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Métamorphisme régional du nord-est de la Sous-province de Pontiac, Abitibi, Québec

Mémoire

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RÉSUMÉ

La Sous-province de Pontiac est localisée au sud de la Sous-province de l'Abitibi dans la Province du Supérieur. Les roches sédimentaires sont caractérisées par un gradient métamorphique barrovien croissant du nord au sud de la zone à biotite, à grenat et à staurotide. L'accrétion de la Sous-province de Pontiac à la Sous-province de l'Abitibi est attribuée à une zone de subduction archéenne mais peu de travail a été fait pour caractériser son évolution en pression-température-temps (P-T-t) afin de tester cette hypothèse et déterminer la relation temporelle avec la minéralisation aurifère. La fabrique régionale est caractérisée par une foliation de biotite lépidoblastique. La croissance des porphyroblastes de grenat et de staurotide est tardi- à post-cinématique par rapport cette fabrique. Le coefficient de partage du Fe-Mg entre la bordure du grenat et la biotite n'est pas significativement différent entre la zone à grenat et à staurotide tout comme les estimés de température faits par le géothermomètre du Ti dans la biotite. La modélisation par pseudosection avec eau saturée des conditions de P-T d'équilibre chimique des cœurs de grenat a permis de contraindre leur croissance à 550-600 ^{0}C et 5-6 kbar lors d'un parcours métamorphique prograde dans un chemin P-T horaire. La datation Lu-Hf de trois échantillons de grenat provenant de la zone à staurotide a permis de définir un âge de 2657 +/- 7 Ma correspondant à ces conditions métamorphiques. Ces résultats démontrent que l'évènement de minéralisation en Au du gisement Canadian Malartic, avec un âge précédemment publié de 2664 Ma par Re-Os sur molybdénite, est au moins plus jeune ou synchrone aux conditions de croissance du grenat dans la zone à staurotide. Cet âge de croissance de grenat permet aussi de mettre en doute le contexte tectonique de prisme d'accrétion employé pour expliquer la relation entre les Sous-provinces de Pontiac et d'Abitibi.

ABSTRACT

The Pontiac Subprovince is located in the Superior Province, south of the Abitibi Subprovince. The metasedimentary rocks are characterized by a Barrovian metamorphic gradient increasing from north to south from biotite zone, to garnet zone and to staurolite zone. The Pontiac Subprovince interpreted as an accretionary wedge that was tectonically docked to the Abitibi Subprovince during Archean subduction, however, few studies have attempted to characterize its pressure-temperature-time path to test this hypothesis and little is known about the timing relationship between regional metamorphism and the Au mineralization. The regional fabric is defined by an E-W, NW-SE lepidoblastic ductile foliation in which garnet and staurolite porphyroblasts are interpreted to be late- to post-kinematic with the rare occurrence of syn-kinematic staurolite growth. The garnet-biotite Fe-Mg partitioning coefficient geothermometer is not significantly different between the garnet and the staurolite zone. Similarly, Ti in biotite geothermometry does not suggest different temperature of equilibration between the biotite, garnet and staurolite zone. Pressure and temperature (PT) forward thermodynamic modelling with a water saturated pseudosection yielded conditions of 550-600 ^{0}C and 5-6 kbar during a prograde, clock-wise P-T path. Lu-Hf dating of garnet from three outcrops within the staurolite zone yielded an age of 2657 +/- 7 Ma that is inferred to be representative of these conditions. The results of this study imply that the Canadian Malartic mineralization event, previously dated at 2664 Ma with Re-Os on molybdenite, is younger or synchronous with the garnet growth condition in the staurolite zone next to the ore body. The age of garnet growth calls into question the accretionary prism tectonic model currently explaining the contact between the Abitibi and Pontiac Subprovinces.

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Minéralogie :

and : andalousite
bi : biotite
cd : cordiérite
chl : chlorite
cz : clinozoïsite
ep : épidote
g : grenat
ill : ilménite
ky : kyanite
mu : muscovite
pa : paragonite
pl : plagioclase
q : quartz
ru : ru
sill : sillimanite
sph : sphène
st : staurotide
H_2O : liquid phase

Géologie :

Zone métamorphique : biotite (1), grenat (2), staurotide (3), kyanite (4)
CLLFZ :Cadillac-Larder Lake Fault Zone
P : Pression
T : Température
P-T : Pression-Température
P-T-t : Pression-Température-Temps
K_D : Coeeficient de partage du Fe-Mg entre le grenat et la biotite

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AVANT-PROPOS

Ce mémoire de Maîtrise est basé sur un manuscrit destiné à une publication dans la revue « Precambrian Research ». Le chapitre 2 qui contient ce manuscrit est rédigé selon le style et la langue de publication en vigueur dans cette revue alors que le chapitre 3 est exclu de l'article mais est rédigé en Anglais afin de faciliter la communication avec les collaborateurs anglophones participant au projet. L'auteur du mémoire est l'auteur original du manuscrit tel que présenté. Ce dernier l'a rédigé dans son entièreté à l'exception des sections de géochronologie Lu-Hf des grenats (Méthodologie et Résultats) qui ont été rédigés par la chercheure Audrey Bouvier. En date de soumission de ce mémoire à la Faculté des Études Supérieures de l'Université Laval le manuscrit est en voie d'être soumis aux co-auteurs pour révision. Les co-auteurs sont Carl Guilmette (directeur de recherche), Audrey Bouvier (Western), Stéphane Perrouty (Western), Pierre Pilote (MERN), Nicolas Gaillard (McGill), Philip Lypaczewski (Alberta), Robert Linnen (Western) et Gema Olivo (Queen's). Outre le rôle mentionné précédemment dans la rédaction de ce manuscrit, les co-auteurs ont contribué intellectuellement à ce travail en participant aux travaux de terrain, en contribuant de leurs observations et en alimentant une discussion continuelle avec l'auteur sur la portée de ses observations et de ses interprétations. Cette collaboration est marquée par la publication d'un article dans la revue « Ore Geology Reviews » (Perrouty et al., 2017) ainsi qu'un rapport public en cours d'édition par le Ministère de l'Énergie et des Ressources Naturelles (MERN) (Piette-Lauzière et al., en édition).

1. INTRODUCTION

La Sous-province de Pontiac est située dans le craton archéen du Supérieur. Elle est prise en étau entre la Sous-province de l'Abitibi, au nord, et le front tectonique du Grenville au sud et à l'est (Figure 1). Le contact ouest de la Sous-province de Pontiac avec le Groupe de Larder-Lake est masqué par le couvert de roches sédimentaires protérozoïques du Groupe de Cobalt et il a été suggéré, sur la base de données gravimétriques, que le contact entre ces deux unités soit faillé (Kalliokoski, 1987). Ainsi, par son faciès lithologique distinctif, son grade métamorphique en apparence contrasté et ses contacts faillés avec les provinces et sous-provinces géologiques adjacentes, la Sous-province de Pontiac est considérée comme ayant les attributs d'un « terrane » archéen d'après la définition de Schermere et al. (1984). Pourtant, il est communément accepté sur la base d'observations géologiques, structurales et pétrologiques que cette sous-province représente un bassin sédimentaire associé à une zone de subduction (Dimroth et al., 1983a; Camiré and Burg, 1993) Dans le contexte où une partie de la communauté scientifique se questionne sur l'existence même du mécanisme du subduction à l'Archéen (Dimroth et al., 1983a; Bédard et al., 2013), et qu'un type de minéralisation aurifère atypique a été identifié à proximité de la suture nord de la Sous-province de Pontiac (mine Canadian Malartic), il est important de développer notre compréhension de la tectonique archéenne en employant le métamorphisme comme outil permettant de générer des données quantitatives. Dans cette optique, seule la portion ouest du Groupe de Pontiac (Figure 1b) a été documentée de façon régionale (Goulet, 1978; Camiré, 1992; Ghassemi, 1996) alors que le nord-est (Figure 1a) de la Sous-province, comprenant le secteur de la mine Canadian Malartic, a été peu documenté.

Deux problématiques complémentaires ont été abordées dans ce projet de maîtrise. Tout d'abord, la Sous-province de Pontiac possède un potentiel aurifère confirmé à sa frontière nord, tel qu'illustré par le gisement Canadian Malartic, situé dans la zone métamorphique des schistes verts (Eakins, 1962; Trudel and Sauvé, 1992; Fallara et al., 2000). Les relations temporelles entre le métamorphisme, la minéralisation aurifère et la déformation régionale doivent être comprises pour promouvoir l'exploration de gisements similaires dans la Sous-province de Pontiac ou ailleurs, dans des zones de plus haut grade métamorphique. Dans cette optique, aucun minéral métamorphique de haut grade (grenat, staurotide, kyanite ou sillimanite) n'a été observé en relation avec la minéralisation dans l'enceinte de la mine de

Canadian Malartic. Il n'est donc pas possible de démontrer de façon directe le lien temporel entre la minéralisation et le métamorphisme à partir des relations texturales. Tablant sur les travaux descriptifs antérieurs (par exemple Sansfaçon and Hubert, 1990), DeSouza et al. (2015) ont lié de façon texturale les épisodes de minéralisation avec la foliation principale, nommée S_2, identifiée localement dans la mine Canadian Malartic. Ils ont démontré que le premier épisode de minéralisation associé à des intrusions de monzonite et monzonite quartzifère a une signature hydrothermale syn-Timiscaming (<2678 Ma) et qu'un second épisode de minéralisation ou de remobilisation est synchrone à la foliation principale. Ainsi, un modèle structural robuste doit être établi afin d'identifier à l'échelle régionale la foliation correspondant à S_2 observée à l'échelle de la mine. Il sera alors possible d'y lier les épisodes de croissances des minéraux métamorphiques et de définir indirectement la relation temporelle entre le métamorphisme, la déformation et la minéralisation au gîte Canadian Malartic. De plus, la datation des grenats par la méthode Lu-Hf, permettra de comparer de façon absolue l'âge du pic métamorphique avec l'âge de la minéralisation défini par DeSouza et al. (2015). Cette seconde problématique a été abordée de façon collaborative avec les chercheurs Stéphane Perrouty (Western University) et Nicolas Gaillard (Université McGill) qui ont travaillé à l'échelle de la propriété minière. Cette collaboration est illustrée par la publication d'un article sur le modèle structural régional et son influence sur la localisation des intrusions intermédiaires spatialement associées à la minéralisation aurifère (Perrouty et al., 2017) ainsi qu'une mention sur la relation temporelle entre les épisodes de minéralisation et le pic métamorphisme.

En second lieu, tel que souligné par Camiré et Burg (1993), il n'existe pas de consensus sur la tectonique archéenne dans le craton du Supérieur : des modèles géodynamiques modernes sont actuellement employés pour décrire les phénomènes observés dans la Sous-province de Pontiac. De ce fait, les assemblages métamorphiques de type barrovien que l'on retrouve dans la Sous-province de Pontiac peuvent être formés à des conditions de température et de pression qui ne sont pas diagnostiques d'un environnement de subduction. Il est donc essentiel d'aborder cette problématique d'un point de vue quantitatif en effectuant une modélisation thermo-barométrique systématique en vue d'en définir le gradient métamorphique. Ces données pourront être employées pour proposer un environnement géodynamique en effectuant une comparaison directe avec le gradient métamorphique des contextes modernes d'accrétion. Cette problématique sera directement abordée dans ce document.

1.1 Contexte géologique.

De nombreuses hypothèses ont été proposées sur la source, le milieu de déposition, le style structural et la nature du métamorphisme de la Sous-province de Pontiac. La revue de la littérature sera divisée entre les travaux historiques, travaux récents et une compilation des datations clefs. Les travaux historiques sont abordés de façon à illustrer la contribution des auteurs qui ont façonné la vision actuelle de l'origine et du contexte tectonique de formation de la Sous-province de Pontiac. Les travaux récents sont présentés de façon à présenter les interprétations tectono-métamorphiques qu'ils véhiculent et les observations sur lesquelles elles ont été formulées.

Suite aux descriptions et à la compilation des plans de la mine Canadian Malartic faite par O'Neil (1935) et Derry (1939), Gunning et Ambrose ont produit en 1943 une description systématique de la minéralisation aurifère du camp minier de Val-d'Or et de Malartic ainsi que des mines Canadian Malartic, Sladen Malartic et East-Malartic, formant aujourd'hui le gisement Canadian Malartic. Sur la base de la minéralogie de la minéralisation, ils ont identifié le caractère distinctif de ces gisements de ceux associés à la faille de Cadillac. Ils soulignent en outre le contrôle structural de la mise en place des intrusions de « porphyres acides » à la mine d'East-Malartic et des fluides « de remplacement » aux mines Canadian Malartic et Sladen Malartic. Gunning et Ambrose (1943) ont aussi noté la présence de grenats dans les greywackes de la Sous-province de Pontiac et l'ont attribué à un processus de métamorphisme de contact. Le Pontiac était alors interprété comme le flanc sud d'un synclinal régional dont le Groupe de Kewagama aurait formé la contrepartie nord.

Holubec (1972) souligne le caractère bien trié des roches sédimentaires de Pontiac et leur granulométrie diminuant apparemment vers le nord. Sur la base de la polarité nord des roches sédimentaires et la diminution de granulométrie, il attribue ces roches sédimentaires à un dépôt de piedmont provenant de l'érosion d'une source situé au sud. Le métamorphisme n'est alors pas envisagé comme mécanisme expliquant l'augmentation apparente de la granulométrie vers le sud de la Sous-province de Pontiac.

La première étude sur le métamorphisme de la Sous-province de Pontiac est effectuée par Jolly (1976) qui divise cette sous-province en quatre zones métamorphiques correspondant à des assemblages minéralogiques distincts. Ces zones, aux frontières E-O, sont caractérisées, du nord vers le sud, par la biotite, le grenat plus hornblende, staurotide et

kyanite. Powell et al. (1995) interprètent un métamorphisme régional syntectonique prenant place entre 2677 et 2643 Ma.

Lors de ses travaux de thèse doctorale localisés dans la partie nord-ouest de la Sous-province de Pontiac (secteur Rouyn-Noranda), Goulet (1978) a également reconnu l'augmentation du grade métamorphique du nord au sud. En plus d'identifier certains minéraux métamorphiques caractéristiques (biotite, grenat, staurotide, sillimanite) il a cartographié deux isogrades réactionnels correspondant aux réactions suivantes et identifié un troisième isograde en les positionnant géographiquement sur une carte :

(1) Chlorite + Muscovite + Carbonate + Quartz = Biotite + Épidote + H_2O + CO_2
(2) Chlorite + Grenat + Muscovite = Staurotide + Biotite + Quartz + H_2O
(3) Staurotide + Muscovite + Quartz = Sillimanite + Grenat + Biotite + H_2O

Au niveau de la géologie structurale, il a identifié deux épisodes de plissement : le premier de plan axial nord-sud ainsi qu'un second est-ouest responsable du grain structural régional. De ce fait, deux schistosités régionales ont été interprétées dans la Sous-province de Pontiac dans le secteur Rouyn-Noranda par Goulet. La foliation S_1 est uniforme alors que S_2 est plus intense à proximité de la faille de Cadillac et est associée au plissement isoclinal de deuxième génération. Par opposition à Holubec (1963), il positionne la source des roches sédimentaires de Pontiac au nord mais prône le même type de milieu de déposition.

Lajoie et Ludden (1984) ont proposé, sur la base de la pétrologie et du patron d'éléments des terres rares, que les roches sédimentaires du Groupe de Pontiac ne sont pas équivalentes aux Groupes de Timiskaming ou de Kewagama. Ils ont déterminé trois types de sources situées au nord de la sous-province lors de sa formation et ont suggéré un milieu de déposition de type marge continentale passive pour expliquer le mode détritique dominé par le quartz, par opposition à l'érosion d'une terrane volcanique. Rocheleau et Dimroth (1985) ont toutefois souligné que l'estimation de la proportion de quartz dans les roches sédimentaires de Pontiac avait été biaisée par la méthodologie employée par Lajoie et Ludden puisqu'elle ne prenait pas en compte la recristallisation métamorphique. Ils ont de plus identifié une source commune possible pour les roches sédimentaires de Pontiac, Kewagama et Timiskaming au sein de la Sous-province de l'Abitibi.

Lors de la subdivision de la Province du Supérieur en Sous-provinces par Card et Ciesielski (1986), il existait deux points de vue opposés sur l'origine de Pontiac véhiculés dans certains articles de synthèse. Tel que souligné par Dimroth et al. (1983a), le contexte tectonique de

formation du craton du Supérieur est sujet à débat opposant alors les partisans de la subduction (Dimroth et al., 1982;1983a; 1983b) et ceux de la tectonique verticale (Goodwin, 1977; Jolly, 1978). Dimroth et al. (1983a) abordent directement la problématique du contact entre les Sous-provinces de Pontiac et de l'Abitibi et proposent un modèle tectonique de subduction au sud de la Sous-province de Pontiac. Cette dernière entrainant la formation d'un arc océanique peu profond alimentant le bassin sédimentaire en matériel de granulométrie fine. La granulométrie des sédiments devenant de plus en plus grossier vers le sud en réponse à l'exhumation de l'arc au niveau de la faille de Cadillac actuelle. De façon opposée, Jolly (1978) invoque les contacts faillés, le contraste de gradient métamorphique entre l'arc volcanique de l'Abitibi et les « schistes du Pontiac » pour proposer une origine plus ancienne des « schistes de Pontiac » par rapport à l'arc volcanique de l'Abitibi. De plus il invoque un mécanisme de tectonique verticale généré par la différence de densité des corps géologiques pour expliquer la subsidence des roches volcaniques et l'émergence de plutons durant l'orogénèse kénoréenne expliquant l'architecture en dôme et bassin.

Dimroth et al. (1982) considéraient le Pontiac comme un bassin sédimentaire développé en marge de la Sous-province de l'Abitibi puis tectoniquement déformé, alors que Jolly (1978) soutenait que la Sous-province de Pontiac était antérieure au volcanisme de la Sous-province de l'Abitibi puis tectoniquement accolé par un mécanisme de diapirisme. Cette seconde interprétation, en partie basée sur l'hypothèse que les contacts du Pontiac avec les unités géologiques encaissantes étaient faillés, fut supportée par les travaux de Kalliokoski (1986) sur la base de l'interprétation d'un levé gravimétrique que la frontière ouest de la Sous-province de Pontiac, masquée par les roches sédimentaires du Groupe de Cobalt, est de nature faillée. Des deux interprétations, Card et Ciesielski ont retenu la seconde et ont on définit le Pontiac comme une Sous-province distincte sur le critère du contraste de faciès métamorphique de part et d'autre de la faille de Cadillac. Ils soulignent toutefois que l'absence de datation représente la plus grande lacune de cette classification.

Dans le cadre de travaux de doctorat, Sansfaçon (1986) et Sansfaçon et Hubert (1990) ont étudié la géologie de la propriété minière Canadian Malartic et ont contribué à la compréhension de la géologie structurale du canton de Fournière. Sur cette propriété, ils ont reconnu deux foliations distinctes. La première, associée à l'épisode de déformation D_1 est d'orientation NE-SO et est observable localement dans la zone Gouldie de la propriété Canadian Malartic. La seconde est associée à une schistosité pénétrative S_2 d'orientation NO-SE subverticale associée à des plis d'entrainement sénestres à axes plongeant à 60

degrés vers l'ouest. En troisième lieux ils reconnaissent des plis de types « kink bands » associés à un épisode de déformation postérieur à D_2. Ils mentionnent aussi la présence de grenat et de staurotide au sein des roches sédimentaires à moins de 1,7 km du puit historique numéro 2 de Canadian Malartic.

DeSouza et al. (2015) ont pris en compte les travaux de Sansfaçon (1986) et de Sansfaçon et Hubert (1990) pour élucider le modèle métallogénique du gisement. Ils se sont aussi attardés à la géologie structurale de la propriété minière. De ce fait, ils soutiennent les observations de Sansfaçon sur la présence de deux fabriques planaires importantes. La foliation S_1 est parallèle au litage des roches sédimentaires, d'orientation NE, et que la schistosité S_2 représente la fabrique dominante de plan axiale aux plis P_2. Les plis P_2 sont ouverts à fermés et plongent fortement vers l'est.

Le projet Lithoprobe (1990-1991) a stimulé la recherche dans la Sous-province de Pontiac en fournissant une base géophysiques sur laquelle asseoir les interprétations structurales. Le levé effectué au sud de Rouyn-Noranda (Ludden et al., 1993) partage le même terrain que les travaux subséquents portant sur la géologie structurale, le métamorphisme et la chimie des roches sédimentaires effectués par Camiré (1993) et Ghassemi (1996). De ces travaux découlent des articles de Camiré et Burg (1993) et de Benn et al. (1993) dont les principales interprétations sont peu compatibles. Camiré et al. (1993) proposent un modèle à deux nappes de style structural distinct, séparées par l'isograde d'apparition du staurotide. La première nappe, au nord, correspond de façon uniforme à l'isograde biotite et grenat et possède les deux phases de plissement suggérées par Goulet (1978). Dans cette nappe, la foliation principale correspond à S_1 et est marquée par l'alignement de la muscovite, biotite et de la première génération de chlorite. D_2 entraine dans cette nappe un clivage de crénulation E-O bien défini. La seconde nappe est située dans le champ de stabilité du staurotide et de la kyanite. À l'opposé de la première nappe, la seconde ne présente pas d'évidence de plissement. L'unique foliation y est interprétée comme S_1 et les auteurs avancent qu'il est improbable que S_2 y soit dominante au point d'effacer S_1 puisque dans la première nappe S_2 est associé à un clivage rétrograde. En somme, le modèle structural invoqué pour expliquer ces structures consiste en un chevauchement vers le sud des roches sédimentaires de Pontiac lors de D_2 de façon contemporaine à un refroidissement induisant un cloisonnement de la déformation (« deformation partitionning ») dans la nappe du nord. L'hydratation de la nappe nord lors de D_2 serait la source des minéraux rétrogrades appartenant au clivage de crénulation S_2. Les auteurs soulignent aussi la continuité

structurale et métamorphique entre la nappe nord et les séquences volcaniques adjacentes appartenant à la Sous-province de l'Abitibi. De plus, ils qualifient d'improbable la mise en place du Pontiac dans un contexte de bassin d'arrière-arc ou de bassin marginal puisqu'il n'y a pas de magmatisme extensionnel synchrone associé. Ils considèrent également que l'aspect monotone et le faciès profond des turbidites est contradictoire avec l'hypothèse d'un bassin en décrochement. Finalement, ils favorisent une hypothèse de collision de type plaque tectonique pour expliquer la courte durée de la sédimentation et de la déformation, qu'ils estiment à 10 Ma, ainsi que la présence de magma d'affinité avec une zone de subduction mis en place avant le pic du métamorphisme. Cette interprétation est donc cohérente avec le modèle du prisme d'accrétion soutenu par Dimroth et al. (1983a).

Benn et al. (1993) ne reconnaissent pas l'existence de deux nappes dans la partie nord-ouest de Pontiac et invoquent un métamorphisme en apparence continu et une répartition régionale de l'observation des structures de D_1 à D_3 pour justifier leur interprétation contrastée avec celle de Camiré et Burg (1993). Ils notent que S_1 forme la foliation principale associée à des plis isoclinaux, alors que D_2 entraine un plissement asymétrique à vergence sud-est et un clivage de crénulation de plan axial. Des traces d'inclusions sigmoïdales appartenant à S_1 au sein des staurotides indiquent que le pic du métamorphisme a eu lieu lors de D_2. Un épisode D_3 de moindre importance entraine une crénulation des structures planaires antérieures et la formation de plis et de zones de cisaillement sénestres à fort pendage vers le nord-ouest. Dans la thèse de Ghassemi (1996), co-auteur du papier précédent, quatre isogrades d'apparition de minéraux métamorphique sont définis (grenat, staurotide, kyanite et sillimanite) ainsi que les conditions du pic métamorphique, calculé à 620°C et 7,2 kbar. Le modèle tectonique suggéré par Ghassemi (1996) correspond à une déposition des sédiments du Pontiac dans un bassin d'arrière-arc lors du rift du système d'arc volcanique de l'Abitibi le long d'une discontinuité ayant évolué pour devenir la faille de Cadillac (2700 à 2690 Ma). Par la suite, la collision d'un terrane océanique ou continental avec le segment sud de l'arc volcanique vers 2680 Ma aurait entrainé la fermeture du bassin. Cela aurait provoqué la collision entre l'arc, le bassin sédimentaire et le terrane puis un épaississement de la croûte synchrone à la mise en place des granites de type I. Lors de cet évènement, vers 2670 Ma, le métamorphisme régional aurait été à son paroxysme durant la formation des structures profondes de nappes de chevauchement, contribuant à l'épaississement crustal (D_1). Finalement une nouvelle contraction de la croûte vers 2626-2529 Ma aurait créé les structures de D_2. Depuis 2500 Ma, le développement d'une marge

passive au sud du craton du Supérieur aurait entrainé le développement de failles normales contribuant à la formation de demi-grabens dans lequel le Groupe de Cobalt se serait déposé. Puis, entre 1.9 et 1.7 Ga, l'orogénèse Pénokéenne serait à l'origine de la formation des structures D_3.

Les modèles structuraux de Camiré et Burg (1993) versus Benn et al. (1993) et Ghassemi (1996) sont difficilement réconciliables. Benn et al. ont repéré l'isograde d'apparition du staurotide et de la kyanite plus au nord que la frontière des nappes suggérées par Camiré. De plus, ils prétendent à une répartition régionale des structures appartenant à D_1 et D_2. Sur cette base ils ne supportent pas la division en nappes distinctes de la Sous-province de Pontiac avancée par Camiré et Burg. De plus le pic métamorphique serait synchrone à D_1 selon Camiré et Burg alors qu'il serait synchrone à D_2 d'après Benn et al. (1993). L'interprétation commune entre ces auteurs est que la foliation S_1, d'envergure régionale, est associée au plan axial de plis isoclinaux alors que S_2 correspond à un clivage de crénulation parfois faible, parfois intense, de plan axial à des plis asymétriques de vergence sud.

1.2 Contraintes géochronologiques

Gariepy et al. (1984) ont déterminé l'âge des roches sources de la Sous-province de Pontiac à partir de 26 zircons détritiques. D'après la distribution des âges de ces zircons, ils ont définis deux populations. La plus jeune, datée entre 2725 et 2700 Ma, correspondrait vraisemblablement à des roches ignées felsiques contemporaines provenant de la Sous-province de l'Abitibi. La plus vieille, âgée d'au moins 2940 Ma faisant partie d'un bassin sédimentaire émergé ou d'un socle sialique plus ancien que l'Abitibi. Davis (2002) obtient des résultats similaires et corrobore l'interprétation des deux familles de zircon détritiques de Gariepy et al. et précise un âge minimal en datant le pluton du lac Fournière, recoupant la Sous-province de Pontiac, à 2682±2 Ma ainsi qu'en obtenant un zircon détritique de 2685 Ma.

Le batholite de Decelles, mise en place dans la Sous-province de Pontiac, représente une certaine difficulté au niveau des datations isotopiques, considérant sa très vaste envergure et la grande variabilité des faciès intrusifs rencontrés (Rive et al., 1990; Machado et al., 1991b). Considérant ces difficultés, Machado et al. (1991a) ont analysé quatre monazites provenant du monzogranite de l'intrusion de Hallé, constituant une phase distinctive du batholite de Decelles. Ces cristaux ont livré un âge identique de 2651±2 Ma, ce qui

représente la meilleure estimation pour dater la cristallisation de l'intrusion de Hallé. Un âge de 2658±2 Ma a également été obtenu pour la monazite provenant d'un granite à muscovite du batholite de Decelles (Machado et al., 1991a). Mortensen et Card (1993) ont également daté de la monazite provenant d'un échantillon de granite pegmatitique prélevé au sud du lac Caron dans le batholite de Decelles. Considérant la température élevée de fermeture de la monazite (720°C) par rapport à la température de mise en place de ce type d'intrusion, les auteurs ont obtenu un âge de 2668 Ma, qu'ils estiment représentatif de la mise en place d'une partie de ce batholite. De leur côté, Powell et al. (1995) ont employé la méthode de datation $^{40}Ar/^{39}Ar$ sur la muscovite d'une enclave de roche sédimentaire de Pontiac présente au sein de ce batholite pour déterminer l'âge de la fin de la cristallisation, celle-ci correspondant idéalement à la température de fermeture du système isotopique de la muscovite à 300°C. Ils ont obtenu 2518±6 Ma, ce qui indiquerait une durée de 150 Ma, à partir de son emplacement jusqu'à l'atteinte de cette température.

Plusieurs auteurs ont tenté de dater les épisodes métamorphiques de Pontiac à l'aide de l'U/Pb sur la titanite et les amphiboles des corps intrusifs métamorphisés et de la méthode $^{40}Ar/^{39}Ar$ sur la biotite et la muscovite métamorphique. Feng et al. (1992) ont déterminé deux évènements thermiques en combinant ces techniques soit 2690-2670 Ma et 2660 et 2630 Ma sur des échantillons représentatifs de l'échelle régionale. Machado et al. (1991c) ont obtenu un âge de 2663±4 Ma pour la titanite d'une intrusion tonalitique métamorphisée (orthogneiss du lac Opasatica) et l'ont interprété comme correspondant au premier évènement métamorphique de la Sous-province de Pontiac. Cet âge est toutefois concordant avec le second évènement métamorphique interprété par Feng et al. (1992). Powell et al. (1995) ont complété l'interprétation de Feng et al. (1992) sur la durée du refroidissement suivant le second pic métamorphique à l'aide de la muscovite et de la biotite prélevée dans la zone à staurotide. Ils ont obtenu respectivement un âge de fermeture de 2578±6 et 2532±7 Ma qu'ils interprètent comme étant prolongée par l'apport thermique du batholite de Decelles. Finalement, le premier épisode de déformation affectant le Pontiac serait syn-Timiskaming selon Robert (2001), i.e de 2687 à 2680 Ma (Corfu et al., 1991). Toujours selon Robert (2001), le second épisode de déformation peut être daté indirectement par les intrusions non déformées à 2660 Ma.

2. REGIONAL METAMORPHISM OF THE PONTIAC SUBPROVINCE, SUPERIOR PROVINCE, QUEBEC

2.1 Introduction

Archean cratons, such as the Neo-Archean age Superior Province, are characterized by large scale, relatively homogenous, clastic meta-sedimentary basins that separate volcano-plutonic greenstone belts of contrasting metamorphic grades (Stockwell, 1964; Goodwin, 1977; Card and Ciesielski, 1986; Card, 1990; Eriksson et al., 1994). This period spans a crucial temporal window in Earth history that includes the potential transition from plume (Hamilton, 1998; Ernst, 2009) or mantle overturn tectonics (Bédard et al., 2013; Bédard and Harris, 2014) to asymmetric subduction. While the existence of fundamentally different Archean tectonic processes is debated (Cawood et al., 2006; Percival et al., 2012; Bédard et al., 2013; Bédard and Harris, 2014), few studies have tested the different tectonic model predictions in the field (Nutman et al., 2002; François et al., 2014). Yet, the metamorphic expression of the opposing views are fundamentally different, and thus metamorphic studies hold excellent potential for recognizing and characterizing this transition (Brown, 2006; 2007; 2008; 2014). While greenstone belts and fault zones of the Superior Craton have received the most attention owing to their economic potential, the deposition and ensuing deformation and metamorphism of bounding sedimentary basins remain poorly constrained. Such basins, however, are likely to have preserved evidence of the tectonic processes that lead to the latest stages of deformation of the craton.

Among these basins, the Pontiac Subprovince, separated from the world-renowned gold and base metal rich Abitibi greenstone belt by the Cadillac Larder-Lake Fault Zone (CLLFZ; Figure 1), is the most accessible. The Pontiac Subprovince consists of a sequence of turbiditic greywacke and mudstone that are intruded by various plutons, notably the Decelles Batholith. The meta-sedimentary rocks display a Barrovian-type metamorphic gradient with a typical succession from biotite to garnet, staurolite, kyanite and sillimanite isograds (Jolly, 1978). The complete sequence is interpreted to be an accretionary complex that is either exotic to (Davis et al., 2002) or sourced from the Abitibi greenstone belt and other subprovinces to the north (Frieman et al., 2017). The sedimentary and magmatic history of the Subprovince are well constrained. The detrital zircon populations indicate a depositional age of the Pontiac Group of ca. 2682 Ma (Davis, 2002; Frieman et al., 2017) and the age of the various intrusions range from 2682 to 2643 Ma (Feng and Kerrich, 1992b; Mortensen

and Card, 1993; Davis, 2002). There is no consensus, however, on the timing of deformation and metamorphism, with a few studies using U-Pb on zircon geochronology on cross-cutting intrusive rocks to bracket peak metamorphism between 2677 and 2643 (Feng and Kerrich, 1991; Machado et al., 1991b; Powell et al., 1995a) or $^{40}Ar/^{39}Ar$ on mica and hornblende constraining very slow cooling from 2601 Ma (hornblende, Machado et al., 1991b) to approximately 2562-2455 Ma (biotite, Feng et al., 1992). Despite providing important first order constraints on the timing of regional prograde, peak and retrograde metamorphism, all these ages were obtained from cross-cutting intrusive rocks in the highest-grade areas of the Pontiac Subprovince, and there is up untill now no precise nor direct dating of prograde or peak metamorphism of the Pontiac metasedimentary rock.

Quantitative metamorphic studies of P-T-t paths or even peak P-T conditions are also very limited in the Pontiac Subprovince and these outline a clock-wise P-T path with peak metamorphism at amphibolite facies (Feng and Kerrich, 1990; Ghassemi, 1996). The scarcity of constraints on the timing and duration of metamorphism for the northern Pontiac Subprovince can in part be explained by its very slow cooling as reflected by the scatter in cooling ages. However, recent advances in the analysis of the Lu-Hf isotopic system and the advent of garnet geochronology now enables dating of garnet growth (Baxter and Scherer, 2013). The intensity and style of metamorphism in terms of P-T-t paths are also very poorly constrained, in part due to the Mn-rich content of garnet, only addressed in the very recent publication of reliable Mn-endmembers activity models (Mahar et al., 1997; Tinkham and Ghent, 2005; White et al., 2014a; 2014c).

The present field- and laboratory-based integrated study investigates the metamorphic evolution of the northern Pontiac metasedimentary belt south of the Val-d'Or and Malartic districts by combining phase equilibria modelling, Lu-Hf garnet geochronology and garnet trace element analysis to elucidate the P-T-t evolution of staurolite-grade metawackes that likely record burial and exhumation of the basin. The results presented in this contribution confirm Barrovian-style metamorphism and indicate that the burial and heating of the northern edge of the basin was contemporaneous with the intrusions that make up the Decelles Batholith. The implications of such an evolution are not satisfactorily explained by the accretionary wedge model proposed for the Pontiac Subprovince.

The study area also provides an opportunity to investigate the relationship between metamorphism and Au mineralization. The western part of the field area is south of the town

of Malartic, which encompasses the Canadian Malartic Au deposit and its hydrothermal halo, whereas the eastern part of the field area lies south of the town of Val d'Or and is free of known mineralization. The Canadian Malartic mineralization is interpreted to be controlled by the regional fabric but metamorphic porphyroblasts have not been observed in mineralized outcrops (Helt et al., 2014; de Souza et al., 2015). Moreover, the lack of reliable information on the timing and duration of regional metamorphism in the Pontiac Subprovince has also impaired the characterization of the relative timing between the main mineralizing event (ca. 2664 Ma, de Souza et al., 2015), deformation, and regional metamorphism. Here we purport that mineralization at the Canadian Malartic gold deposit occurred prior or during burial of the northern edge of the Pontiac basin, suggesting that the deposit and its hydrothermal footprint might have been metamorphosed up to lower amphibolite facies.

2.2 Regional setting of the Pontiac Subprovince

The Pontiac Subprovince is located south of the Abitibi greenstone belt in Québec. It consists mainly of a thick clastic sedimentary sequence that undergone two episode of deformation and metamorphosed to amphibolite facies. Its northern limit is bounded by mafic and ultramafic flows of the Piché Group along the Cadillac-Larder Lake Fault Zone (CLLFZ) (Figure 1). Its south-east boundary is constrained by the Grenville tectonic front and its western limit is overlain by a Proterozoic sedimentary cover. Kalliokoski (1987) suggested, based on a gravity survey, that the western limit of the Pontiac Subprovince is also faulted. The northern Pontiac Subprovince is dominated by monotonous turbiditic greywacke and mudstone interlayered with a few minor mafic and ultramafic units that are variably interpreted as slivers of the oceanic crust forming the basement of the Pontiac Subprovince (Camiré et al., 1993) or as conformable eruptive volcanic flows (Perrouty et al., 2017). The detrital zircon populations were interpreted to represent two component sources for the metasedimentary rocks (Gariépy et al., 1984; Davis, 2002). The main source is attributed to the Abitibi greenstone belt (ca. 2700-2725 Ma) with detrital zircon as young as 2682 Ma (Frieman et al., 2017), but the contribution of an older 2940 Ma source, suggests the erosion of an older terrane. Major and trace element geochemistry of the metasedimentary rocks (Camiré et al., 1993) are consistent with a deeply eroded Archean greenstone belt source, possibly underlying the present Abitibi Subprovince to the north or imbricated within the Grenville Province to the south-east. Frieman et al. (2017) suggest that the Winnipeg River, Marion and Opatica Subprovinces may be the principal source of Mesoarchean detrital zircons in the Pontiac Subprovince.

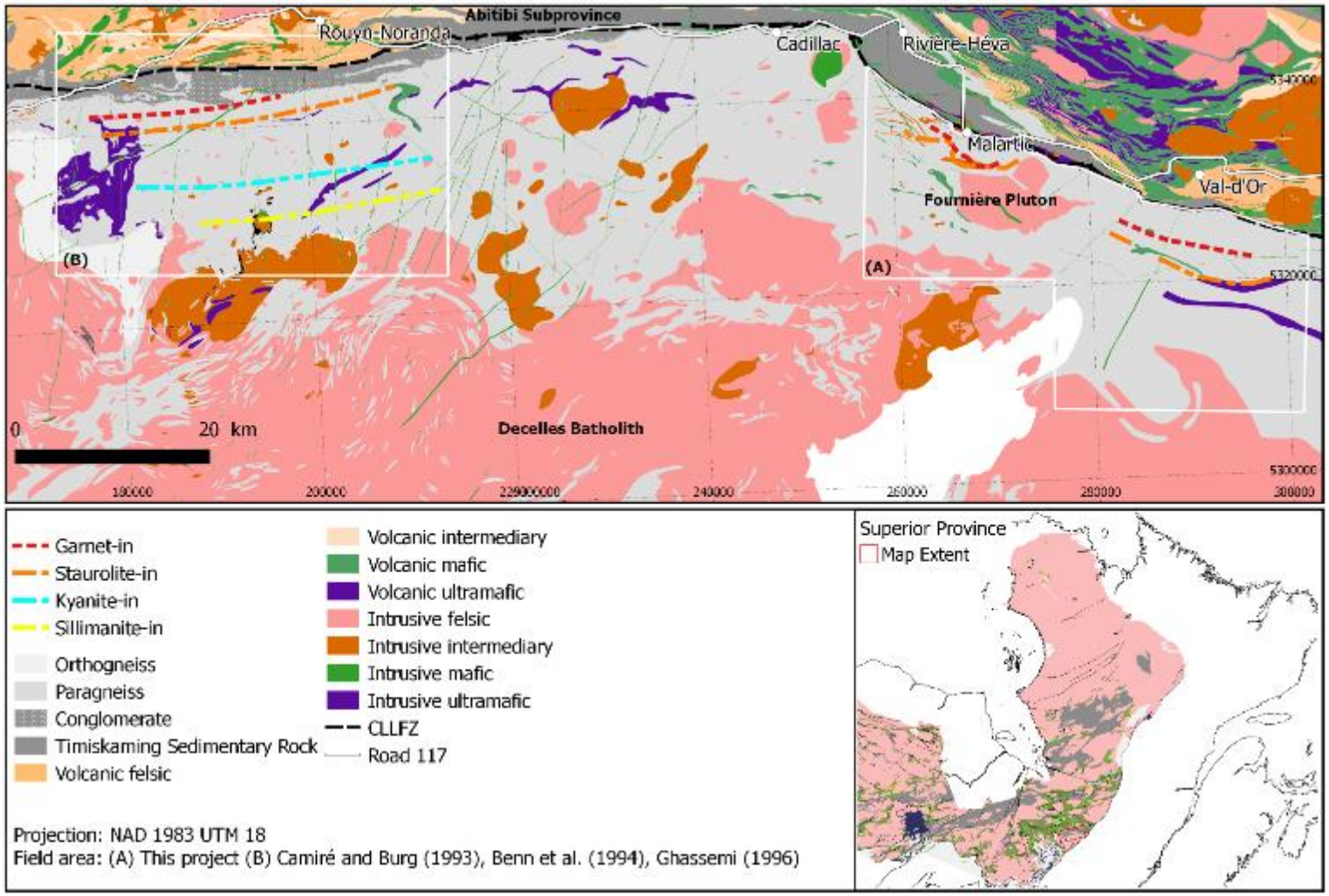


Figure 1: Regional compilation map of the northern Pontiac Subprovince with field area, new mapped isograds (area A) and compiled isograds from Ghassemi (1996) (area B). Map compiled from Gunning et Ambrose (1943), Imreh (1984), Desrochers et Hubert (1996), Pilote (2000; 2013).

Three major intrusive rock types were documented in the study area. The 2682±1 Ma Lac Fournière pluton (Davis, 2002) is located in the northern part of the Subprovince and is interpreted by Perrouty et al. (2017) to be early to syn-kinematic to the first episode of deformation. Timiskaming-type quartz-monzodiorite to granodiorite intrusions (ca. 2678 Ma) are spatially associated with the Canadian Malartic Gold deposit to the north (Helt et al., 2014; de Souza et al., 2015). Farther south, the granitic Decelles batholith covers a large area of the Pontiac Subprovince and is interpreted to be the product of partial melting of metasedimentary rocks (Feng and Kerrich, 1992c; Ghassemi, 1996). This batholith exhibits two texturally distinct intrusive phases, and yielded an U-Pb age on monazite of 2668 Ma and a Pb-Pb age on zircon of 2643 Ma (Feng and Kerrich, 1991).

The structural evolution of the Pontiac Subprovince is debated, but all researchers agree on two significant deformation events (Sansfaçon and Hubert, 1990; Camiré and Burg, 1993; Benn et al., 1994; de Souza et al., 2015; Perrouty et al., 2017). According to Perrouty et al. (2017), the D_1 deformation event is associated with isoclinal folding in the Malartic area, a bedding-parallel pressure solution cleavage, S_1, and a folded micaceous fabric observed within F_2 fold hinges and the D_2 deformation event is associated with open to close folds characterized by an axial planar micaceous foliation. The interference pattern between F_1 and F_2 folds, the crenulation of the S_1 foliation within the F_2 fold hinges and a regional foliation marked by a pressure solution cleavage axial planar to the F_2 fold hinges led to the conclusion that the regional foliation can be attributed to D_2 (Sansfaçon and Hubert, 1993; DeSouza et al., 2015; Perrouty et al. 2017). In the north-western Pontiac Subprovince, south of Rouyn-Noranda (Figure 1 inset B), Camiré and Burg (1993) interpreted that an upper nappe registered two deformation events and a lower nappe with one deformation event, whereas Benn et al. (1994) and Ghassemi (1996) proposed that the two deformation events evenly impacted the whole package. Furthermore, Ghassemi (1996) interpreted regional metamorphism to be syn-D_2 because of sigmoidal inclusion trails observed in staurolite.

The rock package is characterized by a Barrovian metamorphic sequence increasing from north to south from the biotite to the garnet, staurolite, kyanite and sillimanite zones (Gunning and Ambrose, 1943; Goulet, 1978; Jolly, 1978; Dimroth et al., 1983b; Sansfaçon and Hubert, 1990; Camiré and Burg, 1993; Benn et al., 1994; Powell et al., 1995a). The sharp transition between greenschist facies in the northern part of the Pontiac Subprovince to prehnite pumpellyite facies in the Blake River Group of the Abitibi Subprovince north of the CLLFZ is inferred to reflect a 4 to 20 km vertical offset along the CLLFZ between the two

subprovinces (Jolly, 1978; Feng and Kerrich, 1990; Daigneault et al., 2002). Powell et al. (1995), in contrast, mapped isograds that cross-cut the CLLFZ, suggesting that metamorphism post-dates movement along the CLLFZ. However, a recent study demonstrated that the CLLFZ has a protracted history and that the numerous deformation events are heterogeneously distributed along the its lenght (Bedeaux et al., 2016), at odds with that interpretation.

Hornblende geobarometry allowed Feng and Kerrich (1990) to estimate the pressure of emplacement of the syn-metamorphic Lac Remigny batholith at 1.4-3.7 kbar and of the post-metamorphic Lac Fréchette batholith to less than 1 kbar. The only study that delved into pressure-temperature estimates (PT) of the meta-sedimentary rocks is from Ghassemi (1996). His estimation of P-T equilibrium conditions of 9 samples with multi-equilibrium thermobarometry allowed him to define maximum equilibrium temperature and pressure of 620 ^{0}C and 7.2 kbar, a paleo-temperature over paleo-pressure gradient of 26 ^{0}C/km with a clockwise P-T path. According to this author, regional metamorphism is synchronous to the first event of deformation (D_1) characterized by a metamorphic peak at 2670 Ma marking the transition into the second episode of deformation (D_2) leading to crustal thinning. ^{40}Ar-^{39}Ar dating on biotite and muscovite in the Pontiac Subprovince have been used to constrain an extremely slow cooling rate to between 2 and 10 ^{0}C/Ma (Feng and Kerrich, 1990; Powell et al., 1995b; Ghassemi, 1996). This result can be explained by the low closing temperature of muscovite and biotite (350 and 300 ^{0}C respectively, Purdy and Jager, 1976) with respect to the metamorphic conditions and extensive late to post-tectonic granitic intrusions (ca. 2668-2643 Ma, Feng and Kerrich, 1991; Machado et al., 1991b), which have provided a long-lasting heat source.

The absolute age of regional metamorphism in the Pontiac subprovince is not well constrained. The depositional age of the protolith (Davis, 2002) and ^{40}Ar-^{39}Ar on amphibole cooling ages (Feng et al., 1992) bracket two thermal event to 2682 and 2670-2630 Ma. Metamorphic titanite from Lake Opasatica orthogneiss yielded an age of 2660±6 Ma, monazite from the Décelles batholith, interpreted as inherited or metamorphic, yielded an age of 2654±3 Ma, and titanite from a pegmatite intrusive in the Baie des Lys Complex yielded a U-Pb age of 2637±3 Ma similar to the age of zircon overgrowth in the same sample. Based on these data Machado et al. (1991) suggested that Pontiac rocks were subject to polymetamorphism whereas, Powell et al (1995a; 1995b) and Robert (2001) proposed a single long lived metamorphic event from ca. 2660 to 2637 Ma.

2.3 Sampling and analytical methods

The field area covers the northwestern Pontiac Subprovince between the towns of Malartic and Val d'Or and extends to the south up to the contact with the Decelles Batholith (Figure 1, inset A). One hundred and fifty-one outcrops were mapped in this study (Table 2 in Appendix I, also published in Perrouty et al., 2017; Piette-Lauzière et al., in press) from which 97 samples have been selected from the most homogenous mudstone beds of the outcrop to make polished thin sections (Figure 2). Among these samples, three specimens from the staurolite zone with favorable assemblages (0.2 to 1.2% garnet) and representative bulk rock composition were selected for garnet Lu-Hf geochronology and thermodynamic modelling.

2.3.1 Thin section mapping and modal mineralogy

Thin section maps (Figures 5, 6, 7 and Appendix VI) and modal mineralogy were measured at the CREAIT Micro-Analysis Facility, Memorial University, Canada, on a FEI MLA 650F scanning electron microscope (SEM) with mineral liberation analysis (MLA) acquisition and processing software. Discrimination and identification of mineral phases were carried out using back scattered electron (BSE) image software analysis combined with information from energy-dispersive spectrometry (EDS; Gu, 2003). The modal mineralogy was automatically estimated by comparing each EDS spectrum to a mineral reference library calibrated on the thin sections. The classification was then color-coded to produce the thin section maps. The modal proportion uncertainty is dependent on pixel-size and is about 1%.

2.3.2 Whole rock geochemistry

The whole-rock major and trace element composition of rock specimens was measured at SRC Geoanalytical Laboratories, Saskatchewan, Canada (WR1 and REE1 packages, Appendix II). The samples were crushed, split and grinded in an agate crucible, then 0.1 gram of pulp was fused at 1000 ºC with lithium metaborate in a graphite crucible, then dissolved in dilute HNO_3 for ICP-MS major and trace element analysis on a Perkin Elmer Sciex Elan DRC II ICP-MS. The accuracy and precision of the analyses were assessed by processing one standard and one duplicate with the regular samples (Appendix II).

2.3.3 Mineral Chemistry

The mineral chemistry of garnet, staurolite, plagioclase, biotite, muscovite and chlorite (Appendix III) were determined using a CAMECA SX-100 five-spectrometer electron microprobe located at the Université Laval, Québec, Canada. For all phases the analytical

conditions were 15 kV, 20 nA with a counting time of 20 seconds on peaks and 10 seconds on background. Calibration standards used were generally simple oxides (GEO Standard Block of P&H Developments), or minerals where needed (Mineral Standard Mount MINM25-53 of Astimex Scientific Limited; reference samples from Jarosewich et al., 1980). Data were reduced using the PAP model from Pouchou and Pichoir (1991). Major and trace elements qualitative mineral maps were realized by x-ray mapping with the WDS system on the microprobe (wavelength dispersive x-ray spectroscopy). Analytical conditions were set at 15 kV, 40 nA for major element map and 25 kV, 200 nA for trace element map. Counting time was set to 0.2 second.

Rare Earth Element (REE) profiles were measured on garnet by LA-ICP-MS at the Laboratoire des matériaux terrestres of the Université du Québec à Chicoutimi, Canada (Appendix IV). Laser ablation of the polished section used a 193 nm Resonetics M50 Excimer on a continuous profile with a beam size of 55 µm, a repetition rate of 10 to 15 Hz and an ablating speed of 5 µm/s along the profile. The largest garnet grains were selected to maximise the probability of ablating through the core. The ICP-MS analysis was collected on an Agilent 7700x spectrometer. Standards were analysed before and after each session and at each hour to correct for instrument drift. An internal standard of Si, determined from the electron microprobe analysis was used to determine ablation volume. The ablation profile was integrated for each 5 second interval to provide quantitative results and inclusions were omitted during the profile integration as profiles. Additionnal map integration was realized from the same dataset.

2.3.4 Lu-Hf garnet geochronology

Rock samples were sent to Overburden Drilling Management Limited, Ottawa, Canada for garnet conentration. An EPD (Electric Pulse Disaggregator) was used to free ~90% of the mineral grains at <1 mm. The 0.25 to 1.0 mm fraction was refined using heavy liquid separation with a specific gravity >3.3 to separate a heavy mineral fraction (HMC). The ferromagnetic separation of the HMC for 0.25 to 0.5 mm and 0.5 to 1.0 mm was then used for hand picking euhedral garnet. During the disaggregation process, the fine fractions were collected and used for whole-rock powders for geochronology.

Two 0.15 to 0.65 g splits of each of whole-rock powders of samples 1664, 1570, 1682 and 1698 between were dissolved following two methods described in Bouvier et al. (2008). A first split was dissolved using Parr vessel dissolution at 155 ^{0}C to ensure that all refractory

minerals including zircons were fully dissolved. A second split was dissolved in beakers at 120 ^{0}C on table top hot plate at atmospheric pressure to avoid the dissolution of refractory minerals which may be at isotopic disequilibrium.

For each garnet sample, four fractions were prepared according to the methods described in Zirakparvar et al. (2010). About 0.05 to 0.15 g of hand-picked crystals were first acid washed at room temperature in 1M hydrochloric acid (HCl), sonicated for 5 minutes, rinsed in H_2O, sonicated for 5 minutes, and water was pipetted off. Concentrated 15M nitric acid (HNO_3), ultrapure 29M hydrofluoric acid (HF) (1:10 of HNO_3:HF), were added to the beakers for digestion for 24 hours at 120 ^{0}C on hot plate. Samples were dried, before being covered with perchloric acid evaporated at 150-180 ^{0}C. For whole-rock and garnet samples, the final dissolution step consists of uptaking samples in 6M HCl and H_2O_2. After that, solutions were dried and then dissolved again in 6M HCl. A fraction of the whole-rock and garnet solutions were used for quadrupole ICPMS trace element analysis to optimize spike addition. Mixed enriched ^{176}Lu-^{176}Hf spikes for whole-rocks and garnets were added to each sample solution, fluxed together, and once again dried down to ensure sample-spike equilibration.

The column chromatography protocols used for Hf-REE separation from the sample matrices and elemental purification are described in Bouvier et al. (2008; 2015). Briefly, ~8.7 ml of Biorad AG50W-X8 200-400 mesh cation exchange resin was loaded in Savillex® PFA Teflon columns to separate Hf and other high field strengths elements from the sample matrix and from the REE sequentially. Hafnium was further purified using a 0.6 ml Eichrom Ln-spec resin chemistry protocol in house-made shrinkable Teflon columns. The fractions containing Lu with ~25% of Yb (to correct internally the instrumental mass bias) were subsequently separated from the rest of the REE on a 1ml Eichrom Ln-spec resin bed in quartz columns.

Vials used during the chemistry were PFA Teflon Savillex® beakers and PTFE Teflon vessels for the Parr® vessel dissolution. Chemicals (HF, HNO_3, HCl, $HClO_4$, and H_2O_2) used for chemical processing were BDH Aristar® Ultra or SCP Science Plasma Pure Plus. Water was purified to a resistivity of 18.2 MΩ using a Millipore Advantage system and QPOD Element dispenser. Chemistry was carried out in a Class 10 HEPA filtered total exhaust polypropylene fume hood and a perchloric acid polypropylene fume hood within the GEOMETRIC lab at the University of Western Ontario, London, Canada. Total analytical blanks were 20pg for Hf and 5pg for Lu, which are negligible.

Purified fractions of Hf and Lu with Yb were analyzed by Neptune Plus MC-ICPMS using an Aridus II desolvating system at Laboratoire Magmas et Volcans in Clermont-Ferrand (France). The average $^{176}Hf/^{177}Hf$ ratios and 2 standard deviation (2SD) for the JMC 475 Hf isotopic standards measured in static mode (75 ratios) during three analytical sessions were respectively 0.282160 ± 0.000009 (2SD, at 10 ppb Hf), 0.282154 ± 0.000008 (2SD, at 20 ppb Hf), and 0.282147 ± 0.000004 (2SD, at 20 ppb Hf). The Hf isotopic compositions of the samples were normalized for each session to the accepted JMC 475 Hf standard value of 0.282160. The Lu fractions of the samples were collected with ~25% of the Yb of the sample used to correct for instrumental mass bias on $^{175}Lu/^{176}Lu$ using the method described in Vervoort et al. (2004). For age calculations, we used the external reproducibility of ±0.000010 for $^{176}Hf/^{177}Hf$ isotopic ratios (or the internal precision if higher) and of ±0.5% for Lu/Hf based on repeated measurements of BCR-2 standards using the same isotopic dilution method.

2.4 Results

2.4.1 Field relationships

At the lowest metamorphic grade, metasedimentary rocks of the Pontiac Subprovince consists of alternating fine-grained dark pelitic layers, and medium grained paler greywacke layers (Figure 4). Locally, slivers or layers of deformed pillow basalt were observed in contact with the metasedimentary rocks. Where preserved, normal grain sorting and crossbedding lamination indicate a depositional polarity that is variable between outcrops and locally at the outcrop scale, suggesting early tight to isoclinal folding (Perrouty et al., 2017). The main fabric is generally axial planar to these folds and consists of a pressure solution cleavage to the north progressively evolving into a lepidoblastic foliation to the south, whereas the grain size increases progressively to the south, consistent with a progressive increase in the metamorphic grade. The area south of Val d'Or and Malartic (Figure 2) both have three metamorphic zones: a biotite zone (bi+chl±mu), a garnet zone (bi+g±chl±mu) and a staurolite zone (bi+g+st±chl±mu). We did not observe the kyanite and sillimanite zone reported in other areas of the Pontiac Subprovince (Camiré and Burg, 1993; Benn et al., 1994; Ghassemi, 1996).

It is not clear whether the main foliation and the early tight isoclinal folding represent a single or two separate deformation events. The presence of interference patterns with an earlier generation of folds has been reported on the Canadian Malartic Mine property by Sanfaçon and Trudel (1987), Trudel et Sauvé (1992), DeSouza et al. (2015) and Perrouty et al. (2017)

and at the Cartier Malartic outcrop by Neumayr et al. (2000), but was not observed with confidence elsewhere in the Pontiac Subprovince during our fieldwork. However, it is worth noting that the current study focused mainly on the staurolite zone, where ductile deformation and metamorphic recrystallization have potentially obliterated pre-metamorphic fabrics. Nonetheless, we considered the proposed structural model and referred to the main foliation as S_2 to reflect the fact that an earlier fabric is locally identified, which may or may not be related to a previous and distinct deformation event. A millimeter-scale cleavage oriented to the NW overprints the main foliation and will be referred as D_3. Late conjugate kink bands generally oriented NW-SE and NE-SW warp the main foliation and the D_3 cleavage, locally defining small steeply plunging box folds, and will be referred to as D_4.

The Fournière intrusion, dated at 2682 ± 1 Ma (Davis, 2002) is a pre-kinematic 10 km wide dioritic pluton. The main foliation of the surrounding metasedimentary rocks wraps around the pluton, as observed in the field and on a magnetic survey (D'Amours and Intissar, 2012). To the south, the syn- to post-kinematic Decelles batholith, dated at ca. 2668-2643 Ma (Feng and Kerrich, 1991; Machado et al., 1991) has two main intrusive phases texturally distinct but both of granitic composition: a coarse to pegmatitic intrusive phase and a medium grained granite. The latter is overprinted by the same foliation as the metasedimentary rocks in some outcrops of the northern limit of the intrusion. No tectonic foliation is apparent in the core of the batholith.

2.4.2 Mineralogical and textural relationships

In the biotite zone, biotite, chlorite and muscovite are aligned along the main foliation (Figure 4a). A pressure solution cleavage parallel to this foliation is commonly observed. The quartzofeldspathic matrix is heterogeneous and does not show evidence of dynamic recrystallization.

In the garnet zone, chlorite is scarce and is not always aligned with biotite along the main foliation. Muscovite occurs mainly aligned with biotite (Figure 4d). However, it commonly occurs randomly oriented (Figure 5) or associated to late alteration (Figure 7) both in the garnet and staurolite zone. Sub-millimeter size garnet occurs in low abundance (~1 vol%) in the metamorphosed mudstone through the region. Smaller garnet grains (<1 mm) have straight inclusion trails of plagioclase and quartz parallel to the main foliation (Figure 4b). Larger garnet grains (1 mm) have straight inclusion trails at an angle to the main foliation suggesting some degree of rotation. (Figure 4d). The main foliation is slightly deviated

around larger garnet grains. Accordingly, garnet is inferred to be late- to post-kinematic with regard to S_2. The quartzofeldspathic matrix is homogenous and granoblastic.

In the staurolite zone (Figures 5, 6 and 7), staurolite is abundant (locally up to 10%) and forms centimeter-size porphyroblasts with higher modal proportions and grain size in the metamorphosed mudstones compared to the greywackes (Figure 3). Biotite is the main mineral marking the foliation, but this metamorphic zone shares the same ubiquitous presence of apparently late chlorite and muscovite observed in the garnet zone. Large staurolite porphyroblasts generally preserve straight plagioclase-quartz inclusion trails (Figure 4c) and less commonly euhedral to subhedral garnet inclusions (Figure 4c). However, in some outcrops that display evidence of shear, inclusion trails are curved and at a high angle to the main foliation (Figure 4e), indicating rotation during growth. These samples appear to display a strong crenulation schistosity (Figure 4e). However, the microlithons all contain large staurolite porphyroblasts, whereas beds that are devoid of large porphyroblasts do not show any evidence of crenulation. Thus, these domains are interpreted as having developed pressure shadows syn-kinematic with the porphyroblast growth. Staurolite growth is therefore interpreted as syn- to post-kinematic with respect to S_2. A crenulation cleavage locally weakly overprints the main fabric with biotite and locally partly re-orients the main lepidoblastic foliation. There is no clear textural relationship of this structure with respect to metamorphic porphyroblasts. It is interpreted to be late with respect to the metamorphic assemblage and is ascribed to D_3.

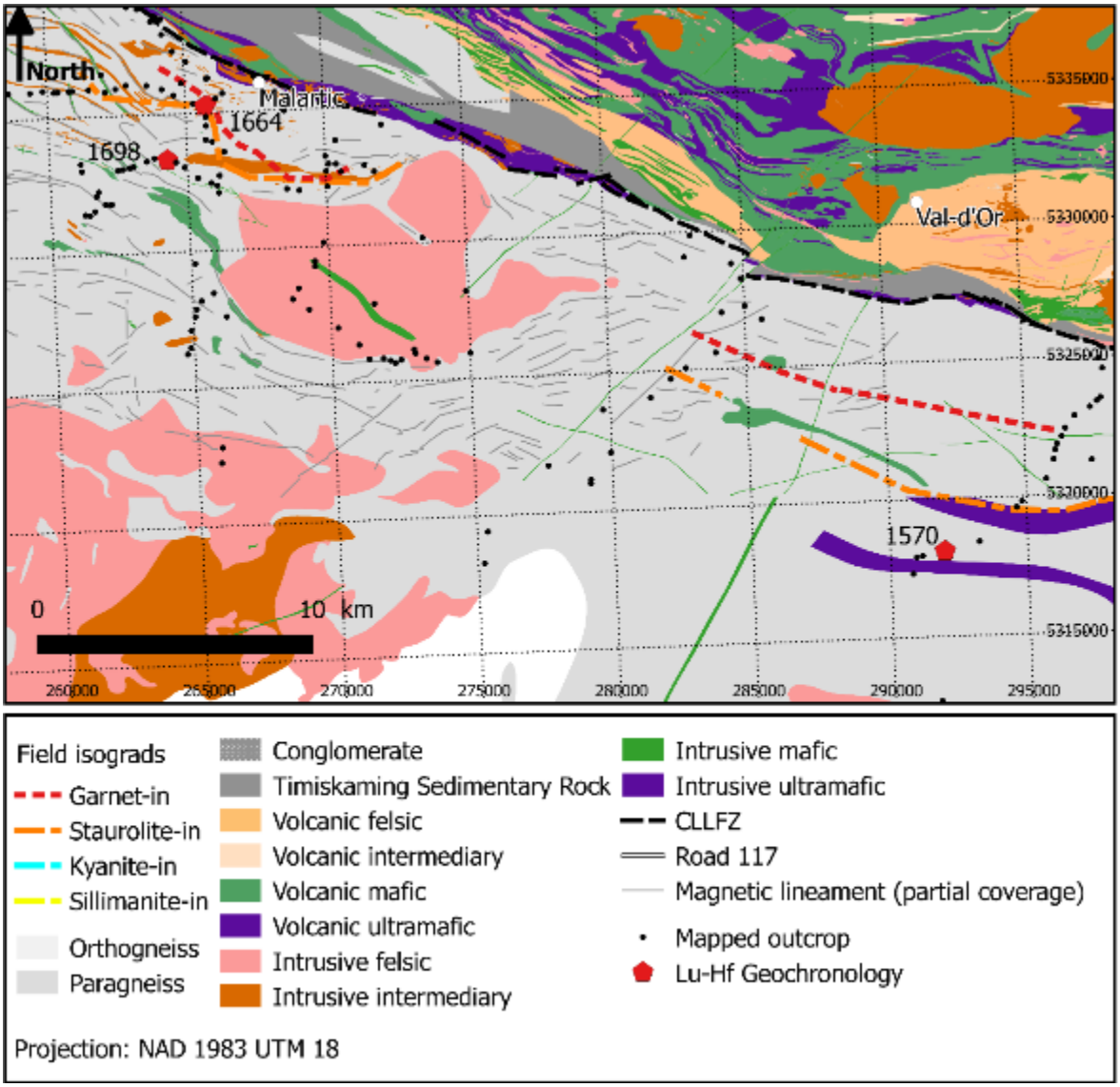


Figure 2: Geological map of the field area. Location and reference in Figure 1. Map compiled from Gunning et Ambrose (1943), Imreh (1984), Desrochers et Hubert (1996), Pilote (2000; 2013).

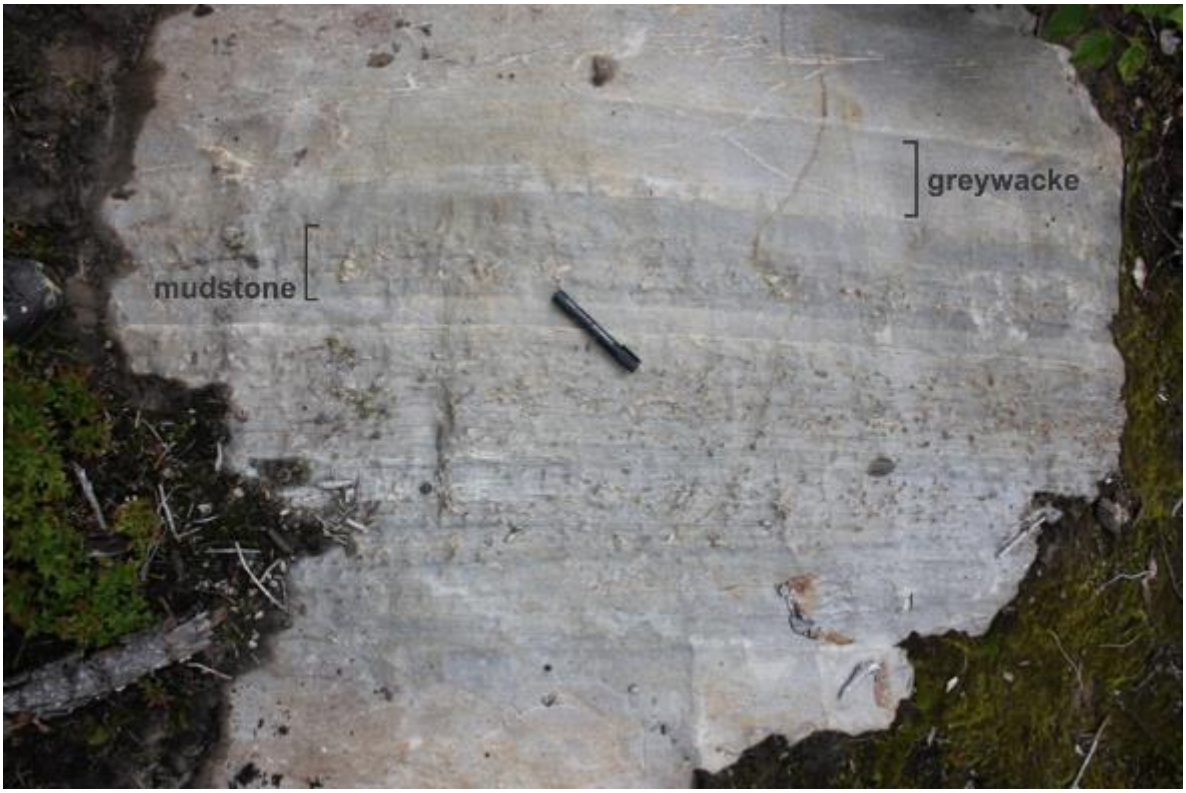


Figure 3: Outcrop of the staurolite zone showing alternating bed of mudstones and greywackes. The homogenous part of the mudstone bed (left tip of the sharpie) is typical of the samples that were taken during the fieldwork: it is the most homogenous bed containing the metamorphic assemblage.

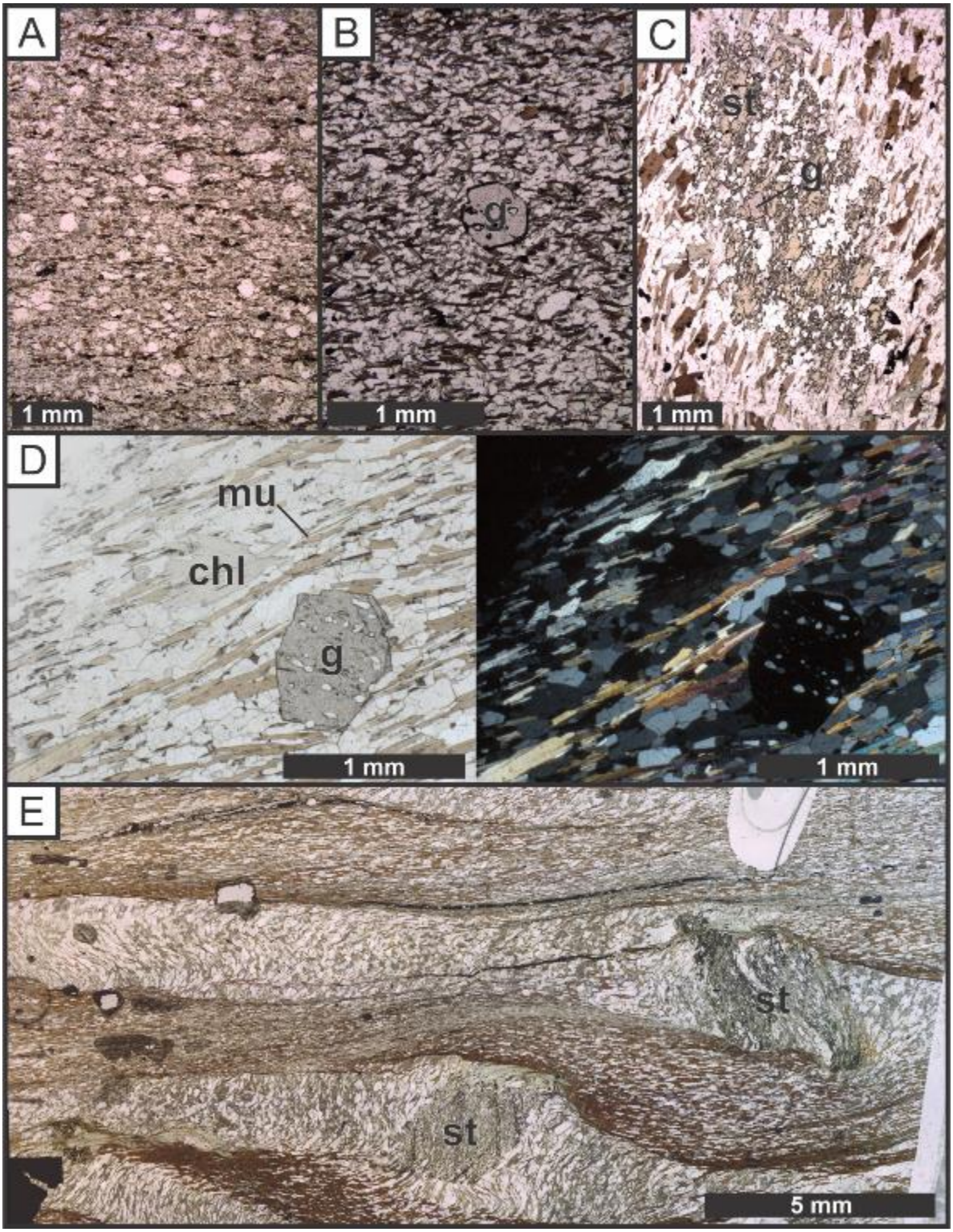

A
1 mm
B
g
1 mm
C
st
g
1 mm
D
mu
chl
g
1 mm
1 mm
E
st
st
5 mm

Figure 4: Photomicrographs of typical textures of the biotite, garnet and staurolite zones. (A) Biotite zone: Heterogenous matrix with little evidence of dynamic crystallization. Foliation defined by biotite and chlorite. (B) Garnet zone: Idiomorphic garnet in a equigranular matrix of quartz and feldspar. Main foliation defined by biotite. (C) Staurolite zone: Poïkilitic staurolite porphyroblast with quartz and garnet inclusions. Main foliation defined by biotite in the matrix. (D) Garnet zone: Plane polarized view (left) and cross-polarized view (right) of an idiomorphic garnet with straight inclusion trail at angle to the main foliation defined by biotite and muscovite in the matrix. (E) Syn-kinematic staurolite: Curved inclusion trails and pressures shadows indicating top-to-the-left kinematics sense.

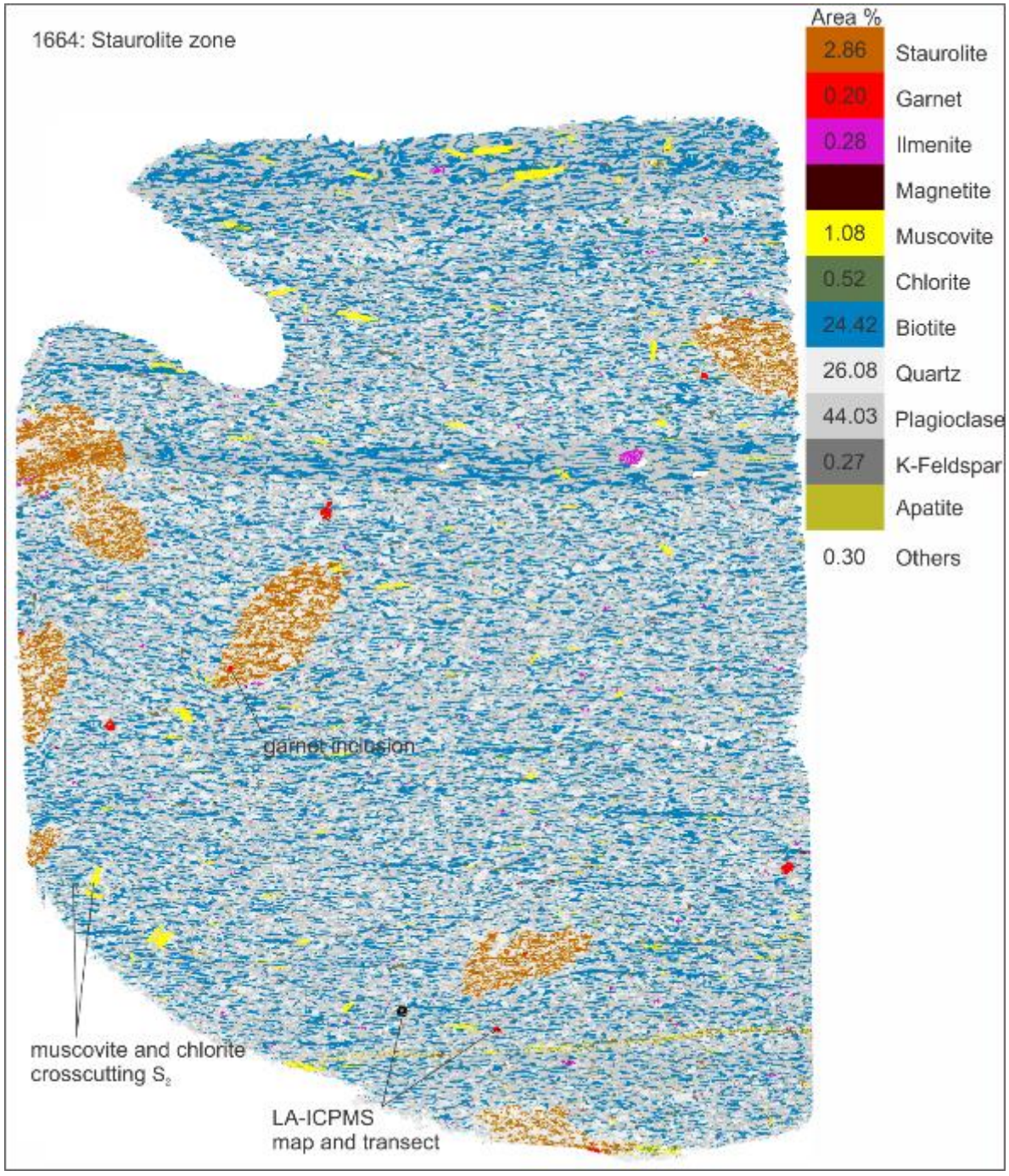


Figure 5: SEM-MLA map of thin section 1664 with modal proportions. Poïkilitic staurolite porphyroblasts with quartz and garnet inclusions in a equigranular quartz and feldspar matrix with xenomorphic garnet. Straight inclusion trails in staurolite are parallel to the main foliation defined by biotite. Muscovite is present either as a late alteration or at angle with respect to the main foliation. Chlorite is either parallel to the main foliation or at angle. The thin section is cut perpendicular to the main foliation and the mineral lineation.

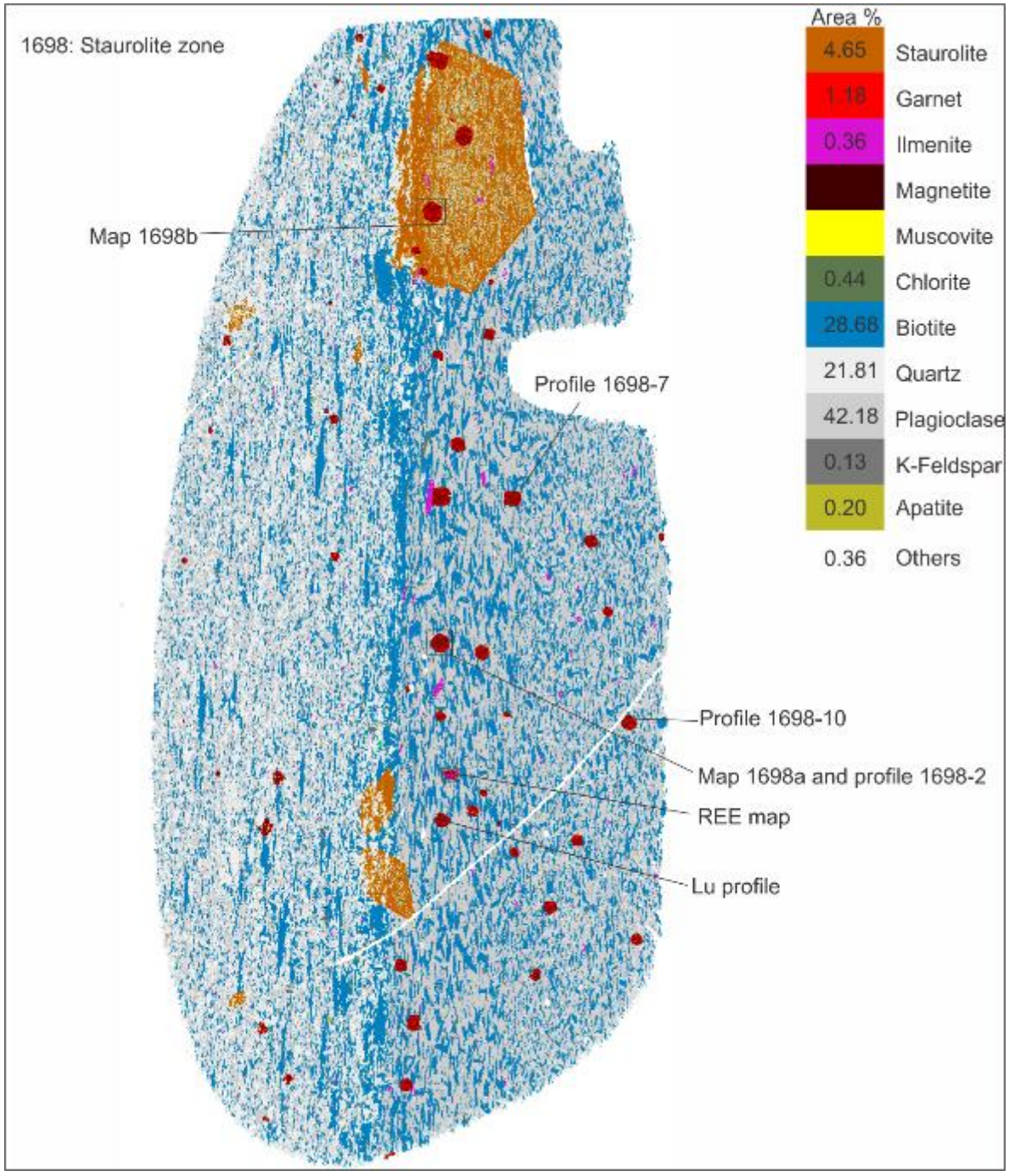


Figure 6: SEM-MLA map of thin section 1698 with modal proportions. Poïkilitic staurolite porphyroblasts with quartz and garnet inclusions in a equigranular quartz and feldspar matrix. Idiomorphic garnet porphyroblasts. Straight inclusion trail in staurolite are parallel to the main foliation defined by biotite and ilmenite. The thin section is cut perpendicular to the main foliation and the mineral lineation.

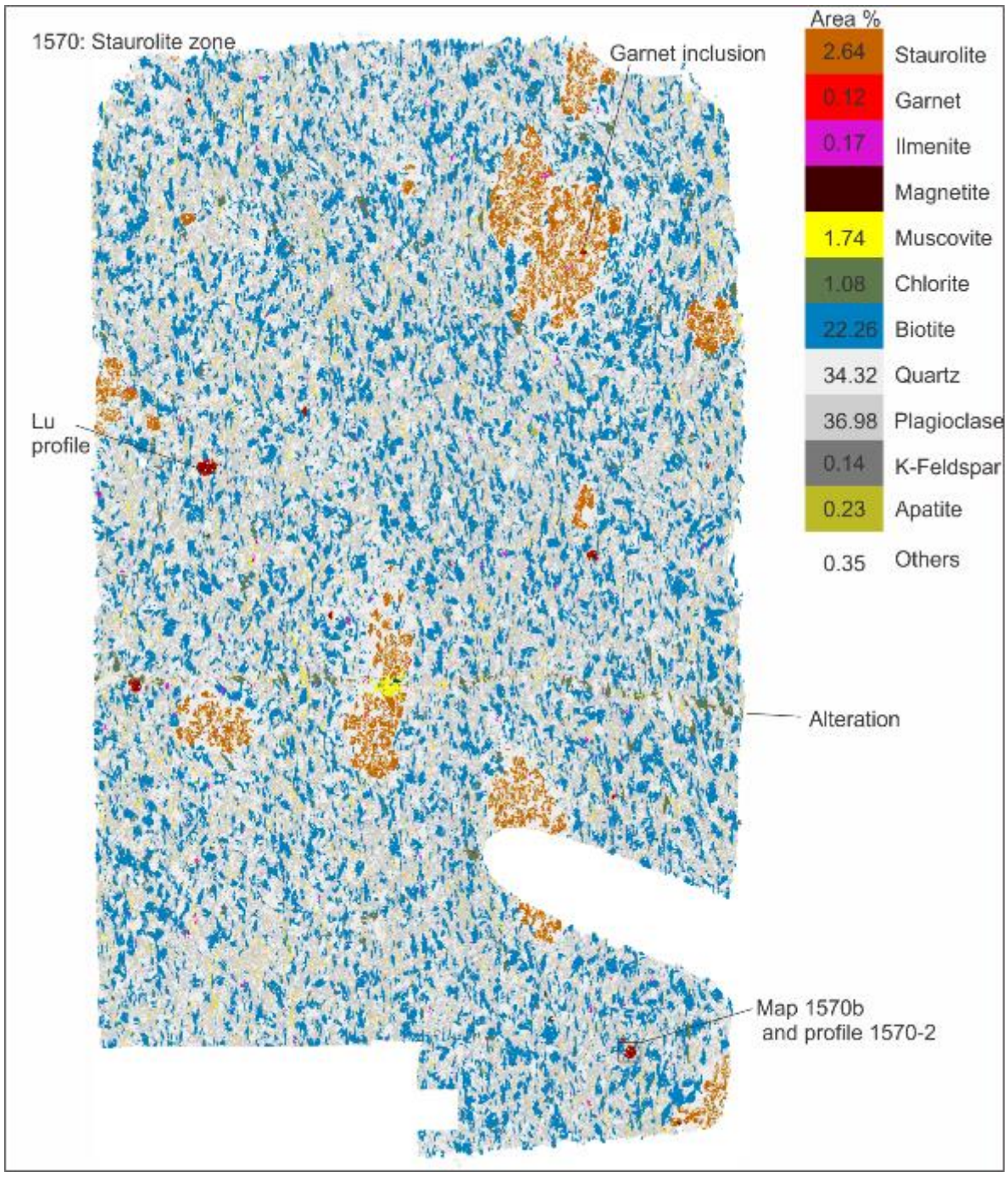


Figure 7: SEM-MLA map of thin section 1570 with modal proportions. Poïkilitic staurolite porphyroblasts with quartz and garnet inclusions in a equigranular quartz and feldspar matrix with xenomorphic garnet. The inclusion trails in staurolite are parallel to the main foliation defined by biotite, muscovite and chlorite. Muscovite and chlorite are also associated to late alteration cross-cutting the main foliation and a staurolite porphyroblast. The thin section is cut perpendicular to the main foliation and the mineral lineation.

2.4.3 Whole rock chemistry

Ten garnet bearing specimens were analysed for whole rock and trace element composition (Analysis are reported in Appendix II). The analysed samples have a Fe# (molar ratio of Fe/(Fe+Mg)) representative of the public lithogeochemistry database (SIGEOM, 2014) except for the kyanite (1642) and magnetite (1682) bearing specimens that are richer in aluminium and iron respectively (Figure 8). Three samples (1664, 1698 and 1570) were selected for Lu-Hf geochronology of garnet. Analysis results are reported in Appendix II.

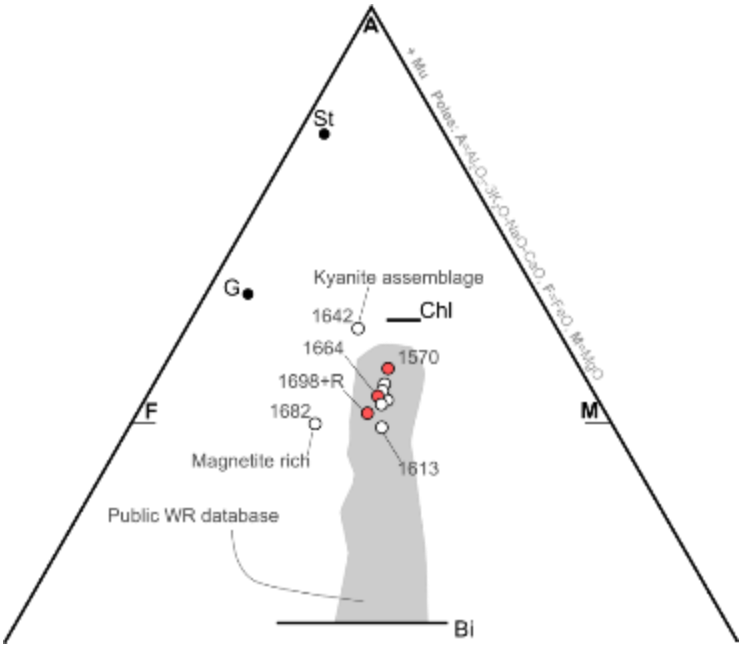


Figure 8: AFM projection of whole rock chemistry. Poles refer to A = molar Al, F = molar Fe, M = molar Mg. Whole rock correction for A = Al_2O_3-$3K_2O$-NaO-CaO. Mineral abbreviation are: St = staurolite, G = garnet, Chl = chlorite, Bi = biotite. The red dots represent the samples used for pseudosection modelling (1664, 1698 and 1570). All samples are from the staurolite zone except 1642 (kyanite) and 1613 (garnet zone). Their Fe# and Al contents are representative of the whole rock chemistry of the Pontiac Subprovince metasedimentary rocks as demonstrated by where they plot in the AFM projection with respect to the public lithogeochemistry database (SIGEOM, 2014).

2.4.4 Mineral chemistry

Biotite, chlorite, muscovite and staurolite are not zoned and their compositions were characterised with spot electron microprobe measurements. Because of its strong compositional zoning, garnet was characterized, using the electronic microprobe, both with qualitative elemental mapping and quantitative spot analysis on the rim, mantle and core. Similarly, Lu maps and profiles of garnet were acquired at the LA-ICPMS. Major and REE maps of garnet are available in Appendix IV.

Biotite

Biotite compositions from 71 samples ranging from the biotite zone to the staurolite zone are presented in Table 1 in Appendix III and figure 9. The biotite are classified as a solid solution of phlogopite and annite end-members according to their Fe# (Rieder et al., 1998). The variability of the data as a function of metamorphic grade is best illustrated in terms of Si content vs Fe# and Al^{VI} vs Mn content. There is no significant variation between the Fe# or Si content of biotite from the biotite and garnet zones, with values ranging from 0.42 to 0.51 and 5.19 to 5.69 a.p.f.u. (atom per formula unit, formula based on 24 O) respectively. Biotite from the staurolite zone, however, stand apart with Fe# from 0.38 to 0.55 and 5.08 to 5.55 Si a.p.f.u.. The Al^{VI} content of biotite increases from the biotite zone to the staurolite zone whereas the Mn content decreases.

Chlorite

Chlorite microprobe measurements from 63 metasedimentary rock samples, principally from the garnet and the staurolite zones, are presented in Table 2 in Appendix III and Figure 10. There is no significant variation in the chlorite Fe# or Al content from the garnet to the staurolite zone, with values ranging from 0.34 to 0.54 and 2.2 to 3.9 a.p.f.u. (formula based on 28O). Based on the Si content and their Fe# they belong to the ripidolite field according to the classification of Hey (1954). There is a minor decrease of Mn content from the garnet to the staurolite zone.

Muscovite

Muscovite compositions from 23 samples, mainly in the staurolite zone, are presented in Table 3 in Appendix III and Figure 11. The muscovite is poor in K according to the mica classification of Rieder et al. (1998). Their compositions range between the muscovite and paragonite end members (White et al., 2014c). The molar Si, Al^{VI} and K contents of

muscovite range from 5.9 to 6.3, 3.5 to 4 and 1.2 to 1.7 a.p.f.u., respectively (formula based on 24 O).

Staurolite

Staurolite compositions from 42 samples are presented in Table 5 in Appendix III and Figure 12. The staurolite compositions reflects a mixing between the Fe- and Mg-Staurolite end members (White et al., 2014c). The variability of the data as a function of metamorphic grade is best illustrated in terms of Fe# vs Al and Si vs Al. There is a positive correlation between the Fe# of staurolite, ranging from 0.77 to 0.86, and its Al content ranging from 9 to 9.4 a.p.f.u. (formula based on 24 O). There is a negative correlation between the Si content of staurolite, ranging from 3.9 to 4.2 a.p.f.u., and its Al content.

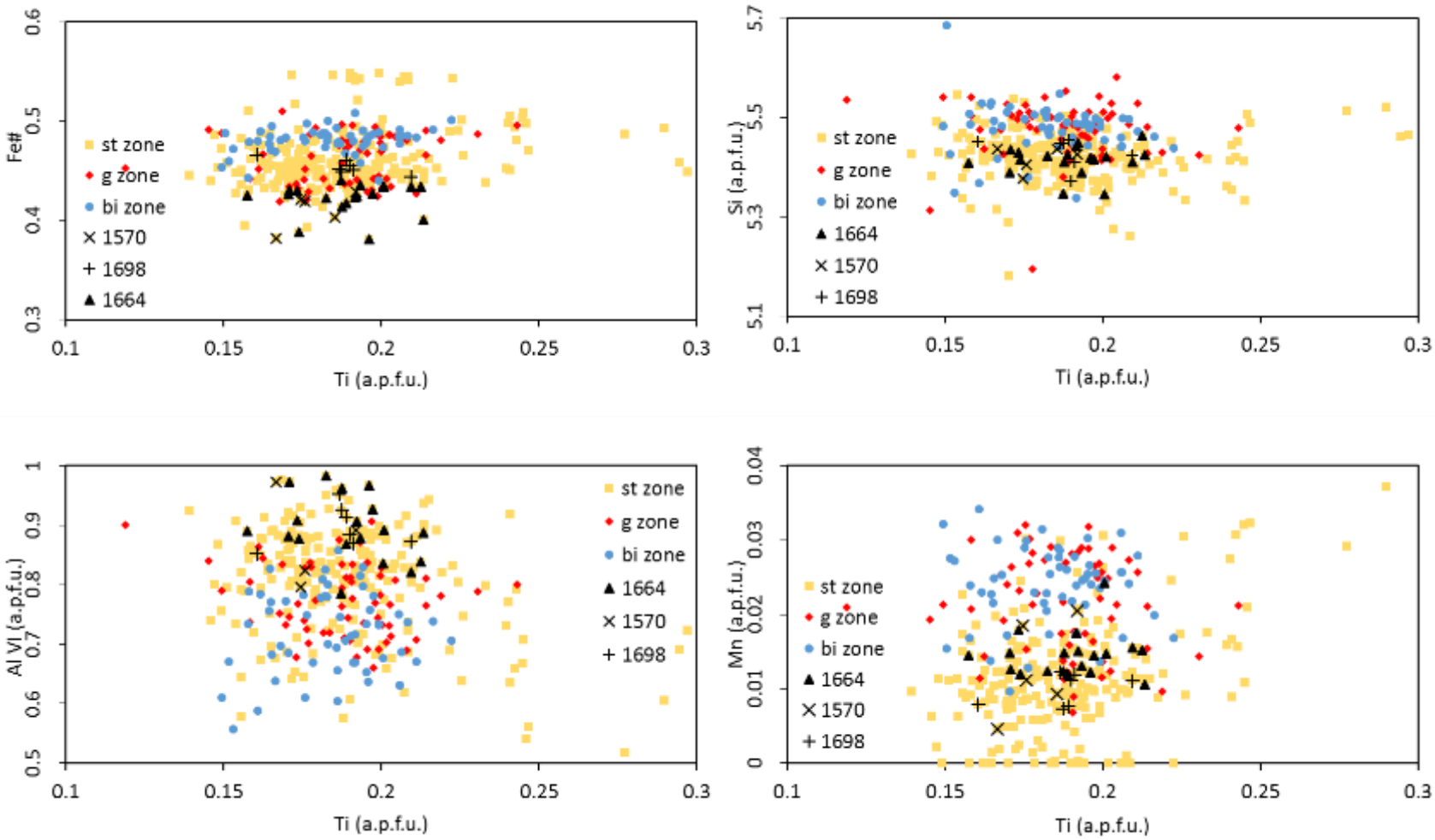


Figure 9: Biotite Fe#, Si, Al^{VI} and Mn vs Ti diagrams from 71 samples, including the selected samples for pseudosection modelling, classified by metamorphic zone.

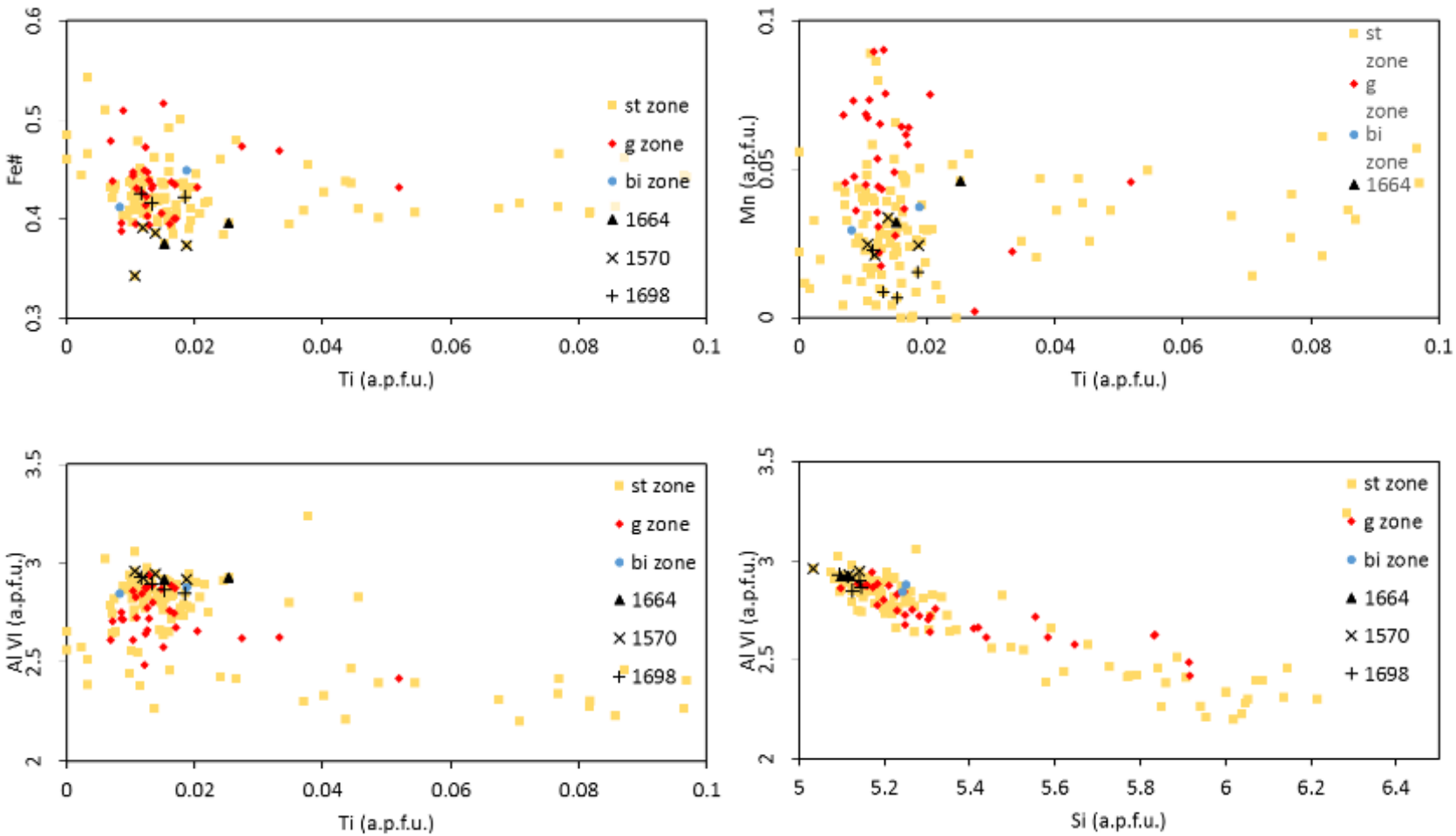


Figure 10: Chlorite Fe#, Mn, Al^{VI} vs and Al^{VI} vs Si diagrams from 63, including the selected samples for pseudosection modelling, classified by metamorphic zone.

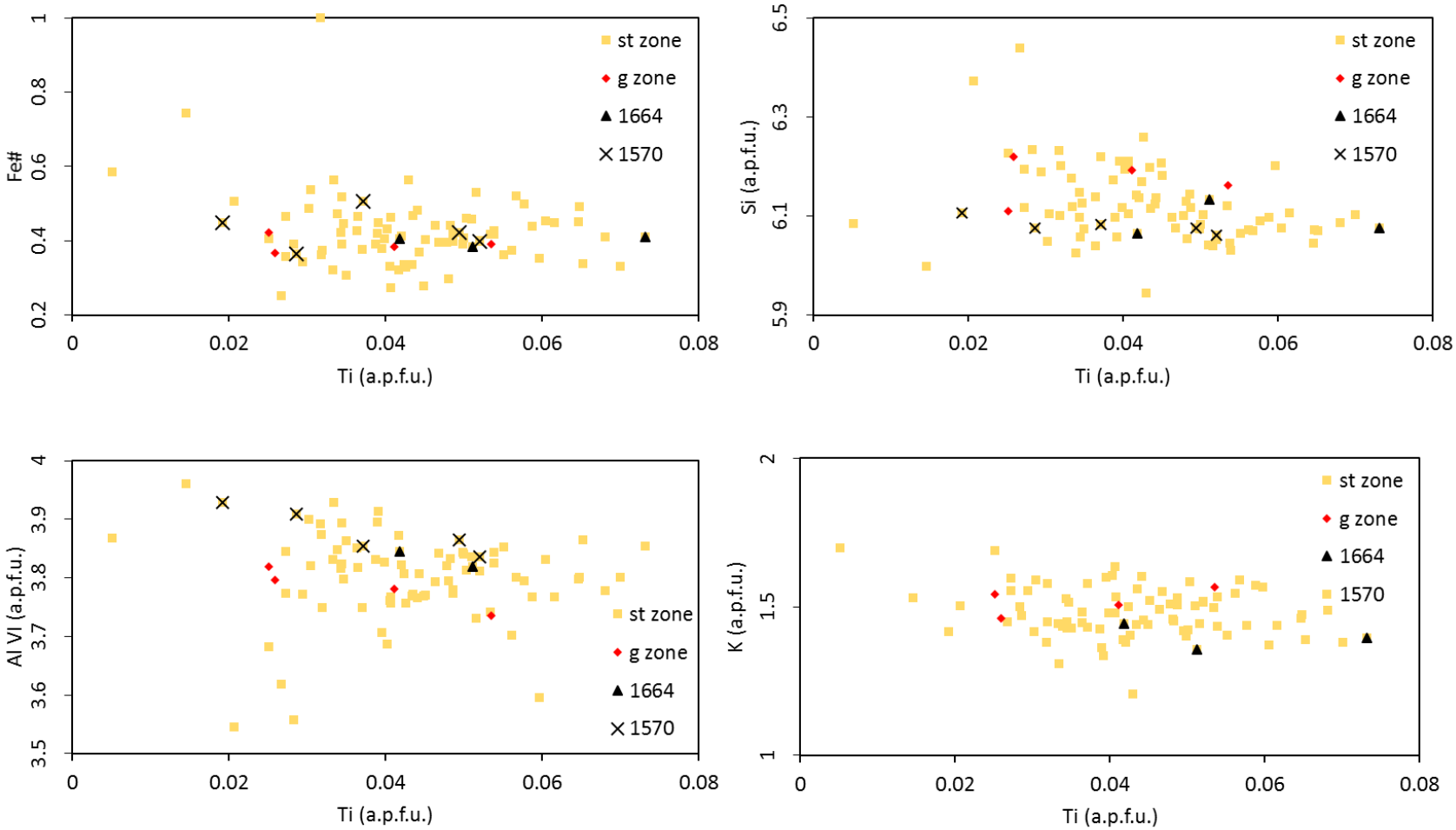


Figure 11: Muscovite Fe#, Si, Al^{VI} and K vs Ti from 23 samples, including the selected samples for pseudosection modelling, classified by metamorphic zone.

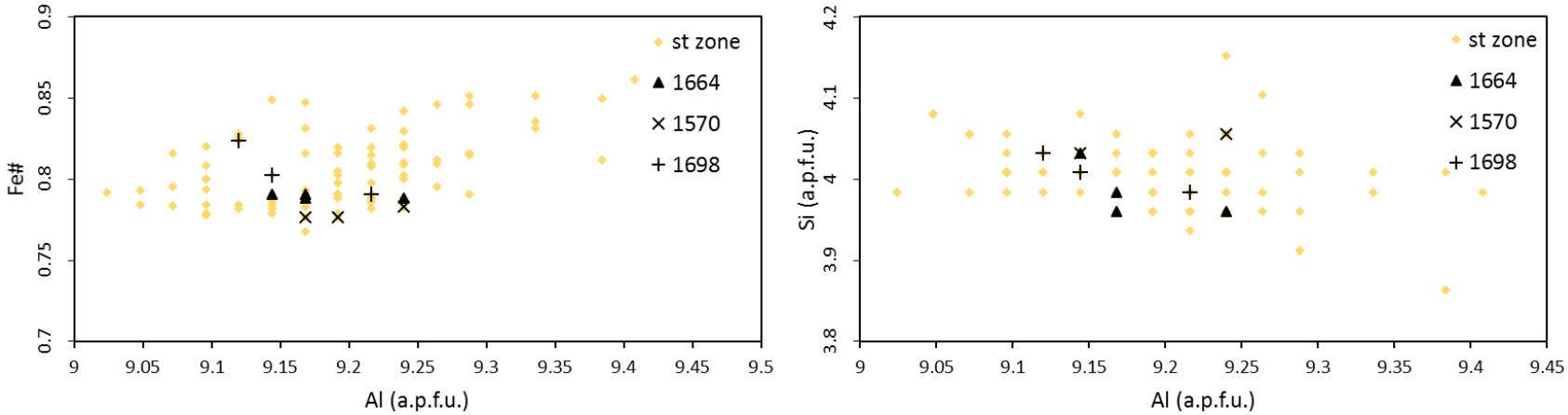


Figure 12: Staurolite Fe# and Si vs Al from 43 samples, including the selected samples for pseudosection modelling, classified by metamorphic zone.

Garnet

Garnet is commonly chemically zoned as a result of its prograde or retrograde history (Kohn, 2014). Accordingly, WDS electron microprobe maps for Ca, Mn, Fe and Mg were generated for garnet grains from 11 samples prior to spot analyses (maps are reported in Appendix III). Three main type of zoning patterns are observed, based on grossular content: bell-shaped patterns, irregular patterns, and flat patterns. The three dated samples have been further investigated with quantitative point analyses along profiles with a 10 µm step (Table 4 in Appendix III).

Figure 13 shows an asymmetric, irregular major element pattern for xenomorphic garnet in sample 1664, ranging from core to rim, 65 - 67% almandine, 10 - 6% grossular, 12 - 9% pyrope and 13 - 15% spessartine. An additional profile can be found in Appendix III. The Ca map suggests that the garnet is retrogressed because of its xenomorphic habit with Ca zoning parallel to the xenomorphic boundaries. The bowl-shaped Mn profiles are also an indication of retrogression (Kohn, 2014), whereas the flat Fe# profiles are suggestive of diffusional homogenization at peak or retrograde conditions. The Lu profile of garnet 1664 (Figure 13) is bell-shaped yet also asymmetric, with values ranging between 2422 and 40 ppm from core to rim. The highest Lu contents generally correspond to areas of maximal grossular contents, which likely represent the cores from which garnet porphyroblast nucleated and preferentially segregated Lu. Because of the obvious retrogression reflected in the xenomorphic shape of porphyroblasts and bowl-shaped spessartine patterns, it is not clear whether the grossular content in such cores represents preserved growth zoning or peak diffusional homogenization followed by retrogression at the rims.

The compositional profiles of euhedral garnet from sample 1698 (Figure 13) are reminiscent of growth zoning (e.g.: Caddick et al., 2010) with bell-shaped grossular, spessartine and Fe# profiles and bowl-shaped pyrope and almandine profiles. The compositions range is, from core to rim, 63 - 69% almandine, 11 - 6% grossular, 8 - 6% pyrope and 18 - 11%. Lu profiles show a significant peak of about 21 ppm at the core with rapid decrease to 3 ppm at the rim. Such profiles are typical of growth zoning (Kohn, 2014).

The compositional profiles of xenomorphic garnet from sample 1570 are generally flat (Figure 13), with a homogeneous composition of 69% almandine, 5% grossular, 12% pyrope and 14% spessartine. A lack of major element zonation in a xenomorphic garnet may indicate resorption and diffusion homogenization during peak or retrograde metamorphism.

Lu distribution defines a strong peak of about 320 ppm in garnet cores with a rapid decrease to 20 ppm at the rims, consistent with formation during growth (Kohn, 2014).

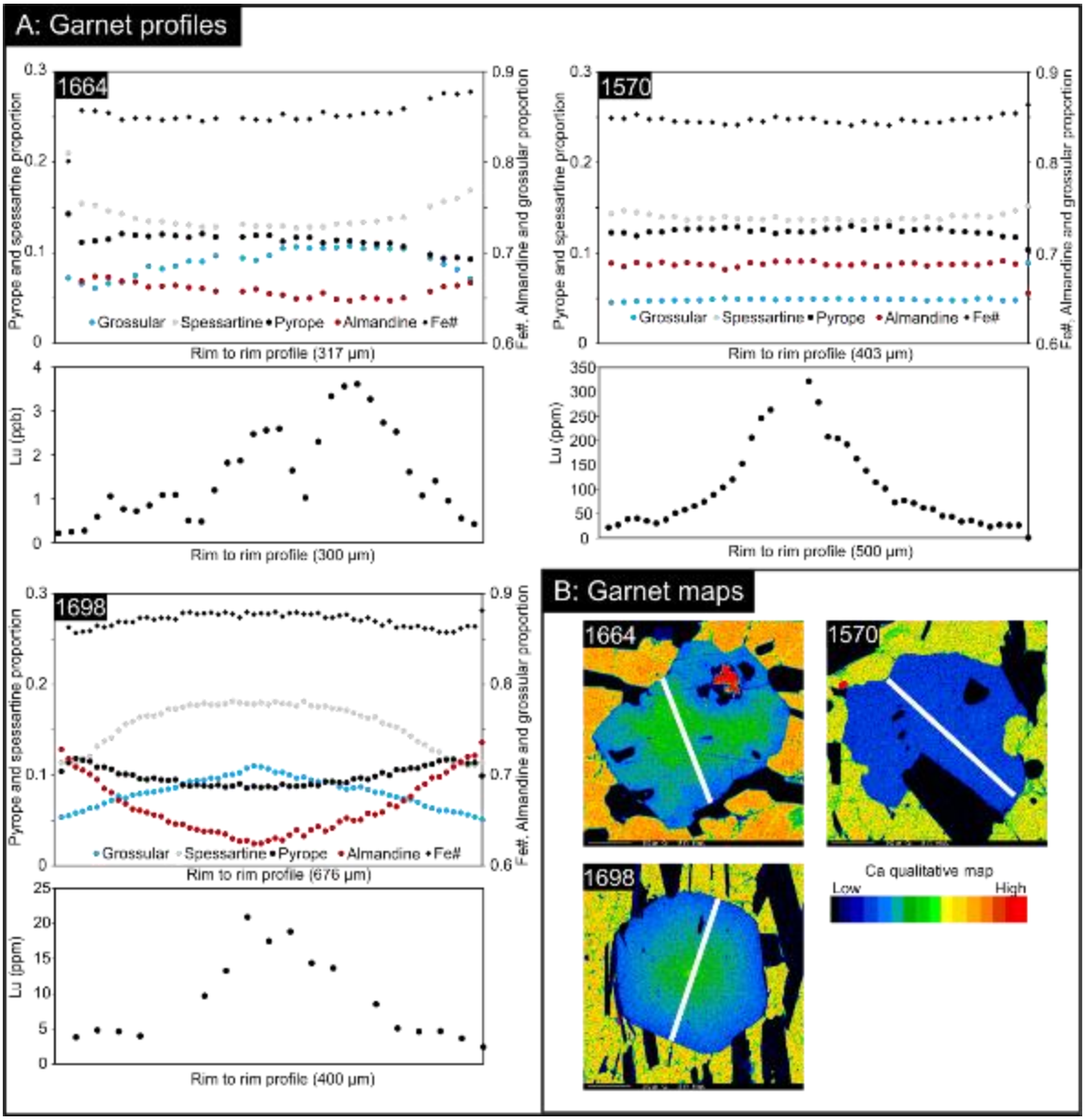


Figure 13: (A) Representative major element and Lu garnet profiles of samples 1664, 1698 and 1570. Sample 1664 displays a bowl-shaped spessartine, almandine and Fe# profile and a bell shaped pyrope, grossular and Lu profile. Sample 1698 displays a bowl shaped pyrope and almandine profile and a bell-shaped spessartine, grossular, Lu and Fe# profile. Additionally, the spessartine, and Fe# profile display a small trough and increase near the rim whereas the pyrope profile shows an increase and a trough toward the rim. Sample 1570 displays flat major element profiles and a bell-shaped Lu profile. (B) Garnet Ca maps of samples 1664, 1698 and 1570 with location of the major element profile. Sample 1664 displays a hypidiomorphic habit and a retrogressed zoning curved around the Ca rich inclusion (apatite). Sample 1698 displays an idiomorphic habit with a concentric Ca zoning that is not affected by retrogression. Sample 1570 displays a xenomorphic habit with a flat Ca pattern.

2.4.5 Geothermometry

Garnet-Biotite geothermometer

The Garnet-Biotite geothermometer (GARB) is a technique used to model the equilibria temperature between the two minerals by using the Fe-Mg partitioning coefficient $K_D = (Mg/Fe)_{garnet}/(Mg/Fe)_{biotite}$ (Ferry and Spear, 1978). As noted in the previous section, garnet Fe# are remarkably homogeneous in investigated samples. In contrast, biotite Fe# shows variability in some samples. Figure 14 presents the results of K_D calculation from 45 samples (103 analysis) with garnet combined with the maximum and minimum measured matrix biotite Fe# (Table 1 in Appendix V). The calculated K_D values range from 0.11 to 0.15 with a maximum frequency at 0.13 for the garnet zone samples and from 0.08 to 0.17 with a maximum frequency at 0.14 for the staurolite zone samples. Following the Ferry and Spear (1978) calibration and assuming a pressure of 5 kbar, garnet-biotite equilibration occurred between 441°C and 524°C with a mean at 484°C in the garnet zone, and between 373°C and 563°C with a mean of 504°C in the staurolite zone. These results are associated to a ±50°C error (Ferry and Spear, 1978). The low temperatures and the overlapping temperature considering error between the garnet and staurolite zone suggest that the homogenization deduced from flat Fe# profiles is retrograde in nature and that these retrograde conditions were the same in both zones.

Ti in biotite geothermometer

The Ti-in-biotite geothermometer is calibrated for metapelites that equilibrated at 4-6 kbar in the presence a Ti buffer such as the ilmenite (Henry et al., 2005), which is present in our samples. For the type of sampling in this project, this method offers, just like the GARB geothermometer, an opportunity to study a large number of samples and obtain a first-order estimation of the temperature of equilibria of the biotite allowing a direct comparison to the K_D results. The formula from Henry et al. (2005) was applied to our electron microprobe dataset of biotite for analyses in between 98.5 and 101.5% (including calculated H_2O) in all metamorphic zones. The result is illustrated at Figure 15 and the data is listed in Table 2 in Appendix V. The equilibrium temperature for all the metamorphic zones overlap at 590°C and there is no significant variation of equilibria temperature between the metamorphic zones.

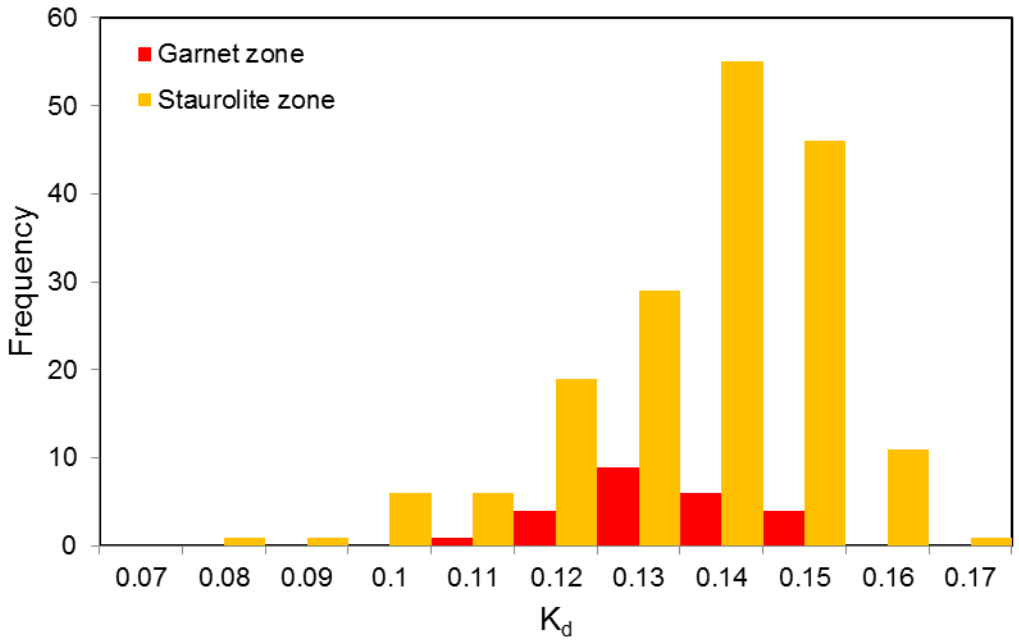


Figure 14: Fe-Mg Garnet-Biotite partitioning coefficient histogram classified by metamorphic zone. Following the Ferry and Spear calibration (1978), K_D of 0.13 and 0.14 corresponds respectively to temperatures of 474 and 494°C.

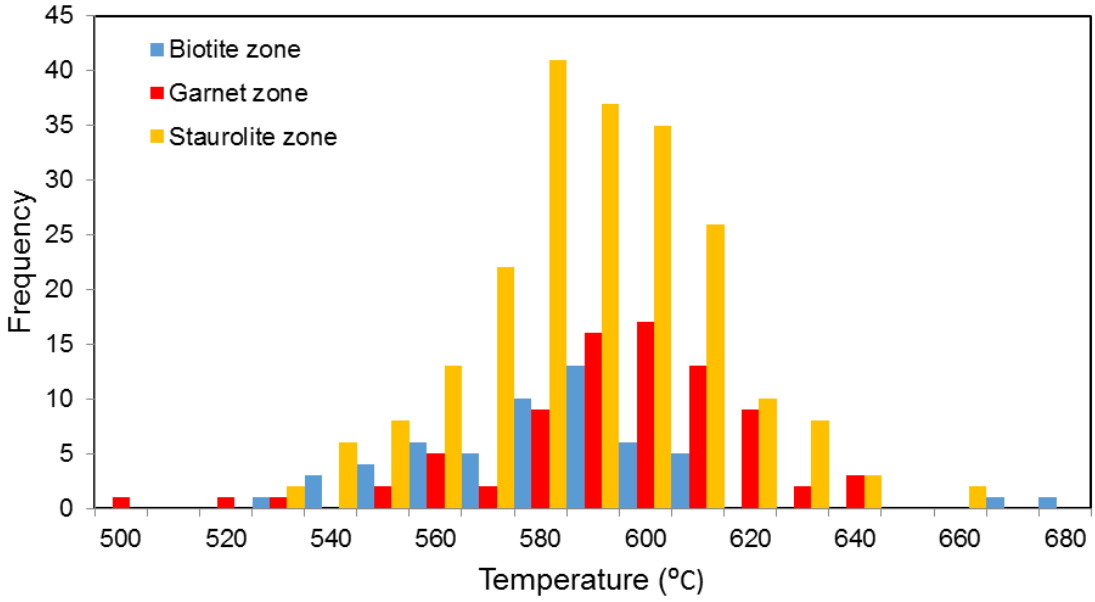


Figure 15: Ti-in-biotite geothermometry result histogram classified by metamorphic zone.

2.4.6 Geochronology

Two individual splits of the whole-rock powder (with and without dissolved zircons) and two hand-picked fractions of garnets for each sample were analyzed for their Lu-Hf isotopic compositions (Table 1). The Lu-Hf internal age of sample 1664 is the most robust of all garnet-whole-rock pairs analyzed in this study. The whole-rock without zircons, regressed with the three garnet fractions Gt1, 3 and 4, yields a precise age of 2658 ± 7 Ma, with initial $^{176}Hf/^{177}Hf$ =0.281233 ± 0.000012, and mean square weighted deviation (MSWD) of 0.72. The Gt2 fraction is slightly disturbed compared to other fractions. With the whole-rock with zircons and Gt2, a similar age, but less precise, is found at 2667 ± 15 Ma, with initial $^{176}Hf/^{177}Hf$ =0.28111 ± 0.00033. The increased scatter, attested by a large MSWD = 135, may be caused by zircon dissolved from the whole rock powder or inclusions in the Gt2 fraction. The age of 2658 ± 7 Ma (Figure 16) is thus our preferred result for this sample.

The garnet fractions for the sample 1570 are the most enriched in Lu (39 ppm) compared to Hf (1.3 ppm), and thus have the most radiogenic Hf isotopic composition (Table 1). The first fraction, Gt1, was underspiked for Lu, and its Lu/Hf was determined by ICPMS which is less precise than using the isotopic dilution method. Taking the next 3 garnet fractions (Gt2, Gt3 and Gt4) and the whole-rock sample without zircons, an age of 2664 ± 35 Ma is obtained, with an initial $^{176}Hf/^{177}Hf$ =0.2810 ± 0.0024, and MSWD = 3.0. If we eliminate the Gt2 fraction, an age of 2657 ± 9 Ma is obtained (similar to sample 1664), with initial $^{176}Hf/^{177}Hf$ =0.281121 ± 0.000012, and MSWD = 0.01 (Figure 16).

The garnet grains from sample 1698 are similar in isotopic composition to those of sample 1664 (Table 1). If regressing the whole-rock without zircons and four garnet fractions, a Lu-Hf age of 2668 ± 48 Ma is obtained, with an initial $^{176}Hf/^{177}Hf$ = 0.28107 ± 0.00084 and MSWD = 4.6, which indicates some scatter. When removing the Gt2 fraction, a more precise age of 2657 ± 6 Ma is obtained, with an initial $^{176}Hf/^{177}Hf$ = 0.281115 ± 0.000010 and MSWD = 0.07 (Figure 16).

The Lu-Hf geochronology results indicate garnet growth at ~2657 Ma in samples 1664, 1570 and 1698. The initial Hf isotopic compositions of whole-rock samples 1664, 1570 and 1698 vary between +1.4 and +5.6 ± 0.5 (expressed in parts per 10,000 relative to the composition of the chondritic uniform reservoir CHUR at 2657 Ma; Bouvier et al., 2008).

Table 1: Results of Lu-Hf isotopic analysis of garnet separates and whole rocks.

Dissolution method	Sample	Weigh t (g)	Lu (ppm)	Hf (ppm)	$^{176}Lu/^{177}Hf$	$^{176}Hf/^{177}Hf$	+/-
bomb	1664 WR	0.147	0.306	4.902	0.0089	0.281475	0.000004
hot plate	1664 TT WR	0.102	0.244	2.747	0.0126	0.281874	0.000012
hot plate	1664 Gt	0.159	16.523	1.798	1.3193	0.348517	0.000006
hot plate	1664 Gt2	0.079	16.361	1.598	1.4724	0.356712	0.000005
bomb	1570 WR	0.183	0.158	3.196	0.0070	0.281396	0.000004
hot plate	1570 WR TT	0.140	0.336	2.709	0.0176	0.282016	0.000011
hot plate	1570 Gt	0.116	-	-	3.3	0.468556	0.000010
hot plate	1570 Gt2	0.084	39.516	1.312	4.4493	0.509379	0.000007
bomb	1698 WR	0.158	0.173	3.959	0.0062	0.281332	0.000006
hot plate	1698 WR TT	0.097	0.230	3.615	0.0090	0.281574	0.000006
hot plate	1698 Gt	0.106	12.165	1.798	0.9683	0.330407	0.000010
hot plate	1698 Gt2	0.083	12.172	1.535	1.1367	0.339549	0.000013

Note: $^{176}Hf/^{177}Hf$ ratios were normalized to $^{179}Hf/^{177}Hf$= 0.7325 and to the recommended value of 0.282160 for the JMC 475 Hf standard to correct for instrumental mass bias and faraday cup efficiency. Lu and Hf concentrations determined using the isotopic dilution method. See text for further details.

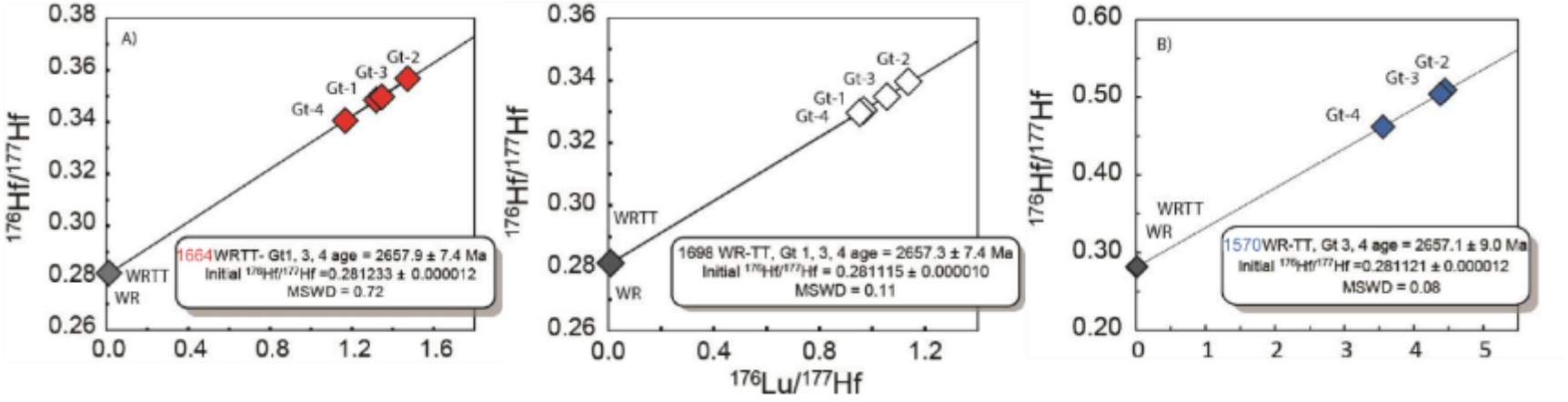


Figure 16: Garnet Lu-Hf geochronology isochrons showing a strong garnet growth signature at 2657 Ma. Sample 1664 yields an age of 2657.9 ± 7.4 Ma, 1698 yields an age of 2657.3 ± 7.4 Ma and 1570 yields an age of 2657.1 ± 9.0 Ma.

2.4.7 Pseudosection modelling

Method

The mineral assemblages, microtextures and mineral chemistry of the three samples that were dated for Lu-Hf in garnet were interpreted using P-T pseudosections constrained with a representative bulk composition for each sample. The whole rock compositions were obtained by XRF analysis of the thin section offcuts (Table 1 in Appendix II). The results were used to produce two alternative pseudosections per sample in the system MnNCKFMASHTO (Mn-Na-Ca-K_2O-Fe-Mg-Al_2O_3-SiO_2-H_2O-TiO_2-O_2) both with a fixed ratio of $Fe^{3+}/(Fe_{tot})$ of 0.05 to reflect the superior stability of ilmenite over magnetite. For each sample, the first pseudosection was calculated with H_2O set in excess to model the conditions of prograde metamorphism. The second pseudosection was calculated using only structural H_2O using the Ti-H substitution scheme of White et al. (2007) in order to investigate post-peak retrograde processes.

The structural water content of the samples for pseudosection modelling was calculated according to the modal mineralogy and the measured end-member composition of each phase. Phase molar proportion were estimated from their mode and molecular volume. A theoretical bulk rock composition was then estimated from the molar proportion and end-member composition (White et al., 2014a) to produce a theoretical bulk-rock composition with structural water content. The mineral compositions were selected from representative microprobe measurements (Appendix III). The mineral proportions are those measured using Memorial University's SEM mineral liberation analysis (SEM-MLA) facility (Figures 5 to 7 and Appendix VI). The measured bulk rock composition was then renormalized with the calculated water content for pseudosection modelling.

Phase equilibria modelling was conducted using Thermocalc 3.4 (Powell and Holland, 1988) with the thermodynamic dataset ds62 (February 2012) of Holland and Powell (2011). Calculations are in the MnNCKFAMSHTO system with the a-x models of White et al. (2014b) for garnet, cordierite, staurolite, chlorite, biotite and ilmenite, white mica and silicate melt, of Holland and Powell (2011) for epidote and of Holland and Powell (2003) for feldspar.

Excess fluid pseudosections

Figures 17a, 18a and 19a present the water in excess pseudosections for the P-T range of 2-8 kbar and 400-700 ºC. In this P-T range, biotite, quartz and plagioclase are always present except for the pseudosection 1570 where a small field lacks biotite at low

temperature. Each pseudosection has a field with stable garnet, staurolite and chlorite and a smaller field with either muscovite or paragonite. The transition between rutile and ilmenite is dependent on the bulk rock oxidation state, a parameter. We will thus not consider the stability of Ti-phases in our interpretation. The topology is similar for all samples except for the garnet stability field of sample 1698 that extends at lower T because of the higher Mn content of the bulk composition. All the fields with aluminosilicates, cordierite or partial melting have been left blank for clarity because these phases have not been observed. The greenschist assemblage is characterized by a bi+mu+chl+ru+pl+q+H_2O field. With increasing temperature and pressure, ilmenite and garnet become stable followed by staurolite, corresponding to the observed assemblage. A pressure-sensitive muscovite to paragonite transition is also predicted. At higher temperature, white micas are not stable, followed by a chlorite-out boundary.

The predicted modal proportions of phases in the field reproducing the inferred peak assemblage (pale blue field, Figures 17-19) have been compared to measured modes. For sample 1664, the inferred peak assemblage and corresponding modal proportions are biotite (24.42%), chlorite (0.52%), muscovite (1.08%), garnet (0.20%), staurolite (2.86%), ilmenite (0.28%), feldspar (44.03%) and quartz (26.08%) (Figure 5). In the corresponding field, the model isomodes roughly reproduce the observed modal proportions except for the predicted mode of muscovite and chlorite. There is systematically more predicted muscovite and chlorite than the observed modal proportion. This field is constrained between 575 and 615 °C and 5.5 and 7.6 kbar (Figure 17). For sample 1698, the inferred peak assemblage and corresponding modal proportions are biotite (26.68%), chlorite (0.44%), garnet (1.18%), staurolite (4.65%), ilmenite (0.36%), feldspar (42.18%) and quartz (21.81%) (Figure 6). In the corresponding field, the model isomodes roughly reproduce the observed modal proportions except for the predicted mode of chlorite. The predicted mode of chlorite is higher than the observed mode.This field is constrained between 570 and 610 °C and 4.5 and 6.6 kbar (Figure 18). For sample 1570, the inferred peak assemblage and corresponding modal proportions are biotite (22.26%), chlorite (1.08%), muscovite (1.74%), garnet (0.12%), staurolite (2.64%), ilmenite (0.17%), feldspar (36.98%) and quartz (34.32%) (Figure 7). In the corresponding field, the model isomodes reproduce the observed modal proportions except for the predicted mode of feldspar and biotite that is too low, muscovite and chlorite that is too high. This field is constrained between 580 and 620 °C and 5 and 8

kbar (Figure 19). We interpret the boundaries of these fields as a first order approximation of peak P-T conditions, which can be further refined using isopleths.

Isopleths were computed for key minerals and elements that may have preserved peak conditions and retrograde conditions. The modeled isopleths are x(g), z(g) and m(g) for the Fe#, grossular and spessartine content of garnet respectively, and x(bi), x(st) and x(chl) for the Fe# of biotite, staurolite and chlorite.

In pseudosection 1664 (Figure 17a), isopleths of x(g), z(g) and m(g) corresponding to core compositions intersect at 6.27 kbar and 680 ºC in the staurolite-absent field at the low-T side of the observed assemblage field (pale blue field). A garnet core composition modeled at the low-T side of the peak staurolite assemblage is in agreement with the interpretation that garnet cores preserved their growth/near peak composition, prior to staurolite growth as expressed by the presence of garnet inclusions in staurolite. The isopleths corresponding to garnet rim, biotite and staurolite compositions, however, cannot be modeled in the fields of interest, especially for staurolite (predicted Fe# = 0.7 vs. observed Fe#= 0.8). This agrees with the calculated temperatures derived from garnet-biotite K_D that suggested late diffusional resetting of the Fe-Mg system in the greenschist facies around 500 ºC.

In pseudosection 1698 (Figure 18a), the modeled x(g), z(g) and m(g) isopleths corresponding to the measured garnet core compositions can all be found in the staurolite-free field at the low-T side of the observed assemblage field (pale blue field), supporting the interpretation that garnet cores preserved a growth composition that was acquired prior to staurolite growth. However, the isopleths do not cross, suggesting some degree of disturbance or discrepancy in the bulk composition. The spessartine and grossular bell-shaped profiles indicate growth zoning whereas the Fe# is homogeneous, hinting to late diffusion. Consequently, the m(g) and z(g) isopleths are preferred in estimating growth/near peak conditions. The isopleths corresponding to measured core compositions cross at 5.9 kbars and 570 ºC where the predicted x(g) is slightly more magnesian. Again, the Fe# of garnet rims, staurolite and biotite cannot be reproduced in the higher temperature fields, as suggested by the greenschist biotite-garnet Fe-Mg K_D.

In pseudosection 1570 (Figure 19a), absence of zoning in garnet porphyroblasts suggests high temperature homogenization. The modeled isopleths corresponding to measured garnet spessartine and grossular core contents intersect in the field of the observed

assemblage at 5.8 kbar and 600 ºC, which we thus consider minimal peak conditions. This point lies very close to the garnet-in boundary, in agreement with the very low modal proportion of garnet in this sample. At these conditions, the predicted Fe# = 0.41 of biotite corresponds to the measured composition of matrix biotite. The observed Fe# = 0.78 of staurolite cannot be modeled in the staurolite stability fields, however, which predict more iron-rich compositions.

Structural H_2O pseudosections

Figures 17b, 18b and 19b present the pseudosections built using the fixed structural H_2O of the samples for the same P-T range. The main effect on the general topology is the extension of the amphibolite facies assemblages to lower temperatures, reflecting the impossibility of the system to revert the prograde dehydration reactions due to water being unavailable. Biotite, plagioclase, quartz and staurolite are stable in all fields, except for a staurolite-absent field in pseudosection 1570 at high temperature. The most Mn-rich bulk compositions have garnet stable in all fields, whereas the relatively Mn-poorer bulk of sample 1570 predicts a garnet-free field at low pressure and temperature. Again, aluminosilicates- or cordierite-bearing fields have been left blank. The higher temperature fields predict a free H_2O fluid phase. As expected, this part of the pseudosections is identical to the water-in-excess pseudosections. From the H_2O-in boundary and going to lower PT, the main mineralogical changes are the transition from ilmenite to rutile, a chlorite-free assemblage at lower T and a white mica-free assemblage at lower P. In these pseudosections, we will investigate the hypothesis of Fe-Mg resetting at greenschist conditions between garnet, biotite and staurolite.

In pseudosection 1664b (Figure 17b), the Fe# isopleths corresponding to measured garnet rims, matrix biotite and staurolite cluster at 5.1 kbar and 460 ºC, in the field corresponding to the observed assemblage field (pale blue field). In pseudosection 1698b, Fe# modeled isopleths corresponding to measured garnet rims, staurolite and matrix biotite intersect at ~ 2.5 kbars and 470 ºC, in the field of observed assemblage. In pseudosection 1570b, Fe# isopleths corresponding to garnet and staurolite compositions intersect in the field of observed assemblage at ~4.5 kbar and 440 ºC. However, Fe# isopleths corresponding to matrix biotite can only be found at higher temperature.

Phase equilibria modelling of subsolidus rocks with fixed water bulk must be interpreted with great caution. At lower temperatures, like those modeled in this study (450-550 ºC), the

kinetics of reactions are very slow and any net transfer reaction would likely be inhibited in the absence of an intergranular fluid and/or deformation. However, Fe-Mg intra- and intergranular diffusion could still be possible depending on cooling rates (e.g. Caddick et al., 2010). Phase equilibria modelling does not take reaction kinetics into account and will allow both exchange and net transfer reactions to occur. Accordingly, we cannot trust the predicted topology and modal proportions, which involves net transfer reactions. On the other hand, Fe-Mg exchanges between phases can be correctly modeled, because crossing Fe# isopleths corresponds to calculating a K_D for Fe-Mg between these phases, and Fe-Mg K_Ds are independent of modal proportions and have low sensitivities to pressure. However, phase equilibria modelling predicts perfect equilibrium between all phases, ignoring any different diffusion rate to host mineral relationship, or different Fe-Mg diffusion closure temperatures for different minerals. We thus use these pseudosections for the sole purpose of testing the equilibrium hypothesis, i.e.: were Fe-Mg in garnet, biotite and staurolite reset at the same conditions.

For samples near the Malartic locality (1664 and 1698), the biotite, garnet and staurolite Fe# can be explained by low temperature diffusion at conditions consistent with results from garnet-biotite thermometry, around 450 ºC. We therefore propose that the Fe-Mg subsystem achieved equilibrium through intra- and intergranular diffusion in absence of intergranular fluid during very slow cooling. For sample 1570, near the Val-d'Or locality, "retrograde equilibrium" of the Fe-Mg subsystem is not supported. Biotite composition is consistent with peak conditions, but garnet and staurolite are not, corresponding to lower temperatures.

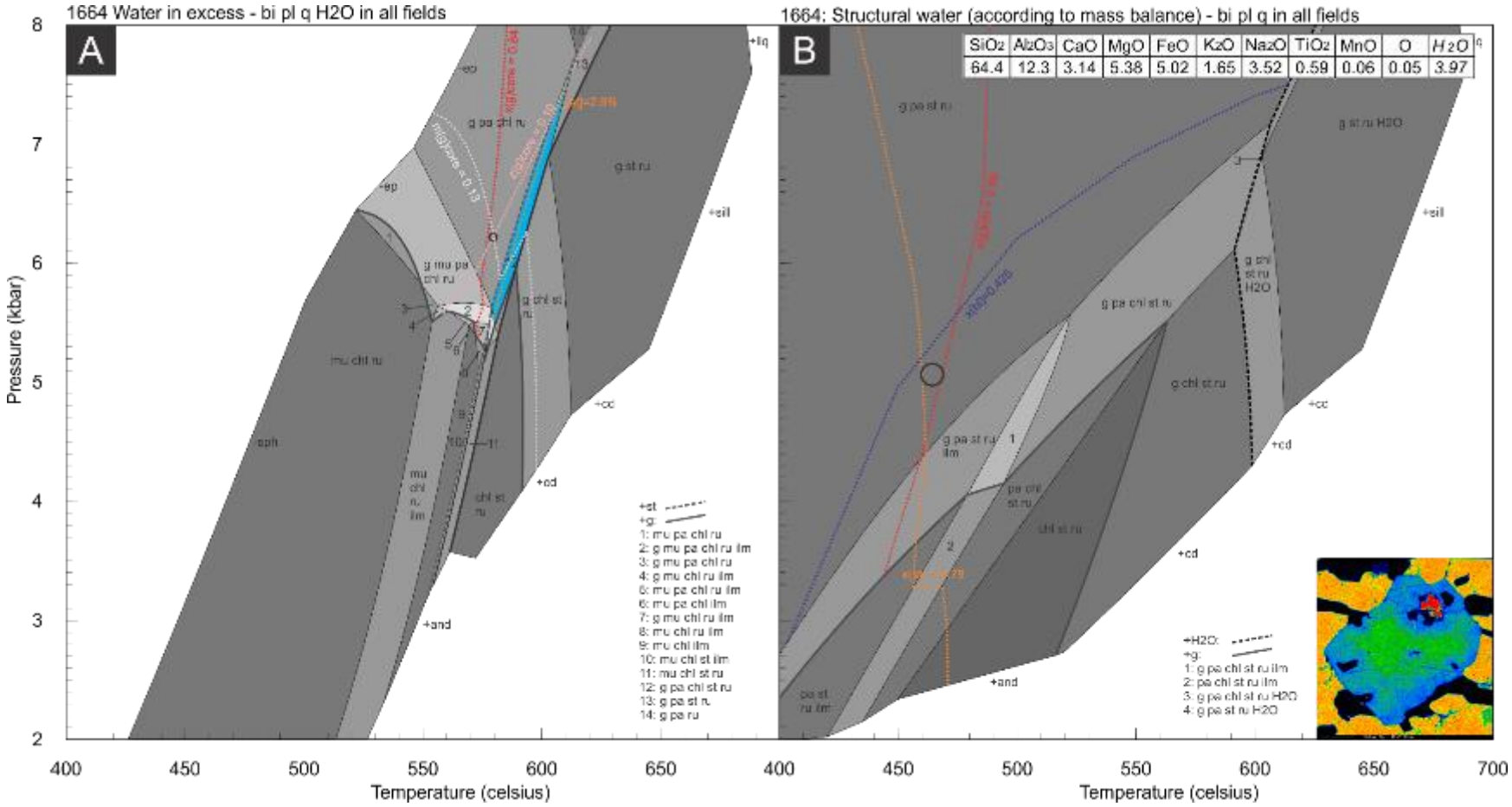
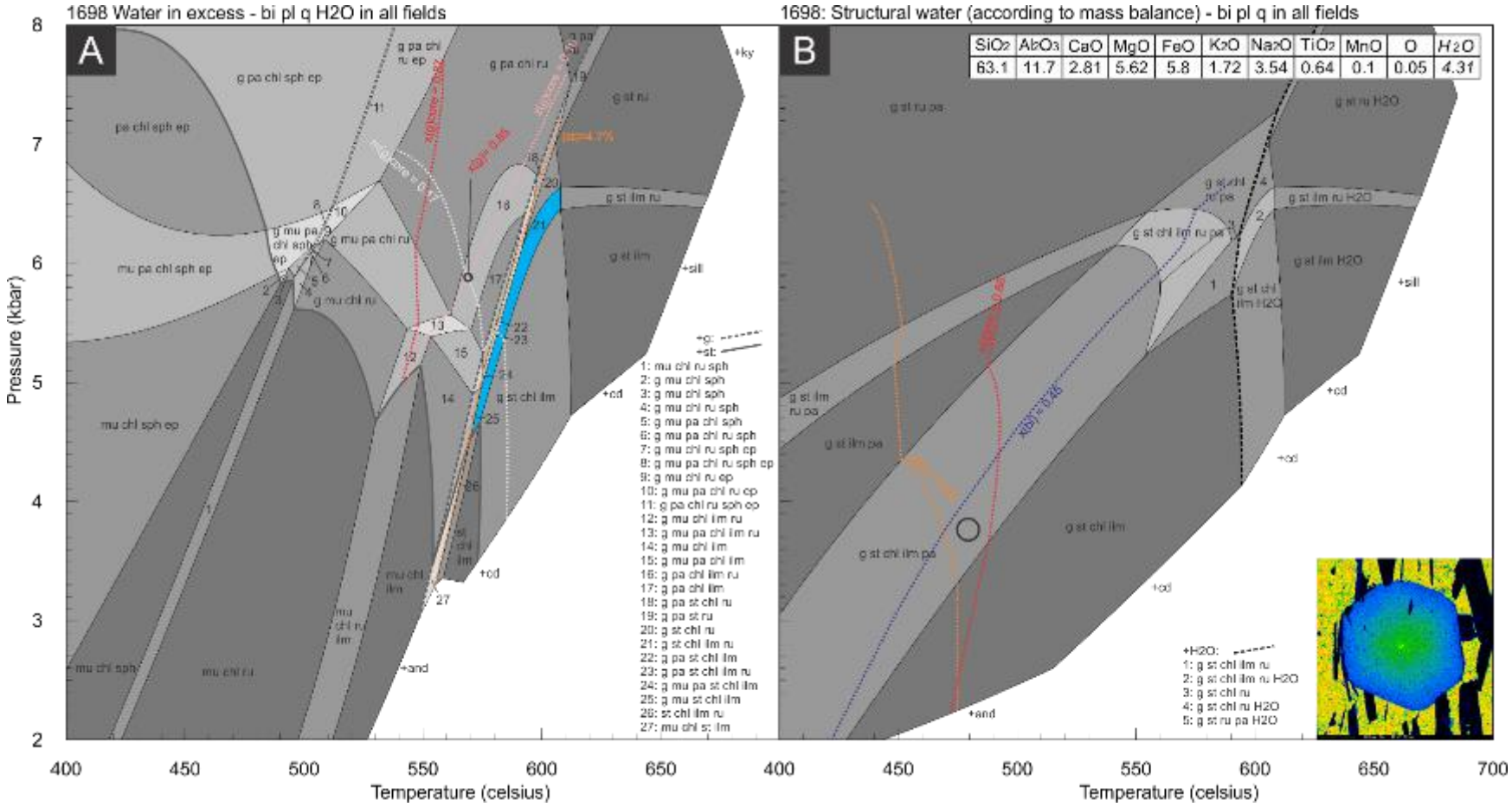


Figure 17: Pseudosection 1664 with water in excess (A) and structural water (B) conditions. Inset on bottom right with qualitative garnet Ca map. Mineral abbreviation following Thermocalc convention. Modelled garnet core growth condition in the g+pa+chl+ru field of pseudosection (A). Observed assemblage in field 12 (pale blue) with g+pa+chl+st+ru. The observed Fe# composition of the garnet rim, staurolite and biotite is modelled in the g+pa+st+ru field of pseudosection (B) indicating that the peak assemblage was preserved as a metastable assemblage during retrograde metamorphism but that the Fe-Mg cation exchange system remained open at lower P-T conditions.



SiO2	Al2O3	CaO	MgO	FeO	K2O	Na2O	TiO2	MnO	O	H2O
63.1	11.7	2.81	5.62	5.8	1.72	3.54	0.64	0.1	0.05	4.31

Figure 18: Pseudosection 1698 with water in excess (A) and structural water (B) conditions. Inset on bottom right with qualitative garnet Ca map. Modelled garnet core growth condition in pseudosection (A) field 16 (g+pa+chl+ilm+ru) and observed assemblage in field 21 (pale blue) (g+st+chl+ilm+ru). Observed Fe# composition of garnet rim, staurolite and biotite modelled in the g+st+chl+ilm+pa field of pseudosection (B) suggesting that the peak assemblage was preserved as a metastable assemblage during retrograde metamorphism but that the Fe-Mg cation exchange system remained open at lower P-T conditions.

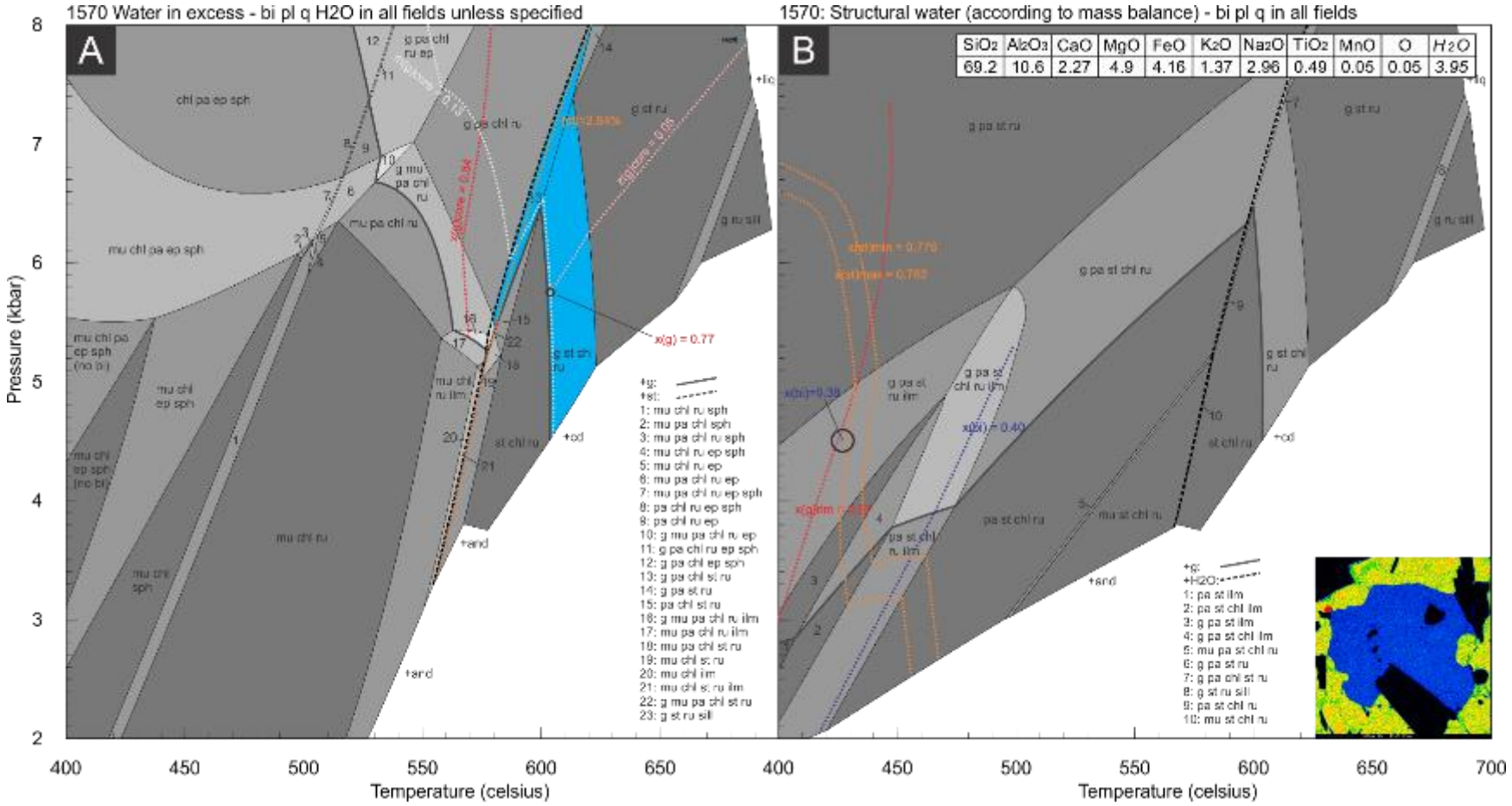


Figure 19: Pseudosection 1570 with water in excess (left) and structural water (right) conditions. Inset on bottom right with qualitative garnet Ca map. Modelled garnet core growth conditions in pseudosection (A) is in the same field than the observed assemblage of g+st+chl+ru±pa (pale blue). Observed Fe# composition of the garnet rim, staurolite and biotite are modelled in pseudosection (B) in the g+pa+st+ru+ilm field suggesting that the peak assemblage was preserved as a metastable assemblage during retrograde metamorphism but that the Fe-Mg cation exchange system remained open at lower P-T conditions..

2.5 Discussion

2.5.1 Assessing equilibria

Temperature and pressure recovery rests on the assumption of a preserved equilibria at a given pressure and temperature, whether using multi-equilibria thermobarometry (Powell and Holland, 1994; 2008) or pseudosection modelling (Powell et al., 1998). This assumes ideal rates of Fe, Mg, Mn, and Ca diffusion that corresponds to a common "instantaneous" behavior and negates the retrograde effect that can be significant as shown by Florence and Spear (1995), Caddick et al. (2010) and Aoki et al. (2014). The results presented earlier indicate a partial deviation from this hypothesis so that the chemical equilibrium for exchange reactions, such as the Fe-Mg sub-system, was effectively reached during retrograde metamorphism. This interpretation is based on: (A) the absence of a metamorphic field gradient in the Ti in biotite geothermometry results and in the GARB's K_D; (B) the disturbed major element profile of garnets (Figure 10) that is either flat or irregular (1664 and 1570) or showing evidences of retrogression near the rim (1698) and; (C) the predicted Fe# of staurolite and biotite, in the stability field corresponding to the observed assemblage in the water in excess pseudosection, is lower and higher respectively than what is measured in the thin section sample and can only be predicted by the structural water pseudosection at lower P-T conditions.

Pseudosections calculated with water in excess were used to model the conditions of prograde metamorphism. After the peak P-T condition is reached, the following drop in temperature and pressure promotes retrograde reactions to form hydrous minerals. Because such retrograde textures are nearly absent from the modelled rocks, we assume that the water content never exceeded the structural water calculated from the modes of hydrated minerals in the thin section samples, and that modal proportions stayed constant during the retrograde P-T path. However, since there are indications that equilibrium has been preserved at lower P-T than the peak conditions, the pseudosections with water fixed to the structural content of the sample must be interpreted accordingly. The metastable assemblage is effectively extended to lower P-T conditions in this second set of pseudosections. It allows the chemical evolution of the peak assemblage preserved during retrograde metamorphism to be modelled and the P-T condition at which they were chemically re-equilibrated. The predicted modal proportions do not significantly change from the inferred metamorphic peak to the modelled retrograde conditions so that the predicted net-transfer reactions during retrograde metamorphism are not significant.

2.5.2 P-T-t path

The compositional isopleth intersection in the pseudosections (Figures 17 to 19) indicate that garnet cores formed at 550-600 ºC and 5-6 kbar and that the Fe# of rims re-equilibrated at 420-490 ^{0}C with matrix staurolite and biotite during retrograde metamorphism. The presence of garnet inclusions within staurolite is an indication that the garnet grew before staurolite and thus constrains the P-T path to a clockwise pattern with respect to the equilibria conditions of prograde garnet growth.

Samples 1664, 1698 and 1570 yielded garnet Lu-Hf ages of 2658 ± 7 Ma, 2657 ± 6 Ma and 2657 ± 9 Ma respectively. The timing of garnet growth is indistinguishable among all the garnet samples regardless of their different sizes and shapes and variable preservation of prograde zoning (Figure 10). When considering trace element zoning, 80% of the Lu is comprised within 15% of the core volume of garnet (Figure 13 and Appendix IV). Therefore, most of the Lu contributing to the age is inherited from the initial stage of garnet growth, well below the closure temperature of the Lu-Hf isotopic system (700 ^{0}C for 1mm size garnet at 2 ^{0}C/Ma cooling rate, Smit et al., 2013). Following predictions from pseudosections 1664a, 1698a and 1570a, garnet grew at conditions of 550-600 ºC and 5-6 kbar before staurolite growth at slightly higher P-T. The Lu-Hf garnet age of 2657 ± 7 Ma is therefore interpreted as a growth age, representing the timing of near-peak prograde metamorphism during crustal thickening.

2.5.3 Tectonic implications

While most researchers recognize that the metamorphic gradient of the Pontiac Subprovince corresponds to Barrovian metamorphism (Jolly, 1978; Camiré and Burg, 1993; Mortensen and Card, 1993), little is known about the processes related to it. The tectonic model for the northeastern Pontiac Subprovince should account for the following conditions: (1) the tight Barrovian metamorphic field gradient crossing the garnet and the staurolite isograd in a 5 km thick crustal section (less than 2 kbar, Figure 2); (2) late to post-kinematic staurolite porphyroblasts with respect to the main foliation (Figure 4a-c); (3) garnet inclusions in staurolite, thus indicating a clockwise P-T path; (4) the Lac Fournière pluton (2682±1 Ma, Davis, 2002) being as old as the youngest detrital zircon found in the Pontiac Subprovince (Davis, 2002; Frieman et al., 2017), indicating late-sedimentation magmatism; (5) the abundant pre-metamorphic intrusions such as the Timiskaming type monzodiorite (ca. 2677-2678 Ma, de Souza et al., 2015) or the Decelles Batholith (ca. 2668 Ma according to Mortensen and Card, 1993); (6) peak metamorphism in excess of 6 kbar around 2657 Ma

(this study); (7) the vertical dip of the main foliation to the north significantly decreasing to the south; and (8) a very slow cooling rate of the order of 2-3 °C/Ma (Feng et al., 1992; Ghassemi, 1996; this study).

The retrograde equilibration of garnet, staurolite and biotite Fe# is well documented for small-scale diffusion between adjacent grains (e.g., Florence and Spear, 1991; Florence and Spear, 1995), but uncommonly reported for thin section-scale re-equilibration, especially at upper greenschist conditions. This inconcistency can be explained by two hypotheses. The simplest, but most unlikely, is homogenous Fe and Mg diffusion rates for the three minerals during very slow cooling, and homogeneous closure temperature of the system around 450 °C. Florence and Spear (1995) reported that the intergranular transport rate of Fe and Mg is an order of magnitude faster in the matrix than in garnet thus restricting the equilibration of the matrix to the rate of garnet diffusion. The second hypothesis is a long-lived thermal 500 ^{0}C plateau at which the biotite, staurolite and garnet rim Fe# equilibrated, regardless of individual intragranular diffusion rates. The Decelles batholith intruded the Pontiac metasedimentary rocks around 2668 Ma (Mortensen and Card, 1993) and magmatism lasted until at least 2643 Ma, as expressed by the numerous peraluminous granitic intrusions in the region (Feng and Kerrich, 1991). This magmatic activity overlaps with the onset of garnet growth (ca. 2657 Ma) and could have provided a long-lasting heat source capable of contributing to the chemical equilibration of the Fe# of the metamorphic assemblages at lower temperature. ^{40}Ar-^{39}Ar thermochronology of amphibole by Feng et al. (1992) indicates that the Pontiac Subprovince cooled through ~500 ºC ca. 2601 Ma which implies ~ 56 Myr to partially re-equilibrate the garnet with the matrix to upper greenschist retrograde conditions. This is a realistic assumption if we base our interpretation on the diffusion coefficient for Fe and Mg in garnet of Korolyuk and Lezin (2008) that predict that the Fe and Mg chemical composition of a 1 mm diameter gem quality garnet grain will be homogenized in a maximum of 100 Myr at 650 ºC and 3 Gyr at 500 ºC in dry conditions. Crystallographic imperfection and fluid enhanced diffusion is likely to accelerate this process in natural samples (Korolyuk and Lepezin, 2008) and is in agreement with the interpretation of re-equilibrated garnet rims but preserved growth chemical composition in the garnet cores.

Feng and Kerrich (1990) suggested that the tight field isograds are an artifact of post-metamorphic deformation. This is not conclusive because the metamorphic porphyroblasts are syn-to post kinematic to the main event of deformation (Figure 4). Aditionnally, the

pseudosections (Figure 14, 15 and 16) calculated in this study predict that the biotite zone assemblage is stable up to 5 kbar and 500 ºC and the progression from this assemblage to the staurolite stability field would require an increase of 1 kbar and 100 ºC in relation to the biotite zone P-T conditions which correlates well with the mapped field isograds. The biotite zone of the Pontiac Subprovince is either separated from the garnet and staurolite zone by discrete shear zones as stated by Feng and Kerrich (1990) or corresponds to higher P-T conditions than previously assumed.

The underthrusting of the Pontiac Subprovince as an accretionary prism under the Abitibi Subprovince was the only mechanism proposed to explain its metamorphic gradient (Dimroth et al., 1983a; Feng and Kerrich, 1992a; Camiré and Burg, 1993; Benn et al., 1994; Daigneault et al., 2002). However, Powell et al (1995) noted that the isograds pattern and the texture of metamorphic minerals are not compatible with syn-kinematic burial but are more representative of flattening dominated strain. Our observations lead to the same conclusion. In addition, the very short time span between the age of the youngest detrital zircon (2682 Ma, Davis 2002; Frieman et al., 2017) and the intrusion of the Fournière pluton (2682 Ma, Davis, 2002) is not adequately explained by the accretionary wedge hypothesis. Indeed, the sediments found in modern accretionary wedges were deposited on the lower plate before being accreted to the growing wedge. Flexural basins or trench fill basins are not environments where syn-sedimentation magmatism is readily found.

Mortensen and Card (1993) suggested that the contrasting metamorphic gradient between the Abitibi Subprovince and the Pontiac Subprovince is induced by the heating by granitic intrusions and a greater post-metamorphic uplift to the south. The inclusions of garnet within staurolite indicates that the pressure was in excess of 5 kbar during the prograde P-T path to allow the garnet stable assemblage to be crossed before the staurolite stable assemblage. The dip of the main foliation, progressively decreasing to the south, and the late to post-kinematic growth of metamorphic porphyroblasts are can be explained by post metamorphic uplift to the south but we lack kinematic indicators to support this model.

The absolute timing of prograde metamorphism in the northern Pontiac province deduced from garnet growth at 2657 ± 7 Ma is also of interest with respect to the evolution of the southern Superior Province. The major exhumation phase for the Pontiac province was estimated to have occurred between 2660 and 2643 Ma by Daigneault et al. (2002), which is not supported by our data. Rather,the results from our study suggest that the Pontiac was

thickened around 2657 Ma (burial path) when the Decelles magmatism contributed heat. The textures cannot rule out heating during the decompression path, as required by the model from Daigneault et al. (2002).

The data presented in this contribution on the age of the burial and/or heating of the Pontiac Subprovince at ca. 2657 ± 7 Ma also has implications for metallogenic models for the northeastern Pontiac Subprovince. These data integrated with Re-Os on molybdenite age of 2664 ± 11 Ma obtained from the Malartic gold deposit (de Souza et al., 2015), in the greenschist metamorphic zone next to the study area, indicate that the gold mineralization is pre- to syn-metamorphic. Considering the overlapping errors on geochronological data, we can rule out the possibility that the gold mineralization postdates the garnet growth metamorphic conditions that occurred close to the southern limit of the deposit (see Gaillard et al., in preparation).

2.6 Conclusions

The regional metamorphism of the north-western Pontiac Subprovince is syn- to late-kinematic with respect to the main event of deformation (D_2) and associated S_2 fabric. The composition of the core of the garnet is representative of prograde metamorphic conditions of 550-600 ºC and 5-6 kbar following a clockwise P-T path. These P-T conditions were reached at 2657±7 Ma according to the Lu-Hf dating of three garnet samples from the staurolite metamorphic zone south of Val d'Or and Malartic. While textural evidence of retrograde metamorphism is limited, the Fe# composition of the garnet rim, staurolite and biotite suggest these were likely re-equilibrated at lower temperature (440-470ºC) by exchange reactions. We attribute this retrograde effect to the slow cooling rate of the Pontiac Subprovince induced by the intrusion of the Decelles Batholith. The very short time span between the end of sedimentation and the first intrusive is not consistent with the model of an accretionary wedge and further detailed kinematic work on the shear related texture registered by the staurolite zone metamorphic assemblages will be required to elucidate the mechanisms responsible for these patterns. The data reported here also indicate that metamorphism occurred synchronously with or post-dated gold mineralization at the Canadian Malartic deposit.

3. IMPLICATIONS FOR THE CANADIAN MALARTIC FOOTPRINT

3.1 Structural and metamorphic analysis

The structural measurements, textural and field observations made from the extensive field mapping undertaken during this project contribute to the understanding of the structural setting of the intrusive rocks hosting the bulk of Canadian Malartic mineralization. These data have been presented in Perrouty et al. (2017) where the statistical variability of bedding orientation and dip is demonstrated to be spatially linked to interference pattern between F_1 and F_2 folds, a structure favourable to the localization of Timiskaming type intrusive rocks.

With the help of phase equilibria modeling (described previously), peak metamorphic conditions are constrained to be on the order of 550-600^{0}C and 5-6 kbar for staurolite zone assemblages, corresponding to a Barrovian gradient. Pseudosection modelling indicate that the Fe-Mg composition of biotite, garnet rim and staurolite from the staurolite zone were all re-equilibrated to greenschist conditions during retrograde metamorphism.

Helt et al. (2014) interpreted a minimum pressure of 1.6 ± 1.5 to 6.0 ± 3.5 kbar emplacement of the deposit based on the Ti in hydrothermal quartz geobarometry and a temperature of ~475^{0}C based on a combination of quartz-hematite and pyrite-barite geothermometry. This result is compatible to the prograde clock-wise P-T path leading to our modelled peak-metamorphic conditions.

3.2 Relative timing between gold mineralization and regional metamorphism

Most of the data presented in this project were collected in the vicinity of the Canadian Malartic deposit, which provided an opportunity to constrain the relative timing of gold mineralization, deformation and metamorphism. This study shows that the regional fabric in the northeastern Pontiac Subprovince is developed as a syn- to late-metamorphic lepido-porphyroblastic foliation, as expressed by snow-ball staurolite observed in some samples. As discussed in de Souza et al. (2015) and Perrouty et al. (2017), the gold mineralization at Canadian Malartic, and thus its hydrothermal halo, are interpreted locally as synchronous with the development of the main foliation, consisting of a pressure solution cleavage parallel to a foliation defined by micas. Whether this pressure solution-cleavage pre-dates, is

synchronous to or post-dates tectonometamorphism is of fundamental importance for the study of the hydrothermal footprint of a deposit. In simplest terms, the mineralogy of a pre-metamorphic mineralization and hydrothermal halo would have recrystallized according to the super-imposed metamorphic conditions, whereas a post-metamorphic mineralization and footprint would only show hydrothermal assemblages. These two conflicting possibilities would call for strongly contrasting exploration tools and strategies, possibly including strategies for hydrothermal haloes metamorphosed up to amphibolite facies.

Observations from the biotite zone to the staurolite zone suggest that the pressure-solution cleavage grades into the regional lepido-porphyroblastic foliation, an interpretation also presented by Perrouty et al. (2017). This texture indicates that the Canadian Malartic mineralization is metamorphosed. Gaillard et al. (in preparation) reports replacement textures, like pyrrhotite overgrowths on gold-bearing pyrite grains that indicate a pre-metamorphic mineralization event, which could be interpreted as a prograde metamorphic reactions, or as a change in oxygen fugacity. Despite indirect inferences suggesting a pre-metamorphic mineralization event, the absence of direct textural evidence, such as relationships of metamorphic porphyroblasts with mineralization or the hydrothermal halo, left attempts at constraining the relative timing between the two events debatable. The solution required absolute dating of metamorphic phases.

In this study Lu-Hf radiometric dates from garnet concentrates from 3 samples in the staurolite zone of the northeastern Pontiac Subprovince were obtained. All three samples yielded the same date within error, at ca. 2657 ± 7 Ma. Phase equilibria modeling and trace element garnet chemistry both indicate that these dates should be interpreted as garnet growth ages. Textural relationships, like garnet included in late-kinematic staurolite, point to early kinematic garnet growth, indicating that the main lepido-porphyroblastic fabric forming the regional fabric would have formed at or after 2657 Ma. Cross-cutting relationships with Timiskaming age dikes and Re-Os molybdenite radiometric dating constrains the mineralization event to between ~2670 and 2664 ± 11 Ma. Despite important error bars on the geochronological data, the possibility that the gold mineralization post-dated garnet growth near the southern limit of the deposit can be ruled out (see Gaillard et al., in preparation). These data are consistent with the deposit forming before or during regional metamorphism.

3.3 Comparison between the Val-d'Or and Malartic localities

In order to qualitatively identify any departure of mineral chemistry from a regional trend, we compared the results from specimens collected in the vicinity of Malartic to those of similar rocks from the same metamorphic zones south of Val-d'Or outside the Canadian Malartic hydrothermal footprint (Figure 2). These results do not indicate any notable difference in the conditions (P-T estimates) and timing (Lu-Hf dating) of prograde or retrograde metamorphism within the garnet and staurolite zones at the two localities. It is worth noting that pseudosection modelling of sample 1570 from south of Val d'Or was likely more affected by retrogression than the two other samples because of the lack of intersection between the garnet isopleths in Figure 19a. The spatial distribution of isograds are farther spaced south of Val d'Or (Figure 2). This difference may reflect the shallower dip of the main foliation east of Malartic. When considering mineral chemistry, once again, there are no notable differences between the compositions of the metamorphic phases from the Malartic and Val-d'Or transects. We observe the same variety of chemical zoning and crystal habits for garnet, the same absence of chemical zoning in staurolite and the same constant composition of matrix minerals. The Fe-Mg K_D between garnet and biotite show a similar pattern in the garnet zone and the staurolite zone in both localities (Figure 20) as well as the Ti-in-biotite thermometry (Henry et al., 2005) results for the biotite, garnet and staurolite zones (Figure 21). In contrast, hyperspectral imaging, used to determine the composition of hydrous minerals (Lypaczewski et al., unpublished results) has been interpreted to show that white mica compositions in the biotite metamorphic zone vary significantly in the Malartic hydrothermal footprint from the values measured south of Val d'Or. However, resolving this difference does not fall within the scope of this study.

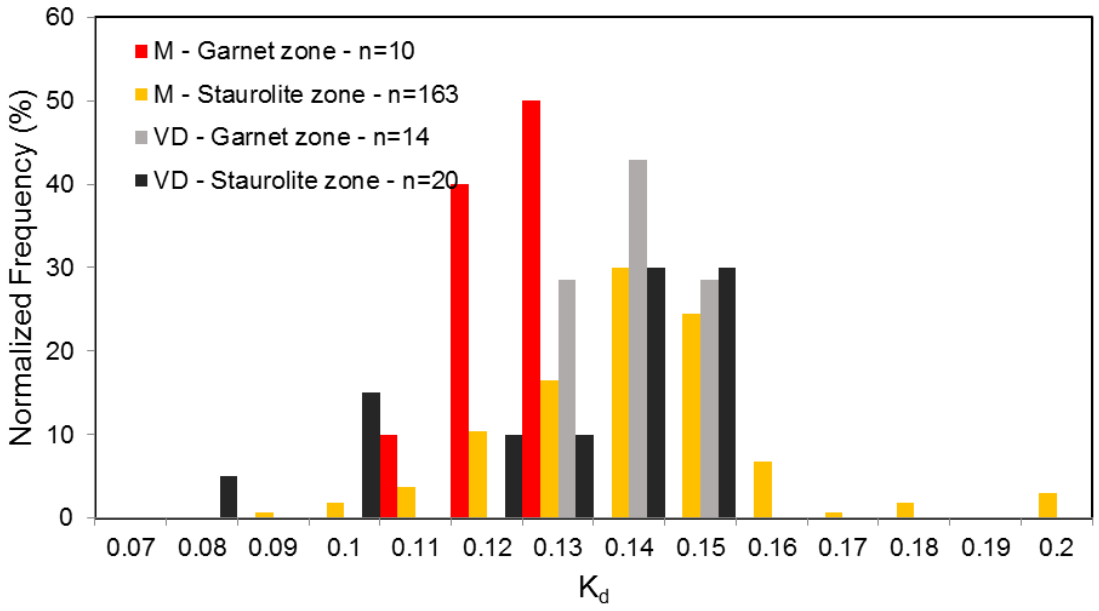


Figure 20 : Fe-Mg Garnet-Biotite partitioning coefficient histogram (normalized to 100) according to metamorphic zone and sampling locality (M=Malartic, VD=Val d'Or). Following the Ferry and Spear calibration (1978), Malartic garnet and staurolite zone most frequent KD correspond respectively to temperatures of 474 and 494°C and in the Val d'Or locality both the garnet and staurolite zone corresponds to a temperature of 494°C.

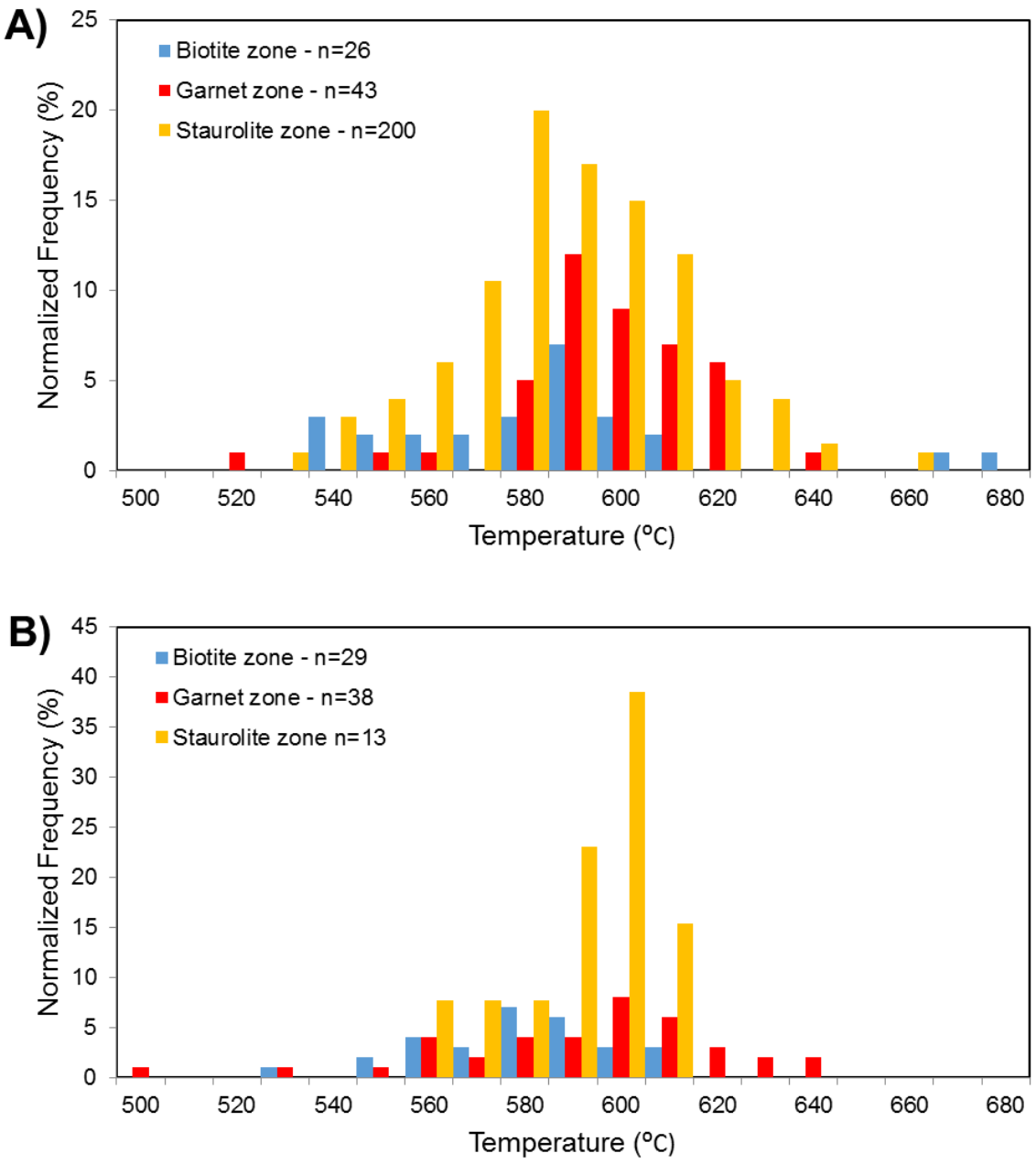


Figure 21 : Histogram of Ti-in-biotite geothermometry results according to metamorphic zone in the Malartic locality (A) and the Val d'Or locality (B). A) At the Malartic locality, biotite from all the metamorphic zones have compositions representative of an equilibria around 580 to 590°C. B) In the Val d'Or locality, biotite from the biotite and garnet zone show a range of equilibrium temperature similar to the Malartic locality but no frequency peak can readily be identified. In the staurolite zone, biotite compositions have a more restricted equilibrium temperature range than in the Val d'Or locality and a higher mean at 600°C. Those differences, however, are not significant based on the uncertainty of the method.

3.4 Recrystallization of the hydrothermal halo

Raskevicius (2017) demonstrated that the hydrogen isotopic composition of the greywacke (δ^2H) hosting the Canadian Malartic deposit has been modified by hydrothermal alteration at a temperature of 300-350 ºC. He argued that the equilibria temperature of ~475ºC from Helt et al. (2014) can be attributed to metamorphic recrystallization of the hydrothermal halo. This result is in direct agreement to the timing and intensity of regional metamorphism constrained in this study. These new results have a significant impact on our understanding of the mineralogical and petrophysical footprint of the Canadian Malartic deposit. First, as shown by Raskevicius (2017), Gaillard et al. (in preparation) and Lypaczewsky et al. (unpublished results), the Canadian Malartic footprint appears to have preserved its hydrothermal signature despite the ensuing regional metamorphic overprint and deformation. It is important to note, however, that the hydrothermal halo is hosted in the chlorite and biotite metamorphic zones of the regional gradient, where slow greenschist metamorphic reaction rates render metamorphic overprinting on hydrothermal rocks inefficient. The southernmost part of the hydrothermal halo have been exposed to higher temperature and to ductile deformation. In such a case, the use of tools relying on chlorite and biotite zone minerals must be adapted to the amphibolite context where tectonometamorphism may have obliterated the hydrothermal origin of the investigated minerals. Indeed, the extent of the footprint as defined on the basis of structural characteristics (Perrouty et al., 2017), mica compositions (Gaillard et al., in preparation; Lypaczewski et al., unpublished results) and rock physical properties (Lafrenière-Bérubé et al., in preparation) all stop close to the staurolite isograd, where the potential for metamorphic recrystallization significantly increased with T and ductile deformation.

It is possible that either the hydrothermal halo does not extend farther south into the amphibolite facies, or that it does, but the tools used to track the hydrothermal character of greenschist facies minerals are ineffective once the rocks recrystallized past a given extent. In the latter case, it still may be possible to track the footprint, on the assumption that regional metamorphism is isochemical. Because the fluid-rock ratio during regional metamorphism is significantly smaller than that of hydrothermal event, it is unlikely that elements added to or leached from the rock during metasomatism will be removed or added back during regional metamorphism. Therefore, whole rock chemistry changed at a larger scale during hydrothermal alteration than the diffusion range of elements during peak metamorphism. This altered chemistry would likely result in meta-greywackes showing either mineral

chemistries departing from the regional trend, or peculiar modal proportions. In particular, recent results have highlighted potassium and carbonate alteration (Gaillard et al., in preparation) and the distinctively lower δ^2H of meta-greywacke around the deposit (Raskevicius, submitted). It is beyound the scope of this study to investigate the quantitative effects of such alteration, but it is reasonable to conceptualize that: (A) the potassic alteration would affect the modal proportions of K-bearing minerals; (B) the carbonate alteration might not survive de-carbonation reactions at amphibolite facies; and (C) the whole rock δ^2H composition of greywackes will not be affected by modal change in hydrous mineral during retrograde metamorphism without fluid of different isotopic composition being added to the system. The pyrite zone of the alteration halo would have the best chance of being detectable at higher grade because the persistence of hydrothermal sulfides at higher temperature would still segregate Fe, causing the Mg# of biotite and other mafic phases to depart from predicted metamorphic trends. Therefore, understanding the metamorphic mineral compositional trends that are overprinted onto the footprint is key to understand mineralogical vectors that will help target the mineralization during future exploration in a similar setting.

4. CONCLUSION

Ce projet de recherche a permis de cartographier en détail les isograde de terrain séparant la zone métamorphique à biotite, grenat et staurotide dans le secteur nord-est de la Sous-Province de Pontiac. Les observations texturales liant les porphyroblastes métamorphiques à la foliation régionale ont permis de démontrer que le métamorphisme est syn- à tardi-cinématique par rapport à l'épisode de déformation régional. Ce résultat a permis de démontrer que l'épisode de minéralisation principal de Canadian Malartic est probablement anté- à syn-cinématique au métamorphisme régional. Cette interprétation est confirmée par le résultat de datation par Lu-Hf des grenats de la zone à staurotide qui ont un âge de croissance de 2657 ±7 Ma. Les estimations de conditions de température permettant l'équilibration du Fe et Mg entre la biotite et le grenat ainsi que la composition en Fe, Mg et Ti des biotites suggère qu'il n'y a pas de variation significative de température d'équilibration des zones à staurotide, grenat et biotite ce qui contrevient à l'observation même d'isogrades de terrain de type Barrovien. Les modélisations par équilibre de phase (pseudosection) de trois échantillons clefs suggère des conditions d'équilibration prograde des cœurs de grenat de 550-600^{0}C et 5-6 kbar et une température d'équilibre rétrograde du ratio Fe/Mg des bordures de grenat, du staurotide et de la biotite à 440-470ºC. Il est probable que la présence du batholihe de Decelles ait contribué à diminuer le taux de refroidissement de la Sous-Province de Pontiac et d'ainsi permettre à la composition en Fe et Mg de ces phases de s'équilibrer lors du métamorphisme rétrograde par échange de cation. Les résultats de ce projet ne permettent pas de soutenir le modèle tectonique de prisme d'accrétion présentement en vigueur pour cette Sous-Province. De plus, ils suggèrent que le halo d'altération de la mine de Canadian Malartic est probablement affecté par le métamorphisme régional ce qui rend possible l'exploration de ce type de gisement à l'aide des vecteurs d'explorations définis dans le projet CMIC-Footprint que dans un contexte métamorphique similaire. À plus haut grade métamorphique, la dévolatilisation du CO_2 caractérisant l'altération proximale du gisement ainsi que la déstabilisation des micas blancs sont susceptibles de diminuer l'efficacité de ces vecteurs d'exploration pour cibler un gisement similaire. En contrepartie, l'altération potassique proximale et la séquestration du Fe dans les sulfures sont des phénomènes qui permettront de retracer un gisement similaire à plus haut grade métamorphique.

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6. APPENDICES

APPENDIX I: FIELD OBSERVATIONS

Table 1: Lithology codes (based on MERN codes).

Code	Rock type	Code	Structure	Mineral	
S3	Greywacke	S0	Bedding	Fsp	Feldspar
V3	Mafic Volcanic	S2	Main foliation	Q	Quartz
S1	Sandstone	Q3	Cleavage	Bi	Biotite
I2C	Quartz syenite	Pol	Bedding polarity	Mu	Muscovite
I2J	Diorite	Pol=0	Unknown	G	Garnet
I3A	Gabbro	Pol=1	North	St	Staurolite
I2I	Quartz diorite	Pol=2	South	Amp	Amphibole
I1	Felsic intrusive			And	Andalusite (?)
I2	Monzodiorite				
S	Sedimentary rock				
Fe	Iron formation				
V3B	Basalt				
I1L	Syenogranite				

Table 2: Field observations.

ID	utm	X	Y	Rock						S0*		Pol	S2		Q3		Lineation	
					Bi	Mu	G	St	Amp	S	D		S2	D	S	D	Dir	Dip
1500	17	712771	5334865	S3	1					265	89	0	305	79				
1501	17	712201	5335406	V3	1								310	81				
1502	17	712168	5335372	S1	1								217	90				
1503	17	712470	5333104	S3						106	89	2	106	89				
1504	17	712243	5333159	S3	1	1							115	83			287	89
1505	17	712504	5331608	S3	1	1	1	1					289	71				
1506	17	712724	5331525	S3	1					102	84	1	102	84	34	99		
1507	18	283116	5329876	S3	1					285	71	2	285	71				
1508	18	282877	5329097	S3	1					289	88	2	289	88				
1509	18	284169	5327047	S3	1	1			1				280	87				
1510	18	285016	5327246	S3									100	84				
1511	18	284904	5328248	S3	1	1							102	90				
1512	18	284574	5328808	S3	1								103	86				
1513	18	284574	5328808	S3	1	1			1				286	90				
1514	18	285620	5326746	S3	1	1			1				293	82			106	41
1515	18	283910	5325600	S3	1	1							275	90				
1516	18	281483	5324049	S3	1		1						279	60				
1517	18	282238	5324706	S3	1	1	1	1		267	77	0	276	76	285	40	77	53
1518	18	282811	5325077	S3	1	1	1			292	76	2	265	76			78	38
1519	18	279194	5321027	S3	1								51	80				
1520	17	712031	5328670	S3	1	1	1	1	1	300	81	0	298	81				
1562	18	290948	5317913	S3	1	1	1	1					282	31			35	29
1563	18	291164	5317952	S3	1	1	1	1	1				280	32			46	27
1564	18	292255	5311534	I2C														
1565	18	292117	5311915	I2C														
1566	18	291863	5312311	S3	1													
1567	18	291694	5312664	S3			1						331	40			71	40
1568	18	295754	5320600	S3	1					304	72	1	304	72				
1569	18	297679	5323364	S3	1					94	80	2	94	80				
1570	18	291982	5318104	S3	1		1	1		329	33	2	329	33	320	34	69	33
1571	18	290801	5317303	S3	1		1	1		277	39	0	277	39				
1589	18	297817	5323488	S3	1					100	80	2	100	80				
1590	18	297431	5323158	S3	1					100	76	0	100	76				
1591	18	296857	5322863	S3	1					280	78	0	275	69			61	56
1592	18	296497	5322415	S3	1					90	76	2	278	82	240	86	65	76
1593	18	296362	5322122	S3	1					92	77	2	97	79			118	62
1594	18	296186	5321856	S3	1	1				80	88	1	80	88	281	70		
1603	17	718030	5332467	S3	1	1				259	82	1	259	82			53	72

*Strike/Dip measurement convention

Table 2 continued: Field observations.

ID	utm	X	Y	Rock						S0		Pol	S2		Q3		Lineation	
					Bi	Mu	G	St	Amp	S	D		S2	D	S	D	Dir	Dip
1604	17	718389	5332248	S3	1	1				263	86	1	263	86	235	85	59	80
1605	17	718571	5333957	S3	1	1				260	85	1	286	75				
1606	17	716937	5333327	S3	1	1				112	86	1	112	86				
1607	17	716590	5332750	S3	1	1				276	74	1	276	74	290	80	13	74
1608	17	716730	5332475	S3	1	1							275	88	40	85	32	88
1609	17	716994	5332476	S3	1	1							263	83				
1610	17	715253	5331506	S3	1	1	1	1		96	9	2	278	87	360	70	284	65
1611	17	715705	5331468	S3	1	1							85	83				
1612	17	716720	5331649	S3	1	1							270	85			279	60
1613	18	294839	5319816	S3	1	1							316	62			349	46
1614	18	296041	5321303	S3	1					281	84	0	281	84	320	90	11	84
1615	18	296113	5321642	S3	1	1				285	82	1	255	82			266	53
1616	17	717184	5332204	S3	1	1				274	84	1	274	84			284	58
1617	17	716654	5332201	S3	1					274	85	2	274	85			286	67
1618	17	716231	5327166	I2J									275	99				
1619	17	717305	5326534	I3A														
1620	17	715619	5327520	I2J									280	99				
1621	17	715813	5327914	I2I									100	70				
1622	17	716372	5328917	I3A														
1623	17	716383	5328737	I2J									260	99				
1624	17	716651	5329610	I2J									5	99				
1625	17	718590	5327461	I2J									70	85				
1626	17	720234	5329914	S3	1	1	1	1		97	67	0	97	67	160	84		
1627	17	721893	5328054	I2I									305	99				
1628	17	722143	5325816	S3	1	1				66	85	0	66	85			71	45
1629	17	720950	5325432	S3	1	1				65	75	0	65	75	295	84	89	57
1630	17	720560	5325554	S3	1					65	99	0	65	99				
1631	17	720153	5325727	S3	1	1							90	72			107	42
1632	17	720099	5325863	I2I									105	75				
1633	17	719645	5325472	S3	1	1							100	90	84	20	100	70
1634	17	719271	5325428	S3	1	1			1				278	80	135	99		
1635	17	719438	5325349	S3	1	1							90	76				
1636	17	719003	5325490	S3	1		1						90	89				
1637	17	718489	5325443	S3	1													
1638	17	718096	5325954	I2I									100	90				
1639	17	713272	5321470	I16														
1640	17	713277	5322034	S3	1	1							335	25	70	99	66	25
1641	17	711878	5325367	I3A									30	68				

Table 2 continued: Field observations.

ID	utm	X	Y	Rock						S0		Pol	S2		Q3		Lineation	
					Bi	Mu	G	St	Amp	S	D		S2	D	S	D	Dir	Dip
1642	17	711989	5325610	I2HR						330	99	0						
1643	17	713253	5326791	S3	1	1							335	88	260	70	148	74
1644	17	712789	5331268	S3	1	1	1	1					315	99				
1645	17	716312	5334685	S3									278	70	105	45	67	54
1646	17	716057	5334679	S3									272	75			77	43
1647	17	705022	5334536	S3	1					85	99	2	80	80				
1648	17	705797	5334600	S3	1	1	1	1		105	85	1	105	85			279	50
1649	17	706262	5334680	S3	1	1				5	75	0	295	88				
1650	17	706669	5334652	S3	1	1				294	89	1	130	85	170	83	135	47
1651	17	706809	5334668	S3	1	1	1	1	1	284	83	2	130	82	60	99		
1652	17	707209	5334712	S3	1	1				184	99	0	274	85				
1653	17	707332	5334735	S3	1	1	1	1		104	74	1	170	70				
1654	17	707915	5334794	S3	1	1	1	1		96	81	2	130	84	331	77	150	73
1655	17	708522	5334732	S3	1	1	1			300	85	0	328	86				
1656	17	708353	5335361	S3	1	1				110	85	2	130	79	10	38	160	69
1657	17	708892	5334866	S3	1	1				305	78	0	305	78	350	99	81	73
1658	17	709263	5335016	S3	1	1	1			316	85	1	316	85	350	40	119	73
1659	17	710007	5335035	S3	1	1				316	90	1	312	76	339	24		
1660	17	710563	5334926	S3	1					80	99	0	104	52				
1661	17	711250	5335173	S3	1					35	90	0	318	30				
1662	17	711010	5334726	S3	1		1			318	99	0	320	71				
1663	17	711726	5334450	S3	1					298	89	0	320	99				
1664	17	712155	5334377	S3	1					95	82	0	105	85			273	67
1665	17	712530	5334675	S3	1					294	79	1	294	79			93	62
1666	17	712749	5327621	S3	1	1	1	1		320	85	0	320	85				
1667	17	712114	5326734	S3	1	1							235	64				
1668	17	712145	5327019	S3	1	1							310	72	354	90		
1669	17	712324	5327321	S3														
1670	17	712316	5327324	S3	1	1	1	1					308	66				
1671	17	712800	5331893	S3	1		1	1					110	85				
1672	17	712931	5332756	S3	1	1	1			290	88		290	88			291	24
1673	17	712205	5333989	S3	1	1	1						250	84			62	55
1674	17	712231	5333671	S3	1	1	1			284	89	2	284	89	300	28		
1675	17	710429	5337460	S1	1					110	76	2						
1676	17	711983	5326224	S3	1								340	75			24	69
1677	17	715041	5334573	S3	1					78	75	1						
1678	17	707978	5330260	I1									310	65				
1679	17	708156	5330252	S3	1	1	1	1		302	52	1	302	52	346	55	63	48

Table 2 continued: Field observations.

ID	utm	X	Y	Rock						S0		Pol	S2		Q3		Lineation	
					Bi	Mu	G	St	Amp	S	D		S2	D	S	D	Dir	Dip
1680	17	708340	5330411	S	1	1	1	1		294	51	0	294	51			47	49
1681	17	708699	5330666	S3	1	1	1	1		300	52	0	300	52			46	51
1682	17	708875	5330679	S3	1		1			332	64	0	332	64	100	99		
1683	17	708929	5330688	S3	1		1											
1684	17	708363	5330943	S3	1		1			104	44		104	44	314	44	235	36
1685	17	708427	5331115	Fe	0		1		1				310	68			53	67
1686	17	707739	5332097	V3	0		1			124	81	1	124	81	153	78	201	81
1687	17	707795	5331834	S3	1					278	72	2	90	99				
1688	17	709100	5331924	V3B														
1689	17	709280	5331962	S	1	1				300	75	0	300	75				
1690	17	709520	5332029	S3	1			1		296	85	0	296	85				
1691	17	709648	5332081	V3B									106	90				
1692	18	293248	5318415	S3	1	1	1	1					310	52			77	46
1693	18	294638	5319608	S3	1	1	1						310	52				
1694	18	297916	5324533	S3	1								100	90				
1695	18	297782	5324901	S3									100	90				
1696	17	710140	5332296	S3	1	1	1	1		310	74	0	310	74	277	90	323	38
1697	17	710413	5332415	S3	1	1	1	1		295	87	1	304	88			306	50
1698	17	710883	5332381	S3	1	1		1		298	84	0	298	84			306	53
1699	17	711196	5332304	S3	1		1			296	86	0	296	86			105	70
1700	17	711505	5332134	S3	1		1	1		294	83	0	294	83			324	73
1701	17	712020	5331763	S3	1	1	1	1		292	89	0	325	78			345	58
1702	17	709168	5337851	S3	1					310	70	0	110	65				
1703	17	709557	5337787	S3	1													
1704	17	710065	5337354	S3	1					58	22	0	278	85				
1705	17	710478	5336911	S3	1					5	20	0	290	41	280	78		
1706	17	710894	5336314	S3	1					45	50	0	310	50				
1707	17	711396	5335954	S3	1					115	90	2	115	90				
1708	18	279961	5322124	S3	1	1							263	50	350	71	35	42
1709	18	2979429	5321239	S3	1	1		1		271	62		271	62	5	75	59	45
1710	18	279203	5321162	S3	1	1		1		272	38		314	25	29	84	33	25
1711	17	722959	5318206	I1														
1712	17	723038	5319359	I1L														
1713	18	277676	5321725	S3	1	1	1	1		280	38		280	38			35	35
1714	18	279733	5323686	S3	1	1	1	1		287	54		287	54				
1715	17	715041	5334338	S	1					285	78		285	78			29	78
1716	18	714966	5334521	S3	1													

APPENDIX II: WHOLE ROCK CHEMISTRY

Table 1: Whole rock major element chemistry.

	1517	1562	1570	1593	1613	1642	1664	1666	1682	1698	1698 R
wt %											
Al_2O_3	16.60	16.90	17.20	20.30	15.90	19.70	19.30	18.60	15.00	18.90	19.10
CaO	1.85	1.88	2.02	1.15	2.68	1.78	2.72	2.66	1.86	2.50	2.49
Fe_2O_3	4.92	5.34	5.26	6.78	5.50	7.39	6.19	5.65	12.00	7.33	7.30
MgO	2.75	3.00	3.13	3.96	3.03	3.25	3.35	3.23	3.82	3.59	3.58
MnO	0.06	0.05	0.06	0.07	0.07	0.09	0.07	0.06	0.07	0.11	0.11
P_2O_5	0.12	0.12	0.12	0.11	0.10	<0.01	0.08	0.05	0.17	0.14	0.14
K_2O	2.49	2.45	2.04	4.52	1.64	2.26	2.40	2.13	2.40	2.56	2.64
Na_2O	2.80	2.69	2.91	1.54	3.62	2.50	3.37	3.28	2.44	3.48	3.46
TiO_2	0.60	0.62	0.62	0.72	0.60	0.73	0.73	0.66	0.65	0.81	0.81
LOI	1.40	1.60	1.00	3.10	1.10	1.50	1.10	1.20	0.70	1.00	1.00
SiO_2	66.20	65.20	66.00	57.10	65.90	61.10	59.80	63.10	60.60	60.10	60.00
SUM	99.79	99.85	100.36	99.35	100.14	100.30	99.11	100.62	99.71	100.52	100.63
moles											
Al_2O_3	0.16	0.17	0.17	0.20	0.16	0.19	0.19	0.18	0.15	0.19	0.19
CaO	0.03	0.03	0.04	0.02	0.05	0.03	0.05	0.05	0.03	0.04	0.04
FeO	0.06	0.07	0.07	0.09	0.07	0.09	0.08	0.07	0.15	0.09	0.09
MgO	0.07	0.07	0.08	0.10	0.08	0.08	0.08	0.08	0.09	0.09	0.09
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K_2O	0.03	0.03	0.02	0.05	0.02	0.02	0.03	0.02	0.03	0.03	0.03
Na_2O	0.05	0.04	0.05	0.02	0.06	0.04	0.05	0.05	0.04	0.06	0.06
TiO_2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SiO_2	1.10	1.09	1.10	0.95	1.10	1.02	1.00	1.05	1.01	1.00	1.00
%											
A	39.8	40.3	42.3	44.3	27.3	45.5	37.2	38.9	21.8	32.6	33.1
K	18.1	16.7	14.3	20.1	14.7	11.2	15.5	14.8	11.3	15.4	15.7
F	42.1	43.0	43.5	35.6	58.1	43.3	47.3	46.3	66.8	52.0	51.2
A	4.0	7.1	12.7	5.1	-1.7	22.1	5.9	8.7	-0.7	1.7	1.7
F	45.6	44.0	40.2	44.1	48.7	41.7	45.5	42.9	61.9	50.0	50.0
M	50.4	48.8	47.2	50.8	53.0	36.2	48.6	48.4	38.9	48.3	48.4

Table 2: Whole rock rare-earth and trace element chemistry.

	1517	1562	1570	1593	1613	1642	1664	1666	1682	1698	1698 R
ppm											
Ag	1	1	0	1	1	0	0	0	1	1	1
As	0	0	<0.1	0	0	0	0	<0.1	0	<0.1	0
Ba	622	693	620	1280	444	884	578	565	515	490	445
Be	1	1	1	1	1	2	2	2	1	2	2
Bi	0	0	<0.1	0	0	0	0	0	0	0	0
Cd	<0.1	<0.1	<0.1	<0.1	0	<0.1	0	<0.1	0	0	0
Ce	58	52	70	6	11	58	65	66	40	76	70
Co	12	19	20	17	17	25	17	18	15	18	16
Cs	2	2	2	2	2	2	2	2	2	2	2
Cu	16	35	34	12	42	29	17	21	13	36	37
Dy	2	2	2	1	1	2	2	2	2	2	2
Er	1	1	1	1	1	1	1	1	1	1	1
Eu	1	1	1	1	1	1	1	1	1	1	1
Ga	15	16	17	22	14	34	22	21	15	22	21
Gd	3	3	3	1	1	3	3	3	3	3	3
Ge	1	1	1	1	1	2	1	1	2	1	2
Hf	4	4	4	4	4	4	5	4	3	7	7
Ho	0	0	0	0	0	1	1	0	1	1	1
La	29	27	36	3	5	27	32	32	19	38	36
Lu	0	0	0	0	0	0	0	0	0	0	0
Mo	4	5	5	5	4	5	5	5	4	5	5
Nb	6	6	6	7	5	6	6	6	5	7	7
Nd	24	22	26	3	4	24	26	27	17	27	28
Ni	48	98	92	80	68	94	70	74	71	64	65
Pb	16	14	15	12	14	12	17	17	12	17	17
Pr	6	6	7	1	1	6	7	7	5	8	8
Rb	89	76	72	116	61	84	90	84	94	98	97
Sb	3	3	3	3	3	3	3	3	3	3	3
Se	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sm	4	4	4	1	1	4	4	4	3	5	4
Sn	2	2	3	4	2	1	3	1	2	2	3
Sr	337	287	282	193	371	310	422	424	303	381	388
Ta	1	1	1	1	1	1	1	1	1	1	1
Tb	0	0	0	0	0	0	0	0	0	0	0
Te	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
Th	8	7	8	9	6	7	9	8	5	12	11
Tm	0	0	0	0	0	0	0	0	0	0	0
U	2	2	2	3	2	2	3	3	1	3	3
W	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Y	12	13	14	8	9	15	15	15	16	16	16
Yb	1	1	1	1	1	1	1	1	1	1	1
Zn	46	67	61	77	59	382	116	102	41	170	167
Zr	146	135	137	127	133	132	166	165	101	246	242

APPENDIX III: MINERAL CHEMISTRY

Table 1: Biotite chemistry.

ID	1505 N5	1505 R10	1505 R9	1515 3	1515 7	1518 R1	1518 R8	1520 11	1520 12	1520 18	1520 19	1520 5
Oxide %												
SiO_2	35.93	35.99	36.33	37.61	36.83	37.13	36.28	36.25	36.62	36.32	36.41	36.11
TiO_2	1.65	1.48	1.55	1.07	1.57	1.45	1.44	1.88	1.87	1.83	1.86	1.78
Al_2O_3	20.45	19.96	19.65	19.39	18.97	19.49	19.28	19.50	20.23	19.63	19.76	19.63
FeO	17.37	16.99	17.40	17.17	16.88	17.28	17.68	17.44	17.13	16.39	16.82	18.00
MnO	0.06	0.04	0.08	0.17	0.12	0.09	0.11	0.12	0.08	0.08	0.08	0.09
MgO	10.79	10.64	10.91	11.64	11.51	11.75	11.33	11.36	11.31	11.34	11.61	11.48
CaO	0.00	0.01	0.00	0.03	0.02	0.01	0.01	0.01	0.04	0.00	0.00	0.10
Na_2O	0.19	0.24	0.44	0.16	0.15	0.27	0.23	0.36	0.38	0.37	0.34	0.26
K_2O	9.24	9.35	9.25	9.68	9.77	9.08	9.08	9.05	8.83	9.07	8.92	8.60
F	0.29	0.21	0.15	0.12	0.22	0.21	0.27	0.26	0.25	0.33	0.27	0.37
NiO	0.04	0.06	0.01	0.02	0.01	0.01	0.00	0.02	0.02	0.05	0.00	0.03
H_2O*	3.88	3.87	3.93	4.01	3.91	3.96	3.87	3.90	3.95	3.85	3.91	3.85
Total	100.02	98.86	99.72	101.19	100.10	100.87	99.74	100.19	100.79	99.26	100.03	100.44
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.362	5.429	5.438	5.536	5.493	5.476	5.438	5.403	5.399	5.437	5.409	5.372
Al^{iv}	2.638	2.571	2.562	2.464	2.507	2.524	2.562	2.597	2.601	2.563	2.591	2.628
Al^{vi}*	0.959	0.977	0.905	0.900	0.828	0.863	0.844	0.828	0.915	0.900	0.871	0.816
Ti	0.185	0.168	0.174	0.119	0.176	0.161	0.162	0.210	0.208	0.206	0.208	0.199
Fe	2.167	2.143	2.178	2.113	2.106	2.131	2.216	2.174	2.113	2.053	2.090	2.240
Mn	0.007	0.005	0.010	0.021	0.015	0.011	0.014	0.015	0.009	0.010	0.010	0.012
Mg	2.400	2.393	2.434	2.555	2.559	2.584	2.530	2.524	2.486	2.530	2.572	2.546
Ca	0.000	0.002	0.000	0.005	0.002	0.001	0.002	0.001	0.006	0.000	0.000	0.016
Na	0.056	0.070	0.127	0.047	0.044	0.076	0.068	0.105	0.108	0.109	0.099	0.075
K	1.759	1.799	1.766	1.817	1.858	1.708	1.736	1.721	1.661	1.733	1.691	1.632
OH	3.862	3.897	3.924	3.939	3.894	3.900	3.871	3.879	3.884	3.845	3.875	3.823
F	0.135	0.101	0.072	0.057	0.104	0.097	0.126	0.121	0.115	0.154	0.125	0.173
Met Zone	3	3	3	2	2	2	2	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1520 6	1562 B10	1562 B12	1562 B13	1562 B18	1562 N14	1562 N15	1562 N6	1562 N9	1562 R10	1562 R12	1562 R14
Oxide %												
SiO_2	35.97	35.54	35.70	35.60	35.84	35.95	35.82	35.58	36.20	36.29	35.85	36.58
TiO_2	1.90	2.11	1.66	1.79	1.76	1.70	1.94	1.38	1.68	1.90	2.05	1.91
Al_2O_3	19.97	18.94	19.26	19.81	19.81	19.52	19.35	19.69	19.56	19.70	19.01	19.91
FeO	16.59	17.10	16.94	16.82	16.18	17.00	16.32	16.97	16.79	16.21	16.26	16.07
MnO	0.09	0.12	0.13	0.08	0.08	0.10	0.09	0.12	0.12	0.11	0.14	0.09
MgO	10.83	11.62	12.24	11.99	12.23	11.73	11.69	12.32	11.81	11.17	11.70	11.41
CaO	0.03	0.01	0.00	0.02	0.07	0.05	0.01	0.01	0.00	0.01	0.03	0.03
Na_2O	0.37	0.04	0.10	0.24	0.31	0.19	0.30	0.08	0.24	0.35	0.18	0.19
K_2O	8.93	9.57	8.63	8.87	8.93	9.02	9.38	8.98	9.31	9.43	9.19	8.92
F	0.37	0.24	0.23	0.28	0.39	0.29	0.39	0.33	0.34	0.25	0.33	0.27
NiO	0.03	0.05	0.00	0.04	0.00	0.03	0.00	0.01	0.03	0.02	0.01	0.01
H_2O*	3.81	3.86	3.88	3.87	3.82	3.86	3.80	3.84	3.86	3.88	3.81	3.90
Total	98.95	99.33	98.97	99.48	99.51	99.53	99.10	99.42	100.07	99.46	98.58	99.41
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.406	5.362	5.368	5.330	5.352	5.385	5.389	5.339	5.395	5.428	5.415	5.444
Al^{iv}	2.594	2.638	2.632	2.670	2.648	2.615	2.611	2.661	2.605	2.572	2.585	2.556
Al^{vi}*	0.943	0.732	0.782	0.827	0.839	0.831	0.821	0.821	0.831	0.902	0.799	0.937
Ti	0.215	0.239	0.188	0.201	0.197	0.192	0.219	0.156	0.188	0.214	0.233	0.213
Fe	2.085	2.158	2.130	2.106	2.021	2.129	2.054	2.130	2.093	2.028	2.054	2.001
Mn	0.011	0.016	0.016	0.010	0.010	0.012	0.012	0.015	0.015	0.014	0.018	0.011
Mg	2.426	2.613	2.744	2.677	2.723	2.620	2.621	2.757	2.624	2.491	2.634	2.532
Ca	0.005	0.002	0.001	0.002	0.012	0.008	0.002	0.001	0.000	0.002	0.004	0.005
Na	0.107	0.011	0.029	0.069	0.091	0.055	0.089	0.023	0.070	0.103	0.054	0.056
K	1.712	1.842	1.655	1.694	1.702	1.723	1.800	1.719	1.771	1.799	1.771	1.694
OH	3.824	3.882	3.890	3.867	3.809	3.859	3.815	3.841	3.842	3.873	3.842	3.872
F	0.173	0.115	0.109	0.132	0.186	0.136	0.184	0.159	0.158	0.119	0.158	0.128
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1562 R4	1562 V10	1562 V11	1562 V14	1562 V3	1562 V5	1562 V7	1562 V8	1562 V9	1570-12	1570-14	1570-21
Oxide %												
SiO_2	36.15	34.02	35.68	35.79	35.52	35.76	35.60	35.08	36.16	36.41	36.28	36.38
TiO_2	1.52	6.38	1.76	1.85	1.78	1.78	1.62	1.80	1.73	1.71	1.48	1.57
Al_2O_3	19.82	18.11	19.37	19.39	19.38	19.16	19.32	19.18	19.42	19.72	20.00	19.53
FeO	16.64	16.81	17.10	16.76	17.32	18.00	17.15	17.90	16.78	15.94	13.94	15.79
MnO	0.10	0.15	0.15	0.10	0.14	0.12	0.09	0.14	0.15	0.16	0.04	0.09
MgO	11.66	11.31	12.01	11.79	11.33	11.24	12.08	12.44	11.84	11.94	12.65	12.27
CaO	0.02	1.27	0.04	0.00	0.00	0.02	0.00	0.01	0.00	0.02	0.03	0.04
Na_2O	0.09	0.07	0.06	0.10	0.07	0.08	0.10	0.05	0.13	0.27	0.29	0.27
K_2O	9.60	7.71	8.92	9.37	9.48	9.46	9.24	8.90	9.53	9.09	8.95	8.88
F	0.22	0.38	0.34	0.18	0.35	0.31	0.37	0.18	0.14	0.60	0.28	0.95
NiO	0.00	0.04	0.04	0.02	0.06	0.03	0.02	0.00	0.01			
H_2O*	3.91	3.83	3.83	3.91	3.80	3.83	3.81	3.90	3.95	3.73	3.87	3.59
Total	99.90	100.22	99.41	99.36	99.41	99.91	99.50	99.69	99.97	99.59	97.85	100.12
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.394	5.083	5.357	5.373	5.360	5.379	5.353	5.276	5.396	5.427	5.438	5.405
Al^{iv}	2.606	2.917	2.643	2.627	2.640	2.621	2.647	2.724	2.604	2.573	2.562	2.595
Al^{vi}*	0.879	0.273	0.785	0.804	0.806	0.776	0.777	0.677	0.812	0.892	0.972	0.824
Ti	0.170	0.717	0.199	0.209	0.202	0.201	0.183	0.203	0.194	0.192	0.167	0.176
Fe	2.076	2.100	2.148	2.104	2.186	2.265	2.156	2.251	2.094	1.987	1.747	1.962
Mn	0.012	0.019	0.019	0.012	0.017	0.016	0.011	0.018	0.019	0.020	0.005	0.011
Mg	2.594	2.519	2.689	2.639	2.549	2.520	2.707	2.788	2.633	2.652	2.827	2.717
Ca	0.004	0.203	0.007	0.000	0.001	0.003	0.000	0.002	0.000	0.003	0.005	0.006
Na	0.025	0.021	0.016	0.029	0.020	0.022	0.029	0.014	0.037	0.077	0.085	0.078
K	1.828	1.469	1.708	1.794	1.824	1.815	1.772	1.707	1.814	1.728	1.710	1.683
OH	3.896	3.818	3.832	3.912	3.828	3.847	3.821	3.914	3.932	3.714	3.867	3.555
F	0.104	0.181	0.163	0.087	0.169	0.149	0.177	0.086	0.068	0.285	0.133	0.444
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1570-28	1570-3	1571 N3	1571 R4	1571 R5	1589 10	1589 15	1589 16	1589 17	1589 18	1589 19	1589 2
Oxide %												
SiO_2	36.64	36.03	36.56	36.49	36.33	36.42	36.30	36.42	36.43	36.34	36.58	36.35
TiO_2	1.66	1.56	1.75	1.76	1.67	1.44	1.82	1.61	1.64	1.74	1.47	1.72
Al_2O_3	20.43	19.42	19.37	19.45	19.50	18.40	18.56	18.68	18.85	18.40	18.69	18.25
FeO	14.46	16.38	17.43	17.09	16.95	17.96	18.31	17.45	17.44	18.13	18.09	18.17
MnO	0.07	0.15	0.05	0.05	0.04	0.18	0.24	0.18	0.22	0.20	0.17	0.20
MgO	11.99	12.66	11.87	11.72	11.50	10.72	10.93	10.89	10.63	10.70	11.40	10.96
CaO	0.01	0.04	0.00	0.01	0.06	0.04	0.02	0.03	0.05	0.03	0.00	0.01
Na_2O	0.37	0.28	0.27	0.31	0.29	0.12	0.12	0.09	0.09	0.11	0.11	0.08
K_2O	9.16	8.79	8.79	8.99	8.82	9.23	9.47	9.71	9.57	9.41	9.72	9.66
F	1.47	0.16	0.19	0.15	0.29	0.15	0.23	0.13	0.15	0.25	0.10	0.32
NiO			0.03	0.00	0.01	0.03	0.04	0.02	0.00	0.00	0.03	0.05
H_2O*	3.34	3.94	3.95	3.96	3.87	3.87	3.88	3.91	3.90	3.84	3.96	3.82
Total	99.74	99.45	100.49	100.16	99.37	98.63	100.00	99.19	99.11	99.26	100.33	99.78
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.437	5.378	5.418	5.421	5.437	5.532	5.460	5.500	5.502	5.499	5.474	5.486
Al^{iv}	2.563	2.622	2.582	2.579	2.563	2.468	2.540	2.500	2.498	2.501	2.526	2.514
Al^{vi}*	1.010	0.795	0.803	0.827	0.876	0.827	0.751	0.825	0.857	0.782	0.771	0.734
Ti	0.185	0.175	0.195	0.196	0.188	0.165	0.206	0.182	0.186	0.198	0.165	0.195
Fe	1.794	2.045	2.160	2.124	2.122	2.281	2.303	2.204	2.203	2.295	2.264	2.293
Mn	0.009	0.018	0.006	0.006	0.005	0.023	0.031	0.023	0.029	0.026	0.022	0.025
Mg	2.652	2.816	2.622	2.595	2.564	2.427	2.451	2.451	2.393	2.415	2.543	2.465
Ca	0.002	0.006	0.000	0.001	0.009	0.006	0.004	0.004	0.008	0.005	0.000	0.002
Na	0.106	0.082	0.077	0.090	0.083	0.034	0.034	0.026	0.027	0.033	0.033	0.024
K	1.734	1.673	1.661	1.703	1.683	1.788	1.817	1.869	1.844	1.816	1.856	1.860
OH	3.309	3.922	3.909	3.928	3.864	3.923	3.891	3.937	3.928	3.877	3.955	3.850
F	0.689	0.076	0.089	0.072	0.136	0.074	0.109	0.060	0.069	0.119	0.045	0.150
Met Zone	3	3	3	3	3	1	1	1	1	1	1	1

Table 1 continued: Biotite chemistry.

ID	1589 20	1589 3	1589 4	1589 5	1589 6	1589 7	1589 8	1589 9	1592 n1	1592 n10	1592 n11	1592 n2
Oxide %												
SiO_2	36.32	36.68	36.60	36.50	36.06	36.48	36.75	36.64	36.71	36.37	36.64	36.35
TiO_2	1.54	1.75	1.61	1.72	1.67	1.62	1.41	1.72	1.61	1.75	1.42	1.91
Al_2O_3	18.41	18.56	18.68	18.82	18.24	18.73	18.76	18.86	18.44	18.21	18.30	18.49
FeO	18.07	18.41	18.44	17.57	18.56	18.30	18.33	17.10	18.37	18.51	18.37	18.61
MnO	0.23	0.19	0.25	0.20	0.17	0.22	0.19	0.19	0.16	0.18	0.18	0.16
MgO	10.82	10.95	10.94	10.90	11.06	11.14	11.18	11.36	10.83	10.86	10.73	10.82
CaO	0.03	0.01	0.01	0.09	0.01	0.04	0.02	0.01	0.02	0.03	0.03	0.01
Na_2O	0.13	0.08	0.10	0.09	0.10	0.09	0.11	0.12	0.11	0.06	0.11	0.04
K_2O	9.62	9.64	9.52	9.38	9.44	9.24	9.67	9.57	9.63	9.73	9.69	9.58
F	0.18	0.11	0.24	0.26	0.30	0.30	0.21	0.37	0.30	0.44	0.41	0.35
NiO	0.00	0.02	0.02	0.01	0.00	0.02	0.04	0.02	0.02	0.00	0.02	0.04
H_2O*	3.87	3.96	3.89	3.86	3.82	3.85	3.92	3.83	3.85	3.76	3.78	3.82
Total	99.32	100.51	100.42	99.47	99.56	100.11	100.66	99.86	100.10	99.91	99.83	100.28
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.498	5.486	5.481	5.492	5.460	5.470	5.486	5.486	5.515	5.493	5.529	5.462
Al^{iv}	2.502	2.514	2.519	2.508	2.540	2.530	2.514	2.514	2.485	2.507	2.471	2.538
Al^{vi}*	0.782	0.758	0.778	0.829	0.714	0.780	0.788	0.814	0.781	0.734	0.784	0.738
Ti	0.175	0.196	0.181	0.194	0.190	0.183	0.158	0.193	0.182	0.199	0.162	0.216
Fe	2.288	2.302	2.309	2.211	2.350	2.295	2.288	2.141	2.308	2.337	2.319	2.339
Mn	0.029	0.024	0.031	0.025	0.022	0.028	0.024	0.025	0.020	0.024	0.023	0.020
Mg	2.440	2.440	2.442	2.443	2.496	2.490	2.488	2.535	2.425	2.444	2.414	2.424
Ca	0.005	0.002	0.002	0.015	0.002	0.006	0.003	0.001	0.003	0.004	0.004	0.001
Na	0.039	0.023	0.029	0.027	0.028	0.027	0.032	0.035	0.032	0.018	0.033	0.010
K	1.856	1.839	1.819	1.800	1.822	1.767	1.842	1.828	1.845	1.874	1.866	1.836
OH	3.912	3.950	3.884	3.875	3.859	3.855	3.902	3.827	3.858	3.788	3.804	3.832
F	0.087	0.050	0.112	0.123	0.141	0.144	0.098	0.173	0.140	0.209	0.195	0.167
Met Zone	1	1	1	1	1	1	1	1	1	1	1	1

Table 1 continued: Biotite chemistry.

ID	1592 n4	1592 n6	1592 n7	1592 n8	1592 v2	1592 v4	1592 v5	1592 v6	1592 v7	1592 v8	1614 1	1614 12
Oxide %												
SiO_2	36.19	36.36	36.82	36.31	36.75	38.96	36.42	35.38	36.10	35.25	34.21	36.41
TiO_2	1.97	1.49	1.86	1.59	1.73	1.37	1.44	1.54	1.61	1.68	1.56	1.66
Al_2O_3	18.44	18.26	18.41	18.43	18.66	21.99	18.06	18.79	18.68	18.66	20.34	18.64
FeO	19.17	18.28	18.59	18.03	18.30	14.84	18.15	19.08	18.61	20.27	19.05	18.63
MnO	0.13	0.13	0.19	0.17	0.17	0.13	0.11	0.10	0.14	0.14	0.17	0.17
MgO	10.71	10.96	11.06	10.62	10.67	8.75	11.14	10.82	10.44	11.00	11.27	10.59
CaO	0.03	0.11	0.03	0.03	0.02	0.04	0.01	0.02	0.02	0.01	0.10	0.02
Na_2O	0.08	0.08	0.06	0.06	0.12	0.11	0.07	0.02	0.07	0.02	0.04	0.16
K_2O	9.66	9.09	9.40	9.59	9.68	9.45	9.45	9.25	9.52	8.77	7.84	9.38
F	0.38	0.25	0.44	0.24	0.30	0.05	0.44	0.12	0.20	0.29	0.14	0.19
NiO	0.01	0.03	0.02	0.00	0.08	0.08	0.02	0.07	0.00	0.05	0.04	0.01
H_2O*	3.81	3.84	3.81	3.84	3.86	4.08	3.74	3.88	3.86	3.82	3.88	3.88
Total	100.61	99.07	100.77	98.97	100.40	99.96	99.11	99.23	99.46	100.07	98.73	99.86
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.440	5.511	5.497	5.511	5.504	5.686	5.526	5.381	5.466	5.338	5.195	5.485
Al^{iv}	2.560	2.489	2.503	2.489	2.496	2.314	2.474	2.619	2.534	2.662	2.805	2.515
Al^{vi}*	0.706	0.772	0.737	0.809	0.797	1.468	0.756	0.749	0.800	0.670	0.836	0.794
Ti	0.222	0.170	0.208	0.181	0.194	0.150	0.164	0.176	0.183	0.192	0.178	0.188
Fe	2.409	2.317	2.320	2.288	2.292	1.811	2.303	2.426	2.356	2.567	2.419	2.348
Mn	0.017	0.017	0.024	0.022	0.021	0.015	0.014	0.013	0.017	0.017	0.021	0.022
Mg	2.399	2.477	2.461	2.403	2.383	1.903	2.519	2.453	2.357	2.482	2.552	2.377
Ca	0.004	0.017	0.005	0.005	0.003	0.005	0.002	0.003	0.004	0.002	0.016	0.003
Na	0.024	0.024	0.018	0.016	0.035	0.031	0.019	0.005	0.021	0.007	0.010	0.046
K	1.851	1.758	1.789	1.857	1.849	1.759	1.830	1.793	1.838	1.695	1.519	1.802
OH	3.821	3.879	3.794	3.884	3.856	3.974	3.787	3.940	3.901	3.861	3.927	3.903
F	0.179	0.119	0.205	0.115	0.144	0.023	0.210	0.059	0.096	0.139	0.068	0.091
Met Zone	1	1	1	1	1	1	1	1	1	1	2	2

Table 1 continued: Biotite chemistry.

ID	1614 13	1614 14	1614 15	1614 19	1614 2	1614 4	1614 5	1614 6	1614 7	1614 8	164 10	1640 R1
Oxide %												
SiO_2	36.46	36.60	36.74	37.22	36.72	36.48	36.61	36.43	36.52	36.07	35.53	36.69
TiO_2	1.49	1.68	1.79	1.81	1.91	2.15	1.31	1.58	1.75	1.77	1.47	2.65
Al_2O_3	17.95	18.39	18.25	18.24	18.92	18.75	18.21	18.61	18.52	19.22	18.92	18.55
FeO	18.35	18.53	18.00	17.81	18.12	18.05	18.37	18.58	18.55	18.21	18.81	16.60
MnO	0.19	0.14	0.15	0.17	0.17	0.17	0.17	0.18	0.20	0.20	0.15	0.38
MgO	11.02	10.56	10.68	10.62	10.58	10.31	10.81	10.72	10.65	10.86	10.12	11.41
CaO	0.01	0.00	0.00	0.02	0.07	0.06	0.00	0.05	0.03	0.08	0.02	0.00
Na_2O	0.13	0.13	0.10	0.14	0.13	0.08	0.12	0.09	0.11	0.05	0.03	0.07
K_2O	9.47	9.61	9.95	9.65	9.67	9.59	9.62	9.72	9.63	9.12	9.69	9.55
F	0.35	0.12	0.17	0.19	0.14	0.09	0.22	0.31	0.23	0.31	0.26	0.20
NiO	0.01	0.04	0.00	0.03	0.01	0.06	0.04	0.05	0.00	0.03	0.02	0.00
H_2O*	3.79	3.92	3.90	3.91	3.95	3.95	3.86	3.84	3.88	3.84	3.80	3.93
Total	99.34	99.92	99.91	99.86	100.57	99.89	99.40	100.31	100.17	99.93	98.91	100.16
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.527	5.512	5.529	5.583	5.482	5.480	5.541	5.477	5.489	5.415	5.428	5.465
Al^{iv}	2.473	2.488	2.471	2.417	2.518	2.520	2.459	2.523	2.511	2.585	2.572	2.535
Al^{vi}*	0.733	0.776	0.766	0.807	0.810	0.800	0.789	0.774	0.769	0.816	0.834	0.723
Ti	0.170	0.191	0.203	0.205	0.214	0.243	0.149	0.179	0.198	0.200	0.169	0.297
Fe	2.326	2.334	2.266	2.234	2.263	2.268	2.326	2.336	2.332	2.286	2.403	2.068
Mn	0.024	0.018	0.019	0.021	0.021	0.021	0.021	0.023	0.025	0.026	0.019	0.048
Mg	2.490	2.370	2.396	2.375	2.354	2.308	2.438	2.402	2.386	2.429	2.305	2.534
Ca	0.001	0.000	0.000	0.004	0.010	0.010	0.000	0.008	0.005	0.012	0.003	0.000
Na	0.038	0.037	0.030	0.039	0.039	0.023	0.034	0.027	0.033	0.015	0.010	0.019
K	1.831	1.846	1.910	1.846	1.842	1.838	1.856	1.864	1.846	1.747	1.887	1.814
OH	3.829	3.937	3.917	3.909	3.929	3.959	3.894	3.851	3.890	3.849	3.873	3.902
F	0.169	0.059	0.082	0.091	0.068	0.041	0.105	0.149	0.108	0.149	0.124	0.096
Met Zone	2	2	2	2	2	2	2	2	2	2	2	3

Table 1 continued: Biotite chemistry.

ID	1640 R4	1642 13	1642 16	1642 17	1642 6	1648 B8	1648 R2	1648 R3	1648 V1	1648 V3	1648 V4	1651 B3
Oxide %												
SiO_2	36.64	35.98	36.02	35.33	36.35	35.76	36.11	36.11	35.66	36.36	35.51	36.10
TiO_2	2.63	1.65	1.69	1.40	1.84	1.66	1.73	1.89	1.74	1.72	2.00	1.50
Al_2O_3	18.38	19.78	19.62	19.91	19.51	19.32	19.51	19.38	19.26	19.31	19.28	19.37
FeO	17.09	17.17	17.11	18.32	16.33	18.43	17.62	17.74	18.14	17.66	17.94	18.05
MnO	0.36	0.06	0.12	0.13	0.08	0.08	0.08	0.09	0.08	0.07	0.07	0.10
MgO	11.33	11.22	11.27	11.29	11.58	10.98	11.15	11.35	11.24	10.99	11.55	13.30
CaO	0.01	0.00	0.01	0.02	0.00	0.03	0.01	0.06	0.05	0.02	0.12	0.05
Na_2O	0.11	0.07	0.12	0.10	0.12	0.24	0.29	0.30	0.28	0.31	0.27	0.11
K_2O	9.59	9.52	9.38	8.85	9.86	8.97	9.06	9.19	8.77	9.17	8.78	8.67
F	0.19	0.26	0.21	0.21	0.16	0.17	0.14	0.25	0.29	0.21	0.21	0.20
NiO	0.03	0.03	0.09	0.00	0.02	0.03	0.01	0.00	0.00	0.03	0.03	0.03
H_2O*	3.93	3.87	3.89	3.87	3.94	3.90	3.93	3.90	3.84	3.90	3.89	3.97
Total	100.40	99.67	99.56	99.61	99.94	99.73	99.65	100.36	99.43	99.76	99.70	101.48
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.461	5.393	5.403	5.318	5.420	5.382	5.411	5.387	5.374	5.447	5.335	5.315
Al^{iv}	2.539	2.607	2.597	2.682	2.580	2.618	2.589	2.613	2.626	2.553	2.665	2.685
Al^{vi}*	0.691	0.888	0.872	0.851	0.849	0.809	0.856	0.794	0.796	0.857	0.748	0.677
Ti	0.294	0.186	0.191	0.158	0.206	0.188	0.195	0.212	0.197	0.193	0.226	0.166
Fe	2.130	2.152	2.147	2.307	2.037	2.320	2.208	2.213	2.286	2.213	2.254	2.223
Mn	0.046	0.008	0.015	0.016	0.010	0.010	0.010	0.011	0.010	0.008	0.009	0.012
Mg	2.516	2.507	2.520	2.534	2.574	2.463	2.490	2.524	2.525	2.455	2.587	2.919
Ca	0.001	0.000	0.002	0.004	0.000	0.005	0.002	0.010	0.008	0.003	0.019	0.007
Na	0.032	0.022	0.035	0.029	0.035	0.070	0.085	0.085	0.083	0.089	0.077	0.031
K	1.823	1.820	1.795	1.699	1.875	1.721	1.731	1.749	1.686	1.752	1.682	1.629
OH	3.908	3.875	3.891	3.888	3.921	3.917	3.929	3.880	3.857	3.899	3.897	3.902
F	0.091	0.123	0.100	0.100	0.077	0.081	0.068	0.117	0.140	0.099	0.099	0.091
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1651 B5	1651 B6	1651 R4	1651 R5	1651 R7	1651 V1	1651 V2	1651 V4	1651 V5	1651 V6	1658 N11	1658 N12
Oxide %												
SiO_2	36.48	36.53	36.50	36.47	36.10	35.64	36.62	36.86	36.28	36.67	36.34	36.94
TiO_2	1.56	1.47	1.60	1.71	1.34	1.45	1.51	1.56	1.40	1.48	1.69	1.68
Al_2O_3	19.21	19.36	20.27	19.30	19.04	19.38	19.38	19.33	19.27	19.31	19.08	19.63
FeO	17.34	17.38	17.80	17.61	17.74	17.43	17.51	17.36	17.37	17.79	17.93	17.91
MnO	0.07	0.05	0.09	0.00	0.09	0.07	0.08	0.09	0.09	0.07	0.11	0.14
MgO	11.88	11.82	11.84	11.65	11.79	11.58	11.79	11.88	11.34	11.94	11.05	11.10
CaO	0.03	0.01	0.06	0.04	0.03	0.03	0.01	0.01	0.03	0.00	0.05	0.08
Na_2O	0.22	0.17	0.24	0.26	0.16	0.22	0.21	0.22	0.16	0.18	0.12	0.15
K_2O	8.95	9.27	8.55	8.72	8.97	8.74	9.06	9.15	9.27	8.99	9.42	9.09
F	0.23	0.16	0.22	0.23	0.11	0.15	0.23	0.27	0.15	0.29	0.19	0.17
NiO	0.04	0.04	0.01	0.01	0.01	0.08	0.03	0.00	0.01	0.04	0.05	0.00
H_2O*	3.91	3.96	3.98	3.92	3.93	3.90	3.93	3.92	3.92	3.91	3.91	3.97
Total	99.99	100.34	101.26	99.99	99.45	98.80	100.45	100.78	99.32	100.72	100.06	100.98
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.438	5.432	5.363	5.433	5.424	5.383	5.437	5.452	5.453	5.435	5.443	5.457
Al^{iv}	2.562	2.568	2.637	2.567	2.576	2.617	2.563	2.548	2.547	2.565	2.557	2.543
Al^{vi}*	0.813	0.824	0.874	0.822	0.796	0.834	0.828	0.822	0.866	0.809	0.813	0.876
Ti	0.175	0.164	0.176	0.192	0.151	0.164	0.168	0.174	0.159	0.165	0.190	0.187
Fe	2.162	2.161	2.187	2.194	2.229	2.201	2.174	2.148	2.183	2.205	2.246	2.214
Mn	0.008	0.007	0.011	0.000	0.011	0.009	0.011	0.012	0.011	0.009	0.013	0.017
Mg	2.639	2.620	2.594	2.587	2.641	2.608	2.610	2.619	2.541	2.638	2.468	2.445
Ca	0.004	0.001	0.009	0.007	0.004	0.005	0.001	0.001	0.004	0.000	0.008	0.012
Na	0.063	0.049	0.069	0.074	0.046	0.064	0.062	0.063	0.047	0.053	0.034	0.044
K	1.701	1.757	1.602	1.657	1.720	1.684	1.716	1.727	1.777	1.698	1.800	1.713
OH	3.890	3.924	3.898	3.891	3.943	3.925	3.893	3.872	3.925	3.863	3.909	3.917
F	0.107	0.076	0.100	0.107	0.054	0.073	0.107	0.128	0.073	0.137	0.090	0.080
Met Zone	3	3	3	3	3	3	3	3	3	3	2	2

Table 1 continued: Biotite chemistry.

ID	1658 N13	1658 N14	1658 N15	1658 N6	1658 N7	1658 N8	1658 N9	1658 V10	1658 V3	1658 V7	1658 V8	1658 V9
Oxide %												
SiO_2	36.72	35.86	36.22	35.59	35.84	35.73	36.50	36.53	35.68	36.05	36.37	36.11
TiO_2	1.70	1.76	1.69	1.77	1.88	1.92	1.78	1.70	1.30	2.04	1.68	1.64
Al_2O_3	18.83	18.84	18.92	18.49	18.69	18.70	19.31	19.14	20.08	18.96	19.21	18.75
FeO	18.16	17.97	18.72	18.44	17.48	17.87	17.76	17.98	19.58	18.20	17.93	17.69
MnO	0.05	0.09	0.13	0.10	0.12	0.08	0.11	0.07	0.15	0.11	0.10	0.09
MgO	10.94	11.02	11.41	10.94	11.24	10.82	11.25	10.97	11.39	10.76	11.27	10.72
CaO	0.02	0.05	0.05	0.02	0.02	0.01	0.04	0.01	0.13	0.04	0.04	0.02
Na_2O	0.19	0.12	0.05	0.04	0.16	0.17	0.08	0.21	0.15	0.14	0.18	0.23
K_2O	9.38	9.35	9.09	9.52	9.16	9.23	9.39	9.10	7.79	9.15	9.15	9.25
F	0.23	0.22	0.18	0.14	0.26	0.14	0.27	0.27	0.30	0.22	0.19	0.01
NiO	0.02	0.01	0.01	0.00	0.00	0.00	0.02	0.02	0.03	0.04	0.00	0.01
H_2O*	3.90	3.86	3.93	3.87	3.84	3.88	3.90	3.88	3.87	3.88	3.92	3.95
Total	100.29	99.25	100.52	99.01	98.86	98.66	100.42	100.06	100.60	99.69	100.20	98.58
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.487	5.424	5.412	5.416	5.429	5.431	5.438	5.461	5.314	5.425	5.431	5.479
Al^{iv}	2.513	2.576	2.588	2.584	2.571	2.569	2.562	2.539	2.686	2.575	2.569	2.521
Al^{vi}*	0.805	0.782	0.744	0.732	0.765	0.781	0.828	0.834	0.840	0.788	0.812	0.834
Ti	0.191	0.200	0.189	0.202	0.214	0.219	0.200	0.191	0.145	0.231	0.189	0.188
Fe	2.269	2.273	2.339	2.346	2.214	2.271	2.213	2.248	2.439	2.290	2.239	2.245
Mn	0.007	0.012	0.016	0.012	0.015	0.010	0.014	0.009	0.019	0.014	0.012	0.011
Mg	2.437	2.484	2.540	2.481	2.538	2.452	2.499	2.445	2.528	2.414	2.509	2.426
Ca	0.004	0.007	0.008	0.004	0.003	0.002	0.007	0.002	0.020	0.006	0.006	0.003
Na	0.054	0.036	0.016	0.012	0.046	0.050	0.024	0.061	0.044	0.042	0.051	0.069
K	1.787	1.804	1.733	1.847	1.770	1.790	1.785	1.735	1.480	1.756	1.742	1.790
OH	3.892	3.895	3.913	3.929	3.875	3.932	3.872	3.873	3.849	3.892	3.909	3.994
F	0.108	0.105	0.085	0.069	0.124	0.065	0.125	0.126	0.140	0.104	0.090	0.005
Met Zone	2	2	2	2	2	2	2	2	2	2	2	2

Table 1 continued: Biotite chemistry.

ID	1662 6	1664 B10	1664 B11	1664 B4	1664 B7	1664 N10	1664 N11	1664 N12	1664 N13	1664 N15	1664 N7	1664 N8
Oxide %												
SiO_2	36.40	36.70	36.37	37.00	36.41	35.53	36.27	36.06	36.51	36.21	35.86	36.26
TiO_2	1.84	1.69	1.76	1.94	1.69	1.77	1.54	1.78	1.63	1.86	1.67	1.40
Al_2O_3	18.02	20.44	19.84	20.03	19.61	19.68	19.72	19.59	20.33	19.36	19.56	19.80
FeO	18.32	15.31	15.91	15.12	15.75	16.46	15.96	15.90	15.40	16.32	17.19	16.15
MnO	0.21	0.12	0.13	0.09	0.10	0.19	0.14	0.12	0.10	0.12	0.10	0.12
MgO	11.09	12.17	11.82	12.69	12.34	12.03	11.90	11.63	11.79	11.94	12.28	12.23
CaO	0.04	0.04	0.01	0.03	0.06	0.03	0.04	0.03	0.06	0.03	0.03	0.04
Na_2O	0.06	0.24	0.30	0.28	0.31	0.29	0.26	0.32	0.33	0.32	0.22	0.29
K_2O	9.62	9.05	8.93	8.78	8.54	8.47	8.87	8.98	8.84	8.84	8.73	8.51
F	0.36	0.10	0.01	0.18	0.12	0.13	0.38	0.26	0.34	0.26	0.29	0.19
NiO	0.00	0.01	0.01	0.04	0.05	0.00	0.00	0.01	0.02	0.05	0.03	0.02
H_2O*	3.80	4.02	4.02	4.00	3.96	3.93	3.82	3.86	3.88	3.89	3.88	3.92
Total	99.98	99.91	99.19	100.29	99.08	98.62	98.99	98.63	99.33	99.39	99.94	99.15
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.488	5.411	5.420	5.426	5.424	5.346	5.429	5.421	5.423	5.411	5.347	5.409
Al^{iv}	2.512	2.589	2.580	2.574	2.576	2.654	2.571	2.579	2.577	2.589	2.653	2.591
Al^{vi}*	0.690	0.963	0.906	0.887	0.868	0.836	0.908	0.892	0.983	0.821	0.785	0.890
Ti	0.208	0.188	0.197	0.213	0.189	0.201	0.173	0.201	0.182	0.209	0.187	0.157
Fe	2.310	1.887	1.984	1.854	1.962	2.070	1.998	1.999	1.913	2.040	2.144	2.015
Mn	0.027	0.015	0.016	0.011	0.012	0.024	0.018	0.015	0.012	0.016	0.012	0.015
Mg	2.491	2.676	2.626	2.773	2.741	2.697	2.655	2.607	2.610	2.660	2.730	2.720
Ca	0.006	0.006	0.001	0.004	0.010	0.005	0.007	0.004	0.009	0.005	0.004	0.006
Na	0.018	0.068	0.086	0.081	0.090	0.084	0.077	0.094	0.095	0.092	0.063	0.085
K	1.850	1.702	1.698	1.642	1.623	1.625	1.692	1.722	1.676	1.686	1.661	1.619
OH	3.825	3.952	3.995	3.912	3.940	3.941	3.818	3.873	3.840	3.878	3.861	3.905
F	0.172	0.045	0.005	0.085	0.055	0.059	0.182	0.124	0.158	0.122	0.134	0.091
Met Zone	2	3	2	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1664 R11	1664 R4	1664 R8	1664 V12	1664 V4	1664 V5	1664 V6	1664 V7	1664 V8	1665 N10	1665 N11	1665 N12
Oxide %												
SiO_2	36.78	37.00	36.73	36.04	36.59	36.83	36.31	36.36	36.59	35.04	36.04	36.30
TiO_2	1.57	1.74	1.77	1.72	1.89	1.54	1.76	1.53	1.71	1.40	1.64	1.66
Al_2O_3	19.94	19.91	20.40	19.79	19.17	20.33	19.97	19.98	19.61	17.83	18.07	18.03
FeO	15.25	16.03	14.20	16.29	16.28	15.93	15.68	16.48	15.84	19.50	18.68	17.82
MnO	0.10	0.12	0.10	0.10	0.12	0.10	0.12	0.12	0.14	0.26	0.22	0.20
MgO	13.47	12.18	12.93	11.82	11.89	11.84	11.79	12.47	12.09	11.87	11.44	11.39
CaO	0.24	0.05	0.11	0.08	0.04	0.05	0.04	0.05	0.03	0.06	0.11	0.01
Na_2O	0.25	0.27	0.31	0.28	0.28	0.32	0.36	0.26	0.29	0.06	0.05	0.14
K_2O	7.54	8.46	8.22	8.70	8.65	8.77	8.81	8.07	8.78	8.47	9.35	9.69
F	0.20	0.27	0.25	0.19	0.21	0.17	0.19	0.18	0.12	0.37	0.36	0.26
NiO	0.02	0.03	0.02	0.00	0.03	0.01	0.00	0.00	0.02	0.00	0.01	0.02
H_2O*	3.97	3.94	3.94	3.92	3.91	3.98	3.93	3.96	3.97	3.74	3.80	3.84
Total	99.33	100.11	99.02	99.14	99.15	100.03	99.06	99.58	99.34	98.72	100.01	99.45
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.416	5.450	5.419	5.390	5.464	5.435	5.416	5.390	5.443	5.369	5.440	5.491
Al^{iv}	2.584	2.550	2.581	2.610	2.536	2.565	2.584	2.610	2.557	2.631	2.560	2.509
Al^{vi}*	0.877	0.907	0.967	0.878	0.839	0.972	0.927	0.881	0.881	0.588	0.656	0.706
Ti	0.174	0.192	0.196	0.193	0.212	0.171	0.197	0.170	0.192	0.161	0.186	0.189
Fe	1.878	1.975	1.752	2.038	2.033	1.966	1.956	2.042	1.971	2.499	2.358	2.254
Mn	0.012	0.015	0.012	0.013	0.015	0.013	0.015	0.015	0.018	0.034	0.028	0.026
Mg	2.956	2.675	2.844	2.636	2.648	2.604	2.622	2.755	2.681	2.710	2.575	2.567
Ca	0.038	0.008	0.018	0.013	0.007	0.007	0.006	0.007	0.005	0.010	0.018	0.001
Na	0.071	0.078	0.087	0.082	0.082	0.093	0.104	0.074	0.082	0.018	0.015	0.040
K	1.416	1.589	1.547	1.660	1.647	1.651	1.676	1.526	1.667	1.655	1.800	1.870
OH	3.903	3.875	3.881	3.907	3.899	3.919	3.908	3.915	3.943	3.820	3.826	3.875
F	0.094	0.124	0.118	0.091	0.100	0.081	0.092	0.085	0.055	0.177	0.171	0.123
Met Zone	3	3	3	3	3	3	3	3	3	1	1	1

Table 1 continued: Biotite chemistry.

ID	1665 N2	1665 N3	1665 N4	1665 N5	1665 N6	1665 N7	1665 R10	1665 R15	1665 R6	1665 R7	1665 R8	1665 R9
Oxide %												
SiO_2	35.17	36.28	36.48	36.14	35.71	36.12	36.64	35.66	35.68	35.98	35.68	35.80
TiO_2	1.34	1.63	1.57	1.77	1.70	1.47	1.70	1.79	1.70	1.68	1.33	1.54
Al_2O_3	17.90	17.89	17.79	18.10	17.86	17.95	18.28	17.74	17.46	18.06	18.10	17.61
FeO	19.60	18.86	18.95	18.20	18.48	18.51	17.88	18.33	18.54	18.57	18.19	18.86
MnO	0.21	0.23	0.18	0.19	0.23	0.20	0.19	0.20	0.21	0.22	0.21	0.23
MgO	12.28	10.88	11.14	11.34	11.30	11.21	11.50	11.26	11.10	11.31	11.99	11.45
CaO	0.06	0.00	0.00	0.05	0.02	0.01	0.01	0.01	0.03	0.03	0.05	0.03
Na_2O	0.04	0.08	0.07	0.10	0.04	0.07	0.08	0.13	0.05	0.05	0.04	0.02
K_2O	8.58	9.68	9.80	9.74	9.55	9.58	9.60	9.54	9.50	9.54	8.96	9.46
F	0.60	0.23	0.25	0.33	0.21	0.42	0.23	0.42	0.49	0.33	0.30	0.28
NiO	0.00	0.02	0.00	0.03	0.01	0.00	0.04	0.02	0.04	0.04	0.00	0.02
H_2O*	3.65	3.85	3.86	3.81	3.83	3.75	3.89	3.73	3.67	3.80	3.80	3.80
Total	99.63	99.67	100.15	99.92	99.03	99.43	100.24	99.10	98.59	99.73	98.85	99.41
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.349	5.499	5.506	5.455	5.445	5.484	5.488	5.441	5.478	5.447	5.426	5.450
Al^{iv}	2.651	2.501	2.494	2.545	2.555	2.516	2.512	2.559	2.522	2.553	2.574	2.550
Al^{vi}*	0.558	0.694	0.670	0.676	0.654	0.697	0.716	0.631	0.636	0.670	0.671	0.610
Ti	0.153	0.186	0.178	0.201	0.195	0.168	0.192	0.206	0.196	0.191	0.152	0.176
Fe	2.493	2.390	2.392	2.298	2.356	2.350	2.240	2.338	2.381	2.351	2.314	2.401
Mn	0.027	0.029	0.023	0.025	0.030	0.025	0.024	0.026	0.027	0.028	0.028	0.030
Mg	2.784	2.457	2.506	2.551	2.569	2.537	2.568	2.560	2.540	2.551	2.718	2.597
Ca	0.009	0.000	0.001	0.008	0.003	0.002	0.002	0.002	0.005	0.004	0.007	0.005
Na	0.010	0.022	0.020	0.028	0.012	0.021	0.024	0.040	0.015	0.015	0.013	0.007
K	1.664	1.872	1.886	1.875	1.858	1.855	1.834	1.857	1.860	1.842	1.739	1.836
OH	3.707	3.890	3.881	3.840	3.895	3.797	3.887	3.795	3.758	3.839	3.856	3.859
F	0.288	0.110	0.117	0.159	0.102	0.201	0.108	0.203	0.236	0.159	0.142	0.137
Met Zone	1	1	1	1	1	1	1	1	1	1	1	1

Table 1 continued: Biotite chemistry.

ID	1665 V1	1665 V12	1665 V14	1665 V2	1665 V3	1665 V4	1665 V5	1665 V6	1665 V7	1666 B10	1666 B4	1666 B6
Oxide %												
SiO_2	36.67	36.13	36.02	36.46	35.96	35.83	35.86	35.99	36.24	36.61	36.60	37.00
TiO_2	1.64	1.61	1.44	1.66	1.30	1.46	1.84	1.81	1.81	1.55	1.58	1.56
Al_2O_3	17.12	18.01	17.74	18.52	17.40	18.07	17.78	17.89	17.83	19.92	19.32	19.72
FeO	18.69	18.61	18.90	18.38	18.24	18.79	18.37	19.23	18.43	16.64	15.29	15.95
MnO	0.21	0.20	0.19	0.18	0.25	0.23	0.22	0.20	0.13	0.12	0.10	0.09
MgO	11.49	11.07	10.83	11.30	12.35	11.92	11.03	11.18	10.98	12.21	13.23	11.88
CaO	0.02	0.06	0.01	0.05	0.02	0.04	0.03	0.01	0.04	0.00	0.00	0.07
Na_2O	0.06	0.11	0.08	0.04	0.03	0.08	0.08	0.05	0.04	0.30	0.23	0.29
K_2O	9.60	9.49	9.74	9.20	8.62	8.94	9.55	9.48	9.64	8.48	9.02	8.66
F	0.45	0.68	0.34	0.34	0.43	0.32	0.38	0.26	0.41	0.01	0.12	0.35
NiO	0.01	0.04	0.02	0.01	0.05	0.05	0.01	0.00	0.04	0.02	0.01	0.05
H_2O*	3.74	3.63	3.77	3.83	3.73	3.81	3.75	3.84	3.75	4.05	3.99	3.88
Total	99.84	99.68	99.31	100.12	98.51	99.68	98.93	100.06	99.50	100.04	99.52	99.64
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.550	5.480	5.493	5.470	5.484	5.418	5.473	5.442	5.498	5.412	5.427	5.485
Al^{iv}	2.450	2.520	2.507	2.530	2.516	2.582	2.527	2.558	2.502	2.588	2.573	2.515
Al^{vi}*	0.604	0.700	0.683	0.746	0.611	0.639	0.671	0.631	0.686	0.881	0.804	0.930
Ti	0.186	0.183	0.165	0.187	0.149	0.166	0.211	0.206	0.206	0.173	0.176	0.174
Fe	2.365	2.361	2.411	2.306	2.326	2.376	2.344	2.431	2.338	2.056	1.896	1.978
Mn	0.026	0.025	0.025	0.022	0.032	0.030	0.028	0.026	0.017	0.015	0.013	0.012
Mg	2.591	2.503	2.462	2.526	2.808	2.687	2.509	2.519	2.483	2.691	2.925	2.625
Ca	0.003	0.009	0.001	0.007	0.003	0.006	0.005	0.002	0.007	0.000	0.000	0.010
Na	0.019	0.032	0.022	0.010	0.009	0.023	0.023	0.014	0.013	0.087	0.065	0.084
K	1.854	1.835	1.893	1.760	1.677	1.725	1.859	1.828	1.865	1.599	1.707	1.637
OH	3.780	3.673	3.833	3.833	3.792	3.842	3.814	3.871	3.799	3.994	3.944	3.837
F	0.217	0.327	0.165	0.162	0.206	0.153	0.184	0.126	0.196	0.005	0.054	0.162
Met Zone	1	1	1	1	1	1	1	1	1	3	3	3

Table 1 continued: Biotite chemistry.

ID	1666 B7	1666 R5	1666 R6	1666 R7	1666 R9	1666 V3	1666 V4	1666 V5	1666 V9	1668 B11	1668 B12	1668 R13
Oxide %												
SiO_2	36.77	35.94	36.91	36.39	36.68	36.69	36.25	36.68	36.56	35.57	35.93	35.36
TiO_2	1.64	1.71	1.63	1.58	1.76	1.60	1.52	1.76	1.64	1.74	1.94	1.96
Al_2O_3	19.63	19.45	19.72	19.54	19.63	19.79	20.02	19.56	19.83	18.32	18.09	17.99
FeO	16.16	16.96	16.49	16.27	16.40	16.45	16.29	16.37	16.07	18.44	18.53	19.39
MnO	0.10	0.16	0.15	0.09	0.12	0.13	0.11	0.13	0.08	0.20	0.19	0.24
MgO	12.86	11.92	12.21	11.95	11.86	12.18	11.87	11.57	11.80	10.59	10.84	10.82
CaO	0.01	0.05	0.03	0.07	0.03	0.03	0.05	0.03	0.02	0.06	0.03	0.03
Na_2O	0.24	0.13	0.28	0.22	0.19	0.28	0.28	0.16	0.31	0.05	0.04	0.05
K_2O	8.94	9.05	8.92	8.96	9.00	8.63	8.71	9.36	8.80	9.48	9.74	9.15
F	0.01	0.36	0.26	0.10	0.24	0.22	0.09	0.19	0.25	0.42	0.27	0.23
NiO	0.04	0.04	0.00	0.01	0.00	0.03	0.00	0.00	0.01	0.04	0.03	0.01
H_2O*	4.07	3.83	3.95	3.97	3.93	3.95	3.98	3.94	3.91	3.72	3.82	3.82
Total	100.61	99.75	100.61	99.17	99.92	100.07	99.26	99.82	99.29	98.65	99.51	99.16
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.406	5.376	5.438	5.438	5.443	5.427	5.404	5.457	5.446	5.444	5.454	5.400
Al^{iv}	2.594	2.624	2.562	2.562	2.557	2.573	2.596	2.543	2.554	2.556	2.546	2.600
Al^{vi}*	0.808	0.805	0.863	0.879	0.876	0.878	0.922	0.887	0.927	0.750	0.689	0.639
Ti	0.181	0.192	0.180	0.177	0.197	0.178	0.171	0.197	0.183	0.200	0.222	0.225
Fe	1.987	2.122	2.031	2.033	2.035	2.035	2.031	2.037	2.002	2.360	2.352	2.477
Mn	0.012	0.021	0.019	0.011	0.015	0.016	0.014	0.016	0.010	0.026	0.025	0.031
Mg	2.819	2.657	2.681	2.661	2.624	2.685	2.638	2.565	2.619	2.415	2.452	2.463
Ca	0.001	0.007	0.004	0.012	0.004	0.005	0.008	0.005	0.003	0.009	0.006	0.004
Na	0.069	0.039	0.079	0.065	0.055	0.081	0.080	0.046	0.088	0.014	0.012	0.013
K	1.678	1.728	1.677	1.708	1.704	1.628	1.657	1.776	1.672	1.851	1.886	1.783
OH	3.994	3.826	3.880	3.955	3.886	3.895	3.956	3.908	3.881	3.794	3.871	3.887
F	0.005	0.171	0.120	0.045	0.113	0.103	0.041	0.090	0.118	0.203	0.128	0.110
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1668 R15	1668 V14	1668 V7	1669 20	1669 4	1671 B12	1671 B9	1671 N10	1671 N14	1671 N15	1671 N17	1671 N5
Oxide %												
SiO_2	36.16	35.54	35.83	36.30	36.66	36.49	36.61	34.44	36.45	35.61	36.42	36.47
TiO_2	1.69	2.11	1.76	1.67	1.70	1.51	1.37	1.82	1.72	2.13	1.40	1.53
Al_2O_3	18.25	18.00	18.23	19.78	19.87	19.67	19.62	19.02	19.88	20.10	19.41	19.76
FeO	18.91	18.73	19.07	16.67	16.72	16.15	16.03	18.87	16.26	16.32	15.56	16.88
MnO	0.20	0.24	0.24	0.09	0.08	0.06	0.05	0.09	0.08	0.07	0.07	0.06
MgO	10.82	10.77	10.61	11.70	11.89	12.23	12.02	11.53	11.82	11.17	13.38	12.02
CaO	0.04	0.01	0.01	0.00	0.00	0.12	0.02	0.02	0.02	0.03	0.00	0.01
Na_2O	0.06	0.07	0.10	0.32	0.36	0.33	0.34	0.08	0.33	0.22	0.24	0.22
K_2O	9.60	9.48	9.63	8.97	9.10	8.64	8.94	8.52	9.02	8.96	9.08	8.98
F	0.27	0.31	0.37	0.12	0.23	0.01	0.22	0.27	0.04	0.23	0.24	0.18
NiO	0.08	0.00	0.01	0.00	0.01	0.07	0.00	0.00	0.04	0.02	0.06	0.04
H_2O*	3.83	3.78	3.77	3.96	3.95	4.02	3.91	3.80	4.02	3.87	3.93	3.96
Total	100.04	99.12	99.79	99.67	100.67	99.39	99.26	98.61	99.76	98.75	99.86	100.21
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.462	5.422	5.438	5.409	5.412	5.428	5.460	5.262	5.413	5.355	5.398	5.407
Al^{iv}	2.538	2.578	2.562	2.591	2.588	2.572	2.540	2.738	2.587	2.645	2.602	2.593
Al^{vi}*	0.711	0.658	0.700	0.883	0.869	0.876	0.908	0.687	0.893	0.918	0.789	0.861
Ti	0.192	0.242	0.200	0.187	0.188	0.169	0.154	0.209	0.192	0.241	0.157	0.171
Fe	2.389	2.390	2.420	2.077	2.064	2.009	1.999	2.411	2.019	2.052	1.929	2.093
Mn	0.026	0.031	0.031	0.012	0.009	0.008	0.006	0.012	0.010	0.009	0.009	0.007
Mg	2.436	2.448	2.402	2.598	2.617	2.712	2.671	2.626	2.618	2.504	2.956	2.658
Ca	0.007	0.002	0.001	0.000	0.000	0.019	0.003	0.003	0.003	0.005	0.000	0.002
Na	0.018	0.020	0.031	0.093	0.102	0.096	0.098	0.025	0.096	0.063	0.069	0.064
K	1.850	1.845	1.865	1.706	1.713	1.639	1.701	1.661	1.708	1.719	1.716	1.698
OH	3.864	3.851	3.821	3.941	3.891	3.990	3.894	3.871	3.982	3.887	3.885	3.913
F	0.131	0.148	0.178	0.058	0.106	0.005	0.105	0.129	0.018	0.111	0.113	0.085
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1671 N6	1671 N9	1671 R5	1671 R9	1671 V10	1671 V11	1671 V12	1671 V13	1671 V14	1671 V8	1671 V9	1672 N11
Oxide %												
SiO_2	36.44	36.17	36.27	36.20	36.52	36.48	36.30	36.36	36.01	36.25	36.55	36.69
TiO_2	1.95	1.60	1.82	1.81	1.25	1.53	1.74	1.69	1.56	1.54	1.64	1.40
Al_2O_3	19.85	19.56	19.45	19.24	19.96	19.84	19.81	19.64	19.72	19.52	19.40	18.28
FeO	16.72	17.57	16.86	16.86	16.93	16.92	16.76	17.06	16.99	17.09	17.34	17.27
MnO	0.07	0.10	0.09	0.07	0.08	0.07	0.06	0.06	0.07	0.12	0.07	0.24
MgO	11.34	11.48	11.69	11.43	11.81	11.51	11.54	11.25	11.52	11.33	11.54	12.25
CaO	0.01	0.00	0.00	0.03	0.04	0.01	0.00	0.01	0.01	0.01	0.01	0.06
Na_2O	0.31	0.28	0.26	0.21	0.32	0.29	0.25	0.27	0.32	0.23	0.26	0.17
K_2O	8.92	9.00	9.13	9.16	8.76	8.91	9.14	9.02	8.93	9.05	8.87	8.89
F	0.19	0.23	0.31	0.19	0.10	0.17	0.10	0.22	0.16	0.25	0.30	0.27
NiO	0.00	0.04	0.03	0.06	0.04	0.02	0.04	0.01	0.00	0.00	0.02	0.01
H_2O*	3.94	3.91	3.88	3.90	3.99	3.94	3.98	3.91	3.92	3.88	3.88	3.87
Total	99.92	100.13	99.95	99.30	99.81	99.70	99.79	99.65	99.29	99.41	99.90	99.39
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.415	5.395	5.409	5.432	5.428	5.433	5.406	5.432	5.398	5.433	5.448	5.505
Al^{iv}	2.585	2.605	2.591	2.568	2.572	2.567	2.594	2.568	2.602	2.567	2.552	2.495
Al^{vi}*	0.892	0.835	0.828	0.836	0.924	0.917	0.884	0.889	0.882	0.882	0.856	0.737
Ti	0.217	0.179	0.204	0.204	0.139	0.172	0.194	0.190	0.175	0.174	0.184	0.158
Fe	2.078	2.192	2.103	2.116	2.105	2.108	2.088	2.131	2.130	2.142	2.161	2.167
Mn	0.009	0.013	0.011	0.009	0.010	0.009	0.008	0.008	0.009	0.016	0.008	0.030
Mg	2.512	2.553	2.599	2.556	2.616	2.555	2.563	2.504	2.573	2.532	2.565	2.739
Ca	0.002	0.000	0.001	0.005	0.006	0.002	0.000	0.002	0.002	0.002	0.001	0.009
Na	0.089	0.080	0.074	0.060	0.093	0.083	0.071	0.078	0.092	0.068	0.074	0.049
K	1.691	1.712	1.737	1.752	1.661	1.693	1.736	1.719	1.708	1.730	1.686	1.701
OH	3.906	3.890	3.855	3.906	3.953	3.918	3.953	3.896	3.919	3.879	3.860	3.873
F	0.091	0.108	0.145	0.092	0.045	0.081	0.045	0.104	0.077	0.119	0.140	0.127
Met Zone	3	3	3	3	3	3	3	3	3	3	3	2

Table 1 continued: Biotite chemistry.

ID	1672 N12	1672 N3	1672 N4	1672 N5	1672 N7	1672 N8	1672 R10	1672 R2	1672 R4	1672 R5	1672 R6	1672 R9
Oxide %												
SiO_2	36.84	37.32	36.29	37.24	36.35	37.02	37.26	36.52	37.26	37.34	36.83	36.62
TiO_2	1.63	1.59	1.56	1.52	1.70	1.77	1.63	1.75	1.89	1.68	1.56	1.53
Al_2O_3	18.29	18.46	18.08	18.90	18.01	18.13	18.14	18.05	18.18	18.00	18.18	17.98
FeO	16.81	16.66	16.61	16.72	17.23	16.19	17.30	17.47	16.58	17.04	17.03	17.14
MnO	0.23	0.22	0.24	0.20	0.22	0.21	0.22	0.21	0.20	0.21	0.25	0.24
MgO	12.38	12.87	12.42	13.03	12.24	12.32	12.27	12.39	12.48	12.31	12.11	12.40
CaO	0.03	0.04	0.03	0.17	0.10	0.05	0.02	0.10	0.03	0.03	0.07	0.02
Na_2O	0.17	0.18	0.16	0.21	0.17	0.19	0.16	0.12	0.15	0.16	0.18	0.17
K_2O	9.05	8.99	8.97	8.38	8.77	8.92	9.00	8.76	9.04	8.83	8.70	9.05
F	0.33	0.31	0.28	0.32	0.16	0.17	0.15	0.12	0.24	0.11	0.27	0.38
NiO	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.03	0.06	0.01	0.05	0.00
H_2O*	3.86	3.91	3.83	3.92	3.90	3.92	3.96	3.95	3.93	3.98	3.87	3.81
Total	99.78	100.61	98.67	100.76	99.00	99.01	100.15	99.58	100.16	99.91	99.22	99.55
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.501	5.511	5.482	5.475	5.479	5.544	5.541	5.473	5.529	5.555	5.526	5.497
Al^{iv}	2.499	2.489	2.518	2.525	2.521	2.456	2.459	2.527	2.471	2.445	2.474	2.503
Al^{vi}*	0.719	0.725	0.702	0.751	0.678	0.744	0.720	0.660	0.708	0.711	0.740	0.678
Ti	0.184	0.176	0.177	0.168	0.192	0.199	0.182	0.198	0.211	0.188	0.175	0.173
Fe	2.100	2.058	2.098	2.056	2.172	2.027	2.151	2.189	2.058	2.119	2.136	2.152
Mn	0.029	0.027	0.030	0.025	0.028	0.027	0.027	0.027	0.026	0.027	0.032	0.031
Mg	2.755	2.832	2.797	2.855	2.749	2.750	2.720	2.767	2.761	2.730	2.709	2.776
Ca	0.004	0.006	0.006	0.027	0.016	0.008	0.004	0.016	0.005	0.005	0.012	0.004
Na	0.050	0.052	0.048	0.061	0.051	0.054	0.046	0.034	0.043	0.046	0.053	0.049
K	1.724	1.693	1.728	1.571	1.686	1.704	1.707	1.675	1.712	1.675	1.664	1.732
OH	3.844	3.853	3.863	3.849	3.922	3.918	3.928	3.944	3.885	3.950	3.872	3.815
F	0.154	0.143	0.134	0.146	0.078	0.082	0.072	0.055	0.113	0.050	0.128	0.182
Met Zone	2	2	2	2	2	2	2	2	2	2	2	2

Table 1 continued: Biotite chemistry.

ID	1672 V10	1672 V11	1672 V12	1672 V13	1672 V2	1672 V5	1672 V6	1672 V9	1674 R14	1674 R4	1674 R5	1676 1
Oxide %												
SiO_2	36.77	36.81	36.76	36.58	36.51	37.37	36.79	36.68	36.32	36.25	36.24	36.43
TiO_2	1.79	1.52	1.80	1.77	1.68	1.57	1.78	1.73	1.50	1.43	1.65	2.43
Al_2O_3	18.17	18.39	18.15	18.14	18.03	18.74	18.23	17.95	18.68	18.86	18.28	16.82
FeO	17.14	16.80	16.72	16.45	16.92	16.90	17.41	16.62	17.71	18.02	18.79	18.94
MnO	0.20	0.21	0.23	0.19	0.22	0.19	0.18	0.23	0.13	0.11	0.11	0.23
MgO	12.16	12.30	12.24	12.12	12.21	12.45	12.19	12.41	10.90	11.14	10.90	11.21
CaO	0.04	0.02	0.01	0.02	0.03	0.03	0.01	0.05	0.04	0.02	0.00	0.00
Na_2O	0.17	0.19	0.19	0.12	0.18	0.15	0.16	0.15	0.03	0.07	0.07	0.04
K_2O	9.12	9.06	9.07	9.19	8.87	9.04	9.21	8.97	9.42	9.82	9.60	9.56
F	0.24	0.07	0.17	0.24	0.36	0.21	0.14	0.27	0.33	0.18	0.29	0.02
NiO	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.02	0.04	0.08
H_2O*	3.89	3.98	3.92	3.86	3.81	3.97	3.95	3.86	3.80	3.90	3.83	3.95
Total	99.76	99.51	99.35	98.82	98.95	100.76	100.15	99.08	98.92	99.98	99.92	99.79
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.499	5.504	5.508	5.511	5.503	5.510	5.487	5.512	5.501	5.451	5.472	5.516
Al^{iv}	2.501	2.496	2.492	2.489	2.497	2.490	2.513	2.488	2.499	2.549	2.528	2.484
Al^{vi}*	0.703	0.745	0.713	0.733	0.705	0.767	0.692	0.692	0.836	0.794	0.726	0.518
Ti	0.202	0.171	0.203	0.200	0.190	0.174	0.199	0.196	0.171	0.162	0.187	0.277
Fe	2.144	2.101	2.095	2.073	2.132	2.084	2.172	2.089	2.244	2.266	2.373	2.399
Mn	0.025	0.026	0.029	0.025	0.028	0.023	0.022	0.029	0.016	0.014	0.014	0.029
Mg	2.712	2.742	2.733	2.721	2.743	2.736	2.711	2.781	2.461	2.498	2.453	2.530
Ca	0.006	0.003	0.002	0.002	0.005	0.004	0.001	0.008	0.006	0.003	0.000	0.001
Na	0.050	0.054	0.054	0.035	0.051	0.041	0.046	0.045	0.009	0.020	0.020	0.011
K	1.739	1.728	1.734	1.767	1.704	1.700	1.753	1.720	1.821	1.883	1.849	1.845
OH	3.886	3.965	3.916	3.882	3.830	3.902	3.931	3.870	3.843	3.913	3.860	3.988
F	0.114	0.032	0.082	0.116	0.170	0.098	0.068	0.129	0.156	0.086	0.140	0.009
Met Zone	2	2	2	2	2	2	2	2	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1676 7	1679 5	1679 6	1680 N2	1680 R5	1681 B3	1681 B7	1681 B8	1681 B9	1681 R7	1681 V1	1681 V3
Oxide %												
SiO_2	36.19	36.16	36.32	36.41	36.58	36.45	36.53	36.60	36.35	36.08	36.28	36.14
TiO_2	2.16	1.75	1.85	1.58	1.63	1.67	1.60	1.56	1.60	1.64	1.54	1.58
Al_2O_3	17.17	19.49	19.56	19.79	20.00	18.86	19.02	19.34	19.13	19.18	19.09	18.79
FeO	18.25	16.82	16.94	16.30	16.14	17.17	17.33	17.19	17.28	17.46	17.16	18.22
MnO	0.25	0.13	0.09	0.07	0.05	0.01	0.02	0.05	0.02	0.00	0.02	0.01
MgO	11.52	11.61	11.68	12.43	11.58	12.04	12.16	12.15	11.76	11.94	11.96	12.06
CaO	0.01	0.00	0.01	0.03	0.01	0.00	0.03	0.01	0.09	0.05	0.00	0.02
Na_2O	0.11	0.27	0.27	0.26	0.28	0.38	0.40	0.40	0.40	0.39	0.39	0.34
K_2O	9.50	8.95	9.05	8.87	8.99	8.43	8.22	8.30	8.14	8.36	8.48	8.22
F	0.14	0.28	0.14	0.28	0.21	0.21	0.17	0.23	0.20	0.34	0.31	0.04
NiO	0.00	0.00	0.04	0.00	0.01	0.03	0.11	0.08	0.08	0.01	0.02	0.03
H_2O*	3.88	3.87	3.96	3.91	3.93	3.91	3.94	3.93	3.91	3.84	3.85	3.98
Total	99.37	99.44	100.10	99.99	99.47	99.36	99.70	100.02	99.17	99.39	99.29	99.63
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.491	5.412	5.400	5.397	5.442	5.453	5.442	5.433	5.444	5.406	5.436	5.411
Al^{iv}	2.509	2.588	2.600	2.603	2.558	2.547	2.558	2.567	2.556	2.594	2.564	2.589
Al^{vi}*	0.562	0.850	0.828	0.856	0.950	0.777	0.781	0.815	0.820	0.794	0.807	0.727
Ti	0.247	0.196	0.207	0.176	0.183	0.188	0.179	0.174	0.181	0.185	0.174	0.178
Fe	2.316	2.106	2.106	2.021	2.008	2.148	2.159	2.134	2.164	2.189	2.151	2.282
Mn	0.032	0.017	0.012	0.009	0.006	0.001	0.003	0.006	0.002	0.000	0.002	0.001
Mg	2.605	2.589	2.590	2.746	2.569	2.684	2.701	2.688	2.625	2.666	2.671	2.692
Ca	0.002	0.000	0.002	0.005	0.001	0.000	0.004	0.001	0.014	0.008	0.000	0.003
Na	0.031	0.080	0.079	0.074	0.082	0.110	0.114	0.115	0.116	0.112	0.112	0.100
K	1.839	1.709	1.716	1.677	1.707	1.607	1.563	1.571	1.555	1.598	1.621	1.570
OH	3.930	3.868	3.932	3.868	3.898	3.898	3.919	3.891	3.904	3.838	3.848	3.979
F	0.069	0.131	0.067	0.129	0.099	0.099	0.081	0.107	0.095	0.162	0.149	0.018
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1681 V7	1681 V8	1682 B3	1682 B6	1682 B8	1682 B9	1682 N10	1682 R1	1682 R10	1682 R7	1682 R8	1682 V1
Oxide %												
SiO_2	37.11	36.60	35.85	35.55	36.02	36.16	36.08	35.69	35.60	35.59	36.77	36.21
TiO_2	1.52	1.62	1.52	1.77	1.45	1.59	1.70	1.44	1.41	1.52	1.41	1.31
Al_2O_3	19.88	19.41	18.21	18.44	18.24	18.69	18.33	18.59	18.14	19.41	19.41	18.31
FeO	17.18	17.26	20.78	19.55	18.66	19.50	18.65	18.91	19.26	19.78	20.05	18.48
MnO	0.02	0.02	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	12.24	11.96	10.87	11.61	11.60	11.89	11.55	11.18	11.32	12.56	10.75	11.54
CaO	0.14	0.02	0.01	0.03	0.01	0.04	0.02	0.02	0.04	0.08	0.14	0.04
Na_2O	0.33	0.33	0.19	0.23	0.33	0.28	0.25	0.30	0.31	0.22	0.25	0.31
K_2O	7.90	8.28	8.90	8.01	8.82	8.35	8.51	8.65	8.71	7.15	7.59	8.46
F	0.24	0.12	0.20	0.16	0.20	0.08	0.00	0.33	0.21	0.00	0.24	0.26
NiO	0.02	0.06	0.00	0.00	0.07	0.00	0.03	0.00	0.00	0.00	0.04	0.02
H_2O*	3.97	3.98	3.87	3.89	3.87	3.98	3.97	3.79	3.84	4.03	3.92	3.84
Total	100.69	99.77	100.48	99.38	99.38	100.56	99.24	98.97	99.05	100.49	100.68	98.81
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.444	5.439	5.413	5.373	5.446	5.396	5.443	5.422	5.419	5.288	5.461	5.486
Al^{iv}	2.556	2.561	2.587	2.627	2.554	2.604	2.557	2.578	2.581	2.712	2.539	2.514
Al^{vi}*	0.882	0.839	0.654	0.659	0.696	0.684	0.704	0.752	0.673	0.687	0.858	0.756
Ti	0.167	0.181	0.172	0.202	0.165	0.178	0.193	0.165	0.162	0.170	0.158	0.149
Fe	2.108	2.145	2.624	2.472	2.360	2.434	2.353	2.403	2.451	2.458	2.491	2.341
Mn	0.002	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	2.677	2.650	2.446	2.615	2.615	2.644	2.598	2.532	2.569	2.782	2.380	2.606
Ca	0.022	0.003	0.002	0.006	0.002	0.006	0.004	0.003	0.007	0.013	0.023	0.007
Na	0.093	0.095	0.054	0.067	0.096	0.082	0.073	0.089	0.093	0.062	0.071	0.090
K	1.478	1.570	1.714	1.545	1.702	1.589	1.639	1.677	1.690	1.355	1.438	1.634
OH	3.887	3.941	3.900	3.922	3.905	3.959	3.999	3.841	3.899	3.996	3.884	3.877
F	0.109	0.058	0.097	0.076	0.095	0.040	0.000	0.159	0.100	0.000	0.113	0.122
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1682 V3	1682 V4	1682 V5	1683 B4	1683 B5	1683 N5	1683 N6	1683 N7	1683 R6	1683 R7	1683 R8	1683 V1
Oxide %												
SiO_2	36.28	35.92	35.92	34.69	35.34	35.52	35.27	35.68	35.48	35.37	35.32	35.38
TiO_2	1.29	1.71	1.60	1.73	1.95	1.68	1.66	1.69	1.50	1.69	1.69	1.82
Al_2O_3	18.54	18.61	18.17	18.71	19.51	18.75	18.99	18.91	18.93	18.72	18.68	18.51
FeO	18.63	18.81	18.63	21.14	19.95	20.54	20.81	21.07	20.56	20.31	21.03	20.70
MnO	0.02	0.00	0.00	0.05	0.00	0.00	0.00	0.03	0.04	0.02	0.00	0.00
MgO	11.06	11.53	11.26	9.73	9.41	9.80	9.65	9.84	9.58	10.44	9.94	9.67
CaO	0.06	0.02	0.07	0.00	0.01	0.00	0.01	0.01	0.04	0.02	0.01	0.01
Na_2O	0.21	0.26	0.23	0.16	0.15	0.10	0.18	0.20	0.19	0.23	0.10	0.21
K_2O	8.72	8.62	8.63	9.35	9.57	9.26	9.40	9.28	9.13	9.29	9.21	9.34
F	0.10	0.03	0.13	0.20	0.23	0.15	0.18	0.20	0.21	0.13	0.19	0.06
NiO	0.05	0.03	0.01	0.07	0.07	0.05	0.00	0.05	0.01	0.00	0.02	0.00
H_2O*	3.91	3.97	3.88	3.82	3.85	3.87	3.86	3.88	3.83	3.90	3.85	3.90
Total	98.97	99.49	98.57	99.81	100.20	99.83	100.07	100.94	99.61	100.18	100.11	99.70
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.492	5.411	5.465	5.313	5.351	5.404	5.364	5.380	5.407	5.359	5.370	5.396
Al^{iv}	2.508	2.589	2.535	2.687	2.649	2.596	2.636	2.620	2.593	2.641	2.630	2.604
Al^{vi}*	0.800	0.717	0.724	0.690	0.833	0.766	0.768	0.741	0.806	0.702	0.718	0.724
Ti	0.147	0.194	0.183	0.199	0.222	0.192	0.190	0.191	0.172	0.193	0.193	0.208
Fe	2.359	2.370	2.371	2.707	2.526	2.613	2.648	2.657	2.620	2.574	2.674	2.640
Mn	0.002	0.000	0.000	0.007	0.000	0.000	0.000	0.004	0.005	0.002	0.000	0.000
Mg	2.497	2.589	2.554	2.222	2.124	2.222	2.187	2.212	2.177	2.358	2.254	2.199
Ca	0.010	0.004	0.012	0.000	0.002	0.000	0.001	0.002	0.007	0.004	0.002	0.002
Na	0.063	0.075	0.068	0.047	0.043	0.030	0.052	0.058	0.056	0.067	0.031	0.063
K	1.683	1.656	1.675	1.827	1.848	1.797	1.824	1.785	1.774	1.796	1.785	1.818
OH	3.953	3.986	3.935	3.904	3.884	3.923	3.912	3.903	3.896	3.938	3.907	3.973
F	0.045	0.013	0.064	0.094	0.112	0.072	0.085	0.097	0.099	0.062	0.089	0.027
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1683 V2	1683 V4	1683 V5	1684 1	1684 2	1687 10	1687 5	1687 6	1688 15	1688 5	1688 8	1689 4
Oxide %												
SiO_2	35.88	35.76	35.56	35.87	35.67	35.08	35.42	35.88	36.39	36.19	36.19	36.36
TiO_2	1.63	1.84	1.79	1.81	1.65	2.14	1.36	1.65	2.14	2.15	1.65	2.15
Al_2O_3	18.88	18.72	18.65	17.58	17.34	18.83	19.07	18.74	18.10	16.91	17.16	19.12
FeO	21.29	20.66	20.18	21.44	21.41	19.37	18.48	17.60	19.97	19.62	19.92	18.74
MnO	0.00	0.00	0.00	0.01	0.00	0.08	0.07	0.06	0.13	0.16	0.13	0.22
MgO	9.93	9.81	9.65	10.02	10.08	10.48	11.11	11.03	10.96	11.10	11.51	10.58
CaO	0.01	0.01	0.00	0.10	0.03	0.00	0.01	0.03	0.06	0.03	0.01	0.03
Na_2O	0.19	0.20	0.19	0.19	0.17	0.07	0.07	0.15	0.02	0.03	0.03	0.10
K_2O	9.31	9.45	9.33	9.00	9.10	9.21	9.28	9.44	8.86	9.17	8.69	9.61
F	0.10	0.21	0.12	0.13	0.10	0.23	0.17	0.16	0.33	0.24	0.18	0.38
NiO	0.03	0.05	0.01	0.00	0.00	0.04	0.04	0.01	0.00	0.01	0.00	0.05
H_2O*	3.94	3.87	3.87	3.87	3.86	3.83	3.87	3.87	3.85	3.83	3.86	3.85
Total	101.23	100.62	99.36	100.03	99.40	99.53	99.10	98.71	100.96	99.46	99.36	101.24
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.392	5.403	5.425	5.463	5.473	5.334	5.378	5.448	5.444	5.507	5.502	5.415
Al^{iv}	2.608	2.597	2.575	2.537	2.527	2.666	2.622	2.552	2.556	2.493	2.498	2.585
Al^{vi}*	0.736	0.737	0.779	0.619	0.608	0.708	0.791	0.802	0.635	0.541	0.576	0.771
Ti	0.185	0.209	0.206	0.207	0.190	0.245	0.155	0.188	0.241	0.246	0.188	0.240
Fe	2.675	2.611	2.575	2.731	2.747	2.463	2.347	2.234	2.499	2.498	2.533	2.334
Mn	0.000	0.000	0.000	0.001	0.000	0.011	0.009	0.008	0.017	0.021	0.017	0.027
Mg	2.223	2.209	2.195	2.274	2.306	2.375	2.515	2.497	2.444	2.518	2.609	2.347
Ca	0.001	0.001	0.000	0.016	0.004	0.000	0.002	0.004	0.009	0.006	0.001	0.004
Na	0.056	0.058	0.055	0.056	0.051	0.020	0.021	0.043	0.005	0.009	0.010	0.029
K	1.784	1.820	1.815	1.748	1.780	1.786	1.797	1.828	1.690	1.780	1.685	1.826
OH	3.952	3.896	3.938	3.933	3.951	3.885	3.918	3.922	3.840	3.886	3.914	3.821
F	0.048	0.102	0.059	0.063	0.049	0.109	0.082	0.078	0.154	0.114	0.086	0.177
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1689 5	1690 B1	1690 B2	1690 B4	1690 B5	1690 B6	1690 B7	1690 B8	1690 N10	1690 N6	1690 N7	1690 N8
Oxide %												
SiO_2	35.81	36.28	35.89	35.77	36.25	36.56	36.04	36.77	36.57	36.29	36.05	35.69
TiO_2	2.15	1.49	1.50	1.69	1.65	1.52	1.59	1.52	1.74	1.32	1.43	1.65
Al_2O_3	18.26	19.31	18.95	19.28	19.35	19.29	19.12	19.44	19.23	19.50	19.40	19.47
FeO	19.45	17.08	17.59	16.99	16.78	16.58	17.35	17.26	17.00	17.27	16.44	17.14
MnO	0.25	0.10	0.04	0.06	0.07	0.07	0.09	0.07	0.10	0.09	0.09	0.06
MgO	10.73	11.79	11.58	11.61	11.89	11.51	11.79	11.82	11.61	11.67	11.60	11.51
CaO	0.01	0.05	0.04	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.02	0.05
Na_2O	0.07	0.27	0.11	0.32	0.36	0.30	0.31	0.34	0.29	0.29	0.25	0.20
K_2O	9.09	8.53	8.90	8.91	9.08	9.07	9.11	9.00	9.13	8.80	9.27	8.95
F	0.29	0.03	0.10	0.20	0.21	0.16	0.30	0.04	0.28	0.40	0.14	0.12
NiO	0.00	0.05	0.05	0.05	0.00	0.01	0.00	0.03	0.10	0.02	0.01	0.06
H_2O*	3.83	3.98	3.92	3.88	3.91	3.92	3.86	4.03	3.89	3.82	3.91	3.92
Total	100.00	99.06	98.82	98.90	99.73	99.04	99.68	100.39	99.99	99.61	98.74	98.90
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.413	5.437	5.423	5.392	5.412	5.482	5.405	5.448	5.450	5.430	5.432	5.380
Al^{iv}	2.587	2.563	2.577	2.608	2.588	2.518	2.595	2.552	2.550	2.570	2.568	2.620
Al^{vi}*	0.668	0.849	0.799	0.819	0.818	0.891	0.785	0.842	0.829	0.869	0.878	0.840
Ti	0.245	0.168	0.171	0.192	0.186	0.171	0.179	0.170	0.195	0.148	0.162	0.187
Fe	2.459	2.141	2.223	2.142	2.096	2.079	2.176	2.138	2.119	2.160	2.072	2.161
Mn	0.032	0.012	0.005	0.008	0.009	0.008	0.012	0.008	0.012	0.011	0.011	0.007
Mg	2.418	2.634	2.609	2.608	2.647	2.572	2.635	2.609	2.579	2.604	2.606	2.586
Ca	0.001	0.008	0.007	0.002	0.003	0.001	0.000	0.000	0.000	0.002	0.003	0.007
Na	0.019	0.080	0.033	0.094	0.104	0.086	0.091	0.098	0.084	0.085	0.073	0.059
K	1.753	1.631	1.716	1.713	1.730	1.734	1.743	1.701	1.736	1.679	1.782	1.722
OH	3.860	3.983	3.953	3.904	3.898	3.923	3.860	3.982	3.869	3.812	3.928	3.943
F	0.139	0.014	0.045	0.096	0.099	0.077	0.140	0.018	0.130	0.188	0.069	0.055
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1690 R7	1690 V3	1690 V6	1690 V7	1693A N5	1693A N6	1693A R4	1696 10	1696 6	1697 11	1697 3	1698 10
Oxide %												
SiO_2	36.20	34.33	36.02	35.32	35.46	36.21	37.18	35.89	36.54	36.54	35.92	36.37
TiO_2	1.61	1.50	1.52	1.56	1.64	1.71	1.41	1.71	1.79	1.48	1.43	1.42
Al_2O_3	19.00	20.08	19.50	19.01	18.91	18.39	18.58	19.75	19.92	19.72	19.33	19.25
FeO	17.82	18.25	16.90	17.75	17.26	18.16	18.25	17.11	16.89	17.57	17.44	17.58
MnO	0.05	0.09	0.10	0.05	0.11	0.14	0.16	0.08	0.06	0.08	0.09	0.06
MgO	11.65	12.86	11.65	11.73	11.47	11.08	11.13	11.20	11.43	11.28	11.50	11.30
CaO	0.00	0.02	0.01	0.01	0.03	0.05	0.03	0.02	0.02	0.00	0.02	0.01
Na_2O	0.20	0.19	0.15	0.30	0.03	0.05	0.04	0.37	0.37	0.40	0.27	0.41
K_2O	9.00	7.05	9.29	8.71	9.95	9.56	9.49	8.99	9.04	9.05	8.90	9.01
F	0.28	0.26	0.29	0.22	0.16	0.15	0.38	0.28	0.08	0.17	0.29	0.18
NiO	0.03	0.01	0.03	0.02	0.06	0.04	0.00	0.00	0.03	0.00	0.04	0.01
H_2O*	3.87	3.85	3.86	3.84	3.87	3.90	3.84	3.86	4.01	3.95	3.84	3.89
Total	99.95	98.60	99.59	98.56	99.00	99.66	100.65	99.37	100.19	100.28	99.08	99.68
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.419	5.181	5.398	5.364	5.381	5.464	5.541	5.388	5.418	5.433	5.414	5.451
Al^{iv}	2.581	2.819	2.602	2.636	2.619	2.536	2.459	2.612	2.582	2.567	2.586	2.549
Al^{vi}*	0.771	0.753	0.842	0.767	0.764	0.736	0.805	0.882	0.899	0.890	0.849	0.852
Ti	0.181	0.170	0.172	0.178	0.187	0.194	0.158	0.193	0.199	0.165	0.162	0.160
Fe	2.231	2.303	2.118	2.254	2.191	2.292	2.274	2.148	2.094	2.185	2.198	2.204
Mn	0.006	0.011	0.013	0.006	0.014	0.017	0.021	0.011	0.008	0.010	0.011	0.008
Mg	2.599	2.893	2.603	2.654	2.596	2.494	2.473	2.507	2.526	2.501	2.584	2.525
Ca	0.000	0.003	0.002	0.002	0.005	0.009	0.004	0.003	0.002	0.000	0.003	0.002
Na	0.057	0.056	0.044	0.088	0.008	0.016	0.012	0.108	0.108	0.114	0.078	0.118
K	1.718	1.357	1.776	1.687	1.925	1.841	1.805	1.721	1.710	1.716	1.711	1.722
OH	3.865	3.874	3.862	3.890	3.922	3.922	3.820	3.866	3.964	3.918	3.860	3.889
F	0.134	0.126	0.136	0.105	0.078	0.073	0.178	0.131	0.036	0.080	0.136	0.086
Met Zone	3	3	3	3	2	2	2	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1698 8	1698 9	1698-b10	1698-b15	1698-b3	1698-b4	1700 N6	1700 N7	1700 R3	1700 R4	1713A R2	1713A R3
Oxide %												
SiO_2	36.68	36.50	36.16	36.58	35.94	35.31	37.11	36.27	36.61	35.93	36.06	36.15
TiO_2	1.67	1.68	1.65	1.88	1.69	1.66	1.81	1.45	1.78	1.56	1.57	1.51
Al_2O_3	20.01	19.65	19.59	19.72	19.49	19.58	19.53	19.90	19.72	19.54	19.80	19.46
FeO	16.62	16.87	16.43	16.68	16.82	17.09	16.52	16.24	17.22	17.07	17.26	17.31
MnO	0.10	0.06	0.06	0.09	0.09	0.09	0.09	0.10	0.10	0.12	0.11	0.08
MgO	11.33	11.10	11.32	11.73	11.48	11.47	11.73	11.94	11.30	11.79	11.11	11.51
CaO	0.03	0.10	0.06	0.02	0.01	0.02	0.00	0.07	0.00	0.08	0.12	0.11
Na_2O	0.33	0.36	0.30	0.25	0.30	0.20	0.33	0.32	0.31	0.28	0.30	0.34
K_2O	8.75	8.82	8.79	8.95	8.79	8.13	9.06	8.78	8.95	8.39	8.47	8.65
F	0.26	0.36	0.95	0.87	0.60	0.86	0.31	0.23	0.12	0.20	0.30	0.29
NiO	0.01	0.00					0.00	0.02	0.00	0.01	0.00	0.00
H_2O*	3.91	3.83	3.53	3.63	3.70	3.53	3.92	3.90	3.98	3.89	3.85	3.86
Total	99.75	99.53	98.83	100.41	98.99	97.95	100.49	99.28	100.22	98.92	99.08	99.41
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.449	5.454	5.447	5.425	5.411	5.372	5.478	5.413	5.432	5.398	5.414	5.418
Al^{iv}	2.551	2.546	2.553	2.575	2.589	2.628	2.522	2.587	2.568	2.602	2.586	2.582
Al^{vi}*	0.952	0.914	0.925	0.873	0.869	0.884	0.876	0.914	0.882	0.857	0.918	0.857
Ti	0.187	0.189	0.187	0.209	0.191	0.190	0.201	0.163	0.199	0.176	0.178	0.170
Fe	2.064	2.108	2.069	2.068	2.117	2.175	2.040	2.026	2.137	2.144	2.167	2.170
Mn	0.012	0.008	0.007	0.011	0.012	0.011	0.012	0.013	0.013	0.015	0.013	0.010
Mg	2.508	2.471	2.541	2.593	2.576	2.601	2.580	2.655	2.501	2.641	2.485	2.571
Ca	0.005	0.016	0.009	0.003	0.002	0.004	0.000	0.011	0.000	0.014	0.020	0.017
Na	0.096	0.105	0.087	0.073	0.088	0.058	0.094	0.093	0.090	0.082	0.087	0.099
K	1.658	1.681	1.688	1.694	1.687	1.577	1.706	1.672	1.694	1.607	1.622	1.653
OH	3.875	3.822	3.547	3.591	3.712	3.584	3.857	3.885	3.941	3.902	3.855	3.858
F	0.122	0.172	0.450	0.406	0.287	0.413	0.143	0.109	0.058	0.096	0.141	0.135
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	1714B N2	1714B R4	1714B R8	329C 14	329C 15	329C 5	334 n6	334 r3	334 r4	365 17	365 18	365 7
Oxide %												
SiO_2	36.19	36.17	36.60	36.46	36.53	36.47	36.05	36.68	36.43	37.04	35.64	35.68
TiO_2	1.60	1.40	1.74	1.50	1.76	1.39	1.72	1.58	1.71	1.43	1.58	1.29
Al_2O_3	19.53	19.25	19.48	17.73	18.38	18.13	18.94	18.82	19.25	20.57	19.24	18.88
FeO	16.42	16.28	16.45	16.44	16.81	17.05	17.16	17.29	17.24	15.15	16.60	17.34
MnO	0.09	0.07	0.12	0.08	0.11	0.13	0.25	0.22	0.23	0.08	0.07	0.05
MgO	12.77	12.05	11.75	12.44	11.98	12.03	10.96	11.17	10.85	10.81	12.40	12.36
CaO	0.00	0.07	0.04	0.05	0.03	0.01	0.00	0.00	0.00	0.06	0.02	0.02
Na_2O	0.28	0.36	0.14	0.03	0.06	0.10	0.12	0.15	0.11	0.13	0.14	0.05
K_2O	8.85	8.97	9.39	9.65	9.55	9.49	9.61	9.42	9.63	8.98	9.01	9.39
F	0.19	0.22	0.22	0.23	0.29	0.37	0.15	0.20	0.25	0.30	0.11	0.40
NiO	0.00	0.07	0.04	0.08	0.02	0.00	0.02	0.04	0.04	0.04	0.04	0.06
H_2O*	3.94	3.89	3.93	3.85	3.85	3.79	3.89	3.90	3.87	3.87	3.93	3.78
Total	99.95	98.92	100.09	98.63	99.55	99.10	98.86	99.62	99.71	98.56	98.85	99.39
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.374	5.434	5.439	5.521	5.482	5.508	5.458	5.503	5.466	5.525	5.366	5.382
Al^{iv}	2.626	2.566	2.561	2.479	2.518	2.492	2.542	2.497	2.534	2.475	2.634	2.618
Al^{vi}*	0.792	0.842	0.850	0.686	0.733	0.734	0.837	0.830	0.870	1.141	0.781	0.740
Ti	0.179	0.158	0.194	0.170	0.199	0.158	0.195	0.178	0.193	0.161	0.179	0.146
Fe	2.039	2.045	2.045	2.081	2.110	2.153	2.172	2.168	2.163	1.890	2.091	2.187
Mn	0.012	0.009	0.015	0.010	0.014	0.017	0.032	0.028	0.029	0.010	0.009	0.006
Mg	2.827	2.697	2.603	2.809	2.681	2.708	2.472	2.497	2.426	2.404	2.783	2.779
Ca	0.000	0.012	0.006	0.007	0.005	0.001	0.000	0.000	0.000	0.010	0.003	0.004
Na	0.079	0.104	0.041	0.009	0.019	0.028	0.036	0.043	0.033	0.037	0.042	0.013
K	1.675	1.718	1.779	1.864	1.828	1.829	1.855	1.803	1.843	1.708	1.730	1.807
OH	3.907	3.893	3.894	3.886	3.857	3.820	3.924	3.904	3.878	3.851	3.948	3.804
F	0.090	0.105	0.104	0.111	0.137	0.178	0.074	0.095	0.118	0.142	0.050	0.190
Met Zone	3	3	3	1	1	1	2	2	2	3	3	3

Table 1 continued: Biotite chemistry.

ID	388 1	388 10	388 13	402 6	409 14	433 1	433 2	456 18	456 6	475 N8	475 R2	475 R3
Oxide %												
SiO_2	36.54	36.52	36.47	35.81	36.29	36.36	36.38	35.79	35.65	36.99	36.93	36.43
TiO_2	1.51	1.69	1.68	1.70	1.74	1.63	1.82	2.12	1.97	1.56	1.75	1.47
Al_2O_3	19.62	19.71	19.33	19.22	17.82	19.16	19.35	18.59	18.94	19.77	19.34	19.36
FeO	15.68	15.36	16.08	17.62	17.51	17.20	17.46	17.43	18.01	16.94	16.55	16.32
MnO	0.06	0.07	0.07	0.07	0.18	0.12	0.11	0.12	0.14	0.08	0.10	0.16
MgO	12.01	11.73	11.69	10.29	11.68	11.42	11.31	10.55	10.50	11.92	11.88	11.82
CaO	0.01	0.02	0.00	0.00	0.00	0.02	0.02	0.01	0.02	0.00	0.03	0.02
Na_2O	0.40	0.28	0.29	0.35	0.15	0.29	0.28	0.12	0.07	0.24	0.26	0.22
K_2O	9.06	9.14	9.20	9.19	9.37	8.94	9.09	9.47	9.56	9.16	8.92	8.78
F	0.05	0.27	0.34	0.32	0.32	0.30	0.19	0.56	0.28	0.11	0.25	0.51
NiO	0.03	0.02	0.01	0.03	0.00	0.03	0.06	0.04	0.04	0.08	0.00	0.01
H_2O*	3.99	3.88	3.84	3.79	3.81	3.86	3.93	3.67	3.82	4.02	3.92	3.75
Total	99.02	98.77	99.07	98.51	98.99	99.48	100.11	98.59	99.04	100.97	100.02	98.89
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.455	5.465	5.466	5.446	5.499	5.451	5.425	5.453	5.414	5.441	5.475	5.468
Al^{iv}	2.545	2.535	2.534	2.554	2.501	2.549	2.575	2.547	2.586	2.559	2.525	2.532
Al^{vi}*	0.907	0.941	0.880	0.891	0.682	0.835	0.827	0.793	0.805	0.870	0.854	0.892
Ti	0.170	0.190	0.189	0.194	0.198	0.184	0.204	0.243	0.224	0.172	0.195	0.166
Fe	1.957	1.922	2.015	2.241	2.219	2.157	2.178	2.221	2.288	2.084	2.052	2.048
Mn	0.007	0.008	0.009	0.009	0.023	0.015	0.014	0.016	0.017	0.010	0.012	0.020
Mg	2.672	2.617	2.612	2.333	2.637	2.552	2.513	2.397	2.377	2.614	2.626	2.645
Ca	0.001	0.004	0.000	0.000	0.000	0.003	0.004	0.002	0.003	0.000	0.004	0.003
Na	0.114	0.080	0.084	0.102	0.044	0.084	0.081	0.036	0.020	0.069	0.074	0.063
K	1.725	1.745	1.758	1.783	1.811	1.710	1.730	1.840	1.852	1.718	1.688	1.681
OH	3.977	3.871	3.838	3.848	3.847	3.857	3.907	3.731	3.865	3.947	3.882	3.756
F	0.023	0.128	0.160	0.152	0.152	0.140	0.090	0.268	0.133	0.053	0.117	0.242
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	615 14	615 8	616 N1	616 N6	616 R5	619 6	619 9	622 B1	622 N1	622 R5	622 R8	974 1
Oxide %												
SiO_2	36.62	36.44	36.25	36.45	36.62	36.58	35.97	36.89	35.68	36.86	36.17	36.16
TiO_2	1.67	1.64	1.52	1.41	1.35	1.59	1.53	1.52	1.36	1.55	1.37	1.65
Al_2O_3	19.10	19.11	18.14	18.13	17.85	18.99	19.18	17.55	17.58	17.60	17.82	19.17
FeO	15.96	16.47	17.74	18.33	17.13	18.27	18.51	17.75	18.41	18.00	18.03	17.41
MnO	0.08	0.10	0.11	0.15	0.09	0.13	0.12	0.16	0.18	0.16	0.14	0.23
MgO	11.74	12.07	11.75	11.38	11.83	11.02	10.76	12.14	12.60	11.87	12.45	10.92
CaO	0.02	0.04	0.01	0.05	0.01	0.00	0.02	0.02	0.04	0.01	0.02	0.01
Na_2O	0.29	0.27	0.06	0.10	0.11	0.15	0.19	0.05	0.03	0.03	0.03	0.12
K_2O	8.83	8.82	9.44	9.49	9.48	9.16	9.18	9.81	8.68	9.91	8.84	9.26
F	0.16	0.17	0.32	0.46	0.37	0.19	0.28	0.58	0.32	0.47	0.33	0.41
NiO	0.02	0.00	0.01	0.00	0.03	0.06	0.01	0.05	0.01	0.00	0.05	0.03
H_2O*	3.92	3.92	3.82	3.76	3.78	3.91	3.84	3.72	3.78	3.77	3.81	3.78
Total	98.55	99.14	99.26	99.88	98.81	100.14	99.74	100.27	98.86	100.38	99.16	99.25
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)												
Si	5.498	5.453	5.480	5.496	5.547	5.472	5.420	5.537	5.427	5.532	5.469	5.454
Al^{iv}	2.502	2.547	2.520	2.504	2.453	2.528	2.580	2.463	2.573	2.468	2.531	2.546
Al^{vi}*	0.879	0.824	0.712	0.719	0.734	0.820	0.826	0.643	0.578	0.645	0.645	0.862
Ti	0.189	0.184	0.173	0.160	0.154	0.179	0.174	0.172	0.155	0.175	0.155	0.187
Fe	2.004	2.061	2.242	2.311	2.170	2.286	2.333	2.228	2.342	2.260	2.281	2.196
Mn	0.010	0.013	0.014	0.019	0.011	0.016	0.015	0.020	0.023	0.021	0.017	0.030
Mg	2.628	2.694	2.647	2.557	2.672	2.457	2.418	2.715	2.857	2.655	2.806	2.455
Ca	0.003	0.006	0.002	0.008	0.002	0.000	0.004	0.002	0.006	0.002	0.003	0.001
Na	0.083	0.078	0.018	0.028	0.031	0.043	0.056	0.014	0.010	0.009	0.009	0.035
K	1.691	1.683	1.820	1.826	1.832	1.747	1.764	1.878	1.685	1.898	1.706	1.780
OH	3.922	3.917	3.849	3.782	3.817	3.907	3.861	3.721	3.840	3.773	3.838	3.802
F	0.074	0.082	0.151	0.217	0.179	0.090	0.135	0.274	0.155	0.225	0.159	0.196
Met Zone	3	3	3	3	3	3	3	3	3	3	3	3

Table 1 continued: Biotite chemistry.

ID	974 2	974 3	978 10	982 7	984 4
Oxide %					
SiO_2	36.05	36.24	36.59	36.48	36.77
TiO_2	1.55	1.54	1.44	1.88	1.60
Al_2O_3	19.09	19.28	19.16	19.57	19.18
FeO	17.63	17.28	17.02	16.57	16.49
MnO	0.24	0.19	0.07	0.12	0.06
MgO	11.14	11.04	11.31	11.28	11.61
CaO	0.01	0.02	0.05	0.04	0.01
Na_2O	0.17	0.14	0.28	0.29	0.35
K_2O	9.03	9.27	9.00	9.20	8.82
F	0.50	0.24	0.63	0.45	0.50
NiO	0.05	0.03	0.00	0.03	0.07
H_2O*	3.74	3.87	3.70	3.80	3.77
Total	99.25	99.19	99.43	99.83	99.28
Cations (formula based on 24 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)					
Si	5.440	5.457	5.489	5.441	5.499
Al^{iv}	2.560	2.543	2.511	2.559	2.501
Al^{vi}*	0.836	0.879	0.877	0.882	0.881
Ti	0.176	0.174	0.163	0.211	0.180
Fe	2.224	2.176	2.135	2.067	2.063
Mn	0.030	0.024	0.008	0.016	0.008
Mg	2.507	2.477	2.530	2.509	2.588
Ca	0.001	0.002	0.007	0.006	0.002
Na	0.049	0.040	0.080	0.084	0.101
K	1.738	1.780	1.721	1.750	1.683
OH	3.762	3.885	3.701	3.783	3.764
F	0.236	0.114	0.299	0.212	0.236
Met Zone	3	3	3	3	3

Table 2 : Chlorite chemistry.

ID	1505 N3	1505 R7	1518 R10	1518 R3	1562 B9	1562 N3	1566 N11	1566 N13	1566 N14	1566 N2	1566 N9
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.09	24.94	25.00	25.50	25.66	24.84	30.18	27.77	29.49	27.38	29.42
TiO_2	0.07	0.10	0.08	0.08	0.23	0.13	0.44	0.29	0.56	0.02	0.53
Al_2O_3	23.33	23.62	23.52	21.73	23.00	24.36	17.31	19.44	17.28	19.99	17.44
Fe_2O_3	0.13	0.18	0.12	0.00	0.28	0.19	1.97	0.97	1.49	0.90	1.77
FeO	22.37	23.29	22.02	22.03	20.56	20.29	19.92	22.49	21.08	22.71	20.07
MnO	0.03	0.07	0.18	0.25	0.15	0.22	0.20	0.22	0.21	0.19	0.35
MgO	16.96	16.20	16.94	17.59	17.87	17.92	17.44	16.91	17.84	16.52	17.64
NiO	0.01	0.00	0.05	0.02	0.04	0.03	0.00	0.03	0.02	0.03	0.01
CaO	0.01	0.02	0.01	0.00	0.03	0.00	0.72	0.04	0.11	0.03	0.06
Na_2O	0.02	0.03	0.04	0.01	0.03	0.00	0.01	0.00	0.03	0.02	0.02
K_2O	0.00	0.02	0.03	0.01	0.14	0.01	0.18	0.05	0.09	0.01	0.11
H_2O*	11.62	11.62	11.63	11.52	11.71	11.73	11.72	11.59	11.66	11.53	11.59
Total	99.65	100.08	99.61	98.74	99.69	99.70	100.10	99.79	99.85	99.32	99.01
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.175	5.143	5.154	5.307	5.249	5.074	6.136	5.727	6.037	5.678	6.053
Al^{iv}	2.825	2.857	2.846	2.693	2.751	2.926	1.864	2.273	1.963	2.322	1.947
Al^{vi}	2.849	2.888	2.874	2.642	2.802	2.944	2.310	2.466	2.228	2.578	2.305
Ti	0.011	0.016	0.012	0.012	0.035	0.019	0.068	0.044	0.086	0.002	0.082
Fe^{3+}	0.021	0.028	0.018	0.000	0.044	0.030	0.302	0.151	0.229	0.141	0.275
Fe^{2+}	3.859	4.017	3.797	3.849	3.516	3.466	3.387	3.879	3.610	3.939	3.454
Mn	0.006	0.012	0.031	0.044	0.026	0.038	0.034	0.039	0.036	0.033	0.061
Mg	5.213	4.980	5.206	5.459	5.448	5.457	5.287	5.199	5.446	5.108	5.410
Ni	0.002	0.000	0.008	0.003	0.006	0.004	0.001	0.005	0.003	0.005	0.001
Ca	0.002	0.004	0.002	0.001	0.005	0.000	0.156	0.008	0.024	0.006	0.013
Na	0.018	0.022	0.030	0.007	0.025	0.003	0.010	0.000	0.021	0.012	0.018
K	0.002	0.011	0.017	0.007	0.075	0.004	0.095	0.025	0.048	0.004	0.057
Met zone	3	3	2	2	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1566 R1	1566 R12	1566 R15	1566 R16	1566 R7	1566 R8	1566 V11	1566 V16	1566 V2	1566 V7	1567 1
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	26.24	28.75	29.16	30.26	27.37	30.06	29.49	29.27	29.75	30.52	28.89
TiO_2	0.00	0.28	0.46	0.57	0.00	0.32	0.53	0.50	0.36	0.24	0.63
Al_2O_3	20.51	17.39	17.11	17.90	21.01	17.95	17.41	17.86	17.87	16.91	18.55
Fe_2O_3	0.19	0.81	1.08	2.79	0.86	2.03	1.58	1.61	1.97	2.03	1.33
FeO	25.64	23.28	21.61	21.37	23.87	19.64	20.35	20.53	19.73	20.09	21.92
MnO	0.32	0.27	0.08	0.19	0.13	0.21	0.12	0.16	0.29	0.12	0.26
MgO	15.37	17.24	17.81	15.64	16.16	17.96	17.89	17.58	17.62	17.83	16.35
NiO	0.01	0.01	0.02	0.02	0.08	0.04	0.02	0.00	0.03	0.01	0.00
CaO	0.02	0.06	0.08	0.23	0.00	0.09	0.07	0.08	0.10	0.18	0.07
Na_2O	0.02	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.02	0.03	0.02
K_2O	0.01	0.10	0.29	0.07	0.01	0.10	0.24	0.22	0.14	0.13	0.66
H_2O*	11.44	11.55	11.57	11.72	11.72	11.77	11.63	11.63	11.68	11.70	11.65
Total	99.76	99.75	99.27	100.77	101.22	100.19	99.34	99.45	99.54	99.77	100.34
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.497	5.954	6.020	6.144	5.589	6.086	6.047	6.000	6.071	6.215	5.907
Al^{iv}	2.503	2.046	1.980	1.856	2.411	1.914	1.953	2.000	1.929	1.785	2.093
Al^{vi}	2.565	2.210	2.201	2.463	2.658	2.396	2.279	2.340	2.397	2.301	2.410
Ti	0.000	0.044	0.071	0.087	0.000	0.049	0.082	0.077	0.054	0.037	0.097
Fe^{3+}	0.030	0.126	0.168	0.427	0.132	0.310	0.244	0.248	0.302	0.311	0.205
Fe^{2+}	4.493	4.032	3.730	3.629	4.077	3.325	3.489	3.520	3.367	3.422	3.749
Mn	0.056	0.047	0.014	0.033	0.022	0.036	0.021	0.027	0.050	0.020	0.045
Mg	4.801	5.322	5.479	4.735	4.918	5.422	5.468	5.373	5.360	5.414	4.985
Ni	0.001	0.002	0.004	0.004	0.013	0.006	0.003	0.000	0.005	0.001	0.000
Ca	0.005	0.014	0.017	0.051	0.000	0.020	0.014	0.018	0.021	0.038	0.016
Na	0.019	0.010	0.004	0.002	0.015	0.009	0.009	0.010	0.015	0.020	0.013
K	0.003	0.054	0.151	0.037	0.006	0.054	0.128	0.114	0.075	0.066	0.346
Met zone	3	3	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1648 R1	1648 V2	1656 B2	1656 R2	1658 N5	1658 R12	1658 R14	1658 R15	1658 R8	1658 R9	1658 V5
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	24.71	25.42	29.13	28.82	25.90	26.38	28.35	26.71	28.62	24.41	25.03
TiO_2	0.12	0.12	0.34	0.08	0.08	0.06	0.18	0.10	0.22	0.07	0.11
Al_2O_3	23.19	23.34	18.73	18.81	21.23	20.75	19.63	19.74	19.79	23.39	23.73
Fe_2O_3	0.00	0.00	1.52	1.44	0.31	0.99	1.52	0.77	1.26	0.00	0.11
FeO	22.98	22.72	21.88	22.59	23.19	25.22	23.05	26.09	22.95	23.16	22.77
MnO	0.15	0.29	0.27	0.20	0.12	0.20	0.01	0.15	0.13	0.25	0.21
MgO	16.76	17.29	17.14	16.42	16.30	14.10	15.25	14.04	15.32	16.10	16.53
NiO	0.05	0.04	0.00	0.00	0.03	0.01	0.00	0.00	0.07	0.00	0.00
CaO	0.00	0.03	0.08	0.09	0.04	0.02	0.15	0.05	0.05	0.07	0.05
Na_2O	0.00	0.02	0.02	0.02	0.00	0.01	0.03	0.03	0.03	0.02	0.06
K_2O	0.00	0.02	0.07	0.09	0.08	0.01	0.36	0.12	0.82	0.02	0.04
H_2O*	11.56	11.77	11.76	11.63	11.45	11.36	11.59	11.31	11.68	11.48	11.67
Total	99.53	101.06	100.93	100.20	98.75	99.11	100.11	99.11	100.93	98.97	100.31
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.122	5.177	5.916	5.914	5.419	5.554	5.832	5.646	5.835	5.099	5.138
Al^{iv}	2.878	2.823	2.084	2.086	2.581	2.446	2.168	2.354	2.165	2.901	2.862
Al^{vi}	2.793	2.784	2.419	2.486	2.664	2.718	2.623	2.578	2.626	2.861	2.886
Ti	0.018	0.019	0.052	0.012	0.013	0.009	0.027	0.015	0.033	0.010	0.016
Fe^{3+}	0.000	0.000	0.233	0.223	0.050	0.157	0.236	0.122	0.194	0.000	0.017
Fe^{2+}	4.004	3.875	3.717	3.877	4.059	4.440	3.967	4.613	3.913	4.058	3.910
Mn	0.026	0.050	0.046	0.035	0.022	0.036	0.002	0.028	0.022	0.045	0.037
Mg	5.179	5.249	5.188	5.023	5.086	4.426	4.677	4.423	4.657	5.011	5.060
Ni	0.009	0.007	0.000	0.000	0.005	0.002	0.000	0.000	0.011	0.000	0.000
Ca	0.001	0.007	0.016	0.021	0.010	0.004	0.033	0.012	0.012	0.017	0.012
Na	0.000	0.018	0.015	0.012	0.002	0.008	0.025	0.022	0.021	0.015	0.046
K	0.000	0.009	0.035	0.048	0.044	0.005	0.190	0.065	0.428	0.010	0.020
Met zone	3	3	2	2	2	2	2	2	2	2	2

Table 2 continued: Chlorite chemistry.

ID	1658 V6	1662 7	1664 B12	1664 V1	1666 R8	1666 V6	1667 6	1668 B5	1668 N12	1668 N4	1668 N6
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.11	26.32	25.18	24.81	25.82	25.07	25.26	35.91	31.98	28.24	33.30
TiO_2	0.08	0.13	0.10	0.16	0.07	0.11	0.13	1.45	0.26	0.09	0.01
Al_2O_3	23.73	21.62	24.40	23.90	23.95	23.45	23.62	18.85	20.94	18.06	25.95
Fe_2O_3	0.39	0.25	0.14	0.32	1.22	0.09	0.42	9.04	4.43	0.41	8.08
FeO	22.32	22.70	19.80	20.22	19.57	20.21	22.18	2.69	15.83	25.11	0.00
MnO	0.10	0.43	0.19	0.26	0.20	0.27	0.11	0.17	0.28	0.22	0.06
MgO	16.24	16.90	18.58	17.57	16.72	18.19	16.67	16.76	13.31	16.62	19.68
NiO	0.04	0.04	0.04	0.00	0.04	0.00	0.04	0.10	0.10	0.06	0.13
CaO	0.04	0.03	0.02	0.01	0.04	0.00	0.00	1.79	0.03	0.02	0.22
Na_2O	0.06	0.02	0.01	0.00	0.03	0.01	0.00	0.05	0.09	0.02	0.05
K_2O	0.05	0.16	0.03	0.01	0.03	0.02	0.01	0.30	1.95	0.10	0.04
H_2O*	11.63	11.65	11.84	11.63	11.70	11.66	11.68	12.31	11.95	11.56	12.71
Total	99.78	100.24	100.33	98.89	99.39	99.08	100.13	99.42	101.14	100.50	100.22
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.171	5.411	5.097	5.114	5.274	5.156	5.182	6.822	6.285	5.849	6.156
Al^{iv}	2.829	2.589	2.903	2.886	2.726	2.844	2.818	1.178	1.715	2.151	1.844
Al^{vi}	2.943	2.659	2.921	2.927	3.061	2.842	2.899	3.149	3.240	2.264	3.927
Ti	0.013	0.020	0.015	0.025	0.011	0.017	0.020	0.208	0.038	0.014	0.002
Fe^{3+}	0.061	0.039	0.021	0.049	0.187	0.013	0.065	1.292	0.655	0.064	1.125
Fe^{2+}	3.844	3.903	3.351	3.486	3.343	3.476	3.806	0.428	2.603	4.350	0.000
Mn	0.017	0.075	0.032	0.046	0.034	0.047	0.019	0.027	0.047	0.039	0.010
Mg	4.985	5.180	5.607	5.399	5.092	5.577	5.098	4.745	3.900	5.130	5.422
Ni	0.007	0.007	0.006	0.000	0.006	0.000	0.007	0.016	0.016	0.010	0.019
Ca	0.009	0.006	0.005	0.002	0.008	0.000	0.001	0.365	0.007	0.005	0.044
Na	0.044	0.017	0.009	0.002	0.021	0.006	0.002	0.038	0.070	0.014	0.033
K	0.027	0.083	0.014	0.005	0.018	0.012	0.004	0.147	0.977	0.052	0.017
Met zone	2	2	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1668 N8	1668 R10	1668 R12	1668 R6	1668 V17	1668 V2	1668 V4	1669 19	1669 8	1669 9	1671 B13
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	40.27	28.47	28.04	28.13	27.74	28.85	27.77	24.98	25.28	25.04	24.45
TiO_2	0.01	0.07	0.17	0.10	0.49	0.62	0.15	0.09	0.11	0.06	0.08
Al_2O_3	27.66	18.59	19.05	18.77	18.89	17.74	18.79	23.90	23.66	23.72	23.76
Fe_2O_3	5.12	0.85	0.36	0.55	0.98	1.37	0.50	0.00	0.23	0.15	0.00
FeO	0.00	23.64	25.21	23.59	23.49	22.37	23.84	21.25	20.98	21.06	21.70
MnO	0.08	0.34	0.32	0.27	0.24	0.33	0.29	0.16	0.26	0.25	0.13
MgO	12.87	16.63	15.54	15.79	15.65	16.52	15.93	17.96	17.63	17.60	16.93
NiO	0.48	0.08	0.07	0.05	0.02	0.00	0.03	0.01	0.03	0.00	0.05
CaO	0.17	0.06	0.05	0.03	0.33	0.60	0.04	0.00	0.02	0.01	0.04
Na_2O	0.05	0.03	0.02	0.05	0.02	0.04	0.01	0.02	0.02	0.01	0.03
K_2O	1.54	0.11	0.67	0.75	0.27	0.05	0.56	0.01	0.02	0.01	0.02
H_2O*	13.21	11.62	11.60	11.49	11.49	11.60	11.46	11.74	11.72	11.67	11.53
Total	101.45	100.49	101.09	99.58	99.60	100.09	99.38	100.13	99.98	99.56	98.72
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	7.176	5.860	5.775	5.841	5.769	5.941	5.790	5.101	5.168	5.142	5.083
Al^{iv}	0.824	2.140	2.225	2.159	2.231	2.059	2.210	2.899	2.832	2.858	2.917
Al^{vi}	5.098	2.384	2.421	2.459	2.417	2.267	2.426	2.855	2.874	2.885	2.906
Ti	0.001	0.011	0.026	0.016	0.077	0.097	0.024	0.014	0.017	0.009	0.012
Fe^{3+}	0.687	0.131	0.056	0.087	0.153	0.212	0.079	0.000	0.035	0.023	0.000
Fe^{2+}	0.000	4.068	4.342	4.097	4.086	3.854	4.156	3.638	3.587	3.617	3.774
Mn	0.012	0.058	0.055	0.048	0.042	0.057	0.051	0.028	0.045	0.043	0.022
Mg	3.420	5.103	4.770	4.887	4.850	5.073	4.952	5.467	5.371	5.388	5.246
Ni	0.068	0.014	0.011	0.008	0.003	0.000	0.005	0.001	0.006	0.000	0.009
Ca	0.032	0.013	0.012	0.007	0.074	0.133	0.009	0.001	0.005	0.001	0.008
Na	0.037	0.022	0.018	0.043	0.019	0.028	0.011	0.012	0.017	0.005	0.025
K	0.699	0.056	0.354	0.398	0.143	0.028	0.297	0.004	0.008	0.004	0.012
Met zone	3	3	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1671 B17	1671 N3	1671 R14	1671 R8	1672 N10	1672 N2	1672 R1	1672 R3	1672 R8	1672 V1	1672 V14
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	24.88	28.38	26.34	24.87	25.14	25.24	25.56	25.88	25.79	25.58	25.81
TiO_2	0.08	0.02	0.14	0.11	0.10	0.08	0.07	0.10	0.08	0.11	0.06
Al_2O_3	24.09	18.84	23.14	23.82	23.47	23.07	23.21	22.42	22.51	22.43	22.33
Fe_2O_3	0.38	1.24	0.34	0.13	0.21	0.00	0.27	0.40	0.05	0.00	0.13
FeO	20.77	23.25	21.07	21.64	21.00	21.39	20.59	20.51	21.09	21.46	20.52
MnO	0.06	0.11	0.18	0.17	0.28	0.38	0.39	0.37	0.25	0.37	0.42
MgO	17.06	15.65	17.54	17.19	17.43	17.82	17.91	17.91	18.21	18.16	18.26
NiO	0.06	0.08	0.12	0.03	0.06	0.01	0.01	0.00	0.06	0.00	0.03
CaO	0.03	0.22	0.04	0.02	0.04	0.03	0.01	0.01	0.00	0.01	0.02
Na_2O	0.03	0.03	0.05	0.02	0.03	0.02	0.02	0.00	0.02	0.01	0.02
K_2O	0.05	0.23	0.37	0.01	0.01	0.02	0.00	0.00	0.04	0.02	0.03
H_2O*	11.63	11.51	11.85	11.66	11.65	11.67	11.71	11.65	11.70	11.68	11.66
Total	99.14	99.56	101.17	99.66	99.40	99.71	99.75	99.27	99.80	99.83	99.26
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.124	5.886	5.313	5.115	5.172	5.184	5.230	5.321	5.283	5.248	5.307
Al^{iv}	2.876	2.114	2.687	2.885	2.828	2.816	2.770	2.679	2.717	2.752	2.693
Al^{vi}	2.980	2.513	2.831	2.894	2.868	2.774	2.830	2.760	2.720	2.677	2.722
Ti	0.013	0.003	0.021	0.017	0.015	0.013	0.011	0.016	0.013	0.017	0.009
Fe^{3+}	0.059	0.193	0.051	0.020	0.033	0.000	0.041	0.062	0.007	0.000	0.019
Fe^{2+}	3.578	4.032	3.555	3.722	3.613	3.686	3.524	3.526	3.613	3.703	3.529
Mn	0.010	0.020	0.030	0.029	0.049	0.065	0.067	0.064	0.043	0.064	0.073
Mg	5.238	4.837	5.275	5.272	5.346	5.456	5.461	5.489	5.561	5.554	5.598
Ni	0.010	0.013	0.020	0.004	0.010	0.002	0.001	0.000	0.010	0.000	0.005
Ca	0.007	0.049	0.008	0.005	0.008	0.006	0.002	0.003	0.000	0.002	0.004
Na	0.024	0.023	0.041	0.013	0.022	0.015	0.017	0.000	0.017	0.009	0.014
K	0.028	0.123	0.189	0.003	0.005	0.008	0.001	0.000	0.020	0.012	0.014
Met zone	3	3	3	3	2	2	2	2	2	2	2

Table 2 continued: Chlorite chemistry.

ID	1672 V3	1672 V4	1674 R15	1674 R6	1679 12	1679 9	1680 N4	1680 R3	1681 R4	1681 V2	1681 V9
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.76	25.60	25.82	25.85	24.98	25.08	25.01	25.27	25.24	25.18	25.01
TiO_2	0.06	0.11	0.05	0.07	0.08	0.08	0.08	0.08	0.06	0.14	0.06
Al_2O_3	22.77	22.90	21.67	22.06	23.70	23.59	23.67	23.98	23.56	23.30	23.38
Fe_2O_3	0.05	0.00	0.04	0.33	0.19	0.19	0.00	0.20	0.50	0.00	0.25
FeO	21.14	21.42	23.12	22.98	21.64	21.25	21.40	21.61	20.58	22.42	20.77
MnO	0.28	0.36	0.24	0.30	0.08	0.03	0.15	0.17	0.07	0.04	0.14
MgO	18.11	18.00	17.07	16.54	17.10	17.58	17.48	17.49	17.10	17.69	17.39
NiO	0.00	0.00	0.00	0.08	0.00	0.03	0.05	0.00	0.05	0.06	0.08
CaO	0.02	0.00	0.02	0.00	0.02	0.00	0.05	0.01	0.04	0.01	0.00
Na_2O	0.04	0.04	0.01	0.00	0.04	0.00	0.08	0.02	0.05	0.01	0.03
K_2O	0.04	0.04	0.00	0.01	0.02	0.00	0.05	0.01	0.04	0.03	0.01
H_2O*	11.73	11.73	11.57	11.59	11.64	11.66	11.67	11.78	11.61	11.74	11.58
Total	99.98	100.19	99.60	99.80	99.49	99.46	99.66	100.61	98.91	100.62	98.70
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.265	5.230	5.352	5.347	5.143	5.155	5.135	5.140	5.205	5.138	5.177
Al^{iv}	2.735	2.770	2.648	2.653	2.857	2.845	2.865	2.860	2.795	2.862	2.823
Al^{vi}	2.754	2.749	2.646	2.729	2.901	2.874	2.868	2.896	2.943	2.751	2.887
Ti	0.009	0.017	0.007	0.011	0.013	0.012	0.012	0.013	0.010	0.022	0.009
Fe^{3+}	0.008	0.000	0.006	0.052	0.030	0.029	0.000	0.030	0.078	0.000	0.039
Fe^{2+}	3.615	3.664	4.007	3.975	3.727	3.654	3.679	3.676	3.550	3.859	3.596
Mn	0.048	0.062	0.042	0.052	0.014	0.004	0.025	0.029	0.012	0.006	0.025
Mg	5.517	5.481	5.276	5.099	5.248	5.387	5.349	5.305	5.255	5.380	5.365
Ni	0.000	0.000	0.000	0.013	0.000	0.004	0.008	0.000	0.008	0.010	0.013
Ca	0.004	0.000	0.004	0.001	0.004	0.000	0.010	0.003	0.009	0.003	0.000
Na	0.034	0.031	0.008	0.002	0.030	0.000	0.061	0.014	0.038	0.009	0.020
K	0.023	0.020	0.000	0.005	0.008	0.000	0.025	0.004	0.021	0.016	0.006
Met zone	2	3	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1672 V3	1672 V4	1674 R15	1674 R6	1679 12	1679 9	1680 N4	1680 R3	1681 R4	1681 V2	1681 V9
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.76	25.60	25.82	25.85	24.98	25.08	25.01	25.27	25.24	25.18	25.01
TiO_2	0.06	0.11	0.05	0.07	0.08	0.08	0.08	0.08	0.06	0.14	0.06
Al_2O_3	22.77	22.90	21.67	22.06	23.70	23.59	23.67	23.98	23.56	23.30	23.38
Fe_2O_3	0.05	0.00	0.04	0.33	0.19	0.19	0.00	0.20	0.50	0.00	0.25
FeO	21.14	21.42	23.12	22.98	21.64	21.25	21.40	21.61	20.58	22.42	20.77
MnO	0.28	0.36	0.24	0.30	0.08	0.03	0.15	0.17	0.07	0.04	0.14
MgO	18.11	18.00	17.07	16.54	17.10	17.58	17.48	17.49	17.10	17.69	17.39
NiO	0.00	0.00	0.00	0.08	0.00	0.03	0.05	0.00	0.05	0.06	0.08
CaO	0.02	0.00	0.02	0.00	0.02	0.00	0.05	0.01	0.04	0.01	0.00
Na_2O	0.04	0.04	0.01	0.00	0.04	0.00	0.08	0.02	0.05	0.01	0.03
K_2O	0.04	0.04	0.00	0.01	0.02	0.00	0.05	0.01	0.04	0.03	0.01
H_2O*	11.73	11.73	11.57	11.59	11.64	11.66	11.67	11.78	11.61	11.74	11.58
Total	99.98	100.19	99.60	99.80	99.49	99.46	99.66	100.61	98.91	100.62	98.70
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.265	5.230	5.352	5.347	5.143	5.155	5.135	5.140	5.205	5.138	5.177
Al^{iv}	2.735	2.770	2.648	2.653	2.857	2.845	2.865	2.860	2.795	2.862	2.823
Al^{vi}	2.754	2.749	2.646	2.729	2.901	2.874	2.868	2.896	2.943	2.751	2.887
Ti	0.009	0.017	0.007	0.011	0.013	0.012	0.012	0.013	0.010	0.022	0.009
Fe^{3+}	0.008	0.000	0.006	0.052	0.030	0.029	0.000	0.030	0.078	0.000	0.039
Fe^{2+}	3.615	3.664	4.007	3.975	3.727	3.654	3.679	3.676	3.550	3.859	3.596
Mn	0.048	0.062	0.042	0.052	0.014	0.004	0.025	0.029	0.012	0.006	0.025
Mg	5.517	5.481	5.276	5.099	5.248	5.387	5.349	5.305	5.255	5.380	5.365
Ni	0.000	0.000	0.000	0.013	0.000	0.004	0.008	0.000	0.008	0.010	0.013
Ca	0.004	0.000	0.004	0.001	0.004	0.000	0.010	0.003	0.009	0.003	0.000
Na	0.034	0.031	0.008	0.002	0.030	0.000	0.061	0.014	0.038	0.009	0.020
K	0.023	0.020	0.000	0.005	0.008	0.000	0.025	0.004	0.021	0.016	0.006
Met zone	2	3	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1682 B5	1682 B7	1682 V2	1682 V8	1684 7	1684 8	1687 8	1687 9	1690 R5	1693A N3	1693A N4
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.32	25.12	25.41	25.15	25.33	25.16	25.03	25.17	24.87	25.59	25.25
TiO_2	0.04	0.11	0.09	0.12	0.10	0.11	0.10	0.10	0.07	0.05	0.07
Al_2O_3	23.16	22.66	22.37	22.54	21.65	22.25	22.98	23.37	24.04	22.12	22.35
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.08	0.04	0.28	0.06	0.05	0.00
FeO	23.14	23.16	22.62	22.99	26.10	25.90	23.01	22.47	22.90	23.25	22.72
MnO	0.03	0.00	0.03	0.05	0.00	0.00	0.12	0.22	0.13	0.26	0.42
MgO	17.10	16.91	17.67	16.93	15.11	14.57	16.64	16.50	16.68	16.77	16.85
NiO	0.02	0.00	0.04	0.00	0.09	0.02	0.04	0.02	0.05	0.00	0.05
CaO	0.00	0.02	0.00	0.02	0.03	0.00	0.00	0.01	0.00	0.02	0.02
Na_2O	0.01	0.04	0.01	0.02	0.01	0.02	0.02	0.04	0.01	0.01	0.01
K_2O	0.01	0.00	0.04	0.03	0.05	0.24	0.01	0.01	0.02	0.03	0.00
H_2O*	11.70	11.57	11.64	11.55	11.44	11.43	11.57	11.62	11.70	11.57	11.54
Total	100.53	99.60	99.91	99.38	99.91	99.80	99.55	99.81	100.52	99.71	99.27
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.190	5.202	5.228	5.218	5.306	5.271	5.187	5.188	5.097	5.302	5.250
Al^{iv}	2.810	2.798	2.772	2.782	2.694	2.729	2.813	2.812	2.903	2.698	2.750
Al^{vi}	2.788	2.737	2.661	2.733	2.654	2.774	2.803	2.875	2.907	2.705	2.727
Ti	0.007	0.017	0.015	0.018	0.016	0.018	0.015	0.015	0.010	0.007	0.011
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.013	0.006	0.043	0.009	0.007	0.000
Fe^{2+}	3.972	4.027	3.933	3.998	4.581	4.538	3.987	3.875	3.926	4.029	3.952
Mn	0.004	0.000	0.004	0.009	0.000	0.001	0.021	0.038	0.023	0.045	0.073
Mg	5.227	5.220	5.419	5.235	4.719	4.549	5.141	5.071	5.095	5.179	5.222
Ni	0.004	0.000	0.006	0.000	0.015	0.003	0.006	0.003	0.008	0.000	0.008
Ca	0.000	0.003	0.000	0.003	0.007	0.000	0.000	0.002	0.000	0.003	0.003
Na	0.004	0.030	0.011	0.014	0.011	0.014	0.018	0.035	0.007	0.008	0.011
K	0.003	0.001	0.022	0.013	0.024	0.127	0.003	0.004	0.009	0.014	0.000
Met zone	3	3	3	3	3	3	3	3	2	2	2

Table 2 continued: Chlorite chemistry.

ID	1693A R1	1693A R6	1697 8	1697 9	1698 15	1700 N5	1700 R1	1713A N4	1714B N1	1714B R5	329C 6
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	26.07	26.95	24.78	24.93	25.02	25.13	25.17	24.94	25.19	24.67	25.29
TiO_2	0.04	0.07	0.08	0.07	0.10	0.07	0.11	0.07	0.09	0.10	0.05
Al_2O_3	21.01	20.56	23.46	23.74	23.58	23.61	23.72	23.24	23.52	23.69	22.90
Fe_2O_3	0.17	0.70	0.00	0.10	0.07	0.00	0.25	0.24	0.00	0.00	0.33
FeO	25.21	22.71	22.95	21.93	22.06	21.96	21.09	21.55	21.11	20.65	21.16
MnO	0.39	0.39	0.13	0.15	0.04	0.20	0.14	0.10	0.25	0.23	0.17
MgO	15.49	16.42	16.45	16.88	17.18	17.49	17.50	16.95	18.04	17.52	17.19
NiO	0.00	0.03	0.00	0.01	0.00	0.06	0.02	0.00	0.04	0.04	0.00
CaO	0.03	0.08	0.01	0.01	0.00	0.00	0.01	0.05	0.00	0.05	0.02
Na_2O	0.04	0.04	0.06	0.09	0.05	0.01	0.02	0.02	0.01	0.11	0.02
K_2O	0.02	0.04	0.04	0.04	0.01	0.00	0.02	0.01	0.01	0.04	0.02
H_2O*	11.48	11.55	11.57	11.63	11.66	11.72	11.70	11.54	11.73	11.58	11.56
Total	99.96	99.55	99.56	99.57	99.77	100.25	99.75	98.70	99.99	98.67	98.71
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.440	5.582	5.132	5.137	5.145	5.143	5.156	5.180	5.150	5.103	5.243
Al^{iv}	2.560	2.418	2.868	2.863	2.855	2.857	2.844	2.820	2.850	2.897	2.757
Al^{vi}	2.613	2.614	2.863	2.908	2.864	2.840	2.891	2.873	2.819	2.887	2.845
Ti	0.007	0.010	0.013	0.010	0.015	0.011	0.017	0.011	0.014	0.016	0.008
Fe^{3+}	0.027	0.109	0.000	0.015	0.012	0.001	0.039	0.037	0.000	0.000	0.052
Fe^{2+}	4.400	3.934	3.979	3.778	3.793	3.760	3.614	3.744	3.614	3.582	3.669
Mn	0.068	0.069	0.023	0.025	0.007	0.034	0.024	0.017	0.043	0.040	0.029
Mg	4.817	5.071	5.079	5.183	5.265	5.338	5.345	5.249	5.500	5.402	5.312
Ni	0.000	0.004	0.000	0.002	0.000	0.009	0.003	0.000	0.007	0.006	0.000
Ca	0.008	0.018	0.003	0.003	0.000	0.000	0.001	0.012	0.000	0.012	0.003
Na	0.032	0.029	0.050	0.068	0.042	0.008	0.017	0.014	0.009	0.089	0.013
K	0.010	0.021	0.023	0.023	0.005	0.001	0.010	0.003	0.006	0.023	0.011
Met zone	2	3	3	3	3	3	3	3	3	1	2

Table 2 continued: Chlorite chemistry.

ID	334 n1	334 n2	334 r10	334 r9	365 13	365 14	388 11	388 12	409 13	409 5	409 6
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.00	25.21	25.24	25.00	25.26	25.32	25.36	25.04	25.54	25.22	25.48
TiO_2	0.09	0.11	0.08	0.09	0.08	0.11	0.16	0.10	0.11	0.07	0.10
Al_2O_3	22.85	23.22	22.83	23.31	23.39	23.34	23.43	23.69	22.07	22.56	22.71
Fe_2O_3	0.06	0.38	0.36	0.31	0.41	0.18	0.59	0.29	0.20	0.00	0.27
FeO	22.60	22.14	21.67	21.94	21.03	20.67	19.38	20.84	20.90	21.69	21.05
MnO	0.43	0.33	0.51	0.51	0.23	0.18	0.00	0.20	0.27	0.24	0.31
MgO	16.58	16.40	16.59	16.44	17.11	18.02	17.92	17.45	17.71	17.51	17.52
NiO	0.00	0.07	0.00	0.04	0.04	0.02	0.02	0.07	0.05	0.02	0.01
CaO	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.00
Na_2O	0.03	0.02	0.04	0.02	0.02	0.01	0.03	0.00	0.03	0.01	0.02
K_2O	0.00	0.03	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.01
H_2O*	11.53	11.59	11.52	11.56	11.62	11.69	11.63	11.65	11.53	11.56	11.60
Total	99.17	99.51	98.83	99.21	99.21	99.53	98.53	99.34	98.39	98.95	99.06
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.199	5.211	5.245	5.183	5.207	5.190	5.218	5.150	5.310	5.232	5.261
Al^{iv}	2.801	2.789	2.755	2.817	2.793	2.810	2.782	2.850	2.690	2.768	2.739
Al^{vi}	2.802	2.876	2.845	2.886	2.897	2.832	2.913	2.899	2.723	2.747	2.794
Ti	0.013	0.017	0.012	0.013	0.012	0.016	0.024	0.016	0.016	0.010	0.015
Fe^{3+}	0.010	0.060	0.056	0.049	0.064	0.027	0.092	0.045	0.031	0.000	0.043
Fe^{2+}	3.931	3.828	3.768	3.804	3.626	3.543	3.335	3.585	3.634	3.763	3.636
Mn	0.076	0.058	0.090	0.090	0.039	0.031	0.000	0.036	0.047	0.042	0.054
Mg	5.141	5.052	5.139	5.080	5.256	5.505	5.498	5.350	5.488	5.415	5.393
Ni	0.000	0.012	0.000	0.007	0.006	0.003	0.003	0.012	0.008	0.004	0.001
Ca	0.000	0.003	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.016	0.000
Na	0.023	0.014	0.033	0.017	0.015	0.010	0.026	0.000	0.021	0.005	0.014
K	0.000	0.017	0.000	0.000	0.011	0.000	0.005	0.002	0.002	0.000	0.004
Met zone	2	2	2	3	3	3	3	3		3	3

Table 2 continued: Chlorite chemistry.

ID	409 7	433 8	456 9	475 N10	475 N5	475 N6	475 R1	616 N7	616 R1	619 7	622 B5
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	25.36	25.23	24.72	27.06	25.30	25.39	25.49	25.39	25.45	24.99	25.87
TiO_2	0.07	0.10	0.13	0.30	0.08	0.13	0.07	0.10	0.09	0.07	0.02
Al_2O_3	22.77	22.66	23.36	22.27	23.30	22.98	23.17	22.82	22.50	23.03	18.90
Fe_2O_3	0.06	0.35	0.35	0.55	0.13	0.08	0.15	0.45	0.43	0.16	0.00
FeO	22.01	21.65	22.54	20.35	21.21	21.17	20.89	21.42	21.55	23.22	28.43
MnO	0.28	0.13	0.17	0.15	0.16	0.17	0.23	0.16	0.18	0.23	0.76
MgO	17.38	16.87	15.97	16.79	17.62	17.96	17.92	16.89	16.87	16.19	13.47
NiO	0.03	0.04	0.06	0.02	0.06	0.01	0.01	0.00	0.02	0.01	0.00
CaO	0.02	0.01	0.01	0.09	0.03	0.03	0.00	0.02	0.02	0.01	0.04
Na_2O	0.01	0.01	0.02	0.03	0.02	0.02	0.01	0.02	0.02	0.00	0.01
K_2O	0.01	0.00	0.00	1.11	0.06	0.00	0.06	0.02	0.00	0.01	0.01
H_2O*	11.63	11.51	11.49	11.77	11.68	11.68	11.70	11.56	11.52	11.54	11.11
Total	99.61	98.54	98.81	100.49	99.65	99.61	99.70	98.85	98.65	99.46	98.62
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.231	5.254	5.157	5.478	5.194	5.213	5.221	5.262	5.291	5.192	5.580
Al^{iv}	2.769	2.746	2.843	2.522	2.806	2.787	2.779	2.738	2.709	2.808	2.420
Al^{vi}	2.768	2.820	2.907	2.827	2.836	2.775	2.819	2.845	2.811	2.834	2.387
Ti	0.011	0.015	0.020	0.046	0.013	0.019	0.010	0.015	0.014	0.011	0.003
Fe^{3+}	0.009	0.055	0.055	0.084	0.020	0.012	0.023	0.070	0.068	0.026	0.000
Fe^{2+}	3.797	3.769	3.933	3.444	3.641	3.635	3.579	3.714	3.746	4.035	5.142
Mn	0.048	0.022	0.029	0.026	0.028	0.030	0.039	0.029	0.032	0.040	0.138
Mg	5.343	5.235	4.967	5.065	5.392	5.496	5.470	5.218	5.228	5.014	4.331
Ni	0.004	0.006	0.010	0.002	0.010	0.001	0.002	0.000	0.004	0.002	0.000
Ca	0.003	0.002	0.003	0.020	0.007	0.007	0.000	0.005	0.004	0.003	0.008
Na	0.006	0.008	0.012	0.027	0.012	0.014	0.011	0.016	0.015	0.000	0.011
K	0.003	0.002	0.000	0.575	0.032	0.000	0.032	0.011	0.001	0.005	0.005
Met zone	3	3	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	622 B8	622 N2	622 R3	622 R4	969 3	974 8	974 9	978 6	982 9	984 2	984 6
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)											
SiO_2	27.00	26.13	25.64	25.44	24.87	25.06	25.12	25.23	25.26	25.05	25.02
TiO_2	0.06	0.06	0.05	0.10	0.10	0.08	0.08	0.07	0.07	0.12	0.06
Al_2O_3	19.64	20.77	21.41	21.99	22.58	22.67	22.47	23.28	23.00	23.46	23.23
Fe_2O_3	0.22	0.08	0.10	0.00	0.00	0.03	0.21	0.45	0.40	0.38	0.21
FeO	23.45	23.48	22.95	22.61	22.69	22.94	22.45	21.74	21.48	20.96	20.86
MnO	0.23	0.18	0.18	0.14	0.37	0.45	0.49	0.08	0.14	0.15	0.16
MgO	17.06	16.85	16.80	17.52	16.61	16.49	16.33	16.40	16.77	17.13	17.40
NiO	0.01	0.05	0.02	0.04	0.03	0.04	0.07	0.01	0.00	0.05	0.08
CaO	0.05	0.06	0.01	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.01
Na_2O	0.02	0.03	0.01	0.00	0.02	0.02	0.02	0.09	0.00	0.03	0.03
K_2O	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.04	0.11	0.00	0.01
H_2O*	11.51	11.49	11.45	11.57	11.47	11.53	11.47	11.56	11.54	11.59	11.56
Total	99.34	99.18	98.63	99.40	98.73	99.31	98.70	99.01	98.76	98.90	98.63
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	5.620	5.451	5.367	5.269	5.199	5.215	5.251	5.224	5.241	5.177	5.186
Al^{iv}	2.380	2.549	2.633	2.731	2.801	2.785	2.749	2.776	2.759	2.823	2.814
Al^{vi}	2.445	2.560	2.652	2.641	2.764	2.775	2.792	2.917	2.874	2.900	2.866
Ti	0.010	0.010	0.008	0.015	0.015	0.012	0.012	0.011	0.011	0.019	0.009
Fe^{3+}	0.035	0.013	0.015	0.000	0.000	0.005	0.033	0.070	0.062	0.059	0.032
Fe^{2+}	4.083	4.096	4.018	3.942	3.972	3.991	3.925	3.765	3.727	3.623	3.615
Mn	0.040	0.032	0.033	0.024	0.066	0.080	0.086	0.015	0.024	0.026	0.027
Mg	5.295	5.240	5.241	5.408	5.176	5.114	5.089	5.063	5.186	5.278	5.377
Ni	0.002	0.008	0.003	0.006	0.006	0.007	0.011	0.002	0.000	0.008	0.013
Ca	0.012	0.013	0.002	0.000	0.000	0.000	0.000	0.011	0.001	0.000	0.002
Na	0.014	0.020	0.011	0.000	0.018	0.014	0.016	0.073	0.000	0.022	0.021
K	0.042	0.000	0.003	0.002	0.000	0.000	0.001	0.019	0.059	0.000	0.007
Met zone	3	3	3	3	3	3	3	3	3	3	3

Table 2 continued: Chlorite chemistry.

ID	1570-9	1570-10	1570-19	1570-22	1698-b11	1698-b12	1698-b13
Oxide % (Reformatted oxide percentages based on 28 O with Fe2+/Fe3+ and OH calculated assuming full site occupancy)							
SiO_2	24.92	25.27	24.71	25.33	24.78	24.76	24.41
TiO_2	0.08	0.09	0.07	0.12	0.12	0.09	0.07
Al_2O_3	23.99	24.17	24.63	24.25	23.48	23.50	23.70
Fe_2O_3	0.19	0.38	0.00	0.25	0.00	0.17	0.06
FeO	20.29	19.87	17.85	19.54	22.20	21.43	21.81
MnO	0.12	0.20	0.14	0.14	0.09	0.05	0.13
MgO	17.82	18.03	19.32	18.62	17.07	17.01	16.52
NiO	0.05	0.04	0.02	0.08	0.00	0.02	0.10
CaO	0.01	0.02	0.04	0.00	0.00	0.02	0.03
Na_2O	0.04	0.02	0.17	0.03	0.02	0.04	0.05
K_2O	0.00	0.02	0.06	0.00	0.02	0.02	0.05
H_2O*	11.67	11.77	11.75	11.84	11.60	11.54	11.48
Total	99.18	99.87	98.76	100.21	99.36	98.63	98.43
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)							
Si	5.117	5.142	5.033	5.126	5.124	5.141	5.094
Al^{iv}	2.883	2.858	2.967	2.874	2.876	2.859	2.906
Al^{vi}	2.927	2.946	2.959	2.917	2.849	2.898	2.928
Ti	0.012	0.014	0.011	0.019	0.019	0.013	0.012
Fe^{3+}	0.030	0.058	0.000	0.038	0.000	0.027	0.009
Fe^{2+}	3.485	3.382	3.062	3.307	3.839	3.722	3.806
Mn	0.021	0.034	0.025	0.024	0.015	0.009	0.023
Mg	5.455	5.469	5.865	5.617	5.261	5.265	5.141
Ni	0.008	0.006	0.003	0.013	0.000	0.003	0.017
Ca	0.003	0.004	0.008	0.000	0.000	0.004	0.008
Na	0.034	0.013	0.130	0.027	0.018	0.030	0.042
K	0.000	0.012	0.030	0.000	0.009	0.012	0.028
Met zone	3	3	3	3	3	3	

Table 3: Muscovite chemistry.

ID	1505-N4	1505-R11	1505-R8	1518-N4	1518-R2	1562-B11	1562-B14	1562-B7	1562-B8	1562-N10	1562-N12
Oxide %											
SiO_2	46.84	46.83	46.45	46.08	46.68	46.28	46.38	45.69	46.57	46.07	47.13
TiO_2	0.30	0.40	0.32	0.25	0.54	0.51	0.48	0.54	0.33	0.61	0.41
Al_2O_3	35.85	35.15	35.25	36.52	35.82	37.16	36.37	37.19	36.18	37.02	35.81
FeO	0.75	1.01	0.92	0.76	0.89	0.79	0.67	0.83	0.71	0.94	0.85
MnO	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
MgO	0.81	0.93	0.86	0.58	0.78	0.64	0.89	0.65	0.84	0.63	0.96
Na2O	1.12	1.02	0.92	1.28	1.06	1.05	0.98	1.12	0.83	1.07	0.87
K2O	9.22	9.46	9.27	9.11	9.30	8.48	8.66	8.50	8.54	8.16	8.81
BaO	0.43	0.43	0.45	0.51	0.52	0.53	0.31	0.26	0.33	0.59	0.33
Cl	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.02	0.01	0.01	0.00
Cr_2O_3	0.01	0.04	0.00	0.00	0.06	0.07	0.15	0.06	0.03	0.03	0.12
H_2O*	4.52	4.43	4.46	4.52	4.52	4.54	4.53	4.47	4.48	4.39	4.49
Total	99.89	99.89	98.99	99.65	100.23	100.11	99.45	99.45	98.95	99.88	99.97
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.190	6.211	6.202	6.110	6.162	6.083	6.130	6.045	6.176	6.076	6.205
Al^{iv}	1.810	1.789	1.798	1.890	1.838	1.917	1.870	1.955	1.824	1.924	1.795
Al^{vi}	3.773	3.706	3.750	3.819	3.735	3.840	3.795	3.844	3.831	3.831	3.761
Ti	0.029	0.040	0.032	0.025	0.054	0.050	0.048	0.054	0.033	0.061	0.041
Cr	0.001	0.004	0.000	0.000	0.006	0.007	0.015	0.006	0.003	0.003	0.012
Fe	0.083	0.112	0.102	0.084	0.099	0.087	0.074	0.092	0.079	0.103	0.094
Mn	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Mg	0.160	0.184	0.171	0.115	0.154	0.126	0.175	0.128	0.165	0.124	0.189
Na	0.286	0.261	0.238	0.329	0.272	0.267	0.252	0.288	0.213	0.274	0.221
K	1.554	1.600	1.579	1.542	1.566	1.421	1.460	1.435	1.444	1.372	1.479
Ba	0.022	0.023	0.023	0.027	0.027	0.027	0.016	0.013	0.017	0.031	0.017
OH*	3.981	3.923	3.973	4.000	3.982	3.978	3.998	3.946	3.967	3.859	3.945
Met Zone	3	3	3	2	2	3	3	3	3	3	3

Table 3 continued: Muscovite chemistry.

ID	1562-N8	1562-R11	1562-R16	1562-R17	1562-R19	1562-R7	1562-R8	1562-V1	1562-V12	1562-V13	1562-V15
Oxide %											
SiO2	46.23	46.35	46.09	45.71	45.75	46.53	47.15	45.53	47.23	47.04	46.44
TiO2	0.32	0.42	0.34	0.35	0.48	0.39	0.44	0.52	0.45	0.41	0.48
Al2O3	37.12	36.68	36.10	36.96	35.88	36.18	35.96	36.76	35.90	35.64	36.94
FeO	0.63	0.57	0.77	0.52	0.94	0.88	0.88	0.70	0.66	0.60	0.63
MnO	0.00	0.02	0.00	0.00	0.06	0.00	0.00	0.00	0.02	0.02	0.01
MgO	0.63	0.68	0.68	0.66	0.80	0.76	0.98	0.59	0.97	0.90	0.54
Na2O	1.07	0.86	1.03	1.12	0.71	0.70	0.97	1.24	1.04	1.03	1.27
K2O	8.61	8.22	8.51	8.43	8.97	8.43	8.59	8.93	8.59	9.11	9.00
BaO	0.32	0.33	0.42	0.49	0.61	0.40	0.26	0.43	0.34	0.32	0.29
Cl	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00
Cr2O3	0.00	0.08	0.12	0.15	0.13	0.07	0.10	0.10	0.09	0.08	0.08
H2O*	4.53	4.47	4.37	4.44	4.43	4.44	4.56	4.46	4.54	4.47	4.52
Total	99.51	98.81	98.72	98.99	98.90	98.98	99.90	99.39	99.91	99.80	100.32
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.100	6.143	6.148	6.074	6.118	6.174	6.198	6.052	6.208	6.211	6.101
Al iv	1.900	1.857	1.852	1.926	1.882	1.826	1.802	1.948	1.792	1.789	1.899
Al vi	3.874	3.872	3.824	3.863	3.774	3.831	3.769	3.812	3.769	3.757	3.821
Ti	0.032	0.042	0.034	0.035	0.049	0.039	0.043	0.052	0.045	0.041	0.048
Cr	0.000	0.008	0.013	0.016	0.014	0.007	0.010	0.011	0.009	0.008	0.009
Fe	0.070	0.064	0.086	0.058	0.105	0.097	0.097	0.078	0.073	0.067	0.069
Mn	0.000	0.002	0.000	0.000	0.006	0.000	0.000	0.000	0.002	0.002	0.001
Mg	0.123	0.135	0.134	0.130	0.159	0.151	0.191	0.117	0.189	0.178	0.106
Na	0.275	0.220	0.266	0.288	0.184	0.181	0.247	0.319	0.265	0.265	0.324
K	1.448	1.389	1.448	1.429	1.530	1.426	1.440	1.514	1.441	1.534	1.508
Ba	0.017	0.017	0.022	0.025	0.032	0.021	0.013	0.022	0.017	0.017	0.015
OH*	3.991	3.953	3.888	3.940	3.948	3.928	3.999	3.954	3.982	3.935	3.964
Met Zone	3	3	3	3	3	3	3	3	3	3	3

Table 3 continued: Muscovite chemistry.

ID	1562-V2	1562-V4	1562-V6	1648	1649	1642-12	1642-2	1642-21	16422-2	1642-3	1642-4
Oxide %											
SiO2	45.94	45.82	46.50	46.94	45.63	46.13	45.58	45.88	46.34	45.76	47.47
TiO2	0.66	0.47	0.43	0.25	0.40	0.51	0.15	0.34	0.62	0.05	0.21
Al2O3	37.20	36.89	36.06	34.89	35.92	36.62	38.44	37.63	36.45	36.91	32.69
FeO	0.57	0.71	0.78	1.24	0.90	0.73	0.57	0.79	0.89	0.88	2.39
MnO	0.00	0.00	0.00	0.03	0.03	0.03	0.01	0.02	0.00	0.00	0.01
MgO	0.63	0.61	0.86	1.02	0.59	0.48	0.11	0.50	0.61	0.35	1.31
Na2O	0.95	0.66	0.70	0.71	1.15	1.05	1.34	1.43	1.32	0.73	0.97
K2O	8.23	9.17	8.86	9.98	9.59	9.40	9.11	8.56	8.54	10.01	8.78
BaO	0.48	0.56	0.34	0.27	0.34	0.41	0.06	1.08	1.24	0.39	0.62
Cl	0.01	0.00	0.00	0.01	0.01	0.02	0.01	0.00	0.00	0.02	0.02
Cr2O3	0.04	0.05	0.03	0.13	0.05	0.00	0.00	0.04	0.03	0.04	0.05
H2O*	4.54	4.52	4.52	4.52	4.45	4.53	4.49	4.54	4.55	4.50	4.40
Total	99.26	99.53	99.08	99.99	99.12	99.90	100.06	100.87	100.60	99.74	99.08
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.071	6.076	6.169	6.226	6.104	6.103	5.998	6.025	6.106	6.084	6.372
Al iv	1.929	1.924	1.831	1.774	1.896	1.897	2.002	1.975	1.894	1.916	1.628
Al vi	3.865	3.843	3.808	3.682	3.767	3.813	3.960	3.848	3.767	3.868	3.545
Ti	0.065	0.047	0.042	0.025	0.041	0.050	0.015	0.034	0.062	0.005	0.021
Cr	0.005	0.006	0.003	0.013	0.005	0.000	0.000	0.004	0.003	0.004	0.005
Fe	0.063	0.079	0.086	0.137	0.101	0.081	0.063	0.087	0.098	0.097	0.269
Mn	0.000	0.000	0.000	0.003	0.003	0.003	0.001	0.002	0.000	0.000	0.001
Mg	0.123	0.121	0.170	0.202	0.117	0.095	0.022	0.097	0.120	0.069	0.263
Na	0.243	0.171	0.180	0.183	0.299	0.268	0.343	0.363	0.336	0.188	0.251
K	1.388	1.550	1.499	1.689	1.636	1.586	1.529	1.433	1.436	1.697	1.503
Ba	0.025	0.029	0.018	0.014	0.018	0.021	0.003	0.055	0.064	0.020	0.033
OH*	3.999	4.000	4.000	3.998	3.975	3.997	3.940	3.973	4.000	3.987	3.941
Met Zone	3	3	3	3	3	3	3	3	3	3	3

Table 3 continued: Muscovite chemistry.

ID	1642-5	1648-B5	1648-B9	1648-N5	1651-R6	1651-R8	1651-R9	1651-V3	1656-R3	1656-V1	1664-B5
Oxide %											
SiO2	45.57	46.15	46.36	47.07	46.44	43.49	46.42	47.09	46.95	47.15	46.87
TiO2	0.54	0.35	0.66	0.34	0.59	0.42	0.42	0.32	0.26	0.42	0.52
Al2O3	37.14	37.73	37.43	37.92	36.90	32.66	36.48	36.27	35.72	36.10	36.85
FeO	0.61	1.02	1.07	0.91	1.21	6.76	1.12	1.34	0.95	0.99	0.89
MnO	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.02
MgO	0.46	0.53	0.73	0.40	0.68	2.95	0.89	0.00	0.92	0.89	0.80
Na2O	1.03	0.83	0.86	1.01	1.02	0.80	0.82	0.88	0.80	0.74	1.03
K2O	9.07	8.52	8.79	7.89	8.59	6.91	8.19	8.17	8.65	9.00	8.12
BaO	1.06	0.48	0.51	0.14	0.30	0.15	0.25	0.29	0.18	0.15	0.57
Cl	0.00	0.00	0.01	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00
Cr2O3	0.15	0.01	0.14	0.09	0.08	0.06	0.01	0.08	0.05	0.06	0.03
H2O*	4.43	4.55	4.54	4.58	4.55	4.36	4.45	4.51	4.51	4.51	4.56
Total	100.30	100.23	101.24	100.44	100.44	98.85	99.25	99.01	99.07	100.14	100.33
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.031	6.057	6.045	6.118	6.090	5.944	6.137	6.233	6.220	6.193	6.134
Al iv	1.969	1.943	1.955	1.882	1.910	2.056	1.863	1.767	1.780	1.807	1.866
Al vi	3.825	3.893	3.798	3.929	3.795	3.207	3.823	3.892	3.797	3.781	3.819
Ti	0.054	0.034	0.065	0.033	0.058	0.043	0.042	0.032	0.026	0.041	0.051
Cr	0.016	0.001	0.014	0.010	0.008	0.006	0.001	0.008	0.005	0.006	0.003
Fe	0.068	0.112	0.117	0.099	0.132	0.773	0.123	0.148	0.105	0.108	0.097
Mn	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.003	0.000	0.002
Mg	0.091	0.104	0.143	0.077	0.133	0.600	0.175	0.000	0.181	0.174	0.157
Na	0.263	0.212	0.217	0.254	0.259	0.211	0.211	0.225	0.205	0.189	0.262
K	1.532	1.427	1.462	1.308	1.437	1.205	1.381	1.379	1.461	1.507	1.355
Ba	0.055	0.025	0.026	0.007	0.015	0.008	0.013	0.015	0.010	0.008	0.029
OH*	3.914	3.982	3.950	3.969	3.978	3.971	3.929	3.981	3.981	3.951	3.978
Met Zone	3	3	3	3	3	3	3	3	2	2	3

Table 3 continued: Muscovite chemistry.

ID	1664-B6	1664-R6	1666-R10	1666-R11	1666-V1	1666-V2	1666-V8	1667-1	1667-11	1669-12	1669-23
Oxide %											
SiO2	46.12	46.17	46.14	46.07	46.28	45.86	46.60	46.18	46.11	45.50	45.51
TiO2	0.42	0.74	0.50	0.56	0.39	0.39	0.71	0.47	0.35	0.51	0.56
Al2O3	37.29	37.26	37.19	37.30	37.33	37.59	36.93	36.62	36.68	37.03	35.81
FeO	0.73	0.63	0.77	0.71	0.76	0.80	0.75	0.90	0.77	0.67	1.17
MnO	0.00	0.00	0.01	0.00	0.02	0.02	0.02	0.00	0.01	0.00	0.02
MgO	0.60	0.51	0.67	0.70	0.59	0.55	0.85	0.64	0.59	0.45	1.09
Na2O	1.09	1.08	1.10	0.97	0.89	0.92	0.94	1.37	1.43	1.39	1.16
K2O	8.61	8.32	8.35	8.36	8.10	7.92	8.25	8.85	9.05	8.88	9.08
BaO	0.65	0.57	0.53	0.44	0.64	0.56	0.65	0.22	0.20	0.46	0.35
Cl	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00
Cr2O3	0.13	0.00	0.08	0.05	0.00	0.03	0.08	0.05	0.00	0.00	0.03
H2O*	4.54	4.53	4.51	4.51	4.46	4.51	4.55	4.49	4.45	4.49	4.46
Total	100.26	99.89	99.95	99.81	99.67	99.25	100.41	99.93	99.81	99.48	99.34
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.065	6.075	6.073	6.065	6.098	6.058	6.102	6.096	6.098	6.041	6.071
Al iv	1.935	1.925	1.927	1.935	1.902	1.942	1.898	1.904	1.902	1.959	1.929
Al vi	3.845	3.854	3.843	3.852	3.896	3.913	3.801	3.794	3.816	3.836	3.702
Ti	0.042	0.073	0.050	0.055	0.039	0.039	0.070	0.046	0.034	0.051	0.056
Cr	0.013	0.000	0.008	0.006	0.000	0.003	0.009	0.005	0.000	0.000	0.003
Fe	0.081	0.069	0.085	0.078	0.084	0.088	0.082	0.099	0.085	0.074	0.130
Mn	0.000	0.000	0.001	0.000	0.002	0.002	0.002	0.000	0.001	0.000	0.002
Mg	0.118	0.100	0.132	0.138	0.115	0.109	0.166	0.125	0.116	0.088	0.217
Na	0.278	0.277	0.280	0.248	0.228	0.237	0.240	0.352	0.366	0.358	0.301
K	1.444	1.396	1.402	1.404	1.361	1.335	1.379	1.490	1.527	1.503	1.545
Ba	0.033	0.029	0.027	0.023	0.033	0.029	0.033	0.012	0.010	0.024	0.019
OH*	3.986	3.973	3.963	3.963	3.919	3.977	3.978	3.958	3.927	3.977	3.968
Met Zone	3	3	3	3	3	3	3	3	3	3	3

Table 3 continued: Muscovite chemistry.

ID	1669-7	1671-N13	1671-N4	1671-N7	1671-N8	1671-R7	1671-V2	1671-V3	1679-4	1679-7	1680-N3
Oxide %											
SiO2	45.94	45.75	47.85	46.91	46.70	46.28	45.69	48.80	46.34	44.94	46.25
TiO2	0.59	0.49	0.43	0.28	0.45	0.40	0.37	0.27	0.54	0.51	0.69
Al2O3	36.24	37.05	35.66	33.98	36.62	36.66	37.30	33.30	36.11	35.93	36.70
FeO	0.86	0.91	0.94	2.13	0.80	0.84	0.77	1.07	0.98	1.69	0.75
MnO	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.06	0.00	0.00
MgO	0.62	0.65	1.08	1.87	0.77	0.70	0.59	1.77	0.77	0.84	0.61
Na2O	1.18	1.00	0.85	0.67	0.99	0.87	1.18	0.63	1.35	1.25	1.25
K2O	9.28	8.60	8.42	8.85	8.69	8.77	8.79	8.61	8.89	8.42	8.86
BaO	0.29	0.71	0.37	0.39	0.53	0.51	0.59	0.24	0.36	0.38	0.51
Cl	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Cr2O3	0.06	0.04	0.00	0.14	0.07	0.07	0.02	0.08	0.09	0.06	0.14
H2O*	4.47	4.47	4.58	4.50	4.50	4.54	4.49	4.48	4.54	4.41	4.44
Total	99.65	99.81	100.25	99.78	100.25	99.66	99.90	99.40	100.03	98.61	100.44
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.098	6.054	6.259	6.234	6.136	6.116	6.040	6.439	6.120	6.039	6.086
Al iv	1.902	1.946	1.741	1.766	1.864	1.884	1.960	1.561	1.880	1.961	1.914
Al vi	3.768	3.833	3.757	3.558	3.807	3.827	3.852	3.619	3.742	3.731	3.778
Ti	0.059	0.048	0.043	0.028	0.044	0.040	0.036	0.027	0.053	0.052	0.068
Cr	0.006	0.004	0.000	0.015	0.007	0.007	0.002	0.009	0.009	0.007	0.014
Fe	0.096	0.101	0.103	0.236	0.088	0.093	0.086	0.118	0.108	0.190	0.083
Mn	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.007	0.000	0.000
Mg	0.123	0.128	0.211	0.370	0.151	0.138	0.115	0.348	0.151	0.168	0.119
Na	0.304	0.256	0.216	0.173	0.253	0.224	0.302	0.161	0.345	0.326	0.318
K	1.571	1.451	1.405	1.499	1.456	1.479	1.481	1.449	1.497	1.444	1.487
Ba	0.015	0.037	0.019	0.020	0.027	0.026	0.031	0.012	0.019	0.020	0.026
OH*	3.956	3.943	4.000	3.987	3.941	4.000	3.959	3.944	3.999	3.957	3.897
Met Zone	3	3	3	3	3	3	3	3	3	3	3

Table 3 continued: Muscovite chemistry.

ID	1680-R4	1696-7	1696-8	1697-10	1697-12	1697-2	1713A-R1	1713A-R8	365-8	365-9	402-5
Oxide %											
SiO2	46.41	46.50	46.68	46.70	46.24	47.19	46.43	46.13	45.95	46.65	45.55
TiO2	0.31	0.37	0.27	0.45	0.44	0.37	0.49	0.65	0.44	0.40	0.30
Al2O3	38.10	36.50	35.68	35.82	36.30	35.59	36.13	36.92	35.91	35.08	36.18
FeO	0.74	1.05	0.71	0.90	1.06	0.82	0.82	0.98	0.93	1.15	0.88
MnO	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01
MgO	0.44	0.68	0.72	0.74	0.68	0.76	0.64	0.57	0.56	0.85	0.43
Na2O	1.27	1.16	1.11	1.16	1.13	1.09	1.17	1.17	1.22	1.14	1.23
K2O	8.52	8.59	9.43	9.02	9.25	9.39	8.93	8.77	9.42	9.47	9.30
BaO	0.50	0.09	0.24	0.16	0.19	0.08	0.25	0.32	0.20	0.26	0.20
Cl	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01
Cr2O3	0.00	0.00	0.06	0.00	0.05	0.10	0.13	0.04	0.08	0.21	0.02
H2O*	4.60	4.49	4.49	4.48	4.53	4.47	4.43	4.55	4.41	4.42	4.37
Total	100.94	99.59	99.49	99.53	99.90	100.06	99.70	100.16	99.34	99.85	98.70
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)											
Si	6.048	6.138	6.194	6.181	6.115	6.220	6.144	6.072	6.125	6.195	6.105
Al iv	1.952	1.862	1.806	1.819	1.885	1.780	1.856	1.928	1.875	1.805	1.895
Al vi	3.900	3.817	3.774	3.770	3.772	3.750	3.779	3.801	3.766	3.686	3.821
Ti	0.030	0.036	0.027	0.045	0.044	0.037	0.049	0.065	0.044	0.040	0.030
Cr	0.000	0.000	0.007	0.000	0.005	0.011	0.013	0.004	0.008	0.022	0.002
Fe	0.081	0.116	0.079	0.099	0.117	0.090	0.091	0.107	0.104	0.128	0.099
Mn	0.001	0.003	0.000	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.001
Mg	0.085	0.133	0.141	0.146	0.134	0.150	0.126	0.111	0.112	0.169	0.086
Na	0.320	0.296	0.284	0.297	0.289	0.277	0.299	0.298	0.316	0.294	0.319
K	1.417	1.446	1.597	1.522	1.560	1.579	1.507	1.473	1.602	1.605	1.589
Ba	0.026	0.004	0.012	0.009	0.010	0.004	0.013	0.016	0.010	0.014	0.010
OH*	3.998	3.950	3.971	3.958	3.995	3.927	3.907	3.995	3.920	3.920	3.906
Met Zone	3	3	3	3	3	3	3	3	3	3	3

Table 3 continued: Muscovite chemistry.

ID	402-8	427-5	427-8	677-12	1570-11	1570-13	1570-15	1570-20	1570-27
Oxide %									
SiO2	46.11	46.09	45.96	45.29	44.73	45.98	45.82	46.45	46.09
TiO2	0.27	0.59	0.35	0.56	0.51	0.29	0.50	0.19	0.37
Al2O3	36.63	34.02	36.10	36.28	36.16	37.45	37.03	37.58	37.09
FeO	0.74	1.26	0.88	0.71	0.69	0.53	0.75	0.66	1.00
MnO	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.05
MgO	0.47	1.29	0.62	0.36	0.59	0.52	0.57	0.46	0.55
Na2O	1.16	1.29	1.32	1.33	1.18	1.10	1.25	1.13	1.26
K2O	9.18	9.13	8.90	9.30	8.79	8.73	8.39	8.45	8.49
BaO	0.16	0.17	0.18	0.25					
Cl	0.00	0.01	0.00	0.01					
Cr2O3	0.01	0.15	0.06	0.11					
H2O*	4.36	4.40	4.45	4.47	4.43	4.54	4.52	4.56	4.54
Total	99.46	98.52	98.93	98.68	97.08	99.17	98.83	99.48	99.47
Cations (Formula based on 28 O, Al^{vi} adjusted from Al tot for Al^{iv}+Si = 8)									
Si	6.117	6.201	6.126	6.070	6.061	6.076	6.077	6.106	6.083
Al iv	1.883	1.799	1.874	1.930	1.939	1.924	1.923	1.894	1.917
Al vi	3.845	3.596	3.798	3.800	3.835	3.908	3.864	3.929	3.854
Ti	0.027	0.060	0.035	0.057	0.052	0.029	0.049	0.019	0.037
Cr	0.001	0.016	0.006	0.012	0.000	0.000	0.000	0.000	0.000
Fe	0.082	0.142	0.099	0.079	0.078	0.059	0.083	0.073	0.110
Mn	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.005
Mg	0.094	0.260	0.122	0.073	0.118	0.103	0.113	0.090	0.108
Na	0.299	0.336	0.342	0.346	0.310	0.282	0.321	0.289	0.323
K	1.553	1.566	1.514	1.590	1.519	1.471	1.419	1.417	1.430
Ba	0.008	0.009	0.009	0.013	0.000	0.000	0.000	0.000	0.000
OH*	3.863	3.947	3.959	3.998	4.000	4.000	4.000	4.000	4.000
Met Zone	3	3	3	3	3	3	3	3	3

Table 4: Garnet chemistry.

ID	1505-N1	1505-N2	1505-R1	1505-R2	1505-R3	1515-1	1515-2	1515-6	1518-N1	1518-N2	1518-R4	1518-R5	1518-R6
Oxide%													
SiO_2	37.30	36.98	37.14	37.47	37.20	37.36	37.21	37.20	37.17	37.24	37.32	37.39	37.11
TiO_2	0.00	0.02	0.05	0.01	0.02	0.00	0.00	0.00	0.02	0.07	0.00	0.00	0.06
Al_2O_3	21.24	21.25	20.90	21.10	21.10	20.95	21.00	20.93	20.93	21.00	21.15	21.13	20.78
Fe_2O_3	0.00	0.00	0.28	0.03	0.00	0.20	0.08	0.09	0.10	0.00	0.00	0.05	0.03
MgO	3.12	2.72	3.09	2.89	2.93	2.60	2.57	2.52	2.94	2.64	2.74	2.99	2.73
CaO	2.58	1.90	2.85	2.93	2.06	3.47	2.31	2.42	1.70	1.36	1.38	1.46	1.42
MnO	4.25	4.18	4.17	5.06	3.84	8.18	7.77	7.65	8.01	7.34	7.25	7.32	7.10
FeO	31.81	33.10	31.38	30.45	32.89	27.01	28.98	28.86	28.72	30.01	30.47	30.21	29.98
ZnO	0.03	0.02	0.00	0.00	0.10	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Na_2O	0.03	0.04	0.03	0.01	0.01	0.03	0.06	0.02	0.05	0.02	0.04	0.02	0.04
Total	100.37	100.20	99.89	99.94	100.15	99.80	99.96	99.71	99.64	99.69	100.36	100.57	99.26
Cations (formula based on 24 O)													
Si	5.973	5.960	5.979	6.016	5.980	6.012	6.001	6.011	6.005	6.019	6.001	5.993	6.022
Ti	0.000	0.002	0.006	0.001	0.002	0.000	0.000	0.000	0.002	0.009	0.000	0.000	0.007
Al	4.009	4.036	3.965	3.991	3.997	3.974	3.992	3.986	3.985	4.000	4.008	3.991	3.975
Fe^{3+}	0.000	0.000	0.034	0.003	0.000	0.025	0.009	0.010	0.013	0.000	0.000	0.006	0.004
Mg	0.744	0.653	0.741	0.692	0.702	0.624	0.617	0.608	0.708	0.636	0.658	0.715	0.661
Ca	0.442	0.328	0.491	0.504	0.355	0.598	0.399	0.420	0.295	0.236	0.238	0.250	0.247
Mn	0.577	0.570	0.568	0.688	0.522	1.115	1.061	1.047	1.096	1.005	0.987	0.994	0.976
Fe^{2+}	4.260	4.460	4.225	4.088	4.421	3.635	3.909	3.901	3.881	4.056	4.097	4.049	4.068
Zn	0.004	0.002	0.000	0.000	0.012	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
Na	0.010	0.011	0.010	0.003	0.004	0.010	0.018	0.007	0.016	0.006	0.011	0.005	0.013
Grossular*	0.07	0.05	0.08	0.08	0.06	0.10	0.07	0.07	0.05	0.04	0.04	0.04	0.04
Pyrope	0.12	0.11	0.12	0.12	0.12	0.10	0.10	0.10	0.12	0.11	0.11	0.12	0.11
Spessartine	0.10	0.09	0.09	0.12	0.09	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16
Almandine	0.71	0.74	0.70	0.68	0.74	0.61	0.65	0.65	0.65	0.68	0.69	0.67	0.68
Position**	1	3	1	2	3	1	3	3	1	3	3	1	3

*Grossular (Ca), Pyrope (Mg), Spessartine (Mn), Almandine (Fe) over Ca+Mg+Mn+Fe. **Position: Core (1), Mantle (2), Rim (3).

Table 4 continued: Garnet chemistry.

ID	1518-R7	1520-1	1520-17	1520-2	1520-3	1520-4	1562R1	1562-R2	1566-N1	1566R14	1567-3	1567-4	1567-5
Oxide%													
SiO_2	37.34	37.47	37.39	37.26	37.32	37.03	36.58	36.78	37.22	37.69	37.39	37.89	37.30
TiO_2	0.00	0.07	0.00	0.07	0.03	0.09	0.00	0.01	0.03	0.00	0.00	0.00	0.05
Al_2O_3	21.00	21.02	21.26	21.16	21.12	21.09	21.44	21.32	21.30	21.38	21.10	21.19	21.02
Fe_2O_3	0.15	0.14	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.02	0.29	0.18
MgO	3.03	2.47	2.91	2.66	3.03	2.95	3.22	3.28	3.27	2.97	3.01	3.50	3.45
CaO	1.78	3.90	2.45	3.70	2.62	2.15	2.09	1.81	3.64	3.08	1.77	2.25	1.80
MnO	7.64	6.33	5.05	6.22	4.96	4.98	5.70	5.69	4.31	4.84	6.48	5.15	5.73
FeO	29.01	28.80	31.37	29.11	31.25	31.60	29.94	30.34	29.70	30.19	30.25	30.67	30.60
ZnO	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na_2O	0.04	0.06	0.04	0.02	0.01	0.01	0.01	0.05	0.03	0.00	0.05	0.01	0.01
Total	99.99	100.25	100.47	100.20	100.45	99.90	98.99	99.27	99.49	100.14	100.06	100.94	100.14
Cations (formula based on 24 O)													
Si	6.008	6.005	5.986	5.977	5.979	5.971	5.920	5.946	5.970	6.019	6.010	6.014	5.985
Ti	0.000	0.009	0.000	0.008	0.003	0.011	0.000	0.001	0.004	0.000	0.000	0.000	0.006
Al	3.982	3.969	4.011	4.001	3.987	4.008	4.090	4.062	4.027	4.024	3.997	3.963	3.975
Fe^{3+}	0.018	0.016	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.002	0.034	0.022
Mg	0.726	0.589	0.694	0.637	0.724	0.710	0.778	0.790	0.782	0.707	0.722	0.829	0.824
Ca	0.306	0.669	0.421	0.636	0.449	0.371	0.362	0.314	0.626	0.527	0.304	0.382	0.310
Mn	1.041	0.859	0.685	0.844	0.672	0.680	0.781	0.780	0.585	0.655	0.882	0.692	0.778
Fe^{2+}	3.903	3.860	4.201	3.906	4.186	4.261	4.052	4.101	3.984	4.033	4.066	4.072	4.106
Zn	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.013	0.019	0.011	0.006	0.003	0.002	0.003	0.014	0.009	0.001	0.014	0.002	0.004
Grossular	0.05	0.11	0.07	0.11	0.07	0.06	0.06	0.05	0.10	0.09	0.05	0.06	0.05
Pyrope	0.12	0.10	0.12	0.11	0.12	0.12	0.13	0.13	0.13	0.12	0.12	0.14	0.14
Spessartine	0.17	0.14	0.11	0.14	0.11	0.11	0.13	0.13	0.10	0.11	0.15	0.12	0.13
Almandine	0.65	0.65	0.70	0.65	0.69	0.71	0.68	0.69	0.67	0.68	0.68	0.68	0.68
Position	2	1	2	2	3	3	1	2	2	3	3	1	3

Table 4 continued: Garnet chemistry.

ID	1571-N1	1571-N2	1571R10	1571R11	1571-R8	1571-R9	1641	1642	1646	1647	1642-10	1642-11	1648-B1
Oxide%													
SiO_2	37.65	37.62	37.53	37.27	37.45	37.45	37.17	36.97	36.92	36.99	37.49	37.76	37.29
TiO_2	0.01	0.00	0.06	0.00	0.00	0.00	0.01	0.07	0.00	0.00	0.03	0.02	0.05
Al_2O_3	21.24	21.20	20.80	20.69	20.82	20.70	20.74	20.72	20.70	20.70	21.04	21.13	21.20
Fe_2O_3	0.23	0.15	0.49	0.49	0.46	0.56	0.27	0.15	0.31	0.21	0.08	0.22	0.00
MgO	3.32	3.25	3.07	3.22	3.23	3.26	2.54	2.66	2.44	2.69	2.85	3.08	3.06
CaO	3.48	2.19	4.07	1.92	2.06	3.55	1.65	1.81	1.70	1.97	1.87	3.15	3.54
MnO	3.60	3.96	5.25	4.12	4.13	3.69	7.43	7.21	7.64	7.64	4.75	4.17	4.92
FeO	31.26	32.59	28.56	31.94	31.88	30.23	29.74	29.60	29.91	28.95	32.24	30.88	29.85
ZnO	0.09	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Na_2O	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.05	0.03	0.05	0.04	0.05	0.07
Total	100.89	101.02	99.85	99.68	100.04	99.50	99.59	99.24	99.64	99.19	100.38	100.44	100.01
Cations (formula based on 24 O)													
Si	5.979	5.985	6.013	6.011	6.015	6.019	6.024	6.007	5.997	6.007	6.009	6.016	5.979
Ti	0.001	0.000	0.007	0.000	0.000	0.000	0.001	0.008	0.000	0.000	0.003	0.002	0.006
Al	3.976	3.975	3.927	3.933	3.942	3.921	3.962	3.969	3.962	3.963	3.976	3.968	4.006
Fe^{3+}	0.028	0.017	0.059	0.059	0.055	0.068	0.033	0.018	0.038	0.025	0.010	0.026	0.000
Mg	0.786	0.771	0.733	0.775	0.773	0.782	0.615	0.643	0.591	0.651	0.682	0.732	0.730
Ca	0.592	0.374	0.698	0.332	0.355	0.611	0.286	0.315	0.296	0.343	0.321	0.537	0.609
Mn	0.485	0.534	0.713	0.563	0.561	0.503	1.021	0.993	1.050	1.051	0.645	0.562	0.668
Fe^{2+}	4.152	4.337	3.826	4.308	4.282	4.064	4.031	4.023	4.062	3.933	4.322	4.114	4.002
Zn	0.010	0.004	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Na	0.005	0.007	0.009	0.008	0.005	0.008	0.010	0.016	0.009	0.015	0.012	0.015	0.020
Grossular	0.10	0.06	0.12	0.06	0.06	0.10	0.05	0.05	0.05	0.06	0.05	0.09	0.10
Pyrope	0.13	0.13	0.12	0.13	0.13	0.13	0.10	0.11	0.10	0.11	0.11	0.12	0.12
Spessartine	0.08	0.09	0.12	0.09	0.09	0.08	0.17	0.17	0.18	0.18	0.11	0.09	0.11
Almandine	0.69	0.72	0.64	0.72	0.72	0.68	0.68	0.67	0.68	0.66	0.72	0.69	0.67
Position	1	3	1	3	3	1	3	1	3	1	2	1	1

Table 4 continued: Garnet chemistry.

ID	1648-B2	1648-B6	1648-N2	1648-N3	1648-N6	1648-R4	1648-R5	1648-R6	1648V10	1648-V9	1651-B1	1651-R1	1651-R2
Oxide%													
SiO_2	36.54	37.34	37.02	36.83	37.07	37.66	37.36	36.96	37.07	37.35	37.30	37.04	36.74
TiO_2	0.03	0.01	0.02	0.00	0.07	0.01	0.01	0.00	0.00	0.06	0.02	0.06	0.00
Al_2O_3	21.26	21.61	21.04	21.21	21.31	21.46	21.22	21.41	21.37	21.57	21.20	21.31	21.29
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
MgO	2.61	3.09	2.43	2.87	3.14	2.32	3.00	2.81	3.00	2.30	3.17	2.87	3.14
CaO	1.81	2.49	3.83	1.83	3.12	2.39	3.65	2.08	2.83	2.50	2.74	4.76	2.88
MnO	5.36	4.45	6.63	4.98	4.20	5.61	5.07	4.98	5.29	5.51	4.79	4.64	4.78
FeO	32.05	31.98	28.21	31.85	31.30	31.83	29.87	31.90	30.73	31.09	30.88	29.03	30.98
ZnO	0.02	0.00	0.06	0.00	0.04	0.00	0.00	0.02	0.00	0.09	0.01	0.00	0.00
Na_2O	0.00	0.02	0.03	0.02	0.01	0.02	0.05	0.03	0.00	0.02	0.04	0.05	0.02
Total	99.68	100.97	99.27	99.60	100.25	101.29	100.27	100.19	100.28	100.49	100.15	99.75	99.83
Cations (formula based on 24 O)													
Si	5.928	5.943	5.992	5.958	5.942	5.997	5.974	5.945	5.941	5.982	5.975	5.944	5.920
Ti	0.004	0.001	0.002	0.000	0.009	0.001	0.001	0.000	0.000	0.007	0.002	0.007	0.000
Al	4.065	4.054	4.014	4.044	4.026	4.028	3.998	4.057	4.037	4.073	4.003	4.030	4.043
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.631	0.732	0.587	0.693	0.750	0.550	0.716	0.674	0.717	0.550	0.757	0.686	0.754
Ca	0.314	0.424	0.665	0.318	0.536	0.408	0.625	0.358	0.486	0.429	0.469	0.819	0.498
Mn	0.736	0.600	0.910	0.682	0.570	0.756	0.687	0.679	0.717	0.748	0.650	0.631	0.652
Fe^{2+}	4.348	4.256	3.818	4.308	4.196	4.239	3.994	4.290	4.119	4.166	4.137	3.897	4.175
Zn	0.003	0.000	0.007	0.000	0.004	0.000	0.000	0.002	0.000	0.010	0.002	0.000	0.000
Na	0.000	0.006	0.008	0.005	0.004	0.007	0.015	0.011	0.000	0.007	0.012	0.016	0.008
Grossular	0.05	0.07	0.11	0.05	0.09	0.07	0.10	0.06	0.08	0.07	0.08	0.14	0.08
Pyrope	0.10	0.12	0.10	0.12	0.12	0.09	0.12	0.11	0.12	0.09	0.13	0.11	0.12
Spessartine	0.12	0.10	0.15	0.11	0.09	0.13	0.11	0.11	0.12	0.13	0.11	0.10	0.11
Almandine	0.72	0.71	0.64	0.72	0.69	0.71	0.66	0.71	0.68	0.71	0.69	0.65	0.69
Position	3	1	2	3	1	3	2	1	1	3	1	1	2

Table 4 continued: Garnet chemistry.

ID	1651-R3	1658-N1	1658-N2	1658-N3	1658-N4	1658-R1	1658-R2	1658-R3	1658-V1	1658-V2	1662-1	1662-2	1664-R1
Oxide%													
SiO_2	36.55	36.64	36.54	36.61	36.58	36.80	36.70	36.91	36.79	36.71	37.03	36.90	37.22
TiO_2	0.04	0.06	0.14	0.00	0.09	0.05	0.06	0.06	0.06	0.08	0.00	0.08	0.00
Al_2O_3	21.17	21.22	21.14	21.29	21.37	21.29	21.23	21.28	21.11	21.21	21.08	21.00	21.14
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	2.35	2.32	2.41	2.29	2.54	2.56	2.50	2.06	2.57	2.22	1.75	1.62	2.96
CaO	2.26	3.67	3.41	2.70	3.26	3.20	3.00	2.64	2.84	2.60	3.86	3.99	3.56
MnO	5.50	7.94	7.15	6.15	6.34	7.02	6.25	6.48	6.13	6.55	11.24	11.72	5.97
FeO	31.52	27.91	28.59	30.64	29.76	27.95	29.28	29.97	30.13	30.06	24.61	24.08	28.25
ZnO	0.00	0.00	0.00	0.00	0.02	0.07	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Na_2O	0.02	0.03	0.03	0.02	0.02	0.04	0.03	0.02	0.02	0.00	0.07	0.03	0.04
Total	99.41	99.78	99.41	99.68	99.96	98.98	99.04	99.42	99.66	99.42	99.63	99.41	99.15
Cations (formula based on 24 O)													
Si	5.943	5.919	5.920	5.936	5.903	5.965	5.955	5.979	5.953	5.959	5.996	5.991	5.993
Ti	0.005	0.007	0.017	0.000	0.011	0.006	0.007	0.007	0.007	0.009	0.000	0.010	0.000
Al	4.056	4.041	4.037	4.067	4.063	4.066	4.061	4.062	4.025	4.058	4.022	4.018	4.012
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.569	0.559	0.582	0.552	0.610	0.618	0.605	0.497	0.621	0.538	0.422	0.391	0.711
Ca	0.393	0.634	0.592	0.468	0.563	0.556	0.522	0.458	0.492	0.453	0.669	0.695	0.615
Mn	0.757	1.086	0.981	0.844	0.867	0.964	0.859	0.889	0.840	0.900	1.541	1.612	0.814
Fe^{2+}	4.287	3.771	3.873	4.155	4.016	3.788	3.973	4.059	4.077	4.081	3.332	3.270	3.804
Zn	0.000	0.000	0.000	0.000	0.002	0.008	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Na	0.005	0.009	0.011	0.006	0.007	0.012	0.009	0.006	0.008	0.001	0.022	0.009	0.011
Grossular	0.07	0.10	0.10	0.08	0.09	0.09	0.09	0.08	0.08	0.08	0.11	0.12	0.10
Pyrope	0.09	0.09	0.10	0.09	0.10	0.10	0.10	0.08	0.10	0.09	0.07	0.07	0.12
Spessartine	0.13	0.18	0.16	0.14	0.14	0.16	0.14	0.15	0.14	0.15	0.26	0.27	0.14
Almandine	0.71	0.62	0.64	0.69	0.66	0.64	0.67	0.69	0.68	0.68	0.56	0.55	0.64
Position	3	1	2	3	1	1	2	3	1	2	1	3	1

Table 4 continued: Garnet chemistry.

ID	1664-R2	1666-B9	1666-R1	1666-R2	1666-R3	1666-R4	1667-7	1667-8	1669-1	16691-5	1669-16	1669-17	1669-18
Oxide%													
SiO_2	37.03	37.19	36.85	37.37	37.25	37.28	37.33	0.06	37.45	37.33	37.14	37.32	37.40
TiO_2	0.06	0.00	0.03	0.00	0.00	0.00	0.03	99.52	0.03	0.27	0.07	0.00	0.02
Al_2O_3	21.09	21.45	21.30	21.34	21.32	21.39	21.41	0.05	21.30	21.40	21.36	21.47	21.45
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	2.71	3.01	2.01	3.28	3.35	2.83	2.49	0.00	3.27	3.14	3.00	3.33	2.92
CaO	2.26	2.96	1.79	3.84	3.10	2.22	1.79	0.00	3.26	3.30	2.06	3.19	2.08
MnO	7.21	6.26	8.79	5.73	5.97	6.94	6.91	0.00	5.62	5.97	6.86	5.60	7.11
FeO	28.90	29.09	28.73	28.17	28.55	29.40	30.59	0.19	29.18	29.40	29.94	29.55	29.76
ZnO	0.02	0.01	0.03	0.03	0.00	0.00	0.00	0.08	0.01	0.00	0.07	0.00	0.00
Na_2O	0.03	0.03	0.01	0.04	0.05	0.01	0.01	0.03	0.02	0.04	0.02	0.02	0.03
Total	99.30	100.00	99.55	99.79	99.58	100.05	100.55	99.92	100.14	100.85	100.52	100.47	100.78
Cations (formula based on 24 O)													
Si	5.993	5.964	5.980	5.981	5.980	5.987	5.986	0.009	5.982	5.938	5.952	5.953	5.973
Ti	0.007	0.000	0.004	0.000	0.000	0.000	0.004	11.959	0.004	0.032	0.008	0.000	0.002
Al	4.022	4.054	4.074	4.026	4.034	4.048	4.047	0.009	4.010	4.011	4.035	4.037	4.038
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.654	0.719	0.486	0.783	0.801	0.676	0.595	0.000	0.779	0.744	0.716	0.793	0.696
Ca	0.392	0.508	0.310	0.659	0.533	0.383	0.307	0.000	0.557	0.562	0.353	0.545	0.356
Mn	0.988	0.851	1.208	0.777	0.811	0.944	0.939	0.000	0.760	0.805	0.932	0.756	0.961
Fe^{2+}	3.911	3.901	3.898	3.771	3.833	3.949	4.103	0.026	3.899	3.911	4.013	3.942	3.975
Zn	0.003	0.001	0.004	0.004	0.000	0.000	0.000	0.009	0.002	0.000	0.008	0.000	0.000
Na	0.009	0.009	0.004	0.011	0.015	0.002	0.002	0.008	0.007	0.011	0.007	0.005	0.010
Grossular	0.07	0.08	0.05	0.11	0.09	0.06	0.05	0.00	0.09	0.09	0.06	0.09	0.06
Pyrope	0.11	0.12	0.08	0.13	0.13	0.11	0.10	0.00	0.13	0.12	0.12	0.13	0.12
Spessartine	0.17	0.14	0.20	0.13	0.14	0.16	0.16	0.00	0.13	0.13	0.15	0.13	0.16
Almandine	0.66	0.65	0.66	0.63	0.64	0.66	0.69	1.00	0.65	0.65	0.67	0.65	0.66
Position	3	1	3	2	1	3	3	2	1	1	3	1	3

Table 4 continued: Garnet chemistry.

ID	1669-2	1669-24	1669-3	1671N11	1671N12	1671-R1	1671R15	1671R16	1671-R2	1671-R3	1674-R1	1674R10	1674R11
Oxide%													
SiO_2	37.29	37.06	37.52	36.72	36.99	36.73	37.05	37.15	36.88	36.96	37.24	37.02	37.17
TiO_2	0.00	0.05	0.02	0.07	0.03	0.02	0.00	0.04	0.03	0.00	0.07	0.01	0.10
Al_2O_3	21.01	21.28	21.29	21.06	21.26	21.14	21.34	21.48	21.19	21.18	20.98	21.11	20.79
Fe_2O_3	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
MgO	3.47	2.90	3.01	2.46	3.14	2.62	2.87	2.85	2.78	2.82	2.07	1.82	2.07
CaO	2.29	2.30	2.04	1.78	2.03	3.12	1.77	2.19	2.27	1.92	4.12	5.31	3.82
MnO	5.99	7.02	6.91	5.61	4.93	7.62	5.05	7.05	7.54	5.20	8.72	9.43	9.47
FeO	29.89	29.70	29.74	31.72	31.29	27.58	31.71	29.30	28.49	31.10	26.42	24.55	25.76
ZnO	0.00	0.00	0.07	0.00	0.00	0.06	0.00	0.05	0.00	0.06	0.00	0.01	0.00
Na_2O	0.02	0.01	0.02	0.01	0.03	0.05	0.04	0.05	0.04	0.03	0.00	0.00	0.03
Total	100.14	100.33	100.61	99.41	99.69	98.93	99.82	100.17	99.22	99.26	99.62	99.25	99.25
Cations (formula based on 24 O)													
Si	5.974	5.951	5.994	5.967	5.958	5.962	5.972	5.964	5.971	5.981	6.010	5.990	6.020
Ti	0.000	0.007	0.002	0.009	0.004	0.002	0.000	0.005	0.004	0.000	0.009	0.001	0.012
Al	3.966	4.028	4.008	4.033	4.036	4.044	4.053	4.064	4.044	4.040	3.990	4.026	3.968
Fe^{3+}	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
Mg	0.829	0.695	0.717	0.595	0.755	0.633	0.688	0.683	0.671	0.680	0.499	0.440	0.499
Ca	0.392	0.396	0.348	0.309	0.350	0.542	0.306	0.376	0.393	0.332	0.712	0.921	0.662
Mn	0.813	0.955	0.935	0.772	0.673	1.048	0.690	0.959	1.034	0.713	1.192	1.292	1.299
Fe^{2+}	4.005	3.989	3.974	4.310	4.215	3.743	4.274	3.934	3.858	4.210	3.566	3.323	3.490
Zn	0.000	0.000	0.008	0.000	0.000	0.007	0.000	0.006	0.000	0.008	0.000	0.001	0.000
Na	0.005	0.004	0.007	0.002	0.009	0.014	0.011	0.016	0.013	0.009	0.000	0.000	0.009
Grossular	0.06	0.07	0.06	0.05	0.06	0.09	0.05	0.06	0.07	0.06	0.12	0.15	0.11
Pyrope	0.14	0.12	0.12	0.10	0.13	0.11	0.12	0.11	0.11	0.11	0.08	0.07	0.08
Spessartine	0.13	0.16	0.16	0.13	0.11	0.18	0.12	0.16	0.17	0.12	0.20	0.22	0.22
Almandine	0.66	0.66	0.67	0.72	0.70	0.63	0.72	0.66	0.65	0.71	0.60	0.56	0.59
Position	2	2	3	3	1	1	3	1	2	3	1	1	2

Table 4 continued: Garnet chemistry.

ID	1674R12	1674-R2	1674-R3	1676-2	1676-3	1676-8	1679-1	1679-11	1679-2	1679-3	1680-R6	1680-R7	1680-R8
Oxide%													
SiO_2	37.29	37.41	37.42	37.71	37.08	37.59	37.51	37.00	37.43	37.30	36.94	37.11	37.06
TiO_2	0.04	0.07	0.00	0.08	0.06	0.03	0.06	0.00	0.06	0.09	0.00	0.02	0.10
Al_2O_3	21.05	20.63	21.11	20.99	21.52	21.12	21.07	21.13	21.25	21.22	21.34	21.37	21.36
Fe_2O_3	0.00	0.20	0.00	0.33	0.00	0.22	0.15	0.00	0.00	0.00	0.00	0.00	0.00
MgO	2.26	2.20	2.15	2.10	2.63	2.66	3.38	2.96	3.25	2.60	2.90	3.24	3.29
CaO	2.89	3.48	2.56	7.86	5.63	5.60	1.69	1.83	2.29	2.35	1.61	2.40	2.64
MnO	7.58	8.58	7.58	7.18	6.83	6.88	5.56	6.17	5.47	6.51	5.87	4.69	4.66
FeO	28.76	26.62	29.38	23.74	26.40	26.05	30.96	30.62	30.34	29.95	31.00	30.93	30.91
ZnO	0.00	0.03	0.00	0.08	0.00	0.00	0.00	0.08	0.00	0.00	0.06	0.00	0.00
Na_2O	0.02	0.01	0.00	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.04	0.02
Total	99.90	99.23	100.21	100.10	100.17	100.17	100.41	99.80	100.12	100.04	99.75	99.79	100.05
Cations (formula based on 24 O)													
Si	6.009	6.046	6.022	6.004	5.927	5.996	6.000	5.973	5.995	5.996	5.964	5.964	5.944
Ti	0.005	0.009	0.000	0.010	0.007	0.004	0.008	0.000	0.008	0.011	0.000	0.002	0.012
Al	3.998	3.928	4.004	3.938	4.054	3.971	3.971	4.020	4.010	4.020	4.060	4.047	4.039
Fe^{3+}	0.000	0.024	0.000	0.040	0.000	0.026	0.018	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.544	0.530	0.517	0.499	0.627	0.633	0.806	0.712	0.777	0.624	0.699	0.775	0.785
Ca	0.499	0.603	0.442	1.341	0.965	0.957	0.290	0.316	0.393	0.404	0.278	0.413	0.454
Mn	1.034	1.174	1.034	0.968	0.925	0.930	0.754	0.844	0.741	0.886	0.802	0.638	0.633
Fe^{2+}	3.876	3.598	3.954	3.161	3.529	3.475	4.141	4.133	4.064	4.027	4.186	4.157	4.146
Zn	0.000	0.003	0.000	0.009	0.000	0.000	0.000	0.009	0.000	0.000	0.007	0.000	0.000
Na	0.007	0.003	0.000	0.010	0.007	0.008	0.006	0.008	0.007	0.005	0.007	0.014	0.007
Grossular	0.08	0.10	0.07	0.22	0.16	0.16	0.05	0.05	0.07	0.07	0.05	0.07	0.08
Pyrope	0.09	0.09	0.09	0.08	0.10	0.11	0.13	0.12	0.13	0.11	0.12	0.13	0.13
Spessartine	0.17	0.20	0.17	0.16	0.15	0.16	0.13	0.14	0.12	0.15	0.13	0.11	0.11
Almandine	0.65	0.61	0.66	0.53	0.58	0.58	0.69	0.69	0.68	0.68	0.70	0.69	0.69
Position	3	2	3	1	2	1	1	3	2	3	1	2	3

Table 4 continued: Garnet chemistry.

ID	1681-B1	1681-R1	1681-R2	1681-R3	1682-B1	1682-B2	1682-N2	1682-N3	1682-N5	1682-R2	1682-R3	1682-R5	1682-R6
Oxide%													
SiO_2	36.87	37.15	37.13	37.51	37.09	37.47	37.00	36.68	36.44	36.64	36.34	36.46	37.04
TiO_2	0.03	0.01	0.05	0.09	0.03	0.03	0.02	0.07	0.00	0.00	0.04	0.01	0.00
Al_2O_3	21.49	21.15	21.23	21.33	21.30	21.35	21.30	21.04	21.11	21.05	20.85	21.01	21.50
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.02	0.00	0.00
MgO	3.78	2.61	2.99	3.68	3.36	3.67	3.45	2.58	3.33	3.33	2.10	2.29	3.26
CaO	1.64	3.06	2.45	1.55	1.86	1.66	1.49	2.91	1.51	1.55	2.67	2.95	1.66
MnO	0.88	3.68	2.98	0.50	0.40	0.10	0.12	1.68	0.13	0.15	3.14	2.07	0.09
FeO	35.39	31.70	33.06	35.95	36.67	36.77	37.14	34.92	36.95	36.89	34.29	35.08	37.33
ZnO	0.03	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02
Na_2O	0.00	0.07	0.02	0.04	0.00	0.02	0.00	0.01	0.00	0.03	0.05	0.00	0.02
Total	100.11	99.44	99.90	100.73	100.70	101.08	100.53	99.90	99.47	99.66	99.51	99.89	100.91
Cations (formula based on 24 O)													
Si	5.914	5.989	5.970	5.975	5.939	5.961	5.932	5.937	5.905	5.923	5.924	5.917	5.924
Ti	0.004	0.001	0.006	0.010	0.003	0.004	0.002	0.008	0.000	0.000	0.004	0.001	0.000
Al	4.063	4.018	4.022	4.005	4.020	4.003	4.024	4.014	4.033	4.010	4.005	4.019	4.053
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.004	0.003	0.000	0.000
Mg	0.904	0.628	0.717	0.873	0.802	0.870	0.824	0.624	0.805	0.801	0.510	0.555	0.777
Ca	0.282	0.529	0.422	0.265	0.319	0.283	0.256	0.504	0.261	0.268	0.466	0.513	0.284
Mn	0.119	0.503	0.405	0.067	0.055	0.014	0.017	0.231	0.017	0.020	0.433	0.284	0.012
Fe^{2+}	4.748	4.274	4.445	4.788	4.910	4.893	4.979	4.727	5.008	4.987	4.674	4.761	4.992
Zn	0.004	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.002
Na	0.000	0.021	0.007	0.011	0.000	0.005	0.000	0.003	0.001	0.008	0.015	0.001	0.005
Grossular	0.05	0.09	0.07	0.04	0.05	0.05	0.04	0.08	0.04	0.04	0.08	0.08	0.05
Pyrope	0.15	0.11	0.12	0.15	0.13	0.14	0.14	0.10	0.13	0.13	0.08	0.09	0.13
Spessartine	0.02	0.08	0.07	0.01	0.01	0.00	0.00	0.04	0.00	0.00	0.07	0.05	0.00
Almandine	0.78	0.72	0.74	0.80	0.81	0.81	0.82	0.78	0.82	0.82	0.77	0.78	0.82
Position	1	1	2	3	1	3	-	-	-	3	1	2	3

Table 4 continued: Garnet chemistry.

ID	1683-N1	1683-N2	1683-N3	1683-N4	1683R10	1683-R2	1683-R3	1683-R4	1683-R9	1684-4	1684-5	1684-6	1687-1
Oxide%													
SiO_2	36.84	37.00	37.02	37.17	37.26	36.81	36.70	36.98	36.92	37.33	37.31	37.37	37.42
TiO_2	0.08	0.01	0.00	0.00	0.02	0.02	0.00	0.06	0.07	0.00	0.00	0.02	0.11
Al_2O_3	21.18	21.08	21.01	21.26	21.18	21.20	21.33	21.24	21.17	21.30	21.03	20.87	21.10
Fe_2O_3	0.00	0.01	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.21	0.36	0.00
MgO	2.45	2.59	2.03	2.46	2.54	2.05	2.12	2.21	2.07	3.24	2.06	2.01	2.20
CaO	4.09	3.78	1.67	2.08	3.99	4.13	4.41	2.34	1.56	2.57	4.11	3.95	5.52
MnO	1.64	1.17	1.24	0.94	1.45	2.40	1.95	1.13	1.34	0.55	4.21	4.91	6.53
FeO	33.44	34.15	37.11	36.45	34.19	33.75	33.52	36.52	37.25	35.76	31.62	30.85	27.12
ZnO	0.00	0.00	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.00
Na_2O	0.02	0.05	0.02	0.03	0.03	0.03	0.02	0.03	0.00	0.00	0.01	0.03	0.01
Total	99.74	99.84	100.15	100.38	100.82	100.38	100.04	100.50	100.38	100.77	100.56	100.39	100.01
Cations (formula based on 24 O)													
Si	5.946	5.967	5.996	5.981	5.956	5.927	5.922	5.957	5.967	5.961	5.989	6.007	5.997
Ti	0.009	0.001	0.000	0.000	0.002	0.002	0.000	0.007	0.008	0.000	0.000	0.002	0.013
Al	4.029	4.007	4.012	4.031	3.990	4.024	4.056	4.033	4.032	4.009	3.978	3.954	3.986
Fe^{3+}	0.000	0.001	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.025	0.043	0.000
Mg	0.591	0.622	0.491	0.590	0.605	0.492	0.510	0.530	0.498	0.772	0.493	0.481	0.524
Ca	0.707	0.653	0.289	0.359	0.684	0.712	0.762	0.404	0.270	0.440	0.707	0.681	0.948
Mn	0.224	0.160	0.170	0.128	0.197	0.327	0.266	0.155	0.183	0.075	0.572	0.668	0.887
Fe^{2+}	4.514	4.607	5.027	4.905	4.570	4.545	4.522	4.921	5.034	4.775	4.244	4.147	3.635
Zn	0.000	0.000	0.006	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.004	0.000
Na	0.007	0.015	0.005	0.008	0.008	0.010	0.006	0.008	0.001	0.000	0.004	0.008	0.002
Grossular	0.12	0.11	0.05	0.06	0.11	0.12	0.13	0.07	0.05	0.07	0.12	0.11	0.16
Pyrope	0.10	0.10	0.08	0.10	0.10	0.08	0.08	0.09	0.08	0.13	0.08	0.08	0.09
Spessartine	0.04	0.03	0.03	0.02	0.03	0.05	0.04	0.03	0.03	0.01	0.10	0.11	0.15
Almandine	0.75	0.76	0.84	0.82	0.75	0.75	0.75	0.82	0.84	0.79	0.71	0.69	0.61
Position	1	2	3	3	1	1	2	3	1	3	2	1	1

Table 4 continued: Garnet chemistry.

ID	1687-12	1687-2	1687-3	1688-1	1688-10	1688-11	1688-2	1688-3	1688-9	1689-1	1689-7	1689-8	1690-R1
Oxide%													
SiO_2	37.30	36.46	37.11	37.47	37.32	37.66	37.23	37.58	37.33	37.46	37.10	37.32	37.10
TiO_2	0.00	0.01	0.44	0.16	0.18	0.11	0.11	0.18	0.15	0.15	0.00	0.17	0.06
Al_2O_3	21.06	20.61	21.17	20.80	21.11	21.10	20.78	21.01	20.84	21.25	21.22	20.95	21.42
Fe_2O_3	0.18	0.56	0.00	0.30	0.00	0.16	0.22	0.20	0.24	0.00	0.00	0.00	0.00
MgO	2.33	2.68	2.21	1.08	1.29	1.73	1.12	1.48	1.21	1.94	1.98	1.86	3.33
CaO	6.25	4.01	3.61	8.05	8.34	8.07	7.63	8.00	7.81	5.73	3.93	5.71	2.27
MnO	4.19	5.14	5.38	11.50	8.40	5.33	11.17	8.82	10.36	9.71	10.28	9.87	5.42
FeO	28.69	30.09	30.33	20.44	23.24	26.09	21.12	23.01	21.80	23.76	25.21	23.38	30.22
ZnO	0.00	0.03	0.03	0.01	0.07	0.08	0.00	0.02	0.07	0.00	0.00	0.05	0.04
Na_2O	0.04	0.00	0.03	0.04	0.01	0.01	0.05	0.02	0.01	0.04	0.03	0.06	0.05
Total	100.05	99.57	100.31	99.86	99.95	100.33	99.42	100.31	99.81	100.03	99.76	99.36	99.91
Cations (formula based on 24 O)													
Si	5.972	5.917	5.959	6.019	5.983	6.001	6.010	5.999	6.003	5.997	5.988	6.018	5.948
Ti	0.000	0.001	0.054	0.020	0.021	0.013	0.013	0.022	0.018	0.018	0.000	0.021	0.007
Al	3.975	3.942	4.007	3.938	3.989	3.963	3.954	3.952	3.951	4.009	4.036	3.980	4.048
Fe^{3+}	0.022	0.068	0.000	0.036	0.000	0.019	0.027	0.024	0.029	0.000	0.000	0.000	0.000
Mg	0.556	0.647	0.529	0.259	0.308	0.411	0.269	0.351	0.289	0.463	0.476	0.446	0.796
Ca	1.072	0.696	0.621	1.385	1.433	1.377	1.319	1.367	1.345	0.982	0.680	0.986	0.390
Mn	0.568	0.707	0.731	1.564	1.140	0.719	1.528	1.192	1.411	1.317	1.405	1.348	0.736
Fe^{2+}	3.841	4.084	4.073	2.745	3.117	3.476	2.851	3.071	2.932	3.180	3.403	3.153	4.052
Zn	0.000	0.003	0.003	0.002	0.008	0.010	0.000	0.002	0.008	0.000	0.000	0.006	0.004
Na	0.012	0.000	0.009	0.011	0.002	0.002	0.016	0.008	0.003	0.011	0.010	0.018	0.014
Grossular	0.18	0.11	0.10	0.23	0.24	0.23	0.22	0.23	0.23	0.17	0.11	0.17	0.07
Pyrope	0.09	0.11	0.09	0.04	0.05	0.07	0.05	0.06	0.05	0.08	0.08	0.08	0.13
Spessartine	0.09	0.12	0.12	0.26	0.19	0.12	0.26	0.20	0.24	0.22	0.24	0.23	0.12
Almandine	0.64	0.67	0.68	0.46	0.52	0.58	0.48	0.51	0.49	0.54	0.57	0.53	0.68
Position	3	2	3	1	2	3	2	3	1	1	3	1	1

Table 4 continued: Garnet chemistry.

ID	1690-R3	1690-V1	1690-V2	1690-V4	1690-V5	1693AN1	1693AN2	1693AR2	1693AR3	1696-1	1696-2	1697-4	1697-5
Oxide%													
SiO_2	36.98	36.91	36.35	37.22	37.09	37.33	37.25	37.28	36.90	36.89	37.22	37.20	37.38
TiO_2	0.02	0.00	0.00	0.05	0.00	0.00	0.03	0.01	0.00	0.03	0.08	0.05	0.00
Al_2O_3	21.32	21.32	21.14	21.56	21.34	20.89	21.01	20.88	20.92	21.25	21.31	21.25	21.18
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.08	0.00	0.00	0.00	0.00	0.00
MgO	3.16	3.54	2.95	2.56	3.45	2.47	2.55	2.42	2.52	2.99	2.96	3.01	3.05
CaO	1.07	1.33	1.03	1.16	1.70	3.58	2.11	3.83	2.25	2.20	2.03	1.81	2.25
MnO	4.62	4.72	5.12	5.45	4.74	8.18	7.87	7.66	7.59	4.53	4.38	4.91	5.54
FeO	32.88	31.88	32.60	32.27	31.84	27.07	28.97	27.07	28.96	31.77	32.26	31.73	30.24
ZnO	0.01	0.01	0.02	0.03	0.00	0.02	0.00	0.03	0.00	0.04	0.01	0.01	0.04
Na_2O	0.01	0.03	0.00	0.03	0.02	0.04	0.03	0.02	0.04	0.06	0.02	0.04	0.06
Total	100.05	99.74	99.21	100.32	100.17	99.84	99.81	99.28	99.17	99.77	100.26	100.02	99.73
Cations (formula based on 24 O)													
Si	5.956	5.942	5.924	5.976	5.949	6.010	6.012	6.024	5.999	5.953	5.971	5.983	6.012
Ti	0.002	0.000	0.000	0.006	0.000	0.000	0.004	0.001	0.000	0.004	0.010	0.007	0.000
Al	4.046	4.044	4.060	4.080	4.034	3.963	3.997	3.976	4.008	4.042	4.028	4.028	4.014
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.031	0.000	0.010	0.000	0.000	0.000	0.000	0.000
Mg	0.758	0.850	0.717	0.613	0.825	0.593	0.612	0.582	0.610	0.720	0.707	0.721	0.732
Ca	0.184	0.230	0.180	0.199	0.292	0.618	0.364	0.663	0.391	0.381	0.349	0.312	0.387
Mn	0.630	0.644	0.707	0.741	0.643	1.116	1.076	1.048	1.045	0.619	0.595	0.669	0.754
Fe^{2+}	4.428	4.292	4.443	4.333	4.271	3.645	3.910	3.658	3.937	4.288	4.328	4.268	4.068
Zn	0.001	0.001	0.003	0.004	0.000	0.003	0.000	0.004	0.000	0.004	0.001	0.001	0.004
Na	0.003	0.009	0.000	0.008	0.007	0.012	0.008	0.005	0.013	0.019	0.007	0.013	0.019
Grossular	0.03	0.04	0.03	0.03	0.05	0.10	0.06	0.11	0.07	0.06	0.06	0.05	0.07
Pyrope	0.13	0.14	0.12	0.10	0.14	0.10	0.10	0.10	0.10	0.12	0.12	0.12	0.12
Spessartine	0.11	0.11	0.12	0.13	0.11	0.19	0.18	0.18	0.17	0.10	0.10	0.11	0.13
Almandine	0.74	0.71	0.73	0.74	0.71	0.61	0.66	0.61	0.66	0.71	0.72	0.71	0.68
Position	3	1	3	3	1	1	3	1	3	3	3	3	2

Table 4 continued: Garnet chemistry.

ID	1697-6	1698-11	1698-12	1698-13	1698-2	1698-3	1698-4	1700-R5	1700-R6	1700-R7	1713AN2	1713AR4	1713AR5
Oxide%													
SiO_2	37.11	37.06	37.24	37.26	37.34	37.42	37.50	37.07	37.16	37.46	37.19	37.22	37.33
TiO_2	0.00	0.03	0.03	0.00	0.04	0.00	0.02	0.06	0.01	0.00	0.00	0.00	0.03
Al_2O_3	21.08	21.35	21.21	21.09	21.00	21.11	20.99	21.19	21.33	21.10	21.00	20.88	20.76
Fe_2O_3	0.00	0.00	0.00	0.00	0.10	0.00	0.12	0.00	0.00	0.11	0.05	0.23	0.30
MgO	2.91	3.04	2.43	2.32	2.29	2.53	2.74	2.93	3.24	3.18	2.66	2.56	2.97
CaO	3.18	2.11	2.79	3.33	3.66	2.74	1.97	1.65	1.84	1.81	2.27	2.35	2.14
MnO	5.56	4.89	7.60	8.13	7.62	7.01	4.88	6.23	5.95	6.13	6.36	6.59	6.11
FeO	29.51	31.99	29.17	27.85	27.82	29.33	31.91	30.46	30.31	30.41	30.33	30.12	29.96
ZnO	0.00	0.01	0.00	0.00	0.06	0.02	0.09	0.01	0.01	0.02	0.07	0.00	0.00
Na_2O	0.09	0.01	0.02	0.05	0.07	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.00
Total	99.47	100.54	100.59	100.03	99.99	100.26	100.32	99.66	99.91	100.23	100.00	100.02	99.66
Cations (formula based on 24 O)													
Si	5.988	5.943	5.975	5.998	6.010	6.009	6.021	5.985	5.973	6.007	5.997	6.004	6.022
Ti	0.000	0.004	0.004	0.000	0.004	0.000	0.002	0.008	0.001	0.000	0.000	0.000	0.003
Al	4.008	4.034	4.011	4.002	3.982	3.995	3.972	4.033	4.041	3.987	3.991	3.969	3.946
Fe^{3+}	0.000	0.000	0.000	0.000	0.012	0.000	0.015	0.000	0.000	0.013	0.007	0.027	0.036
Mg	0.699	0.726	0.580	0.556	0.548	0.607	0.657	0.706	0.775	0.760	0.640	0.616	0.715
Ca	0.550	0.362	0.479	0.574	0.630	0.472	0.338	0.286	0.316	0.310	0.393	0.406	0.370
Mn	0.759	0.665	1.033	1.108	1.039	0.953	0.664	0.852	0.810	0.833	0.868	0.900	0.834
Fe^{2+}	3.982	4.291	3.913	3.750	3.744	3.939	4.285	4.112	4.075	4.078	4.090	4.064	4.041
Zn	0.000	0.001	0.000	0.000	0.007	0.002	0.010	0.002	0.002	0.002	0.008	0.000	0.000
Na	0.029	0.004	0.007	0.016	0.022	0.007	0.009	0.008	0.008	0.008	0.006	0.008	0.000
Grossular	0.09	0.06	0.08	0.10	0.11	0.08	0.06	0.05	0.05	0.05	0.07	0.07	0.06
Pyrope	0.12	0.12	0.10	0.09	0.09	0.10	0.11	0.12	0.13	0.13	0.11	0.10	0.12
Spessartine	0.13	0.11	0.17	0.19	0.17	0.16	0.11	0.14	0.14	0.14	0.14	0.15	0.14
Almandine	0.66	0.71	0.65	0.63	0.63	0.66	0.72	0.69	0.68	0.68	0.68	0.68	0.68
Position	1	3	2	1	1	2	3	3	2	1	3	3	1

Table 4 continued: Garnet chemistry.

ID	1713aR6	1713aR7	1714bR1	1714bR2	1714bR3	329c10	329c11	329c2	329c3	334n3	334n4	334r5	334r6
Oxide%													
SiO_2	37.57	37.39	37.37	37.15	37.33	37.36	37.48	37.29	37.22	36.74	37.06	37.16	37.14
TiO_2	0.10	0.06	0.04	0.02	0.03	0.04	0.00	0.03	0.00	0.04	0.03	0.00	0.04
Al_2O_3	20.97	20.91	20.77	20.89	20.55	21.04	20.68	21.12	21.00	20.53	20.72	20.64	20.63
Fe_2O_3	0.15	0.25	0.29	0.05	0.46	0.17	0.68	0.05	0.22	0.27	0.21	0.37	0.36
MgO	2.99	2.69	3.46	3.50	2.97	2.71	2.72	2.74	2.85	2.07	2.25	2.03	2.24
CaO	3.34	2.63	1.47	1.45	1.46	2.37	4.44	2.34	3.44	2.09	2.38	1.98	2.38
MnO	5.40	6.28	6.06	5.99	6.32	5.84	4.94	5.92	5.29	11.25	11.09	11.64	11.49
FeO	29.49	29.90	29.78	30.04	29.93	30.97	28.86	31.00	29.91	25.89	25.49	25.90	25.04
ZnO	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01
Na_2O	0.03	0.05	0.03	0.02	0.02	0.03	0.03	0.01	0.02	0.02	0.03	0.01	0.04
Total	100.10	100.14	99.28	99.11	99.07	100.53	99.84	100.48	99.94	98.92	99.26	99.73	99.37
Cations (formula based on 24 O)													
Si	6.010	6.010	6.033	6.007	6.055	5.990	6.016	5.983	5.981	6.009	6.016	6.029	6.024
Ti	0.012	0.007	0.005	0.002	0.003	0.005	0.000	0.003	0.000	0.005	0.003	0.000	0.005
Al	3.953	3.961	3.952	3.982	3.928	3.977	3.912	3.995	3.977	3.957	3.965	3.946	3.944
Fe^{3+}	0.018	0.030	0.035	0.006	0.056	0.021	0.082	0.006	0.027	0.033	0.026	0.045	0.044
Mg	0.714	0.645	0.834	0.843	0.719	0.647	0.652	0.655	0.682	0.505	0.545	0.491	0.541
Ca	0.573	0.453	0.254	0.252	0.254	0.408	0.764	0.401	0.592	0.366	0.415	0.344	0.413
Mn	0.731	0.856	0.828	0.820	0.869	0.793	0.672	0.805	0.720	1.559	1.525	1.599	1.579
Fe^{2+}	3.946	4.019	4.020	4.063	4.061	4.153	3.873	4.159	4.020	3.541	3.461	3.513	3.397
Zn	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.001
Na	0.010	0.014	0.009	0.006	0.005	0.008	0.010	0.003	0.007	0.007	0.010	0.004	0.012
Grossular	0.10	0.08	0.04	0.04	0.04	0.07	0.13	0.07	0.10	0.06	0.07	0.06	0.07
Pyrope	0.12	0.11	0.14	0.14	0.12	0.11	0.11	0.11	0.11	0.08	0.09	0.08	0.09
Spessartine	0.12	0.14	0.14	0.14	0.15	0.13	0.11	0.13	0.12	0.26	0.26	0.27	0.27
Almandine	0.66	0.67	0.68	0.68	0.69	0.69	0.65	0.69	0.67	0.59	0.58	0.59	0.57
Position	1	3	1	2	3	2	1	2	1	3	1	3	1

Table 4 continued: Garnet chemistry.

ID	365-10	365-11	365-16	388-15	388-16	388-2	388-3	388-7	388-8	388-9	402-1	402-13	402-14
Oxide%													
SiO_2	37.26	37.22	37.29	37.11	37.34	37.29	37.34	37.17	37.63	37.33	36.93	37.08	37.03
TiO_2	0.00	0.10	0.01	0.00	0.00	0.03	0.05	0.04	0.05	0.16	0.04	0.07	0.10
Al_2O_3	20.93	20.78	20.91	20.98	21.09	20.64	20.75	20.90	20.98	20.83	20.81	20.74	20.66
Fe_2O_3	0.21	0.40	0.29	0.18	0.21	0.51	0.52	0.25	0.36	0.38	0.18	0.24	0.36
MgO	2.82	3.31	3.01	3.05	3.53	3.46	3.47	3.42	3.47	3.52	2.69	2.76	2.74
CaO	2.71	2.07	3.23	2.30	3.11	2.05	2.93	1.97	3.07	2.78	1.92	2.24	2.77
MnO	5.55	5.22	5.25	3.35	3.56	3.00	3.55	3.15	3.44	3.72	4.83	4.84	5.67
FeO	30.30	30.93	29.69	32.89	31.09	32.41	30.95	32.93	31.32	30.97	32.13	31.47	30.09
ZnO	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.06	0.06
Na_2O	0.02	0.02	0.03	0.03	0.02	0.01	0.04	0.05	0.01	0.05	0.04	0.02	0.03
Total	99.81	100.04	99.70	99.97	99.94	99.38	99.59	99.88	100.32	99.77	99.65	99.50	99.52
Cations (formula based on 24 O)													
Si	6.003	5.980	5.995	5.978	5.980	6.016	6.001	5.978	6.001	5.986	5.986	6.001	5.989
Ti	0.000	0.012	0.001	0.000	0.000	0.004	0.006	0.005	0.006	0.019	0.005	0.008	0.012
Al	3.975	3.934	3.963	3.983	3.980	3.924	3.930	3.963	3.943	3.935	3.976	3.956	3.939
Fe^{3+}	0.025	0.048	0.035	0.022	0.025	0.061	0.063	0.030	0.043	0.046	0.022	0.029	0.044
Mg	0.677	0.792	0.721	0.732	0.843	0.832	0.830	0.820	0.826	0.842	0.651	0.666	0.661
Ca	0.468	0.357	0.557	0.397	0.534	0.354	0.504	0.340	0.525	0.477	0.334	0.388	0.480
Mn	0.757	0.711	0.715	0.457	0.482	0.410	0.483	0.430	0.464	0.506	0.663	0.663	0.777
Fe^{2+}	4.083	4.155	3.992	4.431	4.164	4.373	4.160	4.429	4.178	4.153	4.355	4.259	4.071
Zn	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.003	0.010	0.007	0.008
Na	0.008	0.007	0.010	0.010	0.005	0.004	0.011	0.015	0.004	0.016	0.011	0.005	0.011
Grossular	0.08	0.06	0.09	0.07	0.09	0.06	0.08	0.06	0.09	0.08	0.06	0.06	0.08
Pyrope	0.11	0.13	0.12	0.12	0.14	0.14	0.14	0.14	0.14	0.14	0.11	0.11	0.11
Spessartine	0.13	0.12	0.12	0.08	0.08	0.07	0.08	0.07	0.08	0.08	0.11	0.11	0.13
Almandine	0.68	0.69	0.67	0.74	0.69	0.73	0.70	0.74	0.70	0.69	0.73	0.71	0.68
Position	3	1	3	3	1	3	1	3	2	1	3	3	1

Table 4 continued: Garnet chemistry.

ID	402-2	409-10	409-11	409-8	409-9	427-11	427-12	427-2	427-3	433-5	433-6	433-7	456-1
Oxide%													
SiO_2	37.08	37.06	36.92	37.18	37.09	37.30	37.17	37.27	36.96	37.26	37.17	37.29	36.97
TiO_2	0.00	0.03	0.02	0.03	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.04	0.03
Al_2O_3	21.04	20.92	20.77	20.71	21.10	20.70	20.59	20.63	20.59	20.99	20.75	20.64	20.46
Fe_2O_3	0.10	0.09	0.15	0.35	0.00	0.51	0.48	0.55	0.57	0.19	0.48	0.56	0.54
MgO	2.95	2.55	2.91	2.68	2.72	3.05	3.01	3.24	3.32	2.89	2.86	2.81	2.18
CaO	2.56	1.86	1.97	1.89	1.92	2.02	2.58	2.33	2.21	1.49	1.70	1.80	3.56
MnO	4.68	8.04	8.17	7.68	7.45	5.96	5.53	5.35	5.49	6.21	6.98	7.36	6.00
FeO	31.47	29.30	28.05	29.12	29.50	30.18	29.53	29.96	29.89	31.27	29.89	29.37	29.14
ZnO	0.04	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.10	0.00	0.06	0.05	0.00
Na_2O	0.03	0.04	0.07	0.03	0.02	0.04	0.07	0.01	0.03	0.03	0.06	0.04	0.05
Total	99.94	99.87	99.03	99.67	99.80	99.78	98.98	99.35	99.15	100.33	99.94	99.96	98.92
Cations (formula based on 24 O)													
Si	5.973	5.994	6.000	6.015	5.986	6.011	6.013	6.017	5.991	5.993	5.995	6.009	6.020
Ti	0.000	0.004	0.002	0.003	0.000	0.004	0.002	0.000	0.000	0.000	0.000	0.005	0.004
Al	3.994	3.988	3.979	3.949	4.014	3.931	3.926	3.926	3.933	3.979	3.943	3.919	3.926
Fe^{3+}	0.012	0.010	0.019	0.043	0.000	0.061	0.058	0.067	0.069	0.023	0.058	0.068	0.066
Mg	0.707	0.614	0.706	0.647	0.654	0.734	0.726	0.780	0.803	0.692	0.688	0.675	0.529
Ca	0.442	0.322	0.342	0.327	0.333	0.349	0.447	0.402	0.383	0.256	0.293	0.311	0.622
Mn	0.638	1.102	1.124	1.052	1.018	0.814	0.758	0.732	0.753	0.847	0.954	1.004	0.827
Fe^{2+}	4.240	3.963	3.812	3.940	3.982	4.067	3.996	4.045	4.052	4.207	4.031	3.957	3.969
Zn	0.004	0.000	0.000	0.002	0.001	0.000	0.000	0.002	0.012	0.000	0.007	0.006	0.000
Na	0.009	0.011	0.023	0.008	0.005	0.011	0.022	0.002	0.009	0.008	0.018	0.013	0.015
Grossular	0.07	0.05	0.06	0.05	0.06	0.06	0.08	0.07	0.06	0.04	0.05	0.05	0.10
Pyrope	0.12	0.10	0.12	0.11	0.11	0.12	0.12	0.13	0.13	0.12	0.12	0.11	0.09
Spessartine	0.11	0.18	0.19	0.18	0.17	0.14	0.13	0.12	0.13	0.14	0.16	0.17	0.14
Almandine	0.70	0.66	0.64	0.66	0.67	0.68	0.67	0.68	0.68	0.70	0.68	0.67	0.67
Position	1	3	1	3	2	3	1	2	1	3	2	1	3

Table 4 continued: Garnet chemistry.

ID	456-12	456-13	456-14	456-15	456-16	456-2	456-3	475-R6	475-R7	615-13	615-2	615-3	615-4
Oxide%													
SiO_2	37.06	36.81	37.00	36.93	36.94	37.20	37.13	37.26	37.50	36.83	37.05	36.75	37.19
TiO_2	0.01	0.00	0.05	0.03	0.02	0.12	0.11	0.00	0.03	0.00	0.00	0.03	0.00
Al_2O_3	20.65	20.85	20.66	20.55	20.80	20.66	20.60	20.99	21.07	20.40	20.57	20.68	20.80
Fe_2O_3	0.41	0.10	0.31	0.40	0.12	0.35	0.25	0.09	0.12	0.70	0.54	0.28	0.21
MgO	2.28	2.48	2.11	2.29	1.73	1.72	1.65	3.04	3.44	3.16	3.12	3.19	2.83
CaO	4.00	3.27	5.52	3.42	5.86	5.86	6.08	1.49	1.63	1.94	1.69	3.48	1.71
MnO	5.57	5.58	6.06	5.79	8.54	9.09	9.36	7.33	6.83	6.04	6.36	5.79	6.67
FeO	29.10	30.07	27.12	29.55	24.97	24.28	23.51	29.54	29.48	29.92	29.92	28.35	30.07
ZnO	0.00	0.03	0.06	0.00	0.00	0.00	0.05	0.03	0.03	0.00	0.00	0.00	0.00
Na_2O	0.05	0.00	0.00	0.02	0.02	0.01	0.06	0.04	0.01	0.04	0.05	0.02	0.01
Total	99.13	99.18	98.87	98.98	98.99	99.29	98.80	99.81	100.14	99.04	99.30	98.58	99.49
Cations (formula based on 24 O)													
Si	6.010	5.980	6.003	6.011	5.994	6.018	6.024	6.008	6.008	5.991	6.007	5.976	6.020
Ti	0.001	0.000	0.005	0.003	0.002	0.014	0.014	0.000	0.004	0.000	0.000	0.003	0.000
Al	3.947	3.992	3.950	3.942	3.977	3.938	3.939	3.988	3.979	3.911	3.931	3.964	3.967
Fe^{3+}	0.050	0.012	0.038	0.049	0.015	0.042	0.031	0.011	0.015	0.086	0.066	0.034	0.026
Mg	0.552	0.600	0.509	0.556	0.418	0.416	0.398	0.730	0.821	0.767	0.754	0.774	0.683
Ca	0.695	0.569	0.959	0.597	1.019	1.016	1.056	0.258	0.281	0.338	0.294	0.606	0.296
Mn	0.765	0.768	0.832	0.798	1.174	1.246	1.286	1.001	0.926	0.832	0.873	0.797	0.914
Fe^{2+}	3.946	4.086	3.679	4.023	3.388	3.285	3.190	3.984	3.950	4.070	4.057	3.856	4.070
Zn	0.000	0.003	0.007	0.000	0.000	0.000	0.006	0.004	0.003	0.000	0.000	0.000	0.000
Na	0.016	0.000	0.001	0.007	0.006	0.003	0.017	0.012	0.004	0.012	0.015	0.006	0.004
Grossular	0.12	0.09	0.16	0.10	0.17	0.17	0.18	0.04	0.05	0.06	0.05	0.10	0.05
Pyrope	0.09	0.10	0.09	0.09	0.07	0.07	0.07	0.12	0.14	0.13	0.13	0.13	0.11
Spessartine	0.13	0.13	0.14	0.13	0.20	0.21	0.22	0.17	0.15	0.14	0.15	0.13	0.15
Almandine	0.66	0.68	0.62	0.67	0.56	0.55	0.54	0.67	0.66	0.68	0.68	0.64	0.68
Position	3	2	1	3	3	2	1	3	1	3	1	3	1

Table 4 continued: Garnet chemistry.

ID	615-5	616-N4	616-N5	616-R2	616-R3	619-1	619-2	619-3	622-B6	622-N3	622-R2	677-2	677-3
Oxide%													
SiO_2	37.14	37.45	37.46	37.31	37.39	37.16	37.16	37.28	37.46	37.40	37.39	36.93	36.89
TiO_2	0.00	0.00	0.09	0.19	0.09	0.00	0.03	0.02	0.03	0.10	0.08	0.01	0.10
Al_2O_3	20.89	20.97	20.46	20.91	21.12	20.73	20.64	20.66	20.75	20.62	20.60	20.64	20.48
Fe_2O_3	0.21	0.26	0.48	0.01	0.09	0.34	0.46	0.48	0.43	0.51	0.50	0.31	0.42
MgO	3.29	2.55	2.32	2.06	2.35	2.57	2.66	2.49	2.13	2.18	2.09	2.69	2.92
CaO	2.55	3.51	4.55	5.20	5.11	1.73	1.82	1.69	5.43	5.17	5.20	1.62	1.92
MnO	5.77	5.21	6.44	8.69	6.07	7.73	7.85	7.51	8.81	9.09	10.06	6.23	6.32
FeO	29.38	30.21	27.47	25.64	28.13	29.44	29.16	29.87	24.46	24.29	23.72	30.81	29.73
ZnO	0.06	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.00	0.00
Na_2O	0.04	0.02	0.01	0.00	0.00	0.02	0.01	0.01	0.02	0.06	0.01	0.03	0.05
Total	99.35	100.19	99.28	100.05	100.32	99.71	99.77	100.01	99.52	99.42	99.67	99.26	98.82
Cations (formula based on 24 O)													
Si	5.996	6.010	6.040	5.986	5.982	6.017	6.012	6.024	6.031	6.030	6.017	6.006	6.011
Ti	0.000	0.000	0.011	0.023	0.010	0.000	0.004	0.002	0.004	0.012	0.010	0.001	0.013
Al	3.976	3.966	3.889	3.955	3.982	3.956	3.936	3.935	3.938	3.918	3.906	3.957	3.933
Fe^{3+}	0.026	0.031	0.059	0.001	0.010	0.041	0.056	0.059	0.052	0.062	0.061	0.037	0.051
Mg	0.793	0.611	0.556	0.493	0.560	0.620	0.641	0.599	0.510	0.524	0.500	0.652	0.709
Ca	0.441	0.603	0.786	0.894	0.877	0.300	0.316	0.293	0.936	0.892	0.896	0.282	0.334
Mn	0.789	0.709	0.879	1.181	0.823	1.060	1.075	1.028	1.201	1.241	1.371	0.858	0.872
Fe^{2+}	3.968	4.055	3.705	3.441	3.764	3.987	3.945	4.037	3.293	3.275	3.192	4.190	4.051
Zn	0.008	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.000	0.000
Na	0.013	0.007	0.004	0.000	0.000	0.007	0.003	0.003	0.007	0.019	0.002	0.009	0.016
Grossular	0.07	0.10	0.13	0.15	0.15	0.05	0.05	0.05	0.16	0.15	0.15	0.05	0.06
Pyrope	0.13	0.10	0.09	0.08	0.09	0.10	0.11	0.10	0.09	0.09	0.08	0.11	0.12
Spessartine	0.13	0.12	0.15	0.20	0.14	0.18	0.18	0.17	0.20	0.21	0.23	0.14	0.15
Almandine	0.66	0.68	0.63	0.57	0.62	0.67	0.66	0.68	0.55	0.55	0.54	0.70	0.68
Position	-	3	1	3	2	1	2	3	2	2	2	3	1

Table 4 continued: Garnet chemistry.

ID	677-7	677-8	969-6	969-7	969-8	969-9	974-6	974-7	978-1	978-2	978-3	978-4	982-1
Oxide%													
SiO_2	37.01	36.93	37.01	36.86	37.08	37.11	37.04	37.03	37.28	37.26	37.40	37.32	37.01
TiO_2	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.05	0.07	0.02	0.00	0.02	0.09
Al_2O_3	20.80	20.96	20.77	20.50	20.54	20.59	20.61	20.84	20.70	20.67	20.81	20.83	20.78
Fe_2O_3	0.19	0.00	0.04	0.33	0.40	0.43	0.23	0.07	0.27	0.20	0.48	0.18	0.15
MgO	2.84	2.86	2.07	2.21	2.25	2.33	2.12	2.48	2.74	2.15	2.72	2.64	2.62
CaO	1.63	1.93	1.95	2.89	1.84	2.54	1.71	2.03	2.94	2.02	3.49	2.09	1.87
MnO	6.28	6.44	10.18	10.07	10.00	10.64	11.33	10.47	4.96	5.05	4.54	4.55	6.60
FeO	30.77	29.98	27.08	25.60	27.21	25.77	26.01	26.50	30.15	31.85	30.55	31.92	30.35
ZnO	0.04	0.04	0.00	0.03	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.05
Na_2O	0.01	0.04	0.05	0.03	0.00	0.02	0.01	0.03	0.01	0.03	0.05	0.04	0.06
Total	99.57	99.18	99.15	98.52	99.31	99.45	99.07	99.50	99.16	99.25	100.03	99.58	99.58
Cations (formula based on 24 O)													
Si	5.996	5.994	6.031	6.028	6.033	6.019	6.037	6.006	6.035	6.056	6.009	6.032	5.999
Ti	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.007	0.009	0.002	0.000	0.002	0.011
Al	3.972	4.010	3.990	3.952	3.938	3.935	3.960	3.984	3.950	3.960	3.941	3.968	3.969
Fe^{3+}	0.023	0.000	0.005	0.040	0.049	0.052	0.029	0.008	0.033	0.024	0.058	0.022	0.018
Mg	0.687	0.691	0.502	0.540	0.544	0.564	0.516	0.599	0.660	0.522	0.652	0.636	0.633
Ca	0.283	0.335	0.340	0.507	0.321	0.442	0.299	0.352	0.510	0.352	0.600	0.362	0.325
Mn	0.861	0.885	1.405	1.395	1.378	1.462	1.565	1.438	0.680	0.696	0.618	0.623	0.907
Fe^{2+}	4.170	4.070	3.691	3.502	3.702	3.495	3.546	3.594	4.082	4.329	4.105	4.315	4.114
Zn	0.005	0.005	0.000	0.004	0.000	0.001	0.000	0.000	0.004	0.000	0.000	0.000	0.005
Na	0.002	0.012	0.015	0.009	0.000	0.007	0.002	0.008	0.004	0.011	0.015	0.014	0.020
Grossular	0.05	0.06	0.06	0.09	0.05	0.07	0.05	0.06	0.09	0.06	0.10	0.06	0.05
Pyrope	0.11	0.12	0.08	0.09	0.09	0.09	0.09	0.10	0.11	0.09	0.11	0.11	0.11
Spessartine	0.14	0.15	0.24	0.23	0.23	0.25	0.26	0.24	0.11	0.12	0.10	0.10	0.15
Almandine	0.69	0.68	0.62	0.59	0.62	0.59	0.60	0.60	0.69	0.73	0.69	0.73	0.69
Position	3	1	3	1	3	1	3	1	-	-	-	-	3

Table 4 continued: Garnet chemistry.

ID	9822	9823	9824	98410	98411	9848	9849	1570-1	1570-2	1570-17	1570-18	1570-24	1570-25
Oxide%													
SiO_2	37.13	37.15	37.18	37.35	37.07	37.40	37.22	37.36	37.37	38.10	37.60	37.56	37.36
TiO_2	0.05	0.05	0.02	0.00	0.09	0.02	0.05	0.00	0.03	0.05	0.04	0.00	0.02
Al_2O_3	20.67	20.98	20.80	20.80	20.78	20.67	20.51	21.23	21.15	23.81	21.19	21.29	21.75
Fe_2O_3	0.36	0.04	0.26	0.34	0.20	0.56	0.69	0.00	0.00	0.00	0.00	0.02	0.00
MgO	2.88	2.67	2.80	3.02	2.97	3.03	3.14	3.24	2.25	3.03	2.55	3.34	2.70
CaO	1.91	1.85	2.27	1.66	2.12	1.54	1.88	1.71	1.68	1.68	1.63	1.79	1.52
MnO	7.22	6.82	6.57	5.64	7.57	5.75	6.80	6.06	7.45	6.42	6.90	5.79	6.74
FeO	29.11	30.41	29.59	31.05	28.46	31.13	29.25	30.62	31.01	31.30	30.70	30.73	31.13
ZnO	0.00	0.00	0.04	0.03	0.07	0.00	0.00	0.04	0.00	0.00	0.07	0.02	0.05
Na_2O	0.05	0.03	0.02	0.05	0.10	0.02	0.04	0.06	0.03	0.05	0.05	0.07	0.06
Total	99.39	99.98	99.56	99.93	99.42	100.11	99.56	100.31	100.97	104.44	100.73	100.61	101.33
Cations (formula based on 24 O)													
Si	6.016	5.997	6.012	6.014	5.998	6.018	6.015	5.984	5.985	5.842	6.017	5.988	5.942
Ti	0.007	0.006	0.002	0.000	0.011	0.002	0.006	0.000	0.004	0.006	0.005	0.000	0.002
Al	3.947	3.990	3.964	3.947	3.962	3.919	3.907	4.008	3.993	4.302	3.996	4.000	4.078
Fe^{3+}	0.044	0.005	0.031	0.041	0.024	0.068	0.084	0.000	0.000	0.000	0.000	0.003	0.000
Mg	0.695	0.643	0.675	0.726	0.716	0.727	0.756	0.773	0.537	0.692	0.608	0.793	0.641
Ca	0.331	0.319	0.394	0.286	0.367	0.266	0.325	0.293	0.289	0.276	0.280	0.305	0.259
Mn	0.991	0.932	0.900	0.769	1.038	0.783	0.930	0.823	1.011	0.834	0.935	0.782	0.908
Fe^{2+}	3.944	4.104	4.001	4.182	3.850	4.188	3.953	4.102	4.154	4.013	4.108	4.098	4.141
Zn	0.000	0.000	0.005	0.004	0.008	0.000	0.000	0.005	0.000	0.000	0.008	0.003	0.006
Na	0.015	0.008	0.006	0.014	0.031	0.007	0.012	0.018	0.009	0.015	0.014	0.021	0.020
Grossular	0.06	0.05	0.07	0.05	0.06	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Pyrope	0.12	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.09	0.12	0.10	0.13	0.11
Spessartine	0.17	0.16	0.15	0.13	0.17	0.13	0.16	0.14	0.17	0.14	0.16	0.13	0.15
Almandine	0.66	0.68	0.67	0.70	0.64	0.70	0.66	0.68	0.69	0.69	0.69	0.69	0.70
Position	1	3	1	3	1	3	1	1	3	1	3	1	3

Table 4 continued: Garnet chemistry.

ID	1698-b1	1698-b2	1698b16	1698b17	1664Ca	1664	1664	1664	1664	1664	1613	1613r2	1613v1
Oxide%													
SiO_2	37.25	37.21	37.35	37.56	37.94	37.98	37.96	37.67	37.63	37.76	36.97	37.18	36.65
TiO_2	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.07	0.00	0.00
Al_2O_3	21.49	21.37	21.28	21.23	21.21	21.34	21.00	21.13	21.29	21.41	20.69	20.89	20.76
Fe_2O_3	0.00	0.00	0.00	0.00	0.11	0.04	0.09	0.00	0.00	0.00	0.29	0.06	0.00
MgO	2.80	2.99	2.61	2.83	2.87	2.92	2.39	2.16	2.83	2.98	2.61	2.25	2.36
CaO	2.72	2.05	2.79	2.04	2.15	3.65	2.51	2.62	1.98	3.70	2.12	1.92	1.89
MnO	5.90	4.80	6.55	4.86	6.71	5.75	7.12	7.65	6.82	5.64	8.53	8.99	9.00
FeO	30.32	32.11	29.67	32.07	29.79	29.00	29.05	29.05	29.65	28.94	28.00	28.54	28.13
ZnO	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
Na_2O	0.04	0.04	0.05	0.05	0.02	0.05	0.02	0.03	0.05	0.13	0.06	0.04	0.01
Total	100.55	100.57	100.34	100.64	100.82	100.72	100.13	100.40	100.24	100.56	99.33	99.87	98.81
Cations (formula based on 24 O)													
Si	5.956	5.959	5.986	6.005	6.039	6.022	6.078	6.035	6.023	6.000	5.991	6.010	5.988
Ti	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.008	0.000	0.000
Al	4.049	4.034	4.020	4.001	3.978	3.988	3.963	3.990	4.017	4.009	3.951	3.980	3.998
Fe^{3+}	0.000	0.000	0.000	0.000	0.013	0.005	0.011	0.000	0.000	0.000	0.035	0.008	0.000
Mg	0.667	0.714	0.623	0.675	0.681	0.690	0.570	0.517	0.675	0.707	0.629	0.541	0.575
Ca	0.466	0.352	0.478	0.350	0.367	0.620	0.430	0.450	0.340	0.630	0.368	0.333	0.332
Mn	0.799	0.652	0.889	0.658	0.904	0.773	0.965	1.037	0.924	0.760	1.171	1.231	1.245
Fe^{2+}	4.054	4.301	3.977	4.287	3.965	3.845	3.891	3.892	3.969	3.846	3.794	3.858	3.843
Zn	0.000	0.000	0.002	0.000	0.003	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
Na	0.013	0.012	0.017	0.015	0.007	0.015	0.006	0.008	0.016	0.040	0.018	0.012	0.002
Grossular	0.08	0.06	0.08	0.06	0.06	0.10	0.07	0.08	0.06	0.11	0.06	0.06	0.06
Pyrope	0.11	0.12	0.10	0.11	0.12	0.12	0.10	0.09	0.11	0.12	0.11	0.09	0.10
Spessartine	0.13	0.11	0.15	0.11	0.15	0.13	0.16	0.18	0.16	0.13	0.20	0.21	0.21
Almandine	0.68	0.71	0.67	0.72	0.67	0.65	0.66	0.66	0.67	0.65	0.64	0.65	0.64
Position	1	3	1	3	3	2	3	1	3	1	1	3	3

Table 4 continued: Garnet chemistry.

ID	1613v2	1613v3	1613v4	1613v5	1613n1	1613n2	1613n7	1613n8	1692n9	1692n10	1692n11	1692n12	1692n13
Oxide%													
SiO_2	37.01	37.01	36.99	36.88	36.99	36.84	36.77	36.93	37.32	36.54	37.10	37.20	37.40
TiO_2	0.00	0.00	0.10	0.00	0.04	0.03	0.08	0.00	0.02	0.00	0.05	0.03	0.03
Al_2O_3	20.95	20.95	20.88	20.95	20.72	21.00	20.87	20.90	20.01	20.49	20.97	21.22	21.14
Fe_2O_3	0.07	0.05	0.00	0.00	0.07	0.00	0.00	0.00	1.30	0.43	0.09	0.00	0.00
MgO	2.47	2.47	2.54	2.20	2.31	2.50	2.56	2.24	2.96	2.45	3.02	3.16	2.65
CaO	2.46	2.98	2.53	1.87	1.98	2.74	2.51	1.91	2.16	2.61	2.99	2.35	1.86
MnO	8.78	8.69	8.75	9.06	8.97	8.55	8.59	9.36	5.03	5.36	5.27	5.07	5.14
FeO	27.80	27.21	27.50	27.99	27.88	27.52	27.68	28.08	30.24	30.68	29.85	30.76	31.95
ZnO	0.05	0.06	0.00	0.00	0.04	0.00	0.00	0.03	0.01	0.00	0.00	0.02	0.05
Na_2O	0.04	0.04	0.01	0.02	0.03	0.03	0.03	0.03	0.02	0.04	0.05	0.05	0.03
Total	99.60	99.44	99.30	98.96	99.02	99.20	99.10	99.47	99.06	98.59	99.39	99.83	100.24
Cations (formula based on 24 O)													
Si	5.987	5.991	5.997	6.010	6.026	5.977	5.976	5.999	6.054	5.980	5.984	5.975	6.009
Ti	0.000	0.000	0.012	0.000	0.005	0.004	0.010	0.000	0.003	0.000	0.006	0.003	0.004
Al	3.994	3.996	3.989	4.025	3.979	4.015	3.997	4.002	3.826	3.951	3.986	4.017	4.002
Fe^{3+}	0.008	0.006	0.000	0.000	0.008	0.000	0.000	0.000	0.158	0.053	0.010	0.000	0.000
Mg	0.595	0.595	0.613	0.536	0.561	0.604	0.621	0.542	0.715	0.597	0.725	0.756	0.634
Ca	0.426	0.516	0.439	0.326	0.345	0.477	0.437	0.333	0.375	0.457	0.517	0.404	0.319
Mn	1.202	1.191	1.202	1.250	1.237	1.175	1.183	1.288	0.691	0.743	0.720	0.689	0.700
Fe^{2+}	3.761	3.683	3.728	3.814	3.798	3.733	3.762	3.814	4.104	4.198	4.026	4.132	4.292
Zn	0.006	0.007	0.000	0.000	0.005	0.000	0.000	0.003	0.001	0.000	0.000	0.002	0.005
Na	0.012	0.012	0.003	0.006	0.010	0.008	0.009	0.009	0.007	0.014	0.017	0.014	0.008
Grossular	0.07	0.09	0.07	0.06	0.06	0.08	0.07	0.06	0.06	0.08	0.09	0.07	0.05
Pyrope	0.10	0.10	0.10	0.09	0.09	0.10	0.10	0.09	0.12	0.10	0.12	0.13	0.11
Spessartine	0.20	0.20	0.20	0.21	0.21	0.20	0.20	0.22	0.12	0.12	0.12	0.12	0.12
Almandine	0.63	0.62	0.62	0.64	0.64	0.62	0.63	0.64	0.70	0.70	0.67	0.69	0.72
Position	2	1	2	3	3	1	1	3	-	-	-	-	-

Table 5: Staurolite chemistry.

ID	1505 N6	1505 R4	1520 13	1520 14	1562 B1	1562 B2	1562 B3	1562 B4	1562 B5	1562 N1	1562 N2	1562 N4	1562 N5
Oxide%													
SiO_2	26.82	27.72	28.09	27.87	28.01	27.71	27.80	27.93	27.62	28.16	27.89	28.22	28.08
TiO_2	0.47	0.67	0.45	0.62	0.56	0.57	0.61	0.71	0.67	0.61	0.67	0.67	0.66
Al_2O_3	55.39	54.37	54.69	54.47	54.42	54.88	54.50	54.00	54.02	54.38	55.11	54.44	54.83
Cr_2O_3	0.07	0.07	0.01	0.02	0.01	0.02	0.05	0.11	0.06	0.02	0.00	0.06	0.11
MgO	1.85	1.74	2.03	1.98	1.33	1.42	1.34	1.32	1.72	1.52	1.19	1.71	1.22
CaO	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00
MnO	0.24	0.21	0.32	0.30	0.36	0.41	0.43	0.36	0.41	0.35	0.37	0.36	0.37
FeO	13.79	13.58	13.42	13.71	13.07	12.68	13.02	12.76	12.58	12.77	12.61	12.54	12.64
Na_2O	0.02	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.00	0.01	0.02	0.01	0.00
K_2O	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	98.65	98.39	99.03	98.99	97.75	97.71	97.76	97.19	97.08	97.82	97.86	98.02	97.92
Cations (formula based on 24 O)													
Si	3.864	3.984	4.008	3.984	4.032	3.984	4.008	4.056	4.008	4.056	4.008	4.056	4.032
Ti	0.048	0.072	0.048	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
Al	9.384	9.216	9.192	9.192	9.264	9.336	9.288	9.240	9.240	9.240	9.336	9.216	9.288
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.024
Mg	0.384	0.384	0.432	0.432	0.288	0.312	0.288	0.288	0.384	0.336	0.264	0.360	0.264
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.024	0.024	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
Fe	1.656	1.632	1.608	1.632	1.584	1.536	1.584	1.536	1.536	1.536	1.512	1.512	1.512
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St*	0.80	0.80	0.77	0.77	0.83	0.81	0.83	0.82	0.78	0.80	0.83	0.79	0.83
Mg-St	0.19	0.19	0.21	0.20	0.15	0.16	0.15	0.15	0.20	0.18	0.14	0.19	0.14
Mn-St	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03

*Fe-St (Fe), Mg-St (Mg), Mn-St (Mn) over (Fe+Mg+Mn)

Table 5 continued: Staurolite chemistry.

ID	1571n6	1571r6	1642 8	1648b3	1648b4	1648b7	1648n4	1648n8	1651b4	1651b7	1651b8	1664b1	1664b15
Oxide%													
SiO_2	28.13	28.21	27.79	27.70	27.20	27.83	27.54	27.36	27.98	27.93	27.94	27.91	27.80
TiO_2	0.59	0.62	0.72	0.56	0.57	0.68	0.53	0.65	0.60	0.53	0.47	0.75	0.55
Al_2O_3	53.09	52.94	55.79	54.17	54.78	53.72	52.94	53.85	53.57	53.65	53.74	54.33	53.45
Cr_2O_3	0.02	0.04	0.01	0.07	0.11	0.09	0.10	0.10	0.08	0.03	0.04	0.08	0.00
MgO	2.09	1.97	1.08	1.85	1.74	1.69	1.81	1.82	1.97	2.03	2.10	2.07	2.03
CaO	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
MnO	0.27	0.28	0.33	0.28	0.33	0.31	0.30	0.30	0.27	0.27	0.25	0.40	0.37
FeO	13.66	13.60	12.37	14.14	14.26	14.21	14.35	14.06	14.27	14.35	14.59	13.46	13.38
Na_2O	0.04	0.04	0.01	0.02	0.01	0.00	0.01	0.01	0.00	0.02	0.03	0.01	0.00
K_2O	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Total	97.89	97.70	98.10	98.79	98.99	98.52	97.56	98.15	98.72	98.80	99.15	99.01	97.58
Cations (formula based on 24 O)													
Si	4.080	4.080	3.984	3.984	3.912	4.008	4.008	3.960	4.032	4.008	4.008	3.984	4.032
Ti	0.072	0.072	0.072	0.072	0.072	0.072	0.048	0.072	0.072	0.048	0.048	0.072	0.048
Al	9.048	9.048	9.408	9.168	9.288	9.120	9.096	9.192	9.096	9.096	9.096	9.168	9.144
Cr	0.000	0.000	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.456	0.432	0.240	0.384	0.384	0.360	0.384	0.384	0.432	0.432	0.456	0.432	0.432
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.024	0.024	0.048	0.024	0.048	0.048	0.048	0.048	0.024	0.024	0.024	0.048	0.048
Fe	1.656	1.656	1.488	1.704	1.704	1.704	1.752	1.704	1.728	1.728	1.752	1.608	1.632
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St	0.78	0.78	0.84	0.81	0.80	0.81	0.80	0.80	0.79	0.79	0.78	0.77	0.77
Mg-St	0.21	0.20	0.14	0.18	0.18	0.17	0.18	0.18	0.20	0.20	0.20	0.21	0.20
Mn-St	0.01	0.01	0.03	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02

Table 5 continued: Staurolite chemistry.

ID	1664r10	1664r9	1666b1	1666b2	1666b3	1669 13	1669 14	1671b1	1671b11	1671b4	1671b5	1671 N1	1671r10
Oxide%													
SiO_2	27.67	27.58	27.56	27.76	27.75	28.00	27.89	27.87	27.72	27.82	27.82	27.86	28.09
TiO_2	0.74	0.63	0.70	0.63	0.51	0.60	0.62	0.67	0.38	0.47	0.50	0.56	0.50
Al_2O_3	54.30	54.67	54.29	54.40	54.17	53.87	54.12	54.47	54.41	53.87	54.79	54.00	54.31
Cr_2O_3	0.07	0.04	0.11	0.12	0.11	0.00	0.08	0.04	0.11	0.09	0.02	0.05	0.12
MgO	2.06	2.05	2.06	2.07	1.99	2.15	2.07	2.00	1.63	1.91	1.94	2.10	1.70
CaO	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MnO	0.45	0.45	0.42	0.43	0.46	0.41	0.40	0.25	0.31	0.26	0.28	0.28	0.21
FeO	13.71	13.51	13.64	13.53	13.72	13.50	13.48	13.19	13.67	13.32	13.19	13.71	13.21
Na_2O	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.00	0.02	0.01	0.03	0.00	0.00
K_2O	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	99.00	98.94	98.78	98.96	98.71	98.56	98.67	98.49	98.25	97.75	98.57	98.56	98.14
Cations (formula based on 24 O)													
Si	3.960	3.960	3.960	3.984	3.984	4.032	4.008	4.008	4.008	4.032	3.984	4.008	4.032
Ti	0.072	0.072	0.072	0.072	0.048	0.072	0.072	0.072	0.048	0.048	0.048	0.072	0.048
Al	9.168	9.240	9.192	9.192	9.168	9.120	9.168	9.216	9.240	9.192	9.264	9.144	9.216
Cr	0.000	0.000	0.024	0.024	0.024	0.000	0.000	0.000	0.024	0.000	0.000	0.000	0.024
Mg	0.432	0.432	0.432	0.432	0.432	0.456	0.432	0.432	0.360	0.408	0.408	0.456	0.360
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.024	0.048	0.024	0.024	0.024	0.024
Fe	1.632	1.608	1.632	1.632	1.656	1.632	1.608	1.584	1.656	1.608	1.584	1.656	1.584
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St	0.77	0.77	0.77	0.77	0.78	0.76	0.77	0.78	0.80	0.79	0.79	0.78	0.80
Mg-St	0.20	0.21	0.20	0.20	0.20	0.21	0.21	0.21	0.17	0.20	0.20	0.21	0.18
Mn-St	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01

Table 5 continued: Staurolite chemistry

ID	1671 r11	1671 r12	1679 10	1680 N1	1681 B2	1681 B4	1682 10	1682 B4	1682 N6	1683 B2	1683 B3	1690 N1	1690 N2
Oxide%													
SiO_2	28.01	27.20	27.45	27.85	27.47	27.62	27.36	27.03	27.10	27.50	27.54	27.57	27.91
TiO_2	0.52	0.53	0.46	0.58	0.48	0.56	0.54	0.71	0.47	0.68	0.71	0.43	0.58
Al_2O_3	54.00	54.73	54.33	54.47	53.18	53.08	52.97	53.69	52.72	53.35	53.08	54.45	54.63
Cr_2O_3	0.06	0.09	0.00	0.09	0.06	0.23	0.09	0.04	0.07	0.10	0.12	0.11	0.04
MgO	1.64	2.00	1.99	2.15	2.37	2.22	1.96	1.62	1.74	1.47	1.43	1.98	1.88
CaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
MnO	0.27	0.32	0.39	0.34	0.03	0.04	0.00	0.03	0.01	0.03	0.05	0.30	0.27
FeO	13.42	13.58	13.39	13.48	15.02	15.11	14.97	14.57	15.00	14.19	14.26	14.11	13.85
Na_2O	0.02	0.03	0.01	0.02	0.02	0.03	0.02	0.00	0.00	0.00	0.01	0.01	0.00
K_2O	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00
Total	97.92	98.48	98.03	98.99	98.64	98.89	97.90	97.72	97.10	97.33	97.20	98.95	99.17
Cations (formula based on 24 O)													
Si	4.032	3.912	3.960	3.984	3.984	3.984	3.984	3.936	3.984	4.008	4.032	3.960	3.984
Ti	0.048	0.048	0.048	0.072	0.048	0.072	0.048	0.072	0.048	0.072	0.072	0.048	0.072
Al	9.192	9.288	9.240	9.192	9.072	9.024	9.096	9.216	9.120	9.168	9.144	9.216	9.192
Cr	0.000	0.000	0.000	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.024	0.000	0.000
Mg	0.360	0.432	0.432	0.456	0.504	0.480	0.432	0.360	0.384	0.312	0.312	0.432	0.408
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.024	0.048	0.048	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048	0.024
Fe	1.632	1.632	1.608	1.608	1.824	1.824	1.824	1.776	1.848	1.728	1.752	1.704	1.656
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St	0.81	0.77	0.77	0.76	0.78	0.79	0.81	0.83	0.83	0.85	0.85	0.78	0.79
Mg-St	0.18	0.20	0.21	0.22	0.22	0.21	0.19	0.17	0.17	0.15	0.15	0.20	0.20
Mn-St	0.01	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01

Table 5 continued: Staurolite chemistry.

ID	1690 N3	1690 R4	1690 R6	1696 4	1696 5	1697 14	1697 16	1698 1	1700 N3	1700 N4	1713N3	1714N4	329C 1
Oxide%													
SiO_2	28.20	27.72	27.94	27.55	27.81	27.88	27.45	27.92	27.80	27.88	28.00	27.68	37.99
TiO_2	0.69	0.49	0.49	0.56	0.74	0.48	0.57	0.62	0.63	0.80	0.55	0.52	4.09
Al_2O_3	53.51	55.18	54.70	54.62	54.49	54.08	54.25	54.06	54.54	54.19	53.31	53.36	25.48
Cr_2O_3	0.05	0.10	0.05	0.05	0.05	0.00	0.04	0.05	0.03	0.06	0.00	0.05	0.09
MgO	1.81	1.51	1.67	1.80	1.74	1.90	2.00	1.91	2.04	2.12	1.97	1.96	0.02
CaO	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	24.98
MnO	0.32	0.24	0.24	0.24	0.23	0.27	0.24	0.28	0.36	0.32	0.42	0.35	0.07
FeO	14.24	13.18	13.66	13.67	13.70	13.28	13.28	13.74	13.23	13.55	13.96	12.87	5.75
Na_2O	0.03	0.00	0.01	0.00	0.05	0.02	0.02	0.05	0.01	0.01	0.02	0.02	0.01
K_2O	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Total	98.88	98.40	98.77	98.48	98.81	97.93	97.86	98.64	98.65	98.94	98.24	96.81	98.48
Cations (formula based on 24 O)													
Si	4.056	3.984	4.008	3.960	3.984	4.032	3.960	4.008	3.984	3.984	4.056	4.032	5.736
Ti	0.072	0.048	0.048	0.072	0.072	0.048	0.072	0.072	0.072	0.096	0.048	0.048	0.456
Al	9.072	9.336	9.240	9.264	9.216	9.192	9.240	9.144	9.216	9.144	9.072	9.168	4.536
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	0.384	0.312	0.360	0.384	0.360	0.408	0.432	0.408	0.432	0.456	0.432	0.432	0.000
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.032
Mn	0.048	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.048	0.048	0.048	0.048	0.000
Fe	1.704	1.584	1.632	1.632	1.632	1.608	1.608	1.656	1.584	1.632	1.680	1.560	0.720
Na	0.000	0.000	0.000	0.000	0.024	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St	0.80	0.83	0.81	0.80	0.81	0.79	0.78	0.79	0.77	0.76	0.78	0.76	1.00
Mg-St	0.18	0.16	0.18	0.19	0.18	0.20	0.21	0.20	0.21	0.21	0.20	0.21	0.00
Mn-St	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.00

Table 5 continued: Staurolite chemistry.

ID	365 3	365 4	388 17	388 4	402 12	402 3	475 N1	475 N2	475 N3	615 12	615 9	622 B7	677 10
Oxide%													
SiO_2	27.84	28.26	27.66	27.30	28.02	27.94	28.15	28.00	27.60	27.61	27.55	30.86	27.36
TiO_2	0.49	0.58	0.66	0.73	0.55	0.49	0.36	0.56	0.46	0.56	0.78	33.86	0.73
Al_2O_3	55.31	54.51	54.64	53.88	54.01	54.11	53.61	53.38	53.95	53.72	53.12	4.15	52.52
Cr_2O_3	0.09	0.07	0.14	0.05	0.01	0.07	0.00	0.04	0.05	0.05	0.06	0.14	0.08
MgO	1.19	1.72	2.08	2.12	1.69	1.78	2.02	2.08	1.96	2.17	2.13	0.03	1.43
CaO	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	28.84	0.00
MnO	0.32	0.29	0.16	0.15	0.27	0.31	0.43	0.45	0.49	0.34	0.40	0.03	0.30
FeO	12.41	12.27	13.45	13.44	13.44	13.20	13.03	13.31	13.24	13.06	13.56	0.83	10.70
Na_2O	0.01	0.01	0.01	0.02	0.00	0.01	0.02	0.03	0.02	0.02	0.03	0.01	0.09
K_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Total	97.65	97.70	98.80	97.68	97.99	97.91	97.64	97.87	97.75	97.52	97.62	98.80	93.20
Cations (formula based on 24 O)													
Si	4.008	4.056	3.960	3.960	4.032	4.032	4.080	4.056	4.008	4.008	4.008	4.872	4.104
Ti	0.048	0.072	0.072	0.072	0.048	0.048	0.048	0.072	0.048	0.072	0.096	4.032	0.072
Al	9.384	9.240	9.216	9.216	9.192	9.192	9.144	9.096	9.216	9.168	9.096	0.768	9.264
Cr	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.000
Mg	0.264	0.360	0.432	0.456	0.360	0.384	0.432	0.456	0.432	0.480	0.456	0.000	0.312
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.872	0.000
Mn	0.048	0.024	0.024	0.024	0.024	0.048	0.048	0.048	0.048	0.048	0.048	0.000	0.048
Fe	1.488	1.464	1.608	1.632	1.632	1.584	1.584	1.608	1.608	1.584	1.656	0.120	1.344
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St	0.83	0.79	0.78	0.77	0.81	0.79	0.77	0.76	0.77	0.75	0.77	1.00	0.79
Mg-St	0.15	0.19	0.21	0.22	0.18	0.19	0.21	0.22	0.21	0.23	0.21	0.00	0.18
Mn-St	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.03

Table 5 continued: Staurolite chemistry.

ID	677 11	984 1	984 12	984 7	1570-5	1570-6	1570-16	1698-b5	1698b14	1613 r7	1570-2 1	1570-2 2	1692 v4
Oxide%													
SiO_2	27.59	27.75	27.77	27.68	27.83	27.70	27.85	27.46	27.66	37.28	27.83	28.07	28.16
TiO_2	0.52	0.58	0.51	0.52	0.64	0.64	0.59	0.45	0.79	0.58	0.43	0.53	0.45
Al_2O_3	52.13	53.45	53.59	53.63	54.20	54.34	54.99	54.06	53.19	31.59	53.65	54.30	54.17
Cr_2O_3	0.06	0.09	0.01	0.07	0.08	0.16	0.10	0.05	0.00	0.16	0.10	0.10	0.05
MgO	1.44	2.19	2.14	2.12	2.10	2.10	2.00	2.06	1.66	7.52	2.09	1.64	1.60
CaO	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00
MnO	0.34	0.32	0.35	0.33	0.36	0.36	0.36	0.26	0.29	0.06	0.40	0.40	0.34
FeO	10.52	13.82	13.71	13.57	13.23	13.18	13.17	13.41	13.73	7.27	13.32	12.64	13.73
Na_2O	0.09	0.01	0.03	0.02	0.03	0.01	0.02	0.02	0.03	2.18	0.01	0.01	0.02
K_2O	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.01	0.00
Total	92.69	98.22	98.12	97.95	98.49	98.47	99.08	97.76	97.38	87.45	97.82	97.70	98.52
Cations (formula based on 24 O)													
Si	4.152	4.008	4.008	4.008	4.008	3.984	3.984	3.984	4.032	5.904	4.032	4.056	4.056
Ti	0.048	0.072	0.048	0.048	0.072	0.072	0.072	0.048	0.096	0.072	0.048	0.048	0.048
Al	9.240	9.096	9.120	9.144	9.168	9.192	9.240	9.216	9.120	5.880	9.144	9.240	9.168
Cr	0.000	0.000	0.000	0.000	0.000	0.024	0.000	0.000	0.000	0.024	0.000	0.000	0.000
Mg	0.312	0.480	0.456	0.456	0.456	0.456	0.432	0.432	0.360	1.776	0.456	0.360	0.336
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.000	0.000	0.000
Mn	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.024	0.024	0.000	0.048	0.048	0.048
Fe	1.320	1.680	1.656	1.632	1.584	1.584	1.560	1.632	1.680	0.960	1.608	1.536	1.656
Na	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.672	0.000	0.000	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe-St	0.79	0.76	0.77	0.76	0.76	0.76	0.76	0.78	0.81	0.35	0.76	0.79	0.81
Mg-St	0.19	0.22	0.21	0.21	0.22	0.22	0.21	0.21	0.17	0.65	0.22	0.19	0.16
Mn-St	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.00	0.02	0.02	0.02

Table 5 continued: Staurolite chemistry.

ID	1692 n2	1692 n3
Oxide%		
SiO_2	27.75	27.55
TiO_2	0.54	0.61
Al_2O_3	54.42	54.69
Cr_2O_3	0.01	0.06
MgO	1.60	1.68
CaO	0.01	0.00
MnO	0.28	0.29
FeO	13.54	13.24
Na_2O	0.03	0.00
K_2O	0.00	0.01
Total	98.17	98.14
Cations (formula based on 24 O)		
Si	4.008	3.960
Ti	0.048	0.072
Al	9.240	9.288
Cr	0.000	0.000
Mg	0.336	0.360
Ca	0.000	0.000
Mn	0.024	0.024
Fe	1.632	1.584
Na	0.000	0.000
K	0.000	0.000
Fe-St	0.82	0.80
Mg-St	0.17	0.18
Mn-St	0.01	0.01

Table 6: Feldspar chemistry.

ID	1505 R5	1515 4	1515 5	1515 8	1518 N3	1518 R9	1520 10	1520 15	1520 16	1520 7	1520 8	1520 9
Oxide%												
SiO_2	61.08	60.71	62.17	62.13	61.80	62.16	60.21	60.00	59.60	59.47	59.55	59.76
Al_2O_3	24.89	25.14	24.37	24.26	24.16	23.81	25.69	25.58	25.60	25.70	26.06	25.53
MgO	0.01	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.02
CaO	6.23	6.54	5.46	5.61	5.41	5.18	6.95	7.08	7.18	7.12	7.45	7.13
MnO	0.05	0.06	0.04	0.05	0.01	0.00	0.00	0.06	0.00	0.00	0.00	0.00
FeO	0.02	0.25	0.17	0.12	0.15	0.09	0.24	0.28	0.00	0.05	0.26	0.07
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.06	0.00
Na_2O	8.33	8.23	8.67	8.66	8.62	8.81	7.68	7.64	7.51	7.67	7.44	7.67
K_2O	0.05	0.06	0.07	0.08	0.05	0.04	0.05	0.03	0.04	0.04	0.04	0.03
Total	100.71	101.01	100.96	100.91	100.20	100.09	100.92	100.67	99.99	100.08	100.87	100.21
Cations (formula based on 8 O)												
Si	2.698	2.680	2.734	2.735	2.737	2.753	2.660	2.659	2.656	2.650	2.637	2.659
Al	1.296	1.308	1.263	1.259	1.261	1.243	1.337	1.336	1.344	1.350	1.360	1.338
Mg	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001
Ca	0.295	0.309	0.257	0.264	0.257	0.246	0.329	0.336	0.343	0.340	0.353	0.340
Mn	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Fe	0.001	0.009	0.006	0.005	0.005	0.003	0.009	0.010	0.000	0.002	0.009	0.003
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Na	0.713	0.705	0.740	0.739	0.740	0.757	0.658	0.656	0.649	0.663	0.639	0.661
K	0.003	0.003	0.004	0.004	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.002
Orthose*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.71	0.70	0.74	0.74	0.74	0.75	0.67	0.66	0.65	0.66	0.64	0.66
Anorthite	0.29	0.30	0.26	0.26	0.26	0.25	0.33	0.34	0.35	0.34	0.36	0.34

*Orthose (K), Albite (Na), Anorthite (Ca) over (K+Na+Ca).

Table 6 continued: Feldspar chemistry.

ID	1562 B15	1562 B16	1562N13	1562N16	1562N17	1562N18	1562N19	1562N20	1562N21	1562 N7	1562R20	1562R21
Oxide%												
SiO_2	60.34	61.41	60.16	60.16	58.86	60.32	60.41	60.49	59.34	62.51	60.54	60.39
Al_2O_3	24.75	24.13	24.79	25.21	25.38	24.71	24.79	24.56	25.45	23.87	24.77	24.82
MgO	0.02	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
CaO	6.44	5.41	6.29	6.50	7.25	6.29	6.02	6.14	7.13	5.51	6.29	6.22
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
FeO	0.06	0.03	0.00	0.05	0.04	0.07	0.00	0.03	0.03	0.04	0.13	0.07
SrO	0.10	0.16	0.21	0.11	0.11	0.22	0.11	0.10	0.11	0.06	0.10	0.12
BaO	0.00	0.00	0.00	0.03	0.01	0.03	0.07	0.00	0.01	0.00	0.07	0.01
Na_2O	8.08	8.56	8.11	7.95	7.61	7.86	8.34	8.13	7.63	8.29	8.04	8.03
K_2O	0.05	0.04	0.06	0.04	0.03	0.07	0.10	0.05	0.05	0.05	0.04	0.03
Total	99.83	99.75	99.61	100.07	99.30	99.58	99.83	99.50	99.75	100.36	100.01	99.74
Cations (formula based on 8 O)												
Si	2.692	2.734	2.690	2.678	2.647	2.697	2.695	2.704	2.655	2.758	2.696	2.694
Al	1.301	1.266	1.307	1.322	1.345	1.302	1.303	1.294	1.342	1.241	1.300	1.305
Mg	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Ca	0.308	0.258	0.301	0.310	0.349	0.301	0.288	0.294	0.342	0.261	0.300	0.297
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Fe	0.002	0.001	0.000	0.002	0.002	0.002	0.000	0.001	0.001	0.002	0.005	0.003
Sr	0.003	0.004	0.005	0.003	0.003	0.006	0.003	0.003	0.003	0.002	0.003	0.003
Ba	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.000
Na	0.699	0.739	0.703	0.686	0.663	0.682	0.722	0.705	0.662	0.709	0.694	0.695
K	0.003	0.002	0.003	0.002	0.002	0.004	0.005	0.003	0.003	0.003	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.69	0.74	0.70	0.69	0.66	0.69	0.71	0.71	0.66	0.73	0.70	0.70
Anorthite	0.31	0.26	0.30	0.31	0.34	0.31	0.29	0.29	0.34	0.27	0.30	0.30

Table 6 continued: Feldspar chemistry.

ID	1562R22	1562 V16	1562 V17	1562 V18	1566N12	1566N15	1566 N3	1566R11	1566R13	1566 R2	1566 R4	1566 R5
Oxide%												
SiO_2	60.53	59.98	60.74	60.83	68.10	68.18	67.92	68.02	68.72	67.59	66.97	68.21
Al_2O_3	24.58	25.16	24.84	23.93	19.77	20.06	19.97	19.95	19.71	20.42	20.99	20.23
MgO	0.02	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.01
CaO	4.76	6.58	6.15	5.39	0.20	0.20	0.37	0.33	0.08	0.33	0.28	0.40
MnO	0.00	0.02	0.01	0.00	0.00	0.05	0.05	0.05	0.04	0.04	0.00	0.02
FeO	0.09	0.04	0.10	0.09	0.08	0.09	0.07	0.05	0.04	0.06	0.06	0.03
SrO	0.11	0.09	0.16	0.12	0.04	0.04	0.05	0.06	0.02	0.04	0.03	0.08
BaO	0.01	0.06	0.00	0.05	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00
Na_2O	7.83	7.97	8.13	8.52	11.55	11.56	11.53	11.43	11.59	11.03	10.86	11.55
K_2O	1.29	0.05	0.04	0.17	0.05	0.04	0.06	0.05	0.03	0.03	0.05	0.06
Total	99.25	99.98	100.16	99.20	99.81	100.31	100.07	99.97	100.22	99.58	99.25	100.59
Cations (formula based on 8 O)												
Si	2.717	2.674	2.699	2.728	2.982	2.972	2.970	2.975	2.993	2.963	2.944	2.967
Al	1.300	1.322	1.301	1.265	1.020	1.031	1.029	1.028	1.012	1.055	1.087	1.037
Mg	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001
Ca	0.229	0.314	0.293	0.259	0.009	0.009	0.017	0.015	0.004	0.015	0.013	0.019
Mn	0.000	0.001	0.000	0.000	0.000	0.002	0.002	0.002	0.001	0.001	0.000	0.001
Fe	0.003	0.002	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001
Sr	0.003	0.002	0.004	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Ba	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.681	0.689	0.700	0.741	0.980	0.977	0.978	0.969	0.978	0.937	0.926	0.974
K	0.074	0.003	0.002	0.010	0.003	0.002	0.004	0.003	0.001	0.002	0.003	0.003
Orthose	0.08	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.75	0.69	0.70	0.74	0.99	0.99	0.98	0.98	1.00	0.98	0.99	0.98
Anorthite	0.25	0.31	0.30	0.26	0.01	0.01	0.02	0.02	0.00	0.02	0.01	0.02

Table 6 continued: Feldspar chemistry.

ID	1566 R9	1566 V12	1566 V3	1566 V6	1567 6	1567 7	1571 N7	1571 R3	1571 R7	1589 11	1589 12	1589 13
Oxide%												
SiO_2	66.85	67.87	67.39	66.61	62.51	63.01	60.25	61.65	59.52	59.59	60.61	62.12
Al_2O_3	20.34	20.27	19.91	20.47	23.97	23.82	25.46	24.39	25.83	25.57	25.27	24.21
MgO	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00
CaO	0.60	0.47	0.55	0.84	5.11	4.92	6.90	5.74	7.19	6.99	6.63	5.20
MnO	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.03	0.00	0.01	0.00	0.00
FeO	0.12	0.07	0.08	0.11	0.07	0.05	0.13	0.04	0.26	0.02	0.06	0.04
SrO	0.06	0.02	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.06	0.15	0.20
BaO	0.04	0.01	0.05	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.04
Na_2O	10.99	11.52	11.49	11.09	8.80	8.83	7.74	8.42	7.67	7.72	8.08	8.87
K_2O	0.49	0.04	0.06	0.06	0.04	0.05	0.04	0.06	0.03	0.06	0.04	0.10
Total	99.51	100.31	99.64	99.23	100.60	100.70	100.53	100.34	100.51	100.03	100.83	100.81
Cations (formula based on 8 O)												
Si	2.947	2.960	2.963	2.941	2.754	2.769	2.670	2.727	2.644	2.657	2.679	2.738
Al	1.057	1.042	1.032	1.065	1.244	1.234	1.330	1.272	1.352	1.343	1.316	1.258
Mg	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000
Ca	0.028	0.022	0.026	0.040	0.241	0.232	0.328	0.272	0.342	0.334	0.314	0.246
Mn	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Fe	0.004	0.002	0.003	0.004	0.003	0.002	0.005	0.002	0.010	0.001	0.002	0.002
Sr	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.005
Ba	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Na	0.940	0.974	0.980	0.949	0.752	0.753	0.665	0.722	0.660	0.667	0.692	0.758
K	0.027	0.002	0.003	0.004	0.002	0.003	0.003	0.003	0.002	0.003	0.002	0.005
Orthose	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.97	0.98	0.97	0.96	0.76	0.76	0.67	0.73	0.66	0.67	0.69	0.75
Anorthite	0.03	0.02	0.03	0.04	0.24	0.24	0.33	0.27	0.34	0.33	0.31	0.25

Table 6 continued: Feldspar chemistry.

ID	1589 14	1592 n12	1592 v9	1614 10	1614 11	1614 16	1614 17	1614 9	164 11	164 12	1640 R2	1640 R3
Oxide%												
SiO_2	62.14	62.26	62.64	60.96	60.62	60.42	61.59	62.63	60.69	59.81	57.16	58.17
Al_2O_3	24.20	23.95	23.90	24.63	25.34	25.09	24.66	23.96	25.37	25.43	27.46	26.89
MgO	0.02	0.00	0.00	0.01	0.00	0.10	0.00	0.00	0.00	0.01	0.01	0.00
CaO	5.33	5.15	4.88	6.01	6.75	5.19	5.88	5.10	6.52	6.95	9.35	8.44
MnO	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.02	0.03	0.00	0.01
FeO	0.07	0.12	0.11	0.11	0.08	0.24	0.09	0.08	0.07	0.07	0.11	0.03
SrO	0.12	0.08	0.12	0.12	0.18	0.08	0.11	0.14	0.00	0.00	0.00	0.00
BaO	0.00	0.01	0.00	0.00	0.02	0.04	0.00	0.04	0.01	0.00	0.00	0.04
Na_2O	8.71	8.75	9.20	8.07	7.97	7.92	8.48	8.91	7.95	7.83	6.35	6.85
K_2O	0.08	0.05	0.05	0.08	0.04	0.87	0.07	0.05	0.05	0.05	0.06	0.10
Total	100.66	100.37	100.90	100.00	101.03	99.97	100.89	100.93	100.75	100.19	100.50	100.54
Cations (formula based on 8 O)												
Si	2.740	2.751	2.755	2.710	2.675	2.694	2.715	2.754	2.680	2.662	2.552	2.590
Al	1.258	1.247	1.239	1.291	1.318	1.318	1.281	1.241	1.320	1.334	1.445	1.411
Mg	0.001	0.000	0.000	0.001	0.000	0.006	0.000	0.000	0.000	0.001	0.000	0.000
Ca	0.252	0.244	0.230	0.286	0.319	0.248	0.278	0.240	0.309	0.332	0.447	0.403
Mn	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000
Fe	0.003	0.004	0.004	0.004	0.003	0.009	0.003	0.003	0.003	0.003	0.004	0.001
Sr	0.003	0.002	0.003	0.003	0.005	0.002	0.003	0.004	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001
Na	0.745	0.749	0.785	0.696	0.682	0.684	0.725	0.759	0.681	0.675	0.550	0.591
K	0.004	0.003	0.003	0.005	0.002	0.049	0.004	0.003	0.003	0.003	0.004	0.006
Orthose	0.00	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.01
Albite	0.75	0.75	0.77	0.71	0.68	0.73	0.72	0.76	0.69	0.67	0.55	0.59
Anorthite	0.25	0.25	0.23	0.29	0.32	0.27	0.28	0.24	0.31	0.33	0.45	0.41

Table 6 continued: Feldspar chemistry.

ID	1642 19	1642 20	1648 R7	1648 R8	1648 V5	1648 V6	1651 B9	1651R10	1651R11	1651 V7	1651 V8	1656 B3
Oxide%												
SiO_2	60.67	61.84	61.15	61.67	60.86	61.60	60.72	60.23	60.55	60.05	60.49	60.51
Al_2O_3	25.13	24.60	24.74	24.78	24.58	24.67	25.27	25.46	25.38	24.82	24.75	25.44
MgO	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.02	0.00	0.01	0.02	0.01
CaO	6.31	5.59	6.24	6.03	6.02	5.76	6.43	6.85	6.71	6.55	6.18	6.60
MnO	0.03	0.00	0.00	0.00	0.02	0.00	0.05	0.00	0.00	0.00	0.00	0.00
FeO	0.04	0.10	0.16	0.29	0.14	0.04	0.13	0.07	0.13	0.05	0.04	0.17
SrO	0.13	0.17	0.16	0.16	0.19	0.12	0.09	0.14	0.14	0.13	0.14	0.15
BaO	0.05	0.03	0.02	0.00	0.03	0.04	0.03	0.06	0.00	0.00	0.00	0.00
Na_2O	8.15	8.70	8.15	8.28	8.21	8.46	7.97	7.95	8.00	7.94	8.18	7.95
K_2O	0.04	0.06	0.05	0.03	0.05	0.04	0.04	0.03	0.03	0.07	0.04	0.04
Total	100.54	101.13	100.70	101.25	100.12	100.73	100.73	100.80	100.98	99.62	99.81	100.85
Cations (formula based on 8 O)												
Si	2.687	2.720	2.703	2.711	2.706	2.718	2.684	2.666	2.674	2.686	2.697	2.674
Al	1.312	1.275	1.289	1.284	1.288	1.283	1.316	1.328	1.321	1.308	1.300	1.325
Mg	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
Ca	0.300	0.264	0.295	0.284	0.287	0.272	0.305	0.325	0.318	0.314	0.295	0.313
Mn	0.001	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Fe	0.001	0.004	0.006	0.011	0.005	0.001	0.005	0.002	0.005	0.002	0.001	0.006
Sr	0.003	0.004	0.004	0.004	0.005	0.003	0.002	0.004	0.004	0.003	0.003	0.004
Ba	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000
Na	0.700	0.742	0.699	0.706	0.708	0.724	0.683	0.682	0.684	0.689	0.707	0.681
K	0.002	0.004	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.004	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.70	0.74	0.70	0.71	0.71	0.73	0.69	0.68	0.68	0.69	0.71	0.69
Anorthite	0.30	0.26	0.30	0.29	0.29	0.27	0.31	0.32	0.32	0.31	0.29	0.31

Table 6 continued: Feldspar chemistry.

ID	1656 V2	1658N16	1658N17	1658N18	1658N19	1658R16	1658 R7	1658 V11	1658 V12	1658 V13	1658 V4	1662 3
Oxide%												
SiO_2	60.85	59.09	60.69	59.57	61.05	66.80	66.85	59.01	59.60	59.44	60.42	58.65
Al_2O_3	24.08	25.89	24.55	25.53	25.10	20.24	20.43	25.70	25.21	25.36	24.78	26.69
MgO	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
CaO	5.64	7.52	5.98	7.14	6.50	0.69	1.09	7.31	6.85	6.99	6.34	8.21
MnO	0.00	0.03	0.12	0.09	0.06	0.00	0.01	0.08	0.00	0.02	0.10	0.09
FeO	0.10	0.21	0.27	0.35	0.33	0.05	0.22	0.14	0.15	0.23	0.41	0.14
SrO	0.13	0.01	0.17	0.13	0.17	0.09	0.17	0.10	0.07	0.16	0.15	0.00
BaO	0.01	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.01	0.02
Na_2O	8.34	7.41	8.28	7.59	7.91	11.18	11.08	7.51	7.90	7.71	8.05	7.17
K_2O	0.05	0.05	0.05	0.06	0.05	0.07	0.09	0.06	0.05	0.03	0.04	0.05
Total	99.24	100.24	100.15	100.51	101.18	99.15	99.95	99.94	99.91	99.98	100.31	101.06
Cations (formula based on 8 O)												
Si	2.725	2.634	2.702	2.650	2.690	2.950	2.937	2.639	2.663	2.656	2.688	2.599
Al	1.271	1.360	1.288	1.339	1.303	1.053	1.058	1.355	1.327	1.336	1.300	1.394
Mg	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Ca	0.271	0.359	0.285	0.340	0.307	0.033	0.051	0.350	0.328	0.335	0.302	0.390
Mn	0.000	0.001	0.004	0.003	0.002	0.000	0.000	0.003	0.000	0.001	0.004	0.003
Fe	0.004	0.008	0.010	0.013	0.012	0.002	0.008	0.005	0.006	0.008	0.015	0.005
Sr	0.003	0.000	0.004	0.003	0.004	0.002	0.004	0.003	0.002	0.004	0.004	0.000
Ba	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Na	0.724	0.641	0.714	0.655	0.675	0.957	0.944	0.651	0.684	0.668	0.695	0.616
K	0.003	0.003	0.003	0.003	0.003	0.004	0.005	0.004	0.003	0.002	0.002	0.003
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Albite	0.73	0.64	0.71	0.66	0.69	0.97	0.95	0.65	0.68	0.67	0.70	0.61
Anorthite	0.27	0.36	0.29	0.34	0.31	0.03	0.05	0.35	0.32	0.33	0.30	0.39

Table 6 continued: Feldspar chemistry.

ID	1662 41664 B14	1664 B2	1664 B3	1664 B8	1664 B9	1664 N2	1664 N5	1664 N6	1664 N9	1664R12	1664R13
Oxide%											
SiO_2	58.23	60.40	59.75	60.11	60.22	59.49	60.15	59.67	59.49	59.99	59.26	60.11
Al_2O_3	26.96	24.98	25.42	25.19	25.37	25.31	25.25	24.58	24.97	25.00	25.50	24.96
MgO	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.01	0.00	0.00
CaO	8.42	6.36	6.73	6.47	6.50	6.73	6.57	6.44	6.57	6.46	6.95	6.40
MnO	0.00	0.00	0.06	0.05	0.04	0.00	0.04	0.01	0.00	0.00	0.00	0.00
FeO	0.14	0.05	0.22	0.12	0.05	0.08	0.37	0.04	0.04	0.08	0.07	0.06
SrO	0.00	0.11	0.16	0.16	0.11	0.16	0.13	0.16	0.09	0.10	0.14	0.24
BaO	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.03
Na_2O	6.98	7.96	7.83	7.94	8.05	7.82	8.13	8.04	7.90	7.88	7.58	8.02
K_2O	0.06	0.04	0.04	0.03	0.04	0.06	0.04	0.04	0.05	0.06	0.03	0.03
Total	100.84	99.92	100.20	100.06	100.40	99.64	100.78	98.98	99.15	99.58	99.57	99.86
Cations (formula based on 8 O)												
Si	2.586	2.690	2.662	2.677	2.673	2.663	2.666	2.687	2.674	2.682	2.654	2.683
Al	1.411	1.311	1.335	1.322	1.327	1.335	1.319	1.304	1.323	1.318	1.346	1.313
Mg	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Ca	0.401	0.304	0.321	0.309	0.309	0.323	0.312	0.311	0.316	0.309	0.334	0.306
Mn	0.000	0.000	0.002	0.002	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Fe	0.005	0.002	0.008	0.004	0.002	0.003	0.014	0.001	0.002	0.003	0.003	0.002
Sr	0.000	0.003	0.004	0.004	0.003	0.004	0.003	0.004	0.002	0.003	0.004	0.006
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Na	0.601	0.688	0.676	0.685	0.693	0.679	0.699	0.702	0.688	0.683	0.659	0.694
K	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.003	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.60	0.69	0.68	0.69	0.69	0.68	0.69	0.69	0.69	0.69	0.66	0.69
Anorthite	0.40	0.31	0.32	0.31	0.31	0.32	0.31	0.31	0.31	0.31	0.34	0.31

Table 6 continued: Feldspar chemistry.

ID	1664 R5	1664 R7	1664 V13	1664 V14	1664 V2	1664 V3	1664 V9	1665N13	1665N14	1665N15	1665N16	1665R11
Oxide%												
SiO_2	60.54	59.53	60.21	59.35	60.19	59.58	59.88	62.07	61.91	61.84	61.99	61.26
Al_2O_3	25.03	25.61	24.85	25.28	24.90	24.88	25.50	24.17	23.89	24.10	24.33	24.26
MgO	0.02	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.12	0.01	0.01	0.01
CaO	6.39	7.23	6.34	6.82	5.96	6.44	6.65	5.30	3.73	5.46	5.38	5.49
MnO	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.04	0.00	0.05	0.05	0.04
FeO	0.10	0.05	0.13	0.11	0.27	0.10	0.27	0.08	0.36	0.02	0.10	0.08
SrO	0.14	0.11	0.08	0.16	0.20	0.13	0.13	0.11	0.09	0.18	0.13	0.15
BaO	0.02	0.01	0.00	0.03	0.00	0.01	0.04	0.00	0.03	0.00	0.03	0.00
Na_2O	8.09	7.63	8.02	7.81	8.25	8.00	7.92	8.85	8.80	8.66	8.94	8.52
K_2O	0.06	0.04	0.04	0.04	0.10	0.03	0.06	0.07	0.99	0.06	0.06	0.08
Total	100.39	100.22	99.68	99.65	99.92	99.27	100.43	100.67	100.04	100.38	101.01	99.89
Cations (formula based on 8 O)												
Si	2.687	2.651	2.689	2.659	2.686	2.676	2.661	2.739	2.752	2.737	2.730	2.726
Al	1.309	1.344	1.308	1.335	1.310	1.317	1.336	1.257	1.252	1.257	1.262	1.272
Mg	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.008	0.001	0.001	0.001
Ca	0.304	0.345	0.304	0.328	0.285	0.310	0.317	0.250	0.178	0.259	0.254	0.262
Mn	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.000	0.002	0.002	0.002
Fe	0.004	0.002	0.005	0.004	0.010	0.004	0.010	0.003	0.013	0.001	0.004	0.003
Sr	0.003	0.003	0.002	0.004	0.005	0.003	0.003	0.003	0.002	0.005	0.003	0.004
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
Na	0.696	0.659	0.694	0.678	0.714	0.697	0.682	0.757	0.759	0.744	0.763	0.735
K	0.003	0.002	0.002	0.002	0.006	0.002	0.003	0.004	0.056	0.004	0.004	0.005
Orthose	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.06	0.00	0.00	0.00
Albite	0.70	0.66	0.70	0.67	0.71	0.69	0.68	0.75	0.81	0.74	0.75	0.74
Anorthite	0.30	0.34	0.30	0.33	0.29	0.31	0.32	0.25	0.19	0.26	0.25	0.26

Table 6 continued: Feldspar chemistry.

ID	1665R12	1665R13	1665R14	1665V10	1665V11	1665V15	1665V16	1665V8	1665V9	1666B11	1666B5	1666B8
Oxide%												
SiO_2	61.31	65.03	61.33	61.96	61.65	61.53	61.44	61.86	61.52	60.36	61.18	61.00
Al_2O_3	24.05	21.87	24.15	24.41	24.32	24.41	24.09	24.49	24.21	25.00	25.03	25.02
MgO	0.00	0.00	0.00	0.01	0.00	0.01	0.16	0.01	0.01	0.00	0.01	0.00
CaO	5.48	2.76	5.67	5.50	5.51	5.79	4.87	5.61	5.51	6.51	6.47	6.28
MnO	0.00	0.00	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
FeO	0.07	0.06	0.06	0.11	0.07	0.14	0.28	0.14	0.06	0.23	0.11	0.04
SrO	0.15	0.13	0.12	0.13	0.11	0.11	0.17	0.16	0.09	0.15	0.20	0.11
BaO	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.03	0.03	0.00	0.00	0.05
Na_2O	8.73	10.08	8.71	8.57	8.66	8.67	8.39	8.46	8.64	8.06	7.98	8.19
K_2O	0.09	0.05	0.06	0.06	0.06	0.06	0.47	0.07	0.05	0.04	0.04	0.05
Total	99.89	99.97	100.21	100.76	100.37	100.77	99.86	100.81	100.10	100.35	101.03	100.79
Cations (formula based on 8 O)												
Si	2.730	2.865	2.724	2.731	2.729	2.718	2.735	2.727	2.730	2.682	2.696	2.695
Al	1.262	1.135	1.264	1.268	1.268	1.271	1.264	1.272	1.266	1.309	1.300	1.303
Mg	0.000	0.000	0.000	0.001	0.000	0.001	0.010	0.001	0.001	0.000	0.000	0.000
Ca	0.262	0.130	0.270	0.260	0.261	0.274	0.232	0.265	0.262	0.310	0.306	0.297
Mn	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Fe	0.003	0.002	0.002	0.004	0.003	0.005	0.010	0.005	0.002	0.008	0.004	0.001
Sr	0.004	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.002	0.004	0.005	0.003
Ba	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Na	0.754	0.861	0.750	0.733	0.743	0.742	0.724	0.723	0.744	0.695	0.681	0.701
K	0.005	0.003	0.003	0.003	0.003	0.004	0.026	0.004	0.003	0.002	0.002	0.003
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Albite	0.74	0.87	0.74	0.74	0.74	0.73	0.76	0.73	0.74	0.69	0.69	0.70
Anorthite	0.26	0.13	0.26	0.26	0.26	0.27	0.24	0.27	0.26	0.31	0.31	0.30

Table 6 continued: Feldspar chemistry.

ID	1666V10	1666V11	1667 10	1667 3	1667 4	1667 91	1668 B14	1668 B8	1668 B9	1668N10	1668N15	1668N16
Oxide%												
SiO_2	60.18	60.07	68.34	66.38	62.76	68.77	63.35	64.01	66.93	67.72	67.89	63.29
Al_2O_3	25.21	25.10	19.92	20.04	23.95	19.81	22.84	22.15	20.09	19.78	20.05	22.14
MgO	0.00	0.00	0.02	0.33	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00
CaO	6.77	6.65	0.12	0.04	4.77	0.05	3.84	3.18	0.46	0.25	0.44	3.29
MnO	0.01	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.10	0.02
FeO	0.06	0.17	0.04	0.90	0.00	0.05	0.03	0.07	0.16	0.07	0.04	0.14
SrO	0.10	0.15	0.00	0.00	0.00	0.00	0.10	0.00	0.08	0.07	0.02	0.16
BaO	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.04	0.03	0.00	0.00	0.03
Na_2O	7.80	7.84	11.61	10.98	8.84	11.57	9.47	9.92	10.72	11.57	11.44	10.05
K_2O	0.05	0.04	0.04	0.06	0.04	0.05	0.08	0.07	0.86	0.04	0.05	0.07
Total	100.22	100.04	100.12	98.74	100.43	100.31	99.76	99.45	99.39	99.53	100.02	99.23
Cations (formula based on 8 O)												
Si	2.675	2.677	2.981	2.947	2.764	2.991	2.806	2.840	2.957	2.976	2.969	2.823
Al	1.321	1.318	1.024	1.049	1.243	1.015	1.192	1.158	1.046	1.024	1.033	1.164
Mg	0.000	0.000	0.001	0.022	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000
Ca	0.322	0.318	0.006	0.002	0.225	0.002	0.182	0.151	0.022	0.012	0.020	0.157
Mn	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.004	0.001
Fe	0.002	0.006	0.002	0.033	0.000	0.002	0.001	0.003	0.006	0.003	0.001	0.005
Sr	0.003	0.004	0.000	0.000	0.000	0.000	0.003	0.000	0.002	0.002	0.001	0.004
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Na	0.673	0.677	0.982	0.945	0.755	0.976	0.813	0.853	0.918	0.986	0.970	0.869
K	0.003	0.003	0.002	0.004	0.002	0.003	0.005	0.004	0.048	0.002	0.003	0.004
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00
Albite	0.68	0.68	0.99	1.00	0.77	1.00	0.82	0.85	0.98	0.99	0.98	0.85
Anorthite	0.32	0.32	0.01	0.00	0.23	0.00	0.18	0.15	0.02	0.01	0.02	0.15

Table 6 continued: Feldspar chemistry.

ID	1668R14	1668R16	1668 R3	1668 R9	1668V1	1668V11	1668 V6	1669 10	1669 11	1669 21	1669 22	1669 5
Oxide%												
SiO_2	64.03	64.13	64.28	64.26	63.82	63.95	63.58	60.67	61.04	61.28	60.90	61.62
Al_2O_3	22.46	22.70	22.59	22.60	22.73	22.62	22.46	25.06	25.05	24.93	25.13	24.52
MgO	0.00	0.01	0.00	0.01	0.01	0.02	0.02	0.01	0.00	0.00	0.01	0.00
CaO	3.50	3.43	3.47	3.32	3.70	3.61	2.65	6.24	6.29	6.15	6.43	5.69
MnO	0.00	0.00	0.03	0.00	0.01	0.03	0.00	0.01	0.03	0.00	0.06	0.00
FeO	0.08	0.08	0.05	0.05	0.02	0.07	0.17	0.27	0.30	0.04	0.17	0.15
SrO	0.16	0.11	0.12	0.05	0.09	0.03	0.05	0.00	0.00	0.00	0.00	0.00
BaO	0.02	0.01	0.00	0.05	0.00	0.03	0.04	0.03	0.00	0.02	0.00	0.03
Na_2O	9.77	9.73	9.87	9.91	9.60	9.92	9.57	8.14	8.16	8.32	8.14	8.44
K_2O	0.07	0.08	0.09	0.09	0.08	0.06	0.51	0.02	0.04	0.05	0.05	0.04
Total	100.11	100.27	100.50	100.36	100.05	100.32	99.07	100.45	100.93	100.81	100.89	100.50
Cations (formula based on 8 O)												
Si	2.827	2.824	2.826	2.827	2.817	2.818	2.833	2.689	2.693	2.703	2.688	2.723
Al	1.168	1.178	1.170	1.172	1.182	1.175	1.179	1.309	1.303	1.296	1.307	1.277
Mg	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.000
Ca	0.165	0.162	0.163	0.156	0.175	0.170	0.127	0.296	0.297	0.291	0.304	0.269
Mn	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.002	0.000
Fe	0.003	0.003	0.002	0.002	0.001	0.002	0.006	0.010	0.011	0.002	0.006	0.006
Sr	0.004	0.003	0.003	0.001	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
Na	0.836	0.830	0.841	0.845	0.821	0.848	0.827	0.700	0.698	0.712	0.697	0.723
K	0.004	0.004	0.005	0.005	0.005	0.003	0.029	0.001	0.002	0.003	0.003	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Albite	0.84	0.84	0.84	0.84	0.82	0.83	0.87	0.70	0.70	0.71	0.70	0.73
Anorthite	0.16	0.16	0.16	0.16	0.18	0.17	0.13	0.30	0.30	0.29	0.30	0.27

Table 6 continued: Feldspar chemistry.

ID	1669 6	1671B10	1671 B15	1671 B16	1671N16	1671R17	1671R18	1671R19	1671R20	1671V15	1671V16	1671V17
Oxide%												
SiO_2	60.06	61.07	61.07	60.60	60.87	60.36	60.70	61.30	60.52	60.65	60.61	60.74
Al_2O_3	25.36	24.43	25.05	24.68	24.75	24.94	24.97	24.88	24.84	24.93	24.64	24.76
MgO	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01
CaO	6.70	5.80	6.22	6.06	6.09	6.62	6.29	6.04	6.13	6.22	6.08	5.99
MnO	0.05	0.04	0.00	0.00	0.03	0.03	0.00	0.00	0.05	0.00	0.01	0.00
FeO	0.02	0.09	0.22	0.05	0.09	0.11	0.07	0.10	0.05	0.09	0.09	0.05
SrO	0.59	0.17	0.14	0.12	0.19	0.11	0.18	0.11	0.19	0.13	0.14	0.14
BaO	0.01	0.02	0.00	0.01	0.00	0.02	0.04	0.03	0.01	0.00	0.02	0.04
Na_2O	8.06	8.47	8.38	8.33	8.46	8.10	8.23	8.31	8.29	8.36	8.28	8.38
K_2O	0.05	0.04	0.06	0.05	0.04	0.04	0.05	0.04	0.06	0.04	0.04	0.04
Total	100.92	100.12	101.14	99.95	100.53	100.34	100.52	100.87	100.15	100.49	99.93	100.15
Cations (formula based on 8 O)												
Si	2.663	2.714	2.692	2.699	2.698	2.683	2.691	2.704	2.693	2.689	2.700	2.700
Al	1.325	1.280	1.301	1.296	1.293	1.306	1.305	1.293	1.303	1.303	1.294	1.297
Mg	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000
Ca	0.318	0.276	0.294	0.289	0.289	0.315	0.299	0.285	0.292	0.296	0.290	0.285
Mn	0.002	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.002	0.000	0.000	0.000
Fe	0.001	0.003	0.008	0.002	0.003	0.004	0.003	0.004	0.002	0.003	0.003	0.002
Sr	0.015	0.004	0.004	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.004	0.004
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
Na	0.693	0.730	0.716	0.719	0.727	0.698	0.707	0.711	0.715	0.719	0.715	0.722
K	0.003	0.002	0.003	0.003	0.002	0.002	0.003	0.002	0.004	0.002	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.69	0.73	0.71	0.71	0.72	0.69	0.70	0.71	0.71	0.71	0.71	0.72
Anorthite	0.31	0.27	0.29	0.29	0.28	0.31	0.30	0.29	0.29	0.29	0.29	0.28

Table 6 continued: Feldspar chemistry.

ID	1672 N1	1672N13	1672N14	1672N15	1672 N6	1672 N9	1672R11	1672R12	1672R13	1672R14	1672 R7	1672 V15
Oxide%												
SiO_2	61.40	61.28	62.29	61.81	62.00	60.92	61.69	61.00	61.31	61.27	61.11	61.29
Al_2O_3	24.32	24.87	23.98	24.36	23.96	24.78	24.41	24.60	24.67	24.22	24.54	24.13
MgO	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00
CaO	5.75	6.04	5.22	5.50	5.25	6.02	5.64	6.05	5.84	5.44	5.94	5.40
MnO	0.07	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00
FeO	0.01	0.10	0.09	0.03	0.05	0.16	0.06	0.15	0.11	0.07	0.10	0.08
SrO	0.04	0.10	0.09	0.08	0.13	0.11	0.16	0.14	0.15	0.00	0.20	0.05
BaO	0.00	0.03	0.00	0.00	0.00	0.02	0.03	0.01	0.03	0.02	0.00	0.03
Na_2O	8.56	8.44	8.83	8.59	8.76	8.55	8.59	8.37	8.43	8.74	8.53	8.71
K_2O	0.02	0.05	0.05	0.04	0.05	0.06	0.02	0.05	0.04	0.04	0.03	0.05
Total	100.17	100.97	100.55	100.46	100.22	100.61	100.63	100.39	100.63	99.80	100.48	99.74
Cations (formula based on 8 O)												
Si	2.723	2.702	2.749	2.731	2.745	2.698	2.725	2.706	2.711	2.727	2.708	2.730
Al	1.272	1.292	1.247	1.268	1.250	1.294	1.271	1.286	1.286	1.270	1.282	1.267
Mg	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000
Ca	0.273	0.285	0.247	0.260	0.249	0.286	0.267	0.288	0.277	0.259	0.282	0.258
Mn	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Fe	0.000	0.004	0.003	0.001	0.002	0.006	0.002	0.006	0.004	0.003	0.004	0.003
Sr	0.001	0.002	0.002	0.002	0.003	0.003	0.004	0.004	0.004	0.000	0.005	0.001
Ba	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001
Na	0.737	0.722	0.756	0.736	0.752	0.734	0.735	0.719	0.722	0.754	0.733	0.752
K	0.001	0.003	0.003	0.002	0.003	0.003	0.001	0.003	0.002	0.002	0.002	0.003
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.73	0.72	0.75	0.74	0.75	0.72	0.73	0.71	0.72	0.74	0.72	0.74
Anorthite	0.27	0.28	0.25	0.26	0.25	0.28	0.27	0.29	0.28	0.26	0.28	0.26

Table 6 continued: Feldspar chemistry.

ID	1672 V16	1672 V17	1674R13	1674 R8	1674 R9	1676 4	1676 5	1676 6	1679 13	1680 N5	1680 R1	1680 R2
Oxide%												
SiO_2	60.93	61.71	59.27	59.18	59.08	58.77	59.79	59.52	62.75	61.02	61.98	62.57
Al_2O_3	24.40	23.97	25.99	26.05	26.17	26.07	25.66	26.03	23.98	24.87	24.26	23.78
MgO	0.02	0.03	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.00
CaO	5.79	5.19	7.59	7.69	7.77	7.81	7.30	7.60	4.87	6.04	5.26	4.84
MnO	0.00	0.03	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.02	0.00
FeO	0.14	0.14	0.06	0.06	0.05	0.15	0.02	0.02	0.10	0.10	0.09	0.11
SrO	0.11	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.00	0.01	0.01	0.03	0.00	0.02	0.01	0.00	0.02	0.00	0.01	0.02
Na_2O	8.59	8.82	7.44	7.10	7.26	7.32	7.44	7.36	8.96	8.27	8.75	8.91
K_2O	0.07	0.05	0.06	0.06	0.05	0.07	0.05	0.05	0.05	0.06	0.03	0.03
Total	100.05	100.08	100.43	100.19	100.39	100.22	100.26	100.59	100.74	100.34	100.41	100.26
Cations (formula based on 8 O)												
Si	2.711	2.739	2.635	2.635	2.628	2.622	2.657	2.640	2.759	2.703	2.738	2.764
Al	1.280	1.254	1.362	1.367	1.372	1.371	1.344	1.361	1.243	1.298	1.263	1.238
Mg	0.001	0.002	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000
Ca	0.276	0.247	0.361	0.367	0.370	0.373	0.348	0.361	0.229	0.286	0.249	0.229
Mn	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000
Fe	0.005	0.005	0.002	0.002	0.002	0.005	0.001	0.001	0.004	0.004	0.003	0.004
Sr	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.741	0.759	0.642	0.613	0.626	0.634	0.641	0.633	0.763	0.710	0.749	0.763
K	0.004	0.003	0.003	0.004	0.003	0.004	0.003	0.003	0.003	0.003	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.73	0.75	0.64	0.63	0.63	0.63	0.65	0.64	0.77	0.71	0.75	0.77
Anorthite	0.27	0.25	0.36	0.37	0.37	0.37	0.35	0.36	0.23	0.29	0.25	0.23

Table 6 continued: Feldspar chemistry.

ID	1681 B5	1681 B6	1681 R6	1681 V4	1681 V6	1682 B11	1682 B12	1682 B13	1682 N8	1682 N9	1682 V6	1682 V7
Oxide%												
SiO_2	60.84	61.07	59.66	59.68	59.43	61.93	63.39	61.85	62.46	60.63	62.81	62.34
Al_2O_3	24.80	24.56	24.78	25.00	25.00	23.60	23.69	23.35	23.32	24.40	23.91	23.67
MgO	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.02
CaO	6.05	5.86	6.34	6.57	6.51	4.90	4.51	4.48	4.67	5.95	5.03	5.02
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.06	0.00	0.00
FeO	0.13	0.07	0.04	0.09	0.08	0.14	0.04	0.05	0.08	0.15	0.11	0.07
SrO	0.15	0.05	0.13	0.05	0.11	0.14	0.16	0.11	0.14	0.19	0.12	0.19
BaO	0.00	0.08	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.03	0.00
Na_2O	8.21	8.37	7.91	7.78	7.83	9.00	8.98	9.15	8.95	8.39	8.71	8.82
K_2O	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.05	0.03	0.04	0.03
Total	100.22	100.14	98.91	99.19	98.98	99.78	100.89	99.09	99.66	99.81	100.76	100.14
Cations (formula based on 8 O)												
Si	2.701	2.712	2.685	2.678	2.675	2.755	2.781	2.767	2.776	2.706	2.762	2.761
Al	1.298	1.285	1.314	1.322	1.326	1.237	1.225	1.231	1.222	1.283	1.239	1.235
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
Ca	0.288	0.279	0.306	0.316	0.314	0.233	0.212	0.214	0.222	0.284	0.237	0.238
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.000
Fe	0.005	0.003	0.002	0.003	0.003	0.005	0.001	0.002	0.003	0.006	0.004	0.002
Sr	0.004	0.001	0.003	0.001	0.003	0.003	0.004	0.003	0.003	0.005	0.003	0.005
Ba	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Na	0.706	0.721	0.690	0.677	0.683	0.776	0.763	0.794	0.772	0.726	0.742	0.757
K	0.002	0.002	0.001	0.002	0.001	0.002	0.002	0.002	0.003	0.001	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.71	0.72	0.69	0.68	0.69	0.77	0.78	0.79	0.78	0.72	0.76	0.76
Anorthite	0.29	0.28	0.31	0.32	0.31	0.23	0.22	0.21	0.22	0.28	0.24	0.24

Table 6 continued: Feldspar chemistry.

ID	1683 B1	1683 N8	1683 N9	1683 V6	1683 V7	1684 10	1684 9	1687 11	1687 7	1688 12	1688 13	1688 4
Oxide %												
SiO_2	60.64	59.65	60.01	59.26	59.04	63.62	60.36	57.78	57.92	60.61	54.98	57.80
Al_2O_3	25.44	25.44	25.40	25.93	25.87	23.46	24.89	27.28	27.18	25.59	29.85	27.00
MgO	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.22	0.01
CaO	6.98	7.08	7.00	7.44	7.49	4.29	6.32	8.95	8.94	6.94	5.51	8.75
MnO	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.05	0.06	0.00
FeO	0.04	0.00	0.03	0.00	0.00	0.32	0.22	0.00	0.02	0.07	0.63	0.15
SrO	0.14	0.17	0.21	0.16	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.04	0.00	0.04	0.00	0.00	0.04	0.01	0.01	0.02	0.03	0.01	0.03
Na_2O	7.71	7.65	7.75	7.40	7.41	9.27	8.12	6.58	6.64	7.91	5.28	6.81
K_2O	0.06	0.09	0.05	0.05	0.07	0.06	0.05	0.06	0.05	0.05	3.91	0.05
Total	101.08	100.07	100.53	100.25	100.01	101.06	99.97	100.69	100.77	101.31	100.51	100.63
Cations (formula based on 8 O)												
Si	2.674	2.660	2.664	2.639	2.636	2.787	2.689	2.570	2.575	2.667	2.481	2.575
Al	1.322	1.337	1.329	1.361	1.361	1.211	1.307	1.430	1.424	1.327	1.588	1.418
Mg	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.015	0.000
Ca	0.330	0.338	0.333	0.355	0.358	0.201	0.302	0.427	0.426	0.327	0.266	0.418
Mn	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.002	0.000
Fe	0.001	0.000	0.001	0.000	0.000	0.012	0.008	0.000	0.001	0.002	0.024	0.005
Sr	0.004	0.004	0.005	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.659	0.661	0.667	0.639	0.642	0.787	0.701	0.567	0.573	0.675	0.462	0.588
K	0.004	0.005	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.225	0.003
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
Albite	0.67	0.66	0.67	0.64	0.64	0.80	0.70	0.57	0.57	0.67	0.63	0.58
Anorthite	0.33	0.34	0.33	0.36	0.36	0.20	0.30	0.43	0.43	0.33	0.37	0.42

Table 6 continued: Feldspar chemistry.

ID	1689 3	1689 6	1690 B10	1690 B9	1690 R8	1693AN7	1693AN8	1693AR5	1696 3	1696 9	1697 1	1697 13
Oxide%												
SiO_2	61.66	60.54	62.54	63.47	63.97	62.12	60.38	59.43	62.16	61.24	61.29	62.26
Al_2O_3	24.62	25.35	23.04	23.01	23.03	24.29	25.13	25.56	24.40	24.82	24.95	24.10
MgO	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.00
CaO	5.80	6.70	4.23	4.04	3.91	5.45	6.60	7.31	5.45	5.88	5.97	5.25
MnO	0.05	0.01	0.00	0.01	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.02
FeO	0.13	0.19	0.11	0.31	0.22	0.12	0.02	0.04	0.09	0.06	0.07	0.07
SrO	0.00	0.00	0.15	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.02	0.04	0.02	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.01
Na_2O	8.52	7.93	9.18	9.34	9.62	8.51	8.00	7.47	8.58	8.37	8.31	8.88
K_2O	0.07	0.07	0.05	0.07	0.05	0.09	0.04	0.05	0.04	0.03	0.05	0.07
Total	100.87	100.85	99.35	100.33	100.92	100.61	100.20	99.90	100.74	100.43	100.66	100.68
Cations (formula based on 8 O)												
Si	2.717	2.676	2.787	2.800	2.804	2.739	2.682	2.653	2.736	2.709	2.705	2.744
Al	1.279	1.320	1.210	1.196	1.190	1.262	1.316	1.344	1.266	1.294	1.298	1.252
Mg	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.000
Ca	0.274	0.317	0.202	0.191	0.184	0.257	0.314	0.350	0.257	0.279	0.282	0.248
Mn	0.002	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001
Fe	0.005	0.007	0.004	0.011	0.008	0.004	0.001	0.001	0.003	0.002	0.003	0.003
Sr	0.000	0.000	0.004	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.728	0.680	0.793	0.799	0.818	0.728	0.689	0.647	0.732	0.718	0.711	0.759
K	0.004	0.004	0.003	0.004	0.003	0.005	0.002	0.003	0.002	0.002	0.003	0.004
Orthose	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.73	0.68	0.80	0.81	0.82	0.74	0.69	0.65	0.74	0.72	0.72	0.75
Anorthite	0.27	0.32	0.20	0.19	0.18	0.26	0.31	0.35	0.26	0.28	0.28	0.25

Table 6 continued: Feldspar chemistry.

ID	1698 6	1698 7	1700 N1	1700 N2	1700 R8	1713AN1	1713AR9	1714BN3	1714BR6	1714BR7	329C 13	329C 4
Oxide%												
SiO_2	61.64	61.13	61.24	61.15	61.21	61.01	61.21	61.30	61.60	60.83	57.93	59.87
Al_2O_3	24.71	24.88	25.03	25.06	24.82	24.96	24.55	25.04	24.68	24.69	26.58	25.50
MgO	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.01
CaO	5.87	5.95	6.00	6.32	6.00	6.33	5.93	6.00	5.87	5.96	8.44	7.12
MnO	0.04	0.00	0.05	0.00	0.00	0.02	0.00	0.09	0.00	0.01	0.00	0.00
FeO	0.35	0.11	0.07	0.06	0.05	0.01	0.08	0.10	0.06	0.03	0.22	0.20
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
BaO	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00
Na_2O	8.54	8.37	8.37	8.28	8.36	8.32	8.28	8.39	8.34	8.27	6.80	7.24
K_2O	0.13	0.04	0.05	0.03	0.04	0.04	0.04	0.03	0.04	0.08	0.05	0.08
Total	101.28	100.59	100.84	100.93	100.49	100.71	100.10	100.95	100.63	99.90	100.05	100.03
Cations (formula based on 8 O)												
Si	2.710	2.702	2.700	2.696	2.707	2.696	2.716	2.700	2.718	2.706	2.593	2.665
Al	1.281	1.296	1.301	1.302	1.293	1.300	1.284	1.300	1.284	1.294	1.402	1.338
Mg	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Ca	0.277	0.282	0.284	0.298	0.284	0.300	0.282	0.283	0.277	0.284	0.405	0.339
Mn	0.002	0.000	0.002	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.000	0.000
Fe	0.013	0.004	0.003	0.002	0.002	0.000	0.003	0.004	0.002	0.001	0.008	0.007
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.728	0.717	0.715	0.708	0.717	0.713	0.712	0.717	0.714	0.713	0.590	0.625
K	0.007	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.003	0.005
Orthose	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Albite	0.72	0.72	0.72	0.70	0.72	0.70	0.72	0.72	0.72	0.72	0.59	0.65
Anorthite	0.28	0.28	0.28	0.30	0.28	0.30	0.28	0.28	0.28	0.28	0.41	0.35

Table 6 continued: Feldspar chemistry.

ID	329C 8	329C 9	334 n7	334 n8	334 r7	334 r8	365 1	365 15	365 19	365 5	365 6	388 14
Oxide%												
SiO_2	59.06	60.31	61.00	61.96	61.87	61.55	58.37	57.63	60.33	59.90	60.37	60.92
Al_2O_3	25.65	24.92	24.05	23.83	24.22	24.31	26.09	26.66	25.39	25.80	25.48	24.96
MgO	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.27	0.02	0.00	0.01	0.01
CaO	7.29	6.63	5.77	5.38	5.56	5.53	8.06	5.42	6.70	7.30	6.94	6.25
MnO	0.01	0.03	0.00	0.09	0.00	0.00	0.00	0.01	0.03	0.01	0.01	0.06
FeO	0.08	0.10	0.07	0.13	0.08	0.19	0.18	0.62	0.17	0.20	0.38	0.02
SrO	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.00	0.01	0.02	0.03	0.04	0.03	0.06	0.00	0.00	0.01	0.00	0.00
Na_2O	7.31	7.67	8.20	8.32	8.16	8.16	7.04	5.83	7.77	7.50	7.62	7.95
K_2O	0.04	0.05	0.05	0.06	0.07	0.07	0.04	2.56	0.05	0.06	0.11	0.05
Total	99.44	99.76	99.15	99.80	100.00	99.89	99.84	99.04	100.52	100.82	100.92	100.24
Cations (formula based on 8 O)												
Si	2.647	2.690	2.730	2.752	2.741	2.732	2.616	2.613	2.673	2.651	2.668	2.700
Al	1.355	1.310	1.269	1.248	1.265	1.272	1.378	1.424	1.326	1.345	1.327	1.304
Mg	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.018	0.001	0.000	0.000	0.001
Ca	0.350	0.317	0.277	0.256	0.264	0.263	0.387	0.263	0.318	0.346	0.329	0.297
Mn	0.000	0.001	0.000	0.003	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Fe	0.003	0.004	0.003	0.005	0.003	0.007	0.007	0.023	0.006	0.007	0.014	0.001
Sr	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Na	0.635	0.663	0.711	0.717	0.701	0.702	0.611	0.513	0.668	0.644	0.653	0.683
K	0.002	0.003	0.003	0.003	0.004	0.004	0.002	0.148	0.003	0.003	0.006	0.003
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.01	0.00
Albite	0.64	0.68	0.72	0.74	0.73	0.73	0.61	0.66	0.68	0.65	0.66	0.70
Anorthite	0.36	0.32	0.28	0.26	0.27	0.27	0.39	0.34	0.32	0.35	0.34	0.30

Table 6 continued: Feldspar chemistry.

ID	388 5	388 6	402 10	402 9	409 1	409 2	433 3	433 4	456 17	456 5	475 N4	475 N7
Oxide%												
SiO_2	59.16	59.16	60.78	60.56	62.52	63.04	60.88	60.91	58.09	58.77	62.37	61.79
Al_2O_3	25.81	25.03	24.72	24.87	23.99	23.46	24.61	24.71	26.09	25.82	24.21	24.63
MgO	0.02	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.01
CaO	7.41	6.98	6.11	6.37	5.23	4.63	6.07	6.12	8.03	7.59	5.41	5.78
MnO	0.05	0.01	0.04	0.06	0.03	0.01	0.00	0.00	0.10	0.00	0.01	0.00
FeO	0.20	0.00	0.22	0.05	0.06	0.04	0.16	0.15	0.07	0.08	0.22	0.23
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.03	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.00
Na_2O	7.24	7.43	7.99	7.90	8.41	9.06	7.97	8.01	6.75	7.27	8.66	8.43
K_2O	0.03	0.04	0.04	0.04	0.05	0.07	0.04	0.04	0.11	0.06	0.04	0.04
Total	99.93	98.69	99.95	99.86	100.29	100.38	99.75	100.01	99.27	99.59	100.94	100.91
Cations (formula based on 8 O)												
Si	2.642	2.669	2.704	2.696	2.759	2.779	2.711	2.706	2.616	2.634	2.742	2.720
Al	1.358	1.331	1.296	1.305	1.248	1.219	1.292	1.294	1.384	1.364	1.254	1.278
Mg	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Ca	0.354	0.337	0.291	0.304	0.247	0.219	0.290	0.291	0.387	0.365	0.255	0.272
Mn	0.002	0.000	0.002	0.002	0.001	0.000	0.000	0.000	0.004	0.000	0.000	0.000
Fe	0.008	0.000	0.008	0.002	0.002	0.001	0.006	0.005	0.002	0.003	0.008	0.009
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.001	0.000	0.000	0.000
Na	0.626	0.650	0.689	0.682	0.720	0.774	0.688	0.690	0.589	0.632	0.738	0.719
K	0.001	0.003	0.002	0.002	0.003	0.004	0.002	0.002	0.006	0.003	0.002	0.002
Orthose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Albite	0.64	0.66	0.70	0.69	0.74	0.78	0.70	0.70	0.60	0.63	0.74	0.73
Anorthite	0.36	0.34	0.30	0.31	0.26	0.22	0.30	0.30	0.40	0.37	0.26	0.27

Table 6 continued: Feldspar chemistry.

ID	475 R4	475 R5	615 1	615 10	615 11	616 N2	616 N3	616 R4	618 2	619 4	619 5	619 8
Oxide%												
SiO_2	61.42	61.41	61.86	61.90	61.45	59.58	60.59	59.20	61.81	60.42	60.73	60.30
Al_2O_3	24.80	24.78	23.85	24.03	23.90	25.69	25.17	26.35	24.26	24.96	25.01	24.70
MgO	0.01	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.00	0.00	0.00	0.00
CaO	6.08	6.21	5.60	5.35	5.55	7.36	6.65	7.98	5.66	6.64	6.48	6.13
MnO	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04
FeO	0.04	0.08	0.07	0.29	0.36	0.09	0.04	0.07	0.04	0.16	0.16	0.51
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.03	0.00	0.01	0.01	0.04	0.00	0.00	0.00	0.02	0.06	0.04	0.00
Na_2O	8.28	8.15	8.54	8.66	8.33	7.44	8.02	7.18	8.55	8.02	8.09	8.19
K_2O	0.06	0.04	0.04	0.06	0.10	0.23	0.05	0.05	0.09	0.04	0.05	0.05
Total	100.75	100.70	99.96	100.33	99.75	100.42	100.56	100.87	100.45	100.33	100.74	99.96
Cations (formula based on 8 O)												
Si	2.709	2.709	2.746	2.740	2.737	2.649	2.682	2.622	2.732	2.684	2.685	2.690
Al	1.289	1.288	1.247	1.254	1.255	1.346	1.314	1.375	1.264	1.307	1.304	1.299
Mg	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
Ca	0.287	0.293	0.266	0.254	0.265	0.350	0.315	0.379	0.268	0.316	0.307	0.293
Mn	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
Fe	0.001	0.003	0.003	0.011	0.014	0.003	0.002	0.002	0.002	0.006	0.006	0.019
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.000
Na	0.708	0.697	0.735	0.743	0.719	0.641	0.688	0.616	0.733	0.691	0.694	0.708
K	0.003	0.002	0.002	0.004	0.006	0.013	0.003	0.003	0.005	0.002	0.003	0.003
Orthose	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Albite	0.71	0.70	0.73	0.75	0.73	0.65	0.69	0.62	0.73	0.69	0.69	0.71
Anorthite	0.29	0.30	0.27	0.25	0.27	0.35	0.31	0.38	0.27	0.31	0.31	0.29

Table 6 continued: Feldspar chemistry.

ID	622 B3	622 R6	622 R7	677 6	969 1	969 2	974 4	978 13	978 8	982 6	984 13	984 3
Oxide%												
SiO_2	59.33	59.72	58.71	59.90	60.65	60.46	61.63	59.77	60.07	59.79	60.84	60.57
Al_2O_3	26.10	26.02	26.34	24.87	25.06	24.99	24.06	25.52	25.25	25.49	24.74	24.83
MgO	0.00	0.01	0.00	0.01	0.09	0.01	0.01	0.00	0.02	0.00	0.01	0.00
CaO	7.87	7.57	8.16	6.55	6.52	6.35	5.50	7.13	6.63	6.95	6.16	6.42
MnO	0.03	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.05
FeO	0.29	0.17	0.11	0.06	0.08	0.01	0.25	0.09	0.27	0.12	0.40	0.20
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
BaO	0.00	0.00	0.00	0.00	0.05	0.01	0.01	0.02	0.01	0.00	0.00	0.00
Na_2O	7.23	7.64	7.07	7.97	7.81	8.16	8.66	7.57	7.76	7.86	8.30	7.96
K_2O	0.06	0.05	0.05	0.04	0.14	0.04	0.08	0.07	0.10	0.06	0.08	0.07
Total	100.93	101.23	100.48	99.49	100.41	100.06	100.21	100.19	100.13	100.40	100.56	100.15
Cations (formula based on 8 O)												
Si	2.629	2.636	2.613	2.682	2.688	2.688	2.733	2.659	2.674	2.657	2.696	2.693
Al	1.362	1.354	1.381	1.312	1.309	1.310	1.258	1.338	1.325	1.335	1.292	1.301
Mg	0.000	0.001	0.000	0.001	0.006	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Ca	0.374	0.358	0.389	0.314	0.310	0.302	0.261	0.340	0.316	0.331	0.293	0.306
Mn	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002
Fe	0.011	0.006	0.004	0.002	0.003	0.000	0.009	0.003	0.010	0.004	0.015	0.007
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na	0.621	0.654	0.610	0.692	0.671	0.704	0.744	0.653	0.669	0.677	0.713	0.686
K	0.003	0.003	0.003	0.002	0.008	0.002	0.004	0.004	0.005	0.003	0.004	0.004
Orthose	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Albite	0.62	0.65	0.61	0.69	0.68	0.70	0.74	0.66	0.68	0.67	0.71	0.69
Anorthite	0.38	0.35	0.39	0.31	0.32	0.30	0.26	0.34	0.32	0.33	0.29	0.31

Table 6 continued: Feldspar chemistry.

ID	1570-4	1570-23	1570-26	1698-b6	1698-b7	1698-b8	1593 v7	1593 v8	1613 r8	1613 r9	1613 v6	1613 v9
Oxide%												
SiO_2	62.89	62.75	62.67	60.58	61.12	61.29	60.54	60.14	62.21	60.00	60.81	60.42
Al_2O_3	24.32	24.96	24.67	25.13	24.55	24.53	24.61	25.63	24.23	25.34	25.08	24.80
MgO	0.02	0.00	0.00	0.00	0.02	0.02	0.01	0.00	0.01	0.01	0.02	0.00
CaO	5.25	5.74	5.64	6.24	5.76	5.64	5.98	6.76	5.28	6.67	6.38	5.95
MnO	0.04	0.00	0.07	0.00	0.04	0.00	0.00	0.02	0.02	0.04	0.00	0.06
FeO	0.26	0.10	0.16	0.26	0.38	0.06	0.18	0.17	0.08	0.17	0.08	0.09
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.15	0.05	0.17	0.01	0.10
BaO	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.04	0.03	0.00	0.04
Na_2O	8.35	8.03	8.26	8.03	8.37	8.18	8.31	7.79	8.71	8.08	8.18	8.46
K_2O	0.10	0.05	0.04	0.09	0.07	0.05	0.07	0.05	0.08	0.06	0.05	0.05
Total	101.28	101.64	101.52	100.38	100.32	99.80	99.74	100.77	100.81	100.56	100.61	99.96
Cations (formula based on 8 O)												
Si	2.750	2.733	2.736	2.686	2.711	2.723	2.701	2.661	2.739	2.665	2.690	2.693
Al	1.253	1.281	1.269	1.313	1.284	1.285	1.294	1.337	1.257	1.327	1.308	1.303
Mg	0.002	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.000
Ca	0.246	0.268	0.264	0.296	0.274	0.269	0.286	0.321	0.249	0.317	0.302	0.284
Mn	0.001	0.000	0.002	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.002
Fe	0.010	0.004	0.006	0.010	0.014	0.002	0.007	0.006	0.003	0.006	0.003	0.003
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.001	0.004	0.000	0.003
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Na	0.708	0.678	0.700	0.691	0.719	0.704	0.719	0.669	0.744	0.696	0.701	0.731
K	0.005	0.003	0.002	0.005	0.004	0.003	0.004	0.003	0.005	0.003	0.003	0.003
Orthose	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Albite	0.74	0.72	0.73	0.70	0.72	0.72	0.72	0.68	0.75	0.69	0.70	0.72
Anorthite	0.26	0.28	0.27	0.30	0.28	0.28	0.28	0.32	0.25	0.31	0.30	0.28

Table 6 continued: Feldspar chemistry.

ID	1613 n4	1613 n9	16922 v7	16922 n8	16922 10
Oxide%					
SiO_2	61.82	60.54	60.52	62.25	59.62
Al_2O_3	23.98	24.84	25.25	23.95	25.31
MgO	0.01	0.00	0.02	0.01	0.01
CaO	4.99	6.13	6.48	4.97	6.88
MnO	0.01	0.01	0.00	0.03	0.01
FeO	0.27	0.18	0.04	0.04	0.06
SrO	0.18	0.13	0.06	0.09	0.22
BaO	0.00	0.00	0.04	0.01	0.02
Na_2O	8.79	8.20	8.01	8.89	7.91
K_2O	0.08	0.05	0.04	0.06	0.05
Total	100.13	100.07	100.47	100.30	100.07
Cations (formula based on 8 O)					
Si	2.743	2.694	2.682	2.752	2.661
Al	1.254	1.303	1.319	1.248	1.331
Mg	0.001	0.000	0.001	0.001	0.001
Ca	0.237	0.292	0.307	0.236	0.329
Mn	0.000	0.000	0.000	0.001	0.000
Fe	0.010	0.007	0.001	0.002	0.002
Sr	0.005	0.003	0.001	0.002	0.006
Ba	0.000	0.000	0.001	0.000	0.000
Na	0.756	0.707	0.688	0.762	0.684
K	0.005	0.003	0.003	0.003	0.003
Orthose	0.01	0.00	0.00	0.00	0.00
Albite	0.76	0.71	0.69	0.76	0.68
Anorthite	0.24	0.29	0.31	0.24	0.32

Table 7: Alcali-Feldspar chemistry.

ID	1671 B2	1666 V7	622 B4	1668 N3	1566v13	1566 R3	622 N4	622 R1	1668n11	1571 R2	1668 B6	1566 N7	1592 v1
Oxide%													
SiO_2	62.05	63.63	64.38	62.10	64.15	63.55	63.96	64.32	63.73	64.00	62.95	63.40	64.70
Al_2O_3	19.28	18.45	18.64	18.27	18.77	18.53	18.50	18.37	18.50	18.80	18.64	18.31	18.38
MgO	0.00	0.01	0.00	0.57	0.00	0.00	0.00	0.00	0.01	0.00	0.15	0.00	0.00
CaO	0.01	0.02	0.01	0.01	0.05	0.10	0.02	0.00	0.00	0.01	0.05	0.05	0.01
MnO	0.00	0.00	0.09	0.00	0.00	0.04	0.18	0.10	0.00	0.03	0.00	0.00	0.00
FeO	0.12	0.22	0.36	1.22	0.08	0.05	0.40	0.37	0.06	0.28	0.19	0.04	0.21
SrO	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	2.47	0.28	0.51	0.36	0.77	0.55	0.53	0.49	0.33	0.63	0.55	0.44	0.07
Na_2O	0.29	0.63	0.63	0.20	0.52	0.33	0.47	0.34	0.31	0.21	0.11	0.27	0.19
K_2O	15.06	15.45	15.55	15.55	15.66	15.84	15.87	15.99	16.03	16.08	16.16	16.16	16.18
Total	99.70	98.73	100.17	98.28	99.98	99.01	99.93	100.01	98.98	100.08	98.81	98.67	99.73
Cations (formula based on 8 O)													
Si	2.931	2.982	2.980	2.946	2.977	2.978	2.976	2.987	2.983	2.972	2.964	2.984	2.999
Al	1.073	1.019	1.017	1.022	1.026	1.023	1.015	1.005	1.021	1.029	1.034	1.016	1.004
Mg	0.000	0.001	0.000	0.040	0.000	0.000	0.000	0.000	0.001	0.000	0.011	0.000	0.000
Ca	0.000	0.001	0.000	0.001	0.002	0.005	0.001	0.000	0.000	0.001	0.003	0.002	0.000
Mn	0.000	0.000	0.003	0.000	0.000	0.001	0.007	0.004	0.000	0.001	0.000	0.000	0.000
Fe	0.005	0.009	0.014	0.048	0.003	0.002	0.015	0.014	0.002	0.011	0.007	0.001	0.008
Sr	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.046	0.005	0.009	0.007	0.014	0.010	0.010	0.009	0.006	0.012	0.010	0.008	0.001
Na	0.027	0.057	0.057	0.019	0.047	0.030	0.042	0.031	0.028	0.019	0.010	0.024	0.017
K	0.907	0.924	0.918	0.941	0.927	0.947	0.942	0.947	0.957	0.953	0.970	0.970	0.956
Orthose	0.97	0.94	0.94	0.98	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.97	0.98
Albite	0.03	0.06	0.06	0.02	0.05	0.03	0.04	0.03	0.03	0.02	0.01	0.02	0.02
Anorthite	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

*Orthose (K), Albite (Na), Anorthite (Ca) over (K+Na+Ca).

Table 7 continued: Alcali-Feldspar chemistry.

ID	1668 R4	1668 N9	1662 5	1668v16	1668 B7	1668r11	1658r10	1656 R1	427 9	1668 V3	427 4	1668 R2	1668 R5	1668v10
Oxide%														
SiO_2	64.13	63.50	64.09	63.59	63.18	64.43	64.40	64.90	63.74	64.04	63.87	64.02	64.26	63.88
Al_2O_3	18.52	18.34	18.75	18.54	18.28	18.43	18.45	18.43	18.32	18.41	18.28	18.41	18.45	18.29
MgO	0.01	0.00	0.01	0.11	0.01	0.04	0.00	0.00	0.03	0.03	0.01	0.04	0.01	0.09
CaO	0.02	0.11	0.03	0.03	0.03	0.01	0.00	0.01	0.00	0.02	0.00	0.02	0.00	0.01
MnO	0.01	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.04	0.01
FeO	0.11	0.02	0.18	0.40	0.15	0.17	0.08	0.02	0.33	0.18	0.05	0.18	0.28	0.25
SrO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BaO	0.26	0.28	0.43	0.27	0.33	0.17	0.33	0.01	0.05	0.03	0.01	0.04	0.08	0.07
Na_2O	0.21	0.08	0.03	0.20	0.17	0.24	0.09	0.25	0.11	0.16	0.14	0.18	0.18	0.07
K_2O	16.23	16.24	16.27	16.28	16.36	16.38	16.42	16.49	16.54	16.54	16.55	16.55	16.59	16.64
Total	99.53	98.60	99.81	99.50	98.49	99.94	99.76	100.12	99.14	99.39	98.90	99.54	99.96	99.30
Cations (formula based on 8 O)														
Si	2.986	2.986	2.979	2.970	2.981	2.988	2.993	2.998	2.984	2.987	2.991	2.983	2.983	2.986
Al	1.016	1.016	1.027	1.020	1.016	1.007	1.010	1.003	1.011	1.012	1.009	1.011	1.010	1.008
Mg	0.001	0.000	0.001	0.008	0.001	0.003	0.000	0.000	0.002	0.002	0.001	0.003	0.001	0.006
Ca	0.001	0.005	0.002	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
Mn	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000
Fe	0.004	0.001	0.007	0.016	0.006	0.007	0.003	0.001	0.013	0.007	0.002	0.007	0.011	0.010
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.005	0.005	0.008	0.005	0.006	0.003	0.006	0.000	0.001	0.000	0.000	0.001	0.001	0.001
Na	0.019	0.007	0.003	0.018	0.015	0.022	0.008	0.023	0.010	0.014	0.013	0.016	0.016	0.006
K	0.964	0.974	0.965	0.970	0.985	0.969	0.973	0.972	0.988	0.984	0.989	0.984	0.983	0.992
Orthose	0.98	0.99	0.99	0.98	0.98	0.98	0.99	0.98	0.99	0.98	0.99	0.98	0.98	0.99
Albite	0.02	0.01	0.00	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.01
Anorthite	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7 continued: Alcali-Feldspar chemistry.

ID	1668 V5	1668 V9
Oxide%		
SiO_2	64.46	63.96
Al_2O_3	18.46	18.46
MgO	0.01	0.00
CaO	0.01	0.02
MnO	0.00	0.00
FeO	0.05	0.03
SrO	0.00	0.00
BaO	0.00	0.19
Na_2O	0.11	0.05
K_2O	16.65	16.71
Total	99.76	99.42
Cations (formula based on 8 O)		
Si	2.992	2.986
Al	1.010	1.015
Mg	0.001	0.000
Ca	0.001	0.001
Mn	0.000	0.000
Fe	0.002	0.001
Sr	0.000	0.000
Ba	0.000	0.004
Na	0.010	0.004
K	0.986	0.995
Orthose	0.99	1.00
Albite	0.01	0.00
Anorthite	0.00	0.00

Table 8: Ilmenite chemistry.

ID	1505 R6	1698 5	1698 14	1674 R7	1700 N8	1688 6	1687 4	1697 7	433 13	433 14	334 r1	334 r2
Oxide %												
SiO_2	1.34	0.03	0.02	0.05	0.07	0.03	0.03	0.03	0.03	0.03	0.06	0.02
TiO_2	51.99	54.66	53.47	53.88	54.03	53.70	53.37	53.55	53.73	53.91	53.58	53.80
Al_2O_3	0.38	0.02	0.03	0.02	0.07	0.03	0.08	0.05	0.03	0.02	0.01	0.01
Cr_2O_3	0.01	0.01	0.00	0.02	0.02	0.02	0.01	0.02	0.03	0.02	0.02	0.00
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	0.20	0.29	0.25	0.10	0.21	0.07	0.05	0.61	0.10	0.11	0.10	0.15
CaO	0.01	0.00	0.02	0.06	0.00	0.03	0.04	0.02	0.02	0.00	0.00	0.00
MnO	1.58	1.18	0.92	2.99	1.72	1.97	2.04	1.12	2.15	2.09	3.76	3.84
FeO	44.44	44.38	46.50	42.39	43.51	44.93	44.33	45.20	43.73	44.06	41.49	42.00
CoO	0.01	0.00	0.02	0.00	0.00	0.02	0.03	0.00	0.00	0.03	0.02	0.08
NiO	0.00	0.00	0.01	0.00	0.08	0.05	0.02	0.00	0.00	0.00	0.00	0.00
ZnO	0.04	0.04	0.06	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.07	0.00
Na2O	0.01	0.02	0.02	0.00	0.03	0.00	0.00	0.01	0.01	0.00	0.00	0.02
Total	100.02	100.62	101.31	99.51	99.74	100.86	99.99	100.62	99.83	100.25	99.13	99.92
Cations (formula based on 6 O)												
Si	2.931	2.982	2.980	2.946	2.977	2.978	2.976	2.987	2.983	2.972	2.964	2.984
Ti	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000
Al	1.073	1.019	1.017	1.022	1.026	1.023	1.015	1.005	1.021	1.029	1.034	1.016
Mg	0.000	0.001	0.000	0.040	0.000	0.000	0.000	0.000	0.001	0.000	0.011	0.000
Ca	0.000	0.001	0.000	0.001	0.002	0.005	0.001	0.000	0.000	0.001	0.003	0.002
Mn	0.000	0.000	0.003	0.000	0.000	0.001	0.007	0.004	0.000	0.001	0.000	0.000
Fe	0.005	0.009	0.014	0.048	0.003	0.002	0.015	0.014	0.002	0.011	0.007	0.001
Sr	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.046	0.005	0.009	0.007	0.014	0.010	0.010	0.009	0.006	0.012	0.010	0.008
Na	0.027	0.057	0.057	0.019	0.047	0.030	0.042	0.031	0.028	0.019	0.010	0.024
K	0.907	0.924	0.918	0.941	0.927	0.947	0.942	0.947	0.957	0.953	0.970	0.970

Table 8 continued: Ilmenite chemistry.

ID	365 2	456 4	388 18	402 11	1683 R1	1656 B1	1664 N1	974 10	982 11	677 1	677 16	978 9	409 3
Oxide %													
SiO_2	0.00	0.06	0.01	0.04	0.03	6.97	0.02	0.09	0.06	0.06	0.02	0.28	0.02
TiO_2	53.02	53.38	53.56	53.01	53.56	50.06	53.27	52.98	52.90	53.38	53.67	52.59	53.29
Al_2O_3	0.19	0.01	0.00	0.00	0.00	0.22	0.05	0.03	0.01	0.01	0.02	0.04	0.02
Cr_2O_3	0.00	0.03	0.02	0.00	0.00	0.00	0.02	0.00	0.05	0.02	0.00	0.04	0.02
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	0.13	0.09	0.25	0.13	0.09	0.19	0.13	0.03	0.18	0.05	0.03	0.07	0.07
CaO	0.13	0.03	0.00	0.00	0.00	0.01	0.02	0.20	0.00	0.01	0.00	0.01	0.00
MnO	1.57	2.79	0.79	1.39	0.63	2.67	2.32	5.91	1.82	2.26	2.84	1.65	2.55
FeO	44.75	42.14	44.76	44.51	46.61	40.19	43.68	39.25	44.29	42.22	42.76	43.61	43.09
CoO	0.01	0.07	0.00	0.01	0.00	0.09	0.00	0.07	0.00	0.00	0.00	0.07	0.05
NiO	0.06	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.00	0.04	0.00	0.04	0.00
ZnO	0.07	0.00	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.05	0.04
Na2O	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.01	0.01	0.01	0.01	0.01
Total	99.92	98.60	99.46	99.10	100.95	100.43	99.57	98.58	99.32	98.05	99.35	98.45	99.15
Cations (formula based on 6 O)													
Si	2.999	2.986	2.986	2.979	2.970	2.981	2.988	2.993	2.998	2.984	2.987	2.991	2.983
Ti	0.000	0.001	0.000	0.000	0.003	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.002
Al	1.004	1.016	1.016	1.027	1.020	1.016	1.007	1.010	1.003	1.011	1.012	1.009	1.011
Mg	0.000	0.001	0.000	0.001	0.008	0.001	0.003	0.000	0.000	0.002	0.002	0.001	0.003
Ca	0.000	0.001	0.005	0.002	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001
Mn	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Fe	0.008	0.004	0.001	0.007	0.016	0.006	0.007	0.003	0.001	0.013	0.007	0.002	0.007
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.001	0.005	0.005	0.008	0.005	0.006	0.003	0.006	0.000	0.001	0.000	0.000	0.001
Na	0.017	0.019	0.007	0.003	0.018	0.015	0.022	0.008	0.023	0.010	0.014	0.013	0.016
K	0.956	0.964	0.974	0.965	0.970	0.985	0.969	0.973	0.972	0.988	0.984	0.989	0.984

Table 8 continued: Ilmenite chemistry.

ID	1570-7	1570-8	1698-b9	1664
Oxide %				
SiO_2	0.03	0.08	0.05	0.06
TiO_2	54.09	53.37	54.54	53.84
Al_2O_3	0.03	0.05	0.05	0.04
Cr_2O_3	0.00	0.00	0.00	0.00
Fe_2O_3	0.00	0.00	0.00	0.00
MgO	0.39	0.24	0.30	0.06
CaO	0.00	0.00	0.01	0.02
MnO	1.90	1.54	1.22	2.80
FeO	45.10	44.68	44.81	42.63
CoO	0.00	0.07	0.01	0.05
NiO	0.00	0.00	0.01	0.00
ZnO	0.00	0.00	0.00	0.00
Na2O	0.00	0.02	0.02	0.10
Total	101.53	100.04	101.02	99.59
Cations (formula based on 6 O)				
Si	2.983	2.986	2.992	2.986
Ti	0.002	0.000	0.000	0.000
Al	1.010	1.008	1.010	1.015
Mg	0.001	0.006	0.001	0.000
Ca	0.000	0.001	0.001	0.001
Mn	0.001	0.000	0.000	0.000
Fe	0.011	0.010	0.002	0.001
Sr	0.000	0.000	0.000	0.000
Ba	0.001	0.001	0.000	0.004
Na	0.016	0.006	0.010	0.004
K	0.983	0.992	0.986	0.995

Table 9: Epidote chemistry.

ID	1566 N5	1668 B1	1668 B2	1668 R1	1668 R7	1668 V8	1665 N1	1665 R1	1665 R2	1665 R4
Oxide %										
SiO_2	39.12	38.52	38.47	38.30	37.88	38.55	37.45	37.53	37.64	38.01
TiO_2	0.00	0.07	0.00	0.08	0.09	0.02	0.08	0.06	0.01	0.06
Al_2O_3	28.00	25.90	26.28	24.71	24.56	25.97	23.98	23.42	24.05	24.68
La_2O_3	0.00	0.00	0.00	0.00	0.13	0.02	-	-	-	-
Ce_2O_3	0.00	0.01	0.00	0.00	0.24	0.04	-	-	-	-
MgO	0.03	0.02	0.02	0.00	0.01	0.01	0.04	0.01	0.06	0.03
CaO	24.57	24.08	24.01	23.67	23.16	23.74	23.56	23.69	22.64	23.87
MnO	0.01	0.08	0.14	0.07	0.06	0.14	0.19	0.10	1.09	0.18
FeO	6.83	9.19	8.49	10.56	9.48	9.14	11.16	11.65	11.04	10.40
Na_2O	0.00	0.01	0.00	0.03	0.03	0.02	0.00	0.02	0.00	0.00
K_2O	0.00	0.03	0.00	0.01	0.00	0.01	-	-	-	-
H_2O	1.92	1.88	1.87	1.85	1.82	1.87	-	-	-	-
Total	100.48	99.77	99.29	99.28	97.49	99.55	96.54	96.48	96.52	97.32
Cations (formula based on 25 O)										
Si	6.119	6.152	6.151	6.190	6.215	6.165	5.902	5.934	5.931	5.911
Ti	0.000	0.008	0.000	0.010	0.011	0.002	0.009	0.007	0.001	0.006
Al	5.161	4.875	4.952	4.707	4.750	4.895	4.454	4.363	4.466	4.524
La	0.000	0.000	0.000	0.000	0.008	0.001	-	-	-	-
Ce	0.000	0.001	0.000	0.000	0.014	0.003	-	-	-	-
Mg	0.007	0.004	0.004	0.000	0.003	0.002	0.008	0.003	0.013	0.008
Ca	4.117	4.121	4.113	4.098	4.072	4.068	3.979	4.013	3.822	3.977
Mn	0.002	0.010	0.018	0.010	0.008	0.019	0.025	0.013	0.145	0.024
Fe	0.894	1.227	1.135	1.427	1.301	1.223	1.471	1.540	1.455	1.353
Na	0.000	0.002	0.001	0.008	0.010	0.008	0.001	0.005	0.000	0.000
K	0.000	0.005	0.001	0.001	0.000	0.002	-	-	-	-
H	0.636	0.000	0.000	5.211	5.211	5.438	-	-	-	-

Table 10: Zoïsite chemistry.

ID	1566 N6	1566 N8	1671 V1	1671 V4	1671 V6	1671 V7	1668 N1	1668 N2	1668 N5	1668 N7
Oxide %										
SiO_2	43.58	43.38	43.12	43.05	43.50	43.74	43.37	43.46	43.59	44.01
TiO_2	0.09	0.00	0.05	0.48	0.07	0.15	0.00	0.10	0.00	0.01
Al_2O_3	23.90	23.98	24.48	24.09	24.28	24.36	23.75	23.47	23.14	23.72
La_2O_3	0.02	0.00	0.00	0.04	0.00	0.04	0.00	0.00	0.00	0.02
Ce_2O_3	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
MgO	0.00	0.04	0.61	0.32	0.16	0.04	0.00	0.00	0.03	0.00
CaO	27.38	27.72	26.30	26.78	27.54	27.68	27.35	27.19	27.21	27.04
MnO	0.03	0.03	0.05	0.03	0.03	0.01	0.00	0.01	0.00	0.00
FeO	0.88	0.68	0.92	0.54	0.22	0.30	0.98	1.34	1.68	0.63
Na_2O	0.02	0.01	0.00	0.01	0.02	0.02	0.03	0.06	0.07	0.08
K_2O	0.00	0.00	0.00	0.05	0.01	0.01	0.00	0.00	0.00	0.02
H_2O	1.91	1.91	1.91	1.91	1.92	1.93	1.90	1.90	1.90	1.91
Total	97.82	97.77	97.45	97.29	97.75	98.28	97.39	97.54	97.63	97.44
Cations (formula based on 25 O)										
Si	6.823	6.798	6.759	6.764	6.797	6.801	6.825	6.838	6.864	6.895
Ti	0.010	0.000	0.006	0.056	0.008	0.017	0.000	0.012	0.000	0.001
Al	4.410	4.429	4.523	4.460	4.472	4.463	4.405	4.353	4.294	4.381
La	0.001	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.001
Ce	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Mg	0.000	0.009	0.142	0.075	0.037	0.009	0.000	0.000	0.008	0.000
Ca	4.594	4.655	4.417	4.509	4.610	4.611	4.611	4.584	4.590	4.539
Mn	0.004	0.003	0.006	0.004	0.004	0.001	0.000	0.001	0.000	0.000
Fe	0.116	0.088	0.121	0.070	0.028	0.038	0.129	0.176	0.221	0.082
Na	0.005	0.004	0.000	0.004	0.005	0.007	0.010	0.019	0.020	0.023
K	0.001	0.000	0.000	0.010	0.002	0.002	0.000	0.000	0.000	0.005
H	0.636	0.636	5.491	6.439	5.054	5.054	5.289	5.289	5.289	5.289

Table 11: Major element garnet profiles rim to rim.

ID	1698-2												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Oxide %													
SiO_2	36.98	37.08	37.43	37.07	36.94	37.00	36.78	37.04	37.12	37.20	36.66	36.71	36.42
TiO_2	0.00	0.06	0.00	0.03	0.00	0.00	0.01	0.00	0.03	0.09	0.00	0.03	0.00
Al_2O_3	21.31	21.43	21.24	21.47	21.53	21.21	21.45	21.36	21.42	21.50	21.27	21.47	21.41
Fe_2O_3	0.01	0.00	0.00	0.00	0.05	0.00	0.04	0.02	0.00	0.00	0.08	0.06	0.13
MgO	2.57	2.84	2.95	2.90	2.86	2.71	2.70	2.64	2.53	2.50	2.48	2.38	2.36
CaO	1.84	1.91	2.02	2.08	2.19	2.24	2.38	2.48	2.67	2.58	2.69	2.73	2.79
MnO	4.95	4.95	5.02	5.18	5.27	5.77	6.01	6.16	6.56	6.79	6.94	7.15	7.22
FeO	32.02	31.84	31.51	31.30	31.03	30.86	30.35	30.15	29.90	29.49	29.27	29.17	29.12
Na_2O	0.02	0.03	0.02	0.04	0.01	0.02	0.03	0.03	0.02	0.05	0.03	0.05	0.06
Total	99.75	100.16	100.22	100.13	99.92	99.93	99.82	99.91	100.32	100.21	99.45	99.81	99.51
Cations (Formula based on 24 O)													
Si	5.977	5.961	6.004	5.957	5.948	5.969	5.938	5.968	5.962	5.972	5.946	5.932	5.913
Ti	0.000	0.008	0.000	0.003	0.000	0.000	0.001	0.000	0.004	0.011	0.000	0.004	0.000
Al	4.060	4.061	4.016	4.067	4.085	4.032	4.080	4.056	4.055	4.068	4.065	4.090	4.097
Y	0.001	0.000	0.000	0.000	0.004	0.000	0.004	0.001	0.000	0.000	0.007	0.005	0.011
Mg	0.619	0.680	0.706	0.694	0.686	0.651	0.650	0.635	0.605	0.598	0.600	0.572	0.571
Ca	0.318	0.329	0.347	0.358	0.378	0.387	0.412	0.429	0.459	0.443	0.468	0.472	0.485
Mn	0.678	0.673	0.682	0.705	0.719	0.788	0.821	0.841	0.893	0.924	0.953	0.978	0.993
Fe	4.329	4.280	4.227	4.206	4.178	4.163	4.097	4.063	4.016	3.959	3.970	3.943	3.954
Na	0.007	0.009	0.007	0.011	0.002	0.007	0.009	0.008	0.008	0.016	0.010	0.016	0.019
Grossular	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.07	0.08	0.08	0.08
Spessartine	0.11	0.11	0.11	0.12	0.12	0.13	0.14	0.14	0.15	0.16	0.16	0.16	0.17
Almandine	0.73	0.72	0.71	0.71	0.70	0.70	0.69	0.68	0.67	0.67	0.66	0.66	0.66
Pyrope	0.10	0.11	0.12	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10
x(g)	0.87	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.87	0.87	0.87	0.87	0.87

Table 11 continued: Garnet major element profile.

ID	1698-2												
	14	15	16	17	18	19	20	21	22	23	24	25	26
Oxide %													
SiO_2	37.10	36.87	36.36	37.03	36.77	35.21	36.31	36.20	36.53	35.97	36.46	36.75	36.95
TiO_2	0.08	0.00	0.00	0.10	0.03	0.07	0.12	0.10	0.03	0.08	0.00	0.00	0.00
Al_2O_3	21.45	21.50	21.44	21.38	21.29	21.00	21.23	21.33	21.25	21.43	21.43	21.22	21.43
Fe_2O_3	0.08	0.16	0.21	0.08	0.11	0.12	0.16	0.15	0.17	0.17	0.17	0.13	0.17
MgO	2.40	2.35	2.34	2.36	2.21	2.15	2.22	2.18	2.18	2.21	2.14	2.18	2.24
CaO	2.81	2.87	2.93	2.98	3.13	3.16	3.25	3.25	3.34	3.34	3.41	3.48	3.53
MnO	7.22	7.32	7.56	7.55	7.64	7.65	7.74	7.80	7.76	7.77	7.74	7.92	7.83
FeO	29.01	28.94	28.76	28.60	28.60	28.02	28.36	28.10	28.22	28.21	27.84	27.86	27.66
Na_2O	0.05	0.04	0.06	0.06	0.06	0.10	0.07	0.05	0.07	0.06	0.03	0.08	0.08
Total	100.22	100.05	99.75	100.22	99.88	97.53	99.53	99.21	99.59	99.23	99.25	99.62	99.93
Cations (Formula based on 24 O)													
Si	5.962	5.943	5.895	5.955	5.946	5.852	5.902	5.898	5.927	5.865	5.925	5.953	5.955
Ti	0.010	0.000	0.000	0.013	0.003	0.009	0.014	0.013	0.003	0.010	0.000	0.000	0.000
Al	4.064	4.084	4.097	4.052	4.057	4.112	4.066	4.096	4.065	4.119	4.105	4.051	4.069
Y	0.007	0.014	0.018	0.007	0.010	0.010	0.014	0.013	0.015	0.015	0.014	0.012	0.015
Mg	0.575	0.565	0.566	0.565	0.533	0.533	0.537	0.530	0.526	0.538	0.518	0.526	0.538
Ca	0.484	0.495	0.509	0.513	0.542	0.563	0.566	0.567	0.581	0.583	0.594	0.603	0.610
Mn	0.983	0.999	1.038	1.029	1.047	1.076	1.066	1.076	1.066	1.073	1.065	1.087	1.069
Fe	3.898	3.900	3.899	3.846	3.867	3.894	3.855	3.829	3.829	3.846	3.784	3.773	3.728
Na	0.016	0.014	0.019	0.019	0.019	0.034	0.022	0.016	0.023	0.018	0.011	0.024	0.024
Grossular	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Spessartine	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Almandine	0.66	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63
Pyrope	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
x(g)	0.87	0.87	0.87	0.87	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.87

Table 11 continued: Garnet major element profile.

ID	1698-2												
	27	28	29	30	31	32	33	34	35	36	37	38	39
Oxide %													
SiO_2	36.58	36.81	36.79	36.60	36.36	36.14	36.73	36.10	36.15	36.06	36.36	36.31	35.82
TiO_2	0.02	0.02	0.08	0.09	0.03	0.02	0.00	0.00	0.04	0.08	0.06	0.06	0.09
Al_2O_3	21.47	21.38	21.57	21.37	21.46	21.42	21.30	21.35	21.48	21.48	21.27	21.39	21.42
Fe_2O_3	0.13	0.15	0.14	0.19	0.20	0.14	0.20	0.16	0.07	0.11	0.14	0.13	0.14
MgO	2.13	2.17	2.15	2.17	2.14	2.24	2.16	2.16	2.19	2.23	2.20	2.31	2.31
CaO	3.70	3.79	3.78	3.69	3.57	3.58	3.44	3.32	3.37	3.27	3.20	3.26	3.17
MnO	7.80	7.78	7.88	7.78	7.90	7.86	7.75	7.63	7.92	7.73	7.67	7.75	7.59
FeO	27.73	27.61	27.73	27.77	27.93	27.96	27.92	28.07	27.99	28.38	28.49	28.48	28.41
Na_2O	0.05	0.04	0.08	0.06	0.05	0.03	0.06	0.06	0.05	0.03	0.05	0.06	0.02
Total	99.65	99.81	100.21	99.81	99.66	99.43	99.57	98.97	99.39	99.47	99.49	99.78	99.14
Cations (Formula based on 24 O)													
Si	5.922	5.943	5.919	5.920	5.897	5.878	5.949	5.895	5.879	5.866	5.910	5.887	5.849
Ti	0.002	0.002	0.010	0.011	0.004	0.002	0.000	0.000	0.005	0.010	0.007	0.008	0.011
Al	4.097	4.068	4.090	4.073	4.101	4.106	4.067	4.110	4.117	4.118	4.074	4.087	4.122
Y	0.011	0.013	0.012	0.016	0.017	0.012	0.017	0.014	0.006	0.009	0.012	0.011	0.012
Mg	0.513	0.522	0.516	0.523	0.517	0.543	0.522	0.526	0.531	0.540	0.534	0.559	0.561
Ca	0.642	0.656	0.652	0.640	0.620	0.624	0.597	0.580	0.587	0.571	0.558	0.566	0.554
Mn	1.069	1.064	1.074	1.065	1.085	1.083	1.063	1.055	1.091	1.065	1.056	1.064	1.050
Fe	3.754	3.727	3.731	3.757	3.788	3.803	3.782	3.833	3.807	3.861	3.872	3.862	3.880
Na	0.014	0.012	0.025	0.019	0.014	0.010	0.020	0.019	0.014	0.010	0.014	0.017	0.007
Grossular	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
Spessartine	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.17
Almandine	0.63	0.62	0.62	0.63	0.63	0.63	0.63	0.64	0.63	0.64	0.64	0.64	0.64
Pyrope	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
x(g)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.87	0.87

Table 11 continued: Garnet major element profile.

ID	1698-2												
	40	41	42	43	44	45	46	47	48	49	50	51	52
Oxide %													
SiO_2	35.80	36.45	35.63	34.39	35.61	32.27	35.93	36.54	35.29	35.32	36.34	36.39	36.62
TiO_2	0.04	0.00	0.04	0.02	0.07	0.18	0.01	0.06	0.06	0.00	0.05	0.00	0.12
Al_2O_3	21.46	21.42	21.55	21.50	21.48	21.34	21.57	21.58	21.73	21.52	21.40	21.45	21.69
Fe_2O_3	0.04	0.11	0.13	0.13	0.14	0.12	0.10	0.10	0.12	0.07	0.03	0.02	0.00
MgO	2.28	2.27	2.40	2.41	2.38	2.43	2.53	2.48	2.63	2.63	2.69	2.68	2.76
CaO	3.01	2.92	3.00	3.00	2.92	2.77	2.76	2.68	2.61	2.57	2.53	2.43	2.28
MnO	7.55	7.47	7.44	7.24	7.17	7.10	6.82	6.79	6.69	6.51	6.27	6.02	5.86
FeO	28.74	28.81	29.07	28.84	29.30	28.81	28.89	29.60	29.45	29.78	30.08	30.47	30.67
Na_2O	0.05	0.02	0.03	0.04	0.07	0.06	0.06	0.04	0.02	0.03	0.03	0.03	0.03
Total	99.07	99.55	99.39	97.70	99.19	95.18	98.66	99.87	98.62	98.43	99.51	99.55	100.04
Cations (Formula based on 24 O)													
Si	5.850	5.915	5.814	5.725	5.822	5.551	5.874	5.905	5.792	5.812	5.896	5.901	5.900
Ti	0.005	0.000	0.005	0.002	0.009	0.023	0.001	0.007	0.007	0.000	0.007	0.000	0.015
Al	4.134	4.097	4.144	4.220	4.140	4.328	4.156	4.110	4.203	4.173	4.091	4.099	4.117
Y	0.004	0.009	0.011	0.011	0.012	0.011	0.009	0.009	0.010	0.006	0.003	0.002	0.000
Mg	0.556	0.548	0.584	0.598	0.580	0.622	0.616	0.598	0.643	0.645	0.649	0.648	0.663
Ca	0.527	0.507	0.524	0.536	0.512	0.511	0.483	0.465	0.460	0.452	0.440	0.423	0.394
Mn	1.045	1.027	1.028	1.021	0.993	1.035	0.944	0.930	0.931	0.908	0.862	0.827	0.799
Fe	3.929	3.910	3.968	4.015	4.006	4.144	3.950	4.000	4.042	4.098	4.081	4.133	4.132
Na	0.016	0.008	0.011	0.012	0.021	0.021	0.018	0.013	0.007	0.010	0.009	0.008	0.010
Grossular	0.09	0.08	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07
Spessartine	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.14	0.14	0.13
Almandine	0.65	0.65	0.65	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.69	0.69
Pyrope	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11
x(g)	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.86	0.86

Table 11 continued: Garnet major element profile.

ID	1698-2								1698-7				
	53	54	55	56	57	58	59	60	61	1	2	3	4
Oxide %													
SiO_2	35.93	35.86	35.55	36.16	35.22	35.95	34.39	35.30	55.03	35.04	36.22	36.50	35.97
TiO_2	0.02	0.00	0.03	0.00	0.00	0.03	0.03	0.03	0.08	0.00	0.08	0.00	0.05
Al_2O_3	21.63	21.52	21.64	21.58	21.76	21.61	21.50	21.37	21.17	21.56	21.66	21.66	21.61
Fe_2O_3	0.00	0.00	0.00	0.05	0.04	0.01	0.01	0.08	0.00	0.08	0.00	0.00	0.00
MgO	2.79	2.90	2.92	2.93	2.85	2.82	2.79	2.44	0.04	2.35	2.74	2.78	2.86
CaO	2.20	2.12	2.12	2.06	2.02	1.96	1.84	1.76	2.87	1.79	1.85	1.94	1.98
MnO	5.60	5.54	5.23	5.01	4.92	4.84	4.80	4.92	0.08	5.28	4.88	4.89	5.05
FeO	30.98	31.22	31.35	31.50	31.70	32.06	31.55	32.33	6.78	32.26	32.38	32.37	31.83
Na_2O	0.04	0.05	0.05	0.04	0.02	0.02	0.04	0.03	5.26	0.03	0.05	0.03	0.04
Total	99.23	99.22	98.96	99.35	98.53	99.37	97.07	98.31	91.35	98.48	99.86	100.17	99.45
Cations (Formula based on 24 O)													
Si	5.852	5.846	5.813	5.874	5.787	5.851	5.749	5.830	8.172	5.790	5.867	5.889	5.849
Ti	0.002	0.000	0.004	0.000	0.000	0.003	0.004	0.003	0.009	0.000	0.010	0.000	0.006
Al	4.151	4.134	4.170	4.132	4.213	4.146	4.236	4.160	3.706	4.199	4.134	4.118	4.142
Y	0.000	0.000	0.000	0.004	0.003	0.000	0.001	0.007	0.000	0.007	0.000	0.000	0.000
Mg	0.678	0.705	0.713	0.709	0.698	0.685	0.694	0.600	0.009	0.579	0.662	0.668	0.693
Ca	0.383	0.371	0.372	0.358	0.356	0.342	0.329	0.312	0.457	0.316	0.321	0.335	0.345
Mn	0.772	0.765	0.725	0.689	0.684	0.667	0.680	0.689	0.010	0.739	0.670	0.669	0.696
Fe	4.219	4.256	4.286	4.280	4.356	4.364	4.411	4.466	0.842	4.458	4.385	4.368	4.328
Na	0.011	0.014	0.015	0.011	0.005	0.005	0.013	0.010	1.514	0.011	0.014	0.008	0.012
Grossular	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.35	0.05	0.05	0.06	0.06
Spessartine	0.13	0.13	0.12	0.11	0.11	0.11	0.11	0.11	0.01	0.12	0.11	0.11	0.11
Almandine	0.70	0.70	0.70	0.71	0.71	0.72	0.72	0.74	0.64	0.73	0.73	0.72	0.71
Pyrope	0.11	0.12	0.12	0.12	0.11	0.11	0.11	0.10	0.01	0.10	0.11	0.11	0.11
x(g)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.88	0.99	0.89	0.87	0.87	0.86

Table 11 continued: Garnet major element profile.

ID	1698-7												
	5	6	7	8	9	10	11	12	13	14	15	16	17
Oxide %													
SiO_2	35.89	35.36	34.99	35.22	36.06	36.09	35.79	36.35	36.54	35.40	35.39	35.12	35.65
TiO_2	0.00	0.00	0.00	0.05	0.04	0.03	0.03	0.02	0.01	0.00	0.00	0.00	0.00
Al_2O_3	21.55	21.49	21.60	21.74	21.71	21.63	21.73	21.65	21.72	21.85	21.55	21.58	21.59
Fe_2O_3	0.01	0.02	0.01	0.00	0.04	0.04	0.02	0.06	0.06	0.08	0.11	0.10	0.09
MgO	2.84	2.82	2.87	2.85	2.74	2.64	2.73	2.60	2.66	2.62	2.56	2.51	2.48
CaO	2.05	2.10	2.18	2.25	2.29	2.28	2.37	2.51	2.54	2.59	2.64	2.66	2.71
MnO	5.15	5.24	5.39	5.68	5.85	5.95	6.21	6.42	6.61	6.77	6.70	6.89	6.84
FeO	31.66	31.36	31.11	30.87	30.76	30.35	30.68	30.41	30.01	30.17	29.61	29.34	29.38
Na_2O	0.04	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.05
Total	99.24	98.55	98.20	98.72	99.61	99.13	99.71	100.12	100.16	99.64	98.60	98.30	98.78
Cations (Formula based on 24 O)													
Si	5.849	5.812	5.774	5.777	5.850	5.876	5.814	5.871	5.888	5.769	5.814	5.790	5.838
Ti	0.000	0.000	0.000	0.006	0.005	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000
Al	4.140	4.162	4.201	4.203	4.151	4.151	4.161	4.122	4.125	4.195	4.172	4.194	4.168
Y	0.001	0.001	0.001	0.000	0.004	0.003	0.001	0.005	0.005	0.007	0.010	0.008	0.007
Mg	0.691	0.691	0.707	0.698	0.663	0.642	0.662	0.625	0.638	0.637	0.627	0.617	0.605
Ca	0.357	0.370	0.386	0.395	0.397	0.397	0.413	0.435	0.438	0.452	0.464	0.471	0.476
Mn	0.711	0.729	0.754	0.788	0.804	0.821	0.854	0.878	0.902	0.934	0.932	0.963	0.949
Fe	4.316	4.311	4.293	4.235	4.173	4.132	4.168	4.107	4.045	4.111	4.068	4.046	4.024
Na	0.011	0.003	0.007	0.005	0.007	0.010	0.008	0.008	0.008	0.009	0.011	0.012	0.016
Grossular	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08
Spessartine	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16
Almandine	0.71	0.71	0.70	0.69	0.69	0.69	0.68	0.68	0.67	0.67	0.67	0.66	0.66
Pyrope	0.11	0.11	0.12	0.11	0.11	0.11	0.11	0.10	0.11	0.10	0.10	0.10	0.10
x(g)	0.86	0.86	0.86	0.86	0.86	0.87	0.86	0.87	0.86	0.87	0.87	0.87	0.87

Table 11 continued: Garnet major element profile.

ID	1698-7												
	18	19	20	21	22	23	24	25	26	27	28	29	30
Oxide %													
SiO_2	36.89	35.80	35.93	36.57	36.51	36.32	36.75	35.44	35.97	35.66	36.78	35.35	35.95
TiO_2	0.05	0.01	0.03	0.02	0.03	0.08	0.00	0.07	0.03	0.00	0.04	0.00	0.01
Al_2O_3	21.49	21.36	21.53	21.47	21.69	21.76	21.74	21.54	21.43	21.55	21.48	21.80	21.52
Fe_2O_3	0.13	0.17	0.19	0.13	0.16	0.14	0.15	0.11	0.11	0.09	0.20	0.15	0.11
MgO	2.47	2.49	2.46	2.46	2.42	2.37	2.44	2.45	2.35	2.36	2.34	2.38	2.39
CaO	2.80	2.83	2.91	2.97	2.96	3.05	3.03	3.15	3.20	3.22	3.26	3.32	3.42
MnO	7.07	7.15	7.07	7.16	7.25	7.30	7.42	7.33	7.47	7.39	7.23	7.22	7.27
FeO	29.26	29.09	29.10	29.09	29.22	29.32	29.43	28.93	29.03	28.72	28.46	28.53	28.62
Na_2O	0.01	0.03	0.06	0.06	0.06	0.07	0.05	0.02	0.03	0.02	0.06	0.04	0.05
Total	100.19	99.00	99.28	99.95	100.30	100.43	101.16	99.04	99.65	99.05	99.91	98.82	99.32
Cations (Formula based on 24 O)													
Si	5.937	5.855	5.854	5.908	5.883	5.853	5.880	5.801	5.851	5.831	5.933	5.791	5.853
Ti	0.007	0.001	0.004	0.002	0.004	0.010	0.000	0.008	0.004	0.000	0.005	0.000	0.001
Al	4.076	4.117	4.136	4.089	4.119	4.132	4.099	4.157	4.108	4.153	4.085	4.208	4.130
Y	0.011	0.015	0.016	0.011	0.013	0.012	0.013	0.010	0.009	0.008	0.017	0.013	0.010
Mg	0.592	0.608	0.597	0.593	0.582	0.569	0.583	0.599	0.571	0.575	0.562	0.582	0.579
Ca	0.484	0.497	0.509	0.514	0.510	0.526	0.519	0.552	0.557	0.564	0.564	0.583	0.596
Mn	0.964	0.991	0.976	0.980	0.989	0.997	1.005	1.016	1.029	1.023	0.987	1.002	1.002
Fe	3.939	3.980	3.965	3.931	3.938	3.951	3.937	3.960	3.949	3.927	3.839	3.908	3.898
Na	0.004	0.010	0.019	0.018	0.018	0.023	0.015	0.005	0.009	0.007	0.018	0.013	0.016
Grossular	0.08	0.08	0.08	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10
Spessartine	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.16	0.16
Almandine	0.66	0.66	0.66	0.65	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64
Pyrope	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.10	0.09	0.09	0.09	0.10	0.10
x(g)	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Table 11 continued: Garnet major element profile.

ID	1698-7												
	21	22	23	24	25	26	27	28	29	30	31	32	33
Oxide %													
SiO_2	36.78	36.61	34.95	35.53	35.44	35.86	35.97	36.78	35.98	35.17	36.24	36.11	35.67
TiO_2	0.05	0.01	0.00	0.05	0.12	0.05	0.00	0.03	0.05	0.00	0.04	0.00	0.00
Al_2O_3	21.63	21.42	21.40	21.30	21.59	21.54	21.63	21.87	21.88	21.61	21.51	21.70	21.50
Fe_2O_3	0.11	0.12	0.20	0.15	0.16	0.15	0.12	0.15	0.22	0.14	0.13	0.19	0.09
MgO	2.37	2.41	2.31	2.31	2.37	2.47	2.42	2.41	2.29	2.51	2.54	2.42	2.50
CaO	3.37	3.33	3.18	3.13	3.15	3.06	3.06	3.05	3.74	3.00	2.95	2.87	2.78
MnO	7.39	7.14	7.42	7.23	7.27	7.21	7.27	7.26	6.84	7.06	7.26	7.19	7.11
FeO	28.62	28.49	28.31	28.53	28.54	28.72	28.89	29.31	27.98	29.31	29.39	29.27	29.06
Na_2O	0.03	0.05	0.07	0.05	0.05	0.06	0.05	0.03	0.03	0.05	0.07	0.05	0.04
Total	100.48	99.71	97.94	98.31	98.78	99.15	99.44	100.90	99.02	98.87	100.24	99.83	98.79
Cations (Formula based on 24 O)													
Si	5.907	5.921	5.790	5.849	5.808	5.848	5.850	5.887	5.852	5.774	5.856	5.854	5.841
Ti	0.006	0.001	0.000	0.007	0.015	0.007	0.000	0.004	0.006	0.000	0.005	0.000	0.000
Al	4.095	4.084	4.178	4.133	4.171	4.140	4.147	4.126	4.195	4.181	4.095	4.145	4.150
Y	0.010	0.010	0.018	0.013	0.014	0.013	0.010	0.012	0.019	0.012	0.011	0.017	0.008
Mg	0.567	0.582	0.570	0.567	0.580	0.600	0.587	0.574	0.556	0.615	0.611	0.584	0.609
Ca	0.580	0.577	0.564	0.552	0.553	0.535	0.533	0.522	0.653	0.528	0.511	0.498	0.487
Mn	1.005	0.978	1.041	1.009	1.009	0.996	1.002	0.985	0.943	0.981	0.994	0.988	0.986
Fe	3.844	3.854	3.922	3.929	3.913	3.917	3.929	3.923	3.806	4.024	3.972	3.967	3.981
Na	0.008	0.016	0.024	0.015	0.016	0.017	0.016	0.008	0.009	0.015	0.023	0.016	0.011
Grossular	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.11	0.09	0.08	0.08	0.08
Spessartine	0.17	0.16	0.17	0.17	0.17	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16
Almandine	0.64	0.64	0.64	0.65	0.65	0.65	0.65	0.65	0.64	0.65	0.65	0.66	0.66
Pyrope	0.09	0.10	0.09	0.09	0.10	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10
x(g)	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Table 11 continued: Garnet major element profile.

ID	1698-7												
	21	22	23	24	25	26	27	28	29	30	31	32	33
Oxide %													
SiO_2	36.78	36.61	34.95	35.53	35.44	35.86	35.97	36.78	35.98	35.17	36.24	36.11	35.67
TiO_2	0.05	0.01	0.00	0.05	0.12	0.05	0.00	0.03	0.05	0.00	0.04	0.00	0.00
Al_2O_3	21.63	21.42	21.40	21.30	21.59	21.54	21.63	21.87	21.88	21.61	21.51	21.70	21.50
Fe_2O_3	0.11	0.12	0.20	0.15	0.16	0.15	0.12	0.15	0.22	0.14	0.13	0.19	0.09
MgO	2.37	2.41	2.31	2.31	2.37	2.47	2.42	2.41	2.29	2.51	2.54	2.42	2.50
CaO	3.37	3.33	3.18	3.13	3.15	3.06	3.06	3.05	3.74	3.00	2.95	2.87	2.78
MnO	7.39	7.14	7.42	7.23	7.27	7.21	7.27	7.26	6.84	7.06	7.26	7.19	7.11
FeO	28.62	28.49	28.31	28.53	28.54	28.72	28.89	29.31	27.98	29.31	29.39	29.27	29.06
Na_2O	0.03	0.05	0.07	0.05	0.05	0.06	0.05	0.03	0.03	0.05	0.07	0.05	0.04
Total	100.48	99.71	97.94	98.31	98.78	99.15	99.44	100.90	99.02	98.87	100.24	99.83	98.79
Cations (Formula based on 24 O)													
Si	5.907	5.921	5.790	5.849	5.808	5.848	5.850	5.887	5.852	5.774	5.856	5.854	5.841
Ti	0.006	0.001	0.000	0.007	0.015	0.007	0.000	0.004	0.006	0.000	0.005	0.000	0.000
Al	4.095	4.084	4.178	4.133	4.171	4.140	4.147	4.126	4.195	4.181	4.095	4.145	4.150
Y	0.010	0.010	0.018	0.013	0.014	0.013	0.010	0.012	0.019	0.012	0.011	0.017	0.008
Mg	0.567	0.582	0.570	0.567	0.580	0.600	0.587	0.574	0.556	0.615	0.611	0.584	0.609
Ca	0.580	0.577	0.564	0.552	0.553	0.535	0.533	0.522	0.653	0.528	0.511	0.498	0.487
Mn	1.005	0.978	1.041	1.009	1.009	0.996	1.002	0.985	0.943	0.981	0.994	0.988	0.986
Fe	3.844	3.854	3.922	3.929	3.913	3.917	3.929	3.923	3.806	4.024	3.972	3.967	3.981
Na	0.008	0.016	0.024	0.015	0.016	0.017	0.016	0.008	0.009	0.015	0.023	0.016	0.011
Grossular	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.11	0.09	0.08	0.08	0.08
Spessartine	0.17	0.16	0.17	0.17	0.17	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16
Almandine	0.64	0.64	0.64	0.65	0.65	0.65	0.65	0.65	0.64	0.65	0.65	0.66	0.66
Pyrope	0.09	0.10	0.09	0.09	0.10	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10
x(g)	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Table 11 continued: Garnet major element profile.

ID	1698-7												
	34	35	36	37	38	39	40	41	42	43	44	45	46
Oxide %													
SiO_2	36.65	36.91	36.59	35.48	35.38	36.16	36.32	36.38	36.2735.71	36.93	36.83	35.80	
TiO_2	0.00	0.00	0.00	0.10	0.04	0.00	0.03	0.02	0.040.00	0.03	0.00	0.00	
Al_2O_3	21.47	21.38	21.53	21.48	21.64	21.62	21.68	21.58	21.6521.57	21.55	21.52	21.50	
Fe_2O_3	0.15	0.13	0.13	0.12	0.00	0.00	0.00	0.04	0.060.02	0.03	0.00	0.03	
MgO	2.51	2.52	2.57	2.52	2.58	2.77	2.66	2.74	2.732.84	2.88	2.79	2.93	
CaO	2.76	2.69	2.70	2.61	2.63	2.60	2.55	2.51	2.452.31	2.24	2.18	2.07	
MnO	6.96	6.93	6.76	6.73	6.53	6.40	6.25	6.18	5.825.59	5.44	5.28	5.19	
FeO	29.54	29.59	29.67	29.68	29.77	30.19	30.35	30.44	30.3930.72	30.95	31.25	31.58	
Na_2O	0.05	0.04	0.04	0.08	0.04	0.06	0.05	0.05	0.050.02	0.04	0.02	0.06	
Total	100.13	100.22	99.99	98.85	98.67	99.79	99.88	99.94	99.4798.88	100.09	99.99	99.27	
Cations (Formula based on 24 O)													
Si	5.913	5.943	5.908	5.818	5.805	5.857	5.872	5.881	5.8815.838	5.938	5.934	5.837	
Ti	0.000	0.000	0.000	0.013	0.005	0.000	0.004	0.002	0.0050.000	0.003	0.000	0.000	
Al	4.082	4.057	4.097	4.150	4.185	4.128	4.131	4.110	4.1384.157	4.084	4.086	4.131	
Y	0.013	0.011	0.011	0.010	0.000	0.000	0.000	0.004	0.0050.002	0.002	0.000	0.002	
Mg	0.603	0.604	0.619	0.617	0.632	0.668	0.641	0.659	0.6590.692	0.691	0.670	0.712	
Ca	0.477	0.463	0.466	0.459	0.462	0.452	0.442	0.434	0.4260.404	0.385	0.377	0.362	
Mn	0.952	0.945	0.925	0.934	0.908	0.878	0.856	0.846	0.8000.774	0.741	0.721	0.717	
Fe	3.986	3.985	4.006	4.070	4.085	4.089	4.105	4.115	4.1214.200	4.162	4.211	4.306	
Na	0.017	0.012	0.012	0.024	0.014	0.018	0.015	0.014	0.0160.006	0.012	0.006	0.018	
Grossular	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.070.07	0.06	0.06	0.06	
Spessartine	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.130.13	0.12	0.12	0.12	
Almandine	0.66	0.66	0.67	0.67	0.67	0.67	0.68	0.68	0.690.69	0.70	0.70	0.71	
Pyrope	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.110.11	0.12	0.11	0.12	
x(g)	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.860.86	0.86	0.86	0.86	

Table 11 continued: Garnet major element profile.

ID	1698-10 9	10	11	12	13	14	15	16	17	18	19	20	21
Oxide %													
SiO_2	36.02	36.85	37.04	36.97	36.76	37.27	81.85	36.82	36.92	36.96	36.53	36.59	36.61
TiO_2	0.07	0.00	0.02	0.00	0.04	0.04	0.00	0.00	0.03	0.03	0.03	0.00	0.00
Al_2O_3	21.42	21.51	21.50	21.64	21.66	21.16	5.25	21.49	21.58	21.52	21.65	21.65	21.21
Fe_2O_3	0.01	0.00	0.00	0.09	0.10	0.14	0.00	0.06	0.16	0.15	0.08	0.16	0.19
MgO	2.83	2.88	2.89	2.87	2.88	2.78	0.69	2.77	2.79	2.78	2.67	2.74	2.77
CaO	2.17	2.26	2.29	2.37	2.39	2.24	0.61	2.33	2.50	2.50	2.49	2.58	2.63
MnO	5.19	5.37	5.49	5.57	5.68	5.60	1.72	5.94	5.93	6.05	6.10	6.18	6.15
FeO	30.79	30.93	30.58	30.51	30.44	29.75	0.00	30.00	30.00	29.98	30.12	29.94	29.45
Na_2O	0.14	0.04	0.04	0.06	0.05	0.03	0.01	0.03	0.03	0.02	0.06	0.05	0.10
Total	98.66	99.84	99.85	100.17	100.02	99.02	100.15	99.44	99.97	99.99	99.72	99.92	99.12
Cations (Formula based on 24 O)													
Si	5.886	5.940	5.961	5.936	5.916	6.031	10.482	5.952	5.940	5.947	5.904	5.902	5.946
Ti	0.009	0.000	0.002	0.000	0.004	0.005	0.000	0.000	0.003	0.004	0.003	0.000	0.000
Al	4.124	4.086	4.077	4.096	4.109	4.035	0.792	4.095	4.092	4.080	4.124	4.116	4.060
Y	0.001	0.000	0.000	0.008	0.009	0.012	0.000	0.005	0.014	0.013	0.007	0.014	0.017
Mg	0.690	0.691	0.693	0.686	0.692	0.669	0.131	0.667	0.669	0.667	0.643	0.658	0.670
Ca	0.380	0.391	0.394	0.408	0.412	0.389	0.083	0.404	0.432	0.431	0.431	0.445	0.457
Mn	0.718	0.733	0.749	0.757	0.774	0.768	0.187	0.813	0.808	0.824	0.835	0.844	0.847
Fe	4.207	4.169	4.115	4.097	4.096	4.025	0.000	4.056	4.036	4.034	4.072	4.039	4.001
Na	0.044	0.013	0.013	0.019	0.016	0.008	0.003	0.008	0.009	0.007	0.018	0.015	0.030
Grossular	0.06	0.07	0.07	0.07	0.07	0.07	0.21	0.07	0.07	0.07	0.07	0.07	0.08
Spessartine	0.12	0.12	0.13	0.13	0.13	0.13	0.47	0.14	0.14	0.14	0.14	0.14	0.14
Almandine	0.70	0.70	0.69	0.69	0.69	0.69	0.00	0.68	0.68	0.68	0.68	0.67	0.67
Pyrope	0.12	0.12	0.12	0.12	0.12	0.11	0.33	0.11	0.11	0.11	0.11	0.11	0.11
x(g)	0.86	0.86	0.86	0.86	0.86	0.86	0.00	0.86	0.86	0.86	0.86	0.86	0.86

Table 11 continued: Garnet major element profile.

ID	169810												
	22	23	24	25	26	27	28	29	30	31	32	33	34
Oxide %													
SiO_2	35.99	36.81	36.51	36.56	36.35	36.57	36.74	36.63	36.57	36.05	36.78	35.62	36.01
TiO_2	0.00	0.03	0.06	0.06	0.05	0.01	0.01	0.00	0.01	0.02	0.00	0.06	0.04
Al_2O_3	21.59	21.37	21.39	21.54	21.48	21.48	21.69	21.47	21.56	21.56	21.51	21.42	21.46
Fe_2O_3	0.17	0.11	0.17	0.16	0.15	0.18	0.09	0.18	0.13	0.20	0.19	0.18	0.18
MgO	2.68	2.69	2.73	2.66	2.63	2.63	2.64	2.67	2.59	2.64	2.62	2.56	2.60
CaO	2.59	2.49	2.65	2.70	2.77	2.75	2.78	2.79	2.95	3.07	3.07	2.90	2.94
MnO	6.20	6.45	6.29	6.34	6.29	6.24	6.24	6.27	6.35	6.23	6.16	6.25	6.22
FeO	29.81	29.92	29.58	29.58	29.62	29.22	29.65	29.42	29.47	29.49	29.23	29.35	29.44
Na_2O	0.05	0.05	0.07	0.05	0.05	0.07	0.06	0.05	0.03	0.07	0.04	0.03	0.08
Total	99.20	99.94	99.45	99.73	99.41	99.16	99.89	99.62	99.67	99.38	99.59	98.40	99.01
Cations (Formula based on 24 O)													
Si	5.859	5.939	5.917	5.907	5.897	5.933	5.919	5.924	5.912	5.858	5.939	5.849	5.871
Ti	0.000	0.004	0.007	0.008	0.007	0.001	0.001	0.000	0.001	0.002	0.000	0.007	0.004
Al	4.142	4.063	4.085	4.103	4.106	4.108	4.119	4.091	4.108	4.128	4.094	4.145	4.124
Y	0.014	0.010	0.015	0.014	0.013	0.016	0.008	0.016	0.011	0.017	0.016	0.016	0.015
Mg	0.650	0.648	0.659	0.640	0.637	0.636	0.635	0.643	0.624	0.639	0.630	0.626	0.631
Ca	0.452	0.431	0.459	0.468	0.481	0.479	0.480	0.484	0.511	0.534	0.531	0.511	0.514
Mn	0.856	0.881	0.864	0.867	0.864	0.857	0.852	0.859	0.870	0.857	0.843	0.869	0.860
Fe	4.058	4.036	4.009	3.997	4.019	3.964	3.995	3.979	3.984	4.008	3.947	4.031	4.015
Na	0.016	0.017	0.023	0.016	0.015	0.023	0.018	0.016	0.009	0.021	0.012	0.011	0.024
Grossular	0.08	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.08	0.09
Spessartine	0.14	0.15	0.14	0.15	0.14	0.14	0.14	0.14	0.15	0.14	0.14	0.14	0.14
Almandine	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.66	0.67	0.67
Pyrope	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.11	0.11	0.10	0.10
x(g)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.87	0.86

Table 11 continued: Garnet major element profile.

ID	1698-10												
	35	36	37	38	39	40	41	42	43	44	45	46	47
Oxide %													
SiO_2	36.51	36.37	36.24	36.46	35.82	36.44	35.20	35.12	35.91	35.24	36.36	36.88	36.07
TiO_2	0.01	0.02	0.00	0.00	0.03	0.00	0.03	0.08	0.00	0.05	0.00	0.02	0.04
Al_2O_3	21.43	21.67	21.37	21.57	21.40	21.41	21.60	21.56	21.50	21.48	21.43	21.57	21.42
Fe_2O_3	0.21	0.16	0.19	0.27	0.12	0.23	0.15	0.21	0.15	0.11	0.14	0.09	0.08
MgO	2.70	2.63	2.63	2.67	2.70	2.63	2.70	2.73	2.70	2.77	2.70	2.71	2.85
CaO	2.91	2.82	2.78	2.78	2.71	2.68	2.65	2.58	2.57	2.57	2.56	2.49	2.42
MnO	6.30	6.19	6.25	6.13	6.24	6.17	6.12	6.20	5.98	6.05	5.93	5.85	5.67
FeO	29.33	29.61	29.76	29.69	29.52	29.78	29.92	29.83	29.81	30.19	30.32	30.20	30.54
Na_2O	0.06	0.06	0.08	0.04	0.08	0.02	0.06	0.08	0.03	0.04	0.04	0.06	0.02
Total	99.49	99.56	99.39	99.64	98.66	99.39	98.52	98.41	98.66	98.49	99.47	99.89	99.10
Cations (Formula based on 24 O)													
Si	5.913	5.889	5.891	5.900	5.863	5.914	5.788	5.781	5.872	5.796	5.901	5.941	5.876
Ti	0.001	0.002	0.000	0.000	0.003	0.000	0.004	0.010	0.000	0.007	0.000	0.002	0.004
Al	4.090	4.134	4.095	4.113	4.129	4.096	4.187	4.183	4.144	4.165	4.099	4.095	4.113
Y	0.018	0.014	0.016	0.023	0.011	0.019	0.013	0.018	0.013	0.009	0.012	0.008	0.007
Mg	0.652	0.636	0.637	0.645	0.660	0.636	0.661	0.671	0.658	0.679	0.652	0.650	0.692
Ca	0.505	0.490	0.484	0.482	0.475	0.466	0.467	0.454	0.451	0.453	0.444	0.429	0.422
Mn	0.864	0.849	0.861	0.839	0.865	0.848	0.853	0.865	0.828	0.842	0.815	0.799	0.783
Fe	3.972	4.010	4.045	4.018	4.040	4.042	4.114	4.107	4.077	4.153	4.115	4.069	4.161
Na	0.017	0.019	0.026	0.014	0.024	0.008	0.019	0.026	0.010	0.011	0.011	0.020	0.007
Grossular	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07
Spessartine	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13
Almandine	0.66	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.68	0.68	0.68	0.68	0.69
Pyrope	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
x(g)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86

Table 11 continued: Garnet major element profile.

ID	1698-10												
	48	49	50	51	52	53	54	55	56	57	58	59	60
Oxide %													
SiO_2	36.35	36.04	36.66	36.18	36.01	36.67	36.48	36.52	35.96	36.26	36.50	35.82	36.61
TiO_2	0.00	0.00	0.00	0.00	0.03	0.04	0.01	0.06	0.07	0.00	0.00	0.03	0.00
Al_2O_3	21.56	21.40	21.42	21.70	21.84	21.47	21.50	21.52	21.57	21.53	21.56	21.54	21.57
Fe_2O_3	0.05	0.04	0.14	0.06	0.00	0.02	0.02	0.03	0.00	0.00	0.00	0.04	0.03
MgO	2.94	2.88	2.94	2.90	2.87	2.94	2.82	2.89	2.85	2.78	2.79	2.57	2.49
CaO	2.37	2.40	2.29	2.27	2.24	2.15	2.15	2.07	1.97	1.92	1.83	1.79	1.78
MnO	5.65	5.52	5.38	5.27	5.24	5.20	4.83	4.85	4.82	4.93	4.75	4.83	5.14
FeO	30.52	30.61	30.81	30.86	31.10	31.27	31.47	31.65	31.91	31.78	32.01	32.05	32.04
Na_2O	0.02	0.03	0.01	0.01	0.04	0.03	0.02	0.04	0.04	0.05	0.04	0.06	0.08
Total	99.53	98.92	99.71	99.30	99.44	99.89	99.29	99.64	99.23	99.33	99.49	98.77	99.76
Cations (Formula based on 24 O)													
Si	5.888	5.879	5.924	5.873	5.843	5.917	5.919	5.908	5.856	5.894	5.916	5.867	5.927
Ti	0.000	0.000	0.000	0.000	0.004	0.005	0.001	0.007	0.009	0.000	0.000	0.004	0.000
Al	4.116	4.115	4.079	4.151	4.176	4.083	4.111	4.104	4.141	4.124	4.119	4.157	4.116
Y	0.005	0.004	0.012	0.006	0.000	0.002	0.001	0.002	0.000	0.000	0.000	0.004	0.002
Mg	0.709	0.701	0.708	0.701	0.693	0.707	0.682	0.696	0.693	0.674	0.673	0.627	0.601
Ca	0.410	0.419	0.397	0.395	0.389	0.372	0.373	0.359	0.344	0.335	0.318	0.314	0.309
Mn	0.775	0.763	0.736	0.725	0.721	0.710	0.664	0.665	0.665	0.678	0.652	0.670	0.704
Fe	4.135	4.176	4.164	4.189	4.220	4.220	4.270	4.283	4.347	4.320	4.339	4.390	4.338
Na	0.006	0.010	0.002	0.003	0.013	0.008	0.005	0.012	0.012	0.015	0.013	0.019	0.025
Grossular	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
Spessartine	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.12
Almandine	0.69	0.69	0.69	0.70	0.70	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.73
Pyrope	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.12	0.11	0.11	0.11	0.10	0.10
x(g)	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.86	0.86	0.87	0.87	0.88	0.88

Table 11 continued: Garnet major element profile.

ID	1698-10 61	1	2	3	4	5	6	7	8	9	10	11	12
Oxide %													
SiO_2	49.21	36.13	35.94	35.52	36.16	35.91	33.70	36.37	35.90	36.77	36.13	35.98	36.35
TiO_2	0.00	0.00	0.04	0.00	0.02	0.00	0.07	0.00	0.07	0.03	0.00	0.00	0.02
Al_2O_3	24.43	21.32	21.28	21.46	21.49	21.23	21.48	21.41	21.50	21.40	21.44	21.38	21.34
Fe_2O_3	0.00	0.12	0.06	0.13	0.14	0.16	0.05	0.13	0.11	0.15	0.12	0.14	0.13
MgO	0.25	2.07	2.49	2.71	2.77	2.62	2.60	2.83	2.87	2.91	2.92	3.07	3.02
CaO	4.96	2.41	2.43	2.53	2.51	2.63	2.95	3.19	2.68	2.56	2.32	2.24	2.39
MnO	0.43	7.58	6.80	6.62	6.46	6.05	5.67	6.14	6.16	6.14	6.05	6.05	6.04
FeO	5.27	29.02	29.14	29.16	29.41	28.91	28.89	28.97	29.17	29.39	29.79	29.46	29.46
Na_2O	7.82	0.03	0.04	0.03	0.01	0.04	0.08	0.05	0.02	0.06	0.05	0.01	0.02
Total	92.47	98.69	98.25	98.24	99.03	97.63	95.58	99.10	98.50	99.44	98.83	98.37	98.83
Cations (Formula based on 24 O)													
Si	7.393	5.922	5.903	5.841	5.887	5.917	5.709	5.904	5.869	5.943	5.891	5.888	5.916
Ti	0.000	0.000	0.005	0.000	0.002	0.000	0.009	0.000	0.009	0.004	0.000	0.000	0.002
Al	4.326	4.118	4.120	4.160	4.124	4.124	4.288	4.097	4.142	4.076	4.120	4.123	4.093
Y	0.000	0.011	0.005	0.011	0.012	0.014	0.005	0.012	0.009	0.013	0.010	0.012	0.012
Mg	0.055	0.505	0.608	0.665	0.673	0.645	0.657	0.686	0.699	0.702	0.708	0.748	0.732
Ca	0.798	0.422	0.428	0.445	0.437	0.464	0.536	0.554	0.469	0.443	0.404	0.392	0.417
Mn	0.055	1.052	0.946	0.922	0.891	0.844	0.814	0.845	0.852	0.840	0.835	0.838	0.833
Fe	0.663	3.977	4.003	4.011	4.004	3.984	4.092	3.933	3.989	3.972	4.062	4.032	4.010
Na	2.279	0.010	0.014	0.011	0.003	0.013	0.027	0.014	0.006	0.018	0.014	0.002	0.007
Grossular	0.51	0.07	0.07	0.07	0.07	0.08	0.09	0.09	0.08	0.07	0.07	0.07	0.07
Spessartine	0.04	0.18	0.16	0.15	0.15	0.14	0.13	0.14	0.14	0.14	0.14	0.14	0.14
Almandine	0.42	0.67	0.67	0.66	0.67	0.67	0.67	0.65	0.66	0.67	0.68	0.67	0.67
Pyrope	0.04	0.08	0.10	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
x(g)	0.92	0.89	0.87	0.86	0.86	0.86	0.86	0.85	0.85	0.85	0.85	0.84	0.85

Table 11 continued: Garnet major element profile.

ID	1664-1												
	13	14	15	16	17	18	19	20	21	22	23	24	25
Oxide %													
SiO_2	36.04	35.53	35.61	35.32	36.32	36.26	36.84	36.00	35.95	35.80	35.84	35.91	35.36
TiO_2	0.02	0.00	0.00	0.02	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	21.35	21.40	21.34	21.99	21.42	21.69	21.68	21.74	21.67	21.45	21.54	21.78	21.52
Fe_2O_3	0.11	0.07	0.21	0.14	0.11	0.14	0.23	0.20	0.15	0.15	0.14	0.13	0.03
MgO	2.95	2.95	2.92	2.88	2.77	2.88	2.83	2.92	2.89	2.93	2.94	3.00	2.91
CaO	2.29	2.47	2.68	2.73	3.11	3.56	3.58	3.63	3.67	3.19	2.99	2.71	2.57
MnO	6.12	6.06	5.84	5.49	5.83	5.78	5.74	5.79	5.77	5.85	5.80	6.08	6.07
FeO	29.37	29.39	29.33	28.10	28.87	29.11	29.07	29.02	28.87	29.30	29.63	29.70	29.63
Na_2O	0.04	0.04	0.04	0.05	0.05	0.08	0.06	0.05	0.05	0.02	0.03	0.03	0.04
Total	98.35	97.94	97.98	96.72	98.52	99.60	100.02	99.43	99.03	98.70	98.95	99.35	98.19
Cations (Formula based on 24 O)													
Si	5.898	5.850	5.859	5.844	5.919	5.860	5.915	5.832	5.843	5.848	5.843	5.830	5.817
Ti	0.002	0.000	0.000	0.002	0.007	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	4.119	4.152	4.139	4.287	4.114	4.130	4.102	4.151	4.152	4.130	4.138	4.166	4.171
Y	0.010	0.006	0.018	0.012	0.009	0.012	0.019	0.017	0.013	0.013	0.012	0.011	0.003
Mg	0.718	0.723	0.716	0.711	0.673	0.694	0.678	0.706	0.701	0.714	0.716	0.725	0.713
Ca	0.401	0.436	0.473	0.484	0.543	0.617	0.615	0.629	0.639	0.558	0.523	0.471	0.453
Mn	0.849	0.845	0.814	0.769	0.805	0.791	0.780	0.795	0.794	0.810	0.801	0.836	0.846
Fe	4.020	4.047	4.037	3.887	3.934	3.934	3.904	3.932	3.925	4.003	4.039	4.032	4.077
Na	0.011	0.012	0.013	0.016	0.015	0.025	0.019	0.015	0.017	0.007	0.009	0.010	0.014
Grossular	0.07	0.07	0.08	0.08	0.09	0.10	0.10	0.10	0.11	0.09	0.09	0.08	0.07
Spessartine	0.14	0.14	0.13	0.13	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14
Almandine	0.67	0.67	0.67	0.66	0.66	0.65	0.65	0.65	0.65	0.66	0.66	0.66	0.67
Pyrope	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12
x(g)	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85

Table 11 continued: Garnet major element profile.

ID	1664-1						1664-2						
	26	27	28	29	30	31	1	2	3	4	5	6	7
Oxide %													
SiO_2	35.29	36.04	35.74	35.85	36.28	49.40	54.30	36.57	35.85	37.24	36.63	36.22	36.64
TiO_2	0.00	0.00	0.00	0.03	0.00	0.07	0.00	0.04	0.00	0.00	0.00	0.02	0.04
Al_2O_3	21.51	21.75	21.57	21.62	21.55	23.71	15.05	21.34	21.42	21.53	21.17	21.37	21.47
Fe_2O_3	0.14	0.18	0.12	0.10	0.15	0.00	0.01	0.10	0.09	0.05	0.02	0.11	0.03
MgO	2.87	2.89	2.84	2.83	2.71	0.45	1.94	2.71	2.80	2.83	3.03	2.98	2.93
CaO	2.76	2.76	2.76	2.54	2.64	4.98	1.37	2.22	2.10	2.27	2.36	2.61	2.94
MnO	6.04	6.23	6.43	6.59	6.75	1.61	5.02	6.60	6.65	6.33	6.30	6.05	5.89
FeO	29.40	29.67	29.64	29.66	29.35	8.62	13.94	28.95	29.75	29.55	29.85	29.68	29.30
Na_2O	0.03	0.04	0.04	0.03	0.05	6.50	0.04	0.03	0.02	0.04	0.05	0.03	0.10
Total	98.05	99.56	99.17	99.26	99.48	95.44	101.15	98.55	98.71	99.83	99.52	99.10	99.36
Cations (Formula based on 24 O)													
Si	5.813	5.841	5.828	5.836	5.885	7.328	7.840	5.961	5.868	5.985	5.932	5.890	5.924
Ti	0.000	0.000	0.000	0.004	0.000	0.008	0.000	0.004	0.000	0.000	0.000	0.002	0.004
Al	4.177	4.156	4.145	4.148	4.120	4.146	2.560	4.099	4.132	4.077	4.042	4.096	4.092
Y	0.012	0.016	0.011	0.008	0.013	0.000	0.001	0.008	0.007	0.004	0.002	0.009	0.003
Mg	0.704	0.698	0.689	0.686	0.655	0.100	0.418	0.658	0.683	0.678	0.731	0.721	0.707
Ca	0.488	0.479	0.481	0.444	0.458	0.792	0.211	0.388	0.368	0.390	0.409	0.454	0.509
Mn	0.843	0.855	0.888	0.909	0.928	0.203	0.613	0.911	0.922	0.862	0.865	0.833	0.806
Fe	4.050	4.022	4.041	4.038	3.981	1.069	1.683	3.947	4.073	3.972	4.043	4.037	3.962
Na	0.009	0.011	0.012	0.009	0.016	1.869	0.010	0.009	0.007	0.012	0.017	0.009	0.030
Grossular	0.08	0.08	0.08	0.07	0.08	0.37	0.07	0.07	0.06	0.07	0.07	0.08	0.09
Spessartine	0.14	0.14	0.15	0.15	0.15	0.09	0.21	0.15	0.15	0.15	0.14	0.14	0.13
Almandine	0.67	0.66	0.66	0.66	0.66	0.49	0.58	0.67	0.67	0.67	0.67	0.67	0.66
Pyrope	0.12	0.12	0.11	0.11	0.11	0.05	0.14	0.11	0.11	0.11	0.12	0.12	0.12
x(g)	0.85	0.85	0.85	0.85	0.86	0.91	0.80	0.86	0.86	0.85	0.85	0.85	0.85

Table 11 continued: Garnet major element profile.

ID	1664-2												
	8	9	10	11	12	13	14	15	16	17	18	19	20
Oxide %													
SiO_2	36.29	37.08	36.61	36.33	36.54	32.19	36.75	37.38	37.05	37.01	36.20	36.31	37.19
TiO_2	0.02	0.00	0.00	0.02	0.02	0.09	0.01	0.00	0.00	0.04	0.00	0.00	0.04
Al_2O_3	21.35	21.36	21.47	21.41	21.46	20.84	21.43	21.59	21.44	21.67	21.33	21.31	21.44
Fe_2O_3	0.05	0.11	0.11	0.16	0.17	0.07	0.20	0.18	0.16	0.21	0.14	0.17	0.13
MgO	3.02	2.97	2.91	3.00	2.94	3.87	2.93	2.96	2.96	2.79	2.91	2.90	2.73
CaO	2.87	2.97	3.14	3.12	3.36	2.38	3.27	3.17	3.36	3.62	3.68	3.63	3.59
MnO	5.94	5.81	5.74	5.61	5.65	4.14	5.78	5.66	5.67	5.67	5.59	5.62	5.56
FeO	29.65	29.57	29.40	29.23	29.29	29.32	29.29	29.21	29.05	28.94	28.81	28.77	28.76
Na_2O	0.05	0.03	0.05	0.03	0.05	0.05	0.04	0.07	0.07	0.06	0.11	0.08	0.10
Total	99.23	99.89	99.45	98.94	99.50	92.95	99.84	100.22	99.77	100.00	98.78	98.87	99.59
Cations (Formula based on 24 O)													
Si	5.891	5.961	5.917	5.902	5.905	5.605	5.920	5.974	5.956	5.935	5.893	5.903	5.980
Ti	0.002	0.000	0.000	0.002	0.002	0.012	0.001	0.000	0.000	0.005	0.000	0.000	0.005
Al	4.085	4.047	4.090	4.099	4.087	4.276	4.068	4.066	4.061	4.095	4.091	4.083	4.063
Y	0.004	0.010	0.010	0.014	0.015	0.006	0.017	0.015	0.014	0.018	0.012	0.015	0.011
Mg	0.730	0.711	0.702	0.727	0.708	1.005	0.704	0.705	0.710	0.668	0.706	0.703	0.654
Ca	0.499	0.511	0.544	0.543	0.582	0.443	0.565	0.542	0.578	0.622	0.642	0.632	0.619
Mn	0.816	0.791	0.785	0.772	0.773	0.610	0.788	0.766	0.772	0.770	0.771	0.773	0.758
Fe	4.026	3.975	3.973	3.972	3.958	4.270	3.946	3.904	3.905	3.882	3.922	3.911	3.867
Na	0.017	0.011	0.016	0.009	0.017	0.016	0.014	0.023	0.023	0.017	0.034	0.025	0.030
Grossular	0.08	0.09	0.09	0.09	0.10	0.07	0.09	0.09	0.10	0.10	0.11	0.11	0.10
Spessartine	0.13	0.13	0.13	0.13	0.13	0.10	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Almandine	0.66	0.66	0.66	0.66	0.66	0.67	0.66	0.66	0.65	0.65	0.65	0.65	0.66
Pyrope	0.12	0.12	0.12	0.12	0.12	0.16	0.12	0.12	0.12	0.11	0.12	0.12	0.11
x(g)	0.85	0.85	0.85	0.85	0.85	0.81	0.85	0.85	0.85	0.85	0.85	0.85	0.86

Table 11 continued: Garnet major element profile.

ID	1664-2											1664-3	
	21	22	23	24	25	26	27	28	29	30	31	1	2
Oxide %													
SiO_2	37.18	37.46	37.05	37.44	37.13	37.01	33.12	36.71	36.10	36.76	36.16	38.03	35.82
TiO_2	0.05	0.01	0.01	0.04	0.04	0.00	0.12	0.00	0.03	0.02	0.00	0.01	0.00
Al_2O_3	21.38	21.40	21.56	21.38	21.24	21.40	20.84	21.34	21.44	21.26	21.36	26.36	21.41
Fe_2O_3	0.21	0.21	0.19	0.18	0.19	0.13	0.07	0.10	0.14	0.20	0.10	0.05	0.14
MgO	2.83	2.81	2.78	2.73	2.76	2.67	3.72	2.42	2.32	2.33	2.29	1.72	2.60
CaO	3.67	3.71	3.63	3.66	3.62	3.62	2.57	3.23	3.01	2.79	2.44	3.39	2.37
MnO	5.79	5.79	5.87	5.87	6.05	6.10	4.86	6.55	6.83	6.93	7.33	4.69	7.13
FeO	28.82	28.62	28.89	28.71	28.79	28.92	28.14	28.89	29.26	29.09	29.29	18.98	29.43
Na_2O	0.08	0.08	0.06	0.07	0.03	0.02	0.04	0.03	0.04	0.05	0.04	2.55	0.02
Total	100.02	100.08	100.07	100.08	99.89	99.88	93.60	99.25	99.17	99.50	99.13	95.83	99.07
Cations (Formula based on 24 O)													
Si	5.963	5.993	5.942	5.994	5.969	5.953	5.701	5.952	5.884	5.959	5.901	6.033	5.857
Ti	0.007	0.001	0.001	0.004	0.004	0.000	0.015	0.000	0.004	0.002	0.000	0.001	0.000
Al	4.041	4.036	4.076	4.034	4.024	4.057	4.228	4.078	4.119	4.062	4.109	4.928	4.124
Y	0.018	0.018	0.016	0.015	0.016	0.011	0.006	0.009	0.012	0.017	0.008	0.004	0.012
Mg	0.678	0.669	0.664	0.651	0.661	0.639	0.955	0.584	0.564	0.562	0.557	0.408	0.634
Ca	0.630	0.636	0.623	0.627	0.624	0.625	0.473	0.560	0.526	0.485	0.427	0.576	0.416
Mn	0.786	0.784	0.797	0.796	0.824	0.831	0.709	0.899	0.943	0.951	1.013	0.629	0.987
Fe	3.866	3.830	3.875	3.844	3.870	3.891	4.050	3.917	3.989	3.943	3.999	2.518	4.024
Na	0.026	0.024	0.019	0.022	0.010	0.006	0.014	0.008	0.013	0.015	0.012	0.785	0.005
Grossular	0.11	0.11	0.10	0.11	0.10	0.10	0.08	0.09	0.09	0.08	0.07	0.14	0.07
Spessartine	0.13	0.13	0.13	0.13	0.14	0.14	0.11	0.15	0.16	0.16	0.17	0.15	0.16
Almandine	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.66	0.66	0.66	0.67	0.61	0.66
Pyrope	0.11	0.11	0.11	0.11	0.11	0.11	0.15	0.10	0.09	0.09	0.09	0.10	0.10
x(g)	0.85	0.85	0.85	0.86	0.85	0.86	0.81	0.87	0.88	0.88	0.88	0.86	0.86

Table 11 continued: Garnet major element profile.

ID	1664-3												
	3	4	5	6	7	8	9	10	11	12	13	14	15
Oxide %													
SiO_2	34.27	32.73	35.23	34.91	34.57	35.19	34.78	34.82	36.32	35.91	35.99	35.71	35.71
TiO_2	0.00	0.00	0.02	0.00	0.04	0.00	0.02	0.02	0.00	0.05	0.00	0.00	0.00
Al_2O_3	21.60	19.11	22.03	21.66	21.74	21.60	21.59	21.48	21.46	21.72	21.55	21.59	21.48
Fe_2O_3	0.09	0.07	0.17	0.18	0.08	0.07	0.14	0.18	0.15	0.19	0.12	0.09	0.23
MgO	2.67	2.96	2.75	2.76	2.68	2.68	2.67	2.68	2.65	2.69	2.70	2.77	2.77
CaO	2.36	1.85	2.40	2.54	2.77	3.04	3.07	3.27	3.78	3.79	3.69	3.67	3.52
MnO	6.92	5.93	6.72	6.79	6.71	6.67	6.48	6.29	6.20	6.11	6.26	6.16	6.08
FeO	29.40	27.88	29.51	29.58	29.26	29.32	29.33	28.64	28.66	28.61	28.59	28.90	28.52
Na_2O	0.04	0.04	0.06	0.04	0.03	0.04	0.04	0.04	0.05	0.03	0.04	0.05	0.05
Total	97.47	90.57	98.97	98.51	97.97	98.65	98.16	97.42	99.39	99.18	99.02	98.95	98.41
Cations (Formula based on 24 O)													
Si	5.716	5.859	5.762	5.751	5.724	5.779	5.747	5.779	5.885	5.834	5.857	5.823	5.847
Ti	0.000	0.000	0.002	0.000	0.006	0.000	0.002	0.002	0.000	0.005	0.000	0.000	0.000
Al	4.246	4.031	4.247	4.205	4.242	4.181	4.204	4.202	4.099	4.159	4.132	4.150	4.145
Y	0.008	0.007	0.015	0.016	0.007	0.006	0.013	0.016	0.013	0.017	0.011	0.008	0.020
Mg	0.663	0.790	0.670	0.678	0.662	0.655	0.657	0.663	0.641	0.651	0.654	0.672	0.676
Ca	0.422	0.355	0.420	0.449	0.492	0.536	0.543	0.581	0.656	0.660	0.643	0.641	0.617
Mn	0.978	0.899	0.931	0.947	0.940	0.928	0.907	0.884	0.851	0.840	0.863	0.851	0.843
Fe	4.100	4.173	4.036	4.076	4.052	4.027	4.053	3.976	3.884	3.887	3.891	3.941	3.905
Na	0.014	0.012	0.018	0.011	0.010	0.012	0.013	0.014	0.015	0.009	0.014	0.016	0.017
Grossular	0.07	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.11	0.11	0.11	0.10	0.10
Spessartine	0.16	0.14	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.14
Almandine	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.65	0.64	0.64	0.64	0.65	0.65
Pyrope	0.11	0.13	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
x(g)	0.86	0.84	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.85	0.85

Table 11 continued: Garnet major element profile.

ID	1664-3 16	17	18	19	20	21	22	23	24	25	26	27	28
Oxide %													
SiO_2	35.96	34.97	34.95	36.32	34.86	32.71	35.61	35.95	35.40	36.54	36.39	36.42	35.46
TiO_2	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.02	0.00	0.08	0.00	0.01	0.00
Al_2O_3	21.67	21.60	21.82	21.50	15.32	25.24	21.53	21.55	21.65	21.43	21.69	21.59	21.49
Fe_2O_3	0.17	0.20	0.09	0.11	0.09	0.15	0.17	0.15	0.21	0.20	0.20	0.14	0.18
MgO	2.79	2.83	2.87	2.80	1.80	2.96	2.84	2.80	2.78	2.63	2.66	2.68	2.67
CaO	3.19	3.07	3.10	3.16	2.82	3.10	3.39	3.43	3.47	3.59	3.63	3.57	3.59
MnO	6.26	6.19	6.14	6.29	5.92	5.98	6.34	6.29	6.23	6.26	6.25	6.19	6.50
FeO	29.26	28.94	28.88	29.18	23.52	27.66	28.99	28.85	28.94	28.62	28.75	28.79	28.94
Na_2O	0.04	0.06	0.06	0.05	0.10	0.09	0.05	0.05	0.04	0.06	0.05	0.04	0.03
Total	99.34	97.90	98.08	99.46	89.44	97.95	98.93	99.07	98.75	99.52	99.73	99.44	98.85
Cations (Formula based on 24 O)													
Si	5.841	5.774	5.757	5.885	6.290	5.369	5.815	5.850	5.792	5.909	5.877	5.894	5.805
Ti	0.000	0.001	0.001	0.002	0.000	0.000	0.000	0.002	0.000	0.010	0.000	0.001	0.000
Al	4.149	4.204	4.235	4.105	3.257	4.882	4.145	4.133	4.176	4.085	4.128	4.116	4.145
Y	0.014	0.018	0.008	0.010	0.009	0.013	0.015	0.013	0.018	0.018	0.017	0.012	0.016
Mg	0.675	0.696	0.703	0.677	0.483	0.725	0.692	0.678	0.678	0.633	0.641	0.647	0.652
Ca	0.555	0.542	0.547	0.548	0.546	0.545	0.594	0.599	0.609	0.622	0.628	0.619	0.629
Mn	0.861	0.866	0.856	0.863	0.904	0.832	0.877	0.867	0.864	0.857	0.854	0.848	0.901
Fe	3.975	3.997	3.978	3.953	3.548	3.797	3.959	3.926	3.960	3.871	3.883	3.896	3.962
Na	0.012	0.018	0.018	0.015	0.033	0.028	0.017	0.015	0.014	0.018	0.016	0.011	0.008
Grossular	0.09	0.09	0.09	0.09	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Spessartine	0.14	0.14	0.14	0.14	0.16	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15
Almandine	0.66	0.66	0.65	0.65	0.65	0.64	0.65	0.65	0.65	0.65	0.65	0.65	0.64
Pyrope	0.11	0.11	0.12	0.11	0.09	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11
x(g)	0.85	0.85	0.85	0.85	0.88	0.84	0.85	0.85	0.85	0.86	0.86	0.86	0.86

Table 11 continued: Garnet major element profile.

ID	1664-3												
	29	30	31	32	33	34	35	36	37	38	39	40	41
Oxide %													
SiO_2	35.93	36.56	32.93	35.24	34.44	35.23	36.22	34.60	35.38	35.22	34.55	35.03	34.11
TiO_2	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.07	0.02	0.07	0.03	0.02	0.06
Al_2O_3	21.53	21.17	21.44	21.85	21.69	21.77	21.80	21.76	21.78	21.90	21.83	21.81	21.60
Fe_2O_3	0.17	0.17	0.20	0.05	0.07	0.11	0.10	0.15	0.15	0.18	0.26	0.12	0.20
MgO	2.59	2.61	2.93	3.10	2.99	3.08	3.14	3.23	3.16	3.15	3.23	3.21	3.22
CaO	3.51	3.46	2.78	1.50	1.53	1.64	1.70	1.69	1.69	1.71	1.69	1.74	1.70
MnO	6.55	6.57	6.17	6.18	6.04	6.14	6.13	5.93	6.04	5.98	6.03	5.96	5.96
FeO	28.69	28.63	27.15	30.74	30.35	30.54	30.52	30.65	30.73	30.33	30.77	30.54	30.20
Na_2O	0.05	0.05	0.09	0.07	0.11	0.08	0.07	0.05	0.08	0.07	0.06	0.07	0.09
Total	99.06	99.23	93.71	98.75	97.33	98.61	99.67	98.20	99.04	98.66	98.47	98.50	97.18
Cations (Formula based on 24 O)													
Si	5.853	5.934	5.673	5.777	5.736	5.783	5.860	5.716	5.783	5.770	5.700	5.756	5.697
Ti	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.009	0.002	0.008	0.003	0.002	0.008
Al	4.134	4.051	4.354	4.220	4.257	4.211	4.157	4.237	4.196	4.229	4.245	4.224	4.252
Y	0.015	0.015	0.018	0.004	0.006	0.009	0.009	0.013	0.013	0.016	0.022	0.011	0.018
Mg	0.629	0.631	0.752	0.756	0.743	0.752	0.757	0.796	0.769	0.769	0.794	0.787	0.802
Ca	0.613	0.601	0.514	0.264	0.272	0.288	0.294	0.299	0.297	0.299	0.298	0.307	0.304
Mn	0.904	0.903	0.900	0.858	0.852	0.854	0.840	0.830	0.836	0.830	0.843	0.830	0.843
Fe	3.909	3.887	3.912	4.214	4.228	4.193	4.129	4.235	4.200	4.156	4.245	4.197	4.218
Na	0.016	0.015	0.031	0.023	0.036	0.026	0.021	0.016	0.026	0.023	0.019	0.022	0.028
Grossular	0.10	0.10	0.08	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Spessartine	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.14	0.14	0.14
Almandine	0.65	0.65	0.64	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.68
Pyrope	0.10	0.10	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13
x(g)	0.86	0.86	0.84	0.85	0.85	0.85	0.85	0.84	0.85	0.84	0.84	0.84	0.84

Table 11 continued: Garnet major element profile.

ID	1570-3												
	42	43	44	45	46	47	48	49	50	51	52	53	54
Oxide %													
SiO_2	35.47	34.57	35.06	35.20	35.54	34.39	35.57	35.68	34.13	34.79	34.91	34.78	34.12
TiO_2	0.02	0.00	0.02	0.00	0.06	0.05	0.00	0.10	0.01	0.00	0.00	0.00	0.08
Al_2O_3	21.87	21.81	21.81	21.84	21.77	21.83	21.78	21.89	21.65	21.76	21.80	21.85	21.80
Fe_2O_3	0.16	0.17	0.15	0.15	0.14	0.14	0.22	0.13	0.06	0.05	0.23	0.15	0.17
MgO	3.21	3.21	3.26	3.21	3.25	3.25	3.37	3.35	3.35	3.23	3.31	3.38	3.31
CaO	1.73	1.73	1.80	1.76	1.75	1.75	1.78	1.79	1.86	1.85	1.78	1.73	1.73
MnO	5.81	5.71	5.75	5.77	5.87	5.80	5.89	5.74	5.67	5.69	5.74	5.68	5.71
FeO	30.19	30.47	30.49	30.56	30.57	30.44	30.59	30.77	30.46	30.46	30.49	30.61	30.51
Na_2O	0.08	0.06	0.08	0.08	0.07	0.10	0.08	0.09	0.07	0.10	0.10	0.08	0.07
Total	98.53	97.74	98.45	98.57	99.01	97.75	99.30	99.58	97.25	97.93	98.42	98.31	97.53
Cations (Formula based on 24 O)													
Si	5.805	5.728	5.760	5.774	5.799	5.702	5.791	5.788	5.692	5.747	5.742	5.728	5.677
Ti	0.002	0.000	0.002	0.000	0.008	0.007	0.000	0.013	0.001	0.000	0.000	0.000	0.010
Al	4.218	4.259	4.224	4.222	4.186	4.266	4.179	4.186	4.254	4.237	4.226	4.241	4.275
Y	0.014	0.015	0.013	0.013	0.012	0.013	0.019	0.011	0.005	0.004	0.020	0.013	0.015
Mg	0.782	0.792	0.799	0.784	0.790	0.803	0.817	0.809	0.832	0.796	0.812	0.829	0.820
Ca	0.304	0.308	0.318	0.310	0.306	0.310	0.311	0.310	0.332	0.327	0.314	0.306	0.309
Mn	0.806	0.801	0.800	0.801	0.811	0.814	0.812	0.789	0.801	0.796	0.800	0.793	0.804
Fe	4.132	4.222	4.189	4.192	4.172	4.221	4.164	4.175	4.248	4.209	4.195	4.216	4.244
Na	0.026	0.020	0.026	0.025	0.023	0.032	0.026	0.027	0.022	0.031	0.031	0.026	0.023
Grossular	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Spessartine	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Almandine	0.69	0.69	0.69	0.69	0.69	0.69	0.68	0.69	0.68	0.69	0.69	0.69	0.69
Pyrope	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
x(g)	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84

Table 11 continued: Garnet major element profile.

ID	1570-3												
	55	56	57	58	59	60	61	62	63	64	65	66	67
Oxide %													
SiO_2	35.29	35.54	34.91	35.02	34.31	35.01	34.31	35.42	35.43	34.41	33.69	34.45	34.02
TiO_2	0.02	0.03	0.07	0.04	0.00	0.04	0.06	0.07	0.04	0.00	0.04	0.09	0.01
Al_2O_3	21.92	21.72	21.81	22.06	21.90	21.92	21.84	21.86	21.77	21.89	21.70	21.81	21.77
Fe_2O_3	0.18	0.15	0.19	0.22	0.14	0.15	0.16	0.16	0.15	0.21	0.21	0.15	0.21
MgO	3.26	3.30	3.26	3.36	3.32	3.36	3.26	3.27	3.25	3.13	3.19	3.14	3.10
CaO	1.74	1.75	1.74	1.76	1.76	1.77	1.72	1.69	1.73	1.71	1.69	1.69	1.68
MnO	5.74	5.80	5.79	5.87	5.95	5.84	5.91	5.75	5.95	6.02	6.17	6.05	6.21
FeO	30.37	30.60	30.60	30.82	30.75	30.90	30.56	30.57	30.38	30.50	30.56	30.46	30.78
Na_2O	0.07	0.09	0.11	0.05	0.08	0.05	0.06	0.06	0.07	0.09	0.06	0.10	0.04
Total	98.63	99.06	98.54	99.23	98.25	99.10	97.90	98.92	98.80	97.98	97.38	97.93	97.81
Cations (Formula based on 24 O)													
Si	5.777	5.798	5.739	5.718	5.672	5.725	5.687	5.784	5.793	5.700	5.637	5.706	5.664
Ti	0.002	0.004	0.009	0.005	0.000	0.005	0.007	0.009	0.005	0.000	0.005	0.012	0.001
Al	4.229	4.175	4.225	4.245	4.267	4.224	4.267	4.207	4.196	4.272	4.279	4.258	4.271
Y	0.016	0.013	0.017	0.019	0.012	0.013	0.014	0.014	0.013	0.018	0.018	0.013	0.019
Mg	0.795	0.803	0.798	0.817	0.818	0.818	0.806	0.796	0.793	0.772	0.796	0.775	0.769
Ca	0.305	0.306	0.307	0.308	0.313	0.310	0.305	0.295	0.303	0.303	0.303	0.299	0.299
Mn	0.796	0.801	0.806	0.811	0.833	0.809	0.830	0.795	0.824	0.844	0.874	0.849	0.876
Fe	4.158	4.175	4.206	4.208	4.252	4.226	4.236	4.175	4.154	4.225	4.277	4.219	4.285
Na	0.023	0.027	0.035	0.017	0.027	0.016	0.019	0.018	0.022	0.029	0.020	0.031	0.012
Grossular	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Spessartine	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
Almandine	0.69	0.69	0.69	0.68	0.68	0.69	0.69	0.69	0.68	0.69	0.68	0.69	0.69
Pyrope	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12
x(g)	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.85	0.84	0.84	0.85

Table 11 continued: Garnet major element profile.

ID	1570-3					1570-2							
	68	69	70	71	72	1	2	3	4	5	6	7	8
Oxide %													
SiO_2	34.50	34.13	33.41	34.65	43.83	34.43	35.37	36.00	35.89	34.72	35.72	35.40	35.41
TiO_2	0.00	0.07	0.00	0.04	0.04	0.01	0.02	0.00	0.00	0.01	0.03	0.02	0.02
Al_2O_3	21.82	21.87	21.73	21.69	22.02	21.70	21.66	21.63	21.67	21.64	21.61	21.70	21.69
Fe_2O_3	0.18	0.11	0.10	0.14	0.00	0.17	0.05	0.16	0.14	0.13	0.16	0.18	0.17
MgO	2.94	2.78	2.57	2.15	7.30	3.05	3.06	2.97	3.07	3.08	3.15	3.16	3.16
CaO	1.66	1.60	1.59	1.59	2.57	1.57	1.59	1.62	1.64	1.64	1.66	1.66	1.67
MnO	6.22	6.43	6.75	7.14	0.09	6.27	6.46	6.37	6.26	6.14	6.19	5.99	6.07
FeO	30.72	31.04	30.90	30.95	8.85	30.51	30.53	30.69	30.52	30.74	30.68	30.69	30.60
Na_2O	0.05	0.07	0.05	0.06	4.52	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.05
Total	98.12	98.15	97.12	98.41	89.26	97.82	98.80	99.48	99.28	98.20	99.28	98.85	98.84
Cations (Formula based on 24 O)													
Si	5.714	5.668	5.627	5.746	6.912	5.716	5.798	5.853	5.842	5.739	5.822	5.794	5.796
Ti	0.000	0.009	0.000	0.005	0.004	0.001	0.002	0.000	0.000	0.001	0.004	0.002	0.002
Al	4.259	4.280	4.313	4.240	4.093	4.246	4.184	4.145	4.157	4.216	4.150	4.187	4.185
Y	0.016	0.010	0.009	0.013	0.000	0.015	0.004	0.014	0.012	0.011	0.014	0.016	0.015
Mg	0.726	0.689	0.644	0.532	1.717	0.754	0.748	0.719	0.746	0.759	0.765	0.771	0.772
Ca	0.295	0.285	0.286	0.282	0.434	0.279	0.280	0.283	0.286	0.291	0.291	0.291	0.292
Mn	0.872	0.904	0.963	1.003	0.012	0.881	0.897	0.877	0.863	0.860	0.854	0.831	0.842
Fe	4.255	4.311	4.352	4.292	1.168	4.237	4.185	4.172	4.155	4.250	4.181	4.201	4.189
Na	0.015	0.022	0.017	0.019	1.380	0.014	0.016	0.014	0.014	0.012	0.016	0.014	0.016
Grossular	0.05	0.05	0.05	0.05	0.13	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Spessartine	0.14	0.15	0.15	0.16	0.00	0.14	0.15	0.14	0.14	0.14	0.14	0.14	0.14
Almandine	0.69	0.70	0.70	0.70	0.35	0.69	0.68	0.69	0.69	0.69	0.69	0.69	0.69
Pyrope	0.12	0.11	0.10	0.09	0.52	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13
x(g)	0.85	0.86	0.87	0.89	0.40	0.85	0.85	0.85	0.85	0.85	0.85	0.84	0.84

Table 11 continued: Garnet major element profile.

ID	1570-2												
	9	10	11	12	13	14	15	16	17	18	19	20	21
Oxide %													
SiO_2	34.95	35.77	36.06	36.17	35.98	33.87	35.66	35.17	35.61	35.95	35.90	36.11	35.89
TiO_2	0.00	0.03	0.00	0.00	0.09	0.06	0.03	0.06	0.02	0.04	0.00	0.00	0.03
Al_2O_3	21.70	21.52	21.71	21.67	21.57	20.29	21.59	21.68	21.71	21.68	21.60	21.47	21.73
Fe_2O_3	0.15	0.23	0.19	0.17	0.16	0.10	0.12	0.14	0.14	0.11	0.19	0.13	0.16
MgO	3.15	3.18	3.22	3.11	3.14	2.90	3.09	3.07	3.06	3.14	3.16	3.23	3.14
CaO	1.70	1.73	1.71	1.71	1.71	1.60	1.71	1.71	1.70	1.70	1.72	1.67	1.72
MnO	6.04	6.13	6.06	6.06	6.02	5.86	5.97	6.01	5.97	6.01	6.01	5.90	5.97
FeO	30.50	30.19	30.48	30.76	30.59	29.37	30.69	30.69	30.63	30.43	30.46	30.39	30.60
Na_2O	0.04	0.05	0.06	0.02	0.06	0.09	0.05	0.05	0.07	0.05	0.06	0.06	0.08
Total	98.33	98.84	99.52	99.70	99.36	94.14	98.90	98.59	98.92	99.11	99.09	98.98	99.35
Cations (Formula based on 24 O)													
Si	5.758	5.844	5.848	5.859	5.848	5.830	5.829	5.778	5.818	5.851	5.850	5.880	5.834
Ti	0.000	0.004	0.000	0.000	0.011	0.008	0.003	0.008	0.002	0.005	0.000	0.000	0.004
Al	4.214	4.143	4.149	4.137	4.132	4.117	4.159	4.197	4.182	4.158	4.147	4.121	4.164
Y	0.013	0.020	0.016	0.014	0.014	0.009	0.010	0.012	0.012	0.010	0.016	0.012	0.013
Mg	0.774	0.775	0.778	0.750	0.761	0.744	0.753	0.752	0.746	0.763	0.766	0.783	0.761
Ca	0.299	0.302	0.297	0.297	0.298	0.295	0.299	0.300	0.298	0.296	0.300	0.292	0.299
Mn	0.843	0.848	0.832	0.831	0.829	0.855	0.827	0.836	0.826	0.828	0.829	0.814	0.822
Fe	4.202	4.125	4.134	4.166	4.158	4.227	4.196	4.216	4.185	4.141	4.151	4.138	4.160
Na	0.013	0.017	0.020	0.005	0.019	0.029	0.017	0.016	0.022	0.017	0.020	0.018	0.025
Grossular	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Spessartine	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Almandine	0.69	0.68	0.68	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Pyrope	0.13	0.13	0.13	0.12	0.13	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13
x(g)	0.84	0.84	0.84	0.85	0.85	0.85	0.85	0.85	0.85	0.84	0.84	0.84	0.85

Table 11 continued: Garnet major element profile.

ID	1570-2												
	22	23	24	25	26	27	28	29	30	31	32	33	34
Oxide %													
SiO_2	35.66	35.09	35.39	36.13	36.07	35.44	35.55	36.31	36.14	36.33	36.09	35.62	45.95
TiO_2	0.03	0.02	0.03	0.00	0.00	0.04	0.02	0.08	0.00	0.05	0.01	0.05	0.02
Al_2O_3	21.85	21.77	21.60	21.64	21.70	21.62	21.48	21.79	21.70	21.70	21.63	21.65	20.11
Fe_2O_3	0.11	0.11	0.17	0.15	0.18	0.13	0.17	0.16	0.19	0.18	0.17	0.12	0.05
MgO	3.23	3.27	3.09	3.13	3.18	3.16	3.08	3.08	3.06	3.04	2.94	2.91	1.64
CaO	1.73	1.70	1.71	1.68	1.66	1.68	1.66	1.66	1.73	1.73	1.65	1.66	1.96
MnO	6.06	5.99	6.06	6.00	6.17	6.02	6.18	6.18	6.21	6.11	6.25	6.41	4.23
FeO	30.72	30.81	30.62	30.54	30.64	30.57	30.48	30.64	30.58	30.61	30.65	30.42	18.51
Na_2O	0.05	0.03	0.02	0.03	0.06	0.04	0.05	0.04	0.06	0.05	0.06	0.07	2.24
Total	99.47	98.83	98.70	99.32	99.76	98.74	98.73	99.98	99.76	99.82	99.45	98.94	95.99
Cations (Formula based on 24 O)													
Si	5.797	5.753	5.804	5.868	5.843	5.805	5.825	5.861	5.852	5.873	5.865	5.825	7.127
Ti	0.004	0.002	0.003	0.000	0.000	0.005	0.002	0.010	0.000	0.007	0.001	0.006	0.002
Al	4.186	4.206	4.175	4.143	4.142	4.174	4.149	4.145	4.142	4.134	4.141	4.173	3.677
Y	0.010	0.010	0.015	0.013	0.015	0.011	0.015	0.013	0.016	0.015	0.014	0.011	0.004
Mg	0.782	0.799	0.756	0.757	0.767	0.772	0.753	0.742	0.739	0.733	0.713	0.710	0.379
Ca	0.301	0.298	0.300	0.292	0.288	0.295	0.291	0.287	0.300	0.299	0.287	0.290	0.326
Mn	0.835	0.832	0.842	0.826	0.846	0.835	0.857	0.845	0.852	0.837	0.861	0.888	0.556
Fe	4.176	4.224	4.200	4.148	4.150	4.188	4.177	4.136	4.142	4.138	4.164	4.160	2.401
Na	0.016	0.008	0.007	0.009	0.020	0.012	0.015	0.014	0.018	0.016	0.020	0.023	0.672
Grossular	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.09
Spessartine	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15
Almandine	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.66
Pyrope	0.13	0.13	0.12	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.10
x(g)	0.84	0.84	0.85	0.85	0.84	0.84	0.85	0.85	0.85	0.85	0.85	0.85	0.86

Table 11 continued: Garnet major element profile.

ID	1570-2								
	35	36	37	38	39	40	41	42	43
Oxide %									
SiO_2	59.06	60.26	60.36	60.18	60.81	60.12	60.14	35.70	35.86
TiO_2	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.07	0.00
Al_2O_3	24.02	24.69	24.88	24.90	23.64	23.24	24.47	21.67	21.69
Fe_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.20
MgO	0.02	0.00	0.02	0.00	0.03	0.47	0.03	2.96	2.69
CaO	4.55	4.95	5.64	5.47	3.89	3.29	5.25	1.68	1.61
MnO	0.06	0.04	0.00	0.00	0.04	0.00	0.01	6.26	6.68
FeO	0.40	0.35	0.13	0.16	0.58	1.13	0.04	31.04	30.55
Na_2O	8.57	8.50	8.62	8.58	8.91	8.74	8.77	0.05	0.07
Total	96.73	98.85	99.70	99.31	97.94	97.03	98.71	99.63	99.37
Cations (Formula based on 24 O)									
Si	8.135	8.120	8.079	8.082	8.254	8.244	8.120	5.807	5.844
Ti	0.000	0.000	0.002	0.001	0.000	0.000	0.001	0.009	0.000
Al	3.900	3.921	3.925	3.941	3.782	3.757	3.893	4.156	4.167
Y	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.017
Mg	0.004	0.000	0.004	0.000	0.005	0.095	0.005	0.717	0.653
Ca	0.671	0.714	0.808	0.786	0.565	0.483	0.759	0.292	0.282
Mn	0.007	0.005	0.000	0.000	0.004	0.000	0.001	0.863	0.922
Fe	0.046	0.039	0.015	0.018	0.066	0.130	0.005	4.223	4.164
Na	2.290	2.220	2.236	2.233	2.346	2.324	2.295	0.015	0.022
Grossular	0.92	0.94	0.98	0.98	0.88	0.68	0.99	0.05	0.05
Spessartine	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.14	0.15
Almandine	0.06	0.05	0.02	0.02	0.10	0.18	0.01	0.69	0.69
Pyrope	0.01	0.00	0.00	0.00	0.01	0.13	0.01	0.12	0.11
x(g)	0.92	1.00	0.79	1.00	0.93	0.58	0.50	0.85	0.86

Table 12: Garnet trace and REE profiles rim to rim.

ID	1570-1													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
^{89}Y	1818	1796	1884	2081	2059	1841	2111	2263	2041	1891	2043	1787	1765	1900
^{90}Zr	3	2	4	3	5	4	4	4	3	5	3	4	5	3
^{93}Nb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{139}La	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{140}Ce	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{141}Pr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{142}Nd	0	0	0	0	0	0	1	0	0	0	0	0	0	0
^{152}Sm	1	1	1	1	2	1	1	2	2	1	1	0	1	0
^{153}Eu	1	0	0	1	0	1	0	1	0	0	0	0	0	0
^{158}Gd	14	15	24	23	20	28	26	23	24	21	21	15	19	13
^{159}Tb	12	11	15	15	12	14	14	13	11	15	11	12	10	10
^{164}Dy	178	194	218	246	223	221	234	221	213	205	194	185	186	185
^{165}Ho	67	70	84	86	76	76	87	84	80	85	85	74	87	84
^{166}Er	227	266	355	349	291	277	322	371	362	372	389	377	412	429
^{169}Tm	34	40	58	56	44	45	51	63	66	71	73	77	84	89
^{174}Yb	199	254	360	348	318	279	346	453	481	497	564	644	716	758
^{175}Lu	21	27	38	40	35	30	38	51	58	65	74	89	104	120
^{178}Hf	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{180}Hf	0	0	0	0	0	0	0	0	0	0	0	0	0	1
^{238}U	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12: Garnet trace and REE profiles.

ID	15	16	17	18	19	20	21	22	23	24	25	26	27	28
^{89}Y	1701	1619	1626	1469				1538	1477	1270	1195	1221	1334	1178
^{90}Zr	4	2	5	7				4	3	3	5	3	4	10
^{93}Nb	0	0	0	0				0	0	0	0	0	0	0
^{139}La	0	0	0	0				0	0	0	0	0	0	0
^{140}Ce	0	0	1	0				0	0	0	0	0	0	0
^{141}Pr	0	0	0	0				0	0	0	0	0	0	0
^{142}Nd	0	0	0	0				0	0	0	0	0	0	0
^{152}Sm	1	1	1	1				1	0	0	0	0	0	1
^{153}Eu	0	0	0	0				0	0	0	0	0	0	0
^{158}Gd	12	14	12	10				15	7	8	8	10	8	9
^{159}Tb	7	9	6	4				5	5	6	5	6	6	5
^{164}Dy	157	173	149	157				144	130	118	115	122	119	115
^{165}Ho	77	90	78	65				80	72	60	59	60	60	53
^{166}Er	436	507	471	484				545	450	368	370	363	351	324
^{169}Tm	95	117	116	119				138	116	92	95	92	86	76
^{174}Yb	858	1066	1125	1097				1416	1182	952	969	932	848	744
^{175}Lu	152	206	246	263				322	279	208	204	192	163	138
^{178}Hf	0	0	0	0				0	0	0	0	0	0	0
^{180}Hf	0	0	0	0				0	0	0	0	0	0	0
^{238}U	0	0	0	1				0	0	0	0	0	0	0

Table 12: Garnet trace and REE profiles.

ID	29	30	31	32	33	34	35	36	37	38	39	40	41	42
^{89}Y	1176	1471	1299	1396	1510	1336	1401	1471	1578	1263	1263	1180	943	950
^{90}Zr	5	4	6	5	3	5	3	3	4	5	4	4	3	3
^{93}Nb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{139}La	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{140}Ce	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{141}Pr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{142}Nd	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{152}Sm	0	1	0	1	0	1	1	1	2	1	2	1	1	1
^{153}Eu	0	0	0	0	0	0	0	0	0	0	0	1	1	0
^{158}Gd	9	16	12	16	13	15	18	17	17	15	19	18	14	10
^{159}Tb	6	8	7	9	9	9	10	10	9	10	10	11	8	7
^{164}Dy	126	139	140	158	158	142	161	159	163	151	156	121	112	116
^{165}Ho	60	62	58	62	65	62	67	65	64	54	54	48	38	44
^{166}Er	306	311	266	304	322	273	304	282	253	225	225	178	131	170
^{169}Tm	68	69	53	61	61	53	54	50	46	35	39	29	24	29
^{174}Yb	652	599	490	517	521	412	464	360	332	265	280	218	157	202
^{175}Lu	114	101	73	77	72	62	59	45	43	34	36	29	23	27
^{178}Hf	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{180}Hf	0	0	0	0	0	0	0	0	0	0	0	0	0	0
^{238}U	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12: Garnet trace and REE profiles.

ID	1698-1												
	43	44	1	2	3	4	5	6	7	8	9	10	11
^{89}Y	1099	1194	528	561	640	709			1246	1323	1327	1453	1368
^{90}Zr	3	1	12	7	8	8			10	6	8	10	16
^{93}Nb	0	0	0	0	0	0			0	0	0	0	0
^{139}La	0	0	0	0	0	0			0	0	0	0	0
^{140}Ce	0	0	0	0	0	0			0	0	0	0	0
^{141}Pr	0	0	0	0	0	0			0	0	0	0	0
^{142}Nd	0	0	0	1	0	0			0	0	0	0	0
^{152}Sm	1	0	2	2	1	3			3	1	1	1	0
^{153}Eu	0	0	0	1	0	1			0	0	0	0	0
^{158}Gd	10	7	21	25	31	27			23	16	22	18	17
^{159}Tb	7	6	11	12	10	12			10	11	10	12	11
^{164}Dy	115	104	85	104	106	107			159	148	161	173	154
^{165}Ho	45	47	15	17	23	24			44	45	51	57	50
^{166}Er	183	161	40	43	63	63			126	147	157	190	159
^{169}Tm	29	22	5	5	7	7			15	19	20	22	22
^{174}Yb	218	173	24	29	45	36			96	113	152	170	126
^{175}Lu	26	26	4	5	5	4			10	13	21	18	19
^{178}Hf	0	0	0	1	0	0			0	0	0	0	1
^{180}Hf	0	0	0	0	0	0			0	0	0	0	0
^{238}U	0	0	0	0	0	0			0	0	0	0	0

Table 12: Garnet trace and REE profiles.

ID	1664-M2												
	12	13	14	15	16	17	18	19	20	1	2	3	4
^{89}Y	1263	1270		886	765	631	538	533	363	3218	4654	8996	12629
^{90}Zr	7	4		7	13	8	5	7	6	265	471	330	275
^{93}Nb	0	0		0	0	0	0	0	0	128	25	12	27
^{139}La	0	0		0	0	0	0	0	0	17	7	6	13
^{140}Ce	0	0		0	0	0	0	0	0	35	25	14	16
^{141}Pr	0	0		0	0	0	0	0	0	5	4	0	0
^{142}Nd	0	0		0	0	0	0	0	0	24	12	11	9
^{152}Sm	1	1		1	2	2	2	1	1	7	6	0	6
^{153}Eu	0	1		0	1	1	1	1	1	0	0	1	2
^{158}Gd	21	21		20	16	19	23	18	15	7	11	9	40
^{159}Tb	11	10		11	10	9	9	8	5	8	13	20	40
^{164}Dy	166	154		118	102	95	93	82	55	227	329	657	917
^{165}Ho	47	45		33	25	22	19	18	13	147	138	353	524
^{166}Er	149	130		82	69	60	47	47	28	900	1022	2578	3201
^{169}Tm	21	19		10	7	6	5	4	3	265	260	675	848
^{174}Yb	125	98		65	49	37	33	34	24	1886	2336	5536	7093
^{175}Lu	14	14		9	5	5	5	4	2	249	381	779	1228
^{178}Hf	0	0		0	0	0	0	0	0	10	12	4	2
^{180}Hf	0	0		1	0	0	0	0	1	7	3	10	8
^{238}U	0	0		0	0	0	0	0	0	31	6	4	1

Table 12: Garnet trace and REE profiles.

ID	5	6	7	8	9	10	11	12	13	14	15	16	17	18
^{89}Y	7439	8650	17300	17300	18857	26261	23528	21798	21625	10034	11591	20760	22438	21106
^{90}Zr	460	317	185	107	194	156	1730	85	311	363	367	1557	225	78
^{93}Nb	11	3	4	7	2	11	4	2	0	10	4	4	0	7
^{139}La	3	4	0	0	4	0	0	0	0	3	433	38	0	4
^{140}Ce	14	10	2	3	4	3	0	0	4	15	865	97	4	3
^{141}Pr	1	5	0	0	0	0	0	0	0	2	73	14	0	4
^{142}Nd	12	5	-1	1	-1	-2	2	2	2	1	398	66	-1	1
^{152}Sm	8	0	4	6	0	9	19	0	0	0	35	3	19	0
^{153}Eu	0	2	0	0	0	2	6	12	2	2	17	6	8	5
^{158}Gd	24	33	24	61	144	112	54	106	35	61	57	128	64	50
^{159}Tb	14	19	38	36	36	62	48	42	53	23	36	61	34	46
^{164}Dy	472	673	1263	1107	1472	1990	1609	1711	1574	675	900	1555	1574	1401
^{165}Ho	285	393	704	654	789	1002	974	931	848	301	488	879	884	827
^{166}Er	2180	3079	5415	5069	6574	7577	7076	7162	5709	2163	3477	6159	5657	6159
^{169}Tm	566	796	1396	1453	1863	1938	1791	1938	1540	550	934	1609	1557	1505
^{174}Yb	5052	7162	13494	14307	17317	19376	18857	17957	13148	5813	8650	14186	13477	14186
^{175}Lu	900	1436	2353	2560	3097	3443	3391	3166	2128	848	1471	2422	2387	2301
^{178}Hf	9	6	11	2	-1	-1	47	13	16	8	9	66	-1	-1
^{180}Hf	5	18	0	0	6	6	43	2	21	24	10	38	3	8
^{238}U	1	5	2	2	1	1	10	3	4	4	21	5	1	0

Table 12: Garnet trace and REE profiles.

ID	19	20	21	22	23	24	25	26	27	28	29	30	31	32
^{89}Y	16608	17473	11245	3685	6574	14359	8373	7958	6055	6574	10345	7958	1540	952
^{90}Zr	317	258	1107	739	566	606	412	382	282	168	45	272	474	550
^{93}Nb	0	0	3	3	0	5	2	0	8	4	0	0	5	12
^{139}La	3	13	6	8	12	0	8	7	10	7	2	0	13	14
^{140}Ce	4	21	9	33	24	5	21	6	14	12	4	17	27	35
^{141}Pr	0	0	4	2	1	4	1	4	2	2	2	2	3	4
^{142}Nd	-2	1	-1	26	8	1	10	12	-2	-1	-1	-2	21	42
^{152}Sm	0	0	0	0	2	0	14	0	0	0	0	0	4	0
^{153}Eu	5	2	0	1	0	0	0	0	0	0	0	0	6	5
^{158}Gd	81	52	13	20	31	66	36	14	62	12	47	36	19	12
^{159}Tb	54	33	20	21	16	45	18	22	15	7	26	16	7	0
^{164}Dy	1176	1126	576	315	407	900	675	488	439	526	735	606	142	59
^{165}Ho	666	599	433	147	240	554	384	313	247	294	353	311	52	36
^{166}Er	4671	4308	2924	917	1367	3374	2630	1990	1765	2197	3114	1678	367	192
^{169}Tm	1280	1097	727	225	317	779	614	535	360	446	656	467	59	30
^{174}Yb	10726	10899	6505	2405	2699	6782	5657	4031	3512	3875	4792	3287	578	502
^{175}Lu	1695	1644	1021	306	329	917	912	675	541	588	882	415	97	67
^{178}Hf	4	-2	38	6	16	26	0	10	19	-1	-1	1	9	31
^{180}Hf	11	0	33	8	6	7	38	11	24	7	0	5	11	21
^{238}U	1	0	3	3	4	2	5	3	2	1	3	11	6	11

Table 12: Garnet trace and REE profiles.

ID	33
^{89}Y	426
^{90}Zr	635
^{93}Nb	3
^{139}La	18
^{140}Ce	20
^{141}Pr	2
^{142}Nd	3
^{152}Sm	2
^{153}Eu	3
^{158}Gd	5
^{159}Tb	0
^{164}Dy	42
^{165}Ho	32
^{166}Er	99
^{169}Tm	33
^{174}Yb	204
^{175}Lu	40
^{178}Hf	15
^{180}Hf	22
^{238}U	3

APPENDIX IV: GARNET MAPS AND PROFILES

Figure 1: Major element maps of a garnet in 1664.

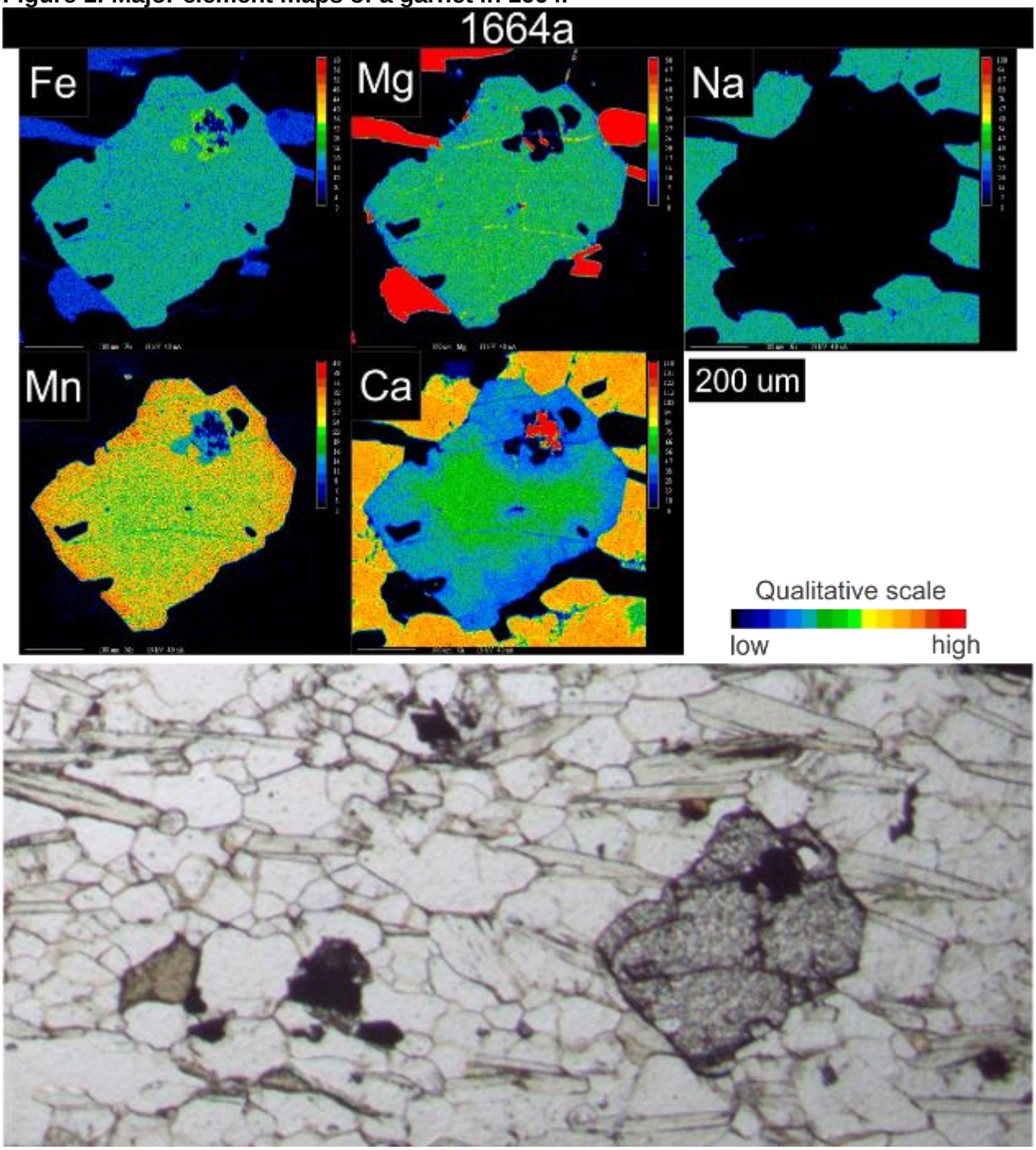


Figure 2: Major and trace element maps of a garnet in 1664. Note the Mg depleted and Mn enriched garnet rim next to the biotite and the oscillatory Y zoning.

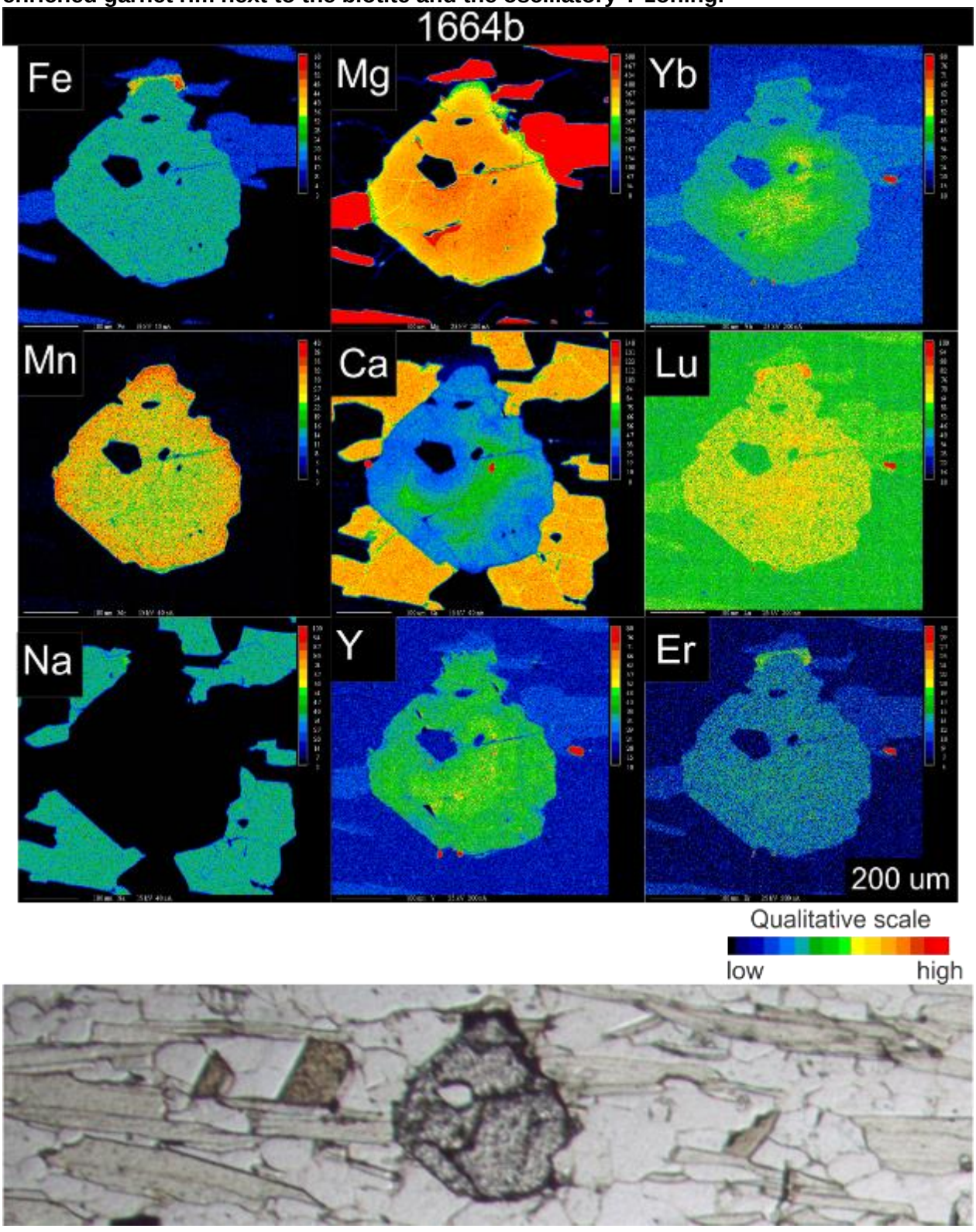


Figure 3: Major element maps of a garnet in 1698.

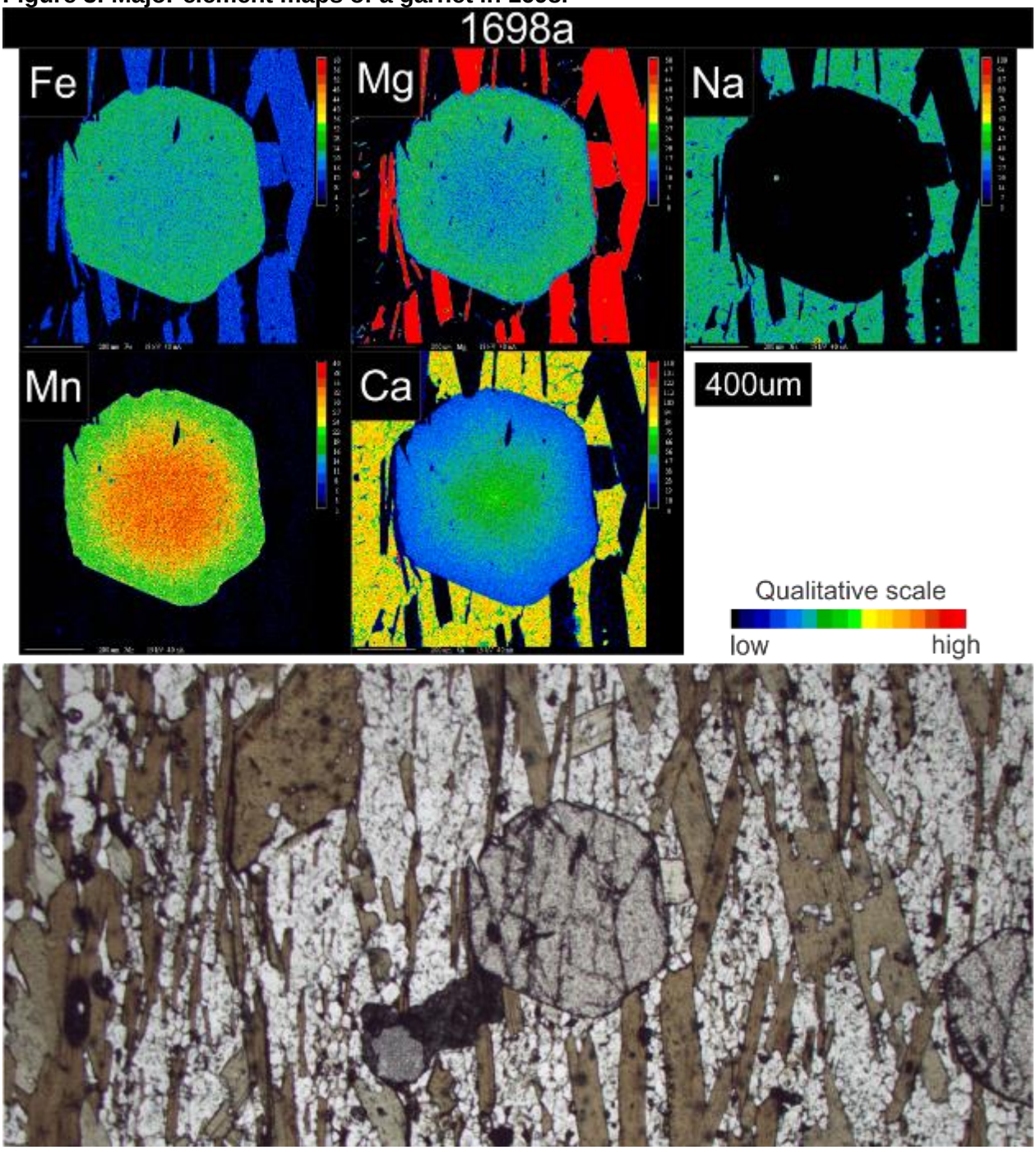


Figure 4: Major element maps of a garnet inclusion in a staurolite in 1698.

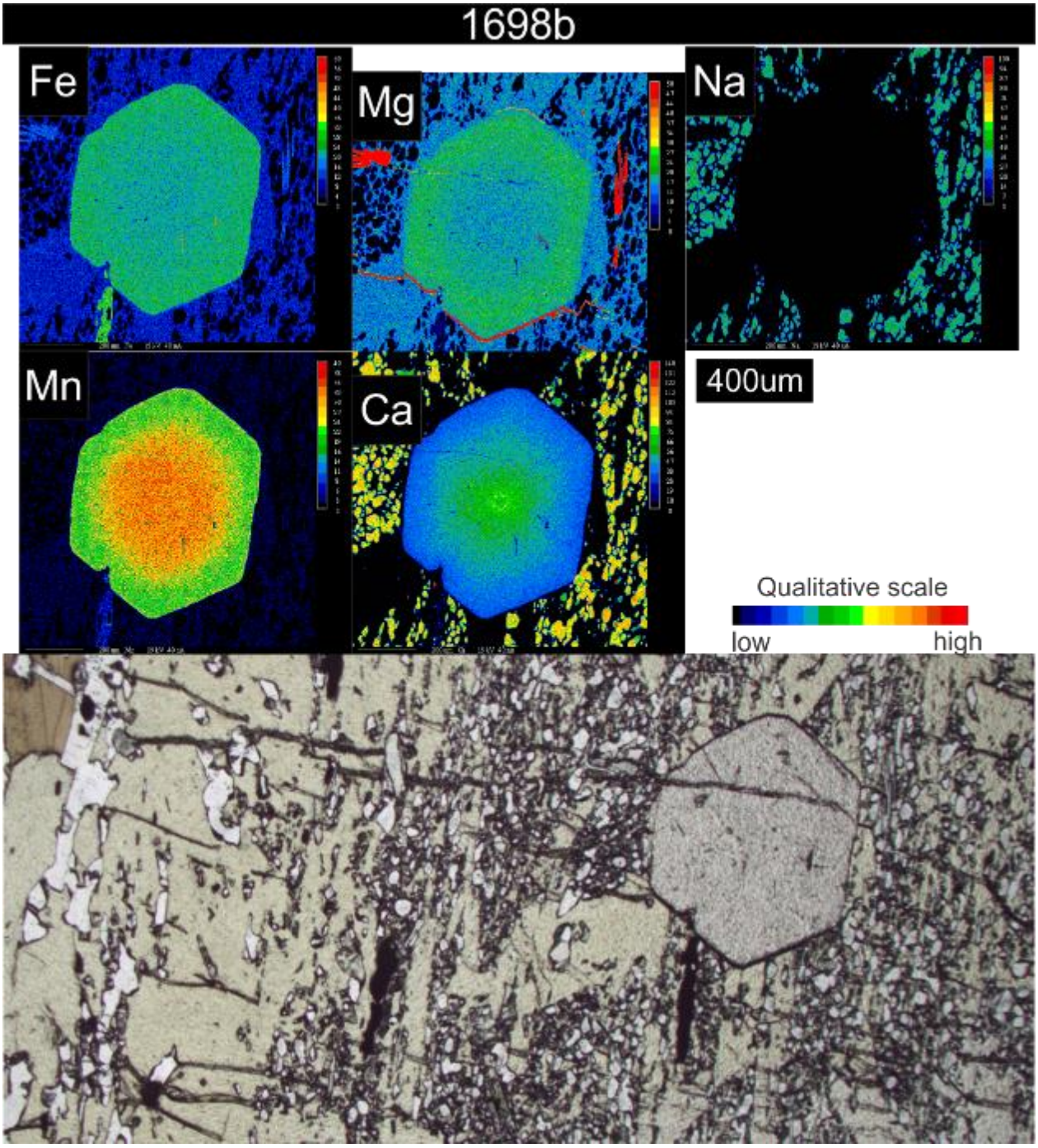


Figure 5: Major element maps of a garnet in 1570. Note the Mg depleted and Mn enriched garnet rim next to the biotite.

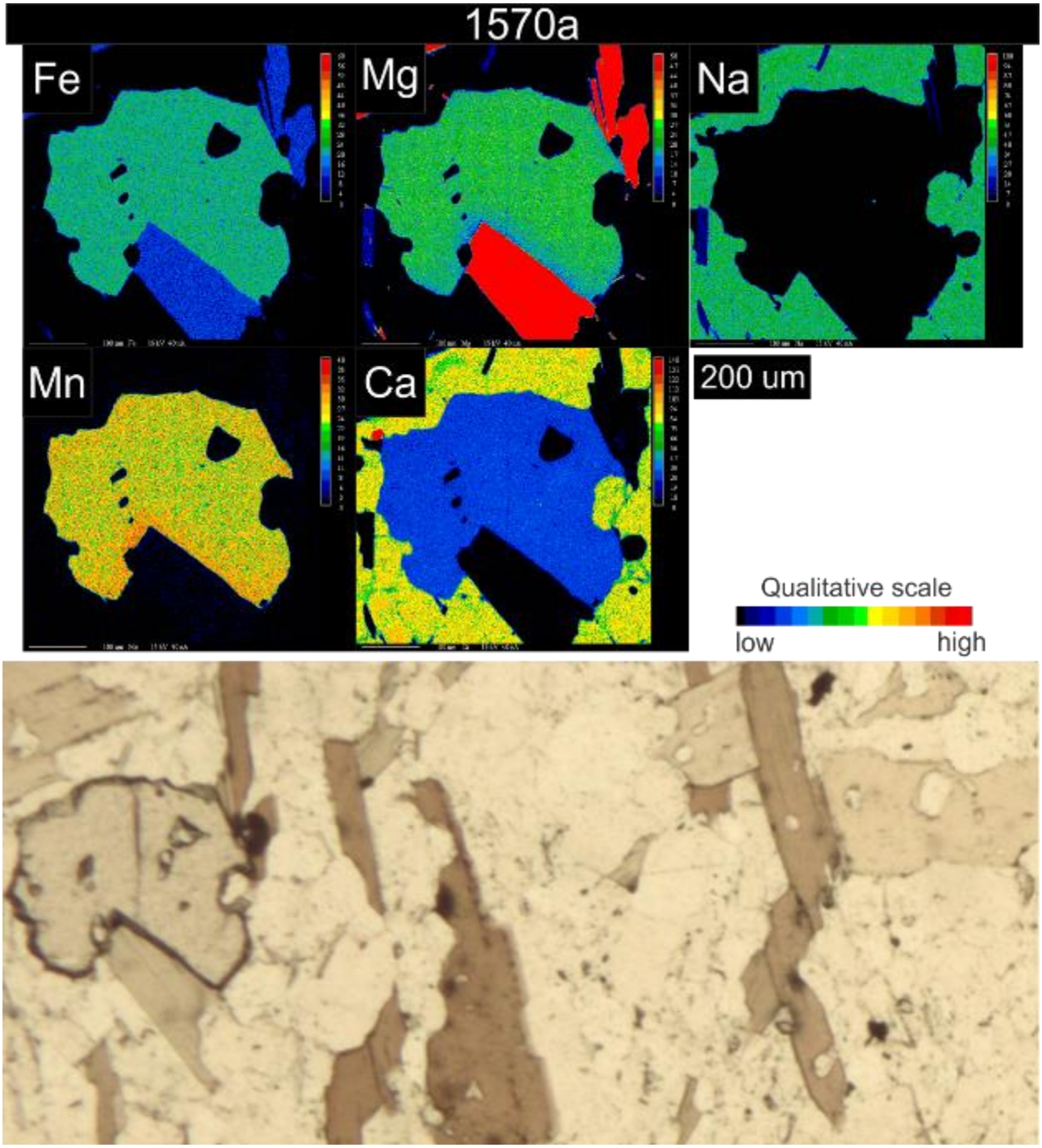


Figure 6: Major and trace element maps of a garnet in 1570.

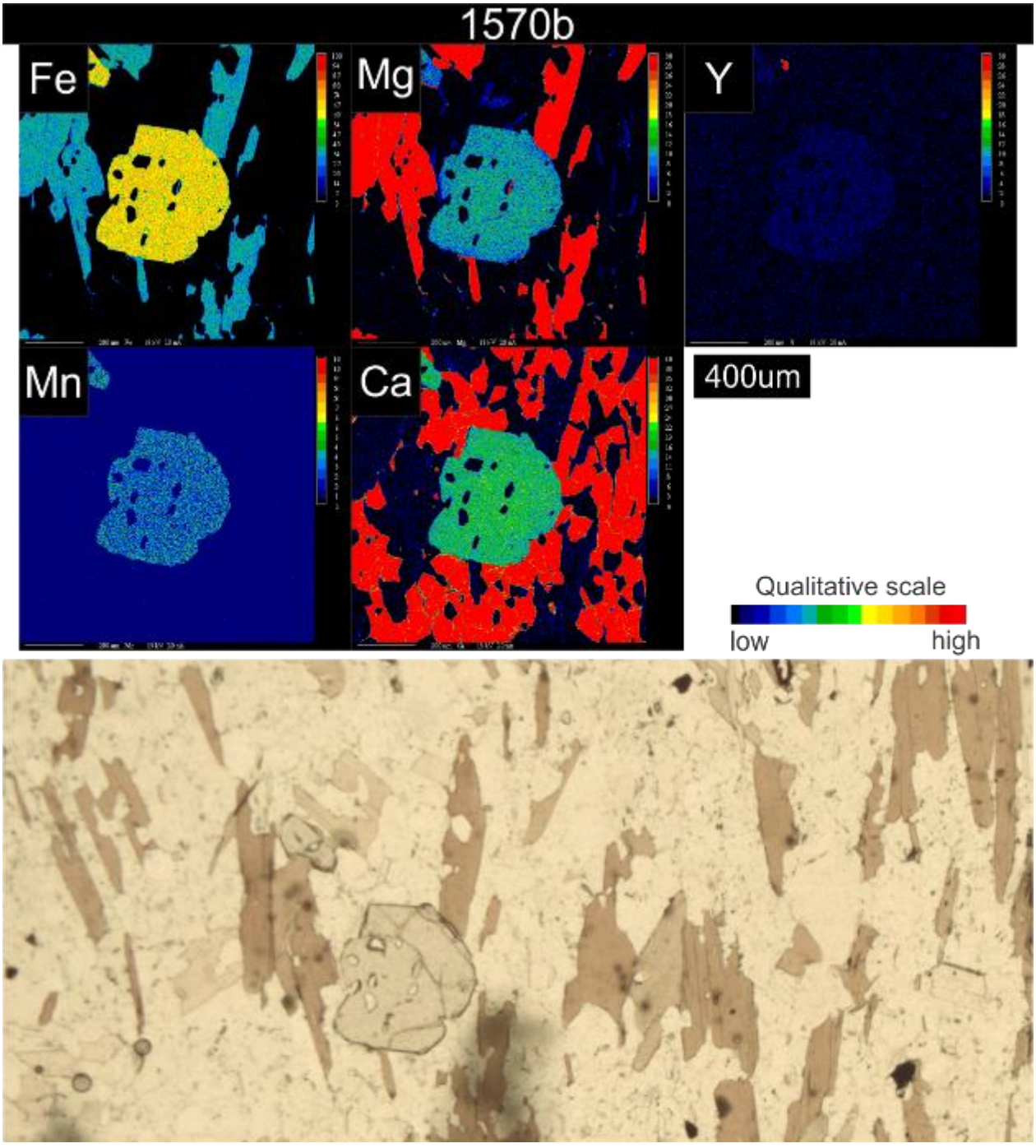


Figure 7: Major element map of an unknown mineral (andalousite?) retrograded to muscovite in thin section 1568. Note the angular relationship between the chlorite inclusions and the main chlorite and muscovite fabric.

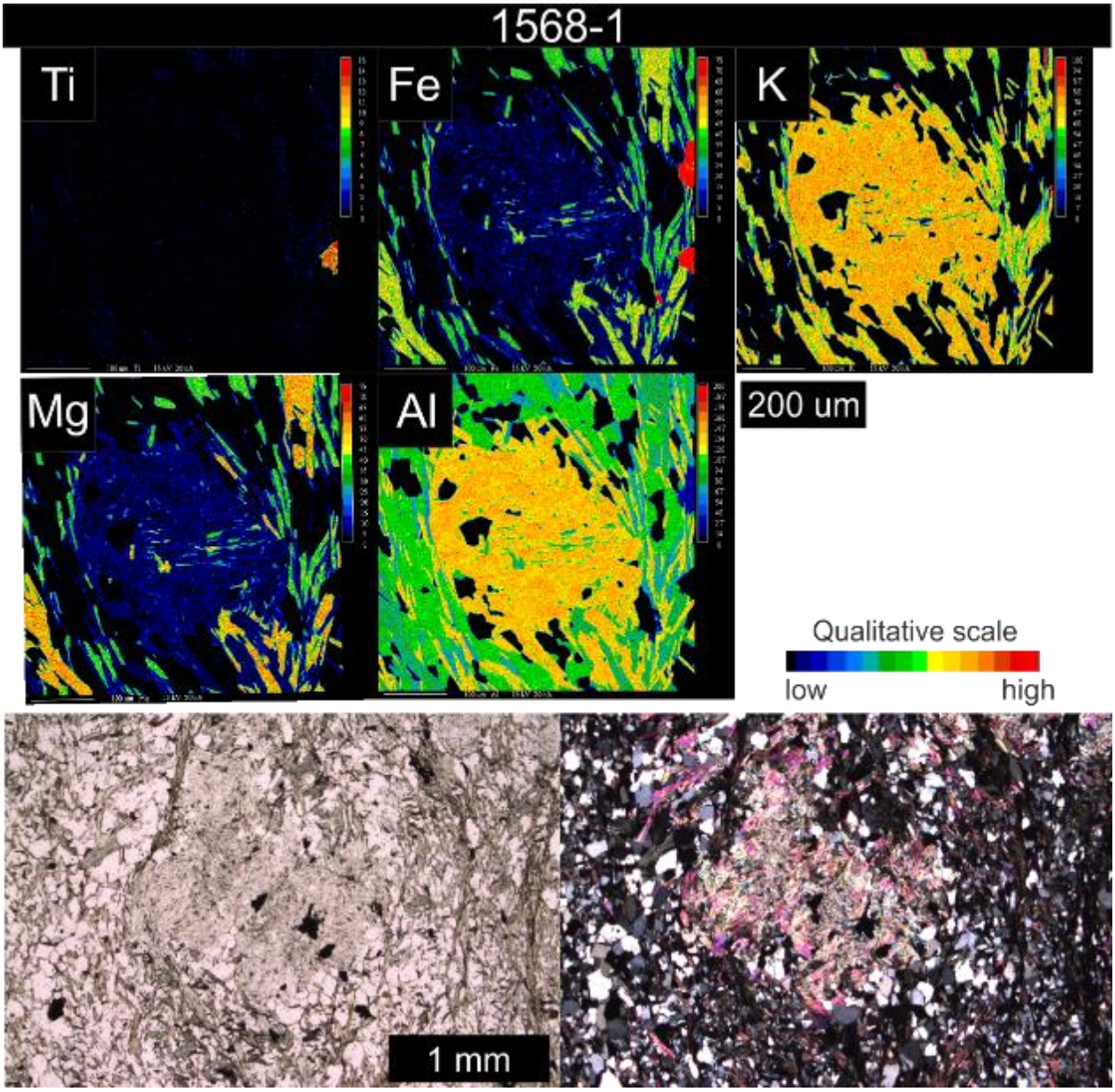


Figure 8: Major and trace element maps of a garnet in K389409 with oscillatory Y zoning and Mn enriched rim.

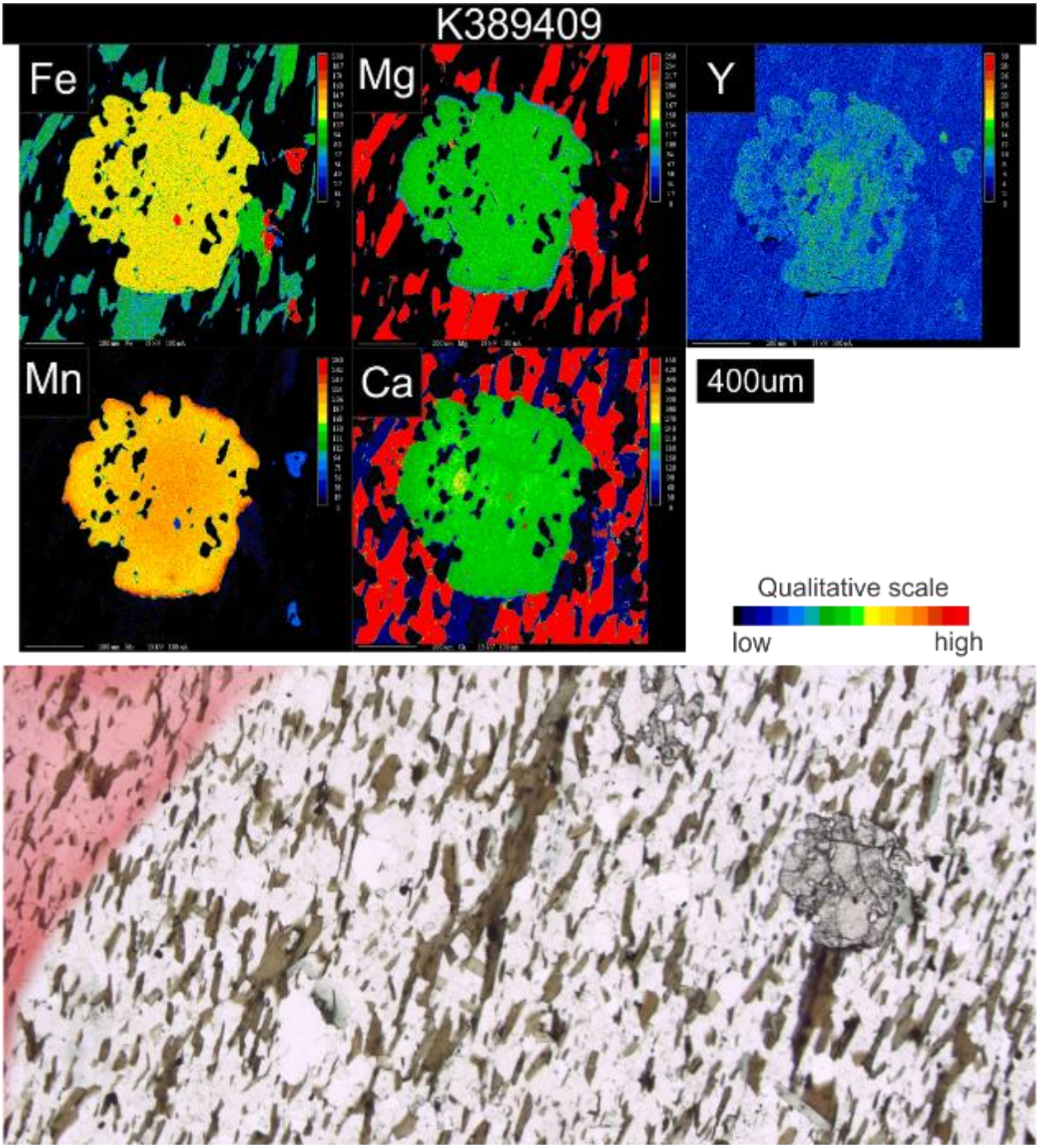


Figure 9: Major and trace element maps of a garnet in K389456 with oscillatory Y zoning.

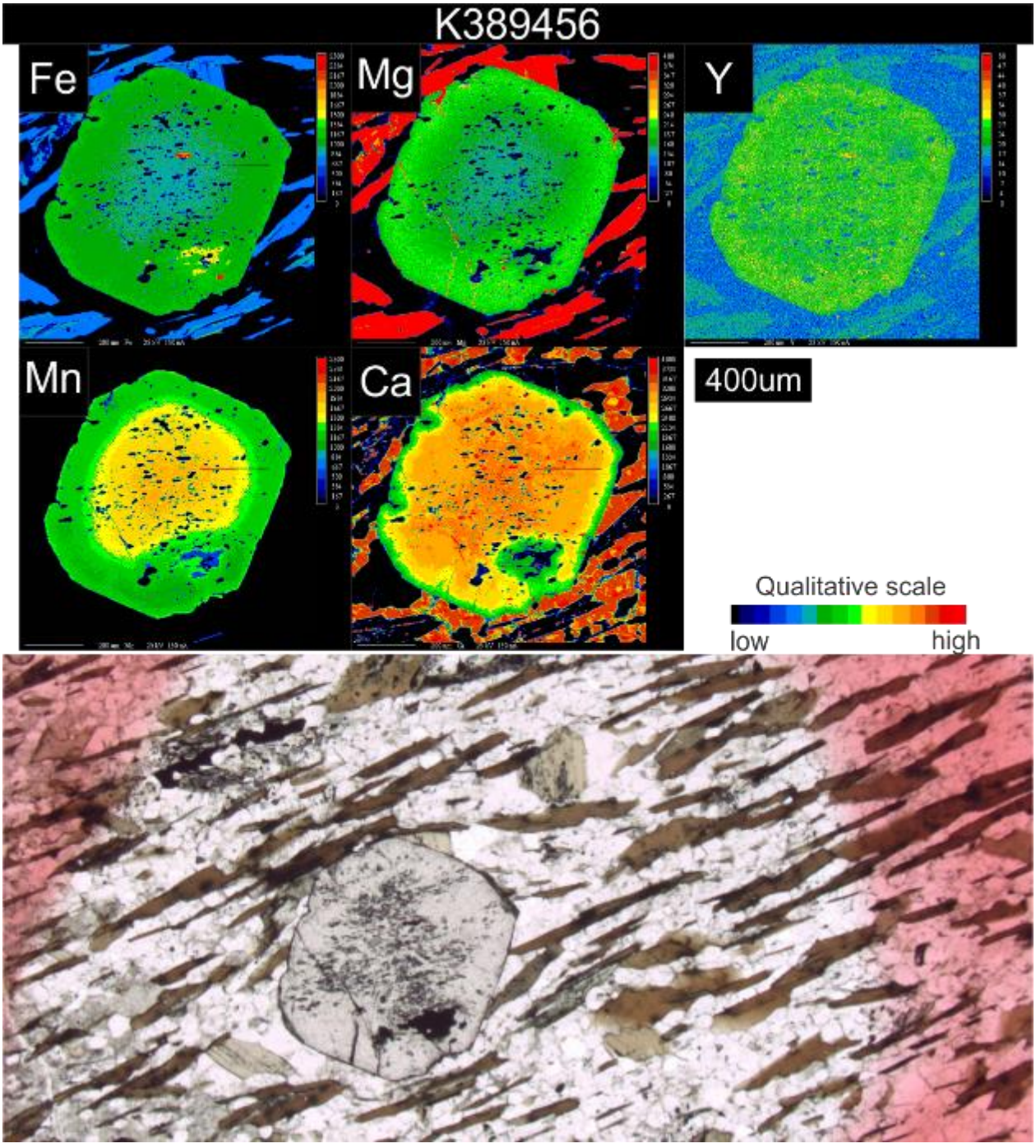


Figure 10: Major element maps of a fractured garnet in K389616.

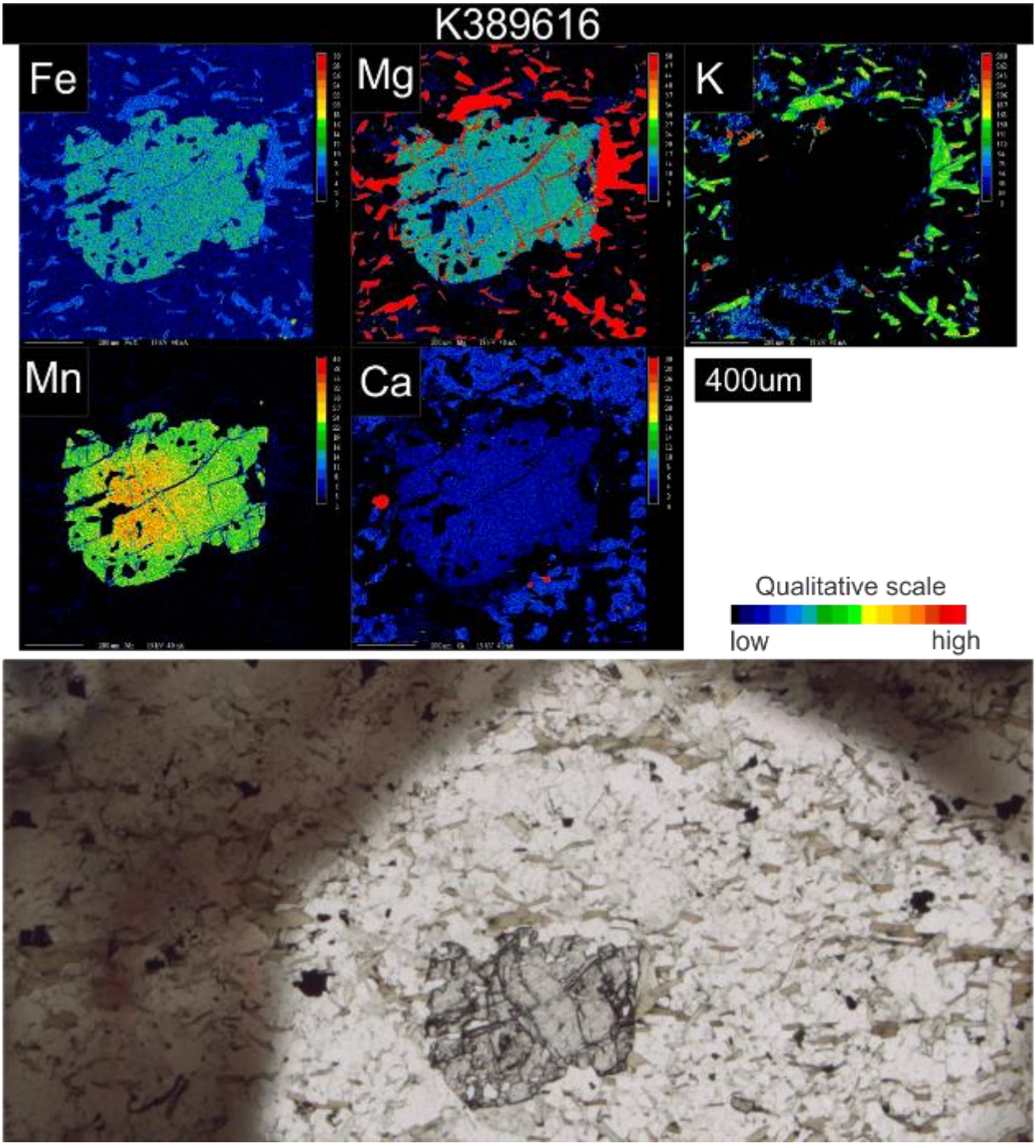


Figure 11: Major element maps of a garnet in K389619.

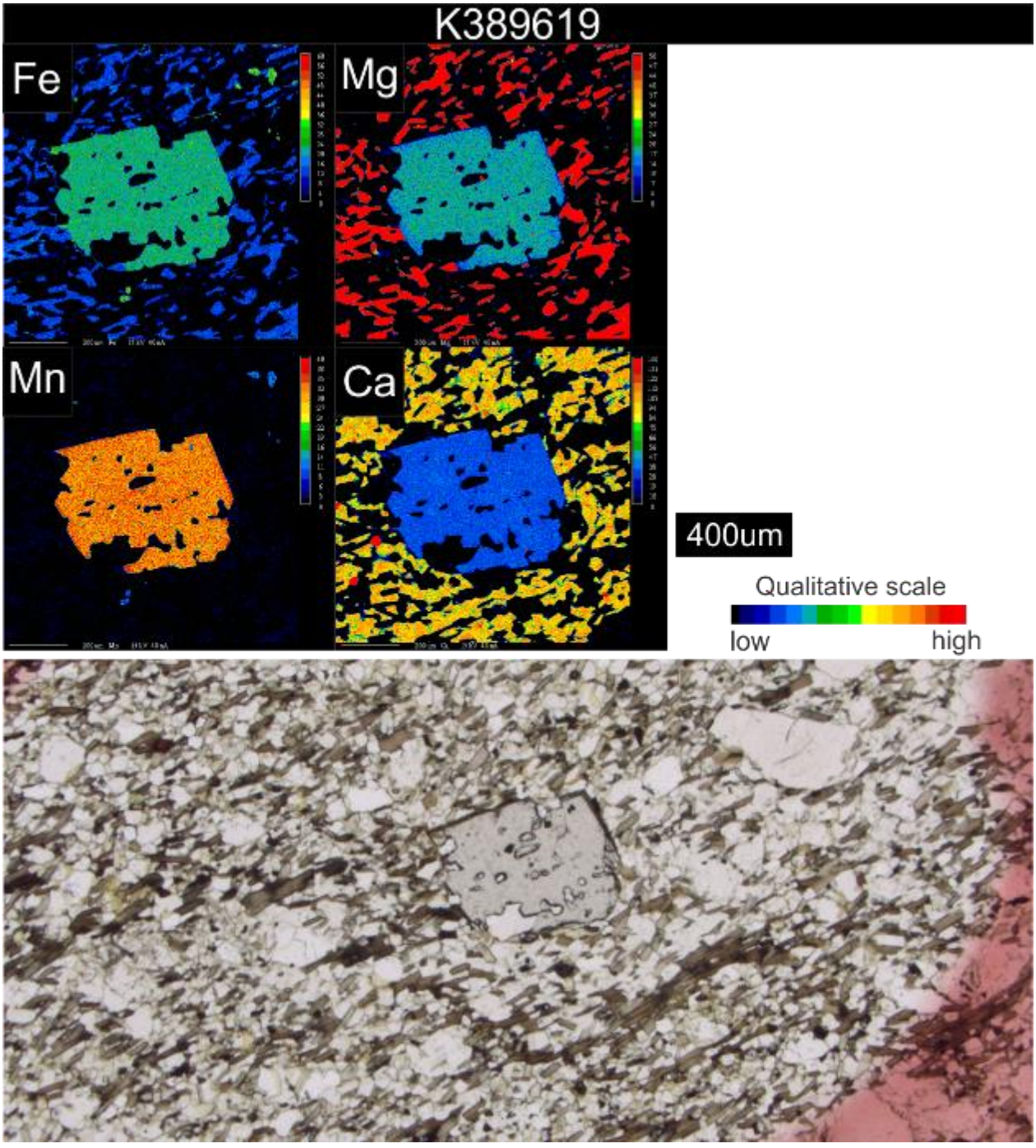


Figure 12: Major element maps of a garnet partly retrogressed to chlorite in K389622.

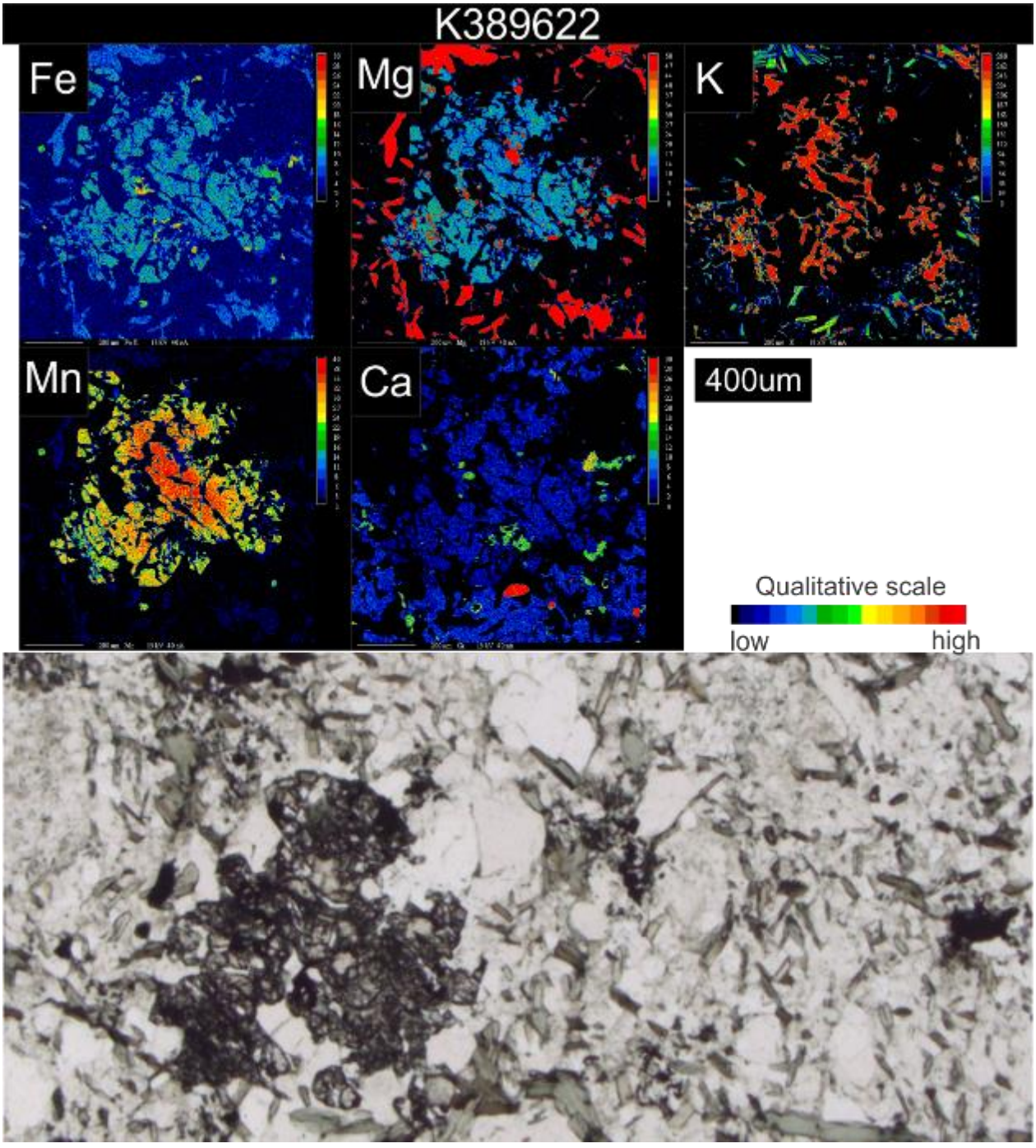


Figure 13: Major and trace elements map of a garnet in K389969.

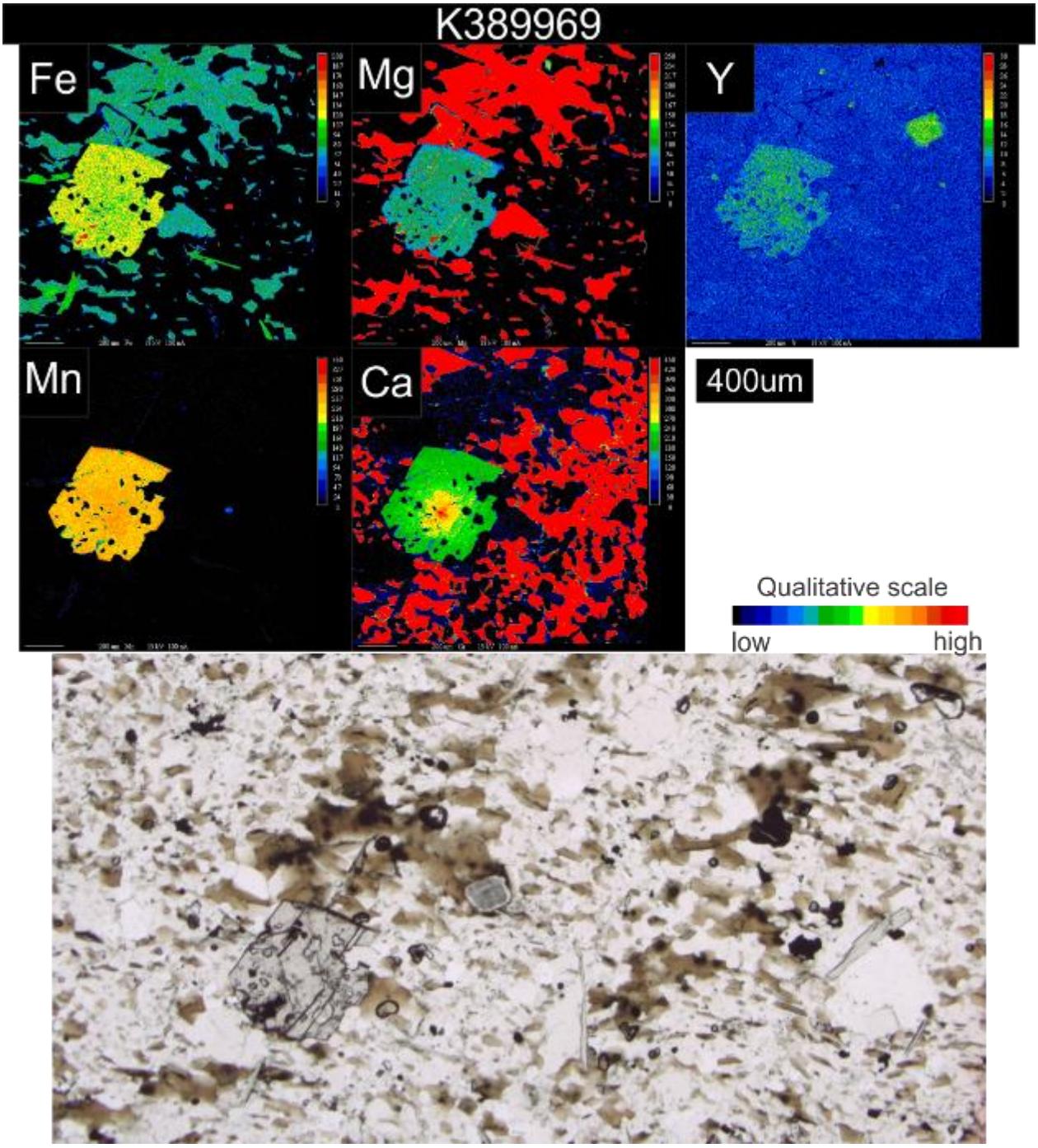


Figure 14: Major element profile of garnet 1664-1 (see Table 11 in Appendix III).

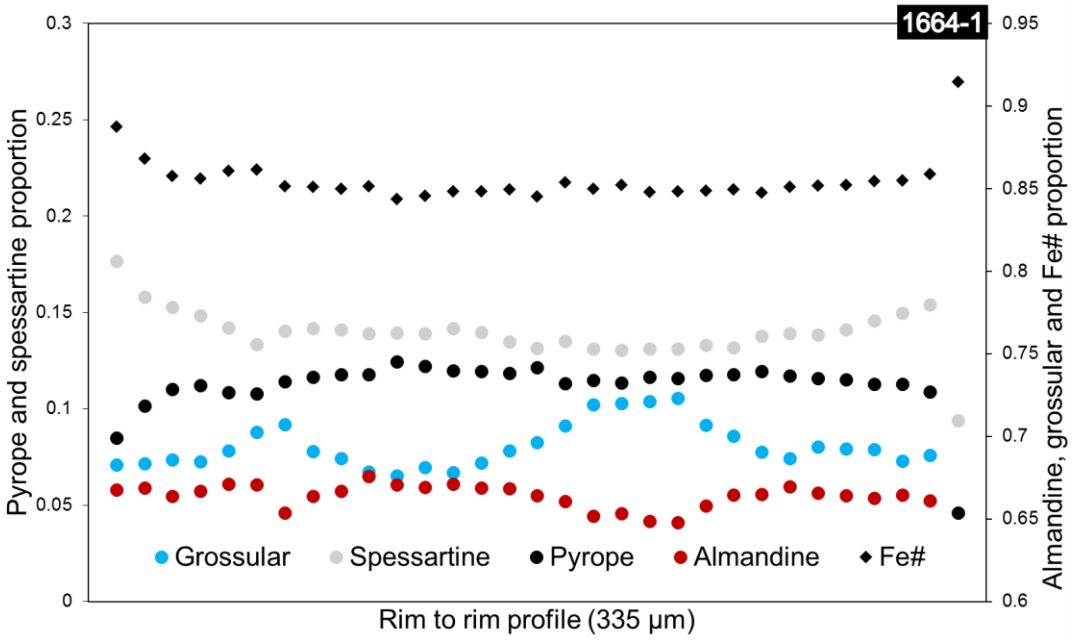


Figure 15: Major element profile of garnet 1664-2 (see Table 11 in Appendix III).

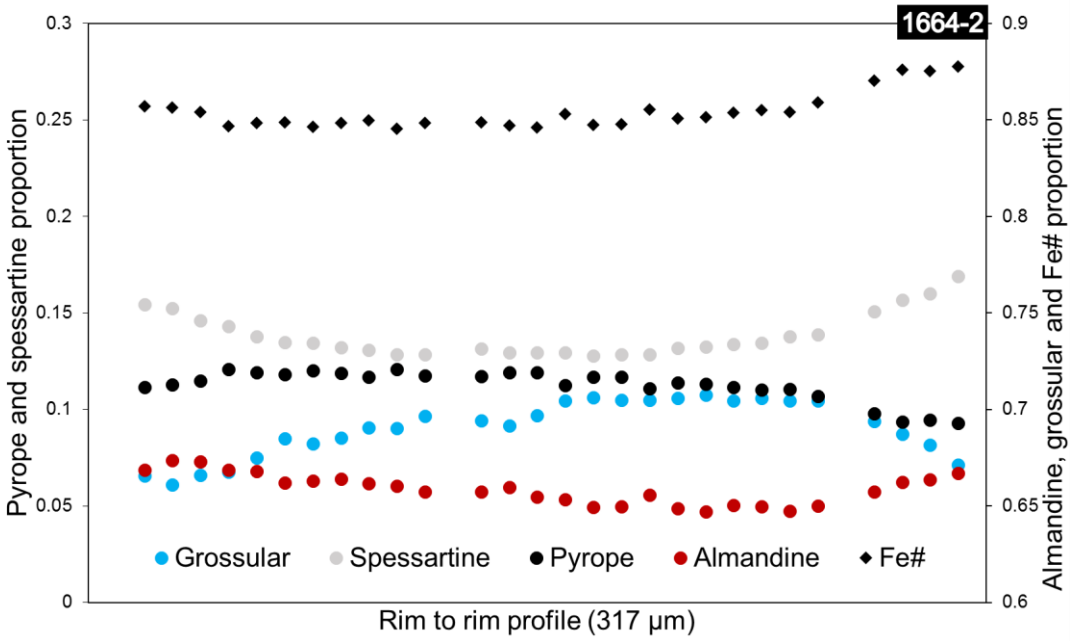


Figure 16: Major element profile of garnet 1664-3 (see Table 11 in Appendix III)..

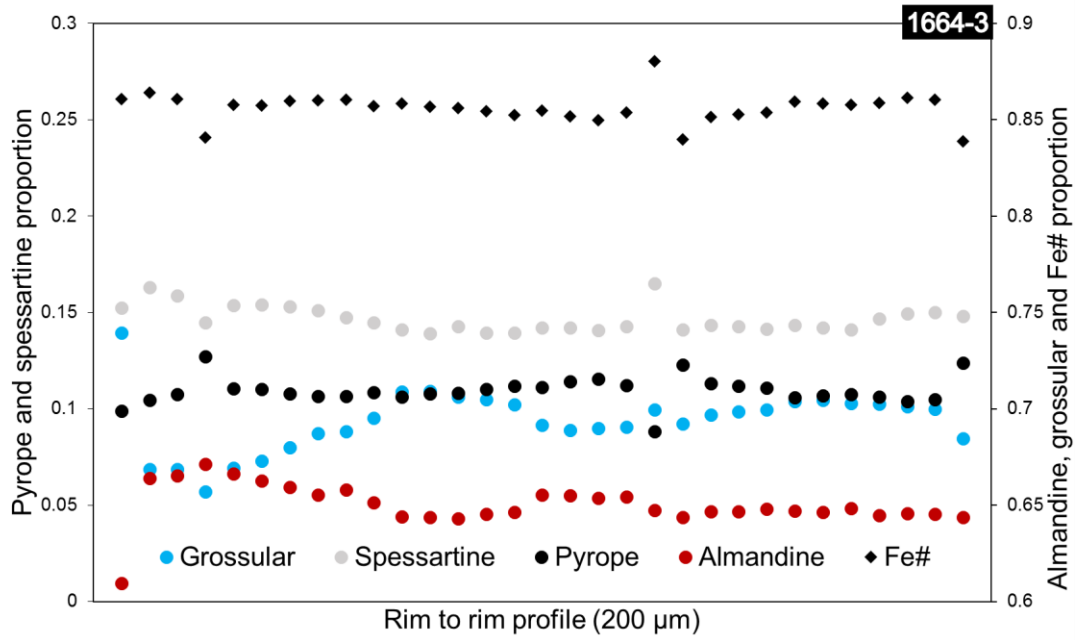


Figure 17: Major element profile 1698-2 (see Table 11 in Appendix III).

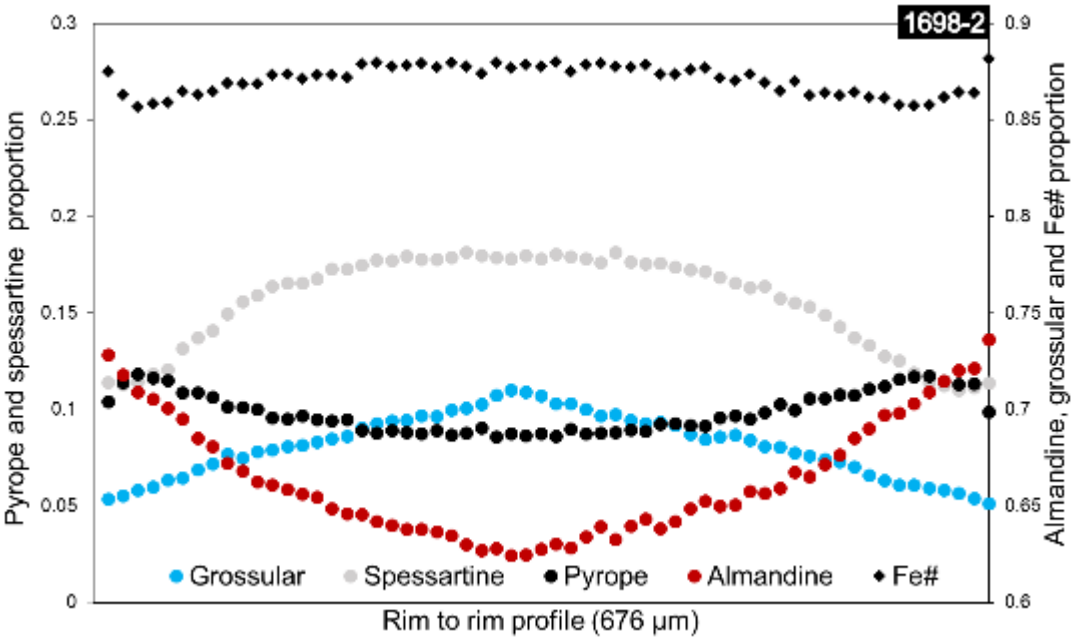


Figure 18: Major element profile of garnet 1698-7 (see Table 11 in Appendix III).

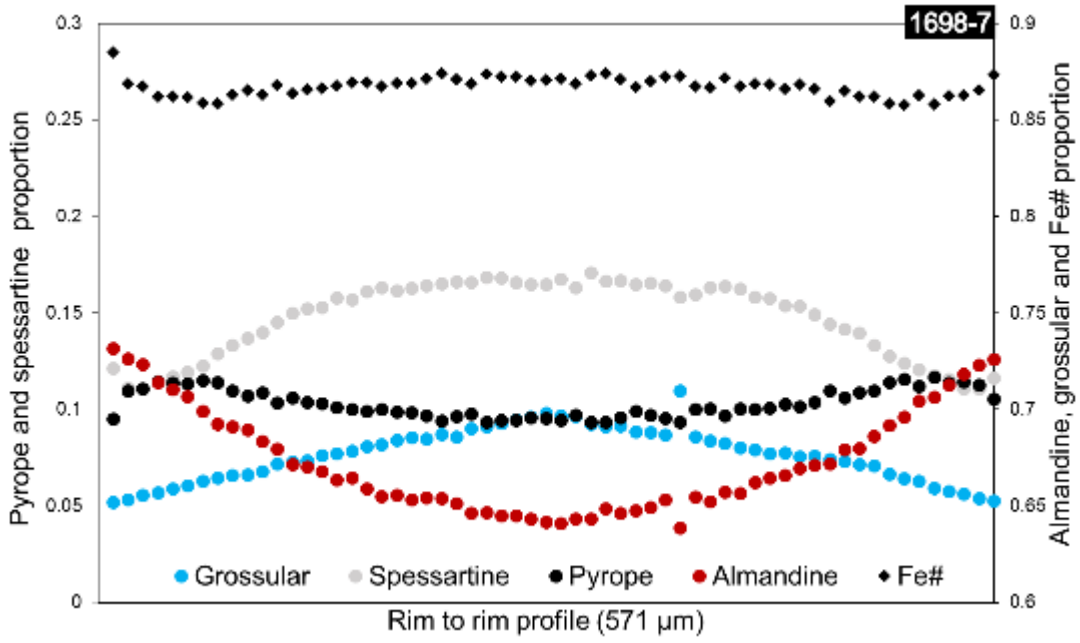


Figure 19: Major element profile of garnet 1698-10 (see Table 11 in Appendix III).

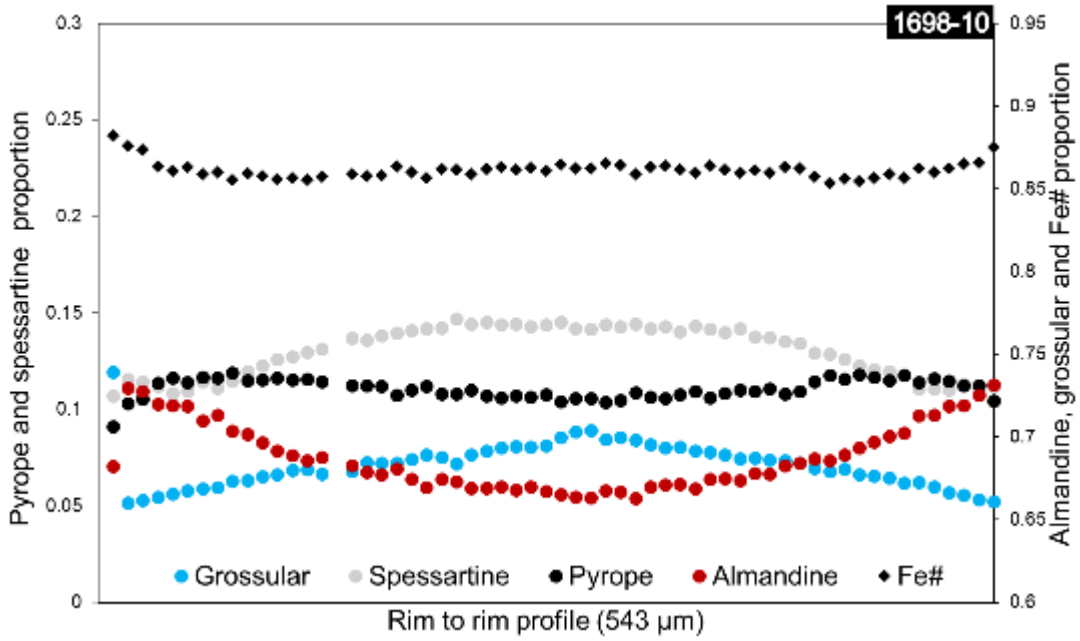


Figure 20: Major element profile of garnet 1570-2 (see Table 11 in Appendix III).

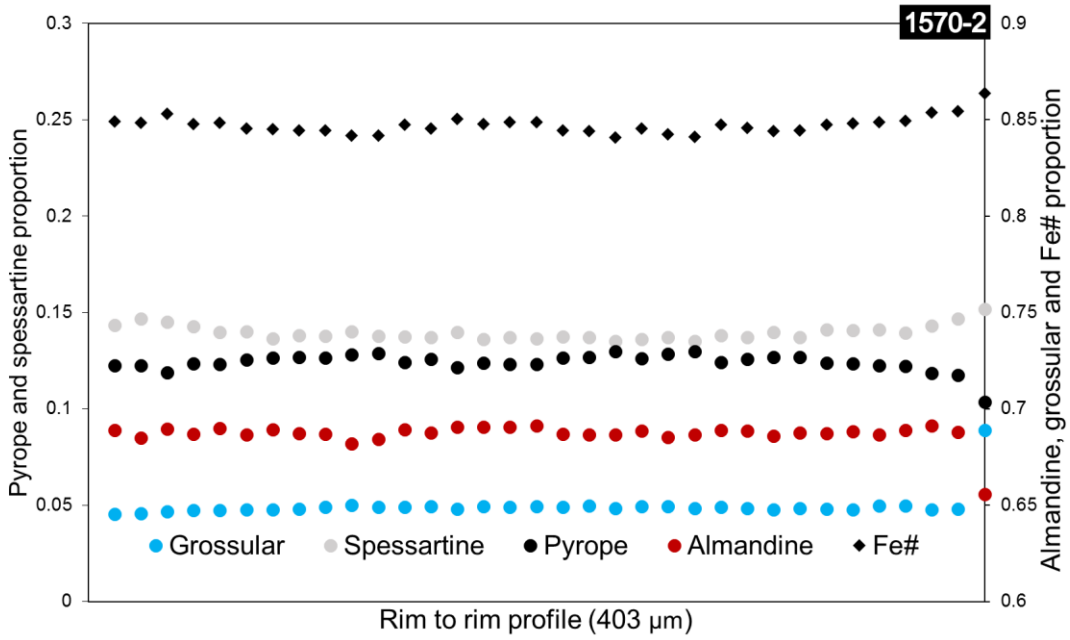


Figure 21: Major element profile of garnet 1570-3 (see Table 11 in Appendix III)..

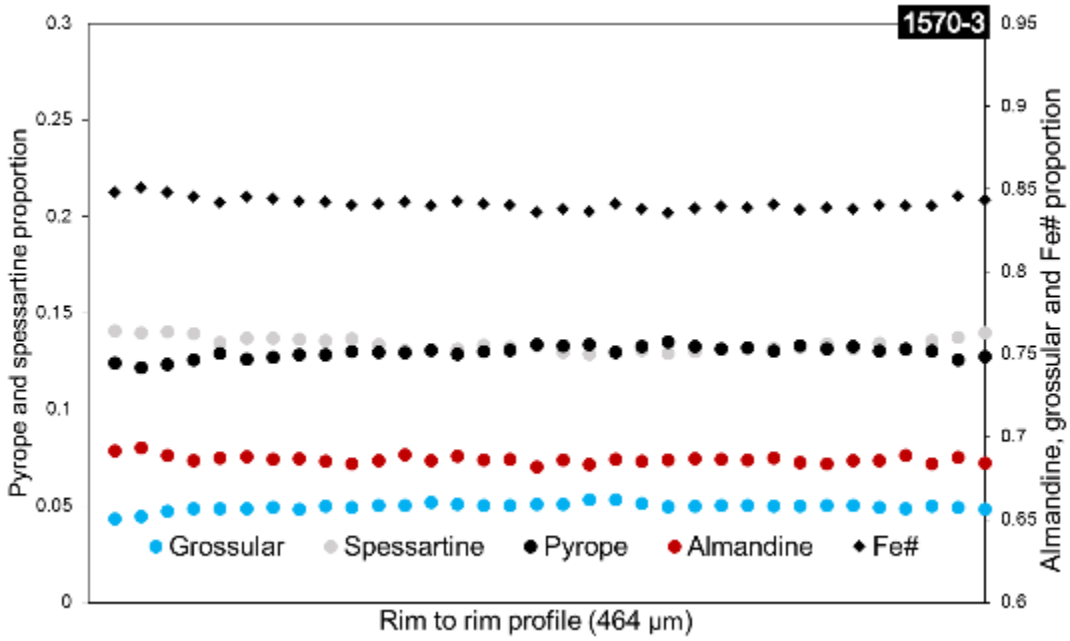


Figure 22: Garnet REE map from 1664, 1698 and 1682 (see Table 2 in Appendix IV).

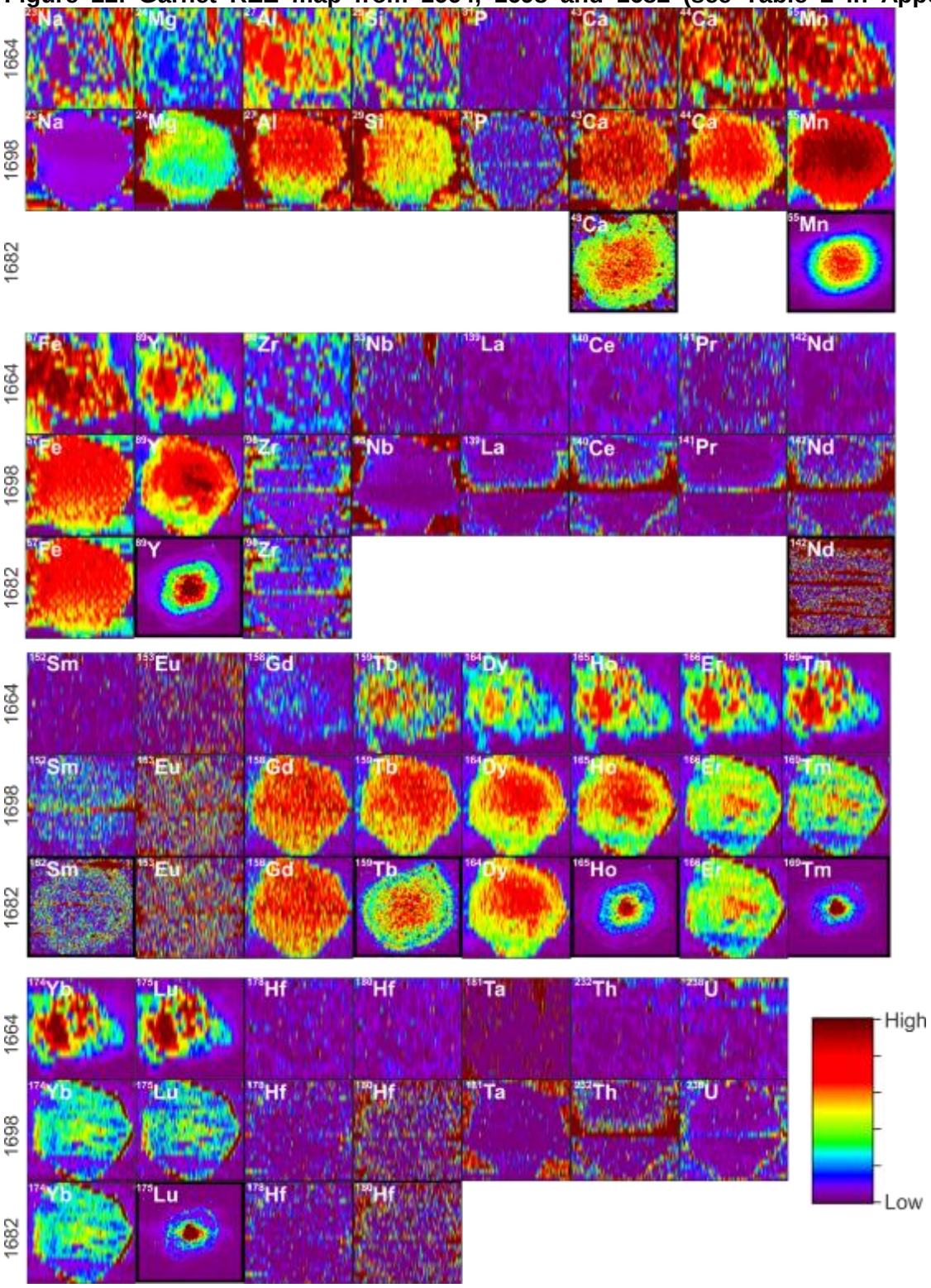
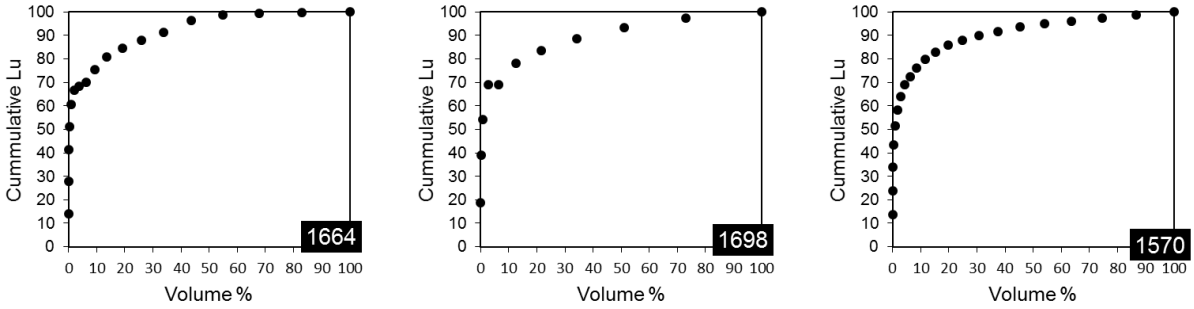


Figure 23: Cummulative Lu according to volume % of garnet from core to rim.



APPENDIX V: GEOTHERMOMETRY

Table 1: Fe-Mg Garnet-Biotite fractionation (K_D).

	Mg# garnet	Mg# Biotite		K_D	
Garnet ID		min	max	min	max
1505 N2	0.146	1.107	1.118	0.132	0.131
1505 R3	0.159	1.107	1.212	0.143	0.131
1515 2	0.158	1.215	1.209	0.130	0.131
1515 6	0.156	1.215	1.209	0.128	0.129
1518 N2	0.157	1.212	1.142	0.129	0.137
1518 R4	0.161	1.212	1.142	0.132	0.141
1518 R6	0.162	1.212	1.142	0.134	0.142
1520 3	0.173	1.232	1.137	0.140	0.152
1520 4	0.167	1.232	1.137	0.135	0.147
1570-18	0.148	1.618	1.335	0.091	0.111
1570-2	0.129	1.618	1.335	0.080	0.097
1570-25	0.155	1.618	1.335	0.096	0.116
1571 N2	0.178	1.209	1.222	0.147	0.145
1571 R11	0.180	1.209	1.222	0.149	0.147
1571 R8	0.181	1.209	1.222	0.149	0.148
1648 B2	0.145	1.148	1.062	0.126	0.137
1648 N3	0.161	1.148	1.062	0.140	0.151
1648 R4	0.130	1.148	1.062	0.113	0.122
1648 V9	0.132	1.148	1.062	0.115	0.124
1651 R3	0.133	1.313	1.164	0.101	0.114
1658 N3	0.133	1.146	1.037	0.116	0.128
1658 R3	0.122	1.146	1.037	0.107	0.118
1662 2	0.120	1.078	1.078	0.111	0.111
1664 R2	0.167	1.273	0.381	0.131	0.439
1664-Ca low	0.172	1.624	1.273	0.106	0.135
1664-Ca low2	0.170	1.624	1.273	0.105	0.134
1664-Mg low1	0.146	1.624	1.273	0.090	0.115
1666 R1	0.125	1.252	1.543	0.100	0.081
1666 R4	0.171	1.252	1.543	0.137	0.111
1669 16	0.178	1.268	1.251	0.141	0.143
1669 18	0.175	1.268	1.251	0.138	0.140
1669 3	0.180	1.268	1.251	0.142	0.144
1671 N11	0.138	1.532	1.089	0.090	0.127
1671 R15	0.161	1.532	1.089	0.105	0.148
1671 R3	0.162	1.532	1.089	0.105	0.148
1674 R12	0.140	1.034	1.034	0.136	0.136
1674 R3	0.131	1.034	1.034	0.126	0.126
1679 11	0.172	1.230	1.230	0.140	0.140
1679 3	0.155	1.230	1.230	0.126	0.126

Table 1 continued: Fe-Mg Garnet-Biotite fractionation (K_d).

	Mg# garnet	Mg# Biotite		K_D	
Garnet ID		min	max	min	max
1680 R8	0.189	1.359	1.279	0.139	0.148
1681 R3	0.182	1.270	1.180	0.144	0.155
1682 B2	0.178	1.132	0.932	0.157	0.191
1682 R2	0.161	1.132	0.932	0.142	0.172
1682 R6	0.156	1.132	0.932	0.138	0.167
1683 N3	0.098	0.916	0.821	0.107	0.119
1683 N4	0.120	0.916	0.821	0.131	0.147
1683 R4	0.108	0.916	0.821	0.118	0.131
1684 3	0.164	0.839	0.833	0.196	0.197
1684 4	0.162	0.839	0.833	0.193	0.194
1687 12	0.145	1.118	0.964	0.130	0.150
1687 3	0.130	1.118	0.964	0.116	0.135
1688 11	0.118	1.030	0.978	0.115	0.121
1688 3	0.114	1.030	0.978	0.111	0.117
1689 2	0.136	1.006	0.983	0.135	0.138
1689 7	0.140	1.006	0.983	0.139	0.142
1690 R3	0.171	1.263	1.165	0.136	0.147
1690 V2	0.161	1.263	1.165	0.128	0.139
1690 V4	0.141	1.263	1.165	0.112	0.121
1693A N2	0.157	1.184	1.088	0.132	0.144
1693A R3	0.155	1.184	1.088	0.131	0.142
1696 1	0.168	1.206	1.167	0.139	0.144
1696 2	0.163	1.206	1.167	0.135	0.140
1697 15	0.171	1.175	1.144	0.145	0.149
1697 4	0.169	1.175	1.144	0.144	0.148
1698 11	0.169	1.146	1.254	0.148	0.135
1698 4	0.153	1.146	1.254	0.134	0.122
1698-b17	0.157	1.215	1.146	0.130	0.137
1698-b2	0.166	1.215	1.146	0.137	0.145
1700 R5	0.172	1.310	1.170	0.131	0.147
1713A N2	0.156	1.185	1.147	0.132	0.136
1713A R4	0.152	1.185	1.147	0.128	0.132
1713A R7	0.160	1.185	1.147	0.135	0.140
1714B R3	0.177	1.386	1.273	0.128	0.139
334 n3	0.143	1.138	1.121	0.125	0.127
334 r5	0.140	1.138	1.121	0.123	0.125
365 10	0.166	1.331	1.271	0.125	0.130
365 16	0.181	1.331	1.271	0.136	0.142
388 15	0.165	1.365	1.296	0.121	0.127

Table 1 continued: Fe-Mg Garnet-Biotite fractionation (K_d).

	Mg# garnet	Mg# Biotite		K_D	
Garnet ID		min	max	min	max
388 2	0.190	1.365	1.296	0.139	0.147
388 7	0.185	1.365	1.296	0.136	0.143
402 1	0.149	1.041	1.041	0.144	0.144
402 13	0.156	1.041	1.041	0.150	0.150
409 10	0.155	1.188	1.188	0.130	0.130
409 8	0.164	1.188	1.188	0.138	0.138
433 5	0.164	1.183	1.154	0.139	0.143
456 1	0.133	1.079	1.039	0.123	0.128
456 12	0.140	1.079	1.039	0.130	0.135
456 15	0.138	1.079	1.039	0.128	0.133
456 16	0.123	1.079	1.039	0.114	0.119
475 R6	0.183	1.292	1.254	0.142	0.146
615 13	0.188	1.312	1.307	0.144	0.144
615 3	0.201	1.312	1.307	0.153	0.154
616 N4	0.151	1.231	1.106	0.122	0.136
616 R2	0.143	1.231	1.106	0.116	0.130
619 3	0.148	1.075	1.029	0.138	0.144
982 1	0.154	1.214	1.214	0.127	0.127
982 3	0.157	1.214	1.214	0.129	0.129
984 10	0.174	1.254	1.254	0.138	0.138
984 8	0.174	1.254	1.254	0.138	0.138

Table 2: Ti in biotite thermometry results.

ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n	ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n
1505 N5	580	st	569	7	3	1589 15	598				
1505 R10	560					1589 16	577				
1505 R9	568					1589 17	580				
1515 3	476	st	526	50	2	1589 18	590				
1515 7	576					1589 19	556				
1518 R1	557	g	555	2	2	1589 2	589				
1518 R8	554					1589 20	565				
1520 11	608	st	607	4	6	1589 3	589				
1520 12	607					1589 4	571				
1520 18	609					1589 5	590				
1520 19	611					1589 6	582				
1520 5	597					1589 7	575				
1520 6	613					1589 8	543				
1562 B10	635	g	612	24	20	1589 9	594				
1562 B12	594					1592 n1	573	bi	574	18	14
1562 B13	607					1592 n10	591				
1562 B18	607					1592 n11	545				
1562 N14	595					1592 n2	606				
1562 N15	623					1592 n4	609				
1562 N6	555					1592 n6	558				
1562 N9	593					1592 n7	601				
1562 R10	616					1592 n8	572				
1562 R12	634					1592 v2	585				
1562 R14	618					1592 v4	528				
1562 R4	572					1592 v5	553				
1562 V10	786					1592 v6	563				
1562 V11	603					1592 v7	570				
1562 V14	613					1592 v8	578				
1562 V3	601					1614 1	567	g	582	19	12
1562 V5	597					1614 12	576				
1562 V7	587					1614 13	558				
1562 V8	607					1614 14	580				
1562 V9	599					1614 15	595				
1570-12	601	st	594	7	5	1614 19	597				
1570-14	590					1614 2	605				
1570-21	587					1614 4	627				
1570-28	603					1614 5	526				
1570-3	585					1614 6	567				
1571 N3	597	st	595	4	3	1614 7	588				
1571 R4	599					1614 8	592				
1571 R5	590					164 10	549				
1589 10	551	bi	577	13	15	1640 R1	671	bi	669	2	2

Table 2 continued: Ti in biotite thermometry results.

ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n	ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n
1640 R4	668					1664 N11	581				
1642 13	584	ky	582	19	4	1664 N12	609				
1642 16	590					1664 N13	593				
1642 17	544					1664 N15	616				
1642 6	611					1664 N7	593				
1648 B8	580	st	597	12	6	1664 N8	561				
1648 R2	592					1664 R11	596				
1648 R3	609					1664 R4	603				
1648 V1	592					1664 R8 (petit)	622				
1648 V3	589					1664 V12	600				
1648 V4	621					1664 V4	619				
1651 B3	571	st	566	11	11	1664 V5	577				
1651 B5	575					1664 V6	607				
1651 B6	561					1664 V7	579				
1651 R4	575					1664 V8	603				
1651 R5	592					1665 N10	547	bi	574	17	24
1651 R7	540					1665 N11	580				
1651 V1	559					1665 N12	586				
1651 V2	566					1665 N2	538				
1651 V4	574					1665 N3	575				
1651 V5	550					1665 N4	568				
1651 V6	562					1665 N5	596				
1658 N11	585	g	588	14	14	1665 N6	590				
1658 N12	581					1665 N7	557				
1658 N13	584					1665 R10	590				
1658 N14	594					1665 R15	600				
1658 N15	583					1665 R6	589				
1658 N6	595					1665 R7	585				
1658 N7	611					1665 R8	540				
1658 N8	611					1665 R9	567				
1658 N9	597					1665 V1	580				
1658 V10	585					1665 V12	574				
1658 V3	518					1665 V14	549				
1658 V7	619					1665 V2	581				
1658 V8	585					1665 V3	539				
1658 V9	581					1665 V4	558				
1662 6	602					1665 V5	604				
1664 B10	602	st	600	12	20	1665 V6	597				
1664 B11	606					1665 V7	599				
1664 B4	630					1666 B10	579	st	590	8	12
1664 B7	602					1666 B4	597				
1664 N10	608					1666 B6	582				

Table 2 continued: Ti in biotite thermometry results.

ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n	ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n
1666 B7	596					1672 R10	586				
1666 R5	597					1672 R2	603				
1666 R6	588					1672 R4	620				
1666 R7	584					1672 R5	595				
1666 R9	604					1672 R6	579				
1666 V3	585					1672 R9	578				
1666 V4	575					1672 V10	607				
1666 V5	602					1672 V11	576				
1666 V9	591					1672 V12	610				
1668 B11	590	bi	602	15	6	1672 V13	608				
1668 B12	611					1672 V2	597				
1668 R13	612					1672 V5	580				
1668 R15	581					1672 V6	603				
1668 V14	627					1672 V9	605				
1668 V7	588					1674 R14	562	g	563	9	3
1669 20	591	st	592	1	2	1674 R4	549				
1669 4	594					1674 R5	577				
1671 B12	577	st	585	19	18	1676 1	651	g	643	8	2
1671 B9	555					1676 7	635				
1671 N10	603					1679 5	600	g	605	5	2
1671 N14	599					1679 6	610				
1671 N15	637					1680 N2	586	st	587	1	2
1671 N17	572					1680 R5	588				
1671 N5	574					1681 B3	592	st	580	5	9
1671 N6	618					1681 B7	583				
1671 N9	577					1681 B8	577				
1671 R5	607					1681 B9	582				
1671 R9	606					1681 R7	587				
1671 V10	524					1681 V1	575				
1671 V11	571					1681 V3	576				
1671 V12	598					1681 V7	569				
1671 V13	590					1681 V8	583				
1671 V14	575					1682 B3	552	st	559	19	13
1671 V8	572					1682 B6	594				
1671 V9	584					1682 B8	555				
1672 N11	557	bi	593	13	21	1682 B9	570				
1672 N12	591					1682 N10	588				
1672 N3	587					1682 R1	550				
1672 N4	585					1682 R10	546				
1672 N5 (petit)	578					1682 R7	563				
1672 N7	598					1682 R8	532				
1672 N8	610					1682 V1	531				

Table 2 continued: Ti in biotite thermometry results.

ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n	ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n
1682 V3	523					1693A R4	543				
1682 V4	589					1696 10	592	st	597	4	2
1682 V5	576					1696 6	601				
1683 B4	576	st	574	11	12	1697 11	558	st	557	1	2
1683 B5	599					1697 3	555				
1683 N5	570					1698 10	551	st	588	11	7
1683 N6	566					1698 8	588				
1683 N7	568					1698 9	588				
1683 R6	543					1698-b10	590				
1683 R7	575					1698-b15	613				
1683 R8	570					1698-b3	593				
1683 V1	586					1698-b4	591				
1683 V2	560					1700 N6	607	st	587	15	4
1683 V4	587					1700 N7	566				
1683 V5	585					1700 R3	599				
1684 1	585	g	576	9	2	1700 R4	578				
1684 2	567					1713A R2	574	st	571	3	2
1687 10	625	g	582	30	3	1713A R3	567				
1687 5	538					1714B N2	591	st	584	16	3
1687 6	584					1714B R4	560				
1688 15	623					1714B R8	600				
1688 5	628					329C 14	579	g	580	17	3
1688 8	578					329C 15	605				
1689 4	624	g	625	1	2	329C 5	555				
1689 5	626					334 n6	593	g	586	8	3
1690 B1	567	st	575	11	15	334 r3	574				
1690 B2	567					334 r4	590				
1690 B4	594					365 17	561	st	562	17	3
1690 B5	591					365 18	587				
1690 B6	572					365 7	538				
1690 B7	580					388 1	578	st	592	9	3
1690 B8	569					388 10	601				
1690 N10	597					388 13	596				
1690 N6	537					402 6	585	st	585		
1690 N7	561					409 14	599	g	599		
1690 N8	588					433 1	583	g	593	9	2
1690 R7	579					433 2	602				
1690 V3	572					456 18	630	g	622	8	2
1690 V6	572					456 6	613				
1690 V7	576					475 N8	574	st	581	13	3
1693A N5	587	g	573	20	3	475 R2	601				
1693A N6	589					475 R3	569				

Table 2 continued: Ti in biotite thermometry results.

ID	T Celsius	Met. zone	Mean Celsius	S.D. Celsius	n
615 14	597	st	594	3	2
615 8	592				
616 N1	570	g	555	10	3
616 N6	547				
616 R5	548				
618 1	657	bi	657		
619 6	571	g	566	5	2
619 9	561				
622 B1	571	g	561	11	4
622 N1	549				
622 R5	573				
622 R8	550				
974 1	582	g	574	6	3
974 2	570				
974 3	569				
978 10	557	g	557		
982 7	612	g	612		
984 4	584	st	584		

APPENDIX VI: THIN SECTION MAPS AND MODAL PROPORTIONS

Figure 1: 1517 thin section map.

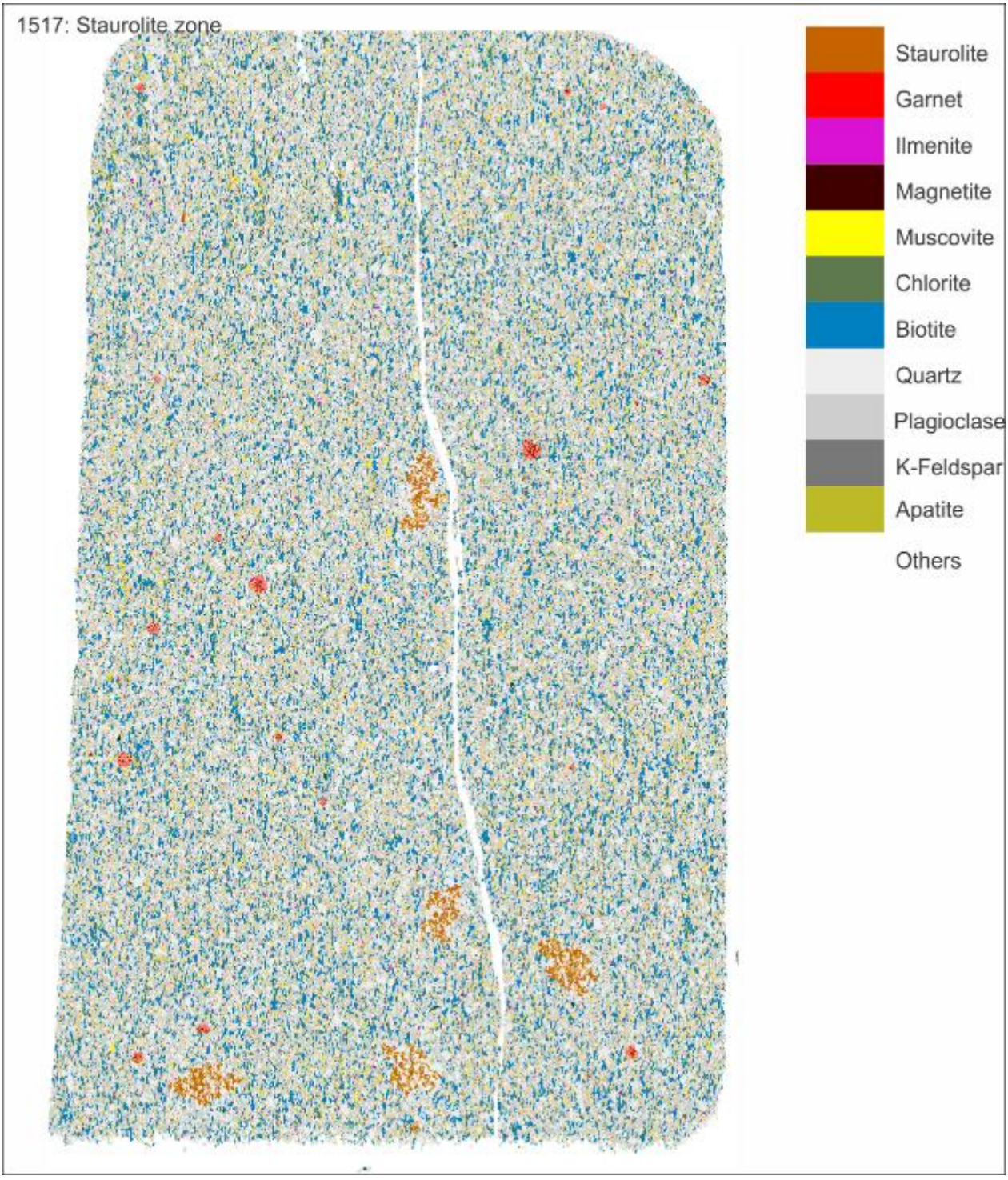


Figure 2: 1562 thin section map and modal proportions:

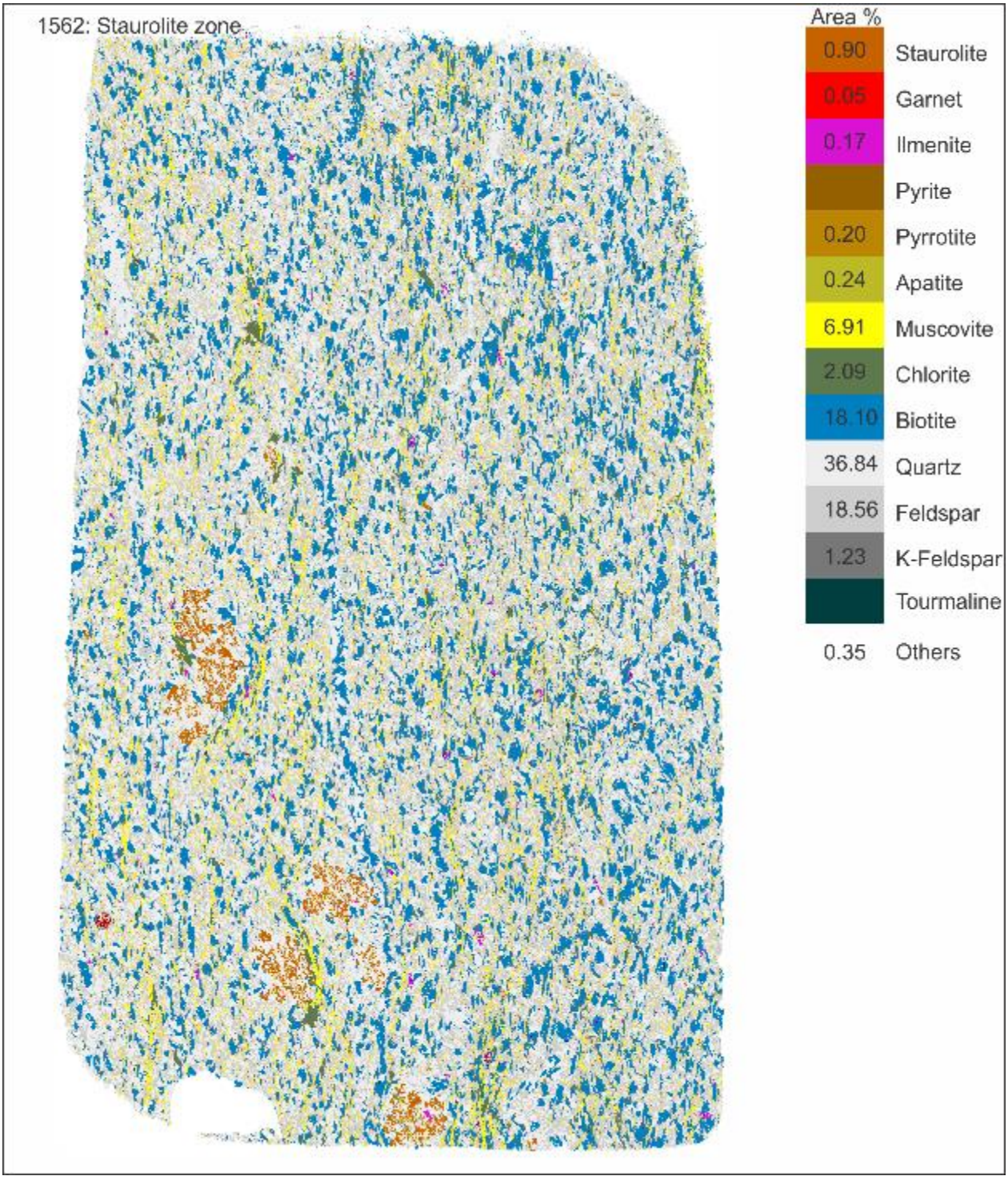


Figure 3: 1613 thin section map and modal proportions.

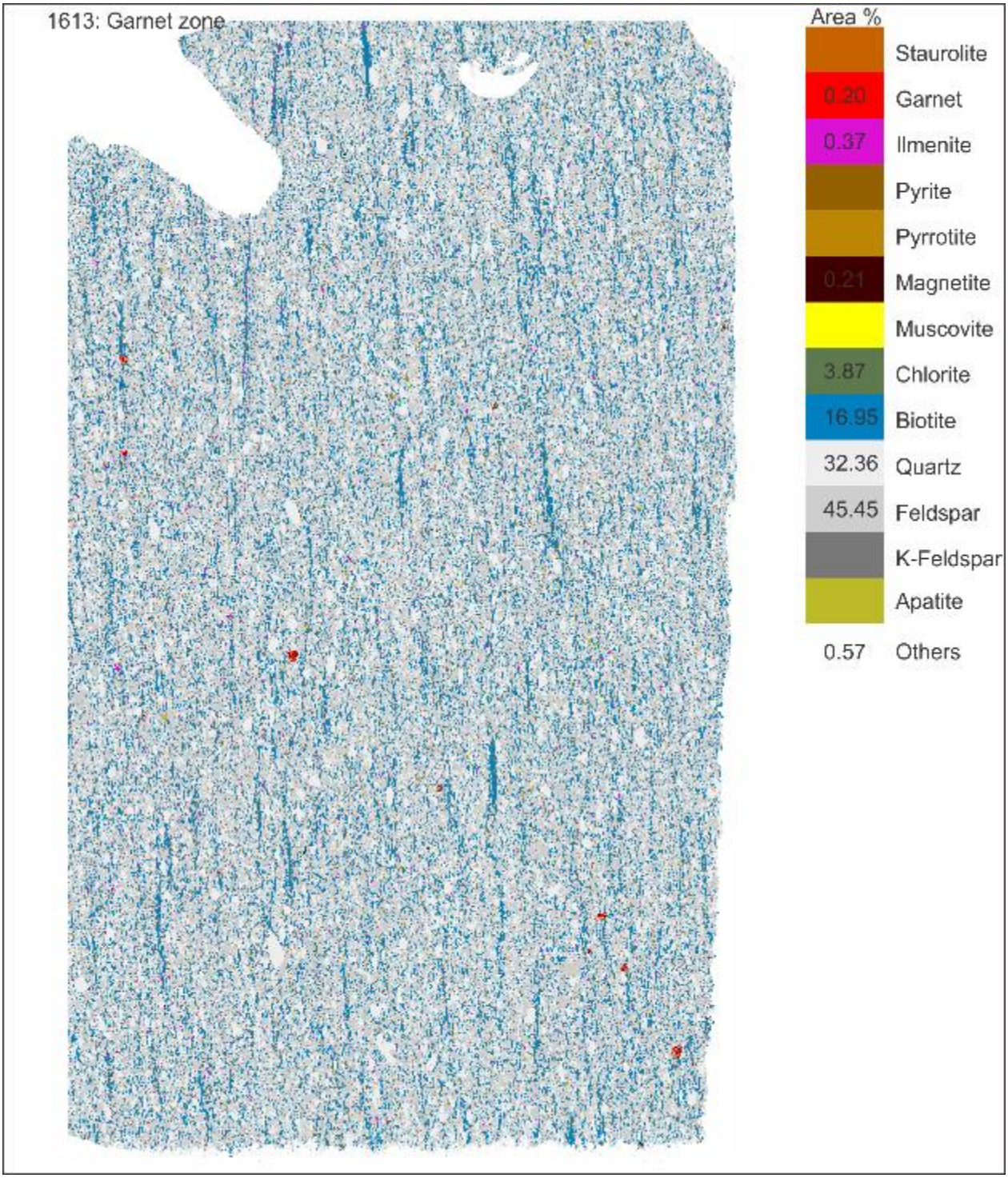


Figure 4: 1642 thin section map and modal proportions.

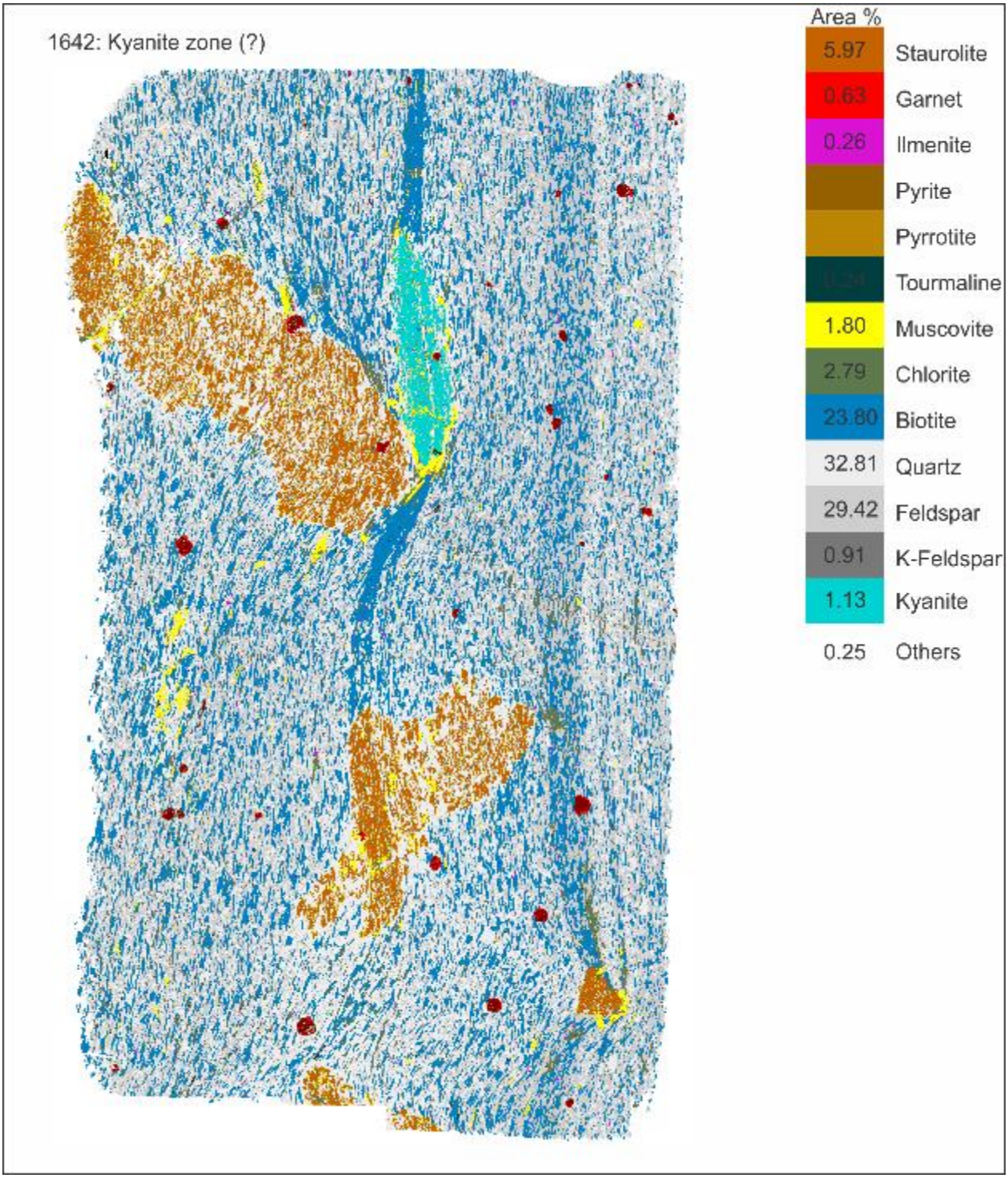


Figure 5: 1666 thin section map and modal proportions.

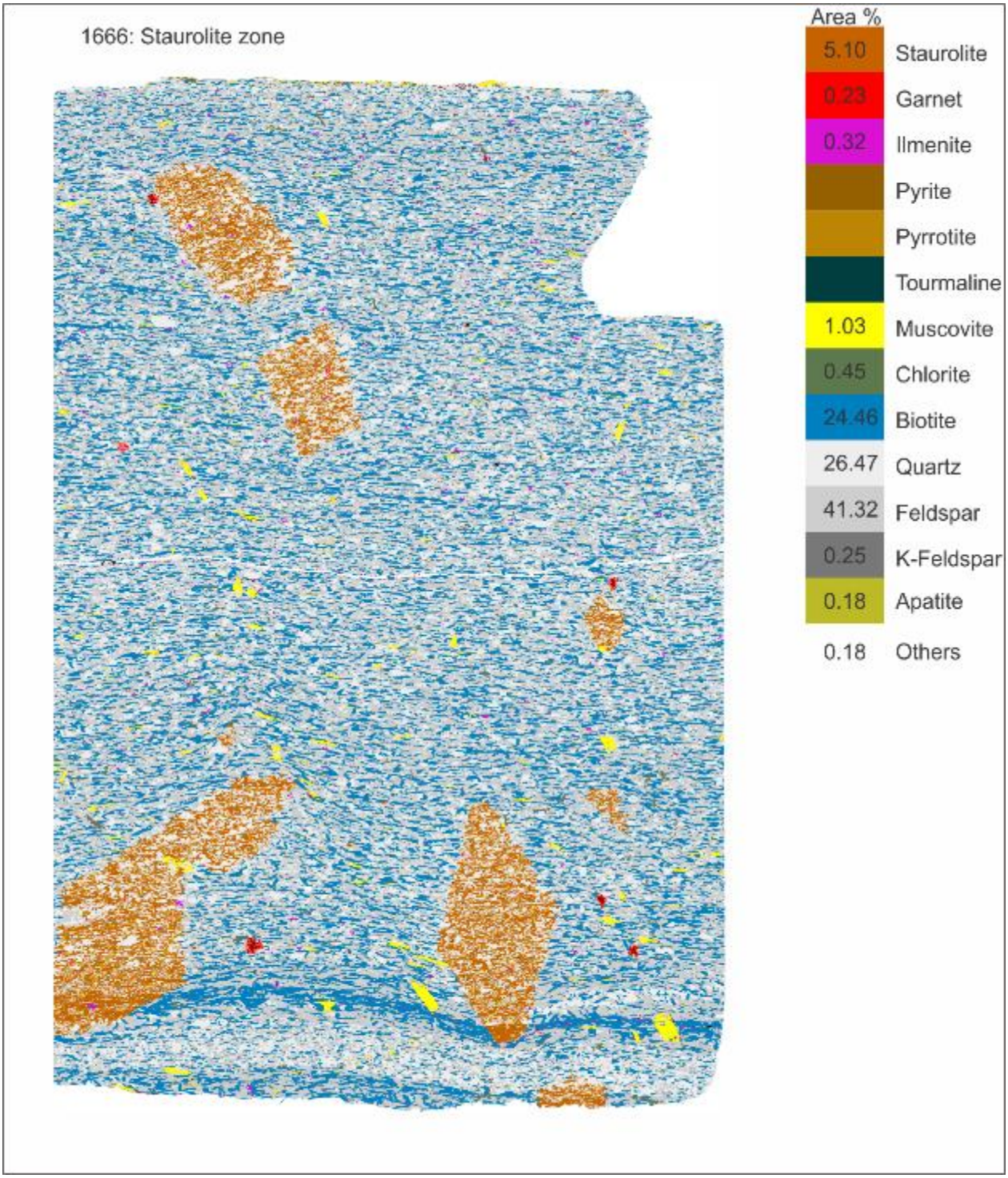


Figure 6: 1682 thin section map and modal proportions.