.946	8.244	8.011	8.072	8.201	8.144
Na2O	8.572	8.583	8.406	6.996	7.206	7.113	6.982	6.979
K2O	0.230	0.170	0.289	0.172	0.181	0.186	0.289	0.261
FeO	0.052	0.077	0.013	0.186	0.084	0.067	0.125	0.069
MgO	0.000	0.003	0.016	0.004	0.007	0.002	0.011	0.008
MnO	0.003	0.000	0.009	0.009	0.019	0.000	0.000	0.000
TiO2	0.011	0.000	0.000	0.011	0.000	0.033	0.033	0.094
SrO	0.069	0.053	0.053	0.076	0.099	0.053	0.096	0.026
BaO	0.029	0.039	0.000	0.027	0.000	0.032	0.000	0.023
Total	100.203	99.820	100.149	100.384	100.179	100.406	99.551	100.139
Cations*								
Si	2.728	2.729	2.725	2.628	2.639	2.640	2.618	2.633
Al	1.256	1.251	1.262	1.354	1.343	1.343	1.363	1.349
Ca	0.280	0.285	0.283	0.394	0.383	0.385	0.396	0.390
Na	0.739	0.743	0.724	0.605	0.624	0.614	0.610	0.605
K	0.013	0.010	0.016	0.010	0.010	0.011	0.017	0.015
Fe2+	0.002	0.003	0.000	0.007	0.003	0.003	0.005	0.003
Mg	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001
Mn	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Ti	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.003
Sr	0.002	0.001	0.001	0.002	0.003	0.001	0.003	0.001
Ba	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
End-members (%)								
An	27.1	27.4	27.7	39.0	37.7	38.1	38.7	38.6
Ab	71.6	71.6	70.8	60.0	61.3	60.8	59.7	59.9
Or	1.3	0.9	1.6	1.0	1.0	1.1	1.6	1.5

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6078A-Pl7	6078A-Pl8-1	6078A-Pl8-2	6078A-Pl9	6078A-Pl10	6078A-Pl11	6078A-Pl12	6078A-Pl13
Localisation	Matrix	Matrix	Grt-margin	Inclusion	Inclusion	Inclusion	Grt-margin	Grt-margin
Oxydes (wt.%)								
SiO2	58.891	59.360	58.294	59.495	58.669	58.532	58.455	58.424
Al2O3	25.621	25.812	25.725	25.449	25.677	25.654	25.749	25.612
CaO	8.048	8.111	8.349	7.860	8.175	8.370	8.211	8.387
Na2O	7.116	7.030	6.895	7.139	6.867	6.834	6.843	6.849
K2O	0.248	0.262	0.206	0.421	0.299	0.244	0.209	0.260
FeO	0.033	0.049	0.153	0.333	0.111	0.017	0.233	0.011
MgO	0.007	0.000	0.086	0.002	0.004	0.008	0.096	0.000
MnO	0.000	0.000	0.075	0.000	0.034	0.009	0.019	0.012
TiO2	0.000	0.000	0.000	0.028	0.000	0.033	0.039	0.000
SrO	0.063	0.073	0.043	0.017	0.010	0.122	0.142	0.059
BaO	0.000	0.025	0.032	0.000	0.014	0.048	0.000	0.082
Total	100.027	100.722	99.858	100.744	99.860	99.871	99.996	99.696
Cations*								
Si	2.634	2.636	2.617	2.645	2.630	2.626	2.620	2.626
Al	1.351	1.351	1.361	1.334	1.356	1.356	1.360	1.357
Ca	0.386	0.386	0.402	0.374	0.393	0.402	0.394	0.404
Na	0.617	0.605	0.600	0.615	0.597	0.594	0.595	0.597
K	0.014	0.015	0.012	0.024	0.017	0.014	0.012	0.015
Fe2+	0.001	0.002	0.006	0.012	0.004	0.001	0.009	0.000
Mg	0.000	0.000	0.006	0.000	0.000	0.001	0.006	0.000
Mn	0.000	0.000	0.003	0.000	0.001	0.000	0.001	0.000
Ti	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
Sr	0.002	0.002	0.001	0.000	0.000	0.003	0.004	0.002
Ba	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001
End-members (%)								
An	37.9	38.3	39.6	36.9	39.0	39.8	39.4	39.7
Ab	60.7	60.1	59.2	60.7	59.3	58.8	59.4	58.7
Or	1.4	1.5	1.2	2.4	1.7	1.4	1.2	1.5

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6078A-Pl14	6080A-Pl1	6080A-Pl2	6080A-Pl3	6080A-Pl4	6080A-Pl5	6080A-Pl6	6080A-Pl7
Localisation	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	57.822	57.037	56.847	56.702	56.708	57.309	56.689	56.851
Al2O3	26.240	26.769	26.927	26.914	26.649	26.767	26.828	27.089
CaO	8.803	9.405	9.790	9.703	9.490	9.458	9.831	9.791
Na2O	6.720	6.401	6.241	6.299	6.262	6.322	6.178	6.220
K2O	0.213	0.161	0.188	0.195	0.235	0.195	0.194	0.203
FeO	0.120	0.037	0.012	0.038	0.244	0.027	0.130	0.082
MgO	0.007	0.005	0.004	0.008	0.077	0.000	0.036	0.008
MnO	0.022	0.000	0.000	0.000	0.050	0.000	0.038	0.000
TiO2	0.000	0.011	0.000	0.006	0.061	0.000	0.084	0.017
SrO	0.103	0.033	0.023	0.130	0.120	0.023	0.057	0.030
BaO	0.041	0.061	0.045	0.000	0.023	0.052	0.000	0.029
Total	100.091	99.920	100.077	99.995	99.919	100.153	100.065	100.320
Cations*								
Si	2.594	2.565	2.555	2.552	2.557	2.570	2.551	2.550
Al	1.387	1.419	1.426	1.428	1.416	1.415	1.423	1.432
Ca	0.423	0.453	0.471	0.468	0.458	0.454	0.474	0.470
Na	0.585	0.558	0.544	0.550	0.547	0.550	0.539	0.541
K	0.012	0.009	0.011	0.011	0.014	0.011	0.011	0.012
Fe2+	0.005	0.001	0.000	0.001	0.009	0.001	0.005	0.003
Mg	0.000	0.000	0.000	0.001	0.005	0.000	0.002	0.001
Mn	0.001	0.000	0.000	0.000	0.002	0.000	0.001	0.000
Ti	0.000	0.000	0.000	0.000	0.002	0.000	0.003	0.001
Sr	0.003	0.001	0.001	0.003	0.003	0.001	0.001	0.001
Ba	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.001
End-members (%)								
An	41.5	44.4	45.9	45.5	45.0	44.7	46.3	46.0
Ab	57.3	54.6	53.0	53.4	53.7	54.1	52.6	52.9
Or	1.2	0.9	1.1	1.1	1.3	1.1	1.1	1.1

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6080A-Pl8	6084A-Pl1	6084A-Pl2	6084A-Pl3	6084A-Pl4	6084A-Pl5	6084A-Pl6	6084A-Pl7
Localisation	Matrix	Matrix	Matrix	Grt-margin	Matrix	Matrix	Matrix	Inclusion
Oxydes (wt.%)								
SiO2	56.380	60.204	59.925	60.097	60.383	59.951	60.399	60.197
Al2O3	26.802	24.714	24.873	24.894	24.991	25.059	25.053	25.115
CaO	9.708	7.043	7.238	6.980	7.083	7.184	7.241	7.203
Na2O	6.162	7.756	7.626	7.768	7.671	7.610	7.639	7.618
K2O	0.282	0.169	0.215	0.096	0.132	0.166	0.218	0.145
FeO	0.053	0.046	0.012	0.070	0.077	0.008	0.008	0.309
MgO	0.000	0.000	0.000	0.004	0.005	0.003	0.000	0.010
MnO	0.013	0.012	0.000	0.000	0.000	0.006	0.000	0.000
TiO2	0.000	0.006	0.056	0.000	0.006	0.000	0.011	0.050
SrO	0.097	0.000	0.000	0.093	0.000	0.043	0.092	0.017
BaO	0.000	0.039	0.029	0.059	0.007	0.022	0.000	0.000
Total	99.497	99.989	99.974	100.061	100.355	100.052	100.661	100.664
Cations*								
Si	2.551	2.686	2.675	2.680	2.682	2.673	2.677	2.670
Al	1.429	1.299	1.309	1.308	1.308	1.317	1.309	1.313
Ca	0.471	0.337	0.346	0.333	0.337	0.343	0.344	0.342
Na	0.541	0.671	0.660	0.672	0.660	0.658	0.657	0.655
K	0.016	0.010	0.012	0.005	0.007	0.009	0.012	0.008
Fe2+	0.002	0.002	0.000	0.003	0.003	0.000	0.000	0.011
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002
Sr	0.003	0.000	0.000	0.002	0.000	0.001	0.002	0.000
Ba	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000
End-members (%)								
An	45.8	33.1	34.0	33.0	33.5	34.0	34.0	34.0
Ab	52.6	65.9	64.8	66.4	65.7	65.1	64.8	65.2
Or	1.6	0.9	1.2	0.5	0.7	0.9	1.2	0.8

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6084A-Pl8	6084A-Pl9	6084A-Pl10	6117A-Pl1	6117A-Pl2	6117A-Pl3	6117A-Pl4	6117A-Pl5
Localisation	Grt-margin	Inclusion	Matrix	Matrix	Grt-margin	Matrix	Grt-margin	Grt-margin
Oxydes (wt.%)								
SiO2	60.095	60.109	59.892	56.690	57.061	56.578	57.008	56.752
Al2O3	24.893	25.127	24.956	27.231	27.126	27.146	26.983	26.948
CaO	7.180	7.162	7.088	10.165	9.833	9.883	9.844	9.736
Na2O	7.535	7.594	7.592	6.025	6.239	6.155	6.249	6.353
K2O	0.221	0.221	0.257	0.123	0.199	0.196	0.165	0.156
FeO	0.048	0.234	0.001	0.000	0.047	0.060	0.030	0.151
MgO	0.000	0.003	0.005	0.000	0.006	0.017	0.007	0.014
MnO	0.012	0.000	0.003	0.000	0.000	0.000	0.028	0.047
TiO2	0.050	0.011	0.028	0.000	0.028	0.000	0.056	0.022
SrO	0.010	0.030	0.030	0.069	0.126	0.030	0.026	0.007
BaO	0.050	0.041	0.000	0.002	0.027	0.000	0.000	0.052
Total	100.094	100.532	99.852	100.305	100.692	100.065	100.396	100.238
Cations*								
Si	2.679	2.671	2.675	2.543	2.551	2.544	2.554	2.550
Al	1.308	1.316	1.314	1.439	1.429	1.439	1.425	1.427
Ca	0.343	0.341	0.339	0.488	0.471	0.476	0.472	0.469
Na	0.651	0.654	0.658	0.524	0.541	0.537	0.543	0.553
K	0.013	0.013	0.015	0.007	0.011	0.011	0.009	0.009
Fe2+	0.002	0.009	0.000	0.000	0.002	0.002	0.001	0.006
Mg	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Ti	0.002	0.000	0.001	0.000	0.001	0.000	0.002	0.001
Sr	0.000	0.001	0.001	0.002	0.003	0.001	0.001	0.000
Ba	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001
End-members (%)								
An	34.0	33.8	33.5	47.9	46.0	46.5	46.1	45.4
Ab	64.6	64.9	65.0	51.4	52.8	52.4	53.0	53.6
Or	1.3	1.2	1.5	0.7	1.1	1.1	0.9	0.9

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6117A-Pl6	6117A-Pl7	6117A-Pl9	6117A-Pl10	6117A-Pl11	6117A-Pl12	6117A-Pl13	6129A-Pl1
Localisation	Inclusion	Grt-margin	Inclusion	Inclusion	Grt-margin	Matrix	Inclusion	Matrix
Oxydes (wt.%)								
SiO2	56.859	56.289	56.041	56.212	55.660	56.188	56.256	59.993
Al2O3	27.166	27.268	27.227	27.384	26.878	27.235	27.342	24.918
CaO	9.929	10.278	10.325	10.306	9.881	10.261	10.422	7.209
Na2O	6.371	6.009	5.946	5.978	5.999	5.976	5.999	7.671
K2O	0.079	0.219	0.142	0.185	0.122	0.191	0.040	0.174
FeO	0.255	0.050	0.496	0.260	0.016	0.022	0.054	0.037
MgO	0.022	0.012	0.009	0.014	0.007	0.004	0.000	0.000
MnO	0.009	0.028	0.006	0.000	0.003	0.000	0.006	0.000
TiO2	0.039	0.000	0.000	0.000	0.000	0.044	0.000	0.000
SrO	0.080	0.109	0.126	0.123	0.043	0.126	0.020	0.043
BaO	0.000	0.063	0.021	0.000	0.005	0.000	0.000	0.032
Total	100.809	100.325	100.339	100.462	98.614	100.047	100.139	100.077
Cations*								
Si	2.542	2.531	2.524	2.525	2.539	2.531	2.530	2.676
Al	1.431	1.445	1.445	1.450	1.445	1.446	1.449	1.310
Ca	0.476	0.495	0.498	0.496	0.483	0.495	0.502	0.344
Na	0.552	0.524	0.519	0.521	0.531	0.522	0.523	0.663
K	0.004	0.013	0.008	0.011	0.007	0.011	0.002	0.010
Fe2+	0.010	0.002	0.019	0.010	0.001	0.001	0.002	0.001
Mg	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
Mn	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.001	0.000	0.000	0.000	0.000	0.002	0.000	0.000
Sr	0.002	0.003	0.003	0.003	0.001	0.003	0.001	0.001
Ba	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
End-members (%)								
An	46.1	48.0	48.6	48.3	47.3	48.2	48.9	33.8
Ab	53.5	50.7	50.6	50.7	52.0	50.8	50.9	65.1
Or	0.4	1.2	0.8	1.0	0.7	1.1	0.2	1.0

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6129A-Pl2	6129A-Pl3	6129A-Pl5	6129A-Pl7	6129A-Pl8	6129A-Pl9	6129A-Pl10	6129A-Pl11
Localisation	Grt-margin	Matrix	Matrix	Inclusion	Matrix	Matrix	Matrix	Inclusion
Oxydes (wt.%)								
SiO2	59.642	59.788	59.960	59.949	60.268	59.729	59.747	59.190
Al2O3	24.836	24.939	24.961	25.232	24.844	24.906	24.998	25.466
CaO	7.229	6.981	7.226	7.284	6.953	7.154	7.385	7.480
Na2O	7.669	7.549	7.603	7.487	7.769	7.577	7.521	7.275
K2O	0.214	0.358	0.168	0.183	0.246	0.197	0.161	0.283
FeO	0.075	0.046	0.019	0.267	0.017	0.030	0.043	0.157
MgO	0.000	0.009	0.011	0.004	0.010	0.021	0.017	0.000
MnO	0.000	0.000	0.028	0.000	0.000	0.000	0.000	0.000
TiO2	0.000	0.017	0.062	0.011	0.000	0.000	0.000	0.000
SrO	0.030	0.080	0.057	0.077	0.070	0.080	0.020	0.060
BaO	0.034	0.009	0.069	0.000	0.000	0.034	0.049	0.000
Total	99.729	99.776	100.164	100.494	100.177	99.728	99.941	99.911
Cations*								
Si	2.672	2.675	2.673	2.665	2.684	2.673	2.669	2.648
Al	1.311	1.315	1.311	1.322	1.304	1.314	1.316	1.343
Ca	0.347	0.335	0.345	0.347	0.332	0.343	0.353	0.359
Na	0.666	0.655	0.657	0.645	0.671	0.658	0.651	0.631
K	0.012	0.020	0.010	0.010	0.014	0.011	0.009	0.016
Fe2+	0.003	0.002	0.001	0.010	0.001	0.001	0.002	0.006
Mg	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.000
Mn	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000
Sr	0.001	0.002	0.001	0.002	0.002	0.002	0.001	0.002
Ba	0.001	0.000	0.001	0.000	0.000	0.001	0.001	0.000
End-members (%)								
An	33.8	33.1	34.1	34.6	32.6	33.9	34.8	35.7
Ab	64.9	64.8	64.9	64.4	66.0	64.9	64.2	62.7
Or	1.2	2.0	0.9	1.0	1.4	1.1	0.9	1.6

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6129A-Pl12	6150A-Pl1	6150A-Pl2	6150A-Pl3	6150A-Pl5	6150A-Pl6	6150A-Pl7	6150A-Pl8
Localisation	Inclusion	Inclusion	Matrix	Matrix	Matrix	Inclusion	Grt-margin	Matrix
Oxydes (wt.%)								
SiO2	59.878	59.502	59.601	59.563	59.098	59.524	59.487	59.402
Al2O3	24.968	25.323	25.529	25.459	25.254	25.214	25.374	25.606
CaO	7.224	7.634	7.620	7.544	7.605	7.692	7.609	7.802
Na2O	7.722	7.632	7.513	7.495	7.491	7.576	7.493	7.406
K2O	0.131	0.072	0.193	0.193	0.241	0.191	0.115	0.147
FeO	0.118	0.070	0.025	0.028	0.000	0.011	0.054	0.008
MgO	0.014	0.009	0.004	0.000	0.006	0.014	0.015	0.009
MnO	0.000	0.059	0.000	0.000	0.012	0.009	0.031	0.000
TiO2	0.000	0.000	0.000	0.000	0.000	0.017	0.000	0.000
SrO	0.093	0.069	0.116	0.106	0.086	0.056	0.050	0.093
BaO	0.036	0.000	0.020	0.000	0.000	0.057	0.036	0.050
Total	100.184	100.370	100.621	100.388	99.793	100.361	100.264	100.523
Cations*								
Si	2.670	2.651	2.649	2.652	2.649	2.654	2.652	2.643
Al	1.312	1.330	1.337	1.336	1.334	1.325	1.333	1.343
Ca	0.345	0.364	0.363	0.360	0.365	0.367	0.363	0.372
Na	0.668	0.659	0.647	0.647	0.651	0.655	0.648	0.639
K	0.007	0.004	0.011	0.011	0.014	0.011	0.007	0.008
Fe2+	0.004	0.003	0.001	0.001	0.000	0.000	0.002	0.000
Mg	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
Mn	0.000	0.002	0.000	0.000	0.000	0.000	0.001	0.000
Ti	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Sr	0.002	0.002	0.003	0.003	0.002	0.001	0.001	0.002
Ba	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001
End-members (%)								
An	33.8	35.5	35.5	35.4	35.5	35.5	35.7	36.5
Ab	65.4	64.2	63.4	63.6	63.2	63.3	63.6	62.6
Or	0.7	0.4	1.1	1.1	1.3	1.1	0.6	0.8

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6150A-Pl9	6150A-Pl10	6150A-Pl11	6210A-Pl1	6210A-Pl2	6210A-Pl3	6210A-Pl4	6210A-Pl5
Localisation	Matrix	Grt-margin	Matrix	Grt-margin	Matrix	Inclusion	Matrix	Inclusion
Oxydes (wt.%)								
SiO2	58.163	58.967	59.505	60.267	60.429	60.068	60.332	60.440
Al2O3	25.693	25.152	25.481	24.816	24.674	24.604	24.680	24.649
CaO	7.558	7.566	7.634	7.027	6.795	7.033	6.922	6.950
Na2O	7.544	7.300	7.371	7.601	7.709	7.580	7.644	7.608
K2O	0.186	0.169	0.192	0.420	0.378	0.315	0.500	0.449
FeO	0.026	0.044	0.011	0.031	0.011	0.037	0.026	0.076
MgO	0.003	0.017	0.008	0.003	0.001	0.021	0.013	0.014
MnO	0.028	0.000	0.000	0.050	0.012	0.000	0.044	0.006
TiO2	0.000	0.022	0.011	0.000	0.000	0.000	0.044	0.000
SrO	0.093	0.000	0.109	0.053	0.141	0.178	0.020	0.023
BaO	0.032	0.052	0.041	0.000	0.000	0.050	0.036	0.059
Total	99.326	99.289	100.363	100.268	100.150	99.886	100.261	100.274
Cations*								
Si	2.623	2.653	2.650	2.683	2.692	2.686	2.687	2.691
Al	1.366	1.334	1.338	1.302	1.295	1.297	1.296	1.293
Ca	0.365	0.365	0.364	0.335	0.324	0.337	0.330	0.332
Na	0.660	0.637	0.637	0.656	0.666	0.657	0.660	0.657
K	0.011	0.010	0.011	0.024	0.021	0.018	0.028	0.025
Fe2+	0.001	0.002	0.000	0.001	0.000	0.001	0.001	0.003
Mg	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.001
Mn	0.001	0.000	0.000	0.002	0.000	0.000	0.002	0.000
Ti	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000
Sr	0.002	0.000	0.003	0.001	0.004	0.005	0.001	0.001
Ba	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001
End-members (%)								
An	35.3	36.0	36.0	33.0	32.1	33.3	32.4	32.7
Ab	63.7	62.9	62.9	64.6	65.8	64.9	64.8	64.7
Or	1.0	1.0	1.1	2.4	2.1	1.8	2.8	2.5

Table S1-1: Plagioclase chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6210A-Pl6	6210A-Pl7	6210A-Pl8	6210A-Pl9	6210A-Pl10	6210A-Pl11
Localisation	Inclusion	Grt-margin	Matrix	Inclusion	Grt-margin	Matrix
Oxydes (wt.%)						
SiO2	60.324	60.463	59.917	59.924	59.970	60.139
Al2O3	24.746	25.137	24.688	24.799	24.746	24.378
CaO	7.045	5.803	7.132	7.096	7.124	6.915
Na2O	7.493	8.157	7.609	7.488	7.565	7.747
K2O	0.671	0.201	0.371	0.551	0.428	0.326
FeO	0.153	0.000	0.018	0.533	0.010	0.000
MgO	0.008	0.018	0.014	0.013	0.000	0.009
MnO	0.009	0.000	0.000	0.000	0.000	0.000
TiO2	0.006	0.000	0.089	0.000	0.022	0.000
SrO	0.000	0.056	0.086	0.145	0.043	0.069
BaO	0.039	0.011	0.000	0.000	0.029	0.000
Total	100.494	99.846	99.924	100.549	99.937	99.583
Cations*						
Si	2.684	2.692	2.679	2.671	2.680	2.694
Al	1.298	1.319	1.301	1.303	1.303	1.287
Ca	0.336	0.277	0.342	0.339	0.341	0.332
Na	0.646	0.704	0.660	0.647	0.655	0.673
K	0.038	0.011	0.021	0.031	0.024	0.019
Fe2+	0.006	0.000	0.001	0.020	0.000	0.000
Mg	0.001	0.001	0.001	0.001	0.000	0.001
Mn	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.000	0.003	0.000	0.001	0.000
Sr	0.000	0.001	0.002	0.004	0.001	0.002
Ba	0.001	0.000	0.000	0.000	0.001	0.000
End-members (%)						
An	32.9	27.9	33.4	33.3	33.4	32.4
Ab	63.3	70.9	64.5	63.6	64.2	65.8
Or	3.7	1.2	2.1	3.1	2.4	1.8

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	1098A-Kfs1	1098A-Kfs2	1098A-Kfs3	1098A-Kfs4	1098A-Kfs5	1098A-Kfs6	1098A-Kfs7	1098A-Kfs8	1098A-Kfs9
Localisation	matrix	matrix	matrix	Grt-margin	Inclusion	matrix	matrix	Grt-margin	matrix
Oxydes (wt.%)									
SiO2	63.568	63.885	63.422	63.934	64.188	63.492	63.828	63.460	63.384
Al2O3	18.401	18.439	18.398	18.386	18.385	18.258	18.494	18.364	18.459
CaO	0.058	0.047	0.037	0.077	0.065	0.049	0.104	0.018	0.043
Na2O	0.759	0.649	0.737	0.973	0.913	0.770	0.758	0.772	0.737
K2O	15.436	15.850	15.683	15.477	15.743	15.570	15.537	15.619	15.642
FeO	0.054	0.054	0.025	0.016	0.083	0.000	0.000	0.071	0.000
MgO	0.013	0.010	0.002	0.004	0.000	0.011	0.001	0.000	0.013
MnO	0.078	0.022	0.022	0.000	0.000	0.019	0.000	0.000	0.000
TiO2	0.039	0.056	0.017	0.022	0.022	0.017	0.045	0.022	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.865	0.969	1.189	0.745	0.289	0.939	0.943	1.194	0.946
Total	99.271	99.981	99.532	99.634	99.688	99.125	99.710	99.520	99.224
Cations*									
Si	2.977	2.977	2.973	2.980	2.984	2.981	2.977	2.975	2.973
Al	1.016	1.013	1.016	1.010	1.007	1.010	1.016	1.014	1.021
Ca	0.003	0.002	0.002	0.004	0.003	0.002	0.005	0.001	0.002
Na	0.069	0.059	0.067	0.088	0.082	0.070	0.069	0.070	0.067
K	0.922	0.942	0.938	0.920	0.934	0.932	0.924	0.934	0.936
Fe2+	0.002	0.002	0.001	0.001	0.003	0.000	0.000	0.003	0.000
Mg	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Mn	0.003	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Ti	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.016	0.018	0.022	0.014	0.005	0.017	0.017	0.022	0.017
End-members (%)									
An	0.3	0.2	0.2	0.4	0.3	0.2	0.5	0.1	0.2
Ab	6.8	5.7	6.5	8.6	8.0	6.9	6.8	6.8	6.6
Or	91.3	92.3	91.2	89.7	91.1	91.2	91.0	91.0	91.5

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	1121A-Kfs1	1121A-Kfs2	1121A-Kfs3	1121A-Kfs4	1121A-Kfs5	1121A-Kfs6	1121A-Kfs7	1121A-Kfs8	142A-Kfs1
Localisation	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)									
SiO2	63.625	63.994	64.259	64.835	64.753	64.466	64.491	64.929	64.101
Al2O3	18.126	18.232	18.297	18.251	18.336	18.380	18.200	18.380	18.313
CaO	0.037	0.024	0.061	0.065	0.104	0.042	0.037	0.068	0.075
Na2O	0.781	1.159	0.956	0.986	1.115	0.995	0.897	1.052	0.292
K2O	15.575	15.107	15.528	15.272	15.258	15.364	15.690	15.275	16.260
FeO	0.003	0.008	0.000	0.000	0.048	0.057	0.008	0.000	0.118
MgO	0.006	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.007
MnO	0.000	0.000	0.000	0.000	0.022	0.047	0.047	0.037	0.000
TiO2	0.000	0.000	0.044	0.000	0.022	0.000	0.000	0.000	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.977	0.782	0.743	0.687	0.641	0.827	0.700	0.664	1.172
Total	99.130	99.322	99.895	100.096	100.299	100.178	100.070	100.405	100.338
Cations*									
Si	2.987	2.988	2.987	2.999	2.991	2.987	2.993	2.994	2.984
Al	1.003	1.003	1.002	0.995	0.998	1.004	0.995	0.999	1.005
Ca	0.002	0.001	0.003	0.003	0.005	0.002	0.002	0.003	0.004
Na	0.071	0.105	0.086	0.088	0.100	0.089	0.081	0.094	0.026
K	0.933	0.900	0.921	0.901	0.899	0.908	0.929	0.899	0.965
Fe2+	0.000	0.000	0.000	0.000	0.002	0.002	0.000	0.000	0.005
Mg	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.001	0.000
Ti	0.000	0.000	0.002	0.000	0.001	0.000	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.018	0.014	0.014	0.012	0.012	0.015	0.013	0.012	0.021
End-members (%)									
An	0.2	0.1	0.3	0.3	0.5	0.2	0.2	0.3	0.4
Ab	7.0	10.3	8.4	8.8	9.8	8.8	7.9	9.3	2.6
Or	91.1	88.2	90.0	89.6	88.5	89.5	90.7	89.2	94.9

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	142A-Kfs2	142A-Kfs3	142A-Kfs4	142A-Kfs5	142A-Kfs6	2112B-Kfs1	2112B-Kfs2	2112B-Kfs3	2112B-Kfs4
Localisation	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)									
SiO2	63.725	63.702	64.118	64.048	63.732	63.693	63.540	63.037	62.768
Al2O3	18.247	18.514	18.294	18.249	18.464	18.452	18.453	18.468	18.621
CaO	0.037	0.026	0.045	0.029	0.055	0.016	0.025	0.018	0.013
Na2O	0.312	0.231	0.386	0.250	0.420	0.951	0.888	0.648	0.660
K2O	16.350	16.262	16.058	16.344	16.067	15.047	15.275	15.297	15.242
FeO	0.187	0.089	0.083	0.063	0.070	0.106	0.309	0.180	0.146
MgO	0.004	0.007	0.017	0.011	0.007	0.007	0.006	0.010	0.016
MnO	0.000	0.037	0.022	0.000	0.000	0.000	0.000	0.000	0.000
TiO2	0.056	0.000	0.028	0.028	0.011	0.045	0.039	0.033	0.006
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.233	1.401	1.314	1.305	1.319	1.896	1.806	2.466	2.512
Total	100.151	100.269	100.365	100.327	100.145	100.213	100.341	100.157	99.984
Cations*									
Si	2.978	2.973	2.984	2.985	2.974	2.972	2.966	2.961	2.954
Al	1.005	1.018	1.003	1.002	1.016	1.015	1.015	1.022	1.033
Ca	0.002	0.001	0.002	0.001	0.003	0.001	0.001	0.001	0.001
Na	0.028	0.021	0.035	0.023	0.038	0.086	0.080	0.059	0.060
K	0.975	0.968	0.953	0.972	0.957	0.896	0.910	0.917	0.915
Fe2+	0.007	0.003	0.003	0.002	0.003	0.004	0.012	0.007	0.006
Mg	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.001
Mn	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.002	0.000	0.001	0.001	0.000	0.002	0.001	0.001	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.023	0.026	0.024	0.024	0.024	0.035	0.033	0.045	0.046
End-members (%)									
An	0.2	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.1
Ab	2.8	2.1	3.4	2.2	3.7	8.5	7.9	5.8	5.9
Or	94.9	95.3	94.0	95.3	93.7	88.1	88.8	89.7	89.5

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3008A-Kfs1	3008A-Kfs10	3008A-Kfs2	3008A-Kfs3	3008A-Kfs4	3008A-Kfs5	3008A-Kfs6	3008A-Kfs7	3008A-Kfs8
Localisation	Matrix	Matrix	Matrix	Matrix	Grt margin	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)									
SiO2	63.483	63.304	63.323	63.806	63.683	63.532	63.492	63.350	63.474
Al2O3	18.011	18.428	18.504	18.362	18.386	18.353	18.576	18.292	18.364
CaO	0.025	0.000	0.019	0.017	0.005	0.017	0.034	0.020	0.035
Na2O	0.602	0.352	0.624	0.716	0.568	0.759	0.701	0.563	0.796
K2O	15.670	16.053	15.659	15.508	15.700	15.487	15.697	15.757	15.228
FeO	0.009	0.109	0.117	0.000	0.040	0.035	0.104	0.001	0.000
MgO	0.003	0.000	0.000	0.000	0.000	0.007	0.004	0.008	0.005
MnO	0.019	0.000	0.000	0.025	0.000	0.000	0.000	0.000	0.019
TiO2	0.050	0.017	0.000	0.006	0.039	0.000	0.061	0.061	0.022
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.780	1.661	1.725	1.528	1.737	1.728	1.564	1.928	1.455
Total	99.652	99.924	99.971	99.968	100.158	99.918	100.233	99.980	99.398
Cations*									
Si	2.984	2.970	2.967	2.980	2.976	2.975	2.964	2.972	2.977
Al	0.998	1.019	1.022	1.011	1.012	1.013	1.022	1.011	1.015
Ca	0.001	0.000	0.001	0.001	0.000	0.001	0.002	0.001	0.002
Na	0.055	0.032	0.057	0.065	0.051	0.069	0.063	0.051	0.072
K	0.940	0.961	0.936	0.924	0.936	0.925	0.935	0.943	0.911
Fe2+	0.000	0.004	0.005	0.000	0.002	0.001	0.004	0.000	0.000
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Mn	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001
Ti	0.002	0.001	0.000	0.000	0.001	0.000	0.002	0.002	0.001
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.033	0.031	0.032	0.028	0.032	0.032	0.029	0.035	0.027
End-members (%)									
An	0.1	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.2
Ab	5.3	3.1	5.5	6.4	5.0	6.7	6.2	5.0	7.2
Or	91.4	93.9	91.3	90.8	91.8	90.1	90.9	91.5	90.0

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3008A-Kfs9	3090A-Kfs1	3090A-Kfs2	3090A-Kfs3	3090A-Kfs4	3090A-Kfs7	3090A-Kfs8	3117A-Kfs1	3117A-Kfs2	3117A-Kfs3
Localisation	Matrix	Matrix	Matrix	Inclusion	Matrix	Matrix	Matrix	matrix	matrix	matrix
Oxydes (wt.%)										
SiO2	63.686	64.286	63.851	64.664	64.286	63.347	63.879	63.965	63.801	63.848
Al2O3	18.304	18.088	18.168	18.303	17.930	18.008	18.227	18.293	18.361	18.417
CaO	0.028	0.056	0.058	0.120	0.042	0.018	0.016	0.007	0.031	0.043
Na2O	0.599	0.441	0.635	1.229	0.551	0.409	0.572	0.667	0.846	0.993
K2O	15.744	16.419	15.978	15.278	16.175	15.773	15.800	15.708	15.544	15.205
FeO	0.012	0.033	0.000	0.056	0.007	0.575	0.106	0.005	0.000	0.027
MgO	0.003	0.004	0.013	0.003	0.003	0.008	0.011	0.000	0.014	0.010
MnO	0.000	0.000	0.047	0.000	0.000	0.044	0.075	0.000	0.000	0.034
TiO2	0.000	0.006	0.000	0.045	0.073	0.000	0.006	0.039	0.022	0.061
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.450	0.650	0.720	0.281	0.661	0.965	1.474	1.407	1.240	1.456
Total	99.826	99.983	99.470	99.979	99.728	99.147	100.166	100.091	99.859	100.094
Cations*										
Si	2.980	2.993	2.987	2.991	2.998	2.983	2.982	2.983	2.978	2.975
Al	1.009	0.993	1.002	0.998	0.985	0.999	1.003	1.005	1.010	1.011
Ca	0.001	0.003	0.003	0.006	0.002	0.001	0.001	0.000	0.002	0.002
Na	0.054	0.040	0.058	0.110	0.050	0.037	0.052	0.060	0.077	0.090
K	0.940	0.975	0.953	0.901	0.962	0.947	0.941	0.934	0.926	0.904
Fe2+	0.000	0.001	0.000	0.002	0.000	0.023	0.004	0.000	0.000	0.001
Mg	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.001
Mn	0.000	0.000	0.002	0.000	0.000	0.002	0.003	0.000	0.000	0.001
Ti	0.000	0.000	0.000	0.002	0.003	0.000	0.000	0.001	0.001	0.002
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.027	0.012	0.013	0.005	0.012	0.018	0.027	0.026	0.023	0.027
End-members (%)										
An	0.1	0.3	0.3	0.6	0.2	0.1	0.1	0.0	0.2	0.2
Ab	5.3	3.9	5.6	10.8	4.9	3.7	5.1	5.9	7.5	8.8
Or	92.0	94.7	92.8	88.1	93.8	94.4	92.2	91.5	90.2	88.4

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3117A-Kfs4	3117A-Kfs5	3117A-Kfs6	3117A-Kfs7	3117A-Kfs8	3117A-Kfs9	3117A-Kfs10	3123A-Kfs1	3123A-Kfs2
Localisation	matrix	Grt-margin	matrix	matrix	matrix	Grt-margin	Grt-margin	Matrix	Matrix
Oxydes (wt.%)									
SiO2	63.889	64.081	63.987	63.852	63.961	63.926	63.970	64.174	64.250
Al2O3	18.315	18.337	18.450	18.476	18.219	18.411	18.284	18.306	18.165
CaO	0.008	0.051	0.036	0.077	0.034	0.018	0.019	0.064	0.037
Na2O	0.687	0.866	0.794	1.028	0.571	0.859	0.752	0.791	1.077
K2O	15.879	15.385	15.638	15.221	15.928	15.382	15.662	15.645	15.308
FeO	0.049	0.236	0.000	0.000	0.003	0.318	0.036	0.030	0.017
MgO	0.000	0.000	0.008	0.000	0.023	0.000	0.015	0.000	0.003
MnO	0.000	0.000	0.000	0.022	0.062	0.000	0.000	0.034	0.028
TiO2	0.017	0.011	0.017	0.022	0.000	0.061	0.000	0.000	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.340	1.162	1.188	1.249	1.260	1.255	1.385	0.711	0.757
Total	100.184	100.129	100.118	99.947	100.061	100.230	100.123	99.755	99.642
Cations*									
Si	2.979	2.981	2.978	2.975	2.984	2.975	2.982	2.987	2.992
Al	1.007	1.005	1.012	1.015	1.002	1.010	1.005	1.004	0.997
Ca	0.000	0.003	0.002	0.004	0.002	0.001	0.001	0.003	0.002
Na	0.062	0.078	0.072	0.093	0.052	0.078	0.068	0.071	0.097
K	0.945	0.913	0.929	0.905	0.948	0.913	0.931	0.929	0.909
Fe2+	0.002	0.009	0.000	0.000	0.000	0.012	0.001	0.001	0.001
Mg	0.000	0.000	0.001	0.000	0.002	0.000	0.001	0.000	0.000
Mn	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.001
Ti	0.001	0.000	0.001	0.001	0.000	0.002	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.024	0.021	0.022	0.023	0.023	0.023	0.025	0.013	0.014
End-members (%)									
An	0.0	0.3	0.2	0.4	0.2	0.1	0.1	0.3	0.2
Ab	6.0	7.7	7.0	9.1	5.0	7.6	6.6	7.0	9.5
Or	91.6	90.0	90.7	88.3	92.6	90.0	90.8	91.4	89.0

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3123A-Kfs3	3123A-Kfs4	3123A-Kfs5	3123A-Kfs6	3123A-Kfs7	3123A-Kfs9	3123A-Kfs10	3123A-Kfs11	4041B-Kfs1
Localisation	Inclusion	Grt margin	Matrix	Matrix	Inclusion	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)									
SiO2	64.768	64.639	64.513	64.334	64.590	64.460	64.024	64.115	64.004
Al2O3	18.437	18.340	18.346	18.014	18.214	18.330	18.238	18.287	18.399
CaO	0.055	0.040	0.094	0.035	0.095	0.087	0.068	0.031	0.060
Na2O	0.905	1.122	1.700	1.009	1.129	1.154	1.005	0.854	0.814
K2O	15.686	15.333	14.241	15.356	15.146	15.294	15.135	15.767	15.559
FeO	0.092	0.039	0.113	0.151	0.021	0.003	0.000	0.122	0.000
MgO	0.000	0.000	0.010	0.009	0.006	0.005	0.001	0.000	0.004
MnO	0.000	0.000	0.009	0.000	0.000	0.000	0.031	0.000	0.000
TiO2	0.100	0.017	0.000	0.083	0.050	0.000	0.044	0.000	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.539	0.714	0.753	0.696	0.537	0.711	0.726	0.607	1.079
Total	100.582	100.244	99.779	99.687	99.788	100.044	99.272	99.783	99.919
Cations*									
Si	2.986	2.990	2.988	2.995	2.995	2.988	2.989	2.985	2.981
Al	1.002	1.000	1.002	0.988	0.995	1.001	1.003	1.004	1.010
Ca	0.003	0.002	0.005	0.002	0.005	0.004	0.003	0.002	0.003
Na	0.081	0.101	0.153	0.091	0.101	0.104	0.091	0.077	0.074
K	0.923	0.905	0.842	0.912	0.896	0.904	0.901	0.937	0.925
Fe2+	0.004	0.002	0.004	0.006	0.001	0.000	0.000	0.005	0.000
Mg	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Ti	0.003	0.001	0.000	0.003	0.002	0.000	0.002	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.010	0.013	0.014	0.013	0.010	0.013	0.013	0.011	0.020
End-members (%)									
An	0.3	0.2	0.5	0.2	0.5	0.4	0.3	0.2	0.3
Ab	8.0	9.9	15.1	9.0	10.0	10.1	9.0	7.6	7.2
Or	90.8	88.7	83.1	89.6	88.5	88.2	89.3	92.3	90.6

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4041B-Kfs2	4041B-Kfs3	4041B-Kfs4	4041B-Kfs5	4041B-Kfs6	4041B-Kfs7	4041B-Kfs8-1	4041B-Kfs8-2	4041B-Kfs9
Localisation	Matrix	Matrix	Grt margin	Matrix	Matrix	Grt margin	Matrix	Grt margin	Matrix
Oxydes (wt.%)									
SiO2	63.831	64.010	63.818	64.406	63.787	63.850	63.937	64.187	63.811
Al2O3	18.374	18.435	18.489	18.702	18.349	18.436	18.372	18.589	18.679
CaO	0.051	0.101	0.049	0.076	0.031	0.036	0.036	0.038	0.145
Na2O	0.586	1.088	1.003	2.698	1.077	1.298	0.957	1.146	1.428
K2O	15.892	14.968	15.057	13.085	15.127	14.692	15.262	15.042	14.449
FeO	0.000	0.013	0.026	0.039	0.002	0.126	0.028	0.020	0.006
MgO	0.016	0.011	0.000	0.008	0.013	0.021	0.002	0.005	0.009
MnO	0.019	0.000	0.000	0.003	0.000	0.000	0.066	0.000	0.000
TiO2	0.011	0.033	0.017	0.000	0.000	0.089	0.000	0.050	0.017
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.131	1.248	1.262	1.083	1.255	1.193	1.276	1.367	1.323
Total	99.911	99.907	99.721	100.100	99.641	99.741	99.936	100.444	99.867
Cations*									
Si	2.979	2.979	2.977	2.972	2.980	2.975	2.980	2.975	2.969
Al	1.011	1.011	1.017	1.017	1.010	1.012	1.009	1.015	1.024
Ca	0.003	0.005	0.002	0.004	0.002	0.002	0.002	0.002	0.007
Na	0.053	0.098	0.091	0.241	0.098	0.117	0.086	0.103	0.129
K	0.946	0.889	0.896	0.770	0.902	0.873	0.908	0.889	0.858
Fe2+	0.000	0.000	0.001	0.001	0.000	0.005	0.001	0.001	0.000
Mg	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.001
Mn	0.001	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000
Ti	0.000	0.001	0.001	0.000	0.000	0.003	0.000	0.002	0.001
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.021	0.023	0.023	0.020	0.023	0.022	0.023	0.025	0.024
End-members (%)									
An	0.3	0.5	0.2	0.4	0.2	0.2	0.2	0.2	0.7
Ab	5.2	9.7	9.0	23.3	9.5	11.6	8.5	10.1	12.7
Or	92.5	87.6	88.5	74.4	88.1	86.1	89.1	87.3	84.3

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4041B-Kfs10	4081A-Kfs1	4081A-Kfs2	4081A-Kfs3	4081A-Kfs4	4081A-Kfs5	4081A-Kfs6	4081A-Kfs7	4081A-Kfs8
Localisation	Grt margin	Matrix	Grt margin	Matrix	Matrix	Grt margin	Matrix	Grt margin	Grt margin
Oxydes (wt.%)									
SiO2	64.151	64.458	64.328	64.740	64.851	63.450	65.075	64.805	65.092
Al2O3	18.416	18.105	17.928	18.267	18.376	20.343	18.157	18.118	18.167
CaO	0.048	0.039	0.010	0.052	0.056	0.093	0.027	0.060	0.040
Na2O	0.969	0.625	0.904	1.113	0.869	1.127	1.174	1.239	1.251
K2O	15.331	16.171	15.719	15.436	15.748	14.377	15.632	15.301	15.511
FeO	0.000	0.013	0.070	0.041	0.032	0.109	0.053	0.046	0.000
MgO	0.010	0.001	0.018	0.000	0.004	0.000	0.002	0.012	0.005
MnO	0.000	0.031	0.000	0.000	0.000	0.000	0.000	0.068	0.031
TiO2	0.028	0.000	0.000	0.094	0.072	0.011	0.000	0.006	0.056
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.153	0.581	0.847	0.562	0.450	0.419	0.330	0.283	0.373
Total	100.106	100.024	99.824	100.305	100.458	99.929	100.450	99.938	100.526
Cations*									
Si	2.981	2.995	2.998	2.991	2.991	2.926	2.999	2.999	2.998
Al	1.009	0.992	0.985	0.995	0.999	1.106	0.986	0.988	0.986
Ca	0.002	0.002	0.001	0.003	0.003	0.005	0.001	0.003	0.002
Na	0.087	0.056	0.082	0.100	0.078	0.101	0.105	0.111	0.112
K	0.909	0.959	0.934	0.910	0.927	0.846	0.919	0.903	0.911
Fe2+	0.000	0.001	0.003	0.002	0.001	0.004	0.002	0.002	0.000
Mg	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000
Mn	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.003	0.001
Ti	0.001	0.000	0.000	0.003	0.003	0.000	0.000	0.000	0.002
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.021	0.011	0.015	0.010	0.008	0.008	0.006	0.005	0.007
End-members (%)									
An	0.2	0.2	0.1	0.3	0.3	0.5	0.1	0.3	0.2
Ab	8.6	5.5	7.9	9.8	7.7	10.5	10.2	10.9	10.8
Or	89.1	93.3	90.5	89.0	91.3	88.2	89.1	88.3	88.3

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4081A-Kfs9	4107A-Kfs1	4107A-Kfs2	5030B-Kfs1	5030B-Kfs2	5030B-Kfs3	5030B-Kfs4	5030B-Kfs5	5030B-Kfs6
Localisation	Matrix	Cpx margin	Matrix	Grt margin	Matrix	Grt margin	Matrix	Inclusion	Grt margin
Oxydes (wt.%)									
SiO2	64.629	64.031	63.319	64.164	63.935	64.173	64.054	63.611	63.656
Al2O3	18.155	18.160	18.061	18.268	18.327	18.494	18.480	18.428	17.406
CaO	0.048	0.051	0.108	0.018	0.042	0.044	0.019	0.070	0.062
Na2O	0.994	0.250	0.326	0.920	0.780	0.931	0.993	1.056	1.110
K2O	15.668	16.565	16.077	15.600	15.712	15.658	15.334	15.279	15.272
FeO	0.015	0.112	0.048	0.055	0.057	0.024	0.030	0.131	0.046
MgO	0.002	0.008	0.049	0.012	0.007	0.002	0.002	0.000	0.013
MnO	0.000	0.000	0.025	0.000	0.016	0.000	0.000	0.000	0.065
TiO2	0.117	0.000	0.000	0.011	0.006	0.044	0.000	0.006	0.006
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.428	0.724	1.152	1.001	1.131	0.812	1.033	1.058	0.880
Total	100.056	99.901	99.165	100.049	100.013	100.182	99.945	99.639	98.516
Cations*									
Si	2.993	2.988	2.983	2.985	2.980	2.978	2.980	2.973	3.006
Al	0.991	0.999	1.003	1.002	1.007	1.012	1.013	1.015	0.969
Ca	0.002	0.003	0.005	0.001	0.002	0.002	0.001	0.004	0.003
Na	0.089	0.023	0.030	0.083	0.071	0.084	0.090	0.096	0.102
K	0.926	0.986	0.966	0.926	0.934	0.927	0.910	0.911	0.920
Fe2+	0.001	0.004	0.002	0.002	0.002	0.001	0.001	0.005	0.002
Mg	0.000	0.001	0.003	0.001	0.000	0.000	0.000	0.000	0.001
Mn	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.003
Ti	0.004	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.008	0.013	0.021	0.018	0.021	0.015	0.019	0.019	0.016
End-members (%)									
An	0.2	0.3	0.5	0.1	0.2	0.2	0.1	0.3	0.3
Ab	8.7	2.2	2.9	8.1	6.9	8.2	8.8	9.3	9.8
Or	90.3	96.3	94.5	90.1	90.9	90.2	89.3	88.5	88.4

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	5030B-Kfs7	5030B-Kfs8	5030B-Kfs9	6078A-Kfs1	6078A-Kfs2	6078A-Kfs3	6078A-Kfs4	6078A-Kfs5	6078A-Kfs6
Localisation	Matrix	Grt margin	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Grt margin
Oxydes (wt.%)									
SiO2	64.344	63.947	64.086	64.857	64.666	64.705	64.465	64.576	64.932
Al2O3	18.385	18.400	18.391	18.030	18.125	18.176	18.265	18.104	18.234
CaO	0.027	0.071	0.086	0.026	0.091	0.033	0.045	0.021	0.038
Na2O	0.621	1.153	0.837	0.619	0.580	0.603	0.627	0.417	0.594
K2O	16.046	15.118	15.860	16.100	16.259	16.065	16.102	16.278	16.092
FeO	0.137	0.231	0.044	0.011	0.045	0.140	0.079	0.304	0.084
MgO	0.006	0.003	0.010	0.007	0.009	0.009	0.004	0.013	0.001
MnO	0.000	0.022	0.000	0.006	0.031	0.000	0.006	0.000	0.022
TiO2	0.056	0.000	0.000	0.022	0.022	0.039	0.050	0.000	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.649	0.892	0.758	0.151	0.178	0.456	0.506	0.316	0.298
Total	100.271	99.837	100.072	99.829	100.006	100.226	100.149	100.029	100.295
Cations*									
Si	2.984	2.977	2.980	3.006	2.997	2.996	2.990	2.997	2.999
Al	1.005	1.010	1.008	0.985	0.990	0.992	0.998	0.990	0.993
Ca	0.001	0.004	0.004	0.001	0.005	0.002	0.002	0.001	0.002
Na	0.056	0.104	0.075	0.056	0.052	0.054	0.056	0.038	0.053
K	0.949	0.898	0.941	0.952	0.961	0.949	0.953	0.964	0.948
Fe2+	0.005	0.009	0.002	0.000	0.002	0.005	0.003	0.012	0.003
Mg	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.001	0.000
Mn	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.001
Ti	0.002	0.000	0.000	0.001	0.001	0.001	0.002	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.012	0.016	0.014	0.003	0.003	0.008	0.009	0.006	0.005
End-members (%)									
An	0.1	0.3	0.4	0.1	0.4	0.2	0.2	0.1	0.2
Ab	5.5	10.2	7.3	5.5	5.1	5.3	5.5	3.7	5.3
Or	93.2	87.9	91.0	94.1	94.1	93.7	93.4	95.6	94.0

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6078A-Kfs7	6078A-Kfs8	6078A-Kfs9	6078A-Kfs10	6080A-Kfs1	6084A-Kfs1	6084A-Kfs2	6084A-Kfs3	6084A-Kfs4
Localisation	Grt margin	Matrix	Matrix	Matrix	Matrix	Grt margin	Matrix	Grt margin	Matrix
Oxydes (wt.%)									
SiO2	64.219	64.370	64.569	64.616	62.660	64.694	64.201	64.316	64.156
Al2O3	18.109	18.178	18.243	18.339	18.408	18.136	18.367	18.494	18.293
CaO	0.018	0.046	0.046	0.068	0.087	0.007	0.012	0.043	0.025
Na2O	0.730	0.727	0.496	0.596	0.315	0.882	0.867	1.018	0.937
K2O	15.877	15.873	16.139	16.019	15.724	15.540	15.520	15.432	15.333
FeO	0.061	0.169	0.048	0.012	0.040	0.213	0.105	0.058	0.040
MgO	0.000	0.093	0.008	0.000	0.013	0.000	0.000	0.015	0.000
MnO	0.009	0.000	0.000	0.012	0.065	0.000	0.000	0.028	0.000
TiO2	0.000	0.017	0.000	0.022	0.000	0.067	0.000	0.000	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.551	0.562	0.555	0.447	2.170	0.700	0.943	0.968	0.948
Total	99.574	100.035	100.104	100.131	99.482	100.239	100.015	100.372	99.732
Cations*									
Si	2.994	2.989	2.995	2.992	2.962	2.995	2.985	2.980	2.988
Al	0.995	0.995	0.997	1.001	1.025	0.990	1.006	1.010	1.004
Ca	0.001	0.002	0.002	0.003	0.004	0.000	0.001	0.002	0.001
Na	0.066	0.065	0.045	0.054	0.029	0.079	0.078	0.091	0.085
K	0.944	0.940	0.955	0.946	0.948	0.918	0.920	0.912	0.911
Fe2+	0.002	0.007	0.002	0.000	0.002	0.008	0.004	0.002	0.002
Mg	0.000	0.006	0.001	0.000	0.001	0.000	0.000	0.001	0.000
Mn	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.000
Ti	0.000	0.001	0.000	0.001	0.000	0.002	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.010	0.010	0.010	0.008	0.040	0.013	0.017	0.018	0.017
End-members (%)									
An	0.1	0.2	0.2	0.3	0.4	0.0	0.1	0.2	0.1
Ab	6.5	6.4	4.4	5.3	2.8	7.8	7.7	8.9	8.3
Or	92.5	92.3	94.4	93.6	92.8	90.9	90.6	89.1	89.8

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6084A-Kfs5	6084A-Kfs6	6084A-Kfs7	6084A-Kfs8	6129A-Kfs1	6129A-Kfs2	6129A-Kfs3	6129A-Kfs4	6129A-Kfs5
Localisation	Grt margin	Matrix	Grt margin	Matrix	Grt margin	Grt margin	Matrix	Matrix	Matrix
Oxydes (wt.%)									
SiO2	64.432	64.496	64.098	64.114	62.829	63.279	62.490	62.973	63.406
Al2O3	18.220	18.418	18.446	18.180	18.365	18.492	18.368	18.471	18.501
CaO	0.046	0.001	0.025	0.022	0.012	0.037	0.014	0.035	0.035
Na2O	1.070	0.739	0.987	0.624	0.647	0.606	0.445	0.585	0.770
K2O	15.180	15.793	15.402	15.908	15.444	15.548	15.823	15.490	15.322
FeO	0.076	0.179	0.035	0.000	0.303	0.196	0.300	0.154	0.000
MgO	0.000	0.010	0.009	0.013	0.003	0.002	0.000	0.050	0.000
MnO	0.000	0.000	0.000	0.003	0.000	0.022	0.000	0.019	0.000
TiO2	0.033	0.050	0.000	0.056	0.000	0.000	0.072	0.000	0.056
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.957	0.995	0.936	0.992	1.838	1.917	2.085	1.887	1.691
Total	100.014	100.681	99.938	99.912	99.441	100.099	99.597	99.664	99.781
Cations*									
Si	2.991	2.983	2.981	2.988	2.964	2.965	2.955	2.963	2.969
Al	0.997	1.004	1.011	0.999	1.021	1.021	1.024	1.024	1.021
Ca	0.002	0.000	0.001	0.001	0.001	0.002	0.001	0.002	0.002
Na	0.096	0.066	0.089	0.056	0.059	0.055	0.041	0.053	0.070
K	0.899	0.932	0.914	0.946	0.929	0.929	0.955	0.930	0.915
Fe2+	0.003	0.007	0.001	0.000	0.012	0.008	0.012	0.006	0.000
Mg	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.004	0.000
Mn	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Ti	0.001	0.002	0.000	0.002	0.000	0.000	0.003	0.000	0.002
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.017	0.018	0.017	0.018	0.034	0.035	0.039	0.035	0.031
End-members (%)									
An	0.2	0.0	0.1	0.1	0.1	0.2	0.1	0.2	0.2
Ab	9.5	6.5	8.7	5.5	5.8	5.4	4.0	5.2	6.9
Or	88.6	91.7	89.5	92.6	90.8	91.0	92.3	91.2	89.9

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6129A-Kfs6	6129A-Kfs7	6129A-Kfs8	6129A-Kfs9	6150A-Kfs1	6150A-Kfs2	6150A-Kfs3	6150A-Kfs4	6150A-Kfs5	6150A-Kfs6
Localisation	Grt margin	Matrix	Matrix	Matrix	Grt margin	Matrix	Matrix	Grt margin	Inclusion	Matrix
Oxydes (wt.%)										
SiO2	63.101	62.822	62.234	63.427	63.480	64.555	64.245	64.215	64.516	64.939
Al2O3	18.452	18.539	18.734	18.561	18.659	18.367	18.380	18.643	18.346	18.664
CaO	0.004	0.045	0.027	0.064	0.041	0.034	0.048	0.079	0.047	0.062
Na2O	0.571	0.628	0.529	1.021	0.940	1.032	0.858	1.099	1.211	0.947
K2O	15.592	15.379	15.452	14.889	15.346	15.403	15.722	15.435	15.282	15.769
FeO	0.163	0.029	0.006	0.026	0.035	0.000	0.000	0.000	0.296	0.000
MgO	0.001	0.000	0.014	0.006	0.004	0.008	0.016	0.002	0.006	0.018
MnO	0.003	0.022	0.040	0.044	0.000	0.003	0.050	0.000	0.000	0.000
TiO2	0.100	0.000	0.006	0.039	0.022	0.017	0.006	0.044	0.033	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	1.810	1.755	1.796	1.648	0.799	0.667	0.647	0.799	0.324	0.822
Total	99.797	99.219	98.838	99.725	99.326	100.086	99.972	100.316	100.061	101.221
Cations*										
Si	2.964	2.963	2.950	2.967	2.969	2.990	2.984	2.973	2.986	2.981
Al	1.021	1.031	1.047	1.023	1.028	1.002	1.006	1.017	1.001	1.010
Ca	0.000	0.002	0.001	0.003	0.002	0.002	0.002	0.004	0.002	0.003
Na	0.052	0.057	0.049	0.093	0.085	0.093	0.077	0.099	0.109	0.084
K	0.934	0.925	0.935	0.889	0.916	0.910	0.932	0.912	0.902	0.924
Fe2+	0.006	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.011	0.000
Mg	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001
Mn	0.000	0.001	0.002	0.002	0.000	0.000	0.002	0.000	0.000	0.000
Ti	0.004	0.000	0.000	0.001	0.001	0.001	0.000	0.002	0.001	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.033	0.032	0.033	0.030	0.015	0.012	0.012	0.014	0.006	0.015
End-members (%)										
An	0.0	0.2	0.1	0.3	0.2	0.2	0.2	0.4	0.2	0.3
Ab	5.1	5.7	4.8	9.1	8.4	9.1	7.6	9.6	10.7	8.2
Or	91.6	90.9	91.8	87.6	90.0	89.5	91.1	88.6	88.5	90.1

Table S1-2: K-feldspath chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6210A-Kfs1	6210A-Kfs2	6210A-Kfs3	6210A-Kfs4	6210A-Kfs5	6210A-Kfs6	6210A-Kfs7	6210A-Kfs8
Localisation	Grt-margin	Matrix	Grt-margin	Inclusion	Grt-margin	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	64.225	63.742	63.791	64.163	63.786	63.703	64.201	62.674
Al2O3	18.357	18.222	18.247	18.720	18.329	18.292	18.302	21.156
CaO	0.060	0.077	0.117	0.550	0.102	0.068	0.080	3.494
Na2O	0.893	0.733	0.869	2.027	1.015	0.950	1.062	4.088
K2O	15.552	15.714	15.484	13.871	15.173	15.466	15.275	8.913
FeO	0.127	0.078	0.067	0.075	0.014	0.010	0.026	0.071
MgO	0.000	0.003	0.000	0.000	0.006	0.009	0.006	0.000
MnO	0.000	0.003	0.009	0.016	0.056	0.031	0.000	0.066
TiO2	0.017	0.011	0.034	0.112	0.006	0.000	0.000	0.000
SrO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.775	0.919	0.993	0.642	1.044	0.978	0.946	0.424
Total	100.006	99.502	99.611	100.176	99.531	99.507	99.898	100.886
Cations*								
Si	2.984	2.983	2.981	2.962	2.980	2.980	2.986	2.842
Al	1.005	1.005	1.005	1.018	1.009	1.008	1.003	1.131
Ca	0.003	0.004	0.006	0.027	0.005	0.003	0.004	0.170
Na	0.080	0.066	0.079	0.181	0.092	0.086	0.096	0.359
K	0.922	0.938	0.923	0.817	0.904	0.923	0.906	0.516
Fe2+	0.005	0.003	0.003	0.003	0.001	0.000	0.001	0.003
Mg	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Mn	0.000	0.000	0.000	0.001	0.002	0.001	0.000	0.003
Ti	0.001	0.000	0.001	0.004	0.000	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.014	0.017	0.018	0.012	0.019	0.018	0.017	0.008
End-members (%)								
An	0.3	0.4	0.6	2.6	0.5	0.3	0.4	16.1
Ab	7.9	6.5	7.7	17.5	9.0	8.4	9.4	34.2
Or	90.4	91.5	90.0	78.8	88.6	89.6	88.6	49.0

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	1098A-Bt1	1098A-Bt2	1098A-Bt3	1098A-Bt4	1098A-Bt5	1098A-Bt6	1098A-Bt7	1098A-Bt8	1098A-Bt9
Localisation	Inclusion	Inclusion	Grt-margin	Matrix	Inclusion	Grt-margin	Matrix	Grt-margin	Matrix
Oxydes (wt.%)									
SiO2	37.228	37.637	37.380	36.671	36.402	37.134	36.446	37.564	37.386
Al2O3	16.303	16.515	15.995	16.275	15.821	16.062	15.873	15.967	16.218
CaO	0.034	0.038	0.011	0.027	0.000	0.037	0.033	0.000	0.050
Na2O	0.127	0.117	0.055	0.042	0.057	0.083	0.050	0.066	0.064
K2O	9.723	9.827	10.247	9.891	10.095	10.058	9.949	10.218	10.093
FeO	9.536	8.463	10.638	10.606	12.297	11.886	13.190	10.642	10.530
MgO	16.961	17.529	16.366	15.653	14.523	15.188	14.051	16.142	16.699
MnO	0.000	0.000	0.000	0.005	0.036	0.000	0.013	0.008	0.000
TiO2	5.677	5.016	4.810	5.484	5.785	5.561	5.335	5.286	4.735
Cr2O3	0.171	0.039	0.068	0.141	0.097	0.161	0.152	0.237	0.068
NiO	0.041	0.006	0.015	0.000	0.028	0.033	0.050	0.037	0.006
BaO	0.247	0.302	0.279	0.198	0.188	0.190	0.352	0.264	0.209
Rb2O	0.056	0.000	0.000	0.011	0.039	0.000	0.034	0.020	0.008
H2O	3.777	3.855	3.746	3.703	3.757	3.850	3.798	3.675	3.764
F	0.745	0.575	0.726	0.745	0.566	0.507	0.458	0.931	0.724
Cl	0.029	0.042	0.032	0.042	0.049	0.041	0.049	0.027	0.033
Sub-total	100.655	99.961	100.368	99.494	99.740	100.791	99.833	101.084	100.587
O=F, Cl	0.320	0.252	0.313	0.323	0.249	0.223	0.204	0.398	0.312
Total	100.335	99.709	100.055	99.171	99.491	100.568	99.629	100.686	100.275
Cations*									
Si	5.396	5.454	5.469	5.407	5.405	5.430	5.426	5.463	5.447
Al iv	2.604	2.546	2.531	2.593	2.595	2.570	2.574	2.537	2.553
Al v	0.181	0.275	0.227	0.236	0.174	0.199	0.212	0.200	0.233
Ca	0.005	0.006	0.002	0.004	0.000	0.006	0.005	0.000	0.008
Na	0.036	0.033	0.016	0.012	0.016	0.024	0.014	0.019	0.018
K	1.798	1.816	1.912	1.860	1.912	1.876	1.889	1.895	1.876
Fe2+	1.156	1.026	1.302	1.308	1.527	1.454	1.642	1.294	1.283
Mg	3.665	3.787	3.569	3.441	3.215	3.311	3.118	3.499	3.627
Mn	0.000	0.000	0.000	0.001	0.005	0.000	0.002	0.001	0.000
Ti	0.619	0.547	0.529	0.608	0.646	0.612	0.597	0.578	0.519
Cr	0.020	0.004	0.008	0.016	0.011	0.019	0.018	0.027	0.008
Ni	0.005	0.001	0.002	0.000	0.003	0.004	0.006	0.004	0.001
Ba	0.014	0.017	0.016	0.011	0.011	0.011	0.021	0.015	0.012
Rb	0.005	0.000	0.000	0.001	0.004	0.000	0.003	0.002	0.001
Fe#	0.240	0.213	0.267	0.275	0.322	0.305	0.345	0.270	0.261

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	1098A-Bt10	1098A-Bt11	1098A-Bt12	1098A-Bt13	1098A-Bt14	1121A-Bt1	1121A-Bt2	1121A-Bt3	1121A-Bt4
Localisation	Inclusion	Inclusion	Inclusion	Grt-margin	Matrix	Matrix	Inclusion	Inclusion	Matrix
Oxydes (wt.%)									
SiO2	37.365	37.164	37.286	37.536	37.057	36.416	36.900	36.576	36.229
Al2O3	16.349	17.151	17.268	15.767	16.033	14.250	14.349	14.491	14.186
CaO	0.014	0.000	0.032	0.019	0.000	0.000	0.022	0.029	0.000
Na2O	0.064	0.197	0.334	0.029	0.041	0.049	0.045	0.072	0.057
K2O	10.005	9.949	9.796	10.219	10.240	9.944	9.702	9.685	9.841
FeO	7.568	9.935	9.240	11.773	12.680	18.581	19.129	18.532	19.476
MgO	18.244	15.460	15.560	15.993	14.066	10.723	11.046	11.206	10.777
MnO	0.000	0.000	0.000	0.008	0.005	0.030	0.036	0.051	0.039
TiO2	4.394	6.344	6.523	5.030	5.676	5.294	5.405	4.945	5.024
Cr2O3	0.116	0.106	0.165	0.287	0.290	0.046	0.000	0.087	0.037
NiO	0.042	0.053	0.019	0.013	0.057	0.009	0.010	0.000	0.000
BaO	0.162	0.390	0.306	0.203	0.346	0.211	0.324	0.240	0.235
Rb2O	0.040	0.030	0.070	0.007	0.002	0.030	0.047	0.010	0.078
H2O	3.747	3.885	3.687	3.773	3.807	3.679	3.798	3.687	3.623
F	0.731	0.546	0.989	0.719	0.561	0.455	0.330	0.497	0.581
Cl	0.031	0.042	0.036	0.030	0.027	0.127	0.119	0.112	0.104
Sub-total	98.872	101.252	101.311	101.406	100.888	99.844	101.262	100.220	100.287
O=F, Cl	0.315	0.239	0.425	0.310	0.242	0.220	0.166	0.235	0.268
Total	98.557	101.013	100.886	101.096	100.646	99.624	101.096	99.985	100.019
Cations*									
Si	5.463	5.364	5.369	5.461	5.447	5.560	5.553	5.552	5.536
Al iv	2.537	2.636	2.631	2.539	2.553	2.440	2.447	2.448	2.464
Al v	0.280	0.282	0.299	0.165	0.225	0.125	0.098	0.145	0.091
Ca	0.002	0.000	0.005	0.003	0.000	0.000	0.004	0.005	0.000
Na	0.018	0.055	0.093	0.008	0.012	0.015	0.013	0.021	0.017
K	1.866	1.832	1.799	1.896	1.920	1.937	1.862	1.875	1.918
Fe2+	0.925	1.199	1.113	1.433	1.559	2.373	2.407	2.353	2.489
Mg	3.976	3.327	3.340	3.469	3.082	2.441	2.478	2.536	2.455
Mn	0.000	0.000	0.000	0.001	0.001	0.004	0.005	0.007	0.005
Ti	0.483	0.689	0.706	0.550	0.627	0.608	0.612	0.565	0.577
Cr	0.013	0.012	0.019	0.033	0.034	0.006	0.000	0.010	0.004
Ni	0.005	0.006	0.002	0.002	0.007	0.001	0.001	0.000	0.000
Ba	0.009	0.022	0.017	0.012	0.020	0.013	0.019	0.014	0.014
Rb	0.004	0.003	0.006	0.001	0.000	0.003	0.005	0.001	0.008
Fe#	0.189	0.265	0.250	0.292	0.336	0.493	0.493	0.481	0.503

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	1121A-Bt5	1121A-Bt6	1121A-Bt7	1121A-Bt8	1121A-Bt9	1121A-Bt10	1121A-Bt11	1121A-Bt13	1121A-Bt15
Localisation	Opx margin	Opx margin	Inclusion	Matrix	Matrix	Grt-margin	Inclusion	Grt-margin	Inclusion
Oxydes (wt.%)									
SiO2	36.404	36.389	36.653	36.845	37.076	35.470	37.225	37.051	37.058
Al2O3	15.676	14.894	14.426	14.789	14.726	15.264	14.674	14.760	14.886
CaO	0.039	0.059	0.000	0.033	0.038	0.072	0.020	0.030	0.039
Na2O	0.069	0.081	0.066	0.101	0.094	0.054	0.141	0.072	0.097
K2O	9.583	9.367	9.611	9.675	9.709	8.119	9.831	9.787	9.763
FeO	18.459	19.343	19.136	19.151	16.936	20.512	15.910	16.951	15.331
MgO	11.403	11.293	11.287	11.135	12.086	11.246	13.208	12.559	13.899
MnO	0.043	0.048	0.066	0.039	0.038	0.013	0.000	0.002	0.022
TiO2	4.258	4.313	4.891	4.323	5.468	4.480	5.479	5.048	5.307
Cr2O3	0.062	0.042	0.000	0.037	0.054	0.029	0.000	0.054	0.000
NiO	0.000	0.035	0.000	0.000	0.000	0.031	0.000	0.000	0.000
BaO	0.126	0.183	0.105	0.122	0.204	0.183	0.182	0.248	0.260
Rb2O	0.054	0.006	0.013	0.061	0.021	0.070	0.073	0.044	0.038
H2O	3.764	3.640	3.753	3.718	3.634	3.632	3.678	3.710	3.670
F	0.385	0.600	0.385	0.460	0.745	0.573	0.704	0.588	0.738
Cl	0.106	0.103	0.095	0.107	0.089	0.091	0.104	0.094	0.105
Sub-total	100.431	100.396	100.487	100.596	100.918	99.839	101.229	100.998	101.213
O=F, Cl	0.186	0.276	0.184	0.218	0.334	0.262	0.320	0.269	0.334
Total	100.245	100.120	100.303	100.378	100.584	99.577	100.909	100.729	100.879
Cations*									
Si	5.495	5.524	5.550	5.575	5.545	5.417	5.528	5.537	5.492
Al iv	2.505	2.476	2.450	2.425	2.455	2.583	2.472	2.463	2.508
Al v	0.283	0.189	0.125	0.212	0.141	0.165	0.096	0.137	0.092
Ca	0.006	0.010	0.000	0.005	0.006	0.012	0.003	0.005	0.006
Na	0.020	0.024	0.019	0.030	0.027	0.016	0.041	0.021	0.028
K	1.845	1.814	1.856	1.867	1.852	1.582	1.862	1.866	1.845
Fe2+	2.330	2.456	2.423	2.423	2.118	2.620	1.976	2.119	1.900
Mg	2.566	2.556	2.548	2.511	2.695	2.560	2.924	2.798	3.070
Mn	0.005	0.006	0.008	0.005	0.005	0.002	0.000	0.000	0.003
Ti	0.483	0.492	0.557	0.492	0.615	0.515	0.612	0.567	0.591
Cr	0.007	0.005	0.000	0.004	0.006	0.004	0.000	0.006	0.000
Ni	0.000	0.004	0.000	0.000	0.000	0.004	0.000	0.000	0.000
Ba	0.007	0.011	0.006	0.007	0.012	0.011	0.011	0.015	0.015
Rb	0.005	0.001	0.001	0.006	0.002	0.007	0.007	0.004	0.004
Fe#	0.476	0.490	0.487	0.491	0.440	0.506	0.403	0.431	0.382

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	1121A-Bt16	142A-Bt3	142A-Bt4	142A-Bt8	2112B-Bt1	2112B-Bt2	2112B-Bt3	2112B-Bt4	2112B-Bt5-1
Localisation	Matrix	Matrix	Matrix	Matrix	Grt-margin	Inclusion	Inclusion	Inclusion	Matrix
Oxydes (wt.%)									
SiO2	36.653	39.121	38.360	38.570	37.003	36.917	36.912	36.789	35.852
Al2O3	14.664	14.833	13.803	14.105	15.137	15.232	14.690	15.139	14.937
CaO	0.020	0.111	0.004	0.029	0.082	0.012	0.002	0.023	0.008
Na2O	0.045	0.050	0.018	0.016	0.180	0.092	0.100	0.087	0.034
K2O	10.011	10.000	10.339	10.231	9.692	9.673	9.538	9.719	9.657
FeO	17.700	9.190	13.218	10.787	14.804	15.442	15.160	14.980	18.175
MgO	11.791	18.853	15.984	17.276	14.126	13.693	13.703	13.976	10.153
MnO	0.012	0.053	0.102	0.088	0.015	0.013	0.029	0.029	0.000
TiO2	5.611	3.924	4.595	4.629	4.539	4.265	4.471	4.242	5.674
Cr2O3	0.054	0.000	0.072	0.102	0.004	0.050	0.021	0.013	0.000
NiO	0.043	0.037	0.031	0.000	0.004	0.000	0.000	0.000	0.000
BaO	0.240	0.515	0.454	0.425	0.682	0.832	0.776	0.755	0.805
Rb2O	0.066	0.000	0.007	0.000	0.002	0.046	0.000	0.000	0.032
H2O	3.698	2.948	2.885	2.951	3.612	3.582	3.510	3.679	3.639
F	0.587	2.534	2.486	2.395	0.768	0.796	0.881	0.571	0.467
Cl	0.092	0.082	0.088	0.089	0.203	0.206	0.222	0.194	0.200
Sub-total	101.287	102.251	102.446	101.693	100.853	100.851	100.015	100.196	99.633
O=F, Cl	0.268	1.085	1.067	1.029	0.369	0.382	0.421	0.284	0.242
Total	101.019	101.166	101.379	100.664	100.484	100.469	99.594	99.912	99.391
Cations*									
Si	5.496	5.626	5.630	5.629	5.509	5.518	5.556	5.496	5.516
Al iv	2.504	2.374	2.370	2.371	2.491	2.482	2.444	2.504	2.484
Al v	0.087	0.140	0.017	0.055	0.165	0.201	0.162	0.195	0.191
Ca	0.003	0.017	0.001	0.005	0.013	0.002	0.000	0.001	0.004
Na	0.013	0.014	0.005	0.005	0.052	0.027	0.029	0.010	0.025
K	1.915	1.834	1.935	1.904	1.841	1.844	1.831	1.888	1.859
Fe2+	2.220	1.105	1.622	1.317	1.843	1.930	1.908	2.330	1.878
Mg	2.635	4.042	3.497	3.758	3.135	3.051	3.075	2.320	3.124
Mn	0.002	0.006	0.013	0.011	0.002	0.002	0.004	0.000	0.004
Ti	0.633	0.424	0.507	0.508	0.508	0.479	0.506	0.654	0.478
Cr	0.006	0.000	0.008	0.012	0.000	0.006	0.002	0.000	0.002
Ni	0.005	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.014	0.029	0.026	0.024	0.040	0.049	0.046	0.048	0.044
Rb	0.006	0.000	0.001	0.000	0.000	0.004	0.000	0.003	0.000
Fe#	0.457	0.215	0.317	0.259	0.370	0.388	0.383	0.501	0.376

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	2112B-Bt5-2	2112B-Bt6	2112B-Bt7	2112B-Bt8	2112B-Bt10	2112B-Bt11	2112B-Bt12	2112B-Bt13	3008A-Bt1
Localisation	Matrix	Grt-margin	Inclusion	Matrix	Inclusion	Inclusion	Matrix	Inclusion	Matrix
Oxydes (wt.%)									
SiO2	37.759	35.873	35.888	35.767	36.181	35.573	36.147	35.710	35.378
Al2O3	14.446	14.523	15.011	14.915	14.781	14.613	14.661	14.467	19.134
CaO	0.010	0.021	0.018	0.012	0.016	0.000	0.000	0.005	0.016
Na2O	0.056	0.064	0.397	0.042	0.048	0.041	0.044	0.046	0.063
K2O	9.479	9.730	9.187	9.737	9.704	9.697	9.876	9.698	9.968
FeO	19.077	19.406	16.451	19.360	18.205	20.088	19.611	19.800	18.176
MgO	9.749	10.143	11.405	10.552	11.425	9.978	10.144	10.066	8.981
MnO	0.013	0.032	0.000	0.032	0.000	0.000	0.032	0.030	0.046
TiO2	5.074	5.380	6.529	4.798	4.712	5.445	5.499	5.543	3.260
Cr2O3	0.091	0.062	0.000	0.112	0.025	0.041	0.062	0.082	0.000
NiO	0.034	0.000	0.016	0.014	0.038	0.000	0.030	0.011	0.038
BaO	0.661	0.923	0.810	0.549	0.883	0.875	0.624	0.924	0.269
Rb2O	0.013	0.049	0.035	0.021	0.051	0.033	0.067	0.067	0.000
H2O	3.688	3.664	3.699	3.675	3.562	3.748	3.669	3.654	3.661
F	0.495	0.406	0.450	0.396	0.686	0.229	0.482	0.435	0.539
Cl	0.192	0.233	0.211	0.215	0.205	0.213	0.189	0.216	0.107
Sub-total	100.837	100.509	100.107	100.197	100.522	100.574	101.137	100.754	99.636
O=F, Cl	0.252	0.224	0.237	0.215	0.335	0.144	0.246	0.232	0.251
Total	100.585	100.285	99.870	99.982	100.187	100.430	100.891	100.522	99.385
Cations*									
Si	5.701	5.495	5.426	5.476	5.508	5.455	5.494	5.469	5.379
Al iv	2.299	2.505	2.574	2.524	2.492	2.545	2.506	2.531	2.621
Al v	0.273	0.117	0.102	0.167	0.160	0.096	0.121	0.081	0.808
Ca	0.002	0.003	0.003	0.002	0.003	0.000	0.000	0.001	0.003
Na	0.016	0.019	0.116	0.012	0.014	0.012	0.013	0.014	0.019
K	1.826	1.901	1.772	1.901	1.884	1.897	1.915	1.894	1.933
Fe2+	2.409	2.486	2.080	2.479	2.318	2.576	2.493	2.536	2.311
Mg	2.194	2.316	2.571	2.408	2.593	2.281	2.298	2.298	2.036
Mn	0.002	0.004	0.000	0.004	0.000	0.000	0.004	0.004	0.006
Ti	0.576	0.620	0.742	0.552	0.539	0.628	0.629	0.638	0.373
Cr	0.011	0.008	0.000	0.014	0.003	0.005	0.007	0.010	0.000
Ni	0.004	0.000	0.002	0.002	0.005	0.000	0.004	0.001	0.005
Ba	0.039	0.055	0.048	0.033	0.053	0.053	0.037	0.055	0.016
Rb	0.001	0.005	0.003	0.002	0.005	0.003	0.007	0.007	0.000
Fe#	0.523	0.518	0.447	0.507	0.472	0.530	0.520	0.525	0.532

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	3008A-Bt2	3008A-Bt3	3008A-Bt4	3008A-Bt5	3008A-Bt6	3008A-Bt7	3008A-Bt8	3008A-Bt9	3008A-Bt10
Localisation	Matrix	Grt-margin	Grt-margin	Matrix	Matrix	Grt-margin	Grt-margin	Matrix	Grt-margin
Oxydes (wt.%)									
SiO2	35.478	36.140	36.063	35.950	35.650	35.708	36.010	35.604	35.441
Al2O3	19.030	20.681	20.256	19.434	18.815	19.859	19.425	18.873	19.259
CaO	0.038	0.024	0.023	0.014	0.000	0.008	0.017	0.000	0.013
Na2O	0.054	0.047	0.058	0.042	0.026	0.039	0.046	0.032	0.068
K2O	9.862	10.041	10.082	9.877	10.025	10.067	10.091	10.115	10.013
FeO	17.896	15.374	16.507	17.623	18.638	17.250	17.095	18.517	17.668
MgO	8.941	11.577	10.640	9.134	8.996	9.261	10.676	9.163	9.283
MnO	0.052	0.000	0.000	0.006	0.013	0.013	0.000	0.059	0.028
TiO2	3.427	1.259	1.943	3.221	3.608	3.575	2.358	3.515	2.938
Cr2O3	0.033	0.000	0.000	0.004	0.000	0.004	0.050	0.012	0.000
NiO	0.020	0.000	0.000	0.039	0.000	0.000	0.000	0.042	0.027
BaO	0.198	0.269	0.143	0.272	0.275	0.228	0.249	0.243	0.277
Rb2O	0.086	0.073	0.000	0.000	0.030	0.000	0.030	0.058	0.000
H2O	3.712	3.917	3.771	3.814	3.759	3.697	3.635	3.754	3.763
F	0.432	0.177	0.463	0.299	0.395	0.586	0.743	0.417	0.332
Cl	0.103	0.072	0.073	0.090	0.082	0.096	0.056	0.077	0.082
Sub-total	99.362	99.651	100.022	99.819	100.312	100.391	100.481	100.481	99.192
O=F, Cl	0.205	0.091	0.211	0.146	0.185	0.268	0.325	0.193	0.158
Total	99.157	99.560	99.811	99.673	100.127	100.123	100.156	100.288	99.034
Cations*									
Si	5.396	5.392	5.394	5.419	5.389	5.355	5.397	5.376	5.393
Al iv	2.604	2.608	2.606	2.581	2.611	2.645	2.603	2.624	2.607
Al v	0.808	1.029	0.965	0.871	0.741	0.865	0.829	0.735	0.847
Ca	0.006	0.004	0.004	0.002	0.000	0.001	0.003	0.000	0.002
Na	0.016	0.014	0.017	0.012	0.008	0.011	0.013	0.009	0.020
K	1.913	1.911	1.923	1.899	1.933	1.926	1.929	1.948	1.943
Fe2+	2.277	1.918	2.065	2.221	2.356	2.163	2.143	2.338	2.248
Mg	2.027	2.575	2.372	2.052	2.027	2.070	2.385	2.062	2.106
Mn	0.007	0.000	0.000	0.001	0.002	0.002	0.000	0.008	0.004
Ti	0.392	0.141	0.219	0.365	0.410	0.403	0.266	0.399	0.336
Cr	0.004	0.000	0.000	0.000	0.000	0.000	0.006	0.001	0.000
Ni	0.002	0.000	0.000	0.005	0.000	0.000	0.000	0.005	0.003
Ba	0.012	0.016	0.008	0.016	0.016	0.013	0.015	0.014	0.017
Rb	0.008	0.007	0.000	0.000	0.003	0.000	0.003	0.006	0.000
Fe#	0.529	0.427	0.465	0.520	0.538	0.511	0.473	0.531	0.516

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	3008A-Bt11	3008A-Bt12	3090A-Bt1	3090A-Bt2	3090A-Bt3	3090A-Bt4	3090A-Bt5	3090A-Bt6	3090A-Bt7
Localisation	Matrix	Matrix	Grt-margin	Grt-margin	Matrix	Matrix	Matrix	Grt-margin	Grt-margin
Oxydes (wt.%)									
SiO2	35.545	35.883	36.102	36.573	36.317	36.008	36.676	36.988	36.414
Al2O3	19.037	19.566	14.149	14.218	14.220	14.337	14.517	14.336	14.432
CaO	0.020	0.016	0.000	0.000	0.019	0.000	0.009	0.002	0.010
Na2O	0.049	0.076	0.041	0.028	0.020	0.000	0.026	0.034	0.059
K2O	10.107	9.983	9.889	9.941	9.891	9.881	9.842	9.852	9.876
FeO	17.960	17.260	20.767	19.903	20.317	20.333	19.638	19.206	19.356
MgO	9.116	9.605	9.909	10.021	9.569	9.711	10.236	11.814	9.704
MnO	0.051	0.021	0.067	0.000	0.024	0.020	0.007	0.000	0.010
TiO2	3.337	2.859	5.333	5.991	5.783	5.416	5.652	4.641	6.122
Cr2O3	0.050	0.000	0.144	0.070	0.054	0.186	0.054	0.083	0.108
NiO	0.000	0.000	0.000	0.016	0.055	0.000	0.013	0.000	0.015
BaO	0.274	0.318	0.333	0.226	0.356	0.379	0.423	0.337	0.291
Rb2O	0.073	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.032
H2O	3.613	3.774	3.788	3.712	3.676	3.627	3.698	3.713	3.701
F	0.681	0.386	0.252	0.485	0.505	0.570	0.537	0.534	0.455
Cl	0.077	0.090	0.079	0.088	0.076	0.074	0.078	0.108	0.123
Sub-total	99.990	99.837	100.853	101.272	100.882	100.542	101.406	101.666	100.708
O=F, Cl	0.304	0.183	0.124	0.224	0.230	0.257	0.244	0.249	0.219
Total	99.686	99.654	100.729	101.048	100.652	100.285	101.162	101.417	100.489
Cations*									
Si	5.388	5.407	5.512	5.533	5.535	5.513	5.536	5.553	5.531
Al iv	2.612	2.593	2.488	2.467	2.465	2.487	2.464	2.447	2.469
Al v	0.790	0.881	0.059	0.068	0.090	0.101	0.118	0.090	0.114
Ca	0.003	0.003	0.000	0.000	0.003	0.000	0.001	0.000	0.002
Na	0.014	0.022	0.012	0.008	0.006	0.000	0.008	0.010	0.017
K	1.954	1.919	1.926	1.918	1.923	1.930	1.895	1.887	1.913
Fe2+	2.277	2.175	2.652	2.518	2.590	2.604	2.479	2.412	2.459
Mg	2.060	2.157	2.255	2.260	2.174	2.217	2.303	2.644	2.197
Mn	0.007	0.003	0.009	0.000	0.003	0.003	0.001	0.000	0.001
Ti	0.380	0.324	0.612	0.682	0.663	0.624	0.642	0.524	0.699
Cr	0.006	0.000	0.017	0.008	0.007	0.023	0.006	0.010	0.013
Ni	0.000	0.000	0.000	0.002	0.007	0.000	0.002	0.000	0.002
Ba	0.016	0.019	0.020	0.013	0.021	0.023	0.025	0.020	0.017
Rb	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003
Fe#	0.525	0.502	0.540	0.527	0.544	0.540	0.518	0.477	0.528

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	3090A-Bt8	3090A-Bt9	3090A-Bt11	3117A-Bt1	3117A-Bt2	3117A-Bt3	3117A-Bt4	3117A-Bt6	3117A-Bt7
Localisation	Matrix	Grt-margin	Inclusion	Grt-margin	Matrix	Inclusion	Inclusion	Matrix	Inclusion
Oxydes (wt.%)									
SiO2	36.143	35.992	36.188	35.772	36.016	36.612	37.004	36.235	36.232
Al2O3	14.646	14.433	14.361	17.766	17.769	18.813	18.667	17.910	18.049
CaO	0.007	0.022	0.038	0.021	0.006	0.036	0.029	0.016	0.003
Na2O	0.041	0.084	0.047	0.035	0.040	0.251	0.219	0.021	0.075
K2O	9.698	9.616	9.843	9.995	9.963	9.280	9.236	10.107	10.007
FeO	20.244	20.750	17.749	14.900	14.567	12.045	10.840	14.962	13.630
MgO	9.622	9.309	11.243	12.283	11.758	14.659	15.434	11.570	12.906
MnO	0.048	0.001	0.019	0.000	0.009	0.027	0.000	0.002	0.010
TiO2	5.701	5.820	6.133	4.378	4.585	3.906	3.610	4.237	4.246
Cr2O3	0.062	0.070	0.033	0.067	0.055	0.038	0.106	0.084	0.143
NiO	0.036	0.007	0.020	0.112	0.073	0.072	0.090	0.056	0.030
BaO	0.434	0.431	0.377	0.291	0.344	0.341	0.249	0.362	0.303
Rb2O	0.026	0.069	0.084	0.007	0.029	0.067	0.000	0.035	0.056
H2O	3.651	3.677	3.623	3.830	3.826	3.877	3.803	3.839	3.835
F	0.569	0.448	0.648	0.349	0.329	0.453	0.617	0.316	0.397
Cl	0.078	0.139	0.111	0.046	0.069	0.068	0.075	0.077	0.064
Sub-total	101.006	100.868	100.517	99.852	99.438	100.545	99.979	99.829	99.986
O=F, Cl	0.257	0.220	0.298	0.157	0.154	0.206	0.277	0.150	0.182
Total	100.749	100.648	100.219	99.695	99.284	100.339	99.702	99.679	99.804
Cations*									
Si	5.500	5.499	5.483	5.353	5.400	5.342	5.393	5.421	5.379
Al iv	2.500	2.501	2.517	2.647	2.600	2.658	2.607	2.579	2.621
Al v	0.126	0.098	0.047	0.486	0.540	0.578	0.600	0.579	0.537
Ca	0.001	0.004	0.006	0.003	0.001	0.006	0.005	0.003	0.000
Na	0.012	0.025	0.014	0.010	0.012	0.071	0.062	0.006	0.022
K	1.882	1.874	1.902	1.908	1.905	1.727	1.717	1.929	1.895
Fe2+	2.576	2.651	2.249	1.865	1.827	1.470	1.321	1.872	1.692
Mg	2.183	2.120	2.539	2.740	2.628	3.189	3.353	2.580	2.856
Mn	0.006	0.000	0.002	0.000	0.001	0.003	0.000	0.000	0.001
Ti	0.652	0.669	0.699	0.493	0.517	0.429	0.396	0.477	0.474
Cr	0.007	0.008	0.004	0.008	0.007	0.004	0.012	0.010	0.017
Ni	0.004	0.001	0.002	0.013	0.009	0.008	0.011	0.007	0.004
Ba	0.026	0.026	0.022	0.017	0.020	0.019	0.014	0.021	0.018
Rb	0.003	0.007	0.008	0.001	0.003	0.006	0.000	0.003	0.005
Fe#	0.541	0.556	0.470	0.405	0.410	0.316	0.283	0.420	0.372

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	3117A-Bt8	3117A-Bt9	3117A-Bt10	3117A-Bt11	3117A-Bt12	3117A-Bt13	3123A-Bt1	3123A-Bt2	3123A-Bt3
Localisation	Grt-margin	Inclusion	Matrix	Inclusion	Grt-margin	Matrix	Matrix	Grt-margin	Inclusion
Oxydes (wt.%)									
SiO2	36.322	37.108	36.326	37.140	36.573	36.536	37.167	36.765	37.209
Al2O3	17.809	17.923	17.671	18.299	17.948	18.035	16.493	16.611	16.939
CaO	0.005	0.000	0.004	0.009	0.033	0.009	0.014	0.016	0.048
Na2O	0.023	0.261	0.044	0.188	0.089	0.051	0.074	0.068	0.110
K2O	10.094	9.448	10.028	9.534	9.719	10.027	10.088	10.067	9.691
FeO	15.004	11.709	15.343	12.686	15.349	15.074	15.628	15.676	14.613
MgO	11.966	14.113	11.451	13.800	12.089	11.863	12.516	13.145	13.364
MnO	0.015	0.000	0.025	0.000	0.003	0.001	0.024	0.000	0.007
TiO2	4.440	5.447	4.693	4.060	4.149	4.449	4.367	3.858	3.828
Cr2O3	0.088	0.127	0.029	0.067	0.088	0.054	0.130	0.029	0.088
NiO	0.059	0.022	0.031	0.033	0.016	0.049	0.000	0.000	0.021
BaO	0.277	0.324	0.359	0.382	0.253	0.306	0.092	0.173	0.157
Rb2O	0.006	0.021	0.016	0.036	0.021	0.069	0.000	0.086	0.049
H2O	3.777	3.873	3.843	3.880	3.740	3.818	3.558	3.456	3.473
F	0.505	0.505	0.337	0.430	0.613	0.459	0.945	1.145	1.145
Cl	0.062	0.069	0.071	0.066	0.070	0.063	0.165	0.142	0.157
Sub-total	100.452	100.950	100.271	100.610	100.753	100.863	101.261	101.237	100.899
O=F, Cl	0.227	0.228	0.158	0.196	0.274	0.207	0.435	0.514	0.518
Total	100.225	100.722	100.113	100.414	100.479	100.656	100.826	100.723	100.381
Cations*									
Si	5.402	5.388	5.417	5.431	5.417	5.408	5.505	5.464	5.501
Al iv	2.598	2.612	2.583	2.569	2.583	2.592	2.495	2.536	2.499
Al v	0.523	0.456	0.523	0.584	0.551	0.554	0.385	0.373	0.453
Ca	0.001	0.000	0.001	0.001	0.005	0.001	0.002	0.003	0.008
Na	0.007	0.073	0.013	0.053	0.026	0.015	0.021	0.020	0.032
K	1.915	1.750	1.907	1.778	1.836	1.893	1.906	1.908	1.827
Fe2+	1.866	1.422	1.914	1.551	1.901	1.866	1.936	1.948	1.807
Mg	2.653	3.055	2.546	3.008	2.669	2.617	2.764	2.912	2.945
Mn	0.002	0.000	0.003	0.000	0.000	0.000	0.003	0.000	0.001
Ti	0.497	0.595	0.526	0.446	0.462	0.495	0.486	0.431	0.426
Cr	0.010	0.015	0.003	0.008	0.010	0.006	0.015	0.003	0.010
Ni	0.007	0.003	0.004	0.004	0.002	0.006	0.000	0.000	0.002
Ba	0.016	0.018	0.021	0.022	0.015	0.018	0.005	0.010	0.009
Rb	0.001	0.002	0.002	0.003	0.002	0.007	0.000	0.008	0.005
Fe#	0.413	0.318	0.429	0.340	0.416	0.416	0.412	0.401	0.380

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	3123A-Bt4	3123A-Bt5	3123A-Bt6	3123A-Bt7	3123A-Bt8	3123A-Bt9	3123A-Bt10	3123A-Bt11	3123A-Bt12
Localisation	Inclusion	Matrix	Grt-margin	Inclusion	Inclusion	Matrix	Matrix	Inclusion	Inclusion
Oxydes (wt.%)									
SiO2	37.026	36.730	36.811	36.637	36.300	36.441	36.421	35.937	36.580
Al2O3	16.426	16.277	16.312	17.337	17.516	16.183	16.145	18.006	16.909
CaO	0.048	0.010	0.002	0.018	0.019	0.000	0.009	0.082	0.028
Na2O	0.089	0.064	0.057	0.064	0.068	0.056	0.053	0.097	0.080
K2O	9.863	10.195	10.126	9.919	9.884	10.024	10.041	9.526	10.012
FeO	14.232	15.797	15.373	14.266	14.701	15.011	15.999	14.016	14.124
MgO	13.906	12.524	13.432	13.188	12.872	12.413	12.475	13.144	13.555
MnO	0.000	0.019	0.000	0.013	0.012	0.014	0.007	0.045	0.034
TiO2	4.150	4.789	4.157	3.720	4.358	4.946	4.757	4.310	3.685
Cr2O3	0.146	0.080	0.113	0.063	0.083	0.083	0.096	0.000	0.139
NiO	0.000	0.000	0.000	0.047	0.015	0.022	0.000	0.017	0.000
BaO	0.224	0.127	0.136	0.148	0.134	0.155	0.149	0.188	0.197
Rb2O	0.048	0.099	0.058	0.087	0.034	0.032	0.009	0.074	0.123
H2O	3.414	3.528	3.623	3.495	3.582	3.614	3.497	3.605	3.542
F	1.258	0.988	0.801	1.052	0.885	0.723	1.001	0.822	0.931
Cl	0.166	0.158	0.155	0.131	0.146	0.158	0.156	0.147	0.139
Sub-total	100.996	101.385	101.156	100.185	100.609	99.875	100.815	100.016	100.078
O=F, Cl	0.567	0.452	0.372	0.473	0.406	0.340	0.457	0.379	0.423
Total	100.429	100.933	100.784	99.712	100.203	99.535	100.358	99.637	99.655
Cations*									
Si	5.479	5.457	5.460	5.456	5.389	5.467	5.445	5.345	5.459
Al iv	2.521	2.543	2.540	2.544	2.611	2.533	2.555	2.655	2.541
Al v	0.344	0.307	0.312	0.499	0.455	0.329	0.289	0.502	0.433
Ca	0.008	0.002	0.000	0.003	0.003	0.000	0.001	0.013	0.004
Na	0.026	0.018	0.016	0.018	0.020	0.016	0.015	0.028	0.023
K	1.862	1.932	1.916	1.884	1.872	1.918	1.915	1.807	1.906
Fe2+	1.761	1.963	1.907	1.777	1.825	1.883	2.000	1.743	1.763
Mg	3.067	2.774	2.970	2.928	2.849	2.776	2.780	2.914	3.015
Mn	0.000	0.002	0.000	0.002	0.002	0.002	0.001	0.006	0.004
Ti	0.462	0.535	0.464	0.417	0.487	0.558	0.535	0.482	0.414
Cr	0.017	0.009	0.013	0.007	0.010	0.010	0.011	0.000	0.016
Ni	0.000	0.000	0.000	0.006	0.002	0.003	0.000	0.002	0.000
Ba	0.013	0.007	0.008	0.009	0.008	0.009	0.009	0.011	0.012
Rb	0.005	0.009	0.006	0.008	0.003	0.003	0.001	0.007	0.012
Fe#	0.365	0.414	0.391	0.378	0.391	0.404	0.418	0.374	0.369

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	3123A-Bt13	3123A-Bt14	3123A-Bt15	3123A-Bt16	3123A-Bt17	4041B-Bt1	4041B-Bt2	4041B-Bt3	4041B-Bt4
Localisation	Grt-margin	Inclusion	Grt-margin	Grt-margin	Matrix	Matrix	Grt-margin	Inclusion	Grt-margin
Oxydes (wt.%)									
SiO2	36.764	37.754	36.266	39.421	36.363	36.610	36.613	36.467	36.735
Al2O3	17.065	17.551	16.687	16.069	16.588	17.988	18.216	18.066	18.534
CaO	0.051	0.077	0.000	0.019	0.000	0.010	0.000	0.007	0.018
Na2O	0.080	0.058	0.068	0.034	0.050	0.066	0.078	0.106	0.084
K2O	9.913	9.956	9.774	9.712	10.066	10.076	10.134	10.035	9.994
FeO	13.735	12.620	15.070	10.843	15.498	15.204	14.834	13.798	14.759
MgO	13.640	16.521	13.137	18.435	12.906	11.902	12.197	13.001	12.194
MnO	0.008	0.024	0.008	0.004	0.026	0.010	0.000	0.017	0.015
TiO2	4.997	0.621	3.908	0.659	4.462	4.245	3.773	4.231	4.311
Cr2O3	0.000	0.013	0.079	0.000	0.100	0.235	0.206	0.242	0.169
NiO	0.011	0.000	0.000	0.000	0.000	0.022	0.025	0.022	0.022
BaO	0.141	0.019	0.157	0.081	0.172	0.263	0.222	0.240	0.225
Rb2O	0.035	0.000	0.011	0.065	0.075	0.000	0.000	0.000	0.020
H2O	3.584	3.290	3.437	3.140	3.613	3.756	3.759	3.827	3.800
F	0.956	1.614	1.091	2.004	0.790	0.594	0.572	0.468	0.576
Cl	0.157	0.045	0.159	0.114	0.146	0.068	0.077	0.059	0.068
Sub-total	101.137	100.163	99.852	100.600	100.855	101.049	100.706	100.586	101.524
O=F, Cl	0.438	0.690	0.495	0.870	0.366	0.265	0.258	0.210	0.258
Total	100.699	99.473	99.357	99.730	100.489	100.784	100.448	100.376	101.266
Cations*									
Si	5.407	5.567	5.444	5.740	5.418	5.414	5.421	5.381	5.386
Al iv	2.593	2.433	2.556	2.260	2.582	2.586	2.579	2.619	2.614
Al v	0.366	0.618	0.396	0.498	0.330	0.549	0.600	0.524	0.589
Ca	0.008	0.012	0.000	0.003	0.000	0.002	0.000	0.001	0.003
Na	0.023	0.017	0.020	0.010	0.014	0.019	0.022	0.030	0.024
K	1.860	1.873	1.871	1.804	1.913	1.901	1.914	1.889	1.869
Fe2+	1.690	1.556	1.892	1.320	1.931	1.880	1.837	1.703	1.810
Mg	2.991	3.632	2.940	4.001	2.866	2.624	2.692	2.860	2.665
Mn	0.001	0.003	0.001	0.000	0.003	0.001	0.000	0.002	0.002
Ti	0.553	0.069	0.441	0.072	0.500	0.472	0.420	0.470	0.475
Cr	0.000	0.002	0.009	0.000	0.012	0.027	0.024	0.028	0.020
Ni	0.001	0.000	0.000	0.000	0.000	0.003	0.003	0.003	0.003
Ba	0.008	0.001	0.009	0.005	0.010	0.015	0.013	0.014	0.013
Rb	0.003	0.000	0.001	0.006	0.007	0.000	0.000	0.000	0.002
Fe#	0.361	0.300	0.392	0.248	0.403	0.417	0.406	0.373	0.404

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	4041B-Bt5	4041B-Bt6	4041B-Bt8	4041B-Bt9	4041B-Bt10	4041B-Bt11	4041B-Bt12	4041B-Bt13	4041B-Bt14
Localisation	Grt-margin	Grt-margin	Inclusion	Matrix	Matrix	Matrix	Grt-margin	Inclusion	Matrix
Oxydes (wt.%)									
SiO2	36.597	36.504	36.447	36.448	36.496	36.544	36.298	36.709	36.758
Al2O3	18.528	18.241	18.561	18.009	17.748	17.990	17.752	19.895	18.127
CaO	0.000	0.012	0.028	0.001	0.000	0.000	0.006	0.011	0.000
Na2O	0.086	0.064	0.095	0.062	0.041	0.051	0.074	0.383	0.071
K2O	10.143	10.091	9.782	10.116	10.175	10.075	9.896	9.686	10.000
FeO	14.669	14.239	13.877	14.802	15.060	15.151	15.582	10.224	14.848
MgO	12.102	12.048	12.844	11.984	12.177	12.025	11.947	15.523	12.212
MnO	0.015	0.019	0.025	0.000	0.000	0.013	0.006	0.040	0.021
TiO2	4.072	3.644	4.238	4.151	3.619	4.568	4.275	3.595	3.897
Cr2O3	0.224	0.195	0.237	0.148	0.245	0.224	0.126	0.137	0.177
NiO	0.028	0.016	0.091	0.034	0.049	0.043	0.082	0.029	0.045
BaO	0.123	0.236	0.236	0.351	0.266	0.214	0.242	0.336	0.314
Rb2O	0.013	0.019	0.000	0.057	0.010	0.000	0.022	0.006	0.003
H2O	3.820	3.759	3.795	3.691	3.776	3.731	3.822	3.897	3.756
F	0.499	0.513	0.557	0.700	0.475	0.677	0.418	0.519	0.597
Cl	0.051	0.068	0.079	0.053	0.080	0.063	0.052	0.063	0.074
Sub-total	100.970	99.668	100.892	100.607	100.217	101.369	100.600	101.053	100.900
O=F, Cl	0.222	0.231	0.252	0.307	0.218	0.299	0.188	0.233	0.268
Total	100.748	99.437	100.640	100.300	99.999	101.070	100.412	100.820	100.632
Cations*									
Si	5.393	5.445	5.357	5.414	5.442	5.387	5.397	5.292	5.432
Al iv	2.607	2.555	2.643	2.586	2.558	2.613	2.603	2.708	2.568
Al v	0.611	0.653	0.573	0.568	0.562	0.513	0.508	0.673	0.589
Ca	0.000	0.002	0.004	0.000	0.000	0.000	0.001	0.002	0.000
Na	0.025	0.019	0.027	0.018	0.012	0.015	0.021	0.107	0.020
K	1.907	1.920	1.834	1.917	1.935	1.894	1.877	1.781	1.885
Fe2+	1.808	1.776	1.706	1.839	1.878	1.868	1.938	1.233	1.835
Mg	2.658	2.679	2.814	2.654	2.707	2.643	2.648	3.336	2.690
Mn	0.002	0.002	0.003	0.000	0.000	0.002	0.001	0.005	0.003
Ti	0.451	0.409	0.469	0.464	0.406	0.506	0.478	0.390	0.433
Cr	0.026	0.023	0.028	0.017	0.029	0.026	0.015	0.016	0.021
Ni	0.003	0.002	0.011	0.004	0.006	0.005	0.010	0.003	0.005
Ba	0.007	0.014	0.014	0.020	0.016	0.012	0.014	0.019	0.018
Rb	0.001	0.002	0.000	0.005	0.001	0.000	0.002	0.001	0.000
Fe#	0.405	0.399	0.377	0.409	0.410	0.414	0.423	0.270	0.406

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	4041B-Bt15	4041B-Bt16	4041B-Bt17	4081A-Bt1	4081A-Bt2	4081A-Bt3	4081A-Bt4	4081A-Bt5	4081A-Bt6
Localisation	Inclusion	Grt-margin	Matrix	Inclusion	Inclusion	Grt-margin	Matrix	Matrix	Grt-margin
Oxydes (wt.%)									
SiO2	37.439	36.644	36.357	36.907	36.155	36.913	36.237	36.350	37.077
Al2O3	18.398	18.081	18.400	14.698	15.167	15.402	14.771	15.198	15.074
CaO	0.026	0.004	0.042	0.020	0.015	0.004	0.010	0.034	0.102
Na2O	0.402	0.054	0.081	0.028	0.071	0.034	0.043	0.058	0.183
K2O	9.462	10.202	9.926	9.553	9.752	10.017	10.034	9.611	8.899
FeO	11.145	14.753	14.748	17.979	19.554	19.231	20.366	19.936	16.346
MgO	14.506	12.270	11.867	11.903	10.281	10.693	9.720	9.963	13.556
MnO	0.019	0.000	0.027	0.023	0.028	0.027	0.086	0.070	0.045
TiO2	4.870	4.165	3.765	3.846	4.681	4.274	4.870	4.932	4.176
Cr2O3	0.192	0.207	0.178	0.000	0.029	0.000	0.041	0.140	0.029
NiO	0.031	0.039	0.089	0.010	0.000	0.021	0.000	0.008	0.007
BaO	0.377	0.298	0.214	0.181	0.212	0.148	0.146	0.173	0.108
Rb2O	0.017	0.036	0.000	0.020	0.046	0.016	0.000	0.054	0.069
H2O	3.757	3.804	3.708	3.500	3.529	3.664	3.578	3.603	3.473
F	0.794	0.509	0.634	0.887	0.805	0.631	0.696	0.696	1.089
Cl	0.098	0.076	0.076	0.085	0.089	0.069	0.074	0.083	0.075
Sub-total	101.533	101.142	100.112	99.640	100.414	101.144	100.672	100.909	100.308
O=F, Cl	0.356	0.231	0.284	0.393	0.359	0.281	0.310	0.312	0.475
Total	101.177	100.911	99.828	99.247	100.055	100.863	100.362	100.597	99.833
Cations*									
Si	5.399	5.406	5.413	5.615	5.512	5.561	5.534	5.513	5.546
Al iv	2.601	2.594	2.587	2.385	2.488	2.439	2.466	2.487	2.454
Al v	0.527	0.550	0.641	0.250	0.237	0.296	0.192	0.230	0.204
Ca	0.004	0.001	0.007	0.003	0.002	0.001	0.002	0.006	0.016
Na	0.112	0.015	0.023	0.008	0.021	0.010	0.013	0.017	0.053
K	1.741	1.920	1.885	1.854	1.896	1.925	1.954	1.859	1.698
Fe2+	1.344	1.820	1.836	2.287	2.493	2.423	2.601	2.529	2.045
Mg	3.119	2.699	2.634	2.699	2.336	2.401	2.213	2.253	3.023
Mn	0.002	0.000	0.003	0.003	0.004	0.003	0.011	0.009	0.006
Ti	0.528	0.462	0.422	0.440	0.537	0.484	0.559	0.563	0.470
Cr	0.022	0.024	0.021	0.000	0.003	0.000	0.005	0.017	0.003
Ni	0.004	0.005	0.011	0.001	0.000	0.003	0.000	0.001	0.001
Ba	0.021	0.017	0.012	0.011	0.013	0.009	0.009	0.010	0.006
Rb	0.002	0.003	0.000	0.002	0.005	0.002	0.000	0.005	0.007
Fe#	0.301	0.403	0.411	0.459	0.516	0.502	0.540	0.529	0.404

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	4081A-Bt7	4081A-Bt8	4081A-Bt9	4081A-Bt10	4081A-Bt11	4081A-Bt12	4081A-Bt13	4107A-Bt1	4107A-Bt3
Localisation	Matrix	Grt-margin	Inclusion	Inclusion	Inclusion	Inclusion	Grt-margin	Matrix	Matrix
Oxydes (wt.%)									
SiO2	36.080	36.454	36.567	36.602	37.061	36.916	36.336	38.433	38.232
Al2O3	14.880	14.950	15.319	15.087	15.418	15.128	14.680	13.957	13.667
CaO	0.000	0.015	0.000	0.029	0.060	0.038	0.000	0.012	0.000
Na2O	0.050	0.079	0.060	0.042	0.153	0.064	0.049	0.035	0.012
K2O	9.788	9.574	9.847	9.855	9.418	9.670	9.952	10.184	10.119
FeO	20.927	20.734	19.147	18.562	17.041	18.743	20.240	11.958	11.784
MgO	9.491	10.057	11.169	11.384	12.893	11.604	9.597	15.739	15.758
MnO	0.042	0.026	0.061	0.000	0.031	0.043	0.036	0.095	0.076
TiO2	5.115	4.381	4.154	4.976	3.533	4.225	5.679	4.900	4.326
Cr2O3	0.033	0.029	0.161	0.017	0.083	0.095	0.074	0.000	0.021
NiO	0.000	0.000	0.032	0.002	0.021	0.000	0.019	0.027	0.004
BaO	0.154	0.125	0.125	0.043	0.142	0.043	0.080	0.432	0.438
Rb2O	0.033	0.000	0.000	0.001	0.020	0.020	0.042	0.000	0.000
H2O	3.643	3.631	3.517	3.633	3.684	3.663	3.666	3.069	3.121
F	0.563	0.615	0.921	0.702	0.616	0.644	0.558	2.044	1.823
Cl	0.087	0.072	0.077	0.079	0.077	0.079	0.085	0.112	0.107
Sub-total	100.886	100.742	101.157	101.014	100.251	100.975	101.093	100.997	99.488
O=F, Cl	0.257	0.275	0.405	0.313	0.277	0.289	0.254	0.886	0.792
Total	100.629	100.467	100.752	100.701	99.974	100.686	100.839	100.111	98.696
Cations*									
Si	5.503	5.548	5.518	5.506	5.562	5.549	5.514	5.667	5.714
Al iv	2.497	2.452	2.482	2.494	2.438	2.451	2.486	2.333	2.286
Al v	0.178	0.229	0.243	0.181	0.289	0.230	0.140	0.093	0.121
Ca	0.000	0.002	0.000	0.005	0.010	0.006	0.000	0.002	0.000
Na	0.015	0.023	0.018	0.012	0.045	0.019	0.014	0.010	0.003
K	1.904	1.858	1.895	1.891	1.803	1.854	1.926	1.916	1.929
Fe2+	2.669	2.639	2.416	2.335	2.139	2.356	2.569	1.475	1.473
Mg	2.158	2.281	2.513	2.553	2.884	2.600	2.171	3.460	3.511
Mn	0.005	0.003	0.008	0.000	0.004	0.005	0.005	0.012	0.010
Ti	0.587	0.501	0.471	0.563	0.399	0.478	0.648	0.543	0.486
Cr	0.004	0.003	0.019	0.002	0.010	0.011	0.009	0.000	0.002
Ni	0.000	0.000	0.004	0.000	0.003	0.000	0.002	0.003	0.000
Ba	0.009	0.007	0.007	0.003	0.008	0.003	0.005	0.025	0.026
Rb	0.003	0.000	0.000	0.000	0.002	0.002	0.004	0.000	0.000
Fe#	0.553	0.536	0.490	0.478	0.426	0.475	0.542	0.299	0.296

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	4107A-Bt4	4107A-Bt5	5030B-Bt1	5030B-Bt2	5030B-Bt4	5030B-Bt5	5030B-Bt7	5030B-Bt8	5030B-Bt11
Localisation	Matrix	Matrix	Grt-margin	Inclusion	Matrix	Inclusion	Grt-margin	Matrix	Inclusion
Oxydes (wt.%)									
SiO2	38.456	38.314	37.220	37.176	36.858	36.550	37.257	37.162	36.715
Al2O3	14.113	13.661	17.998	18.397	17.360	17.142	18.312	17.782	18.924
CaO	0.018	0.024	0.000	0.000	0.009	0.008	0.041	0.015	0.002
Na2O	0.039	0.030	0.141	0.183	0.044	0.101	0.052	0.064	0.089
K2O	10.215	9.975	10.107	9.771	10.118	10.049	9.574	10.053	10.084
FeO	11.002	12.556	10.434	9.538	12.984	13.300	12.572	12.214	10.069
MgO	16.492	15.098	15.533	17.512	13.820	13.946	14.538	14.606	16.164
MnO	0.115	0.106	0.000	0.041	0.013	0.000	0.000	0.003	0.000
TiO2	4.795	4.696	4.896	3.359	4.461	4.854	3.063	3.752	3.967
Cr2O3	0.064	0.080	0.140	0.106	0.181	0.194	0.051	0.148	0.106
NiO	0.043	0.000	0.040	0.000	0.027	0.036	0.000	0.000	0.005
BaO	0.402	0.423	0.128	0.198	0.095	0.148	0.123	0.139	0.363
Rb2O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024
H2O	3.001	3.123	3.678	3.515	3.660	3.603	3.600	3.667	3.707
F	2.220	1.827	0.976	1.339	0.840	0.961	1.001	0.873	0.902
Cl	0.117	0.138	0.045	0.042	0.049	0.059	0.053	0.041	0.054
Sub-total	101.092	100.051	101.336	101.177	100.519	100.951	100.237	100.519	101.175
O=F, Cl	0.961	0.800	0.421	0.573	0.365	0.418	0.433	0.377	0.392
Total	100.131	99.251	100.915	100.604	100.154	100.533	99.804	100.142	100.783
Cations*									
Si	5.648	5.710	5.375	5.357	5.429	5.380	5.465	5.446	5.308
Al iv	2.352	2.290	2.625	2.643	2.571	2.620	2.535	2.554	2.692
Al v	0.091	0.110	0.439	0.482	0.442	0.355	0.630	0.518	0.533
Ca	0.003	0.004	0.000	0.000	0.001	0.001	0.006	0.002	0.000
Na	0.011	0.009	0.039	0.051	0.013	0.029	0.015	0.018	0.025
K	1.914	1.896	1.862	1.796	1.901	1.887	1.791	1.879	1.860
Fe2+	1.351	1.565	1.260	1.150	1.599	1.637	1.542	1.497	1.217
Mg	3.611	3.354	3.344	3.762	3.034	3.060	3.179	3.191	3.484
Mn	0.014	0.013	0.000	0.005	0.002	0.000	0.000	0.000	0.000
Ti	0.530	0.526	0.532	0.364	0.494	0.537	0.338	0.414	0.431
Cr	0.007	0.009	0.016	0.012	0.021	0.023	0.006	0.017	0.012
Ni	0.005	0.000	0.005	0.000	0.003	0.004	0.000	0.000	0.001
Ba	0.023	0.025	0.007	0.011	0.005	0.009	0.007	0.008	0.021
Rb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Fe#	0.272	0.318	0.274	0.234	0.345	0.349	0.327	0.319	0.259

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	5030B-Bt12	5030B-Bt13	5030B-Bt15	6078A-Bt1	6078A-Bt2	6078A-Bt3	6078A-Bt4	6078A-Bt5	6078A-Bt6
Localisation	Matrix	Grt-margin	Matrix	Matrix	Matrix	Inclusion	Inclusion	Grt-margin	Matrix
Oxydes (wt.%)									
SiO2	36.104	36.418	36.458	36.517	36.093	37.488	37.226	36.792	36.610
Al2O3	18.135	18.058	16.929	14.204	13.721	15.185	14.864	13.798	13.948
CaO	0.023	0.072	0.008	0.032	0.009	0.010	0.003	0.025	0.002
Na2O	0.089	0.063	0.050	0.046	0.000	0.126	0.061	0.023	0.050
K2O	9.880	9.669	10.106	9.957	9.871	9.935	9.813	10.025	9.971
FeO	13.031	12.010	14.209	20.714	20.637	15.208	16.188	19.236	19.825
MgO	12.797	14.457	13.143	9.385	9.150	14.161	13.508	10.931	9.891
MnO	0.020	0.016	0.017	0.000	0.001	0.000	0.000	0.009	0.000
TiO2	4.850	4.220	5.196	5.818	6.086	3.654	4.458	5.455	6.081
Cr2O3	0.148	0.220	0.046	0.139	0.181	0.076	0.105	0.062	0.103
NiO	0.013	0.028	0.000	0.000	0.043	0.098	0.050	0.001	0.036
BaO	0.220	0.223	0.201	0.002	0.075	0.166	0.122	0.224	0.132
Rb2O	0.000	0.000	0.000	0.074	0.028	0.063	0.053	0.059	0.038
H2O	3.595	3.599	3.668	3.621	3.540	3.397	3.640	3.455	3.489
F	0.900	0.968	0.790	0.535	0.616	1.233	0.665	0.928	0.832
Cl	0.073	0.057	0.052	0.286	0.268	0.193	0.274	0.248	0.266
Sub-total	99.878	100.078	100.873	101.330	100.319	100.993	101.030	101.271	101.274
O=F, Cl	0.395	0.420	0.344	0.290	0.320	0.563	0.342	0.447	0.410
Total	99.483	99.658	100.529	101.040	99.999	100.430	100.688	100.824	100.864
Cations*									
Si	5.358	5.363	5.391	5.547	5.549	5.577	5.546	5.575	5.556
Al iv	2.642	2.637	2.609	2.453	2.451	2.423	2.454	2.425	2.444
Al v	0.530	0.497	0.341	0.090	0.036	0.240	0.157	0.039	0.050
Ca	0.004	0.011	0.001	0.005	0.001	0.002	0.000	0.004	0.000
Na	0.026	0.018	0.014	0.014	0.000	0.036	0.018	0.007	0.015
K	1.870	1.816	1.906	1.929	1.936	1.885	1.865	1.937	1.930
Fe2+	1.617	1.479	1.757	2.631	2.654	1.892	2.017	2.438	2.516
Mg	2.831	3.174	2.897	2.125	2.097	3.141	3.000	2.469	2.237
Mn	0.003	0.002	0.002	0.000	0.000	0.000	0.000	0.001	0.000
Ti	0.541	0.467	0.578	0.665	0.704	0.409	0.500	0.622	0.694
Cr	0.017	0.026	0.005	0.017	0.022	0.009	0.012	0.007	0.012
Ni	0.002	0.003	0.000	0.000	0.005	0.012	0.006	0.000	0.004
Ba	0.013	0.013	0.012	0.000	0.005	0.010	0.007	0.013	0.008
Rb	0.000	0.000	0.000	0.007	0.003	0.006	0.005	0.006	0.004
Fe#	0.364	0.318	0.378	0.553	0.559	0.376	0.402	0.497	0.529

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6078A-Bt7	6078A-Bt8	6078A-Bt9	6078A-Bt10	6078A-Bt11	6078A-Bt12	6078A-Bt13	6078A-Bt14	6078A-Bt15
Localisation	Matrix	Inclusion	Inclusion	Grt-margin	Matrix	Grt-margin	Inclusion	Matrix	Grt-margin
Oxydes (wt.%)									
SiO2	36.591	37.433	37.057	36.748	36.889	36.763	37.405	37.024	39.078
Al2O3	14.105	14.305	14.411	13.982	14.253	13.800	13.801	14.829	16.224
CaO	0.000	0.000	0.007	0.000	0.006	0.022	0.008	0.014	0.014
Na2O	0.009	0.054	0.095	0.042	0.038	0.033	0.043	0.032	0.046
K2O	10.013	9.936	9.937	9.965	10.039	9.867	10.113	10.058	10.053
FeO	20.061	15.801	16.100	18.552	18.788	19.014	15.612	18.273	11.990
MgO	10.328	13.753	13.225	11.367	11.818	10.999	13.996	12.475	18.041
MnO	0.035	0.008	0.000	0.000	0.027	0.003	0.037	0.026	0.000
TiO2	5.519	4.694	4.913	5.578	4.484	5.229	4.934	3.225	0.188
Cr2O3	0.000	0.000	0.000	0.020	0.071	0.066	0.092	0.000	0.021
NiO	0.024	0.044	0.060	0.035	0.009	0.026	0.007	0.014	0.007
BaO	0.091	0.221	0.345	0.203	0.126	0.149	0.115	0.069	0.021
Rb2O	0.023	0.082	0.064	0.048	0.042	0.061	0.097	0.028	0.000
H2O	3.604	3.402	3.498	3.572	3.565	3.664	3.406	3.546	3.274
F	0.590	1.181	0.918	0.704	0.720	0.441	1.156	0.729	1.610
Cl	0.281	0.229	0.267	0.251	0.255	0.271	0.238	0.294	0.262
Sub-total	101.274	101.143	100.897	101.067	101.130	100.408	101.060	100.636	100.829
O=F, Cl	0.312	0.549	0.447	0.353	0.361	0.247	0.540	0.373	0.737
Total	100.962	100.594	100.450	100.714	100.769	100.161	100.520	100.263	100.092
Cations*									
Si	5.549	5.584	5.553	5.552	5.571	5.593	5.588	5.597	5.710
Al iv	2.451	2.416	2.447	2.448	2.429	2.407	2.412	2.403	2.290
Al v	0.070	0.099	0.099	0.042	0.108	0.067	0.018	0.240	0.505
Ca	0.000	0.000	0.001	0.000	0.001	0.004	0.001	0.002	0.002
Na	0.003	0.016	0.028	0.012	0.011	0.010	0.012	0.009	0.013
K	1.937	1.891	1.899	1.920	1.934	1.915	1.927	1.939	1.874
Fe2+	2.544	1.971	2.018	2.344	2.373	2.419	1.950	2.310	1.465
Mg	2.335	3.058	2.954	2.560	2.661	2.494	3.117	2.811	3.930
Mn	0.004	0.001	0.000	0.000	0.003	0.000	0.005	0.003	0.000
Ti	0.629	0.527	0.554	0.634	0.509	0.598	0.554	0.367	0.021
Cr	0.000	0.000	0.000	0.002	0.008	0.008	0.011	0.000	0.002
Ni	0.003	0.005	0.007	0.004	0.001	0.003	0.001	0.002	0.001
Ba	0.005	0.013	0.020	0.012	0.007	0.009	0.007	0.004	0.001
Rb	0.002	0.008	0.006	0.005	0.004	0.006	0.009	0.003	0.000
Fe#	0.521	0.392	0.406	0.478	0.471	0.492	0.385	0.451	0.272

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6078A-Bt16	6080A-Bt1	6080A-Bt2	6080A-Bt3	6084A-Bt1	6084A-Bt2	6084A-Bt3	6084A-Bt4	6084A-Bt5
Localisation	Inclusion	Matrix	Matrix	Matrix	Matrix	Grt-margin	Inclusion	Inclusion	Matrix
Oxydes (wt.%)									
SiO2	37.781	36.154	35.896	35.634	36.580	36.610	35.185	36.718	36.664
Al2O3	14.940	15.087	14.857	14.444	17.284	17.380	17.961	17.504	16.973
CaO	0.009	0.023	0.027	0.015	0.026	0.004	0.018	0.013	0.000
Na2O	0.072	0.057	0.068	0.100	0.094	0.061	0.246	0.116	0.082
K2O	9.881	9.761	9.786	9.535	9.787	9.910	9.636	9.966	10.221
FeO	13.086	21.446	21.246	21.261	14.820	14.432	13.005	12.776	15.195
MgO	15.501	9.081	9.076	8.671	12.296	13.145	12.731	14.071	12.542
MnO	0.000	0.017	0.000	0.000	0.029	0.008	0.007	0.004	0.034
TiO2	4.158	5.219	5.318	5.868	4.187	4.000	5.807	4.537	4.004
Cr2O3	0.000	0.049	0.016	0.082	0.067	0.121	0.106	0.118	0.000
NiO	0.000	0.018	0.000	0.000	0.016	0.045	0.025	0.056	0.000
BaO	0.262	0.490	0.582	0.868	0.210	0.145	0.274	0.213	0.155
Rb2O	0.063	0.000	0.000	0.000	0.092	0.118	0.044	0.066	0.105
H2O	3.503	3.713	3.719	3.654	3.757	3.576	3.617	3.807	3.698
F	1.045	0.474	0.411	0.476	0.507	0.940	0.803	0.535	0.627
Cl	0.223	0.045	0.039	0.068	0.074	0.080	0.078	0.073	0.096
Sub-total	100.524	101.634	101.041	100.676	99.826	100.575	99.543	100.573	100.396
O=F, Cl	0.490	0.210	0.182	0.216	0.230	0.414	0.356	0.242	0.286
Total	100.034	101.424	100.859	100.460	99.596	100.161	99.187	100.331	100.110
Cations*									
Si	5.586	5.490	5.486	5.483	5.462	5.431	5.252	5.398	5.469
Al iv	2.414	2.510	2.514	2.517	2.538	2.569	2.748	2.602	2.531
Al v	0.190	0.190	0.163	0.103	0.504	0.470	0.412	0.431	0.453
Ca	0.001	0.004	0.004	0.002	0.004	0.001	0.003	0.002	0.000
Na	0.021	0.017	0.020	0.030	0.027	0.018	0.071	0.033	0.024
K	1.864	1.890	1.908	1.871	1.864	1.875	1.835	1.869	1.945
Fe2+	1.618	2.723	2.716	2.736	1.851	1.791	1.623	1.571	1.896
Mg	3.417	2.055	2.068	1.989	2.737	2.907	2.833	3.084	2.789
Mn	0.000	0.002	0.000	0.000	0.004	0.001	0.001	0.000	0.004
Ti	0.462	0.596	0.611	0.679	0.470	0.446	0.652	0.502	0.449
Cr	0.000	0.006	0.002	0.010	0.008	0.014	0.013	0.014	0.000
Ni	0.000	0.002	0.000	0.000	0.002	0.005	0.003	0.007	0.000
Ba	0.015	0.029	0.035	0.052	0.012	0.008	0.016	0.012	0.009
Rb	0.006	0.000	0.000	0.000	0.009	0.011	0.004	0.006	0.010
Fe#	0.321	0.570	0.568	0.579	0.403	0.381	0.364	0.337	0.405

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6084A-Bt6	6084A-Bt7	6084A-Bt8	6084A-Bt9	6084A-Bt10	6084A-Bt11	6084A-Bt12	6084A-Bt13	6084A-Bt14
Localisation	Grt-margin	Inclusion	Inclusion	Matrix	Grt-margin	Inclusion	Matrix	Inclusion	Grt-margin
Oxydes (wt.%)									
SiO2	37.230	36.522	36.412	37.415	36.718	36.883	36.560	37.012	36.722
Al2O3	17.819	17.704	17.110	17.521	16.868	16.870	16.887	17.097	16.568
CaO	0.002	0.009	0.006	0.036	0.000	0.009	0.022	0.002	0.007
Na2O	0.057	0.339	0.321	0.070	0.060	0.114	0.080	0.076	0.044
K2O	10.000	9.625	9.784	9.459	10.207	10.089	9.911	10.143	10.016
FeO	13.135	11.777	12.666	14.632	14.685	13.692	14.652	14.029	14.914
MgO	14.123	14.658	12.663	12.073	12.722	13.363	12.974	13.679	13.419
MnO	0.004	0.040	0.000	0.004	0.000	0.023	0.026	0.035	0.000
TiO2	3.583	5.622	6.561	4.207	4.294	5.127	4.578	4.316	4.274
Cr2O3	0.101	0.043	0.013	0.117	0.076	0.097	0.110	0.021	0.063
NiO	0.000	0.031	0.011	0.016	0.056	0.000	0.038	0.059	0.000
BaO	0.109	0.278	0.259	0.199	0.199	0.266	0.157	0.185	0.314
Rb2O	0.004	0.071	0.059	0.015	0.104	0.017	0.011	0.054	0.018
H2O	3.665	3.677	3.852	3.681	3.734	3.748	3.625	3.613	3.669
F	0.856	0.901	0.406	0.742	0.574	0.657	0.831	0.940	0.748
Cl	0.067	0.069	0.078	0.084	0.086	0.057	0.073	0.073	0.070
Sub-total	100.755	101.366	100.201	100.271	100.383	101.012	100.535	101.334	100.846
O=F, Cl	0.376	0.395	0.189	0.331	0.261	0.289	0.366	0.412	0.331
Total	100.379	100.971	100.012	99.940	100.122	100.723	100.169	100.922	100.515
Cations*									
Si	5.461	5.313	5.372	5.534	5.466	5.429	5.430	5.443	5.448
Al iv	2.539	2.687	2.628	2.466	2.534	2.571	2.570	2.557	2.552
Al v	0.541	0.349	0.348	0.588	0.426	0.355	0.386	0.406	0.346
Ca	0.000	0.001	0.001	0.006	0.000	0.001	0.004	0.000	0.001
Na	0.016	0.096	0.092	0.020	0.017	0.033	0.023	0.022	0.013
K	1.871	1.786	1.841	1.784	1.938	1.894	1.878	1.903	1.895
Fe2+	1.611	1.433	1.563	1.810	1.828	1.685	1.820	1.725	1.851
Mg	3.088	3.179	2.785	2.662	2.823	2.932	2.872	2.999	2.968
Mn	0.000	0.005	0.000	0.001	0.000	0.003	0.003	0.004	0.000
Ti	0.395	0.615	0.728	0.468	0.481	0.568	0.511	0.477	0.477
Cr	0.012	0.005	0.002	0.014	0.009	0.011	0.013	0.002	0.007
Ni	0.000	0.004	0.001	0.002	0.007	0.000	0.005	0.007	0.000
Ba	0.006	0.016	0.015	0.012	0.012	0.015	0.009	0.011	0.018
Rb	0.000	0.007	0.006	0.001	0.010	0.002	0.001	0.005	0.002
Fe#	0.343	0.311	0.359	0.405	0.393	0.365	0.388	0.365	0.384

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6084A-Bt15	6117A-Bt1	6117A-Bt2	6117A-Bt3	6117A-Bt4	6117A-Bt5	6117A-Bt6	6117A-Bt7	6117A-Bt8
Localisation	Matrix	Inclusion	Matrix	Grt-margin	Inclusion	Inclusion	Matrix	Matrix	Matrix
Oxydes (wt.%)									
SiO2	36.727	36.835	36.795	37.042	38.399	37.471	36.822	37.342	37.209
Al2O3	16.805	13.786	14.747	13.894	13.736	13.985	14.815	14.290	14.526
CaO	0.038	0.116	0.000	0.070	0.011	0.018	0.002	0.000	0.032
Na2O	0.086	0.095	0.048	0.096	0.050	0.060	0.053	0.035	0.109
K2O	9.929	9.859	10.056	9.164	9.869	9.788	9.900	10.070	9.677
FeO	14.709	18.775	15.870	17.769	14.850	16.392	17.712	16.844	17.304
MgO	12.902	11.873	12.298	12.133	15.420	13.611	10.988	12.246	12.160
MnO	0.000	0.037	0.021	0.017	0.000	0.000	0.003	0.012	0.018
TiO2	5.125	4.089	4.845	5.051	3.489	4.640	5.309	4.722	4.646
Cr2O3	0.025	0.087	0.000	0.000	0.072	0.141	0.075	0.087	0.020
NiO	0.000	0.014	0.029	0.001	0.034	0.009	0.021	0.018	0.000
BaO	0.136	0.147	0.187	0.296	0.000	0.429	0.161	0.244	0.207
Rb2O	0.053	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.042
H2O	3.677	3.822	3.629	3.723	3.742	3.708	3.789	3.744	3.677
F	0.765	0.231	0.686	0.498	0.625	0.641	0.368	0.490	0.631
Cl	0.080	0.009	0.007	0.008	0.007	0.013	0.016	0.021	0.026
Sub-total	101.057	99.775	99.222	99.762	100.304	100.906	100.034	100.165	100.284
O=F, Cl	0.340	0.099	0.290	0.211	0.265	0.273	0.159	0.211	0.272
Total	100.717	99.676	98.932	99.551	100.039	100.633	99.875	99.954	100.012
Cations*									
Si	5.424	5.616	5.578	5.607	5.700	5.596	5.565	5.624	5.602
Al iv	2.576	2.384	2.422	2.393	2.300	2.404	2.435	2.376	2.398
Al v	0.349	0.093	0.213	0.086	0.103	0.058	0.205	0.161	0.179
Ca	0.006	0.019	0.000	0.011	0.002	0.003	0.000	0.000	0.005
Na	0.025	0.028	0.014	0.028	0.014	0.017	0.016	0.010	0.032
K	1.870	1.917	1.944	1.769	1.869	1.865	1.909	1.935	1.858
Fe2+	1.817	2.394	2.012	2.249	1.844	2.047	2.239	2.122	2.179
Mg	2.840	2.698	2.779	2.738	3.412	3.030	2.476	2.749	2.729
Mn	0.000	0.005	0.003	0.002	0.000	0.000	0.000	0.002	0.002
Ti	0.569	0.469	0.552	0.575	0.390	0.521	0.603	0.535	0.526
Cr	0.003	0.010	0.000	0.000	0.008	0.017	0.009	0.010	0.002
Ni	0.000	0.002	0.004	0.000	0.004	0.001	0.003	0.002	0.000
Ba	0.008	0.009	0.011	0.018	0.000	0.025	0.010	0.014	0.012
Rb	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Fe#	0.390	0.470	0.420	0.451	0.351	0.403	0.475	0.436	0.444

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6117A-Bt9	6117A-Bt10	6117A-Bt11	6117A-Bt12	6129A-Bt1	6129A-Bt2	6129A-Bt3	6129A-Bt4	6129A-Bt5
Localisation	Inclusion	Inclusion	Inclusion	Grt-margin	Matrix	Matrix	Inclusion	Inclusion	Grt-margin
Oxydes (wt.%)									
SiO2	37.778	38.199	37.152	37.240	36.284	36.310	36.069	36.010	36.523
Al2O3	13.938	14.008	14.040	14.224	15.818	15.293	15.003	15.366	15.959
CaO	0.107	0.033	0.026	0.039	0.023	0.010	0.007	0.000	0.017
Na2O	0.089	0.034	0.119	0.096	0.069	0.071	0.105	0.037	0.071
K2O	9.750	9.574	9.800	9.896	9.515	9.518	9.695	9.688	9.774
FeO	17.321	15.955	16.913	16.090	19.001	19.886	18.725	16.868	17.829
MgO	13.058	14.510	12.411	13.055	10.376	10.077	11.010	11.525	10.415
MnO	0.000	0.000	0.017	0.003	0.056	0.031	0.061	0.000	0.000
TiO2	4.091	4.040	4.819	3.948	5.162	4.827	5.497	5.230	4.662
Cr2O3	0.025	0.029	0.000	0.009	0.091	0.000	0.029	0.058	0.141
NiO	0.030	0.031	0.055	0.033	0.000	0.004	0.026	0.035	0.076
BaO	0.128	0.104	0.225	0.276	0.977	0.874	0.659	0.764	0.759
Rb2O	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.017
H2O	3.637	3.844	3.810	3.645	3.947	3.890	3.902	3.824	3.881
F	0.758	0.422	0.324	0.647	0.076	0.119	0.132	0.256	0.166
Cl	0.023	0.014	0.014	0.009	0.025	0.031	0.024	0.023	0.031
Sub-total	100.733	100.797	99.725	99.210	101.420	100.952	100.944	99.684	100.321
O=F, Cl	0.324	0.181	0.140	0.274	0.038	0.057	0.061	0.113	0.077
Total	100.409	100.616	99.585	98.936	101.382	100.895	100.883	99.571	100.244
Cations*									
Si	5.661	5.660	5.615	5.647	5.454	5.505	5.448	5.465	5.520
Al iv	2.339	2.340	2.385	2.353	2.546	2.495	2.552	2.535	2.480
Al v	0.122	0.106	0.116	0.190	0.257	0.239	0.119	0.214	0.363
Ca	0.017	0.005	0.004	0.006	0.004	0.002	0.001	0.000	0.003
Na	0.026	0.010	0.035	0.028	0.020	0.021	0.031	0.011	0.021
K	1.863	1.809	1.889	1.914	1.824	1.841	1.868	1.876	1.884
Fe2+	2.171	1.977	2.138	2.041	2.389	2.522	2.365	2.141	2.254
Mg	2.917	3.205	2.796	2.951	2.325	2.278	2.479	2.608	2.347
Mn	0.000	0.000	0.002	0.000	0.007	0.004	0.008	0.000	0.000
Ti	0.461	0.450	0.548	0.450	0.584	0.550	0.624	0.597	0.530
Cr	0.003	0.003	0.000	0.001	0.011	0.000	0.003	0.007	0.017
Ni	0.004	0.004	0.007	0.004	0.000	0.000	0.003	0.004	0.009
Ba	0.008	0.006	0.013	0.016	0.058	0.052	0.039	0.045	0.045
Rb	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Fe#	0.427	0.382	0.433	0.409	0.507	0.525	0.488	0.451	0.490

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6129A-Bt6	6129A-Bt7	6129A-Bt8	6129A-Bt9	6129A-Bt10	6129A-Bt11	6129A-Bt12	6129A-Bt13	6129A-Bt14
Localisation	Matrix	Inclusion	Inclusion	Matrix	Matrix	Matrix	Inclusion	Inclusion	Inclusion
Oxydes (wt.%)									
SiO2	36.140	35.671	36.057	36.166	36.108	36.199	36.853	36.671	36.704
Al2O3	15.133	15.513	15.044	15.315	15.991	15.257	15.454	15.304	15.865
CaO	0.034	0.000	0.000	0.000	0.015	0.031	0.025	0.021	0.007
Na2O	0.109	0.104	0.060	0.052	0.071	0.065	0.107	0.113	0.046
K2O	9.398	9.721	9.639	9.845	9.516	9.401	9.397	9.551	9.808
FeO	20.006	17.446	18.932	19.458	19.407	19.605	16.813	16.299	17.139
MgO	10.327	11.717	10.626	10.072	9.960	10.145	12.756	13.122	12.230
MnO	0.019	0.006	0.036	0.000	0.014	0.000	0.038	0.003	0.031
TiO2	4.724	5.072	5.500	5.167	4.843	4.862	4.472	4.625	4.227
Cr2O3	0.062	0.021	0.017	0.156	0.008	0.136	0.000	0.004	0.012
NiO	0.047	0.060	0.012	0.000	0.021	0.000	0.022	0.017	0.000
BaO	0.683	0.618	0.770	0.796	0.604	0.638	0.674	0.595	0.484
Rb2O	0.000	0.000	0.000	0.037	0.023	0.000	0.000	0.000	0.000
H2O	3.889	3.802	3.747	3.763	3.845	3.767	3.820	3.871	3.873
F	0.109	0.310	0.437	0.402	0.229	0.360	0.396	0.277	0.265
Cl	0.027	0.024	0.017	0.029	0.026	0.027	0.027	0.020	0.023
Sub-total	100.707	100.085	100.894	101.258	100.681	100.493	100.854	100.493	100.714
O=F, Cl	0.052	0.136	0.188	0.176	0.102	0.158	0.173	0.121	0.117
Total	100.655	99.949	100.706	101.082	100.579	100.335	100.681	100.372	100.597
Cations*									
Si	5.491	5.409	5.462	5.476	5.468	5.503	5.505	5.487	5.496
Al iv	2.509	2.591	2.538	2.524	2.532	2.497	2.495	2.513	2.504
Al v	0.201	0.182	0.148	0.209	0.322	0.237	0.226	0.186	0.296
Ca	0.006	0.000	0.000	0.000	0.002	0.005	0.004	0.003	0.001
Na	0.032	0.031	0.018	0.015	0.021	0.019	0.031	0.033	0.013
K	1.821	1.880	1.863	1.901	1.838	1.823	1.791	1.823	1.873
Fe2+	2.542	2.213	2.399	2.464	2.458	2.493	2.101	2.040	2.146
Mg	2.339	2.649	2.400	2.273	2.248	2.299	2.841	2.927	2.730
Mn	0.002	0.001	0.005	0.000	0.002	0.000	0.005	0.000	0.004
Ti	0.540	0.578	0.627	0.588	0.552	0.556	0.502	0.520	0.476
Cr	0.007	0.003	0.002	0.019	0.001	0.016	0.000	0.000	0.001
Ni	0.006	0.007	0.001	0.000	0.003	0.000	0.003	0.002	0.000
Ba	0.041	0.037	0.046	0.047	0.036	0.038	0.039	0.035	0.028
Rb	0.000	0.000	0.000	0.004	0.002	0.000	0.000	0.000	0.000
Fe#	0.521	0.455	0.500	0.520	0.522	0.520	0.425	0.411	0.440

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6129A-Bt15	6129A-Bt16	6129A-Bt1	6129A-Bt2	6129A-Bt3	6129A-Bt4	6129A-Bt5	6129A-Bt6	6129A-Bt7
Localisation	Grt-margin	Matrix	Grt-margin	Matrix	Inclusion	Matrix	Matrix	Grt-margin	Inclusion
Oxydes (wt.%)									
SiO2	35.786	35.991	36.046	35.854	35.410	35.990	36.150	35.722	35.941
Al2O3	15.692	15.740	16.553	15.657	16.725	16.248	15.778	16.404	15.880
CaO	0.000	0.014	0.070	0.000	0.079	0.027	0.000	0.031	0.014
Na2O	0.069	0.043	0.051	0.036	0.075	0.056	0.047	0.092	0.050
K2O	9.725	9.898	9.072	9.873	8.974	9.917	10.009	9.707	9.800
FeO	19.189	19.520	18.549	19.609	18.653	18.418	19.011	18.827	18.645
MgO	10.634	10.489	11.802	10.203	10.100	10.375	10.858	10.370	10.569
MnO	0.010	0.045	0.003	0.014	0.000	0.015	0.017	0.033	0.000
TiO2	4.408	4.422	2.707	4.609	4.262	4.203	3.844	4.515	4.388
Cr2O3	0.099	0.054	0.083	0.079	0.146	0.062	0.212	0.162	0.017
NiO	0.021	0.034	0.000	0.059	0.038	0.030	0.044	0.024	0.000
BaO	0.436	0.461	0.159	0.495	0.327	0.392	0.346	0.350	0.288
Rb2O	0.001	0.000	0.000	0.000	0.000	0.000	0.026	0.000	0.000
H2O	3.747	3.911	3.722	3.792	3.887	3.846	3.851	3.824	3.692
F	0.393	0.087	0.450	0.307	0.045	0.189	0.198	0.266	0.499
Cl	0.011	0.012	0.024	0.018	0.031	0.018	0.020	0.023	0.026
Sub-total	100.221	100.721	99.291	100.605	98.752	99.786	100.411	100.350	99.809
O=F, Cl	0.168	0.039	0.195	0.133	0.026	0.084	0.088	0.117	0.216
Total	100.053	100.682	99.096	100.472	98.726	99.702	100.323	100.233	99.593
Cations*									
Si	5.451	5.457	5.484	5.455	5.422	5.477	5.487	5.415	5.478
Al iv	2.549	2.543	2.516	2.545	2.578	2.523	2.513	2.585	2.522
Al v	0.268	0.270	0.452	0.262	0.441	0.391	0.310	0.346	0.330
Ca	0.000	0.002	0.011	0.000	0.013	0.004	0.000	0.005	0.002
Na	0.020	0.013	0.015	0.011	0.022	0.017	0.014	0.027	0.015
K	1.889	1.914	1.760	1.916	1.753	1.925	1.938	1.877	1.905
Fe2+	2.445	2.475	2.360	2.495	2.389	2.344	2.413	2.387	2.376
Mg	2.415	2.371	2.677	2.314	2.306	2.354	2.457	2.343	2.401
Mn	0.001	0.006	0.000	0.002	0.000	0.002	0.002	0.004	0.000
Ti	0.505	0.504	0.310	0.527	0.491	0.481	0.439	0.515	0.503
Cr	0.012	0.006	0.010	0.010	0.018	0.007	0.025	0.019	0.002
Ni	0.003	0.004	0.000	0.007	0.005	0.004	0.005	0.003	0.000
Ba	0.026	0.027	0.009	0.030	0.020	0.023	0.021	0.021	0.017
Rb	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000
Fe#	0.503	0.511	0.469	0.519	0.509	0.499	0.496	0.505	0.497

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6129A-Bt8	6129A-Bt9	6129A-Bt10	6129A-Bt11	6129A-Bt13	6129A-Bt14	6129A-Bt15	6150A-Bt1	6150A-Bt2
Localisation	Matrix	Matrix	Grt-margin	Inclusion	Inclusion	Inclusion	Grt-margin	Matrix	Inclusion
Oxydes (wt.%)									
SiO2	36.140	35.703	35.549	35.915	36.836	36.090	36.073	36.461	38.228
Al2O3	16.105	16.392	16.217	16.432	15.905	15.923	15.896	17.476	18.782
CaO	0.019	0.025	0.038	0.050	0.024	0.077	0.001	0.032	0.035
Na2O	0.075	0.083	0.044	0.082	0.078	0.158	0.056	0.121	0.108
K2O	9.864	9.775	9.483	9.494	9.760	9.381	9.855	9.936	9.657
FeO	19.215	19.153	18.994	19.294	15.548	16.890	19.112	14.543	8.296
MgO	10.983	10.447	10.244	9.887	13.085	12.052	10.595	13.192	18.995
MnO	0.051	0.052	0.024	0.044	0.000	0.001	0.000	0.000	0.000
TiO2	3.170	4.073	4.877	5.003	4.271	4.652	4.623	3.877	0.547
Cr2O3	0.083	0.108	0.141	0.124	0.101	0.084	0.116	0.021	0.030
NiO	0.000	0.007	0.004	0.004	0.000	0.007	0.017	0.000	0.009
BaO	0.254	0.239	0.421	0.411	0.322	0.425	0.427	0.078	0.061
Rb2O	0.060	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.070
H2O	3.792	3.839	3.844	3.845	3.845	3.906	3.873	3.686	3.304
F	0.307	0.210	0.200	0.265	0.349	0.135	0.187	0.684	1.754
Cl	0.017	0.024	0.026	0.018	0.017	0.027	0.033	0.096	0.043
Sub-total	100.135	100.141	100.106	100.868	100.141	99.808	100.864	100.203	99.919
O=F, Cl	0.133	0.094	0.090	0.116	0.151	0.063	0.086	0.310	0.748
Total	100.002	100.047	100.016	100.752	99.990	99.745	100.778	99.893	99.171
Cations*									
Si	5.498	5.427	5.403	5.419	5.502	5.441	5.449	5.419	5.528
Al iv	2.502	2.573	2.597	2.581	2.498	2.559	2.551	2.581	2.472
Al v	0.386	0.365	0.308	0.341	0.302	0.271	0.279	0.481	0.730
Ca	0.003	0.004	0.006	0.008	0.004	0.012	0.000	0.005	0.005
Na	0.022	0.024	0.013	0.024	0.023	0.046	0.016	0.035	0.030
K	1.914	1.895	1.838	1.827	1.859	1.804	1.899	1.884	1.781
Fe2+	2.445	2.435	2.414	2.434	1.942	2.130	2.414	1.808	1.003
Mg	2.491	2.367	2.321	2.224	2.913	2.709	2.386	2.923	4.095
Mn	0.007	0.007	0.003	0.006	0.000	0.000	0.000	0.000	0.000
Ti	0.363	0.466	0.557	0.568	0.480	0.528	0.525	0.433	0.059
Cr	0.010	0.013	0.017	0.015	0.012	0.010	0.014	0.002	0.003
Ni	0.000	0.001	0.000	0.000	0.000	0.001	0.002	0.000	0.001
Ba	0.015	0.014	0.025	0.024	0.019	0.025	0.025	0.005	0.003
Rb	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.007
Fe#	0.495	0.507	0.510	0.523	0.400	0.440	0.503	0.382	0.197

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6150A-Bt3	6150A-Bt4	6150A-Bt5	6150A-Bt6	6150A-Bt7	6150A-Bt9	6150A-Bt10	6150A-Bt11	6150A-Bt12
Localisation	Matrix	Inclusion	Grt-margin	Matrix	Grt-margin	Matrix	Matrix	Matrix	Inclusion
Oxydes (wt.%)									
SiO2	36.833	37.974	37.282	36.600	36.935	36.417	36.937	37.160	38.051
Al2O3	17.101	17.917	17.977	16.808	18.645	17.025	16.769	17.470	18.377
CaO	0.010	0.043	0.010	0.030	0.017	0.017	0.008	0.019	0.058
Na2O	0.056	0.077	0.079	0.055	0.055	0.036	0.046	0.084	0.177
K2O	10.122	9.542	10.076	9.882	9.889	10.055	10.140	10.053	9.380
FeO	13.154	8.879	12.151	15.654	10.292	14.152	13.664	13.127	8.479
MgO	14.203	19.769	15.493	12.384	15.899	12.865	13.536	14.329	19.684
MnO	0.000	0.004	0.008	0.015	0.008	0.001	0.031	0.012	0.000
TiO2	4.021	0.553	2.386	3.974	2.428	4.233	3.686	3.535	0.430
Cr2O3	0.126	0.009	0.072	0.029	0.030	0.063	0.080	0.050	0.064
NiO	0.018	0.000	0.041	0.015	0.030	0.000	0.000	0.000	0.000
BaO	0.190	0.017	0.098	0.099	0.110	0.197	0.153	0.104	0.000
Rb2O	0.092	0.000	0.012	0.071	0.104	0.128	0.003	0.048	0.028
H2O	3.567	3.347	3.492	3.544	3.479	3.527	3.542	3.496	3.276
F	0.990	1.626	1.207	0.923	1.206	0.957	0.958	1.176	1.806
Cl	0.089	0.052	0.084	0.096	0.075	0.101	0.083	0.086	0.041
Sub-total	100.572	99.809	100.468	100.179	99.202	99.774	99.636	100.749	99.851
O=F, Cl	0.437	0.696	0.527	0.410	0.525	0.426	0.422	0.515	0.770
Total	100.135	99.113	99.941	99.769	98.677	99.348	99.214	100.234	99.081
Cations*									
Si	5.442	5.511	5.473	5.479	5.442	5.451	5.514	5.468	5.508
Al iv	2.558	2.489	2.527	2.521	2.558	2.549	2.486	2.532	2.492
Al v	0.420	0.577	0.583	0.445	0.680	0.455	0.465	0.498	0.644
Ca	0.002	0.007	0.002	0.005	0.003	0.003	0.001	0.003	0.009
Na	0.016	0.022	0.022	0.016	0.016	0.010	0.013	0.024	0.050
K	1.907	1.766	1.887	1.887	1.858	1.920	1.931	1.887	1.732
Fe2+	1.625	1.078	1.492	1.960	1.268	1.772	1.706	1.616	1.027
Mg	3.128	4.277	3.390	2.764	3.492	2.871	3.012	3.143	4.248
Mn	0.000	0.000	0.001	0.002	0.001	0.000	0.004	0.001	0.000
Ti	0.447	0.060	0.263	0.447	0.269	0.477	0.414	0.391	0.047
Cr	0.015	0.001	0.008	0.003	0.003	0.007	0.009	0.006	0.007
Ni	0.002	0.000	0.005	0.002	0.004	0.000	0.000	0.000	0.000
Ba	0.011	0.001	0.006	0.006	0.006	0.012	0.009	0.006	0.000
Rb	0.009	0.000	0.001	0.007	0.010	0.012	0.000	0.005	0.003
Fe#	0.342	0.201	0.306	0.415	0.266	0.382	0.362	0.339	0.195

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6210A-Bt2	6210A-Bt4	6210A-Bt5	6210A-Bt6	6210A-Bt7	6210A-Bt9	6210A-Bt10	6210A-Bt11	6210A-Bt14
Localisation	Inclusion	Matrix	Grt-margin	Inclusion	Inclusion	Inclusion	Inclusion	Grt-margin	Inclusion
Oxydes (wt.%)									
SiO2	38.444	37.523	38.331	37.819	37.829	37.331	37.122	38.409	38.099
Al2O3	15.050	15.172	15.195	16.896	16.261	16.603	16.830	16.283	15.164
CaO	0.005	0.053	0.065	0.003	0.049	0.016	0.117	0.057	0.083
Na2O	0.368	0.045	0.058	0.339	0.303	0.268	0.394	0.060	0.195
K2O	9.855	10.234	10.162	10.135	9.953	10.085	9.827	9.779	10.093
FeO	6.772	10.875	8.134	7.278	7.141	8.270	7.022	7.033	7.240
MgO	19.296	15.710	18.254	17.732	17.932	17.539	17.875	18.873	18.924
MnO	0.000	0.000	0.000	0.000	0.020	0.000	0.001	0.000	0.006
TiO2	5.049	5.499	4.896	5.569	5.480	5.556	6.148	4.599	5.225
Cr2O3	0.021	0.132	0.081	0.081	0.111	0.128	0.099	0.064	0.060
NiO	0.000	0.014	0.000	0.000	0.000	0.000	0.014	0.000	0.029
BaO	0.284	0.285	0.298	0.208	0.288	0.287	0.313	0.295	0.365
Rb2O	0.061	0.048	0.045	0.069	0.070	0.059	0.037	0.076	0.054
H2O	3.217	3.086	3.017	3.274	3.140	3.366	3.193	3.012	3.048
F	1.960	2.077	2.344	1.901	2.121	1.650	2.034	2.430	2.301
Cl	0.023	0.026	0.029	0.024	0.025	0.023	0.030	0.037	0.028
Sub-total	100.405	100.779	100.909	101.328	100.723	101.181	101.056	101.007	100.914
O=F, Cl	0.830	0.880	0.994	0.806	0.899	0.700	0.863	1.032	0.975
Total	99.575	99.899	99.915	100.522	99.824	100.481	100.193	99.975	99.939
Cations*									
Si	5.552	5.519	5.557	5.424	5.463	5.388	5.345	5.519	5.510
Al iv	2.448	2.481	2.443	2.576	2.537	2.612	2.655	2.481	2.490
Al v	0.115	0.149	0.154	0.280	0.231	0.213	0.201	0.277	0.096
Ca	0.001	0.008	0.010	0.000	0.008	0.002	0.018	0.009	0.013
Na	0.103	0.013	0.016	0.094	0.085	0.075	0.110	0.017	0.055
K	1.816	1.920	1.879	1.854	1.833	1.857	1.805	1.792	1.862
Fe2+	0.818	1.338	0.986	0.873	0.863	0.998	0.846	0.845	0.876
Mg	4.154	3.444	3.945	3.791	3.861	3.774	3.836	4.042	4.080
Mn	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.001
Ti	0.548	0.608	0.534	0.601	0.595	0.603	0.666	0.497	0.568
Cr	0.002	0.015	0.009	0.009	0.013	0.015	0.011	0.007	0.007
Ni	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.003
Ba	0.016	0.016	0.017	0.012	0.016	0.016	0.018	0.017	0.021
Rb	0.006	0.005	0.004	0.006	0.006	0.005	0.003	0.007	0.005
Fe#	0.165	0.280	0.200	0.187	0.183	0.209	0.181	0.173	0.177

Table S1-3: Biotite chemistry

*Formula proportion of cations based on 22 O atoms

Analysis#	6210A-Bt15
Localisation	Matrix
Oxydes (wt.%)	
SiO2	37.392
Al2O3	15.203
CaO	0.011
Na2O	0.037
K2O	10.173
FeO	10.697
MgO	15.992
MnO	0.004
TiO2	6.162
Cr2O3	0.046
NiO	0.018
BaO	0.368
Rb2O	0.043
H2O	3.230
F	1.822
Cl	0.029
Sub-total	101.227
O=F, Cl	0.774
Total	100.453
Cations*	
Si	5.467
Al iv	2.533
Al v	0.086
Ca	0.002
Na	0.010
K	1.897
Fe2+	1.308
Mg	3.485
Mn	0.000
Ti	0.678
Cr	0.005
Ni	0.002
Ba	0.021
Rb	0.004
Fe#	0.273

Table S1-4: Amphibole chemistry

*Formula proportion of cations based on 23 O atoms

Analysis#	142A-Amp1	142A-Amp2	142A-Amp3	142A-Amp4	142A-Amp5	142A-Amp6	142A-Amp7	142A-Amp8
Localisation	Matrix	Matrix (core)	Matrix (rim)	Matrix	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	42.939	43.024	43.221	42.897	43.204	43.317	43.071	42.744
Al2O3	11.374	11.381	11.128	10.930	11.061	11.319	10.997	10.844
CaO	12.000	11.942	11.882	11.976	11.869	12.125	11.844	11.952
Na2O	1.628	1.656	1.607	1.575	1.642	1.377	1.600	1.548
K2O	1.869	1.813	1.828	1.856	1.898	1.930	1.825	1.800
FeO	13.469	13.703	13.570	12.829	13.472	12.428	13.149	13.470
MgO	12.958	13.046	13.000	12.965	13.085	12.826	12.953	12.810
MnO	0.248	0.312	0.263	0.208	0.268	0.229	0.298	0.290
TiO2	2.128	1.873	1.882	2.272	2.228	2.756	2.260	2.174
Cr2O3	0.000	0.000	0.000	0.051	0.004	0.106	0.068	0.017
CoO	0.009	0.000	0.000	0.019	0.000	0.018	0.010	0.000
NiO	0.000	0.035	0.000	0.062	0.000	0.019	0.022	0.000
H2O	1.551	1.634	1.476	1.548	1.465	1.555	1.433	1.480
F	0.955	0.790	1.107	0.931	1.141	0.961	1.191	1.055
Cl	0.098	0.087	0.098	0.093	0.099	0.103	0.094	0.109
Sub-total	101.226	101.296	101.062	100.212	101.436	101.069	100.815	100.293
O=F, Cl	0.424	0.352	0.488	0.413	0.503	0.428	0.523	0.469
Total	100.802	100.944	100.574	99.799	100.933	100.641	100.292	99.824
Cations*								
Si	9.054	9.326	9.663	9.933	10.167	10.467	10.731	10.978
Al iv	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al vi	2.827	2.907	2.932	2.983	3.068	3.224	3.229	3.282
Ca	2.711	2.773	2.846	2.971	2.993	3.139	3.162	3.289
Na	0.666	0.696	0.697	0.707	0.749	0.645	0.773	0.771
K	0.503	0.501	0.521	0.548	0.570	0.595	0.580	0.590
Fe2+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe3+	2.375	2.484	2.537	2.484	2.651	2.512	2.740	2.893
Mg	4.073	4.216	4.333	4.476	4.591	4.620	4.811	4.904
Mn	0.044	0.057	0.050	0.041	0.053	0.047	0.063	0.063
Ti	0.338	0.305	0.316	0.396	0.394	0.501	0.424	0.420
Cr	0.000	0.000	0.000	0.009	0.001	0.020	0.013	0.003
Ni	0.000	0.006	0.000	0.012	0.000	0.004	0.004	0.000
Fe#	0.368	0.371	0.369	0.357	0.366	0.352	0.363	0.371
Amph group	Ca	Ca	Ca	Ca	Ca	Ca	Ca	Ca

Table S1-4: Amphibole chemistry

*Formula proportion of cations based on 23 O atoms

Analysis#	3090A-Amp1	4102A-Amp1	4102A-Amp2	4102A-Amp3	4102A-Amp4	4102A-Amp5	4102A-Amp6	4102A-Amp7
Localisation	Inclusion	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (rim)	Matrix	Matrix	Matrix (core)
Oxydes (wt.%)								
SiO2	43.718	43.615	44.580	44.381	44.418	44.560	44.109	43.793
Al2O3	11.160	11.048	10.070	10.565	10.293	10.196	10.383	10.702
CaO	11.884	11.426	11.396	11.500	11.686	11.398	11.474	11.465
Na2O	1.271	1.806	1.627	1.696	1.524	1.653	1.708	1.713
K2O	1.462	0.716	0.535	0.684	0.611	0.575	0.653	0.689
FeO	15.244	17.961	17.278	18.131	17.333	17.336	17.898	17.549
MgO	10.639	9.838	10.494	9.988	10.233	10.406	10.129	10.071
MnO	0.055	0.257	0.273	0.251	0.283	0.274	0.272	0.278
TiO2	2.003	1.949	1.788	1.398	1.402	1.588	1.615	1.695
Cr2O3	0.042	0.058	0.104	0.033	0.067	0.013	0.096	0.054
CoO	0.000	0.010	0.017	0.000	0.000	0.000	0.004	0.000
NiO	0.000	0.000	0.011	0.000	0.057	0.000	0.045	0.022
H2O	1.845	1.985	1.924	1.901	1.989	1.953	1.994	1.941
F	0.312	0.025	0.153	0.210	0.000	0.093	0.000	0.102
Cl	0.049	0.048	0.058	0.041	0.056	0.038	0.043	0.044
Sub-total	99.684	100.742	100.308	100.779	99.952	100.083	100.423	100.118
O=F, Cl	0.142	0.021	0.078	0.098	0.013	0.048	0.010	0.053
Total	99.542	100.721	100.230	100.681	99.939	100.035	100.413	100.065
Cations*								
Si	9.008	6.439	6.570	6.543	6.585	6.581	6.518	6.494
Al iv	0.000	1.561	1.430	1.457	1.415	1.419	1.482	1.506
Al vi	2.710	0.362	0.319	0.379	0.383	0.356	0.327	0.364
Ca	2.624	1.807	1.799	1.817	1.856	1.804	1.817	1.822
Na	0.508	0.517	0.465	0.485	0.438	0.473	0.489	0.493
K	0.384	0.135	0.101	0.129	0.116	0.108	0.123	0.130
Fe2+	0.000	1.725	1.592	1.718	1.703	1.621	1.673	1.685
Fe3+	2.627	0.493	0.538	0.517	0.446	0.520	0.539	0.491
Mg	3.268	2.165	2.306	2.195	2.261	2.291	2.231	2.226
Mn	0.010	0.032	0.034	0.031	0.036	0.034	0.034	0.035
Ti	0.310	0.216	0.198	0.155	0.156	0.176	0.180	0.189
Cr	0.007	0.007	0.012	0.004	0.008	0.002	0.011	0.006
Ni	0.000	0.000	0.001	0.000	0.007	0.000	0.005	0.003
Fe#	0.446	0.506	0.480	0.505	0.487	0.483	0.498	0.494
Amph group	Ca	Ca	Ca	Ca	Ca	Ca	Ca	Ca

Table S1-4: Amphibole chemistry

*Formula proportion of cations based on 23 O atoms

Analysis#	4102A-Amp8	4102A-Amp9	4102A-Amp10	4107A-Amp1	4107A-Amp2	4107A-Amp3	4107A-Amp4	4107A-Amp5
Localisation	Matrix (rim)	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
Oxydes (wt.%)								
SiO2	44.059	43.909	44.420	44.282	43.514	43.408	43.683	43.357
Al2O3	10.537	10.479	10.680	10.491	10.914	10.892	10.826	11.216
CaO	11.489	11.213	11.514	12.104	11.925	11.873	12.084	12.146
Na2O	1.634	1.651	1.541	1.495	1.772	1.750	1.672	1.626
K2O	0.682	0.665	0.626	1.644	1.647	1.643	1.642	1.719
FeO	16.968	17.685	17.722	11.863	12.897	12.923	11.984	12.506
MgO	10.161	10.034	10.174	13.368	12.845	12.876	13.092	12.743
MnO	0.260	0.305	0.275	0.175	0.221	0.196	0.214	0.203
TiO2	1.720	1.873	1.507	1.872	1.889	1.953	1.816	1.610
Cr2O3	0.092	0.125	0.079	0.059	0.059	0.080	0.140	0.025
CoO	0.009	0.006	0.018	0.006	0.009	0.004	0.000	0.039
NiO	0.000	0.008	0.000	0.004	0.028	0.000	0.000	0.003
H2O	1.975	1.927	1.953	1.551	1.478	1.441	1.606	1.519
F	0.017	0.136	0.101	0.934	1.061	1.137	0.788	0.955
Cl	0.062	0.031	0.053	0.127	0.153	0.145	0.150	0.161
Sub-total	99.665	100.047	100.663	99.975	100.412	100.321	99.697	99.828
O=F, Cl	0.021	0.064	0.054	0.422	0.481	0.511	0.366	0.438
Total	99.644	99.983	100.609	99.553	99.931	99.810	99.331	99.390
Cations*								
Si	6.553	6.503	6.531	6.534	6.429	6.416	6.480	6.446
Al iv	1.447	1.497	1.469	1.466	1.571	1.584	1.520	1.554
Al vi	0.400	0.332	0.381	0.359	0.329	0.314	0.372	0.412
Ca	1.831	1.779	1.814	1.914	1.888	1.880	1.920	1.935
Na	0.471	0.474	0.439	0.428	0.508	0.502	0.481	0.469
K	0.129	0.126	0.117	0.309	0.310	0.310	0.311	0.326
Fe2+	1.722	1.615	1.617	1.343	1.372	1.344	1.393	1.440
Fe3+	0.388	0.575	0.562	0.121	0.221	0.254	0.094	0.115
Mg	2.253	2.215	2.230	2.941	2.829	2.837	2.895	2.824
Mn	0.033	0.038	0.034	0.022	0.028	0.025	0.027	0.026
Ti	0.192	0.209	0.167	0.208	0.210	0.217	0.203	0.180
Cr	0.011	0.015	0.009	0.007	0.007	0.009	0.016	0.003
Ni	0.000	0.001	0.000	0.000	0.003	0.000	0.000	0.000
Fe#	0.484	0.497	0.494	0.332	0.360	0.360	0.339	0.355
Amph group	Ca	Ca	Ca	Ca	Ca	Ca	Ca	Ca

Table S1-4: Amphibole chemistry

*Formula proportion of cations based on 23 O atoms

Analysis#	4107A-Amp6	4107A-Amp7	4107A-Amp8	4107A-Amp9	6080A-Amp1	6080A-Amp2	6080A-Amp3	6080A-Amp4
Localisation	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Inclusion	Matrix
Oxydes (wt.%)								
SiO2	43.076	42.992	43.189	42.901	41.463	41.661	41.644	41.693
Al2O3	11.100	11.208	10.994	11.069	12.597	12.447	11.899	12.187
CaO	11.918	11.903	11.939	11.828	11.664	11.573	11.605	11.651
Na2O	1.801	1.773	1.754	1.785	1.522	1.561	1.656	1.531
K2O	1.698	1.743	1.711	1.763	1.777	1.715	1.645	1.688
FeO	12.970	13.186	12.716	13.071	17.977	17.969	18.188	19.083
MgO	12.776	12.451	12.842	12.300	7.825	8.164	8.405	7.685
MnO	0.217	0.237	0.235	0.249	0.069	0.101	0.075	0.106
TiO2	1.811	1.975	1.891	2.086	2.214	2.570	2.701	2.419
Cr2O3	0.068	0.004	0.021	0.000	0.075	0.000	0.129	0.046
CoO	0.000	0.031	0.018	0.018	0.013	0.000	0.068	0.011
NiO	0.044	0.015	0.000	0.009	0.000	0.000	0.000	0.016
H2O	1.619	1.613	1.498	1.515	1.801	1.785	1.907	1.861
F	0.745	0.744	1.005	0.945	0.306	0.365	0.119	0.202
Cl	0.155	0.172	0.143	0.150	0.061	0.065	0.046	0.057
Sub-total	99.998	100.047	99.956	99.689	99.364	99.976	100.087	100.236
O=F, Cl	0.349	0.352	0.455	0.432	0.143	0.168	0.060	0.098
Total	99.649	99.695	99.501	99.257	99.221	99.808	100.027	100.138
Cations*								
Si	6.386	6.388	6.412	6.410	6.823	7.075	7.332	7.596
Al iv	1.614	1.612	1.588	1.590	1.177	0.925	0.668	0.404
Al vi	0.326	0.351	0.336	0.360	1.266	1.566	1.801	2.213
Ca	1.893	1.895	1.899	1.894	2.057	2.106	2.189	2.274
Na	0.518	0.511	0.505	0.517	0.486	0.514	0.565	0.541
K	0.321	0.330	0.324	0.336	0.373	0.372	0.369	0.392
Fe2+	1.357	1.450	1.379	1.513	0.000	0.000	0.000	0.000
Fe3+	0.251	0.188	0.200	0.121	2.474	2.552	2.678	2.908
Mg	2.824	2.758	2.842	2.740	1.920	2.067	2.206	2.087
Mn	0.027	0.030	0.030	0.032	0.010	0.015	0.011	0.016
Ti	0.202	0.221	0.211	0.234	0.274	0.328	0.358	0.332
Cr	0.008	0.000	0.002	0.000	0.010	0.000	0.018	0.007
Ni	0.005	0.002	0.000	0.001	0.000	0.000	0.000	0.002
Fe#	0.363	0.373	0.357	0.373	0.563	0.553	0.548	0.582
Amph group	Ca	Ca	Ca	Ca	Ca	Ca	Ca	Ca

Table S1-4: Amphibole chemistry

*Formula proportion of cations based on 23 O atoms

Analysis#	6080A-Amp5	6080A-Amp6	6080A-Amp7
Localisation	Matrix	Matrix	Matrix
Oxydes (wt.%)			
SiO2	41.685	41.467	41.576
Al2O3	12.049	12.119	12.202
CaO	11.636	11.481	11.595
Na2O	1.516	1.557	1.498
K2O	1.735	1.720	1.825
FeO	18.098	18.567	18.237
MgO	8.002	7.814	8.029
MnO	0.102	0.131	0.082
TiO2	2.513	2.377	2.368
Cr2O3	0.029	0.008	0.091
CoO	0.000	0.000	0.000
NiO	0.000	0.011	0.037
H2O	1.840	1.861	1.777
F	0.230	0.170	0.373
Cl	0.059	0.061	0.045
Sub-total	99.494	99.344	99.735
O=F, Cl	0.110	0.085	0.167
Total	99.384	99.259	99.568
Cations*			
Si	7.902	8.140	8.400
Al iv	0.098	0.000	0.000
Al vi	2.595	2.804	2.906
Ca	2.363	2.415	2.510
Na	0.557	0.593	0.587
K	0.420	0.431	0.470
Fe2+	0.000	0.000	0.000
Fe3+	2.869	3.048	3.081
Mg	2.261	2.287	2.418
Mn	0.016	0.022	0.014
Ti	0.358	0.351	0.360
Cr	0.004	0.001	0.015
Ni	0.000	0.002	0.006
Fe#	0.559	0.571	0.560
Amph group	Ca	Ca	Ca

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	1098A-Grt1	1098A-Grt2	1098A-Grt3	1098A-Grt4	1098A-Grt5	1098A-Grt6	1098A-Grt7	1098A-Grt8
Localisation	Core	Mantle	Rim	Core	Mantle	Rim	Core	Mantle-core
Oxydes (wt.%)								
SiO2	39.648	39.204	39.145	39.052	39.242	39.049	39.572	39.594
Al2O3	21.885	21.930	21.674	21.607	21.582	21.347	21.849	21.792
Na2O	0.019	0.012	0.002	0.011	0.010	0.022	0.018	0.000
CaO	1.197	1.246	1.254	1.237	1.271	1.210	1.410	1.375
FeO	25.188	25.541	26.052	28.653	26.888	27.274	25.171	25.224
Fe2O3	0.797	0.583	0.869	0.326	0.954	1.093	0.896	0.926
MgO	11.221	11.135	10.692	8.521	10.017	9.630	11.282	11.157
MnO	0.534	0.501	0.576	0.597	0.576	0.617	0.519	0.558
TiO2	0.057	0.000	0.010	0.114	0.000	0.000	0.000	0.000
Y2O3	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr2O3	0.000	0.054	0.056	0.076	0.047	0.088	0.077	0.062
ZrO2	0.006	0.000	0.000	0.000	0.000	0.035	0.000	0.019
ZnO	0.112	0.046	0.057	0.000	0.058	0.085	0.042	0.016
Total	100.682	100.252	100.387	100.194	100.645	100.450	100.836	100.723
Cations*								
Si	5.999	5.968	5.974	6.030	5.995	5.997	5.983	5.994
Al	3.903	3.934	3.898	3.932	3.886	3.864	3.893	3.888
Ca	0.194	0.203	0.205	0.205	0.208	0.199	0.228	0.223
Na	0.006	0.003	0.001	0.003	0.003	0.007	0.005	0.000
Fe2+	3.187	3.252	3.325	3.700	3.435	3.503	3.183	3.193
Fe3+	0.091	0.067	0.100	0.038	0.110	0.126	0.102	0.105
Mg	2.531	2.527	2.432	1.961	2.281	2.205	2.543	2.518
Mn	0.068	0.065	0.074	0.078	0.075	0.080	0.066	0.071
Ti	0.007	0.000	0.001	0.013	0.000	0.000	0.000	0.000
Y	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr	0.000	0.006	0.007	0.009	0.006	0.011	0.009	0.007
Zr	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.001
Zn	0.013	0.005	0.006	0.000	0.006	0.010	0.005	0.002
End-members (%)								
Almandin	53.3	53.8	55.1	62.3	57.3	58.5	52.9	53.2
Pyrope	42.4	41.8	40.3	33.0	38.0	36.8	42.2	41.9
Grossular	0.8	1.5	0.7	1.9	0.6	0.0	1.0	0.9
Sperssartine	1.2	1.1	1.2	1.3	1.2	1.3	1.1	1.2
Andradite	2.4	1.7	2.5	1.2	2.7	3.2	2.5	2.6
X(Ca)	0.033	0.034	0.034	0.035	0.035	0.033	0.038	0.037
Fe#	0.561	0.565	0.581	0.655	0.605	0.618	0.560	0.563
radius(%)	0.0	45.4	100.0	0.0	50.9	100.0	0.0	31.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	1098A-Grt9	1098A-Grt11	1098A-Grt12	1098A-Grt13	1098A-Grt14	1098A-Grt15	1098A-Grt16	1121A-Grt1
Localisation	Mantle-rim	Core	Mantle	Rim	Core	Mantle	Rim	Core
Oxydes (wt.%)								
SiO2	39.651	39.590	39.470	39.120	39.524	39.706	39.602	37.923
Al2O3	21.835	21.660	21.710	21.625	21.852	21.845	21.634	20.919
Na2O	0.000	0.011	0.018	0.022	0.011	0.006	0.011	0.026
CaO	1.772	1.395	1.462	1.239	1.270	1.239	1.293	4.411
FeO	25.036	25.649	25.951	28.195	25.527	25.589	25.876	30.057
Fe2O3	0.962	1.006	0.952	0.831	0.730	0.809	1.145	0.918
MgO	11.003	10.649	10.612	9.405	11.034	10.939	10.795	4.724
MnO	0.527	0.534	0.557	0.599	0.485	0.532	0.553	1.358
TiO2	0.000	0.016	0.041	0.072	0.047	0.000	0.031	0.000
Y2O3	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.012
Cr2O3	0.021	0.009	0.030	0.041	0.042	0.089	0.030	0.000
ZrO2	0.035	0.004	0.010	0.000	0.000	0.037	0.017	0.000
ZnO	0.094	0.021	0.002	0.000	0.000	0.071	0.000	0.000
Total	100.936	100.562	100.815	101.149	100.522	100.862	100.987	100.348
Cations*								
Si	5.992	6.015	5.992	5.979	5.996	6.007	5.999	5.990
Al	3.889	3.879	3.885	3.896	3.907	3.895	3.862	3.894
Ca	0.287	0.227	0.238	0.203	0.206	0.201	0.210	0.746
Na	0.000	0.003	0.005	0.007	0.003	0.002	0.003	0.008
Fe2+	3.164	3.259	3.295	3.604	3.239	3.238	3.278	3.970
Fe3+	0.109	0.115	0.109	0.096	0.083	0.092	0.130	0.109
Mg	2.479	2.412	2.402	2.143	2.495	2.467	2.438	1.112
Mn	0.068	0.069	0.072	0.078	0.062	0.068	0.071	0.182
Ti	0.000	0.002	0.005	0.008	0.005	0.000	0.004	0.000
Y	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Cr	0.002	0.001	0.004	0.005	0.005	0.011	0.004	0.000
Zr	0.003	0.000	0.001	0.000	0.000	0.003	0.001	0.000
Zn	0.010	0.002	0.000	0.000	0.000	0.008	0.000	0.000
End-members (%)								
Almandin	52.8	54.6	54.9	59.8	54.0	54.2	54.7	66.1
Pyrope	41.3	40.4	40.0	35.6	41.6	41.3	40.7	18.5
Grossular	2.0	0.8	1.0	0.7	1.1	0.8	0.1	9.7
Sperssartine	1.1	1.2	1.2	1.3	1.0	1.1	1.2	3.0
Andradite	2.7	2.9	2.8	2.5	2.2	2.3	3.3	2.7
X(Ca)	0.048	0.038	0.040	0.034	0.035	0.034	0.035	0.127
Fe#	0.565	0.579	0.582	0.630	0.568	0.571	0.578	0.783
radius(%)	62.0	0.0	46.5	100.0	0.0	49.3	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	1121A-Grt2	1121A-Grt3	1121A-Grt4	1121A-Grt5	1121A-Grt6	1121A-Grt7	1121A-Grt9	1121A-Grt8
Localisation	mantle	Rim	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle-core
Oxydes (wt.%)								
SiO2	37.939	37.733	38.192	38.016	37.880	37.657	38.039	37.830
Al2O3	21.046	20.821	20.868	21.058	20.941	20.865	21.086	21.198
Na2O	0.017	0.020	0.008	0.004	0.009	0.013	0.033	0.025
CaO	4.652	5.178	4.988	4.948	4.985	5.039	4.229	4.426
FeO	30.019	30.049	29.683	30.018	30.277	30.252	30.271	30.376
Fe2O3	0.782	0.853	1.041	0.822	0.725	0.704	0.747	0.602
MgO	4.613	3.994	4.461	4.504	4.184	3.969	4.882	4.845
MnO	1.437	1.357	1.390	1.360	1.328	1.339	1.384	1.377
TiO2	0.000	0.015	0.000	0.000	0.124	0.052	0.072	0.057
Y2O3	0.121	0.010	0.052	0.028	0.016	0.075	0.057	0.019
Cr2O3	0.023	0.000	0.041	0.000	0.009	0.009	0.012	0.000
ZrO2	0.028	0.000	0.000	0.000	0.000	0.032	0.006	0.000
ZnO	0.000	0.025	0.000	0.000	0.068	0.018	0.000	0.020
Total	100.677	100.055	100.724	100.758	100.546	100.024	100.818	100.775
Cations*								
Si	5.978	5.994	6.009	5.983	5.985	5.987	5.979	5.954
Al	3.908	3.898	3.869	3.906	3.900	3.910	3.906	3.932
Ca	0.785	0.881	0.841	0.834	0.844	0.858	0.712	0.746
Na	0.005	0.006	0.002	0.001	0.003	0.004	0.010	0.008
Fe2+	3.956	3.992	3.906	3.951	4.001	4.022	3.979	3.998
Fe3+	0.093	0.102	0.123	0.097	0.086	0.084	0.088	0.071
Mg	1.084	0.946	1.046	1.057	0.985	0.941	1.144	1.137
Mn	0.192	0.183	0.185	0.181	0.178	0.180	0.184	0.184
Ti	0.000	0.002	0.000	0.000	0.015	0.006	0.009	0.007
Y	0.010	0.001	0.004	0.002	0.001	0.006	0.005	0.002
Cr	0.003	0.000	0.005	0.000	0.001	0.001	0.001	0.000
Zr	0.002	0.000	0.000	0.000	0.000	0.003	0.000	0.000
Zn	0.000	0.003	0.000	0.000	0.008	0.002	0.000	0.002
End-members (%)								
Almandin	65.8	66.5	65.3	65.6	66.7	67.1	66.2	66.0
Pyrope	18.0	15.8	17.5	17.5	16.4	15.7	19.0	18.8
Grossular	10.7	12.1	10.8	11.4	11.5	12.0	9.4	10.4
Sperssartine	3.2	3.0	3.1	3.0	3.0	3.0	3.1	3.0
Andradite	2.3	2.6	3.1	2.4	2.4	2.2	2.3	1.9
X(Ca)	0.134	0.150	0.144	0.142	0.144	0.146	0.121	0.126
Fe#	0.787	0.810	0.791	0.791	0.804	0.812	0.779	0.780
radius(%)	46.5	100.0	0.0	34.2	64.0	100.0	0.0	38.6

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	1121A-Grt10	1121A-Grt11	1121A-Grt12	1121A-Grt13	1121A-Grt14	2112B-Grt1	2112B-Grt2	2112B-Grt3
Localisation	Mantle-rim	Rim	core	mantle	rim	Core	Mantle-core	Mantle-rim
Oxydes (wt.%)								
SiO2	38.125	37.695	37.932	38.119	38.095	38.467	37.884	38.033
Al2O3	21.061	20.967	21.018	21.082	21.023	20.832	20.912	20.689
Na2O	0.021	0.005	0.019	0.015	0.000	0.016	0.017	0.034
CaO	4.728	5.311	4.501	4.568	5.258	5.595	5.560	5.529
FeO	29.945	30.070	30.358	30.142	29.569	28.479	28.688	28.635
Fe2O3	0.838	0.727	0.795	0.776	0.786	1.311	0.935	1.158
MgO	4.590	4.099	4.520	4.631	4.383	5.100	5.059	4.721
MnO	1.396	1.330	1.450	1.332	1.328	0.879	0.884	0.892
TiO2	0.000	0.000	0.057	0.031	0.010	0.021	0.031	0.000
Y2O3	0.028	0.033	0.036	0.039	0.000	0.013	0.000	0.000
Cr2O3	0.000	0.012	0.018	0.000	0.000	0.000	0.015	0.000
ZrO2	0.024	0.012	0.061	0.041	0.010	0.000	0.000	0.000
ZnO	0.038	0.000	0.111	0.056	0.013	0.000	0.000	0.000
Total	100.794	100.261	100.876	100.832	100.475	100.713	99.985	99.691
Cations*								
Si	5.994	5.975	5.974	5.992	6.003	6.016	5.977	6.019
Al	3.902	3.917	3.901	3.905	3.905	3.840	3.889	3.859
Ca	0.796	0.902	0.760	0.769	0.888	0.938	0.940	0.937
Na	0.007	0.001	0.006	0.005	0.000	0.005	0.005	0.011
Fe2+	3.937	3.986	3.998	3.962	3.897	3.725	3.785	3.790
Fe3+	0.099	0.087	0.094	0.092	0.093	0.154	0.111	0.138
Mg	1.076	0.969	1.061	1.085	1.030	1.189	1.190	1.114
Mn	0.186	0.179	0.193	0.177	0.177	0.116	0.118	0.120
Ti	0.000	0.000	0.007	0.004	0.001	0.002	0.004	0.000
Y	0.002	0.003	0.003	0.003	0.000	0.001	0.000	0.000
Cr	0.000	0.001	0.002	0.000	0.000	0.000	0.002	0.000
Zr	0.002	0.001	0.005	0.003	0.001	0.000	0.000	0.000
Zn	0.004	0.000	0.013	0.007	0.002	0.000	0.000	0.000
End-members (%)								
Almandin	65.7	66.1	66.5	66.1	65.1	62.4	62.8	63.6
Pyrope	18.0	16.1	17.7	18.1	17.2	19.9	19.7	18.7
Grossular	10.8	12.8	10.1	10.5	12.5	11.8	12.7	12.3
Sperssartine	3.1	3.0	3.2	3.0	3.0	2.0	2.0	2.0
Andradite	2.5	2.2	2.5	2.4	2.4	3.9	2.8	3.5
X(Ca)	0.136	0.153	0.129	0.131	0.151	0.158	0.157	0.159
Fe#	0.788	0.806	0.792	0.787	0.793	0.762	0.763	0.776
radius(%)	63.5	100.0	0.0	37.7	100.0	0.0	27.1	65.7

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	2112B-Grt4	2112B-Grt5	2112B-Grt6	2112B-Grt7	2112B-Grt8	2112B-Grt9	2112B-Grt10	2112B-Grt11
Localisation	Rim	Core	Mantle	Rim	Core	Mantle-core	Mantle-rim	Rim
Oxydes (wt.%)								
SiO2	38.033	37.121	37.321	37.079	37.949	37.711	37.582	38.107
Al2O3	20.681	20.861	20.895	20.766	20.931	20.971	20.890	21.110
Na2O	0.035	0.016	0.018	0.003	0.007	0.011	0.000	0.011
CaO	5.911	5.699	6.189	6.629	5.415	5.676	5.640	6.301
FeO	29.213	30.215	29.865	30.030	29.187	29.253	29.459	30.935
Fe2O3	1.174	0.742	0.744	0.762	1.021	0.914	0.941	0.546
MgO	4.239	4.133	3.922	3.383	5.054	4.935	4.595	2.893
MnO	0.873	0.996	0.887	0.996	0.863	0.928	1.004	1.054
TiO2	0.031	0.000	0.031	0.042	0.000	0.083	0.000	0.052
Y2O3	0.000	0.000	0.000	0.024	0.000	0.029	0.000	0.048
Cr2O3	0.056	0.044	0.000	0.000	0.059	0.035	0.000	0.000
ZrO2	0.067	0.018	0.039	0.073	0.018	0.010	0.002	0.010
ZnO	0.027	0.000	0.067	0.000	0.000	0.058	0.029	0.000
Total	100.340	99.845	99.978	99.787	100.504	100.614	100.142	101.067
Cations*								
Si	6.005	5.923	5.941	5.933	5.967	5.936	5.951	6.012
Al	3.848	3.923	3.920	3.916	3.879	3.891	3.899	3.925
Ca	1.000	0.974	1.055	1.136	0.912	0.957	0.957	1.065
Na	0.011	0.005	0.006	0.001	0.002	0.003	0.000	0.003
Fe2+	3.857	4.032	3.976	4.019	3.838	3.851	3.901	4.082
Fe3+	0.139	0.089	0.089	0.092	0.121	0.108	0.112	0.065
Mg	0.998	0.983	0.931	0.807	1.185	1.158	1.085	0.680
Mn	0.117	0.135	0.120	0.135	0.115	0.124	0.135	0.141
Ti	0.004	0.000	0.004	0.005	0.000	0.010	0.000	0.006
Y	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.004
Cr	0.007	0.006	0.000	0.000	0.007	0.004	0.000	0.000
Zr	0.005	0.001	0.003	0.006	0.001	0.001	0.000	0.001
Zn	0.003	0.000	0.008	0.000	0.000	0.007	0.003	0.000
End-members (%)								
Almandin	64.6	65.8	65.4	65.9	63.4	63.3	64.2	68.4
Pyrope	16.7	16.1	15.3	13.2	19.6	19.0	17.9	11.4
Grossular	13.0	13.6	15.1	16.3	11.9	12.7	13.0	16.1
Sperssartine	2.0	2.2	2.0	2.2	1.9	2.0	2.2	2.4
Andradite	3.6	2.2	2.3	2.3	3.0	2.8	2.8	1.7
X(Ca)	0.169	0.161	0.176	0.189	0.152	0.159	0.160	0.182
Fe#	0.797	0.806	0.812	0.834	0.767	0.771	0.785	0.858
radius(%)	100.0	0.0	48.7	100.0	0.0	46.1	77.3	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	2112B-Grt12	2112B-Grt13	2112B-Grt14	3008A-Grt1	3008A-Grt2	3008A-Grt3	3008A-Grt4	3008A-Grt5
Localisation	Core	Mantle	Rim	Core	Mantle	Rim	Core	Mantle
Oxydes (wt.%)								
SiO2	37.873	37.582	37.464	37.689	37.931	37.906	37.463	37.505
Al2O3	21.146	20.925	20.678	20.865	20.812	20.837	21.030	20.838
Na2O	0.026	0.010	0.019	0.019	0.010	0.000	0.029	0.000
CaO	5.664	5.691	5.718	1.275	1.269	1.234	1.281	1.244
FeO	29.542	29.331	29.756	33.050	33.113	33.842	34.393	34.381
Fe2O3	0.672	0.860	0.972	0.624	0.864	0.763	0.398	0.637
MgO	4.769	4.668	4.212	4.972	5.062	4.548	4.389	4.270
MnO	0.876	0.929	0.966	1.158	1.146	1.259	1.349	1.361
TiO2	0.047	0.021	0.016	0.000	0.000	0.000	0.056	0.000
Y2O3	0.000	0.000	0.000	0.000	0.000	0.014	0.064	0.012
Cr2O3	0.074	0.000	0.118	0.000	0.000	0.000	0.000	0.000
ZrO2	0.033	0.000	0.024	0.012	0.033	0.027	0.000	0.000
ZnO	0.000	0.000	0.000	0.071	0.000	0.000	0.008	0.000
Total	100.722	100.017	99.943	99.735	100.240	100.430	100.460	100.248
Cations*								
Si	5.951	5.952	5.959	6.012	6.019	6.024	5.972	5.994
Al	3.916	3.906	3.876	3.923	3.892	3.903	3.951	3.925
Ca	0.954	0.966	0.974	0.218	0.216	0.210	0.219	0.213
Na	0.008	0.003	0.006	0.006	0.003	0.000	0.009	0.000
Fe2+	3.882	3.885	3.958	4.409	4.394	4.498	4.586	4.595
Fe3+	0.079	0.102	0.116	0.075	0.103	0.091	0.048	0.077
Mg	1.117	1.102	0.999	1.182	1.198	1.077	1.043	1.017
Mn	0.117	0.125	0.130	0.156	0.154	0.169	0.182	0.184
Ti	0.006	0.002	0.002	0.000	0.000	0.000	0.007	0.000
Y	0.000	0.000	0.000	0.000	0.000	0.001	0.005	0.001
Cr	0.009	0.000	0.015	0.000	0.000	0.000	0.000	0.000
Zr	0.002	0.000	0.002	0.001	0.003	0.002	0.000	0.000
Zn	0.000	0.000	0.000	0.008	0.000	0.000	0.001	0.000
End-members (%)								
Almandin	64.0	63.9	65.3	73.9	73.7	75.5	76.1	76.5
Pyrope	18.4	18.1	16.5	19.8	20.1	18.1	17.3	16.9
Grossular	13.4	13.3	12.8	1.8	1.0	1.2	2.3	1.6
Sperssartine	1.9	2.1	2.2	2.6	2.6	2.9	3.0	3.1
Andradite	2.1	2.6	2.9	1.9	2.6	2.3	1.3	1.9
X(Ca)	0.159	0.161	0.163	0.037	0.037	0.036	0.037	0.036
Fe#	0.778	0.781	0.801	0.790	0.788	0.808	0.815	0.820
radius(%)	0.0	41.7	100.0	0.0	55.5	100.0	0.0	52.3

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3008A-Grt6	3008A-Grt7	3008A-Grt8	3008A-Grt9	3008A-Grt10	3008A-Grt11	3008A-Grt12	3008A-Grt13
Localisation	Rim	Core	Mantle	Rim	Core	Mantle-core	Mantle-rim	Rim
Oxydes (wt.%)								
SiO2	37.780	37.906	37.862	37.756	37.837	37.864	37.556	37.598
Al2O3	20.720	20.970	20.682	20.810	21.019	20.977	20.842	20.755
Na2O	0.008	0.014	0.007	0.007	0.001	0.021	0.011	0.000
CaO	1.253	1.273	1.282	1.262	1.300	1.257	1.273	1.291
FeO	34.756	33.233	33.322	33.753	33.674	33.466	33.972	35.055
Fe2O3	0.771	0.643	0.972	0.772	0.594	0.554	0.666	0.668
MgO	3.629	4.988	4.930	4.647	4.848	4.867	4.551	3.631
MnO	1.610	1.227	1.200	1.205	1.237	1.201	1.297	1.390
TiO2	0.000	0.000	0.066	0.000	0.020	0.061	0.000	0.000
Y2O3	0.040	0.006	0.000	0.018	0.057	0.000	0.000	0.006
Cr2O3	0.000	0.000	0.006	0.000	0.000	0.000	0.026	0.000
ZrO2	0.000	0.045	0.000	0.024	0.012	0.055	0.000	0.000
ZnO	0.000	0.012	0.000	0.000	0.000	0.024	0.029	0.000
Total	100.567	100.317	100.329	100.254	100.599	100.347	100.223	100.394
Cations*								
Si	6.033	6.012	6.014	6.011	5.997	6.009	5.992	6.018
Al	3.900	3.920	3.871	3.905	3.926	3.924	3.919	3.915
Ca	0.214	0.216	0.218	0.215	0.221	0.214	0.218	0.221
Na	0.003	0.004	0.002	0.002	0.000	0.007	0.003	0.000
Fe2+	4.642	4.408	4.426	4.494	4.464	4.442	4.533	4.693
Fe3+	0.093	0.077	0.116	0.092	0.071	0.066	0.080	0.080
Mg	0.864	1.179	1.167	1.103	1.145	1.151	1.082	0.866
Mn	0.218	0.165	0.161	0.163	0.166	0.161	0.175	0.188
Ti	0.000	0.000	0.008	0.000	0.002	0.007	0.000	0.000
Y	0.003	0.000	0.000	0.002	0.005	0.000	0.000	0.000
Cr	0.000	0.000	0.001	0.000	0.000	0.000	0.003	0.000
Zr	0.000	0.003	0.000	0.002	0.001	0.004	0.000	0.000
Zn	0.000	0.001	0.000	0.000	0.000	0.003	0.003	0.000
End-members (%)								
Almandin	78.2	73.9	74.2	75.2	74.5	74.5	75.5	78.6
Pyrope	14.6	19.8	19.6	18.5	19.1	19.3	18.0	14.5
Grossular	1.3	1.7	0.5	1.3	1.9	1.7	1.5	1.7
Sperssartine	3.7	2.8	2.7	2.7	2.8	2.7	2.9	3.2
Andradite	2.3	1.9	3.0	2.3	1.8	1.8	2.0	2.0
X(Ca)	0.037	0.037	0.037	0.037	0.038	0.037	0.037	0.038
Fe#	0.844	0.790	0.793	0.805	0.797	0.795	0.809	0.845
radius(%)	100.0	0.0	61.5	100.0	0.0	40.8	77.7	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3008A-Grt14	3008A-Grt15	3008A-Grt16	3090A-Grt1	3090A-Grt2	3090A-Grt3	3090A-Grt4	3090A-Grt5
Localisation	Core	Mantle	Rim	Core	Mantle-core	Mantle-rim	Rim	Core
Oxydes (wt.%)								
SiO2	37.467	37.557	37.382	37.702	38.262	38.035	37.449	37.855
Al2O3	21.084	21.004	20.726	20.749	20.673	20.397	20.624	20.758
Na2O	0.030	0.000	0.009	0.018	0.008	0.006	0.003	0.001
CaO	1.317	1.301	1.269	7.195	7.197	7.278	7.245	7.336
FeO	33.531	34.024	34.753	27.995	27.850	27.622	28.567	28.223
Fe2O3	0.333	0.612	0.625	1.070	1.373	1.555	0.882	1.163
MgO	4.822	4.733	3.707	4.147	4.117	4.085	3.554	3.977
MnO	1.338	1.346	1.598	1.116	1.181	1.224	1.210	1.140
TiO2	0.000	0.005	0.005	0.099	0.115	0.115	0.120	0.104
Y2O3	0.000	0.052	0.000	0.018	0.066	0.047	0.041	0.021
Cr2O3	0.000	0.000	0.000	0.000	0.000	0.092	0.137	0.000
ZrO2	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.030
ZnO	0.000	0.029	0.000	0.009	0.000	0.011	0.073	0.019
Total	99.922	100.679	100.074	100.118	100.842	100.467	99.905	100.627
Cations*								
Si	5.979	5.967	6.004	5.964	6.002	5.996	5.962	5.966
Al	3.966	3.933	3.923	3.868	3.822	3.790	3.869	3.855
Ca	0.225	0.221	0.218	1.219	1.210	1.229	1.236	1.239
Na	0.009	0.000	0.003	0.005	0.002	0.002	0.001	0.000
Fe2+	4.475	4.521	4.668	3.703	3.654	3.642	3.803	3.720
Fe3+	0.040	0.073	0.076	0.127	0.162	0.185	0.106	0.138
Mg	1.147	1.121	0.888	0.978	0.963	0.960	0.843	0.934
Mn	0.181	0.181	0.217	0.150	0.157	0.163	0.163	0.152
Ti	0.000	0.001	0.001	0.012	0.014	0.014	0.014	0.012
Y	0.000	0.004	0.000	0.002	0.005	0.004	0.003	0.002
Cr	0.000	0.000	0.000	0.000	0.000	0.012	0.017	0.000
Zr	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.002
Zn	0.000	0.003	0.000	0.001	0.000	0.001	0.009	0.002
End-members (%)								
Almandin	74.2	74.8	77.9	61.3	61.2	60.8	63.0	61.6
Pyrope	19.0	18.6	14.8	16.2	16.1	16.0	14.0	15.5
Grossular	2.7	1.8	1.7	16.7	15.8	15.3	17.1	16.8
Sperssartine	3.0	3.0	3.6	2.5	2.6	2.7	2.7	2.5
Andradite	1.0	1.8	1.9	3.3	4.3	4.8	2.8	3.6
X(Ca)	0.038	0.038	0.038	0.204	0.205	0.208	0.208	0.208
Fe#	0.797	0.803	0.841	0.794	0.795	0.795	0.821	0.802
radius(%)	0.0	43.9	100.0	0.0	32.9	70.7	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3090A-Grt6	3090A-Grt7	3090A-Grt8	3090A-Grt9	3090A-Grt10	3090A-Grt11	3090A-Grt12	3090A-Grt13
Localisation	Mantle-core	Mantle	Mantle-rim	Rim	Core	Mantle	Rim	Core
Oxydes (wt.%)								
SiO2	38.081	37.738	37.440	37.390	38.199	37.724	38.010	38.255
Al2O3	20.423	20.678	20.544	20.713	20.581	20.574	20.440	20.757
Na2O	0.005	0.021	0.000	0.000	0.008	0.018	0.012	0.011
CaO	7.353	7.217	7.399	7.282	7.258	7.083	7.198	7.906
FeO	27.647	28.161	29.250	29.442	28.157	28.545	28.530	27.850
Fe2O3	1.564	1.200	1.032	0.838	1.507	1.267	1.479	1.303
MgO	3.910	3.806	2.831	2.882	3.773	3.674	3.305	3.893
MnO	1.191	1.217	1.327	1.398	1.172	1.207	1.320	1.038
TiO2	0.047	0.000	0.114	0.000	0.000	0.036	0.000	0.151
Y2O3	0.066	0.064	0.061	0.013	0.031	0.045	0.078	0.000
Cr2O3	0.071	0.009	0.000	0.092	0.000	0.024	0.036	0.030
ZrO2	0.000	0.085	0.038	0.002	0.002	0.000	0.000	0.000
ZnO	0.071	0.000	0.000	0.059	0.000	0.000	0.000	0.030
Total	100.429	100.196	100.036	100.111	100.688	100.197	100.408	101.224
Cations*								
Si	6.007	5.977	5.976	5.966	6.013	5.982	6.019	5.985
Al	3.797	3.860	3.865	3.895	3.818	3.845	3.815	3.827
Ca	1.243	1.225	1.265	1.245	1.224	1.203	1.221	1.325
Na	0.002	0.006	0.000	0.000	0.002	0.006	0.004	0.003
Fe2+	3.647	3.730	3.905	3.929	3.707	3.786	3.778	3.644
Fe3+	0.186	0.143	0.124	0.101	0.179	0.151	0.176	0.153
Mg	0.920	0.898	0.674	0.685	0.885	0.869	0.780	0.908
Mn	0.159	0.163	0.179	0.189	0.156	0.162	0.177	0.137
Ti	0.006	0.000	0.014	0.000	0.000	0.004	0.000	0.018
Y	0.006	0.005	0.005	0.001	0.003	0.004	0.007	0.000
Cr	0.009	0.001	0.000	0.012	0.000	0.003	0.004	0.004
Zr	0.000	0.007	0.003	0.000	0.000	0.000	0.000	0.000
Zn	0.008	0.000	0.000	0.007	0.000	0.000	0.000	0.004
End-members (%)								
Almandin	61.1	62.0	64.9	65.0	62.1	62.9	63.4	60.7
Pyrope	15.4	14.9	11.2	11.3	14.8	14.4	13.1	15.1
Grossular	15.8	16.8	17.6	17.8	16.0	16.1	16.0	17.7
Sperssartine	2.7	2.7	3.0	3.1	2.6	2.7	3.0	2.3
Andradite	4.8	3.6	3.3	2.5	4.5	3.8	4.4	4.1
X(Ca)	0.211	0.207	0.214	0.211	0.207	0.203	0.208	0.223
Fe#	0.803	0.809	0.855	0.853	0.811	0.816	0.832	0.804
radius(%)	32.2	65.1	93.5	100.0	0.0	46.0	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3090A-Grt14	3090A-Grt15	3090A-Grt16	3117A-Grt1	3117A-Grt2	3117A-Grt3	3117A-Grt4	3117A-Grt5
Localisation	Mantle-core	Mantle-rim	Rim	Core	Mantle	Rim	Core	Mantle
Oxydes (wt.%)								
SiO2	38.025	37.864	38.265	38.155	38.102	38.105	38.462	38.641
Al2O3	20.691	20.703	20.031	21.427	21.253	20.996	21.382	21.491
Na2O	0.031	0.018	0.014	0.006	0.032	0.015	0.015	0.001
CaO	7.578	7.174	7.069	1.191	1.111	1.245	1.371	1.242
FeO	28.341	28.540	27.987	31.097	30.879	32.849	30.659	31.282
Fe2O3	1.311	1.178	2.135	0.514	0.706	0.811	0.677	0.625
MgO	3.775	3.723	3.803	7.463	7.422	5.937	7.479	7.369
MnO	1.162	1.190	1.160	0.548	0.527	0.608	0.455	0.516
TiO2	0.130	0.000	0.068	0.026	0.000	0.051	0.021	0.077
Y2O3	0.000	0.004	0.004	0.000	0.027	0.000	0.056	0.000
Cr2O3	0.045	0.077	0.056	0.044	0.000	0.052	0.000	0.000
ZrO2	0.000	0.026	0.000	0.000	0.031	0.000	0.023	0.023
ZnO	0.000	0.024	0.003	0.055	0.028	0.000	0.000	0.000
Total	101.089	100.521	100.595	100.526	100.118	100.669	100.600	101.267
Cations*								
Si	5.972	5.981	6.035	5.955	5.969	5.994	5.984	5.982
Al	3.830	3.855	3.723	3.941	3.924	3.893	3.921	3.921
Ca	1.275	1.214	1.195	0.199	0.187	0.210	0.228	0.206
Na	0.009	0.006	0.004	0.002	0.010	0.004	0.005	0.000
Fe2+	3.722	3.771	3.691	4.059	4.045	4.322	3.990	4.050
Fe3+	0.155	0.140	0.253	0.060	0.083	0.096	0.079	0.073
Mg	0.884	0.877	0.894	1.736	1.733	1.392	1.735	1.701
Mn	0.155	0.159	0.155	0.072	0.070	0.081	0.060	0.068
Ti	0.015	0.000	0.008	0.003	0.000	0.006	0.002	0.009
Y	0.000	0.000	0.000	0.000	0.002	0.000	0.005	0.000
Cr	0.006	0.010	0.007	0.005	0.000	0.006	0.000	0.000
Zr	0.000	0.002	0.000	0.000	0.002	0.000	0.002	0.002
Zn	0.000	0.003	0.000	0.006	0.003	0.000	0.000	0.000
End-members (%)								
Almandin	61.8	62.6	62.3	66.9	67.0	72.0	66.4	67.3
Pyrope	14.7	14.6	15.1	28.6	28.7	23.2	28.9	28.3
Grossular	16.8	16.4	13.4	1.6	1.0	0.8	1.8	1.4
Sperssartine	2.6	2.6	2.6	1.2	1.2	1.4	1.0	1.1
Andradite	4.1	3.5	6.5	1.5	2.1	2.5	2.0	2.0
X(Ca)	0.214	0.205	0.202	0.033	0.031	0.035	0.038	0.034
Fe#	0.811	0.814	0.810	0.702	0.702	0.758	0.699	0.706
radius(%)	34.0	71.3	100.0	0.0	55.3	100.0	0.0	48.2

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3117A-Grt6	3117A-Grt7	3117A-Grt8	3117A-Grt9	3117A-Grt10	3117A-Grt11	3117A-Grt12	3117A-Grt13
Localisation	Rim	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle	Rim
Oxydes (wt.%)								
SiO2	38.178	38.595	38.700	38.219	38.406	38.117	38.180	37.882
Al2O3	21.198	21.466	21.228	21.133	21.197	21.326	21.314	21.020
Na2O	0.010	0.008	0.001	0.015	0.001	0.003	0.026	0.017
CaO	1.250	1.213	1.070	1.086	1.370	1.282	1.174	1.211
FeO	32.702	31.115	30.781	31.095	31.931	31.166	31.460	32.823
Fe2O3	0.698	0.658	0.870	0.851	0.648	0.716	0.673	0.863
MgO	6.174	7.514	7.554	7.207	6.365	7.397	7.219	6.114
MnO	0.560	0.499	0.531	0.538	0.597	0.532	0.506	0.611
TiO2	0.026	0.031	0.021	0.000	0.000	0.020	0.046	0.000
Y2O3	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Cr2O3	0.000	0.049	0.099	0.000	0.078	0.000	0.003	0.014
ZrO2	0.033	0.000	0.000	0.039	0.025	0.055	0.000	0.020
ZnO	0.004	0.017	0.000	0.004	0.012	0.000	0.000	0.000
Total	100.833	101.165	100.855	100.189	100.630	100.614	100.601	100.575
Cations*								
Si	5.986	5.978	6.005	5.988	6.012	5.950	5.963	5.968
Al	3.917	3.918	3.882	3.902	3.911	3.923	3.924	3.903
Ca	0.210	0.201	0.178	0.182	0.230	0.214	0.196	0.204
Na	0.003	0.002	0.000	0.005	0.000	0.001	0.008	0.005
Fe2+	4.288	4.030	3.995	4.074	4.180	4.069	4.109	4.325
Fe3+	0.082	0.077	0.102	0.100	0.076	0.084	0.079	0.102
Mg	1.443	1.735	1.748	1.683	1.486	1.721	1.681	1.436
Mn	0.074	0.065	0.070	0.071	0.079	0.070	0.067	0.081
Ti	0.003	0.004	0.002	0.000	0.000	0.002	0.005	0.000
Y	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr	0.000	0.006	0.012	0.000	0.010	0.000	0.000	0.002
Zr	0.003	0.000	0.000	0.003	0.002	0.004	0.000	0.002
Zn	0.001	0.002	0.000	0.001	0.001	0.000	0.000	0.000
End-members (%)								
Almandin	71.3	66.8	66.7	67.8	70.0	67.0	67.9	71.5
Pyrope	24.0	28.8	29.2	28.0	24.9	28.3	27.8	23.8
Grossular	1.4	1.2	0.1	0.5	1.7	1.4	1.1	0.8
Sperssartine	1.2	1.1	1.2	1.2	1.3	1.2	1.1	1.4
Andradite	2.1	2.0	2.6	2.5	1.9	2.1	2.0	2.5
X(Ca)	0.035	0.034	0.030	0.030	0.039	0.035	0.033	0.034
Fe#	0.750	0.701	0.698	0.710	0.740	0.705	0.712	0.753
radius(%)	100.0	0.0	40.3	70.2	100.0	0.0	64.2	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3123A-Grt1	3123A-Grt2	3123A-Grt3	3123A-Grt4	3123A-Grt5	3123A-Grt6	3123A-Grt7	3123A-Grt8
Localisation	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle-core	Mantle-rim	Rim
Oxydes (wt.%)								
SiO2	37.905	37.951	38.067	37.527	38.120	38.398	38.348	37.944
Al2O3	20.900	20.911	20.999	20.768	20.908	20.986	21.058	20.847
Na2O	0.004	0.004	0.018	0.008	0.009	0.012	0.000	0.013
CaO	2.275	2.207	2.057	2.028	2.459	2.551	2.525	2.022
FeO	32.381	32.448	32.628	33.373	31.247	30.954	31.538	32.969
Fe2O3	0.753	0.757	0.719	0.799	0.948	0.923	0.906	0.881
MgO	5.014	5.092	4.922	4.535	5.771	5.867	5.597	4.740
MnO	1.071	1.050	1.064	1.107	0.958	1.027	0.996	1.069
TiO2	0.092	0.067	0.000	0.000	0.092	0.077	0.056	0.000
Y2O3	0.016	0.000	0.000	0.038	0.006	0.002	0.000	0.000
Cr2O3	0.012	0.070	0.000	0.046	0.020	0.090	0.000	0.000
ZrO2	0.020	0.043	0.000	0.000	0.000	0.031	0.027	0.008
ZnO	0.000	0.000	0.052	0.000	0.000	0.000	0.000	0.020
Total	100.443	100.600	100.526	100.229	100.538	100.918	101.051	100.513
Cations*								
Si	5.997	5.995	6.016	5.983	5.994	6.006	6.002	6.012
Al	3.897	3.893	3.911	3.902	3.875	3.869	3.885	3.893
Ca	0.386	0.373	0.348	0.346	0.414	0.428	0.424	0.343
Na	0.001	0.001	0.006	0.002	0.003	0.004	0.000	0.004
Fe2+	4.284	4.286	4.313	4.449	4.109	4.049	4.128	4.368
Fe3+	0.090	0.090	0.086	0.096	0.112	0.109	0.107	0.105
Mg	1.182	1.199	1.160	1.078	1.353	1.368	1.306	1.120
Mn	0.144	0.140	0.142	0.149	0.128	0.136	0.132	0.144
Ti	0.011	0.008	0.000	0.000	0.011	0.009	0.007	0.000
Y	0.001	0.000	0.000	0.003	0.000	0.000	0.000	0.000
Cr	0.001	0.009	0.000	0.006	0.003	0.011	0.000	0.000
Zr	0.002	0.003	0.000	0.000	0.000	0.002	0.002	0.001
Zn	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.002
End-members (%)								
Almandin	71.5	71.5	72.3	73.9	68.5	67.8	69.0	73.1
Pyrope	19.7	20.0	19.5	17.9	22.6	22.9	21.8	18.7
Grossular	3.9	3.6	3.7	3.2	3.8	3.9	4.2	3.1
Sperssartine	2.4	2.3	2.4	2.5	2.1	2.3	2.2	2.4
Andradite	2.4	2.4	2.2	2.4	3.0	2.9	2.8	2.6
X(Ca)	0.065	0.063	0.059	0.058	0.070	0.072	0.072	0.058
Fe#	0.785	0.783	0.790	0.807	0.755	0.750	0.762	0.798
radius(%)	0.0	28.7	87.3	100.0	0.0	22.4	54.3	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	3123A-Grt9	3123A-Grt10	3123A-Grt11	3123A-Grt12	3123A-Grt13	3123A-Grt14	3123A-Grt15	3123A-Grt16
Localisation	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle-core	Mantle-rim	Rim
Oxydes (wt.%)								
SiO2	37.898	37.995	38.123	37.854	37.917	37.975	37.884	38.625
Al2O3	21.137	21.162	21.270	20.908	19.765	21.143	21.078	21.020
Na2O	0.000	0.000	0.014	0.022	0.012	0.011	0.042	0.002
CaO	2.260	2.153	2.558	2.208	2.270	2.291	2.295	1.997
FeO	32.108	32.373	31.474	32.242	29.207	30.720	30.926	30.836
Fe2O3	0.660	0.649	0.544	0.767	2.285	0.655	0.747	1.077
MgO	5.533	5.446	5.728	5.045	6.382	6.346	6.153	6.264
MnO	1.078	1.055	0.962	1.092	0.974	0.935	0.979	0.964
TiO2	0.000	0.010	0.051	0.000	0.062	0.103	0.041	0.000
Y2O3	0.000	0.000	0.000	0.000	0.064	0.069	0.068	0.033
Cr2O3	0.073	0.043	0.012	0.026	0.000	0.000	0.017	0.000
ZrO2	0.000	0.022	0.018	0.041	0.024	0.051	0.039	0.006
ZnO	0.089	0.022	0.000	0.035	0.000	0.011	0.000	0.029
Total	100.836	100.930	100.754	100.240	98.962	100.310	100.269	100.853
Cations*								
Si	5.964	5.974	5.980	5.999	6.037	5.967	5.965	6.029
Al	3.921	3.922	3.932	3.905	3.709	3.915	3.912	3.867
Ca	0.381	0.363	0.430	0.375	0.387	0.386	0.387	0.334
Na	0.000	0.000	0.004	0.007	0.004	0.003	0.013	0.000
Fe2+	4.226	4.257	4.129	4.274	3.889	4.037	4.073	4.025
Fe3+	0.078	0.077	0.064	0.091	0.274	0.077	0.089	0.127
Mg	1.298	1.277	1.339	1.192	1.515	1.486	1.444	1.458
Mn	0.144	0.141	0.128	0.147	0.131	0.124	0.131	0.127
Ti	0.000	0.001	0.006	0.000	0.007	0.012	0.005	0.000
Y	0.000	0.000	0.000	0.000	0.005	0.006	0.006	0.003
Cr	0.009	0.005	0.001	0.003	0.000	0.000	0.002	0.000
Zr	0.000	0.002	0.001	0.003	0.002	0.004	0.003	0.000
Zn	0.010	0.003	0.000	0.004	0.000	0.001	0.000	0.003
End-members (%)								
Almandin	69.9	70.5	68.6	71.4	65.3	67.0	67.5	67.7
Pyrope	21.5	21.2	22.2	19.9	25.5	24.7	24.0	24.5
Grossular	4.1	3.9	5.4	3.9	0.0	4.2	4.0	2.4
Sperssartine	2.4	2.3	2.1	2.5	2.2	2.1	2.2	2.1
Andradite	1.9	1.9	1.7	2.3	7.0	2.1	2.3	3.2
X(Ca)	0.064	0.061	0.072	0.064	0.065	0.065	0.065	0.057
Fe#	0.767	0.771	0.756	0.784	0.727	0.733	0.740	0.737
radius(%)	0.0	36.5	70.7	100.0	0.0	31.2	63.4	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	4041b1Grt1	4041b1Grt2	4041b1Grt3	4041b1Grt4	4041b1Grt5	4041b1Grt6	4041b1Grt7	4041b1Grt8
Localisation	Core	Mantle	Rim	Core	Mantle	Rim	Core	Mantle-core
Oxydes (wt.%)								
SiO2	38.311	38.739	38.380	38.633	38.504	38.059	38.530	38.488
Al2O3	21.408	21.355	21.478	21.480	21.254	21.296	21.659	21.600
Na2O	0.001	0.000	0.008	0.000	0.028	0.000	0.012	0.004
CaO	1.217	1.175	1.194	1.190	1.226	1.199	1.148	1.216
FeO	30.478	30.250	30.836	29.954	29.968	32.454	30.110	29.963
Fe2O3	0.704	0.828	0.585	0.764	0.927	0.559	0.537	0.497
MgO	7.697	7.709	7.535	8.103	7.888	6.354	8.180	8.189
MnO	0.759	0.776	0.781	0.750	0.774	0.928	0.793	0.695
TiO2	0.000	0.041	0.047	0.000	0.026	0.000	0.000	0.052
Y2O3	0.033	0.030	0.000	0.000	0.000	0.000	0.002	0.000
Cr2O3	0.000	0.000	0.021	0.021	0.021	0.079	0.021	0.018
ZrO2	0.050	0.012	0.000	0.044	0.000	0.008	0.015	0.000
ZnO	0.020	0.000	0.079	0.035	0.000	0.000	0.008	0.000
Total	100.678	100.915	100.944	100.974	100.616	100.936	101.015	100.722
Cations*								
Si	5.960	5.999	5.961	5.973	5.981	5.963	5.955	5.960
Al	3.925	3.898	3.932	3.914	3.891	3.932	3.945	3.942
Ca	0.203	0.195	0.199	0.197	0.204	0.201	0.190	0.202
Na	0.000	0.000	0.002	0.000	0.008	0.000	0.004	0.001
Fe2+	3.966	3.918	4.006	3.873	3.893	4.252	3.892	3.880
Fe3+	0.082	0.096	0.068	0.089	0.108	0.066	0.062	0.058
Mg	1.785	1.780	1.745	1.868	1.827	1.484	1.885	1.890
Mn	0.100	0.102	0.103	0.098	0.102	0.123	0.104	0.091
Ti	0.000	0.005	0.005	0.000	0.003	0.000	0.000	0.006
Y	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Cr	0.000	0.000	0.003	0.003	0.003	0.010	0.003	0.002
Zr	0.004	0.001	0.000	0.003	0.000	0.001	0.001	0.000
Zn	0.002	0.000	0.009	0.004	0.000	0.000	0.001	0.000
End-members (%)								
Almandin	65.5	65.4	66.2	64.2	64.6	70.2	64.1	64.0
Pyrope	29.5	29.7	28.9	30.9	30.3	24.5	31.1	31.2
Grossular	1.3	0.7	1.4	1.0	0.6	1.5	1.5	1.7
Sperssartine	1.7	1.7	1.7	1.6	1.7	2.0	1.7	1.5
Andradite	2.0	2.5	1.8	2.2	2.7	1.6	1.5	1.5
X(Ca)	0.034	0.033	0.033	0.033	0.034	0.034	0.032	0.034
Fe#	0.692	0.690	0.698	0.677	0.684	0.743	0.675	0.674
radius(%)	0.0	48.3	100.0	0.0	41.7	100.0	0.0	35.1

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	4041b1Grt9	4041b1Grt10	4041b1Grt11	4041b1Grt12	4041b1Grt13	4041b1Grt14	4041b1Grt15	4041b1Grt16
Localisation	Mantle-rim	Rim	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle
Oxydes (wt.%)								
SiO2	38.536	38.141	39.077	38.814	38.561	38.392	38.625	38.416
Al2O3	21.430	21.179	21.485	21.411	21.381	21.236	21.402	21.383
Na2O	0.008	0.010	0.000	0.020	0.006	0.002	0.021	0.015
CaO	1.217	1.183	1.205	1.202	1.195	1.184	1.181	1.218
FeO	30.190	31.125	29.809	29.813	30.509	32.539	29.851	30.131
Fe2O3	0.763	0.745	0.862	0.803	0.782	0.747	0.806	0.701
MgO	7.921	6.994	8.014	8.010	7.615	6.131	8.121	7.942
MnO	0.725	0.851	0.750	0.700	0.804	0.928	0.730	0.676
TiO2	0.000	0.000	0.000	0.021	0.005	0.000	0.005	0.000
Y2O3	0.000	0.000	0.019	0.012	0.000	0.000	0.000	0.000
Cr2O3	0.035	0.021	0.009	0.024	0.012	0.029	0.050	0.074
ZrO2	0.000	0.017	0.033	0.006	0.000	0.058	0.000	0.000
ZnO	0.069	0.000	0.032	0.007	0.000	0.012	0.000	0.000
Total	100.894	100.266	101.295	100.843	100.870	101.258	100.792	100.556
Cations*								
Si	5.971	5.981	6.012	6.001	5.984	5.996	5.979	5.970
Al	3.913	3.914	3.896	3.901	3.910	3.909	3.905	3.916
Ca	0.202	0.199	0.199	0.199	0.199	0.198	0.196	0.203
Na	0.002	0.003	0.000	0.006	0.002	0.001	0.006	0.005
Fe2+	3.912	4.082	3.835	3.855	3.959	4.250	3.865	3.916
Fe3+	0.089	0.088	0.100	0.093	0.091	0.088	0.094	0.082
Mg	1.830	1.635	1.838	1.846	1.762	1.427	1.874	1.840
Mn	0.095	0.113	0.098	0.092	0.106	0.123	0.096	0.089
Ti	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.000
Y	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000
Cr	0.004	0.003	0.001	0.003	0.001	0.004	0.006	0.009
Zr	0.000	0.001	0.002	0.000	0.000	0.004	0.000	0.000
Zn	0.008	0.000	0.004	0.001	0.000	0.001	0.000	0.000
End-members (%)								
Almandin	64.8	67.7	64.2	64.4	65.7	70.9	64.1	64.8
Pyrope	30.3	27.1	30.8	30.8	29.2	23.8	31.1	30.4
Grossular	1.0	1.1	0.8	0.9	1.0	1.0	0.7	1.1
Sperssartine	1.6	1.9	1.6	1.5	1.8	2.1	1.6	1.5
Andradite	2.2	2.2	2.5	2.4	2.3	2.2	2.4	2.0
X(Ca)	0.034	0.033	0.034	0.033	0.033	0.033	0.033	0.034
Fe#	0.684	0.716	0.679	0.679	0.695	0.751	0.676	0.683
radius(%)	69.9	100.0	0.0	28.3	79.0	100.0	0.0	46.6

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	4041b1Grt17	4081A-Grt1	4081A-Grt2	4081A-Grt3	4081A-Grt4	4081A-Grt5	4081A-Grt6	4081A-Grt7
Localisation	Rim	Core	Mantle	Rim	Core	Mantle	Rim	Core
Oxydes (wt.%)								
SiO2	37.895	37.876	37.279	37.298	37.549	37.735	37.684	37.685
Al2O3	21.073	20.356	20.469	20.548	20.778	20.549	20.521	20.490
Na2O	0.007	0.023	0.002	0.000	0.000	0.030	0.001	0.013
CaO	1.153	5.170	4.844	5.346	4.596	4.821	5.044	4.959
FeO	32.054	29.218	29.750	30.191	29.694	29.249	29.436	30.198
Fe2O3	0.696	1.456	1.099	1.032	0.970	1.224	1.283	1.192
MgO	6.257	3.579	3.752	3.253	4.270	4.180	3.943	3.462
MnO	1.084	2.336	2.382	2.214	2.328	2.239	2.247	2.253
TiO2	0.057	0.000	0.046	0.000	0.000	0.026	0.046	0.000
Y2O3	0.000	0.100	0.058	0.058	0.082	0.037	0.085	0.015
Cr2O3	0.009	0.000	0.026	0.020	0.038	0.044	0.000	0.093
ZrO2	0.064	0.000	0.000	0.000	0.040	0.000	0.028	0.008
ZnO	0.000	0.000	0.037	0.000	0.053	0.020	0.015	0.000
Total	100.349	100.114	99.744	99.960	100.398	100.154	100.333	100.368
Cations*								
Si	5.972	6.029	5.971	5.973	5.960	5.994	5.987	6.001
Al	3.914	3.819	3.864	3.878	3.887	3.847	3.842	3.845
Ca	0.195	0.882	0.831	0.917	0.782	0.820	0.859	0.846
Na	0.002	0.007	0.001	0.000	0.000	0.009	0.000	0.004
Fe2+	4.225	3.889	3.985	4.044	3.942	3.885	3.911	4.021
Fe3+	0.083	0.174	0.132	0.124	0.116	0.146	0.153	0.143
Mg	1.470	0.849	0.896	0.777	1.010	0.990	0.934	0.822
Mn	0.145	0.315	0.323	0.300	0.313	0.301	0.302	0.304
Ti	0.007	0.000	0.006	0.000	0.000	0.003	0.006	0.000
Y	0.000	0.008	0.005	0.005	0.007	0.003	0.007	0.001
Cr	0.001	0.000	0.003	0.003	0.005	0.006	0.000	0.012
Zr	0.005	0.000	0.000	0.000	0.003	0.000	0.002	0.001
Zn	0.000	0.000	0.004	0.000	0.006	0.002	0.002	0.000
End-members (%)								
Almandin	70.1	65.5	66.1	67.0	65.2	64.8	65.2	67.1
Pyrope	24.4	14.3	14.9	12.9	16.7	16.5	15.6	13.7
Grossular	1.0	10.5	10.3	12.0	9.9	9.8	10.3	10.3
Sperssartine	2.4	5.3	5.4	5.0	5.2	5.0	5.0	5.1
Andradite	2.2	4.4	3.4	3.1	2.9	3.7	3.9	3.6
X(Ca)	0.033	0.154	0.144	0.158	0.135	0.142	0.149	0.147
Fe#	0.744	0.824	0.819	0.841	0.798	0.800	0.810	0.833
radius(%)	100.0	0.0	51.6	100.0	0.0	60.9	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	4081A-Grt8	4081A-Grt9	4081A-Grt10	4081A-Grt11	4081A-Grt12	5030B1Grt1	5030B1Grt2	5030B1Grt3
Localisation	Mantle	Rim	Core	Mantle	Rim	Core	Mantle	Rim
Oxydes (wt.%)								
SiO2	37.456	37.758	37.714	37.249	37.709	38.428	38.452	37.999
Al2O3	20.496	20.646	20.449	20.540	20.435	21.690	21.558	21.083
Na2O	0.000	0.012	0.019	0.000	0.016	0.032	0.014	0.019
CaO	5.022	6.147	4.910	4.711	5.154	1.188	1.158	1.123
FeO	29.833	29.704	29.092	30.097	30.151	29.013	29.213	31.975
Fe2O3	1.098	1.013	1.284	1.037	1.303	0.554	0.621	0.683
MgO	3.705	3.040	4.085	3.852	3.416	9.057	8.748	6.543
MnO	2.212	2.005	2.207	2.241	2.127	0.589	0.566	0.678
TiO2	0.000	0.051	0.026	0.051	0.046	0.046	0.000	0.010
Y2O3	0.043	0.000	0.119	0.038	0.078	0.011	0.000	0.000
Cr2O3	0.129	0.029	0.059	0.023	0.061	0.023	0.035	0.087
ZrO2	0.022	0.024	0.000	0.018	0.018	0.000	0.000	0.014
ZnO	0.047	0.027	0.046	0.000	0.031	0.090	0.052	0.000
Total	100.063	100.456	100.010	99.857	100.545	100.721	100.417	100.214
Cations*								
Si	5.979	6.002	6.001	5.960	5.997	5.928	5.954	5.982
Al	3.856	3.868	3.835	3.873	3.830	3.944	3.934	3.911
Ca	0.859	1.047	0.837	0.808	0.878	0.196	0.192	0.189
Na	0.000	0.004	0.006	0.000	0.005	0.010	0.004	0.006
Fe2+	3.982	3.949	3.871	4.027	4.010	3.743	3.783	4.209
Fe3+	0.132	0.121	0.154	0.125	0.156	0.064	0.072	0.081
Mg	0.882	0.720	0.969	0.919	0.810	2.083	2.019	1.535
Mn	0.299	0.270	0.297	0.304	0.286	0.077	0.074	0.090
Ti	0.000	0.006	0.003	0.006	0.006	0.005	0.000	0.001
Y	0.004	0.000	0.010	0.003	0.007	0.001	0.000	0.000
Cr	0.016	0.004	0.007	0.003	0.008	0.003	0.004	0.011
Zr	0.002	0.002	0.000	0.001	0.001	0.000	0.000	0.001
Zn	0.006	0.003	0.005	0.000	0.004	0.010	0.006	0.000
End-members (%)								
Almandin	66.1	66.0	64.8	66.5	67.0	61.4	62.3	69.9
Pyrope	14.6	12.0	16.2	15.2	13.5	34.2	33.3	25.5
Grossular	10.6	14.2	9.9	10.0	10.4	1.4	1.3	0.8
Sperssartine	5.0	4.5	5.0	5.0	4.8	1.3	1.2	1.5
Andradite	3.3	3.1	3.9	3.2	4.0	1.7	1.8	2.0
X(Ca)	0.148	0.181	0.145	0.139	0.152	0.032	0.032	0.032
Fe#	0.821	0.848	0.803	0.817	0.835	0.644	0.654	0.735
radius(%)	42.2	100.0	0.0	53.5	100.0	0.0	49.0	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	5030B1Grt4	5030B1Grt5	5030B1Grt6	5030B1Grt7	5030B1Grt8	5030B1Grt9	5030B1Grt10	5030B1Grt11
Localisation	Core	Mantle	Rim	Core	Mantle	Rim	Core	Mantle
Oxydes (wt.%)								
SiO2	38.538	38.451	38.241	38.779	38.692	38.381	38.317	38.153
Al2O3	21.753	21.774	21.554	21.824	21.573	21.381	21.585	21.558
Na2O	0.022	0.000	0.009	0.013	0.023	0.023	0.009	0.007
CaO	1.188	1.110	1.139	1.145	1.137	1.188	1.123	1.067
FeO	29.891	29.710	31.543	30.114	30.245	31.695	29.289	29.612
Fe2O3	0.394	0.232	0.283	0.421	0.627	0.566	0.464	0.482
MgO	8.410	8.487	7.123	8.349	8.031	6.894	8.750	8.586
MnO	0.597	0.580	0.566	0.565	0.581	0.604	0.542	0.550
TiO2	0.000	0.000	0.051	0.000	0.010	0.031	0.000	0.000
Y2O3	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr2O3	0.053	0.053	0.000	0.029	0.000	0.020	0.070	0.026
ZrO2	0.000	0.008	0.014	0.043	0.000	0.000	0.000	0.000
ZnO	0.029	0.000	0.000	0.033	0.000	0.000	0.000	0.045
Total	100.897	100.405	100.523	101.315	100.919	100.783	100.149	100.086
Cations*								
Si	5.951	5.957	5.971	5.964	5.982	5.987	5.948	5.938
Al	3.959	3.976	3.967	3.956	3.931	3.931	3.949	3.954
Ca	0.197	0.184	0.190	0.189	0.188	0.199	0.187	0.178
Na	0.006	0.000	0.003	0.004	0.007	0.007	0.003	0.002
Fe2+	3.860	3.850	4.119	3.873	3.910	4.135	3.802	3.854
Fe3+	0.046	0.027	0.033	0.049	0.073	0.066	0.054	0.056
Mg	1.936	1.960	1.658	1.914	1.851	1.603	2.025	1.992
Mn	0.078	0.076	0.075	0.074	0.076	0.080	0.071	0.073
Ti	0.000	0.000	0.006	0.000	0.001	0.004	0.000	0.000
Y	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr	0.006	0.006	0.000	0.004	0.000	0.003	0.009	0.003
Zr	0.000	0.001	0.001	0.003	0.000	0.000	0.000	0.000
Zn	0.003	0.000	0.000	0.004	0.000	0.000	0.000	0.005
End-members (%)								
Almandin	63.6	63.4	68.2	64.0	64.9	68.8	62.5	63.2
Pyrope	31.9	32.3	27.5	31.6	30.7	26.7	33.3	32.7
Grossular	2.0	2.2	2.2	1.8	1.3	1.5	1.5	1.5
Sperssartine	1.3	1.3	1.2	1.2	1.3	1.3	1.2	1.2
Andradite	1.1	0.7	0.9	1.2	1.8	1.7	1.3	1.4
X(Ca)	0.033	0.031	0.032	0.031	0.031	0.033	0.031	0.029
Fe#	0.667	0.663	0.714	0.671	0.681	0.722	0.654	0.661
radius(%)	0.0	46.2	100.0	0.0	47.8	100.0	0.0	53.4

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	5030B1Grt12	6078A-Grt1	6078A-Grt2	6078A-Grt3	6078A-Grt4	6078A-Grt5	6078A-Grt6	6078A-Grt7
Localisation	Rim	Core	Mantle	Rim	Core	Mantle	Rim	Core
Oxydes (wt.%)								
SiO2	38.616	38.152	38.187	38.150	37.936	38.090	38.032	38.255
Al2O3	21.349	20.853	20.822	20.920	20.991	20.999	20.838	20.954
Na2O	0.007	0.012	0.020	0.009	0.002	0.011	0.018	0.000
CaO	1.179	4.955	4.941	5.620	4.763	4.841	5.959	5.033
FeO	31.057	29.638	29.647	30.141	29.833	29.374	29.481	29.304
Fe2O3	0.661	1.095	1.068	0.907	0.829	0.840	0.998	0.898
MgO	7.237	4.777	4.717	4.017	4.901	5.018	4.007	4.911
MnO	0.558	1.092	1.083	1.001	1.101	1.102	1.020	1.074
TiO2	0.046	0.036	0.057	0.098	0.000	0.031	0.016	0.103
Y2O3	0.000	0.000	0.000	0.019	0.000	0.006	0.033	0.000
Cr2O3	0.029	0.038	0.053	0.021	0.062	0.035	0.000	0.024
ZrO2	0.033	0.004	0.000	0.037	0.010	0.006	0.010	0.039
ZnO	0.003	0.072	0.034	0.037	0.000	0.016	0.000	0.000
Total	100.775	100.724	100.629	100.977	100.428	100.369	100.412	100.595
Cations*								
Si	6.004	5.996	6.005	5.999	5.978	5.993	6.006	6.004
Al	3.912	3.862	3.859	3.877	3.899	3.894	3.878	3.876
Ca	0.196	0.834	0.832	0.947	0.804	0.816	1.008	0.846
Na	0.002	0.004	0.006	0.003	0.001	0.003	0.005	0.000
Fe2+	4.038	3.895	3.899	3.964	3.932	3.865	3.893	3.846
Fe3+	0.077	0.129	0.126	0.107	0.098	0.099	0.119	0.106
Mg	1.677	1.119	1.106	0.942	1.151	1.177	0.943	1.149
Mn	0.074	0.145	0.144	0.133	0.147	0.147	0.136	0.143
Ti	0.005	0.004	0.007	0.012	0.000	0.004	0.002	0.012
Y	0.000	0.000	0.000	0.002	0.000	0.000	0.003	0.000
Cr	0.004	0.005	0.007	0.003	0.008	0.004	0.000	0.003
Zr	0.002	0.000	0.000	0.003	0.001	0.000	0.001	0.003
Zn	0.000	0.008	0.004	0.004	0.000	0.002	0.000	0.000
End-members (%)								
Almandin	67.5	65.0	65.2	66.3	65.2	64.4	65.1	64.4
Pyrope	28.0	18.7	18.5	15.8	19.1	19.6	15.8	19.2
Grossular	1.1	10.5	10.4	12.8	10.7	10.9	13.8	11.1
Sperssartine	1.2	2.4	2.4	2.2	2.4	2.5	2.3	2.4
Andradite	2.0	3.3	3.3	2.9	2.4	2.5	3.0	2.9
X(Ca)	0.033	0.141	0.141	0.160	0.135	0.138	0.171	0.144
Fe#	0.708	0.780	0.782	0.810	0.776	0.769	0.807	0.772
radius(%)	100.0	0.0	49.5	100.0	0.0	60.5	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6078A-Grt8	6078A-Grt9	6078A-Grt10	6078A-Grt11	6078A-Grt12	6080A-Grt1	6080A-Grt2	6080A-Grt3
Localisation	Mantle	Rim	Core	Mantle	Rim	Core	Mantle-core	Mantle-rim
Oxydes (wt.%)								
SiO2	37.928	37.872	38.231	38.095	38.323	37.877	37.635	37.733
Al2O3	20.939	20.901	20.867	21.048	21.008	20.533	20.412	20.538
Na2O	0.011	0.000	0.021	0.013	0.000	0.012	0.019	0.011
CaO	5.557	6.978	4.958	5.012	5.434	7.191	7.256	7.145
FeO	29.423	29.517	28.826	28.644	28.380	28.973	28.290	28.560
Fe2O3	0.892	0.742	1.282	0.881	0.997	1.446	1.597	1.346
MgO	4.516	3.341	5.536	5.581	5.244	3.435	3.977	3.870
MnO	0.967	0.902	0.896	0.923	1.026	1.064	1.024	1.128
TiO2	0.047	0.057	0.010	0.047	0.021	0.000	0.068	0.161
Y2O3	0.000	0.000	0.031	0.000	0.002	0.012	0.054	0.000
Cr2O3	0.000	0.044	0.012	0.015	0.000	0.000	0.000	0.000
ZrO2	0.022	0.010	0.000	0.006	0.018	0.000	0.002	0.000
ZnO	0.107	0.037	0.008	0.000	0.000	0.000	0.000	0.000
Total	100.409	100.401	100.678	100.265	100.453	100.543	100.334	100.492
Cations*								
Si	5.982	5.995	5.985	5.979	6.003	5.994	5.960	5.965
Al	3.892	3.899	3.850	3.893	3.879	3.829	3.810	3.827
Ca	0.939	1.183	0.832	0.843	0.912	1.219	1.231	1.210
Na	0.003	0.000	0.006	0.004	0.000	0.004	0.006	0.003
Fe2+	3.881	3.908	3.774	3.759	3.718	3.834	3.747	3.776
Fe3+	0.106	0.088	0.151	0.104	0.118	0.172	0.190	0.160
Mg	1.062	0.788	1.292	1.306	1.225	0.810	0.939	0.912
Mn	0.129	0.121	0.119	0.123	0.136	0.143	0.137	0.151
Ti	0.006	0.007	0.001	0.005	0.002	0.000	0.008	0.019
Y	0.000	0.000	0.003	0.000	0.000	0.001	0.005	0.000
Cr	0.000	0.006	0.001	0.002	0.000	0.000	0.000	0.000
Zr	0.002	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Zn	0.012	0.004	0.001	0.000	0.000	0.000	0.000	0.000
End-members (%)								
Almandin	64.6	65.2	62.7	62.4	62.1	63.8	61.9	62.5
Pyrope	17.7	13.2	21.5	21.7	20.5	13.5	15.5	15.1
Grossular	12.9	17.2	10.0	11.2	12.2	16.0	15.4	15.6
Sperssartine	2.2	2.0	2.0	2.0	2.3	2.4	2.3	2.5
Andradite	2.7	2.3	3.8	2.7	3.0	4.3	4.8	4.3
X(Ca)	0.158	0.200	0.139	0.141	0.154	0.205	0.205	0.202
Fe#	0.787	0.834	0.749	0.745	0.755	0.829	0.804	0.809
radius(%)	45.2	100.0	0.0	59.0	100.0	0.0	33.0	72.9

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6080A-Grt4	6080A-Grt5	6080A-Grt6	6080A-Grt7	6080A-Grt8	6080A-Grt9	6080A-Grt10	6080A-Grt11
Localisation	Rim	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle-core	Mantle-rim
Oxydes (wt.%)								
SiO2	37.559	38.300	37.859	37.574	37.481	37.662	37.537	37.526
Al2O3	20.548	20.581	20.424	20.662	20.450	20.529	20.564	20.485
Na2O	0.036	0.018	0.010	0.006	0.008	0.022	0.000	0.016
CaO	7.405	7.196	7.208	7.134	7.463	7.158	7.170	7.058
FeO	29.267	28.076	27.755	28.842	29.392	28.317	28.201	28.643
Fe2O3	1.216	1.546	1.550	1.288	1.310	1.406	1.335	1.385
MgO	3.081	4.141	4.106	3.855	3.000	4.016	4.136	3.892
MnO	1.081	1.005	1.030	0.989	1.092	1.068	1.001	1.089
TiO2	0.042	0.119	0.000	0.000	0.067	0.089	0.047	0.078
Y2O3	0.000	0.000	0.029	0.055	0.060	0.000	0.000	0.000
Cr2O3	0.027	0.015	0.059	0.012	0.038	0.024	0.000	0.045
ZrO2	0.002	0.026	0.063	0.000	0.000	0.047	0.026	0.000
ZnO	0.007	0.000	0.000	0.038	0.004	0.062	0.000	0.052
Total	100.271	101.023	100.093	100.455	100.365	100.400	100.017	100.269
Cations*								
Si	5.975	6.001	5.991	5.950	5.966	5.958	5.954	5.953
Al	3.852	3.800	3.809	3.856	3.836	3.827	3.844	3.830
Ca	1.262	1.208	1.222	1.210	1.273	1.213	1.218	1.200
Na	0.011	0.006	0.003	0.002	0.003	0.007	0.000	0.005
Fe2+	3.894	3.679	3.673	3.819	3.913	3.746	3.741	3.800
Fe3+	0.146	0.182	0.185	0.153	0.157	0.167	0.159	0.165
Mg	0.731	0.967	0.969	0.910	0.712	0.947	0.978	0.920
Mn	0.146	0.133	0.138	0.133	0.147	0.143	0.135	0.146
Ti	0.005	0.014	0.000	0.000	0.008	0.011	0.006	0.009
Y	0.000	0.000	0.002	0.005	0.005	0.000	0.000	0.000
Cr	0.003	0.002	0.007	0.001	0.005	0.003	0.000	0.006
Zr	0.000	0.002	0.005	0.000	0.000	0.004	0.002	0.000
Zn	0.001	0.000	0.000	0.004	0.001	0.007	0.000	0.006
End-members (%)								
Almandin	64.6	61.5	61.2	62.9	64.8	62.0	61.6	62.7
Pyrope	12.1	16.2	16.1	15.0	11.8	15.7	16.1	15.2
Grossular	17.1	15.2	15.6	16.1	16.9	15.6	16.0	15.3
Sperssartine	2.4	2.2	2.3	2.2	2.4	2.4	2.2	2.4
Andradite	3.7	4.8	4.6	3.8	4.0	4.3	4.0	4.2
X(Ca)	0.212	0.203	0.205	0.201	0.213	0.203	0.203	0.200
Fe#	0.844	0.796	0.795	0.811	0.849	0.802	0.796	0.808
radius(%)	100.0	0.0	34.0	70.4	100.0	0.0	43.5	81.4

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6080A-Grt12	6080A-Grt13	6080A-Grt15	6080A-Grt16	6084A-Grt1	6084A-Grt2	6084A-Grt3	6084A-Grt4
Localisation	Rim	Core	Mantle	Rim	Core	Mantle-core	Mantle-rim	Rim
Oxydes (wt.%)								
SiO2	37.812	37.797	37.715	37.390	38.700	38.446	38.227	38.038
Al2O3	20.711	20.447	20.359	20.629	21.132	21.211	21.105	20.765
Na2O	0.009	0.009	0.023	0.027	0.000	0.001	0.000	0.000
CaO	7.160	7.244	7.210	7.102	1.522	1.430	1.446	1.560
FeO	29.100	28.282	28.489	29.480	29.480	29.882	30.737	31.964
Fe2O3	1.025	1.556	1.625	1.064	1.001	0.701	0.781	0.966
MgO	3.445	4.093	3.836	3.345	7.551	7.403	6.837	5.560
MnO	1.168	0.988	0.970	1.110	0.838	0.846	0.909	0.986
TiO2	0.135	0.115	0.047	0.057	0.000	0.005	0.031	0.000
Y2O3	0.000	0.000	0.015	0.000	0.000	0.012	0.022	0.022
Cr2O3	0.059	0.042	0.054	0.068	0.000	0.061	0.000	0.000
ZrO2	0.043	0.000	0.020	0.000	0.057	0.000	0.000	0.000
ZnO	0.010	0.000	0.025	0.000	0.000	0.008	0.000	0.031
Total	100.677	100.573	100.388	100.272	100.281	100.006	100.095	99.892
Cations*								
Si	5.976	5.965	5.973	5.949	6.024	6.009	5.999	6.028
Al	3.858	3.803	3.800	3.869	3.877	3.907	3.904	3.878
Ca	1.212	1.225	1.223	1.211	0.254	0.240	0.243	0.265
Na	0.003	0.003	0.007	0.008	0.000	0.000	0.000	0.000
Fe2+	3.846	3.733	3.773	3.923	3.837	3.906	4.034	4.236
Fe3+	0.122	0.185	0.194	0.127	0.117	0.083	0.092	0.115
Mg	0.812	0.963	0.906	0.793	1.752	1.725	1.600	1.314
Mn	0.156	0.132	0.130	0.150	0.110	0.112	0.121	0.132
Ti	0.016	0.014	0.006	0.007	0.000	0.001	0.004	0.000
Y	0.000	0.000	0.001	0.000	0.000	0.001	0.002	0.002
Cr	0.007	0.005	0.007	0.009	0.000	0.008	0.000	0.000
Zr	0.003	0.000	0.002	0.000	0.004	0.000	0.000	0.000
Zn	0.001	0.000	0.003	0.000	0.000	0.001	0.000	0.004
End-members (%)								
Almandin	63.9	61.8	62.6	64.6	64.5	65.3	67.3	71.2
Pyrope	13.5	15.9	15.0	13.1	29.4	28.8	26.7	22.1
Grossular	16.5	15.2	15.2	16.4	1.3	1.7	1.7	1.6
Sperssartine	2.6	2.2	2.2	2.5	1.9	1.9	2.0	2.2
Andradite	3.3	4.8	4.9	3.3	3.0	2.1	2.4	2.9
X(Ca)	0.204	0.204	0.204	0.202	0.043	0.041	0.041	0.045
Fe#	0.828	0.799	0.810	0.834	0.690	0.696	0.718	0.766
radius(%)	100.0	0.0	82.1	100.0	0.0	34.2	72.9	100.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6084A-Grt5	6084A-Grt6	6084A-Grt7	6084A-Grt8	6084A-Grt9	6084A-Grt10	6084A-Grt11	6084A-Grt12
Localisation	Core	mantle	Rim	Core	mantle	Rim	Core	mantle
Oxydes (wt.%)								
SiO2	38.199	38.039	38.030	38.056	38.011	38.066	38.025	38.090
Al2O3	21.146	21.158	21.132	21.603	21.104	21.125	21.209	20.906
Na2O	0.029	0.019	0.029	0.008	0.000	0.000	0.000	0.029
CaO	1.554	1.498	1.485	1.519	1.521	1.460	1.567	1.513
FeO	30.908	30.964	32.248	32.351	31.885	33.091	31.791	31.602
Fe2O3	0.810	0.712	0.605	0.167	0.722	0.614	0.510	0.884
MgO	6.769	6.799	5.896	6.168	6.232	5.470	6.280	6.098
MnO	0.859	0.828	0.982	0.943	0.889	1.009	0.875	0.970
TiO2	0.000	0.000	0.072	0.000	0.000	0.061	0.062	0.067
Y2O3	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.001
Cr2O3	0.000	0.000	0.017	0.000	0.044	0.055	0.052	0.023
ZrO2	0.016	0.014	0.022	0.000	0.000	0.018	0.025	0.002
ZnO	0.000	0.000	0.007	0.016	0.000	0.033	0.000	0.011
Total	100.290	100.031	100.532	100.831	100.408	101.002	100.396	100.196
Cations*								
Si	5.989	5.980	5.986	5.962	5.981	5.986	5.978	6.004
Al	3.908	3.920	3.920	3.989	3.913	3.915	3.930	3.884
Ca	0.261	0.252	0.250	0.255	0.256	0.246	0.264	0.256
Na	0.009	0.006	0.009	0.002	0.000	0.000	0.000	0.009
Fe2+	4.053	4.071	4.245	4.239	4.196	4.352	4.180	4.166
Fe3+	0.096	0.084	0.072	0.020	0.085	0.073	0.060	0.105
Mg	1.582	1.593	1.383	1.440	1.462	1.282	1.472	1.433
Mn	0.114	0.110	0.131	0.125	0.119	0.134	0.117	0.130
Ti	0.000	0.000	0.008	0.000	0.000	0.007	0.007	0.008
Y	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Cr	0.000	0.000	0.002	0.000	0.005	0.007	0.007	0.003
Zr	0.001	0.001	0.002	0.000	0.000	0.001	0.002	0.000
Zn	0.000	0.000	0.001	0.002	0.000	0.004	0.000	0.001
End-members (%)								
Almandin	67.4	67.6	70.7	70.0	69.6	72.4	69.3	69.7
Pyrope	26.3	26.4	23.0	23.8	24.2	21.3	24.4	24.0
Grossular	2.0	2.1	2.1	3.7	2.0	1.9	2.5	1.4
Sperssartine	1.9	1.8	2.2	2.1	2.0	2.2	1.9	2.2
Andradite	2.4	2.1	1.9	0.5	2.1	1.9	1.6	2.8
X(Ca)	0.044	0.042	0.042	0.043	0.043	0.042	0.044	0.043
Fe#	0.722	0.721	0.756	0.747	0.744	0.774	0.741	0.746
radius(%)	0.0	46.0	100.0	0.0	54.6	100.0	0.0	53.2

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6084A-Grt13	6117A-Grt1	6117A-Grt2	6117A-Grt3	6117A-Grt4	6117A-Grt5	6117A-Grt6	6117A-Grt7
Localisation	Rim	Rim	Core	Rim	Core	Mantle	Rim	Core
Oxydes (wt.%)								
SiO2	37.735	38.215	38.190	38.345	38.187	38.419	38.132	38.097
Al2O3	21.188	20.706	20.695	20.721	20.570	20.619	20.490	20.687
Na2O	0.006	0.027	0.029	0.014	0.017	0.023	0.013	0.007
CaO	1.477	7.101	6.966	6.933	7.087	6.970	7.074	7.009
FeO	33.155	28.070	27.585	27.430	26.871	27.036	28.322	27.275
Fe2O3	0.382	1.220	1.193	1.183	1.461	1.515	1.367	1.330
MgO	5.344	3.850	4.289	4.335	4.672	4.604	3.711	4.699
MnO	0.912	1.201	1.143	1.117	1.140	1.108	1.173	1.037
TiO2	0.015	0.026	0.057	0.057	0.005	0.000	0.000	0.036
Y2O3	0.000	0.000	0.060	0.038	0.000	0.049	0.046	0.000
Cr2O3	0.000	0.059	0.083	0.044	0.074	0.024	0.186	0.036
ZrO2	0.039	0.053	0.000	0.000	0.002	0.020	0.000	0.000
ZnO	0.000	0.041	0.025	0.000	0.000	0.000	0.000	0.000
Total	100.253	100.569	100.315	100.217	100.086	100.387	100.514	100.213
Cations*								
Si	5.979	6.015	6.011	6.030	6.010	6.027	6.017	5.993
Al	3.957	3.841	3.839	3.840	3.815	3.812	3.811	3.835
Ca	0.251	1.198	1.175	1.168	1.195	1.172	1.196	1.181
Na	0.002	0.008	0.009	0.004	0.005	0.007	0.004	0.002
Fe2+	4.393	3.695	3.631	3.607	3.537	3.547	3.738	3.588
Fe3+	0.046	0.144	0.141	0.140	0.173	0.179	0.162	0.157
Mg	1.262	0.903	1.006	1.016	1.096	1.077	0.873	1.102
Mn	0.122	0.160	0.152	0.149	0.152	0.147	0.157	0.138
Ti	0.002	0.003	0.007	0.007	0.001	0.000	0.000	0.004
Y	0.000	0.000	0.005	0.003	0.000	0.004	0.004	0.000
Cr	0.000	0.007	0.010	0.006	0.009	0.003	0.023	0.004
Zr	0.003	0.004	0.000	0.000	0.000	0.002	0.000	0.000
Zn	0.000	0.005	0.003	0.000	0.000	0.000	0.000	0.000
End-members (%)								
Almandin	72.9	62.1	60.9	60.8	59.2	59.7	62.7	59.7
Pyrope	20.9	15.2	16.9	17.1	18.3	18.1	14.6	18.4
Grossular	3.0	16.2	15.7	15.8	15.4	15.1	15.4	15.5
Sperssartine	2.0	2.7	2.6	2.5	2.5	2.5	2.6	2.3
Andradite	1.2	3.7	3.7	3.6	4.4	4.5	4.1	4.0
X(Ca)	0.042	0.204	0.200	0.199	0.202	0.199	0.203	0.199
Fe#	0.778	0.807	0.786	0.783	0.768	0.772	0.814	0.769
radius(%)	100.0	0.0	58.3	100.0	0.0	46.6	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6117A-Grt8	6117A-Grt9	6117A-Grt10	6117A-Grt11	6117A-Grt12	6117A-Grt13	6129A-Grt1	6129A-Grt2
Localisation	Mantle	Rim	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle-core
Oxydes (wt.%)								
SiO2	38.434	38.152	38.461	38.368	38.458	38.179	37.495	37.015
Al2O3	20.805	20.437	21.162	20.782	20.930	20.613	20.934	20.928
Na2O	0.024	0.000	0.015	0.018	0.017	0.000	0.000	0.010
CaO	6.973	7.028	7.037	7.000	6.967	7.010	1.691	1.761
FeO	27.279	27.668	26.915	26.438	26.869	27.051	33.022	32.825
Fe2O3	1.340	1.598	0.973	1.394	1.200	1.401	0.657	0.549
MgO	4.653	4.162	5.211	5.176	5.055	4.664	5.106	5.250
MnO	1.072	1.228	0.977	1.061	1.029	1.116	1.190	1.255
TiO2	0.010	0.000	0.057	0.042	0.062	0.067	0.000	0.000
Y2O3	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.013
Cr2O3	0.000	0.092	0.000	0.000	0.000	0.036	0.032	0.015
ZrO2	0.000	0.036	0.028	0.014	0.018	0.028	0.023	0.000
ZnO	0.000	0.000	0.000	0.117	0.000	0.078	0.030	0.000
Total	100.590	100.401	100.836	100.410	100.623	100.243	100.180	99.621
Cations*								
Si	6.016	6.012	5.986	6.001	6.003	6.003	5.965	5.926
Al	3.838	3.796	3.882	3.831	3.850	3.820	3.925	3.949
Ca	1.169	1.187	1.173	1.173	1.165	1.181	0.288	0.302
Na	0.007	0.000	0.004	0.005	0.005	0.000	0.000	0.003
Fe2+	3.571	3.646	3.503	3.458	3.507	3.557	4.393	4.395
Fe3+	0.158	0.189	0.114	0.164	0.141	0.166	0.079	0.066
Mg	1.086	0.978	1.209	1.207	1.176	1.093	1.211	1.253
Mn	0.142	0.164	0.129	0.140	0.136	0.149	0.160	0.170
Ti	0.001	0.000	0.007	0.005	0.007	0.008	0.000	0.000
Y	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Cr	0.000	0.011	0.000	0.000	0.000	0.004	0.004	0.002
Zr	0.000	0.003	0.002	0.001	0.001	0.002	0.002	0.000
Zn	0.000	0.000	0.000	0.014	0.000	0.009	0.004	0.000
End-members (%)								
Almandin	59.8	61.0	58.3	57.9	58.7	59.5	72.6	71.8
Pyrope	18.2	16.4	20.1	20.2	19.7	18.3	20.0	20.5
Grossular	15.6	14.8	16.5	15.4	15.8	15.3	2.7	3.3
Sperssartine	2.4	2.7	2.1	2.4	2.3	2.5	2.7	2.8
Andradite	4.0	4.8	2.9	4.2	3.7	4.3	2.0	1.6
X(Ca)	0.198	0.201	0.197	0.198	0.197	0.200	0.049	0.050
Fe#	0.771	0.793	0.746	0.746	0.753	0.769	0.785	0.779
radius(%)	57.5	100.0	0.0	50.1	78.6	100.0	0.0	37.3

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6129A-Grt3	6129A-Grt4	6129A-Grt5	6129A-Grt6	6129A-Grt7	6129A-Grt8	6129A-Grt9	6129A-Grt10
Localisation	Mantle-rim	Rim	Core	Mantle-core	Mantle-rim	Rim	Core	Mantle-core
Oxydes (wt.%)								
SiO2	37.705	37.782	37.584	37.689	37.230	37.209	37.762	38.222
Al2O3	20.922	20.955	20.810	20.808	20.712	20.676	20.904	21.016
Na2O	0.019	0.008	0.004	0.009	0.028	0.017	0.000	0.004
CaO	1.794	3.850	3.153	2.929	2.938	3.721	3.178	3.147
FeO	32.626	31.206	31.802	31.897	32.140	32.563	31.235	31.328
Fe2O3	0.679	0.694	0.889	0.803	0.855	0.798	0.791	0.922
MgO	5.238	4.484	4.640	4.633	4.661	3.644	5.159	5.308
MnO	1.131	1.258	1.316	1.185	1.189	1.307	1.067	1.097
TiO2	0.041	0.000	0.000	0.000	0.000	0.000	0.041	0.077
Y2O3	0.011	0.000	0.008	0.055	0.065	0.025	0.000	0.000
Cr2O3	0.076	0.047	0.009	0.047	0.058	0.056	0.044	0.047
ZrO2	0.051	0.000	0.000	0.014	0.000	0.049	0.018	0.012
ZnO	0.046	0.000	0.005	0.040	0.000	0.000	0.000	0.034
Total	100.339	100.284	100.220	100.109	99.876	100.065	100.199	101.214
Cations*								
Si	5.977	5.988	5.974	5.992	5.950	5.962	5.977	5.985
Al	3.909	3.914	3.898	3.899	3.901	3.905	3.900	3.879
Ca	0.305	0.654	0.537	0.499	0.503	0.639	0.539	0.528
Na	0.006	0.002	0.001	0.003	0.009	0.005	0.000	0.001
Fe2+	4.325	4.136	4.227	4.241	4.296	4.364	4.135	4.103
Fe3+	0.081	0.083	0.106	0.096	0.103	0.096	0.094	0.109
Mg	1.238	1.059	1.099	1.098	1.110	0.870	1.217	1.239
Mn	0.152	0.169	0.177	0.160	0.161	0.177	0.143	0.146
Ti	0.005	0.000	0.000	0.000	0.000	0.000	0.005	0.009
Y	0.001	0.000	0.001	0.005	0.006	0.002	0.000	0.000
Cr	0.009	0.006	0.001	0.006	0.007	0.007	0.006	0.006
Zr	0.004	0.000	0.000	0.001	0.000	0.004	0.001	0.001
Zn	0.005	0.000	0.001	0.005	0.000	0.000	0.000	0.004
End-members (%)								
Almandin	71.9	68.7	70.0	70.7	70.8	72.1	68.6	68.3
Pyrope	20.6	17.6	18.2	18.3	18.3	14.4	20.2	20.6
Grossular	2.7	8.7	6.2	5.8	5.6	8.0	6.3	5.7
Sperssartine	2.5	2.8	2.9	2.7	2.7	2.9	2.4	2.4
Andradite	2.1	2.1	2.6	2.4	2.5	2.4	2.4	2.9
X(Ca)	0.052	0.111	0.091	0.085	0.084	0.108	0.091	0.089
Fe#	0.779	0.798	0.796	0.796	0.797	0.835	0.775	0.770
radius(%)	66.8	100.0	0.0	36.8	36.8	100.0	0.0	39.1

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6129A-Grt11	6129A-Grt12	6129A-Grt13	6129A-Grt14	6129A-Grt15	6129A-Grt16	6129A-Grt17	6129A-Grt18	6129A-Grt19	6129A-Grt20
Localisation	Mantle-rim	Rim	Core	Mantle-core	Mantle	Mantle-rim	Rim	Core	Mantle-core	Mantle-rim
Oxydes (wt.%)										
SiO2	37.565	37.521	37.545	37.732	37.746	37.788	37.796	38.134	37.882	37.814
Al2O3	20.912	20.902	21.177	21.140	21.012	20.973	20.597	20.928	21.082	20.864
Na2O	0.012	0.006	0.014	0.007	0.002	0.010	0.000	0.016	0.000	0.018
CaO	3.428	3.722	1.488	1.563	1.712	2.280	4.123	2.041	2.744	2.467
FeO	31.258	30.910	32.362	32.377	32.218	31.855	31.378	32.053	31.637	32.278
Fe2O3	0.695	0.786	0.412	0.600	0.748	0.695	1.084	0.939	0.555	0.752
MgO	4.910	4.867	5.821	5.743	5.587	5.192	3.918	5.262	5.041	4.625
MnO	1.107	1.178	1.257	1.226	1.322	1.274	1.264	1.311	1.268	1.364
TiO2	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
Y2O3	0.000	0.000	0.000	0.007	0.003	0.000	0.035	0.002	0.027	0.007
Cr2O3	0.059	0.000	0.079	0.000	0.000	0.000	0.047	0.000	0.047	0.029
ZrO2	0.000	0.004	0.033	0.000	0.000	0.012	0.000	0.000	0.033	0.000
ZnO	0.000	0.069	0.000	0.000	0.002	0.008	0.000	0.003	0.003	0.021
Total	99.951	99.965	100.188	100.395	100.352	100.087	100.242	100.689	100.319	100.249
Cations*										
Si	5.969	5.962	5.946	5.962	5.971	5.991	6.012	6.010	5.991	6.005
Al	3.916	3.915	3.953	3.937	3.917	3.919	3.861	3.887	3.929	3.905
Ca	0.584	0.634	0.253	0.265	0.290	0.387	0.703	0.345	0.465	0.420
Na	0.004	0.002	0.004	0.002	0.001	0.003	0.000	0.005	0.000	0.006
Fe2+	4.154	4.108	4.287	4.279	4.262	4.224	4.174	4.224	4.184	4.287
Fe3+	0.083	0.094	0.049	0.071	0.089	0.083	0.130	0.111	0.066	0.090
Mg	1.163	1.153	1.374	1.353	1.318	1.227	0.929	1.236	1.189	1.095
Mn	0.149	0.159	0.169	0.164	0.177	0.171	0.170	0.175	0.170	0.184
Ti	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Y	0.000	0.000	0.000	0.001	0.000	0.000	0.003	0.000	0.002	0.001
Cr	0.007	0.000	0.010	0.000	0.000	0.000	0.006	0.000	0.006	0.004
Zr	0.000	0.000	0.003	0.000	0.000	0.001	0.000	0.000	0.003	0.000
Zn	0.000	0.008	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.003
End-members (%)										
Almandin	68.7	67.9	70.5	70.6	70.5	70.3	69.9	70.6	69.7	71.6
Pyrope	19.2	19.1	22.6	22.3	21.8	20.4	15.6	20.7	19.8	18.3
Grossular	7.4	8.1	2.7	2.6	2.6	4.4	8.4	3.0	5.9	4.6
Sperssartine	2.5	2.6	2.8	2.7	2.9	2.9	2.9	2.9	2.8	3.1
Andradite	2.1	2.3	1.2	1.8	2.2	2.1	3.3	2.8	1.7	2.3
X(Ca)	0.098	0.107	0.043	0.045	0.049	0.066	0.120	0.059	0.079	0.072
Fe#	0.783	0.783	0.758	0.761	0.766	0.777	0.820	0.776	0.780	0.798
radius(%)	73.9	100.0	0.0	37.0	60.6	84.0	100.0	0.0	35.2	74.5

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6129A-Grt21	6129A-Grt22	6129A-Grt23	6129A-Grt24	6129A-Grt25	6150A-Grt1	6150A-Grt3	6150A-Grt4	6150A-Grt5	6150A-Grt6	6150A-Grt7
Localisation	Rim	Rim	Mantle-rim	Mantle-core	Core	Core	Rim	Rim	Mantle	Core	Core
Oxydes (wt.%)											
SiO2	37.400	37.705	37.728	37.884	37.690	38.705	38.073	38.414	38.390	38.595	38.341
Al2O3	20.602	21.136	21.385	21.413	21.390	21.116	21.046	21.106	21.281	21.304	21.182
Na2O	0.003	0.014	0.004	0.025	0.017	0.013	0.002	0.015	0.005	0.018	0.012
CaO	3.949	4.075	2.559	2.169	2.079	1.480	1.436	1.425	1.463	1.467	1.494
FeO	32.466	30.925	32.868	32.534	32.470	29.808	32.208	30.929	30.282	30.063	30.718
Fe2O3	0.802	0.448	0.121	0.288	0.135	1.004	0.693	0.883	0.761	0.730	0.891
MgO	3.090	4.438	4.570	5.191	5.252	7.476	5.699	6.839	7.383	7.464	6.983
MnO	1.508	1.354	1.329	1.279	1.317	0.851	1.067	0.985	0.876	0.911	0.956
TiO2	0.000	0.005	0.000	0.000	0.000	0.026	0.000	0.026	0.031	0.087	0.020
Y2O3	0.000	0.037	0.037	0.066	0.040	0.000	0.050	0.003	0.000	0.003	0.000
Cr2O3	0.015	0.000	0.044	0.000	0.058	0.055	0.000	0.081	0.020	0.032	0.000
ZrO2	0.033	0.000	0.000	0.022	0.000	0.010	0.002	0.008	0.000	0.000	0.000
ZnO	0.000	0.015	0.089	0.043	0.000	0.000	0.000	0.000	0.055	0.000	0.104
Total	99.868	100.152	100.734	100.914	100.448	100.544	100.276	100.714	100.547	100.674	100.701
Cations*											
Si	6.006	5.980	5.968	5.965	5.959	6.017	6.009	5.998	5.982	5.996	5.984
Al	3.899	3.950	3.987	3.974	3.986	3.869	3.915	3.884	3.908	3.901	3.897
Ca	0.679	0.692	0.434	0.366	0.352	0.247	0.243	0.238	0.244	0.244	0.250
Na	0.001	0.004	0.001	0.008	0.005	0.004	0.000	0.005	0.001	0.005	0.004
Fe2+	4.360	4.102	4.348	4.284	4.293	3.875	4.251	4.038	3.946	3.906	4.010
Fe3+	0.097	0.054	0.014	0.034	0.016	0.117	0.082	0.104	0.089	0.085	0.105
Mg	0.740	1.049	1.078	1.218	1.238	1.733	1.341	1.592	1.715	1.729	1.625
Mn	0.205	0.182	0.178	0.171	0.176	0.112	0.143	0.130	0.116	0.120	0.126
Ti	0.000	0.001	0.000	0.000	0.000	0.003	0.000	0.003	0.004	0.010	0.002
Y	0.000	0.003	0.003	0.005	0.003	0.000	0.004	0.000	0.000	0.000	0.000
Cr	0.002	0.000	0.005	0.000	0.007	0.007	0.000	0.010	0.003	0.004	0.000
Zr	0.003	0.000	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.000	0.000
Zn	0.000	0.002	0.010	0.005	0.000	0.000	0.000	0.000	0.006	0.000	0.012
End-members (%)											
Almandin	72.9	68.1	72.0	70.9	70.9	65.0	71.1	67.3	65.6	65.2	66.7
Pyrope	12.4	17.4	17.9	20.2	20.4	29.1	22.4	26.5	28.5	28.9	27.0
Grossular	8.9	10.2	6.7	5.2	5.2	0.9	2.0	1.1	1.7	1.6	1.5
Sperssartine	3.4	3.0	3.0	2.8	2.9	1.9	2.4	2.2	1.9	2.0	2.1
Andradite	2.4	1.3	0.4	0.9	0.4	3.0	2.1	2.6	2.3	2.3	2.7
X(Ca)	0.117	0.118	0.074	0.062	0.060	0.042	0.041	0.040	0.041	0.041	0.042
Fe#	0.856	0.797	0.802	0.779	0.777	0.694	0.762	0.720	0.699	0.696	0.714
radius(%)	100.0	100.0	73.1	31.8	0.0	0.0	100.0	0.0	48.9	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6150A-Grt8	6150A-Grt9	6150A-Grt10	6150A-Grt11	6150A-Grt12	6150A-Grt13	6150A-Grt14	6150A-Grt15	6150A-Grt16	6150A-Grt17	6210A-Grt1
Localisation	Mantle	Rim	Core	Mantle	Rim	Core	Mantle-core	Mantle	Mantle-rim	Rim	Core
Oxydes (wt.%)											
SiO2	38.277	38.071	38.290	38.306	37.921	38.140	38.230	38.368	38.213	38.021	39.484
Al2O3	21.169	21.126	21.070	20.921	21.013	21.025	21.184	21.102	21.141	20.873	21.785
Na2O	0.017	0.026	0.016	0.027	0.009	0.000	0.025	0.015	0.000	0.015	0.007
CaO	1.430	1.442	1.432	1.432	1.409	1.500	1.444	1.406	1.381	1.408	1.131
FeO	31.019	31.772	30.584	30.860	32.589	30.397	30.542	30.807	31.216	31.996	25.806
Fe2O3	0.773	0.826	0.986	1.067	0.680	0.872	0.685	0.775	0.554	0.875	0.922
MgO	6.888	6.385	7.068	6.709	5.588	6.976	6.901	6.650	6.316	5.701	11.024
MnO	0.982	1.063	0.920	0.921	1.077	1.060	0.954	0.990	1.093	1.216	0.392
TiO2	0.108	0.000	0.031	0.000	0.010	0.072	0.021	0.031	0.062	0.026	0.000
Y2O3	0.000	0.011	0.018	0.054	0.000	0.008	0.000	0.000	0.003	0.000	0.000
Cr2O3	0.023	0.043	0.000	0.064	0.055	0.000	0.009	0.000	0.006	0.015	0.000
ZrO2	0.000	0.000	0.000	0.031	0.027	0.000	0.064	0.021	0.000	0.027	0.010
ZnO	0.015	0.000	0.047	0.010	0.036	0.000	0.025	0.000	0.012	0.015	0.060
Total	100.701	100.765	100.462	100.402	100.414	100.050	100.084	100.165	99.997	100.188	100.621
Cations*											
Si	5.979	5.970	5.987	6.005	5.991	5.988	5.996	6.018	6.015	6.010	5.992
Al	3.897	3.905	3.883	3.865	3.913	3.890	3.916	3.901	3.922	3.889	3.897
Ca	0.239	0.242	0.240	0.241	0.239	0.252	0.243	0.236	0.233	0.238	0.184
Na	0.005	0.008	0.005	0.008	0.003	0.000	0.008	0.005	0.000	0.004	0.002
Fe2+	4.052	4.167	4.000	4.045	4.306	3.991	4.006	4.041	4.110	4.230	3.275
Fe3+	0.091	0.097	0.116	0.126	0.081	0.103	0.081	0.091	0.066	0.104	0.105
Mg	1.604	1.493	1.648	1.568	1.316	1.633	1.614	1.555	1.482	1.343	2.494
Mn	0.130	0.141	0.122	0.122	0.144	0.141	0.127	0.132	0.146	0.163	0.050
Ti	0.013	0.000	0.004	0.000	0.001	0.009	0.002	0.004	0.007	0.003	0.000
Y	0.000	0.001	0.002	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Cr	0.003	0.005	0.000	0.008	0.007	0.000	0.001	0.000	0.001	0.002	0.000
Zr	0.000	0.000	0.000	0.002	0.002	0.000	0.005	0.002	0.000	0.002	0.001
Zn	0.002	0.000	0.005	0.001	0.004	0.000	0.003	0.000	0.001	0.002	0.007
End-members (%)											
Almandin	67.3	69.0	66.6	67.7	71.7	66.4	66.9	67.8	68.9	70.8	54.6
Pyrope	26.7	24.7	27.4	26.2	21.9	27.2	27.0	26.1	24.8	22.5	41.5
Grossular	1.3	1.5	1.0	0.7	1.8	1.4	1.9	1.6	2.1	1.3	0.4
Sperssartine	2.2	2.3	2.0	2.1	2.4	2.4	2.1	2.2	2.4	2.7	0.8
Andradite	2.5	2.4	3.0	3.2	2.0	2.7	2.1	2.4	1.8	2.7	2.6
X(Ca)	0.040	0.041	0.040	0.041	0.040	0.043	0.041	0.040	0.040	0.041	0.031
Fe#	0.719	0.739	0.711	0.724	0.768	0.712	0.715	0.724	0.736	0.761	0.572
radius(%)	45.3	100.0	0.0	42.9	100.0	0.0	20.2	49.7	77.4	100.0	0.0

Table S1-5: Garnet chemistry

*Formula proportion of cations based on 24 O atoms

Analysis#	6210A-Grt2	6210A-Grt3	6210A-Grt4	6210A-Grt5	6210A-Grt6	6210A-Grt7	6210A-Grt8	6210A-Grt9	6210A-Grt10	6210A-Grt11	6210A-Grt12
Localisation	Mantle	Rim	Core	Mantle	Rim	Core	Mantle	Rim	Core	Mantle	Rim
Oxydes (wt.%)											
SiO2	39.706	39.312	39.455	39.691	39.630	39.040	39.319	39.186	38.840	39.247	39.268
Al2O3	21.815	21.408	21.805	21.894	21.742	21.879	21.743	21.638	21.744	21.647	21.600
Na2O	0.000	0.015	0.022	0.020	0.033	0.040	0.013	0.026	0.010	0.017	0.009
CaO	1.177	1.185	1.147	1.181	1.225	1.123	1.113	1.167	1.158	1.121	1.122
FeO	25.766	25.480	25.864	25.995	25.899	25.935	25.848	27.253	26.543	26.338	26.897
Fe2O3	0.867	1.271	1.015	0.870	1.040	0.553	0.855	0.873	0.766	0.769	0.984
MgO	11.081	10.915	11.151	10.894	10.953	11.042	10.995	10.034	10.692	10.445	10.255
MnO	0.422	0.447	0.440	0.419	0.396	0.364	0.459	0.429	0.438	0.420	0.467
TiO2	0.140	0.000	0.000	0.000	0.036	0.109	0.052	0.052	0.010	0.036	0.005
Y2O3	0.005	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr2O3	0.003	0.009	0.000	0.000	0.030	0.000	0.003	0.024	0.000	0.038	0.035
ZrO2	0.008	0.000	0.033	0.019	0.000	0.004	0.000	0.037	0.037	0.027	0.000
ZnO	0.019	0.006	0.024	0.052	0.061	0.096	0.000	0.044	0.011	0.000	0.033
Total	101.009	100.068	100.956	101.035	101.045	100.185	100.400	100.763	100.249	100.105	100.675
Cations*											
Si	5.998	6.003	5.973	6.001	5.994	5.956	5.983	5.984	5.945	6.002	5.992
Al	3.884	3.853	3.891	3.901	3.876	3.934	3.899	3.894	3.922	3.902	3.884
Ca	0.191	0.194	0.186	0.191	0.198	0.184	0.181	0.191	0.190	0.184	0.183
Na	0.000	0.004	0.007	0.006	0.010	0.012	0.004	0.008	0.003	0.005	0.003
Fe2+	3.255	3.254	3.275	3.287	3.276	3.309	3.289	3.480	3.397	3.369	3.432
Fe3+	0.099	0.146	0.116	0.099	0.118	0.063	0.098	0.100	0.088	0.088	0.113
Mg	2.495	2.485	2.517	2.455	2.470	2.511	2.494	2.284	2.440	2.381	2.333
Mn	0.054	0.058	0.056	0.054	0.051	0.047	0.059	0.055	0.057	0.054	0.060
Ti	0.016	0.000	0.000	0.000	0.004	0.012	0.006	0.006	0.001	0.004	0.001
Y	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr	0.000	0.001	0.000	0.000	0.004	0.000	0.000	0.003	0.000	0.005	0.004
Zr	0.001	0.000	0.002	0.001	0.000	0.000	0.000	0.003	0.003	0.002	0.000
Zn	0.002	0.001	0.003	0.006	0.007	0.011	0.000	0.005	0.001	0.000	0.004
End-members (%)											
Almandin	54.4	54.1	54.3	54.9	54.7	54.8	54.6	57.9	55.9	56.3	57.1
Pyrope	41.7	41.3	41.7	41.0	41.2	41.6	41.4	38.0	40.1	39.8	38.8
Grossular	0.3	0.0	0.2	0.7	0.2	1.2	0.4	0.5	0.9	0.6	0.1
Sperssartine	0.9	1.0	0.9	0.9	0.9	0.8	1.0	0.9	0.9	0.9	1.0
Andradite	2.7	3.6	2.9	2.5	3.0	1.8	2.5	2.6	2.2	2.3	2.8
X(Ca)	0.032	0.032	0.031	0.032	0.033	0.030	0.030	0.032	0.031	0.031	0.031
Fe#	0.570	0.572	0.570	0.576	0.575	0.571	0.572	0.607	0.585	0.589	0.599
radius(%)	58.1	100.0	0.0	39.0	100.0	0.0	47.1	100.0	0.0	44.5	100.0

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	142A-Cpx1	142A-Cpx2	142A-Cpx3	142A-Cpx4	142A-Cpx5	142A-Cpx6	142A-Cpx7	142A-Cpx8	3090A-Cpx1
Localisation	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)
Oxydes (wt.%)									
SiO2	52.398	52.694	51.803	51.999	52.361	52.298	52.174	51.390	51.030
Al2O3	2.064	1.892	2.772	2.361	2.415	1.806	2.312	2.684	1.539
CaO	22.598	22.464	21.185	22.669	22.778	22.606	22.557	22.692	21.337
Na2O	0.507	0.515	0.604	0.566	0.623	0.446	0.499	0.613	0.335
K2O	0.000	0.001	0.000	0.000	0.003	0.003	0.000	0.000	0.000
FeO	9.122	8.579	10.783	8.960	8.926	8.767	8.923	8.878	14.542
MgO	13.611	13.668	13.004	12.881	12.875	13.642	13.070	12.631	10.397
MnO	0.456	0.451	0.543	0.472	0.493	0.480	0.474	0.485	0.216
TiO2	0.221	0.125	0.235	0.324	0.147	0.125	0.295	0.251	0.262
Cr2O3	0.039	0.000	0.000	0.009	0.022	0.039	0.073	0.013	0.021
NiO	0.027	0.000	0.024	0.000	0.008	0.028	0.000	0.000	0.000
Total	101.043	100.389	100.953	100.241	100.651	100.240	100.377	99.637	99.679
Cations*									
Si	1.931	1.951	1.919	1.935	1.939	1.942	1.938	1.923	1.955
Al	0.090	0.083	0.121	0.104	0.105	0.079	0.101	0.118	0.069
Ca	0.892	0.891	0.841	0.904	0.904	0.899	0.898	0.910	0.876
Na	0.036	0.037	0.043	0.041	0.045	0.032	0.036	0.044	0.025
Fe2+	0.210	0.221	0.263	0.229	0.224	0.212	0.238	0.211	0.436
Fe3+	0.071	0.045	0.071	0.050	0.053	0.061	0.039	0.066	0.030
Mg	0.748	0.755	0.718	0.714	0.711	0.755	0.724	0.704	0.594
Mn	0.014	0.014	0.017	0.015	0.015	0.015	0.015	0.015	0.007
Ti	0.006	0.003	0.007	0.009	0.004	0.003	0.008	0.007	0.008
Cr	0.001	0.000	0.000	0.000	0.001	0.001	0.002	0.000	0.001
End-members (%)									
X(Wo)	46.4	46.6	44.4	47.6	47.8	46.7	47.3	48.1	45.2
X(En)	38.9	39.5	37.9	37.7	37.6	39.2	38.1	37.2	30.7
X(Fs)	14.6	13.9	17.6	14.7	14.6	14.1	14.6	14.7	24.1
Fe#	0.273	0.260	0.317	0.281	0.280	0.265	0.277	0.283	0.440

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	3090A-Cpx2	3090A-Cpx3	3090A-Cpx4	3090A-Cpx5	3090A-Cpx6	3090A-Cpx7	4102A-Cpx1	4102A-Cpx2	4102A-Cpx3
Localisation	Matrix (rim)	Inclusion	Inclusion	Matrix (rim)	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (rim)
Oxydes (wt.%)									
SiO2	51.591	51.737	51.343	51.659	51.017	51.670	52.355	52.420	52.388
Al2O3	1.131	1.613	1.689	1.185	1.700	1.223	1.533	1.454	1.415
CaO	22.345	22.601	22.463	21.201	21.062	22.146	22.469	21.883	22.471
Na2O	0.273	0.377	0.349	0.227	0.338	0.300	0.379	0.339	0.366
K2O	0.007	0.000	0.000	0.006	0.001	0.000	0.000	0.000	0.000
FeO	13.348	12.677	12.691	13.682	14.089	13.268	11.285	12.004	11.104
MgO	10.598	10.716	10.598	11.133	10.344	10.742	11.948	11.886	12.097
MnO	0.154	0.197	0.213	0.158	0.213	0.221	0.421	0.464	0.434
TiO2	0.168	0.256	0.329	0.058	0.248	0.168	0.191	0.176	0.161
Cr2O3	0.106	0.009	0.013	0.008	0.000	0.004	0.000	0.000	0.000
NiO	0.048	0.000	0.000	0.031	0.048	0.000	0.000	0.000	0.000
Total	99.769	100.183	99.688	99.348	99.060	99.742	100.581	100.626	100.436
Cations*									
Si	1.971	1.961	1.957	1.979	1.966	1.971	1.962	1.968	1.965
Al	0.051	0.072	0.076	0.053	0.077	0.055	0.068	0.064	0.063
Ca	0.915	0.918	0.917	0.870	0.870	0.905	0.902	0.880	0.903
Na	0.020	0.028	0.026	0.017	0.025	0.022	0.028	0.025	0.027
Fe2+	0.412	0.383	0.388	0.436	0.452	0.408	0.329	0.363	0.323
Fe3+	0.014	0.019	0.016	0.003	0.002	0.015	0.024	0.013	0.025
Mg	0.604	0.606	0.602	0.636	0.594	0.611	0.668	0.665	0.676
Mn	0.005	0.006	0.007	0.005	0.007	0.007	0.013	0.015	0.014
Ti	0.005	0.007	0.009	0.002	0.007	0.005	0.005	0.005	0.005
Cr	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
End-members (%)									
X(Wo)	47.0	47.7	47.7	44.8	45.3	46.7	46.9	45.8	46.8
X(En)	31.0	31.5	31.3	32.7	31.0	31.5	34.7	34.6	35.1
X(Fs)	21.9	20.9	21.0	22.5	23.7	21.8	18.4	19.6	18.1
Fe#	0.414	0.399	0.402	0.408	0.433	0.409	0.346	0.362	0.340

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4102A-Cpx4	4102A-Cpx5	4102A-Cpx6	4102A-Cpx7	4102A-Cpx8	4102A-Cpx9	4107A-Cpx1	4107A-Cpx2	4107A-Cpx3
Localisation	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (rim)	Matrix (rim)
Oxydes (wt.%)									
SiO2	51.943	52.131	51.872	51.885	52.010	51.931	51.965	52.160	52.114
Al2O3	1.487	1.568	1.463	1.389	1.482	1.656	2.493	2.201	2.549
CaO	22.978	22.573	22.180	22.324	22.274	22.488	21.777	22.376	22.552
Na2O	0.355	0.412	0.403	0.378	0.383	0.424	0.752	0.656	0.781
K2O	0.000	0.000	0.000	0.000	0.009	0.000	0.006	0.007	0.003
FeO	11.142	11.198	11.558	10.940	11.604	11.344	8.283	8.337	8.428
MgO	11.844	11.685	12.009	11.853	11.963	11.789	13.271	13.462	13.221
MnO	0.431	0.421	0.454	0.405	0.410	0.395	0.411	0.375	0.432
TiO2	0.176	0.110	0.183	0.022	0.161	0.191	0.309	0.324	0.287
Cr2O3	0.056	0.000	0.017	0.000	0.030	0.073	0.000	0.004	0.022
NiO	0.000	0.000	0.001	0.000	0.016	0.000	0.008	0.001	0.000
Total	100.412	100.098	100.140	99.196	100.342	100.291	99.275	99.903	100.389
Cations*									
Si	1.951	1.964	1.953	1.970	1.955	1.952	1.943	1.939	1.927
Al	0.066	0.070	0.065	0.062	0.066	0.073	0.110	0.096	0.111
Ca	0.924	0.911	0.895	0.908	0.897	0.906	0.872	0.891	0.894
Na	0.026	0.030	0.029	0.028	0.028	0.031	0.055	0.047	0.056
Fe2+	0.303	0.326	0.316	0.323	0.323	0.317	0.217	0.204	0.187
Fe3+	0.047	0.027	0.048	0.024	0.042	0.040	0.041	0.055	0.073
Mg	0.663	0.656	0.674	0.671	0.670	0.661	0.740	0.746	0.729
Mn	0.014	0.013	0.014	0.013	0.013	0.013	0.013	0.012	0.014
Ti	0.005	0.003	0.005	0.001	0.005	0.005	0.009	0.009	0.008
Cr	0.002	0.000	0.001	0.000	0.001	0.002	0.000	0.000	0.001
End-members (%)									
X(Wo)	47.7	47.5	46.3	47.1	46.4	47.1	46.6	47.0	47.5
X(En)	34.2	34.2	34.9	34.8	34.7	34.4	39.5	39.3	38.7
X(Fs)	18.1	18.4	18.8	18.0	18.9	18.5	13.8	13.7	13.8
Fe#	0.345	0.350	0.351	0.341	0.352	0.351	0.259	0.258	0.263

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	4107A-Cpx4	4107A-Cpx5	4107A-Cpx6	4107A-Cpx7	4107A-Cpx8	4107A-Cpx9	4107A-Cpx10	4107A-Cpx11	6080A-Cpx1
Localisation	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (rim)	Inclusion
Oxydes (wt.%)									
SiO2	52.198	52.112	52.633	52.062	52.062	52.095	51.962	52.539	53.209
Al2O3	2.773	2.516	1.965	2.512	2.373	2.613	2.677	2.125	2.184
CaO	22.445	21.841	22.719	21.131	18.977	22.272	21.994	21.950	22.514
Na2O	0.818	0.722	0.631	0.721	0.558	0.727	0.720	0.589	0.335
K2O	0.008	0.000	0.000	0.006	0.010	0.008	0.000	0.000	0.013
FeO	8.522	8.307	8.056	9.461	11.172	8.783	9.344	8.586	11.533
MgO	12.747	13.312	13.815	13.493	14.263	13.180	13.403	13.916	10.994
MnO	0.386	0.429	0.421	0.462	0.518	0.427	0.396	0.407	0.160
TiO2	0.155	0.184	0.236	0.323	0.124	0.235	0.301	0.169	0.161
Cr2O3	0.000	0.000	0.000	0.000	0.055	0.000	0.021	0.000	0.000
NiO	0.009	0.049	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Total	100.061	99.472	100.476	100.171	100.112	100.340	100.818	100.281	101.107
Cations*									
Si	1.939	1.945	1.943	1.933	1.938	1.930	1.917	1.944	1.992
Al	0.121	0.111	0.085	0.110	0.104	0.114	0.116	0.093	0.096
Ca	0.893	0.873	0.898	0.841	0.757	0.884	0.869	0.870	0.903
Na	0.059	0.052	0.045	0.052	0.040	0.052	0.051	0.042	0.024
Fe2+	0.214	0.218	0.187	0.236	0.296	0.207	0.203	0.214	0.361
Fe3+	0.051	0.041	0.062	0.058	0.052	0.065	0.085	0.052	0.000
Mg	0.706	0.741	0.760	0.747	0.792	0.728	0.737	0.768	0.614
Mn	0.012	0.014	0.013	0.015	0.016	0.013	0.012	0.013	0.005
Ti	0.004	0.005	0.007	0.009	0.003	0.007	0.008	0.005	0.005
Cr	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.000
End-members (%)									
X(Wo)	47.9	46.6	47.1	44.7	39.9	46.9	45.9	45.7	48.1
X(En)	37.9	39.5	39.9	39.7	41.7	38.6	38.9	40.3	32.7
X(Fs)	14.2	13.8	13.0	15.6	18.3	14.4	15.2	14.0	19.2
Fe#	0.273	0.259	0.246	0.282	0.305	0.272	0.281	0.257	0.370

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6080A-Cpx2	6080A-Cpx3	6080A-Cpx4	6080A-Cpx5	6080A-Cpx6	6080A-Cpx7	6080A-Cpx8	6080A-Cpx9	6080A-Cpx10
Localisation	Matrix	Matrix	Matrix	Matrix	Grt-margin	Inclusion	Matrix	Matrix	Grt-margin
Oxydes (wt.%)									
SiO2	50.777	51.314	50.870	51.143	52.146	51.532	51.268	51.263	50.837
Al2O3	1.806	1.869	2.089	1.900	1.414	2.213	1.677	1.817	2.096
CaO	17.042	20.035	19.985	21.253	21.354	22.766	20.471	22.167	20.296
Na2O	0.282	0.334	0.303	0.320	0.292	0.424	0.307	0.333	0.345
K2O	0.004	0.001	0.000	0.002	0.007	0.002	0.007	0.003	0.000
FeO	18.337	15.421	15.464	14.422	13.773	12.609	15.003	13.108	15.403
MgO	11.136	10.799	10.784	10.620	11.654	10.667	10.590	10.414	10.662
MnO	0.207	0.204	0.220	0.194	0.158	0.136	0.217	0.213	0.213
TiO2	0.158	0.203	0.239	0.254	0.240	0.248	0.232	0.116	0.333
Cr2O3	0.000	0.013	0.029	0.046	0.000	0.004	0.025	0.013	0.000
NiO	0.040	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.017
Total	99.789	100.196	99.983	100.154	101.038	100.601	99.797	99.447	100.202
Cations*									
Si	1.954	1.956	1.943	1.947	1.959	1.943	1.963	1.961	1.938
Al	0.082	0.084	0.094	0.085	0.063	0.098	0.076	0.082	0.094
Ca	0.703	0.818	0.818	0.867	0.860	0.920	0.840	0.909	0.829
Na	0.021	0.025	0.022	0.024	0.021	0.031	0.023	0.025	0.025
Fe2+	0.568	0.474	0.466	0.431	0.406	0.364	0.473	0.406	0.455
Fe3+	0.022	0.018	0.028	0.028	0.027	0.033	0.008	0.014	0.036
Mg	0.639	0.614	0.614	0.603	0.653	0.599	0.604	0.594	0.606
Mn	0.007	0.007	0.007	0.006	0.005	0.004	0.007	0.007	0.007
Ti	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.003	0.010
Cr	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000
End-members (%)									
X(Wo)	36.4	42.5	42.5	44.9	44.2	48.0	43.6	47.3	43.0
X(En)	33.1	31.9	31.9	31.2	33.6	31.3	31.4	30.9	31.5
X(Fs)	30.6	25.6	25.6	23.8	22.2	20.7	25.0	21.8	25.5
Fe#	0.480	0.445	0.446	0.432	0.399	0.399	0.443	0.414	0.448

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6080A-Cpx11	6117A-Cpx1	6117A-Cpx2	6117A-Cpx3	6117A-Cpx4	6117A-Cpx5	6117A-Cpx6	6117A-Cpx7	6117A-Cpx8
Localisation	Matrix	Inclusion	Matrix (core)	Matrix (rim)	Inclusion	Matrix (core)	Matrix (rim)	Inclusion	Inclusion
Oxydes (wt.%)									
SiO2	50.788	52.329	52.493	51.736	52.308	51.622	52.384	51.730	52.374
Al2O3	1.839	1.492	1.137	1.639	1.258	1.804	1.433	1.802	1.442
CaO	21.517	22.307	23.033	21.562	22.330	20.787	22.841	21.474	22.848
Na2O	0.322	0.310	0.299	0.317	0.289	0.327	0.316	0.331	0.300
K2O	0.003	0.006	0.000	0.000	0.000	0.013	0.000	0.002	0.000
FeO	13.480	11.227	10.914	11.762	10.783	12.205	11.191	12.036	10.391
MgO	10.578	12.103	12.095	11.954	12.917	11.855	11.820	12.197	12.768
MnO	0.159	0.193	0.189	0.175	0.139	0.213	0.140	0.187	0.166
TiO2	0.240	0.182	0.132	0.102	0.183	0.218	0.132	0.262	0.154
Cr2O3	0.008	0.072	0.030	0.000	0.030	0.068	0.043	0.064	0.064
NiO	0.029	0.000	0.000	0.000	0.030	0.000	0.000	0.062	0.004
Total	98.963	100.221	100.322	99.247	100.267	99.112	100.300	100.147	100.511
Cations*									
Si	1.953	1.968	1.971	1.966	1.959	1.968	1.970	1.949	1.955
Al	0.083	0.066	0.050	0.073	0.056	0.081	0.063	0.080	0.063
Ca	0.887	0.899	0.927	0.878	0.896	0.849	0.920	0.867	0.914
Na	0.024	0.023	0.022	0.023	0.021	0.024	0.023	0.024	0.022
Fe2+	0.414	0.344	0.322	0.361	0.301	0.389	0.340	0.350	0.286
Fe3+	0.020	0.009	0.021	0.012	0.037	0.000	0.012	0.029	0.038
Mg	0.607	0.678	0.677	0.677	0.721	0.674	0.663	0.685	0.710
Mn	0.005	0.006	0.006	0.006	0.004	0.007	0.004	0.006	0.005
Ti	0.007	0.005	0.004	0.003	0.005	0.006	0.004	0.007	0.004
Cr	0.000	0.002	0.001	0.000	0.001	0.002	0.001	0.002	0.002
End-members (%)									
X(Wo)	46.0	46.6	47.6	45.5	45.8	44.4	47.6	44.9	46.9
X(En)	31.5	35.1	34.8	35.1	36.9	35.2	34.2	35.5	36.5
X(Fs)	22.5	18.3	17.6	19.4	17.3	20.4	18.2	19.6	16.6
Fe#	0.417	0.342	0.336	0.356	0.319	0.366	0.347	0.356	0.313

Table S1-6: Clinopyroxene chemistry

*Formula proportion of cations based on 8 O atoms

Analysis#	6117A-Cpx9	6117A-Cpx10	6117A-Cpx11	6117A-Cpx12
Localisation	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (rim)
Oxydes (wt.%)				
SiO2	51.134	51.863	52.195	52.555
Al2O3	2.299	1.554	1.723	1.209
CaO	20.353	22.049	22.493	21.960
Na2O	0.376	0.318	0.344	0.296
K2O	0.027	0.000	0.001	0.002
FeO	12.428	12.073	10.826	11.802
MgO	12.115	12.007	11.912	12.402
MnO	0.170	0.179	0.185	0.165
TiO2	0.182	0.139	0.249	0.175
Cr2O3	0.000	0.055	0.021	0.000
NiO	0.000	0.000	0.000	0.013
Total	99.084	100.237	99.949	100.579
Cations*				
Si	1.946	1.953	1.967	1.970
Al	0.103	0.069	0.077	0.053
Ca	0.830	0.890	0.908	0.882
Na	0.028	0.023	0.025	0.022
Fe2+	0.373	0.341	0.340	0.352
Fe3+	0.023	0.039	0.001	0.018
Mg	0.687	0.674	0.669	0.693
Mn	0.005	0.006	0.006	0.005
Ti	0.005	0.004	0.007	0.005
Cr	0.000	0.002	0.001	0.000
End-members (%)				
X(Wo)	43.4	45.8	47.3	45.3
X(En)	35.9	34.7	34.9	35.6
X(Fs)	20.7	19.6	17.8	19.0
Fe#	0.365	0.361	0.338	0.348

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	1121A-Opx1	1121A-Opx2	1121A-Opx3	1121A-Opx4	1121A-Opx5	1121A-Opx6	1121A-Opx7	1121A-Opx8
Localisation	Matrix (core)	Matrix (rim)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (rim)
Oxydes (wt.%)								
SiO2	50.623	50.968	50.558	50.681	50.841	50.877	50.940	51.120
Al2O3	1.088	0.794	0.990	1.049	1.123	0.832	0.965	0.948
CaO	0.504	0.470	0.515	0.477	0.480	0.405	0.516	0.447
Na2O	0.026	0.021	0.011	0.004	0.006	0.022	0.023	0.021
K2O	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000
FeO	30.452	30.334	31.390	30.969	30.903	30.216	30.721	30.650
MgO	15.603	15.715	15.585	15.413	15.495	15.796	15.396	16.013
MnO	0.658	0.643	0.665	0.630	0.642	0.695	0.645	0.676
TiO2	0.000	0.034	0.014	0.076	0.014	0.021	0.117	0.021
Cr2O3	0.000	0.000	0.000	0.051	0.000	0.000	0.000	0.035
NiO	0.051	0.025	0.000	0.000	0.000	0.034	0.000	0.000
Total	99.005	99.004	99.728	99.350	99.509	98.898	99.323	99.931
Cations*								
Si	1.990	2.002	1.976	1.989	1.990	2.000	1.999	1.988
Al	0.050	0.037	0.046	0.049	0.052	0.039	0.045	0.043
Ca	0.021	0.020	0.022	0.020	0.020	0.017	0.022	0.019
Na	0.002	0.002	0.001	0.000	0.000	0.002	0.002	0.002
Fe2+	1.001	0.997	1.023	1.016	1.012	0.993	1.008	0.997
Fe3+	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
Mg	0.914	0.920	0.908	0.902	0.904	0.926	0.900	0.928
Mn	0.022	0.021	0.022	0.021	0.021	0.023	0.021	0.022
Ti	0.000	0.001	0.000	0.002	0.000	0.001	0.003	0.001
Cr	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.001
End-members (%)								
X(Wo)	1.1	1.0	1.1	1.0	1.0	0.9	1.1	1.0
X(En)	47.2	47.5	46.4	46.5	46.7	47.8	46.7	47.8
X(Fs)	51.7	51.5	52.5	52.4	52.3	51.3	52.2	51.3
Fe#	0.523	0.520	0.530	0.530	0.528	0.518	0.528	0.518

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	142A-Opx1	142A-Opx2	142A-Opx3	142A-Opx4	142A-Opx5	142A-Opx6	142A-Opx7	142A-Opx8
Localisation	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)
Oxydes (wt.%)								
SiO2	52.755	52.451	52.803	52.371	52.366	52.127	52.335	52.275
Al2O3	1.087	1.144	0.998	1.157	1.091	1.225	1.135	1.173
CaO	0.542	0.577	0.560	0.591	0.583	0.557	0.602	0.576
Na2O	0.025	0.000	0.016	0.024	0.021	0.008	0.025	0.015
K2O	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
FeO	22.690	22.953	23.166	23.298	23.730	23.382	23.261	23.316
MgO	20.648	20.841	20.828	20.690	21.059	20.589	20.930	20.709
MnO	1.162	1.236	1.189	1.135	1.173	1.234	1.169	1.283
TiO2	0.126	0.000	0.007	0.119	0.042	0.049	0.000	0.070
Cr2O3	0.000	0.000	0.000	0.000	0.000	0.008	0.028	0.000
NiO	0.013	0.000	0.032	0.019	0.000	0.000	0.000	0.019
Total	99.048	99.202	99.599	99.404	100.065	99.179	99.490	99.436
Cations*								
Si	2.000	1.984	1.992	1.980	1.965	1.976	1.974	1.976
Al	0.049	0.051	0.044	0.052	0.048	0.055	0.050	0.052
Ca	0.022	0.023	0.023	0.024	0.023	0.023	0.024	0.023
Na	0.002	0.000	0.001	0.002	0.002	0.001	0.002	0.001
Fe2+	0.719	0.726	0.731	0.737	0.724	0.741	0.732	0.737
Fe3+	0.000	0.000	0.000	0.000	0.020	0.000	0.002	0.000
Mg	1.167	1.175	1.171	1.166	1.178	1.164	1.177	1.167
Mn	0.037	0.040	0.038	0.036	0.037	0.040	0.037	0.041
Ti	0.004	0.000	0.000	0.003	0.001	0.001	0.000	0.002
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
End-members (%)								
X(Wo)	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2
X(En)	61.1	61.1	60.9	60.5	60.5	60.4	60.8	60.5
X(Fs)	37.7	37.7	38.0	38.2	38.3	38.5	37.9	38.2
Fe#	0.381	0.382	0.384	0.387	0.387	0.389	0.384	0.387

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	2112B-Opx5	2112B-Opx6	2112B-Opx7	2112B-Opx9	2112B-Opx12	3090A-Opx1	3090A-Opx4	3090A-Opx5
Localisation	Matrix	Matrix	Matrix	Matrix	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (rim)
Oxydes (wt.%)								
SiO2	52.280	50.429	50.438	50.688	50.606	50.206	50.622	50.347
Al2O3	0.981	0.770	0.951	1.153	0.811	0.796	0.817	0.590
CaO	0.581	0.484	0.533	0.624	0.491	0.631	1.698	0.776
Na2O	0.014	0.004	0.000	0.004	0.018	0.009	0.006	0.011
K2O	0.011	0.003	0.000	0.007	0.000	0.000	0.006	0.000
FeO	31.124	31.649	31.552	31.342	31.267	32.386	31.944	33.434
MgO	15.468	15.078	15.181	15.388	15.373	13.979	13.786	13.588
MnO	0.360	0.373	0.318	0.320	0.352	0.525	0.461	0.473
TiO2	0.014	0.137	0.048	0.185	0.027	0.034	0.138	0.110
Cr2O3	0.000	0.000	0.023	0.051	0.000	0.000	0.000	0.062
NiO	0.000	0.004	0.000	0.004	0.000	0.049	0.020	0.000
Total	100.833	98.931	99.044	99.766	98.945	98.615	99.498	99.391
Cations*								
Si	2.021	1.993	1.988	1.981	1.994	2.004	2.001	2.001
Al	0.045	0.036	0.044	0.053	0.038	0.037	0.038	0.028
Ca	0.024	0.020	0.023	0.026	0.021	0.027	0.072	0.033
Na	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.001
Fe2+	1.006	1.046	1.040	1.025	1.030	1.081	1.056	1.111
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.891	0.888	0.892	0.897	0.903	0.832	0.813	0.805
Mn	0.012	0.012	0.011	0.011	0.012	0.018	0.015	0.016
Ti	0.000	0.004	0.001	0.005	0.001	0.001	0.004	0.003
Cr	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.002
End-members (%)								
X(Wo)	1.3	1.0	1.2	1.3	1.1	1.4	3.7	1.7
X(En)	46.4	45.4	45.6	46.0	46.2	42.9	41.9	41.3
X(Fs)	52.4	53.5	53.2	52.6	52.7	55.7	54.4	57.0
Fe#	0.530	0.541	0.538	0.533	0.533	0.565	0.565	0.580

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	3090A-Opx6	3090A-Opx7	3090A-Opx8	3090A-Opx9	4081A-Opx1	4081A-Opx2	4081A-Opx3	4081A-Opx4
Localisation	Inclusion	Matrix (rim)	Matrix (core)	Inclusion	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (rim)
Oxydes (wt.%)								
SiO2	50.052	50.250	50.594	50.581	50.175	50.090	50.464	50.461
Al2O3	0.658	0.684	0.656	0.555	1.288	0.998	0.769	0.872
CaO	1.132	0.946	0.855	0.712	0.632	0.496	0.501	0.424
Na2O	0.027	0.027	0.007	0.002	0.035	0.019	0.023	0.000
K2O	0.000	0.002	0.000	0.000	0.009	0.005	0.000	0.000
FeO	31.365	32.863	32.862	32.228	32.092	32.614	32.004	32.487
MgO	14.522	13.813	13.883	14.504	13.927	14.374	14.422	14.277
MnO	0.452	0.495	0.484	0.420	0.855	0.877	0.731	0.697
TiO2	0.221	0.055	0.117	0.000	0.014	0.027	0.096	0.041
Cr2O3	0.078	0.000	0.070	0.000	0.015	0.004	0.058	0.000
NiO	0.015	0.002	0.000	0.012	0.000	0.007	0.000	0.015
Total	98.522	99.137	99.528	99.014	99.042	99.511	99.068	99.274
Cations*								
Si	1.990	1.997	2.003	2.005	1.991	1.978	1.999	1.998
Al	0.031	0.032	0.031	0.026	0.060	0.046	0.036	0.041
Ca	0.048	0.040	0.036	0.030	0.027	0.021	0.021	0.018
Na	0.002	0.002	0.001	0.000	0.003	0.001	0.002	0.000
Fe2+	1.043	1.092	1.088	1.068	1.065	1.077	1.060	1.076
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.861	0.818	0.819	0.857	0.824	0.846	0.852	0.843
Mn	0.015	0.017	0.016	0.014	0.029	0.029	0.025	0.023
Ti	0.007	0.002	0.003	0.000	0.000	0.001	0.003	0.001
Cr	0.002	0.000	0.002	0.000	0.000	0.000	0.002	0.000
End-members (%)								
X(Wo)	2.5	2.1	1.9	1.5	1.4	1.1	1.1	0.9
X(En)	44.1	41.9	42.2	43.8	43.0	43.5	44.1	43.5
X(Fs)	53.4	56.0	56.0	54.6	55.6	55.4	54.8	55.6
Fe#	0.548	0.572	0.570	0.555	0.564	0.560	0.555	0.561

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	4081A-Opx6	4081A-Opx7	4102A-Opx2	4102A-Opx3	4102A-Opx5	4102A-Opx6	4102A-Opx7	4102A-Opx8
Localisation	Matrix (rim)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)
Oxydes (wt.%)								
SiO2	50.286	50.253	51.115	50.886	50.918	51.421	50.767	52.131
Al2O3	1.113	1.132	0.834	0.949	0.923	0.681	0.854	0.764
CaO	0.450	0.499	0.617	0.616	0.590	0.609	0.575	0.572
Na2O	0.000	0.012	0.027	0.028	0.022	0.000	0.002	0.004
K2O	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
FeO	32.017	32.231	29.266	29.469	29.309	28.882	29.620	29.368
MgO	14.588	14.283	16.085	15.470	16.043	15.942	15.815	15.759
MnO	0.727	0.740	1.118	1.110	1.120	1.122	1.081	1.105
TiO2	0.048	0.021	0.028	0.069	0.097	0.069	0.021	0.062
Cr2O3	0.054	0.070	0.012	0.000	0.000	0.000	0.008	0.000
NiO	0.000	0.014	0.011	0.000	0.000	0.011	0.064	0.000
Total	99.283	99.255	99.114	98.597	99.022	98.737	98.807	99.765
Cations*								
Si	1.986	1.988	2.000	2.007	1.994	2.021	1.997	2.031
Al	0.052	0.053	0.038	0.044	0.043	0.032	0.040	0.035
Ca	0.019	0.021	0.026	0.026	0.025	0.026	0.024	0.024
Na	0.000	0.001	0.002	0.002	0.002	0.000	0.000	0.000
Fe2+	1.057	1.067	0.958	0.972	0.960	0.949	0.974	0.957
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.859	0.843	0.938	0.910	0.937	0.934	0.927	0.915
Mn	0.024	0.025	0.037	0.037	0.037	0.037	0.036	0.036
Ti	0.001	0.001	0.001	0.002	0.003	0.002	0.001	0.002
Cr	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000
End-members (%)								
X(Wo)	1.0	1.1	1.3	1.4	1.3	1.3	1.3	1.3
X(En)	44.4	43.6	48.8	47.7	48.7	48.9	48.2	48.3
X(Fs)	54.6	55.3	49.8	51.0	50.0	49.7	50.6	50.5
Fe#	0.552	0.559	0.505	0.517	0.506	0.504	0.512	0.511

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	4102A-Opx9	4102A-Opx10	4107A-Opx1	4107A-Opx2	4107A-Opx4	4107A-Opx5	4107A-Opx7	4107A-Opx8
Localisation	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix (rim)	Matrix (core)	Matrix (rim)	Matrix (core)
Oxydes (wt.%)								
SiO2	50.947	51.016	52.862	52.910	53.055	53.133	53.034	53.065
Al2O3	0.723	0.695	1.117	1.062	1.052	1.013	0.970	0.869
CaO	0.544	0.633	0.604	0.578	0.571	0.552	0.547	0.473
Na2O	0.000	0.031	0.027	0.023	0.000	0.009	0.020	0.017
K2O	0.000	0.008	0.000	0.005	0.004	0.006	0.008	0.000
FeO	29.779	29.541	21.149	21.514	21.464	21.026	21.991	21.109
MgO	16.073	16.086	21.752	21.546	21.625	21.982	21.571	21.901
MnO	1.115	1.082	1.092	1.105	1.100	1.078	1.056	1.252
TiO2	0.041	0.000	0.084	0.126	0.063	0.063	0.070	0.000
Cr2O3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036
NiO	0.009	0.018	0.000	0.000	0.006	0.032	0.036	0.000
Total	99.231	99.110	98.687	98.869	98.940	98.894	99.303	98.722
Cations*								
Si	1.994	1.997	1.995	1.997	2.001	2.000	1.996	2.002
Al	0.033	0.032	0.050	0.047	0.047	0.045	0.043	0.039
Ca	0.023	0.027	0.024	0.023	0.023	0.022	0.022	0.019
Na	0.000	0.002	0.002	0.002	0.000	0.001	0.001	0.001
Fe2+	0.974	0.967	0.668	0.679	0.677	0.662	0.692	0.666
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.938	0.939	1.224	1.212	1.216	1.234	1.210	1.232
Mn	0.037	0.036	0.035	0.035	0.035	0.034	0.034	0.040
Ti	0.001	0.000	0.002	0.004	0.002	0.002	0.002	0.000
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
End-members (%)								
X(Wo)	1.2	1.4	1.3	1.2	1.2	1.2	1.1	1.0
X(En)	48.5	48.6	63.9	63.3	63.5	64.3	62.9	64.3
X(Fs)	50.4	50.0	34.8	35.5	35.3	34.5	36.0	34.7
Fe#	0.510	0.507	0.353	0.359	0.358	0.349	0.364	0.351

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	4107A-Opx9	4107A-Opx10	6078A-Opx1	6078A-Opx2	6078A-Opx3	6078A-Opx4	6078A-Opx5	6078A-Opx6
Localisation	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (core)	Matrix (core)
Oxydes (wt.%)								
SiO2	52.859	52.849	50.170	50.332	50.104	50.539	50.989	50.537
Al2O3	1.091	1.102	0.991	0.815	1.109	1.046	0.945	0.941
CaO	0.779	0.573	0.529	0.587	0.977	0.776	0.517	0.534
Na2O	0.034	0.011	0.000	0.021	0.000	0.005	0.003	0.011
K2O	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
FeO	21.538	21.677	33.110	32.785	32.375	32.185	31.161	31.470
MgO	21.742	21.807	13.966	13.875	13.890	14.179	15.664	15.240
MnO	1.014	1.082	0.418	0.412	0.415	0.434	0.374	0.368
TiO2	0.035	0.021	0.000	0.000	0.075	0.055	0.062	0.076
Cr2O3	0.113	0.008	0.054	0.015	0.012	0.000	0.000	0.000
NiO	0.018	0.037	0.004	0.046	0.037	0.000	0.037	0.013
Total	99.223	99.167	99.242	98.888	98.995	99.219	99.752	99.190
Cations*								
Si	1.986	1.988	1.991	2.005	1.991	2.000	1.991	1.989
Al	0.048	0.049	0.046	0.038	0.052	0.049	0.043	0.044
Ca	0.031	0.023	0.022	0.025	0.042	0.033	0.022	0.023
Na	0.002	0.001	0.000	0.002	0.000	0.000	0.000	0.001
Fe2+	0.677	0.682	1.099	1.092	1.076	1.065	1.018	1.036
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	1.218	1.223	0.826	0.824	0.823	0.837	0.912	0.894
Mn	0.032	0.034	0.014	0.014	0.014	0.015	0.012	0.012
Ti	0.001	0.001	0.000	0.000	0.002	0.002	0.002	0.002
Cr	0.003	0.000	0.002	0.000	0.000	0.000	0.000	0.000
End-members (%)								
X(Wo)	1.6	1.2	1.2	1.3	2.1	1.7	1.1	1.2
X(En)	63.2	63.4	42.4	42.4	42.4	43.2	46.7	45.8
X(Fs)	35.1	35.4	56.4	56.3	55.4	55.1	52.2	53.1
Fe#	0.357	0.358	0.571	0.570	0.567	0.560	0.527	0.537

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	6078A-Opx7	6078A-Opx8	6078A-Opx9	6078A-Opx10	6078A-Opx11	6080A-Opx1	6080A-Opx2	6080A-Opx3
Localisation	Matrix (rim)	Matrix (core)	Matrix (rim)	Matrix (rim)	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix
Oxydes (wt.%)								
SiO2	50.701	50.669	51.070	50.892	50.893	50.142	50.018	50.628
Al2O3	1.015	1.128	0.845	1.101	1.233	0.834	0.615	0.777
CaO	0.570	0.579	0.483	0.592	0.568	0.452	0.424	0.688
Na2O	0.010	0.029	0.021	0.028	0.000	0.010	0.031	0.003
K2O	0.007	0.000	0.000	0.000	0.008	0.001	0.006	0.009
FeO	32.266	32.081	30.495	30.797	30.780	32.846	34.190	31.014
MgO	15.030	15.006	16.106	15.718	15.885	13.819	13.448	14.979
MnO	0.397	0.329	0.321	0.388	0.358	0.417	0.448	0.408
TiO2	0.158	0.034	0.000	0.089	0.103	0.137	0.000	0.158
Cr2O3	0.000	0.000	0.000	0.039	0.039	0.124	0.050	0.000
NiO	0.000	0.050	0.026	0.008	0.001	0.000	0.020	0.016
Total	100.154	99.905	99.367	99.652	99.868	98.782	99.250	98.680
Cations*								
Si	1.981	1.984	1.995	1.986	1.981	2.001	1.994	2.005
Al	0.047	0.052	0.039	0.051	0.057	0.039	0.029	0.036
Ca	0.024	0.024	0.020	0.025	0.024	0.019	0.018	0.029
Na	0.001	0.002	0.002	0.002	0.000	0.001	0.002	0.000
Fe2+	1.054	1.050	0.996	1.005	1.002	1.096	1.140	1.027
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.875	0.876	0.938	0.914	0.922	0.822	0.799	0.884
Mn	0.013	0.011	0.011	0.013	0.012	0.014	0.015	0.014
Ti	0.005	0.001	0.000	0.003	0.003	0.004	0.000	0.005
Cr	0.000	0.000	0.000	0.001	0.001	0.004	0.002	0.000
End-members (%)								
X(Wo)	1.2	1.2	1.0	1.3	1.2	1.0	0.9	1.5
X(En)	44.8	44.9	48.0	47.0	47.3	42.4	40.8	45.6
X(Fs)	54.0	53.9	51.0	51.7	51.5	56.6	58.2	52.9
Fe#	0.546	0.545	0.515	0.524	0.521	0.571	0.588	0.537

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	6080A-Opx4	6080A-Opx5	6080A-Opx6	6080A-Opx7	6080A-Opx8	6080A-Opx9	6117A-Opx1	6117A-Opx2
Localisation	Matrix	Matrix	Matrix (core)	Matrix (rim)	Matrix	Matrix	Matrix (core)	Matrix (rim)
Oxydes (wt.%)								
SiO2	50.297	50.377	49.977	50.152	50.241	50.067	51.188	51.395
Al2O3	0.990	0.842	0.869	0.874	0.830	0.901	0.674	0.560
CaO	0.502	0.477	1.253	0.534	0.770	1.105	1.325	0.453
Na2O	0.027	0.000	0.004	0.024	0.012	0.037	0.028	0.040
K2O	0.000	0.000	0.017	0.005	0.000	0.000	0.000	0.000
FeO	32.241	32.440	32.610	32.838	32.814	32.527	28.888	30.763
MgO	14.100	14.244	13.544	13.814	14.111	13.946	16.098	16.153
MnO	0.418	0.420	0.425	0.422	0.445	0.396	0.428	0.403
TiO2	0.116	0.075	0.116	0.014	0.157	0.096	0.131	0.000
Cr2O3	0.004	0.047	0.016	0.000	0.070	0.012	0.000	0.000
NiO	0.011	0.008	0.000	0.036	0.000	0.000	0.000	0.000
Total	98.706	98.930	98.831	98.713	99.450	99.087	98.760	99.767
Cations*								
Si	2.002	2.001	1.994	2.002	1.988	1.987	2.006	2.000
Al	0.046	0.039	0.041	0.041	0.039	0.042	0.031	0.026
Ca	0.021	0.020	0.054	0.023	0.033	0.047	0.056	0.019
Na	0.002	0.000	0.000	0.002	0.001	0.003	0.002	0.003
Fe2+	1.073	1.078	1.088	1.096	1.086	1.080	0.947	1.001
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.837	0.844	0.805	0.822	0.832	0.825	0.940	0.937
Mn	0.014	0.014	0.014	0.014	0.015	0.013	0.014	0.013
Ti	0.003	0.002	0.003	0.000	0.005	0.003	0.004	0.000
Cr	0.000	0.001	0.001	0.000	0.002	0.000	0.000	0.000
End-members (%)								
X(Wo)	1.1	1.0	2.8	1.2	1.7	2.4	2.9	1.0
X(En)	43.3	43.4	41.4	42.3	42.7	42.3	48.4	47.9
X(Fs)	55.6	55.5	55.9	56.5	55.7	55.3	48.7	51.2
Fe#	0.562	0.561	0.575	0.571	0.566	0.567	0.502	0.517

Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

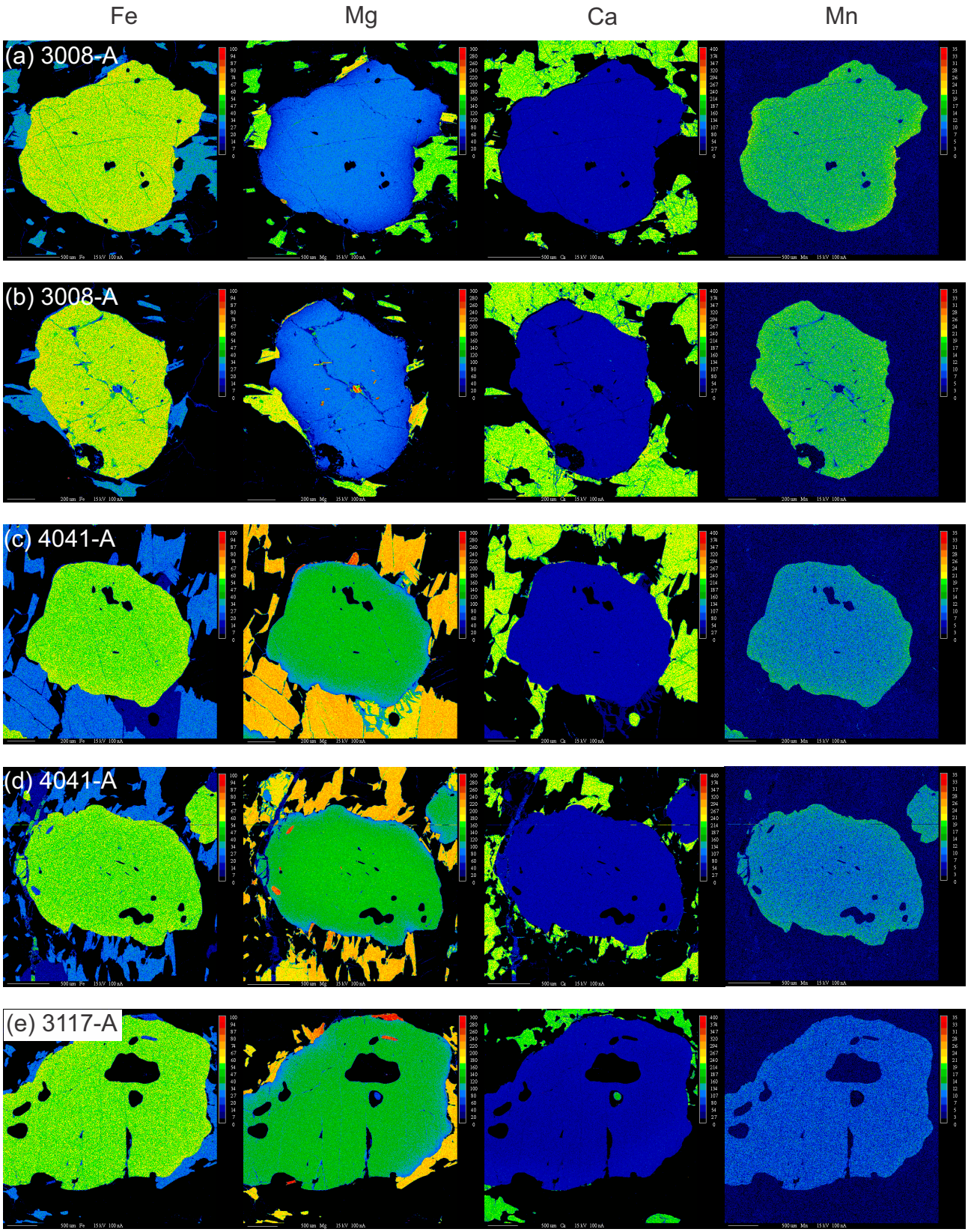
Analysis##	6117A-Opx3	6117A-Opx4	6117A-Opx5	6117A-Opx6	6129A-Opx1	6129A-Opx2	6129A-Opx3	6129A-Opx5
Localisation	Matrix (rim)	Matrix (core)	Inclusion	Inclusion	Matrix (core)	Matrix (core)	Matrix (rim)	Matrix (core)
Oxydes (wt.%)								
SiO2	51.175	51.398	51.376	51.857	50.907	50.608	52.001	50.624
Al2O3	0.792	0.837	0.847	0.642	0.959	0.953	0.842	1.057
CaO	1.093	0.972	1.092	0.551	0.532	0.550	0.472	0.436
Na2O	0.030	0.011	0.023	0.000	0.015	0.011	0.008	0.011
K2O	0.000	0.003	0.011	0.007	0.003	0.000	0.000	0.001
FeO	29.430	29.582	28.359	28.176	31.171	31.228	30.966	31.094
MgO	16.175	16.376	17.457	18.330	15.071	15.390	15.491	15.453
MnO	0.416	0.426	0.358	0.320	0.549	0.558	0.466	0.488
TiO2	0.117	0.007	0.028	0.076	0.055	0.082	0.000	0.034
Cr2O3	0.016	0.067	0.000	0.079	0.023	0.000	0.000	0.016
NiO	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.026
Total	99.244	99.679	99.551	100.038	99.293	99.380	100.254	99.240
Cations*								
Si	1.997	1.996	1.983	1.985	50.907	1.986	2.021	1.988
Al	0.036	0.038	0.039	0.029	0.959	0.044	0.039	0.049
Ca	0.046	0.040	0.045	0.023	0.532	0.023	0.020	0.018
Na	0.002	0.001	0.002	0.000	0.015	0.001	0.001	0.001
Fe2+	0.960	0.961	0.915	0.902	31.171	1.025	1.007	1.021
Fe3+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.941	0.948	1.004	1.046	15.071	0.900	0.898	0.905
Mn	0.014	0.014	0.012	0.010	0.549	0.019	0.015	0.016
Ti	0.003	0.000	0.001	0.002	0.055	0.002	0.000	0.001
Cr	0.000	0.002	0.000	0.002	0.023	0.000	0.000	0.000
End-members (%)								
X(Wo)	2.3	2.1	2.3	1.1	1.1	1.2	1.0	0.9
X(En)	48.3	48.6	51.1	53.1	43.6	46.2	46.7	46.5
X(Fs)	49.3	49.3	46.6	45.8	55.3	52.6	52.3	52.5
Fe#	0.505	0.503	0.477	0.463	0.537	0.532	0.529	0.530

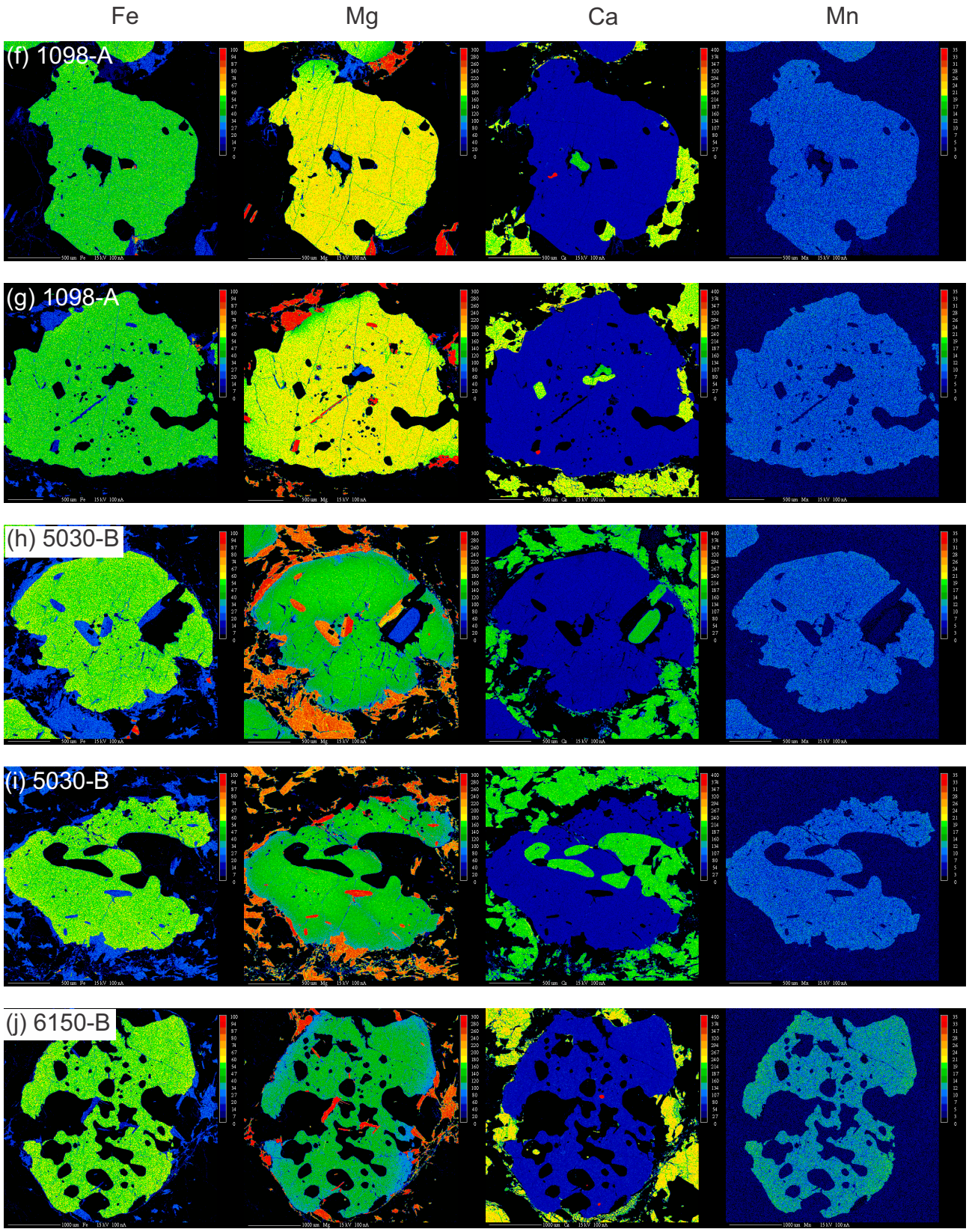
Table S1-7: Orthopyroxene chemistry

*Formula proportion of cations based on 6 O atoms

Analysis##	6129A-Opx7	6129A-Opx2	6129A-Opx10	6129A-Opx11
Localisation	Matrix (core)	Matrix	Matrix (rim)	Matrix
Oxydes (wt.%)				
SiO2	50.317	50.187	50.118	50.651
Al2O3	0.871	1.511	1.648	1.417
CaO	0.538	0.366	0.332	0.364
Na2O	0.013	0.019	0.000	0.012
K2O	0.000	0.000	0.000	0.000
FeO	31.267	30.745	31.162	30.502
MgO	15.482	15.340	14.842	15.611
MnO	0.498	0.354	0.427	0.395
TiO2	0.021	0.082	0.069	0.096
Cr2O3	0.000	0.000	0.019	0.016
NiO	0.022	0.018	0.000	0.053
Total	99.029	98.622	98.617	99.117
Cations*				
Si	1.981	1.981	1.984	1.988
Al	0.040	0.070	0.077	0.066
Ca	0.023	0.015	0.014	0.015
Na	0.001	0.001	0.000	0.001
Fe2+	1.029	1.015	1.032	1.001
Fe3+	0.000	0.000	0.000	0.000
Mg	0.909	0.903	0.876	0.913
Mn	0.017	0.012	0.014	0.013
Ti	0.001	0.002	0.002	0.003
Cr	0.000	0.000	0.001	0.000
End-members (%)				
X(Wo)	1.2	0.8	0.7	0.8
X(En)	46.3	46.7	45.6	47.3
X(Fs)	52.5	52.5	53.7	51.9
Fe#	0.531	0.529	0.541	0.523

Figure S2: Garnet maps

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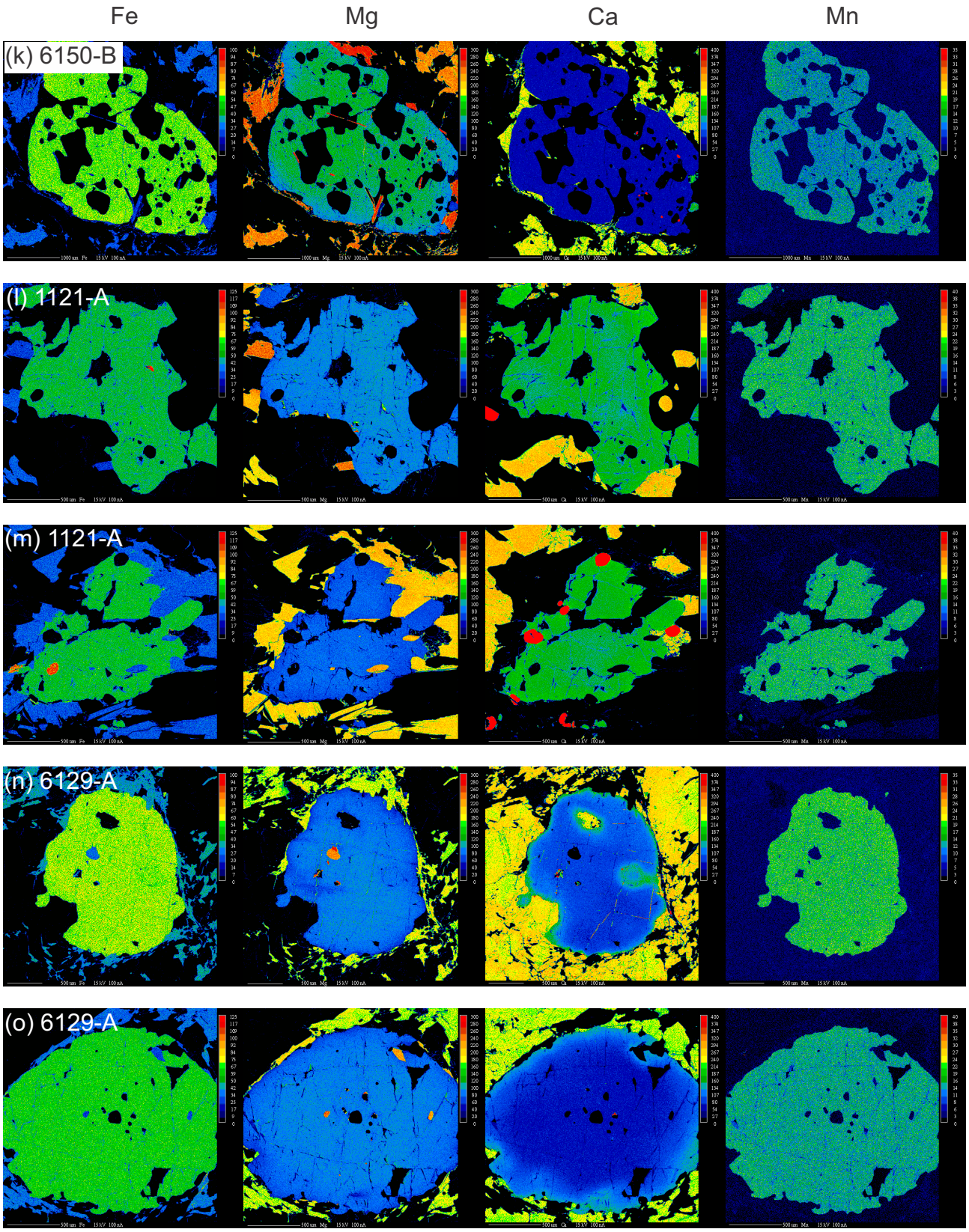
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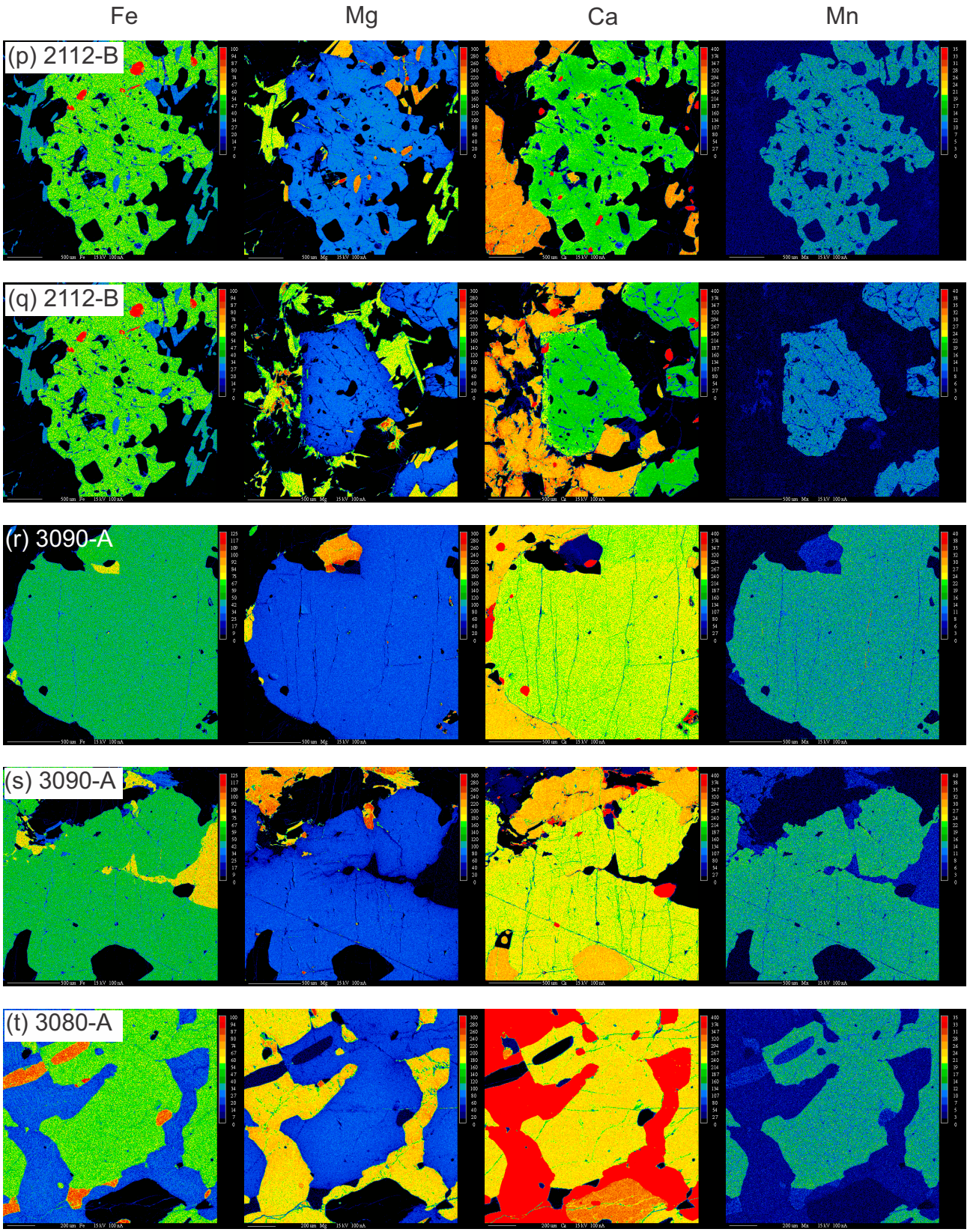
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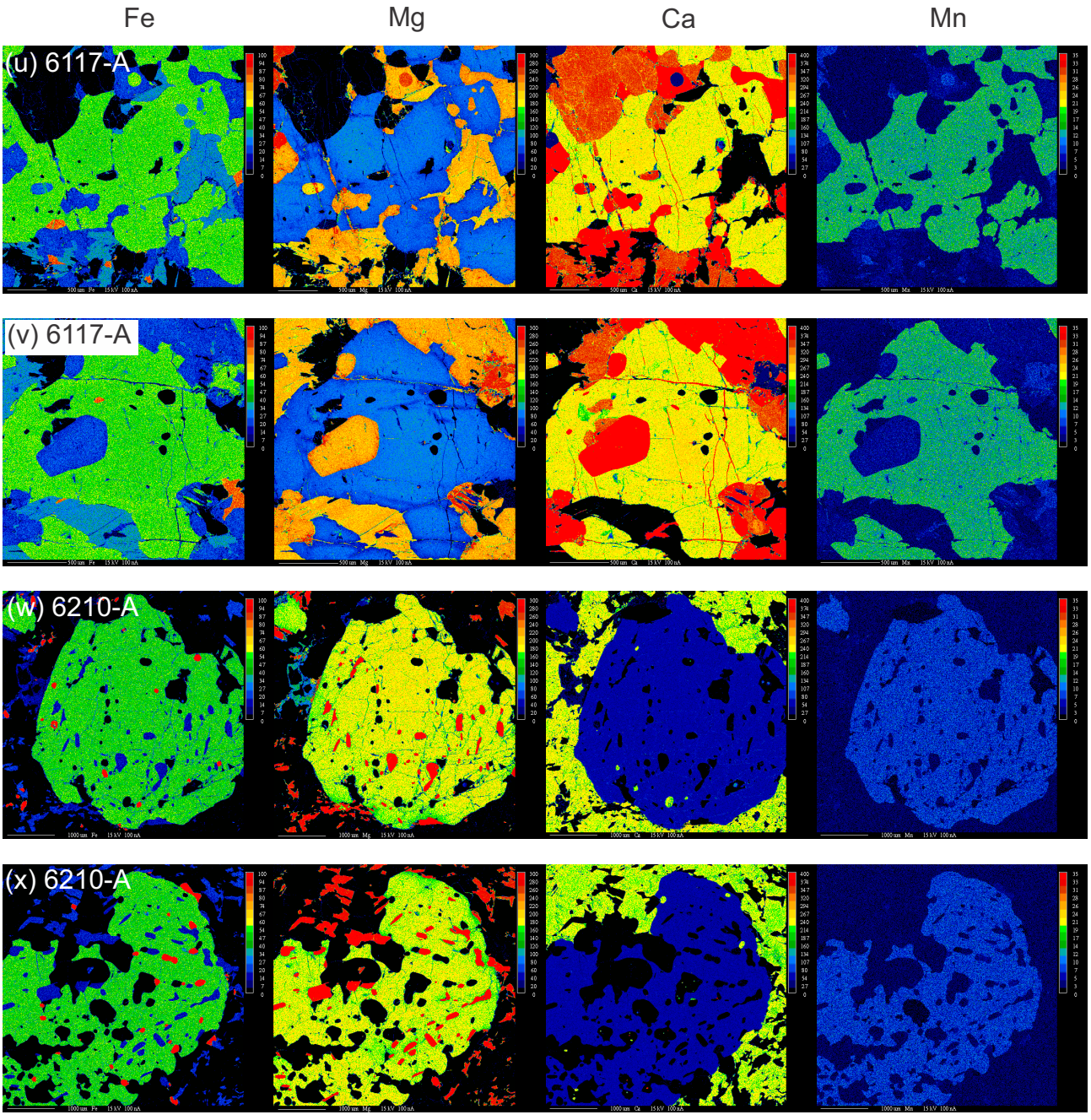
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APPENDIX 3: U-PB GEOCHRONOLOGY METHOD

Radioactive isotope analyses were conducted by Don W. Davis at the University of Toronto. After standard mineral separation by gravity, paramagnetism and heavy liquids, pristine zircon crystals were handpicked and mounted on epoxy. Imaging of chemical zonation, microfractures and alteration was acquired by cathodoluminescence (CL) and backscattered electron (BSE) mapping (Figs. S3 & S4 for zircons and monazites respectively). Domains selected from CL and BSE images were partially ablated using a 213 nm New Wave laser with beam diameters of 25-55 microns at 5-10 Hz and 40% power. Mass spectrometry was carried out on a VG Series 2 Plasmaquad ICP-MS equipped with an S-option 75 L/s rotary pump for enhanced sensitivity. The flux stability was maintained by the use of a 25 ml mixing chamber in-line with the He flow transporting the ablated sample to the plasma. Data were collected on ^{88}Sr (10 ms), ^{206}Pb (30 ms), ^{207}Pb (70 ms). ^{232}Th (10ms) and ^{238}U (20ms). ICP-MS signals from domains with very high U concentration push the detector into analog mode (>1.2 Mcps) for ^{238}U, which results in biased Pb/U measurements although $^{207}Pb/^{206}Pb$ is not affected. ^{235}U was measured for these high-U domains (sample 3008-A, Table S4).

Prior to each spot analysis, the surface was pre-ablated for 10 seconds and a baseline was accumulated for 10 seconds. The acquisition run lasted 25 seconds, and was followed by a 50 second washout period. About 150 measurement cycles per spot analysis were produced and ablation pits were about 15 microns deep. For every three spot analyses, standards were analysed for calibration and to correct for instrumental drift. The standards used were a monzodiorite from the Pontiac Province (Quebec,

Canada; DD91-1 dated at 2682±1 Ma by Davis, 2002) and a quartziferous diorite from northern Ontario (Canada; DD85-17 dated at 3002±2 Ma by Tomlinson *et al.*, 2003).

Data reduction was carried out using in-house VBA software. The $^{206}Pb/^{238}U$ ratios show only slight fractionation caused by the penetration depth through the run and most of the $^{207}Pb/^{206}Pb$ and $^{206}Pb/^{238}U$ data can be averaged. The peak for common Pb was too small to be measured, and thus no corrections were made for common Pb. The ^{88}Sr intensity was monitored in order to detect intersection of the beam with zones of alteration or inclusions. Age data from areas with excess ^{88}Sr signal were rejected. U-Pb dates were calculated using the reference values established by the *IUGS Subcommission on Geochronology*: $t_{\frac{1}{2}}(^{235}U) = 7.0381 \pm 0{,}0048 \times 10^8$ years, $t_{\frac{1}{2}}(^{238}U) = 4.4683 \pm 0.0024 \times 10^9$ years (Jaffey *et al.*, 1971), and $\frac{^{238}U}{^{235}U} = 137.88$ (Steiger and Jäger, 1977).

APPENDIX 4: ZIRCON U-PB ISOTOPE ANALYSES AND ZIRCON IMAGING

(*) Measured with U in analog mode, only $^{207}Pb/^{206}Pb$ is valid. c - core; r - rim; lt - bright in CL; dk - dark in CL; alt - altered domain; z - zoned; m - mantle (between core and rim). Err. Correl. - Error correlation coefficient for concordia coordinates; Disc. – Discordance. U decay constants (L238 & L235) from Jaffey *et al.* (1971).

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th/U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
6117-A															
BC6117-31	868	281	0.09	4.905	0.041	0.3236	0.0020	0.7613	1799	10	1803	7	1807	10	-1
BC6117-15.2r	287	94	0.32	5.009	0.046	0.3294	0.0021	0.6957	1804	12	1821	8	1835	10	-2
BC6117-6	433	143	0.29	5.039	0.047	0.3313	0.0022	0.7022	1804	12	1826	8	1845	11	-3
BC6117-29	217	70	0.33	4.903	0.050	0.3222	0.0020	0.6130	1806	15	1803	9	1800	10	0
BC6117-22.2r	1733	570	0.20	5.012	0.040	0.3287	0.0020	0.7674	1809	9	1821	7	1832	10	-1
BC6117-23	330	111	0.32	5.157	0.051	0.3370	0.0026	0.7644	1816	12	1846	8	1872	12	-4
BC6117-16.2r	547	183	0.23	5.115	0.041	0.3340	0.0020	0.7395	1817	10	1839	7	1858	10	-3
BC6117-25	878	287	0.34	5.018	0.046	0.3274	0.0022	0.7382	1819	11	1822	8	1826	11	0
BC6117-13	225	75	0.30	5.097	0.051	0.3321	0.0023	0.6787	1821	13	1836	9	1849	11	-2
BC6117-1.2r	285	95	0.30	5.133	0.042	0.3336	0.0020	0.7228	1826	10	1842	7	1856	9	-2
BC6117-16.1c	217	70	0.27	4.988	0.049	0.3233	0.0022	0.7095	1830	12	1817	8	1806	11	2
BC6117-7	357	117	0.33	5.043	0.051	0.3269	0.0022	0.6643	1831	14	1827	9	1823	11	0
BC6117-22.1c	1252	415	0.36	5.118	0.043	0.3314	0.0021	0.7628	1832	10	1839	7	1845	10	-1
BC6117-20.2r	516	172	0.29	5.129	0.046	0.3321	0.0022	0.7343	1832	11	1841	8	1848	11	-1
BC6117-3	102	34	0.29	5.205	0.057	0.3361	0.0024	0.6455	1837	15	1853	9	1868	11	-2
BC6117-26	274	91	0.29	5.150	0.056	0.3316	0.0021	0.5859	1842	16	1844	9	1846	10	0
BC6117-5	256	86	0.30	5.214	0.050	0.3354	0.0022	0.6849	1844	13	1855	8	1865	11	-1
BC6117-19	275	91	0.23	5.144	0.052	0.3307	0.0023	0.6811	1845	13	1843	9	1842	11	0
BC6117-30	309	102	0.34	5.131	0.046	0.3296	0.0019	0.6507	1847	12	1841	8	1836	9	1
BC6117-4	232	78	0.26	5.266	0.051	0.3373	0.0022	0.6765	1852	13	1863	8	1874	11	-1
BC6117-24	488	161	0.61	5.137	0.054	0.3290	0.0023	0.6760	1852	14	1842	9	1834	11	1
BC6117-18	212	70	0.34	5.175	0.055	0.3314	0.0022	0.6333	1852	15	1848	9	1845	11	0
BC6117-20.1c	359	121	0.26	5.264	0.054	0.3369	0.0025	0.7262	1853	13	1863	9	1872	12	-1
BC6117-2	241	80	0.26	5.174	0.056	0.3312	0.0025	0.6850	1853	14	1848	9	1844	12	1
BC6117-10	361	118	0.40	5.115	0.050	0.3273	0.0022	0.6782	1854	13	1839	8	1825	10	2
BC6117-32	1355	450	0.29	5.205	0.045	0.3324	0.0022	0.7786	1857	10	1853	7	1850	11	0
BC6117-28	834	280	0.42	5.254	0.043	0.3356	0.0021	0.7726	1857	9	1861	7	1865	10	-1
BC6117-21	461	152	0.35	5.179	0.049	0.3308	0.0024	0.7520	1857	11	1849	8	1842	11	1
BC6117-27	1700	535	0.13	4.935	0.065	0.3149	0.0039	0.9398	1859	8	1808	11	1765	19	6
BC6117-12	271	90	0.29	5.235	0.053	0.3337	0.0023	0.6708	1860	14	1858	9	1857	11	0
BC6117-11	319	107	0.42	5.282	0.051	0.3367	0.0022	0.6646	1861	13	1866	8	1871	10	-1
BC6117-9	436	142	0.48	5.129	0.046	0.3268	0.0021	0.7145	1861	11	1841	8	1823	10	2
BC6117-14	388	129	0.46	5.210	0.046	0.3318	0.0022	0.7378	1862	11	1854	8	1847	10	1
BC6117-8	484	161	0.42	5.227	0.048	0.3329	0.0022	0.7286	1862	11	1857	8	1852	11	1
BC6117-15.1c	133	44	0.28	5.258	0.060	0.3342	0.0025	0.6432	1866	16	1862	10	1858	12	0
BC6117-1.1c	152	52	0.31	5.392	0.053	0.3404	0.0024	0.7149	1878	12	1884	8	1888	12	-1

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th / U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
6210-A															
BC6210-6	160	53	0.25	5.058	0.046	0.3284	0.0025	0.8486	1827	9	1829	8	1831	12	0
BC6210-15	347	114	0.12	5.068	0.045	0.3282	0.0025	0.8534	1832	8	1831	8	1829	12	0
BC6210-8	153	50	0.41	5.060	0.045	0.3266	0.0024	0.8338	1838	9	1829	7	1822	12	1
BC6210-1	447	151	0.04	5.250	0.044	0.3383	0.0025	0.8756	1841	7	1861	7	1878	12	-2
BC6210-17	270	89	0.53	5.109	0.047	0.3288	0.0026	0.8512	1843	9	1838	8	1833	13	1
BC6210-11	186	61	0.84	5.057	0.046	0.3253	0.0024	0.8192	1844	9	1829	8	1815	12	2
BC6210-3	176	57	0.46	5.057	0.043	0.3253	0.0024	0.8489	1845	8	1829	7	1815	12	2
BC6210-10	237	77	0.73	5.048	0.042	0.3246	0.0022	0.8339	1845	8	1827	7	1812	11	2
BC6210-4	349	117	0.07	5.236	0.040	0.3365	0.0022	0.8629	1846	7	1858	6	1870	11	-1
BC6210-9	377	126	0.07	5.196	0.040	0.3336	0.0022	0.8479	1848	7	1852	7	1856	11	0
BC6210-2	166	54	0.51	5.118	0.044	0.3285	0.0023	0.8322	1848	9	1839	7	1831	11	1
BC6210-18	325	107	0.53	5.162	0.046	0.3308	0.0024	0.8105	1851	9	1846	8	1842	12	1
BC6210-12	701	242	0.03	5.387	0.048	0.3448	0.0028	0.8957	1853	7	1883	8	1910	13	-4
BC6210-13	528	174	0.11	5.144	0.042	0.3292	0.0023	0.8673	1853	7	1843	7	1835	11	1
BC6210-5	479	163	0.04	5.301	0.043	0.3393	0.0025	0.8857	1854	7	1869	7	1883	12	-2
BC6210-19	715	262	0.13	6.347	0.065	0.3661	0.0031	0.8343	2039	10	2025	9	2011	15	2
BC6210-20	287	117	0.67	7.873	0.073	0.4090	0.0030	0.7934	2222	10	2217	8	2210	14	1
BC6210-21	1179	548	0.06	10.192	0.075	0.4645	0.0029	0.8312	2447	7	2452	7	2459	13	-1

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th / U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
1098-A															
DB1098-6r	165	55	0.07	5.164	0.046	0.3355	0.0021	0.7076	1826	11	1847	8	1865	10	-2
DB1098-26	190	63	0.06	5.105	0.043	0.3299	0.0021	0.7435	1836	10	1837	7	1838	10	0
DB1098-17	539	164	0.04	4.739	0.052	0.3051	0.0031	0.9426	1843	7	1774	9	1716	15	8
DB1098-12	85	29	0.09	5.330	0.056	0.3421	0.0024	0.6629	1848	14	1874	9	1897	11	-3
DB1098-9	82	27	0.20	5.204	0.055	0.3335	0.0025	0.7232	1851	13	1853	9	1855	12	0
DB1098-4c	345	117	0.02	5.290	0.042	0.3388	0.0023	0.8499	1852	7	1867	7	1881	11	-2
DB1098-20	260	91	0.04	5.477	0.043	0.3505	0.0022	0.8089	1854	8	1897	7	1937	11	-5
DB1098-3c	108	36	0.05	5.240	0.048	0.3344	0.0023	0.7609	1858	11	1859	8	1860	11	0
DB1098-11	172	58	0.08	5.274	0.045	0.3346	0.0021	0.7430	1869	10	1865	7	1861	10	1
DB1098-2.1c	409	147	0.01	5.901	0.045	0.3608	0.0020	0.7208	1935	9	1961	7	1986	9	-3
DB1098-5	132	50	0.32	7.310	0.073	0.3796	0.0023	0.6020	2223	14	2150	9	2074	11	8
DB1098-19r	596	270	0.01	9.922	0.076	0.4535	0.0031	0.8833	2442	6	2428	7	2411	14	2
DB1098-18	409	212	0.00	11.708	0.218	0.5184	0.0093	0.9649	2495	8	2581	17	2693	40	-10
DB1098-8r	452	217	0.00	11.209	0.088	0.4795	0.0033	0.8730	2553	6	2541	7	2525	14	1
DB1098-23	312	144	0.36	11.070	0.094	0.4617	0.0032	0.8033	2595	8	2529	8	2447	14	7
DB1098-22	736	344	0.00	11.196	0.109	0.4668	0.0042	0.9249	2596	6	2540	9	2470	18	6
DB1098-1z	56	26	0.27	11.241	0.111	0.4667	0.0037	0.8137	2603	10	2543	9	2469	16	6
DB1098-24	383	184	0.39	12.066	0.086	0.4809	0.0028	0.8179	2671	7	2610	7	2531	12	6
DB1098-2.2r	31	15	0.43	12.237	0.145	0.4854	0.0044	0.7636	2679	13	2623	11	2551	19	6
DB1098-15	116	62	0.37	13.732	0.128	0.5326	0.0034	0.6855	2716	11	2731	9	2753	14	-2
DB1098-13	288	144	0.41	12.963	0.109	0.5002	0.0029	0.6973	2724	10	2677	8	2615	13	5
DB1098-25	88	41	0.53	12.131	0.180	0.4667	0.0051	0.7366	2729	16	2615	14	2469	22	11
DB1098-16	99	49	0.46	13.157	0.142	0.4933	0.0042	0.7916	2772	11	2691	10	2585	18	8
DB1098-14	68	36	0.40	14.402	0.136	0.5277	0.0039	0.7752	2809	10	2777	9	2732	16	3
DB1098-7	74	40	0.47	14.749	0.134	0.5357	0.0036	0.7407	2824	10	2799	9	2765	15	3

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th/U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
3008-A	**(mesuring ^{235}U)**														
IL3008-25.2alt	3788	178	0.02	0.366	0.007	0.0469	0.0008	0.8335	477	24	317	5	296	5	39
IL3008-14.1r	370	127	0.12	5.278	0.109	0.3431	0.0066	0.9339	1825	13	1865	18	1902	32	-5
IL3008-12.2r	2494	837	0.01	5.202	0.085	0.3356	0.0051	0.9313	1839	11	1853	14	1865	25	-2
IL3008-25.1	3841	1267	0.02	5.123	0.095	0.3299	0.0058	0.9374	1842	12	1840	16	1838	28	0
IL3008-29	1898	639	0.06	5.236	0.075	0.3368	0.0045	0.9269	1844	10	1858	12	1871	21	-2
IL3008-9r	2791	893	0.01	4.971	0.109	0.3198	0.0067	0.9553	1844	12	1814	19	1789	33	3
IL3008-31	1193	392	0.02	5.125	0.076	0.3289	0.0044	0.9111	1849	11	1840	13	1833	21	1
IL3008-5	3725	1253	0.01	5.246	0.077	0.3363	0.0046	0.9287	1850	10	1860	13	1869	22	-1
IL3008-8	2062	685	0.06	5.189	0.075	0.3321	0.0044	0.9259	1854	10	1851	12	1848	21	0
IL3008-28	6586	2173	0.01	5.157	0.099	0.3299	0.0060	0.9397	1854	12	1845	16	1838	29	1
IL3008-6	3366	1151	0.04	5.347	0.105	0.3418	0.0063	0.9426	1856	12	1876	17	1895	30	-2
IL3008-10.1c	510	178	0.17	5.481	0.145	0.3494	0.0088	0.9471	1860	15	1898	23	1932	42	-4
IL3008-11	1343	432	0.01	5.064	0.089	0.3219	0.0053	0.9403	1866	11	1830	15	1799	26	4
IL3008-13	804	259	0.12	5.080	0.111	0.3227	0.0065	0.9266	1867	15	1833	19	1803	32	4
IL3008-24.2r	651	219	0.13	5.316	0.129	0.3367	0.0077	0.9465	1872	14	1871	21	1871	37	0
IL3008-10.2r	4394	1400	0.06	5.037	0.095	0.3187	0.0056	0.9370	1874	12	1826	16	1783	28	6
IL3008-7	4464	1551	0.06	5.495	0.149	0.3475	0.0089	0.9490	1875	15	1900	24	1922	43	-3
IL3008-19	483	159	0.13	5.227	0.125	0.3299	0.0074	0.9453	1879	14	1857	20	1838	36	2
IL3008-27	292	112	0.89	7.055	0.225	0.3852	0.0117	0.9510	2136	17	2118	28	2100	54	2
IL3008-14.2c	176	74	0.51	8.714	0.259	0.4207	0.0119	0.9510	2349	16	2309	27	2264	54	4
IL3008-23.1c	270	120	0.50	9.786	0.267	0.4444	0.0114	0.9420	2453	15	2415	25	2370	51	4
IL3008-23.2r	199	92	0.56	10.368	0.333	0.4626	0.0142	0.9553	2482	16	2468	30	2451	62	2
IL3008-12.1c	767	358	0.69	10.856	0.219	0.4671	0.0088	0.9361	2543	12	2511	19	2471	39	3
IL3008-32c	83	41	0.67	11.581	0.444	0.4964	0.0183	0.9629	2550	17	2571	35	2598	79	-2
IL3008-24.1c	157	76	0.79	11.359	0.439	0.4857	0.0180	0.9571	2554	19	2553	36	2552	78	0
IL3008-17	219	106	0.93	11.360	0.288	0.4831	0.0117	0.9559	2563	12	2553	24	2541	51	1

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th/U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
3008-A	**(mesuring ^{238}U)**														
IL3008-9.2r*	3398	695	0.01	3.167	0.023	0.2044	0.0011	0.7825	1839	8	1449	6	1199	6	38
IL3008-13	511	170	0.12	5.192	0.042	0.3334	0.0020	0.7506	1848	10	1851	7	1855	10	0
IL3008-10.2r*	5165	996	0.03	3.005	0.018	0.1928	0.0009	0.7331	1849	7	1409	5	1136	5	42
IL3008-3r	1431	472	0.08	5.159	0.063	0.3302	0.0037	0.9156	1853	9	1846	10	1840	18	1
IL3008-7*	7509	1322	0.02	2.751	0.020	0.1761	0.0010	0.8087	1853	8	1342	5	1046	6	47
IL3008-8*	5644	1053	0.02	2.917	0.019	0.1866	0.0010	0.8016	1854	7	1386	5	1103	5	44
IL3008-10.1c	417	139	0.14	5.199	0.048	0.3324	0.0023	0.7357	1855	11	1853	8	1850	11	0
IL3008-6*	8007	1344	0.02	2.646	0.037	0.1678	0.0021	0.9152	1870	10	1314	10	1000	12	50
IL3008-5*	9197	1520	0.01	2.615	0.037	0.1653	0.0021	0.9081	1876	11	1305	10	986	12	51
IL3008-2c	1190	417	0.10	5.999	0.046	0.3500	0.0021	0.7896	2019	8	1976	7	1935	10	5
IL3008-1	571	284	0.19	11.919	0.095	0.4966	0.0032	0.8080	2597	8	2598	7	2599	14	0

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th/U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
6150-A	**(overgrowths)**														
BC6150-16U	1063	351	0.1	4.971	0.079	0.3304	0.0043	0.8252	1785	16	1814	13	1840	21	-4
BC6150-18.2Uo	982	330	0.08	5.053	0.068	0.3356	0.0036	0.7961	1786	15	1828	11	1865	17	-5
BC6150-15.3Ukr	342	114	0.05	5.024	0.077	0.3332	0.004	0.7847	1789	17	1823	13	1854	19	-4
BC6150-8Uo	606	203	0.05	5.046	0.062	0.3341	0.0032	0.7757	1792	14	1827	10	1858	15	-4
BC6150-20U	919	304	0.08	5.008	0.073	0.3312	0.0039	0.8093	1794	16	1821	12	1844	19	-3
BC6150-17Uo	939	310	0.08	5.004	0.073	0.3302	0.0039	0.8215	1798	15	1820	12	1840	19	-3
BC6150-4.1Uc	1018	339	0.08	5.058	0.066	0.3328	0.0035	0.8152	1803	14	1829	11	1852	17	-3
BC6150-5.1Uo	642	211	0.04	4.992	0.063	0.3284	0.0032	0.7888	1803	14	1818	11	1831	16	-2
BC6150-10Uo	847	281	0.11	5.053	0.068	0.3315	0.0035	0.7941	1809	15	1828	11	1846	17	-2
BC6150-6.2Ur	747	244	0.1	4.98	0.069	0.3264	0.0038	0.8281	1810	14	1816	12	1821	18	-1
BC6150-9Uo	839	280	0.11	5.103	0.066	0.3341	0.0035	0.8035	1812	14	1837	11	1858	17	-3
BC6150-5.2Ur	499	164	0.04	5.022	0.074	0.3279	0.0036	0.7383	1817	18	1823	12	1828	17	-1
BC6150-1Ur	1423	477	0.09	5.137	0.07	0.3352	0.0036	0.7923	1818	15	1842	12	1864	17	-3
BC6150-19U	552	184	0.06	5.121	0.065	0.3338	0.0032	0.764	1820	15	1840	11	1857	16	-2
BC6150-15.1Uc	1097	365	0.08	5.115	0.069	0.3327	0.0034	0.7459	1824	16	1839	12	1851	16	-2
BC6150-3Ur	919	304	0.11	5.086	0.067	0.3307	0.0034	0.7681	1825	15	1834	11	1842	16	-1
BC6150-15.2Ukr	527	171	0.06	4.991	0.069	0.3241	0.0036	0.8002	1827	15	1818	12	1810	17	1
BC6150-4.2Ukr	683	226	0.05	5.108	0.07	0.3313	0.0037	0.8174	1829	14	1837	12	1845	18	-1
BC6150-13Uo	903	299	0.08	5.097	0.076	0.3307	0.0039	0.7824	1829	17	1836	13	1842	19	-1
BC6150-14.2Uo	868	289	0.08	5.142	0.079	0.3328	0.004	0.783	1833	17	1843	13	1852	19	-1
BC6150-7Uo	612	202	0.05	5.118	0.073	0.3307	0.0036	0.7725	1836	16	1839	12	1842	18	0
BC6150-12.2Uo	1001	332	0.1	5.171	0.078	0.332	0.004	0.7899	1848	17	1848	13	1848	19	0
BC6150-12.1Uc	1685	684	0.07	7.724	0.096	0.4057	0.004	0.7946	2203	13	2199	11	2195	18	0
BC6150-18.1kc	206	87	0.64	8.477	0.226	0.4223	0.0078	0.6916	2294	33	2283	24	2271	35	1
BC6150-2c	130	57	0.47	9.504	0.142	0.4422	0.0043	0.6548	2411	19	2388	14	2361	19	3
BC6150-6.1c	186	83	0.63	9.565	0.134	0.4436	0.005	0.8021	2417	14	2394	13	2367	22	2
BC6150-14.1c	400	168	1.31	9.132	0.143	0.4197	0.0049	0.7391	2432	18	2351	14	2259	22	8

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th / U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
6150-A	**(cores)**														
BC6150d-26.2Uo	1128	374	0.1	4.998	0.052	0.3316	0.0028	0.8014	1788	11	1819	9	1846	13	-4
BC6150d-25Uc	1576	528	0	5.072	0.051	0.3349	0.0026	0.7777	1797	11	1831	8	1862	13	-4
BC6150d-23Uo	1724	576	0	5.118	0.054	0.3339	0.0028	0.7908	1819	12	1839	9	1857	13	-2
BC6150d-49	124	41	0.6	5.216	0.08	0.3282	0.0035	0.688	1884	20	1855	13	1830	17	3
BC6150d-48	249	89	0.4	6.413	0.091	0.3591	0.0037	0.737	2092	17	2034	12	1978	18	6
BC6150d-52	60	22	1.6	6.655	0.121	0.3723	0.0047	0.6873	2093	23	2067	16	2040	22	3
BC6150d-51	66	25	0.4	6.828	0.117	0.3765	0.0039	0.5973	2118	24	2089	15	2060	18	3
BC6150d-60	684	262	0.5	7.177	0.077	0.3833	0.0034	0.8188	2174	11	2134	10	2092	16	4
BC6150d-47	354	140	0.3	7.435	0.106	0.3944	0.0044	0.7859	2186	15	2165	13	2143	20	2
BC6150d-58	227	94	0.4	7.919	0.1	0.413	0.0039	0.746	2216	15	2222	11	2229	18	-1
BC6150d-33	213	85	0.3	7.733	0.092	0.4006	0.0036	0.7578	2227	13	2200	11	2172	17	3
BC6150d-61	838	335	0.4	7.823	0.083	0.3998	0.0034	0.8037	2251	11	2211	10	2168	16	4
BC6150d-28	50	20	0.4	7.914	0.107	0.4036	0.0038	0.7015	2254	17	2221	12	2186	18	4
BC6150d-8	102	41	0.6	7.926	0.108	0.4033	0.004	0.7374	2258	16	2223	12	2184	19	4
BC6150d-18	319	130	0.6	8.037	0.087	0.4074	0.0034	0.7776	2265	12	2235	10	2203	16	3
BC6150d-15	155	65	0.4	8.287	0.101	0.4189	0.0038	0.7466	2270	14	2263	11	2255	17	1
BC6150d-26.1c	105	45	0.4	8.411	0.102	0.4243	0.0038	0.7309	2273	14	2276	11	2280	17	0
BC6150d-31	137	57	0.7	8.284	0.098	0.4175	0.0039	0.7893	2275	13	2263	11	2249	18	1
BC6150d-16	504	210	0.6	8.277	0.095	0.4167	0.0039	0.8103	2277	12	2262	10	2246	18	2
BC6150d-50	341	141	0.8	8.238	0.094	0.4146	0.0037	0.7753	2277	12	2258	10	2236	17	2
BC6150d-35	582	243	0.2	8.325	0.088	0.418	0.0035	0.7845	2281	11	2267	10	2251	16	2
BC6150d-4	172	72	0.4	8.367	0.103	0.4195	0.004	0.775	2284	13	2272	11	2258	18	1
BC6150d-45	325	141	0.7	8.662	0.108	0.434	0.0041	0.7554	2285	14	2303	11	2324	18	-2
BC6150d-21	425	177	0.7	8.327	0.094	0.417	0.0036	0.7623	2286	13	2267	10	2247	16	2
BC6150d-30	273	116	0.8	8.539	0.086	0.4264	0.0035	0.8179	2291	10	2290	9	2289	16	0
BC6150d-40	272	116	0.6	8.602	0.105	0.4285	0.004	0.7572	2295	14	2297	11	2299	18	0
BC6150d-27	112	47	0.4	8.457	0.094	0.4204	0.0037	0.7986	2298	11	2281	10	2262	17	2
BC6150d-20	442	191	0.6	8.695	0.103	0.4321	0.0039	0.7582	2299	13	2307	11	2315	17	-1
BC6150d-7	123	52	0.6	8.552	0.102	0.424	0.0037	0.721	2303	14	2291	11	2278	17	1
BC6150d-29	277	120	0.3	8.805	0.091	0.433	0.0035	0.7806	2317	11	2318	9	2319	16	0
BC6150d-37	134	57	0.5	8.626	0.112	0.4237	0.0038	0.6856	2319	16	2299	12	2277	17	2
BC6150d-6	180	77	0.4	8.785	0.097	0.4278	0.0035	0.7291	2334	13	2316	10	2296	16	2
BC6150d-24	96	40	0.8	8.612	0.128	0.4193	0.0047	0.7515	2334	17	2298	14	2258	21	4
BC6150d-46	287	122	0.4	8.764	0.124	0.4259	0.0045	0.7531	2337	16	2314	13	2287	20	3
BC6150d-53	651	288	0.8	9.164	0.098	0.4431	0.0038	0.8003	2346	11	2355	10	2364	17	-1
BC6150d-3	314	137	0.6	9.078	0.101	0.4377	0.0037	0.7597	2351	12	2346	10	2340	17	1

Table S2: U-Pb isotope zircon analyses

Analysis#	U (ppm)	Pb^{206} (ppm)	Th/U	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)
6150-B	**(cores)**														
BC6150d-9	170	73	0.7	8.941	0.106	0.431	0.0041	0.8037	2351	12	2332	11	2310	19	2
BC6150d-11	198	84	0.4	8.794	0.108	0.4231	0.0039	0.7448	2355	14	2317	11	2274	18	4
BC6150d-43	601	260	0.5	9.021	0.117	0.4333	0.0044	0.7736	2357	14	2340	12	2321	20	2
BC6150d-14	360	158	0.8	9.167	0.109	0.4388	0.0042	0.7989	2363	12	2355	11	2345	19	1
BC6150d-42Uz	1421	631	0.4	9.281	0.111	0.444	0.004	0.7619	2364	13	2366	11	2369	18	0
BC6150d-5	423	190	0.3	9.419	0.106	0.4487	0.004	0.7986	2371	12	2380	10	2390	18	-1
BC6150d-2	121	53	1.1	9.182	0.112	0.4364	0.0039	0.7419	2375	14	2356	11	2335	18	2
BC6150d-19	495	218	0.9	9.273	0.099	0.4401	0.0036	0.7581	2378	12	2365	10	2351	16	1
BC6150d-39	254	108	0.5	8.977	0.12	0.4241	0.0042	0.7465	2386	15	2336	12	2279	19	5
BC6150d-54	480	216	0.5	9.518	0.109	0.4491	0.0041	0.7952	2388	12	2389	10	2391	18	0
BC6150d-41	239	105	0.9	9.33	0.123	0.4396	0.0041	0.7063	2390	16	2371	12	2349	18	2
BC6150d-12.1c	513	228	0.5	9.467	0.107	0.4447	0.0043	0.8465	2395	10	2384	10	2372	19	1
BC6150d-55	573	257	1.2	9.555	0.107	0.4482	0.0039	0.7708	2398	12	2393	10	2387	17	1
BC6150d-13	216	94	0.6	9.319	0.111	0.4363	0.004	0.7802	2401	13	2370	11	2334	18	3
BC6150d-1	424	191	1.9	9.663	0.116	0.4521	0.0044	0.8115	2402	12	2403	11	2404	20	0
BC6150d-12.2o	111	47	0.8	9.159	0.202	0.4239	0.0075	0.8036	2420	22	2354	20	2278	34	7
BC6150d-62	259	112	1	9.36	0.109	0.4307	0.0039	0.7822	2430	12	2374	11	2309	18	6
BC6150d-22	562	257	0.7	9.976	0.103	0.457	0.0035	0.7516	2438	11	2433	9	2426	16	1
BC6150d-17	376	176	0.7	10.468	0.115	0.4676	0.0039	0.7635	2480	12	2477	10	2473	17	0
BC6150d-32	211	118	0.9	14.165	0.145	0.5582	0.0046	0.8014	2690	10	2761	10	2859	19	-8

Figure S3-1: Zircon imaging in natural light

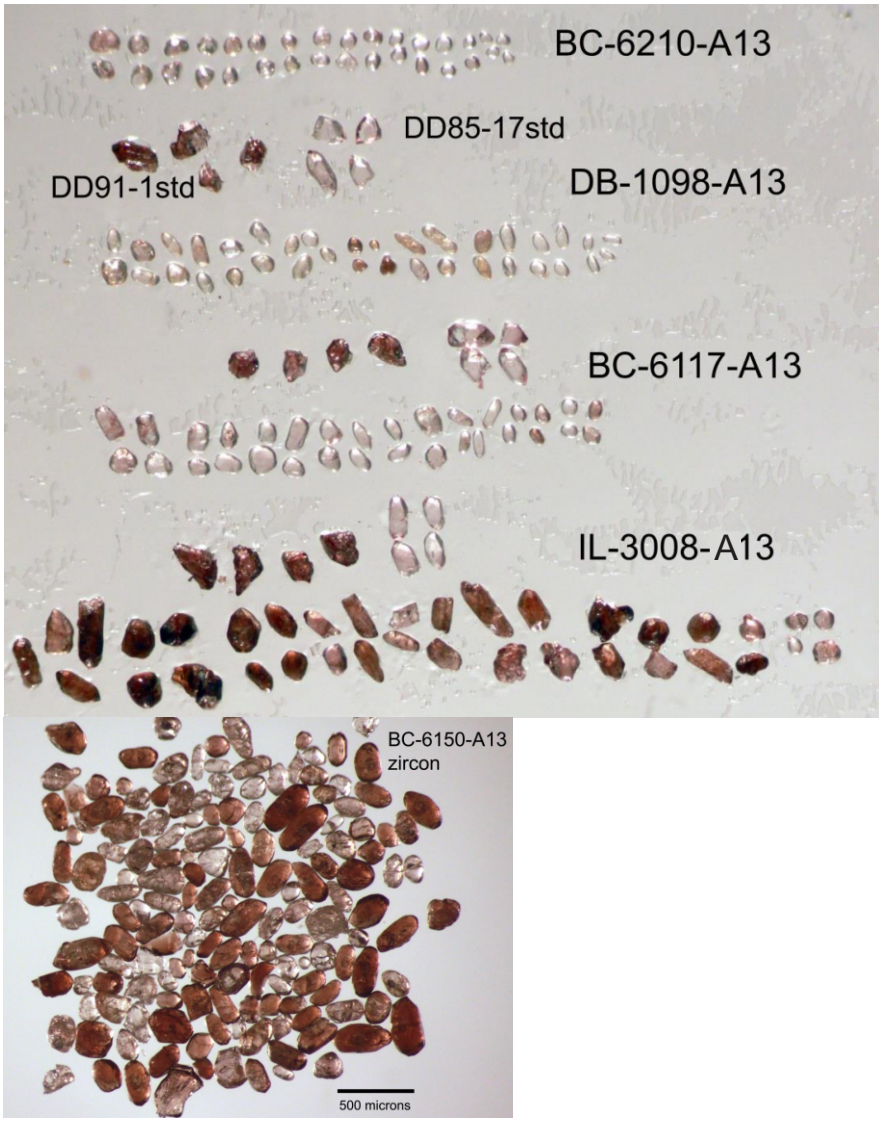


Figure S3-2: BSE (left) and CL (right) zircon imaging of sample 3008-A

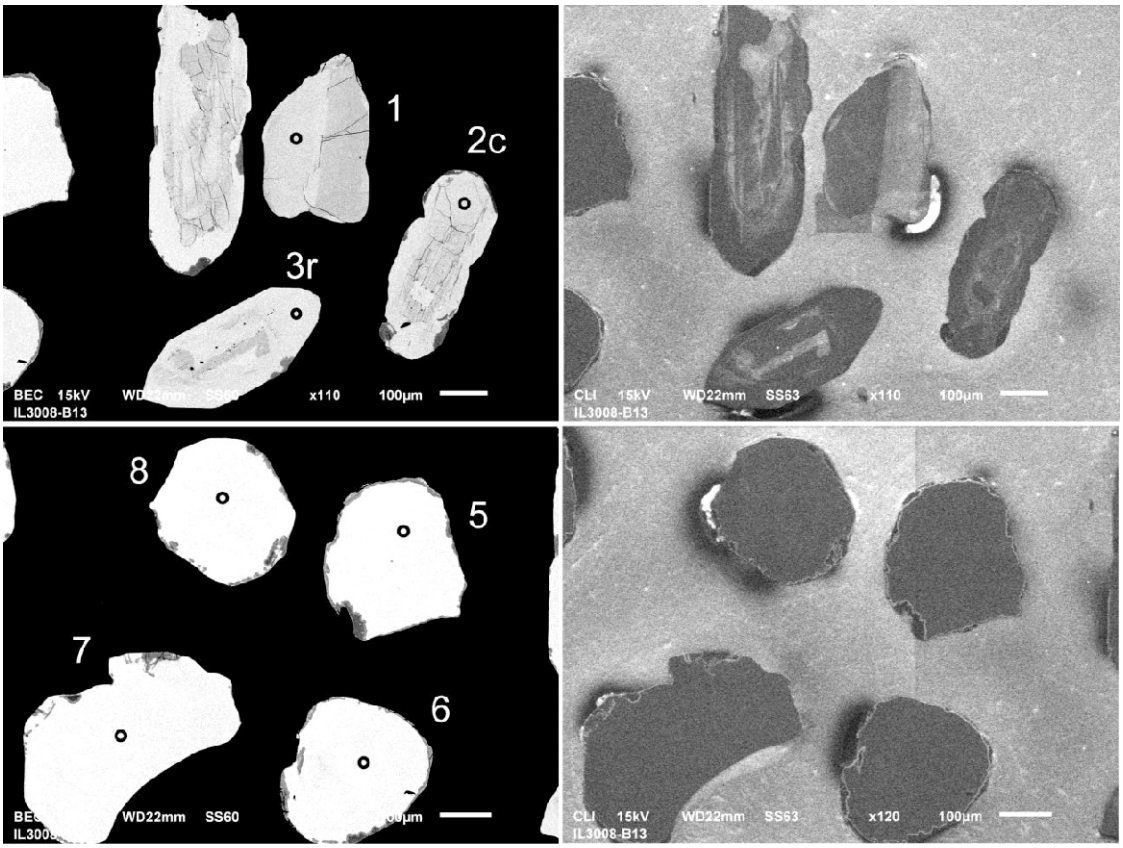


Figure S3-2 (continued)

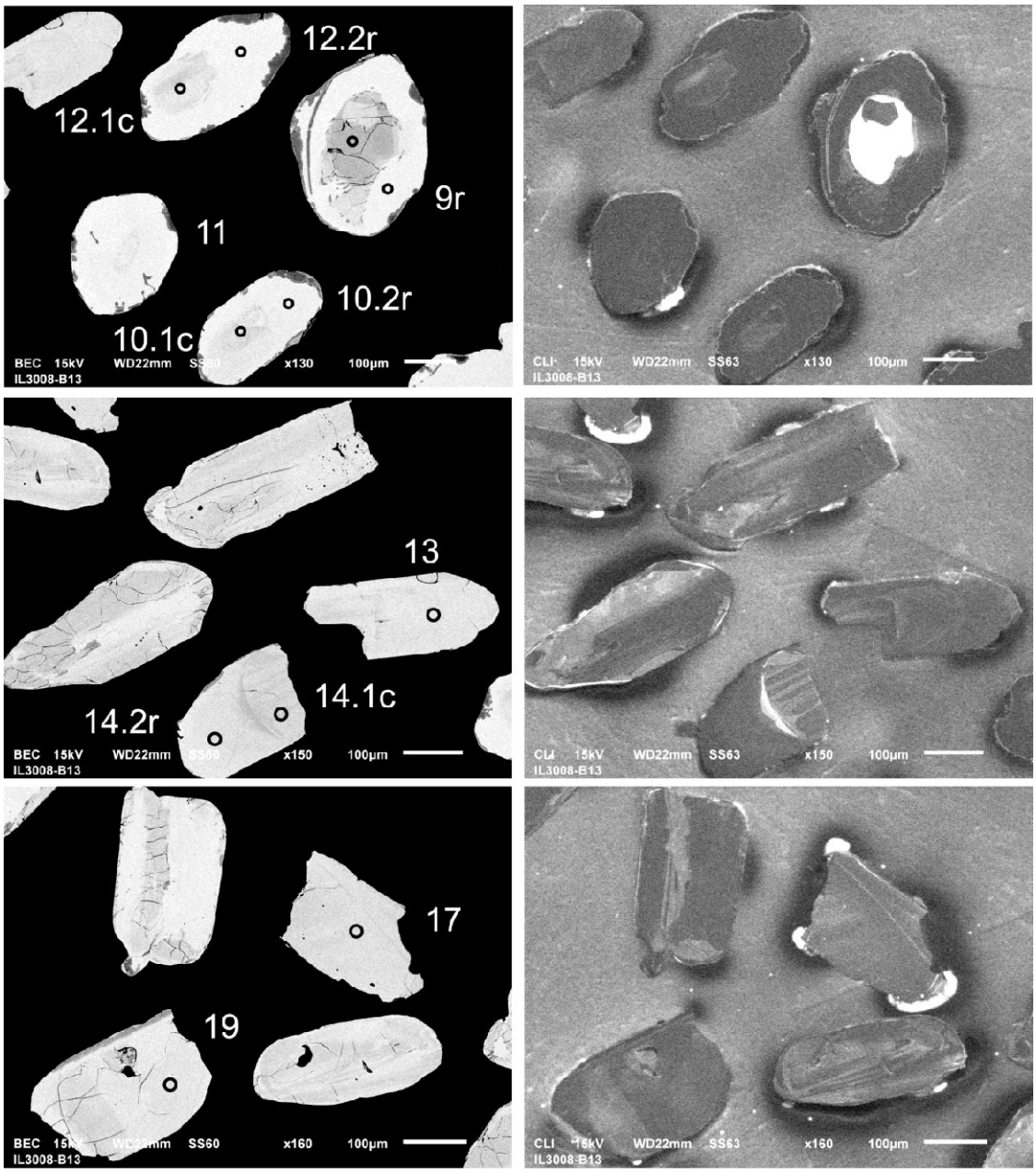


Figure S3-2 (continued)

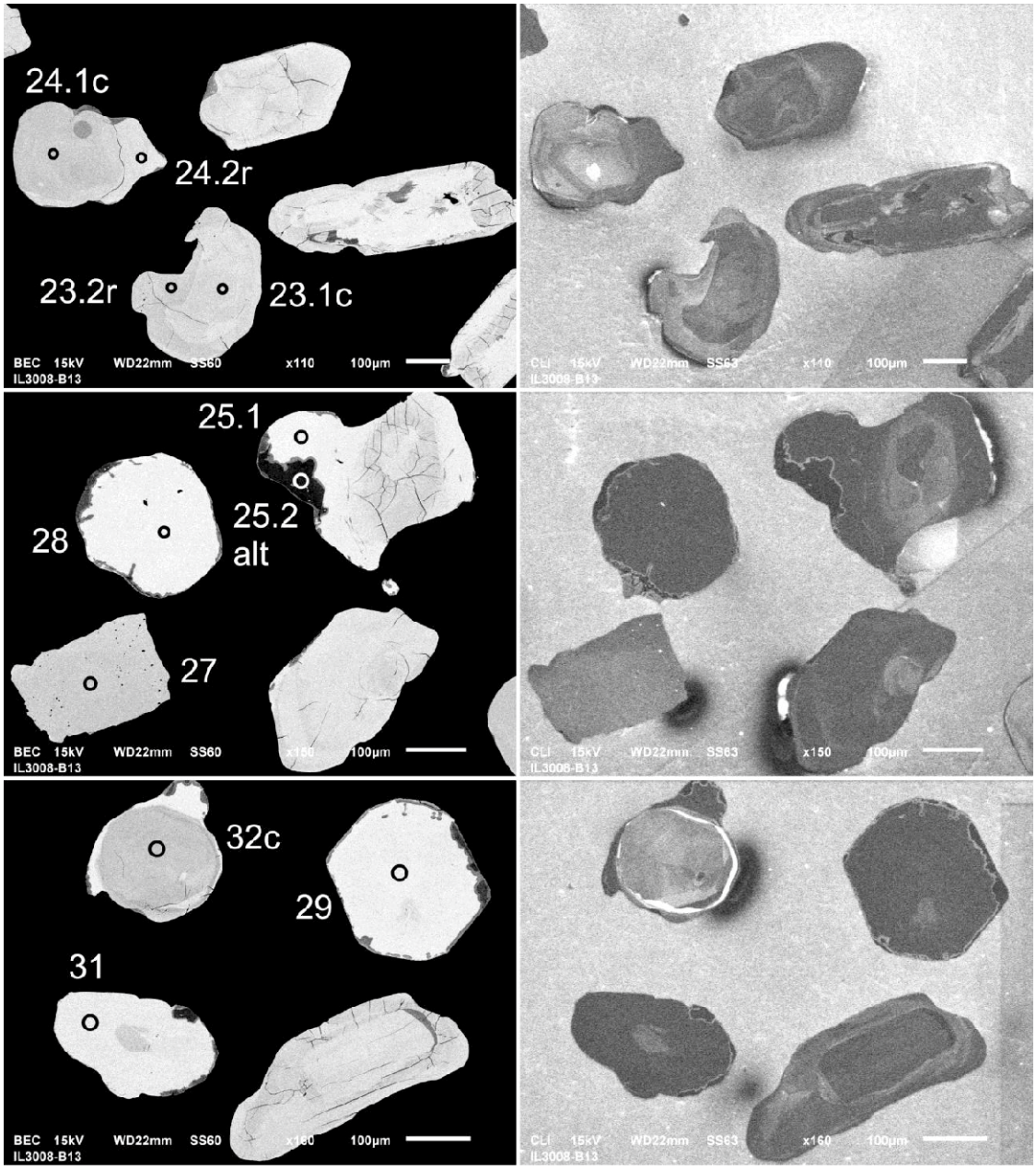


Figure S3-3: BSE (left) and CL (right) imaging of zircon overgrowths of sample 6150-A

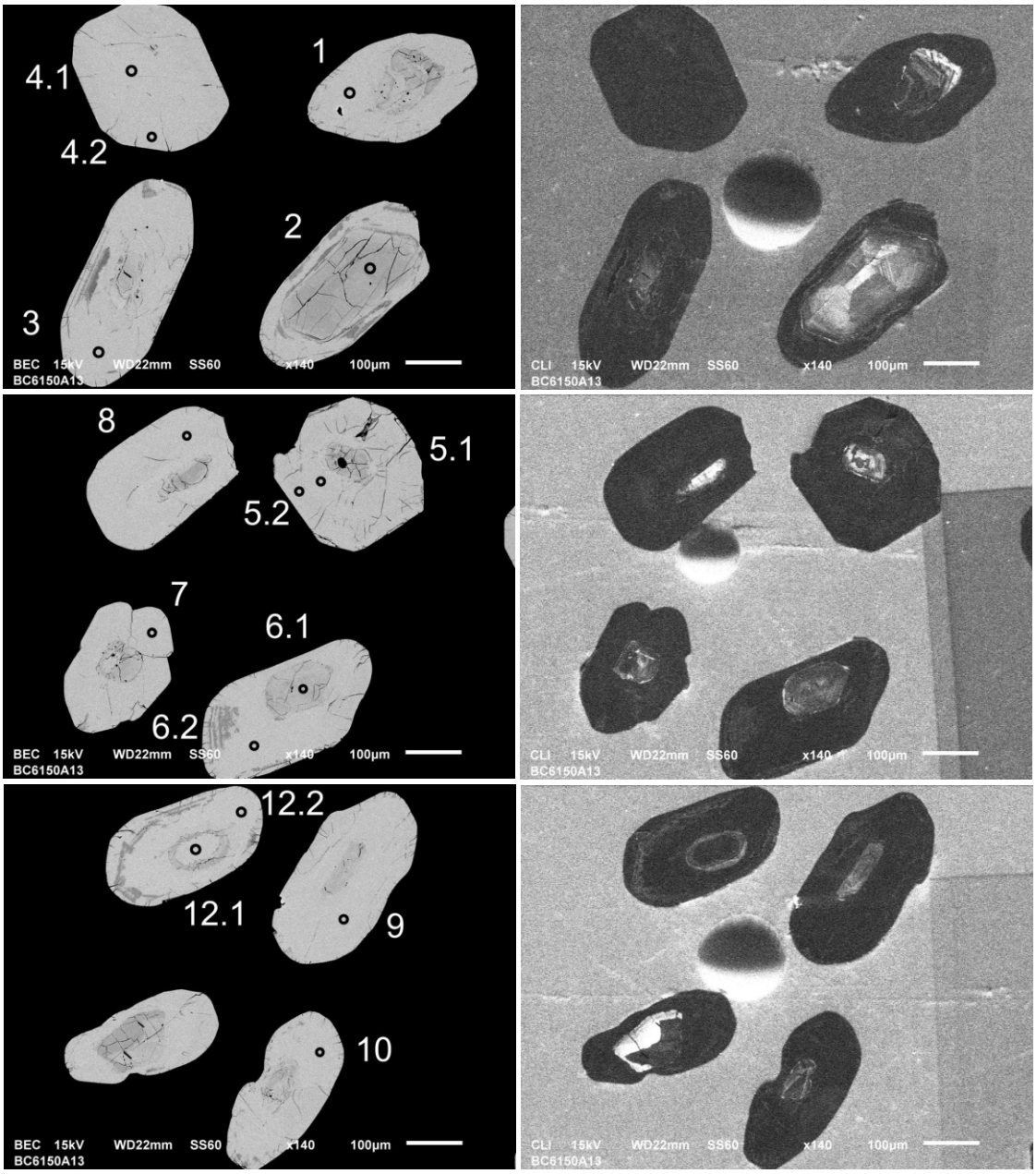


Figure S3-3 (continued)

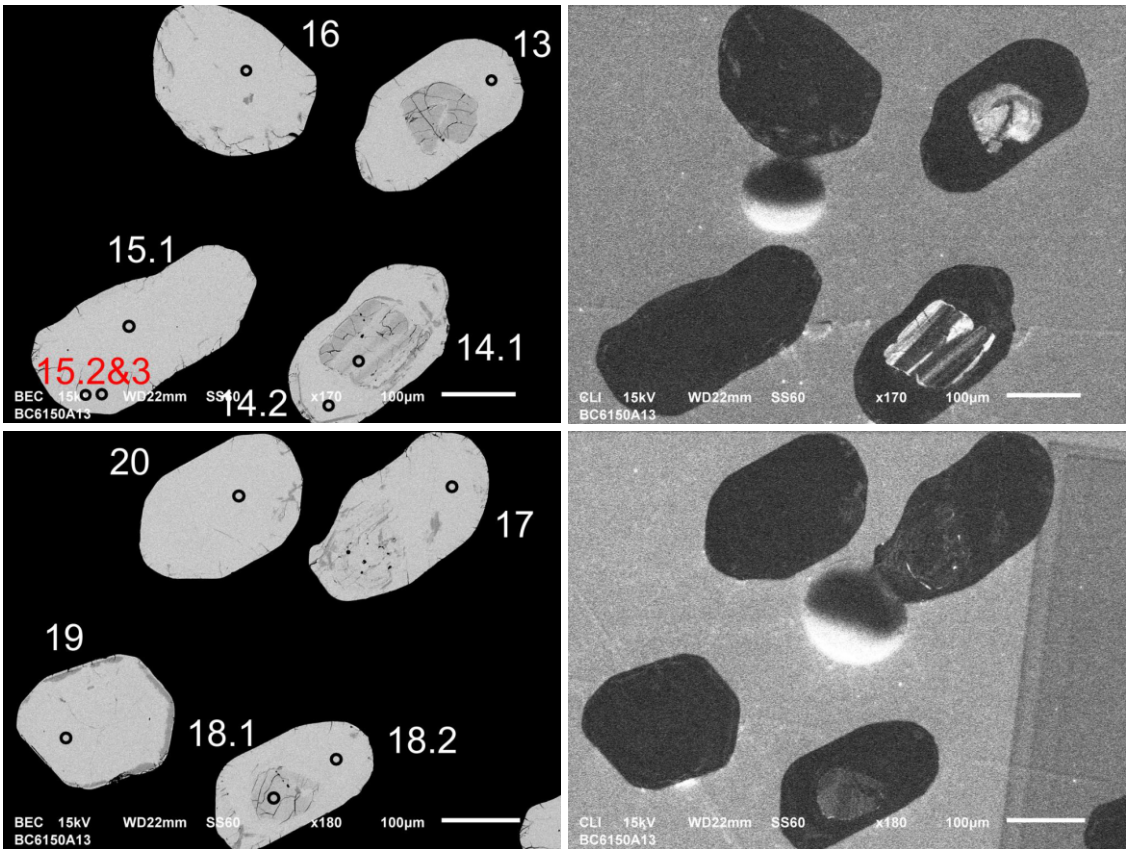


Figure S3-4: BSE (left) and CL (right) imaging of zircon cores of sample 6150-A

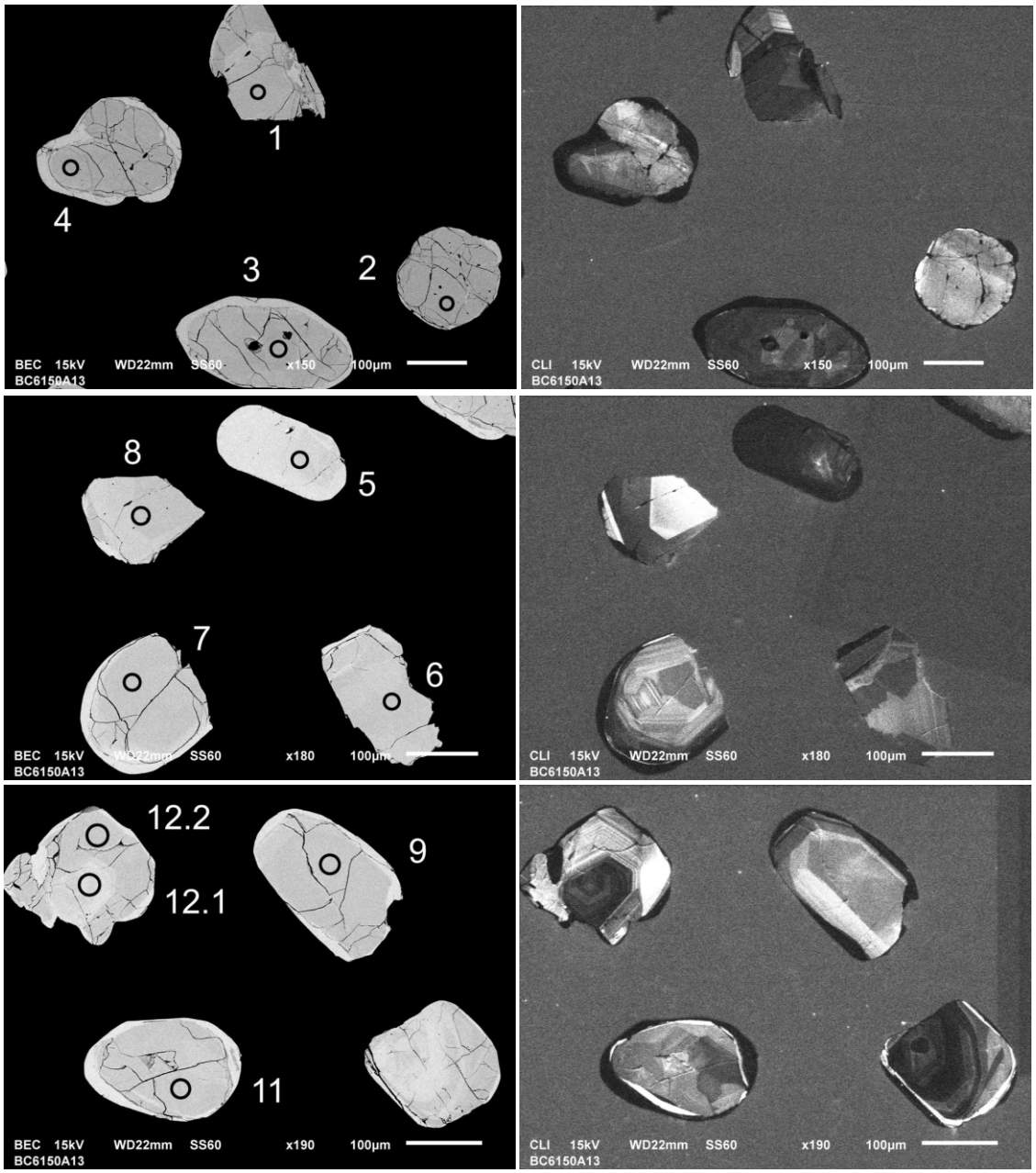


Figure S3-4 (continued)

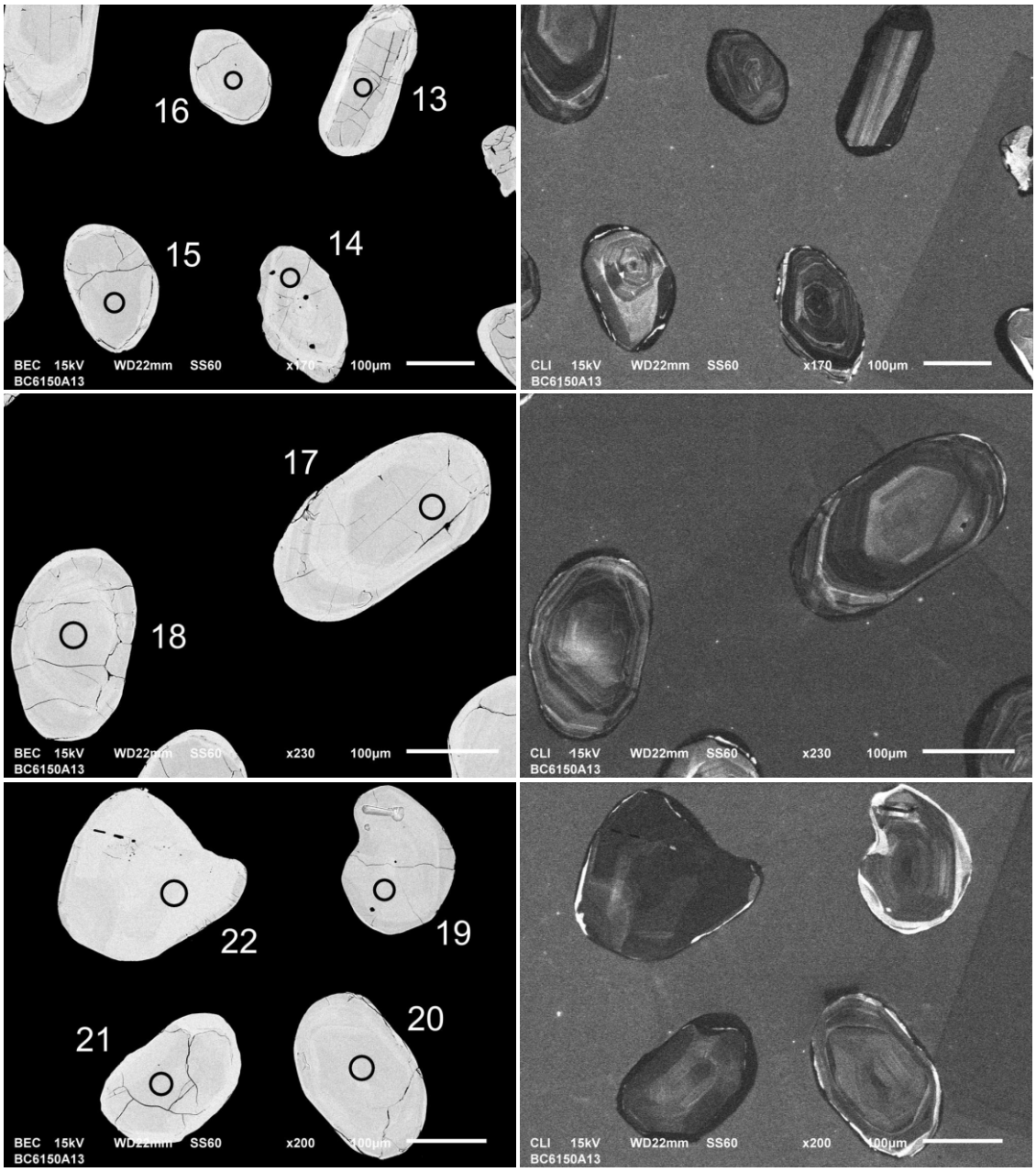


Figure S3-4 (continued)

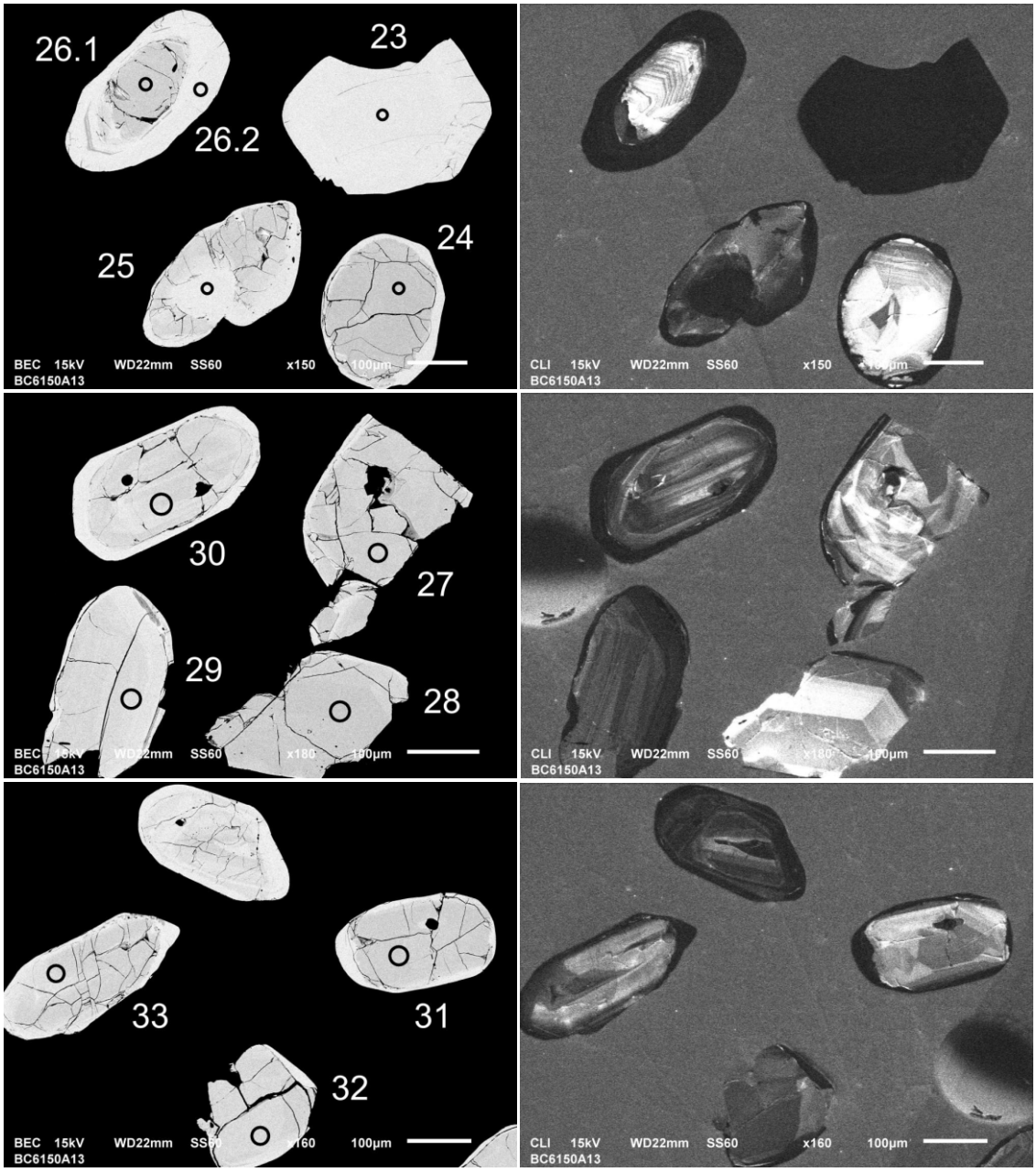


Figure S3-4 (continued)

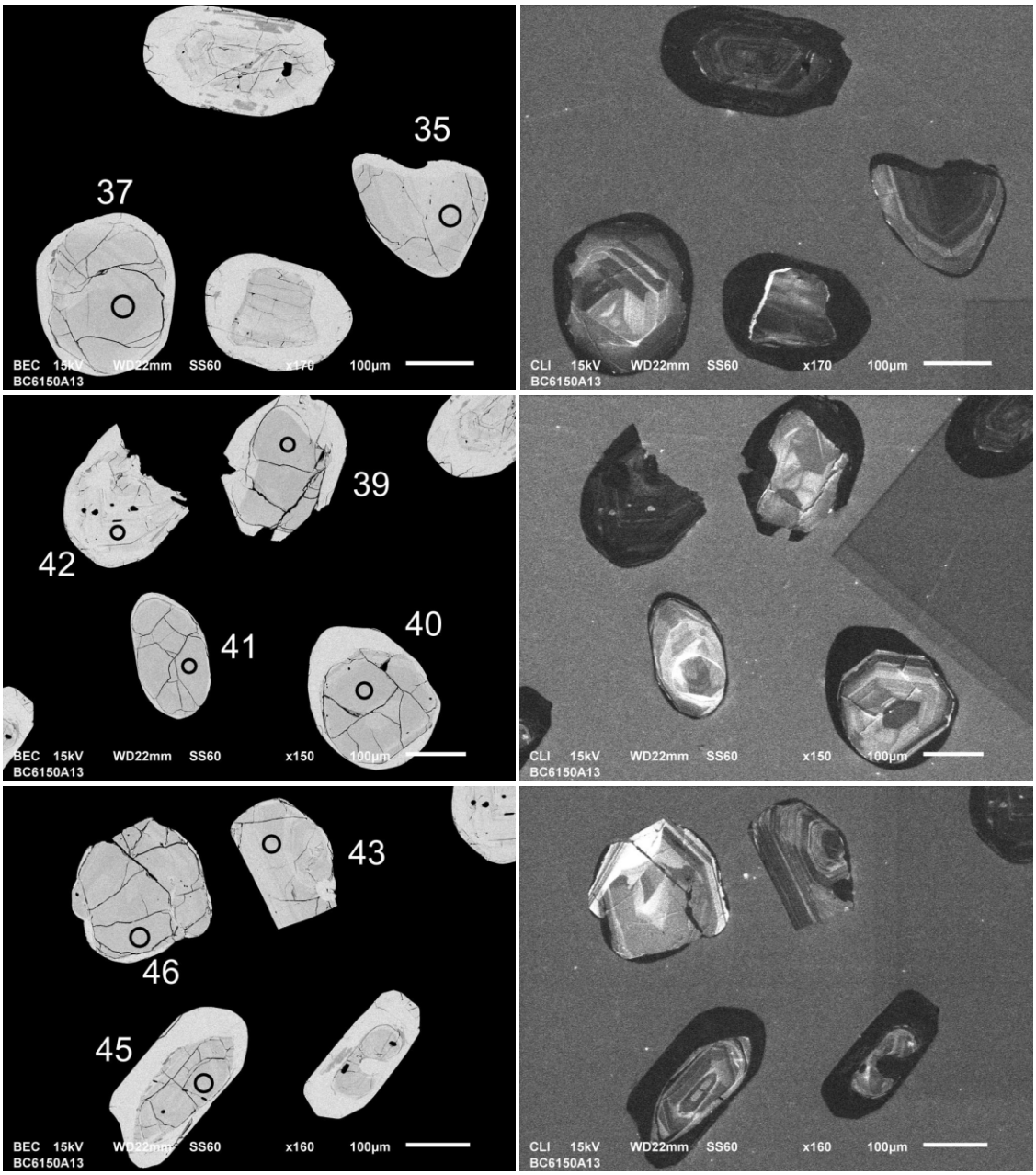


Figure S3-4 (continued)

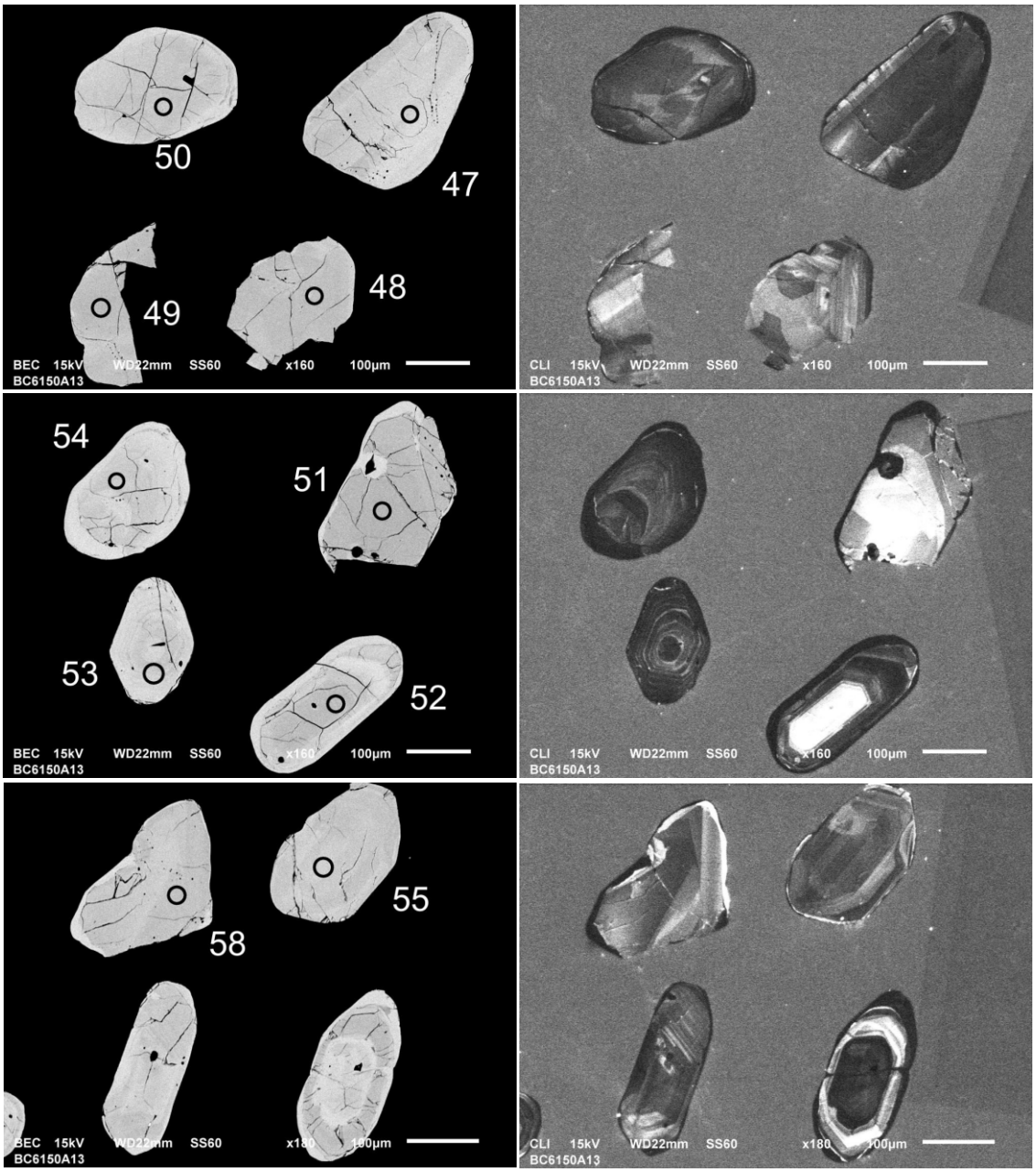


Figure S3-4 (continued)

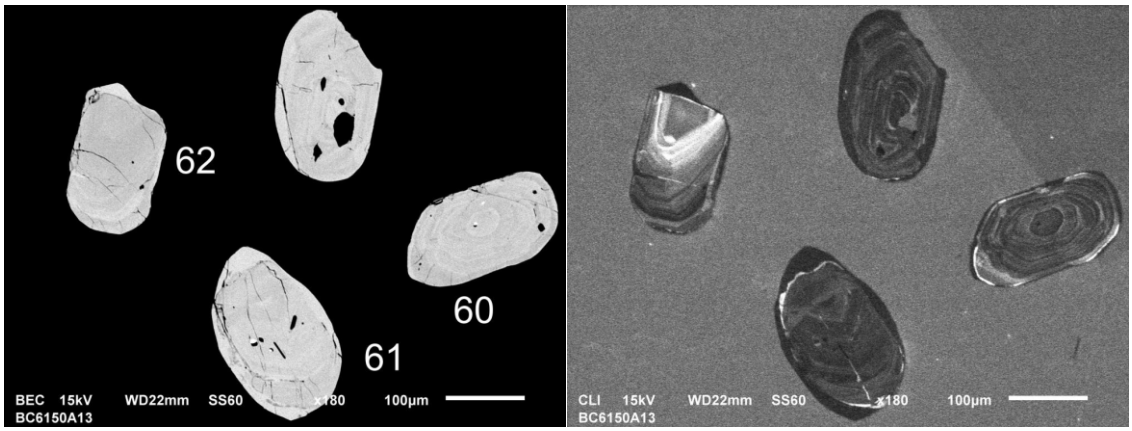


Figure S3-5: BSE (left) and CL (right) zircon imaging of sample 1098-A

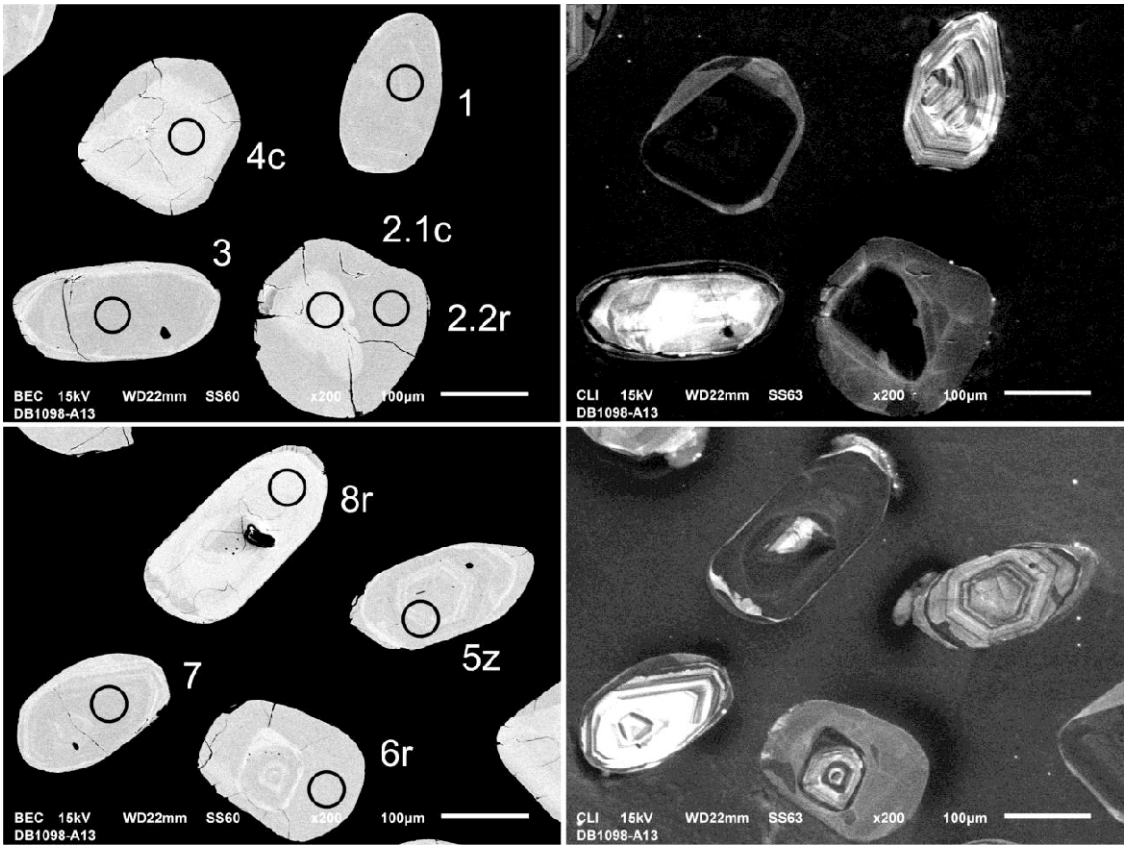


Figure S3-5 (continued)

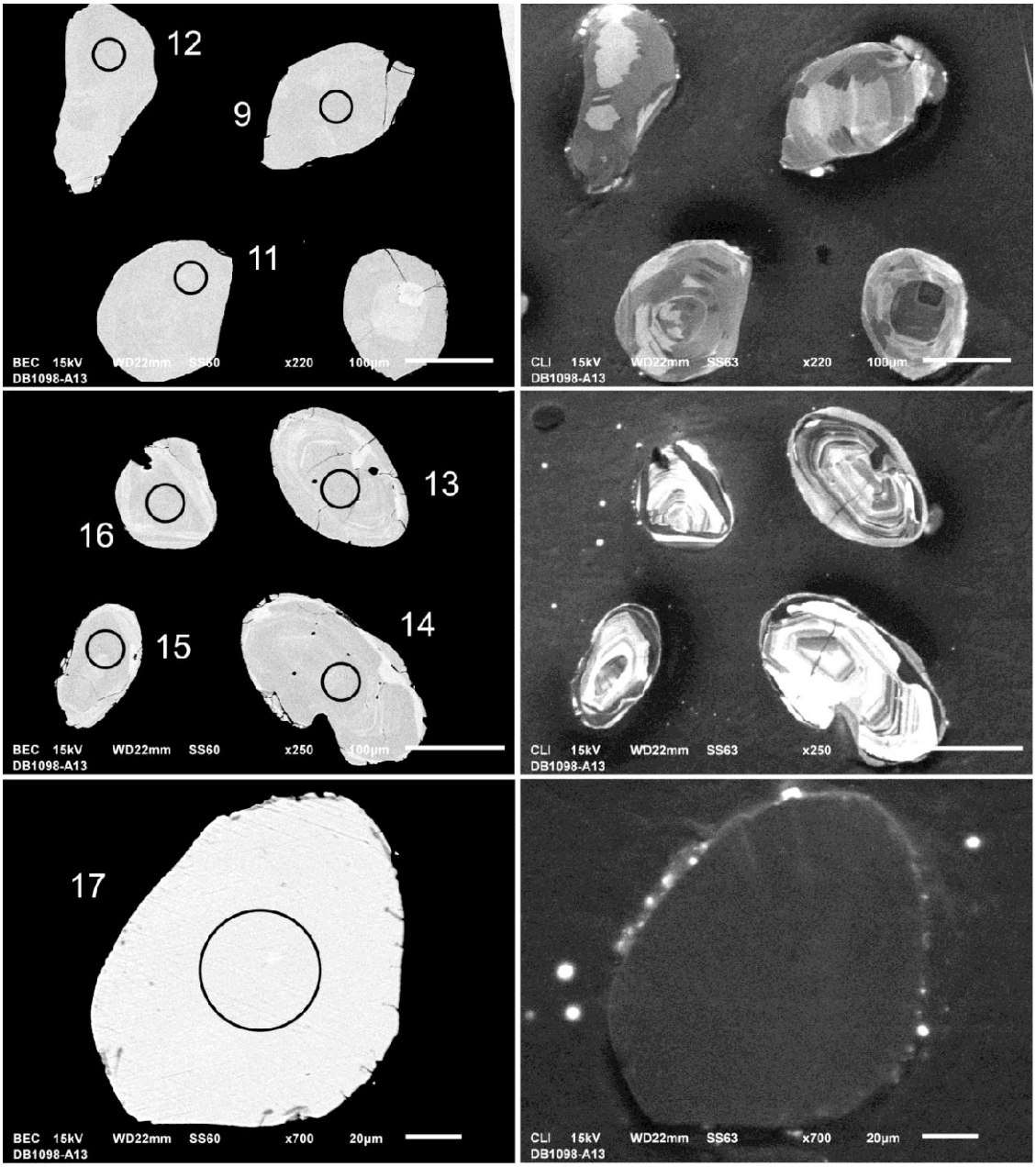


Figure S3-5 (continued)

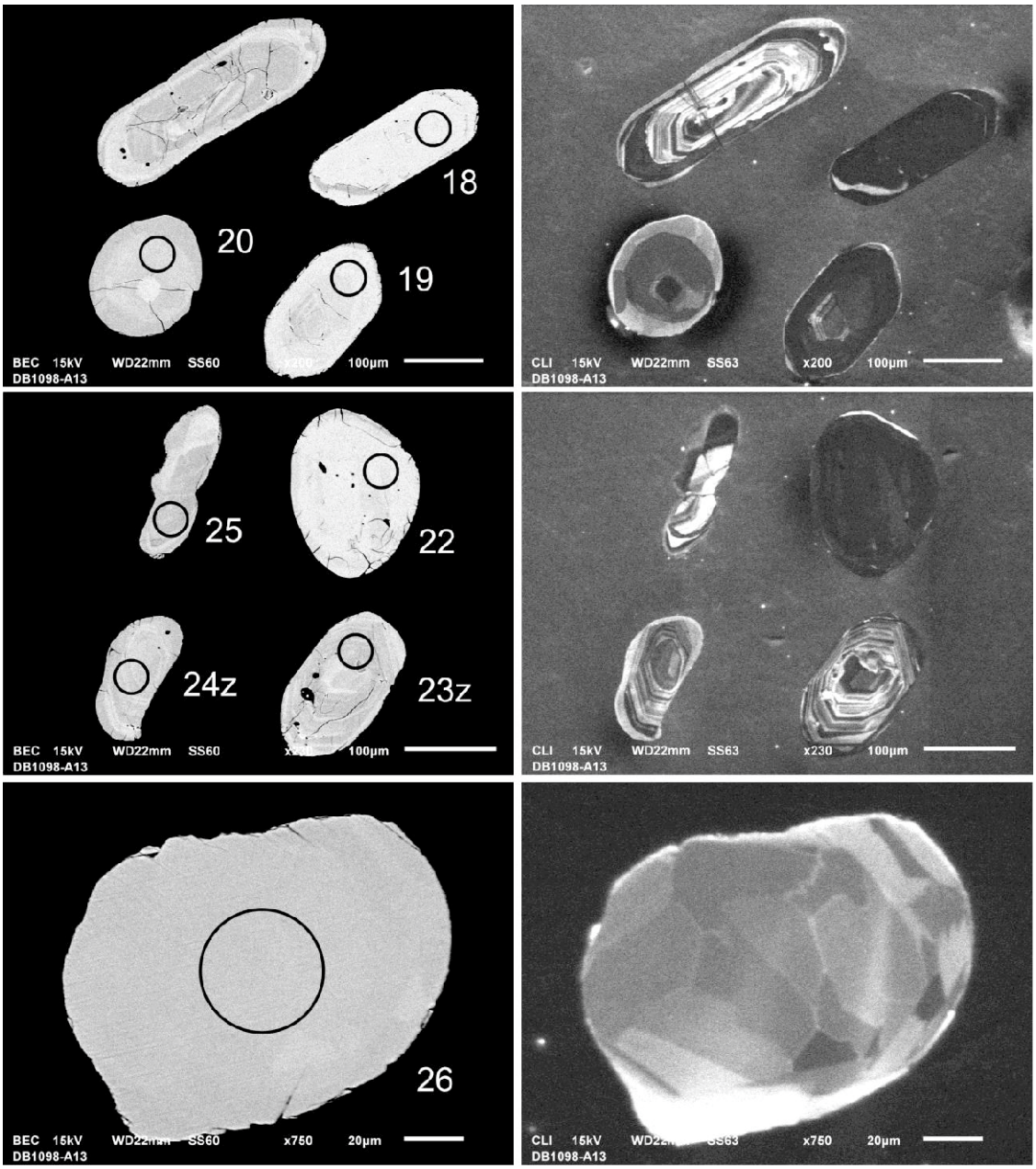


Figure S3-6: BSE (left) and CL (right) zircon imaging of sample 6117-A

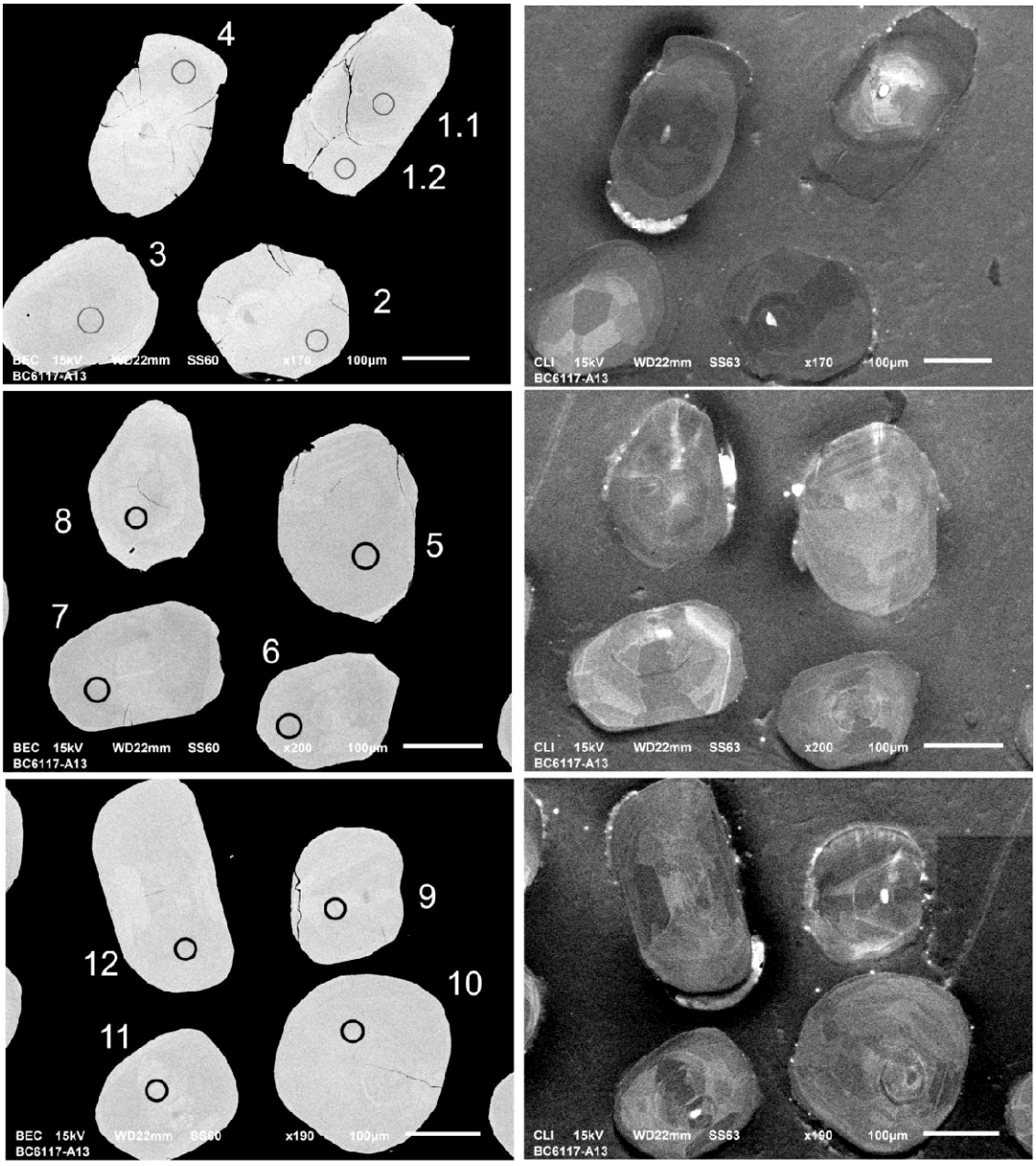


Figure S3-6 (continued)

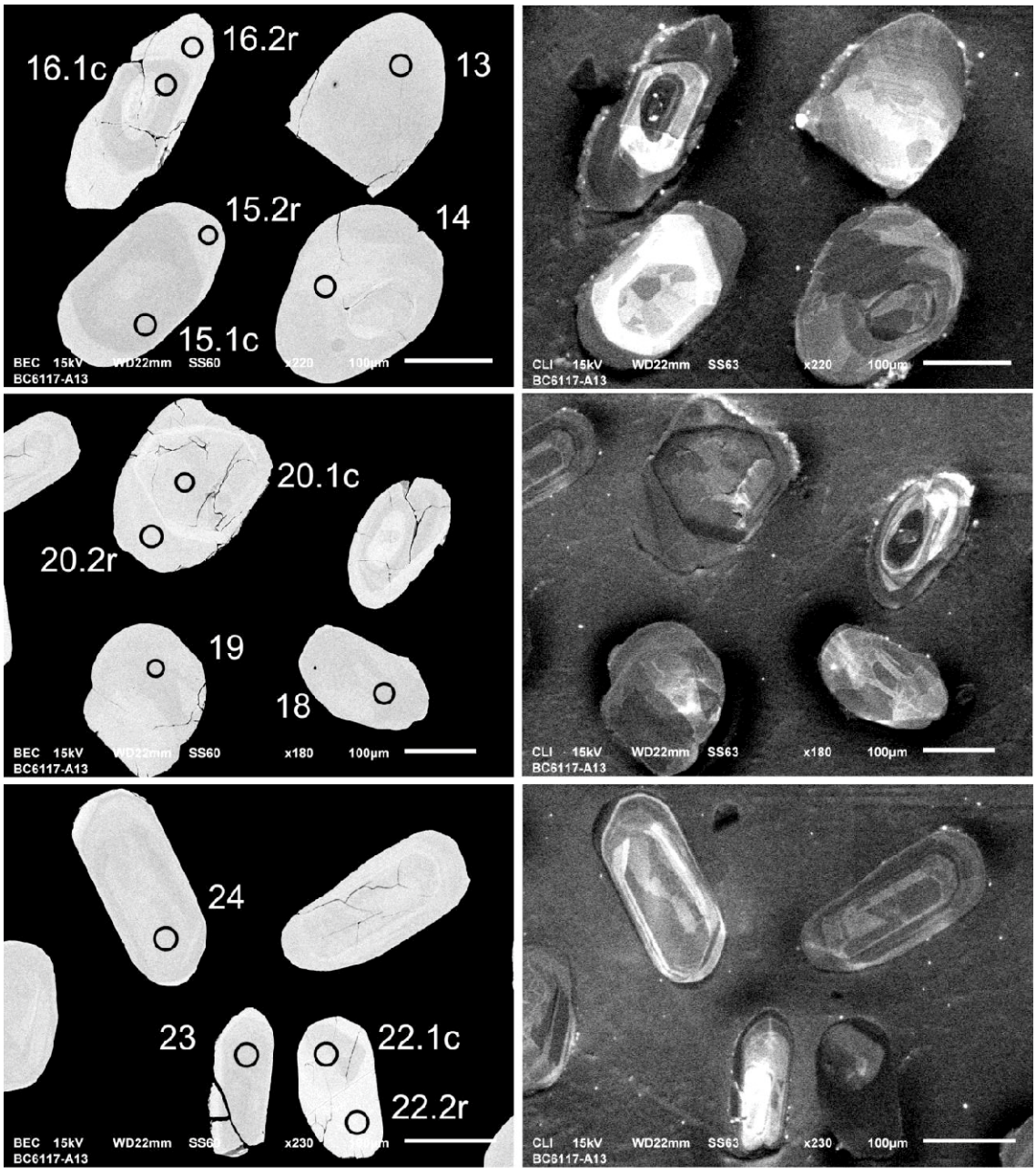


Figure S3-6 (continued)

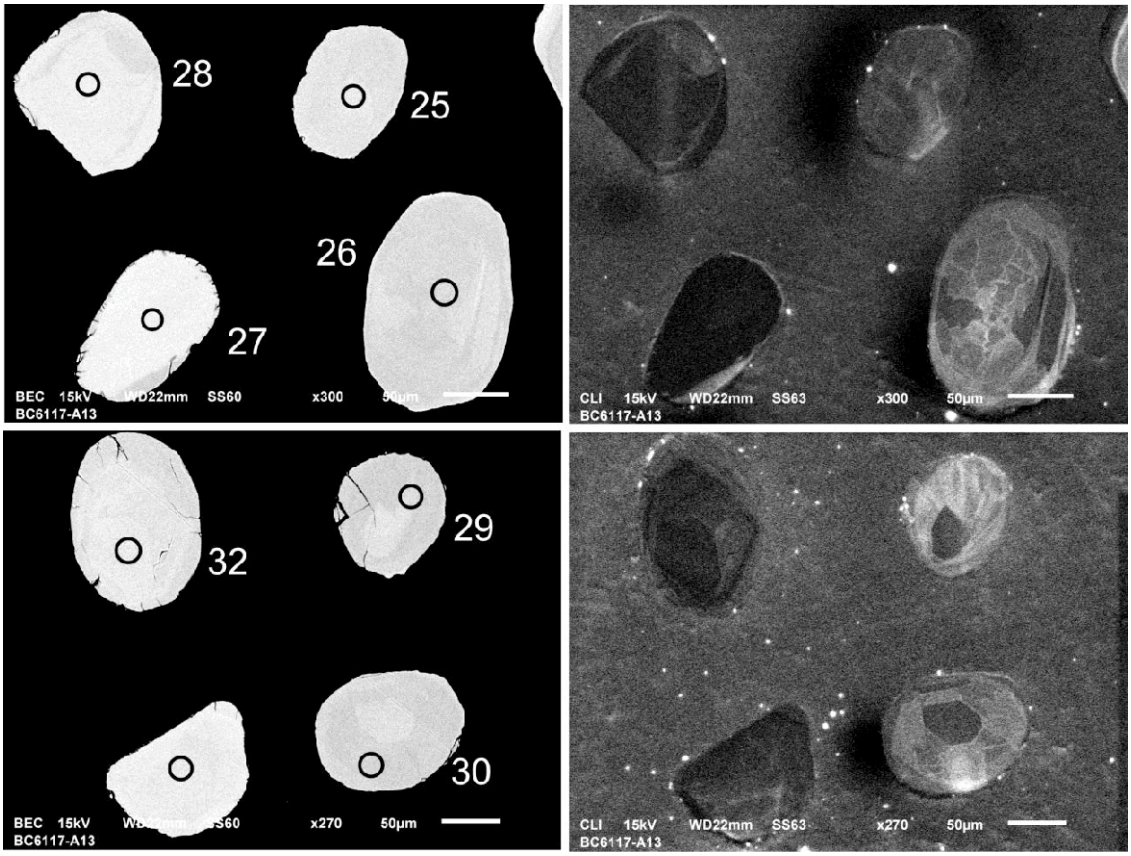


Figure S3-7: BSE (left) and CL (right) zircon imaging of sample 6210-A

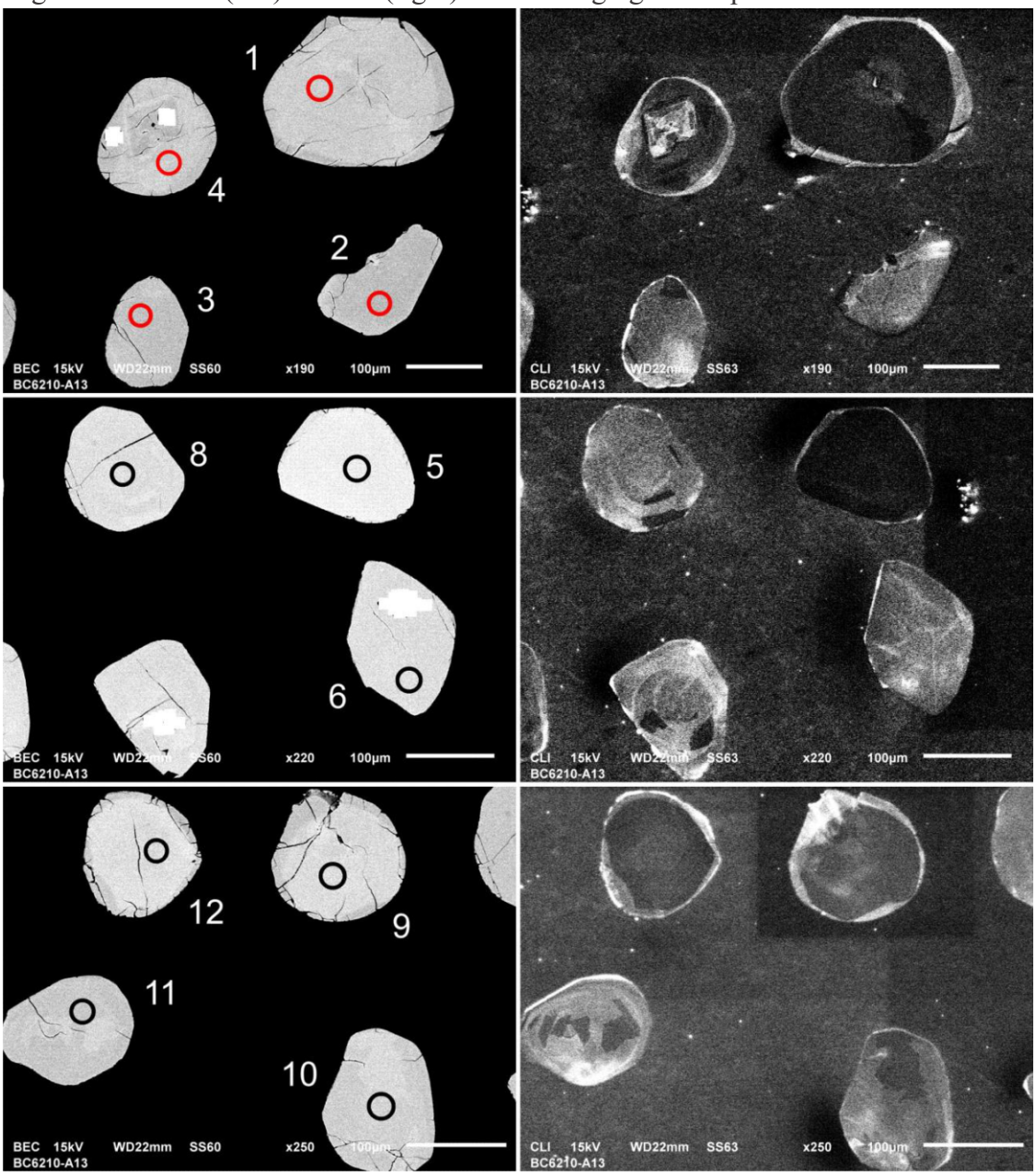
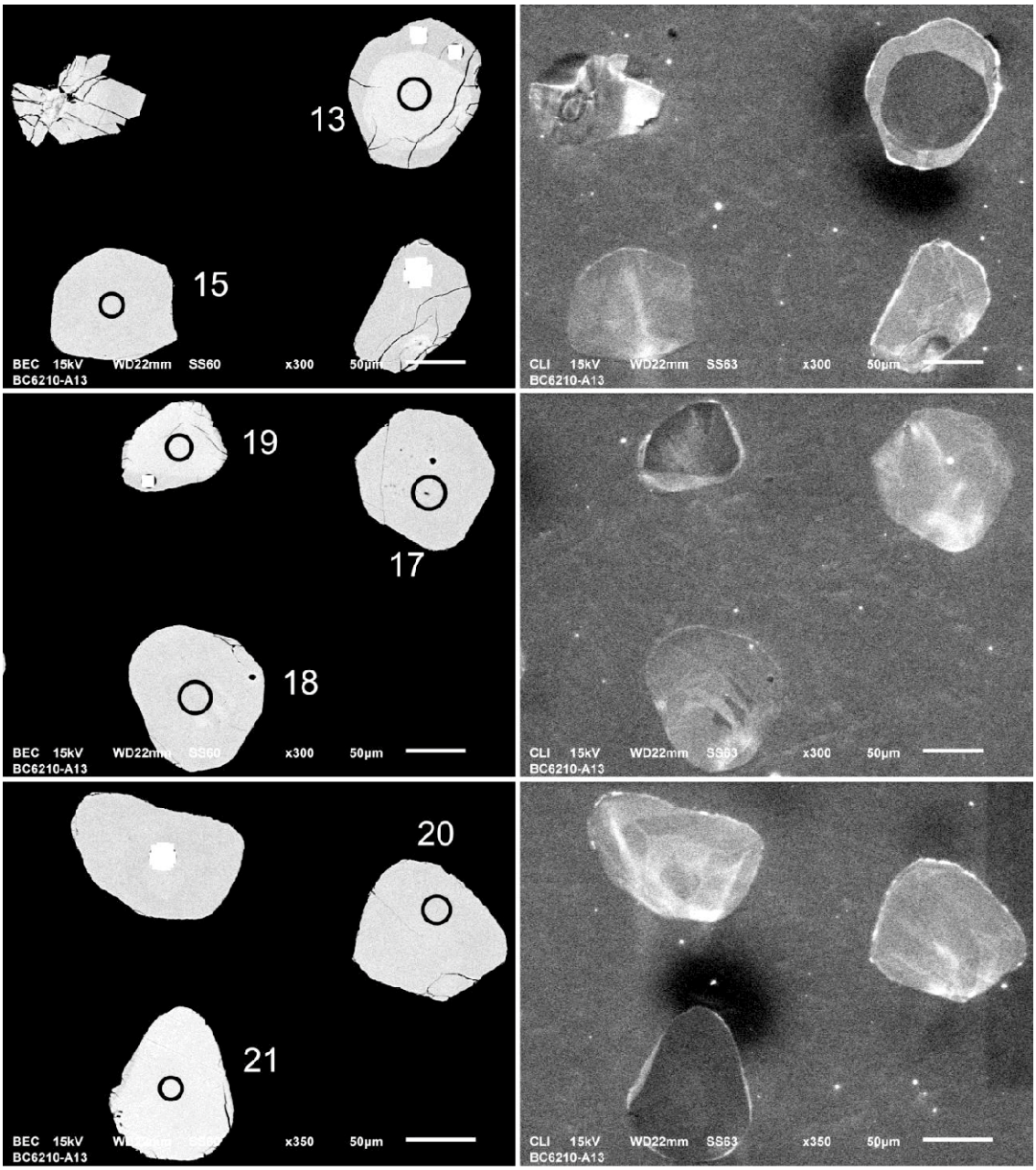


Figure S3-7 (continued)



APPENDIX 5: MONAZITE IMAGING, U-PB ISOTOPE ANALYSES, CHEMISTRY AND Y-MAPS

Monazite qualitative Y-profiles were conducted for all crystals analyzed for U-Pb radioactive isotopes. Each profile was acquired so that it passes through U-Pb LA-ICP-MS spot analysis and in order to characterize all zonation observed on BSE imaging. Spot analyses were acquired in order to quantify the different domains identified from profiles. All spot analyses are reported in Table S3.

Sample 3008-A monazites of: a) homogeneous low-Y crystal (crystal 4); b) moderate-Y crystal with low Y rim (crystal 6); c) homogeneous crystal (crystal 8); d) high-Y crystal with moderate-Y rim (crystal 14). Sample 6150-A monazites: e) nebulitic zoning of low to moderate-Y domains (crystal 1); f) high-Y core surrounded by low-Y monazite (crystal 3); g) oscillatory zoned monazite (crystal 6); h) relic high-Y core surrounded by low-Y domain (crystal 8); i) nebulitic zoning of low to moderate-Y domains (crystal 12). Sample 1098-A monazites of: j)-k) high-Y domain corroded by moderate-Y domain (crystals 6 and 12, respectively); l) homogeneous moderate-Y monazite (crystal 20). Sample 6210-A monazites: m)-n) irregular high-Y core surrounded by large moderate-Y domain and low-Y rim (crystals 13 and 16, respectively).

(*) Measured with U in analog mode, only $^{207}Pb/^{206}Pb$ is valid. c - core; r - rim; lt - bright in CL; dk - dark in CL; alt - altered domain; z - zoned; m - mantle (between core and rim). Err. Correl. - Error correlation coefficient for concordia coordinates; Disc. – Discordance. U decay constants (L238 & L235) from Jaffey *et al.* (1971).

Figure S4-1: Monazite imaging in natural light

Figure S4-2: BSE monazite imaging of sample 3008-A

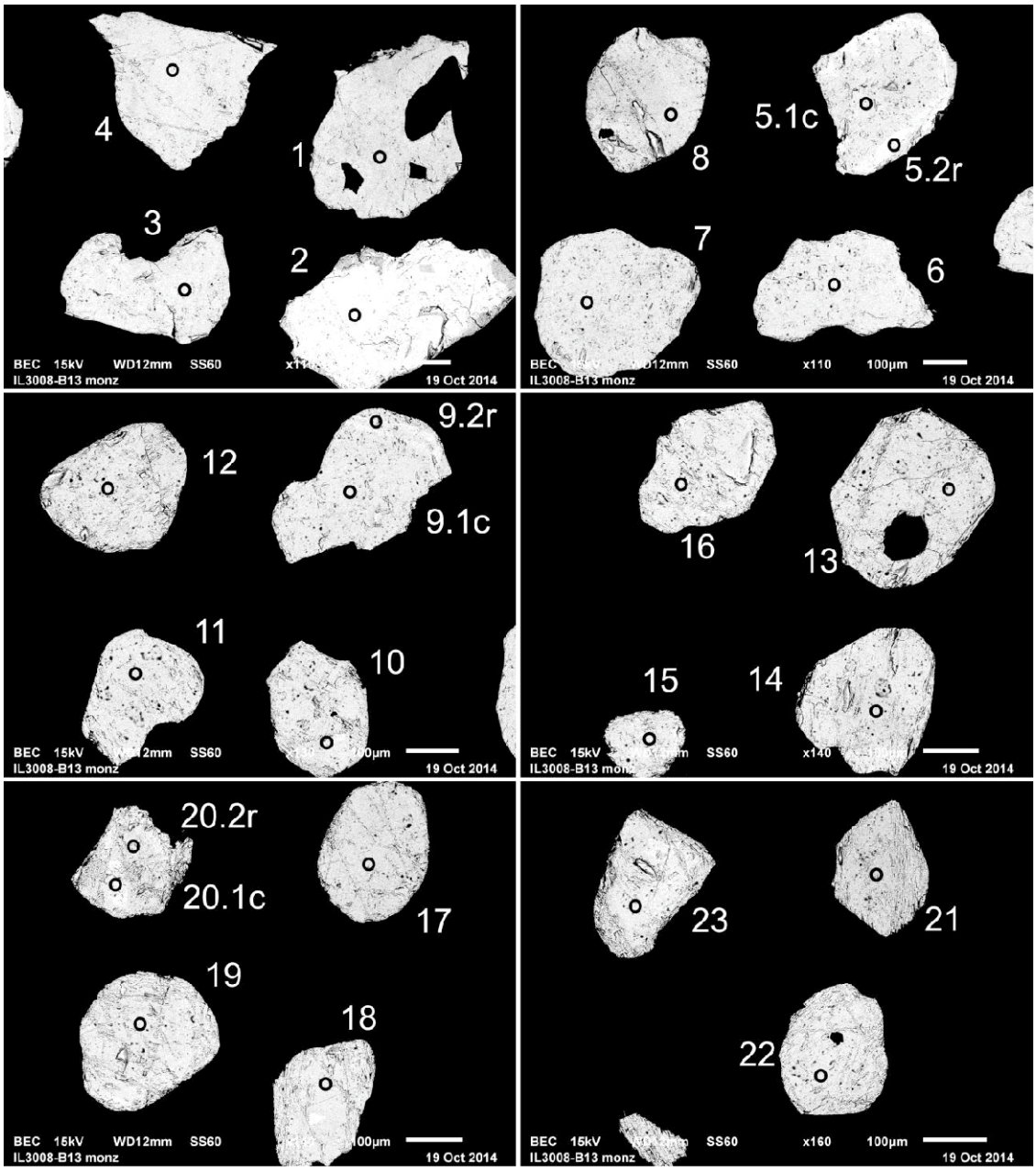


Figure S4-3: BSE monazite imaging of sample 6150-A

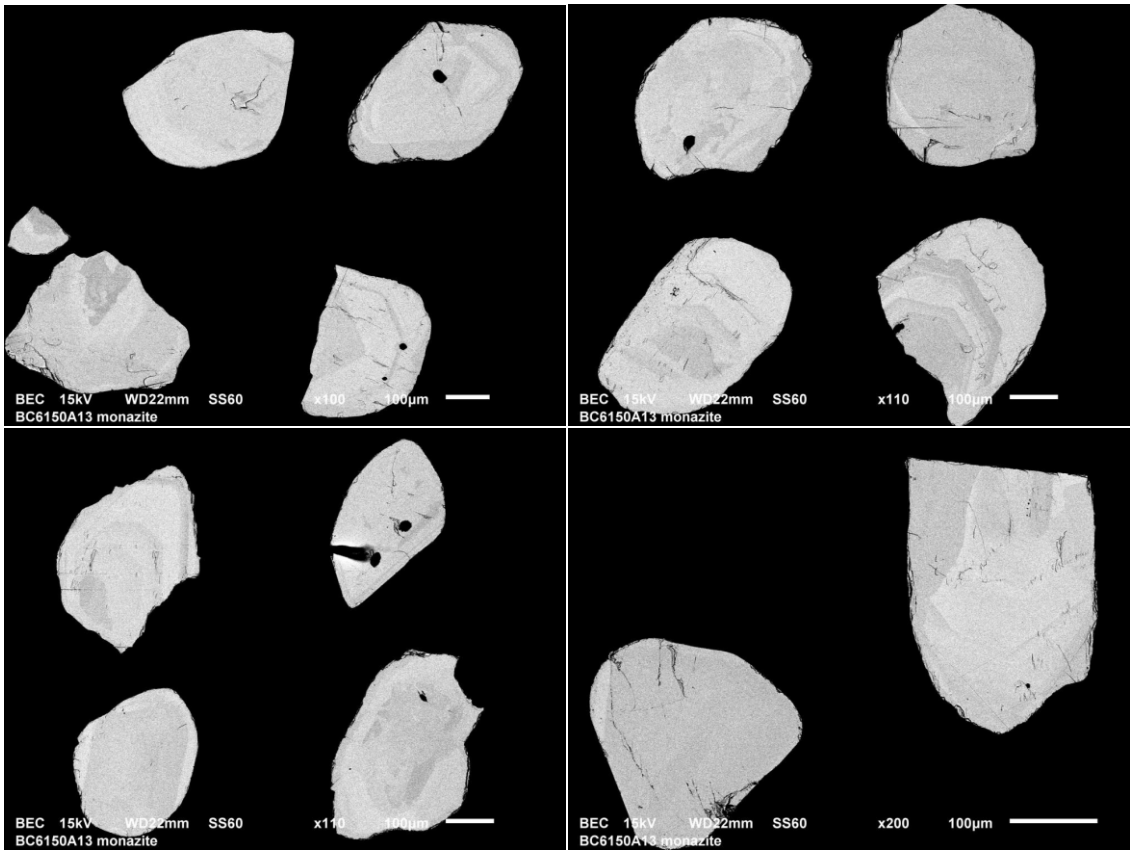


Figure S4-4: BSE monazite imaging of sample 1098-A

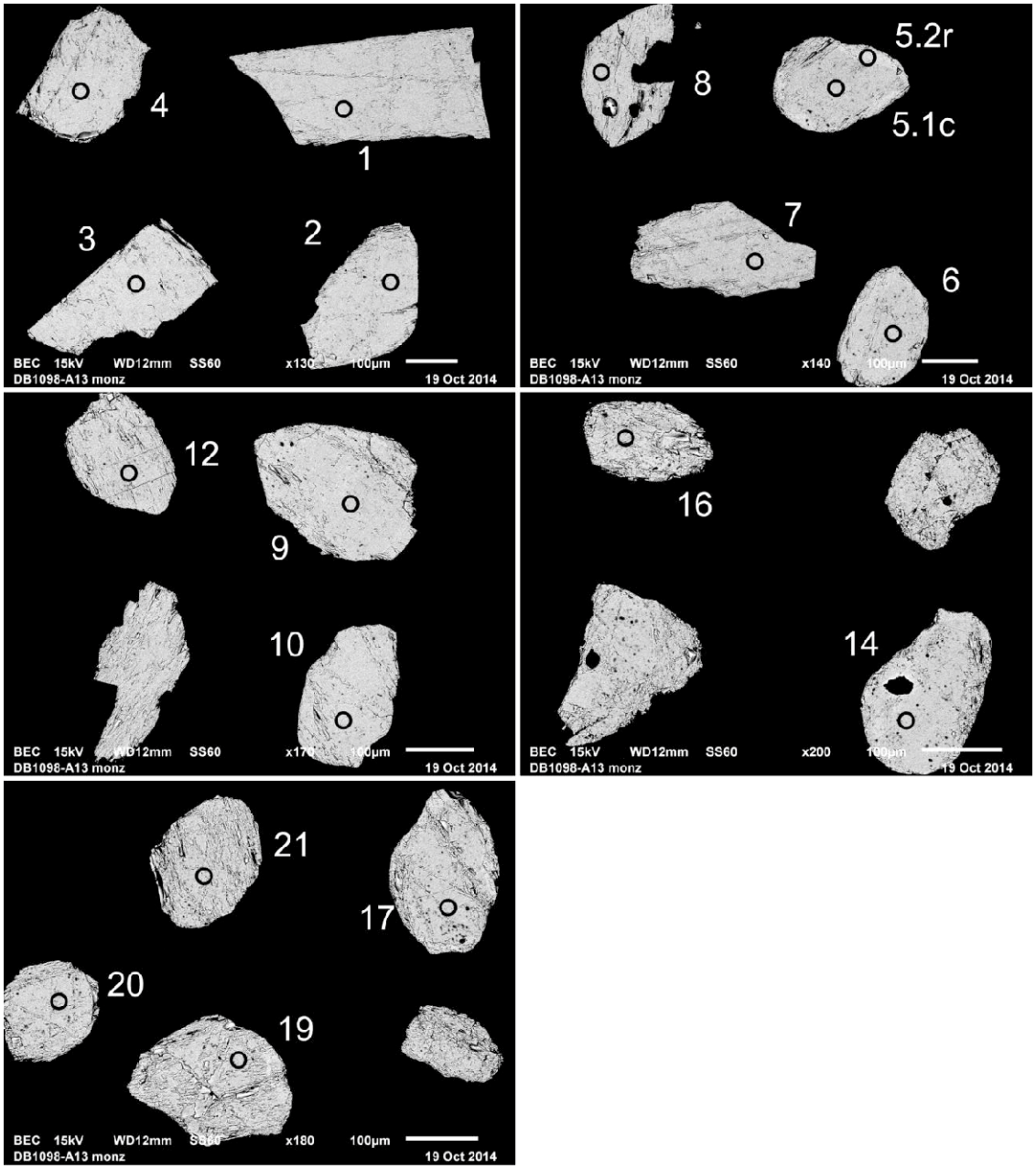


Figure S4-5: BSE monazite imaging of sample 6210-A

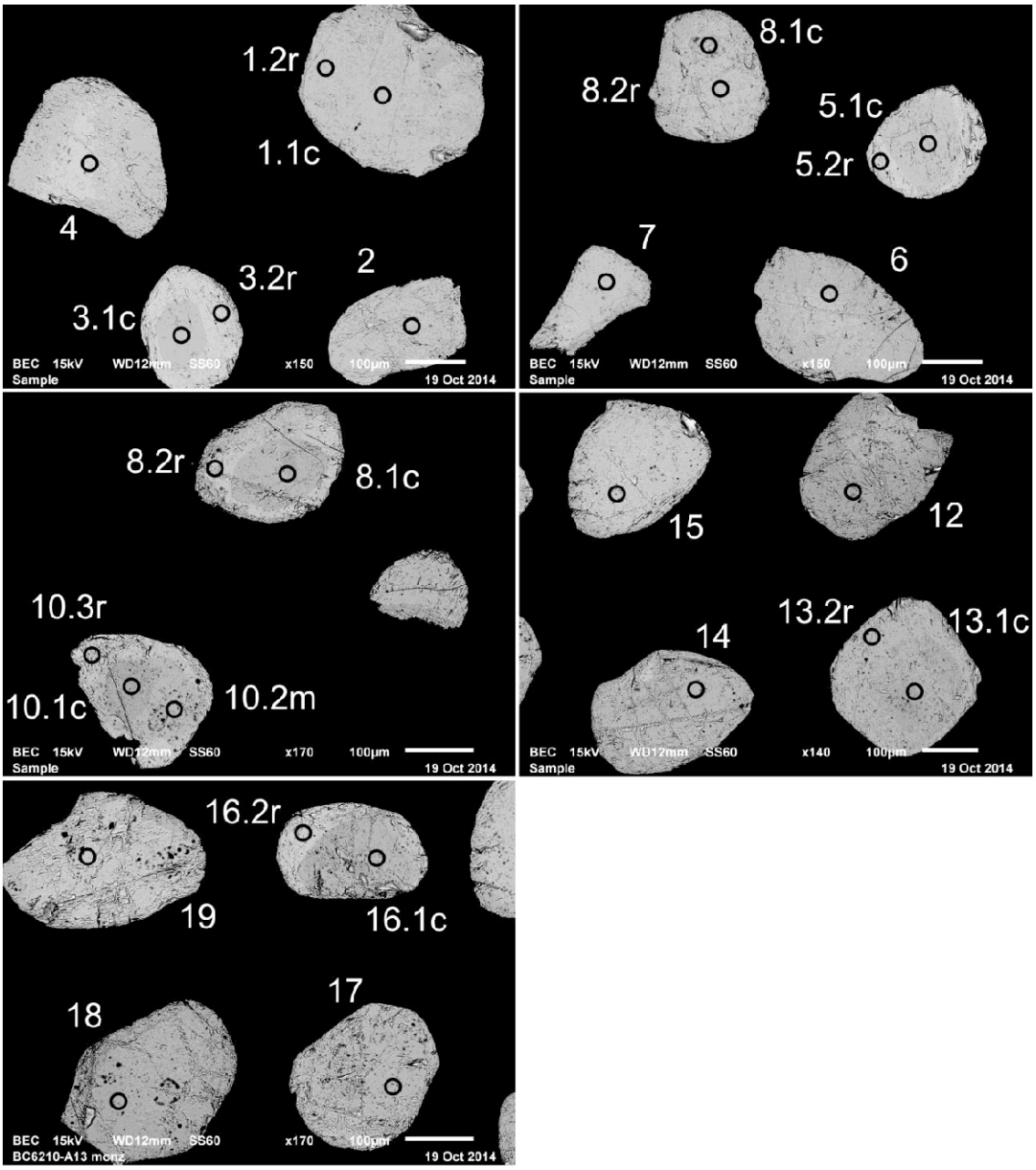


Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	3008-1_1	3008-1b_1	3008-2a_1	3008-2a_2	3008-2b_1	3008-2b_2	3008-3_1	3008-4a_1
Oxydes (wt.%)								
P2O5	30.055	30.249	26.726	30.205	30.466	26.802	29.475	28.494
SiO2	0.519	0.593	2.731	0.336	0.210	2.717	1.076	1.148
Al2O3	0.000	0.012	0.006	0.021	0.023	0.012	0.005	0.024
CaO	1.583	1.627	1.175	1.213	1.027	1.119	2.056	0.854
Na2O	0.130	0.017	0.069	0.005	0.000	0.015	0.000	0.000
FeO	0.041	0.055	0.000	0.045	0.000	0.010	0.000	0.072
MgO	0.004	0.030	0.000	0.042	0.000	0.018	0.009	0.023
U2O3	1.022	0.949	0.446	0.085	0.277	0.434	0.942	0.443
ThO2	8.457	8.802	16.031	7.011	5.468	15.696	13.123	8.343
Y2O3	2.799	0.233	0.455	0.000	0.247	0.467	0.398	0.092
La2O3	12.314	13.092	10.387	13.662	14.350	10.931	12.262	12.647
Ce2O3	26.480	26.295	24.619	27.999	29.045	24.127	24.331	27.638
Pr2O3	3.184	2.954	2.549	3.005	2.860	2.677	2.832	3.300
Nd2O3	11.137	10.603	10.747	11.862	11.890	10.749	10.028	12.426
SmO	1.932	1.822	1.410	1.647	1.646	1.455	1.600	1.657
Total	99.657	97.333	97.351	97.138	97.509	97.229	98.137	97.161
Cations*								
P	3.964	4.047	3.690	4.059	4.076	3.699	3.952	3.902
Si	0.081	0.094	0.445	0.053	0.033	0.443	0.170	0.186
Al	0.000	0.002	0.001	0.004	0.004	0.002	0.001	0.005
Ca	0.264	0.276	0.205	0.206	0.174	0.196	0.349	0.148
Na	0.039	0.005	0.022	0.002	0.000	0.005	0.000	0.000
Fe^{2+}	0.005	0.007	0.000	0.006	0.000	0.001	0.000	0.010
Mg	0.001	0.007	0.000	0.010	0.000	0.004	0.002	0.006
U	0.036	0.034	0.017	0.003	0.010	0.016	0.034	0.016
Th	0.300	0.317	0.595	0.253	0.197	0.582	0.473	0.307
Y	0.232	0.020	0.040	0.000	0.021	0.040	0.034	0.008
La	0.708	0.763	0.625	0.800	0.836	0.657	0.716	0.755
Ce	1.510	1.522	1.470	1.627	1.681	1.440	1.411	1.637
Pr	0.181	0.170	0.151	0.174	0.165	0.159	0.163	0.195
Nd	0.620	0.599	0.626	0.673	0.671	0.626	0.567	0.718
Sm	0.109	0.104	0.083	0.094	0.094	0.086	0.092	0.097

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	3008-4b_1	3008-4b_2	3008-5a_2	3008-5b_1	3008-6_1	3008-6_2	3008-7a_1	3008-7b_1
Oxydes (wt.%)								
P2O5	28.482	28.594	27.546	29.663	28.529	28.664	30.241	30.148
SiO2	1.079	1.111	1.912	0.783	1.337	1.130	0.711	0.641
Al2O3	0.013	0.002	0.026	0.026	0.028	0.016	0.026	0.004
CaO	0.971	0.823	1.679	2.084	0.877	0.862	1.736	1.711
Na2O	0.000	0.008	0.031	0.000	0.015	0.007	0.031	0.037
FeO	0.065	0.048	0.000	0.072	0.061	0.000	0.038	0.000
MgO	0.009	0.012	0.000	0.013	0.000	0.000	0.018	0.007
U2O3	0.383	0.518	1.017	1.219	0.299	0.392	0.874	0.822
ThO2	8.258	7.807	15.423	11.723	9.029	8.246	9.925	9.661
Y2O3	0.334	0.000	0.274	0.335	0.565	0.646	0.293	0.225
La2O3	11.659	13.310	11.877	11.412	14.154	12.908	12.301	12.871
Ce2O3	27.700	27.698	23.755	24.144	27.138	27.126	26.234	26.481
Pr2O3	3.050	3.188	2.681	2.533	3.023	3.201	2.936	2.913
Nd2O3	12.830	13.244	10.072	10.704	11.745	11.915	10.727	10.693
SmO	1.997	1.754	1.508	1.902	1.704	1.762	1.844	1.672
Total	96.830	98.117	97.801	96.613	98.504	96.875	97.935	97.886
Cations*								
P	3.911	3.894	3.784	4.014	3.862	3.918	4.028	4.026
Si	0.175	0.179	0.310	0.125	0.214	0.182	0.112	0.101
Al	0.002	0.000	0.005	0.005	0.005	0.003	0.005	0.001
Ca	0.169	0.142	0.292	0.357	0.150	0.149	0.293	0.289
Na	0.000	0.003	0.010	0.000	0.005	0.002	0.009	0.011
Fe^{2+}	0.009	0.006	0.000	0.010	0.008	0.000	0.005	0.000
Mg	0.002	0.003	0.000	0.003	0.000	0.000	0.004	0.002
U	0.014	0.019	0.038	0.045	0.011	0.015	0.032	0.030
Th	0.305	0.286	0.569	0.426	0.329	0.303	0.355	0.347
Y	0.029	0.000	0.024	0.028	0.048	0.056	0.025	0.019
La	0.697	0.790	0.711	0.673	0.835	0.769	0.714	0.749
Ce	1.645	1.631	1.411	1.413	1.589	1.603	1.511	1.529
Pr	0.180	0.187	0.159	0.148	0.176	0.188	0.168	0.167
Nd	0.743	0.761	0.584	0.611	0.671	0.687	0.603	0.602
Sm	0.117	0.102	0.088	0.110	0.098	0.103	0.105	0.095

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	3008-8a_1	3008-8b_1	3008-8b_2	3008-9a_1	3008-9b_1	3008-10_1	3008-11_2	3008-11_3
Oxydes (wt.%)								
P2O5	30.060	29.528	30.616	29.416	29.688	28.066	29.487	29.764
SiO2	0.184	0.548	0.398	0.857	0.836	1.292	0.802	0.662
Al2O3	0.038	0.028	0.020	0.016	0.004	0.033	0.011	0.027
CaO	0.958	1.411	1.404	1.808	1.806	1.764	2.313	2.367
Na2O	0.026	0.000	0.056	0.014	0.066	0.051	0.000	0.022
FeO	0.000	0.079	0.034	0.154	0.106	0.133	0.000	0.092
MgO	0.000	0.012	0.003	0.014	0.000	0.003	0.011	0.000
U2O3	0.250	1.119	0.722	0.758	0.813	0.781	1.451	1.852
ThO2	4.793	7.793	7.118	11.179	11.081	12.906	12.349	11.813
Y2O3	0.302	0.103	0.333	0.290	0.147	0.361	0.181	0.264
La2O3	14.732	13.582	13.095	11.788	12.694	11.800	11.635	11.648
Ce2O3	30.570	28.560	27.837	25.986	25.865	25.316	24.359	23.816
Pr2O3	3.251	3.013	2.966	2.857	2.635	2.533	2.808	2.590
Nd2O3	11.687	11.213	11.204	10.348	10.366	10.535	9.879	9.910
SmO	1.622	1.652	1.653	1.575	1.471	1.614	1.426	1.717
Total	98.473	98.641	97.459	97.060	97.578	97.188	96.712	96.544
Cations*								
P	4.024	3.972	4.077	3.979	3.990	3.857	3.996	4.028
Si	0.029	0.087	0.063	0.137	0.133	0.210	0.128	0.106
Al	0.007	0.005	0.004	0.003	0.001	0.006	0.002	0.005
Ca	0.162	0.240	0.237	0.309	0.307	0.307	0.397	0.405
Na	0.008	0.000	0.017	0.004	0.020	0.016	0.000	0.007
Fe^{2+}	0.000	0.010	0.005	0.021	0.014	0.018	0.000	0.012
Mg	0.000	0.003	0.001	0.003	0.000	0.001	0.003	0.000
U	0.009	0.041	0.026	0.028	0.030	0.029	0.053	0.068
Th	0.172	0.282	0.255	0.406	0.400	0.477	0.450	0.430
Y	0.025	0.009	0.028	0.025	0.012	0.031	0.015	0.022
La	0.859	0.796	0.760	0.695	0.743	0.706	0.687	0.687
Ce	1.770	1.661	1.603	1.520	1.503	1.504	1.428	1.394
Pr	0.187	0.174	0.170	0.166	0.152	0.150	0.164	0.151
Nd	0.660	0.636	0.629	0.590	0.588	0.611	0.565	0.566
Sm	0.093	0.095	0.094	0.091	0.084	0.095	0.082	0.099

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	3008-12a_1	3008-12b_1	3008-14a_2	3008-14a_3	3008-14b_1	3008-14b_3	3008-16b_1	3008-16b_2
Oxydes (wt.%)								
P2O5	30.256	30.229	28.795	29.622	30.543	29.293	30.972	29.628
SiO2	0.695	0.818	0.878	0.530	0.550	0.569	0.657	0.523
Al2O3	0.026	0.027	0.020	0.000	0.046	0.029	0.019	0.030
CaO	1.908	1.913	1.696	1.625	0.584	1.638	1.887	2.013
Na2O	0.041	0.049	0.002	0.007	0.060	0.005	0.082	0.000
FeO	0.000	0.086	0.031	0.065	0.021	0.147	0.000	0.106
MgO	0.019	0.029	0.000	0.003	0.000	0.035	0.029	0.004
U2O3	1.028	1.083	0.968	1.019	0.169	1.077	1.429	1.612
ThO2	10.812	10.955	10.425	8.789	4.549	8.882	9.985	9.623
Y2O3	0.281	0.257	0.266	0.268	0.524	0.281	0.230	0.390
La2O3	12.004	11.731	12.107	13.305	14.544	13.361	11.738	10.635
Ce2O3	25.617	24.429	26.108	26.033	30.532	26.459	24.979	26.314
Pr2O3	2.588	2.809	2.766	3.135	3.304	2.918	2.886	2.744
Nd2O3	10.765	10.781	10.805	11.089	12.475	10.581	10.407	10.913
SmO	1.713	1.837	1.667	1.609	1.243	1.802	1.890	1.964
Total	97.753	97.033	96.534	97.099	99.144	97.077	97.190	96.499
Cations*								
P	4.034	4.041	3.947	4.012	4.024	3.984	4.101	4.026
Si	0.109	0.129	0.142	0.085	0.086	0.091	0.103	0.084
Al	0.005	0.005	0.004	0.000	0.008	0.005	0.004	0.006
Ca	0.322	0.324	0.294	0.278	0.097	0.282	0.316	0.346
Na	0.012	0.015	0.000	0.002	0.018	0.002	0.025	0.000
Fe^{2+}	0.000	0.011	0.004	0.009	0.003	0.020	0.000	0.014
Mg	0.004	0.007	0.000	0.001	0.000	0.008	0.007	0.001
U	0.037	0.039	0.036	0.037	0.006	0.040	0.051	0.059
Th	0.388	0.394	0.384	0.320	0.161	0.325	0.355	0.351
Y	0.024	0.022	0.023	0.023	0.043	0.024	0.019	0.033
La	0.697	0.683	0.723	0.785	0.835	0.792	0.677	0.630
Ce	1.477	1.412	1.548	1.525	1.739	1.556	1.430	1.546
Pr	0.149	0.162	0.163	0.183	0.187	0.171	0.164	0.160
Nd	0.606	0.608	0.625	0.634	0.693	0.607	0.581	0.626
Sm	0.097	0.105	0.097	0.093	0.070	0.105	0.107	0.114

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	3008-17a_1	3008-18_1	3008-18_2	3008-21_1	3008-22b_1	3008-23_1	3008-23_2	6150-1a_1
Oxydes (wt.%)								
P2O5	30.776	30.830	24.108	29.878	29.214	28.870	28.386	29.928
SiO2	0.350	0.601	3.640	0.135	0.576	0.873	1.247	1.108
Al2O3	0.398	0.018	0.051	0.041	0.017	0.009	0.050	0.000
CaO	1.266	2.183	0.349	0.746	1.653	0.757	0.797	1.118
Na2O	0.083	0.075	0.000	0.036	0.000	0.000	0.021	0.348
FeO	0.000	0.000	0.104	0.000	0.000	0.133	0.096	0.000
MgO	0.013	0.000	0.000	0.023	0.000	0.000	0.000	0.000
U2O3	0.335	1.642	1.065	0.064	0.897	0.195	0.296	0.165
ThO2	6.707	10.676	15.976	3.718	9.078	6.435	8.353	9.056
Y2O3	0.341	0.248	0.146	0.228	0.300	0.159	0.487	0.361
La2O3	13.298	11.726	12.011	15.537	12.161	13.560	13.034	12.510
Ce2O3	29.165	24.836	24.471	30.538	26.584	30.315	28.241	28.610
Pr2O3	3.245	2.965	2.963	3.202	2.932	3.178	3.344	2.778
Nd2O3	11.436	10.404	10.852	11.786	11.169	12.345	12.063	11.337
SmO	1.723	1.768	0.910	1.713	1.973	1.384	1.376	1.590
Total	99.136	97.972	96.646	97.645	96.554	98.213	97.791	98.909
Cations*								
P	4.034	4.075	3.457	4.031	3.994	3.914	3.868	3.961
Si	0.054	0.094	0.617	0.021	0.093	0.140	0.201	0.173
Al	0.073	0.003	0.010	0.008	0.003	0.002	0.009	0.000
Ca	0.210	0.365	0.063	0.127	0.286	0.130	0.137	0.187
Na	0.025	0.023	0.000	0.011	0.000	0.000	0.007	0.119
Fe^{2+}	0.000	0.000	0.015	0.000	0.000	0.018	0.013	0.000
Mg	0.003	0.000	0.000	0.005	0.000	0.000	0.000	0.000
U	0.012	0.059	0.041	0.002	0.033	0.007	0.011	0.006
Th	0.236	0.379	0.616	0.135	0.334	0.235	0.306	0.322
Y	0.028	0.021	0.013	0.019	0.026	0.014	0.042	0.030
La	0.759	0.675	0.750	0.913	0.724	0.801	0.774	0.721
Ce	1.653	1.420	1.518	1.782	1.572	1.777	1.664	1.637
Pr	0.183	0.169	0.183	0.186	0.172	0.185	0.196	0.158
Nd	0.632	0.580	0.657	0.671	0.644	0.706	0.693	0.633
Sm	0.096	0.100	0.056	0.099	0.115	0.080	0.080	0.090

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-1a_2	6150-1a_3	6150-1b_1	6150-1b_2	6150-2a_1	6150-2a_2	6150-2b_1	6150-2b_2
Oxydes (wt.%)								
P2O5	29.759	30.974	29.369	29.417	30.426	29.843	29.917	29.967
SiO2	0.579	0.510	0.940	1.299	0.866	0.499	0.707	1.459
Al2O3	0.032	0.013	0.006	0.010	0.032	0.025	0.000	0.036
CaO	1.328	1.331	1.346	1.094	1.195	1.452	1.202	1.175
Na2O	0.000	0.145	0.017	0.023	0.124	0.000	0.000	0.198
FeO	0.000	0.000	0.000	0.061	0.000	0.000	0.010	0.000
MgO	0.000	0.000	0.000	0.021	0.000	0.000	0.007	0.020
U2O3	0.294	0.219	0.137	0.119	0.239	0.272	0.087	0.203
ThO2	8.001	7.474	9.501	10.088	8.576	8.261	7.992	10.243
Y2O3	0.127	0.172	0.498	0.325	0.411	0.264	0.448	0.300
La2O3	13.564	13.108	12.180	12.912	13.308	13.890	13.160	12.010
Ce2O3	28.033	29.180	27.623	28.126	28.630	28.773	28.861	27.956
Pr2O3	3.188	3.141	2.821	2.862	3.068	3.085	2.832	2.915
Nd2O3	11.429	11.141	10.621	10.505	10.950	11.213	11.113	10.260
SmO	1.420	1.613	1.631	1.683	1.767	1.716	1.660	1.354
Total	97.754	99.021	96.690	98.545	99.592	99.293	97.996	98.096
Cations*								
P	4.005	4.063	3.980	3.930	3.998	3.982	4.002	3.965
Si	0.092	0.079	0.150	0.205	0.134	0.079	0.112	0.228
Al	0.006	0.002	0.001	0.002	0.006	0.005	0.000	0.007
Ca	0.226	0.221	0.231	0.185	0.199	0.245	0.203	0.197
Na	0.000	0.049	0.006	0.008	0.042	0.000	0.000	0.068
Fe^{2+}	0.000	0.000	0.000	0.008	0.000	0.000	0.001	0.000
Mg	0.000	0.000	0.000	0.005	0.000	0.000	0.002	0.005
U	0.011	0.008	0.005	0.004	0.009	0.010	0.003	0.007
Th	0.289	0.264	0.346	0.362	0.303	0.296	0.287	0.364
Y	0.011	0.014	0.042	0.027	0.034	0.022	0.038	0.025
La	0.795	0.749	0.719	0.751	0.762	0.807	0.767	0.692
Ce	1.632	1.655	1.619	1.625	1.627	1.660	1.669	1.599
Pr	0.185	0.177	0.165	0.165	0.173	0.177	0.163	0.166
Nd	0.649	0.616	0.607	0.592	0.607	0.631	0.627	0.573
Sm	0.082	0.090	0.094	0.096	0.099	0.098	0.095	0.076

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-2b_3	6150-2b_4	6150-3a_1	6150-3a_2	6150-3a_3	6150-3a_4	6150-3b_1	6150-3b_2
Oxydes (wt.%)								
P2O5	29.842	28.160	30.589	30.709	30.007	29.027	29.131	31.031
SiO2	0.678	0.995	0.334	0.547	0.544	1.163	0.934	0.581
Al2O3	0.027	0.021	0.018	0.006	0.008	0.039	0.032	0.054
CaO	1.441	1.228	1.086	0.853	1.348	1.045	1.082	1.384
Na2O	0.000	0.011	0.007	0.104	0.000	0.000	0.008	0.129
FeO	0.000	0.000	0.041	0.077	0.036	0.033	0.005	0.000
MgO	0.021	0.000	0.022	0.023	0.031	0.000	0.000	0.007
U2O3	0.297	0.149	1.101	0.239	0.282	0.205	0.053	0.262
ThO2	8.719	9.219	4.637	5.651	7.601	8.983	9.066	7.582
Y2O3	0.116	0.269	1.893	0.430	0.088	0.331	0.257	0.133
La2O3	12.806	12.536	14.816	13.955	13.818	13.239	13.997	13.368
Ce2O3	28.292	28.421	29.000	30.032	28.963	29.158	29.997	28.552
Pr2O3	3.120	2.776	2.794	3.206	3.272	3.132	3.086	3.170
Nd2O3	11.646	11.258	10.309	11.434	11.730	11.508	10.734	11.180
SmO	1.451	1.656	1.547	1.371	1.607	1.445	1.392	1.428
Total	98.456	96.699	98.194	98.637	99.335	99.308	99.774	98.861
Cations*								
P	3.991	3.890	4.061	4.049	3.990	3.890	3.898	4.064
Si	0.107	0.162	0.052	0.085	0.085	0.184	0.148	0.090
Al	0.005	0.004	0.003	0.001	0.001	0.007	0.006	0.010
Ca	0.244	0.215	0.182	0.142	0.227	0.177	0.183	0.229
Na	0.000	0.004	0.002	0.035	0.000	0.000	0.003	0.044
Fe^{2+}	0.000	0.000	0.005	0.010	0.005	0.004	0.001	0.000
Mg	0.005	0.000	0.005	0.005	0.007	0.000	0.000	0.002
U	0.011	0.006	0.040	0.009	0.010	0.007	0.002	0.009
Th	0.313	0.342	0.165	0.200	0.272	0.324	0.326	0.267
Y	0.010	0.023	0.158	0.036	0.007	0.028	0.022	0.011
La	0.746	0.754	0.857	0.802	0.801	0.773	0.816	0.763
Ce	1.636	1.698	1.665	1.712	1.666	1.690	1.736	1.617
Pr	0.180	0.165	0.160	0.182	0.187	0.181	0.178	0.179
Nd	0.657	0.656	0.577	0.636	0.658	0.651	0.606	0.618
Sm	0.083	0.098	0.088	0.077	0.091	0.083	0.079	0.080

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-4a_1	6150-4a_2	6150-4a_3	6150-4b_1	6150-4b_2	6150-5a_1	6150-5a_2	6150-5b_1
Oxydes (wt.%)								
P2O5	29.014	28.984	29.802	30.473	29.081	30.115	29.906	29.751
SiO2	0.905	1.267	0.756	0.911	1.224	0.441	0.602	0.589
Al2O3	0.028	0.000	0.024	0.026	0.038	0.031	0.016	0.022
CaO	1.174	1.124	1.330	1.165	1.063	1.252	1.290	1.421
Na2O	0.000	0.000	0.000	0.119	0.092	0.040	0.024	0.021
FeO	0.010	0.056	0.151	0.000	0.000	0.000	0.015	0.026
MgO	0.000	0.000	0.000	0.002	0.028	0.000	0.000	0.017
U2O3	0.127	0.244	0.361	0.188	0.165	0.245	0.072	0.263
ThO2	8.495	9.734	8.318	8.464	9.382	6.822	7.514	8.104
Y2O3	0.165	0.339	0.596	0.223	0.314	0.169	0.130	0.246
La2O3	13.257	12.769	13.014	12.954	12.597	13.691	14.301	12.615
Ce2O3	28.703	27.777	27.181	29.037	29.430	29.732	30.202	28.706
Pr2O3	2.934	2.791	3.087	3.181	2.936	3.339	3.238	3.128
Nd2O3	11.505	10.977	11.237	11.339	11.175	11.397	11.258	11.112
SmO	1.559	1.789	2.079	1.494	1.875	1.858	1.736	1.660
Total	97.876	97.851	97.936	99.576	99.400	99.132	100.304	97.681
Cations*								
P	3.932	3.918	3.996	3.998	3.890	4.007	3.956	4.003
Si	0.145	0.202	0.120	0.141	0.193	0.069	0.094	0.094
Al	0.005	0.000	0.004	0.005	0.007	0.006	0.003	0.004
Ca	0.201	0.192	0.226	0.193	0.180	0.211	0.216	0.242
Na	0.000	0.000	0.000	0.040	0.032	0.014	0.008	0.007
Fe^{2+}	0.001	0.007	0.020	0.000	0.000	0.000	0.002	0.003
Mg	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.004
U	0.005	0.009	0.013	0.007	0.006	0.009	0.003	0.010
Th	0.309	0.354	0.300	0.298	0.337	0.244	0.267	0.293
Y	0.014	0.029	0.050	0.018	0.026	0.014	0.011	0.021
La	0.783	0.752	0.760	0.740	0.734	0.794	0.824	0.740
Ce	1.682	1.624	1.576	1.648	1.702	1.711	1.728	1.670
Pr	0.171	0.162	0.178	0.180	0.169	0.191	0.184	0.181
Nd	0.658	0.626	0.636	0.628	0.631	0.640	0.628	0.631
Sm	0.090	0.103	0.119	0.084	0.107	0.105	0.098	0.095

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-6a_2	6150-6a_3	6150-7a_1	6150-7a_2	6150-7a_3	6150-7b_1	6150-8a_1	6150-8a_2
Oxydes (wt.%)								
P2O5	29.194	29.925	30.427	28.979	28.442	29.149	30.206	29.448
SiO2	1.148	0.296	0.318	1.175	1.324	1.320	0.599	0.763
Al2O3	0.025	0.031	0.019	0.031	0.171	0.161	0.170	0.014
CaO	1.086	1.174	1.705	1.080	1.053	1.112	1.419	1.174
Na2O	0.000	0.000	0.095	0.000	0.000	0.118	0.074	0.000
FeO	0.000	0.056	0.000	0.000	0.069	0.026	0.097	0.054
MgO	0.002	0.022	0.011	0.006	0.026	0.011	0.003	0.002
U2O3	0.177	0.280	0.516	0.111	0.202	0.131	0.345	0.259
ThO2	9.284	6.154	8.140	9.548	10.321	9.865	8.465	7.936
Y2O3	0.338	0.640	0.818	0.319	0.314	0.282	0.245	0.589
La2O3	12.945	13.580	11.798	12.967	12.545	12.435	12.990	13.266
Ce2O3	28.324	30.245	27.811	28.486	28.934	27.855	28.204	29.121
Pr2O3	2.836	2.967	3.004	2.813	2.889	3.186	3.146	3.042
Nd2O3	10.988	11.212	10.615	10.843	10.726	10.513	11.107	10.903
SmO	1.565	1.566	1.972	1.634	1.387	1.259	1.787	1.796
Total	97.912	98.148	97.249	97.992	98.403	97.423	98.857	98.367
Cations*								
P	3.935	4.015	4.072	3.915	3.854	3.921	4.005	3.959
Si	0.183	0.047	0.050	0.188	0.212	0.210	0.094	0.121
Al	0.005	0.006	0.004	0.006	0.032	0.030	0.031	0.003
Ca	0.185	0.199	0.289	0.185	0.181	0.189	0.238	0.200
Na	0.000	0.000	0.033	0.000	0.000	0.041	0.025	0.000
Fe^{2+}	0.000	0.007	0.000	0.000	0.009	0.003	0.013	0.007
Mg	0.000	0.005	0.003	0.001	0.006	0.003	0.001	0.000
U	0.006	0.010	0.019	0.004	0.007	0.005	0.012	0.009
Th	0.336	0.222	0.293	0.347	0.376	0.357	0.302	0.287
Y	0.029	0.054	0.069	0.027	0.027	0.024	0.020	0.050
La	0.760	0.794	0.688	0.763	0.740	0.729	0.750	0.777
Ce	1.651	1.755	1.610	1.664	1.695	1.620	1.617	1.693
Pr	0.164	0.171	0.173	0.164	0.168	0.184	0.180	0.176
Nd	0.625	0.635	0.599	0.618	0.613	0.597	0.621	0.618
Sm	0.090	0.090	0.113	0.094	0.080	0.072	0.101	0.103

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-8b_1	6150-8b_2	6150-8b_3	6150-9a_1	6150-9a_2	6150-10a_1	6150-10a_2	6150-10a_3
Oxydes (wt.%)								
P2O5	30.448	29.701	28.924	28.948	29.466	30.317	28.539	29.950
SiO2	0.625	0.524	0.943	1.138	1.146	0.796	1.259	0.285
Al2O3	0.024	0.010	0.175	0.168	0.162	0.032	0.034	0.001
CaO	1.462	1.266	0.957	1.135	1.106	1.317	1.135	1.386
Na2O	0.074	0.000	0.006	0.049	0.060	0.042	0.000	0.000
FeO	0.005	0.038	0.112	0.020	0.094	0.054	0.015	0.000
MgO	0.000	0.000	0.004	0.000	0.000	0.000	0.024	0.035
U2O3	0.234	0.155	0.086	0.258	0.099	0.191	0.144	0.454
ThO2	8.636	7.402	7.958	9.067	8.900	8.177	10.072	6.688
Y2O3	0.172	0.195	0.426	0.395	0.380	0.316	0.389	0.963
La2O3	12.986	13.580	13.493	12.091	12.584	13.387	13.714	14.229
Ce2O3	28.505	27.974	30.233	27.921	28.645	27.853	28.705	28.180
Pr2O3	3.044	3.293	3.151	3.120	2.912	2.896	2.930	2.830
Nd2O3	11.276	11.504	11.513	11.261	10.601	11.070	10.609	10.668
SmO	1.841	1.812	1.702	1.507	1.650	1.546	1.563	1.879
Total	99.332	97.454	99.683	97.078	97.805	97.994	99.132	97.548
Cations*								
P	4.017	4.010	3.876	3.926	3.945	4.024	3.853	4.033
Si	0.097	0.084	0.149	0.182	0.181	0.125	0.201	0.045
Al	0.004	0.002	0.033	0.032	0.030	0.006	0.006	0.000
Ca	0.244	0.216	0.162	0.195	0.187	0.221	0.194	0.236
Na	0.025	0.000	0.002	0.017	0.021	0.014	0.000	0.000
Fe^{2+}	0.001	0.005	0.015	0.003	0.012	0.007	0.002	0.000
Mg	0.000	0.000	0.001	0.000	0.000	0.000	0.006	0.008
U	0.008	0.006	0.003	0.009	0.004	0.007	0.005	0.017
Th	0.306	0.269	0.287	0.331	0.320	0.292	0.365	0.242
Y	0.014	0.017	0.036	0.034	0.032	0.026	0.033	0.082
La	0.746	0.799	0.788	0.714	0.734	0.774	0.807	0.835
Ce	1.626	1.633	1.752	1.638	1.658	1.599	1.676	1.641
Pr	0.173	0.191	0.182	0.182	0.168	0.165	0.170	0.164
Nd	0.628	0.655	0.651	0.644	0.599	0.620	0.604	0.606
Sm	0.104	0.104	0.097	0.087	0.094	0.088	0.090	0.108

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-10b_1	6150-10b_2	6150-10b_3	6150-11a_1	6150-11b_2	6150-11b_3	6150-12a_1	6150-12a_2
Oxydes (wt.%)								
P2O5	30.571	29.974	29.642	30.306	30.574	30.120	30.626	29.701
SiO2	0.759	1.157	1.101	0.802	0.667	0.770	0.492	0.991
Al2O3	0.081	0.053	0.032	0.009	0.019	0.022	0.014	0.062
CaO	1.254	1.041	1.063	1.429	1.367	1.483	1.374	1.274
Na2O	0.141	0.083	0.028	0.083	0.140	0.059	0.070	0.000
FeO	0.000	0.000	0.099	0.015	0.172	0.000	0.000	0.064
MgO	0.039	0.000	0.043	0.011	0.000	0.000	0.000	0.001
U2O3	0.248	0.009	0.137	0.151	0.190	0.173	0.304	0.234
ThO2	8.264	9.009	8.971	8.757	7.950	9.225	7.647	9.255
Y2O3	0.397	0.257	0.367	0.532	0.241	0.262	0.642	0.433
La2O3	12.624	13.976	13.531	12.968	12.809	13.157	12.916	12.672
Ce2O3	28.266	29.350	29.198	27.655	27.984	27.898	28.011	28.700
Pr2O3	2.896	3.033	3.039	3.200	3.021	2.856	2.808	2.955
Nd2O3	10.500	10.529	10.748	11.007	11.106	10.667	10.991	10.909
SmO	1.734	1.518	1.658	1.820	1.491	1.495	2.165	1.522
Total	97.774	99.989	99.657	98.745	97.731	98.187	98.060	98.773
Cations*								
P	4.046	3.940	3.928	4.006	4.051	4.008	4.063	3.955
Si	0.119	0.180	0.172	0.125	0.104	0.121	0.077	0.156
Al	0.015	0.010	0.006	0.002	0.004	0.004	0.003	0.011
Ca	0.210	0.173	0.178	0.239	0.229	0.250	0.231	0.215
Na	0.048	0.028	0.010	0.028	0.048	0.020	0.024	0.000
Fe^{2+}	0.000	0.000	0.013	0.002	0.023	0.000	0.000	0.008
Mg	0.009	0.000	0.010	0.003	0.000	0.000	0.000	0.000
U	0.009	0.000	0.005	0.005	0.007	0.006	0.011	0.008
Th	0.294	0.318	0.320	0.311	0.283	0.330	0.273	0.331
Y	0.033	0.021	0.031	0.044	0.020	0.022	0.054	0.036
La	0.728	0.800	0.781	0.747	0.739	0.763	0.747	0.735
Ce	1.618	1.668	1.673	1.581	1.603	1.605	1.607	1.653
Pr	0.165	0.172	0.173	0.182	0.172	0.164	0.160	0.169
Nd	0.586	0.584	0.601	0.614	0.621	0.599	0.615	0.613
Sm	0.098	0.085	0.094	0.103	0.084	0.085	0.123	0.086

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-12a_3	6150-12b_2	6150-12b_3	6150-12b_4	6150-12b_5	6150-13a_1	6150-13a_2	6150-13b_1
Oxydes (wt.%)								
P2O5	28.914	28.723	29.356	29.399	28.775	29.585	30.374	29.428
SiO2	0.997	1.483	1.371	1.425	1.372	1.481	0.591	0.574
Al2O3	0.025	0.041	0.006	0.035	0.048	0.037	0.016	0.014
CaO	1.127	1.265	1.184	1.152	1.129	1.268	1.289	1.540
Na2O	0.000	0.069	0.095	0.079	0.000	0.066	0.049	0.000
FeO	0.000	0.061	0.010	0.041	0.000	0.000	0.089	0.000
MgO	0.025	0.050	0.018	0.010	0.000	0.000	0.000	0.000
U2O3	0.062	0.149	0.181	0.082	0.137	0.179	0.235	0.226
ThO2	8.827	11.577	10.688	10.318	10.499	10.858	7.777	8.884
Y2O3	0.212	0.358	0.336	0.347	0.290	0.333	0.080	0.603
La2O3	13.617	12.617	12.446	12.456	12.102	12.018	13.601	12.796
Ce2O3	29.077	27.525	27.124	28.098	28.366	27.841	28.058	28.373
Pr2O3	3.204	3.123	2.899	2.987	2.937	2.784	2.895	3.019
Nd2O3	11.314	10.396	10.590	10.133	11.100	10.332	11.550	11.027
SmO	1.728	1.403	1.575	1.347	1.511	1.563	1.718	1.633
Total	99.129	98.840	97.879	97.909	98.266	98.345	98.322	98.117
Cations*								
P	3.893	3.859	3.936	3.929	3.885	3.935	4.036	3.969
Si	0.159	0.235	0.217	0.225	0.219	0.233	0.093	0.091
Al	0.005	0.008	0.001	0.007	0.009	0.007	0.003	0.003
Ca	0.192	0.215	0.201	0.195	0.193	0.213	0.217	0.263
Na	0.000	0.024	0.033	0.027	0.000	0.023	0.017	0.000
Fe^{2+}	0.000	0.008	0.001	0.005	0.000	0.000	0.012	0.000
Mg	0.006	0.012	0.004	0.002	0.000	0.000	0.000	0.000
U	0.002	0.005	0.007	0.003	0.005	0.006	0.008	0.008
Th	0.319	0.418	0.385	0.371	0.381	0.388	0.278	0.322
Y	0.018	0.030	0.028	0.029	0.025	0.028	0.007	0.051
La	0.799	0.738	0.727	0.725	0.712	0.696	0.787	0.752
Ce	1.693	1.599	1.573	1.624	1.656	1.601	1.612	1.655
Pr	0.186	0.181	0.167	0.172	0.171	0.159	0.166	0.175
Nd	0.643	0.589	0.599	0.571	0.632	0.580	0.647	0.627
Sm	0.099	0.080	0.090	0.077	0.087	0.089	0.097	0.094

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6150-14a_1	6150-14b_1	1098-1_1	1098-2_1	1098-2b_1	1098-3_1	1098-4_1	1098-5a_1
Oxydes (wt.%)								
P2O5	30.608	29.615	30.435	30.548	30.059	31.348	30.330	30.207
SiO2	0.367	0.750	0.149	0.126	0.096	0.107	0.087	0.148
Al2O3	0.013	0.038	0.029	0.020	0.026	0.000	0.000	0.035
CaO	1.249	1.351	0.588	0.949	0.876	1.069	0.733	0.452
Na2O	0.030	0.014	0.000	0.000	0.009	0.000	0.018	0.026
FeO	0.000	0.023	0.038	0.000	0.000	0.031	0.089	0.000
MgO	0.014	0.012	0.029	0.000	0.023	0.008	0.000	0.035
U2O3	0.402	0.197	0.441	0.000	0.039	0.048	0.000	0.183
ThO2	6.207	8.722	2.503	4.442	4.200	5.201	3.507	2.296
Y2O3	0.411	0.271	0.336	0.087	0.118	0.126	0.145	0.209
La2O3	13.127	13.056	15.074	13.107	13.983	12.190	13.082	13.603
Ce2O3	28.276	28.501	31.537	29.656	29.814	28.625	29.725	31.126
Pr2O3	3.052	3.008	3.243	3.384	3.494	3.435	3.417	3.301
Nd2O3	11.038	11.221	12.628	13.133	13.567	13.944	14.443	13.959
SmO	1.940	1.728	1.727	1.710	1.697	2.106	1.784	1.943
Total	96.734	98.507	98.757	97.162	98.001	98.238	97.360	97.523
Cations*								
P	4.099	3.968	4.048	4.093	4.041	4.131	4.077	4.062
Si	0.058	0.119	0.023	0.020	0.015	0.017	0.014	0.024
Al	0.002	0.007	0.005	0.004	0.005	0.000	0.000	0.007
Ca	0.212	0.229	0.099	0.161	0.149	0.178	0.125	0.077
Na	0.010	0.005	0.000	0.000	0.003	0.000	0.006	0.008
Fe^{2+}	0.000	0.003	0.005	0.000	0.000	0.004	0.012	0.000
Mg	0.003	0.003	0.007	0.000	0.005	0.002	0.000	0.008
U	0.015	0.007	0.016	0.000	0.001	0.002	0.000	0.007
Th	0.223	0.314	0.089	0.160	0.152	0.184	0.127	0.083
Y	0.035	0.023	0.028	0.007	0.010	0.010	0.012	0.018
La	0.766	0.762	0.873	0.765	0.819	0.700	0.766	0.797
Ce	1.637	1.652	1.814	1.718	1.733	1.631	1.728	1.810
Pr	0.176	0.173	0.186	0.195	0.202	0.195	0.198	0.191
Nd	0.624	0.634	0.708	0.742	0.769	0.775	0.819	0.792
Sm	0.111	0.099	0.098	0.098	0.097	0.118	0.102	0.111

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	1098-5b_1	1098-6_1	1098-6_2	1098-6_3	1098-7_1	1098-7_2	1098-8a_1	1098-8b_1
Oxydes (wt.%)								
P2O5	30.528	30.168	30.763	30.225	30.473	32.405	29.988	30.275
SiO2	0.068	0.186	0.150	0.149	0.135	0.118	0.073	0.090
Al2O3	0.020	0.016	0.004	0.000	0.000	0.028	0.000	0.022
CaO	0.436	0.965	0.728	1.064	0.492	0.730	0.743	0.732
Na2O	0.000	0.004	0.111	0.029	0.024	0.000	0.023	0.027
FeO	0.000	0.000	0.010	0.055	0.000	0.158	0.027	0.007
MgO	0.012	0.000	0.007	0.023	0.000	0.000	0.013	0.000
U2O3	0.219	0.023	0.106	0.002	0.455	0.000	0.052	0.000
ThO2	1.809	5.169	3.535	5.523	2.039	3.780	3.492	3.520
Y2O3	0.196	0.088	0.280	0.130	0.408	0.081	0.124	0.113
La2O3	15.217	12.810	13.143	12.527	14.411	11.094	12.530	13.980
Ce2O3	31.362	28.500	29.848	28.864	31.125	28.143	29.845	31.499
Pr2O3	3.361	3.590	3.322	3.475	3.179	3.505	3.604	3.618
Nd2O3	13.012	14.576	12.919	15.002	13.445	15.317	15.132	13.474
SmO	1.755	1.710	1.968	1.988	1.881	2.279	2.089	1.677
Total	97.995	97.805	96.894	99.056	98.067	97.638	97.735	99.034
Cations*								
P	4.078	4.052	4.113	4.031	4.070	4.216	4.048	4.035
Si	0.011	0.029	0.024	0.023	0.021	0.018	0.012	0.014
Al	0.004	0.003	0.001	0.000	0.000	0.005	0.000	0.004
Ca	0.074	0.164	0.123	0.180	0.083	0.120	0.127	0.124
Na	0.000	0.001	0.034	0.009	0.007	0.000	0.007	0.008
Fe^{2+}	0.000	0.000	0.001	0.007	0.000	0.020	0.004	0.001
Mg	0.003	0.000	0.002	0.005	0.000	0.000	0.003	0.000
U	0.008	0.001	0.004	0.000	0.016	0.000	0.002	0.000
Th	0.065	0.187	0.127	0.198	0.073	0.132	0.127	0.126
Y	0.016	0.007	0.024	0.011	0.034	0.007	0.011	0.009
La	0.886	0.750	0.766	0.728	0.839	0.629	0.737	0.812
Ce	1.812	1.655	1.726	1.665	1.798	1.584	1.742	1.815
Pr	0.193	0.208	0.191	0.199	0.183	0.196	0.209	0.208
Nd	0.733	0.826	0.729	0.844	0.758	0.841	0.862	0.758
Sm	0.100	0.098	0.112	0.113	0.107	0.126	0.120	0.095

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	1098-9a_1	1098-9b_1	1098-10_1	1098-12_1	1098-12_2	1098-14_2	1098-16b_1	1098-17_1
Oxydes (wt.%)								
P2O5	29.876	29.721	30.218	29.467	29.324	30.676	30.602	29.972
SiO2	0.125	0.150	0.107	0.988	0.099	0.120	0.338	0.162
Al2O3	0.056	0.045	0.050	0.423	0.074	0.025	0.012	0.039
CaO	0.532	0.581	0.790	0.655	0.725	0.490	0.869	0.574
Na2O	0.029	0.019	0.007	0.073	0.004	0.060	0.059	0.013
FeO	0.027	0.031	0.082	1.313	0.000	0.000	0.000	0.110
MgO	0.014	0.000	0.021	0.021	0.000	0.003	0.021	0.015
U2O3	0.073	0.368	0.236	0.204	0.000	0.276	0.251	0.257
ThO2	2.315	2.402	3.485	2.605	3.551	2.220	4.979	2.761
Y2O3	0.055	0.138	0.186	0.327	0.115	0.382	0.000	0.377
La2O3	14.359	14.586	12.156	14.052	12.562	14.035	13.654	14.360
Ce2O3	31.728	30.976	29.917	29.533	30.596	30.789	29.047	29.991
Pr2O3	3.639	3.624	3.980	3.243	3.561	3.316	3.272	3.463
Nd2O3	13.367	13.508	14.394	11.874	14.796	13.173	12.997	13.205
SmO	1.388	1.639	1.818	1.758	1.797	1.809	1.890	2.119
Total	97.583	97.788	97.447	96.536	97.204	97.374	97.991	97.418
Cations*								
P	4.032	4.019	4.064	3.941	4.006	4.098	4.073	4.045
Si	0.020	0.024	0.017	0.156	0.016	0.019	0.053	0.026
Al	0.010	0.008	0.009	0.079	0.014	0.005	0.002	0.007
Ca	0.091	0.099	0.135	0.111	0.125	0.083	0.146	0.098
Na	0.009	0.006	0.002	0.022	0.001	0.018	0.018	0.004
Fe^{2+}	0.004	0.004	0.011	0.174	0.000	0.000	0.000	0.015
Mg	0.003	0.000	0.005	0.005	0.000	0.001	0.005	0.004
U	0.003	0.013	0.009	0.007	0.000	0.010	0.009	0.009
Th	0.084	0.087	0.126	0.094	0.130	0.080	0.178	0.100
Y	0.005	0.012	0.016	0.027	0.010	0.032	0.000	0.032
La	0.844	0.859	0.712	0.819	0.748	0.817	0.792	0.844
Ce	1.852	1.811	1.740	1.708	1.808	1.779	1.672	1.750
Pr	0.211	0.211	0.230	0.187	0.209	0.191	0.187	0.201
Nd	0.761	0.771	0.817	0.670	0.853	0.742	0.730	0.752
Sm	0.080	0.095	0.104	0.100	0.105	0.103	0.107	0.122

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	1098-17_3	1098-19a_1	1098-19a_2	1098-20_1	1098-21_1	6210-1_1	6210-2_1	6210-3a_1
Oxydes (wt.%)								
P2O5	29.908	30.317	29.567	30.589	29.841	30.419	30.040	29.107
SiO2	0.267	0.130	0.361	0.115	0.098	0.235	0.278	0.948
Al2O3	0.005	0.011	0.022	0.066	0.017	0.007	0.029	0.132
CaO	1.152	0.649	1.445	0.959	0.810	1.247	1.432	1.899
Na2O	0.000	0.006	0.015	0.036	0.019	0.022	0.004	0.001
FeO	0.031	0.075	0.024	0.021	0.079	0.072	0.075	0.000
MgO	0.018	0.000	0.007	0.008	0.006	0.000	0.007	0.013
U2O3	0.000	0.286	0.000	0.000	0.000	0.064	0.299	0.091
ThO2	6.205	3.097	8.171	4.697	3.719	6.354	7.372	13.149
Y2O3	0.044	0.373	0.110	0.150	0.165	0.144	0.195	0.119
La2O3	12.498	14.114	11.214	13.745	12.700	12.023	11.694	9.655
Ce2O3	28.744	29.821	28.828	30.632	30.687	27.415	26.647	24.016
Pr2O3	3.517	3.477	3.104	3.474	3.482	3.404	3.212	3.152
Nd2O3	14.324	13.141	13.774	13.979	14.207	14.019	13.401	13.492
SmO	1.543	1.700	1.686	1.854	1.692	1.849	2.000	1.907
Total	98.256	97.197	98.328	100.325	97.522	97.274	96.685	97.681
Cations*								
P	4.017	4.076	3.987	4.026	4.035	4.077	4.062	3.940
Si	0.042	0.021	0.057	0.018	0.016	0.037	0.044	0.152
Al	0.001	0.002	0.004	0.012	0.003	0.001	0.005	0.025
Ca	0.196	0.110	0.247	0.160	0.139	0.212	0.245	0.325
Na	0.000	0.002	0.005	0.011	0.006	0.007	0.001	0.000
Fe^{2+}	0.004	0.010	0.003	0.003	0.011	0.010	0.010	0.000
Mg	0.004	0.000	0.002	0.002	0.001	0.000	0.002	0.003
U	0.000	0.010	0.000	0.000	0.000	0.002	0.011	0.003
Th	0.224	0.112	0.296	0.166	0.135	0.229	0.268	0.478
Y	0.004	0.032	0.009	0.012	0.014	0.012	0.017	0.010
La	0.731	0.827	0.659	0.788	0.748	0.702	0.689	0.569
Ce	1.670	1.734	1.681	1.743	1.794	1.589	1.558	1.406
Pr	0.203	0.201	0.180	0.197	0.203	0.196	0.187	0.184
Nd	0.812	0.745	0.783	0.776	0.810	0.793	0.764	0.770
Sm	0.088	0.098	0.097	0.104	0.098	0.106	0.115	0.110

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6210-3a_2	6210-4_1	6210-5b_1	6210-6_1	6210-7_1	6210-8a_1	6210-8b_1	6210-10a_2
Oxydes (wt.%)								
P2O5	30.347	29.633	30.757	29.105	30.668	30.852	30.414	29.014
SiO2	0.343	0.866	0.434	0.264	0.626	0.372	0.316	0.874
Al2O3	0.012	0.006	0.018	0.081	0.000	0.000	0.004	0.026
CaO	1.644	1.435	1.618	0.799	1.366	0.992	0.908	1.892
Na2O	0.000	0.000	0.077	0.097	0.057	0.054	0.000	0.000
FeO	0.000	0.072	0.000	0.014	0.109	0.000	0.000	0.041
MgO	0.022	0.009	0.022	0.000	0.010	0.000	0.000	0.034
U2O3	0.006	0.025	0.014	0.014	0.000	0.023	0.000	0.074
ThO2	9.454	10.484	8.785	4.582	8.798	5.692	5.603	12.493
Y2O3	0.094	0.080	0.166	0.078	0.017	0.187	0.129	0.162
La2O3	10.836	10.190	11.152	11.461	10.251	11.063	12.190	9.603
Ce2O3	26.280	24.496	25.333	29.299	27.034	27.420	28.630	24.529
Pr2O3	3.268	3.458	3.197	3.740	3.540	3.759	3.610	3.126
Nd2O3	14.041	15.016	13.333	15.568	14.924	15.326	15.443	13.578
SmO	2.025	1.814	1.708	1.854	1.713	1.819	1.698	1.614
Total	98.372	97.584	96.614	96.956	99.113	97.559	98.945	97.060
Cations*								
P	4.047	3.990	4.102	3.988	4.038	4.097	4.040	3.950
Si	0.054	0.138	0.068	0.043	0.097	0.058	0.050	0.141
Al	0.002	0.001	0.003	0.015	0.000	0.000	0.001	0.005
Ca	0.277	0.245	0.273	0.139	0.228	0.167	0.153	0.326
Na	0.000	0.000	0.024	0.031	0.017	0.016	0.000	0.000
Fe^{2+}	0.000	0.010	0.000	0.002	0.014	0.000	0.000	0.005
Mg	0.005	0.002	0.005	0.000	0.002	0.000	0.000	0.008
U	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.003
Th	0.339	0.379	0.315	0.169	0.311	0.203	0.200	0.457
Y	0.008	0.007	0.014	0.007	0.001	0.016	0.011	0.014
La	0.630	0.598	0.648	0.684	0.588	0.640	0.706	0.570
Ce	1.516	1.426	1.461	1.736	1.539	1.575	1.645	1.444
Pr	0.188	0.200	0.184	0.221	0.201	0.215	0.206	0.183
Nd	0.790	0.853	0.750	0.900	0.829	0.859	0.866	0.780
Sm	0.115	0.104	0.097	0.108	0.096	0.103	0.096	0.094

Table S3: Monazite chemistry

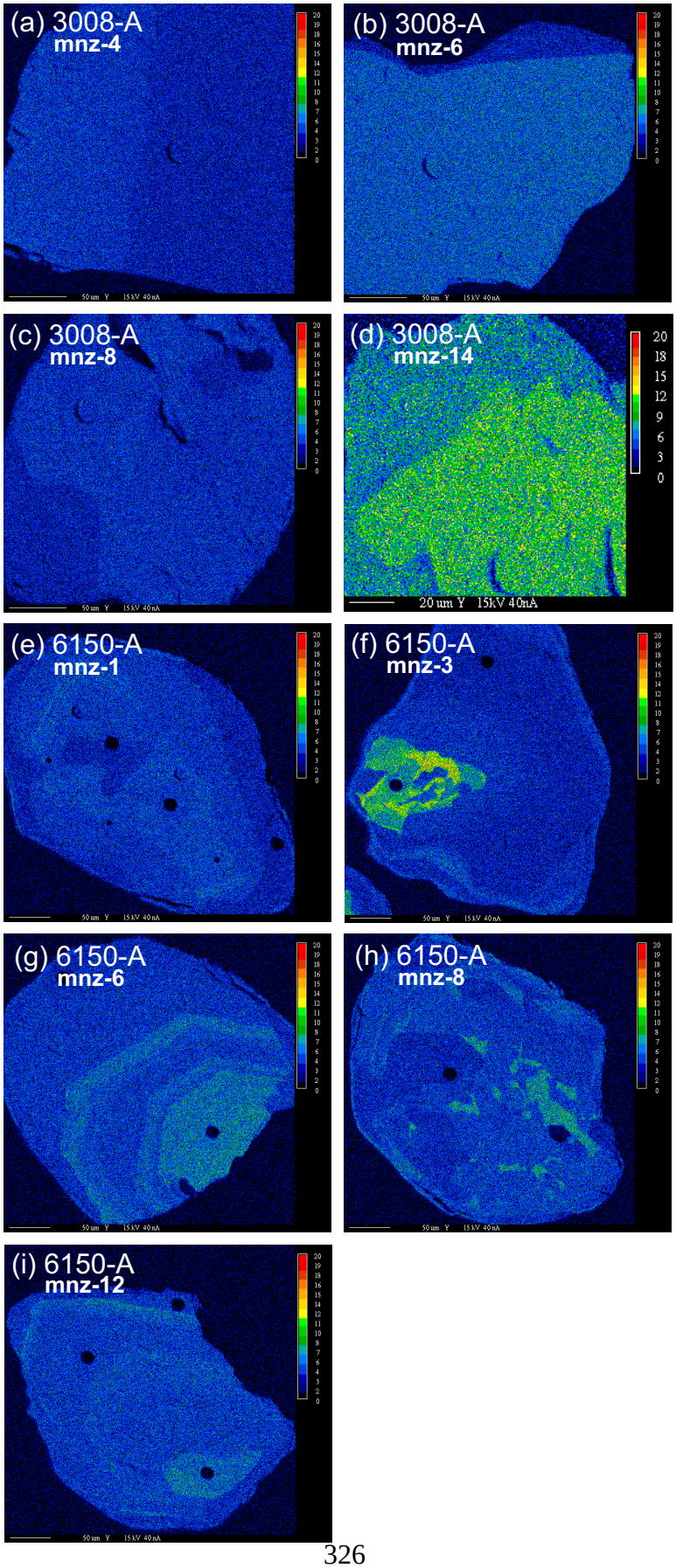
*Formula proportion of cations based on 16 O atoms

Analysis#	6210-10b_1	6210-11a_1	6210-11b_1	6210-12_1	6210-13b_1	6210-14b_1	6210-15_1	6210-16_1
Oxydes (wt.%)								
P2O5	30.297	30.912	29.019	32.389	30.117	29.655	28.862	30.684
SiO2	0.396	0.344	0.958	0.093	0.390	0.330	1.200	0.235
Al2O3	0.011	0.032	0.017	0.002	0.044	0.014	0.025	0.031
CaO	1.527	1.408	1.488	0.366	1.525	1.415	1.674	1.173
Na2O	0.000	0.066	0.029	0.114	0.000	0.044	0.055	0.040
FeO	0.000	0.031	0.065	0.000	0.020	0.003	0.147	0.000
MgO	0.018	0.018	0.002	0.042	0.003	0.028	0.017	0.020
U2O3	0.131	0.180	0.036	0.004	0.052	0.184	0.072	0.157
ThO2	8.644	8.024	10.916	1.654	8.656	8.029	12.451	6.161
Y2O3	0.107	0.413	0.133	0.104	0.093	0.147	0.064	0.096
La2O3	11.590	12.040	9.337	13.397	11.308	10.423	10.252	12.314
Ce2O3	27.396	26.510	25.448	31.968	27.351	27.359	24.206	27.651
Pr2O3	3.182	3.173	3.436	4.039	3.370	3.236	3.385	3.425
Nd2O3	13.916	13.642	14.708	15.376	13.856	14.050	14.100	13.432
SmO	2.000	1.786	1.532	1.924	2.225	2.030	1.400	1.890
Total	99.215	98.579	97.124	101.472	99.010	96.947	97.910	97.309
Cations*								
P	4.022	4.075	3.947	4.129	4.014	4.029	3.904	4.096
Si	0.062	0.054	0.154	0.014	0.061	0.053	0.192	0.037
Al	0.002	0.006	0.003	0.000	0.008	0.003	0.005	0.006
Ca	0.257	0.235	0.256	0.059	0.257	0.243	0.287	0.198
Na	0.000	0.020	0.009	0.033	0.000	0.014	0.017	0.012
Fe^{2+}	0.000	0.004	0.009	0.000	0.003	0.000	0.020	0.000
Mg	0.004	0.004	0.000	0.009	0.001	0.007	0.004	0.005
U	0.005	0.006	0.001	0.000	0.002	0.007	0.003	0.006
Th	0.308	0.284	0.399	0.057	0.310	0.293	0.453	0.221
Y	0.009	0.034	0.011	0.008	0.008	0.013	0.005	0.008
La	0.670	0.692	0.553	0.744	0.657	0.617	0.604	0.716
Ce	1.573	1.511	1.497	1.762	1.576	1.607	1.416	1.596
Pr	0.182	0.180	0.201	0.222	0.193	0.189	0.197	0.197
Nd	0.779	0.759	0.844	0.827	0.779	0.805	0.805	0.756
Sm	0.113	0.100	0.089	0.105	0.126	0.118	0.081	0.108

Table S3: Monazite chemistry

*Formula proportion of cations based on 16 O atoms

Analysis#	6210-16_2	6210-17_1	6210-18_1	6210-19_1
Oxydes (wt.%)				
P2O5	29.266	30.532	30.355	28.857
SiO2	0.336	0.404	0.224	1.095
Al2O3	0.386	0.018	0.029	0.041
CaO	1.373	1.455	0.769	1.545
Na2O	0.041	0.019	0.000	0.011
FeO	0.010	0.188	0.062	0.000
MgO	0.003	0.006	0.000	0.034
U2O3	0.114	0.063	0.000	0.028
ThO2	7.725	8.455	4.529	11.936
Y2O3	0.095	0.124	0.143	0.000
La2O3	12.534	11.834	11.622	9.917
Ce2O3	26.393	25.957	28.993	25.551
Pr2O3	3.342	3.484	3.746	3.297
Nd2O3	13.326	13.730	16.213	14.227
SmO	1.830	2.023	1.768	1.553
Total	96.774	98.292	98.453	98.092
Cations*				
P	3.984	4.056	4.050	3.909
Si	0.054	0.063	0.035	0.175
Al	0.073	0.003	0.005	0.008
Ca	0.237	0.245	0.130	0.265
Na	0.013	0.006	0.000	0.003
Fe^{2+}	0.001	0.025	0.008	0.000
Mg	0.001	0.001	0.000	0.008
U	0.004	0.002	0.000	0.001
Th	0.283	0.302	0.162	0.435
Y	0.008	0.010	0.012	0.000
La	0.743	0.685	0.676	0.585
Ce	1.554	1.491	1.673	1.497
Pr	0.196	0.199	0.215	0.192
Nd	0.765	0.769	0.913	0.813
Sm	0.106	0.115	0.101	0.090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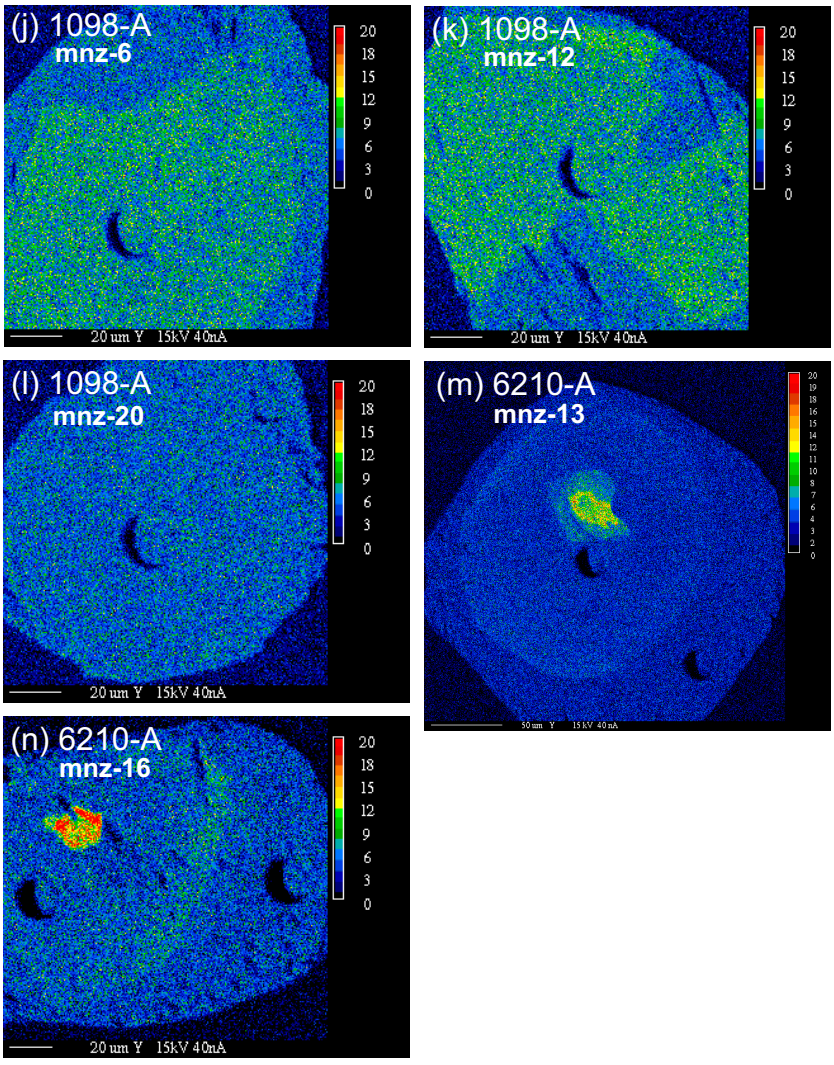
mnz-4
(b) 3008-A
mnz-6
(c) 3008-A
mnz-8
(d) 3008-A
mnz-14
20 18 15 12 9 6 3 0
20 um Y 15kV 40nA
(e) 6150-A
mnz-1
(f) 6150-A
mnz-3
(g) 6150-A
mnz-6
(h) 6150-A
mnz-8
(i) 6150-A
mnz-12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mnz-6
20 18 15 12 9 6 3 0
20 um Y 15kV 40nA
(k) 1098-A
mnz-12
20 18 15 12 9 6 3 0
20 um Y 15kV 40nA
(l) 1098-A
mnz-20
20 18 15 12 9 6 3 0
20 um Y 15kV 40nA
(m) 6210-A
mnz-13
20 19 18 16 15 14 12 11 10 9 7 6 4 3 2 0
50 um Y 15kV 40nA
(n) 6210-A
mnz-16
20 18 15 12 9 6 3 0
20 um Y 15kV 40nA

Table S4: U-Pb isotope monazite analyses and Y content

Analysis#	U (ppm)	Pb^{206} (ppm)	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)	Spot analysis	Y (ppm)
6210-A																
BC6210mz-12	1968	603	4.670	0.053	0.3063	0.0027	0.7828	1809	13	1762	9	1723	13	5	6210-12 1	80
BC6210mz-8.1dkc	1166	384	5.047	0.059	0.3292	0.0030	0.7788	1819	13	1827	10	1834	15	-1	6210-8b 1	110
BC6210mz-18	1672	517	4.753	0.055	0.3094	0.0027	0.7504	1823	14	1777	10	1738	13	5	6210-18 1	120
BC6210mz-15	1100	345	4.824	0.062	0.3138	0.0030	0.7499	1824	15	1789	11	1759	15	4	6210-15 1	50
BC6210mz-2	3463	1184	5.267	0.056	0.3418	0.0029	0.7879	1828	12	1863	9	1895	14	-4	6210-2 1	170
BC6210mz-19	1096	351	4.936	0.063	0.3200	0.0030	0.7341	1830	16	1808	11	1790	15	2	6210-19 1	0
BC6210mz-8.2ltr	1036	345	5.139	0.065	0.3331	0.0034	0.7992	1831	14	1843	11	1853	16	-1	6210-8a 1	160
BC6210mz-6	1272	414	5.033	0.057	0.3251	0.0029	0.7832	1837	13	1825	10	1815	14	1	6210-6 1	70
BC6210mz-13.2ltr	1973	617	4.847	0.054	0.3126	0.0027	0.7803	1840	13	1793	9	1753	13	5	6210-13b 1	80
BC6210mz-3.1dkc	965	334	5.377	0.060	0.3464	0.0030	0.7784	1841	13	1881	10	1917	14	-5	6210-3a 2	80
BC6210mz-16.1dkc	2565	812	4.920	0.054	0.3166	0.0027	0.7765	1844	12	1806	9	1773	13	4	6210-16 2	80
BC6210mz-11.2ltr	644	220	5.320	0.068	0.3422	0.0034	0.7800	1844	15	1872	11	1897	16	-3	6210-11b 1	110
BC6210mz-10.1dkc	4281	1375	5.003	0.054	0.3211	0.0028	0.8018	1848	12	1820	9	1795	14	3	-	-
BC6210mz-1.2r	2307	785	5.302	0.049	0.3402	0.0025	0.7818	1849	10	1869	8	1888	12	-2	6210-1 1	120
BC6210mz-17	1589	515	5.048	0.058	0.3237	0.0029	0.7823	1850	13	1827	10	1808	14	3	6210-17 1	100
BC6210mz-5.1dkc	1033	353	5.332	0.056	0.3419	0.0027	0.7717	1850	12	1874	9	1896	13	-3	-	-
BC6210mz-14	4094	1270	4.840	0.058	0.3102	0.0030	0.8064	1851	13	1792	10	1742	15	7	6210-14b 1	130
BC6210mz-1.1c	2255	767	5.311	0.052	0.3401	0.0026	0.7879	1852	11	1871	8	1887	13	-2	6210-1 1	120
BC6210mz-10.2m	1407	471	5.228	0.067	0.3345	0.0035	0.8224	1854	13	1857	11	1860	17	0	6210-10b 1	90
BC6210mz-16.2ltr	683	224	5.127	0.066	0.3275	0.0030	0.7068	1857	16	1841	11	1826	14	2	6210-16 1	80
BC6210mz-7	722	243	5.270	0.068	0.3363	0.0035	0.7929	1858	14	1864	11	1869	17	-1	6210-7 1	10
BC6210mz-4	736	252	5.366	0.059	0.3419	0.0028	0.7536	1861	13	1880	9	1896	14	-2	6210-4 1	70
BC6210mz-11.1dkc	2403	796	5.215	0.065	0.3311	0.0033	0.7841	1868	14	1855	11	1844	16	1	6210-11a 1	340
BC6210mz-10.3ltr	771	265	5.413	0.073	0.3437	0.0035	0.7628	1868	16	1887	11	1904	17	-2	6210-10a 2	140
BC6210mz-3.2ltr	801	278	5.482	0.060	0.3471	0.0028	0.7286	1873	14	1898	9	1921	13	-3	6210-3a 1	100
BC6210mz-5.2ltr	718	249	5.485	0.059	0.3459	0.0028	0.7586	1880	13	1898	9	1915	14	-2	6210-5b 1	140

Table S4: U-Pb isotope monazite analyses and Y content

Analysis#	U (ppm)	Pb^{206} (ppm)	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)	Spot analysis	Y (ppm)
1098-A																
DB1098mz-4	1376	454	5.062	0.067	0.3297	0.0032	0.7424	1821	16	1830	11	1837	16	-1	1098-4 1	120
DB1098mz-5.2ltr	1368	460	5.208	0.085	0.3366	0.0041	0.7395	1836	20	1854	14	1870	20	-2	1098-5a 1	180
DB1098mz-20	806	258	4.958	0.070	0.3198	0.0031	0.6779	1839	19	1812	12	1789	15	3	1098-20 1	120
DB1098mz-3	1795	598	5.181	0.069	0.3329	0.0033	0.7357	1846	16	1849	11	1852	16	0	1098-3 1	100
DB1098mz-10	1862	613	5.140	0.067	0.3290	0.0033	0.7679	1853	15	1843	11	1834	16	1	1098-10 1	160
DB1098mz-1	6219	2088	5.245	0.067	0.3357	0.0033	0.7645	1853	15	1860	11	1866	16	-1	1098-1 1	280
DB1098mz-12	3345	1030	4.815	0.063	0.3078	0.0032	0.7919	1855	14	1787	11	1730	16	8	1098-12 1	270
DB1098mz-14	3783	1217	5.037	0.065	0.3217	0.0033	0.8000	1857	14	1826	11	1798	16	4	1098-14 2	320
DB1098mz-6	4269	1437	5.271	0.078	0.3365	0.0040	0.8031	1858	16	1864	13	1870	19	-1	1098-6 2	240
DB1098mz-21	788	253	5.034	0.070	0.3209	0.0031	0.6994	1861	18	1825	12	1794	15	4	1098-21 1	140
DB1098mz-2	1528	498	5.113	0.066	0.3257	0.0032	0.7529	1862	15	1838	11	1818	15	3	1098-2b 1	100
DB1098mz-17	4019	1290	5.042	0.056	0.3209	0.0027	0.7620	1863	13	1826	9	1794	13	4	1098-17 1	320
DB1098mz-8	1143	367	5.063	0.082	0.3214	0.0041	0.7773	1868	18	1830	14	1797	20	4	1098-8b 1	90
DB1098mz-16	2887	927	5.059	0.060	0.3211	0.0029	0.7593	1868	14	1829	10	1795	14	4	1098-16b 1	0
DB1098mz-19	3726	1222	5.169	0.058	0.3280	0.0028	0.7573	1869	13	1848	9	1829	13	2	1098-19a 1	320
DB1098mz-5.1dkc	3786	1228	5.114	0.074	0.3244	0.0037	0.7920	1870	16	1838	12	1811	18	4	1098-5b 1	160
DB1098mz-7	4821	1571	5.156	0.076	0.3259	0.0039	0.8139	1876	15	1845	13	1819	19	3	1098-7 1	340
DB1098mz-9	3900	1263	5.155	0.068	0.3238	0.0034	0.7869	1887	15	1845	11	1808	16	5	1098-9b 1	120

Table S4: U-Pb isotope monazite analyses and Y content

Analysis#	U (ppm)	Pb^{206} (ppm)	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)	Spot analysis	Y (ppm)
3008-A																
IL3008mz-2	3982	1369	5.211	0.069	0.3439	0.0034	0.7603	1798	15	1854	11	1905	16	-7	3008-2a 1	400
IL3008mz-20.2dkr	10976	3713	5.176	0.066	0.3383	0.0033	0.7670	1815	15	1849	11	1878	16	-4	-	-
IL3008mz-9.1c	7155	2463	5.278	0.068	0.3443	0.0034	0.7628	1819	15	1865	11	1907	16	-6	3008-9a 1	250
IL3008mz-3	8771	2986	5.232	0.066	0.3404	0.0032	0.7534	1823	15	1858	11	1889	16	-4	3008-3 1	340
IL3008mz-18	15468	5346	5.313	0.068	0.3456	0.0035	0.8052	1824	14	1871	11	1914	17	-6	3008-18 1	210
IL3008mz-22	7926	2676	5.199	0.062	0.3376	0.0031	0.7737	1827	14	1852	10	1875	15	-3	-	-
IL3008mz-14	2475	822	5.119	0.070	0.3322	0.0033	0.7245	1828	17	1839	12	1849	16	-1	3008-14b 1	430
IL3008mz-15	9348	3211	5.296	0.063	0.3435	0.0032	0.7766	1829	14	1868	10	1904	15	-5	-	-
IL3008mz-20.1ltc	15847	5386	5.248	0.064	0.3399	0.0033	0.7950	1832	13	1860	10	1886	16	-3	-	-
IL3008mz-8	8255	2829	5.295	0.079	0.3427	0.0040	0.7890	1833	17	1868	13	1900	19	-4	3008-8a 1	250
IL3008mz-16	13566	4660	5.310	0.064	0.3435	0.0032	0.7743	1834	14	1871	10	1904	15	-4	3008-16b 1	190
IL3008mz-10	9164	3094	5.220	0.064	0.3377	0.0031	0.7501	1834	15	1856	10	1875	15	-3	3008-10 1	310
IL3008mz-21	2427	794	5.065	0.074	0.3272	0.0034	0.7109	1837	18	1830	12	1825	16	1	3008-21 1	190
IL3008mz-1	8961	3009	5.200	0.067	0.3358	0.0034	0.7898	1837	14	1853	11	1866	17	-2	3008-1b 1	200
IL3008mz-11	18052	6080	5.225	0.064	0.3368	0.0031	0.7661	1840	14	1857	10	1871	15	-2	-	-
IL3008mz-7	8876	2992	5.233	0.066	0.3371	0.0033	0.7823	1842	14	1858	11	1873	16	-2	3008-7a 1	250
IL3008mz-9.2zndr	9934	3291	5.185	0.063	0.3313	0.0031	0.7637	1857	14	1850	10	1844	15	1	3008-9b 1	120
IL3008mz-5.2ltr	16508	5694	5.405	0.077	0.3449	0.0039	0.8045	1859	15	1886	12	1910	19	-3	3008-5a 2	240
IL3008mz-6	3875	1299	5.255	0.079	0.3352	0.0039	0.7636	1859	18	1862	13	1863	19	0	3008-6 1	480
IL3008mz-19	3809	1302	5.361	0.074	0.3418	0.0035	0.7485	1860	17	1879	12	1896	17	-2	-	-
IL3008mz-13	2197	728	5.196	0.074	0.3313	0.0034	0.7301	1860	18	1852	12	1845	17	1	-	-
IL3008mz-4	5961	1984	5.246	0.072	0.3329	0.0033	0.7286	1869	17	1860	12	1852	16	1	3008-4a 1	80

Table S4: U-Pb isotope monazite analyses and Y content

Analysis#	U (ppm)	Pb^{206} (ppm)	$^{207}Pb/^{235}U$	1 Sig	$^{206}Pb/^{238}U$	1 Sig	Err. Correl.	$^{207}Pb/^{206}Pb$ Age (Ma)	1 Sig	$^{207}Pb/^{235}U$ Age (Ma)	1 Sig	$^{206}Pb/^{238}U$ Age (Ma)	1 Sig	Disc. (%)	Spot analysis	Y (ppm)
6150-A																
BC6150mz-11.2r	2968	966	4.911	0.059	0.3257	0.0025	0.6474	1789	17	1804	10	1817	12	-2	6150-11b 3	219
BC6150mz-12.2	2622	868	5.001	0.056	0.3312	0.0024	0.6506	1791	15	1820	9	1844	12	-3	6150-12b 5	246
BC6150mz-13.2r	3350	1079	4.875	0.058	0.3221	0.0026	0.6871	1796	16	1798	10	1800	13	0	6150-13a 2	67
BC6150mz-12.1c	6239	2010	4.884	0.053	0.3222	0.0025	0.7243	1798	14	1799	9	1800	12	0	6150-12a 1	535
BC6150mz-4.2r	2198	727	5.063	0.06	0.3307	0.0026	0.6658	1817	16	1830	10	1842	13	-2	6150-4b 2	264
BC6150mz-7.1c	5513	1786	4.963	0.051	0.324	0.0025	0.7467	1817	12	1813	9	1809	12	1	6150-7a 1	688
BC6150mz-11.1c	3930	1300	5.067	0.055	0.3309	0.0027	0.7474	1817	13	1831	9	1843	13	-2	6150-11a 1	442
BC6150mz-14	6776	2185	4.946	0.049	0.3225	0.0022	0.6848	1819	13	1810	8	1802	11	1	6150-14a 1	346
BC6150mz-1.3r	3034	985	4.985	0.05	0.3248	0.0023	0.7017	1821	13	1817	8	1813	11	1	6150-1a 3	142
BC6150mz-9	2311	754	5.006	0.063	0.3261	0.0027	0.668	1821	17	1820	11	1820	13	0	6150-9a 2	320
BC6150mz-13.1	2795	923	5.067	0.06	0.3302	0.0028	0.7034	1821	15	1831	10	1840	13	-1	6150-13a 1	278
BC6150mz-3.1c	11175	3525	4.845	0.048	0.3155	0.0023	0.7531	1822	12	1793	8	1768	11	3	6150-3a 2	356
BC6150mz-12.3r	3605	1185	5.05	0.061	0.3286	0.0026	0.6617	1823	17	1828	10	1831	13	-1	6150-12b 2	302
BC6150mz-6.1c	5928	1908	4.947	0.052	0.3218	0.0024	0.725	1824	13	1810	9	1799	12	2	-	-
BC6150mz-4.1	2296	748	5.012	0.054	0.3259	0.0025	0.7029	1825	14	1821	9	1819	12	0	6150-4b 1	184
BC6150mz-2.3r	2910	949	5.026	0.051	0.3262	0.0022	0.6437	1828	14	1824	9	1820	10	1	6150-2b 4	234
BC6150mz-8.1	3581	1141	4.908	0.057	0.3186	0.0026	0.7136	1828	15	1804	10	1783	13	3	6150-8b 1	143
BC6150mz-5c	4437	1445	5.025	0.052	0.3256	0.0024	0.707	1831	13	1824	9	1817	12	1	6150-5a 1	141
BC6150mz-2.1	2673	884	5.109	0.052	0.3307	0.0023	0.6699	1833	14	1838	9	1842	11	-1	6150-2b 2	249
BC6150mz-3.2r	3111	979	4.877	0.055	0.3148	0.0025	0.7083	1838	14	1798	9	1764	12	5	6150-3b 2	109
BC6150mz-1.2	1903	613	4.994	0.055	0.3221	0.0024	0.6728	1840	15	1818	9	1800	12	2	6150-1a 1	300
BC6150mz-2.2c	3191	1032	5.014	0.053	0.3233	0.0024	0.6946	1840	14	1822	9	1806	12	2	6150-2a 1	339
BC6150mz-7.2	2675	880	5.112	0.062	0.329	0.0025	0.6284	1843	17	1838	10	1833	12	1	6150-7b 1	238
BC6150mz-6.2r	2442	797	5.072	0.059	0.3262	0.0025	0.6465	1845	16	1831	10	1820	12	2	-	-
BC6150mz-1.1c	2921	924	4.923	0.049	0.3163	0.0021	0.6632	1846	14	1806	8	1772	10	5	6150-1b 2	273
BC6150mz-10.1c	2498	811	5.094	0.059	0.3245	0.0026	0.6797	1861	15	1835	10	1812	13	3	6150-10a 1	264
BC6150mz-10.2r	2107	693	5.165	0.062	0.3288	0.0027	0.6779	1863	16	1847	10	1832	13	2	6150-10b 3	306

APPENDIX 6 : LU-HF AND SM-ND GEOCHRONOLOGY METHOD

Lu-Hf and Sm-Nd geochronology was conducted at Peter Hooper GeoAnalytical lab of Washington State University on five samples, *i.e.,* one from the CZ, three from the Sukaliuk Complex, and one from the Lomier Complex. All analytical results are available in Tables S6 and S7 (Appendix 7) for Lu-Hf and Sm-Nd isotopes, respectively. Hand samples were crushed with the combination of hammer and silicon oxide mortar and pestle until the crushed sample grain size is similar to or smaller than the garnet grain size (500-2000 μm). From each crushed sample, six garnet fractions of ~ 250 mg were hand-picked and one whole-rock fraction was largely cleared of garnets and separated to produce two low-Hf whole-rock fractions. To avoid a chemical/mineralogical bias of the garnet population, magnetic separation was avoided prior to obtaining garnet fractions. However, after fractions were collected, two additional garnet fractions were pulverized to 350μm and paramagnetic Hf-rich minerals such as zircon, ilmenite and rutile were separated using a Frantz Isodynamic Separator.

Prior to digestion, garnet fractions were leached with 1.0M HCl in a ultrasonic bath to remove any contaminant and superficial alteration. Garnets and whole-rock powders were digested by tabletop dissolution in Savillex beakers. Additionally, a sub-fraction of whole-rock powder for each sample was bomb-digested in steel-jacketed PTFE dissolution vessels (Parr type). Unlike the tabletop dissolution, this second digestion method completely dissolves high-Hf refractory phases such as zircons, and was conducted in order to test the presence of high-Hf and inherited phases that produce erroneous isochrons as discussed in Scherer *et al.* (2000). For both

methods, samples were first attacked with a 10:1 HF-HNO_3 acid mixture. The same acid solution was then added to samples and heated on a hotplate at 120°C over 24 hours for Savillex-dissolved samples (garnets and whole-rocks), or heated in the oven at 160°C over 5 to 7 days in steel-jacketed bombs for bomb-digested whole-rock fractions. The solutions were then dried, producing fluoride residues. Fluorides were converted to chlorides by adding a saturated solution of H_3BO_3 to samples and heating over 8-12 hours to produce BF_3 gas, followed by addition of HCl. Refractory minerals from garnet fractions dissolved in Savillex beakers (tabletop dissolution method) were separated by centrifuging and extracting the garnet solution. These garnet solutions were then transferred to clean Parr Teflon bombs, and together with the bomb-digested whole-rock fractions, were heated at 160°C over 12 hours in steel-jacketed bombs.

Dissolved samples were spiked with ^{176}Lu-^{180}Hf and ^{149}Sm-^{150}Nd tracer solutions whose concentration and calibration are detailed in Vervoort *et al.* (2004) (see Tables S6 & S7 in Appendix 7 for the spike ID of each fraction; Lu-Hf-7 or -8, and Sm-Nd-3 or -4). Spiked solutions were equilibrated on a hotplate at 100°C over 8-12 hours prior to chemical separation by column chromatography. A first series of 10mL Bio-Rad AG50W-X12 resin-bed columns was used to collect three types of eluates: 1) Hf-HFSE, 2) Lu-Yb and other HREE, and 3) Sm-Nd and other LREE. Each of these eluates was loaded into a second series of columns to purify the isotopes of interest. Both Hf and Lu were eluted from 0.9mL Eichrom Ln-Spec resin-bed columns, whereas Sm and Nd were eluated from 1.7mL HDEHP-coated Teflon resin-bed columns. Additionally, all Hf eluates were passed through 180µL BioRad AG50W-X12 resin-bed columns to remove any residual Yb or Lu, and to reduce

isotopic interferences on ^{176}Hf. All final eluates were treated with HNO_3 to remove organic residues, and dissolved in 2% HNO_3 prior to mass spectrometry.

Radioactive isotope analyses were conducted on a ThermoFinnigan Neptune MC-ICP-MS at Peter Hooper GeoAnalytical lab of Washington State University. A Teflon low-flow nebulizer and a glass spray chamber were used as the sample introduction system for Lu, Sm and Nd. For Hf, a Cetac Aridus desolvating nebulizer system replaced the previous setting in order to enhance the MC-ICP-MS sensitivity and to improve signal stability. Isotope measurements were conducted using nine Faraday cups in static mode to gain the highest precision on isotopic ratios. The measurement procedure followed either three series of 25 times eight-second integrations for Hf and Nd isotope analyses, or one series of 30 times eight-second integrations for Lu-Yb and Sm isotope analyses. Standards were run every 3 to 5 samples. The standardized solutions used are: the Johnson Matthey Hf standard JMC-475 (25 ppb), three Lu-Yb standards (100 ppb Lu and 10, 50 or 100 ppb Yb) mixed in-house from Lu and Yb oxides, La Jolla Nd-standard (100 ppb), and a Sm-standard (100 ppb) prepared in-house from ultrapure metal.

Data are normalized to the known H and Nd isotope ratios of the standards (*i.e.*, respectively, JMC475 $^{176}Hf/^{177}Hf = 0.282160$ and La Jolla $^{143}Nd/^{144}Nd = 0.511858$). The average $^{176}Hf/^{177}Hf$ ratio of JMC475 standard measured during this study is 0.282136 ± 0.000030 (2σ, n = 27), whereas the La Jolla standard yielded an average $^{143}Nd/^{144}Nd$ ratio of 0.511834 ± 0.000015 (2σ, n = 11). Reported Hf isotope ratios are corrected for instrumental mass fractionation using an exponential law based on natural $^{179}Hf/^{177}Hf=0.7325$, and $^{176}Lu/^{177}Hf$ ratios are corrected for

interference by ^{176}Yb using the method detailed in Vervoort *et al.* (2004). Similarly, an exponential mass bias correction for Nd isotopes was done assuming that natural ^{146}Nd/^{144}Nd = 0.7219. The intensity of ^{152}Sm was corrected for interference by ^{152}Gd (^{152}Sm is used to calculate ^{147}Sm/^{144}Nd). Analyses with high interferences (*i.e.*, ^{173}Yb for ^{176}Lu analyses, and ^{155}Gd and ^{140}Ce for Sm-Nd analyses) were rejected. The 2σ absolute uncertainties on the isotope ratios are reported in Tables S6 and S7 (Appendix 7).

APPENDIX 7 : LA-ICP-MS GARNET CHEMISTRY AND PROFILES, AND LU-HF AND SM-ND ISOTOPE ANALYSES

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
3008-A L1 (Grt-1)																																				
0.0	18.05	0.01	2.80	3.36	15.70	0.01	3137	0.88	0.92	0.01	0.01	1.17	32.58	0.70	234.3	8.32	0.04	0.08	0.15	0.02	0.29	1.93	0.07	17.23	6.93	44.09	8.07	17.51	2.33	13.39	1.85	0.34	0.22	0.00	0.00	0.13
3.8	18.05	0.01	2.53	2.71	12.45	0.01	3068	0.76	0.83	0.00	0.01	0.99	29.00	bdl	234.6	5.96	bdl	bdl	0.00	bdl	0.70	1.61	0.06	13.54	6.32	45.12	7.94	21.66	2.53	14.98	3.07	0.25	0.05	bdl	0.02	0.00
7.6	18.05	0.00	2.86	2.99	13.43	0.01	2942	0.88	0.90	0.01	0.01	1.06	31.97	0.78	272.5	6.57	0.03	0.00	0.01	0.02	0.32	1.77	0.10	15.70	6.55	48.58	9.67	22.29	2.83	16.42	2.24	0.17	0.16	0.01	bdl	0.00
11.4	18.05	0.00	2.85	3.01	13.23	0.01	2869	0.86	0.90	0.01	0.01	1.06	32.03	0.27	352.6	6.97	bdl	0.01	0.00	0.02	0.24	1.79	0.05	14.91	6.62	56.49	11.73	28.41	3.63	21.57	2.63	0.16	0.16	0.01	0.00	0.00
15.2	18.05	0.01	2.71	3.61	12.63	0.01	2707	0.81	0.81	0.01	0.01	1.03	30.00	bdl	451.2	6.32	bdl	bdl	0.02	bdl	0.31	1.39	0.12	13.54	6.68	55.95	14.80	43.31	5.96	36.09	4.69	0.05	0.04	bdl	bdl	0.00
18.9	18.05	0.01	2.63	2.76	11.80	0.01	2238	0.78	0.81	0.01	0.01	0.97	30.00	0.60	463.8	6.03	bdl	0.00	0.01	0.01	0.18	1.17	0.06	13.14	5.59	59.92	15.88	45.66	6.46	38.44	5.47	0.16	0.21	0.00	0.00	0.00
22.7	18.05	0.00	2.78	2.85	12.18	0.01	2057	0.78	0.80	0.01	0.00	1.03	32.50	3.07	508.9	6.59	bdl	0.00	0.00	0.00	0.13	1.21	0.07	12.56	5.59	60.46	17.83	55.22	7.94	48.55	6.71	0.21	0.19	0.00	0.00	0.00
26.6	18.05																																			
30.4	18.05	0.01	2.26	2.44	9.08	0.01	1299	0.61	0.60	0.00	0.00	0.87	26.10	0.36	375.4	3.70	0.00	0.00	0.02	0.00	0.12	0.95	0.04	8.28	3.70	41.51	13.17	44.40	6.59	42.59	5.94	0.10	0.06	0.00	0.00	0.01
34.2	18.05																																			
38.0	18.05	0.01	2.58	2.60	10.45	0.01	1492	0.69	0.72	0.00	0.00	0.98	28.40	0.38	433.1	4.35	0.01	0.00	0.01	0.00	0.06	1.08	0.08	10.02	4.19	48.37	15.30	53.60	8.79	62.98	9.22	0.09	0.06	0.00	0.00	0.00
41.7	18.05	0.01	3.25	2.53	9.38	0.01	1372	0.56	0.61	0.00	0.00	0.99	26.00	bdl	397.0	3.07	0.01	0.00	0.03	0.03	0.17	0.79	0.10	8.48	3.97	45.12	14.80	52.34	7.94	64.97	9.93	0.31	0.23	0.00	0.00	0.00
45.5	18.05	0.01	2.58	2.71	10.32	0.01	1415	0.64	0.68	0.00	0.00	1.03	29.70	0.23	404.3	3.56	0.00	0.00	0.00	0.01	0.07	0.82	0.04	10.05	4.26	45.30	14.44	52.70	8.72	64.07	10.00	0.05	0.08	0.00	0.00	0.00
49.3	18.05	0.01	2.26	2.53	9.91	0.01	1215	0.60	0.63	0.00	0.00	0.97	29.30	0.27	370.0	3.75	0.01	0.00	0.00	0.00	0.07	0.78	0.03	8.32	3.66	39.88	12.92	47.28	8.01	59.92	9.13	0.08	0.08	0.00	0.00	0.00
53.1	18.05	0.01	1.64	2.17	7.58	0.01	993	0.49	0.49	0.00	0.00	0.96	25.00	bdl	270.7	4.69	0.01	0.00	0.01	bdl	0.01	0.45	0.02	6.68	3.25	32.48	11.91	46.92	7.04	57.75	8.12	0.05	0.08	0.00	0.00	0.00
56.9	18.05	0.01	2.47	2.60	9.87	0.01	1249	0.66	0.67	0.00	0.00	0.96	30.30	0.33	377.2	5.29	0.00	0.00	0.01	0.00	0.07	0.88	0.05	8.52	3.79	42.23	14.55	56.31	9.75	71.65	10.77	0.16	0.09	0.00	0.00	0.01
60.7	18.05	0.00	2.71	2.71	9.75	0.01	1263	0.56	0.78	0.00	0.00	1.26	29.00	bdl	360.9	5.77	0.00	0.02	0.00	bdl	0.05	0.65	bdl	9.75	3.79	39.70	14.98	57.75	10.29	70.38	11.19	0.27	0.05	0.02	0.00	0.00
64.5	18.05	0.01	2.56	2.78	10.68	0.01	1265	0.64	0.67	0.00	0.00	0.99	29.50	0.42	366.4	6.86		0.08	0.08	0.02	0.11	0.79	0.08	8.93	4.15	43.49	13.77	54.14	9.51	69.48	10.81	0.19	0.18	0.00	0.00	0.05
68.3	18.05	0.00	2.17	2.35	9.75	0.01	1101	0.65	0.70	0.00	0.00	0.83	29.00	bdl	306.8	3.61	bdl	0.01	0.02	0.00	0.15	1.06	0.05	6.32	3.97	41.51	12.27	41.51	6.14	45.12	7.76	0.13	0.10	0.00	0.02	0.02
72.1	18.05	0.01	2.56	2.59	10.65	0.01	1209	0.61	0.63	0.00	0.00	1.04	30.20	0.34	334.4	3.54	0.00	0.01	0.04	0.01	0.09	0.74	0.07	7.74	4.24	44.40	12.13	41.51	7.07	51.79	8.18	0.10	0.08	0.00	0.00	0.02
75.9	18.05	0.00	3.61	3.07	15.16	0.01	1462	0.81	0.76	0.00	0.00	1.12	33.00	0.02	397.0	2.89	0.00	0.00	0.09	0.01	0.18	0.72	0.06	11.19	5.23	50.53	14.62	45.12	8.66	61.36	9.56	0.12	0.23	0.02	0.00	0.03
79.6	18.05	0.01	2.47	2.72	10.56	0.01	1254	0.63	0.62	0.00	0.00	0.92	30.20	0.40	319.8	2.91	0.01	0.02	0.04	0.00	0.04	0.72	0.04	8.82	4.57	43.49	11.91	41.15	6.70	50.17	7.62	0.09	0.09	0.00	0.01	0.05
83.4	18.05																																			
87.2	18.05	0.01	2.31	2.47	9.67	0.01	1189	0.58	0.60	0.00	0.00	0.95	29.20	0.19	301.4	3.63	0.00	0.00	0.02	0.01	0.06	0.67	0.04	8.46	4.20	41.87	10.67	37.00	6.32	47.46	7.04	0.09	0.06	0.00	0.00	0.02
91.0	18.05	0.00	2.71	2.35	11.01	0.01	866	0.51	0.60	0.00	0.00	0.90	27.00	1.37	288.8	2.89	0.00	0.01	0.02	bdl	0.04	0.56	0.08	7.58	4.33	37.90	9.38	30.68	5.77	37.90	5.05	0.12	0.05	0.00	0.00	0.00
95.3	18.05	0.00	2.44	2.58	10.50	0.01	1211	0.62	0.65	0.00	0.00	1.00	28.80	0.23	321.6	3.43	0.01	0.02	0.03	0.00	0.08	0.84	0.09	8.43	4.71	44.47	11.41	36.82	5.77	40.79	6.05	0.09	0.09	0.00	0.00	0.03
100.0	18.05																																			
3008-A L2 (Grt-1)																																				
0.0	18.05	0.00	2.51	2.53	10.36	0.01	738	0.64	0.65	0.00	0.00	0.93	29.20	0.10	400.6	2.65	0.00	0.00	0.01	0.00	0.10	0.97	0.06	9.17	3.84	44.76	14.46	52.88	8.90	66.23	9.94	0.04	0.03	0.00	0.00	0.00
6.7	18.05	0.00	3.07	2.53	9.93	0.01	740	0.65	0.63	0.00	0.00	0.94	28.00	0.38	379.0	3.79	bdl	0.01	0.02	0.00	0.01	0.61	0.03	9.02	3.61	39.70	12.99	46.92	8.30	55.95	9.20	0.04	0.20	0.01	0.00	0.01
13.5	18.05	0.00	2.50	2.82	10.11	0.01	742	0.66	0.67	0.00	0.00	0.93	28.40	0.33	376.6	3.25	0.00	0.00	0.01	0.00	0.08	0.80	0.07	8.66	3.77	42.77	13.26	48.62	8.27	61.54	9.60	0.08	0.09	0.00	0.00	0.01
20.1	18.05	0.00	2.53	2.53	10.47	0.01	956	0.67	0.69	0.00	0.00	1.05	28.00	0.34	415.1	3.43	bdl	0.02	0.00	0.01	0.10	0.65	0.03	9.20	3.79	45.12	15.52	54.14	8.66	70.38	10.47	0.05	0.11	0.00	0.04	0.00
26.7	18.05	0.01	2.77	2.88	11.35	0.01	951	0.73	0.72	0.00	0.00	1.01	30.30	0.33	431.3	15.34	bdl	0.08	0.16	0.02	0.17	0.87	0.11	9.82	4.26	49.09	16.13	60.82	10.09	74.17	11.75	0.24	0.23	0.00	0.02	0.04
33.4	18.05	0.01	2.70	2.85	10.86	0.01	1047	0.68	0.70	0.00	0.00	0.96	29.10	0.22	424.1	5.87	0.01	0.07	0.08	0.06	0.17	0.98	0.07	9.82	4.06	47.10	15.72	57.75	9.69	73.63	11.41	0.13	0.16	0.00	0.00	0.06
40.0	18.05	0.01	3.43	3.43	12.81	0.01	1281	0.70	0.87	0.01	0.01	1.12	35.00	bdl	451.2	5.96	0.01	0.00	0.06	0.00	0.12	0.61	0.06	11.73	5.41	52.34	17.87	66.77	11.37	75.80	13.72	0.00	0.12	0.00	0.00	0.03
46.8	18.05	0.01	2.60	2.94	10.79	0.01	1308	0.73	0.74	0.00	0.00	0.97	29.80	0.22	425.9	4.26	0.00	0.00	0.00	0.00	0.09	0.90	0.05	10.45	4.40	48.55	15.74	58.11	9.73	74.89	11.50	0.14	0.12	0.00	0.00	0.01

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
53.4	18.05	0.00	1.70	1.71	7.22	0.01	884	0.52	0.47	0.00	0.00	0.70	21.00	0.18	288.8	2.35	0.04	0.00	0.00	0.00	bdl	0.56	0.07	6.86	3.07	30.68	11.73	39.70	6.68	52.34	7.22	0.08	0.12	0.00	0.00	0.00
60.1	18.05	0.01	2.63	2.87	11.24	0.01	1379	0.71	0.72	0.00	0.00	0.95	31.60	0.43	465.6	4.89	0.00	0.01	0.02	0.01	0.12	1.03	0.06	10.83	4.66	52.52	17.02	61.90	10.05	73.09	11.39	0.10	0.15	0.00	0.00	0.01
66.7	18.05																																			
73.4	18.05	0.01	2.83	2.71	10.49	0.01	1714	0.67	0.71	0.00	0.00	1.01	32.20	0.18	476.4	6.15	bdl	0.02	0.05	0.02	0.14	1.03	0.07	9.87	4.53	53.42	17.87	59.37	8.86	57.93	8.52	0.18	0.14	0.00	0.00	0.04
80.0	18.05																																			
86.8	18.05	0.01	2.40	2.60	9.78	0.01	1229	0.62	0.63	0.00	0.00	0.91	31.20	0.32	395.2	7.06	0.00	0.00	0.00	0.01	0.27	1.17	0.08	9.40	4.48	49.99	14.83	45.12	6.35	41.33	5.87	0.14	0.14	0.00	0.00	0.01
93.4	18.05	0.00	1.64	1.77	7.76	0.00	830	0.36	0.45	0.00	0.00	0.61	16.00	0.34	252.7	2.89	0.02	0.03	0.02	0.02	0.03	0.51	0.02	5.96	2.89	34.29	8.66	23.46	3.61	19.85	3.07	0.00	0.05	0.00	0.00	0.01
100.0	18.05	0.01	2.67	2.78	11.46	0.01	1460	0.70	0.70	0.00	0.00	1.14	35.20	0.25	404.3	4.55	0.00	0.02	0.04	0.01	0.13	0.78	0.04	9.19	5.14	54.86	13.84	38.98	5.32	31.76	4.48	0.11	0.14	0.01	0.01	0.06
3008-A L3 (Grt-2)																																				
0.0	18.05	0.01	2.11	2.21	14.46	0.01	2220	0.90	0.95	0.01	0.01	1.37	33.81	bdl	276.3	8.27	0.08	0.00	0.01	0.01	0.20	1.41	0.09	15.63	7.22	51.97	9.67	21.53	2.80	16.55	2.48	0.29	0.24	0.00	0.00	0.01
4.2	18.05	0.01	2.42	2.54	13.57	0.01	2187	0.85	0.90	0.01	0.01	1.19	33.34	0.13	266.9	8.28	0.02	0.02	0.02	0.02	0.27	1.57	0.10	14.35	6.75	49.56	9.84	22.31	2.83	18.01	2.62	0.23	0.22	0.00	0.00	0.00
8.3	18.05	0.01	2.71	2.71	13.72	0.02	2166	0.90	0.88	0.00	0.01	1.10	34.00	0.45	306.8	9.38	0.04	bdl	0.00	bdl	0.15	1.62	0.03	11.01	6.32	54.14	11.37	23.46	2.89	21.66	3.61	0.47	0.52	0.00	0.00	0.00
12.5	18.05	0.01	2.71	2.86	13.95	0.01	2021	0.91	0.92	0.01	0.01	1.08	32.61	0.32	345.1	11.08	0.01	0.19	0.21	0.02	0.39	1.32	0.10	13.44	6.53	56.74	12.00	30.32	3.88	24.51	3.65	0.35	0.27	0.00	0.01	0.07
16.9	18.05	0.01	2.71	2.90	13.28	0.01	1895	0.92	0.89	0.01	0.01	1.02	36.70	0.74	436.2	10.34	0.05	0.03	0.06	0.01	0.28	1.61	0.08	12.60	6.75	64.97	15.23	40.06	5.43	34.65	5.00	0.28	0.27	0.00	0.00	0.02
22.3	18.05																																			
51.5	18.05	0.01	2.45	2.73	11.73	0.02	1539	0.73	0.73	0.00	0.00	1.01	31.70	bdl	575.7	5.50	0.00	11.73	42.05	2.35	29.06	2.04	0.11	10.05	5.14	62.08	20.59	79.04	12.96	96.91	16.60	0.18	0.09	0.01	0.32	0.34
56.8	18.05	0.01	2.73	2.91	12.24	0.02	1545	0.73	0.90	0.00	0.00	0.98	30.80	0.29	557.7	6.86	0.01	5.77	27.07	1.50	11.19	1.57	0.13	10.72	5.11	61.72	19.91	74.53	12.87	96.91	16.13	0.15	0.16	0.01	0.20	0.16
64.6	18.05	0.01	2.47	2.62	12.18	0.01	1575	0.74	0.77	0.00	0.00	0.98	33.70	0.38	610.0	6.42	0.01	1.75	13.72	0.58	8.48	1.55	0.07	10.63	5.16	66.95	21.66	81.57	13.70	99.62	16.51	0.12	0.13	0.00	0.14	0.04
68.7	18.05	0.01	2.35	2.35	11.91	0.02	1408	0.69	0.79	0.01	0.00	1.01	30.00	bdl	631.6	6.14	0.05	0.01	25.27	0.03	0.15	0.97	0.08	11.19	5.41	68.58	25.27	84.82	13.72	102.87	16.24	0.15	0.11	0.00	0.00	0.00
72.9	18.05	0.01	2.38	2.33	11.62	0.01	1554	0.70	0.75	0.01	0.00	1.08	31.60	0.63	619.0	7.36	0.02	1.48	12.99	0.49	4.51	1.23	0.10	9.69	5.04	67.50	22.25	79.41	12.49	91.50	15.09	0.15	0.16	0.00	0.11	0.02
77.2	18.05	0.01	1.99	2.17	11.19	0.01	1335	0.74	0.65	0.01	0.00	0.94	27.00	0.32	577.5	7.94	bdl	0.05	0.47	0.04	0.14	1.06	0.02	7.58	5.05	68.58	19.85	70.38	11.01	77.60	12.63	0.40	0.07	0.00	0.05	0.00
81.4	18.05	0.01	2.26	2.20	10.74	0.01	1444	0.67	0.71	0.00	0.00	1.05	30.40	0.32	516.1	8.64	bdl	0.60	3.43	0.25	1.77	1.26	0.08	9.08	4.62	61.72	18.59	61.36	9.46	65.87	10.49	0.16	0.20	0.00	0.03	0.02
85.6	18.05	0.01	2.35	2.17	14.62	0.02	1408	0.78	0.83	0.00	0.01	1.71	29.00	0.00	469.2	10.29	0.01	0.15	2.17	3.07	1.99	1.19	bdl	11.73	5.96	61.36	17.87	46.92	6.68	48.73	8.48	0.20	0.15	0.00	0.02	0.00
89.7	18.05	0.01	2.31	2.31	12.04	0.02	1608	0.74	0.77	0.01	0.00	1.14	33.50	0.42	404.3	9.19	0.00	1.50	2.06	0.27	1.23	1.23	0.07	10.07	5.38	55.76	14.28	40.79	5.76	39.52	6.14	0.23	0.21	0.00	0.01	0.03
94.7	18.05																																			
100.0	18.05	0.01	2.20	2.22	12.09	0.01	1496	0.75	0.78	0.00	0.00	1.25	32.90	0.23	253.6	6.33	0.00	1.03	1.14	0.07	0.94	1.30	0.06	11.15	5.32	42.23	8.90	21.84	2.73	18.88	2.65	0.13	0.16	0.01	0.02	0.01
3008-A L4 (Grt-3)																																				
0.0	18.05	0.01	2.40	2.50	13.86	0.01	1823	0.82	0.85	0.00	0.00	1.05	32.10	0.25	496.3	6.32	0.03	0.03	0.06	0.00	0.19	0.94	0.08	12.69	6.84	66.05	16.57	44.94	6.05	35.55	4.11	0.40	0.30	0.00	0.00	0.03
4.0	18.05	0.00	2.71	2.89	13.72	0.01	1516	0.69	0.81	0.00	0.00	1.08	34.00	0.07	523.4	3.61	0.08	bdl	0.00	0.03	0.16	2.35	0.06	14.08	6.14	63.16	15.70	54.14	7.40	45.12	6.14	0.06	0.10	0.00	0.00	0.00
8.1	18.05	0.01	2.68	2.84	13.37	0.01	1774	0.80	0.83	0.00	0.00	1.03	32.41	0.32	480.6	4.30	0.00	0.00	0.03	0.00	0.12	0.93	0.10	13.64	6.55	63.90	17.13	53.51	8.28	53.78	7.47	0.12	0.10	0.00	0.00	0.01
12.1	18.05																																			
16.2	18.05	0.00	2.71	2.91	13.05	0.01	1742	0.81	0.82	0.00	0.00	1.02	31.74	0.23	477.5	5.00	0.01	0.02	0.04	0.00	0.13	0.87	0.06	13.37	6.41	57.53	17.13	60.66	10.32	69.66	10.74	0.14	0.15	0.01	0.00	0.00
20.3	18.05																																			
24.3	18.05	0.01	2.62	2.83	11.98	0.01	1303	0.70	0.72	0.00	0.00	1.02	34.00	0.40	384.4	3.48	0.03	0.02	0.05	0.01	0.12	0.92	0.07	10.63	5.05	47.10	13.34	48.00	7.92	56.85	8.23	0.11	0.16	0.01	0.00	0.02
28.4	18.05	0.01	3.07	2.89	14.08	0.01	1534	0.78	0.78	0.00	0.00	1.55	42.00	0.06	379.0	2.89	0.01	0.03	0.03	bdl	0.18	0.92	0.15	12.99	5.59	52.34	15.16	50.53	8.48	57.75	8.30	bdl	0.14	0.00	0.00	0.00
32.4	18.05	0.01	2.76	2.69	11.26	0.01	1162	0.67	0.68	0.00	0.00	0.96	31.40	0.27	330.3	8.66	0.02	0.03	0.04	0.01	0.06	0.76	0.07	10.05	4.60	41.69	11.60	38.98	6.37	45.30	6.15	0.26	0.23	0.00	0.00	0.04

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
36.4	18.05	0.01	2.53	2.69	11.15	0.01	1209	0.74	0.69	0.00	0.00	0.93	33.30	0.20	299.6	13.54	0.03	0.02	0.07	0.06	0.14	0.74	0.08	9.73	4.35	39.52	10.43	33.93	5.25	36.63	4.80	0.43	0.49	0.00	0.00	0.03
40.5	18.05	0.00	2.53	2.71	10.47	0.01	1281	0.67	0.65	0.00	0.01	0.99	26.00	0.07	288.8	6.86	0.12	bdl	0.00	0.02	0.20	1.05	0.12	11.91	4.51	41.51	10.65	34.29	5.41	34.29	4.15	0.22	0.40	0.02	0.00	0.01
44.5	18.05	0.00	2.62	2.74	11.75	0.01	1206	0.70	0.73	0.00	0.00	0.96	29.80	0.63	280.8	7.99	bdl	0.01	0.06	0.02	0.17	0.96	0.04	10.14	4.31	38.80	9.91	29.06	4.48	29.58	3.75	0.44	0.37	0.00	0.00	0.02
48.5	18.05	0.01	3.18	3.00	12.00	0.02	1218	0.71	0.74	0.00	0.00	1.01	31.50	0.43	269.4	18.41	0.02	0.08	0.15	0.04	0.22	1.02	0.10	10.49	4.20	38.62	9.38	27.70	4.02	27.25	3.19	0.80	0.91	0.01	0.00	0.05
52.6	18.05																																			
56.7	18.05	0.01	2.67	2.74	10.56	0.02	1090	0.67	0.67	0.00	0.00	0.99	31.50	0.19	249.1	8.97	0.03	0.00	0.04	0.00	0.06	0.88	0.05	8.70	3.37	33.39	8.70	25.30	3.57	22.83	2.80	0.41	0.36	0.03	0.00	0.01
60.7	18.05	0.01	2.53	2.53	12.09	0.02	1119	0.79	0.74	0.00	0.00	0.99	34.00	0.76	288.8	6.32	0.02	0.06	0.00	0.01	0.06	1.17	0.06	9.38	3.79	41.51	11.19	30.68	4.33	25.27	3.43	0.49	0.22	0.00	0.00	0.01
64.7	18.05	0.01	3.03	2.87	10.56	0.02	1137	0.67	0.69	0.00	0.00	1.05	30.90	1.08	270.7	8.12	0.01	0.01	0.01	0.01	0.10	1.06	0.04	8.48	3.34	35.55	9.31	25.09	3.74	23.98	2.80	0.39	0.39	0.00	0.00	0.01
68.8	18.05	0.01	3.25	3.43	13.17	0.02	1444	0.79	0.81	0.01	0.01	1.30	33.00	0.42	324.8	16.78	0.06	0.01	0.00	bdl	0.14	1.01	0.14	9.38	3.79	41.51	12.09	34.29	5.96	39.70	5.05	0.81	0.61	0.00	0.00	0.03
73.9	18.05	0.01	2.71	2.98	10.97	0.02	1224	0.68	0.72	0.00	0.00	1.05	32.20	0.23	333.9	12.63	0.00	0.00	0.01	0.01	0.15	1.24	0.08	8.37	3.52	40.24	12.06	40.06	6.53	45.48	6.35	0.46	0.40	0.00	0.00	0.01
81.8	18.05	0.01	2.78	2.80	11.24	0.02	1103	0.97	0.68	0.00	0.00	1.02	30.10	0.32	391.6	5.11	0.01	8.12	28.51	1.30	13.35	2.06	0.12	8.16	3.28	43.85	14.42	51.97	8.16	53.42	7.60	0.14	0.13	0.00	0.12	0.15
86.6	18.05																																			
95.8	18.05	0.01	2.47	2.67	10.65	0.02	1097	0.66	0.70	0.00	0.00	0.97	29.50	0.34	339.3	4.02	0.00	12.45	49.27	3.97	27.25	3.09	0.36	11.69	4.67	44.76	11.53	29.60	4.22	25.27	3.10	0.13	0.11	0.00	0.21	0.32
100.0	18.05																																			
3008-A L5 (Grt-4)																																				
0.0	18.05	0.00	2.13	2.26	14.26	0.01	2281	0.93	0.93	0.01	0.01	1.53	32.75	0.27	609.3	5.38	bdl	0.04	0.01	0.03	0.60	1.61	0.08	16.44	7.72	79.41	20.41	61.90	9.15	64.77	10.02	0.18	0.17	0.01	0.01	0.00
5.7	18.05																																			
11.5	18.05	0.01	2.46	2.60	13.49	0.01	2341	0.82	1.01	0.01	0.01	1.38	32.95	0.58	670.6	6.06	bdl	0.00	0.01	0.03	0.16	1.66	0.05	15.99	7.24	78.86	23.32	85.18	14.49	108.82	18.71	0.28	0.17	0.01	0.00	0.00
17.3	18.05	0.01	2.71	2.71	13.90	0.01	2166	0.83	0.87	0.00	0.01	1.35	33.00	0.32	685.8	7.58	bdl	bdl	bdl	0.03	0.45	1.48	0.11	15.52	6.86	73.99	23.46	88.43	15.70	128.13	25.27	0.29	0.05	bdl	0.05	0.00
23.0	18.05	0.01	2.62	2.75	13.50	0.01	2352	1.08	0.89	0.01	0.01	1.35	33.22	0.02	678.6	6.98	bdl	0.01	0.01	0.01	0.14	1.58	0.08	15.81	6.64	75.26	24.07	91.75	16.60	134.45	24.74	0.13	0.14	0.00	0.00	0.01
28.7	18.05	0.01	2.68	2.80	13.25	0.01	2189	0.79	0.88	0.01	0.01	1.33	32.58	0.31	611.8	3.65	0.01	0.02	0.01	0.01	0.17	1.50	0.08	14.78	6.32	69.12	21.94	83.02	15.30	126.69	23.68	0.15	0.08	0.00	0.01	0.01
34.5	18.05	0.01	2.53	2.71	12.45	0.01	1985	0.74	0.76	0.01	0.01	1.44	52.00	bdl	523.4	5.05	0.01	0.08	0.72	0.05	0.60	0.83	0.05	10.65	5.23	55.95	17.69	64.97	12.27	101.06	18.05	0.27	0.38	0.01	0.06	0.38
40.3	18.05	0.02	2.40	2.62	11.19	0.01	1563	0.69	0.73	0.00	0.00	1.32	33.00	0.36	451.2	7.40	0.01	0.06	0.20	0.06	0.25	1.17	0.09	11.41	4.76	51.97	16.24	61.72	11.59	93.12	17.09	0.26	0.18	0.00	0.01	0.11
46.1	18.05																																			
52.9	18.05	0.01	2.13	2.17	9.22	0.01	1224	0.53	0.59	0.00	0.00	1.15	28.20	0.32	377.2	3.79	0.01	0.01	0.07	0.01	0.14	0.94	0.05	8.93	4.02	42.59	13.26	51.43	9.40	79.41	13.77	0.10	0.07	0.00	0.00	0.06
58.7	18.05	0.01	2.15	2.26	9.28	0.01	1164	0.57	0.62	0.00	0.00	1.17	29.10	0.32	359.1	3.46	0.01	0.01	0.02	0.01	0.08	0.88	0.03	8.72	3.63	39.70	12.42	48.91	8.88	74.17	12.99	0.09	0.09	0.00	0.00	0.06
64.5	18.05	0.01	2.17	2.53	10.83	0.01	1191	0.70	0.61	0.00	0.01	1.15	50.00	bdl	415.1	4.15	bdl	0.00	0.00	bdl	0.27	1.30	0.12	10.11	5.23	48.73	16.96	59.55	10.29	88.43	14.08	0.17	0.20	0.02	0.01	0.00
70.2	18.05	0.01	2.31	2.53	10.12	0.01	1258	0.65	0.66	0.00	0.00	1.16	30.20	1.03	397.0	4.24	0.00	0.01	0.03	0.01	0.12	1.02	0.05	10.25	4.30	46.74	14.44	53.42	9.67	78.14	13.14	0.10	0.10	0.00	0.00	0.02
76.0	18.05	0.01	2.27	2.62	10.12	0.01	1252	0.62	0.65	0.00	0.00	1.23	29.80	0.09	416.9	4.66	0.00	0.03	0.04	0.01	0.16	1.16	0.08	10.47	4.42	48.37	14.42	53.06	9.11	68.94	11.48	0.11	0.16	0.00	0.00	0.01
81.8	18.05	0.00	1.79	1.99	8.84	0.01	1137	0.63	0.58	0.00	0.00	0.96	22.00	0.47	306.8	3.79	bdl	0.00	0.10	bdl	0.07	1.10	0.05	8.30	4.15	34.29	9.56	34.29	5.96	39.70	6.32	0.06	0.00	0.00	0.01	0.01
87.6	18.05	0.01	2.33	2.56	10.39	0.01	1289	0.66	0.68	0.00	0.00	1.34	35.80	0.31	350.1	3.12	0.01	0.00	0.01	0.01	0.19	1.12	0.06	11.01	4.96	46.56	12.07	38.26	5.61	40.24	5.99	0.10	0.09	0.00		0.01
93.3	18.05																																			
100.0	18.05	0.19	1.80	1.91	9.73	0.01	1029	0.64	0.65	0.00	0.00	1.14	26.00	1.26	326.7	9.93	0.00	0.43	0.45	0.05	0.61	0.95	0.15	9.13	4.10	40.61	10.02	31.58	4.80	35.37	4.67	0.44	0.44	0.00	0.00	0.18
3008-A L6 (Grt-5)																																				
0.0	18.05	0.12	2.47	2.63	12.74	0.01	1823	0.84	0.87	0.00	0.00	1.12	28.30	0.65	597.4	11.73	0.02	0.07	0.16	0.03	0.40	1.66	0.11	16.78	8.01	75.80	19.27	57.93	8.32	54.32	7.49	0.32	0.17	0.01	0.00	0.06
4.6	18.05	0.01	2.89	2.89	13.54	0.01	2166	0.87	0.85	0.01	0.00	1.28	32.00	0.00	505.3	4.87	0.04	bdl	0.05	0.03	0.32	0.99	0.03	14.26	7.40	66.77	14.98	43.31	5.77	41.51	5.59	bdl	0.16	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
9.1	18.05	0.01	2.81	2.98	13.55	0.01	1810	0.87	0.88	0.00	0.00	1.26	32.25	0.07	514.7	4.22	0.03	0.00	0.02	0.02	0.17	1.61	0.09	17.79	7.80	71.74	16.51	44.67	6.19	40.06	5.38	0.09	0.06	0.01	0.00	0.00
13.7	18.05	0.01	2.89	3.07	13.17	0.01	1516	0.90	0.88	0.00	0.00	1.28	31.00	0.47	577.5	5.59	bdl	bdl	0.05	0.08	0.05	1.99	0.22	15.52	7.22	73.99	18.05	50.53	8.48	55.95	6.14	0.05	0.09	0.00	0.00	0.00
18.3	18.05	0.01	2.82	2.99	13.17	0.01	1597	0.87	0.87	0.00	0.00	1.24	31.71	0.05	575.0	5.07	0.00	0.01	0.02	0.01	0.25	1.57	0.09	16.24	7.56	76.55	19.71	58.51	8.21	55.22	7.44	0.13	0.14	0.01	0.01	0.00
22.8	18.05	0.01	3.79	3.07	12.45	0.01	1534	1.03	0.83	0.01	0.00	1.52	32.00	0.70	577.5	5.59	bdl	0.08	0.11	0.01	0.23	0.88	0.09	18.05	7.40	79.41	21.66	63.16	9.56	63.16	9.75	bdl	0.04	0.00	0.02	0.00
27.3	18.05	0.00	2.71	2.73	11.60	0.01	1321	0.71	0.75	0.00	0.00	1.14	29.00	0.45	510.7	5.22	0.03	0.01	0.02	0.01	0.19	1.21	0.08	13.19	6.42	65.69	17.52	53.06	7.76	54.50	7.87	0.11	0.15	0.00	0.00	0.02
31.8	18.05	0.00	2.17	2.35	11.01	0.02	1209	0.63	0.74	0.00	0.00	1.05	35.00	bdl	505.3	3.61	0.04	bdl	0.00	bdl	0.25	0.74	bdl	11.91	5.77	63.16	16.24	52.34	7.94	52.34	8.12	0.08	0.06	0.00	0.00	0.00
36.4	18.05	0.01	2.36	2.42	9.98	0.01	1083	0.62	0.67	0.00	0.00	1.08	26.50	0.36	429.5	3.95	0.01	0.00	0.01	0.00	0.12	0.86	0.06	10.23	5.47	57.03	15.34	45.48	6.86	47.82	7.33	0.12	0.11	0.00	0.00	0.13
40.9	18.05	0.00	2.35	1.68	7.40	0.01	866	0.51	0.52	0.00	0.00	0.69	24.00	bdl	288.8	3.79	0.03	0.00	0.01	bdl	0.18	0.87	0.08	7.76	3.79	39.70	10.83	30.68	5.05	34.29	5.23	0.18	0.07	0.02	0.00	0.00
45.4	18.05	0.01	2.80	3.00	12.13	0.01	1252	0.72	0.79	0.00	0.00	1.27	32.10	1.99	438.5	5.05	0.01	0.01	0.01	0.01	0.13	0.90	0.06	12.27	6.21	60.82	15.21	47.46	7.51	56.85	9.67	0.13	0.09	0.00	0.00	0.00
49.9	18.05	0.01	2.56	2.69	11.86	0.01	1227	0.74	0.75	0.00	0.00	1.28	30.00	2.35	424.1	4.75	0.00	0.01	0.01	0.02	0.14	1.01	0.04	12.51	6.39	58.65	14.51	45.48	7.44	57.39	10.03	0.08	0.13	0.01	0.00	0.00
54.5	18.05	0.00	2.71	2.71	8.84	0.01	1029	0.58	0.58	0.01	0.00	1.46	26.00	0.43	324.8	2.17	0.01	0.04	0.00	bdl	0.08	1.14	0.04	11.01	5.23	48.73	11.55	37.90	6.50	48.73	7.94	0.07	0.02	0.00	0.00	0.00
59.0	18.05	0.00	2.45	2.82	11.77	0.00	1191	0.71	0.72	0.00	0.00	1.15	31.50	0.07	397.0	2.87	0.01		0.00	0.00	0.11	1.35	0.09	15.21	6.37	55.95	14.15	46.20	7.94	64.43	10.59	0.06	0.04	0.01	0.00	0.01
63.5	18.05	0.00	2.49	2.47	11.37	0.01	1141	0.71	0.74	0.00	0.00	1.27	29.40	0.40	360.9	3.48	0.00	0.00	0.00	0.01	0.12	1.29	0.05	13.43	5.68	50.17	13.34	44.76	7.63	61.72	10.68	0.08	0.06	0.00	0.00	0.00
68.1	18.05	0.00	1.44	1.53	6.68	0.01	794	0.43	0.47	0.00	0.00	0.69	18.00	0.00	198.5	2.71	bdl	0.02	0.00	0.00	0.00	0.67	0.03	7.58	3.43	27.07	7.22	27.07	4.15	34.29	5.96	0.02	0.20	0.00	0.00	0.00
72.6	18.05	0.01	2.49	2.45	11.15	0.01	1144	0.72	0.71	0.00	0.00	1.10	30.10	0.63	319.4	4.84	0.08	0.04	0.10	0.03	0.20	1.12	0.05	11.84	4.84	42.77	11.35	39.16	6.91	53.78	8.93	0.17	0.23	0.00	0.00	0.01
77.1	18.05	0.01	2.52	2.83	12.24	0.01	1222	0.75	0.80	0.01	0.01	1.22	32.00	0.32	380.8	27.43	0.06	0.19	0.28	0.05	0.33	1.19	0.11	13.61	5.40	50.35	13.95	48.55	8.21	63.71	10.11	0.44	0.49	0.00	0.01	0.11
81.6	18.05	0.01	2.53	2.89	14.08	0.01	1372	0.76	0.83	0.01	0.00	1.41	34.00	0.22	451.2	6.14	0.03	bdl	0.01	0.02	0.25	1.80	0.02	15.34	5.77	57.75	14.98	52.34	9.02	68.58	9.56	0.58	0.03	0.00	0.00	0.00
86.1	18.05	0.00	2.54	2.63	12.47	0.01	1173	0.78	0.78	0.00	0.00	1.24	31.20	0.38	442.2	4.91	0.01	0.00	0.04	0.02	0.18	1.50	0.08	14.28	5.81	58.65	16.22	52.88	8.28	56.85	8.46	0.08	0.14	0.00	0.00	0.02
90.8	18.05	0.01	2.36	2.51	11.91	0.01	1070	0.73	0.77	0.00	0.00	1.30	30.20	0.49	429.5	3.61	0.00	0.01	0.04	0.01	0.15	1.37	0.08	13.75	6.14	59.01	15.25	47.82	6.98	46.56	6.30	0.06	0.09	0.00	0.00	0.01
95.3	18.05	0.01	1.99	2.17	10.11	0.01	884	0.61	0.63	0.00	0.01	1.05	25.00	0.58	360.9	2.71	bdl	bdl	0.00	0.00	0.16	1.10	0.05	11.73	5.96	48.73	12.81	32.48	4.87	30.68	4.15	0.06	0.15	0.02	0.01	0.00
100.0	18.05	0.01	2.29	2.42	12.04	0.01	1025	0.72	0.76	0.00	0.00	1.25	30.20	0.47	416.9	3.57	0.03	0.01	0.03	0.01	0.16	1.35	0.06	13.82	6.28	59.92	13.93	37.18	5.27	33.93	4.37	0.08	0.09	0.00	0.00	0.00
3008-A L7 (Grt-6)																																				
0.0	18.05	0.01	2.25	2.35	14.39	0.01	2185	0.91	0.96	0.01	0.01	1.41	33.89	0.52	415.6	5.38	0.02	0.00	0.02	0.02	0.35	2.04	0.09	21.42	8.63	66.23	14.20	37.90	5.59	34.65	5.07	0.17	0.11	0.00	0.00	0.00
6.2	18.05																																			
12.5	18.05	0.01	2.57	2.71	13.63	0.01	2194	0.87	0.98	0.01	0.01	1.26	33.35	0.38	398.5	4.55	0.01	0.00	0.03	0.02	0.25	2.06	0.07	19.65	7.96	62.95	12.70	29.98	4.02	25.10	3.14	0.13	0.18	0.00	0.00	0.00
18.7	18.05	0.00	2.71	2.89	13.72	0.01	1985	0.78	0.94	0.01	0.00	1.28	34.00	1.08	577.5	5.05	bdl	0.05	0.02	0.01	0.32	2.17	0.07	17.51	8.48	73.99	19.85	52.34	7.04	39.70	5.59	0.14	0.16	bdl	0.00	0.00
25.2	18.05	0.01	2.75	2.88	13.51	0.01	1971	0.85	1.06	0.00	0.01	1.23	32.85	0.34	543.4	4.60	0.00	0.01	0.02	0.01	0.18	1.53	0.10	15.41	7.49	75.26	18.80	50.17	6.37	36.53	4.84	0.18	0.17	0.01	0.00	0.00
31.4	18.05	0.01	2.79	2.99	13.91	0.01	1830	1.01	0.85	0.01	0.01	1.25	33.70	0.27	476.4	6.39	0.01	0.03	0.07	0.03	0.27	1.59	0.10	14.55	7.22	68.22	16.08	42.95	5.65	33.78	4.49	0.20	0.18	0.01	0.00	0.08
37.7	18.05																																			
44.0	18.05	0.02	2.54	2.60	11.06	0.01	1354	0.71	0.74	0.01	0.01	1.04	28.60	1.25	447.6	6.55	0.03	0.18	0.25	0.05	0.27	1.25	0.08	11.44	5.65	58.65	16.37	47.82	6.55	39.88	5.61	0.20	0.25	0.01	0.02	0.13
50.3	18.05	0.01	2.17	2.17	8.30	0.01	1552	0.67	0.56	0.00	0.00	0.90	28.00	0.13	397.0	5.41	bdl	0.00	0.00	bdl	0.17	0.97	0.08	8.48	4.51	50.53	13.54	43.31	5.96	34.29	5.05	0.29	0.27	0.00	0.00	0.01
57.2	18.05	0.01	2.29	2.63	10.47	0.01	1159	0.61	0.66	0.00	0.00	1.15	29.70	0.29	420.5	5.43	0.01	0.01	0.04	0.00	0.09	0.96	0.05	10.00	4.91	53.96	15.34	46.74	6.51	41.33	5.87	0.11	0.13	0.00	0.02	0.02
64.7	18.05																																			
71.0	18.05	0.02	2.24	2.40	10.41	0.02	1047	0.70	0.73	0.01	0.01	0.93	25.20	2.89	514.3	12.81	1.62	0.16	0.34	0.04	0.32	1.28	0.06	9.84	5.20	61.72	18.41	57.93	8.46	54.50	7.72	0.46	0.38	0.01	0.02	0.18
77.2	18.05																																			
83.6	18.05	0.01	2.71	2.71	12.78	0.01	1491	0.74	0.76	0.01	0.01	1.20	31.70	0.36	628.0	8.57	0.06	0.01	0.06	0.01	0.17	1.39	0.07	12.02	6.19	77.96	23.86	74.17	10.70	68.76	10.27	0.20	0.21	0.00	0.00	0.03
89.9	18.05																																			

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
3008-A L8 (Grt-6)																																			
0.0	18.05	0.01	2.32	2.47	10.11	0.02	583	0.65	0.64	0.00	0.00	1.06	28.60	0.30	402.4	4.58	0.00	28.87	131.74	9.93	59.01	5.40	0.14	12.56	4.75	49.45	15.12	48.37	7.24	47.10	6.68	0.12	0.12	0.00	1.82	0.69
9.3	18.05	0.01	2.29	2.45	9.51	0.02	648	0.64	0.65	0.00	0.00	1.05	29.50	0.32	364.6	4.08	0.00	25.27	88.43	6.01	36.45	3.97	0.13	11.08	4.26	44.94	13.30	42.41	6.41	42.95	6.19	0.14	0.11	0.00	1.25	0.30
18.7	18.05	0.00	2.17	2.35	10.11	0.01	704	0.65	0.61	0.00	0.00	0.90	22.00	0.07	342.9	4.15	bdl	5.23	48.73	4.15	23.46	4.33	0.05	9.56	4.33	43.31	12.45	43.31	6.32	39.70	5.77	0.05	0.06	0.00	0.43	0.12
28.0	18.05	0.00	2.15	2.15	9.22	0.02	698	0.60	0.62	0.00	0.00	0.93	26.70	0.49	368.2	4.11	0.01	13.54	46.38	4.33	21.11	2.38	0.08	10.00	4.35	46.56	13.48	41.33	6.21	42.23	5.87	0.12	0.10	0.00	0.63	0.28
37.5	18.05																																			
46.9	18.05	0.00	2.28	2.43	10.65	0.01	913	0.68	0.68	0.00	0.00	1.06	28.20	0.39	418.7	5.05	0.00	13.17	39.16	2.49	14.80	2.00	0.10	11.48	5.05	53.60	14.96	47.46	6.80	45.84	6.71	0.11	0.14	0.00	0.74	0.15
56.9	18.05																																			
70.3	18.05	0.01	2.33	2.48	11.87	0.01	1236	0.72	0.74	0.00	0.00	1.28	32.40	0.36	427.7	4.53	0.00	3.79	19.85	0.67	5.77	2.06	0.09	12.34	5.68	60.46	14.92	41.87	5.77	36.63	5.11	0.10	0.11	0.00	0.21	0.08
79.8	18.05	0.00	1.80	1.80	9.20	0.01	1372	0.61	0.60	0.00	0.00	1.03	27.00	bdl	270.7	3.79	0.04	0.09	0.29	0.51	0.27	1.03	0.06	12.09	4.51	41.51	8.30	23.46	3.07	16.96	3.25	0.16	0.15	0.00	0.06	0.00
89.3	18.05	0.01	2.04	2.18	10.49	0.01	1209	0.65	0.67	0.00	0.00	1.13	30.70	0.23	265.3	3.88	0.00	0.49	10.65	1.41	3.61	1.66	0.06	11.87	5.29	42.41	8.90	21.66	3.03	19.31	2.49	0.09	0.12	0.00	0.04	0.02
100.0	18.05																																			
3008-A L9 (Grt-7)																																			
0.0	18.05	0.01	2.26	2.55	14.38	0.01	1931	0.87	0.91	0.00	0.00	1.41	34.20	0.09	638.9	5.27	bdl	0.02	0.03	0.04	3.07	1.75	0.11	17.79	8.77	84.64	22.45	69.30	10.12	68.94	10.12	0.14	0.07	0.00	0.00	0.01
4.9	18.05	0.01	2.71	2.71	13.35	0.01	1751	0.70	0.90	0.01	0.01	1.37	34.00	bdl	613.6	7.76	bdl	bdl	bdl	bdl	0.16	1.05	0.07	19.85	8.12	83.02	21.66	70.38	10.83	84.82	11.73	bdl	0.29	0.02	0.00	0.00
9.9	18.05	0.01	2.37	2.53	13.17	0.01	1821	0.81	0.84	0.01	0.00	1.30	32.10	0.29	595.5	7.62	0.03	0.03	0.12	0.01	0.20	1.43	0.12	15.63	6.97	72.55	21.80	75.80	11.73	79.23	12.16	0.18	0.20	0.01	0.00	0.02
15.0	18.05	0.01	2.17	2.53	12.27	0.01	1696	0.76	0.78	0.00	0.00	1.10	67.00	0.54	595.5	5.41	bdl	bdl	bdl	0.01	0.42	1.05	0.06	14.26	6.86	66.77	21.66	72.19	12.81	93.84	14.08	bdl	0.05	bdl	0.00	0.00
20.0	18.05	0.01	2.58	2.69	13.25	0.01	1781	0.87	0.86	0.00	0.00	1.22	32.90	0.23	604.6	4.46	bdl	0.00	0.83	0.02	0.14	1.23	0.08	15.27	7.25	73.63	21.57	79.77	13.55	99.62	15.30	0.11	0.10	0.00	0.00	0.00
26.3	18.05																																			
35.4	18.05	0.01	2.45	2.67	11.95	0.01	1464	0.78	0.76	0.00	0.00	1.28	34.00	0.07	434.9	3.86	0.01	0.01	0.02	0.00	0.10	0.94	0.04	11.82	5.32	55.40	16.21	59.19	10.39	79.59	12.60	0.16	0.15	0.00		0.00
40.5	18.05	0.00	1.19	1.01	5.59	0.01	650	0.31	0.31	0.00	0.00	0.65	22.00	0.09	198.5	1.41	bdl	0.00	0.00	0.00	0.04	0.60	0.03	5.23	2.71	23.46	7.22	28.87	4.51	36.09	5.23	0.04	0.08	0.00	0.00	0.00
45.8	18.05	0.01	2.24	2.45	11.04	0.01	1335	0.65	0.74	0.00	0.00	1.17	32.90	0.07	407.9	2.31	0.01	0.00	0.02	0.01	1.26	0.99	0.04	10.58	4.84	49.45	15.32	55.40	9.78	74.17	11.60	0.07	0.08	0.00	0.00	0.03
62.9	18.05	0.01	2.38	2.45	11.24	0.01	1276	0.70	0.73	0.00	0.00	1.14	32.50	0.27	460.2	7.58	0.01	0.01	0.29	0.02	0.12	0.93	0.06	11.37	4.94	53.24	16.86	62.98	11.08	84.64	13.66	0.15	0.10	0.00	0.00	0.03
67.9	18.05	0.01	2.71	2.35	11.19	0.01	1191	0.69	0.76	0.00	0.00	0.88	34.00	bdl	451.2	6.32	0.01	bdl	0.00	0.01	0.06	0.63	0.09	10.47	5.05	54.14	15.88	64.97	11.55	83.02	14.08	0.43	0.23	0.00	0.00	0.01
72.9	18.05	0.01	2.18	2.38	10.07	0.01	1263	0.61	0.67	0.00	0.00	1.18	28.80	0.08	433.1	6.75	0.00	0.00	0.02	0.00	0.11	1.05	0.04	11.64	4.82	49.81	15.86	61.00	10.54	79.77	12.51	0.08	0.14	0.00	0.00	0.03
77.9	18.05	0.01	2.17	2.35	8.12	0.00	1083	0.58	0.61	0.00	0.00	0.79	24.00	0.06	342.9	3.97	bdl	0.02	0.15	0.00	0.02	0.74	0.05	9.02	4.69	43.31	11.91	45.12	7.40	52.34	8.30	0.22	0.10	0.01	0.00	0.01
82.9	18.05	0.01	2.26	2.20	8.99	0.01	1148	0.62	0.60	0.00	0.00	1.04	26.40	0.21	353.7	3.99	bdl	0.01	0.07	0.00	0.12	0.88	0.03	9.87	4.37	44.76	12.72	44.03	7.13	51.25	7.42	0.08	0.11	0.00	0.01	0.06
87.9	18.05																																			
93.5	18.05	0.04	2.69	2.74	11.24	0.01	1624	0.68	0.94	0.00	0.00	1.17	30.10	0.51	413.3	7.58	0.05	0.10	0.25	0.02	0.21	0.97	0.08	10.88	5.49	54.32	14.65	45.66	6.30	41.87	5.96	0.24	0.23	0.00	0.01	0.10
100.0	18.05																																			
3008-A L10 (Grt-7)																																			
0.0	18.05	0.01	2.14	2.31	9.02	0.01	794	0.74	0.63	0.00	0.00	1.06	29.30	1.26	346.5	3.18	0.01	0.01	0.12	0.01	0.11	0.79	0.05	8.07	3.75	40.42	13.03	47.82	8.59	66.41	10.45	0.08	0.07	0.00	0.00	0.02
10.4	18.05	0.01	1.57	1.80	8.30	0.01	596	0.49	0.49	0.00	0.00	0.99	21.00	0.07	270.7	3.97	bdl	0.05	0.04	0.00	0.08	0.74	0.04	5.77	2.35	36.09	11.01	37.90	7.04	52.34	8.12	0.05	0.17	0.01	0.00	0.01
20.8	18.05	0.01	2.24	2.36	9.56	0.01	740	0.60	0.63	0.00	0.00	1.03	30.20	0.21	388.0	5.32	0.00	0.01	0.05	0.01	1.08	0.87	0.06	8.54	3.75	43.13	13.86	53.42	9.06	68.04	10.14	0.11	0.13	0.00	0.00	0.02
31.1	18.05																																			

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
41.6	18.05	0.01	2.22	2.32	10.47	0.01	888	0.69	0.68	0.00	0.00	1.06	30.10	0.25	418.7	5.25	0.00	0.14	0.21	0.02	1.08	1.05	0.08	10.18	4.64	49.63	15.00	53.96	8.21	59.55	8.55	0.16	0.16	0.01	0.00	0.02
56.3	18.05	0.01	2.26	2.45	11.21	0.01	984	0.75	0.74	0.01	0.01	1.19	32.50	0.22	416.9	5.58	0.00	0.12	0.19	0.03	0.42	1.19	0.08	11.08	5.22	53.78	14.71	47.64	7.22	47.64	6.86	0.12	0.17	0.00	0.01	0.02
66.7	18.05	0.01	2.29	2.31	10.99	0.01	1061	0.77	0.74	0.01	0.01	1.18	32.60	bdl	375.4	4.60	0.01	0.05	0.22	0.01	0.22	1.24	0.09	11.71	5.38	51.43	13.10	39.16	6.03	38.80	5.45	0.10	0.12	0.00	0.00	0.01
77.2	18.05																																			
87.7	18.05	0.01	2.18	2.09	10.70	0.01	1014	0.66	0.69	0.01	0.00	1.24	31.10	0.12	277.9	3.39	0.00	0.02	1.10	0.02	0.47	1.34	0.06	12.31	5.23	42.05	8.88	24.00	3.28	22.92	2.94	0.07	0.07	0.01	0.01	0.01
100.0	18.05																																			
1098-A L1 (Grt-1)																																				
0.0	18.05	0.00	6.25	6.53	13.61	0.01	2225	0.81	0.84	0.01	0.01	0.50	23.06	0.83	164.4	16.77	0.00	0.00	0.01	0.01	0.35	3.34	0.33	13.84	2.91	22.94	5.99	17.70	2.45	16.86	2.37	0.30	0.31	0.00	0.00	0.00
2.9	18.05	0.00	6.22	6.49	13.05	0.00	2213	0.79	0.81	0.01	0.01	0.47	23.13	0.58	155.6	12.78	0.01	0.01	0.00	0.00	0.22	3.21	0.27	12.11	2.69	21.80	5.81	17.23	2.38	16.12	2.41	0.22	0.27	0.00	0.00	0.00
5.7	18.05	0.00	6.32	6.68	13.35	0.00	2527	0.81	0.83	0.01	0.01	0.49	25.00	0.47	166.0	14.44	bdl	bdl	0.00	0.04	0.45	3.61	0.42	12.81	2.53	23.46	5.59	16.24	2.35	14.26	2.17	0.36	0.52	0.00	0.00	0.00
8.5	18.05	0.00	6.27	6.58	13.03	0.00	2267	0.79	0.82	0.01	0.01	0.49	23.69	0.36	165.7	15.30	0.00	0.00	0.01	0.01	0.30	3.28	0.35	12.98	2.81	22.96	6.08	17.92	2.56	16.98	2.31	0.19	0.23	0.00	0.00	0.00
11.4	18.05	0.01	6.23	6.50	12.87	0.00	2115	0.77	0.80	0.01	0.01	0.48	23.17	0.43	159.0	16.08	0.02	0.00	0.01	0.01	0.30	3.34	0.29	12.69	2.55	22.54	5.96	17.18	2.28	15.88	2.15	0.25	0.31	0.00	0.00	0.00
14.3	18.05																																			
17.1	18.05	0.01	5.72	6.21	11.78	0.00	1631	0.67	0.73	0.01	0.01	0.46	21.70	0.34	137.2	14.76	0.01	0.00	0.00	0.00	0.32	3.36	0.26	11.03	2.29	19.38	5.00	15.00	2.13	13.10	1.86	0.19	0.20	0.00		0.00
20.0	18.05																																			
29.2	18.05	0.02	5.45	6.01	10.32	0.00	1299	0.58	0.61	0.05	0.05	0.44	22.10	0.40	107.7	10.29	0.02	0.02	0.08	0.01	0.28	2.45	0.24	8.70	1.85	16.03	4.01	11.66	1.61	10.54	1.56	0.21	0.16	0.00	0.01	0.02
32.0	18.05	0.01	5.41	4.69	8.30	0.00	1173	0.47	0.58	0.04	0.06	0.52	17.00	0.17	95.7	9.75	0.07	0.01	0.15	0.00	0.20	2.17	0.25	8.12	1.68	12.99	3.25	10.11	1.37	8.48	1.41	0.12	0.12	0.00	0.01	0.01
34.9	18.05	0.02	5.38	5.61	10.11	0.00	1337	0.58	0.58	0.05	0.05	0.41	20.30	0.47	101.1	11.55	0.05	0.01	0.07	0.01	0.22	2.33	0.26	8.82	1.78	14.82	3.75	10.83	1.57	9.73	1.30	0.11	0.12	0.00	0.00	0.02
37.8	18.05																																			
40.7	18.05	0.02	6.68	6.41	11.87	0.01	1590	0.66	0.69	0.04	0.03	0.52	22.80	0.31	105.9	11.91	0.01	0.12	0.24	0.05	0.41	2.51	0.26	10.09	2.22	16.12	4.04	11.55	1.45	10.54	1.59	0.19	0.23	0.01	0.04	0.03
43.5	18.05	0.01	6.32	5.96	11.91	0.00	1678	0.74	0.69	0.04	0.02	0.45	26.00	0.99	120.9	15.16	bdl	0.05	0.11	0.02	0.27	2.53	0.18	11.01	2.35	18.05	5.05	13.17	1.55	10.11	1.80	0.09	0.14	0.04	0.00	0.02
46.5	18.05	0.01	5.58	6.10	10.52	0.00	1319	0.60	0.64	0.02	0.02	0.43	21.00	0.16	99.1	13.16	0.02	0.02	0.04	0.01	0.27	2.69	0.25	9.85	2.04	16.24	3.97	10.16	1.44	9.04	1.34	0.25	0.23	0.00	0.00	0.01
49.3	18.05	0.00	6.68	4.69	9.20	0.02	1408	0.72	0.56	0.01	0.02	0.38	18.00	0.60	83.0	13.17	0.01	bdl	0.03	0.03	0.18	2.35	0.22	9.75	1.99	12.99	3.43	9.02	1.21	7.22	1.06	0.22	0.14	0.00	0.00	0.03
52.1	18.05	0.01	5.92	6.57	11.26	0.01	1480	0.67	0.69	0.02	0.02	0.48	25.40	0.09	92.9	13.55	0.00	0.05	0.07	0.03	0.34	2.67	0.23	9.11	2.06	15.11	3.77	10.32	1.31	9.01	1.25	0.24	0.21	0.00	0.00	0.00
55.0	18.05	0.01	6.14	4.33	9.75	0.01	1083	0.47	0.56	0.01	0.01	0.36	26.00	bdl	70.4	9.56	bdl	bdl	0.01	0.04	0.25	2.17	0.14	6.86	1.80	12.63	2.89	7.76	0.72	6.32	1.08	0.23	0.15	0.00	0.00	0.00
57.8	18.05	0.01	5.41	5.59	9.51	0.01	1177	0.52	0.56	0.01	0.01	0.48	23.70	0.18	71.8	9.87	0.00	0.00	0.03	0.00	0.22	1.86	0.18	7.83	1.70	12.36	2.85	7.72	1.04	6.61	0.90	0.20	0.17	0.00	0.00	0.00
60.7	18.05	0.01	4.93	4.93	9.11	0.01	1110	0.54	0.53	0.01	0.01	0.46	19.70	0.02	67.7	10.21	0.00	0.01	0.02	0.01	0.23	1.84	0.16	7.45	1.64	11.48	2.69	7.20	0.95	5.63	0.81	0.14	0.12	0.00	0.00	0.00
63.5	18.05																																			
66.4	18.05	0.01	5.74	5.50	10.03	0.01	1289	0.60	0.62	0.01	0.01	0.49	22.00	0.27	73.1	9.44	0.11	0.05	0.09	0.02	0.32	2.18	0.21	7.60	1.77	13.26	2.87	7.71	1.02	6.24	0.86	0.13	0.14	0.00	0.00	0.00
69.2	18.05																																			
72.1	18.05	0.01	5.36	5.83	10.20	0.02	1276	0.56	0.59	0.01	0.01	0.45	20.00	0.18	66.6	8.72	0.01	0.07	0.15	0.04	0.47	2.31	0.20	7.15	1.62	11.98	2.82	6.79	0.90	5.38	0.77	0.13	0.14	0.00	0.00	0.00
75.0	18.05	0.01	2.89	2.71	6.50	0.01	776	0.27	0.34	0.01	0.01	0.25	12.00	0.01	37.9	5.41	0.03	0.00	0.01	0.00	0.45	1.25	0.10	4.15	1.15	6.86	1.50	3.97	0.42	2.89	0.31	0.08	0.03	0.01	0.00	0.00
77.8	18.05	0.01	5.31	5.02	9.69	0.02	1220	0.60	0.59	0.01	0.01	0.50	22.40	0.22	59.7	8.23	bdl	0.00	0.05	0.03	0.53	2.24	0.19	7.42	1.59	11.41	2.27	5.92	0.64	3.95	0.51	0.13	0.09	0.00	0.00	0.01
80.7	18.05	0.01	5.63	5.76	10.11	0.02	1281	0.58	0.60	0.01	0.01	0.49	23.90	0.29	55.0	7.27	0.00	0.04	0.13	0.03	0.41	2.33	0.19	7.62	1.65	11.12	2.11	4.84	0.60	3.14	0.38	0.08	0.10	0.00	0.00	0.00
84.1	18.05	0.01	5.18	5.67	10.07	0.02	1233	0.56	0.61	0.01	0.01	0.47	24.20	0.14	55.0	7.06	0.00	0.05	0.10	0.03	0.50	2.33	0.23	8.30	1.82	11.51	2.08	4.66	0.51	2.94	0.32	0.11	0.07	0.00	0.00	0.01
92.6	18.05	0.02	5.20	6.01	10.41	0.02	1312	0.58	0.63	0.01	0.01	0.50	23.40	4.87	48.4	9.71	0.01	0.13	0.22	0.04	0.62	2.24	0.23	8.32	1.76	10.41	1.80	3.84	0.41	2.26	0.25	0.07	0.11	0.00	0.00	0.00
96.3	18.05																																			

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
100.0	18.05	0.02	4.42	5.31	9.04	0.02	1177	0.55	0.55	0.01	0.01	0.46	22.20	1.75	36.6	8.19	0.01	0.15	0.31	0.06	0.47	1.89	0.23	6.97	1.45	7.83	1.25	2.45	0.26	1.41	0.15	0.12	0.11	0.00	0.00	0.03
1098-A L2 (Grt-1)																																				
0.0	18.05	0.01	5.61	6.06	10.90	0.00	1110	0.64	0.68	0.02	0.02	0.45	21.70	0.43	116.0	13.97	0.02	0.02	0.05	0.02	0.33	2.44	0.29	9.67	2.13	16.53	4.44	12.74	1.79	12.06	1.75	0.23	0.22	0.00	0.00	0.00
1.9	18.05	0.01	7.04	6.68	11.91	0.02	1408	0.65	0.63	0.03	0.01	0.60	21.00	0.14	111.9	12.09	0.03	0.02	0.09	0.03	0.22	2.89	0.17	10.47	2.35	15.88	4.69	12.63	1.53	12.09	1.99	0.51	0.20	0.00	0.00	0.00
3.8	18.05	0.01	5.74	5.99	10.94	0.01	1289	0.65	0.68	0.01	0.01	0.44	20.80	0.40	105.6	11.59	0.00	0.16	0.27	0.03	0.33	2.44	0.28	9.47	1.97	15.83	3.81	11.80	1.63	10.92	1.58	0.23	0.24	0.00	0.00	0.01
5.8	18.05	0.01	6.50	6.50	11.91	0.01	1317	0.78	0.74	0.02	0.02	0.47	22.00	bdl	120.9	16.60	bdl	0.05	0.15	bdl	0.38	2.71	0.78	10.47	2.53	17.14	4.69	12.27	1.77	15.88	1.80	0.09	0.25	0.00	0.00	0.00
7.8	18.05	0.01	5.99	6.32	11.51	0.01	2166	0.66	0.67	0.01	0.01	0.52	23.20	0.27	102.1	12.60	0.04	0.10	0.24	0.04	0.41	2.74	0.27	9.37	2.06	15.01	3.90	11.71	1.65	10.81	1.64	0.20	0.24	0.01	0.01	0.01
9.7	18.05	0.01	5.59	6.68	10.29	0.01	1281	0.61	0.60	0.01	0.01	0.43	28.00	0.52	86.6	12.27	0.06	0.05	0.14	bdl	0.27	1.80	0.06	7.58	1.80	13.35	3.25	11.19	1.57	8.84	1.41	0.27	0.20	0.00	0.00	0.00
11.7	18.05	0.01	5.67	5.79	10.70	0.01	1375	0.63	0.65	0.01	0.01	0.49	23.60	0.18	87.9	12.00	0.00	0.07	0.13	0.02	0.27	2.18	0.19	8.95	1.81	13.66	3.28	10.09	1.42	9.44	1.49	0.14	0.16	0.01	0.00	0.00
13.7	18.05	0.01	4.87	4.87	7.58	0.01	920	0.51	0.45	0.01	0.01	0.38	15.00	0.47	63.2	7.58	0.22	0.05	0.01	0.02	0.23	1.70	0.10	7.22	1.30	9.93	2.35	6.68	0.85	7.94	0.96	0.07	0.11	0.00	0.00	0.01
15.6	18.05	0.01	5.27	5.67	9.11	0.01	947	0.54	0.55	0.01	0.01	0.44	20.70	0.09	69.7	8.79	0.00	0.40	0.03	0.00	0.18	1.80	0.18	7.00	1.47	10.74	2.74	8.01	1.11	8.03	1.15	0.12	0.16	0.00	0.00	0.00
17.6	18.05	0.00	4.15	4.51	7.94	0.01	866	0.42	0.49	0.01	0.01	0.36	20.00	0.11	63.2	9.20	bdl	0.02	0.00	0.00	0.15	1.64	0.17	6.32	1.34	11.55	2.71	7.04	1.06	7.58	1.01	0.22	0.13	0.00	0.00	0.00
19.5	18.05	0.01	5.67	5.59	10.16	0.01	1106	0.59	0.60	0.01	0.01	0.45	21.60	0.36	78.0	11.73	0.00	0.01	0.02	0.02	0.24	2.02	0.20	8.10	1.74	12.25	3.00	8.61	1.22	8.36	1.18	0.21	0.14	0.00	0.00	0.00
21.5	18.05	0.01	5.22	5.96	10.34	0.01	1162	0.59	0.63	0.01	0.01	0.43	21.80	0.20	77.6	10.56	0.01	0.00	0.01	0.01	0.20	2.04	0.18	8.46	1.68	12.90	3.07	8.46	1.17	8.19	1.18	0.21	0.16	0.00	0.00	0.00
23.4	18.05	0.00	5.59	7.94	10.83	0.01	1173	0.58	0.87	0.01	0.01	0.45	22.00	bdl	77.6	11.19	0.13	0.02	0.00	0.05	0.27	1.80	0.03	7.40	1.71	12.63	2.71	9.20	1.21	7.58	0.94	0.14	0.16	0.00	0.00	0.03
25.4	18.05	0.01	5.70	6.08	10.70	0.01	1256	0.62	0.64	0.01	0.01	0.49	23.60	3.97	75.8	10.09	0.01	0.00	0.01	0.00	0.22	2.29	0.14	7.76	1.66	12.96	2.82	8.77	1.09	7.81	1.16	0.13	0.13	0.00	0.00	0.00
27.4	18.05	0.00	4.33	4.51	9.38	0.01	1047	0.51	0.58	0.01	0.01	0.34	24.00	0.20	70.4	8.30	0.00	bdl	0.01	bdl	0.25	1.71	0.20	6.68	1.73	10.47	2.53	8.30	1.01	6.50	0.79	0.38	0.09	0.00	0.00	0.00
29.3	18.05	0.00	5.41	5.36	9.71	0.01	1072	0.74	0.59	0.01	0.01	0.49	22.20	0.25	72.2	8.43	0.00	0.03	0.06	0.01	0.16	1.73	0.16	7.99	1.59	11.75	2.73	7.71	1.06	7.20	1.04	0.16	0.18	0.00	0.00	0.00
31.2	18.05	0.01	6.68	5.05	10.83	0.01	1191	0.54	0.56	0.01	0.01	0.49	26.00	bdl	70.4	12.27	0.01	0.20	0.43	0.07	0.67	2.17	0.34	8.48	1.59	11.91	2.71	7.76	1.05	7.04	0.92	0.14	0.25	0.00	0.01	0.01
33.2	18.05	0.01	5.16	5.63	9.66	0.01	1101	0.69	0.57	0.01	0.01	0.44	22.00	0.09	70.6	11.55	0.00	0.16	0.31	0.03	0.61	2.22	0.20	7.92	1.62	11.33	2.65	7.51	1.04	6.86	1.02	0.20	0.15	0.00	0.00	0.01
35.2	18.05	0.01	9.75	7.58	9.02	0.02	1317	0.60	0.63	0.01	0.01	0.45	19.00	0.25	77.6	10.83	0.05	0.18	0.17	0.00	0.23	2.35	0.34	7.22	1.43	12.45	2.71	8.12	1.10	7.58	0.97	0.14	0.11	0.00	0.00	0.01
37.1	18.05	0.01	4.58	5.23	8.48	0.01	944	0.49	0.51	0.01	0.01	0.40	22.10	0.25	61.9	9.93	0.00	0.17	0.30	0.04	0.39	1.68	0.18	6.86	1.38	10.12	2.49	6.57	0.83	5.94	0.84	0.18	0.15	0.00	0.00	0.02
39.1	18.05	0.00	3.43	4.15	7.04	0.01	686	0.43	0.43	0.01	0.01	0.34	23.00	0.67	56.0	9.38	0.03	0.02	0.03	0.04	0.20	1.68	0.10	6.50	1.12	7.94	2.17	5.05	0.87	4.87	0.72	0.10	0.13	0.00	0.00	0.02
41.4	18.05	0.01	5.36	5.45	10.49	0.01	1207	0.83	0.63	0.01	0.01	0.46	23.60	0.24	83.2	13.63	0.02	0.30	0.55	0.08	0.60	2.63	0.27	8.95	1.74	13.70	3.23	8.99	1.15	7.56	1.05	0.20	0.20	0.00	0.00	0.01
44.3	18.05	0.01	5.36	5.13	9.84	0.01	1137	0.65	0.64	0.01	0.01	0.44	21.50	0.32	76.7	11.32	0.01	0.04	0.14	0.02	0.31	2.38	0.20	8.18	1.69	12.92	2.91	8.25	1.11	7.15	1.01	0.15	0.21	0.00	0.00	0.01
46.3	18.05	0.01	5.96	5.23	11.19	0.01	1155	0.58	0.61	0.01	0.01	0.49	22.00	1.05	81.2	12.27	bdl	bdl	0.06	0.04	0.43	2.53	0.17	7.94	1.62	14.62	3.07	8.48	1.08	6.50	1.21	0.23	0.14	0.00	0.00	0.00
48.2	18.05	0.01	5.05	5.04	9.13	0.01	1240	0.53	1.17	0.01	0.01	0.45	20.00	0.31	72.7	11.28	0.01	0.02	0.05	0.02	0.36	2.20	0.18	7.63	1.62	11.23	2.71	7.62	0.96	6.88	0.89	0.12	0.14	0.00	0.00	0.01
50.2	18.05	0.00	4.69	5.59	9.38	0.00	1137	0.58	0.63	0.01	0.01	0.42	18.00	0.17	70.4	11.19	0.01	bdl	0.13	bdl	0.15	2.53	0.31	9.38	1.71	11.37	3.07	6.68	1.37	7.40	0.79	bdl	0.20	0.00	0.00	0.00
52.2	18.05	0.01	5.25	5.27	9.67	0.01	1215	0.55	0.58	0.01	0.01	0.41	22.30	0.18	67.0	9.44	0.00	0.01	0.06	0.01	0.36	2.02	0.14	7.63	1.53	11.08	2.54	6.93	0.95	6.21	0.90	0.12	0.14	0.00	0.00	0.00
54.1	18.05	0.00	3.97	5.23	7.94	0.02	956	0.47	0.56	0.01	0.01	0.49	19.00	0.31	56.0	6.68	bdl	0.01	0.02	0.02	0.31	1.32	0.12	6.68	1.21	9.02	2.17	6.32	0.67	3.79	0.58	0.00	0.05	0.00	0.00	0.00
56.1	18.05	0.01	4.87	5.18	8.61	0.02	1007	0.52	0.54	0.01	0.01	0.47	24.80	0.23	54.7	8.50	0.02	0.00	0.02	0.01	0.18	1.50	0.13	6.37	1.39	9.19	2.06	5.61	0.76	4.73	0.66	0.16	0.16	0.00	0.00	0.00
58.0	18.05	0.01	4.98	5.40	8.92	0.02	1049	0.76	0.56	0.01	0.01	0.46	22.40	0.13	53.8	8.68	bdl	0.00	0.02	0.00	0.18	1.73	0.18	6.50	1.35	9.26	2.00	5.50	0.74	4.85	0.61	0.10	0.16	0.00	0.00	0.00
60.0	18.05																																			
61.9	18.05	0.01	5.40	5.65	9.60	0.02	1157	0.56	0.62	0.01	0.01	0.48	23.90	0.07	56.1	11.15	0.00	0.07	0.14	0.03	0.33	2.04	0.18	7.00	1.45	9.58	2.06	5.49	0.68	4.44	0.60	0.17	0.21	0.00	0.00	0.00
63.9	18.05																																			
65.9	18.05	0.01	5.09	5.36	9.35	0.02	1142	0.97	0.59	0.01	0.01	0.44	20.80	0.11	49.3	8.99	0.00	0.00	0.02	0.02	0.41	2.27	0.23	6.44	1.43	9.33	2.00	4.48	0.53	3.30	0.39	0.12	0.09	0.00	0.00	0.02
67.8	18.05																																			

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
69.8	18.05	0.01	5.13	5.58	10.05	0.02	1298	0.62	0.65	0.01	0.01	0.45	22.20	0.09	48.2	6.97	0.01	0.01	0.06	0.02	0.55	2.42	0.17	6.06	1.46	8.93	1.77	3.92	0.41	2.40	0.30	0.11	0.13	0.00	0.00	0.00
71.8	18.05	0.01	4.87	5.59	10.29	0.02	1372	0.61	0.69	0.01	0.01	0.42	24.00	bdl	45.1	5.96	0.09	0.01	0.03	0.08	0.56	2.71	0.25	6.86	1.50	9.20	1.59	3.79	0.27	1.99	0.31	0.16	0.06	0.00	0.00	0.00
73.7	18.05	0.01	5.20	5.79	10.38	0.02	1209	0.66	0.65	0.01	0.01	0.52	26.00	0.29	42.2	5.52	0.02	0.01	0.06	0.03	0.53	2.49	0.22	6.55	1.35	8.81	1.51	2.94	0.35	1.97	0.24	0.08	0.08	0.02	0.01	0.01
75.7	18.05	0.01	6.14	8.12	12.09	0.05	1805	0.88	0.81	0.01	0.02	0.47	41.00	0.87	45.1	8.48	0.05	0.11	0.25	0.02	0.72	2.17	0.36	10.65	1.62	11.73	1.41	3.43	0.31	1.37	0.20	0.14	0.22	27.07	0.02	0.00
77.6	18.05	0.01	5.18	5.85	10.61	0.03	1339	0.62	0.66	0.01	0.01	0.47	21.80	0.21	39.7	9.71	0.01	0.15	0.30	0.05	0.56	2.35	0.27	7.25	1.58	8.72	1.48	2.89	0.33	1.56	0.19	0.15	0.20	0.00	0.00	0.01
79.6	18.05	0.04	4.69	4.57	9.49	0.03	1121	0.60	0.56	0.01	0.01	0.37	19.70	0.45	30.7	10.86	0.02	0.51	0.92	0.11	0.71	1.68	0.20	5.45	1.20	6.80	1.21	2.24	0.25	1.37	0.16	0.37	0.42	0.00	0.00	0.01
81.6	18.05																																			
83.5	18.05	0.01	5.34	5.38	10.27	0.03	1391	0.63	0.68	0.01	0.01	0.50	25.40	0.23	31.2	7.09	bdl	0.01	0.10	0.03	0.41	1.97	0.18	6.91	1.38	7.33	1.17	2.11	0.21	1.32	0.12	0.16	0.13	0.00	0.00	0.01
85.4	18.05	0.01	5.96	7.40	13.54	0.03	1227	0.74	0.81	0.02	0.02	0.58	24.00	bdl	30.7	8.48	0.00	0.03	0.12	0.02	0.47	3.07	0.12	6.86	1.79	6.14	1.03	2.35	0.16	1.99	0.25	0.27	0.20	0.00	0.00	0.00
87.4	18.05	0.01	4.89	5.47	9.85	0.03	1220	0.58	0.63	0.01	0.01	0.44	21.90	0.12	23.8	6.88	bdl	0.01	0.16	0.03	0.51	1.80	0.15	5.50	1.08	5.92	0.86	1.53	0.18	0.91	0.12	0.12	0.12	0.00	0.00	0.00
89.4	18.05	0.01	5.09	5.22	9.53	0.03	1245	0.62	0.65	0.01	0.01	0.51	23.50	0.32	22.7	7.60	0.00	0.00	0.12	0.04	0.55	1.53	0.13	5.68	1.15	5.50	0.77	1.61	0.15	1.01	0.12	0.17	0.12	0.00	0.00	0.01
91.3	18.05																																			
93.3	18.05	0.01	5.32	5.47	9.96	0.03	1213	0.62	0.65	0.01	0.01	0.51	24.90	0.19	24.7	9.04	bdl	0.01	0.19	0.04	0.47	1.91	0.14	5.94	1.11	5.34	0.83	1.71	0.19	1.09	0.15	0.15	0.12	0.00	0.00	0.01
95.3	18.05	0.00	2.71	3.61	5.77	0.02	650	0.31	0.34	0.01	0.01	0.36	11.00	0.01	13.9	4.87	0.01	0.00	0.00	0.02	0.23	0.60	0.02	4.33	0.60	3.07	0.49	1.35	0.10	0.47	0.06	0.00	0.06	0.01	0.00	0.01
97.5	18.05	0.01	5.31	5.83	10.34	0.04	1184	0.58	0.65	0.01	0.01	0.49	25.10	0.15	26.9	9.38	0.01	0.09	0.23	0.05	0.69	1.93	0.17	5.65	1.07	5.92	0.94	1.97	0.24	1.59	0.21	0.20	0.18	0.00	0.00	0.01
100.0	18.05	0.01	5.00	5.43	10.52	0.04	1157	0.64	0.79	0.01	0.01	0.53	25.40	bdl	34.7	9.60	0.00	0.03	0.08	0.03	0.41	1.68	0.16	6.37	1.30	7.09	1.24	2.78	0.35	2.15	0.27	0.14	0.13	0.00	0.00	0.01
1098-A L3 (Grt-2)																																				
0.0	18.05	0.01	6.03	6.30	13.16	0.02	1767	0.75	0.80	0.01	0.01	0.45	21.50	0.58	121.8	8.75	bdl	0.00	0.01	0.01	0.14	2.20	0.25	9.29	1.93	16.28	4.48	15.36	2.51	18.05	2.96	0.21	0.18	bdl	0.00	0.00
2.0	18.05																																			
4.1	18.05	0.01	6.08	6.42	12.87	0.02	1745	0.78	0.78	0.01	0.01	0.47	22.62	0.31	123.4	13.41	0.01	0.00	0.01	0.01	0.24	2.49	0.21	8.92	2.01	16.13	4.69	15.32	2.56	17.22	2.89	0.28	0.27	bdl	0.00	0.00
6.1	18.05																																			
8.1	18.05	0.01	6.16	6.48	12.76	0.01	1633	0.76	0.77	0.01	0.01	0.46	22.78	0.51	127.2	8.68	bdl	0.04	0.04	0.01	0.21	2.18	0.24	9.58	2.00	18.05	5.00	16.87	2.67	19.47	3.28	0.19	0.18	0.00	0.00	0.00
10.1	18.05	0.01	5.05	5.59	11.37	0.02	1462	0.76	0.67	0.01	0.01	0.65	20.00	0.43	97.5	12.99	0.03	0.20	0.36	0.08	0.49	1.66	0.22	6.86	1.99	14.62	3.79	12.63	1.99	14.98	1.99	0.09	0.43	0.00	0.00	0.00
12.1	18.05	0.01	6.55	6.33	12.33	0.03	1648	0.72	0.75	0.01	0.01	0.50	22.90	0.43	107.0	11.75	0.01	0.27	0.49	0.08	0.45	2.08	0.20	7.35	1.80	14.56	4.10	13.81	2.17	15.68	2.49	0.27	0.29	0.00	0.00	0.01
14.1	18.05	0.01	5.59	5.77	12.27	0.02	1660	0.72	0.69	0.01	0.01	0.45	25.00	0.20	108.3	7.94	bdl	bdl	0.02	bdl	0.07	1.57	0.25	7.94	1.99	12.99	3.43	13.54	2.17	16.24	2.89	0.25	bdl	0.00	0.00	0.00
16.1	18.05	0.01	5.77	6.50	11.93	0.03	1415	0.69	0.72	0.01	0.01	0.49	22.90	0.45	101.6	9.04	0.00	0.03	0.05	0.02	0.14	1.84	0.17	7.47	1.64	13.86	3.81	12.99	2.13	15.16	2.40	0.13	0.20	0.00	0.00	0.01
18.1	18.05																																			
20.1	18.05	0.01	5.76	5.79	10.79	0.03	1150	0.63	0.66	0.01	0.01	0.42	23.00	0.18	88.4	7.63	0.00	0.08	0.15	0.02	0.19	1.57	0.20	6.48	1.46	11.86	3.23	11.10	1.88	13.46	2.08	0.11	0.13	0.00	0.01	0.00
22.7	18.05																																			
25.2	18.05	0.01	5.96	6.03	11.69	0.02	1285	0.68	0.71	0.01	0.01	0.51	22.80	0.12	115.0	8.30	bdl	0.01	0.07	0.01	0.15	1.99	0.21	8.01	1.82	15.90	4.37	15.05	2.40	17.92	2.85	0.12	0.12	0.00	0.00	0.03
28.8	18.05	0.01	5.83	6.03	11.04	0.02	1301	0.63	0.68	0.01	0.01	0.43	23.00	0.34	101.6	5.18	0.00	0.01	0.03	0.01	0.08	1.32	0.14	7.09	1.61	13.39	3.97	13.05	2.17	15.30	2.49	0.12	0.07	0.00	0.00	0.00
30.8	18.05																																			
32.8	18.05	0.01	5.92	6.57	11.78	0.02	1420	0.70	0.75	0.01	0.01	0.49	23.60	0.34	114.6	7.45	0.01	0.01	0.05	0.02	0.29	2.47	0.20	8.82	1.86	14.44	4.37	14.89	2.33	16.82	2.89	0.15	0.18	0.00	0.00	0.01
34.8	18.05	0.01	5.77	5.77	11.01	0.02	1390	0.58	0.74	0.01	0.01	0.45	21.00	bdl	99.3	4.87	0.00	bdl	0.09	bdl	bdl	1.71	0.10	6.68	1.50	13.54	4.33	13.17	1.80	17.32	2.53	bdl	0.10	0.00	0.02	0.00
36.9	18.05	0.01	6.14	6.48	12.09	0.02	1458	0.71	0.75	0.01	0.01	0.48	24.10	0.32	108.8	4.37	0.00	0.00	0.02	0.04	0.15	1.96	0.18	7.80	1.73	14.60	4.11	14.00	2.26	16.57	2.75	0.12	0.12	0.00	0.00	0.00
38.9	18.05	0.01	5.96	7.94	12.81	0.02	1696	0.76	0.79	0.01	0.01	0.65	22.00	bdl	119.1	8.12	bdl	bdl	0.00	bdl	0.16	1.80	0.20	10.83	1.71	16.42	4.33	12.81	2.89	23.46	3.07	0.38	0.16	0.00	0.00	0.00
40.9	18.05	0.01	6.05	6.23	11.91	0.02	1435	0.70	0.73	0.01	0.01	0.43	22.30	0.34	109.5	7.51	bdl	0.01	0.03	0.01	0.14	2.10	0.20	8.05	1.86	14.60	4.11	13.59	2.27	16.96	2.69	0.12	0.16			0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
42.8	18.05	0.01	5.23	5.41	10.83	0.02	1155	0.67	0.69	0.01	0.01	0.42	20.00	1.37	101.1	7.04	0.02	0.08	0.10	bdl	0.07	1.61	0.22	8.12	1.79	11.37	3.25	12.81	2.17	15.16	2.89	0.14	0.10	0.00	0.00	0.02
44.9	18.05	0.01	6.19	6.28	11.93	0.02	1323	0.65	0.71	0.01	0.01	0.49	22.00	0.08	105.9	7.60	bdl	0.00	0.02	0.01	0.20	2.05	0.21	8.21	1.75	14.20	4.01	13.55	2.17	16.22	2.74	0.13	0.11	0.01	0.00	0.00
46.9	18.05	0.01	6.32	5.96	11.19	0.01	1173	0.60	0.70	0.01	0.01	0.42	24.00	0.63	106.5	7.76	0.02	bdl	0.00	bdl	0.06	1.99	0.23	6.86	1.80	14.08	4.33	12.45	2.53	17.32	2.71	0.08	0.27	0.00	0.00	0.00
48.9	18.05	0.01	5.61	6.33	11.21	0.01	1292	0.66	0.69	0.01	0.01	0.44	23.70	0.23	114.1	9.13	0.01	0.00	0.02	0.01	0.17	2.33	0.23	8.70	1.86	15.34	4.20	14.56	2.31	17.49	3.07	0.18	0.22	0.02	0.00	0.00
50.9	18.05	0.01	5.52	5.81	10.76	0.01	1193	0.66	0.66	0.01	0.01	0.45	23.80	0.13	108.3	9.67	0.01	0.02	0.01	0.01	0.22	2.06	0.22	7.98	1.89	14.80	4.13	13.64	2.24	16.24	2.83	0.22	0.18	0.01	0.00	0.11
52.9	18.05																																			
55.0	18.05	0.01	5.50	5.94	10.99	0.01	1256	0.63	0.67	0.01	0.01	0.45	20.50	0.16	111.4	9.55	0.02	0.00	0.01	0.00	0.17	2.22	0.19	8.97	1.88	15.85	4.35	14.13	2.29	16.84	2.89	0.20	0.15	0.00	0.00	0.00
57.0	18.05	0.01	6.32	16.60	12.63	0.01	1335	0.81	0.81	0.01	0.01	0.79	22.00	bdl	142.6	10.47	0.04	bdl	0.00	0.02	0.25	2.35	0.47	8.84	2.53	16.24	5.05	14.44	3.07	18.05	2.89	0.22	0.08	0.00	0.00	0.00
59.0	18.05	0.01	5.87	6.33	11.66	0.01	1361	0.68	0.71	0.01	0.01	0.43	22.20	0.27	116.4	10.76	bdl	0.00	0.00	0.01	0.23	2.24	0.24	8.93	1.91	16.42	4.39	14.98	2.40	17.04	3.00	0.19	0.21	0.00	0.01	0.00
61.0	18.05	0.01	6.89	6.42	12.29	0.01	1411	0.74	0.76	0.01	0.01	0.47	22.70	0.36	123.4	9.28	bdl	0.00	0.02	0.00	0.20	2.54	0.24	9.78	2.10	17.79	4.78	15.68	2.49	18.77	3.14	0.23	0.20	0.00	0.00	
63.0	18.05	0.01	7.76	6.14	12.27	0.01	1444	0.72	0.79	0.01	0.01	0.47	22.00	0.32	129.9	14.08	0.02	bdl	0.00	0.07	0.54	2.53	0.23	9.38	2.35	19.85	5.41	17.69	2.71	17.51	2.71	0.36	0.20	0.00	0.00	0.00
65.0	18.05	0.01	6.21	6.15	12.20	0.00	1357	0.69	0.75	0.01	0.01	0.47	25.00	0.27	130.3	13.77	0.02	0.01	0.00	0.01	0.26	2.85	0.27	10.90	2.27	18.62	4.93	16.13	2.62	18.68	3.06	0.27	0.33	0.00	0.00	0.00
67.6	18.05	0.01	6.32	6.50	11.01	0.01	1498	0.61	0.70	0.01	0.01	0.45	20.00	0.07	113.7	12.09	0.00	bdl	0.00	bdl	bdl	1.99	0.25	9.93	2.35	16.24	4.69	13.35	1.99	16.60	2.53	0.70	0.07	0.00	0.00	0.00
70.3	18.05	0.01	5.56	5.94	11.42	0.00	1247	0.64	0.69	0.01	0.01	0.46	22.60	0.15	111.7	11.42	0.00	0.03	0.06	0.03	0.20	2.63	0.23	9.42	2.07	16.03	4.46	13.86	2.26	15.54	2.46	0.19	0.23	0.00	0.00	0.00
75.0	18.05	0.01	5.68	6.21	12.04	0.00	1265	0.67	0.71	0.01	0.01	0.45	21.60	0.56	107.4	10.11	0.02	0.11	0.21	0.02	0.18	2.36	0.26	10.00	2.04	16.17	4.08	13.41	1.99	14.02	2.27	0.23	0.23	0.00	0.01	0.01
77.0	18.05	0.01	6.86	6.68	12.45	0.00	1660	0.69	0.76	0.02	0.01	0.52	26.00	bdl	126.3	14.80	bdl	0.03	0.05	bdl	0.32	3.07	0.47	11.91	2.35	18.05	4.87	16.24	2.17	18.05	2.35	0.45	0.07	0.00	0.00	0.00
79.0	18.05	0.01	5.56	5.59	10.76	0.00	1189	0.64	0.66	0.01	0.01	0.46	24.30	0.13	105.0	13.03	0.00	0.01	0.03	0.01	0.32	2.58	0.27	9.24	2.07	15.65	4.19	12.72	1.81	13.26	1.93	0.22	0.20	0.01	0.00	0.00
81.0	18.05	0.00	6.32	6.68	13.35	0.00	1263	0.67	0.81	0.02	0.01	0.61	28.00	0.08	128.1	14.26	bdl	bdl	0.00	bdl	0.22	2.89	0.36	10.47	2.35	18.05	4.87	14.08	2.35	16.24	2.71	0.20	0.16	0.00	0.00	0.00
83.0	18.05	0.01	6.03	6.89	11.17	0.01	1236	0.64	0.69	0.01	0.01	0.47	23.30	0.29	108.6	13.32	bdl	0.00	0.01	0.01	0.24	2.58	0.24	9.20	2.13	16.06	4.20	12.83	1.86	13.08	1.95	0.22	0.22	0.00	0.00	0.00
85.0	18.05	0.01	6.01	6.57	12.02	0.00	1243	0.67	0.71	0.01	0.01	0.46	23.30	0.43	114.6	14.20	0.04	0.01	0.02	0.02	0.28	2.67	0.18	9.51	2.14	16.55	4.44	13.84	1.97	13.05	1.93	0.29	0.25	0.00	0.03	0.00
87.0	18.05	0.01	5.77	7.04	12.45	0.01	1263	0.67	0.96	0.01	0.01	0.47	23.00	bdl	131.7	15.16	bdl	bdl	0.00	0.02	0.29	3.07	0.29	10.47	2.71	19.85	4.69	14.08	2.71	14.62	1.99	0.15	0.32	0.00	0.00	0.00
89.1	18.05	0.01	5.87	5.88	10.95	0.00	1280	0.64	0.67	0.01	0.01	0.48	23.10	0.14	107.2	13.44	bdl	0.01	0.01	0.02	0.31	2.49	0.26	9.37	2.02	15.57	4.17	12.61	1.91	12.15	1.86	0.22	0.24	0.00	0.00	0.00
91.1	18.05	0.01	5.96	6.86	11.73	0.01	1083	0.63	0.70	0.01	0.01	0.43	30.00	0.31	108.3	14.44	bdl	0.09	0.03	bdl	0.11	3.25	0.40	10.65	1.55	15.70	4.15	12.81	1.61	11.37	1.99	0.42	0.18	0.03	0.05	0.00
93.1	18.05	0.01	5.70	5.94	11.03	0.01	1202	0.62	0.68	0.01	0.01	0.44	22.80	0.45	94.0	14.44	0.05	0.28	0.53	0.07	0.58	2.47	0.42	8.57	1.83	14.60	3.92	11.62	1.67	11.23	1.73	0.24	0.23	0.00	0.01	0.00
95.1	18.05	0.01	5.49	5.85	11.41	0.01	1195	0.63	0.67	0.01	0.01	0.45	21.00	0.11	98.0	14.15	0.00	0.08	0.16	0.02	0.32	2.65	0.22	8.70	1.96	15.43	3.97	11.51	1.64	11.10	1.51	0.16	0.28	0.00	0.00	0.00
97.4	18.05	0.01	6.32	6.32	12.63	0.03	1209	0.81	0.78	0.01	0.01	0.56	27.00	0.32	108.3	16.42	0.00	bdl	0.03	0.01	0.20	1.99	0.29	9.02	1.99	16.78	3.97	10.65	1.68	9.93	1.37	0.10	0.40	0.00	0.00	0.00
100.0	18.05	0.01	5.61	6.23	11.53	0.02	1195	0.68	0.68	0.01	0.01	0.50	25.10	0.34	85.9	13.39	0.02	0.02	0.03	0.01	0.25	2.49	0.23	8.14	1.88	13.41	3.25	9.04	1.26	8.43	1.20	0.21	0.29	0.00	0.00	0.01
1098-A L4 (Grt-2)																																				
0.0	18.05	0.01	5.59	5.92	10.43	0.02	763	0.64	0.61	0.01	0.01	0.43	20.20	0.16	85.7	6.59	0.00	0.01	0.06	0.02	0.12	1.70	0.19	6.66	1.40	11.97	3.37	10.86	1.89	13.30	2.08	0.16	0.12	0.00	0.00	0.00
2.6	18.05	0.01	4.51	4.69	8.12	0.04	668	0.49	0.60	0.01	0.01	0.36	17.00	0.11	63.2	7.76	0.02	0.00	0.07	0.01	0.04	1.46	0.14	5.41	0.88	8.30	2.53	8.66	1.43	10.83	1.35	0.20	0.06	0.00	0.00	0.00
5.2	18.05	0.01	5.43	5.85	10.38	0.03	729	0.65	0.65	0.01	0.01	0.44	21.70	0.21	76.5	9.71	0.00	0.01	0.05	0.00	0.13	1.73	0.15	5.87	1.36	10.14	2.85	9.93	1.58	11.39	1.75	0.14	0.17	0.00	0.00	0.00
7.8	18.05																																			
10.4	18.05	0.01	5.85	5.92	10.18	0.03	754	0.63	0.62	0.01	0.01	0.45	21.40	0.16	70.2	8.81	bdl	0.01	0.02	0.01	0.16	1.62	0.15	5.18	1.12	9.60	2.69	8.95	1.50	10.61	1.67	0.14	0.16	0.00	0.00	0.00
13.0	18.05																																			
15.6	18.05	0.01	5.79	5.68	10.09	0.03	805	0.59	0.62	0.01	0.01	0.45	23.20	0.18	70.6	8.48	bdl	0.00	0.01	0.01	0.13	1.47	0.18	5.49	1.19	9.82	2.59	9.31	1.37	10.47	1.59	0.15	0.19	0.00	0.00	0.00
18.1	18.05	0.01	4.69	5.59	9.75	0.02	938	0.61	0.58	0.01	0.01	0.47	20.00	0.22	75.8	8.12	0.01	0.00	0.00	0.00	0.02	1.55	0.03	6.86	1.23	10.83	2.71	8.84	1.55	12.99	1.80	0.12	0.02	0.02	0.00	0.00
20.7	18.05	0.01	5.90	6.03	10.67	0.03	882	0.64	0.64	0.01	0.01	0.44	21.60	0.27	79.4	8.63	0.01	0.00	0.01	0.00	0.13	1.61	0.23	6.57	1.34	10.79	2.91	9.91	1.59	11.24	1.79	0.15	0.17	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
23.3	18.05	0.01	5.52	5.58	9.85	0.03	861	0.61	0.60	0.01	0.01	0.43	21.00	bdl	69.5	8.08	0.00	0.01	0.01	0.00	0.16	1.61	0.19	5.47	1.29	9.60	2.67	8.88	1.38	10.09	1.56	0.15	0.14	0.00	0.00	0.00
25.9	18.05	0.01	5.05	5.41	9.20	0.03	812	0.54	0.63	0.01	0.01	0.36	19.00	0.74	66.8	8.84	bdl	0.01	0.02	0.02	0.22	1.08	0.09	5.23	1.08	7.94	2.53	8.48	1.35	9.20	1.59	0.10	0.08	0.00	0.00	0.00
28.5	18.05	0.01	5.40	5.59	9.96	0.03	738	0.61	0.60	0.01	0.01	0.43	21.00	0.03	68.0	9.06	0.00	0.01	0.01	0.02	0.13	1.55	0.16	5.96	1.11	9.24	2.45	8.46	1.38	10.29	1.47	0.18	0.16	0.00	0.00	0.00
31.0	18.05	0.01	6.32	6.68	10.11	0.03	902	0.70	0.65	0.01	0.01	0.43	22.00	bdl	72.2	8.30	bdl	0.08	0.23	0.02	0.17	1.99	0.25	5.05	1.28	10.11	2.89	9.93	1.35	10.29	1.53	bdl	0.08	0.00	0.00	0.00
33.6	18.05	0.01	5.20	5.67	10.14	0.03	848	0.57	0.59	0.01	0.01	0.43	20.90	0.10	65.5	7.22	0.00	0.29	0.53	0.06	0.41	1.44	0.18	5.41	1.11	8.86	2.44	8.34	1.34	9.91	1.49	0.14	0.12	0.00	0.00	0.01
36.5	18.05																																			
40.2	18.05	0.01	5.68	6.05	10.67	0.03	863	0.62	0.62	0.01	0.01	0.42	22.00	0.25	68.0	6.08	0.00	0.03	0.12	0.01	0.25	1.52	0.16	5.68	1.24	9.35	2.60	8.75	1.32	10.30	1.59	0.09	0.10	0.00	0.00	0.00
42.7	18.05	0.01	5.67	5.96	10.03	0.03	884	0.60	0.61	0.01	0.01	0.46	21.30	0.22	70.2	5.61	bdl	0.02	0.10	0.01	0.16	1.31	0.16	6.01	1.34	10.30	2.74	9.31	1.47	11.15	1.70	0.10	0.11	0.01	0.00	0.00
45.3	18.05	0.01	6.14	5.05	9.56	0.02	812	0.65	0.54	0.01	0.01	0.45	21.00	0.36	70.4	5.96	bdl	0.02	0.09	0.00	0.05	1.57	0.05	6.14	1.37	9.93	2.53	9.75	1.68	10.65	1.80	0.09	0.09	0.02	0.00	0.01
47.9	18.05	0.01	5.18	6.10	9.62	0.01	834	0.57	0.56	0.01	0.01	0.43	21.60	0.16	77.2	6.93	0.00	0.01	0.04	0.00	0.12	1.68	0.18	6.61	1.53	10.68	3.04	10.07	1.58	11.78	1.87	0.15	0.13	0.00	0.00	0.01
50.5	18.05	0.01	5.77	6.32	9.02	0.02	975	0.65	0.72	0.01	0.01	0.47	23.00	bdl	81.2	8.48	0.03	0.00	0.05	0.03	0.14	1.99	0.25	7.22	1.34	12.63	2.89	10.11	1.75	12.63	1.80	0.20	0.00	0.00	0.00	0.01
53.1	18.05	0.01	5.45	5.76	10.12	0.01	803	0.56	0.59	0.01	0.01	0.43	22.20	0.10	77.6	6.95	0.01	0.01	0.03	0.00	0.17	1.59	0.17	6.71	1.50	11.19	2.98	9.42	1.56	12.25	1.85	0.14	0.13	0.00	0.00	0.00
55.7	18.05	0.01	7.22	6.14	11.19	0.01	902	0.61	0.67	0.01	0.01	0.49	20.00	0.42	81.2	7.40	0.00	0.08	0.32	bdl	0.22	2.53	0.40	7.58	1.62	11.37	3.43	11.73	1.99	12.63	2.17	0.10	0.05	0.01	0.00	0.04
58.3	18.05	0.01	5.58	6.05	10.41	0.01	879	0.61	0.61	0.01	0.01	0.44	21.60	0.29	78.0	5.59	0.01	0.03	0.07	0.01	0.16	1.64	0.17	7.18	1.54	11.32	3.00	9.44	1.56	12.29	1.89	0.09	0.12	0.00	0.00	0.01
60.9	18.05	0.01	5.22	5.74	9.84	0.01	818	0.57	0.62	0.01	0.01	0.45	21.40	0.18	81.6	6.19	0.00	0.10	0.22	0.03	0.19	1.67	0.20	7.02	1.58	11.51	3.16	10.49	1.75	12.27	1.93	0.12	0.11	0.00	0.00	0.00
63.5	18.05	0.00	5.05	4.87	8.84	0.01	686	0.63	0.60	0.01	0.01	0.36	16.00	bdl	74.0	5.77	bdl	0.02	0.08	0.02	0.31	1.66	0.16	7.76	1.30	10.83	3.07	9.93	1.37	10.47	1.64	0.08	0.06	0.00	0.01	0.03
66.1	18.05	0.01	5.36	5.88	10.43	0.01	841	0.61	0.63	0.01	0.01	0.46	22.10	0.15	85.9	7.90	0.01	0.04	0.12	0.01	0.21	1.68	0.17	7.74	1.73	13.03	3.21	11.06	1.75	12.98	2.04	0.17	0.14	0.00	0.01	0.01
68.7	18.05	0.01	6.32	6.50	11.73	0.02	920	0.81	0.72	0.01	0.01	0.49	25.00	0.27	93.8	8.84	bdl	0.03	0.08	bdl	0.09	1.99	0.22	9.02	1.99	12.63	3.43	10.47	1.80	14.26	2.35	0.18	0.20	0.00	0.00	0.00
71.3	18.05	0.01	5.58	5.85	11.33	0.02	828	0.66	0.69	0.01	0.01	0.49	22.60	0.23	82.1	8.34	0.00	0.01	0.04	0.01	0.11	1.60	0.18	7.40	1.67	12.33	3.13	10.52	1.68	12.11	2.01	0.20	0.21	0.00	0.00	0.00
73.9	18.05	0.00	5.41	5.41	10.47	0.02	686	0.63	0.67	0.01	0.01	0.42	20.00	0.14	77.6	8.30	0.00	0.02	0.08	bdl	0.17	1.19	0.25	8.30	1.53	13.17	3.25	10.11	1.61	11.55	1.99	0.12	0.23	0.02	0.00	0.00
76.5	18.05	0.01	5.65	5.96	11.60	0.02	854	0.66	0.69	0.01	0.01	0.47	22.24	0.24	85.5	11.42	0.00	0.06	0.12	0.02	0.19	1.68	0.24	8.05	1.58	12.96	3.47	11.06	1.74	13.75	2.14	0.20	0.25	0.00	0.00	0.01
79.0	18.05	0.01	5.59	6.50	11.55	0.02	848	0.65	0.69	0.01	0.01	0.43	22.00	bdl	84.8	12.09	0.00	0.01	0.01	bdl	0.32	1.43	0.22	7.76	1.46	13.35	3.43	11.73	1.53	12.63	2.35	0.22	0.49	0.00	0.00	0.00
81.6	18.05	0.01	5.73	6.06	11.89	0.02	812	0.68	0.71	0.01	0.01	0.46	22.01	0.33	91.0	12.96	bdl	0.00	0.01	0.01	0.21	2.30	0.20	8.12	1.58	13.08	3.69	12.20	1.90	14.28	2.25	0.21	0.21	0.00	0.00	0.00
84.2	18.05	0.01	6.14	5.96	12.99	0.01	830	0.67	0.78	0.01	0.01	0.47	25.00	bdl	108.3	12.63	0.01	0.18	0.29	0.02	0.23	1.80	0.11	9.20	1.99	14.44	3.97	13.35	1.99	16.24	2.53	0.38	0.17	0.01	0.00	0.00
86.8	18.05	0.00	5.61	5.87	11.80	0.01	812	0.69	0.69	0.01	0.01	0.45	21.30	0.05	107.6	14.22	bdl	0.04	0.06	0.01	0.32	2.54	0.25	9.13	1.89	15.48	4.35	14.64	2.26	16.37	2.60	0.21	0.23	0.00	0.00	0.00
89.4	18.05	0.01	5.77	5.77	11.55	0.01	794	0.72	0.72	0.01	0.01	0.45	22.00	0.45	113.7	12.99	bdl	0.01	0.00	0.02	0.29	2.71	0.16	10.83	1.79	15.88	4.69	15.34	2.35	14.44	2.53	0.03	0.31	0.00	0.00	0.00
92.0	18.05	0.00	5.65	6.05	12.20	0.01	1000	0.70	0.74	0.01	0.01	0.47	23.00	0.22	109.4	11.39	0.00	0.00	0.00	0.01	0.25	2.38	0.25	9.15	1.95	15.72	4.44	14.00	2.17	15.63	2.63	0.22	0.19	0.01	0.00	0.00
94.6	18.05	0.01	6.14	6.14	12.63	0.01	1137	0.69	0.87	0.01	0.01	0.45	25.00	bdl	120.9	11.01	0.22	bdl	0.04	bdl	0.29	3.07	0.34	10.47	2.35	19.85	4.51	16.24	2.71	16.60	3.07	0.17	0.36	0.00	0.00	0.04
97.1	18.05	0.01	5.76	6.33	12.69	0.01	1406	0.77	0.79	0.01	0.01	0.49	23.40	0.18	129.0	11.42	bdl	0.00	0.01	0.00	0.21	2.91	0.30	11.46	2.44	18.28	4.94	15.68	2.35	16.84	2.69	0.21	0.23	0.00	0.00	0.00
100.0	18.05	0.01	5.88	6.91	13.34	0.01	1594	0.80	0.86	0.01	0.01	0.47	23.50	0.07	136.1	13.44	0.00	0.10	0.19	0.02	0.36	3.32	0.34	12.78	2.62	19.15	5.02	16.13	2.41	18.12	2.81	0.29	0.21	0.00	0.01	0.00
1098-A L5 (Grt-3)																																				
0.0	18.05	0.01	6.37	6.44	13.35	0.01	2003	1.09	1.12	0.02	0.02	0.45	20.90		462.0	15.70	0.02	bdl	0.03	0.04	0.51	3.48	0.29	9.13	4.04	59.73	18.23	52.16	7.31	43.13	5.77	0.21	0.19	0.01	0.01	0.00
1.9	18.05																																			
3.9	18.05	0.01	6.15	6.44	13.43	0.01	2137	1.00	1.07	0.02	0.02	0.44	20.81	0.32	457.9	15.85	0.02	0.13	0.23	0.04	0.71	3.79	0.27	9.46	4.24	57.21	16.84	42.21	5.13	30.82	4.22	0.20	0.19	0.00	0.00	0.01
5.9	18.05																																			
7.9	18.05	0.01	6.36	6.63	13.21	0.01	1648	0.91	0.97	0.02	0.02	0.47	22.41	0.18	414.7	14.11	bdl	bdl	0.02	0.02	0.62	2.85	0.32	9.08	3.79	52.68	14.28	34.22	4.01	23.73	3.32	0.20	0.21	0.00	0.00	0.00
9.8	18.05	0.01	6.32	7.76	12.63	0.01	1173	0.92	0.92	0.02	0.01	0.56	22.00	0.36	360.9	15.88	bdl	bdl	0.00	bdl	0.29	2.89	0.29	10.47	3.43	43.31	12.09	27.07	3.25	17.51	2.89	0.18	0.20	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
11.7	18.05	0.01	6.28	6.68	12.67	0.01	1027	0.84	0.90	0.02	0.02	0.48	22.70	0.26	336.4	15.14	bdl	0.00	0.00	0.02	0.41	2.56	0.28	8.64	3.28	42.57	11.86	26.37	3.09	18.34	2.61	0.23	0.23	0.00		0.00
13.7	18.05	0.01	7.22	5.59	10.65	0.01	704	0.72	0.83	0.01	0.01	0.51	23.00	0.56	252.7	13.17	bdl	0.00	0.00	0.03	0.34	2.71	0.23	7.22	2.71	34.29	8.66	17.87	2.17	13.54	1.57	0.15	0.14	0.00	0.00	0.00
15.7	18.05	0.01	5.25	5.22	9.53	0.01	682	0.63	0.68	0.01	0.01	0.39	20.70	0.24	211.2	11.01	0.00	0.09	0.15	0.03	0.41	2.18	0.18	5.94	2.20	27.25	7.20	15.70	1.80	10.76	1.59	0.17	0.19	0.00	0.00	0.01
17.7	18.05	0.01	5.09	5.76	9.28	0.01	605	0.61	0.64	0.01	0.01	0.42	21.60	0.21	176.9	9.67	0.00	0.02	0.08	0.02	0.46	1.82	0.19	5.13	1.93	23.82	5.85	12.61	1.44	8.27	1.32	0.15	0.19	0.00	0.00	0.01
19.6	18.05	0.01	6.68	6.86	12.27	0.02	848	0.74	0.87	0.02	0.01	0.52	25.00	0.36	216.6	14.98	0.03	0.00	0.08	bdl	0.10	2.89	0.16	6.86	2.53	30.68	7.22	13.72	1.39	11.37	1.14	0.27	0.27	0.01	0.00	0.00
21.6	18.05	0.01	5.81	6.10	10.11	0.01	751	0.66	0.72	0.01	0.01	0.46	21.50	0.31	166.8	11.26	bdl	0.00	0.02	0.01	0.25	2.04	0.18	6.14	2.13	23.44	5.54	11.19	1.28	7.85	1.15	0.20	0.19	0.00	0.00	0.01
23.9	18.05	0.01	5.41	5.23	9.75	0.02	758	0.63	0.65	0.01	0.01	0.45	21.00	0.72	122.7	10.83	0.03	0.05	0.06	bdl	0.32	2.71	0.22	5.05	1.80	21.66	4.33	8.84	1.15	7.04	1.03	0.18	0.05	0.03	0.00	0.01
26.2	18.05	0.01	5.16	5.97	10.16	0.02	821	0.61	0.66	0.01	0.01	0.45	19.40	0.18	116.9	9.75	0.00	0.12	0.20	0.02	0.34	1.60	0.20	5.49	1.89	18.46	3.97	8.25	0.94	5.90	0.85	0.14	0.21	0.00	0.01	0.00
33.1	18.05	0.01	5.81	5.92	10.94	0.01	895	0.68	0.72	0.07	0.06	0.43	21.20	0.28	137.9	11.50	1.57	0.01	0.17	0.02	0.47	2.29	0.22	7.53	2.59	22.23	4.58	9.44	1.13	7.00	0.93	0.23	0.23	0.08	0.00	0.02
35.1	18.05	0.01	6.05	6.08	11.35	0.01	993	0.70	0.74	0.08	0.08	0.47	22.60	0.10	135.0	12.81	3.12	0.02	0.18	0.02	0.26	2.24	0.23	7.44	2.54	23.37	4.69	10.05	1.17	6.68	1.06	0.29	0.23	0.15	0.00	0.04
37.0	18.05	0.01	4.33	5.77	9.02	0.01	938	0.52	0.56	0.05	0.02	0.38	20.00	bdl	110.1	9.93	0.54	0.01	0.25	0.03	0.54	1.64	0.13	6.86	2.17	18.05	3.79	8.84	0.70	5.59	0.88	0.38	0.25	0.03	0.00	0.01
39.0	18.05	0.01	5.45	5.74	10.05	0.01	897	0.63	0.67	0.03	0.04	0.44	21.80	0.47	114.2	9.40	1.05	0.04	0.13	0.01	0.24	1.71	0.19	6.79	2.33	20.34	4.10	8.73	0.97	6.03	0.81	0.20	0.17	0.03	0.01	0.03
40.9	18.05	0.01	5.74	6.21	11.39	0.01	937	0.71	0.74	0.02	0.03	0.45	22.30	0.34	121.8	10.14	0.51	0.11	0.34	0.03	0.37	1.84	0.22	7.38	2.61	21.67	4.35	9.06	1.13	6.80	0.95	0.16	0.22	0.03	0.02	0.01
42.9	18.05	0.01	7.58	6.14	11.19	0.00	993	0.61	0.76	0.03	0.03	0.42	21.00	0.01	115.5	12.09	0.63	0.07	0.03	0.01	0.08	2.17	0.27	6.32	2.53	19.85	3.79	9.93	1.12	7.04	1.01	0.36	0.03	0.00	0.00	0.00
44.8	18.05	0.01	5.68	6.05	11.04	0.00	942	0.70	0.74	0.02	0.02	0.49	22.00	0.22	117.3	11.01	0.45	0.00	0.06	0.01	0.24	2.15	0.24	7.09	2.56	21.24	4.30	9.28	1.13	6.91	0.88	0.24	0.18	0.01	0.00	0.02
46.8	18.05	0.01	5.76	5.88	11.57	0.01	1011	0.69	0.76	0.02	0.01	0.44	20.80	0.35	109.7	15.70	0.16	0.24	0.49	0.06	0.46	1.68	0.21	6.88	2.35	20.93	4.13	8.99	1.04	6.46	0.86	0.26	0.17	0.01	0.00	0.03
48.7	18.05	0.01	6.14	5.77	9.93	0.00	902	0.61	0.72	0.01	0.01	0.42	23.00	bdl	111.9	12.27	0.11	0.04	0.15	0.07	0.31	2.17	0.23	5.77	2.35	21.66	3.61	9.75	1.34	6.32	0.79	0.07	0.31	0.03	0.00	0.00
50.7	18.05	0.01	5.23	5.43	10.27	0.01	928	0.64	0.66	0.02	0.01	0.43	19.00	0.10	99.4	12.15	0.08	0.15	0.31	0.06	0.51	2.36	0.24	7.09	2.28	18.59	3.65	8.37	0.96	5.79	0.84	0.17	0.20	0.00	0.00	0.00
52.7	18.05																																			
55.3	18.05	0.01	5.38	5.68	10.11	0.00	881	0.66	0.68	0.01	0.01	0.46	21.50	0.25	97.1	11.64	0.03	0.02	0.06	0.02	0.34	2.18	0.20	7.81	2.38	18.41	3.70	8.45	1.01	6.39	0.91	0.21	0.19		0.00	0.01
57.7	18.05																																			
69.3	18.05	0.07	5.83	6.10	11.44	0.00	1160	0.73	0.76	0.09	0.14	0.47	22.00	12.45	106.7	13.50	10.29	0.04	0.09	0.02	0.42	2.94	0.24	8.88	2.74	20.57	3.79	8.77	1.14	7.16	1.01	0.34	0.30	0.42	0.00	0.16
71.2	18.05																																			
86.2	18.05	0.01	5.79	6.23	10.86	0.00	1233	0.75	0.77	0.02	0.02	0.45	22.30	3.79	82.1	99.26	0.14	0.00	0.01	0.01	0.35	2.83	0.25	8.61	2.54	16.86	2.94	6.24	0.74	4.33	0.54	2.20	2.62	0.02	0.00	0.76
88.2	18.05	0.00	7.94	6.50	12.09	0.01	1245	0.85	0.83	0.01	0.02	0.47	21.00	0.94	90.2	84.82	bdl	bdl	0.00	0.02	0.22	1.79	0.23	9.93	2.89	21.66	3.43	7.58	1.17	5.41	0.88	1.08	0.51	0.00	0.02	0.12
90.1	18.05	0.01	5.36	5.43	10.14	0.00	1050	0.68	0.71	0.01	0.02	0.43	22.90	0.25	76.5	25.27	0.09	0.00	0.01	0.01	0.25	2.54	0.23	8.39	2.17	14.98	2.91	6.62	0.82	5.68	0.68	1.10	0.78	0.01	0.00	0.12
92.1	18.05	0.00	5.41	6.32	12.63	0.00	1065	0.90	0.81	0.02	0.01	0.56	22.00	0.01	93.8	16.60	0.08	0.05	0.08	0.01	0.61	2.17	0.20	8.48	2.71	16.60	3.79	9.02	0.97	5.77	1.08	0.27	0.10	0.00	0.00	0.34
94.1	18.05	0.01	5.47	5.61	11.12	0.01	1081	0.71	0.72	0.01	0.01	0.43	22.00	0.27	76.9	22.74	0.22	0.10	0.21	0.04	0.43	2.44	0.23	8.05	2.08	14.33	2.85	7.35	0.97	6.59	0.90	0.45	0.38	0.00	0.00	0.02
96.1	18.05	0.00	5.41	5.41	11.01	0.01	1101	0.65	0.69	0.01	0.01	0.43	26.00	0.42	66.8	19.85	bdl	0.00	0.06	0.01	0.38	2.35	0.27	7.94	1.99	13.17	2.89	6.68	0.90	5.77	0.88	0.32	0.15	0.01	0.00	0.00
98.0	18.05	0.01	4.91	5.32	9.40	0.01	929	0.59	0.61	0.01	0.01	0.45	20.10	0.22	58.8	15.52	0.02	0.01	0.04	0.01	0.29	1.93	0.21	7.15	1.71	11.30	2.22	5.68	0.76	4.76	0.72	0.45	0.49	0.01	0.00	0.02
100.0	18.05																																			
1098-A L6 (Grt-3)																																				
0.0	18.05	0.01	6.17	6.06	11.75	0.01	863	0.72	0.76	0.02	0.02	0.44	22.20	0.43	189.7	16.96	0.15	0.03	0.11	0.03	0.28	2.40	0.19	6.77	2.60	27.97	6.84	14.82	1.89	11.46	1.57	0.32	0.25	0.02	0.00	0.01
2.2	18.05	0.01	6.06	6.51	10.95	0.01	749	0.70	0.73	0.01	0.01	0.46	21.90	0.15	158.1	11.71	0.31	0.00	0.02	0.03	0.33	2.22	0.19	6.82	2.38	23.50	5.59	11.62	1.48	9.06	1.31	0.21	0.17	0.00	0.00	0.00
4.4	18.05	0.01	5.02	5.68	9.38	0.01	603	0.59	0.62	0.01	0.01	0.41	20.10	0.67	118.2	9.20	0.03	0.00	0.02	0.01	0.19	1.84	0.17	5.16	1.82	18.23	4.30	9.17	1.14	6.95	0.99	0.18	0.18	0.00	0.00	0.00
6.5	18.05	0.01	7.22	8.66	14.80	0.01	596	0.76	0.97	0.01	0.01	0.65	29.00	0.25	135.4	11.01	bdl	0.00	0.01	0.00	0.22	2.17	0.23	5.96	1.99	23.46	4.69	10.29	1.23	8.30	1.21	0.18	0.10	0.00	0.00	0.00
8.7	18.05	0.01	5.65	6.01	10.20	0.02	559	0.63	0.64	0.01	0.01	0.43	21.70	0.09	100.9	8.16	0.00	0.01	0.01	0.01	0.24	1.71	0.15	4.80	1.68	16.44	3.50	7.63	0.95	6.53	1.03	0.14	0.12	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
10.9	18.05	0.01	7.04	6.14	11.55	0.02	578	0.78	0.78	0.01	0.01	0.61	29.00	0.29	108.3	10.47	0.03	0.02	0.03	0.03	0.25	1.79	0.29	5.59	1.80	19.85	3.79	9.38	1.12	7.58	0.99	0.08	0.40	0.00	0.00	0.00
13.0	18.05	0.01	5.87	6.19	11.30	0.02	574	0.69	0.70	0.01	0.01	0.45	21.10	0.28	97.6	9.40	0.02	0.00	0.01	0.01	0.23	1.87	0.20	5.49	1.78	16.13	3.52	7.78	0.99	6.89	1.11	0.18	0.15	0.00	0.00	0.01
15.2	18.05	0.01	7.04	7.22	12.27	0.02	830	0.83	0.79	0.01	0.01	0.52	29.00	0.38	111.9	11.19	0.03	0.14	0.14	0.05	0.22	2.17	0.23	8.48	2.35	18.05	3.79	10.29	1.21	9.02	1.71	0.12	0.14	0.00	0.01	0.00
17.8	18.05	0.01	5.52	5.65	10.77	0.01	567	0.64	0.67	0.01	0.01	0.43	20.60	0.22	99.4	9.10	0.02	0.07	0.10	0.01	0.23	1.89	0.20	6.33	1.94	17.25	3.59	8.32	1.09	8.05	1.35	0.15	0.19	0.00	0.00	0.00
20.6	18.05	0.01	5.54	5.49	10.36	0.01	585	0.65	0.64	0.01	0.01	0.43	19.40	0.23	95.8	7.49	0.01	0.01	0.06	0.01	0.16	1.91	0.20	6.44	1.93	16.69	3.63	8.43	1.12	7.78	1.28	0.13	0.14	0.00	0.00	0.01
38.6	18.05	0.02	5.22	5.49	10.16	0.00	3248	0.64	0.67	0.04	0.05	0.39	19.50	2.53	105.0	15.74	0.58	0.02	0.18	0.16	0.30	2.45	0.26	7.74	2.27	19.15	3.81	9.58	1.25	8.64	1.34	0.35	0.27	0.02	0.00	0.25
40.7	18.05	0.01	5.41	5.77	11.19	0.00	902	0.72	0.70	0.03	0.03	0.42	20.00	0.47	113.7	14.44	0.22	0.01	0.01	bdl	0.45	2.89	0.32	7.40	2.53	18.05	4.15	9.38	1.21	8.84	1.43	0.22	0.17	0.01	0.00	0.09
42.9	18.05	0.01	5.99	6.32	12.11	0.00	1099	0.79	0.79	0.03	0.03	0.45	21.90	0.54	125.1	16.17	0.15	0.03	0.05	0.03	0.30	2.89	0.29	9.78	2.67	21.73	4.57	10.92	1.42	9.04	1.33	0.26	0.24	0.01	0.00	0.02
47.6	18.05	0.01	6.08	6.01	11.89	0.00	1052	0.73	0.75	0.01	0.01	0.46	20.90	0.36	118.6	15.18	0.06	0.12	0.22	0.03	0.33	2.82	0.21	9.76	2.63	20.79	4.40	10.21	1.29	7.99	1.10	0.22	0.21	0.00	0.00	0.02
49.8	18.05	0.01	5.79	6.26	11.86	0.00	1009	0.75	0.75	0.02	0.01	0.48	22.60	0.40	118.2	14.31	0.07	0.08	0.11	0.02	0.39	2.96	0.28	9.67	2.51	20.70	4.22	10.38	1.23	7.87	1.09	0.16	0.15	0.00	0.00	0.01
51.9	18.05	0.01	7.22	6.86	12.63	0.00	1011	0.69	0.69	0.02	0.02	0.60	23.00	1.44	111.9	12.27	0.08	0.07	0.03	0.01	0.40	3.79	0.08	9.02	2.17	19.85	3.79	8.66	1.25	7.58	0.90	0.11	0.23	0.01	0.00	0.00
54.1	18.05	0.01	5.25	4.89	8.95	0.00	682	0.52	0.54	0.01	0.01	0.40	19.30	0.20	76.5	9.85	0.02	0.01	0.03	0.02	0.26	1.97	0.20	6.23	1.75	13.43	2.82	6.41	0.82	5.00	0.68	0.18	0.13	0.00	0.00	0.01
56.2	18.05																																			
58.4	18.05	0.01	5.45	6.08	10.39	0.00	892	0.64	0.65	0.01	0.01	0.46	22.10	0.25	90.4	13.17	0.03	0.04	0.10	0.03	0.27	2.42	0.26	7.71	2.06	15.97	3.34	7.49	0.91	5.63	0.71	0.20	0.24	0.00	0.00	0.00
60.6	18.05																																			
62.8	18.05	0.01	5.04	5.58	9.56	0.00	803	0.58	0.58	0.01	0.01	0.42	19.00	0.20	81.9	10.58	0.01	0.02	0.07	0.02	0.26	2.11	0.24	6.88	1.84	14.94	2.96	6.70	0.80	4.60	0.57	0.16	0.13	0.00	0.00	0.00
64.9	18.05																																			
67.1	18.05	0.01	5.81	5.90	11.28	0.00	1016	0.67	0.68	0.02	0.02	0.50	24.10	0.19	95.1	13.01	0.01	0.10	0.23	0.02	0.46	2.65	0.27	8.61	2.13	16.68	3.52	8.03	0.97	6.01	0.70	0.21	0.15	0.00	0.00	0.01
69.2	18.05																																			
71.4	18.05	0.01	5.87	6.06	11.35	0.00	993	0.67	0.69	0.01	0.01	0.47	22.70	0.25	87.5	12.34	0.00	0.00	0.03	0.02	0.28	2.45	0.22	8.82	2.11	15.66	3.25	7.51	1.01	6.19	0.80	0.21	0.14	0.00	0.00	0.00
73.5	18.05	0.00	7.40	5.59	10.65	0.00	830	0.56	0.58	0.01	0.00	0.43	23.00	0.27	74.0	10.29	0.00	0.02	0.11	bdl	0.42	2.35	0.32	7.76	1.99	14.08	2.71	6.50	0.88	6.32	0.69	0.40	0.31	0.02	0.00	0.00
75.7	18.05	0.01	5.72	5.94	10.76	0.00	976	0.63	0.65	0.01	0.01	0.45	21.80	1.26	82.7	11.73	0.00	0.02	0.06	0.02	0.25	2.51	0.32	8.97	2.13	14.65	3.12	7.51	0.96	6.71	1.00	0.26	0.26	0.00	0.00	0.00
77.9	18.05	0.01	5.76	6.50	11.30	0.01	1081	0.67	0.69	0.01	0.01	0.48	24.10	0.20	73.8	10.38	0.01	0.02	0.06	0.01	0.22	2.17	0.27	8.46	2.04	13.88	2.81	6.79	0.95	6.10	0.87	0.25	0.23	0.00	0.00	0.01
80.0	18.05	0.00	6.86	5.23	10.83	0.02	938	0.69	0.67	0.01	0.01	0.45	19.00	0.76	59.6	10.11	bdl	0.01	0.04	0.01	0.27	1.70	0.12	7.40	1.99	11.73	2.17	4.33	0.63	4.51	0.51	0.15	0.25	0.00	0.00	0.00
82.2	18.05	0.01	5.16	5.54	11.86	0.01	1029	0.61	0.65	0.01	0.01	0.42	19.50	0.20	49.3	9.49	0.00	0.20	0.39	0.04	0.32	1.61	0.22	7.02	1.56	9.96	1.81	4.30	0.55	3.34	0.47	0.17	0.15	0.00	0.00	0.00
84.4	18.05	0.01	4.69	6.68	16.96	0.02	1173	0.74	0.65	0.01	0.01	0.40	18.00	0.51	43.3	7.22	bdl	0.05	0.34	0.01	0.36	1.99	0.31	7.22	1.71	9.75	1.68	3.79	0.42	3.07	0.31	0.15	0.16	0.00	0.00	0.03
86.6	18.05	0.01	5.70	6.46	12.36	0.02	1083	0.66	0.69	0.01	0.01	0.48	21.80	0.10	46.9	8.73	0.01	0.06	0.08	0.02	0.15	1.70	0.21	7.40	1.64	9.71	1.86	4.06	0.45	2.98	0.41	0.17	0.19	0.00	0.00	0.01
88.7	18.05	0.01	5.41	5.79	11.03	0.02	998	0.66	0.66	0.01	0.01	0.41	21.60	0.21	41.5	8.21	0.01	0.03	0.05	0.01	0.10	1.27	0.16	6.64	1.62	9.11	1.53	3.36	0.43	2.36	0.34	0.12	0.17	0.00		0.00
90.9	18.05	0.01	5.96	6.32	13.54	0.02	1065	0.78	0.74	0.01	0.01	0.63	22.00	bdl	48.7	8.84	bdl	0.10	0.13	0.01	0.34	1.80	0.27	7.40	1.99	9.56	1.39	3.97	0.29	2.71	0.40	0.43	0.36	0.00	0.00	0.00
93.2	18.05	0.01	6.30	6.79	12.22	0.02	1092	0.72	0.74	0.01	0.01	0.47	21.60	0.15	46.6	10.85	0.00	0.05	0.11	0.02	0.18	1.68	0.23	7.56	1.73	10.39	1.70	3.50	0.39	2.49	0.36	0.18	0.22	0.00	0.00	0.00
95.3	18.05	0.01	6.20	6.59	12.87	0.02	1052	0.76	0.76	0.01	0.01	0.47	22.71	0.49	51.3	13.68	0.04	0.09	0.18	0.04	0.21	1.89	0.28	8.82	1.88	11.60	1.90	3.97	0.45	2.42	0.72	0.28	0.24	0.00	0.01	0.02
97.7	18.05	0.01	6.12	6.57	12.63	0.02	1065	0.71	0.74	0.01	0.01	0.48	22.50	0.29	50.2	13.26	0.00	0.05	0.11	0.01	0.14	1.68	0.22	8.73	1.98	11.32	1.95	4.02	0.43	2.60	0.32	0.23	0.23	0.00	0.01	0.01
100.0	18.05																																			
1098-A L7 (Grt-4)																																				
0.0	18.05	0.01	6.28	6.62	13.73	0.01	1686	0.78	0.83	0.01	0.01	0.46	22.51	0.58	106.7	12.70	bdl	0.13	0.18	0.01	0.25	2.96	0.27	11.41	2.49	17.54	4.10	13.23	2.15	17.02	2.94	0.27	0.22	0.00	0.00	0.02
2.1	18.05																																			
4.1	18.05	0.01	6.33	6.63	13.01	0.01	1740	0.77	0.81	0.01	0.01	0.47	23.05	0.02	106.8	10.29	0.01	0.02	0.02	0.01	0.18	3.18	0.25	11.30	2.61	17.67	4.06	13.48	2.07	16.95	3.07	0.24	0.19	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
6.2	18.05																																			
8.3	18.05	0.01	6.19	6.48	13.11	0.01	1779	0.78	0.79	0.01	0.01	0.46	22.84	0.27	104.3	11.30	bdl	0.10	0.19	0.02	0.32	3.03	0.27	10.79	2.51	16.87	4.04	12.29	1.96	15.54	2.56	0.24	0.25	0.01	0.00	0.00
10.3	18.05	0.01	6.32	6.50	12.63	0.00	1390	0.78	0.79	0.01	0.01	0.47	23.00	bdl	102.9	10.65	bdl	bdl	0.00	0.02	0.27	3.25	0.23	12.09	1.99	15.88	4.33	13.35	1.77	16.96	3.25	0.12	0.00	0.00	0.00	0.00
12.4	18.05	0.00	6.26	6.59	12.94	0.01	1455	0.77	0.81	0.01	0.01	0.47	22.72	bdl	107.4	10.39	bdl	0.01	0.02	0.00	0.33	3.21	0.31	11.78	2.45	17.27	3.97	12.52	2.01	15.48	2.57	0.21	0.23	0.00	0.00	0.00
14.4	18.05	0.00	6.26	6.43	12.56	0.01	1512	0.76	0.78	0.01	0.01	0.47	22.27	0.25	103.4	10.09	0.02	0.00	0.01	0.00	0.37	3.05	0.25	11.13	2.49	16.82	4.06	11.95	1.95	15.25	2.56	0.21	0.17	0.00	0.01	0.00
16.5	18.05																																			
18.6	18.05	0.01	5.85	5.79	10.90	0.01	1234	0.60	0.64	0.01	0.01	0.46	20.70	0.14	81.8	7.65	bdl	0.11	0.17	0.02	0.27	2.44	0.27	8.79	1.99	14.33	3.10	9.84	1.55	12.00	2.13	0.15	0.11	0.00	0.00	0.01
20.6	18.05																																			
22.7	18.05	0.00	5.56	5.23	10.36	0.01	1193	0.61	0.63	0.01	0.01	0.46	20.10	0.26	78.9	8.72	0.00	0.01	0.06	0.00	0.17	2.29	0.31	8.19	1.84	13.43	2.98	9.11	1.55	11.73	2.11	0.13	0.14	0.00	0.00	0.00
24.7	18.05	0.00	5.41	6.32	11.19	0.01	1155	0.61	0.67	0.01	0.01	0.42	20.00	bdl	83.0	10.11	0.03	0.01	0.00	bdl	0.13	3.07	0.12	7.58	2.35	14.98	3.07	9.75	1.61	12.81	2.35	0.47	0.03	0.00	0.00	0.00
26.8	18.05	0.01	5.96	6.12	11.69	0.01	1193	0.66	0.67	0.01	0.01	0.45	22.00	0.81	82.8	9.02	0.03	0.15	0.28	0.03	0.34	2.45	0.26	8.68	1.97	14.11	3.25	9.60	1.56	12.15	2.04	0.17	0.16		0.00	0.01
29.5	18.05	0.00	4.15	5.23	8.84	0.01	1083	0.52	0.56	0.01	0.01	0.32	23.00	bdl	66.8	7.22	bdl	0.04	0.00	0.02	0.45	1.66	0.15	7.04	1.71	10.11	2.71	7.94	1.12	8.84	1.12	0.03	0.23	0.00	0.00	0.00
32.1	18.05	0.01	5.81	6.32	11.32	0.01	1182	0.67	0.68	0.01	0.01	0.43	20.90	0.14	82.1	9.82	0.01	0.01	0.02	0.01	0.21	2.62	0.29	8.64	2.01	13.63	3.14	9.71	1.57	11.30	1.89	0.17	0.16	0.00	0.01	0.00
36.0	18.05	0.01	6.24	6.59	12.15	0.01	1305	0.71	0.75	0.01	0.01	0.53	22.50	0.22	98.4	10.83	0.01	0.00	0.03	0.00	0.24	3.00	0.29	10.45	2.45	16.53	3.61	10.67	1.63	12.98	2.02	0.20	0.18	0.00	0.00	0.00
38.1	18.05	0.00	5.92	6.23	11.91	0.01	1285	0.68	0.70	0.01	0.01	0.44	22.90	0.36	88.4	12.13	0.01	0.01	0.02	0.01	0.22	2.65	0.24	9.40	2.04	14.91	3.28	9.98	1.57	11.53	1.99	0.22	0.21	0.00	0.00	0.00
40.1	18.05	0.01	5.59	5.77	14.08	0.01	1299	0.72	0.70	0.01	0.01	0.47	20.00	0.13	90.2	12.63	bdl	bdl	0.10	bdl	0.29	2.71	0.07	8.66	2.17	16.78	3.61	9.75	1.55	11.91	1.53	0.04	0.18	0.00	0.00	0.00
42.1	18.05	0.01	6.32	6.82	11.95	0.01	1312	0.66	0.71	0.01	0.01	0.48	23.70	0.18	90.6	11.13	0.03	0.02	0.01	0.01	1.03	2.44	0.27	8.92	2.06	14.74	3.43	10.39	1.55	11.57	1.91	0.22	0.17	0.00	0.00	0.00
44.2	18.05	0.00	4.69	4.51	9.75	0.01	1047	0.45	0.49	0.01	0.00	0.36	15.00	0.17	68.6	7.40	0.01	0.00	0.00	bdl	0.02	1.23	0.18	6.68	1.62	9.75	2.53	7.04	1.14	9.56	1.41	0.31	0.07	0.00	0.01	0.00
46.2	18.05	0.01	6.15	5.74	10.56	0.01	1177	0.60	0.65	0.01	0.01	0.44	23.20	0.01	88.3	9.24	0.01	0.06	0.10	0.01	0.26	2.33	0.22	8.70	1.97	14.31	3.45	9.69	1.48	10.18	1.54	0.22	0.17	0.00	0.00	0.00
49.0	18.05																																			
56.7	18.05	0.01	6.17	6.66	12.33	0.00	1328	0.71	0.74	0.01	0.02	0.47	22.50	0.52	110.3	9.71	0.46	0.02	0.04	0.02	0.17	2.18	0.25	9.60	2.48	17.43	4.14	12.07	1.66	10.95	1.68	0.18	0.20	0.03	0.00	0.03
58.8	18.05	0.00	5.81	6.15	10.76	0.00	1243	0.65	0.67	0.02	0.02	0.42	20.50	0.22	96.7	7.47	0.60	0.01	0.01	0.01	0.10	2.27	0.26	8.66	2.08	15.54	3.65	10.49	1.39	9.55	1.46	0.16	0.15	0.01	0.00	0.01
60.8	18.05	0.01	5.77	5.23	11.19	0.00	1191	0.52	0.65	0.01	0.03	0.40	19.00	1.25	95.7	9.38	0.32	0.13	0.14	0.00	0.31	2.35	0.32	8.66	1.99	15.16	3.79	11.55	1.39	9.93	1.43	0.23	0.27	0.00	0.00	0.00
62.9	18.05	0.01	5.38	5.43	10.86	0.01	1040	0.60	0.62	0.01	0.01	0.43	18.90	0.31	91.0	10.59	0.21	0.13	0.18	0.02	0.27	2.24	0.23	7.96	2.08	14.85	3.48	9.80	1.34	8.61	1.27	0.21	0.20	0.02	0.00	0.01
65.0	18.05	0.01	5.77	5.96	11.91	0.01	1390	0.69	0.69	0.03	0.02	0.51	23.00	bdl	102.9	12.45	0.72	0.09	0.31	0.03	0.42	2.89	0.18	7.58	2.35	18.05	3.79	11.01	1.28	9.93	1.32	0.32	0.22	0.00	0.00	0.02
67.0	18.05	0.01	5.97	6.50	10.90	0.01	1171	0.62	0.65	0.01	0.02	0.44	21.90	0.51	95.3	10.86	0.26	0.10	0.17	0.02	0.29	2.13	0.21	8.41	2.04	15.65	3.65	9.49	1.35	8.61	1.27	0.19	0.18	0.03	0.00	0.02
71.2	18.05	0.03	5.63	6.33	11.41	0.01	1029	0.65	0.69	0.01	0.01	0.46	21.20	6.86	98.5	9.71	0.07	0.03	0.09	0.01	0.21	2.33	0.21	8.18	2.18	15.95	3.74	9.82	1.33	8.45	1.13	0.14	0.18	0.00	0.00	0.00
73.2	18.05	0.01	6.32	6.68	12.63	0.01	1209	0.70	0.81	0.01	0.01	0.45	21.00	2.89	111.9	12.81	bdl	0.05	0.08	0.00	0.18	3.61	0.25	8.84	2.53	21.66	4.87	11.73	1.39	9.38	1.32	0.18	0.14	0.05	0.00	0.00
75.3	18.05	0.02	5.87	6.17	11.93	0.00	1155	0.66	0.69	0.01	0.01	0.44	22.20	1.64	105.0	12.07	0.03	0.17	0.30	0.04	0.43	2.45	0.27	9.67	2.36	17.45	4.13	10.56	1.26	7.92	1.10	0.23	0.25		0.00	0.01
77.4	18.05	0.01	5.41	5.99	10.56	0.00	1003	0.63	0.63	0.01	0.01	0.45	20.80	0.99	95.8	12.70	0.02	0.11	0.17	0.01	0.33	2.62	0.24	8.99	2.24	16.42	3.66	9.11	1.10	6.89	0.90	0.19	0.23	0.00	0.00	0.00
79.4	18.05																																			
81.5	18.05	0.01	5.74	6.08	10.02	0.00	895	0.59	0.62	0.01	0.01	0.46	21.90	0.83	85.9	11.32	0.00	0.07	0.14	0.02	0.36	2.35	0.24	8.54	1.95	14.42	3.19	7.92	0.92	6.01	0.74	0.19	0.23	0.00	0.00	0.00
83.5	18.05	0.01	4.51	3.79	8.66	0.01	686	0.36	0.54	0.01	0.01	0.34	16.00	0.15	66.8	10.11	0.01	0.05	0.04	0.01	0.20	1.77	0.31	7.22	1.35	10.47	2.53	5.41	0.58	4.69	0.49	0.18	0.14	0.00	0.00	0.00
85.6	18.05	0.01	5.56	6.26	10.47	0.00	1032	0.61	0.65	0.01	0.01	0.45	22.20	0.43	89.7	13.84	0.01	0.01	0.05	0.01	0.33	2.76	0.25	8.82	2.22	15.90	3.50	8.39	0.94	5.88	0.80	0.21	0.23	0.00	0.00	0.00
91.9	18.05	0.01	5.34	5.70	10.56	0.00	1124	0.62	0.67	0.01	0.01	0.43	20.20	bdl	85.0	14.35	0.01	0.04	0.20	0.01	0.22	2.27	0.18	8.77	2.09	15.47	3.01	7.45	1.00	5.88	0.80	0.23	0.21	0.00	0.00	0.00
93.9	18.05	0.00	4.51	6.32	9.38	0.01	866	0.60	0.56	0.01	0.01	0.34	19.00	0.63	61.4	11.73	0.02	0.00	0.04	0.02	0.22	2.53	0.18	8.30	1.70	11.37	2.71	5.77	0.65	3.79	0.69	0.36	0.22	0.00	0.00	0.03
95.9	18.05	0.01	6.03	5.81	10.99	0.01	1220	0.64	0.67	0.01	0.01	0.45	22.00	0.29	72.0	13.37	0.01	0.02	0.15	0.01	0.38	2.54	0.25	9.04	2.17	13.21	2.78	6.55	0.77	5.14	0.71	0.17	0.23	0.00	0.00	0.00
98.0	18.05	0.00	6.32	6.86	13.90	0.02	1660	0.76	0.83	0.01	0.02	0.51	25.00	bdl	77.6	15.16	0.01	bdl	0.10	0.02	0.70	3.25	0.12	8.84	2.35	16.06	2.89	6.50	0.61	4.33	0.70	0.32	0.20	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
100.0	18.05	0.01	5.49	5.88	10.85	0.02	1261	0.63	0.66	0.01	0.01	0.43	20.60	0.18	57.4	12.06	0.00	0.01	0.05	0.01	0.26	2.04	0.21	7.71	1.79	11.55	2.24	4.62	0.59	3.27	0.43	0.17	0.18	0.00	0.00	0.00
1098-A L8 (Grt-4)																																				
0.0	18.05	0.01	5.76	5.54	9.91	0.01	801	0.60	0.61	0.01	0.01	0.45	19.70	0.27	71.1	9.38	0.05	0.01	0.03	0.00	0.20	2.38	0.24	8.01	1.84	12.06	2.71	8.92	1.49	11.91	2.22	0.15	0.16	0.01	0.00	0.00
2.2	18.05																																			
4.4	18.05	0.00	5.68	6.28	10.25	0.01	834	0.59	0.63	0.01	0.01	0.43	22.20	0.16	75.1	10.14	0.00	0.00	0.02	0.01	0.25	2.22	0.22	7.99	1.73	12.25	2.84	9.22	1.57	14.26	2.74	0.16	0.19	0.00	0.00	0.00
6.5	18.05	0.00	5.96	6.50	10.65	0.00	993	0.65	0.72	0.01	0.01	0.74	21.00	0.14	77.6	7.76	bdl	0.00	0.03	0.01	0.05	1.80	0.31	7.40	2.35	12.81	3.07	10.11	2.17	14.44	3.79	0.25	0.11	0.00	0.00	0.00
8.7	18.05	0.00	5.29	5.63	9.80	0.01	776	0.58	0.60	0.01	0.01	0.42	19.90	0.16	67.9	6.39	0.01	0.00	0.01	0.01	0.11	1.71	0.21	6.84	1.57	10.88	2.56	8.82	1.49	13.19	2.49	0.14	0.12	0.00	0.00	0.00
10.9	18.05																																			
13.1	18.05	0.01	5.83	6.01	10.47	0.01	899	0.61	0.63	0.01	0.01	0.46	21.10	0.32	74.0	6.17	0.05	0.05	0.06	0.01	0.18	1.97	0.22	7.80	1.75	11.71	2.89	9.31	1.74	14.26	2.49	0.14	0.11	0.00	0.00	0.00
15.3	18.05																																			
17.5	18.05	0.01	5.58	5.65	9.93	0.01	785	0.55	0.59	0.01	0.01	0.45	22.10	0.11	66.8	5.87	0.00	0.00	0.01	0.01	0.12	1.94	0.18	6.77	1.62	10.58	2.54	8.41	1.49	12.13	2.23	0.10	0.10	0.00	0.00	0.00
19.7	18.05	0.01	4.87	5.41	9.02	0.01	812	0.47	0.61	0.00	0.01	0.38	18.00	0.04	68.6	4.69	0.05	0.02	0.02	0.01	0.20	1.48	0.05	7.22	1.52	12.09	2.53	8.12	1.41	13.54	2.17	0.29	0.10	0.00	0.00	0.00
22.3	18.05	0.00	5.25	5.43	9.49	0.01	792	0.56	0.57	0.01	0.01	0.42	19.60	0.19	69.8	9.20	0.00	0.01	0.02	0.01	0.12	1.77	0.17	6.62	1.56	11.06	2.69	8.73	1.55	12.78	2.32	0.13	0.19	0.00	0.00	0.00
25.1	18.05																																			
37.9	18.05	0.12	5.49	5.72	10.70	0.01	5216	0.65	0.70	0.01	0.01	0.42	20.30	14.62	95.7	11.10	0.00	0.14	0.26	0.05	0.36	2.11	0.24	9.04	1.91	14.49	3.63	13.43	2.33	18.34	3.28	0.23	0.20	0.00	0.00	0.04
40.1	18.05	0.06	5.23	5.96	11.55	0.01	4873	0.61	0.83	0.01	0.01	0.43	24.00	8.30	110.1	15.16	0.03	0.05	0.03	0.02	0.52	3.25	0.25	9.38	1.80	17.69	5.05	16.06	2.53	21.66	3.97	0.25	0.15	0.00	0.00	0.00
42.3	18.05	0.05	5.63	6.06	11.55	0.01	3321	0.72	0.70	0.01	0.01	0.46	21.80	6.14	109.9	15.27	0.01	0.02	0.04	0.04	0.30	2.85	0.23	8.70	2.00	15.43	4.19	16.77	2.76	21.51	3.59	0.26	0.24	0.00	0.00	0.00
44.4	18.05	0.06	5.96	6.68	12.63	0.01	3790	0.72	0.81	0.02	0.01	0.45	23.00	11.01	124.5	14.98	bdl	0.27	0.29	0.16	0.94	1.80	0.31	9.75	1.99	18.05	5.23	19.85	3.07	25.27	4.15	0.45	0.17	0.00	0.00	0.00
46.6	18.05	0.03	6.06	6.35	12.27	0.01	2635	0.75	0.75	0.01	0.01	0.46	21.90	4.10	120.2	15.83	bdl	0.13	0.23	0.02	0.48	2.76	0.29	9.84	2.10	16.28	4.82	18.84	2.98	21.55	3.48	0.25	0.24	0.00	0.00	0.00
48.8	18.05																																			
50.9	18.05	0.02	6.14	6.44	11.39	0.01	2130	0.69	0.71	0.01	0.01	0.49	24.40	2.87	108.3	13.79	bdl	0.01	0.05	0.00	0.27	2.53	0.20	8.90	2.08	14.80	4.30	14.69	2.29	15.70	2.44	0.23	0.17	0.00	0.00	0.01
53.1	18.05	0.02	6.32	6.86	9.56	0.01	1570	0.61	0.61	0.01	0.01	0.49	35.00	1.80	88.4	9.75	bdl	0.12	0.10	0.01	0.16	2.35	0.23	7.94	1.53	13.17	3.79	10.83	1.73	10.65	1.64	0.03	0.08	0.00	0.00	0.00
55.3	18.05	0.02	5.25	5.81	9.80	0.01	1487	0.56	0.57	0.02	0.02	0.44	21.30	1.12	80.3	9.49	0.09	0.33	0.61	0.05	0.45	1.80	0.21	6.50	1.60	11.50	3.09	9.82	1.44	10.03	1.41	0.16	0.23	0.00	0.00	0.01
57.5	18.05	0.02	4.87	4.87	9.56	0.01	1317	0.58	0.61	0.03	0.02	0.43	19.00	0.45	90.2	8.48	0.06	0.34	0.60	0.08	0.54	1.35	0.22	7.58	1.99	11.91	3.79	10.65	1.64	9.38	1.44	0.27	0.32	0.00	0.00	0.06
59.7	18.05	0.01	6.05	6.19	10.83	0.01	1433	0.60	0.64	0.02	0.02	0.47	22.60	1.17	95.1	11.26	0.02	0.08	0.23	0.03	0.26	2.29	0.22	7.96	1.89	14.04	3.45	10.81	1.59	10.38	1.43	0.13	0.21	0.00	0.00	0.02
61.9	18.05	0.01	5.59	4.87	9.02	0.01	1173	0.51	0.58	0.01	0.01	0.45	20.00	0.36	77.6	10.47	0.09	0.22	0.34	0.01	0.40	1.14	0.22	7.76	1.70	11.01	3.25	8.30	1.59	7.76	1.12	0.16	0.15	0.00	0.00	0.01
64.1	18.05	0.01	5.63	5.90	10.43	0.01	1296	0.60	0.63	0.01	0.01	0.44	21.10	0.61	81.0	9.93	0.01	0.26	0.52	0.05	0.35	1.86	0.23	7.38	1.70	12.49	3.12	9.26	1.37	8.46	1.26	0.18	0.21	0.00	0.00	0.01
66.3	18.05																																			
68.5	18.05	0.01	5.25	6.08	9.46	0.01	1200	0.56	0.60	0.01	0.01	0.45	20.90	0.49	71.5	9.20	0.01	0.02	0.11	0.01	0.19	1.55	0.18	6.28	1.45	11.19	2.80	7.76	1.06	7.04	0.97	0.10	0.18	0.00	0.00	0.00
70.7	18.05																																			
72.9	18.05	0.01	5.45	5.79	10.38	0.01	1088	0.58	0.59	0.01	0.01	0.46	21.40	0.38	70.4	10.29	0.00	0.02	0.06	0.01	0.15	1.66	0.19	7.13	1.58	11.19	2.63	7.45	0.95	6.30	0.90	0.14	0.12	0.00	0.00	0.01
75.1	18.05																																			
77.3	18.05	0.01	5.49	6.03	9.67	0.01	1032	0.56	0.57	0.01	0.01	0.42	20.70	0.63	56.9	10.45	0.00	0.05	0.10	0.02	0.23	1.62	0.18	6.50	1.60	10.70	2.15	5.49	0.74	4.87	0.74	0.11	0.13	0.00	0.00	0.00
79.5	18.05	0.01	6.32	6.68	11.19	0.02	1281	0.67	0.72	0.01	0.01	0.49	34.00	bdl	57.8	10.11	bdl	0.03	0.12	0.00	0.34	1.39	0.13	7.22	1.50	11.01	2.35	4.69	0.87	4.33	0.74	0.07	0.42	0.00	0.00	0.00
81.7	18.05	0.01	5.50	5.45	10.03	0.01	1030	0.55	0.57	0.01	0.01	0.46	21.10	0.58	49.8	10.43	bdl	0.06	0.13	0.01	0.22	1.59	0.18	6.23	1.48	9.38	1.89	4.46	0.54	3.84	0.48	0.09	0.14	0.00	0.00	0.00
83.9	18.05	0.01	6.32	6.14	10.11	0.02	1047	0.60	0.67	0.01	0.01	0.56	20.00	bdl	43.3	9.20	bdl	0.08	0.18	0.00	0.27	1.28	0.22	5.77	1.43	8.30	1.77	4.33	0.42	3.07	0.49	0.10	0.22	0.00	0.00	0.00
86.0	18.05	0.01	5.54	5.65	10.23	0.02	1023	0.58	0.58	0.01	0.01	0.43	21.30	0.39	43.7	9.10	0.00	0.25	0.46	0.05	0.44	1.52	0.18	5.70	1.33	8.01	1.61	3.81	0.45	3.03	0.41	0.11	0.16	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
88.2	18.05	0.01	6.14	7.58	9.56	0.02	902	0.61	0.52	0.01	0.01	0.45	20.00	0.03	41.5	9.02	0.00	0.05	0.11	0.02	0.23	2.35	0.11	5.59	1.59	8.30	1.37	3.97	0.38	1.77	0.38	0.03	0.08	0.00	0.00	0.00
90.4	18.05	0.01	5.43	6.03	9.75	0.02	969	0.54	0.57	0.01	0.01	0.42	20.70	0.29	40.8	9.75	0.00	0.13	0.27	0.04	0.34	1.61	0.15	5.52	1.32	8.43	1.47	3.28	0.40	2.33	0.26	0.16	0.17	0.00	0.00	0.00
92.6	18.05	0.01	5.32	5.88	10.34	0.02	1065	0.57	0.60	0.01	0.01	0.44	22.00	0.29	41.0	10.02	bdl	0.10	0.27	0.05	0.39	1.84	0.21	6.32	1.28	8.32	1.43	3.03	0.34	2.26	0.29	0.09	0.15	0.00	0.00	0.00
94.8	18.05	0.01	5.23	5.23	9.20	0.02	884	0.54	0.58	0.01	0.01	0.34	22.00	0.36	36.1	8.30	0.03	0.00	0.16	0.04	0.25	1.99	0.27	6.86	1.21	7.22	1.26	2.35	0.29	2.17	0.25	0.13	0.25	0.00	0.00	0.00
97.2	18.05	0.01	5.23	5.83	10.12	0.02	1023	0.56	0.56	0.01	0.01	0.45	20.20	0.35	39.5	10.38	0.00	0.11	0.25	0.04	0.38	1.77	0.23	5.94	1.32	7.51	1.33	2.85	0.37	2.18	0.28	0.14	0.18	0.00	0.00	0.01
100.0	18.05																																			
1098-A L9 (Grt-5)																																				
0.0	18.05	0.01	6.27	6.68	13.95	0.02	1527	0.99	0.97	0.01	0.01	0.46	22.16	0.16	191.3	11.69	0.01	0.10	0.22	0.04	0.29	2.74	0.20	9.75	3.19	28.03	6.68	17.36	2.48	15.39	2.31	0.21	0.22	bdl	0.00	0.00
1.7	18.05	0.00	6.25	6.62	13.41	0.01	1469	0.90	0.94	0.01	0.01	0.46	22.31	0.32	213.9	14.55	0.00	bdl	0.00	0.01	0.40	2.87	0.24	11.15	3.57	31.42	7.63	19.33	2.58	16.87	2.50	0.27	0.33	0.00	0.00	0.00
3.5	18.05																																			
5.3	18.05	0.00	4.55	4.78	9.46	0.01	1063	0.66	0.69	0.01	0.01	0.34	16.00	0.34	140.8	10.12	0.00	0.00	0.01	0.01	0.23	2.29	0.16	7.27	2.11	20.39	4.96	12.80	1.62	10.67	1.62	0.19	0.19	0.00	0.00	0.00
7.0	18.05	0.01	6.14	6.68	12.81	0.02	1317	0.81	0.90	0.01	0.01	0.49	23.00	0.63	171.4	13.72	bdl	bdl	0.02	0.04	0.09	2.89	0.02	10.83	2.71	27.07	5.96	14.26	1.73	12.81	2.17	0.29	0.18	0.00	0.00	0.00
8.8	18.05	0.01	6.24	6.63	13.01	0.02	1422	0.91	0.93	0.01	0.01	0.47	22.73	0.45	175.6	14.35	0.00	0.01	0.05	0.01	0.47	2.87	0.23	9.96	2.95	26.96	6.32	14.53	1.83	12.27	1.77	0.27	0.26	0.00	0.01	0.00
10.5	18.05	0.01	6.68	7.22	13.72	0.01	1678	0.90	0.92	0.01	0.01	0.56	25.00	bdl	198.5	15.16	bdl	0.01	0.08	0.06	0.65	3.61	0.18	10.11	3.79	30.68	6.68	14.08	1.80	12.27	1.99	0.34	0.18	0.00	0.00	0.00
12.3	18.05	0.01	5.94	6.33	12.72	0.01	1597	0.83	0.83	0.01	0.01	0.48	22.70	0.20	160.6	15.16	0.01	0.21	0.45	0.09	0.71	3.07	0.25	9.31	3.12	26.15	5.67	13.12	1.64	10.92	1.85	0.28	0.28	0.00	0.00	0.00
14.0	18.05	0.00	5.96	7.04	12.81	0.00	1480	0.96	0.96	0.01	0.01	0.54	28.00	0.20	178.7	13.72	0.02	bdl	0.06	0.07	0.58	2.89	0.51	11.55	3.79	28.87	7.22	15.34	1.68	12.63	1.99	0.29	0.25	0.03	0.00	0.00
15.8	18.05	0.00	5.88	6.19	11.73	0.01	1307	0.76	0.78	0.01	0.01	0.48	23.00	0.20	146.9	12.04	bdl	0.00	0.02	0.02	0.33	2.74	0.19	9.13	3.05	24.36	5.18	11.91	1.46	10.14	1.72	0.19	0.24	0.00	0.00	0.00
17.5	18.05																																			
19.3	18.05	0.00	5.52	6.06	11.13	0.01	1160	0.72	0.73	0.01	0.01	0.46	20.60	0.33	136.1	8.88	bdl	0.03	0.06	0.01	0.31	2.06	0.18	7.76	2.49	22.02	4.96	11.39	1.40	9.42	1.73	0.16	0.17	0.00	0.00	0.00
21.1	18.05	0.00	5.23	4.51	8.48	0.01	975	0.56	0.54	0.01	0.01	0.32	16.00	0.22	106.5	9.93	bdl	0.08	0.06	bdl	0.22	1.99	0.22	6.32	1.99	17.51	3.25	8.66	0.97	7.58	1.61	0.18	0.14	0.00	0.00	0.00
22.8	18.05	0.01	5.70	6.05	11.41	0.01	1177	0.77	0.78	0.01	0.01	0.44	22.50	0.36	134.6	13.08	bdl	0.03	0.11	0.03	0.43	2.36	0.17	8.45	2.67	22.36	4.73	11.01	1.41	9.56	1.78	0.14	0.25	0.00	0.00	0.00
24.6	18.05																																			
26.4	18.05	0.01	5.34	5.85	10.63	0.01	1164	0.71	0.75	0.01	0.01	0.49	21.70	0.23	124.0	13.03	0.02	0.04	0.09	0.02	0.38	2.38	0.20	8.03	2.58	20.57	4.46	9.93	1.29	8.95	1.71	0.15	0.15	0.00	0.00	0.00
28.1	18.05																																			
29.9	18.05	0.01	5.20	6.03	10.65	0.01	1354	0.71	0.74	0.01	0.01	0.45	21.70	0.22	117.1	11.82	bdl	0.09	0.18	0.03	0.49	2.29	0.20	7.31	2.35	19.49	4.08	9.06	1.28	8.07	1.64	0.18	0.18	0.00	0.00	0.00
31.6	18.05																																			
33.4	18.05	0.00	5.99	5.99	11.75	0.01	1251	0.76	0.79	0.01	0.01	0.48	23.30	0.18	134.6	11.21	bdl	0.02	0.06	0.02	0.39	2.76	0.21	8.86	2.71	23.46	4.69	10.76	1.34	9.73	1.73	0.26	0.21	0.00	0.00	0.01
35.3	18.05																																			
38.5	18.05	0.01	5.50	5.54	10.88	0.01	1159	0.72	0.75	0.01	0.01	0.43	21.60	0.21	113.2	9.40	0.14	0.06	0.16	0.03	0.44	2.31	0.18	8.14	2.56	20.21	4.17	9.40	1.10	7.56	1.30	0.13	0.21	0.01	0.00	0.02
40.3	18.05	0.00	5.96	5.59	10.83	0.01	1155	0.79	0.78	0.01	0.02	0.43	18.00	bdl	120.9	13.54	bdl	0.04	0.10	0.04	0.23	3.07	0.29	8.12	2.89	21.66	4.33	11.55	1.46	7.04	1.12	0.25	0.45	0.00	0.03	0.01
42.0	18.05	0.01	5.67	5.96	11.33	0.01	1142	0.78	0.80	0.02	0.02	0.48	24.70	0.10	118.2	13.55	0.23	0.00	0.06	0.02	0.45	2.96	0.24	8.55	2.85	21.48	4.22	9.38	1.06	7.27	1.20	0.28	0.22	0.00	0.00	0.02
43.8	18.05	0.00	5.65	6.32	10.67	0.01	1110	0.80	0.81	0.02	0.01	0.47	20.80	0.11	113.9	13.41	0.29	0.00	0.05	0.03	0.47	2.63	0.24	8.45	2.62	21.66	4.22	8.75	1.06	6.71	1.10	0.25	0.27	0.01	0.00	0.01
45.6	18.05																																			
47.3	18.05	0.01	6.17	6.48	11.01	0.01	1119	0.84	0.89	0.02	0.02	0.51	21.70	0.27	124.9	13.46	0.27	0.01	0.04	0.02	0.42	2.78	0.23	9.02	2.96	23.64	4.69	9.89	1.11	7.04	1.16	0.30	0.29	0.01	0.00	0.02
49.1	18.05																																			
50.9	18.05	0.01	5.72	6.39	11.53	0.01	1227	0.87	0.86	0.01	0.02	0.47	23.50	0.44	126.2	15.90	0.15	0.18	0.30	0.05	0.58	3.00	0.24	9.42	3.03	23.46	4.64	9.33	1.08	7.09	1.06	0.26	0.29	0.01	0.00	0.01
54.0	18.05	0.01	6.12	6.32	11.93	0.01	1112	0.87	0.92	0.01	0.01	0.49	22.30	0.11	106.5	20.57	0.11	0.18	0.34	0.06	0.72	3.23	0.29	9.26	2.91	22.07	3.68	6.89	0.69	4.17	0.62	0.41	0.47	0.00	0.00	0.13

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
56.2	18.05	0.01	5.68	5.77	10.32	0.00	1135	0.83	0.89	0.01	0.01	0.44	20.50	0.20	88.1	18.23	0.07	0.01	0.04	0.03	0.53	2.82	0.27	8.52	2.73	19.85	3.07	5.27	0.50	2.83	0.37	0.25	0.32	0.00	0.00	0.04
59.7	18.05	0.01	5.47	6.21	10.23	0.00	1101	0.85	0.87	0.01	0.01	0.42	20.00	0.16	72.6	16.78	0.02	0.00	0.03	0.03	0.50	3.03	0.27	8.70	2.78	17.69	2.47	3.72	0.37	1.77	0.19	0.18	0.27	0.00	0.00	0.05
61.4	18.05	0.00	5.77	6.41	12.09	0.00	1332	0.97	1.03	0.02	0.02	0.49	22.80	0.20	78.5	17.14	0.22	0.01	0.04	0.01	0.77	3.52	0.27	10.39	3.27	19.87	2.71	4.20	0.36	2.06	0.23	0.32	0.30	0.01	0.00	0.03
63.2	18.05	0.01	4.51	5.96	9.93	0.00	1011	0.78	0.85	0.01	0.01	0.40	17.00	0.92	63.2	9.56	bdl	0.04	0.20	0.09	0.74	3.07	0.16	8.66	2.17	17.69	1.80	3.25	0.38	1.80	0.22	0.34	0.13	0.00	0.00	0.12
65.0	18.05	0.01	5.76	6.80	11.84	0.00	1292	0.98	1.02	0.01	0.01	0.47	23.40	0.29	72.7	11.32	0.04	0.01	0.06	0.03	0.58	3.52	0.32	9.82	3.05	18.80	2.49	3.81	0.36	1.97	0.21	0.19	0.21	0.00	0.00	0.01
66.9	18.05																																			
83.1	18.05	0.01	6.33	6.37	12.22	0.00	1269	0.79	0.82	0.06	0.07	0.47	22.90	0.09	77.1	16.78	1.70	0.00	0.03	0.02	0.36	3.05	0.29	10.83	2.71	16.86	2.80	5.34	0.60	3.52	0.48	0.20	0.34	0.04	0.00	0.03
84.9	18.05	0.01	8.84	7.40	13.72	0.00	1281	0.85	0.83	0.02	0.06	0.51	23.00	0.81	83.0	14.26	0.83	0.03	0.04	0.02	0.25	3.07	0.15	14.26	2.71	15.70	3.07	6.32	0.69	4.33	0.92	0.43	0.29	0.01	0.00	0.04
86.6	18.05	0.01	5.61	5.70	11.21	0.00	1182	0.70	0.67	0.05	0.03	0.45	20.20	0.20	66.1	17.51	0.36	0.29	0.54	0.05	0.58	2.20	0.19	8.54	2.18	14.11	2.47	4.96	0.56	3.37	0.43	0.27	0.35	0.03	0.00	0.06
88.4	18.05																																			
90.1	18.05	0.01	5.52	6.03	11.17	0.00	1137	0.67	0.73	0.02	0.02	0.43	21.30	0.27	69.5	14.33	0.31	0.16	0.32	0.04	0.32	2.09	0.26	9.96	2.33	15.00	2.47	5.34	0.68	4.01	0.54	0.18	0.27	0.01	0.00	0.01
91.9	18.05																																			
93.6	18.05	0.01	4.60	5.00	14.26	0.01	1240	0.54	0.58	0.02	0.02	0.40	20.20	0.23	48.6	8.28	0.60	0.14	0.30	0.03	0.17	1.05	0.18	6.50	1.66	10.32	1.84	4.04	0.47	2.89	0.38	0.17	0.16	0.02	0.00	0.02
95.6	18.05	0.01	5.34	5.65	10.83	0.01	1018	0.62	0.64	0.01	0.02	0.42	22.00	0.40	55.2	11.93	0.22	0.05	0.13	0.01	0.19	1.57	0.21	8.05	1.85	11.30	2.15	4.42	0.53	3.32	0.43	0.20	0.19	0.02	0.00	0.01
97.8	18.05	0.01	5.77	7.22	10.83	0.02	1191	0.65	0.67	0.01	0.03	0.40	20.00	0.22	52.3	10.65	0.04	0.06	0.14	bdl	0.27	1.21	0.22	7.40	1.80	9.75	1.99	4.51	0.69	2.89	0.45	0.08	0.52	0.02	0.00	0.00
100.0	18.05	0.01	5.70	5.50	11.01	0.02	1023	0.63	0.66	0.01	0.02	0.48	24.10	0.27	52.9	10.95	0.25	0.03	0.10	0.01	0.13	1.31	0.17	7.33	1.80	10.79	1.97	4.20	0.50	3.10	0.37	0.17	0.23	0.01	0.00	0.00
6150-A L1 (Grt-1)																																				
0.0	18.05	0.01	4.35	4.46	13.41	0.02	2546	0.89	0.90	0.01	0.01	0.76	26.80	0.90	260.2	6.30	0.23	0.06	0.18	0.06	0.41	1.70	0.08	8.54	3.75	37.18	9.67	24.60	3.09	19.69	2.73	0.21	0.29	0.00	0.03	0.01
5.2	18.05	0.03	4.26	4.44	13.21	0.02	2736	0.91	1.23	0.01	0.01	0.80	28.21	0.97	270.2	6.28	bdl	0.04	0.07	0.03	0.35	1.28	0.10	7.20	3.65	37.93	9.71	25.32	3.04	18.75	2.52	0.19	0.20	0.01	0.01	0.02
11.7	18.05	0.01	4.16	4.33	13.25	0.02	2557	0.84	1.68	0.01	0.01	0.78	30.50	1.10	241.7	13.90	0.40	0.72	1.50	0.17	0.96	1.17	0.13	6.28	3.12	35.19	8.82	22.36	2.83	16.82	2.32	0.48	0.45	0.03	0.31	0.06
20.9	18.05	0.01	4.19	4.30	12.42	0.02	2204	0.87	0.80	0.01	0.01	0.80	27.40	0.72	220.5	6.24	0.11	0.17	0.56	0.06	0.42	0.82	0.08	5.59	2.76	32.09	7.90	20.75	2.58	15.61	2.27	0.21	0.22	0.00	0.16	0.02
24.9	18.05	0.01	3.61	5.05	11.01	0.02	1751	0.72	0.74	0.01	0.01	0.83	24.00	bdl	180.5	4.87	bdl	bdl	0.00	0.05	0.06	0.90	0.08	5.23	2.35	27.07	7.04	17.14	2.17	14.26	1.68	0.43	0.22	0.03	0.00	0.01
29.4	18.05	0.03	3.99	4.17	10.86	0.02	1846	0.74	0.70	0.01	0.01	0.76	27.40	0.81	192.6	7.15	0.23	0.14	0.32	0.05	0.34	0.70	0.07	4.37	2.35	26.35	6.88	17.42	2.26	13.35	1.92	0.26	0.26	0.00	0.19	0.04
39.4	18.05	0.06	3.53	3.72	10.47	0.02	1173	0.88	0.78	0.01	0.01	0.68	23.20	1.66	173.6	7.04	0.16	0.27	0.54	0.06	0.37	0.63	0.05	4.15	2.08	23.98	6.19	16.21	2.04	12.52	1.73	0.27	0.24	0.01	0.12	0.03
43.8	18.05	0.03	3.61	3.43	9.38	0.02	1642	0.63	0.60	0.01	0.01	0.70	24.00	0.63	166.0	7.04	0.00	0.13	0.20	0.05	0.31	0.38	0.05	3.07	2.17	25.27	6.32	15.88	2.17	12.09	1.44	0.23	0.49	0.00	0.13	0.04
49.5	18.05	0.02	4.13	4.20	11.60	0.02	1792	0.77	0.77	0.01	0.01	0.79	27.10	0.69	182.5	8.45	0.08	0.08	0.28	0.04	0.24	0.66	0.06	4.69	2.57	27.97	7.02	18.06	2.30	13.16	1.94	0.27	0.27	0.00	0.19	0.02
53.5	18.05	0.02	4.06	4.10	11.46	0.02	1673	0.77	0.74	0.01	0.01	0.77	26.50	0.56	179.2	6.93	0.01	0.02	0.11	0.02	0.20	0.72	0.06	4.71	2.40	26.17	7.04	17.07	2.11	12.92	1.85	0.17	0.21	0.00	0.02	0.03
59.1	18.05	0.01	3.88	3.97	10.92	0.02	1653	0.83	0.74	0.01	0.01	0.80	28.70	0.56	175.4	5.74	0.01	0.05	0.19	0.02	0.17	0.69	0.06	4.73	2.54	26.67	6.88	17.25	2.02	12.56	1.78	0.26	0.23	0.00	0.08	0.01
64.1	18.05																																			
69.2	18.05	0.01	3.77	3.61	11.17	0.02	1585	0.70	0.70	0.01	0.01	0.75	26.60	1.06	173.4	5.52	0.03	0.11	0.25	0.03	0.30	0.74	0.05	4.82	2.36	26.17	6.46	16.10	1.97	12.15	1.71	0.17	0.17	0.00	0.65	0.02
75.7	18.05	0.01	3.90	3.88	10.09	0.02	1415	0.69	0.73	0.01	0.01	0.86	26.10	0.42	187.3	5.67	0.03	0.09	0.27	0.04	0.35	0.68	0.06	4.71	2.44	27.00	6.61	17.05	2.19	13.82	1.93	0.13	0.14	0.00	0.46	0.02
79.7	18.05																																			
83.7	18.05	0.01	3.61	3.59	10.23	0.02	1361	0.69	0.73	0.01	0.01	0.80	31.00	0.45	187.7	4.39	0.03	0.07	0.25	0.05	0.26	0.73	0.05	4.78	2.44	26.71	7.06	18.77	2.54	15.52	2.27	0.15	0.17	0.00	0.29	0.02
87.7	18.05	0.01	4.15	3.61	11.73	0.01	1660	0.65	0.76	0.01	0.01	0.99	36.00	0.67	252.7	4.15	bdl	0.01	0.08	0.11	0.40	0.79	0.20	6.32	2.71	36.09	8.84	23.46	2.89	21.66	2.89	0.23	0.03	0.00	0.04	0.06
91.7	18.05	0.01	3.74	3.81	10.86	0.02	1431	0.73	0.73	0.01	0.01	0.86	29.00	0.30	194.2	3.92	0.01	0.03	0.11	0.04	0.27	0.96	0.05	6.15	2.91	28.69	6.98	19.49	2.49	14.91	1.97	0.10	0.12	0.00	0.06	0.01
95.7	18.05	0.01	3.07	3.25	9.38	0.02	1372	0.67	0.61	0.01	0.01	0.87	28.00	0.09	140.8	4.33	0.06	0.11	0.09	0.03	0.34	1.57	0.10	7.40	2.53	27.07	6.14	14.80	1.19	9.93	1.19	bdl	0.05	0.00	0.12	0.02
100.0	18.05	0.01	3.09	3.16	9.85	0.02	1400	0.66	0.66	0.01	0.01	0.86	27.60	0.29	141.7	5.20	0.09	0.04	0.13	0.04	0.37	1.67	0.06	8.36	3.16	25.63	5.32	11.95	1.44	8.39	1.02	0.16	0.17	0.01	0.15	0.02

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
6150-A L2 (Grt-1)																																				
0.0	18.05	0.01	4.03	4.13	11.17	0.02	967	0.75	0.75	0.01	0.01	0.76	26.70	0.32	204.3	6.19	0.01	0.04	0.14	0.03	0.32	0.95	0.07	5.31	2.36	27.21	7.11	19.60	2.47	15.54	2.12	0.21	0.18	0.00	0.02	0.03
3.4	18.05	0.01	3.79	3.97	10.83	0.02	1065	0.61	0.79	0.01	0.01	0.72	47.00	0.32	176.9	7.94	0.03	0.29	0.49	0.05	0.47	0.90	0.04	4.33	2.17	21.66	5.59	18.05	2.17	12.81	1.64	0.27	0.42	0.00	0.13	0.07
6.7	18.05	0.01	3.74	3.90	10.43	0.02	1065	0.71	0.70	0.01	0.01	0.74	25.30	4.87	181.6	7.35	0.05	0.13	0.35	0.05	0.36	0.69	0.04	4.17	2.04	24.18	6.51	17.81	2.22	13.01	1.84	0.21	0.23	0.00	0.06	0.03
10.0	18.05	0.01	2.89	3.43	8.12	0.02	812	0.56	0.51	0.01	0.01	0.70	20.00	0.22	146.2	6.50	0.00	0.08	0.23	0.00	0.25	0.60	0.04	3.43	1.62	19.85	5.59	14.08	1.50	10.11	1.50	0.04	0.17	0.00	0.03	0.07
13.4	18.05	0.01	3.83	4.11	10.18	0.02	1054	0.71	0.69	0.01	0.01	0.74	25.90	0.51	173.6	7.33	0.03	0.04	0.20	0.05	0.28	0.64	0.04	3.52	1.93	22.41	6.23	16.24	2.04	12.49	1.72	0.23	0.17	0.00	0.03	0.02
16.8	18.05																																			
20.1	18.05	0.02	3.61	3.97	10.47	0.03	1011	0.78	0.76	0.01	0.01	0.69	23.00	0.72	198.5	9.02	bdl	0.04	0.14	0.01	0.47	0.61	0.02	3.61	1.79	23.46	6.68	19.85	2.17	12.63	1.80	0.06	0.23	0.00	0.02	0.02
23.5	18.05	0.01	4.15	4.28	11.53	0.02	1328	0.77	0.77	0.01	0.01	0.77	27.50	0.14	228.7	11.26	0.03	0.06	0.19	0.03	0.35	0.82	0.06	4.82	2.51	28.51	8.10	21.91	2.67	15.66	2.08	0.29	0.26	0.00	0.01	0.02
26.8	18.05	0.01	2.89	3.43	8.48	0.01	1209	0.65	0.58	0.01	0.01	0.60	19.00	0.13	198.5	7.76	0.14	0.09	0.23	0.03	0.23	0.74	0.01	3.61	2.17	25.27	7.40	19.85	2.71	15.34	1.80	0.02	0.29	0.02	0.00	0.00
30.1	18.05	0.01	3.83	4.11	11.46	0.02	1384	0.73	0.75	0.01	0.01	0.75	25.70	0.70	240.2	10.67	0.03	0.08	0.22	0.03	0.30	0.80	0.05	4.66	2.43	29.06	8.46	22.85	3.03	17.51	2.24	0.28	0.36	0.00	0.01	0.02
33.5	18.05	0.01	3.86	3.97	10.56	0.02	1346	0.70	1.14	0.01	0.01	0.76	25.70	0.69	230.6	10.18	0.40	0.15	0.38	0.04	0.37	0.79	0.07	4.37	2.36	29.72	8.36	24.53	3.10	17.45	2.40	0.22	0.28	0.01	0.05	0.02
38.7	18.05																																			
44.4	18.05	0.01	3.88	4.01	10.58	0.03	1428	0.75	1.80	0.01	0.01	0.82	28.10	0.42	284.6	11.42	0.04	0.03	0.17	0.02	0.26	0.97	0.07	5.56	2.84	36.00	10.79	31.35	3.93	22.45	3.04	0.30	0.31	0.00	0.02	0.16
49.4	18.05	0.01	3.46	3.92	10.11	0.02	1310	0.72	0.68	0.01	0.01	0.74	28.10	0.23	261.7	9.91	0.03	0.01	0.12	0.01	0.16	0.76	0.05	5.23	2.56	33.03	9.93	30.50	3.90	21.66	3.07	0.30	0.28	0.01	0.00	0.02
60.3	18.05	0.02	3.63	4.06	10.14	0.02	1301	0.71	0.69	0.01	0.01	0.80	25.30	0.63	256.3	11.35	0.05	0.05	0.14	0.02	0.24	1.03	0.06	5.13	2.42	30.68	9.37	29.24	4.02	23.53	3.46	0.33	0.29	0.00	0.03	0.02
63.6	18.05																																			
67.0	18.05	0.01	3.97	3.61	10.47	0.03	1281	0.76	0.76	0.01	0.01	0.79	26.00	0.17	252.7	10.83	bdl	0.03	0.15	bdl	0.40	1.15	0.01	6.14	2.35	30.68	9.75	32.48	3.79	25.27	3.79	0.45	0.32	0.00	0.05	0.07
70.4	18.05	0.02	3.66	3.56	10.83	0.02	1361	0.73	0.73	0.01	0.01	0.73	28.60	0.31	254.3	12.67	0.02	0.12	0.27	0.04	0.45	1.43	0.08	6.70	2.76	33.21	10.02	31.04	4.22	25.70	3.61	0.32	0.33	0.00	0.04	0.01
73.8	18.05	0.01	3.59	3.77	10.79	0.02	1379	0.88	0.75	0.01	0.01	0.83	29.40	0.40	247.2	12.58	0.00	0.04	0.15	0.02	0.31	1.68	0.06	7.98	2.91	32.30	10.00	30.86	4.06	25.09	3.63	0.31	0.26	0.00	0.01	0.01
77.1	18.05	0.01	3.25	3.79	10.65	0.03	1588	0.76	0.74	0.01	0.01	0.83	28.00	0.79	252.7	8.66	bdl	bdl	0.09	0.09	0.63	1.80	bdl	9.93	3.07	36.09	9.75	30.68	3.79	23.46	3.43	0.36	0.05	0.00	0.03	0.03
80.4	18.05	0.01	3.54	3.54	10.11	0.02	1325	0.72	0.72	0.01	0.01	0.81	26.00	0.51	214.8	8.25	0.03	0.04	0.15	0.03	0.41	1.79	0.05	9.06	3.12	29.96	8.14	25.09	3.46	21.66	2.92	0.26	0.21	0.01	0.01	0.01
83.8	18.05	0.01	3.07	2.89	7.94	0.01	1155	0.65	0.60	0.01	0.01	0.65	21.00	0.31	180.5	7.76	bdl	0.11	0.23	0.05	0.16	2.17	0.09	9.02	3.07	27.07	7.22	19.85	2.71	19.85	2.89	0.23	0.11	0.02	0.03	0.01
87.3	18.05	0.01	3.28	3.23	10.50	0.01	1382	0.83	0.71	0.01	0.01	0.81	26.30	0.65	189.5	7.80	0.00	0.02	0.12	0.03	0.43	2.20	0.08	11.69	3.56	28.69	6.88	20.39	2.87	19.67	2.73	0.14	0.15	0.00	0.01	0.02
91.4	18.05																																			
96.2	18.05	0.04	3.12	3.28	10.32	0.01	2039	0.70	0.74	0.01	0.01	0.84	26.20	0.27	141.1	11.19	0.05	0.54	1.19	0.15	1.15	2.80	0.17	13.10	3.63	24.54	5.16	14.44	2.26	13.44	2.04	0.22	0.27		0.05	0.06
100.0	18.05	0.01	3.01	3.28	10.09	0.01	1354	0.77	0.75	0.01	0.01	0.86	27.30	0.07	151.6	9.53	0.02	0.05	0.22	0.03	0.59	2.76	0.13	14.08	3.93	26.17	5.67	14.62	2.06	13.90	1.93	0.26	0.22	0.00	0.01	0.03
6150-A L3 (Grt-2)																																				
3.3	18.05	0.01	4.19	4.39	13.28	0.02	2887	0.94	0.96	0.01	0.01	0.76	27.99	0.56	302.3	14.06	0.04	0.26	0.65	0.07	0.75	3.00	0.11	16.80	4.94	43.38	12.36	46.13	7.53	55.17	9.24	0.37	0.38	0.01	0.06	0.02
13.7	18.05	0.03	3.88	4.01	11.68	0.02	1357	0.91	0.92	0.01	0.01	0.65	24.02	2.67	265.1	10.86	0.08	0.02	0.08	0.02	0.19	1.53	0.09	12.38	4.31	37.45	10.09	33.26	5.40	40.10	6.24	0.25	0.28	0.01	0.01	0.00
16.4	18.05	0.01	3.95	4.17	12.02	0.02	1850	0.86	0.87	0.01	0.01	0.69	25.00	0.92	267.1	12.92	0.01	0.07	0.21	0.03	0.41	2.02	0.10	11.10	3.84	36.82	10.54	38.08	6.03	42.59	6.73	0.35	0.36	0.00	0.02	0.01
16.4	18.05	0.01	3.95	4.17	12.02	0.02	1850	0.86	0.87	0.01	0.01	0.69	25.00	0.92	267.1	12.92	0.01	0.07	0.21	0.03	0.41	2.02	0.10	11.10	3.84	36.82	10.54	38.08	6.03	42.59	6.73	0.35	0.36	0.00	0.02	0.01
19.1	18.05	0.01	4.69	4.51	12.99	0.02	1805	0.81	0.85	0.01	0.01	0.69	25.00	1.34	270.7	15.16	0.04	0.01	0.11	0.03	0.07	2.53	0.07	8.66	3.43	36.09	11.19	36.09	6.32	45.12	6.68	0.27	0.32	0.00	0.00	0.01
21.8	18.05	0.01	4.02	4.28	11.59	0.03	1825	0.83	0.85	0.01	0.01	0.71	26.60	0.45	274.3	14.85	0.01	0.04	0.15	0.04	0.34	1.57	0.08	8.32	3.28	35.19	11.15	40.06	6.23	42.95	6.35	0.33	0.38	0.00	0.01	0.03
24.5	18.05	0.01	3.88	3.93	11.21	0.02	1823	0.80	0.80	0.01	0.01	0.68	25.90	1.17	261.7	13.86	0.02	0.02	0.10	0.08	0.28	1.40	0.05	7.67	2.96	33.57	10.92	38.26	6.01	40.42	5.96	0.35	0.35	0.01	0.01	0.01
27.2	18.05	0.01	3.61	3.79	10.65	0.02	1805	0.92	0.85	0.01	0.01	0.69	23.00	0.06	270.7	12.45	0.05	0.01	0.05	0.07	0.23	1.71	0.01	7.04	2.71	34.29	11.37	34.29	5.59	39.70	6.32	0.38	0.36	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
29.8	18.05	0.01	3.75	4.35	11.51	0.02	1671	0.77	0.79	0.01	0.01	0.67	27.50	0.52	265.3	11.53	0.03	0.01	0.11	0.02	0.34	1.48	0.07	6.80	2.74	32.30	10.34	37.18	5.97	40.42	6.05	0.30	0.32	0.00	0.01	0.01
32.5	18.05																																			
35.2	18.05	0.01	3.46	3.81	10.34	0.02	1446	0.71	0.71	0.01	0.01	0.73	26.50	0.31	236.4	8.46	0.02	0.04	0.16	0.04	0.37	1.26	0.06	6.08	2.45	28.15	9.10	31.76	5.00	33.75	5.40	0.20	0.29	0.00	0.03	0.01
37.9	18.05	0.01	3.61	3.25	10.11	0.02	1390	0.70	0.63	0.01	0.01	0.52	33.00	bdl	216.6	9.75	bdl	bdl	0.09	bdl	0.10	1.35	0.07	6.14	2.17	25.27	8.12	27.07	3.97	28.87	3.97	0.32	0.38	0.01	0.01	0.01
40.5	18.05	0.01	4.17	4.31	11.28	0.02	1603	0.80	0.81	0.01	0.01	0.81	27.50	0.32	240.0	12.65	bdl	0.03	0.10	0.03	0.37	1.52	0.05	6.21	2.63	29.78	9.22	30.32	4.67	32.66	5.02	0.33	0.31	0.00	0.02	0.02
43.2	18.05	0.01	3.43	3.25	10.83	0.03	1588	0.65	0.74	0.01	0.01	0.69	24.00	0.43	216.6	11.55	bdl	0.06	0.14	0.03	0.38	1.21	0.03	5.41	2.53	25.27	8.12	25.27	3.97	27.07	3.61	0.31	0.43	0.00	0.00	0.00
45.9	18.05	0.01	3.86	4.11	11.04	0.02	1496	0.75	0.79	0.01	0.01	0.80	27.90	0.43	212.6	11.77	0.03	0.07	0.18	0.03	0.35	1.35	0.08	6.46	2.54	27.43	7.96	24.90	3.66	24.90	3.56	0.31	0.38	0.00	0.06	0.01
48.6	18.05	0.01	3.61	4.87	9.93	0.01	1606	0.88	0.72	0.01	0.01	0.76	25.00	0.17	216.6	11.55	0.02	0.01	0.03	0.01	0.22	1.52	0.08	5.23	2.71	30.68	7.58	23.46	3.07	19.85	3.25	0.18	0.23	0.00	0.00	0.00
51.4	18.05	0.01	3.52	3.92	9.80	0.02	1408	0.71	0.70	0.01	0.01	0.74	26.20	0.45	193.3	11.91		0.01	0.06	0.02	0.32	1.06	0.06	5.49	2.27	25.09	7.09	21.30	3.12	19.85	2.74	0.36	0.32	0.00	0.00	0.00
54.1	18.05																																			
62.1	18.05	0.01	3.70	3.92	10.76	0.02	1514	0.73	0.71	0.01	0.01	0.78	25.10	0.61	193.1	7.96	0.06	0.14	0.32	0.05	0.36	0.83	0.05	4.49	2.08	24.90	6.97	20.21	2.65	16.96	2.24	0.29	0.24	0.00	0.08	0.01
65.2	18.05																																			
72.8	18.05	0.01	3.52	3.68	10.36	0.01	1491	0.69	0.69	0.01	0.01	0.83	25.80	0.72	218.4	3.95	0.02	0.01	0.09	0.02	0.28	1.15	0.07	6.46	2.78	29.06	7.36	19.49	2.65	15.54	2.04	0.07	0.09	0.00	0.00	0.02
75.5	18.05	0.01	3.57	3.90	10.83	0.02	1588	0.74	0.76	0.01	0.01	0.81	29.80	1.99	225.6	4.28		0.02	0.09	0.03	0.36	1.14	0.05	7.90	3.14	32.30	7.65	20.21	2.44	15.03	1.91	0.14	0.09	0.00	0.02	0.04
78.2	18.05																																			
80.9	18.05	0.01	3.66	3.77	11.06	0.02	1639	0.75	0.77	0.01	0.01	0.78	27.90	0.34	200.0	4.26	0.01	0.01	0.05	0.02	0.38	1.80	0.06	8.82	3.39	31.04	6.86	17.14	2.27	12.96	1.76	0.12	0.09	0.00	0.01	0.01
84.0	18.05	0.00	3.43	3.43	11.37	0.01	1480	0.74	0.78	0.01	0.01	0.65	30.00	0.69	167.8	6.14	bdl	bdl	0.03	0.12	0.60	1.62	0.14	10.11	3.43	32.48	6.32	14.62	1.99	10.83	1.35	0.15	0.25	0.01	0.00	0.00
87.0	18.05	0.01	3.39	3.46	10.43	0.01	1539	0.67	0.70	0.01	0.01	0.76	27.40	0.51	170.2	5.99	0.05	0.01	0.05	0.03	0.43	1.79	0.07	10.86	3.77	28.87	6.05	14.37	1.80	10.72	1.30	0.19	0.19	0.01	0.00	0.02
90.3	18.05																																			
93.6	18.05	0.01	3.18	3.57	10.72	0.02	1465	0.71	0.71	0.01	0.01	0.90	29.50	0.27	129.6	8.25	0.18	0.08	0.21	0.05	0.46	2.20	0.06	11.48	3.46	24.90	4.60	9.98	1.22	7.60	0.88	0.28	0.25	0.00	0.01	0.02
96.3	18.05	0.01	3.97	3.43	11.55	0.01	1787	0.85	0.76	0.01	0.01	0.85	29.00	0.29	131.7	7.58	0.01	0.04	0.32	0.04	0.58	2.35	0.16	12.45	3.25	19.85	3.79	10.29	0.79	6.68	0.63	0.22	0.05	0.00	0.01	0.00
100.0	18.05	0.01	2.74	3.07	9.49	0.02	1258	0.65	0.64	0.01	0.01	0.83	27.30	0.34	91.7	7.47	0.67	0.20	0.47	0.07	0.58	1.95	0.09	10.03	2.80	16.80	3.00	6.46	0.81	4.67	0.58	0.26	0.22	0.00	0.03	0.03
6150-A L4 (Grt-2)																																				
0.0	18.05	0.02	4.08	4.16	12.94	0.02	1890	0.85	0.88	0.01	0.02	0.75	27.80	0.83	277.9	14.73	0.17	1.12	2.24	0.24	1.39	2.17	0.20	12.09	4.08	37.72	11.17	39.83	6.17	44.99	6.97	0.37	0.41	0.01	1.59	0.08
1.6	18.05																																			
3.3	18.05	0.01	3.77	3.95	11.51	0.02	1536	0.86	0.83	0.01	0.01	0.70	25.20	1.28	232.3	10.76	0.04	0.39	0.90	0.13	0.83	2.20	0.11	11.97	3.59	31.58	8.86	31.40	5.02	36.09	5.83	0.22	0.32	0.00	0.64	0.04
4.9	18.05																																			
6.5	18.05	0.01	3.90	4.11	10.83	0.01	1245	0.84	0.81	0.01	0.01	0.72	28.10	1.43	233.4	7.85	0.05	0.10	0.32	0.04	0.31	2.06	0.09	12.89	4.04	33.69	8.97	30.48	5.13	38.66	6.19	0.15	0.19	0.01	0.15	0.03
8.2	18.05																																			
9.8	18.05	0.01	3.79	4.19	11.04	0.01	1155	0.82	0.84	0.01	0.01	0.74	27.30	1.28	232.4	8.52	0.02	0.04	0.17	0.03	0.40	2.29	0.12	12.29	3.84	32.57	9.06	31.04	5.18	39.70	6.46	0.19	0.16	0.00	0.05	0.02
11.4	18.05	0.01	4.15	4.33	11.01	0.02	1281	0.79	0.81	0.01	0.01	0.79	31.00	1.46	216.6	11.19	0.04	0.08	0.22	0.04	0.54	2.89	0.20	11.19	3.61	30.68	9.02	32.48	5.59	41.51	6.32	0.58	0.27	0.00	0.05	0.02
13.1	18.05	0.01	3.84	3.99	10.65	0.02	1133	0.76	0.78	0.01	0.01	0.73	25.70	0.90	202.7	13.46	0.03	0.09	0.24	0.04	0.47	2.31	0.10	10.54	3.07	28.69	8.50	30.86	5.09	37.72	6.48	0.40	0.39	0.00	0.07	0.05
14.7	18.05																																			
16.3	18.05	0.01	3.74	4.10	10.49	0.02	1034	0.76	0.77	0.01	0.01	0.70	24.80	0.67	205.4	9.64	0.01	0.02	0.11	0.03	0.42	2.02	0.08	9.37	2.92	28.15	8.93	34.47	5.54	42.41	7.35	0.21	0.20	0.00	0.01	0.02
18.0	18.05																																			
19.6	18.05	0.01	3.80	4.04	10.45	0.02	1159	0.80	0.80	0.01	0.01	0.73	26.50	0.96	204.3	12.00	0.00	0.02	0.10	0.03	0.40	2.20	0.10	9.47	2.83	28.23	9.47	38.21	6.14	45.66	7.78	0.30	0.26	0.01	0.02	0.03
21.3	18.05	0.01	4.01	4.11	10.92	0.02	1189	0.78	0.78	0.01	0.01	0.72	27.00	0.63	214.0	13.34	0.03	0.04	0.15	0.03	0.35	1.94	0.11	9.37	3.07	28.69	9.75	38.98	6.41	46.74	8.34	0.39	0.41	0.00	0.02	0.03

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
22.9	18.05	0.01	2.89	3.43	9.20	0.02	1155	0.54	0.61	0.01	0.01	0.54	20.00	0.32	180.5	21.66	0.01	0.01	0.02	0.01	0.06	1.77	0.10	7.40	2.53	27.07	8.48	36.09	5.96	43.31	8.66	0.54	0.54	0.00	0.06	0.11
24.6	18.05	0.01	4.37	4.73	11.13	0.02	1298	0.72	0.74	0.01	0.01	0.73	26.00	0.51	226.7	21.30	0.04	0.16	0.37	0.04	0.31	1.76	0.09	9.60	3.03	31.18	10.88	45.30	7.85	58.69	10.34	0.65	0.63	0.00	0.14	0.21
26.2	18.05																																			
28.2	18.05	0.01	4.08	4.01	10.32	0.02	1195	0.73	0.73	0.01	0.01	0.71	26.80	0.47	252.7	16.10	0.02	0.02	0.14	0.04	0.33	1.68	0.07	7.33	2.62	32.48	13.12	57.03	9.62	71.10	12.78	0.37	0.35	0.01	0.05	0.05
29.8	18.05	0.01	3.61	3.97	10.65	0.02	1642	0.65	0.88	0.01	0.01	0.78	26.00	0.99	252.7	13.17	0.05	0.10	0.08	0.04	0.38	1.23	0.12	9.02	3.43	39.70	12.63	52.34	9.75	68.58	12.27	0.25	0.31	0.00	0.05	0.09
31.5	18.05	0.01	4.08	3.97	10.56	0.02	1305	0.77	0.77	0.01	0.01	0.76	26.20	0.72	232.8	11.44	0.07	0.18	0.52	0.05	0.43	1.45	0.09	10.09	3.68	33.39	10.18	40.06	6.77	52.70	9.40	0.32	0.34	0.01	0.30	0.06
43.5	18.05	0.01	3.57	3.68	11.15	0.01	1556	0.78	0.78	0.01	0.01	0.67	25.30	1.26	245.4	7.74	0.01	0.06	0.14	0.03	0.38	1.91	0.08	12.06	3.84	33.93	9.80	35.91	6.10	46.38	8.36	0.23	0.17	0.00	0.02	0.02
45.4	18.05																																			
50.5	18.05	0.01	3.66	3.99	12.11	0.01	1527	0.84	0.83	0.01	0.01	0.76	26.70	0.79	274.0	6.71	0.08	0.12	0.36	0.06	0.49	2.40	0.14	14.28	4.51	38.37	9.82	32.75	5.25	38.71	6.19	0.17	0.17	0.00	0.06	0.02
53.6	18.05	0.01	3.34	3.70	11.33	0.01	1424	0.78	0.78	0.01	0.01	0.76	26.20	0.56	225.8	7.67	0.07	0.15	0.38	0.05	0.32	1.99	0.08	11.91	3.65	31.22	8.81	28.15	4.62	33.39	5.29	0.25	0.36	0.00	0.06	0.03
55.3	18.05	0.01	3.48	3.83	10.90	0.02	1276	0.76	0.78	0.01	0.01	0.72	25.70	0.60	221.8	11.73	0.18	0.12	0.28	0.04	0.32	1.89	0.09	10.88	3.52	30.14	8.27	27.25	4.30	31.76	5.13	0.46	0.36	0.00	0.06	0.04
57.7	18.05	0.01	3.39	3.63	10.85	0.02	1159	0.70	0.75	0.01	0.01	0.73	28.30	0.37	202.3	10.20	0.05	0.04	0.17	0.04	0.32	1.54	0.09	8.81	3.00	26.89	7.63	24.71	4.08	29.24	4.62	0.29	0.29	0.00	0.04	0.03
59.3	18.05	0.01	4.15	4.10	11.10	0.02	1307	0.76	0.76	0.01	0.01	0.85	28.20	0.54	215.1	11.03	0.03	0.01	0.12	0.02	0.41	1.64	0.08	8.66	2.94	28.87	8.32	27.61	4.28	31.58	4.76	0.27	0.32	0.01	0.01	0.05
60.9	18.05																																			
62.6	18.05	0.01	3.41	3.83	10.21	0.02	1166	0.71	0.72	0.01	0.01	0.76	29.00	0.25	192.4	10.54	0.01	0.10	0.25	0.04	0.36	1.44	0.06	6.48	2.33	24.36	7.54	25.45	3.93	26.89	4.20	0.35	0.25	0.00	0.04	0.02
64.2	18.05																																			
65.8	18.05	0.01	3.23	3.50	9.26	0.02	1036	0.67	0.66	0.01	0.01	0.69	27.20	0.40	182.3	8.88	0.01	0.04	0.19	0.03	0.32	1.16	0.06	5.13	2.01	22.92	7.09	24.31	3.54	25.48	3.83	0.28	0.24	0.00	0.03	0.02
67.5	18.05	0.01	3.07	3.25	10.47	0.03	1065	0.72	0.69	0.01	0.01	0.76	25.00	bdl	198.5	9.56	bdl	0.05	0.22	bdl	0.51	1.41	0.08	5.77	2.17	28.87	7.76	28.87	3.79	28.87	3.97	0.29	0.36	0.00	0.03	0.01
69.1	18.05	0.01	3.39	3.61	10.02	0.02	1137	0.71	0.70	0.01	0.01	0.72	25.40	0.36	198.5	8.81	0.00	0.01	0.10	0.02	0.32	1.38	0.06	6.48	2.31	25.45	7.76	26.71	4.04	27.61	4.20	0.26	0.24	0.01	0.01	0.02
70.7	18.05	0.01	3.46	3.56	10.09	0.02	1137	0.73	0.69	0.01	0.01	0.75	24.50	0.34	209.3	7.89	0.05	0.02	0.10	0.03	0.32	1.63	0.08	7.51	2.71	25.99	7.54	25.99	4.13	27.97	4.37	0.14	0.16	0.00	0.01	0.08
72.4	18.05																																			
92.9	18.05	0.01	3.43	3.61	12.45	0.01	1805	0.83	0.90	0.01	0.01	0.79	27.00	0.43	270.7	7.04	0.07	0.01	0.18	0.02	0.52	2.35	bdl	16.06	4.87	41.51	9.38	25.27	4.33	27.07	4.15	0.10	0.31	0.00	0.00	0.02
94.6	18.05	0.01	3.66	3.85	13.19	0.01	1926	0.90	0.94	0.01	0.01	0.86	29.03	0.79	293.6	6.86	0.08	0.08	0.21	0.04	0.50	2.76	0.14	14.91	4.67	40.70	9.85	28.17	4.11	28.19	4.08	0.17	0.16	0.01	0.01	0.02
96.2	18.05	0.01	3.61	3.77	13.10	0.01	1868	0.92	0.92	0.01	0.01	0.86	29.11	0.65	275.9	5.81	0.02	0.03	0.10	0.03	0.55	2.22	0.09	12.31	4.15	37.70	9.19	24.83	3.50	23.05	3.12	0.14	0.15	0.01		0.01
98.0	18.05																																			
100.0	18.05	0.01	3.19	3.32	11.77	0.02	1668	0.80	0.81	0.01	0.01	0.84	29.40	0.42	194.9	4.62	0.03	0.01	0.03	0.04	0.33	1.25	0.08	6.19	2.85	28.15	6.91	17.25	2.15	13.77	1.69	0.14	0.14	0.00	0.00	0.02
6150-A L5 (Grt-3)																																				
0.0	18.05	0.01	4.09	4.27	14.58	0.01	2433	1.04	1.03	0.01	0.01	0.79	29.65	0.85	519.8	10.02	0.02	0.07	0.18	0.05	0.57	2.33	0.14	8.92	3.72	53.24	23.46	125.61	29.49	275.39	53.96	0.18	0.29	0.00	0.08	0.02
4.1	18.05																																			
8.2	18.05	0.01	3.99	4.19	13.55	0.01	2373	0.96	0.97	0.01	0.01	0.81	29.51	0.52	417.6	12.16	0.01	0.05	0.14	0.03	0.55	2.56	0.11	10.95	3.68	47.25	19.02	97.09	21.19	190.94	36.80	0.32	0.29	0.00	0.05	0.02
12.3	18.05	0.01	3.79	3.97	13.17	0.01	2527	0.88	0.97	0.01	0.01	0.78	30.00	bdl	379.0	10.83	0.04	0.06	0.34	0.03	1.03	2.35	0.13	11.91	4.69	50.53	16.24	83.02	16.24	146.18	25.27	0.23	0.56	0.00	0.07	0.06
16.4	18.05	0.01	3.82	4.07	13.30	0.01	2209	0.97	0.95	0.01	0.01	0.79	31.40	0.70	353.7	11.28	0.16	0.06	0.19	0.05	0.67	2.63	0.08	13.86	4.71	46.02	15.16	69.30	13.59	117.85	21.55	0.21	0.33	0.01	0.06	0.23
20.5	18.05	0.01	3.56	3.86	12.78	0.01	1909	0.90	0.90	0.01	0.01	0.76	29.70	0.52	310.4	10.18	0.07	0.11	0.23	0.05	0.58	2.51	0.13	14.80	5.00	43.31	12.47	49.27	9.24	77.78	13.77	0.30	0.26	0.01	0.20	0.01
24.6	18.05	0.01	3.07	3.61	10.83	0.01	1137	0.79	0.87	0.00	0.00	0.88	31.00	bdl	288.8	7.58	0.01	0.05	0.34	0.01	0.31	1.28	0.14	12.99	4.51	48.73	10.83	39.70	5.77	46.92	7.58	0.25	0.23	0.02	0.45	0.01
28.6	18.05	0.01	3.61	3.65	11.17	0.01	1377	0.84	0.82	0.00	0.00	0.77	26.90	0.32	261.7	6.24	0.01	0.02	0.07	0.02	0.15	0.90	0.07	10.56	4.40	40.61	10.34	34.29	6.03	45.66	7.53	0.15	0.16	0.00	0.09	0.02
40.6	18.05	0.01	3.72	3.90	11.41	0.02	1308	0.79	0.80	0.03	0.03	0.79	27.90	0.21	209.3	8.23	0.43	0.07	0.32	0.05	0.52	2.06	0.08	9.46	3.07	27.97	8.54	30.86	4.98	37.18	5.54	0.20	0.21	0.02	0.03	0.02
45.0	18.05	0.01	3.61	3.70	10.29	0.01	1285	0.77	0.73	0.03	0.03	0.74	28.80	0.44	194.5	6.50	0.49	0.05	0.25	0.04	0.54	1.80	0.10	9.10	2.96	26.89	7.74	27.79	4.46	34.11	5.02	0.18	0.15	0.01	0.01	0.02

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
57.8	18.05	0.01	3.78	3.97	12.13	0.01	1393	0.83	0.82	0.02	0.02	0.82	29.60	0.32	259.2	9.02	0.29	0.15	0.45	0.10	0.61	2.09	0.11	11.91	3.88	34.11	9.42	34.83	6.12	48.73	7.29	0.32	0.29	0.01	0.03	0.03
61.9	18.05																																			
66.0	18.05	0.01	3.74	3.77	11.12	0.01	1325	0.77	0.78	0.01	0.01	0.72	28.60	0.36	281.5	7.56	0.43	0.13	0.52	0.06	0.51	2.04	0.08	8.16	3.01	35.01	11.87	49.45	9.42	72.37	11.60	0.26	0.27	0.01	0.04	0.05
70.1	18.05																																			
74.3	18.05	0.01	3.66	4.04	10.52	0.01	1245	0.70	0.72	0.01	0.01	0.81	28.80	0.99	240.0	6.05	0.13	0.08	0.30	0.04	0.47	1.66	0.08	6.75	2.53	29.96	10.21	42.77	7.49	59.55	9.51	0.21	0.15	0.00	0.02	0.05
78.4	18.05																																			
82.5	18.05	0.01	3.46	3.72	10.16	0.02	1115	0.69	0.69	0.01	0.01	0.75	26.70	0.24	196.7	5.58	0.17	0.11	0.35	0.04	0.47	1.61	0.05	7.53	2.49	25.63	8.07	31.04	5.43	40.24	6.51	0.20	0.18	0.00	0.06	0.03
86.6	18.05																																			
100.0	18.05	0.04	1.75	1.91	5.68	0.01	606	0.45	0.47	0.01	0.01	0.35	13.50	1.66	107.0	3.14	0.08	0.12	0.27	0.03	0.16	0.52	0.04	4.58	1.73	15.45	3.97	13.19	2.06	15.41	2.27	0.10	0.14	0.01	0.08	0.01
6150-A L6 (Grt-3)																																				
0.0	18.05	0.01	3.37	3.59	10.43	0.01	863	0.78	0.77	0.02	0.02	0.69	26.80	0.29	258.1	7.62	0.26	0.09	0.34	0.04	0.42	1.56	0.11	8.88	2.96	32.12	11.60	56.31	12.13	110.81	21.48	0.19	0.23	0.01	0.11	0.02
3.4	18.05	0.01	3.57	3.80	10.30	0.01	855	0.75	0.79	0.02	0.02	0.74	28.40	0.29	228.1	6.84	0.29	0.07	0.27	0.04	0.36	1.81	0.09	9.28	3.18	30.05	9.49	43.85	9.06	80.67	15.25	0.19	0.19	0.01	0.05	0.02
6.8	18.05																																			
10.2	18.05	0.01	3.27	3.45	10.29	0.01	843	0.71	0.74	0.01	0.01	0.71	26.40	0.31	197.4	6.19	0.70	0.11	0.32	0.04	0.30	1.41	0.09	9.84	3.16	28.15	8.01	33.39	6.12	54.86	9.31	0.20	0.16	0.01	0.09	0.03
31.0	18.05	0.02	3.54	3.86	12.61	0.01	1552	0.85	0.88	0.02	0.02	0.73	28.20	0.47	257.9	16.06	1.34	0.22	0.63	0.09	0.54	2.22	0.15	12.31	3.83	35.19	10.99	42.77	7.27	51.97	7.96	0.38	0.46	0.04	0.14	0.08
34.4	18.05	0.03	3.97	4.15	13.72	0.01	1678	0.97	0.96	0.02	0.01	0.83	30.00	bdl	306.8	12.09	0.12	0.22	1.19	0.05	0.51	2.53	0.07	13.90	4.15	46.92	13.35	54.14	9.20	59.55	9.75	0.40	0.42	0.00	0.05	0.00
37.7	18.05	0.02	3.77	3.95	12.45	0.01	1601	0.86	0.90	0.01	0.01	0.75	27.50	0.54	294.7	10.86	0.11	0.96	0.43	0.04	0.58	2.31	0.11	13.28	4.48	40.68	11.84	42.86	7.38	52.52	8.36	0.29	0.25	0.00	0.14	0.03
62.4	18.05	0.16	3.77	4.01	12.34	0.01	1594	0.84	0.85	0.01	0.01	0.72	26.80	0.34	267.1	7.38	0.14	0.11	0.31	0.04	0.32	1.88	0.10	12.06	3.88	35.19	10.02	34.47	5.65	41.51	6.06	0.19	0.22	0.01	0.12	0.01
72.5	18.05	0.01	3.57	3.83	11.95	0.02	1404	0.90	0.92	0.01	0.01	0.74	26.40	0.49	252.7	9.53	0.22	0.10	0.22	0.04	0.29	1.66	0.10	9.85	3.12	31.15	9.10	29.92	4.53	32.79	4.37	0.38	0.36	0.01	0.01	0.01
75.9	18.05	0.01	3.61	3.43	11.91	0.02	1263	0.81	0.87	0.01	0.01	0.74	27.00	0.12	234.6	7.94	0.38	0.08	0.20	0.03	0.10	1.80	0.09	9.02	2.89	28.87	7.22	23.46	3.79	28.87	3.97	0.36	0.18	0.01	0.02	0.06
79.3	18.05	0.03	3.39	3.50	11.51	0.02	1377	0.84	0.84	0.01	0.01	0.72	26.70	1.57	211.2	7.96	0.65	0.36	0.69	0.08	0.69	1.53	0.06	8.03	2.73	26.53	7.49	25.09	3.57	24.18	3.28	0.38	0.42	0.00	0.30	0.03
82.7	18.05	0.04	3.21	3.43	10.79	0.02	902	0.84	0.85	0.01	0.01	0.77	25.70	0.88	203.0	6.17	0.04	0.21	0.49	0.04	0.39	1.45	0.09	7.20	2.49	25.32	7.11	22.29	3.39	22.32	2.99	0.19	0.21	0.00	0.09	0.02
96.6	18.05	0.01	3.27	3.28	10.43	0.02	1070	0.68	0.69	0.01	0.01	0.75	27.10	0.47	166.0	6.57	0.12	0.16	0.69	0.07	0.58	1.35	0.11	7.89	2.54	23.28	6.14	16.78	2.45	16.78	2.24	0.18	0.16	0.01	0.03	0.14
100.0	18.05																																			
6150-A L7 (Grt-4)																																				
0.0	18.05	0.01	3.95	4.28	14.02	0.01	2509	1.03	1.03	0.01	0.01	0.84	28.80	0.18	357.3	13.59	0.01	0.29	0.50	0.08	0.77	2.89	0.14	18.95	6.35	54.32	14.71	53.60	9.35	74.53	12.92	0.38	0.34	0.00	0.07	0.02
4.9	18.05	0.01	4.24	4.24	13.54	0.02	2420	0.98	0.99	0.01	0.01	0.85	29.57	0.74	346.0	17.69	0.01	0.26	0.46	0.09	0.71	2.51	0.13	14.31	4.78	49.47	16.42	65.69	11.71	88.43	16.10	0.50	0.40	0.02	0.12	0.06
9.8	18.05	0.01	3.97	4.15	13.17	0.02	2166	1.01	0.97	0.02	0.01	0.88	31.00	0.08	397.0	18.05	bdl	0.04	0.15	0.06	0.61	2.17	0.06	9.02	4.33	50.53	21.66	83.02	16.78	120.91	19.85	0.52	0.14	0.04	0.00	0.00
14.7	18.05	0.01	3.92	4.13	13.57	0.02	2350	0.97	0.98	0.01	0.01	0.88	29.53	0.72	394.7	19.42	bdl	0.04	0.11	0.03	0.72	2.63	0.08	10.38	4.01	50.75	20.25	88.97	15.66	115.50	20.99	0.48	0.52	0.01	0.02	0.02
19.5	18.05	0.01	3.97	4.15	13.90	0.02	2527	1.12	1.05	0.02	0.01	0.90	31.00	1.46	415.1	18.05	0.01	0.07	0.07	0.00	0.47	1.99	0.06	11.01	4.15	48.73	19.85	88.43	16.96	111.89	21.66	0.32	0.31	0.08	0.07	0.05
24.3	18.05	0.01	3.66	3.59	12.27	0.02	1806	0.86	0.91	0.01	0.01	0.86	29.10	0.32	303.2	14.89	0.01	0.14	0.40	0.06	0.57	2.11	0.07	11.77	3.90	40.79	14.26	59.01	10.54	80.13	14.24	0.35	0.39	0.01	0.12	0.02
30.0	18.05																																			
38.5	18.05	0.05	2.94	2.95	9.93	0.01	1117	0.85	0.82	0.01	0.01	0.72	25.60	2.04	232.4	8.05	0.47	0.64	2.02	0.14	0.94	0.94	0.12	9.53	3.81	34.47	9.24	32.12	5.81	48.37	8.08	0.27	0.18	0.01	0.14	0.18
45.2	18.05	0.01	3.48	3.56	11.68	0.01	1557	0.81	0.85	0.01	0.01	0.89	28.20	0.42	247.2	11.78	0.05	0.12	0.31	0.04	0.49	2.36	0.13	13.91	4.78	37.18	10.11	36.27	7.00	57.75	10.11	0.37	0.29	0.00	0.07	0.02
50.0	18.05	0.01	3.43	3.43	14.08	0.02	1805	0.92	0.90	0.01	0.01	1.08	36.00	0.29	252.7	14.44	0.16	0.18	0.14	0.11	0.81	2.89	bdl	13.72	4.33	34.29	11.01	45.12	7.58	63.16	9.56	0.36	0.69	0.00	0.05	0.00
54.9	18.05	0.01	3.63	3.66	11.82	0.02	1428	0.84	0.83	0.01	0.01	0.86	28.10	0.52	229.2	12.25	0.03	0.05	0.23	0.04	0.44	2.38	0.08	11.97	3.57	32.66	10.11	41.69	7.51	60.28	10.81	0.39	0.26	0.00	0.06	0.02

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
62.0	18.05	0.01	3.45	3.74	11.19	0.02	1366	0.83	0.81	0.01	0.01	0.80	28.10	0.42	233.7	10.85	0.02	0.03	0.16	0.02	0.52	2.35	0.07	11.23	3.54	32.02	10.30	42.95	7.96	62.62	11.46	0.28	0.23		0.01	0.01
66.8	18.05																																			
72.7	18.05	0.01	3.05	3.16	10.09	0.02	1189	0.72	0.70	0.01	0.01	0.78	26.30	0.31	250.9	8.81	0.00	0.05	0.16	0.04	0.45	1.79	0.07	8.19	2.67	31.22	11.77	52.34	9.29	72.73	12.63	0.17	0.23	0.00	0.02	0.02
78.6	18.05																																			
84.7	18.05	0.01	2.98	3.27	9.56	0.02	1095	0.68	0.69	0.01	0.01	0.77	26.30	0.23	234.6	9.08	0.02	0.09	0.21	0.02	0.31	1.65	0.06	7.00	2.47	29.06	11.21	48.37	8.46	66.95	11.15	0.25	0.20	0.01	0.06	0.02
94.0	18.05	0.01	3.21	3.34	10.54	0.02	1227	0.74	0.78	0.01	0.01	0.88	29.20	0.20	259.9	10.18	0.01	0.06	0.15	0.03	0.37	2.04	0.08	8.66	3.05	32.30	11.86	51.43	8.77	65.87	11.30	0.21	0.20	0.00	0.08	0.02
100.0	18.05																																			

6150-A L8 (Grt-5)

0.0	18.05	0.01	4.06	4.31	14.46	0.02	2546	1.01	1.03	0.01	0.01	0.86	29.62	0.43	330.6	14.94	0.04	0.27	0.51	0.11	0.97	2.76	0.13	14.62	5.09	47.82	14.20	48.18	7.29	49.99	7.45	0.53	0.40	0.00	0.25	0.05
3.3	18.05	0.01	4.05	4.24	13.66	0.02	2406	0.95	0.99	0.01	0.01	0.88	30.08	0.36	310.4	16.37	0.04	0.10	0.23	0.03	0.66	2.76	0.09	11.77	4.07	42.48	13.79	49.07	7.16	48.56	7.31	0.34	0.43		0.06	0.02
6.5	18.05	0.01	4.12	4.25	13.85	0.02	2375	0.97	0.99	0.01	0.01	0.88	30.10	0.40	300.5	18.68	0.03	0.29	0.66	0.09	1.14	2.71	0.12	11.89	4.06	42.77	13.81	49.25	6.95	47.46	6.98	0.53	0.43	0.01	0.29	0.02
9.7	18.05																																			
27.4	18.05	0.01	3.34	3.54	10.85	0.02	1640	0.76	0.77	0.01	0.01	0.77	24.80	0.47	227.4	13.72	0.08	0.38	1.14	0.10	0.77	1.86	0.06	8.63	3.09	30.50	9.10	30.50	4.42	30.86	4.37	0.43	0.42	0.01	1.26	0.06
30.7	18.05	0.01	3.34	3.37	10.76	0.02	1588	0.76	0.77	0.01	0.01	0.71	25.20	0.40	225.6	11.50	0.03	0.24	0.56	0.07	0.60	1.57	0.09	7.20	2.65	28.51	8.95	31.22	4.67	30.32	4.37	0.33	0.36	0.01	0.53	0.03
33.9	18.05	0.01	3.79	3.79	11.37	0.02	1714	0.85	0.85	0.01	0.01	0.78	27.00	0.32	270.7	11.55	0.00	0.22	0.45	0.03	1.30	2.17	0.04	8.66	2.89	32.48	10.11	36.09	4.69	34.29	4.87	0.32	0.25	0.00	0.20	0.08
37.4	18.05	0.01	3.81	3.86	12.47	0.01	1722	0.88	0.92	0.01	0.01	0.82	27.90	0.32	289.8	10.52	0.13	0.14	0.30	0.05	0.61	2.31	0.08	12.02	4.02	37.90	10.90	36.58	5.36	37.21	5.23	0.21	0.22	0.01	0.19	0.02

6150-A L9 (Grt-5)

0.0	18.05	0.02	3.81	3.82	12.00	0.02	4331	0.81	0.87	0.01	0.01	0.83	26.90	0.43	308.1	13.73	0.01	0.03	0.08	0.04	0.46	2.58	0.07	11.53	3.83	41.15	13.44	50.71	8.16	58.83	8.95	0.36	0.32	0.00	0.05	0.01
3.2	18.05	0.01	3.61	3.61	12.63	0.02	1588	0.96	0.90	0.01	0.01	0.88	28.00	0.22	288.8	13.17	0.00	0.09	0.07	0.09	0.29	1.46	0.07	12.63	3.25	39.70	14.80	55.95	7.76	57.75	9.56	0.38	0.29	0.00	0.00	0.03
6.4	18.05	0.01	3.50	3.74	11.53	0.02	1381	0.84	0.82	0.01	0.01	0.81	28.40	0.36	292.5	13.39	0.09	0.15	0.40	0.06	0.62	2.24	0.09	10.52	3.52	38.08	12.98	51.07	8.48	62.98	10.05	0.35	0.40	0.01	0.11	0.03
9.6	18.05	0.01	3.74	3.84	11.69	0.02	1341	0.80	0.82	0.01	0.01	0.83	26.10	0.42	277.6	12.80	0.05	0.13	0.31	0.06	0.51	2.15	0.09	9.89	3.30	35.03	12.51	52.52	8.97	66.05	10.58	0.34	0.29	0.00	0.12	0.03
12.7	18.05	0.04	3.79	3.97	10.65	0.02	1065	0.78	0.96	0.01	0.01	0.92	30.00	bdl	306.8	13.17	0.02	bdl	0.09	0.02	0.51	2.71	0.05	8.12	3.25	30.68	12.81	54.14	9.02	75.80	11.37	0.29	0.42	0.00	0.08	0.01
15.9	18.05	0.01	3.90	3.68	11.26	0.02	1222	0.79	0.82	0.01	0.01	0.80	27.60	0.34	272.3	12.16	0.00	0.03	0.12	0.03	0.43	2.04	0.08	9.56	3.17	33.03	12.09	50.71	9.20	70.38	11.68	0.32	0.33	0.00	0.01	0.02
19.0	18.05	0.01	4.87	4.33	13.90	0.02	1426	0.97	1.01	0.01	0.01	1.03	28.00	1.41	360.9	13.17	0.01	0.20	0.40	0.07	0.31	3.25	0.11	9.93	3.79	43.31	15.88	64.97	12.45	99.26	16.96	0.52	0.29	0.00	0.25	0.03
22.1	18.05	0.01	3.56	3.72	11.04	0.02	1234	0.80	0.80	0.01	0.01	0.81	27.00	0.30	303.0	9.71	0.01	0.14	0.23	0.03	0.43	1.95	0.07	8.97	3.01	36.27	13.37	61.72	11.46	92.22	15.20	0.22	0.22	0.01	0.18	0.02
25.2	18.05	0.01	3.74	3.75	11.39	0.02	1198	0.77	0.80	0.01	0.01	0.82	28.70	0.20	314.0	7.56	0.00	0.02	0.08	0.01	0.27	1.91	0.07	9.08	2.85	35.73	14.08	66.77	12.67	101.42	16.87	0.13	0.13	0.01	0.02	0.01
28.4	18.05																																			
31.5	18.05	0.01	3.43	3.65	10.58	0.02	1086	0.77	0.75	0.01	0.01	0.83	26.60	0.14	303.2	7.16	0.00	0.15	0.31	0.05	0.30	1.80	0.08	7.20	2.58	33.30	14.02	67.31	13.26	109.00	18.84	0.18	0.15	0.00	0.11	0.01
34.7	18.05	0.01	3.43	3.43	9.75	0.02	956	0.67	0.72	0.01	0.01	0.70	28.00	0.74	288.8	10.11	0.00	0.15	0.65	0.01	0.34	1.26	0.07	7.04	2.53	32.48	14.80	75.80	14.44	113.69	19.85	0.42	0.34	0.00	0.29	0.01
37.8	18.05	0.01	3.25	3.43	9.47	0.02	1065	0.66	0.70	0.01	0.01	0.78	25.60	0.26	299.0	9.46	0.00	0.08	0.22	0.03	0.28	1.43	0.07	5.77	2.22	32.66	14.31	70.92	14.17	116.94	19.92	0.23	0.21	0.00	0.08	0.02
40.9	18.05	0.01	3.61	3.61	10.65	0.02	1083	0.61	0.72	0.01	0.01	0.90	24.00	0.51	342.9	10.65	0.05	0.02	0.12	0.02	0.65	1.61	0.09	4.51	1.99	34.29	17.32	86.62	16.24	131.74	21.66	0.27	0.20	0.00	0.03	0.09
44.0	18.05	0.01	3.61	3.79	10.56	0.02	1103	0.73	0.75	0.01	0.01	0.83	26.40	0.29	356.1	11.53	0.02	0.07	0.21	0.02	0.27	1.34	0.06	5.09	2.27	38.26	17.02	86.08	17.07	143.83	24.90	0.25	0.30	0.00	0.10	0.01
47.1	18.05	0.01	3.79	4.15	11.55	0.02	1372	0.92	0.87	0.01	0.02	0.85	33.00	bdl	415.1	9.93	bdl	0.03	0.04	0.01	0.38	2.17	0.08	7.58	2.53	45.12	21.66	101.06	21.66	169.64	28.87	0.23	0.12	0.00	0.03	0.10
50.2	18.05	0.01	3.43	3.66	11.19	0.02	1159	0.79	0.77	0.01	0.01	0.87	27.90	0.23	389.8	11.46	0.02	0.18	0.45	0.03	0.44	1.34	0.07	5.50	2.29	40.06	18.16	90.78	17.96	153.04	25.61	0.32	0.32	0.00	0.16	0.06
53.3	18.05	0.01	3.97	3.97	11.37	0.02	1155	0.67	0.76	0.01	0.01	0.79	26.00	0.23	360.9	11.55	0.06	0.06	0.42	0.01	0.16	1.19	0.07	3.97	2.35	37.90	17.69	86.62	16.60	140.77	23.46	0.06	0.52	0.01	0.23	0.05
56.5	18.05	0.01	3.32	3.46	10.32	0.02	1063	0.94	0.71	0.01	0.01	0.86	26.40	0.24	347.8	9.17	0.00	0.11	0.26	0.03	0.29	1.19	0.08	4.64	2.05	36.00	16.53	79.04	15.99	129.76	21.66	0.25	0.19	0.00	0.04	0.03

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
59.6	18.05	0.01	3.63	3.74	10.85	0.02	1090	0.72	0.96	0.01	0.01	0.84	29.50	0.26	357.3	9.40	0.00	0.15	0.45	0.04	0.38	1.41	0.08	5.13	2.24	37.54	16.39	79.77	15.38	126.33	20.18	0.25	0.20	0.00	0.08	0.03
62.8	18.05	0.01	3.43	3.25	9.56	0.02	1065	0.69	0.76	0.01	0.01	0.78	27.00	0.14	360.9	9.20	0.01	0.10	0.42	0.08	0.25	0.63	0.03	5.96	2.17	36.09	15.16	75.80	15.88	113.69	19.85	0.03	0.17	0.05	0.06	0.01
65.9	18.05	0.01	3.25	3.68	10.85	0.02	1193	0.73	0.78	0.01	0.01	0.85	25.90	0.15	366.9	10.07	0.01	0.08	0.24	0.03	0.30	1.27	0.07	5.88	2.35	38.62	16.37	78.14	14.96	117.12	19.71	0.23	0.28	0.01	0.06	0.01
69.0	18.05	0.01	3.25	3.43	9.93	0.02	1083	0.76	0.74	0.01	0.01	0.74	31.00	bdl	324.8	9.93	bdl	0.00	0.04	bdl	0.13	1.71	0.16	5.05	2.53	36.09	14.98	72.19	14.26	110.09	18.05	0.20	0.23	0.04	0.00	0.00
72.2	18.05	0.01	3.43	3.77	10.65	0.02	1151	0.72	0.79	0.01	0.01	0.88	27.90	0.10	339.3	11.33	0.00	0.03	0.08	0.01	0.25	1.36	0.07	5.68	2.38	38.26	15.81	72.73	13.75	107.02	17.56	0.26	0.27	0.01	0.01	0.02
75.3	18.05	0.01	3.25	3.79	11.73	0.02	1065	0.69	0.72	0.01	0.01	0.81	34.00	bdl	342.9	12.63	0.00	0.00	0.06	0.02	0.08	0.94	0.03	3.97	1.99	34.29	16.60	70.38	13.72	102.87	16.42	0.20	0.31	0.00	0.03	0.06
78.4	18.05	0.01	3.59	3.99	10.90	0.02	1144	0.75	0.79	0.01	0.01	0.89	29.20	0.20	333.9	13.12	0.01	0.16	0.41	0.05	0.36	1.31	0.06	5.25	2.34	37.18	16.13	70.56	12.70	101.06	16.96	0.28	0.37	0.00	0.09	0.04
81.5	18.05	0.01	3.61	3.25	12.09	0.02	1101	0.76	0.78	0.01	0.01	0.97	28.00	0.40	306.8	10.65	0.03	0.01	0.10	0.03	0.49	1.80	0.05	5.41	2.17	36.09	16.78	59.55	11.01	92.04	15.34	0.29	0.38	0.00	0.00	0.02
84.6	18.05	0.01	3.35	3.49	10.47	0.02	989	0.74	0.79	0.01	0.01	0.87	28.50	0.18	289.5	10.32	0.01	0.01	0.06	0.00	0.18	1.40	0.06	5.38	2.25	32.16	13.26	59.19	10.70	81.39	13.30	0.20	0.23	0.00	0.01	0.02
88.0	18.05																																			
6117-A L1 (Grt-1)																																				
0.0	18.05	0.01	2.77	3.10	13.22	0.00		4.63	4.72	0.03	0.03	1.02	25.70																							
21.2	18.05	0.01	2.53	2.71	12.09	0.00	2433	4.15	4.33	0.03	0.03	0.94	25.27	1.12	429.0	13.54	0.00	0.16	0.75	0.33	3.95	9.38	0.94	35.25	8.70	61.36	13.37	37.28	5.68	43.40	5.88	0.18	0.25	0.01	0.00	0.03
40.8	18.05	0.01	1.84	2.09	9.29	0.00	2166	3.39	3.50	0.02	0.02	0.71	17.79	1.21	415.1	8.12	bdl	0.11	0.58	0.27	3.79	10.83	0.74	30.68	7.40	54.14	13.90	41.51	5.96	45.12	6.50	0.58	0.40	0.03	0.00	0.00
59.7	18.05	0.01	2.71	2.89	12.81	0.00	1373	4.51	4.69	0.03	0.03	1.01	25.27	1.21	326.7	6.82	0.03	0.31	0.81	0.22	2.78	6.23	0.62	24.18	5.87	45.30	10.85	33.03	5.22	39.52	5.97	0.22	0.19	0.00	0.01	0.02
80.1	18.05	0.01	2.52	2.91	12.25	0.00	2346	4.30	4.46	0.03	0.03	1.03	25.01	1.21	505.3	8.30	bdl	0.11	0.78	0.31	3.79	7.58	0.78	32.48	7.58	70.38	19.85	61.36	9.20	68.58	11.55	0.20	0.20	0.01	0.00	0.00
100.0	18.05						2259							1.03	489.1	6.84	0.00	0.18	0.96	0.33	3.68	8.64	0.84	31.40	8.08	67.13	18.39	60.82	9.62	71.47	11.93	0.19	0.21	0.01	0.00	0.01
6117-A L2 (Grt-1)																																				
0.0	18.05	0.01	2.27	2.60	13.48	0.00		5.04	4.80	0.02	0.03	1.08	26.31																							
25.4	18.05	0.01	2.26	2.57	12.83	0.00		4.66	4.65	0.02	0.02	1.08	26.53																							
50.0	18.05						2111							0.96	262.2	4.55		0.05	0.28	0.18	2.46	7.45	0.93	28.78	6.46	41.87	9.29	24.18	3.52	25.27	3.39	0.08	0.09	0.00	0.00	0.04
75.1	18.05	0.01	2.50	2.82	13.10	0.00	2245	4.72	4.69	0.03	0.03	1.05	26.26	0.29	333.9	5.45	0.00	0.11	0.61	0.19	2.85	7.54	0.95	26.91	6.79	50.35	12.15	36.82	5.61	40.97	6.42	0.11	0.15	0.01	0.01	0.02
100.0	18.05	0.01	2.44	2.82	12.87	0.00		4.61	4.68	0.03	0.03	1.03	25.92																							
6117-A L3 (Grt-2)																																				
0.0	18.05	0.01	2.73	3.13	14.22	0.00	2155	4.95	5.00	0.04	0.04	0.99	26.13	0.09	500.8	6.44	0.03	0.08	0.49	0.24	3.12	7.65	0.93	30.41	8.37	69.48	17.78	55.31	8.52	62.26	10.12	0.14	0.20	0.02		0.03
2.1	18.05	0.01	2.88	3.30	13.48	0.00	2056	4.64	4.77	0.03	0.03	1.00	26.78	0.27	500.6	6.79	0.01	0.05	0.52	0.24	3.16	7.94	0.83	30.52	8.61	69.68	18.06	56.85	8.73	63.89	10.07	0.16	0.17	0.01	0.01	0.04
4.2	18.05																																			
9.6	18.05	0.00	2.69	3.08	13.02	0.00	2066	4.53	4.66	0.03	0.03	0.97	26.33	0.81	283.0	9.31	0.00	0.01	0.51	0.35	4.69	9.19	1.09	28.66	6.70	46.92	11.39	31.40	4.38	30.30	4.78	0.21	0.19	0.01	0.00	0.02
14.9	18.05	0.01	2.29	2.46	12.36	0.00	2247	4.15	4.19	0.03	0.03	1.03	25.82	0.74	265.8	7.72	0.03	0.19	0.75	0.35	3.65	8.73	1.09	25.05	5.83	43.26	10.25	29.24	4.22	28.44	4.24	0.12	0.22	0.00	0.00	0.02
17.0	18.05	0.01	2.44	2.76	12.15	0.00		4.33	4.19	0.03	0.03	1.03	30.86																							
19.1	18.05	0.01	2.45	3.18	11.46	0.00	2270	3.86	4.06	0.03	0.03	0.93	25.27	0.81	243.6	5.58	0.02	0.17	0.78	0.19	3.21	8.19	1.05	24.27	5.59	38.24	9.29	26.76	3.90	28.69	4.62	0.14	0.16	0.01	0.00	0.04
21.2	18.05	0.01	2.89	3.16	11.51	0.00	1879	3.99	4.13	0.03	0.03	1.05	32.30	0.54	229.9	5.99	0.07	0.32	1.21	0.28	3.18	7.25	0.97	21.10	5.05	37.00	8.30	24.47	3.65	26.24	4.08	0.16	0.13	0.01	0.00	0.16
23.2	18.05	0.01	2.89	2.96	11.86	0.00	1796	4.17	4.06	0.03	0.03	0.96	23.82	1.43	196.4	5.27	0.05	0.19	0.72	0.23	2.56	7.25	0.89	19.33	4.31	31.76	7.51	21.37	3.30	23.71	3.81	0.13	0.09	0.01	0.01	0.07

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25.3	18.05	0.00	2.89	3.25	13.17	0.00	1640	4.87	5.23	0.04	0.04	1.08	28.87	0.63	187.5	5.36	0.05	0.20	0.62	0.22	2.69	6.59	0.94	19.13	4.04	30.14	7.15	20.84	3.16	22.92	3.61	0.12	0.09	0.01	0.00	0.09
27.3	18.05	0.01	2.51	2.73	11.39	0.00	1696	3.97	3.97	0.03	0.03	0.89	23.64	0.88	180.5	4.91	0.03	0.11	0.49	0.17	2.76	6.68	0.88	17.14	3.84	27.79	6.61	20.93	3.09	22.56	3.83	0.13	0.15	0.00	0.00	0.08
29.4	18.05	0.01	2.22	2.63	11.55	0.00	1709	4.01	4.10	0.05	0.06	0.94	25.63	0.47	186.1	5.56	0.03	0.06	0.28	0.16	3.03	7.07	0.87	16.55	3.83	28.51	7.18	20.74	3.36	24.90	4.01	0.15	0.08	0.00	0.00	0.05
57.6	18.05	0.01	2.98	3.18	11.50	9.02	2166	29.96	30.86	0.06	0.07	0.91	24.90	bdl	216.6	7.40	0.04	0.08	0.79	0.51	3.97	9.38	1.48	18.05	4.15	30.68	7.58	23.46	3.61	27.07	4.15	bdl	0.12	0.03	0.00	0.05
60.4	18.05	0.49	8.12	9.02	5.77	613.59	1606	1714.45	1696.40	0.25	0.18	3.36	41.33	0.51	172.0	5.85	0.00	0.04	0.42	0.25	3.25	6.98	0.86	15.52	3.59	25.81	6.15	18.41	3.03	22.74	3.72	0.11	0.08	0.00	0.00	0.07
62.5	18.05	1.15	8.84	9.93	14.08	1461.79	1723	3880.06	3880.06	0.43	0.25	2.53	73.99	0.65	181.0	5.94	0.27	0.15	0.67	0.31	3.32	7.06	0.95	16.51	3.52	27.07	6.50	20.57	3.12	24.90	4.06	0.14	0.13	0.02	0.00	0.05
64.5	18.05	0.20	1.03	0.83	1.68	288.75	1893	685.78	685.78	0.07	0.05	0.18	25.27	20.21	267.1	3.97	0.48	794.06	2436.32	330.26	1696.40	209.34	15.88	129.94	14.08	59.92	9.93	22.92	2.89	19.40	2.83	0.10	0.14	0.03	0.81	15.52
66.6	18.05	0.12	2.87	2.73	12.09	133.55	13355	342.89	342.89	0.08	0.05	1.06	26.53	312.21	3645.5	10.29	2.17	4674.12	######	3753.73	######	5017.01	398.83	3645.45	328.45	1082.81	124.52	182.27	14.80	61.36	6.86	0.27	0.78	0.16	12.45	631.64
69.0	18.05	0.03	2.85	3.22	11.57	37.00	34289	106.48	106.48	0.03	0.02	0.93	25.45	721.87	7760.1	30.86	5.96	9745.27	######	9023.40	######	######	902.34	8662.46	757.97	2400.22	272.51	395.22	30.86	124.52	13.35	1.10	1.17	1.37	32.66	1570.07
71.2	18.05	0.67	3.23	4.06	8.66	776.01	4331	2075.38	2057.34	0.20	0.04	1.11	44.40	137.16	1371.6	5.41	0.61	1732.49	8662.46	1624.21	9384.34	2165.62	173.25	1570.07	138.96	433.12	48.73	64.97	5.77	23.46	2.35	bdl	bdl	0.09	6.32	288.75
73.3	18.05	0.11	3.48	4.02	10.00	115.50	3248	326.65	319.43	0.04	0.02	0.79	25.46	90.23	866.3	6.14	0.85	938.43	4872.64	902.34	5053.10	1155.00	88.43	848.20	77.60	252.66	32.48	52.34	5.96	26.71	3.54	0.15	0.14	0.07	3.43	155.20
75.4	18.05	0.80	5.00	5.47	7.81	1136.95	1805	3104.05	3086.00	0.27	0.06	1.17	50.35	38.62	380.8	3.77	0.13	1768.59	5053.10	667.73	3501.08	480.04	33.03	301.38	27.61	97.45	14.26	26.89	3.19	19.49	2.62	0.08	0.13	0.01	2.60	57.75
78.4	18.05	0.02	2.60	2.91	11.71	24.00	14979	72.19	72.19	0.02	0.02	0.91	23.98	462.00	4349.3	13.72	1.37	8842.93	######	6135.91	######	7218.72	523.36	4962.87	434.93	1353.51	153.40	220.17	16.78	72.19	7.94	0.61	0.38	0.23	24.54	992.57
80.5	18.05	0.00	2.78	3.14	13.30	0.06	2671	4.66	4.89	0.02	0.02	1.00	26.38	86.26	907.8	5.67	0.32	1606.17	6605.13	1155.00	6280.29	1389.60	97.45	916.78	83.20	267.09	31.94	50.35	4.91	24.72	3.23	0.25	0.10	0.03	6.06	205.73
82.7	18.05	0.01	2.84	3.22	13.23	0.03	18949	4.57	4.76	0.02	0.02	0.99	26.10	1245.23	12452.3	61.18	3.03	######	######	######	######	######	1479.84	######	1245.23	3825.92	436.73	606.37	48.00	178.66	18.95	0.85	1.89	0.36	129.94	3898.11
84.8	18.05	0.00	2.72	3.09	12.83	0.02	1404	4.41	4.64	0.02	0.02	0.99	25.93	23.82	469.2	3.27	0.12	281.53	1461.79	288.75	1570.07	397.03	31.94	301.38	31.04	113.69	16.42	32.12	3.63	22.56	2.98	0.10	0.12	0.03	1.97	68.58
86.9	18.05						1527							0.61	220.5	2.96	0.02	1.12	11.37	0.51	3.39	6.59	1.03	25.43	5.59	38.98	8.46	21.76	3.01	20.92	3.03	0.09	0.10	0.00	0.00	0.13
91.3	18.05	0.01	2.58	3.01	12.87	0.01	1772	4.24	4.49	0.03	0.03	0.99	26.17	0.54	219.3	2.44	0.02	1.08	8.48	0.58	3.41	7.13	1.01	23.82	5.56	37.01	8.50	22.02	3.20	21.04	3.17	0.06	0.10	0.01	0.00	0.10
93.6	18.05	0.01	2.50	2.94	12.13	0.01	1778	4.33	4.45	0.03	0.03	0.96	25.63	0.67	217.1	2.65	0.04	0.76	2.71	0.27	2.45	7.07	0.93	25.05	5.41	37.23	8.10	22.36	3.12	21.44	3.23	0.10	0.10	0.01	0.00	0.05
95.8	18.05																																			
97.9	18.05	0.01	2.20	2.69	11.68	0.00	1700	3.88	4.01	0.02	0.02	1.04	24.90	1.46	231.9	19.85	0.11	0.45	2.53	0.29	4.11	7.45	0.92	23.73	5.40	38.08	8.86	24.67	3.50	23.71	3.54	0.45	0.43	0.00	0.01	0.06
100.0	18.05						1678							0.65	223.6	4.30	0.04	0.29	1.80	0.45	3.50	7.60	0.97	23.28	5.29	36.45	8.52	23.70	3.59	23.50	3.57	0.16	0.10	0.00	0.00	0.02
6117-A L4 (Grt-2)																																				
0.0	18.05	0.01	2.42	2.56	10.83	0.01		4.33	4.37	0.05	0.05	0.90	23.79																							
2.8	18.05	0.01	2.61	3.19	11.06	0.01	1485	4.04	4.35	0.05	0.04	0.93	24.54	0.58	183.9	4.35	bdl	0.20	0.72	0.17	2.45	6.70	0.93	20.75	4.80	32.30	6.95	19.13	2.54	17.09	2.47	0.14	0.13	0.00	0.09	0.03
5.4	18.05	0.01	2.89	3.21	11.50	0.01		4.12	4.44	0.05	0.05	0.94	28.87																							
7.8	18.05	0.00	1.21	1.59	5.05	0.01		1.80	1.99	0.02	0.02	0.42	14.08																							
10.3	18.05	0.00	2.29	2.71	9.01	0.01	1197	3.28	3.36	0.03	0.04	0.82	22.20	0.45	174.5	4.42	0.29	1.32	3.18	0.94	4.26	6.70	0.80	17.78	3.84	27.40	6.48	19.92	3.12	22.99	3.59	0.12	0.09	0.01	0.00	0.07
12.8	18.05	0.01	2.69	3.00	9.78	0.01	1377	3.59	3.70	0.04	0.04	0.83	21.66	0.43	175.4	4.33	0.17	0.49	2.53	0.36	4.17	7.24	1.02	18.73	4.19	27.43	6.28	18.62	3.03	21.94	3.63	0.04	0.12	0.01	0.00	0.03
21.4	18.05	0.00	2.65	2.96	10.09	0.00	1381	3.70	3.57	0.03	0.03	0.86	25.27	0.40	175.1	4.11	0.16	0.15	0.87	0.25	3.86	7.85	0.90	19.74	4.03	28.13	6.28	19.24	2.94	22.94	3.61	0.07	0.10	0.01	0.00	0.03
23.9	18.05	0.00	2.44	2.83	10.03	0.00	650	3.54	3.72	0.03	0.03	0.80	23.64	bdl	77.6	2.35	0.13	0.13	0.11	0.29	1.28	3.97	0.51	7.76	1.66	12.09	2.71	8.12	1.50	10.11	1.75	0.00	0.00	0.00	0.00	0.01
26.4	18.05	0.00	2.35	3.07	8.12	0.00	1144	3.61	3.25	0.02	0.04	0.85	21.66	0.31	119.8	4.13	0.12	0.09	0.72	0.21	2.51	5.68	0.74	13.90	2.92	18.41	4.31	12.81	2.04	16.24	2.69	0.12	0.11	0.00	0.00	0.03
28.8	18.05	0.01	2.45	2.69	8.97	0.00	1335	3.21	3.39	0.03	0.04	0.77	20.21	0.94	124.5	5.00	0.09	0.10	0.39	0.45	3.12	6.23	0.85	16.06	3.14	19.13	4.55	13.72	2.15	17.87	2.91	0.12	0.11	0.00	0.00	0.16
35.0	18.05	0.01	2.69	3.34	10.70	0.00	1285	3.77	3.92	0.03	0.03	0.81	24.36	0.38	122.4	4.28	0.07	0.22	0.31	0.18	2.44	6.41	0.76	16.24	3.12	18.77	4.20	12.99	2.02	15.70	2.54	0.12	0.06	0.00	0.00	0.02
37.5	18.05	0.01	2.45	3.36	10.38	0.00	1222	3.79	3.88	0.03	0.03	0.88	23.82	0.36	113.7	4.78	0.06	0.03	0.60	0.19	2.69	6.39	0.88	16.06	3.05	18.05	4.06	12.25	1.91	14.98	2.40	0.08	0.08	0.00	0.00	0.03
40.2	18.05	0.01	2.82	3.21	11.41	0.00	1209	3.83	3.99	0.03	0.03	1.00	27.61	0.16	95.7	4.87	0.14	0.03	0.36	0.14	3.25	5.96	0.67	13.72	2.35	15.34	3.43	11.73	1.80	11.91	2.17	0.06	0.05	0.03	0.00	0.02
42.6	18.05	0.01	2.71	3.07	11.10	0.00	1056	3.95	3.95	0.03	0.03	0.97	27.43	2.54	94.0	3.57	1.44	0.83	2.00	0.31	3.27	6.08	0.71	13.82	2.65	15.36	3.34	9.91	1.56	12.36	1.97	0.09	0.10	0.01	0.02	0.03

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
45.1	18.05						1335							0.60	121.5	3.75	0.02	0.49	0.65	0.20	2.92	6.71	0.90	17.14	3.43	19.67	4.37	12.27	1.83	14.51	2.29	0.12	0.12	0.00	0.00	0.01
54.3	18.05	0.01	2.96	3.21	11.69	0.00	1341	4.26	4.28	0.06	0.07	1.03	25.45	0.76	120.0	3.95	0.03	0.35	1.48	0.33	2.92	6.82	0.85	17.69	3.56	20.57	4.30	12.36	1.84	13.26	2.09	0.06	0.07	0.00	0.01	0.03
57.9	18.05	0.01	2.74	3.21	9.62	0.00	1482	3.41	3.57	0.04	0.05	1.00	25.27	0.72	132.3	5.02	0.01	0.19	0.90	0.26	3.12	6.91	0.86	19.13	3.86	22.20	4.53	13.01	1.99	14.73	2.24	0.11	0.08	0.00	0.00	0.02
62.0	18.05	0.00	2.62	3.19	11.50	0.00	1449	3.83	4.01	0.04	0.05	0.90	25.09	0.90	138.6	5.70	0.06	0.09	0.81	0.22	3.25	7.22	0.94	19.69	3.83	23.28	4.76	13.46	2.04	14.71	2.20	0.11	0.10	0.00	0.00	0.02
64.4	18.05	0.01	1.99	2.35	8.30	0.00		2.89	3.07	0.02	0.05	0.76	19.85																							
66.9	18.05	0.01	2.60	2.76	10.25	0.00	1426	3.84	4.10	0.03	0.03	0.91	27.61	0.49	185.0	6.70	0.49	1.68	17.87	1.57	10.11	8.39	1.00	21.11	4.40	29.24	6.62	19.67	2.89	20.75	3.09	0.14	0.15	0.05	1.99	0.74
76.8	18.05	2.54	0.44	0.67	9.37	0.00	1231	4.04	4.26	0.02	0.02	0.14	3.21	0.47	158.5	8.84	0.26	1.25	10.47	1.03	8.12	7.42	0.89	17.32	3.79	25.09	5.76	16.42	2.42	17.51	2.51	0.18	0.21	0.02	0.51	0.72
79.4	18.05						1368							0.36	183.0	6.06	0.38	0.74	6.50	0.97	7.56	8.01	0.95	20.39	4.44	29.24	6.55	18.05	2.76	18.30	3.03	0.14	0.14	0.02	0.19	0.58
81.9	18.05	3.14	0.26	0.29	9.60	0.00	1101	4.13	4.28	0.01	0.02	0.06	1.86	0.04	149.8	6.14	0.10	0.18	1.80	0.67	7.94	5.41	0.76	15.88	4.33	23.46	5.59	14.98	2.17	15.16	1.99	0.06	0.13	0.02	0.07	0.40
84.3	18.05	3.19	0.33	0.33	10.16	0.00	1263	4.66	4.55	0.01	0.01	0.09	2.74	0.40	164.2	5.27	0.16	0.40	3.77	0.58	4.84	6.84	0.88	18.95	4.33	27.61	6.17	16.96	2.36	17.69	2.51	0.15	0.19	0.01	0.12	0.21
86.8	18.05						892							0.25	4.3	0.27	0.09	7.54	12.83	1.20	6.39	0.87	1.80	0.72	0.11	0.99	0.19	0.42	0.06	0.51	0.07	0.00	0.01	0.00	0.03	0.05
89.7	18.05	0.61	2.29	2.65	11.06	0.00		4.42	4.28	0.03	0.03	0.84	22.20																							
92.3	18.05	0.18	2.54	2.98	12.13	0.00	1070	4.62	4.76	0.03	0.03	0.98	25.45	0.26	3.4	0.08	0.06	9.38	15.03	1.20	6.64	0.51	1.82	0.36	0.08	0.49	0.08	0.14	0.04	0.25	0.02	0.01	0.00	0.00	0.01	0.02
95.0	18.05	0.14	2.38	2.73	11.19	0.00	1187	4.11	4.24	0.03	0.03	0.93	24.72	0.34	8.8	0.25	0.10	7.42	12.81	1.14	6.44	0.65	1.93	1.30	0.27	1.84	0.36	1.12	0.12	0.99	0.12	0.00	0.02	0.00	0.04	0.04
97.6	18.05	0.05	2.20	2.47	12.02	0.00		4.10	4.15	0.03	0.03	1.01	25.09																							
100.0	18.05						1485							0.32	184.1	6.41	0.08	7.20	11.91	1.37	9.75	7.06	1.03	21.30	4.94	33.39	7.38	20.03	2.58	16.24	2.45	0.12	0.10	0.00	0.03	0.07
6117-A L5 (Grt-3)																																				
0.0	18.05	0.01	2.83	3.24	13.34	0.01	1568	4.70	4.75	0.03	0.03	0.93	25.23	0.32	204.1	6.33	0.03	7.40	10.94	1.20	8.92	8.03	1.07	23.46	5.52	36.82	8.19	20.74	2.71	17.31	2.44	0.11	0.15	0.00	0.01	0.05
3.5	18.05	0.01	2.91	3.30	12.87	0.01	1447	4.39	4.50	0.03	0.03	0.94	25.28	0.42	175.8	5.38	0.04	1.93	4.98	0.78	6.32	7.02	1.06	21.30	5.02	33.57	6.95	17.81	2.36	14.29	1.99	0.10	0.18	0.00	0.05	0.06
6.9	18.05	0.01	2.87	3.26	12.72	0.00	1518	4.47	4.50	0.03	0.03	0.95	25.50	0.54	173.1	5.25	0.04	0.24	1.41	0.40	4.64	8.10	1.05	23.10	5.18	32.12	6.55	15.88	2.02	12.56	1.75	0.14	0.17	0.00	0.02	0.05
10.3	18.05	0.00	2.78	3.17	12.65	0.00		4.49	4.49	0.03	0.03	0.95	25.45																							
13.6	18.05																																			
17.0	18.05	0.01	2.65	3.03	12.42	0.00	1742	4.46	4.50	0.03	0.03	0.93	25.09	0.58	264.9	8.45	0.02	0.15	0.79	0.31	4.48	8.86	1.02	27.67	6.05	44.03	10.09	28.89	4.10	29.27	4.58	0.18	0.13	bdl	0.00	0.01
20.4	18.05						1691							1.21	251.0	7.35	0.03	0.16	0.67	0.28	3.75	8.64	1.02	25.59	5.74	41.16	9.42	26.94	4.09	28.24	4.09	0.14	0.14	0.00	0.02	0.02
23.7	18.05	0.00	2.89	3.41	12.81	0.00	1853	4.62	4.44	0.04	0.04	0.89	24.06	0.45	242.9	5.61	0.00	0.07	0.49	0.22	3.21	8.45	0.96	24.65	5.68	38.66	9.31	25.92	3.90	27.50	4.14	0.26	0.14	0.00	0.00	0.01
26.9	18.05						1698							0.40	229.4	6.12	bdl	0.08	0.50	0.26	3.30	8.08	1.03	24.54	5.32	37.07	8.64	24.29	3.67	25.37	3.74	0.16	0.11	0.01	0.00	0.03
30.1	18.05	0.00	2.74	3.07	11.13	0.00		4.08	4.40	0.04	0.03	0.86	23.10																							
33.5	18.05	0.00	1.77	2.35	9.20	0.00	1651	3.07	3.43	0.03	0.03	0.76	23.46	0.40	210.6	7.40	0.01	0.12	0.58	0.31	3.88	8.25	1.06	23.19	4.89	33.78	7.81	22.52	3.25	23.23	3.47	0.14	0.18	0.00	0.01	0.04
36.7	18.05	0.01	2.47	2.98	11.23	0.00		4.10	4.30	0.03	0.04	1.02	25.27																							
40.0	18.05	0.01	2.53	2.53	9.38	0.00	1418	3.25	3.25	0.02	0.03	0.70	19.85	0.56	204.8	7.09	bdl	0.03	0.30	0.24	3.66	7.81	0.95	20.75	4.42	31.18	7.62	22.16	3.36	25.01	3.86	0.22	0.18		0.00	0.03
43.3	18.05	0.01	3.18	3.52	11.87	0.00		4.42	4.33	0.03	0.04	0.87	25.27																							
46.6	18.05	0.01	2.62	3.12	11.32	0.00	1261	3.93	4.17	0.04	0.03	0.86	24.00	0.51	188.8	5.72	bdl	0.29	0.74	0.25	3.68	7.22	0.85	15.72	3.61	27.25	7.15	22.20	3.54	25.09	3.95	0.18	0.12	0.00	0.00	0.01
53.3	18.05	0.01	2.61	3.06	11.57	0.00	1227	4.10	4.04	0.03	0.03	0.86	24.36	0.18	180.5	5.41	0.03	0.14	0.49	0.23	2.35	7.94	0.69	14.08	2.89	25.27	7.04	21.66	3.07	21.66	3.61	0.07	0.03	0.00	0.00	0.04
56.6	18.05	0.00	2.71	3.43	12.81	0.01	1316	4.69	4.51	0.04	0.03	0.88	25.27	0.45	223.2	6.98	0.03	0.06	0.53	0.34	3.66	7.15	0.90	16.68	3.97	32.48	8.77	28.15	4.26	30.14	4.71	0.18	0.06	0.00	0.00	0.03
59.9	18.05	0.01	2.89	3.34	12.34	0.00	1101	4.48	4.37	0.03	0.03	0.97	25.63	0.05	180.5	5.77	bdl	0.14	0.43	0.38	3.07	6.32	0.54	12.63	2.89	27.07	7.04	21.66	3.07	23.46	4.15	0.03	0.13	0.00	0.00	0.00
63.3	18.05						1395							0.51	238.6	6.35	bdl	0.12	0.55	0.28	3.66	7.54	1.00	17.88	4.22	35.17	9.29	30.39	4.67	33.89	5.43	0.10	0.17	0.00	0.00	0.02
66.6	18.05	0.01	2.65	3.23	11.35	0.00	1321	4.02	4.06	0.03	0.03	0.90	25.63	0.38	225.2	5.05	0.01	0.22	1.08	0.34	3.88	7.13	0.98	16.62	4.11	32.66	8.82	28.39	4.55	32.12	5.32	0.10	0.12	0.00	0.01	0.16

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
69.9	18.05						1379							0.45	205.9	8.12	0.00	0.07	0.43	0.26	3.65	7.44	0.91	17.63	4.01	31.13	7.94	23.82	3.65	25.99	4.01	0.20	0.16	0.00	0.01	0.02
73.3	18.05	0.01	2.56	3.09	11.12	0.00	1408	3.95	3.97	0.03	0.03	0.88	24.00	0.07	198.5	6.14	bdl	0.00	0.18	0.38	3.79	8.12	0.49	18.05	4.51	30.68	6.32	19.85	3.07	19.85	3.61	0.20	0.29	0.01	0.00	0.00
76.7	18.05	0.01	2.74	3.19	11.73	0.00	1446	3.99	4.13	0.03	0.03	0.90	24.90	0.22	182.8	8.28	0.00	0.40	1.17	0.32	3.99	8.19	0.99	19.27	4.11	28.33	6.41	18.48	2.82	20.27	3.12	0.17	0.16	0.01	0.00	0.04
80.0	18.05	0.01	2.71	3.25	12.09	0.00		4.33	4.51	0.03	0.03	0.90	25.27																							
83.3	18.05	0.01	2.58	2.78	11.26	0.00	1408	3.90	4.10	0.03	0.03	0.97	25.99	0.32	161.7	7.38	0.01	0.03	0.23	0.21	3.23	7.02	0.97	18.41	3.93	25.45	5.85	15.75	2.44	18.88	2.83	0.20	0.13	0.00	0.01	0.02
86.7	18.05	0.01	2.36	2.76	11.89	0.01		4.22	4.26	0.03	0.03	1.05	30.14																							
90.0	18.05	0.00	1.62	1.80	8.30	0.00	1366	2.89	3.25	0.02	0.02	0.67	18.05	0.27	175.8	7.62	bdl	0.02	0.29	0.22	3.23	7.16	0.87	19.31	4.22	27.79	6.32	18.05	2.94	20.57	3.27	0.13	0.18	0.00	0.00	0.02
93.3	18.05	0.00	2.29	2.63	11.13	0.00	1359	4.06	4.10	0.02	0.02	0.91	25.81	0.38	198.3	6.15	0.01	0.06	0.36	0.21	3.45	7.36	0.90	19.40	4.66	31.00	7.22	21.28	3.09	22.74	3.56	0.15	0.14	0.00	0.00	0.04
96.7	18.05						1498							0.23	234.6	5.41	0.03	0.06	0.43	0.45	3.43	7.94	0.76	25.27	5.41	37.90	9.20	27.07	3.79	27.07	4.15	0.00	0.22	0.00	0.00	0.08
100.0	18.05	0.01	2.40	2.98	11.55	0.00	1366	4.22	4.17	0.02	0.02	1.05	26.17	0.42	222.0	6.08	0.02	0.26	0.81	0.23	3.68	7.11	0.86	20.92	4.75	34.83	8.30	24.72	3.75	26.35	3.90	0.13	0.13	0.00	0.00	0.03
6117-A L6 (Grt-3)																																				
0.0	18.05	0.01	2.37	2.67	9.19	0.00	1583	3.45	3.45	0.03	0.03	0.82	23.19	0.60	244.5	7.63	0.00	0.33	0.99	0.32	3.88	7.58	0.99	22.74	5.18	38.80	9.40	28.51	4.28	29.99	4.51	0.12	0.17	0.00	0.06	0.09
8.7	18.05						1029							0.16	167.8	2.71	bdl	0.15	0.29	0.11	1.99	4.87	0.74	14.80	2.89	27.07	6.50	19.85	2.53	18.05	3.07	0.14	0.03	0.00	0.00	0.02
17.4	18.05	0.01	2.45	2.65	8.99	0.00	1438	3.37	3.50	0.03	0.03	0.82	23.46	0.65	211.9	3.65	0.00	0.11	0.39	0.12	2.20	6.71	0.76	22.20	5.13	35.01	8.01	23.01	3.32	22.14	3.41	0.09	0.11	0.00	0.00	0.04
25.7	18.05																																			
34.0	18.05	0.00	2.40	2.76	10.00	0.00	2274	3.59	3.65	0.03	0.03	0.87	22.02	2.42	186.4	4.60	0.02	0.41	1.14	0.26	3.23	7.00	0.87	22.02	4.94	33.57	7.15	18.59	2.53	16.22	2.36	0.11	0.12	0.00	0.00	0.03
42.4	18.05	0.04	3.25	3.79	10.11	0.00		3.97	3.79	0.02	0.02	0.90	27.07																							
51.0	18.05	0.01	2.58	3.01	11.23	0.00	644	4.02	4.17	0.02	0.02	0.88	24.06	0.51	118.0	4.30	0.03	0.08	0.52	0.20	2.48	5.04	0.71	12.78	2.61	17.20	3.86	11.57	1.91	13.55	1.96	0.08	0.10	0.00	0.00	0.03
59.2	18.05	0.01	2.53	3.43	11.91	0.00		3.97	4.33	0.03	0.02	0.97	27.07																							
67.3	18.05	0.01	2.83	3.01	11.32	0.00	711	4.04	4.30	0.02	0.02	0.94	26.35	0.39	129.8	4.13	0.02	0.09	0.62	0.21	2.44	4.82	0.68	12.36	2.73	18.77	4.48	13.30	2.02	14.35	2.13	0.09	0.07	0.00	0.00	0.06
75.5	18.05	0.01	3.97	3.07	11.37	0.00		4.69	4.51	0.03	0.03	1.39	27.07																							
83.6	18.05	0.01	2.11	2.65	10.20	0.00	892	3.56	3.61	0.02	0.02	1.01	25.81	0.52	165.1	5.09	0.01	0.12	0.47	0.20	2.58	5.67	0.70	16.10	3.66	26.17	6.30	17.36	2.51	17.45	2.46	0.10	0.10	0.00	0.00	0.04
91.7	18.05						1083							0.03	180.5	4.69	0.07	1.99	5.23	0.81	3.97	4.69	0.63	17.32	3.79	30.68	6.68	21.66	2.35	21.66	3.25	0.09	0.07	0.00	0.00	0.15
100.0	18.05	0.01	2.27	2.42	9.60	0.00	1233	3.50	3.41	0.02	0.02	1.00	25.63	0.34	212.4	5.29	0.02	0.22	0.76	0.22	2.65	6.10	0.87	18.89	4.51	32.48	7.74	22.09	3.25	21.01	3.29	0.13	0.12	0.00	0.00	0.01
6117-A L7 (Grt-4)																																				
0.0	18.05	0.01	2.86	3.27	13.93	0.00	1426	4.85	5.04	0.03	0.03	0.94	24.85	0.42	216.6	5.41	bdl	0.05	0.23	0.10	2.89	7.04	0.81	19.85	4.51	36.09	8.48	25.27	3.43	25.27	3.79	0.12	0.12	0.00	0.00	0.01
7.4	18.05	0.00	2.96	3.39	13.14	0.00	1334	4.63	4.65	0.03	0.03	0.95	25.39	0.51	211.7	4.87	bdl	0.04	0.25	0.16	2.45	6.28	0.79	19.56	4.62	34.47	8.34	23.39	3.39	23.82	3.63	0.17	0.09	0.00	0.00	0.03
11.0	18.05	0.00	2.95	3.33	13.44	0.00	1462	4.57	4.60	0.03	0.03	0.98	25.90	0.18	216.6	4.87	bdl	0.22	0.42	0.17	2.17	6.50	1.12	17.51	5.05	36.09	8.66	25.27	3.79	23.46	3.61	0.29	0.06	0.00	0.00	0.00
14.7	18.05						1155							0.29	167.8	3.01	0.03	0.06	0.31	0.13	1.52	4.66	0.64	16.06	3.88	26.89	6.55	19.31	2.80	20.39	3.05	0.07	0.12	0.02	0.00	0.02
18.4	18.05	0.01	2.50	2.83	12.70	0.00		4.71	4.76	0.03	0.03	0.99	26.46																							
22.0	18.05	0.00	3.07	3.79	12.99	0.00	1054	5.59	4.69	0.04	0.03	1.05	28.87	0.43	158.5	3.90	0.01	0.03	0.24	0.15	1.89	5.47	0.61	15.88	3.61	26.35	6.30	18.23	2.56	17.00	2.67	0.09	0.09	0.01	0.00	0.01
25.7	18.05	0.01	2.91	3.14	11.01	0.00		3.90	4.02	0.03	0.03	0.91	25.45																							
29.3	18.05	0.01	2.71	3.00	9.47	0.00	1788	3.52	3.46	0.03	0.03	0.91	24.36	0.47	255.7	7.53	0.01	0.03	0.41	0.26	3.77	8.84	0.94	26.47	6.24	42.77	9.56	28.77	3.86	26.69	4.19	0.15	0.18	0.01	0.00	0.02
33.0	18.05	0.01	2.89	2.35	11.73	0.00	1879	3.25	3.97	0.03	0.02	0.65	19.85	0.49	247.2	19.49		0.00	0.21	0.22	3.59	7.92	0.97	24.11	5.61	39.20	9.08	26.80	4.10	27.02	4.24	0.40	0.37	0.01	0.00	0.01
36.8	18.05	0.01	2.62	3.18	10.02	0.00	1908	3.68	3.66	0.03	0.03	0.99	24.00	0.70	244.0	10.79	bdl	0.04	0.31	0.29	3.65	8.54	0.98	25.09	5.68	39.16	8.86	25.50	3.70	25.97	4.08	0.20	0.22	0.01	0.00	0.03
77.7	18.05	0.01	2.76	3.14	10.36	0.01		3.83	3.95	0.03	0.03	0.85	23.64																							

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
81.6	18.05						1709							0.76	227.9	13.35	0.02	0.19	0.88	0.35	4.17	8.10	0.96	23.64	5.27	36.09	8.54	24.27	3.57	24.85	3.84	0.24	0.25	0.01	0.00	0.07
85.3	18.05	0.01	2.76	3.27	9.76	0.01	1769	3.56	3.86	0.03	0.03	0.91	23.82	0.56	234.6	9.75	bdl	0.04	0.32	0.36	3.97	8.30	1.01	23.46	5.96	39.70	8.66	25.27	3.43	25.27	3.43	0.27	0.25	0.02	0.06	0.02
89.0	18.05	0.00	1.99	1.99	10.11	0.00	1359	2.35	2.53	0.02	0.03	0.70	15.88	0.51	189.5	8.68	0.01	0.04	0.41	0.24	3.07	6.93	0.75	20.57	4.60	29.96	6.88	19.67	2.91	20.21	2.98	0.14	0.13	0.00	0.01	0.03
92.6	18.05	0.00	2.26	2.62	8.99	0.00	1061	3.14	3.43	0.03	0.03	0.80	23.46	0.54	148.0	6.73	0.02	0.08	0.51	0.23	2.76	5.83	0.72	15.52	3.50	24.90	5.29	15.34	2.27	16.24	2.33	0.19	0.12	0.00	0.00	0.06
96.3	18.05						938							0.31	135.4	8.48	0.03	0.29	0.65	0.11	2.17	6.14	0.60	12.81	3.25	21.66	5.23	14.44	2.17	16.06	2.17	0.23	0.13	0.00	0.00	0.01
100.0	18.05	0.00	2.35	2.74	9.55	0.00	1086	3.41	3.79	0.03	0.03	0.87	21.84	0.37	162.4	6.51	0.01	0.32	0.90	0.27	3.10	5.79	0.81	16.12	3.59	26.17	5.96	17.60	2.51	18.35	2.69	0.22	0.16	0.20	0.00	0.07
6117-A L8 (Grt-4)																																				
0.0	18.05	0.01	2.80	3.12	11.01	0.01	1121	4.02	4.15	0.03	0.03	0.92	25.27	0.36	119.7	7.94	0.02	1.48	3.09	0.51	4.66	6.12	0.82	13.10	2.56	17.32	4.30	14.20	2.30	18.06	2.89	0.15	0.12	0.00	0.01	0.07
11.7	18.05	0.01	2.56	2.83	10.61	0.01		3.84	4.11	0.03	0.03	0.94	24.18																							
22.2	18.05	0.01	2.96	2.91	10.59	0.01	1011	3.72	3.97	0.02	0.03	0.99	24.72	0.34	124.5	5.88	0.00	0.21	1.17	0.34	3.28	5.90	0.73	12.47	2.51	17.94	4.62	15.11	2.45	19.13	3.07	0.09	0.10	0.00	0.00	0.06
32.1	18.05						812							0.54	111.9	3.79	bdl	0.23	0.47	0.12	2.35	3.61	0.61	9.20	2.17	16.42	3.79	11.55	1.80	15.16	2.53	0.07	0.10	0.00	0.00	0.03
42.1	18.05	0.01	2.78	2.94	9.60	0.00	975	3.48	3.70	0.03	0.03	0.99	24.18	0.39	124.2	4.98	0.00	0.13	0.90	0.26	3.05	5.32	0.66	12.29	2.51	18.05	4.51	14.31	2.35	17.14	2.73	0.11	0.10	0.00	0.00	0.03
52.5	18.05																																			
69.5	18.05	0.01	2.65	3.18	10.47	0.00	1038	3.75	3.93	0.02	0.02	0.90	24.36	0.28	144.7	6.35	0.00	0.60	1.25	0.29	2.94	5.50	0.84	13.01	3.07	20.75	5.14	15.27	2.49	18.41	2.74	0.14	0.11	0.00	0.01	0.03
79.8	18.05																																			
90.0	18.05	0.01	2.35	2.46	10.90	0.01	1101	6.01	6.15	0.02	0.03	1.06	27.79	0.76	164.1	5.63	0.00	0.14	0.80	0.35	3.66	6.86	0.85	19.31	4.39	29.24	6.05	15.74	2.10	14.40	2.04	0.12	0.16	0.00	0.00	0.02
100.0	18.05	0.01	2.29	2.29	11.13	0.00	1099	5.87	6.35	0.02	0.02	1.14	29.06	0.50	141.9	5.38	0.01	0.09	0.70	0.29	3.34	6.30	0.85	18.59	4.15	26.35	5.13	12.47	1.64	10.81	1.33	0.16	0.14	0.00	0.00	0.04
6117-A L9 (Grt-5)																																				
0.0	18.05	0.01	2.17	2.48	13.41	0.00	985	4.91	5.00	0.03	0.03	1.12	27.61	0.65	139.7	4.26	0.00	0.07	0.70	0.20	2.67	5.63	0.81	17.87	3.95	26.35	5.20	12.63	1.57	9.93	1.23	0.12	0.09	0.00	0.00	0.03
8.7	18.05	0.01	2.50	2.87	13.10	0.00		4.47	4.62	0.03	0.03	1.07	27.38																							
16.4	18.05	0.00	2.63	3.04	12.92	0.00	958	4.49	4.53	0.03	0.03	1.02	26.38	0.56	120.0	4.42	0.01	0.02	0.36	0.19	2.35	5.50	0.74	16.55	3.65	22.74	4.58	10.81	1.28	8.41	1.01	0.08	0.10	0.00	0.00	0.06
24.2	18.05	0.01	2.65	3.28	12.54	0.00		4.25	4.58	0.03	0.03	1.05	27.43																							
30.0	18.05	0.01	2.69	3.01	10.52	0.00	1095	3.84	3.99	0.03	0.03	0.99	25.63	1.46	138.8	7.76	0.04	1.66	3.88	0.46	3.63	5.77	0.72	17.16	3.84	25.45	5.50	13.43	1.75	10.52	1.41	0.11	0.11	0.00	0.01	0.08
44.5	18.05	0.01	2.47	2.82	9.94	0.00		3.68	3.74	0.03	0.03	0.89	23.82																							
52.3	18.05	0.01	2.65	3.16	10.83	0.00	1150	3.77	3.86	0.05	0.04	0.92	24.72	1.57	182.5	7.20	0.07	5.43	10.47	1.03	7.22	6.66	0.86	20.39	4.53	31.62	6.70	18.32	2.51	16.49	2.29	0.16	0.18	0.00	0.01	0.13
62.8	18.05	0.02	2.62	3.07	11.35	0.00	1139	3.95	4.11	0.04	0.04	0.92	25.81	0.92	199.1	7.94	0.03	10.39	18.95	1.46	10.03	6.33	0.81	18.23	4.46	31.58	7.47	21.11	2.92	20.03	2.82	0.18	0.12	0.00	0.00	0.13
69.1	18.05	0.02	2.67	2.96	10.29	0.00		3.65	3.83	0.04	0.03	0.87	23.03																							
78.2	18.05	0.01	2.71	3.18	11.53	0.00	1731	4.02	4.11	0.04	0.04	0.91	24.56	0.70	186.2	4.75	0.00	0.69	1.91	0.57	5.65	9.15	1.14	27.23	5.86	36.44	7.27	17.09	2.02	12.13	1.50	0.10	0.11	0.00	0.00	0.03
84.7	18.05	0.01	2.76	3.19	11.68	0.00	1698	3.98	4.10	0.04	0.04	0.87	23.33	0.87	185.9	5.09	0.02	0.16	0.95	0.46	4.84	9.28	1.10	27.40	5.76	36.47	7.07	16.64	2.04	11.80	1.52	0.14	0.17	0.00	0.00	0.04
92.3	18.05	0.01	2.74	3.15	11.98	0.00	1586	4.07	4.16	0.03	0.03	0.86	23.71	0.70	190.2	5.18	0.01	0.08	0.70	0.41	4.49	9.38	1.04	26.87	5.77	36.51	7.40	17.60	2.18	12.98	1.59	0.12	0.12	0.01	0.00	0.02
100.0	18.05	0.00	2.79	3.22	12.63	0.00	1426	4.15	4.35	0.04	0.04	0.90	24.20	0.69	204.5	5.54	0.01	0.05	0.49	0.27	3.95	8.64	1.03	24.54	5.65	36.92	8.16	21.01	2.60	17.18	2.38	0.10	0.14	0.00	0.00	0.01
6117-A L10 (Grt-5)																																				
0.0	18.05	0.01	2.67	2.74	9.53	0.00	1011	3.59	3.61	0.03	0.03	0.91	24.90	0.50	147.6	5.45	0.00	1.61	2.54	0.48	4.24	6.33	0.83	14.71	3.19	22.97	5.63	17.79	2.71	19.60	3.21	0.11	0.08	0.00	0.00	0.05
6.3	18.05	0.01	2.17	2.35	9.38	0.00	928	3.61	3.43	0.03	0.03	0.81	21.66	0.41	110.3	5.43	0.00	0.36	1.55	0.31	3.41	5.92	0.73	10.99	2.18	15.27	3.81	12.76	2.04	16.66	2.58	0.10	0.09	0.00	0.00	0.04
12.7	18.05	0.01	2.51	2.94	10.09	0.00	1009	3.65	3.74	0.03	0.03	0.85	22.72	0.42	109.7	5.56	0.09	0.63	1.37	0.31	3.70	6.33	0.84	11.41	2.17	15.43	3.75	12.85	2.15	16.39	2.67	0.11	0.10	0.00	0.00	0.03

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
19.1	18.05						1018							0.49	119.8	6.17	0.06	0.36	1.93	0.41	3.99	6.77	0.86	11.86	2.45	16.53	4.33	14.06	2.31	18.26	2.83	0.14	0.12	0.01	0.00	0.04
41.0	18.05	0.01	2.51	2.84	11.50	0.00	861	4.49	4.67	0.08	0.08	0.94	25.70	0.44	112.6	5.61	0.09	0.30	1.75	0.43	3.95	6.28	0.78	11.73	2.25	16.44	4.24	13.50	2.20	16.84	2.71	0.10	0.11	0.01	0.00	0.03
48.1	18.05						919							0.38	130.5	6.10	0.04	0.15	0.95	0.34	3.83	6.62	0.86	11.82	2.45	17.63	4.42	14.67	2.36	17.76	2.85	0.11	0.11	0.00	0.00	0.02
54.8	18.05	0.01	2.06	2.40	10.52	0.00	879	3.63	3.63	0.04	0.05	0.84	24.18	0.44	145.8	5.79	0.03	0.11	0.86	0.35	4.17	6.37	0.89	11.75	2.57	20.18	5.13	15.86	2.57	18.28	2.86	0.08	0.10	0.00	0.00	0.04
61.3	18.05	0.01	2.89	2.89	9.56	0.00	875	2.89	3.07	0.04	0.04	0.72	19.85	0.76	183.4	6.33	0.04	0.14	0.69	0.27	3.56	7.18	0.88	18.21	4.02	28.57	6.91	20.66	3.11	20.92	3.26	0.12	0.11	0.00	0.00	0.02
67.9	18.05	0.00	2.29	2.74	10.32	0.00	969	3.54	3.61	0.04	0.04	0.81	23.82	0.69	216.2	8.25	0.01	0.07	0.52	0.31	3.66	7.81	0.95	21.10	4.84	35.34	8.77	26.22	3.84	24.40	3.93	0.17	0.17	0.01	0.00	0.02
74.2	18.05	0.01	3.07	3.43	12.09	0.00		4.15	6.14	0.04	0.05	0.92	28.87																							
80.6	18.05	0.00	2.33	3.03	10.21	0.00	504	3.61	3.84	0.03	0.03	0.88	22.20	0.34	87.9	5.11	0.01	0.09	0.58	0.22	2.91	5.92	0.80	8.97	1.68	12.29	3.21	10.61	1.86	14.26	2.36	0.15	0.10	0.00	0.00	0.02
86.9	18.05	0.01	2.45	2.96	11.42	0.00	541	3.46	3.81	0.03	0.03	0.86	25.09	0.17	70.4	4.87	0.02	0.08	0.47	0.29	2.35	5.59	0.88	8.12	1.34	11.91	2.71	8.66	1.57	11.55	1.80	0.00	0.07	0.00	0.00	0.01
93.3	18.05						568							0.26	85.2	5.32	0.01	0.06	0.51	0.25	2.71	5.92	0.83	9.75	1.81	12.54	3.12	10.05	1.68	13.25	2.12	0.11	0.10	0.00	0.00	0.03
100.0	18.05	0.01	2.53	2.89	11.01	0.00		3.84	4.15	0.03	0.03	1.00	27.97																							
6210-A L1 (Grt-1)																																				
0.0	18.05	0.01	6.06	6.38	13.82	0.02	2797	0.74	0.77	0.04	0.04	0.39	23.86	0.79	166.4	29.92	0.09	0.00	0.01	0.01	0.63	3.61	0.17	9.44	3.26	27.41	6.32	15.79	1.88	10.34	1.46	0.75	0.70	0.01	0.00	0.00
2.5	18.05	0.01	6.32	6.68	13.54	0.03	2527	0.76	0.70	0.01	0.01	0.40	24.00	bdl	142.6	30.68	0.03	0.04	0.00	0.01	0.74	3.07	0.10	8.48	3.07	25.27	5.23	12.99	1.99	9.20	1.23	0.25	0.92	bdl	0.00	0.00
5.1	18.05	0.01	5.99	6.28	13.14	0.03	2597	0.74	0.73	0.02	0.02	0.39	24.02	0.52	142.4	28.84	bdl	0.00	0.02	0.00	0.49	3.28	0.16	8.75	2.60	23.95	5.34	12.99	1.56	8.61	1.27	0.64	0.64	0.00	0.00	0.00
7.6	18.05	0.01	5.94	6.22	13.06	0.03	2451	0.72	0.73	0.02	0.02	0.39	24.05	0.63	143.8	27.76	bdl	0.00	0.01	0.00	0.50	3.54	0.17	8.81	2.82	23.61	5.49	13.05	1.47	9.19	1.29	0.50	0.56	0.00	0.00	0.00
10.2	18.05																																			
12.7	18.05	0.01	5.92	6.23	12.83	0.03	2240	0.67	0.73	0.01	0.01	0.40	24.00	0.31	134.8	27.79	0.02	0.56	1.34	0.21	2.20	3.28	0.13	8.63	2.73	22.94	5.14	12.27	1.36	8.84	1.12	0.55	0.60	0.00	0.00	0.58
15.2	18.05																																			
17.7	18.05	0.02	5.97	6.10	12.58	0.07	2090	0.65	0.69	0.03	0.03	0.37	23.80	0.72	116.0	21.76	0.16	0.29	0.85	0.25	3.25	3.56	0.10	7.58	2.24	19.54	4.35	10.68	1.22	7.24	1.06	0.47	0.51	0.00	0.05	0.02
20.2	18.05	0.01	6.14	6.32	12.99	0.03	1805	0.81	0.72	0.01	0.01	0.40	24.00	1.01	129.9	19.85	bdl	0.01	0.00	bdl	0.45	3.25	0.13	9.93	2.35	23.46	5.05	12.27	1.43	9.38	1.08	0.47	0.27	bdl	0.00	0.00
22.7	18.05	0.01	5.97	6.10	11.82	0.05	1834	0.62	0.68	0.02	0.02	0.45	27.40	0.51	116.2	17.11	0.02	0.01	0.05	0.00	0.41	2.65	0.14	8.23	2.26	18.88	4.33	10.21	1.21	7.31	1.03	0.37	0.50	0.00	0.00	0.00
25.2	18.05																																			
27.7	18.05	0.01	5.47	6.59	10.95	0.05	1678	0.59	0.63	0.01	0.01	0.40	25.60	0.29	97.1	19.31	0.03	0.29	0.67	0.12	1.34	2.83	0.18	7.54	2.13	17.02	3.68	8.48	1.08	6.10	0.85	0.35	0.32	0.00	0.01	0.22
30.3	18.05	0.01	7.94	6.68	13.54	0.10	1805	0.67	0.70	0.01	0.01	0.49	25.00	1.14	106.5	19.85	bdl	bdl	0.10	0.02	0.88	3.79	bdl	9.93	2.35	19.85	4.33	9.56	0.99	7.04	0.63	0.78	0.51	bdl	0.00	0.34
32.8	18.05	0.01	5.76	6.42	10.70	0.04	1624	0.56	0.61	0.01	0.02	0.41	26.60	0.32	87.9	18.05	0.01	0.00	0.16	0.01	0.31	2.87	0.15	7.87	1.93	16.01	3.23	7.58	0.87	6.01	0.75	0.40	0.47	0.00	0.00	0.04
35.3	18.05	0.01	5.18	5.56	10.34	0.03	1518	0.56	0.57	0.01	0.01	0.37	24.40	0.19	83.0	20.21	bdl	0.15	0.42	0.08	1.03	2.87	0.13	7.87	2.04	14.51	3.12	7.27	0.85	5.27	0.73	0.41	0.40	0.00	0.01	0.23
45.2	18.05	0.02	4.94	5.36	9.49	0.04	1382	0.49	0.53	0.01	0.01	0.37	21.20	3.79	61.2	14.31	0.01	0.02	0.08	0.02	0.18	1.68	0.11	6.71	1.55	11.06	2.26	5.52	0.63	4.46	0.64	0.35	0.32	0.00	0.00	0.03
47.7	18.05																																			
50.2	18.05	0.02	5.59	6.01	11.19	0.03	1610	0.60	0.62	0.01	0.01	0.38	22.50	1.08	72.9	19.67		0.01	0.04	0.00	0.22	2.85	0.13	9.04	2.24	13.54	2.45	5.70	0.71	4.62	0.64	0.38	0.43	0.00	0.00	0.01
52.7	18.05	0.01	6.14	7.58	12.99	0.03	2346	0.78	0.72	0.02	0.02	0.42	24.00	1.10	88.4	27.07	0.03	bdl	0.06	bdl	0.65	5.59	0.20	11.55	3.43	18.05	2.89	6.68	0.72	4.87	0.65	0.43	0.54	bdl	0.00	0.00
55.2	18.05	0.01	5.76	6.19	12.27	0.03	1884	0.67	0.69	0.02	0.02	0.39	24.60	0.63	78.0	24.00	0.06	0.01	0.03	0.01	0.64	3.86	0.15	11.19	2.63	15.59	2.62	5.41	0.64	4.11	0.63	0.45	0.45	0.01	0.00	0.01
57.7	18.05	0.01	5.56	5.87	11.60	0.02	1864	0.67	0.67	0.01	0.01	0.36	22.10	0.83	67.1	18.59	0.01	0.01	0.03	0.00	0.55	3.57	0.15	10.09	2.42	14.09	2.29	4.58	0.55	3.56	0.43	0.34	0.35	0.00	0.00	0.00
60.2	18.05	0.01	5.96	6.32	12.63	0.03	1805	0.72	0.69	0.02	0.02	0.38	24.00	0.27	61.4	16.06	bdl	0.03	0.00	bdl	1.03	4.15	0.25	9.93	2.89	12.99	2.17	4.51	0.65	3.61	0.56	0.76	0.18	bdl	0.00	0.00
62.7	18.05	0.01	5.79	6.32	12.20	0.03	1797	0.69	0.69	0.02	0.02	0.37	25.10	0.58	59.0	13.99	0.01	0.00	0.01	0.02	0.66	3.70	0.14	10.79	2.43	12.78	1.96	3.92	0.46	3.14	0.37	0.23	0.27	0.00	0.00	0.00
65.2	18.05	0.01	5.56	5.72	11.42	0.03	1718	0.61	0.67	0.02	0.02	0.37	22.90	0.31	53.6	12.85	0.01	0.01	0.02	0.01	0.63	3.72	0.12	10.07	2.24	11.26	1.71	3.32	0.43	2.74	0.36	0.15	0.34	0.01	0.00	0.01
67.7	18.05	0.01	8.30	6.32	14.98	0.03	1985	0.72	0.69	0.02	0.02	0.42	26.00	0.03	63.2	15.34	0.14	bdl	0.00	0.00	0.31	4.33	0.13	12.09	2.71	12.81	1.99	4.87	0.45	3.07	0.25	0.09	0.31	0.01	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
71.4	18.05	0.01	5.72	5.96	11.28	0.02	1556	0.58	0.63	0.02	0.02	0.37	22.00	0.34	51.4	13.39	0.01	0.00	0.01	0.00	0.72	3.59	0.17	10.67	2.33	11.30	1.66	3.50	0.43	2.69	0.38	0.25	0.27	0.00	0.00	0.00
75.7	18.05	0.01	6.10	6.03	11.53	0.02	1545	0.62	0.64	0.02	0.02	0.39	22.80	0.40	53.6	14.47	bdl	bdl	0.01	0.01	0.66	3.75	0.15	11.51	2.44	11.69	1.68	3.56	0.47	2.92	0.39	0.32	0.27	0.00	0.00	0.00
78.9	18.05	0.01	5.43	5.65	11.21	0.06	1532	0.60	0.61	0.02	0.02	0.36	22.00	0.97	52.2	16.31	0.20	0.20	0.35	0.05	0.88	3.27	0.16	10.86	2.27	10.90	1.74	3.68	0.44	3.07	0.34	0.43	0.37	0.00	0.02	0.00
89.1	18.05	0.02	5.79	5.79	12.07	0.03	1251	0.67	0.69	0.02	0.02	0.36	22.00	0.85	72.4	21.76	0.02	0.09	0.26	0.06	0.93	4.22	0.16	12.90	2.61	14.09	2.75	6.53	0.80	5.61	0.75	0.45	0.45	0.00	0.01	0.00
91.7	18.05																																			
94.2	18.05	0.01	5.87	6.14	12.43	0.02	1698	0.69	0.67	0.02	0.02	0.39	25.10	0.43	78.7	22.92	bdl	0.00	0.04	0.01	0.93	4.78	0.20	15.34	2.80	15.12	3.03	7.53	1.07	6.19	0.97	0.45	0.43	0.00	0.00	0.00
96.8	18.05	0.00	4.33	4.51	9.20	0.02	1426	0.51	0.52	0.01	0.01	0.31	20.00	0.14	66.8	21.66	bdl	0.00	0.00	bdl	0.47	3.97	0.12	11.55	2.53	12.45	2.35	5.77	1.01	5.96	1.01	0.38	0.52	0.00	0.00	0.00
100.0	18.05	0.01	5.38	5.61	12.38	0.04	1525	0.67	0.71	0.01	0.02	0.38	23.80	0.43	84.3	29.96	0.05	0.10	0.18	0.04	0.57	4.75	0.20	14.78	2.78	15.81	3.21	8.34	1.22	8.52	1.28	0.52	0.51	0.00	0.02	0.00
6210-A L2 (Grt-1)																																				
0.0	18.05	0.01	5.63	5.90	11.55	0.03	1195	0.65	0.66	0.01	0.01	0.38	23.39	0.58	109.7	21.42	0.00	0.02	0.22	0.04	0.66	2.36	0.10	7.25	2.28	19.47	4.48	10.39	1.14	6.73	0.91	0.49	0.48	0.00	0.01	0.03
15.6	18.05	0.06	5.68	5.92	9.87	0.04	1166	0.52	0.56	0.10	0.13	0.34	20.70	0.34	81.0	19.74	3.52	0.05	0.11	0.02	0.41	1.71	0.10	5.58	1.84	14.98	3.07	6.77	0.77	4.33	0.58	0.50	0.41	0.14	0.07	0.01
18.5	18.05																																			
24.9	18.05	0.04	5.32	5.87	10.25	0.05	1166	0.53	0.57	0.05	0.07	0.39	22.20	0.69	73.6	15.43	1.06	0.06	0.07	0.01	0.45	2.11	0.08	5.67	1.82	14.08	2.78	5.58	0.60	3.59	0.47	0.29	0.33	0.03	0.01	0.01
27.4	18.05	0.01	5.23	5.96	10.83	0.04	1209	0.54	0.51	0.03	0.05	0.36	21.00	0.74	68.6	15.52	0.97	0.00	0.00	0.00	0.22	2.71	0.03	6.50	1.80	14.08	2.17	4.87	0.54	3.07	0.40	0.58	0.47	0.02	0.00	0.00
30.6	18.05	0.02	5.52	5.79	10.14	0.05	1191	0.53	0.53	0.02	0.02	0.37	22.50	0.45	64.4	16.60	0.38	0.01	0.03	0.01	0.59	1.88	0.10	5.96	1.88	13.21	2.31	4.73	0.50	3.01	0.39	0.39	0.43	0.03	0.00	0.01
42.4	18.05	0.04	5.36	5.50	9.46	0.05	1104	0.49	0.51	0.14	0.11	0.36	22.80	0.51	52.5	17.74	2.42	0.01	0.02	0.00	0.34	1.97	0.07	6.14	1.75	11.39	1.91	3.70	0.42	2.42	0.31	0.37	0.41	0.07	0.00	0.01
45.0	18.05	0.04	4.87	9.93	8.66	0.03	1065	0.63	0.49	0.10	0.06	0.34	19.00	0.18	48.7	16.78	3.07	0.02	0.04	bdl	0.52	1.30	0.05	5.77	1.61	10.29	1.80	3.97	0.31	2.35	0.34	0.43	0.43	0.11	0.00	0.00
47.6	18.05	0.05	5.70	6.61	10.45	0.06	1243	0.55	0.55	0.10	0.16	0.40	29.30	0.51	52.5	17.87	3.37	0.01	0.03	0.01	0.42	2.13	0.11	6.79	1.97	11.48	1.80	3.50	0.40	2.49	0.30	0.37	0.39	0.07	0.00	0.00
50.0	18.05																																			
52.6	18.05	0.02	5.70	5.72	10.94	0.03	1307	0.55	0.59	0.08	0.09	0.41	24.00	0.26	50.9	17.32	1.84	0.01	0.01	0.00	0.48	2.27	0.09	7.87	1.99	11.78	1.79	3.56	0.38	2.24	0.29	0.31	0.35	0.05	0.00	0.00
55.1	18.05	0.01	7.94	6.50	12.63	0.04	1732	0.79	0.76	0.06	0.04	0.52	27.00	0.27	66.8	19.85	0.70	bdl	0.04	0.00	0.56	2.53	0.08	11.55	2.71	16.24	2.17	3.61	0.42	2.71	0.42	0.10	0.60	bdl	0.00	0.00
57.7	18.05	0.01	5.83	6.08	11.39	0.04	1514	0.60	0.63	0.04	0.04	0.38	24.00	0.42	50.7	16.98	0.58	0.01	0.01	0.01	0.72	2.71	0.12	8.70	2.08	11.82	1.80	3.34	0.42	2.29	0.36	0.38	0.38	0.02	0.00	0.00
60.3	18.05	0.01	5.58	6.05	11.17	0.04	1428	0.60	0.65	0.03	0.03	0.40	23.00	0.63	46.0	17.18	0.37	0.00	0.02	0.01	0.62	2.78	0.10	8.36	2.15	11.26	1.62	3.18	0.33	2.06	0.30	0.37	0.38	0.02	0.00	0.01
62.9	18.05	0.01	5.58	5.43	9.98	0.03	1281	0.54	0.57	0.03	0.02	0.39	26.60	0.38	41.2	15.52	0.19	0.01	0.01	0.00	0.54	2.49	0.09	7.92	1.88	10.03	1.44	2.85	0.30	2.11	0.27	0.34	0.33	0.01	0.00	0.00
65.4	18.05																																			
68.0	18.05	0.01	4.57	5.20	8.25	0.03	1032	0.46	0.46	0.02	0.02	0.37	22.20	0.34	33.0	11.39	0.15	0.00	0.01	0.00	0.58	2.36	0.10	7.04	1.57	7.90	1.18	2.44	0.28	1.62	0.26	0.17	0.21	0.00	0.00	0.01
70.6	18.05	0.00	7.22	5.59	10.47	0.03	1354	0.54	0.58	0.02	0.02	0.40	23.00	0.90	43.3	15.88	0.00	0.01	0.05	0.00	0.56	3.43	0.09	10.65	1.99	9.38	1.73	2.89	0.29	2.17	0.29	0.07	0.20	0.00	0.01	0.00
73.1	18.05	0.01	4.82	5.49	9.33	0.03	1117	0.51	0.52	0.02	0.02	0.39	23.50	0.34	40.2	15.18	0.05	0.01	0.02	0.02	0.63	2.94	0.10	9.35	1.80	8.86	1.44	3.18	0.35	2.36	0.31	0.33	0.31	0.00	0.00	0.01
76.7	18.05	0.01	5.00	5.47	9.46	0.03	1097	0.49	0.53	0.02	0.02	0.39	21.70	0.36	40.1	15.09	0.06	0.03	0.07	0.03	0.69	3.25	0.12	8.68	1.76	8.92	1.35	2.96	0.39	2.45	0.32	0.26	0.32	0.00	0.00	0.00
83.0	18.05	0.01	4.75	5.32	9.69	0.04	1198	0.52	0.54	0.01	0.02	0.37	21.40	0.38	47.1	18.95	0.05	0.01	0.04	0.03	0.73	3.66	0.16	10.77	2.04	10.38	1.73	3.97	0.48	3.00	0.41	0.34	0.32	0.00	0.00	0.00
92.2	18.05	0.02	5.52	5.63	10.52	0.03	1294	0.52	0.55	0.10	0.11	0.37	24.00	0.27	54.7	23.35	1.19	0.02	0.08	0.05	1.08	4.91	0.20	12.42	1.96	10.52	1.97	4.60	0.60	4.08	0.58	0.45	0.41	0.02	0.00	0.01
100.0	18.05	0.02	4.15	4.42	7.96	0.03	998	0.45	0.54	0.09	0.10	0.35	20.90	0.31	44.9	19.85	0.94	0.01	0.05	0.04	0.88	3.50	0.14	9.22	1.61	8.25	1.61	4.19	0.61	4.01	0.60	0.36	0.35	0.01	0.00	0.01
6210-A L3 (Grt-2)																																				
0.0	18.05	0.01	5.57	5.84	12.33	0.03	1002	0.69	0.72	0.01	0.01	0.37	23.04	0.54	88.2	25.81	0.02	0.02	0.04	0.01	0.11	2.89	0.19	14.17	2.76	16.78	3.40	8.72	1.27	8.50	1.28	0.51	0.53	0.00	0.00	0.00
2.7	18.05	0.01	5.59	5.96	12.81	0.03	1029	0.72	0.70	0.01	0.01	0.38	24.00	bdl	84.8	25.27	0.05	0.06	0.25	0.04	0.14	4.15	0.10	15.52	2.71	16.42	3.07	7.22	1.21	4.69	0.90	0.40	0.96	0.00	0.03	0.02
5.5	18.05	0.01	5.53	5.78	12.10	0.03	978	0.65	0.68	0.01	0.01	0.36	23.19	0.34	78.0	24.81	0.01	0.06	0.19	0.02	0.31	4.01	0.21	14.28	2.62	15.16	2.78	6.97	0.85	5.67	0.85	0.49	0.43	0.00	0.00	0.01

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
8.3	18.05	0.01	5.63	5.90	12.09	0.03	960	0.66	0.69	0.01	0.01	0.37	22.84	0.36	73.8	24.74	0.01	0.00	0.01	0.01	0.16	3.93	0.22	13.90	2.60	15.01	2.78	6.51	0.86	5.52	0.74	0.47	0.48	0.00	0.00	0.00
11.4	18.05																																			
25.0	18.05	0.03	5.49	6.08	10.03	0.06	884	0.52	0.54	0.20	0.21	0.32	20.10	0.45	51.1	30.68	0.35	0.05	0.14	0.02	0.15	2.27	0.16	8.95	1.88	10.63	1.75	3.65	0.48	2.80	0.36	0.69	0.79	0.01	0.03	0.12
28.2	18.05	0.03	5.43	6.05	11.06	0.06	935	0.58	0.58	0.14	0.14	0.35	21.40	0.43	55.8	47.46	0.28	0.04	0.13	0.02	0.11	2.33	0.13	9.76	2.06	11.97	1.97	4.06	0.46	3.18	0.38	0.88	0.99	0.01	0.03	0.26
33.2	18.05	0.02	5.32	5.25	9.87	0.05	884	0.54	0.56	0.11	0.12	0.34	20.70	0.58	48.9	49.99	0.40	0.03	0.11	0.02	0.15	1.95	0.13	8.14	1.79	10.27	1.79	3.81	0.45	2.83	0.39	0.76	0.94	0.00	0.02	0.47
35.9	18.05	0.01	7.58	5.96	12.27	0.05	1209	0.56	0.70	0.05	0.06	0.72	30.00	0.67	66.8	28.87	0.03	0.04	0.13	bdl	0.12	2.35	0.06	10.47	2.71	14.44	2.53	5.96	0.47	2.89	0.45	1.77	1.57	0.00	0.09	0.14
38.6	18.05	0.01	5.23	5.76	10.11	0.05	906	0.56	0.58	0.05	0.04	0.39	23.70	0.69	57.9	38.62	0.12	0.03	0.14	0.01	0.11	2.04	0.16	9.15	2.04	11.73	2.13	4.58	0.53	3.45	0.45	0.97	0.97	0.01	0.02	0.54
41.4	18.05	0.01	4.87	4.33	9.75	0.08	866	0.49	0.52	0.02	0.02	0.34	17.00	0.05	48.7	14.62	0.01	0.06	0.18	0.01	0.02	1.70	0.18	5.96	1.66	10.11	2.17	3.79	0.40	3.25	0.34	0.47	0.31	0.00	0.00	0.14
44.1	18.05	0.01	5.05	5.47	9.53	0.03	902	0.49	0.55	0.02	0.02	0.35	22.00	0.35	55.0	20.75	0.06	0.02	0.10	0.00	0.06	1.86	0.14	8.12	1.84	11.12	2.04	4.13	0.49	3.09	0.38	0.42	0.49	0.00	0.01	0.09
46.8	18.05																																			
49.5	18.05	0.01	5.49	5.68	10.29	0.03	1005	0.55	0.59	0.01	0.01	0.34	22.20	0.47	63.5	22.38	0.08	0.01	0.03	0.01	0.17	2.18	0.18	8.05	2.06	12.33	2.40	5.00	0.51	3.09	0.42	0.48	0.38	0.00	0.00	0.04
52.3	18.05																																			
55.0	18.05	0.01	5.38	5.67	10.25	0.03	1516	0.54	0.60	0.01	0.01	0.37	23.10	0.13	65.9	12.13	0.04	0.00	0.04	0.01	0.06	2.02	0.12	7.54	1.93	13.39	2.45	5.11	0.52	3.27	0.40	0.35	0.49	0.00	0.00	0.01
57.7	18.05																																			
60.5	18.05	0.01	5.29	5.65	10.32	0.03	1381	0.62	0.59	0.01	0.01	0.39	22.50	0.90	80.0	18.95	0.02	0.08	0.09	0.01	0.12	2.33	0.11	6.70	1.97	15.39	2.83	5.58	0.65	3.46	0.53	0.51	0.40	0.00	0.00	0.01
63.2	18.05																																			
66.6	18.05	0.01	5.45	5.79	9.60	0.03	1224	0.52	0.54	0.01	0.01	0.37	24.70	0.42	86.4	20.57	0.05	0.02	0.06	0.02	0.15	1.77	0.11	5.67	1.99	15.43	3.14	6.88	0.66	3.74	0.49	0.50	0.49	0.00	0.00	0.00
75.7	18.05	0.01	5.56	5.85	10.32	0.03	1077	0.54	0.58	0.05	0.05	0.38	23.80	0.40	110.8	23.10	0.88	0.02	0.06	0.01	0.19	1.97	0.10	5.96	2.22	19.13	4.11	8.64	0.91	4.46	0.56	0.71	0.74	0.04	0.00	0.01
78.4	18.05	0.02	5.49	6.10	10.67	0.03	1197	0.56	0.58	0.06	0.07	0.36	24.00	0.47	111.9	22.20	2.96	0.02	0.09	0.02	0.21	1.99	0.10	6.06	2.15	18.62	4.26	9.26	0.92	4.82	0.61	0.62	0.60	0.17	0.00	0.01
81.6	18.05																																			
89.3	18.05	0.01	5.47	6.01	10.39	0.03	1137	0.55	0.57	0.03	0.03	0.43	24.50	0.23	118.8	17.14	0.54	0.01	0.01	0.01	0.10	1.99	0.11	6.73	2.05	18.95	4.48	10.76	1.12	5.72	0.67	0.39	0.38	0.01	0.00	0.00
94.5	18.05	0.01	6.23	5.87	10.05	0.03	967	0.53	0.53	0.02	0.02	0.38	28.40	0.25	115.3	16.06	0.26	0.00	0.06	0.01	0.07	1.75	0.10	7.53	2.15	18.59	4.40	11.03	1.21	6.44	0.75	0.29	0.31	0.02	0.00	0.01
97.3	18.05	0.01	4.33	4.33	8.66	0.03	848	0.36	0.52	0.01	0.01	0.38	20.00	0.29	90.2	13.72	0.10	0.08	0.00	bdl	0.05	1.15	0.12	5.96	1.64	15.16	4.51	10.83	1.05	5.77	0.72	0.09	0.32	0.00	0.00	0.00
100.0	18.05	0.01	5.34	5.59	9.93	0.04	956	0.50	0.54	0.01	0.01	0.39	24.40	0.45	98.0	13.30	0.13	0.04	0.06	0.02	0.07	1.34	0.10	6.98	1.86	15.54	3.99	9.67	1.22	6.50	0.89	0.22	0.27	0.00	0.02	0.01
6210-A L4 (Grt-2)																																				
0.0	18.05	0.01	5.41	5.76	10.61	0.03	574	0.61	0.60	0.03	0.04	0.35	22.80	0.42	58.3	15.05	0.40	0.10	0.38	0.02	0.23	1.84	0.12	8.45	1.86	12.07	2.14	4.72	0.53	3.19	0.43	0.30	0.28	0.01	0.01	0.02
16.9	18.05	0.01	5.31	5.41	10.72	0.04	771	0.62	0.63	0.02	0.01	0.35	21.10	0.49	63.0	144.37	0.11	0.09	0.28	0.04	0.22	1.86	0.14	8.70	1.93	12.51	2.25	5.29	0.60	3.70	0.52	4.01	4.11	0.02	0.07	1.55
20.0	18.05	0.01	5.96	7.22	12.09	0.04	884	0.63	0.72	0.01	0.01	0.42	23.00	0.65	74.0	151.59	bdl	0.00	0.02	0.01	0.14	1.66	0.27	10.29	1.99	15.16	2.71	6.32	0.70	4.15	0.47	2.35	7.22	0.00	0.01	2.35
23.1	18.05	0.01	5.56	5.77	10.67	0.03	807	0.63	0.63	0.01	0.01	0.35	23.10	0.15	64.6	92.04	0.06	0.01	0.07	0.02	0.11	1.80	0.16	8.73	2.02	12.81	2.40	5.32	0.62	3.61	0.51	3.09	2.74	0.01	0.02	0.83
26.2	18.05	0.01	5.70	5.88	11.32	0.04	812	0.62	0.66	0.01	0.01	0.36	22.30	0.28	66.1	72.19	0.05	0.04	0.13	0.04	0.13	2.00	0.14	8.70	2.09	13.68	2.50	5.43	0.63	3.68	0.47	2.22	2.08	0.00	0.03	0.59
29.3	18.05																																			
34.7	18.05	0.01	5.07	5.43	10.58	0.03	727	0.58	0.61	0.01	0.01	0.36	21.70	0.18	63.5	22.74	0.00	0.01	0.04	0.01	0.07	1.88	0.15	7.54	2.06	12.67	2.31	4.89	0.53	3.23	0.46	0.81	0.76	0.01	0.00	0.08
38.6	18.05	0.01	5.45	5.87	11.13	0.03	809	0.61	0.64	0.01	0.01	0.39	22.80	0.34	74.7	18.95	0.03	0.00	0.03	0.01	0.10	2.24	0.15	9.11	2.41	15.39	2.75	5.61	0.64	3.83	0.52	0.61	0.40	0.00	0.00	0.07
42.8	18.05	0.01	5.47	5.68	11.41	0.03	794	0.62	0.66	0.01	0.01	0.38	24.10	0.72	69.5	16.60	0.04	0.02	0.07	0.02	0.15	2.44	0.16	8.23	2.25	14.60	2.53	4.96	0.56	3.46	0.42	0.37	0.34	0.01	0.00	0.03
45.9	18.05	0.01	4.87	6.14	10.29	0.04	776	0.63	0.60	0.01	0.01	0.36	21.00	0.04	65.0	16.60	0.11	0.00	0.00	0.02	0.17	2.53	0.04	7.76	2.17	14.26	1.99	4.51	0.49	3.43	0.29	0.18	0.18	0.00	0.00	0.01
49.0	18.05	0.01	5.58	5.81	11.53	0.04	794	0.61	0.64	0.02	0.02	0.38	23.50	0.45	68.9	18.05	0.19	0.14	0.51	0.08	0.49	2.60	0.14	8.37	2.23	14.35	2.38	4.66	0.48	3.23	0.41	0.47	0.36	0.01	0.02	0.04
52.1	18.05	0.01	5.70	5.83	11.44	0.03	790	0.61	0.66	0.01	0.01	0.37	22.80	0.17	70.0	20.21	0.12	0.01	0.04	0.01	0.13	2.42	0.14	8.63	2.37	14.46	2.49	4.46	0.54	3.25	0.43	0.38	0.37	0.01	0.00	0.02

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
55.2	18.05																																			
58.3	18.05	0.01	5.54	5.52	11.01	0.03	765	0.58	0.61	0.01	0.01	0.37	21.80	0.45	67.7	17.70	0.06	0.00	0.01	0.00	0.14	2.18	0.15	8.75	2.24	14.26	2.38	4.44	0.52	3.12	0.42	0.56	0.39	0.00	0.00	0.00
61.3	18.05																																			
64.7	18.05	0.01	5.58	5.52	11.32	0.03	727	0.61	0.63	0.01	0.01	0.34	21.70	0.32	71.7	20.27	0.01	0.02	0.03	0.00	0.09	2.20	0.16	8.84	2.37	14.87	2.55	4.96	0.55	3.37	0.41	0.53	0.46	0.01	0.00	0.01
70.9	18.05	0.01	5.70	5.99	12.29	0.04	825	0.64	0.67	0.01	0.01	0.37	22.32	0.07	71.3	19.24	0.00	0.06	0.85	0.06	0.41	2.47	0.20	9.58	2.37	14.74	2.56	5.22	0.58	3.72	0.50	0.43	0.40	0.00	0.00	0.02
74.0	18.05	0.01	5.59	5.77	11.73	0.03	794	0.61	0.65	0.00	0.00	0.34	24.00	0.04	63.2	16.42	bdl	0.01	0.27	bdl	0.14	2.89	0.18	8.66	2.35	15.16	2.17	4.69	0.49	3.25	0.51	0.40	0.25	0.00	0.00	0.00
77.1	18.05	0.01	5.52	5.97	12.02	0.03	805	0.63	0.66	0.01	0.01	0.37	22.49	0.16	66.1	16.04	0.14	0.07	0.30	0.02	0.31	2.07	0.14	9.26	2.19	13.66	2.38	4.76	0.59	3.47	0.45	0.27	0.35	0.00	0.00	0.02
80.5	18.05	0.01	5.65	5.92	11.80	0.03	753	0.62	0.66	0.01	0.01	0.35	22.70	0.23	64.8	14.71	0.00	0.04	0.27	0.03	0.19	2.15	0.15	9.35	2.28	13.64	2.29	4.82	0.59	3.81	0.48	0.21	0.30	0.00	0.00	0.01
87.6	18.05	0.01	5.27	5.49	11.48	0.02	729	0.58	0.62	0.01	0.01	0.35	21.50	0.61	69.5	15.14	0.00	0.18	1.05	0.07	0.69	2.29	0.18	9.76	2.25	14.33	2.48	5.81	0.70	4.53	0.61	0.29	0.23	0.00	0.00	0.03
94.9	18.05	0.01	5.38	5.87	12.02	0.03	781	0.63	0.67	0.01	0.01	0.36	22.49	0.34	78.9	16.75	0.00	0.20	0.83	0.07	0.88	2.61	0.21	11.78	2.47	15.21	2.82	6.93	0.88	5.63	0.75	0.30	0.37	0.00	0.01	0.03
100.0	18.05	0.01	5.48	5.71	12.16	0.02	902	0.64	0.67	0.01	0.01	0.37	22.79	0.18	94.4	19.20	bdl	0.19	0.92	0.11	0.62	2.44	0.19	13.08	2.90	17.43	3.47	8.68	1.15	7.35	0.95	0.39	0.41	0.00	0.00	0.05
6210-A L5 (Grt-3)																																				
0.0	18.05	0.01	6.05	6.26	13.75	0.02	2128	0.77	0.80	0.00	0.00	0.38	23.66	0.43	137.3	9.22	bdl	0.00	0.05	0.03	0.10	1.89	0.16	13.70	3.01	22.22	5.16	14.71	2.16	15.32	2.20	0.22	0.34	bdl	0.00	0.02
1.2	18.05	0.01	6.03	6.30	13.24	0.03	2075	0.73	0.76	0.00	0.00	0.39	24.05	0.29	130.7	8.92	bdl	0.04	0.06	0.00	0.15	1.77	0.14	12.65	2.98	20.77	4.98	14.15	2.16	15.59	2.23	0.25	0.24	bdl	0.00	0.02
2.4	18.05	0.01	6.14	6.14	12.45	0.02	2166	0.81	0.74	0.01	0.00	0.42	25.00	0.40	135.4	7.76	0.02	0.02	bdl	0.01	bdl	1.99	0.23	14.26	2.89	18.05	5.05	14.80	1.99	14.80	2.17	0.22	0.00	bdl	0.03	0.00
3.5	18.05	0.01	5.83	6.08	12.47	0.02	1940	0.66	0.71	0.00	0.00	0.37	23.10	0.36	125.2	7.76	bdl	0.02	0.05	0.01	0.04	1.75	0.19	11.98	2.73	19.35	4.76	14.04	2.17	15.11	2.31	0.19	0.20	0.00	0.00	0.00
4.7	18.05	0.01	5.94	6.17	12.61	0.02	1969	0.68	0.72	0.00	0.00	0.39	24.30	0.43	136.6	9.38	bdl	0.01	0.00	0.00	0.02	1.80	0.13	13.54	2.90	21.11	5.32	15.50	2.32	17.60	2.58	0.26	0.17	0.00	0.00	0.01
16.9	18.05	0.01	4.87	5.50	9.29	0.04	1178	0.53	0.54	0.00	0.00	0.35	21.80	0.72	81.0	5.65	0.02	2.85	7.22	0.79	3.43	1.64	0.14	7.99	1.73	12.49	2.96	9.76	1.70	13.39	2.22	0.12	0.10	0.00	0.87	0.43
18.0	18.05	0.01	4.51	5.23	9.75	0.03	1119	0.56	0.56	0.00	0.00	0.29	20.00	0.20	79.4	5.59	0.01	0.17	1.99	0.29	0.65	0.72	0.07	8.66	1.75	13.17	2.71	11.37	1.70	13.35	1.99	0.10	0.08	0.00	0.09	0.06
19.2	18.05	0.01	5.23	5.41	9.75	0.03	1242	0.54	0.54	0.00	0.00	0.34	21.00	0.39	80.3	6.23	0.00	1.99	3.61	0.52	2.87	1.32	0.08	8.16	1.75	12.42	3.03	10.03	1.73	13.77	2.45	0.11	0.12	0.00	0.63	0.16
20.4	18.05																																			
24.8	18.05	0.06	4.60	4.87	8.63	0.04	984	0.47	0.53	0.00	0.00	0.31	19.10	3.34	79.0	3.99	bdl	0.79	1.75	0.09	0.79	1.37	0.13	8.28	1.68	11.75	3.00	10.05	1.75	15.21	2.58	0.07	0.08	0.00	0.10	0.05
26.0	18.05	0.02	4.33	5.05	7.58	0.03	938	0.47	0.45	0.00	0.00	0.27	15.00	2.17	72.2	3.97	0.02	0.04	0.36	0.14	0.20	1.68	0.06	7.04	1.37	10.65	2.53	8.12	1.66	16.60	2.89	0.14	0.02	0.00	0.00	0.01
27.2	18.05	0.02	5.02	5.43	9.53	0.04	1197	0.51	0.54	0.00	0.00	0.34	20.30	1.26	89.7	4.57	0.00	0.36	0.60	0.07	0.36	1.44	0.12	9.19	2.00	13.43	3.48	11.78	2.09	17.36	3.21	0.08	0.09	0.00	0.02	0.02
28.5	18.05																																			
33.2	18.05	0.01	5.59	5.97	10.50	0.04	1168	0.55	0.59	0.00	0.00	0.36	22.60	0.54	93.5	9.15	0.03	0.08	0.42	0.04	0.16	1.66	0.12	9.93	2.12	14.33	3.84	13.81	2.42	22.27	4.37	0.22	0.21	0.00	0.01	0.01
37.3	18.05	0.01	5.23	5.76	10.59	0.04	1197	0.53	0.57	0.01	0.01	0.36	22.10	0.14	102.3	108.28	0.00	0.03	0.08	0.01	0.11	1.66	0.14	10.09	2.11	15.77	4.46	16.59	3.12	27.43	6.03	2.00	2.80	0.00	0.06	1.66
38.4	18.05	0.01	5.77	6.32	10.47	0.05	1263	0.54	0.56	0.03	0.03	0.32	23.00	1.28	110.1	79.41	bdl	0.23	0.45	0.02	0.36	1.80	0.20	12.45	2.53	16.42	4.69	19.85	3.79	30.68	7.04	3.97	3.07	0.00	0.01	0.85
39.6	18.05	0.01	5.88	5.70	10.43	0.04	1211	0.51	0.56	0.02	0.02	0.35	26.80	0.31	106.7	70.38	0.01	0.12	0.46	0.04	0.47	2.00	0.12	10.79	2.22	17.14	4.91	18.59	3.63	31.76	6.98	2.15	1.91	0.00	0.06	0.61
40.8	18.05	0.01	5.77	6.32	10.83	0.08	1227	0.54	0.63	0.02	0.01	0.38	25.00	1.03	102.9	52.34	0.03	0.09	0.36	0.03	0.38	1.41	0.04	7.58	2.17	16.60	4.69	19.85	3.61	30.68	7.04	4.87	0.96	0.00	0.16	0.72
42.4	18.05	0.02	5.81	6.17	9.96	0.03	958	0.51	0.55	0.01	0.01	0.37	23.50	0.36	82.8	80.85	0.01	0.09	0.42	0.04	0.26	1.17	0.10	7.06	1.65	12.52	3.61	14.74	2.69	24.54	5.20	2.08	2.35	0.00	0.09	1.80
44.8	18.05	0.02	5.11	5.41	9.94	0.04	818	0.52	0.56	0.02	0.02	0.32	19.80	0.57	88.1	46.92	0.08	0.12	0.49	0.03	0.21	1.62	0.12	8.46	1.85	13.44	3.74	14.49	2.70	23.46	4.78	1.10	1.55	0.01	0.04	0.28
46.0	18.05	0.01	7.40	7.40	11.91	0.05	1209	0.70	0.74	0.04	0.04	0.45	27.00	bdl	97.5	46.92	0.06	0.10	0.92	bdl	1.08	1.99	0.06	11.91	2.17	18.05	3.97	14.26	2.71	23.46	4.15	0.40	3.61	0.01	0.03	1.43
47.2	18.05	0.01	5.81	5.85	10.83	0.04	1059	0.58	0.58	0.04	0.04	0.39	23.70	0.34	90.2	34.47	0.08	0.10	0.32	0.03	0.23	1.75	0.10	9.15	1.96	13.81	3.79	14.09	2.51	20.90	4.10	1.05	1.17	0.00	0.05	0.31
48.4	18.05																																			
49.9	18.05	0.01	5.88	5.77	10.74	0.04	1178	0.56	0.59	0.03	0.02	0.39	23.10	0.38	86.4	33.57	0.08	0.09	0.35	0.04	0.25	1.88	0.11	9.62	2.03	13.70	3.63	12.36	2.17	17.90	3.61	0.79	0.48	0.01	0.01	0.06
51.1	18.05																																			

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
52.3	18.05	0.02	5.61	5.61	10.16	0.07	1054	0.56	0.55	0.01	0.01	0.38	24.40	0.94	79.6	22.38	0.08	0.07	0.24	0.03	0.25	1.62	0.11	8.88	1.86	12.58	3.16	10.07	1.71	14.98	2.65	0.60	0.46	0.01	0.01	0.06
53.5	18.05																																			
57.7	18.05	0.01	4.26	4.80	8.46	0.04	980	0.44	0.46	0.01	0.00	0.29	18.30	0.22	63.5	12.63	0.00	0.02	0.07	0.02	0.08	1.28	0.10	6.75	1.47	9.82	2.36	7.83	1.22	10.88	1.86	0.28	0.31	0.00	0.01	0.03
58.9	18.05																																			
60.1	18.05	0.01	5.31	5.61	10.02	0.03	1337	0.55	0.57	0.00	0.00	0.34	22.00	0.18	92.0	11.19	0.01	0.03	0.12	0.13	0.13	1.70	0.12	9.40	2.03	14.26	3.39	11.48	1.82	15.43	2.61	0.21	0.25	0.00	0.01	0.05
61.3	18.05	0.03	5.59	6.50	12.81	0.04	1480	0.70	0.65	0.01	0.00	0.40	28.00	bdl	99.3	14.62	0.03	0.03	0.18	0.00	0.11	1.46	0.23	11.01	2.71	19.85	3.43	10.47	1.59	16.60	2.53	0.00	1.08	0.00	0.00	0.03
62.4	18.05	0.01	6.05	5.81	11.12	0.04	1438	0.60	0.64	0.01	0.01	0.38	23.60	0.22	103.4	10.86	0.01	0.07	0.16	0.01	0.15	1.68	0.11	10.11	2.17	16.08	3.83	12.33	2.11	15.85	2.85	0.40	0.21	0.01	0.01	0.02
63.6	18.05																																			
72.5	18.05	0.04	4.67	4.85	9.76	0.02	1409	0.56	0.57	0.00	0.00	0.30	18.40	4.15	105.9	64.79	0.04	0.13	0.51	0.09	0.30	2.20	0.18	9.80	2.09	15.99	3.88	12.29	1.89	14.69	2.36	0.90	0.90	0.00	0.02	0.07
74.0	18.05	0.03	5.38	5.76	11.51	0.02	1649	0.61	0.66	0.01	0.01	0.35	21.42	0.18	129.8	41.69	0.03	0.11	0.35	0.03	0.25	2.36	0.13	11.69	2.62	19.49	4.71	14.65	2.25	17.29	2.76	0.68	0.70	0.00	0.03	0.04
85.1	18.05	0.01	4.80	5.27	9.28	0.03	897	0.49	0.52	0.01	0.01	0.35	20.10	0.22	76.3	13.16	0.02	7.40	33.21	3.70	20.93	3.75	0.22	7.71	1.76	12.98	2.83	6.66	0.80	5.05	0.62	0.29	0.27	0.00	2.36	1.21
86.3	18.05	0.01	5.68	5.85	10.43	0.04	1146	0.58	0.58	0.01	0.01	0.38	24.30	0.39	87.7	18.41	0.00	7.40	24.54	1.97	11.37	3.34	0.17	8.08	2.13	15.12	3.21	7.29	0.88	5.76	0.73	0.28	0.36	0.00	2.54	0.51
89.7	18.05	0.01	4.35	4.53	7.94	0.03	837	0.42	0.45	0.01	0.01	0.29	18.80	0.10	64.4	19.49	0.01	1.14	4.33	0.38	3.25	1.88	0.11	5.97	1.50	11.39	2.27	5.09	0.63	3.92	0.50	0.38	0.45	0.01	0.42	0.08
90.9	18.05	0.00	3.43	3.97	6.32	0.03	830	0.34	0.36	0.00	0.00	0.25	15.00	0.54	54.1	11.73	0.02	0.58	0.70	0.05	2.71	1.05	0.08	5.05	1.61	8.30	1.80	3.97	0.60	2.89	0.38	0.15	0.06	0.00	0.20	0.05
92.2	18.05	0.01	4.51	5.09	9.22	0.03	1014	0.50	0.51	0.01	0.01	0.32	19.80	0.19	66.4	11.21	0.01	0.60	4.33	0.21	2.18	1.97	0.13	6.89	1.81	11.86	2.36	5.34	0.63	3.95	0.49	0.21	0.26	0.00	0.58	0.10
93.4	18.05	0.01	5.04	5.00	9.60	0.03	1047	0.52	0.53	0.01	0.01	0.33	21.50	0.25	74.0	13.23	0.00	0.96	0.43	0.27	1.28	2.26	0.14	8.05	1.97	13.30	2.67	6.05	0.70	4.46	0.54	0.34	0.23	0.00	0.26	0.25
100.0	18.05	0.01	4.71	5.25	9.66	0.04	1097	0.51	0.54	0.01	0.01	0.33	20.40	0.31	72.0	17.69	0.02	0.42	0.58	0.03	0.48	2.78	0.13	9.20	1.99	12.87	2.69	6.55	0.83	5.32	0.70	0.33	0.34	0.00	0.03	0.01
6210-A L6 (Grt-3)																																				
0.0	18.05	0.01	5.32	5.77	10.58	0.04	572	0.60	0.58	0.01	0.01	0.36	22.00	0.25	99.8	60.28	0.01	0.03	0.15	0.00	0.09	1.82	0.15	10.29	2.21	15.30	3.83	13.16	2.32	21.01	3.88	2.35	1.26	0.00	0.02	0.51
1.8	18.05	0.01	5.52	5.56	9.89	0.04	646	0.58	0.57	0.01	0.01	0.36	23.30	0.18	92.4	50.53	0.01	0.02	0.07	0.01	0.13	1.71	0.13	9.91	2.04	14.06	3.41	11.86	2.09	17.76	3.32	1.34	1.06	0.00	0.01	0.49
3.6	18.05	0.01	5.52	5.49	9.64	0.04	7580	0.55	0.56	0.01	0.01	0.33	21.00	0.28	89.5	32.85	0.03	0.02	0.09	0.01	0.11	1.64	0.13	9.76	1.89	13.68	3.36	11.48	2.02	17.04	3.16	1.06	1.03	0.00	0.02	0.25
5.4	18.05																																			
7.1	18.05	0.01	5.47	5.94	10.38	0.03	680	0.59	0.61	0.01	0.01	0.36	21.28	0.23	92.2	23.28	0.02	0.02	0.06	0.01	0.08	1.74	0.12	10.38	2.03	13.93	3.40	11.62	1.93	16.62	2.89	0.57	0.87	0.00	0.02	0.21
9.0	18.05	0.01	5.22	5.47	10.05	0.02	635	0.56	0.57	0.01	0.01	0.35	22.10	0.16	83.0	26.35	0.01	0.03	0.06	0.01	0.08	1.52	0.14	8.81	1.78	12.69	3.02	10.11	1.70	15.12	2.57	0.76	0.76	0.00	0.01	0.13
10.7	18.05	0.01	6.32	6.86	10.65	0.03	776	0.60	0.65	0.01	0.01	0.38	22.00	0.05	86.6	19.85	0.03	0.07	0.23	0.01	0.07	1.99	0.10	10.11	1.80	14.98	4.15	14.08	1.80	16.24	3.25	0.79	0.38	0.02	0.00	0.10
12.5	18.05	0.01	5.70	5.88	10.32	0.03	720	0.58	0.59	0.01	0.01	0.38	23.00	0.41	80.3	25.27	0.02	0.02	0.08	0.01	0.10	1.64	0.11	8.61	1.88	12.81	3.12	9.94	1.70	14.31	2.47	0.51	0.61	0.00	0.01	0.12
14.4	18.05	0.01	5.11	5.29	9.69	0.03	700	0.56	0.54	0.00	0.00	0.35	20.80	0.33	80.9	13.17	0.01	0.04	0.11	0.02	0.11	1.47	0.10	8.28	1.80	12.63	3.12	9.69	1.67	14.11	2.44	0.32	0.25	0.00	0.00	0.08
22.4	18.05	0.01	5.07	5.40	10.34	0.04	1124	0.56	0.57	0.00	0.00	0.32	20.80	0.41	89.2	12.27	0.02	0.05	0.15	0.10	0.13	1.75	0.12	9.85	2.09	13.37	3.25	10.72	1.70	14.04	2.44	0.28	0.28	0.01	0.85	0.03
24.1	18.05	0.02	4.85	5.45	10.49	0.04	1086	0.60	0.60	0.01	0.01	0.32	20.60	0.67	86.8	12.83	0.01	0.10	0.30	0.04	0.21	1.70	0.11	9.87	1.95	13.77	3.09	9.98	1.76	14.18	2.29	0.28	0.31	0.00	0.06	0.01
25.8	18.05																																			
31.5	18.05	0.01	5.22	5.63	10.97	0.03	1480	0.58	0.60	0.03	0.04	0.36	20.60	0.25	100.5	11.37	0.03	0.08	0.30	0.03	0.17	1.88	0.15	11.17	2.31	16.60	3.83	11.80	1.88	14.60	2.36	0.22	0.26	0.02	0.02	0.03
33.5	18.05																																			
43.8	18.05	0.01	4.57	5.16	10.00	0.03	1198	0.55	0.57	0.02	0.03	0.31	20.40	0.63	102.1	18.23	0.14	0.01	0.09	0.02	0.12	2.22	0.19	11.39	2.38	16.24	3.74	11.04	1.77	13.79	2.18	0.36	0.35	0.00	0.01	0.02
50.8	18.05	0.03	6.03	6.42	12.47	0.04	1518	0.67	0.70	0.01	0.01	0.40	24.50	0.40	124.2	25.01	0.04	0.12	0.23	0.05	0.26	3.46	0.18	13.81	2.77	18.97	4.64	13.64	2.19	15.81	2.54	0.45	2.53	0.00	0.03	0.02
52.6	18.05	0.01	5.59	6.14	12.63	0.05	1335	0.63	0.67	0.01	0.01	0.60	23.00	bdl	131.7	27.07	bdl	bdl	0.00	bdl	0.23	4.33	0.20	15.70	2.89	18.05	4.69	14.62	2.35	18.05	3.07	0.72	0.31	0.00	0.00	0.03
54.3	18.05	0.01	5.63	6.01	11.86	0.04	1420	0.65	0.67	0.01	0.01	0.38	23.20	0.38	125.1	28.87	0.00	0.09	0.23	0.05	0.20	3.83	0.26	14.92	2.85	19.24	4.60	14.82	2.10	15.41	2.36	0.42	0.47	0.00	0.02	0.01
56.0	18.05	0.01	6.14	6.32	13.90	0.03	1317	0.63	0.74	0.01	0.01	0.38	26.00	0.05	131.7	17.87	0.00	bdl	0.00	bdl	0.12	3.25	0.12	14.08	2.71	19.85	4.33	12.99	2.17	15.16	2.17	0.22	0.42	0.00	0.00	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
57.8	18.05	0.01	5.79	6.39	11.60	0.03	1361	0.67	0.69	0.01	0.01	0.36	24.20	0.43	119.5	14.22	0.01	0.01	0.02	0.00	0.07	2.67	0.14	12.63	2.58	17.99	4.42	13.54	1.95	13.55	2.11	0.34	0.28	0.00	0.00	0.01
59.9	18.05																																			
62.4	18.05	0.01	5.14	5.49	10.20	0.03	1144	0.53	0.57	0.01	0.01	0.34	21.70	0.36	107.2	17.32	0.01	0.01	0.01	0.01	0.10	3.16	0.17	10.59	2.18	16.10	3.93	11.75	1.60	10.67	1.51	0.28	0.28	0.00	0.16	0.00
64.6	18.05																																			
70.6	18.05	0.01	4.89	5.41	9.42	0.03	1003	0.50	0.50	0.04	0.05	0.32	21.90	0.38	88.8	11.46	0.01	0.00	0.02	0.00	0.15	2.29	0.12	7.47	1.79	14.26	3.34	9.04	1.14	6.37	0.81	0.25	0.25	0.00	0.00	0.00
72.3	18.05	0.01	5.27	5.40	9.66	0.03	1027	0.50	0.56	0.05	0.04	0.40	23.60	0.16	90.6	13.17	0.03	0.01	0.03	0.00	0.12	2.40	0.10	7.71	1.89	14.44	3.37	8.66	1.02	6.30	0.82	0.31	0.32	0.00	0.00	0.01
74.1	18.05	0.01	5.41	7.04	10.83	0.06	1299	0.61	0.72	0.03	0.02	0.34	23.00	bdl	117.3	14.08	bdl	0.01	0.03	bdl	0.20	3.79	0.11	9.75	2.17	17.14	3.97	10.11	1.34	5.77	0.79	0.31	0.42	0.00	0.00	0.00
75.8	18.05	0.01	5.65	5.27	9.91	0.04	1012	0.54	0.57	0.03	0.03	0.35	21.20	0.38	98.2	14.98	0.02	0.03	0.13	0.02	0.26	2.78	0.16	8.19	2.18	15.74	3.54	8.75	1.08	5.94	0.72	0.38	0.38	0.00	0.01	0.00
77.6	18.05	0.01	5.68	5.63	11.03	0.03	1065	0.58	0.59	0.03	0.04	0.39	23.60	0.32	103.6	13.57	0.01	0.02	0.06	0.01	0.23	3.25	0.24	9.04	2.15	17.14	3.77	8.55	1.02	6.30	0.72	0.28	0.25	0.00	0.00	0.02
79.3	18.05	0.01	4.15	4.69	9.20	0.03	938	0.52	0.52	0.02	0.02	0.25	30.00	0.67	83.0	9.38	0.03	0.03	0.04	0.00	0.36	3.07	0.08	9.20	1.61	13.17	3.25	7.04	0.60	5.05	0.31	0.25	0.17	0.01	0.02	0.00
81.1	18.05	0.01	5.45	5.81	10.85	0.04	1130	0.60	0.65	0.03	0.02	0.35	21.30	0.51	94.4	11.60	0.02	0.02	0.04	0.01	0.29	3.10	0.15	9.53	2.31	15.47	3.43	7.85	0.88	5.49	0.62	0.21	0.20	0.00	0.00	0.00
82.9	18.05	0.01	5.41	5.59	11.01	0.03	1173	0.65	0.58	0.03	0.01	0.31	21.00	0.02	86.6	15.88	0.02	0.07	0.06	0.04	0.51	3.43	0.23	10.47	2.17	13.90	3.25	7.58	0.97	5.23	0.67	0.16	0.32	0.00	0.00	0.00
84.6	18.05	0.01	5.79	5.83	11.04	0.04	1146	0.60	0.63	0.02	0.01	0.37	21.90	0.38	89.2	16.31	0.02	0.02	0.06	0.02	0.33	3.37	0.18	10.47	2.33	15.48	3.05	7.51	0.93	5.87	0.69	0.26	0.29	0.00	0.00	0.00
86.3	18.05																																			
88.1	18.05	0.01	5.85	5.97	11.32	0.04	1198	0.64	0.68	0.02	0.02	0.38	23.90	0.34	88.1	16.08	0.04	0.12	0.27	0.05	0.56	3.83	0.19	11.66	2.36	16.06	3.27	7.60	1.00	5.83	0.77	0.30	0.27	0.00	0.00	0.00
89.8	18.05	0.01	5.77	5.96	13.17	0.02	1444	0.67	0.69	0.02	0.02	0.40	21.00	0.65	88.4	17.69	0.00	0.01	0.05	0.04	0.69	3.79	0.18	15.88	2.71	17.32	2.89	8.30	0.87	5.23	0.83	0.51	0.09	0.00	0.00	0.00
91.6	18.05	0.01	5.36	5.77	10.47	0.03	1068	0.54	0.60	0.02	0.02	0.35	23.90	0.19	76.2	17.02	0.01	0.00	0.01	0.01	0.63	4.11	0.15	11.37	2.22	13.73	2.78	6.48	0.90	5.11	0.64	0.33	0.29	0.00	0.27	0.00
93.9	18.05																																			
100.0	18.05	0.04	6.15	5.79	10.56	0.02	962	0.58	0.58	0.02	0.02	0.36	22.80	9.20	71.7	25.27	0.00	0.01	0.07	0.04	1.01	4.55	0.19	12.43	2.24	12.76	2.54	5.88	0.77	4.57	0.52	0.34	0.44	0.01	0.00	0.01
6210-A L7 (Grt-4)																																				
0.0	18.05	0.01	6.44	6.56	13.79	0.02	1716	0.75	0.79	0.01	0.01	0.38	23.26	0.25	182.5	25.86	0.03	0.01	0.03	0.01	0.12	4.53	0.21	13.30	3.02	25.79	7.24	21.62	2.90	16.78	2.62	0.39	0.44	0.01	0.00	bdl
2.4	18.05																																			
4.8	18.05	0.01	6.16	6.56	13.20	0.02	2048	0.71	0.76	0.01	0.01	0.39	23.72	0.09	182.1	23.15	bdl	bdl	0.01	bdl	0.19	4.84	0.18	12.33	2.93	25.68	7.24	21.80	2.67	16.28	2.44	0.51	0.52	0.00	0.00	0.00
7.1	18.05																																			
9.4	18.05	0.01	6.42	6.52	12.89	0.03	1709	0.76	0.73	0.01	0.01	0.38	23.67	0.16	175.2	20.14	0.02	0.00	0.01	0.00	0.12	4.98	0.19	11.39	2.95	26.17	7.04	19.91	2.32	15.07	2.11	0.45	0.38	0.00		0.01
11.8	18.05																																			
14.1	18.05	0.01	5.83	5.90	11.12	0.03	1171	0.60	0.63	0.01	0.01	0.42	24.60	0.34	131.0	17.22	0.03	0.01	0.01	0.00	0.13	3.36	0.14	8.55	2.22	20.19	5.34	14.94	1.80	10.54	1.42	0.30	0.35	0.00	0.01	0.01
16.4	18.05																																			
18.7	18.05	0.01	5.25	5.79	9.55	0.03	836	0.76	0.55	0.01	0.01	0.34	22.00	0.20	92.9	13.97	0.03	0.01	0.06	0.01	0.16	2.80	0.12	6.86	1.64	14.94	3.88	10.56	1.33	7.90	1.04	0.31	0.27	0.00	0.00	
21.0	18.05																																			
23.6	18.05	0.01	5.65	6.17	10.52	0.03	1000	0.53	0.63	0.01	0.01	0.36	21.90	0.65	105.8	14.85	0.00	0.01	0.06	0.01	0.13	3.25	0.17	7.92	1.82	16.91	4.44	11.68	1.39	7.51	1.03	0.29	0.28	0.00	0.00	0.01
25.9	18.05	0.01	6.14	5.77	12.09	0.07	956	0.63	0.67	0.01	0.01	0.40	25.00	0.20	110.1	16.60	0.00	bdl	0.00	0.00	0.06	4.69	0.27	7.04	2.17	16.96	3.97	11.55	1.48	7.22	1.01	0.52	0.31	0.00	0.00	0.00
28.2	18.05	0.01	5.43	6.03	9.96	0.03	875	0.70	0.55	0.01	0.01	0.34	23.10	0.40	95.7	12.20	0.03	0.02	0.06	0.01	0.17	3.56	0.16	7.51	1.85	14.96	3.54	9.33	1.13	6.44	0.86	0.25	0.31	0.00		0.01
30.5	18.05	0.01	5.59	5.41	11.19	0.03	956	0.70	0.60	0.02	0.02	0.42	26.00	0.40	95.7	13.90	0.00	0.01	0.03	0.09	0.12	3.97	0.29	8.84	2.17	19.85	4.33	10.29	1.37	7.58	0.83	0.23	0.22	0.01	0.00	0.01
32.8	18.05	0.01	5.29	5.41	9.66	0.03	901	0.53	0.59	0.03	0.03	0.35	22.50	0.24	87.7	13.28	0.01	0.01	0.04	0.01	0.11	3.23	0.15	8.10	1.77	14.40	3.41	8.52	0.97	5.74	0.74	0.27	0.23		0.00	0.02
35.1	18.05	0.01	5.31	5.50	9.73	0.03	971	0.53	0.55	0.02	0.02	0.33	21.70	0.17	88.4	13.90	0.01	0.00	0.03	0.01	0.07	3.14	0.12	8.07	1.96	14.58	3.28	8.18	0.93	5.59	0.76	0.24	0.27	0.00	0.00	0.00
37.4	18.05																																			

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
39.7	18.05	0.01	5.34	5.50	9.31	0.03	913	0.52	0.55	0.01	0.01	0.34	20.80	0.27	82.5	15.99	0.01	0.00	0.05	0.01	0.06	3.16	0.17	8.34	1.82	14.08	3.09	7.47	0.90	4.96	0.67	0.27	0.30	0.00	0.00	0.00
42.2	18.05																																			
49.0	18.05	0.01	5.29	5.58	9.60	0.02	917	0.53	0.79	0.05	0.05	0.32	20.70	0.35	72.9	12.96	0.05	0.01	0.03	0.00	0.10	2.63	0.12	8.18	1.75	12.80	2.65	6.21	0.69	3.75	0.53	0.31	0.28	0.00		0.01
54.1	18.05	0.23	5.54	5.68	8.23	0.04	1272	0.48	0.43	0.09	0.09	0.32	19.80	3.21	33.9	6.41	0.06	0.06	0.14	0.16	0.08	1.62	0.10	3.21	0.79	6.44	1.13	2.65	0.36	2.17	0.25	0.16	0.11	0.00	0.00	0.00
56.3	18.05																																			
62.8	18.05	0.01	6.21	6.29	12.40	0.03	1225	0.71	0.71	0.03	0.03	0.37	22.23	0.92	98.4	20.54	0.09	0.02	0.22	0.00	0.11	3.63	0.18	11.57	2.74	18.41	3.68	7.20	0.85	4.55	0.63	0.39	0.26	0.00	0.00	0.01
65.1	18.05																																			
67.4	18.05	0.01	5.96	6.33	12.24	0.03	1330	0.65	0.71	0.02	0.02	0.36	22.60	0.32	92.2	18.64	0.03	0.00	0.02	0.00	0.11	3.93	0.19	11.69	2.73	18.39	3.18	6.84	0.82	4.55	0.57	0.39	0.45	0.00	0.00	0.00
69.7	18.05	0.01	5.41	5.96	10.47	0.02	1299	0.56	0.65	0.01	0.01	0.34	19.00	bdl	72.2	17.32	0.01	0.01	0.01	bdl	0.06	3.79	0.15	9.38	2.53	14.62	2.53	5.23	0.72	3.97	0.38	0.45	0.40	0.00	0.00	0.00
72.0	18.05	0.01	6.61	6.50	12.56	0.03	1305	0.68	0.70	0.01	0.01	0.42	24.00	0.40	85.9	19.65	0.04	0.01	0.06	0.01	0.06	3.54	0.19	11.93	2.58	17.34	2.96	5.92	0.68	3.83	0.50	0.47	0.42	0.00	0.00	0.01
74.3	18.05	0.01	5.23	5.41	11.19	0.04	993	0.54	0.67	0.01	0.01	0.31	20.00	0.16	65.0	16.42	0.04	0.04	0.08	bdl	0.09	2.71	0.11	8.30	1.99	12.81	2.35	4.69	0.61	2.35	0.40	0.54	0.18	0.01	0.00	0.00
76.6	18.05	0.01	5.77	6.17	10.63	0.03	1059	0.59	0.61	0.01	0.01	0.37	22.80	0.24	66.1	15.70	0.05	0.06	0.11	0.01	0.14	2.65	0.11	8.77	2.04	13.64	2.33	4.53	0.53	3.30	0.38	0.34	0.34	0.01	0.00	0.00
78.9	18.05	0.01	6.50	6.50	9.38	0.04	740	0.58	0.47	0.01	0.01	0.36	27.00	0.42	54.1	10.47	bdl	0.00	0.03	0.01	0.07	2.17	0.18	7.40	1.70	10.65	1.99	3.97	0.42	2.17	0.34	0.31	0.16	0.00	0.00	0.00
81.2	18.05	0.01	5.85	5.97	9.87	0.03	751	0.53	0.53	0.03	0.02	0.38	23.50	0.27	50.7	12.81	0.02	0.01	0.05	0.01	0.07	2.13	0.12	7.25	1.78	10.52	1.62	3.28	0.36	2.44	0.27	0.24	0.23	0.00	0.00	0.00
83.5	18.05	0.01	4.69	5.41	8.12	0.02	794	0.52	0.56	0.01	0.01	0.34	18.00	0.29	54.1	11.37	0.03	0.00	0.00	0.04	0.17	2.35	0.22	8.84	1.99	11.19	1.77	3.79	0.52	2.71	0.36	0.25	0.14	0.00	0.00	0.02
85.8	18.05	0.01	5.25	5.34	9.47	0.02	816	0.54	0.55	0.02	0.02	0.35	20.80	0.15	52.9	13.05	0.07	0.16	0.34	0.04	0.29	2.67	0.14	7.90	1.84	10.90	1.73	3.46	0.42	2.53	0.35	0.29	0.26	0.00	0.00	0.06
88.2	18.05	0.01	5.59	5.54	10.16	0.03	879	0.54	0.55	0.03	0.03	0.37	21.60	0.23	53.2	12.72	0.08	0.01	0.04	0.01	0.12	2.71	0.15	8.07	1.89	10.81	1.70	3.50	0.44	2.80	0.36	0.26	0.23	0.00	0.00	0.00
90.9	18.05																																			
97.4	18.05	0.01	5.79	5.92	10.34	0.02	1009	0.56	0.97	0.06	0.07	0.36	21.30	0.37	58.8	18.95	0.06	0.40	0.92	0.06	0.45	3.09	0.14	9.89	2.10	11.35	2.02	4.80	0.66	3.92	0.47	0.33	0.36	0.01	0.00	0.12
100.0	18.05																																			
6210-A L8 (Grt-4)																																				
0.0	18.05	0.43	6.35	6.34	13.84	0.02	1352	0.78	1.99	0.01	0.01	0.38	23.39	0.76	131.7	19.69	0.02	0.07	0.25	0.03	0.21	2.62	0.22	14.11	3.05	21.01	5.11	16.39	2.55	19.40	3.35	0.53	0.38	0.00	0.02	0.01
1.5	18.05	0.01	6.32	6.86	13.17	0.02	1444	0.78	0.74	0.01	0.01	0.38	24.00	bdl	128.1	21.66	bdl	bdl	0.00	bdl	0.11	1.55	0.29	14.62	2.35	17.87	5.23	18.05	2.71	21.66	3.25	0.76	0.58	0.02	0.00	0.00
3.0	18.05	0.01	6.30	6.60	13.29	0.03	1610	0.83	0.81	0.01	0.01	0.39	24.26	0.51	137.2	24.33	0.01	0.05	0.19	0.01	0.17	3.54	0.19	14.60	2.83	20.16	5.05	17.90	2.93	21.13	3.50	0.48	0.47	0.01	0.01	0.01
4.5	18.05	0.01	6.38	6.78	13.25	0.03	1536	0.70	0.75	0.01	0.01	0.39	25.02	0.72	143.8	25.03		0.12	0.34	0.04	0.30	3.83	0.21	14.22	2.81	21.87	5.83	20.57	3.30	23.55	3.89	0.59	0.58	0.00	0.03	0.01
6.0	18.05	0.01	7.40	6.68	13.17	0.02	1245	0.65	0.70	0.01	0.00	0.36	24.00	1.28	153.4	21.66	bdl	0.09	0.36	0.11	0.20	3.43	0.14	12.27	2.71	21.66	6.32	23.46	3.07	27.07	3.97	0.51	0.52	0.00	0.05	0.00
7.5	18.05	0.01	5.23	5.65	10.95	0.03	1216	0.60	0.62	0.01	0.01	0.34	22.50	0.90	136.6	15.34	0.01	0.25	1.03	0.06	0.33	3.16	0.18	11.59	2.31	19.31	5.72	20.21	3.21	22.74	3.72	0.40	0.46	0.00	0.02	0.01
12.6	18.05	0.01	4.78	5.04	8.48	0.03	765	0.48	0.49	0.01	0.01	0.32	19.50	0.34	97.5	10.85	0.03	0.04	0.13	0.02	0.12	1.99	0.10	7.62	1.53	13.81	4.02	14.06	2.40	16.78	2.62	0.30	0.23	0.00	0.01	0.09
15.9	18.05	0.01	5.58	5.72	10.09	0.03	973	0.55	0.58	0.02	0.02	0.37	22.40	0.35	118.6	16.37	0.02	0.04	0.07	0.02	0.14	3.00	0.19	9.31	1.99	16.44	4.80	16.86	2.85	19.60	3.03	0.39	0.27	0.00	0.00	0.01
17.4	18.05	0.01	5.96	6.32	12.09	0.02	1191	0.70	0.70	0.01	0.01	0.38	28.00	bdl	155.2	19.85	bdl	0.06	0.04	bdl	0.04	2.53	0.31	11.73	2.17	21.66	6.50	19.85	3.07	25.27	3.79	0.38	0.58	0.05	0.00	0.00
18.9	18.05	0.01	5.94	6.32	12.09	0.02	1234	0.70	0.70	0.02	0.02	0.38	23.10	0.38	144.0	20.57	0.03	0.00	0.02	0.02	0.07	2.96	0.15	12.52	2.54	20.59	5.70	19.87	3.18	23.28	3.61	0.34	0.54	0.01	0.00	0.00
20.4	18.05	0.01	6.32	8.30	11.19	0.02	1101	0.69	0.65	0.01	0.01	0.38	23.00	0.14	133.6	19.85	bdl	bdl	0.07	0.02	0.31	2.35	0.16	13.35	2.71	17.87	5.59	18.05	2.71	19.85	3.43	0.20	0.45	0.00	0.00	0.00
21.9	18.05	0.01	5.99	6.14	11.82	0.02	1198	0.65	0.68	0.01	0.01	0.38	25.10	0.16	139.3	18.30	0.03	0.01	0.02	0.00	0.12	3.37	0.18	12.22	2.56	19.24	5.38	17.45	2.91	21.48	3.22	0.35	0.25	0.00	0.00	0.01
23.7	18.05	0.01	5.40	5.83	9.71	0.01	873	0.53	0.59	0.02	0.02	0.33	20.10	0.40	119.1	18.23	0.03	0.00	0.01		0.05	3.52	0.19	11.91	2.33	17.14	4.53	14.98	2.38	18.59	2.76	0.30	0.34	0.00	0.00	0.00
25.3	18.05	0.01	5.18	5.32	9.13	0.02	762	0.51	0.51	0.01	0.01	0.35	21.10	0.43	97.8	11.48	0.00	0.00	0.03	0.02	0.07	2.76	0.12	9.82	1.93	13.84	3.63	11.93	1.93	14.78	2.31	0.18	0.19	0.00	0.00	0.01
26.8	18.05	0.01	6.14	6.32	7.22	0.03	596	0.40	0.49	0.00	0.01	0.43	27.00	0.49	77.6	9.02	0.04	0.03	0.08	0.00	0.08	2.53	0.20	7.94	1.44	10.29	3.07	9.02	1.68	12.09	1.99	0.27	0.20	0.01	0.00	0.00
28.2	18.05	0.01	5.18	5.41	9.15	0.02	693	0.48	0.49	0.01	0.00	0.33	23.20	0.15	79.8	10.54	0.00	0.03	0.43	0.03	0.12	2.08	0.13	7.78	1.62	11.78	3.00	9.93	1.66	12.70	1.97	0.18	0.22	0.00	0.01	0.00

Table S5: LA-ICP-MS garnet chemistry

Radius	Si*	^{23}Na	^{24}Mg	^{25}Mg	^{27}Al	^{31}P	^{34}S	^{43}Ca	^{44}Ca	^{47}Ti	^{49}Ti	^{55}Mn	^{57}Fe	^{75}As	^{89}Y	^{90}Zr	^{93}Nb	^{139}La	^{140}Ce	^{141}Pr	^{142}Nd	^{152}Sm	^{153}Eu	^{158}Gd	^{159}Tb	^{164}Dy	^{165}Ho	^{166}Er	^{169}Tm	^{174}Yb	^{175}Lu	^{178}Hf	^{180}Hf	^{181}Ta	^{232}Th	^{238}U
%	%	%	%	%	%	%	ppm	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
29.7	18.05	0.01	5.05	5.77	9.02	0.02	632	0.49	0.54	0.01	0.01	0.27	17.00	0.63	81.2	12.99	0.01	0.00	0.05	0.00	0.06	2.35	0.03	8.66	1.66	11.91	3.07	9.38	1.75	14.62	1.79	0.18	0.20	0.00	0.00	0.00
31.2	18.05	0.01	5.54	5.65	10.32	0.02	689	0.57	0.58	0.01	0.01	0.35	21.60	0.31	96.6	15.94	0.00	0.03	0.27	0.01	0.09	2.83	0.15	9.47	1.78	13.55	3.75	12.58	1.97	14.40	2.29	0.30	0.27	0.00	0.00	0.00
32.7	18.05																																			
34.2	18.05	0.01	5.59	5.85	10.38	0.02	653	0.58	0.61	0.02	0.02	0.35	22.70	0.43	104.5	16.57	0.04	0.04	0.05	0.02	0.10	2.76	0.17	9.20	1.77	14.40	3.96	14.09	2.03	15.34	2.34	0.31	0.30	0.00	0.00	0.01
35.7	18.05	0.01	5.96	5.77	11.55	0.02	812	0.52	0.58	0.01	0.01	0.32	23.00	0.01	106.5	15.16	0.00	0.00	0.04	0.00	0.09	3.07	0.12	8.12	1.50	14.44	3.97	13.72	1.73	14.80	2.53	0.31	0.27	0.00	0.00	0.00
37.2	18.05	0.01	5.20	5.47	9.55	0.02	563	0.54	0.55	0.01	0.01	0.34	20.10	0.22	105.2	14.24	0.00	0.00	0.02	0.01	0.08	2.83	0.16	9.24	1.72	14.58	4.33	14.17	2.07	13.90	2.15	0.32	0.27	0.00	0.00	0.00
38.6	18.05	0.01	5.76	5.87	10.20	0.02	659	0.57	0.60	0.01	0.01	0.35	21.62	0.14	112.8	16.15	0.01	0.00	0.03	0.01	0.12	3.23	0.14	9.24	1.88	16.04	4.48	14.53	2.21	14.33	2.07	0.34	0.25	0.00	0.00	0.00
40.1	18.05	0.01	4.87	5.59	10.11	0.02	614	0.60	0.60	0.02	0.02	0.31	22.00	0.01	104.7	15.16	0.00	0.01	0.01	0.00	0.03	3.25	0.12	8.66	1.73	13.54	3.97	11.73	1.77	12.81	1.79	0.14	0.34	0.01	0.00	0.02
41.6	18.05	0.01	5.52	5.87	10.39	0.02	603	0.58	0.59	0.01	0.01	0.36	21.57	0.23	106.5	16.69	0.02	0.00	0.02	0.01	0.08	3.00	0.15	8.77	1.85	15.00	4.11	12.76	1.77	11.44	1.61	0.29	0.30	0.00	0.00	0.00
43.4	18.05																																			
46.8	18.05	0.01	5.41	5.76	10.27	0.02	630	0.58	0.59	0.04	0.04	0.34	21.00	0.26	98.0	14.65	0.05	0.04	0.11	0.02	0.09	2.48	0.12	7.65	1.76	14.64	3.84	10.65	1.41	8.48	1.14	0.26	0.26	0.00	0.00	0.01
48.3	18.05																																			
50.6	18.05	0.09	5.40	5.68	10.43	0.03	837	1.17	0.63	0.03	0.04	0.33	20.50	3.00	105.4	15.18	0.21	0.34	0.88	0.07	0.53	2.54	0.16	7.71	1.83	15.12	3.77	10.23	1.23	7.58	0.99	0.36	0.34	0.01	0.02	0.04
52.0	18.05	0.02	5.23	6.50	10.29	0.04	776	0.60	0.52	0.01	0.01	0.31	22.00	1.43	99.3	16.42	0.08	0.08	0.85	0.08	0.29	2.53	0.14	8.48	2.17	14.98	3.97	8.48	1.15	6.68	1.01	0.32	0.36	0.01	0.01	0.03
53.5	18.05	0.09	5.31	5.74	10.67	0.04	3248	0.66	0.64	0.02	0.02	0.33	20.80	2.29	100.3	16.96	0.21	0.23	0.51	0.05	0.40	2.85	0.18	8.43	1.92	15.39	3.59	9.10	1.08	6.46	0.90	0.35	0.36	0.01	0.02	0.01
55.0	18.05																																			
59.0	18.05	0.25	1.26	1.41	2.54	0.02	902	0.23	0.45	0.01	0.01	0.08	4.96	23.46	20.6	4.85	0.17	0.18	0.31	0.08	0.16	0.60	0.04	1.84	0.43	3.30	0.74	2.17	0.23	1.44	0.18	0.13	0.12	0.01	0.09	0.25
60.5	18.05	0.01	7.04	6.68	12.63	0.02	1119	0.61	0.70	0.01	0.01	0.36	22.00	1.34	104.7	21.66	0.11	bdl	0.02	0.04	bdl	3.07	0.02	8.66	2.89	19.85	3.61	9.02	0.99	5.05	0.78	0.43	0.32	0.00	0.00	0.00
62.4	18.05	0.01	5.77	6.12	12.07	0.03	1182	1.23	0.79	0.01	0.01	0.38	22.90	0.97	100.9	21.37	0.04	0.11	0.12	0.01	0.11	3.74	0.24	11.91	2.45	17.83	3.95	8.90	0.95	5.85	0.77	0.37	0.40	0.03	0.00	0.06
64.8	18.05	0.01	5.94	6.59	12.49	0.03	1263	0.68	0.71	0.01	0.01	0.38	23.23	0.60	96.7	20.32	0.04	0.02	0.05	0.02	0.13	3.46	0.16	12.15	2.48	17.47	3.61	8.54	1.00	5.56	0.79	0.42	0.35	0.01	0.00	0.00
66.3	18.05																																			
67.7	18.05	0.01	5.96	5.92	11.91	0.02	1373	0.75	0.70	0.01	0.01	0.38	23.30	0.40	87.7	12.87	0.00	0.02	0.05	0.01	0.11	2.24	0.14	11.82	2.85	15.81	3.25	7.65	0.89	5.34	0.76	0.28	0.37	0.00	0.00	0.01
69.2	18.05	0.01	6.68	6.32	10.29	0.02	812	0.56	0.63	0.01	0.00	0.32	21.00	0.51	74.0	10.47	bdl	0.01	0.00	bdl	0.09	2.17	0.20	8.84	1.99	12.63	2.71	5.41	0.81	5.77	0.69	0.08	0.15	0.00	0.01	0.00
71.3	18.05	0.01	4.85	5.09	9.47	0.02	816	0.55	0.78	0.01	0.01	0.32	21.00	0.36	64.8	11.51	0.01	0.08	0.17	0.02	0.19	1.71	0.13	8.63	1.93	11.59	2.42	5.43	0.63	3.92	0.55	0.27	0.22	0.00	0.00	0.01
84.7	18.05	0.08	4.62	5.22	8.25	0.02	1173	0.47	0.49	0.18	0.16	0.27	19.00	0.38	52.9	6.70	2.18	0.04	0.19	0.02	0.14	1.52	0.11	7.63	1.66	9.51	1.82	4.24	0.55	3.36	0.44	0.19	0.16	0.03	0.00	0.03
86.2	18.05	0.05	5.81	5.65	10.68	0.02	1150	0.62	0.60	0.13	0.16	0.35	20.80	0.65	63.9	11.23	3.43	0.02	0.08	0.01	0.11	2.26	0.13	9.73	2.02	12.27	2.27	5.13	0.65	4.06	0.52	0.23	0.24	0.04	0.00	0.04
87.7	18.05	0.02	6.14	7.04	13.72	0.03	1498	0.72	17.51	0.08	0.09	0.40	24.00	0.69	79.4	17.51	1.71	0.04	0.27	bdl	0.22	4.33	0.05	14.08	3.07	15.70	2.17	6.68	0.99	3.97	0.79	0.49	0.20	0.05	0.00	0.00
89.2	18.05	0.02	5.79	6.08	11.98	0.03	1269	0.66	0.68	0.10	0.09	0.37	23.10	0.54	74.4	16.49	2.09	0.05	0.15	0.01	0.18	3.30	0.17	12.69	2.55	14.47	2.60	5.79	0.74	4.66	0.64	0.30	0.20	0.03	0.00	0.01
90.6	18.05																																			
92.1	18.05	0.01	6.35	6.42	12.67	0.02	1287	0.71	0.71	0.03	0.04	0.40	25.30	0.13	85.4	18.75	0.54	0.25	0.38	0.05	0.36	4.67	0.18	15.29	3.05	15.85	2.87	6.42	0.86	5.36	0.68	0.40	0.30	0.01	0.00	0.02
93.6	18.05	0.01	5.77	6.86	12.09	0.02	1083	0.70	0.65	0.02	0.04	0.43	28.00	0.85	77.6	19.85	bdl	0.34	0.96	0.11	0.27	4.15	0.32	14.44	2.17	12.99	2.53	5.59	0.67	4.33	0.56	0.60	0.25	0.00	0.00	0.00
95.1	18.05	0.02	5.34	5.13	9.56	0.02	881	0.50	0.54	0.02	0.02	0.34	24.10	0.34	59.7	14.89	0.08	0.03	0.12	0.01	0.23	3.05	0.12	10.94	2.04	11.80	2.09	4.84	0.60	4.10	0.57	0.25	0.24	0.00	0.00	0.05
96.6	18.05	0.01	6.32	5.77	9.75	0.02	848	0.60	0.60	0.01	0.03	0.69	29.00	0.51	72.2	18.05	bdl	0.08	0.61	0.00	0.36	3.07	0.18	12.09	2.35	12.81	2.17	5.41	0.70	5.23	0.69	0.23	0.40	0.00	0.00	0.00
98.1	18.05	0.01	5.13	5.61	9.24	0.02	819	0.52	0.53	0.02	0.02	0.39	23.50	0.32	61.5	19.13	0.32	1.48	2.71	0.17	1.35	2.83	0.13	10.30	1.98	11.10	2.10	4.75	0.62	4.28	0.55	0.29	0.34	0.00	0.00	0.13
100.0	18.05																																			

Figure S6-1: Garnet profiles for sample 3008-A

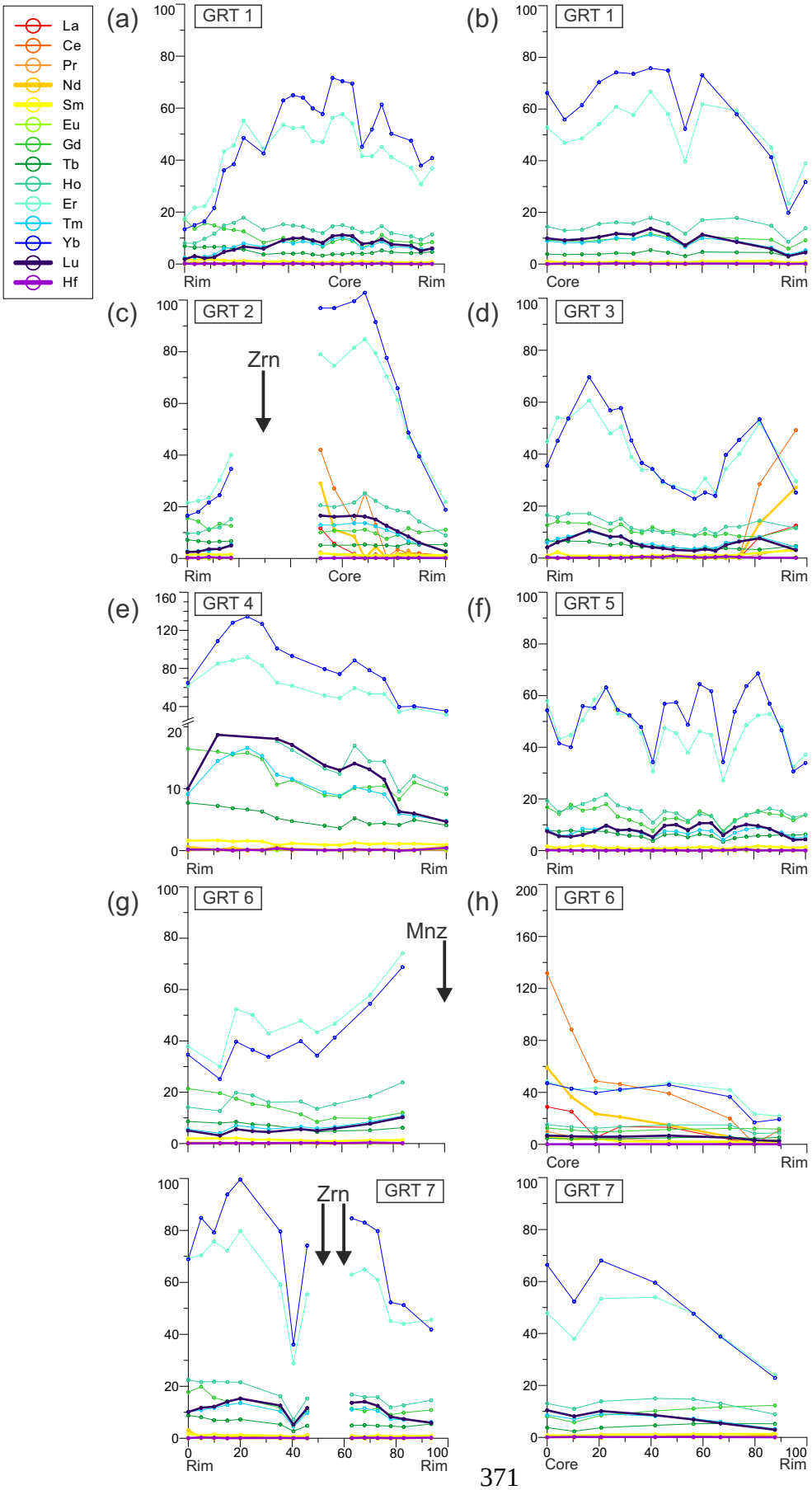

Figure S6-2: Garnet profiles for sample 6150-A

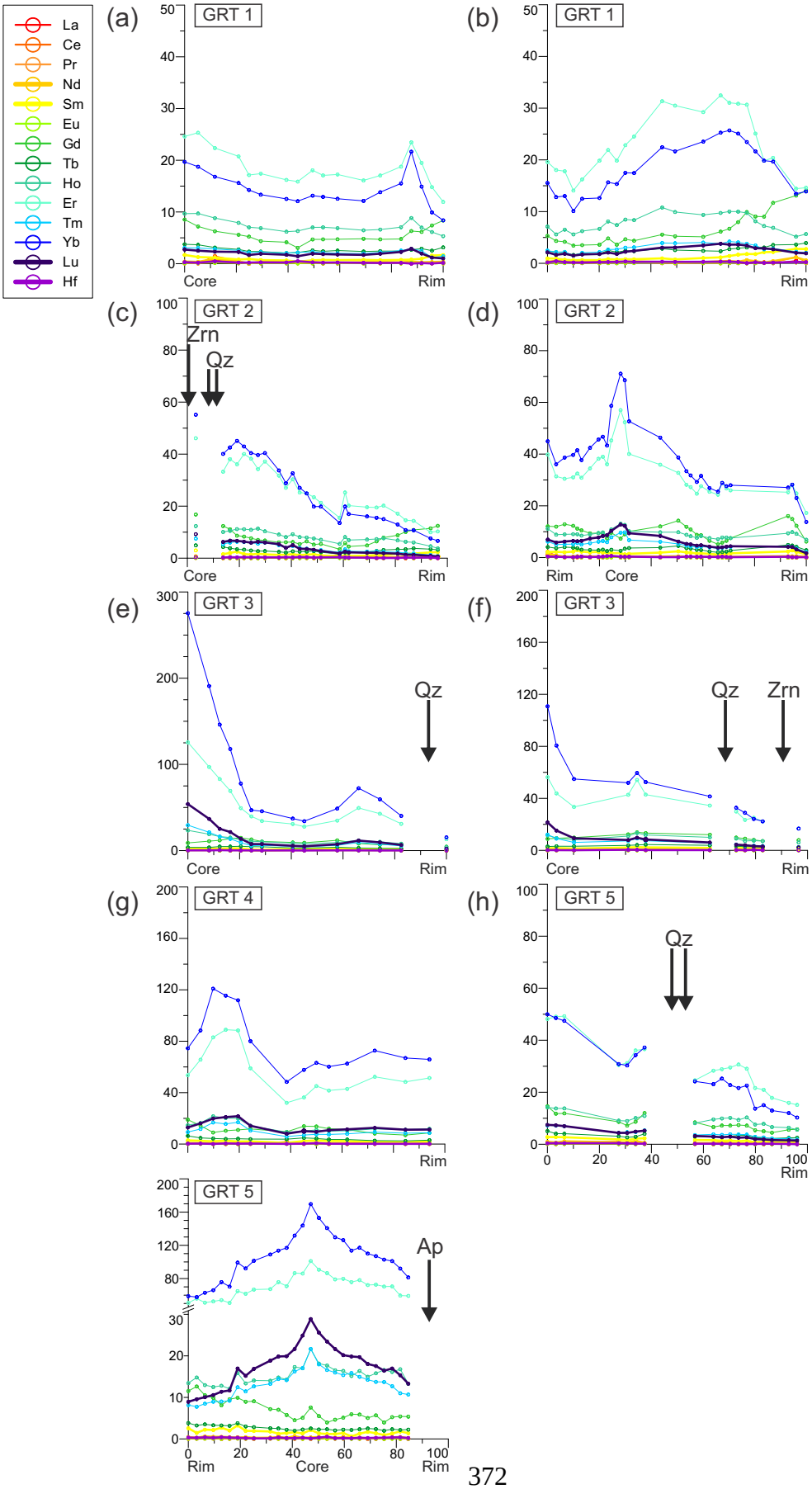

Figure S6-3: Garnet profiles for sample 1098-A

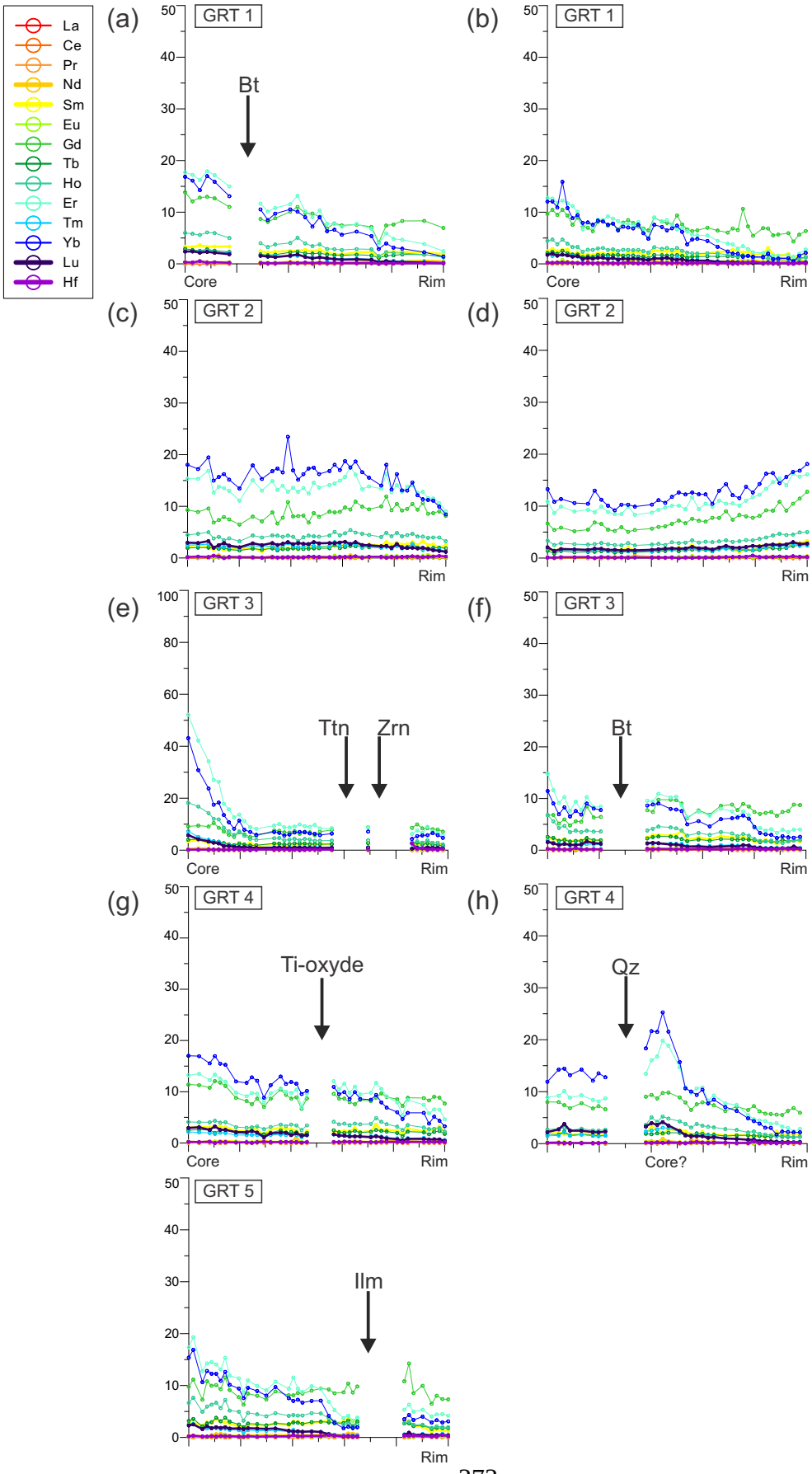

Figure S6-4: Garnet profiles for sample 6117-A

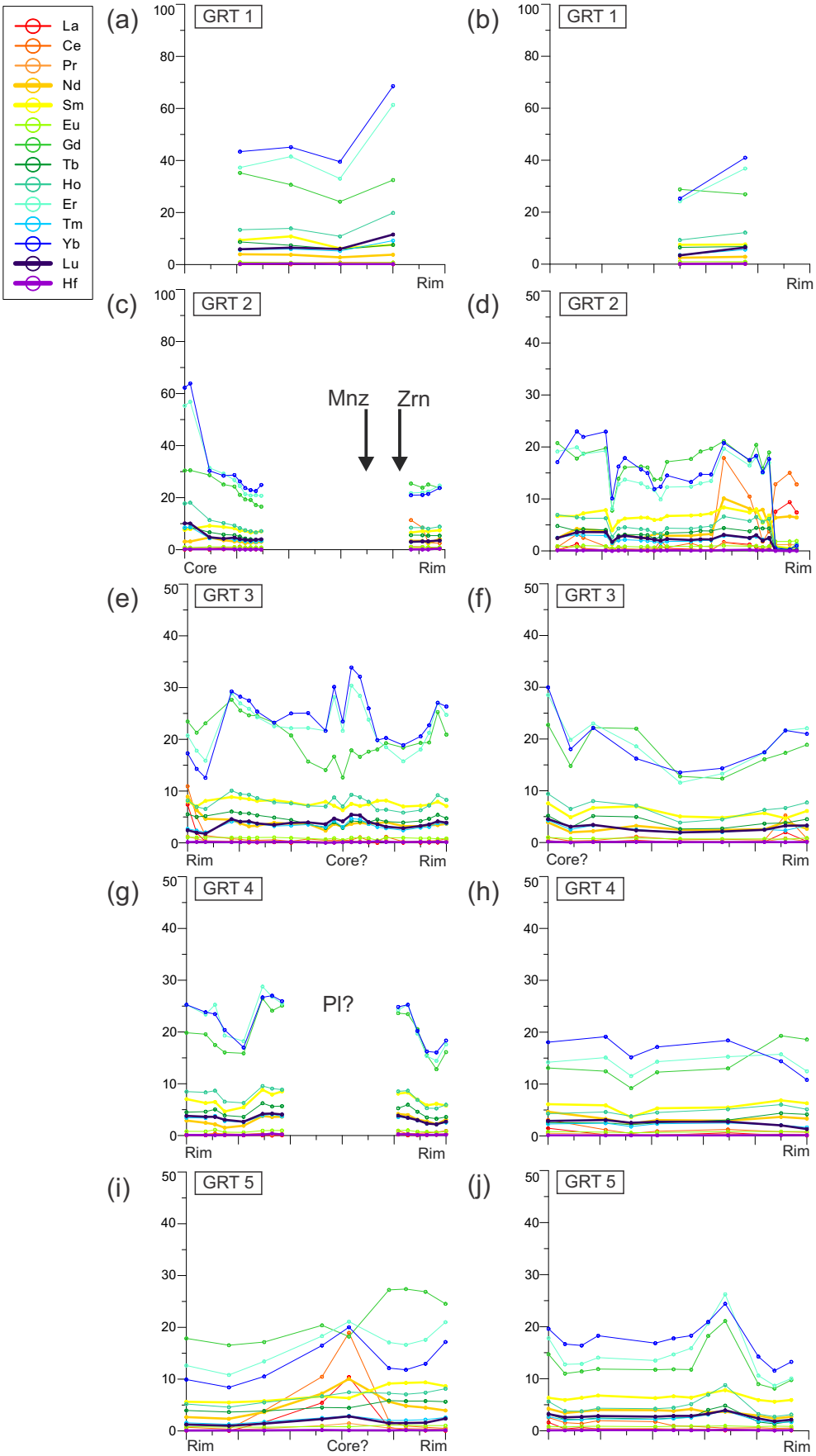

Figure S6-5: Garnet profiles for sample 6210-A

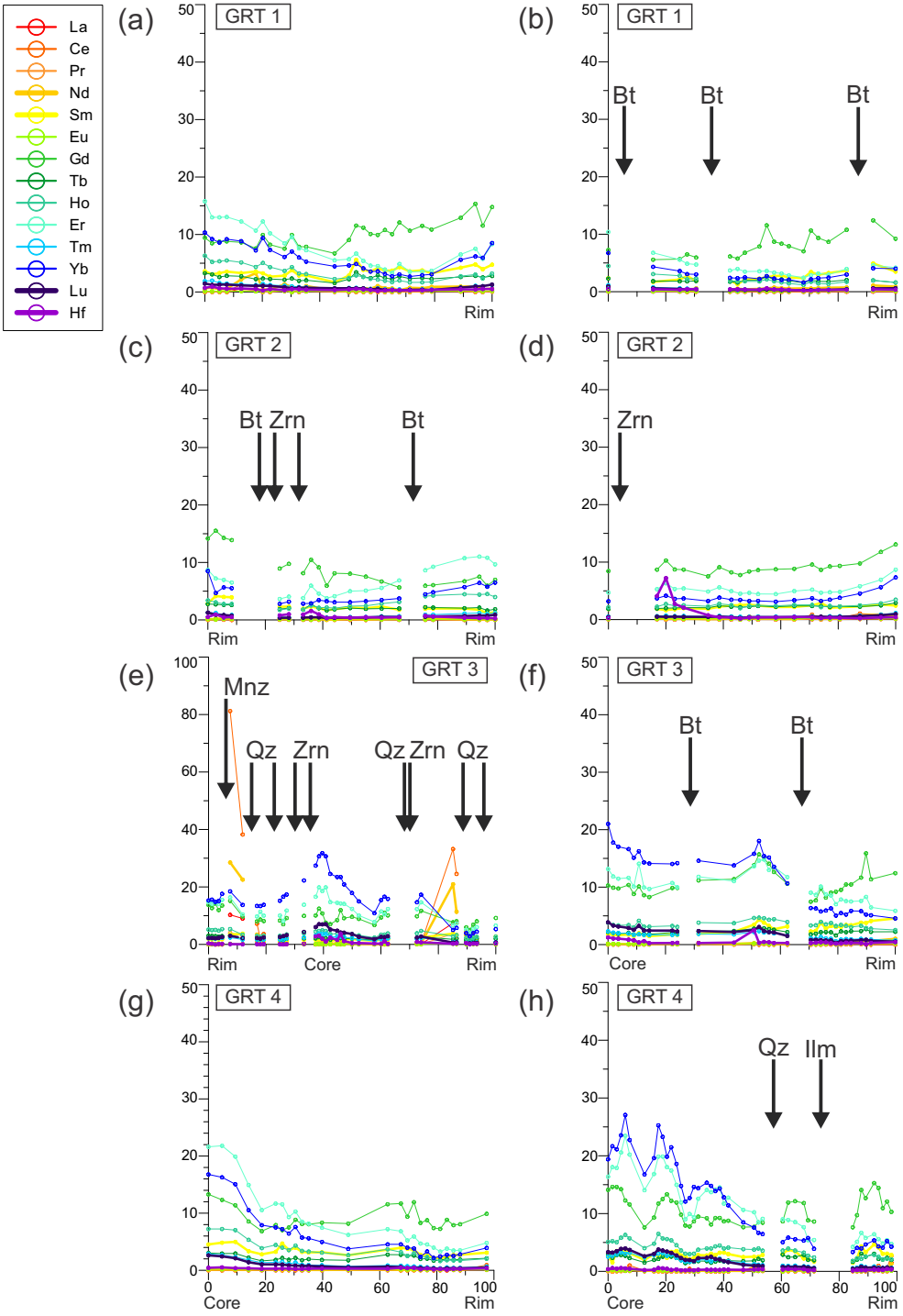

Table S6: Lu-Hf isotope garnet analyses

sample	spike	Concentrations		Intensities (V)		Lu ratios	Interferences		Ratios				
		Lu (ppm)	Hf (ppm)	^{175}Lu	^{176}Hf	$^{176}Lu/^{175}Lu$	$^{175}Lu/^{177}Hf$	$^{173}Yb/^{177}Hf$	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
30008-A_WR-B	Lu-Hf-7	0.054	2.534	0.043	0.748	1.911861	0.000006	0.000000	0.003017	± 0.000015	0.281513	± 0.000016
30008-A_WR-S	Lu-Hf-7	0.058	2.345	0.052	0.773	1.834855	0.000000	0.000001	0.003490	± 0.000017	0.281375	± 0.000016
3008-A_Grt1	Lu-Hf-8	11.101	1.874	4.980	0.875	0.252374	0.000001	0.000000	0.845117	± 0.004226	0.311899	± 0.000016
3008-A_Grt3	Lu-Hf-8	12.377	2.095	6.376	0.865	0.243812	0.000002	0.000004	0.842712	± 0.004214	0.311977	± 0.000017
3008-A_Grt4	Lu-Hf-8	11.076	1.999	7.136	0.880	0.244553	0.000008	0.000009	0.790201	± 0.003951	0.309745	± 0.000017
3008-A_Grt5	Lu-Hf-8	11.157	2.003	6.110	0.931	0.253737	0.000019	0.000005	0.794374	± 0.003972	0.309455	± 0.000016
3008-A_Grt6	Lu-Hf-8	11.594	0.609	4.310	0.905	0.093955	0.000001	0.000004	2.747512	± 0.013738	0.378904	± 0.000020
3008-A_Grt7	Lu-Hf-8	11.338	0.669	4.210	0.851	0.125437	0.000001	0.000000	2.444542	± 0.012223	0.369738	± 0.000019
6150-A_WR-B	Lu-Hf-7	0.043	7.650	0.012	0.507	6.746738	0.000009	0.000000	0.000799	± 0.000004	0.281305	± 0.000016
6150-A_WR-S	Lu-Hf-7	0.036	7.045	0.015	0.366	7.001434	0.000007	0.000001	0.000722	± 0.000004	0.281319	± 0.000016
6150-A_Grt2	Lu-Hf-8	5.482	3.370	5.371	0.663	0.774060	0.000000	0.000000	0.231071	± 0.001155	0.289558	± 0.000016
6150-A_Grt3	Lu-Hf-8	6.414	3.770	4.322	0.785	0.734855	0.000002	0.000001	0.241702	± 0.001209	0.289956	± 0.000016
6150-A_Grt4	Lu-Hf-8	5.446	3.882	6.073	0.780	0.913191	0.000001	0.000141	0.199236	± 0.000996	0.288441	± 0.000016
6150-A_Grt5	Lu-Hf-6	5.312	4.073	6.010	0.655	0.113740	0.000001	0.000000	0.185218	± 0.000926	0.288008	± 0.000016
6150-A_Grt6	Lu-Hf-8	4.791	1.980	6.240	0.823	0.523785	0.000004	0.000002	0.343968	± 0.001720	0.293730	± 0.000015
6150-A_Grt7	Lu-Hf-8	5.004	2.103	6.910	0.878	0.572155	0.000000	0.000001	0.338306	± 0.001692	0.293458	± 0.000016
1098-A_WR-B	Lu-Hf-7	0.031	3.490	0.079	0.691	4.384565	0.000014	0.000005	0.001265	± 0.000006	0.281168	± 0.000016
1098-A_WR-S	Lu-Hf-7	0.039	1.859	0.209	0.626	1.797515	0.000003	0.000004	0.002945	± 0.000015	0.281245	± 0.000016
1098-A_Grt1	Lu-Hf-8	2.144	4.459	4.461	0.754	2.496904	0.000014	0.000002	0.068222	± 0.000341	0.283740	± 0.000016
1098-A_Grt2	Lu-Hf-8	2.256	4.914	5.472	0.770	2.654909	0.000002	0.000000	0.065153	± 0.000326	0.283865	± 0.000016
1098-A_Grt3	Lu-Hf-8	1.825	4.526	7.368	0.803	2.714625	0.000000	0.000000	0.057212	± 0.000286	0.283331	± 0.000016
1098-A_Grt4	Lu-Hf-8	2.588	3.813	5.137	0.647	1.745621	0.000002	0.000003	0.096348	± 0.000482	0.285046	± 0.000015
1098-A_Grt5	Lu-Hf-6	2.248	4.814	5.020	0.639	0.255610	0.000003	0.000006	0.066279	± 0.000331	0.283693	± 0.000015
1098-A_Grt6	Lu-Hf-6	2.724	3.796	8.350	0.515	0.168242	0.000000	0.000000	0.101867	± 0.000509	0.285313	± 0.000016
1098-A_Grt7	Lu-Hf-8	2.390	2.526	5.470	0.731	1.310513	0.000005	0.000002	0.134338	± 0.000672	0.286683	± 0.000015
1098-A_Grt8	Lu-Hf-8	2.910	3.230	4.730	0.708	1.317170	0.000001	0.000000	0.127923	± 0.000640	0.286577	± 0.000015
6117 WR-B	Lu-Hf-7	0.090	2.723	0.260	0.838	1.218832	0.000004	0.000003	0.004680	± 0.000023	0.281734	± 0.000015
6117 WR-S	Lu-Hf-7	0.096	1.518	0.480	0.770	0.571242	0.000004	0.000002	0.008930	± 0.000045	0.281877	± 0.000015
6117-A Grt1	Lu-Hf-8	3.599	0.920	4.120	0.765	0.319277	0.000004	0.000003	0.556820	± 0.002784	0.301082	± 0.000016
6117-A Grt2	Lu-Hf-8	3.465	0.854	4.300	0.546	0.342547	0.000032	0.000009	0.577540	± 0.002888	0.301810	± 0.000017
6117-D Grt3	Lu-Hf-8	4.468	2.179	2.840	0.666	0.582761	0.000006	0.000000	0.291340	± 0.001457	0.291718	± 0.000015
6117-D Grt4	Lu-Hf-8	4.515	2.006	4.160	0.669	0.516208	0.000000	0.000000	0.319820	± 0.001599	0.292689	± 0.000015
6117-A Cpx1	Lu-Hf-8	0.075	1.751	0.290	0.753	18.099468	0.000059	0.000000	0.006110	± 0.000031	0.281749	± 0.000015
6117-D Cpx2	Lu-Hf-8	0.098	0.833	0.340	0.290	8.961376	0.000957	0.000010	0.016640	± 0.000083	0.281170	± 0.000016

Table S6: Lu-Hf isotope garnet analyses

sample	spike	Concentrations		Intensities (V)		Lu ratios	Interferences		Ratios			
		Lu (ppm)	Hf (ppm)	^{175}Lu	^{176}Hf	$^{176}Lu/^{175}Lu$	$^{175}Lu/^{177}Hf$	$^{173}Yb/^{177}Hf$	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
6210-A_WR-B	Lu-Hf-7	0.015	2.698	0.012	0.873	9.106057	0.000018	0.000003	0.000814	± 0.000004	0.281214	± 0.000016
6210-A_WR-S	Lu-Hf-7	0.013	1.888	0.011	0.799	8.438014	0.000019	0.000005	0.000974	± 0.000005	0.281198	± 0.000016
6210-A_Grt3	Lu-Hf-8	1.662	2.029	5.080	0.903	1.417159	0.000002	0.000012	0.116226	± 0.000581	0.285492	± 0.000015
6210-A_Grt4	Lu-Hf-8	1.204	2.148	6.556	0.784	2.195824	0.000001	0.000001	0.079524	± 0.000398	0.284153	± 0.000015
6210-A_Grt5	Lu-Hf-6	1.321	2.252	4.190	0.722	0.204712	0.000000	0.000000	0.083257	± 0.000416	0.284310	± 0.000015
6210-A_Grt6	Lu-Hf-6	1.938	2.132	3.780	0.632	0.151736	0.000002	0.000007	0.129027	± 0.000645	0.285960	± 0.000015
6210-A_Grt7	Lu-Hf-8	1.675	1.783	8.800	0.809	1.399478	0.001206	0.000042	0.133369	± 0.000667	0.284944	± 0.000015
6210-A_Grt8	Lu-Hf-8	1.697	1.692	9.380	0.708	1.204153	0.000000	0.000017	0.142406	± 0.000712	0.286472	± 0.000015

Table S7: Sm-Nd isotope garnet analyses

sample	spike	Concentrations		Intensities (V)		Sm ratios	Interferences			Ratios			
		Sm (ppm)	Nd (ppm)	^{149}Sm	^{143}Nd	^{149}Sm/^{152}Sm	^{155}Gd/^{152}Sm	^{140}Ce/^{144}Nd	^{147}Sm/^{144}Nd	^{147}Sm/^{144}Nd	2σ	^{143}Nd/^{144}Nd	2σ
3008-A_WR-B	Sm-Nd-3	4.260	28.800	3.100	0.800	1.281124	0.131307	0.237082	0.000009	0.089420	± 0.000450	0.510779	± 0.000027
3008-A_WR-S	Sm-Nd-3	4.680	31.520	2.800	0.800	1.367809	0.073143	0.337772	0.000002	0.089830	± 0.000450	0.510770	± 0.000027
3008-A_Grt2	Sm-Nd-3	5.050	23.210	3.100	0.800	1.018208	0.016492	0.205206	0.000003	0.131450	± 0.000660	0.511295	± 0.000027
3008-A_Grt3	Sm-Nd-3	5.120	24.550	2.900	0.700	1.174634	0.012072	0.170418	0.000010	0.126010	± 0.000630	0.511239	± 0.000027
3008-A_Grt4	Sm-Nd-3	6.560	34.370	2.600	0.800	1.132477	2.144511	0.392888	0.000011	0.115300	± 0.000580	0.511088	± 0.000027
3008-A_Grt5	Sm-Nd-3	5.970	30.430	2.300	0.700	1.121318	0.018409	0.263655	0.000008	0.118620	± 0.000590	0.511130	± 0.000027
3008-A_Grt6	Sm-Nd-3	3.810	15.060	2.300	0.800	1.007167	0.038008	0.198528	0.000003	0.153200	± 0.000770	0.511540	± 0.000027
3008-A_Grt7	Sm-Nd-3	4.260	18.430	2.100	0.800	1.168819	0.045442	0.215160	0.000014	0.139800	± 0.000700	0.511389	± 0.000027
6150-A_WR-B	Sm-Nd-3	18.140	111.050	3.500	0.700	1.299140	0.019467	0.258298	0.000009	0.098740	± 0.000490	0.511067	± 0.000027
6150-A_WR-S	Sm-Nd-3	15.580	96.470	2.400	0.700	1.279604	0.019828	0.195956	0.000005	0.097660	± 0.000490	0.511062	± 0.000027
6150-A_Grt1	Sm-Nd-3	13.610	65.250	2.900	0.700	1.101241	0.014202	0.183356	0.000010	0.126080	± 0.000630	0.511420	± 0.000027
6150-A_Grt2	Sm-Nd-3	9.060	40.640	3.100	0.700	1.124528	0.007011	0.201176	0.000004	0.134810	± 0.000670	0.511563	± 0.000027
6150-A_Grt3	Sm-Nd-3	9.010	40.880	2.600	0.600	1.010575	0.040253	0.157194	0.000011	0.133210	± 0.000670	0.511535	± 0.000027
6150-A_Grt4	Sm-Nd-3	8.400	37.200	2.400	0.700	1.001878	0.078382	0.227418	0.000015	0.136570	± 0.000680	0.511551	± 0.000027
6150-A_Grt6	Sm-Nd-3	4.720	14.060	2.700	0.900	0.819459	0.049803	0.181217	0.000019	0.202920	± 0.001010	0.512357	± 0.000026
6150-A_Grt7	Sm-Nd-3	5.260	17.730	2.500	0.800	0.964973	0.014490	0.131900	0.000013	0.179360	± 0.000900	0.512081	± 0.000027
1098-A_WR-B	Sm-Nd-3	2.780	18.750	2.800	0.500	1.373452	0.036109	0.386992	0.000001	0.089620	± 0.000450	0.510890	± 0.000027
1098-A_WR-S	Sm-Nd-3	2.760	18.300	3.300	0.700	1.329131	0.027602	0.420099	0.000009	0.091120	± 0.000460	0.510915	± 0.000027
1098-A_Grt1	Sm-Nd-3	8.060	35.760	2.800	0.800	1.101541	0.013688	0.250220	0.000012	0.136260	± 0.000680	0.511425	± 0.000027
1098-A_Grt2	Sm-Nd-3	6.060	21.230	3.100	0.800	0.952887	0.018888	0.222231	0.000015	0.172550	± 0.000860	0.511857	± 0.000027
1098-A_Grt3	Sm-Nd-3	8.120	36.160	2.600	0.800	1.081148	0.034642	0.225917	0.000013	0.135740	± 0.000680	0.511419	± 0.000027
1098-A_Grt4	Sm-Nd-3	14.190	78.790	2.500	0.700	1.177289	0.035285	0.148189	0.000014	0.108860	± 0.000540	0.511101	± 0.000027
1098-A_Grt7	Sm-Nd-3	2.940	4.700	2.500	0.900	0.766549	0.012099	0.285215	0.000016	0.378760	± 0.001890	0.514282	± 0.000027
1098-A_Grt8	Sm-Nd-3	3.640	6.840	2.400	0.900	0.709345	0.045884	0.265330	0.000022	0.321760	± 0.001610	0.513605	± 0.000027
6117-A_WR-B	Sm-Nd-3	5.769	23.541	1.600	0.600	0.978118	0.005356	0.165944	0.000041	0.148170	± 0.000740	0.511798	± 0.000029
6117-A_WR-S	Sm-Nd-3	5.824	23.706	2.100	0.500	0.987375	0.026246	0.310956	0.000053	0.148560	± 0.000740	0.511837	± 0.000028
6117-A_Grt1	Sm-Nd-4	7.648	8.509	2.000	1.200	0.526466	0.003117	0.392390	0.000082	0.544070	± 0.002720	0.516562	± 0.000027
6117-A_Grt2	Sm-Nd-4	7.716	7.590	2.100	9.800	0.523621	0.002207	0.334092	0.000021	0.615470	± 0.003080	0.517409	± 0.000027
6117-D_Grt3	Sm-Nd-4	10.629	9.887	1.200	1.200	0.530750	0.052625	0.476898	0.000083	0.650940	± 0.003250	0.517724	± 0.000027
6117-D_Grt4	Sm-Nd-4	9.488	8.840	3.000	1.200	0.538256	0.004090	0.752763	0.000078	0.650000	± 0.003250	0.518478	± 0.000027
6117-A-Cpx-1	Sm-Nd-4	7.929	32.463	2.200	1.300	0.539702	0.010736	0.253745	0.000099	0.147690	± 0.000740	0.511818	± 0.000027
6117-D_Cpx2	Sm-Nd-4	6.229	22.944	0.900	1.300	0.576498	0.009978	0.369313	0.000074	0.164160	± 0.000820	0.512006	± 0.000027

Table S7: Sm-Nd isotope garnet analyses

sample	spike	Concentrations		Intensities (V)		Sm ratios	Interferences			Ratios			
		Sm (ppm)	Nd (ppm)	^{149}Sm	^{143}Nd	$^{149}Sm/^{152}Sm$	$^{155}Gd/^{152}Sm$	$^{140}Ce/^{144}Nd$	$^{147}Sm/^{144}Nd$	$^{147}Sm/^{144}Nd$	2σ	$^{143}Nd/^{144}Nd$	2σ
6210-A_WR-B	Sm-Nd-3	4.340	33.760	2.700	4.900	1.572567	0.010406	0.192161	0.000029	0.077730	± 0.000390	0.510833	± 0.000030
6210-A_WR-S	Sm-Nd-3	5.670	43.110	3.300	0.500	1.514415	1.621554	0.496434	0.000016	0.079510	± 0.000400	0.510841	± 0.000027
6210-A_Grt1	Sm-Nd-3	6.520	19.170	2.900	0.800	0.915200	0.017467	0.276203	0.000011	0.205650	± 0.001030	0.512338	± 0.000027
6210-A_Grt2	Sm-Nd-3	12.640	58.790	2.700	0.800	1.023151	0.002310	0.131113	0.000007	0.130020	± 0.000650	0.511447	± 0.000027
6210-A_Grt3	Sm-Nd-3	8.120	28.180	2.600	0.800	1.001344	0.026116	0.091412	0.000010	0.174240	± 0.000870	0.511964	± 0.000027
6210-A_Grt4	Sm-Nd-3	8.800	30.890	2.800	0.600	0.958380	0.016742	0.116829	0.000006	0.172160	± 0.000860	0.511939	± 0.000027
6210-A_Grt7	Sm-Nd-3	6.900	20.850	2.300	0.700	0.000000	0.004124	0.200555	0.000008	0.200030	± 0.001000	0.512251	± 0.000027
6210-A_Grt8	Sm-Nd-3	6.830	20.440	2.400	0.800	0.000000	0.007858	0.177998	0.000005	0.202130	± 0.001010	0.512283	± 0.000027

APPENDIX 8: PSEUDOSECTION TOPOGRAPHIES, ISOMODES AND ISOPLETHS

Figure S7-1: Pseudosection topology, isomodes and isopleths for sample 3008-A

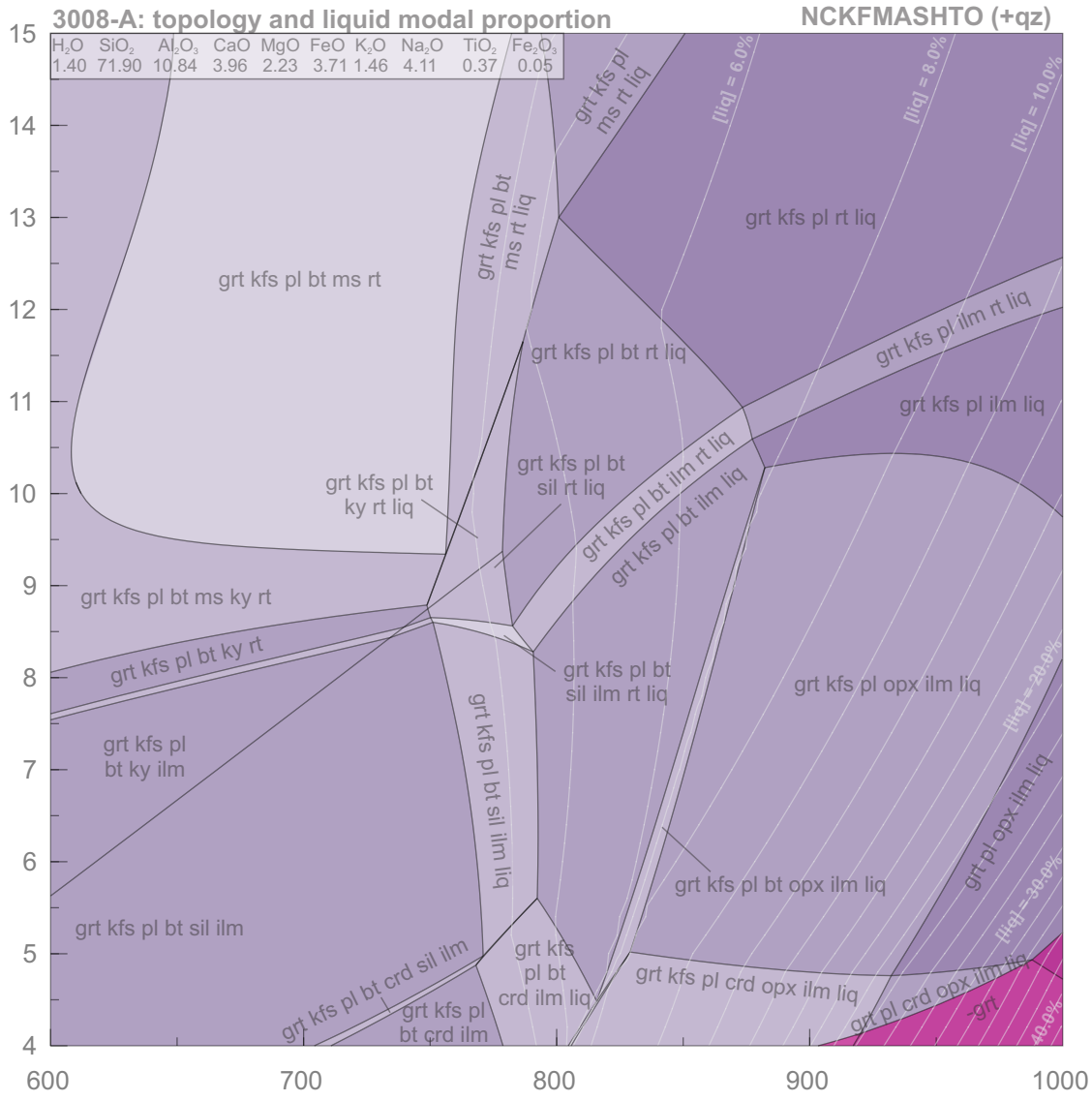

Figure S7-1 (continued)

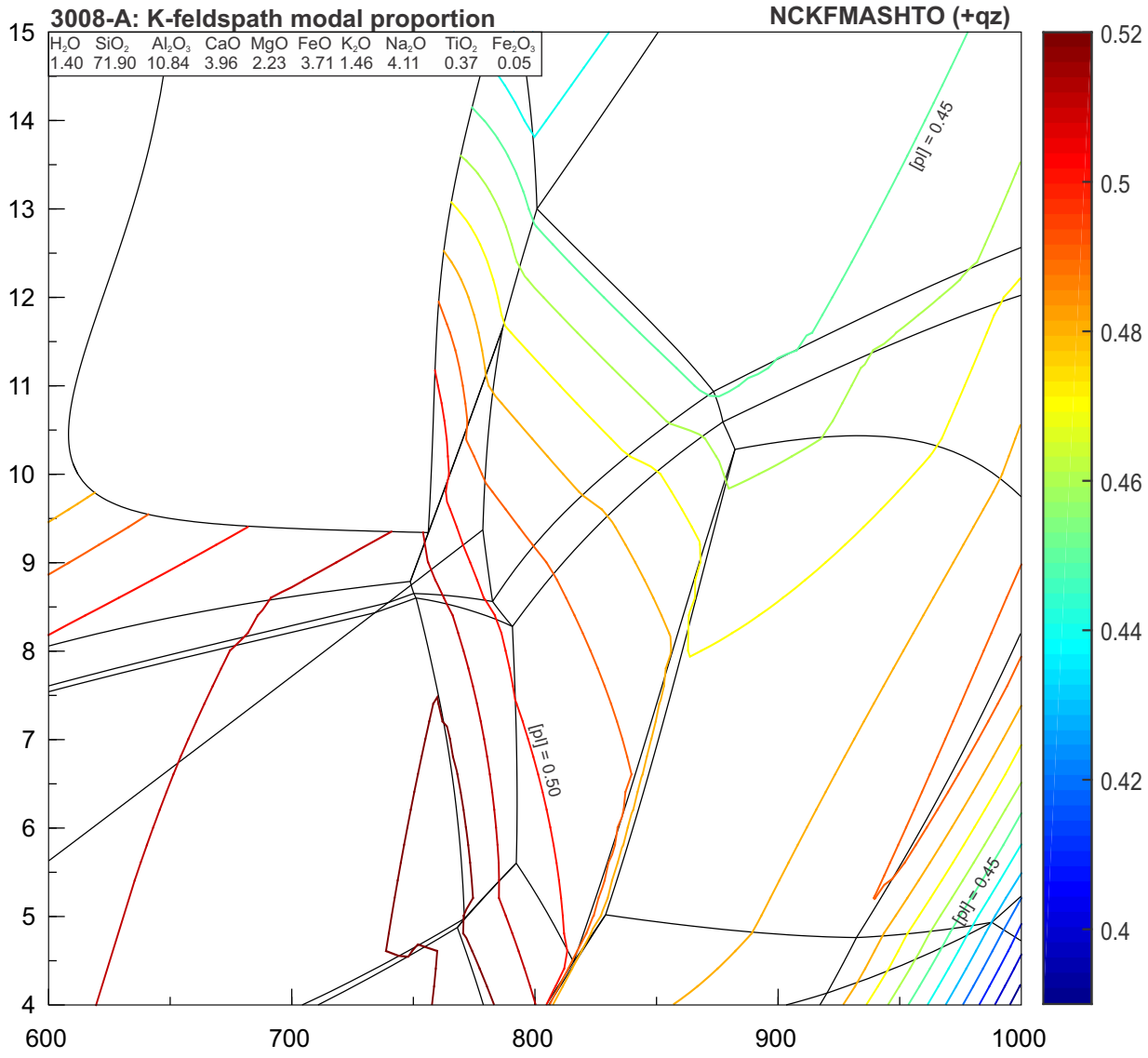

Figure S7-1 (continued)

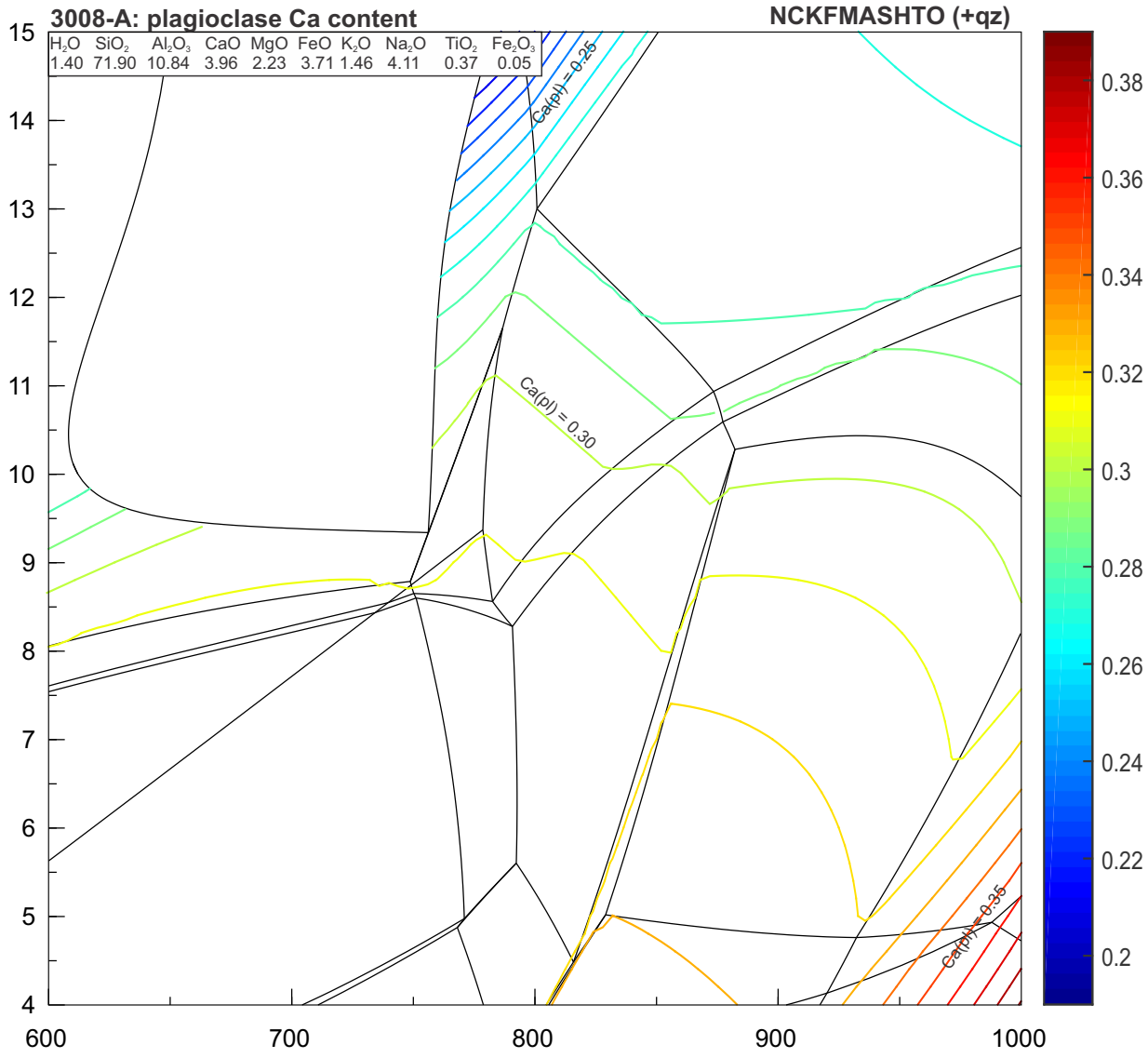

Figure S7-1 (continued)

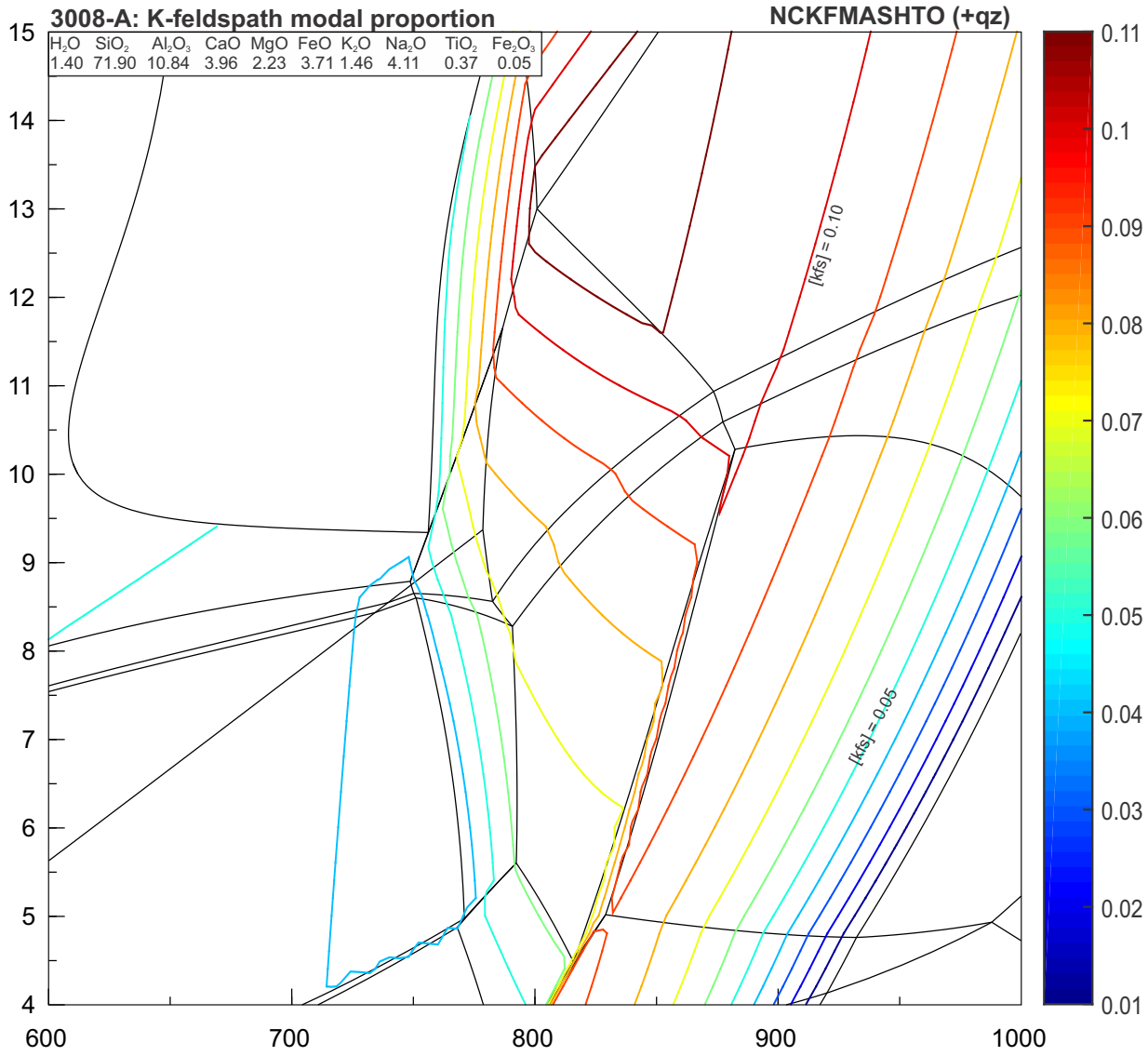

Figure S7-1 (continued)

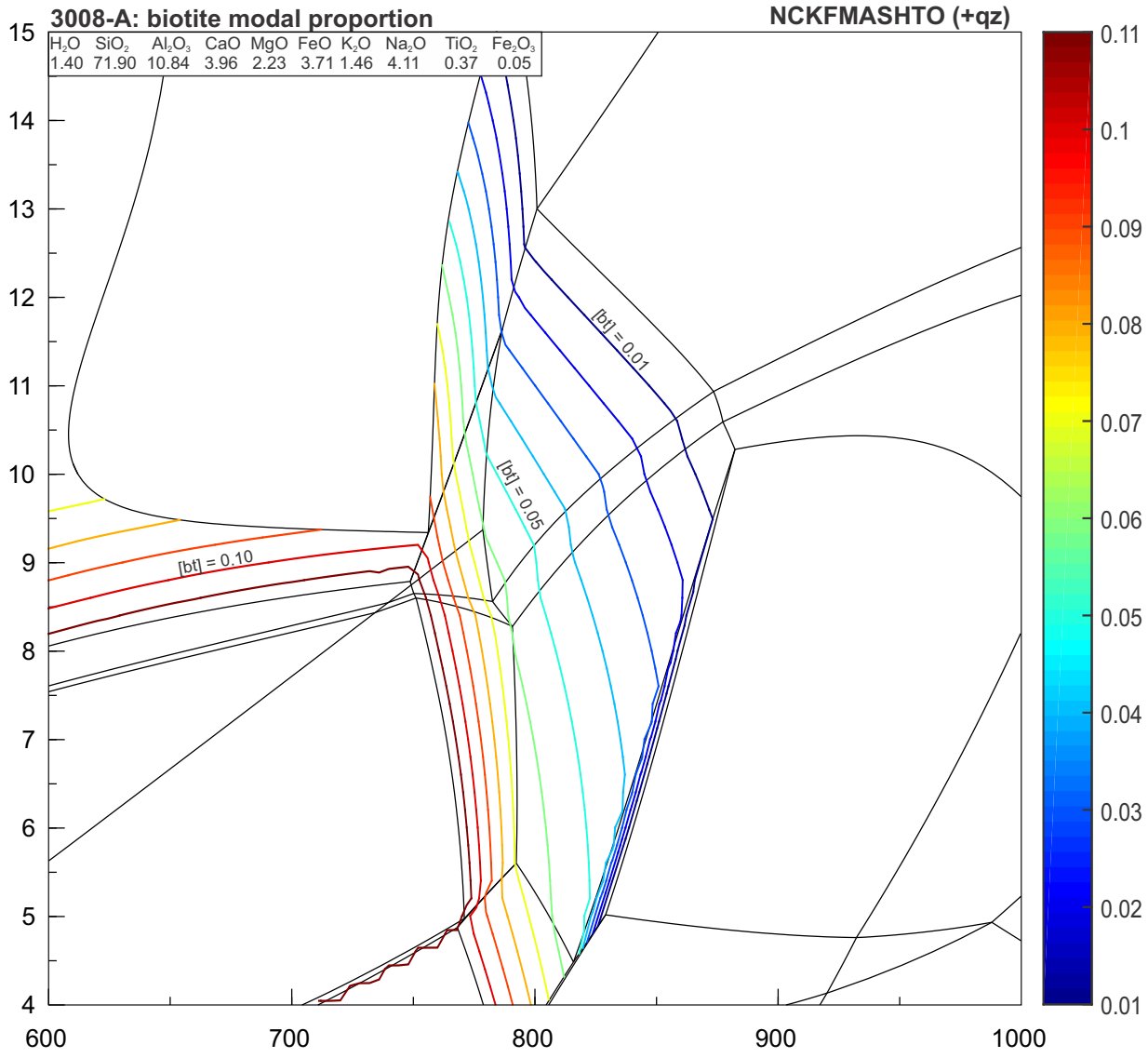

Figure S7-1 (continued)

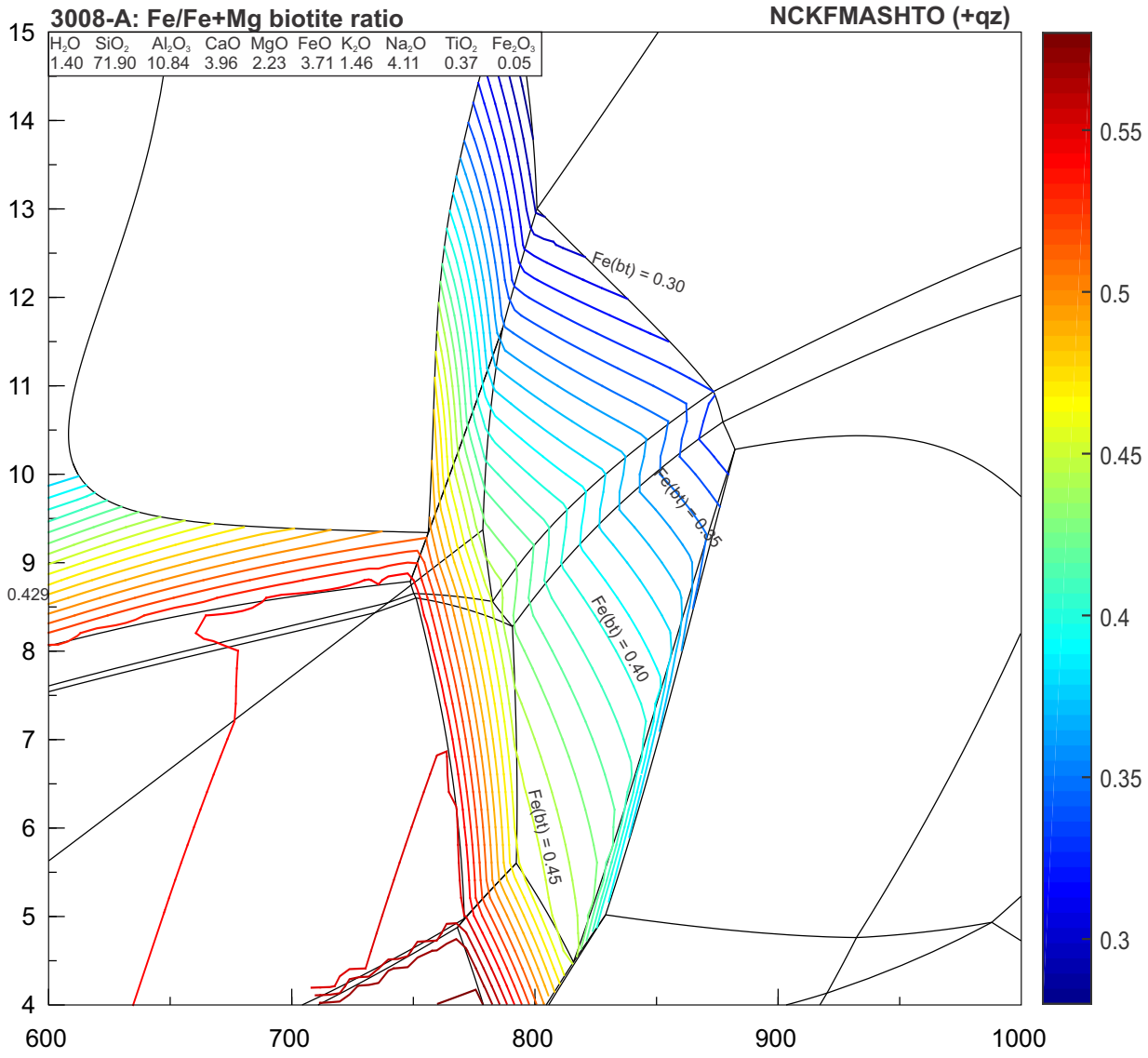

Figure S7-1 (continued)

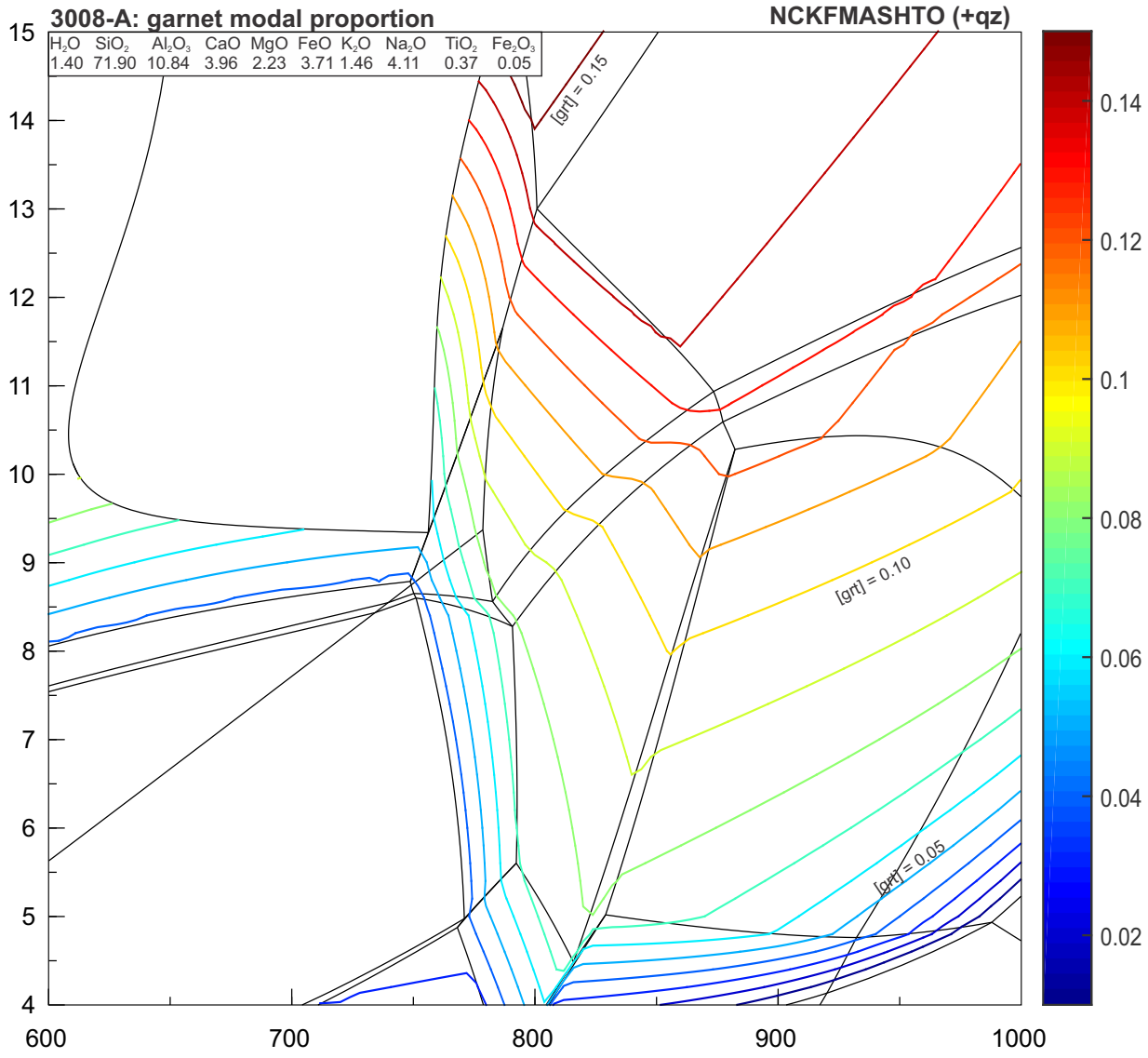

Figure S7-1 (continued)

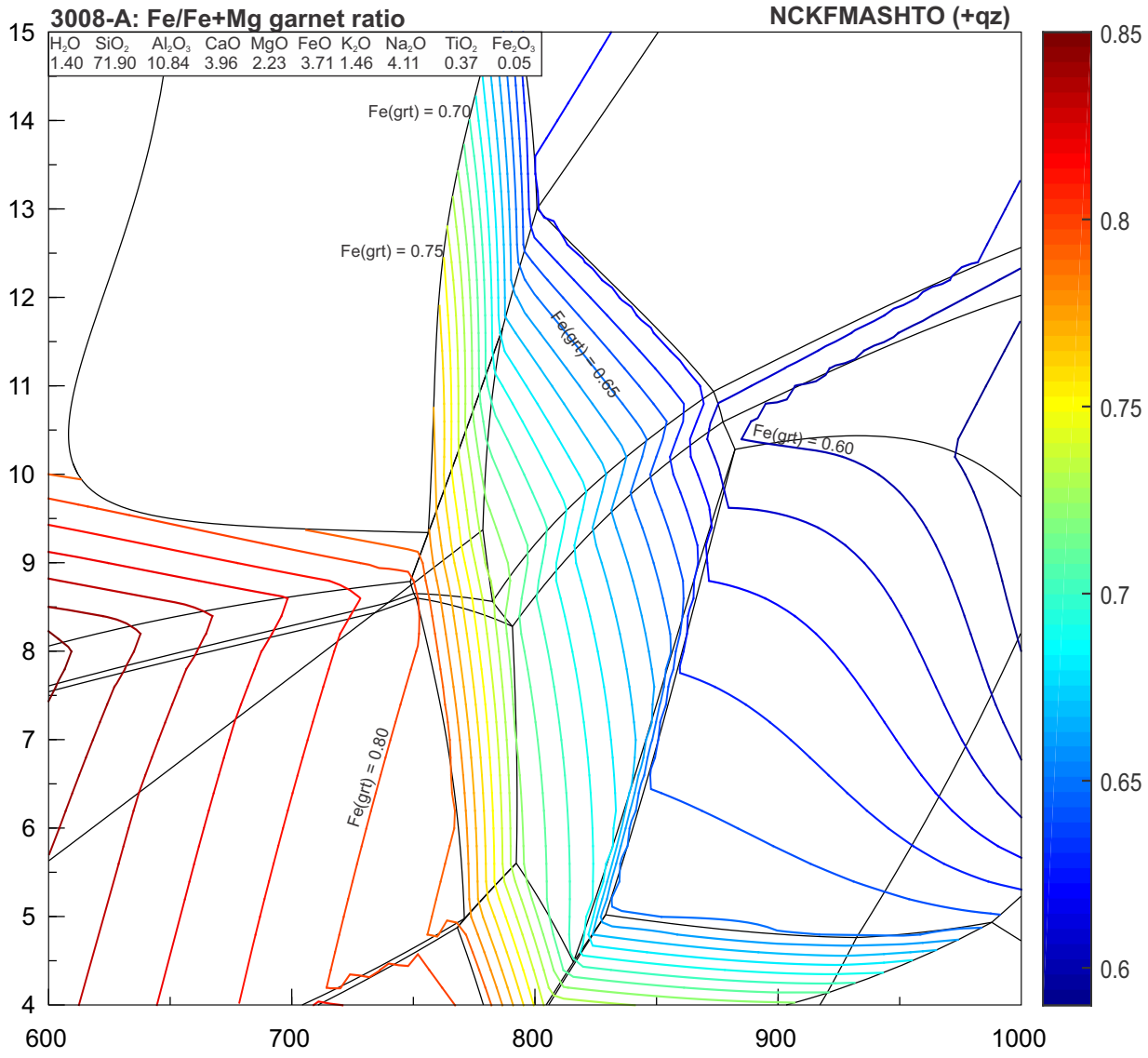

Figure S7-1 (continued)

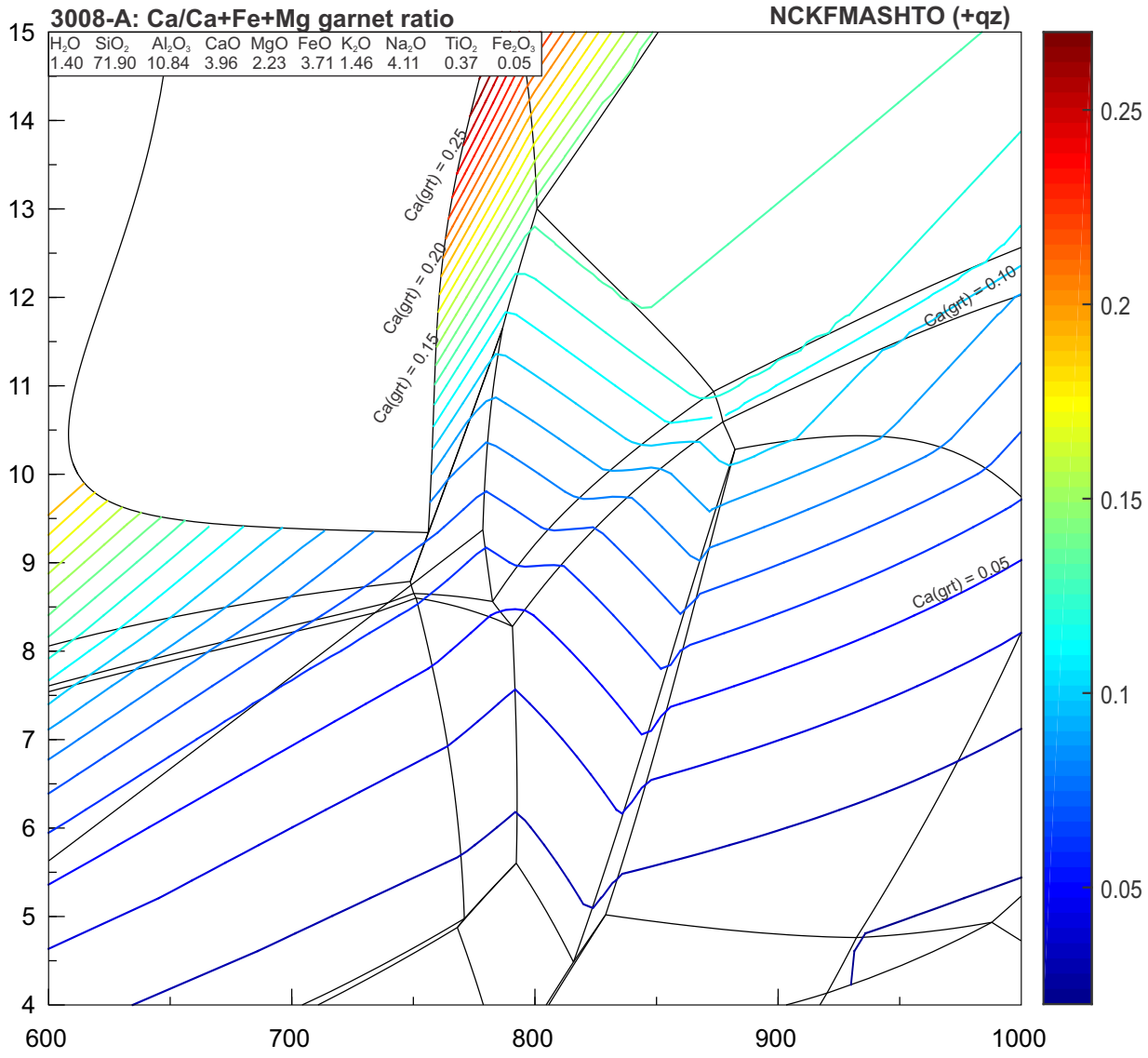

Figure S7-1 (continued)

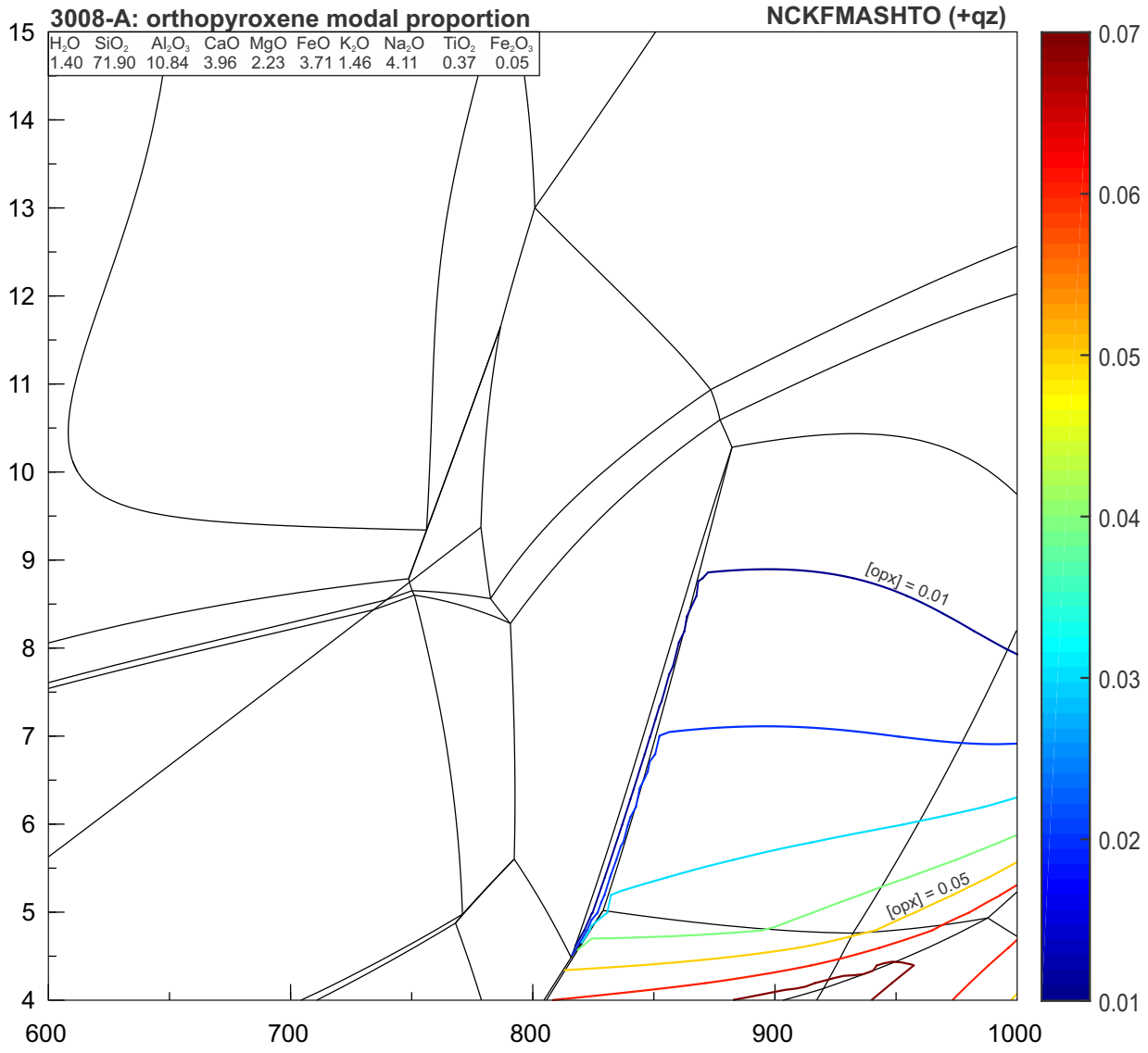

Figure S7-1 (continued)

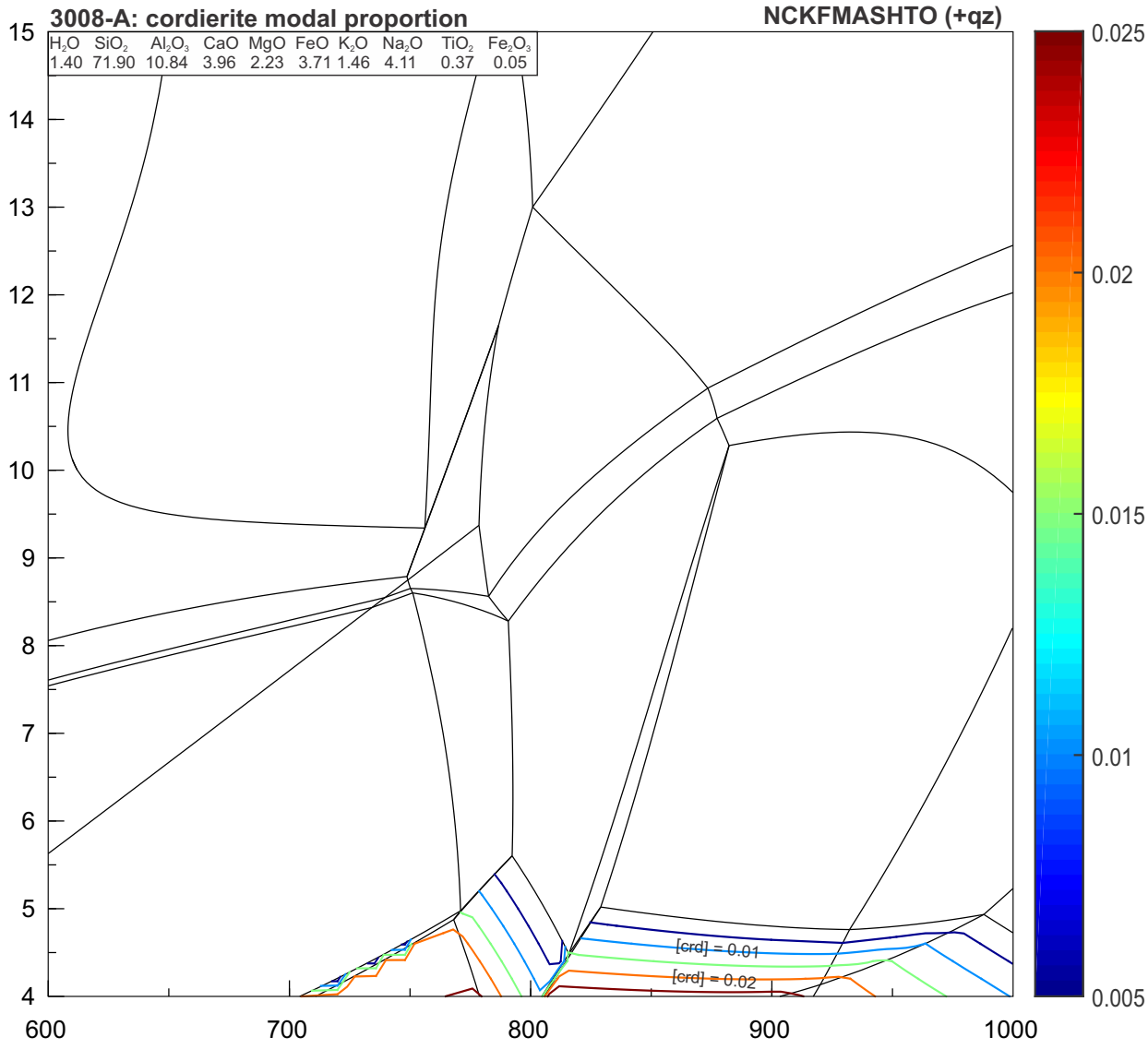

Figure S7-1 (continued)

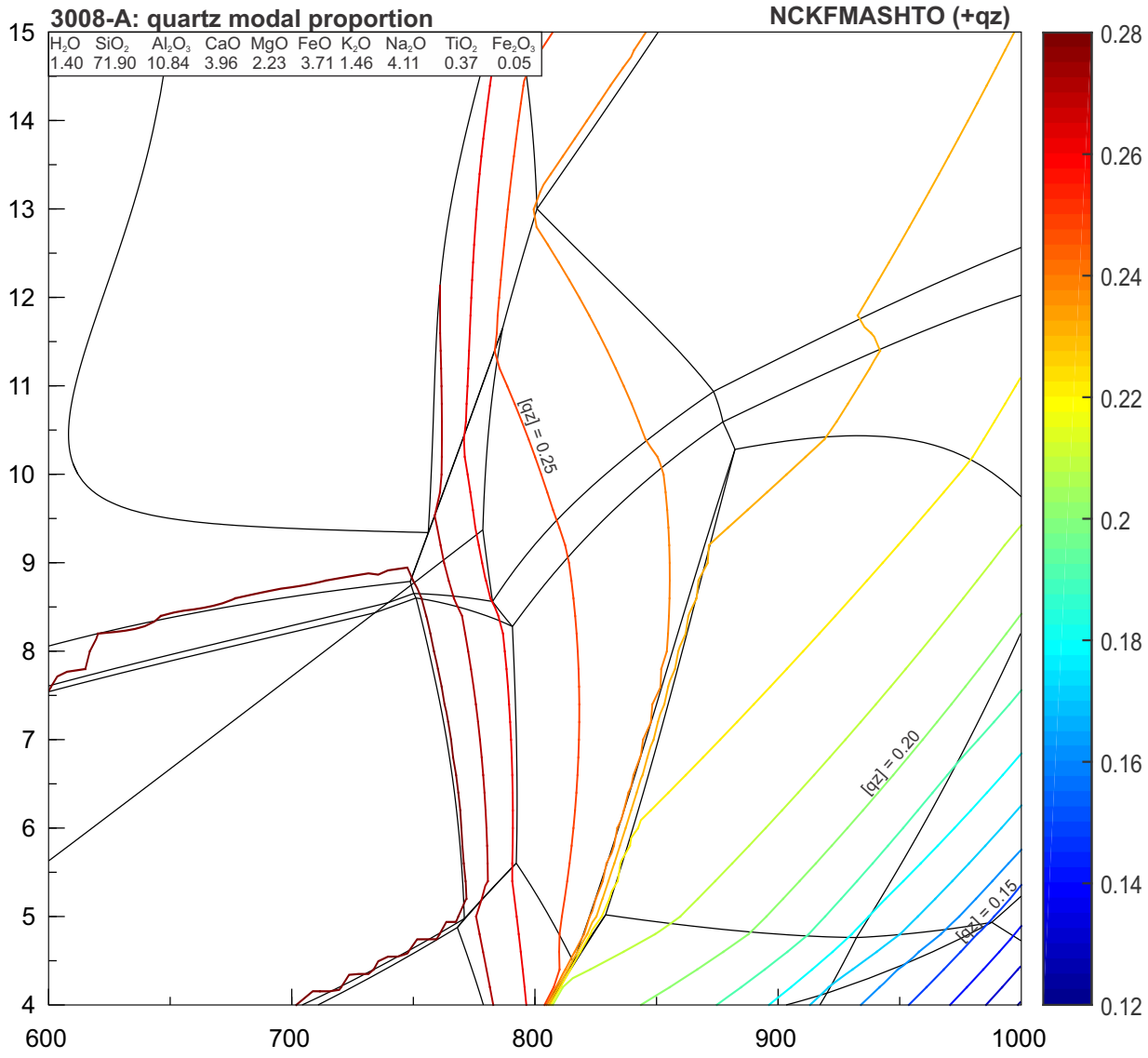

Figure S7-1 (continued)

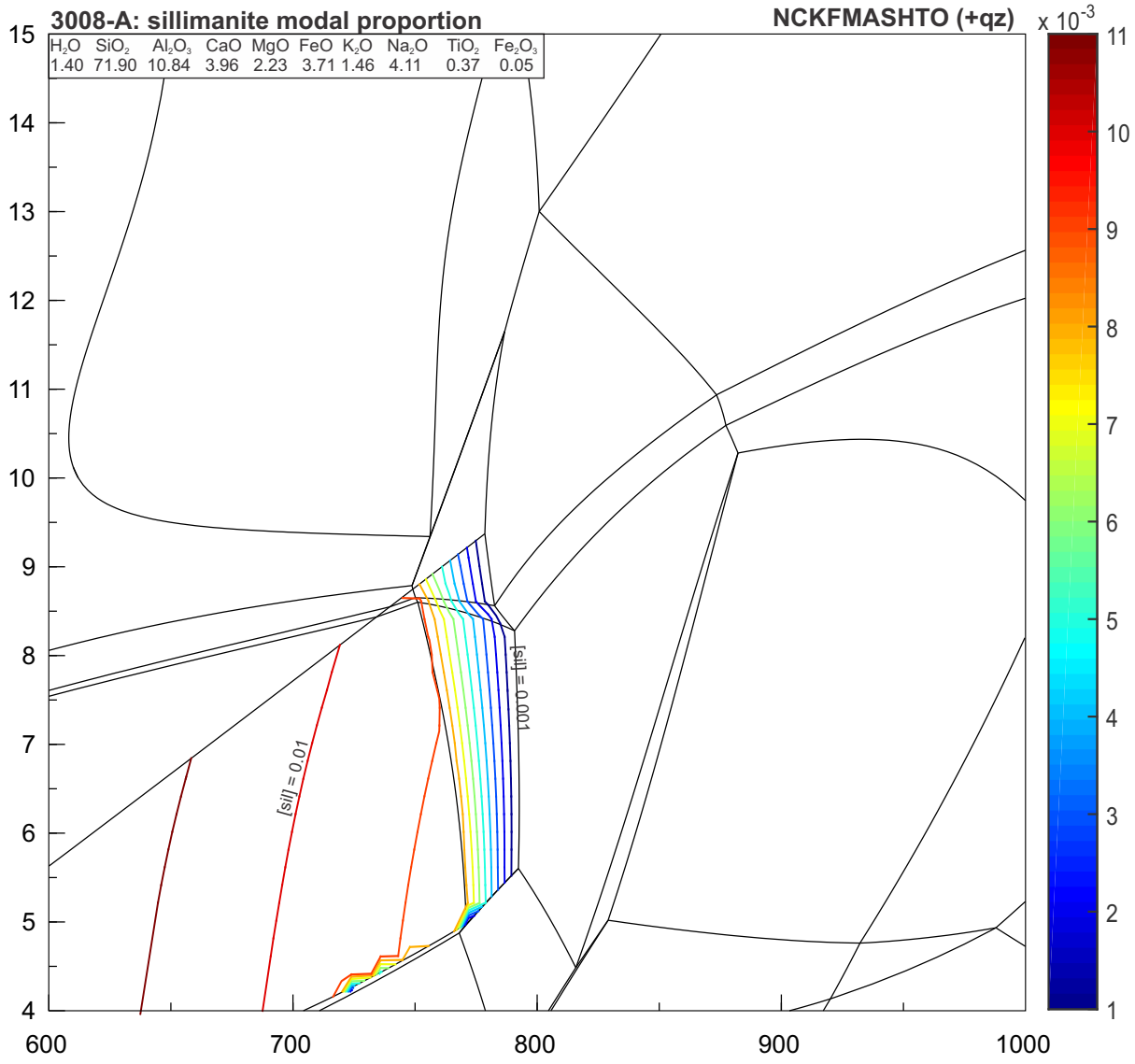

Figure S7-2: Pseudosection topology, isomodes and isopleths for sample 1098-A

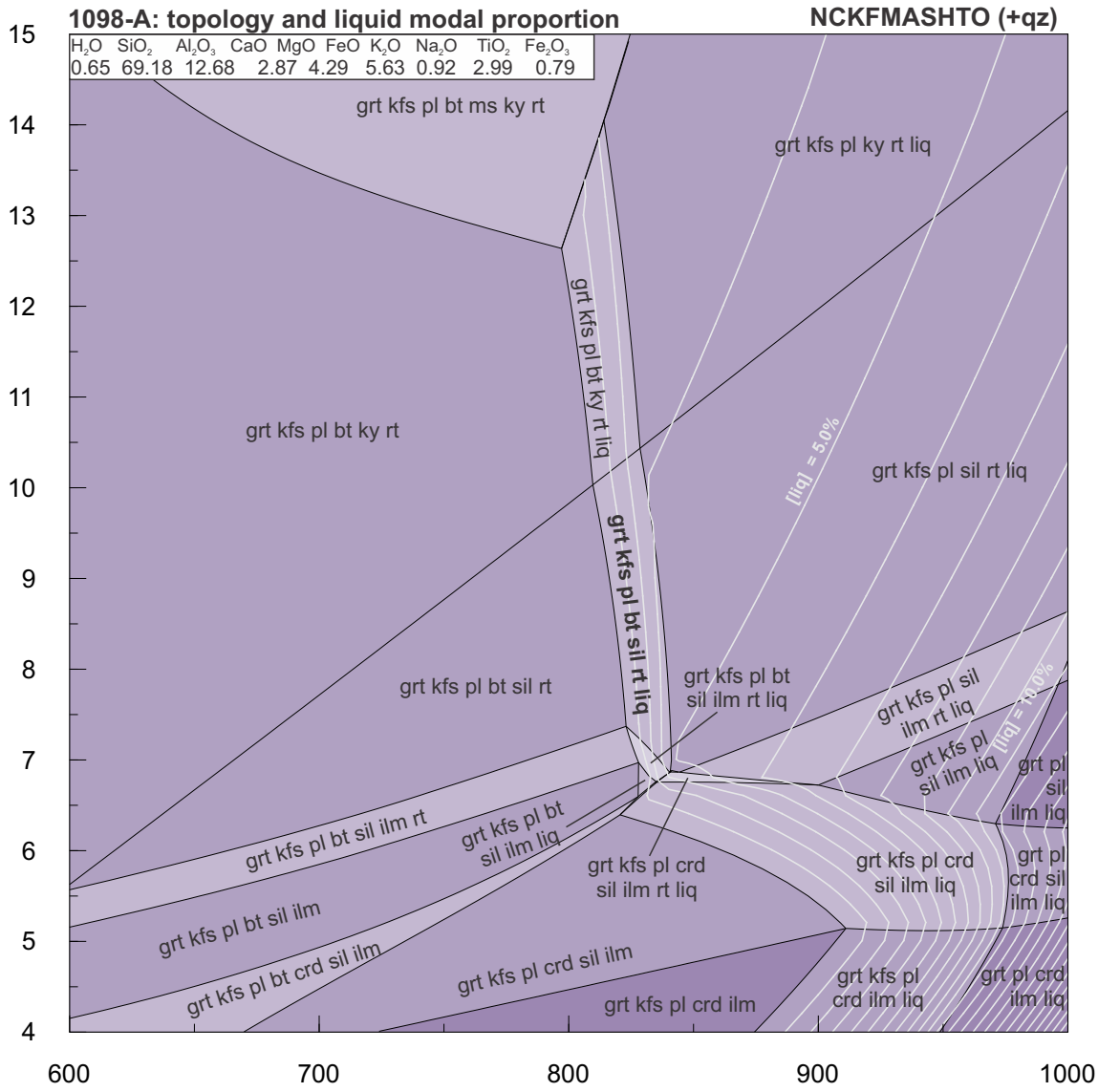

Figure S7-2 (continued)

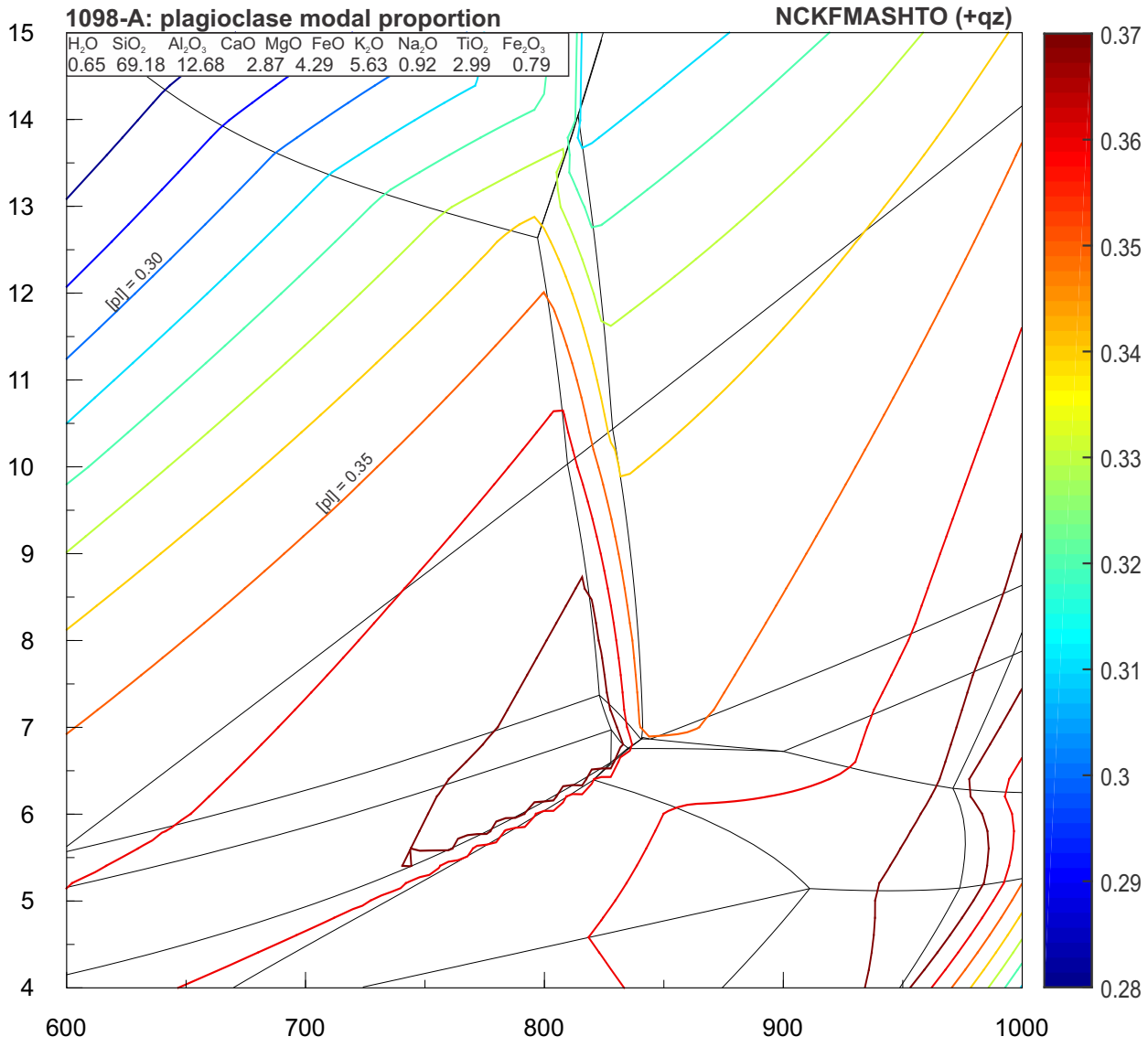

Figure S7-2 (continued)

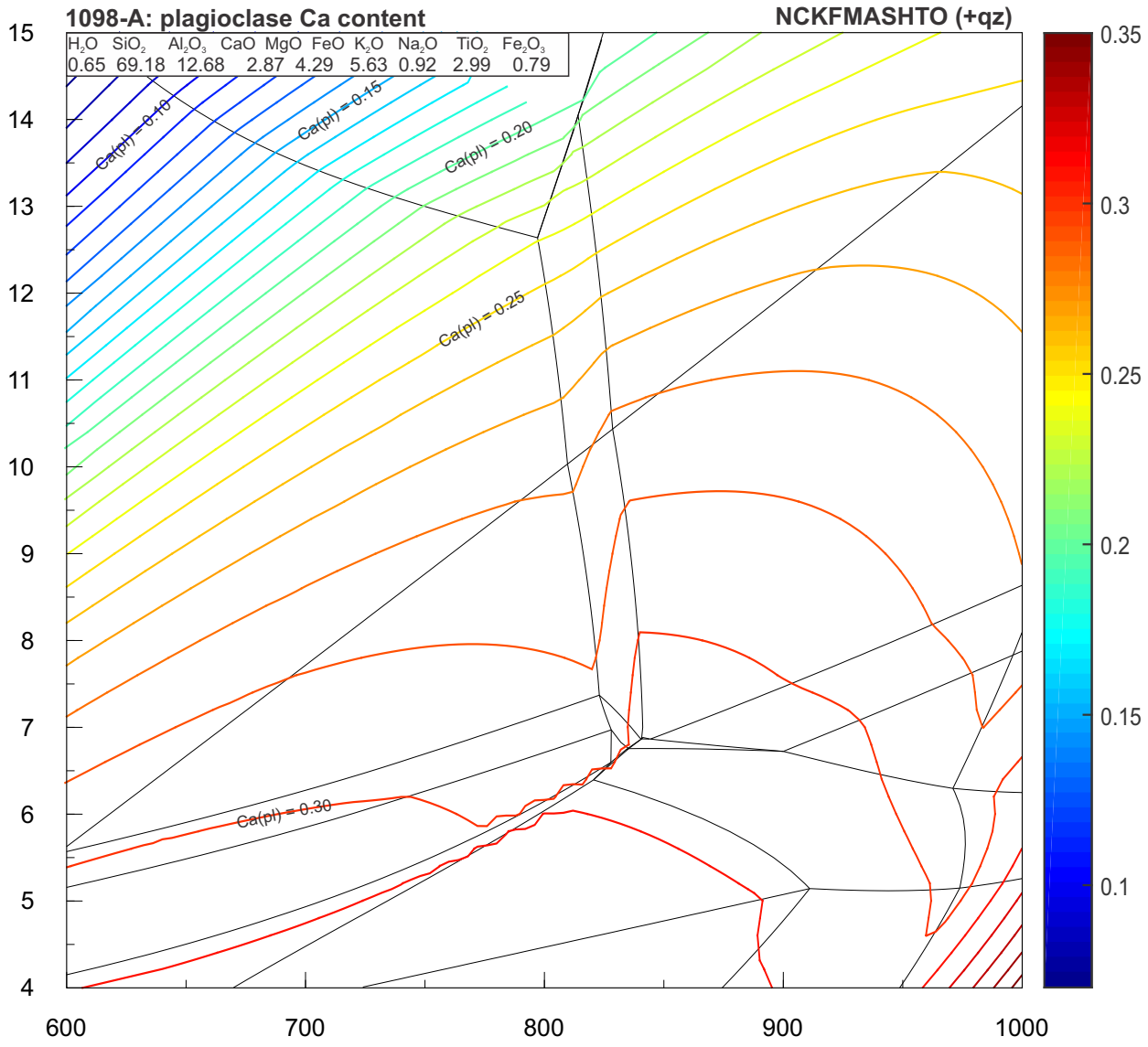

Figure S7-2 (continued)

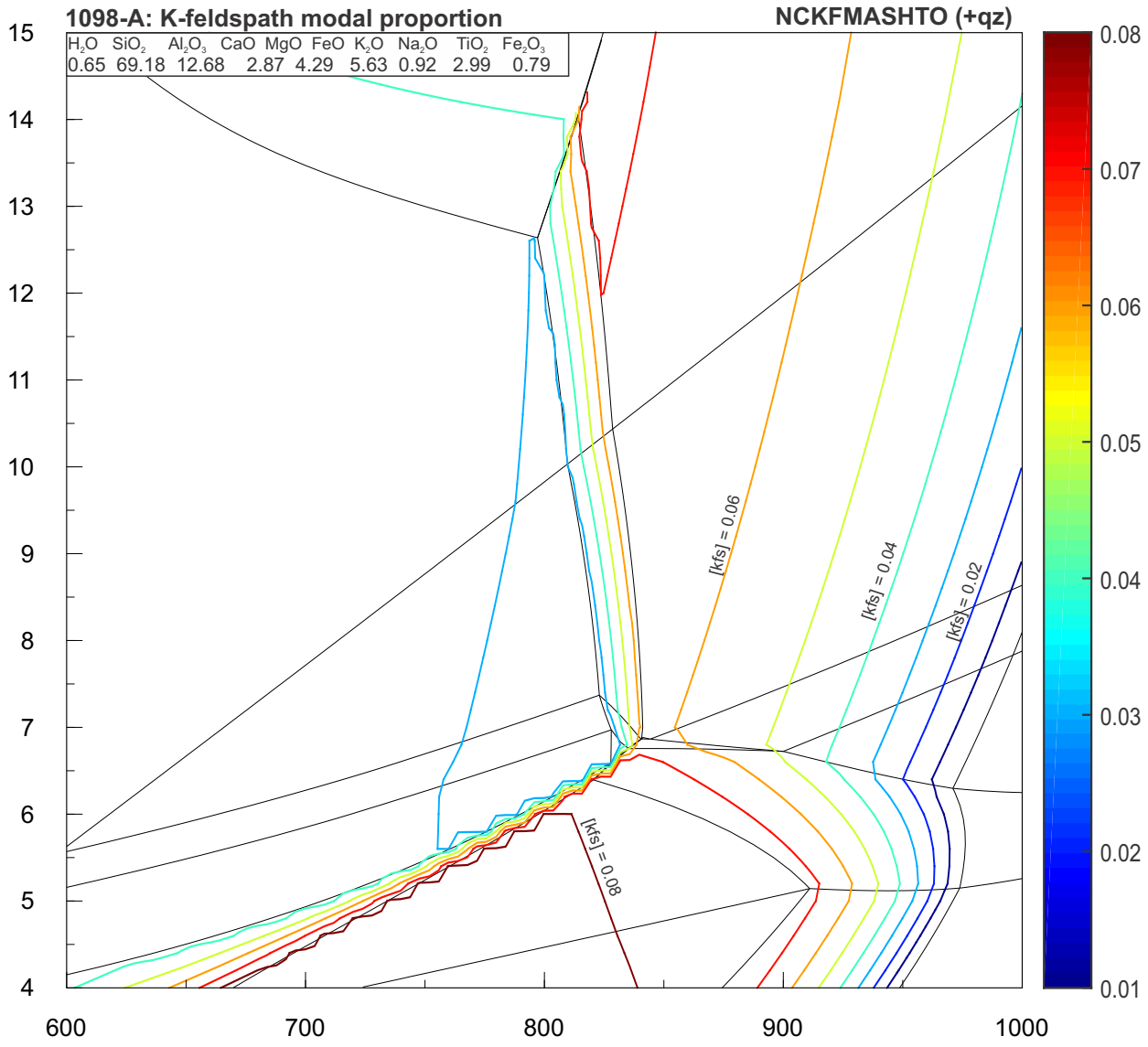

Figure S7-2 (continued)

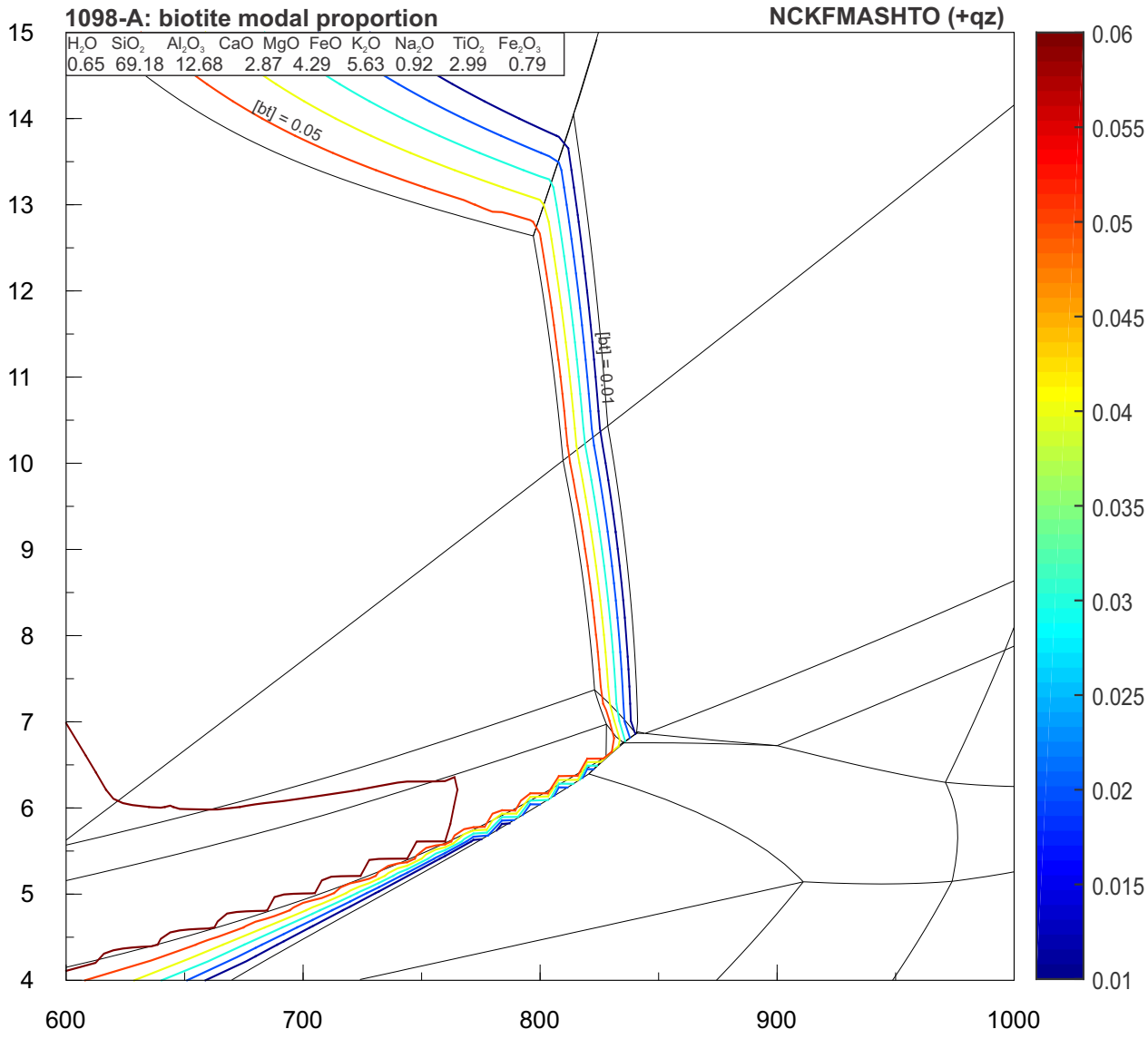

Figure S7-2 (continued)

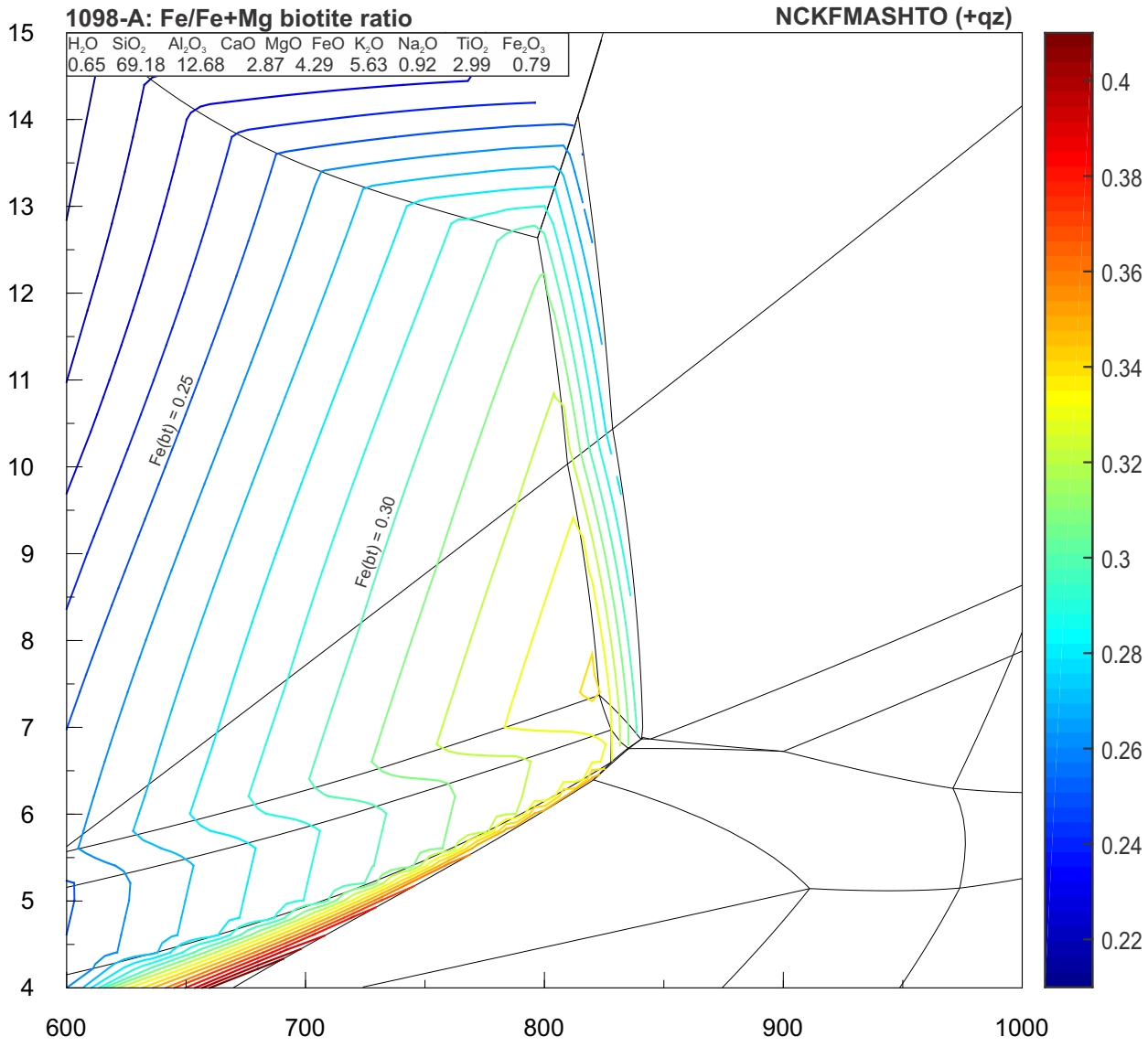

Figure S7-2 (continued)

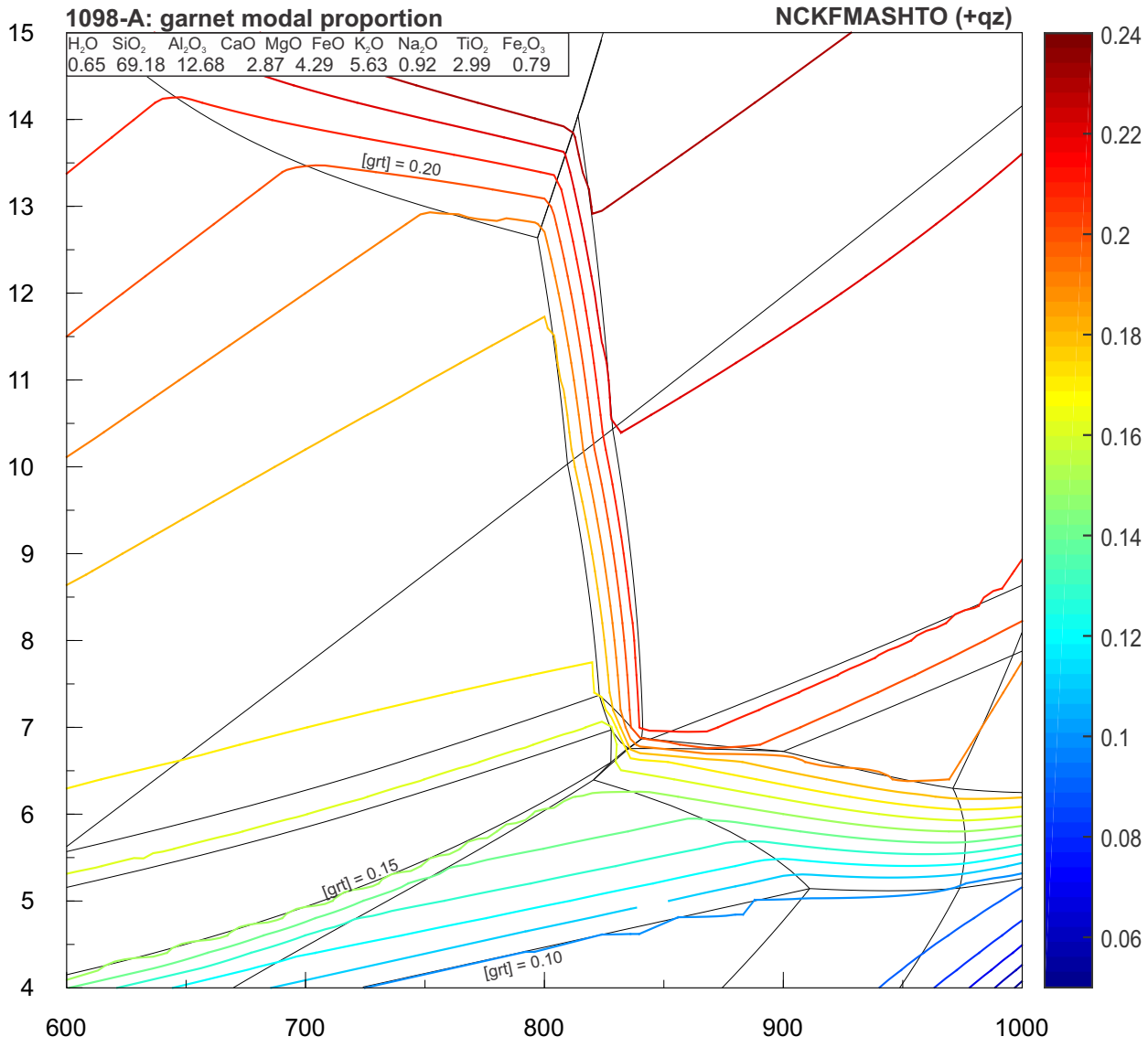

Figure S7-2 (continued)

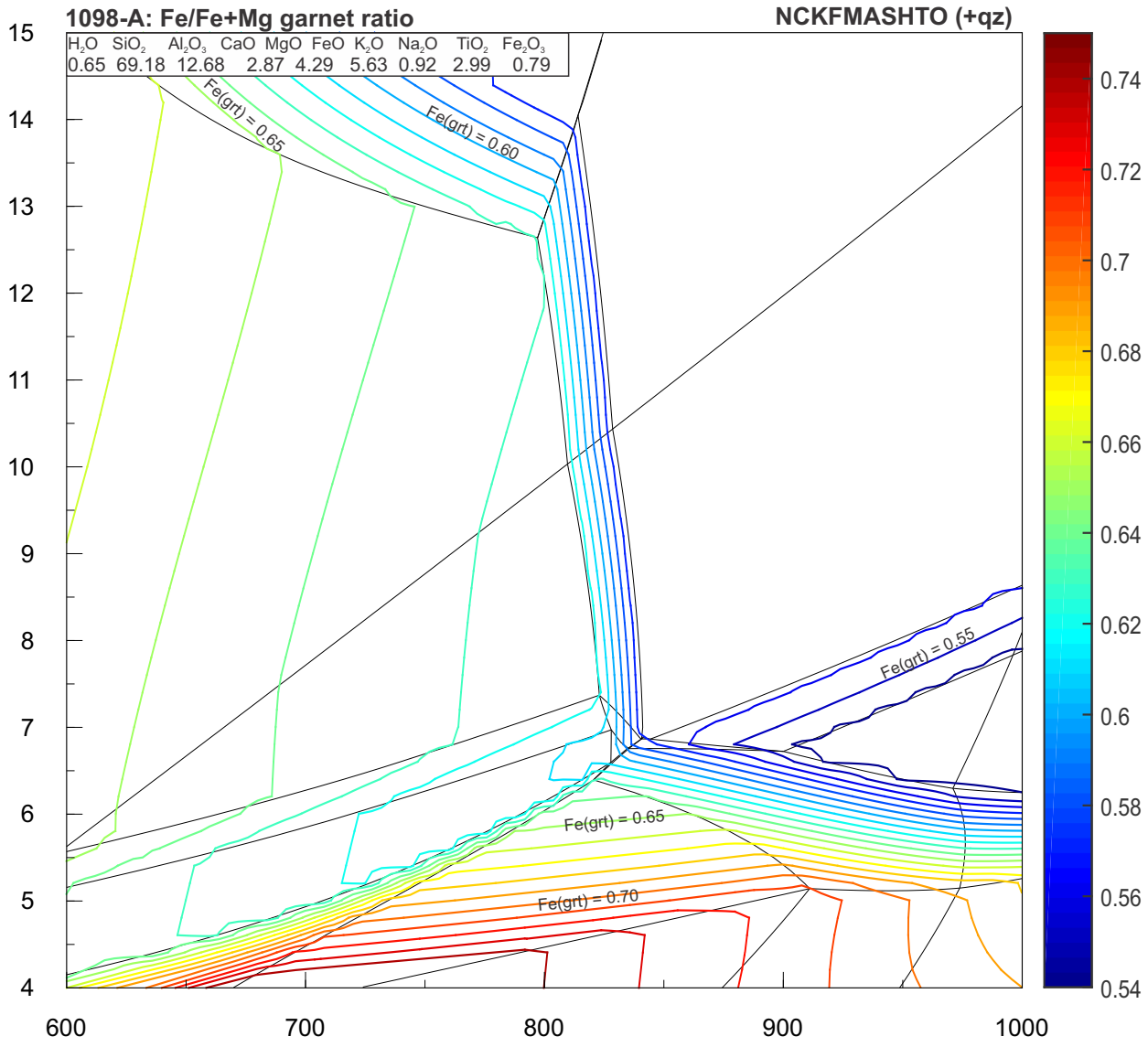

Figure S7-2 (continued)

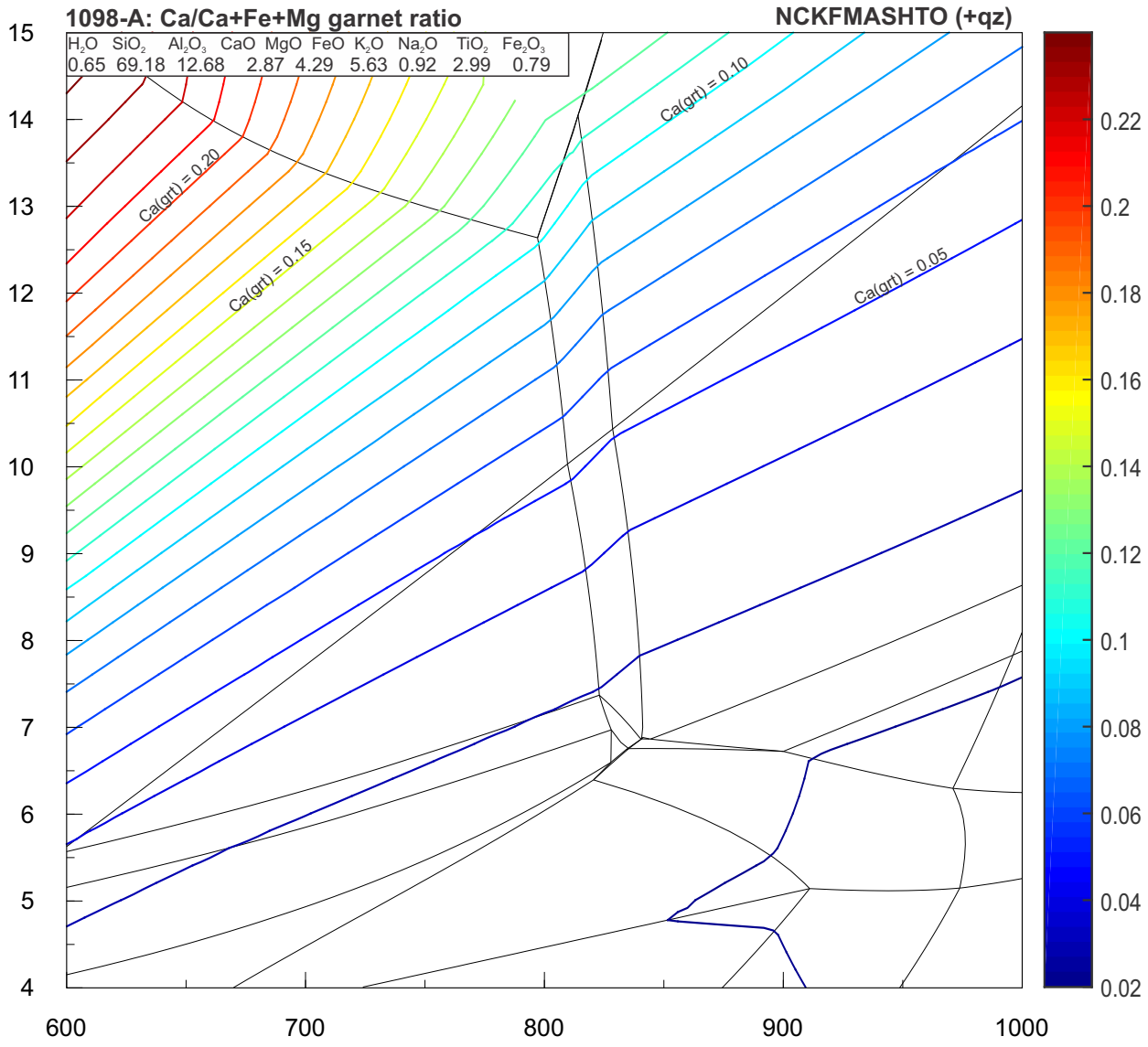

Figure S7-2 (continued)

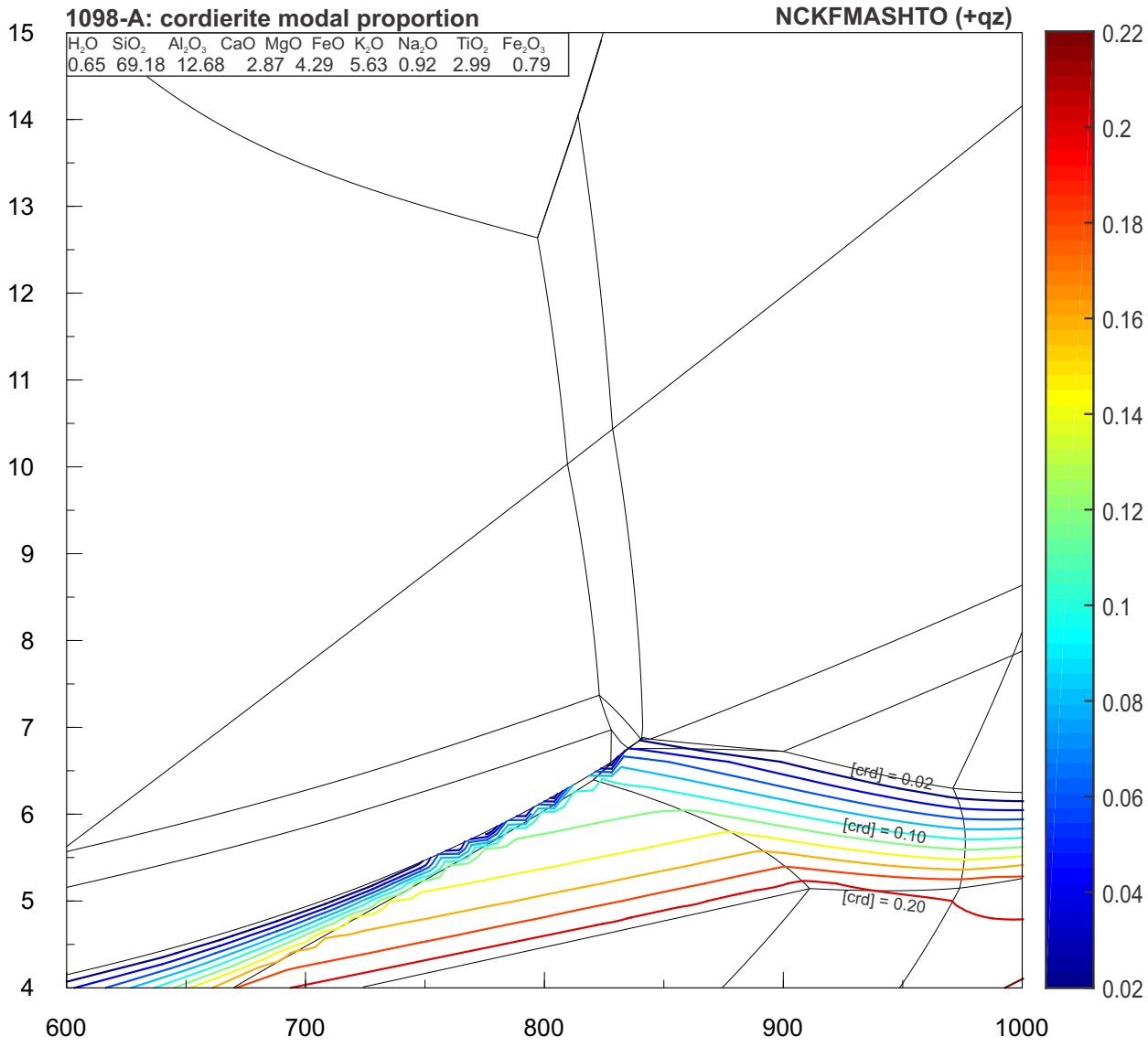

Figure S7-2 (continued)

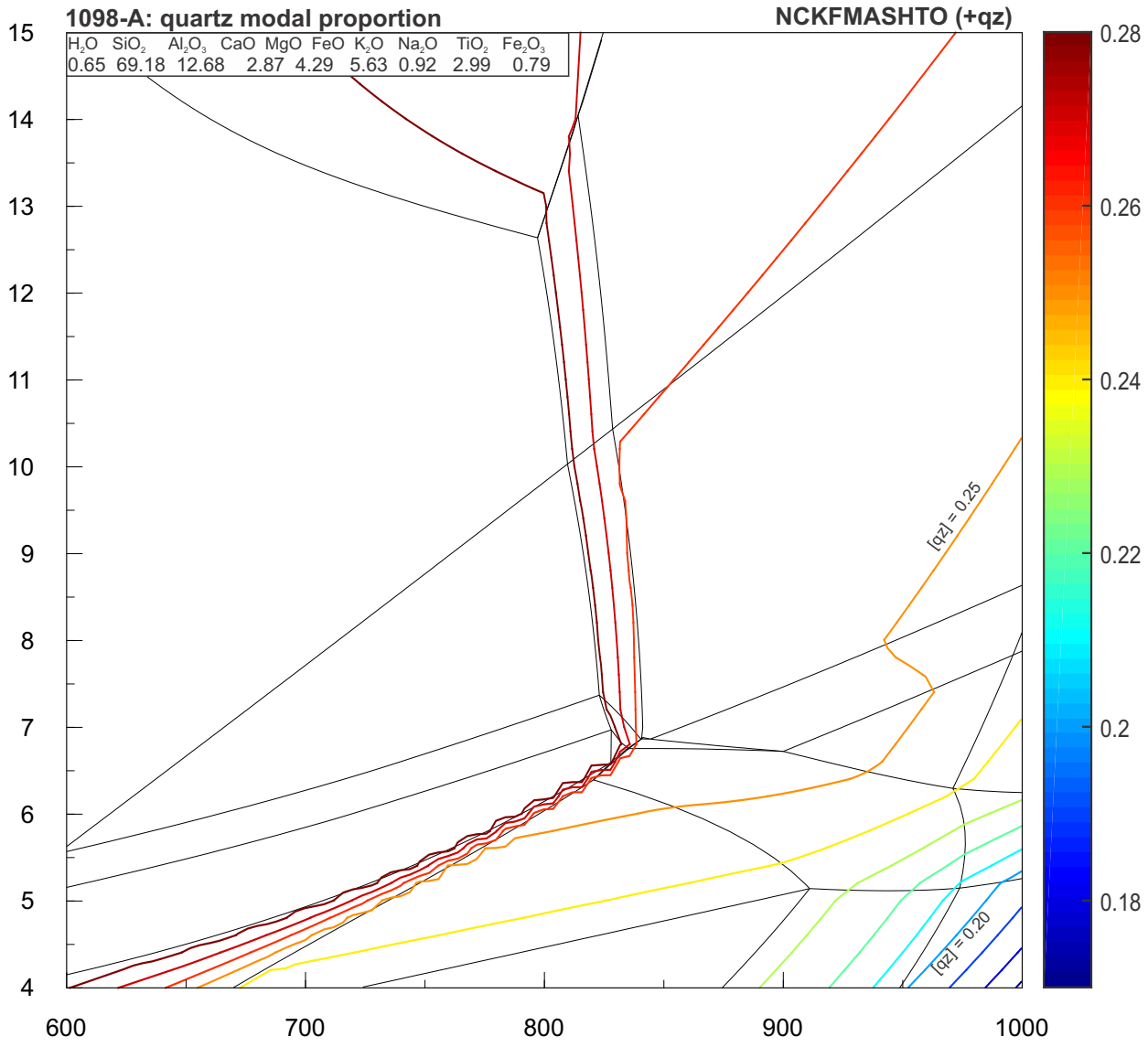

Figure S7-2 (continued)

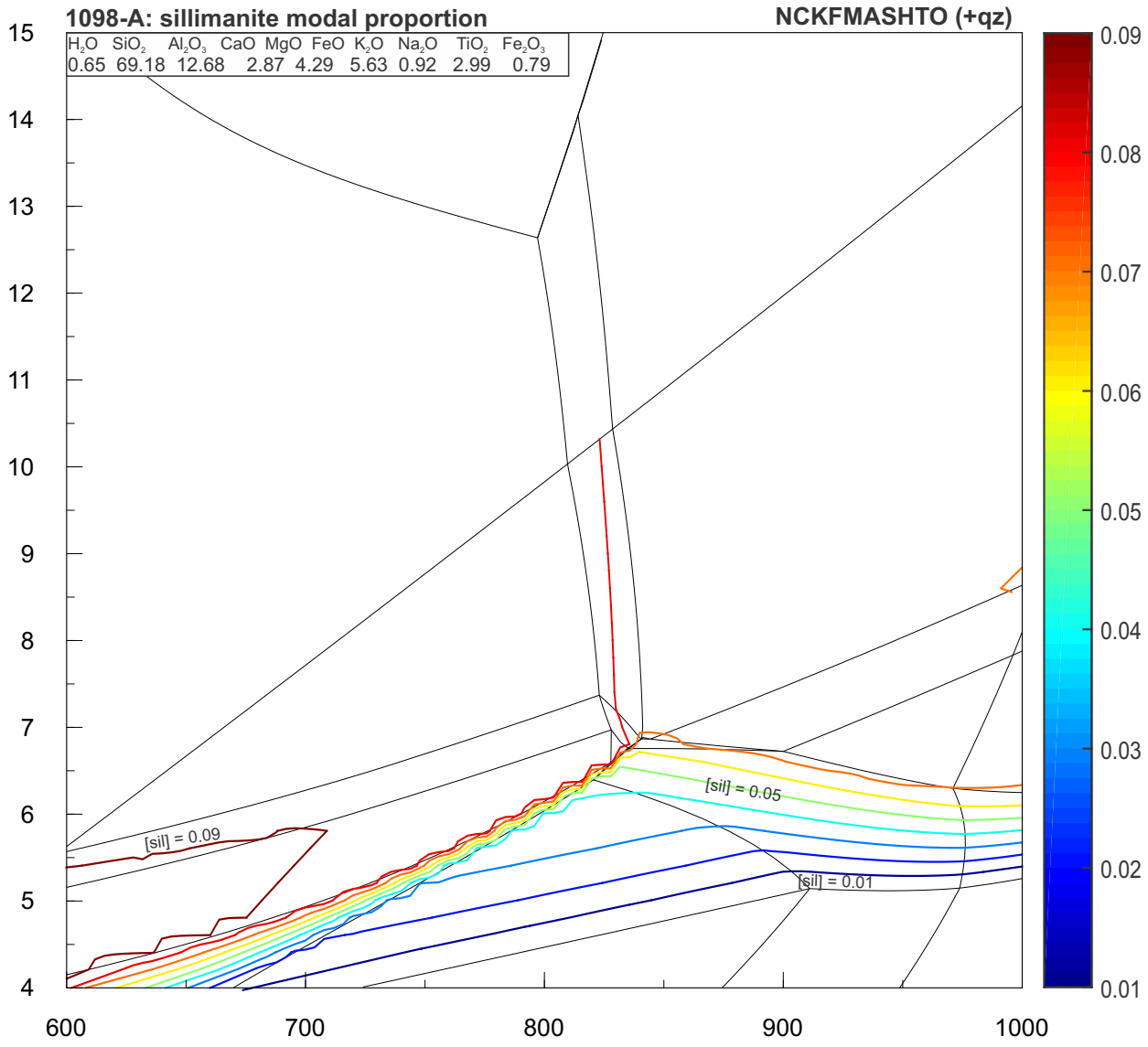

Figure S7-3: Pseudosection topology, isomodes and isopleths for sample 6210-A

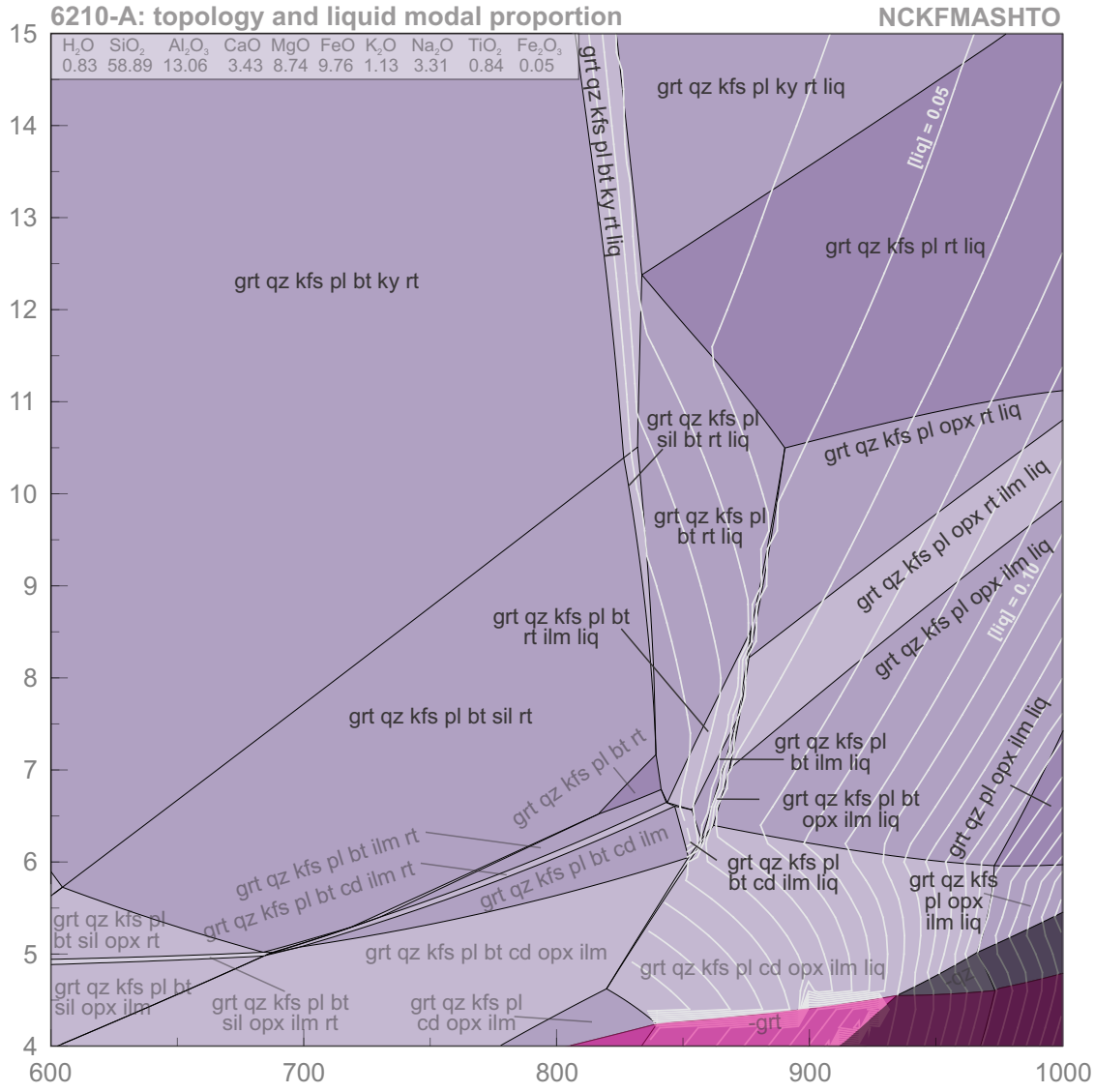

Figure S7-3 (continued)

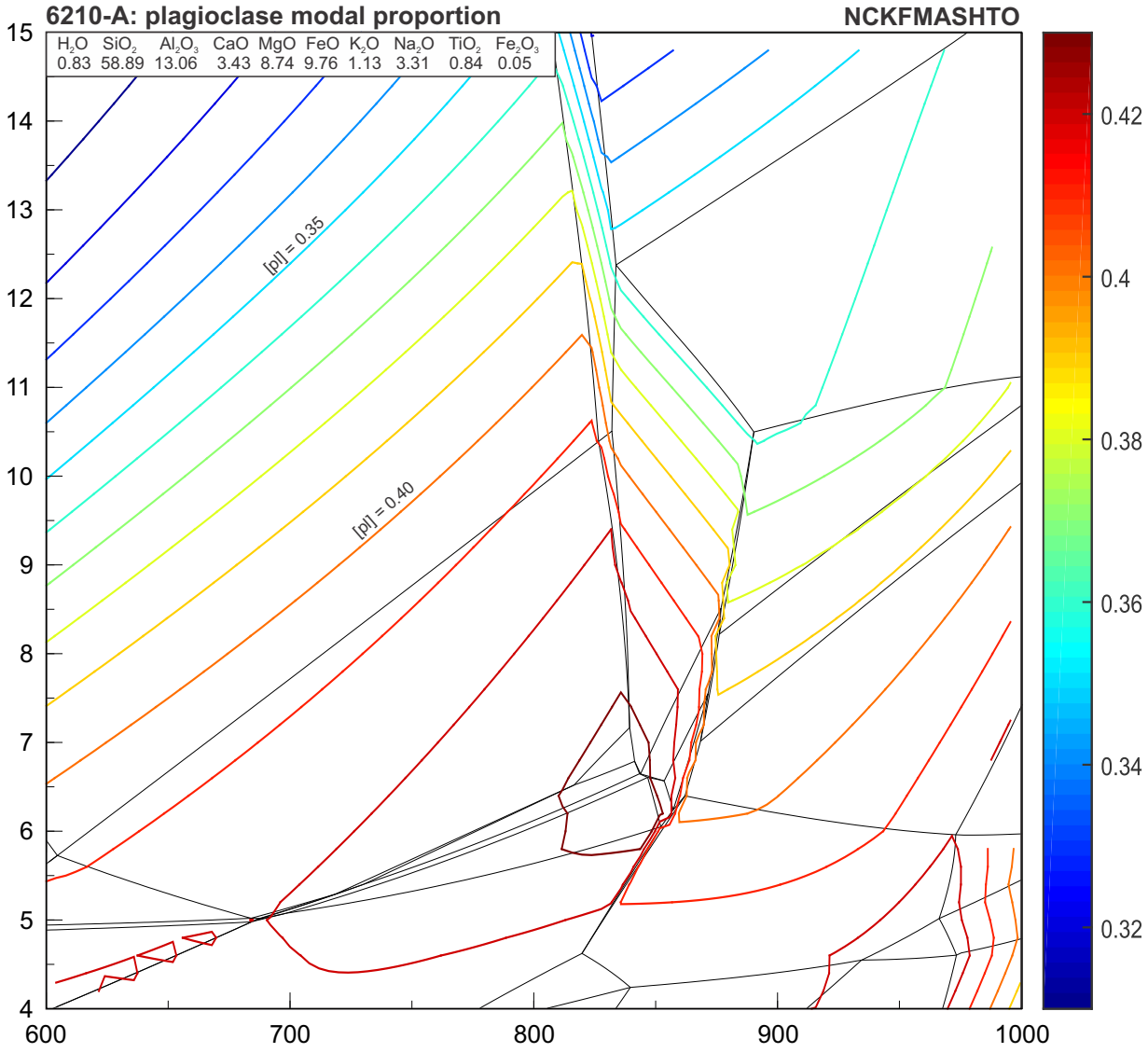

Figure S7-3 (continued)

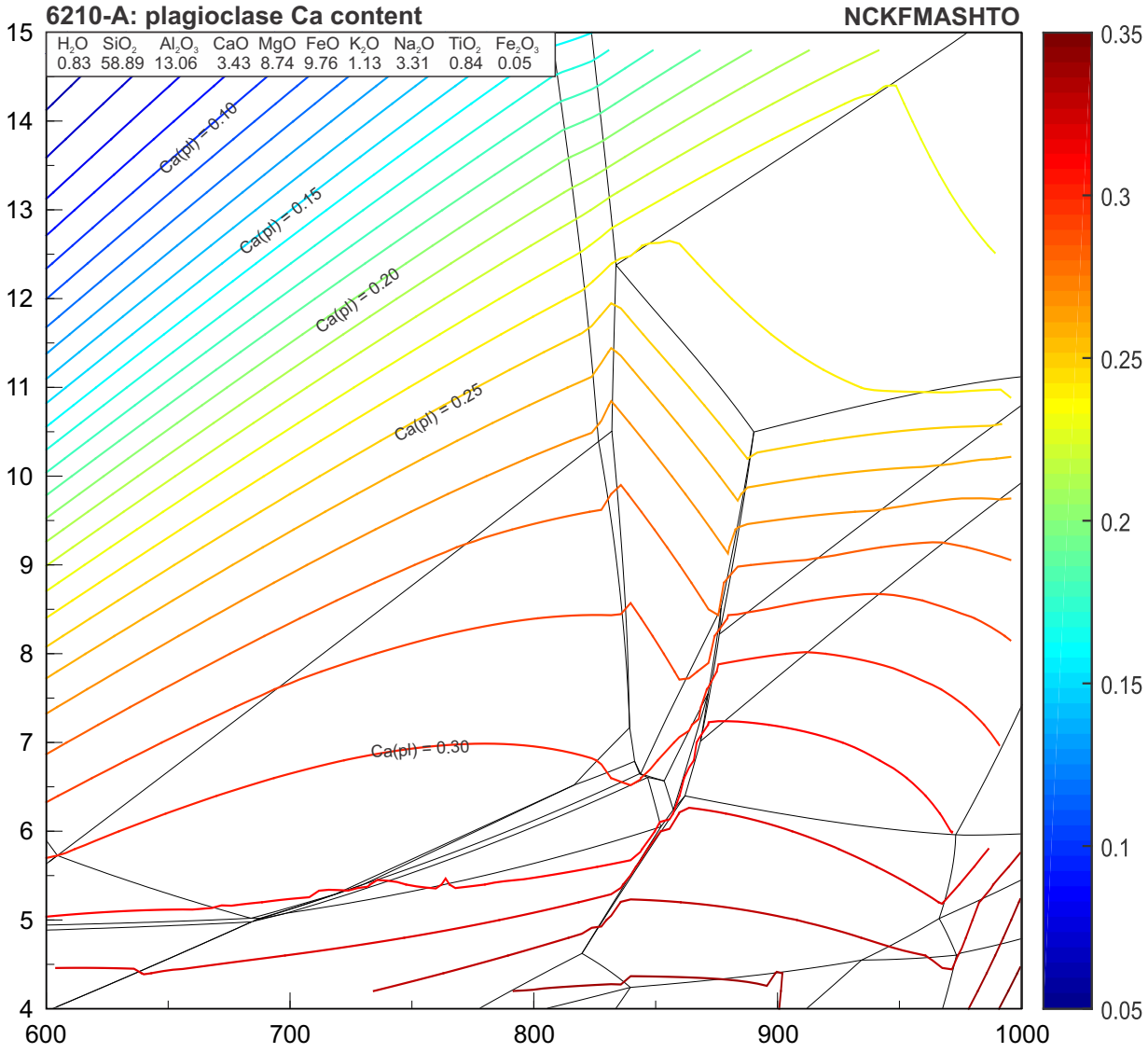

Figure S7-3 (continued)

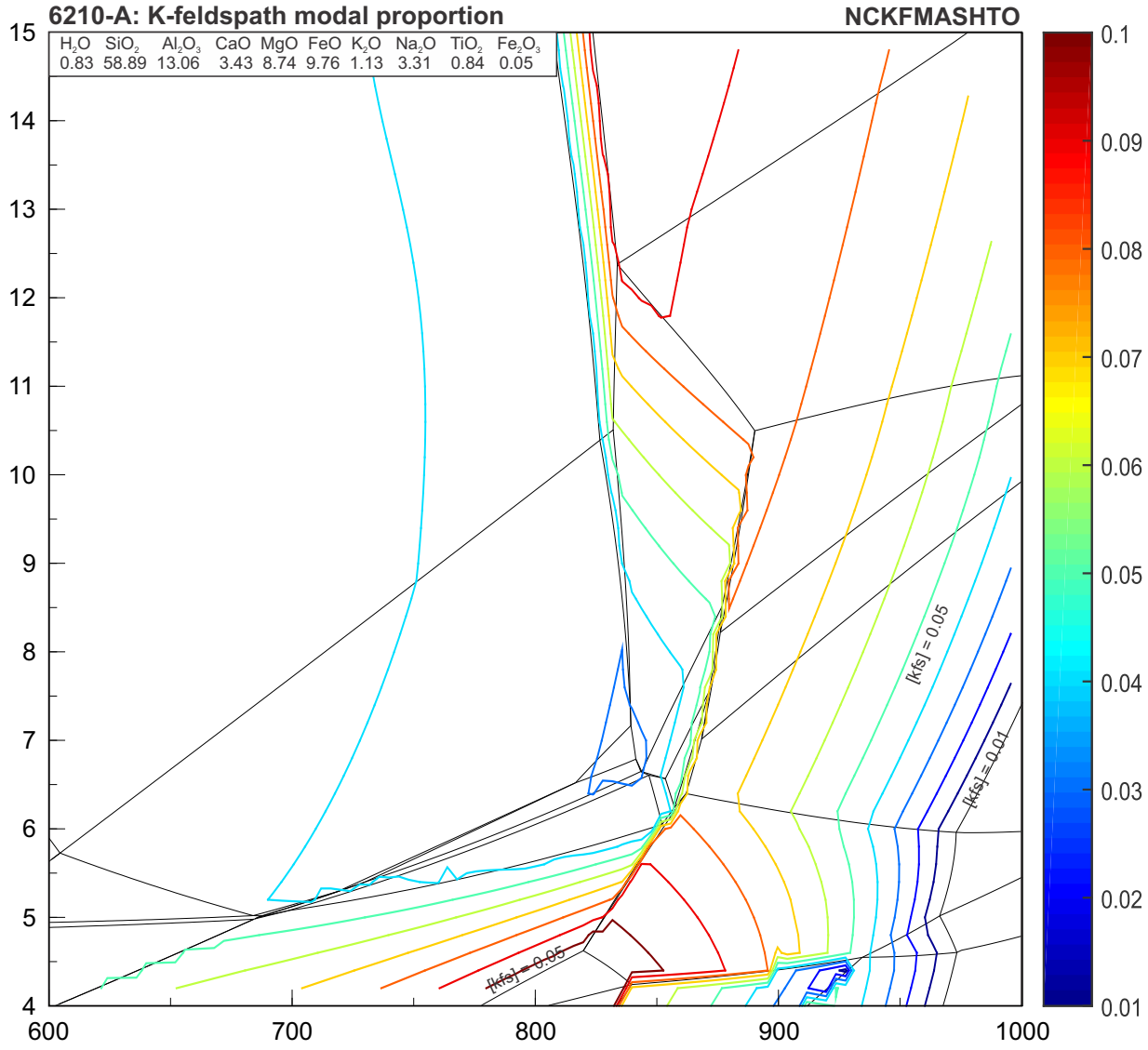

Figure S7-3 (continued)

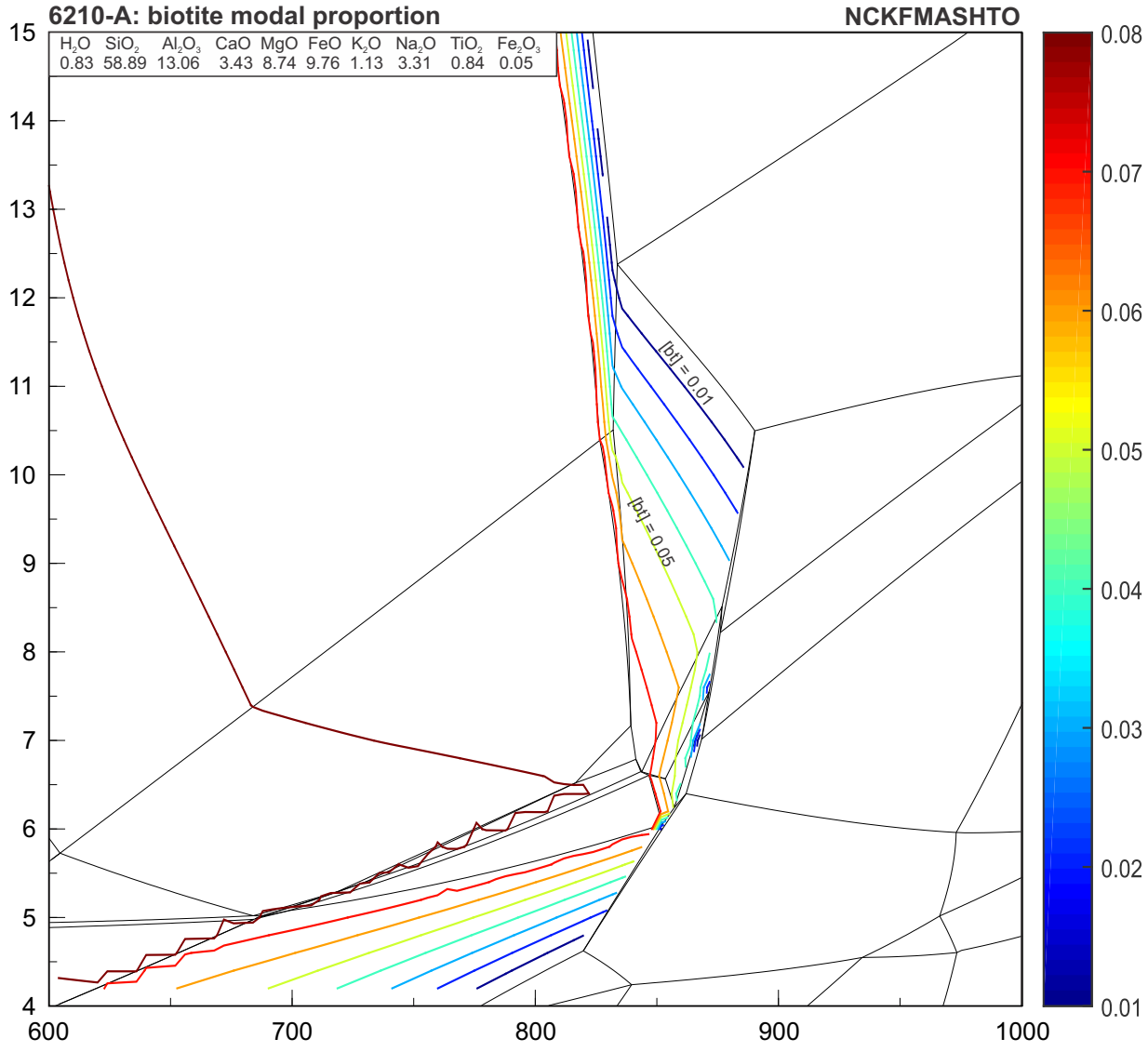

Figure S7-3 (continued)

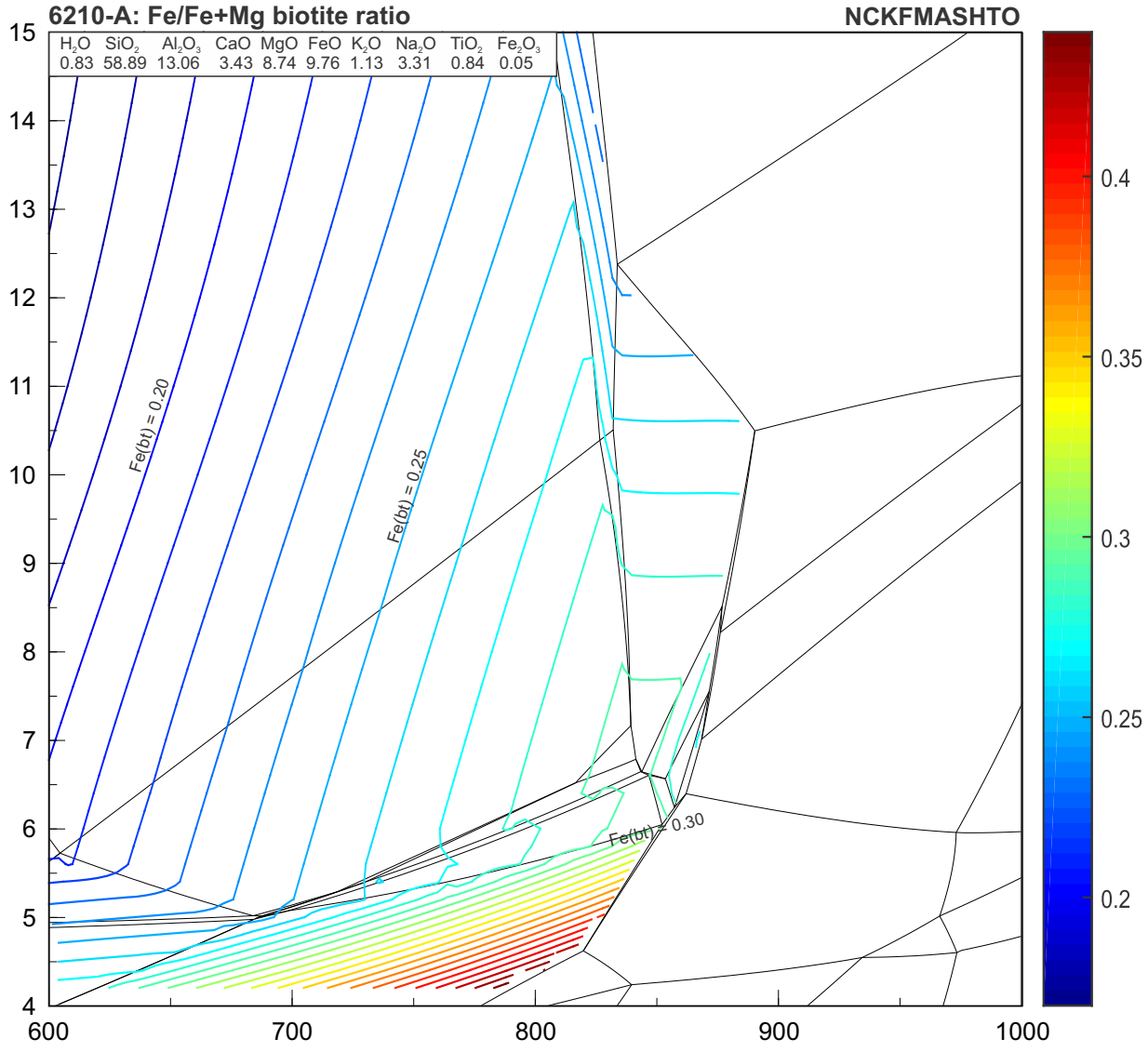

Figure S7-3 (continued)

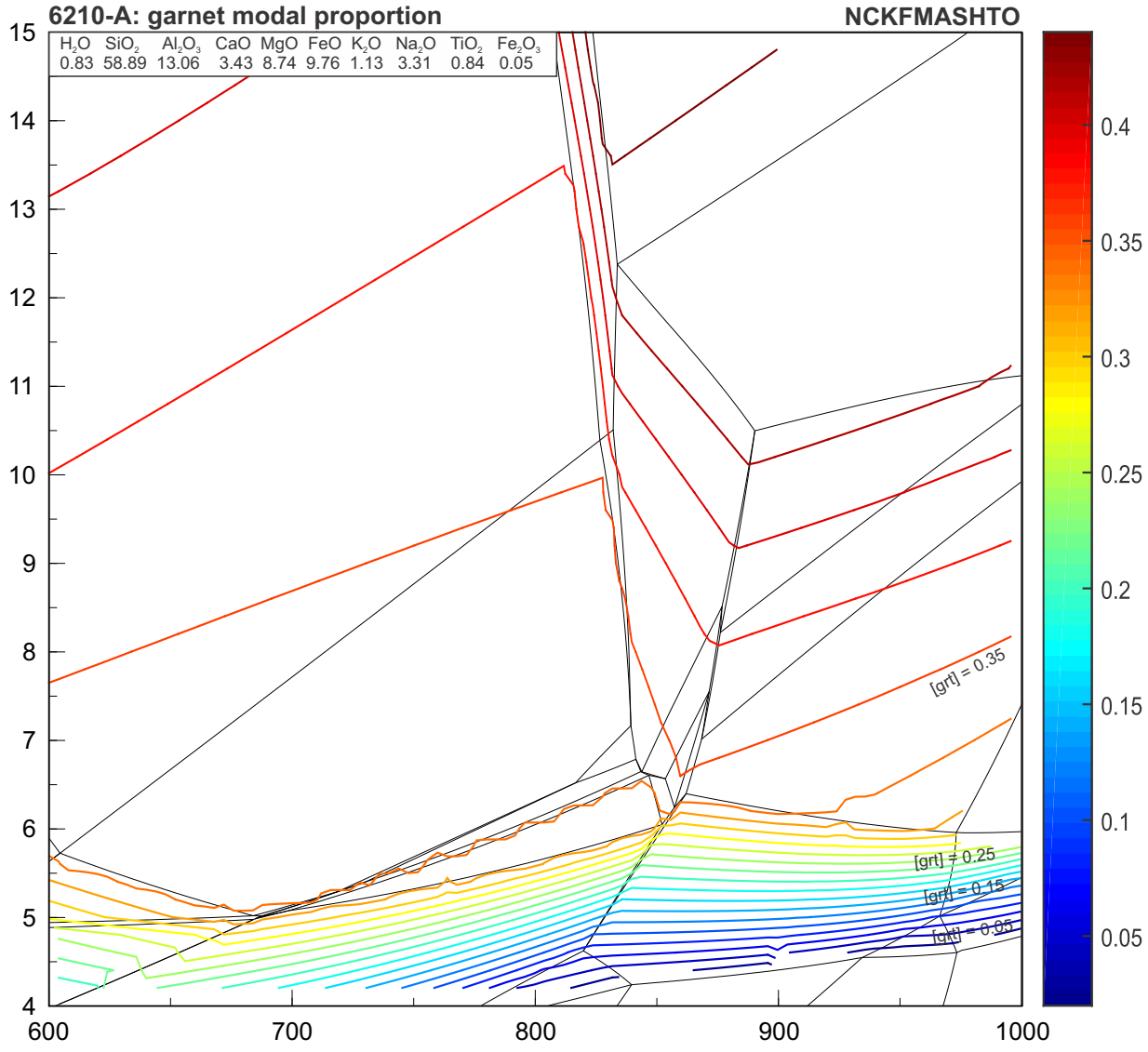

Figure S7-3 (continued)

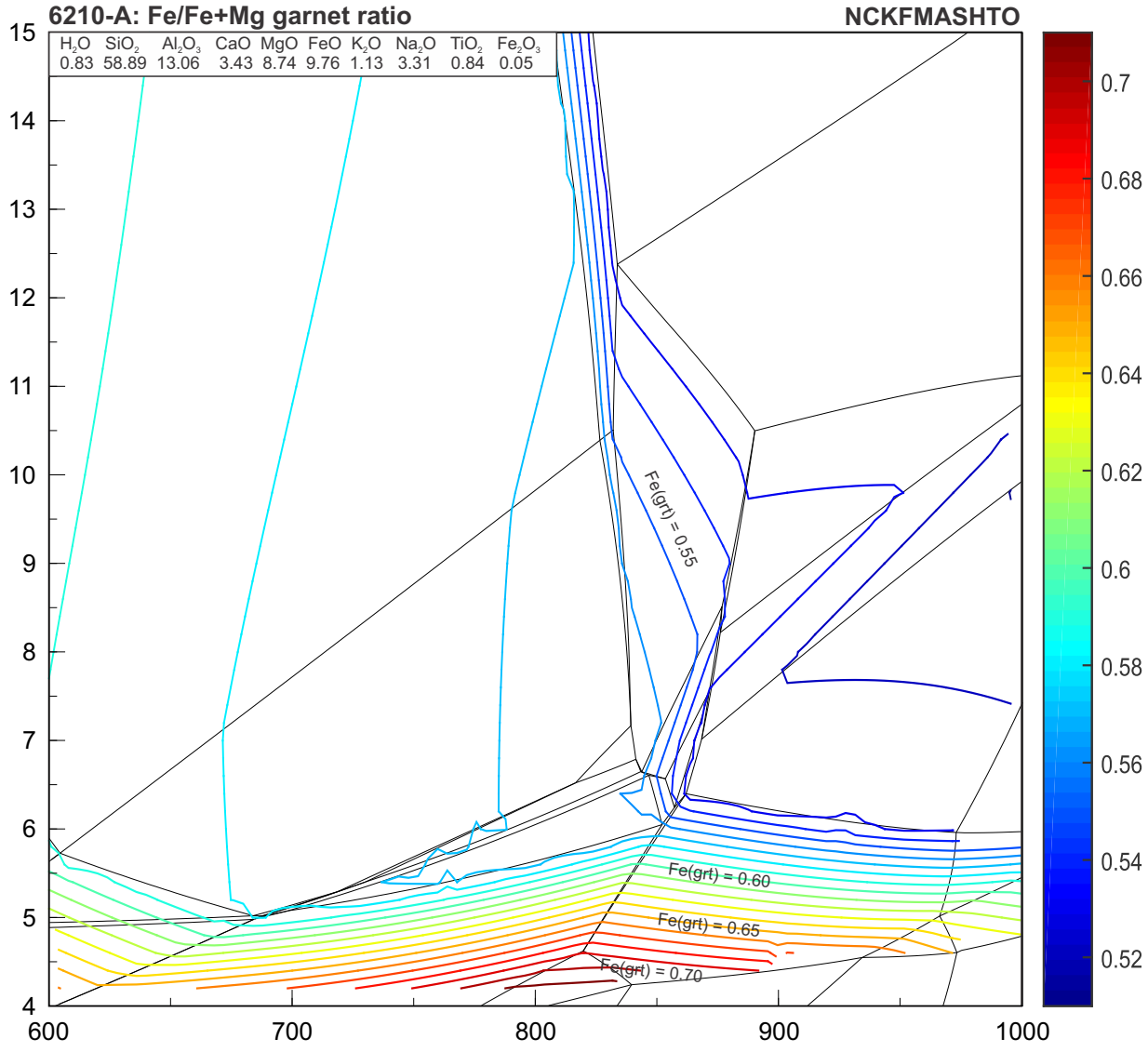

Figure S7-3 (continued)

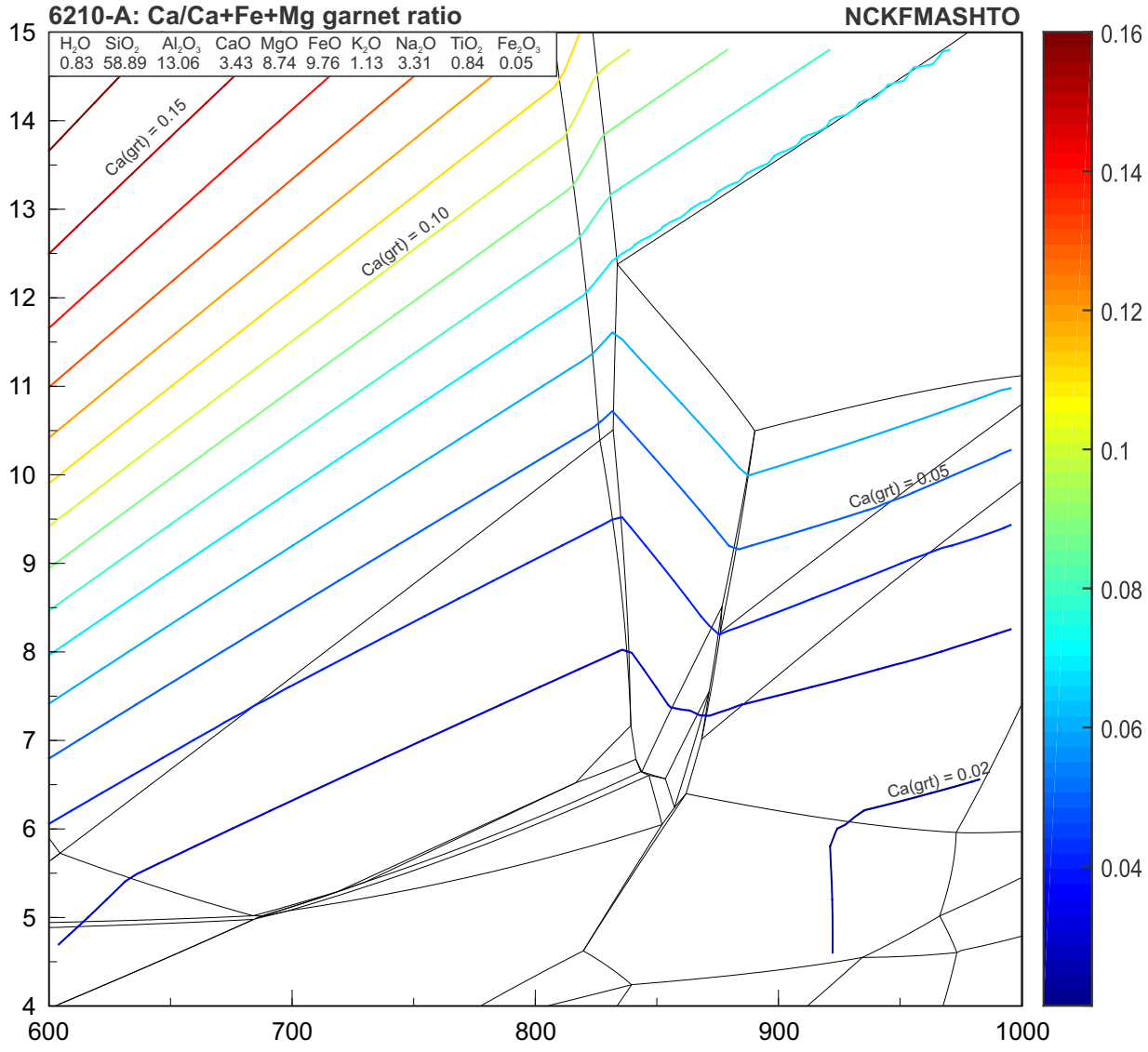

Figure S7-3 (continued)

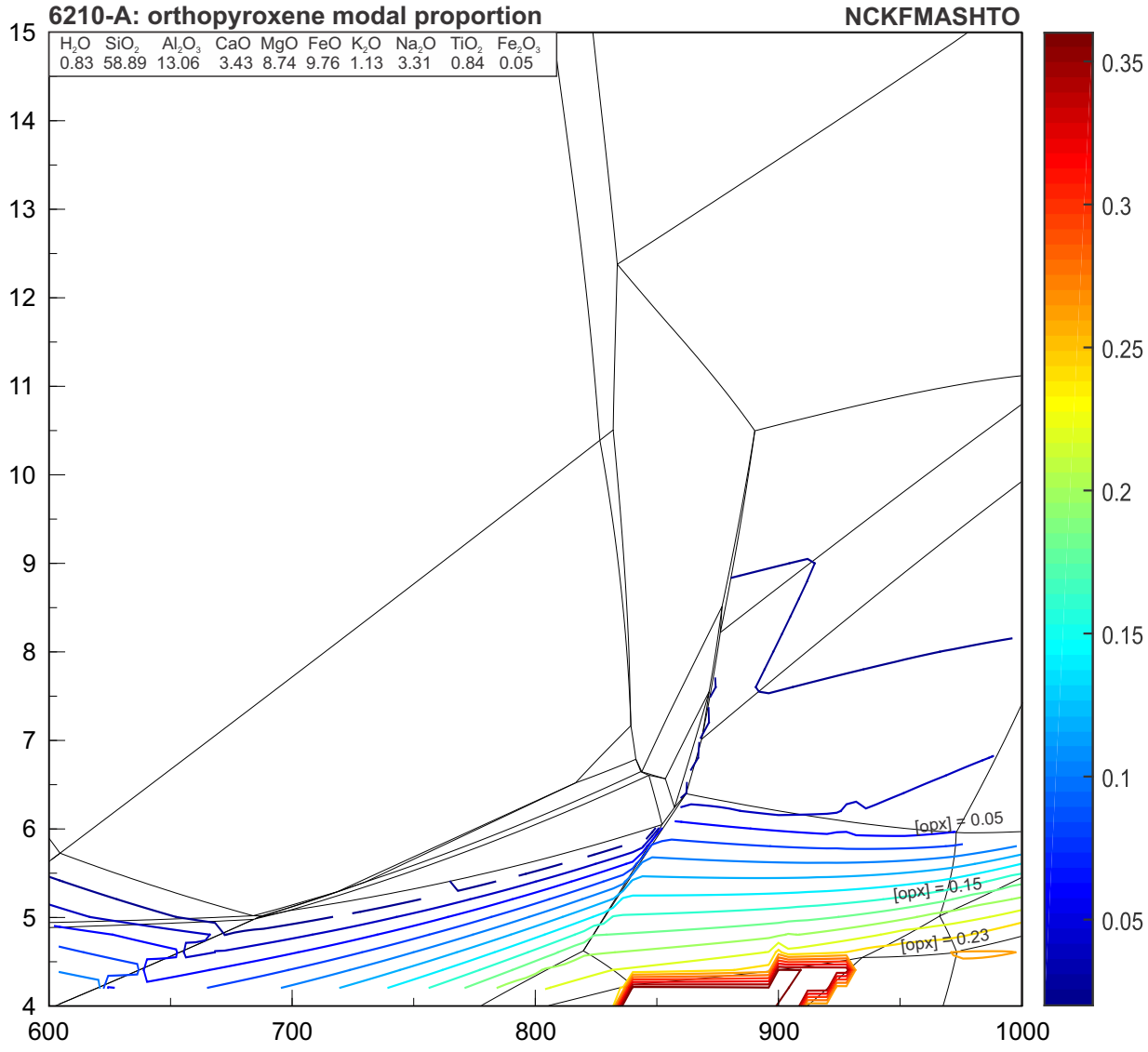

Figure S7-3 (continued)

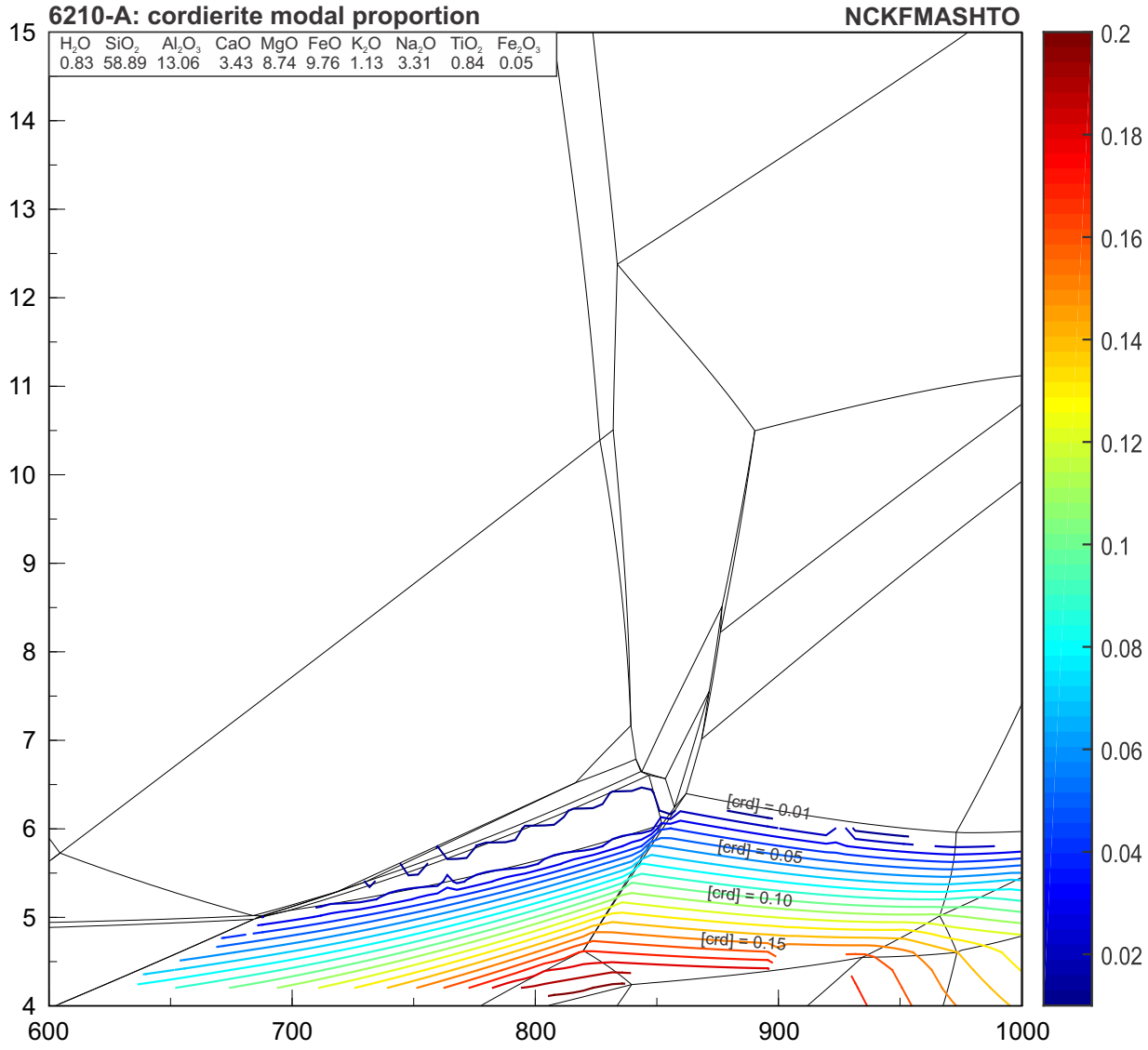

Figure S7-3 (continued)

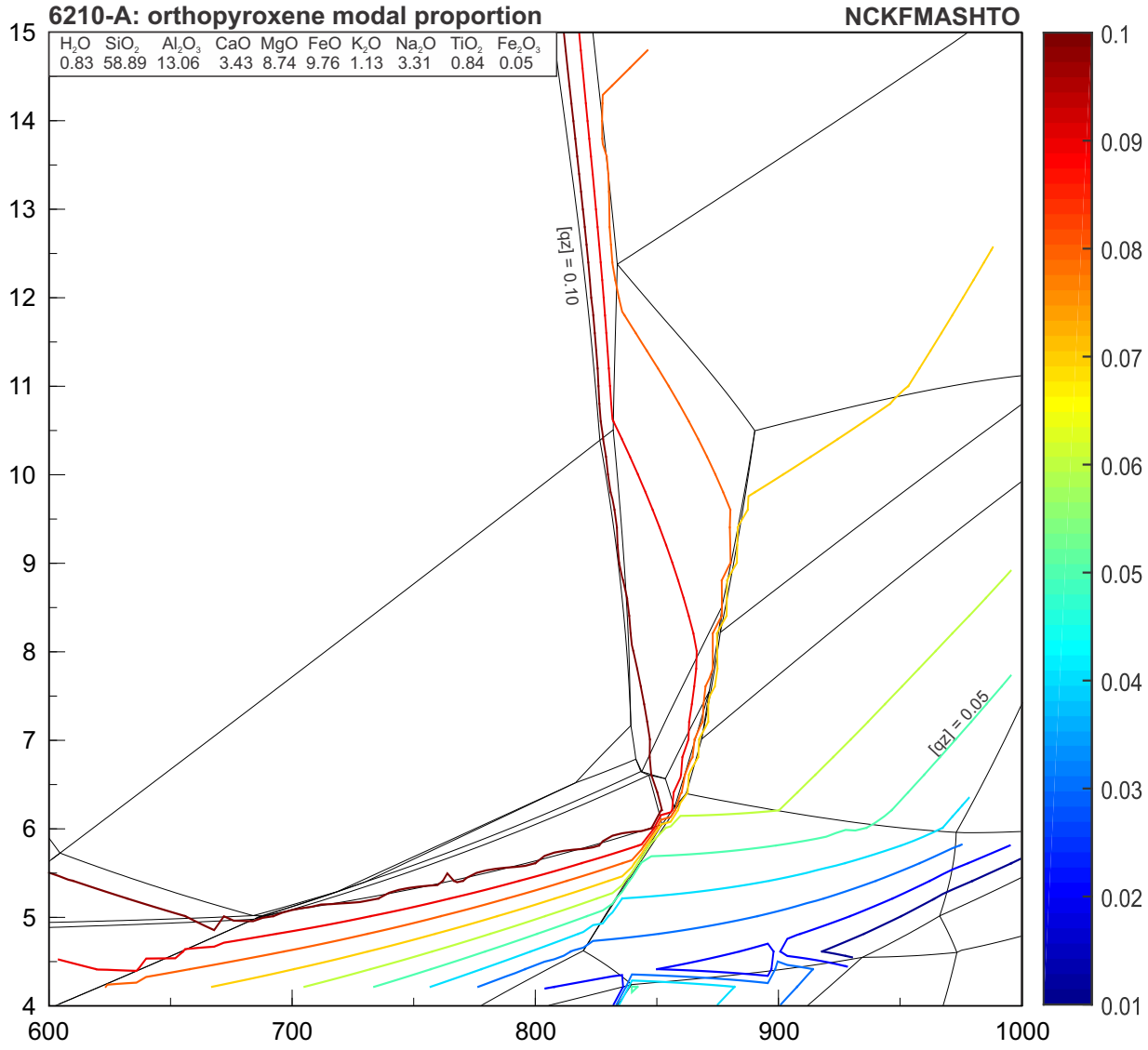

Figure S7-3 (continued)