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Variety of chemical compositions of the clinopyroxenes from the eclogites (Seba eclogitic basic schists) in the Sambagawa metamorphic belt, central Shikoku, Japan

Md. Fazle KABIR and Akira TAKASU
Department of Geoscience, Faculty of Science and Engineering, Shimane University,
1060 Nishikawatsu, Matsue 690-8504, Japan
M. F. KABIR: fazlekabir@gmail.com
A. TAKASU: takasu@riko.shimane-u.ac.jp

Abstract

Seba eclogitic basic schists consist of garnet, clinopyroxene, amphibole, epidote and phengite, minor amounts of rutile, titanite, albite, paragonite, chlorite, hematite and quartz. Clinopyroxenes in the Seba eclogitic basic schists represent a variety of modes of occurrence (Cpx 1~5) and a wide range of the chemical compositions such as omphacite, aegirine-augite and augite. Aegirine-augite and omphacite (Cpx-1, X_{Jd} = 0.23–0.39 and X_{Aeg} = 0–0.29) occur as inclusions in porphyroblastic garnets. Omphacite (Cpx-2, X_{Jd} = 0.29–0.37 and X_{Aeg} = 0.08–0.15) occur as inclusions in the large-grained epidotes. Omphacite (Cpx-3) occurring as a schistosity forming mineral is clinopyroxene with highest jadeite contents (X_{Jd} = 0.24–0.48 and X_{Aeg} = 0–0.25). Omphacite (Cpx-4, X_{Jd} = 0.25–0.36 and X_{Aeg} = 0.10–0.24) is randomly oriented to the matrix schistosity. Omphacites are partly replaced by symplectites of clinopyroxene (Cpx-5) with lesser jadeite content (augite and agerine-augite, X_{Jd} = 0.10–0.19 and X_{Aeg} = 0.01–0.36) with sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, Mg-hornblende, actinolite) and albite (An < 4). Cpx-1 and Cpx-2 are formed during the prograde epidote–amphibolite to the peak eclogite facies stages. The peak eclogite facies stage is represented by the occurrences of Cpx-3 and Cpx-4. Cpx-5 represented retrograde stage is defined by the phases replacing the minerals of the peak metamorphic stage.

Key words: Sambagawa (Sanbagawa) metamorphic belt, clinopyroxene, Sebadani, Besshi district.

1. Introduction

The Sambagawa metamorphic belt is a Cretaceous high *P/T*-type metamorphic belt in Japan, and it extends from the Kanto Mountains, through Kii Peninsula and Shikoku to Kyushu for over 800 km with maximum width of 50 km in Shikoku (Fig. 1). The protoliths are dominated by sandstone and shale with a small amount of basalt, chert and limestone. Metamorphic grade ranges from prehnite–pumpellyite facies through blueschist/greenschist facies to amphibolite facies and locally to eclogite facies (e.g. Banno, 1964; Higashino, 1990; Enami *et al*., 1994). In the Besshi district the metamorphic belt is divided into four zones based on index minerals in pelitic schists (e.g. Enami, 1983; Higashino, 1990). These are chlorite (300–360 °C, 5.5–6.5 kbar), garnet (425–470 °C, 7–8.5 kbar), albite–biotite (470–590 °C, 8–9.5 kbar) and oligoclase–biotite (585–635 °C, 9–11 kbar) zones (Fig. 1; Enami, 1983; Enami *et al*., 1994). The mineral parageneses of the albite–biotite and oligoclase–biotite zones roughly coincide with those of epidote–amphibolite facies conditions, and their equilibrium *P–T* conditions have been estimated to be 8–11 kbar and 470–635 °C (Enami *et al*. 1994).

Eclogite facies assemblages sporadically occur in metagabbro, metabasite, peridotite and minor amounts of metapelite in the epidote–amphibolite facies areas of the Besshi district in central Shikoku (e.g. Takasu 1989; Aoya 2001; Ota *et al*. 2004; Zaw Win Ko *et al*., 2005; Kouketsu *et al*., 2010; Kabir and Takasu, 2010a, b). These assemblages are considered to be evidence that the Sambagawa metamorphic rocks have partly experienced eclogite facies metamorphism before recrystallization under epidote–amphibolite facies conditions.

The Sebadani area belongs to the albite–biotite zone and is located in the central part of the Besshi district. The Sebadani area is mainly composed of the Seba basic schists with intercalation of pelitic and siliceous schists. Eclogites (Seba eclogitic basic schists) are sporadically preserved in the Seba basic

schists (Aoya, 2001; Zaw Win Ko *et al*., 2005; Kabir and Takasu, 2009, 2010a, b), and they experienced three distinct events of metamorphism (Kabir and Takasu, 2009). These are a precursor metamorphic event (amphibolite facies), a first high-pressure metamorphic event (eclogite facies) and a second high-pressure metamorphic event (epidote–amphibolite facies). Since such complex metamorphic history of the Seba eclogitic basic schists, and clinopyroxene in the schists have various modes of occurrence and the variety of their chemical compositions.

In this paper we describe the variety of texture and chemical compositions of the clinopyroxenes from the Seba eclogitic basic schists. Clinopyroxene end-member components were calculated on the basis of jadeite ($NaAlSi_2O_6$) (X_{Jd}) = lower value among Al^{VI} and Na in M_2 site, aegirine ($NaFe^{3+}Si_2O_6$) (X_{Aeg}) = lower value of Fe^{3+} in M_1 site among rest of Na in M_2 site and Quad (Ca-Mg-Fe pyroxene) = 1-(Jd + Aeg), wollastonite ($Ca_2Si_2O_6$) (X_{Wo}) = Ca/(Ca + Mg + ΣFe) where ΣFe = (Fe^{2+} + Fe^{3+} + Mn), enstatite ($Mg_2Si_2O_6$) (X_{En}) = Mg/(Ca + Mg + ΣFe) and ferrosilite ($Fe^{2+}Si_2O_6$) (X_{Fs}) = ΣFe/(Ca + Mg + ΣFe) (Morimoto, 1989). The mineral abbreviations used in the text, tables and figures follow Whitney and Evans (2010), except for Agt, agerine-augite.

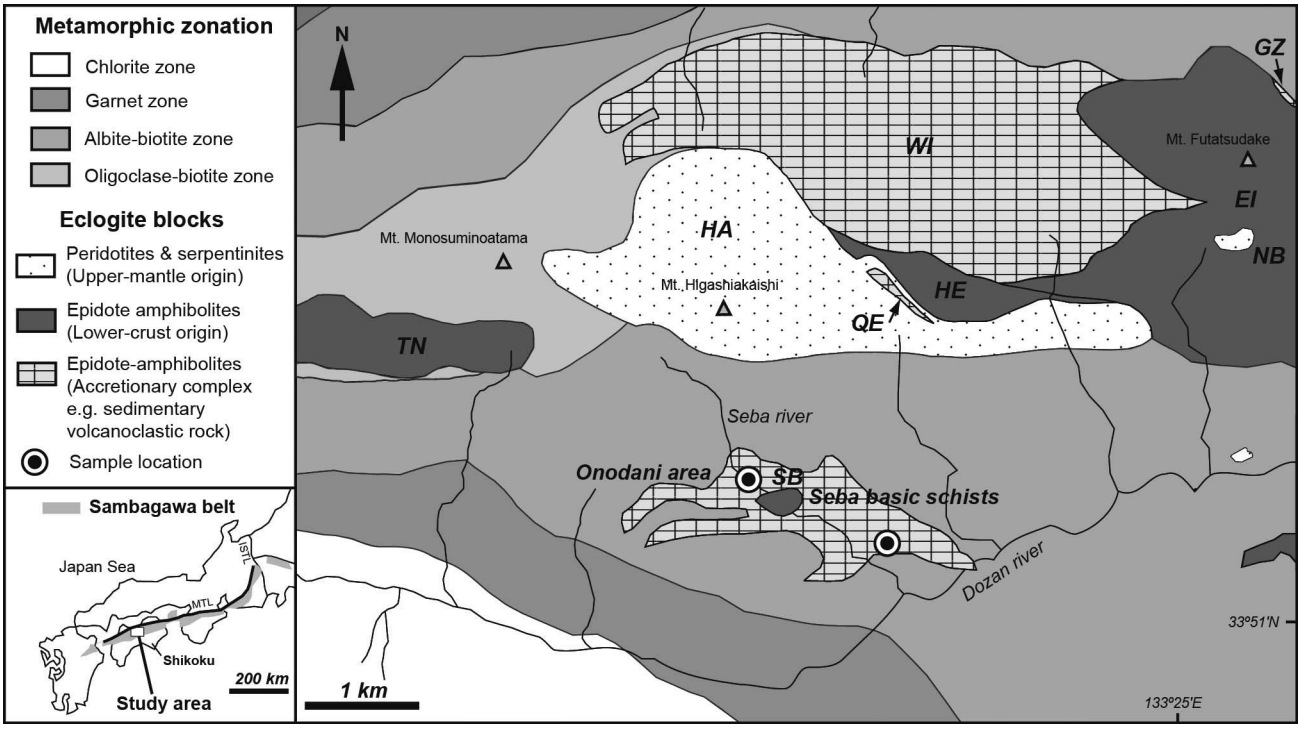

Figure 1. Geological and metamorphic zonal map of the Sambagawa metamorphic belt in the Besshi district, central Shikoku, Japan (compiled from Takasu and Makino, 1980; Takasu, 1989; Higashino, 1990; Kugimiya and Takasu, 2002; Sakurai and Takasu, 2009). SB, Sebadani metagabbro mass; TN, Tonaru metagabbro mass; WI, Western Iratsu mass; EI, Eastern Iratsu mass; HA, Higashi-akaishi peridotite mass; QE, Quartz eclogite mass; HE, Hornblende eclogite mass; NB, Nikubuchi peridotite mass; GZ, Gazo eclogite mass.

2. Petrography and the modes of occurrence of clinopyroxenes

The Seba eclogitic basic schists consist mainly of garnet, clinopyroxene (omphacite/aegirine-augite/augite), sodic/sodic-calcic/calcic-amphiboles (glaucophane, winchite, barroisite, Fe-barroisite, taramite, katophorite, Mg-katophorite, edenite, actinolite and Mg-hornblende), epidote and phengite (Fig. 2a-b). Minor amounts of rutile, titanite, albite, hematite and quartz are also present. Chlorite, paragonite and carbonates (calcite and ankerite) occur occasionally. A schistosity is defined by preferred orientation of phengite, and a lineation is defined by aligned prismatic omphacite and sodic-calcic/calcic-amphibole (Kabir and Takasu, 2010b). Layers (< 4 mm) of carbonate minerals (calcite and ankerite) and large calcite patch (< 4 mm across) occur in the matrix.

Garnets occur as euhedral to subhedral porphyroblasts up to 5 mm in diameter. Some of them are optically zoned wi-

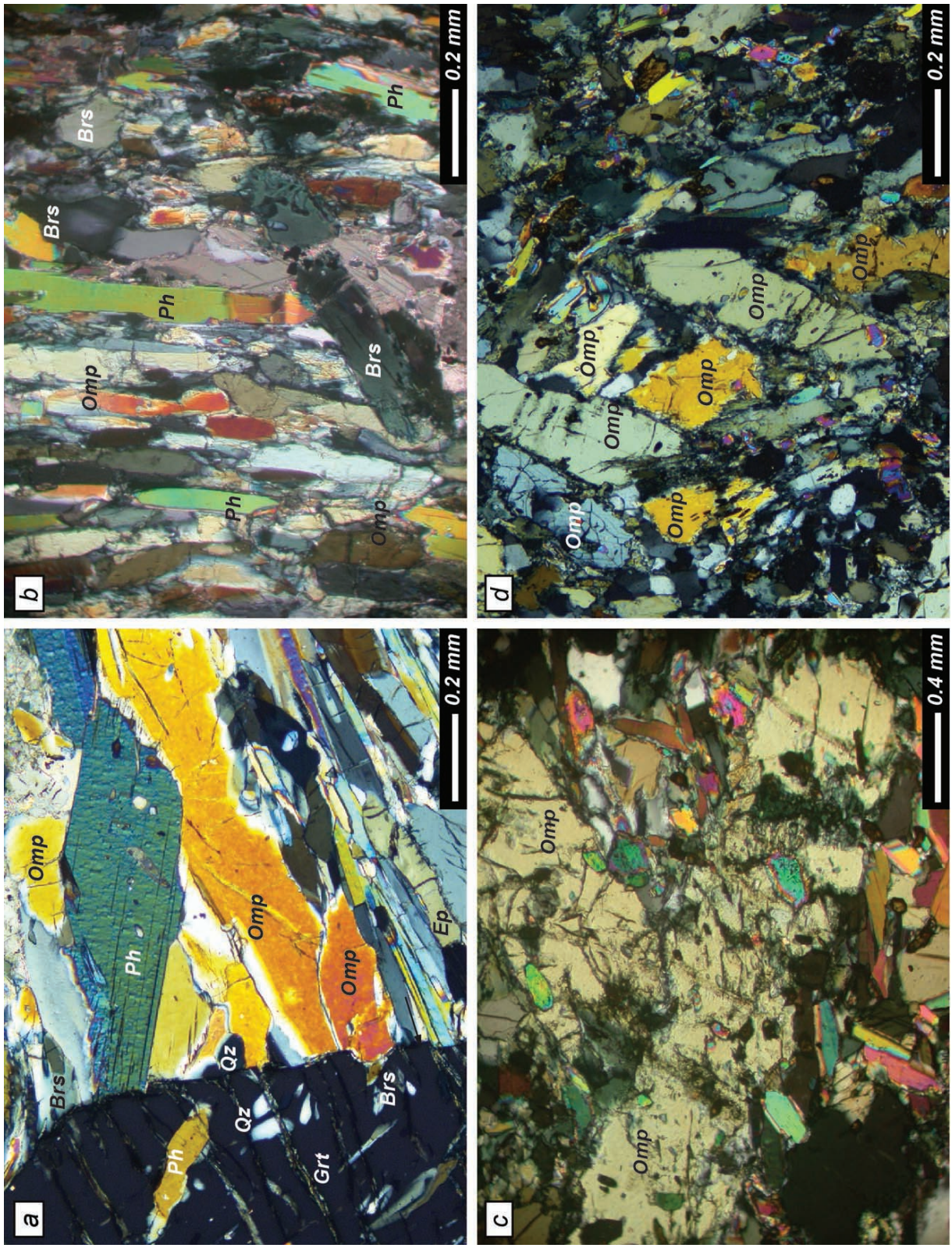

Figure 2. Photomicrographs of eclogite from the Seba eclogitic basic schists showing, (a) porphyroblastic garnet and schistosity-forming omphacite (Cpx-3), barroisitic amphibole, phengite, epidote and quartz. The garnet contains inclusions of barroisitic amphibole, phengite and quartz. (b) Schistosity-forming matrix omphacite (Cpx-3) and other matrix minerals (phengite, barroisite). (c-d) randomly oriented omphacites (Cpx-4) are cross-cutting to the matrix schistosity.

th pale orange-colored cores and colorless mantles. Both cores and mantles contain numerous inclusions and they commonly show a sigmoidal pattern. The cores of the garnets contain inclusions of sodic- and sodic-calcic amphiboles (glaucophane, winchite, barroisite), epidote (X_{Ps} = 0.24–0.29), paragonite, albite (An < 3), titanite, hematite, chlorite, calcite and quartz. The mantles of the garnets contain inclusions of clinopyroxene, sodic-calcic amphiboles (barroisite, taramite, katophorite), epidote (X_{Ps} = 0.24–0.32), phengite (Si = 6.65–6.81 cations per formula unit, pfu), rutile, titanite, albite (An < 3), chlorite and quartz (Kabir and Takasu, 2010b).

The clinopyroxenes in the Seba eclogitic basic schists commonly display five different mode of occurrence. Cpx-1 (X_{Jd} = 0.23–0.39) occurring as inclusions in the mantles of porphyroblastic garnets is euhedral to subhedral grains up to 1 mm across (Fig. 3a). Cpx-1 also occurs as a constituent mineral of polyphase inclusions, which consist of Cpx-1 (omphacite), amphibole (barroisite, Fe-barroisite, taramite) and phengite (Si = 6.65–6.69 pfu), and Cpx-1 (omphacite), amphibole (barroisite), epidote and phengite (Si = 6.70–6.74 pfu). Cpx-2 is documented as inclusions in coarse-grained epidotes and it occurs as subhedral fine grained relict crystals up to 0.03 mm across (Fig. 3b). Schistosity forming Cpx-3 occurring in the matrix forms subhedral prismatic grains up to 4 mm long (Fig. 2a-b). It is sometimes zoned with pale green cores to colorless rims. Cpx-3 contain inclusions of sodic-calcic amphiboles (barroisite), garnet, epidote, phengite (Si = 6.56–6.59 pfu), rutile, chlorite and calcite. Some clinopyroxenes are randomly oriented to the matrix schistosity (Cpx-4) (Fig. 2c-d) up to 4 mm long. They are sometimes zoned with pale green cores to colorless rims and contain inclusions of garnet, sodic-calcic amphiboles (barroisite, Mg-katophorite), epidote and rutile. Cpx-4 is partly replaced by symplectites of clinopyroxene (Cpx -5); augite, sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, actinolite), albite (An < 4) (Fig. 3c), and agerine-augite, sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, Mg-hornblende) and albite (An < 3) (Fig. 3d).

3. Chemical compositions of clinopyroxenes

Chemical compositions and compositional zoning of the clinopyroxenes in the Seba eclogitic basic schists have been investigated by electron microprobe analyzer (JEOL JXA 8800M and 8530F) in Shimane University. Analytical conditions were 15 kV accelerating voltage, 20 nA specimen current and 5 mm beam diameter for quantitative analysis. The correction was carried out by the procedure of Bence and Albee (1968). Fe^{3+} estimation for clinopyroxene used the Fe^{3+} = 4–2 × Si–2 × Ti-Al + Na (for 6 oxygen's). Ti (< 0.18 wt%), K (< 0.07 wt%) and Cr (< 0.08 wt%) are negligible for all clinopyroxenes.

Clinopyroxenes (Cpx-1) as inclusions in porphyroblastic garnets are classified as omphacite and aegirine-augite with X_{Jd} = 0.23–0.39 and X_{Aeg} = 0–0.29 (Fig. 4a; Table 1). Omphacites inclusions (Cpx-2) in coarse-grained epidotes have similar X_{Jd} (0.29–0.37) and X_{Aeg} (0.08–0.15) contents (Fig. 4a). Omphacites with preferred orientation in the matrix (Cpx-3) have relatively higher X_{Jd} (X_{Jd} = 0.24–0.48, X_{Aeg} = 0–0.25) contents than those included in garnets (Cpx-1) and epidotes (Cpx-2) (Fig. 4b).

The clinopyroxenes (Cpx-3) are occasionally zoned, with X_{Jd} increasing from core (X_{Jd} = 0.25–0.36, X_{Aeg} = 0.05–0.17) to rim (X_{Jd} = 0.34–0.48, X_{Aeg} = 0.02–0.14). Randomly oriented omphacites (Cpx-4) with X_{Jd} = 0.25–0.36 and X_{Ae} = 0.10–0.24 are slightly lower X_{Jd} contents than omphacites (Cpx-3) in the matrix (Fig. 4c). They are occasionally zoned with increasing X_{Jd} from core (X_{Jd} = 0.27, X_{Aeg} = 0.20) to rim (X_{Jd} = 0.36, X_{Aeg} = 0.11). Clinopyroxene (Cpx-5) as a constituent of the symplectite with sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, Mg-hornblende) and albite (An < 3) is aegirine -augite in composition and it has lower in X_{Jd} = 0.11–0.19 and higher in X_{Aeg} = 0.32–0.36 contents. Clinopyroxenes (Cpx-5) as a constituent of symplectite with sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, actinolite), albite (An < 4) is classified as augite (Ca-Fe-Mg pyroxenes) has lower in X_{Jd} = 0.10–0.13 and X_{Aeg} = 0.01–0.07 than all other modes of occurrences (Fig. 4b, d; Table 1). This clinopyroxene has quadrilateral compositions of X_{Wo} = 0.21–0.23, X_{Fs} = 0.22–0.25 and X_{En} = 0.53–0.56 contents (Fig. 4d).

4. Discussion and conclusions

The clinopyroxenes from the Seba eclogitic basic schists occur in various modes of occurrences. Their chemical compositions show a wide range of X_{Jd} from 0.10 to 0.48 including omphacite, aegirine-augite and augite compositions, responsible for a diversity of their equilibrium *P–T* conditions.

Aegirine-augite and omphacites (Cpx-1) inclusions in porphyroblastic garnets are crystallized before or during garnet growth. These clinopyroxenes are the products of the prograde

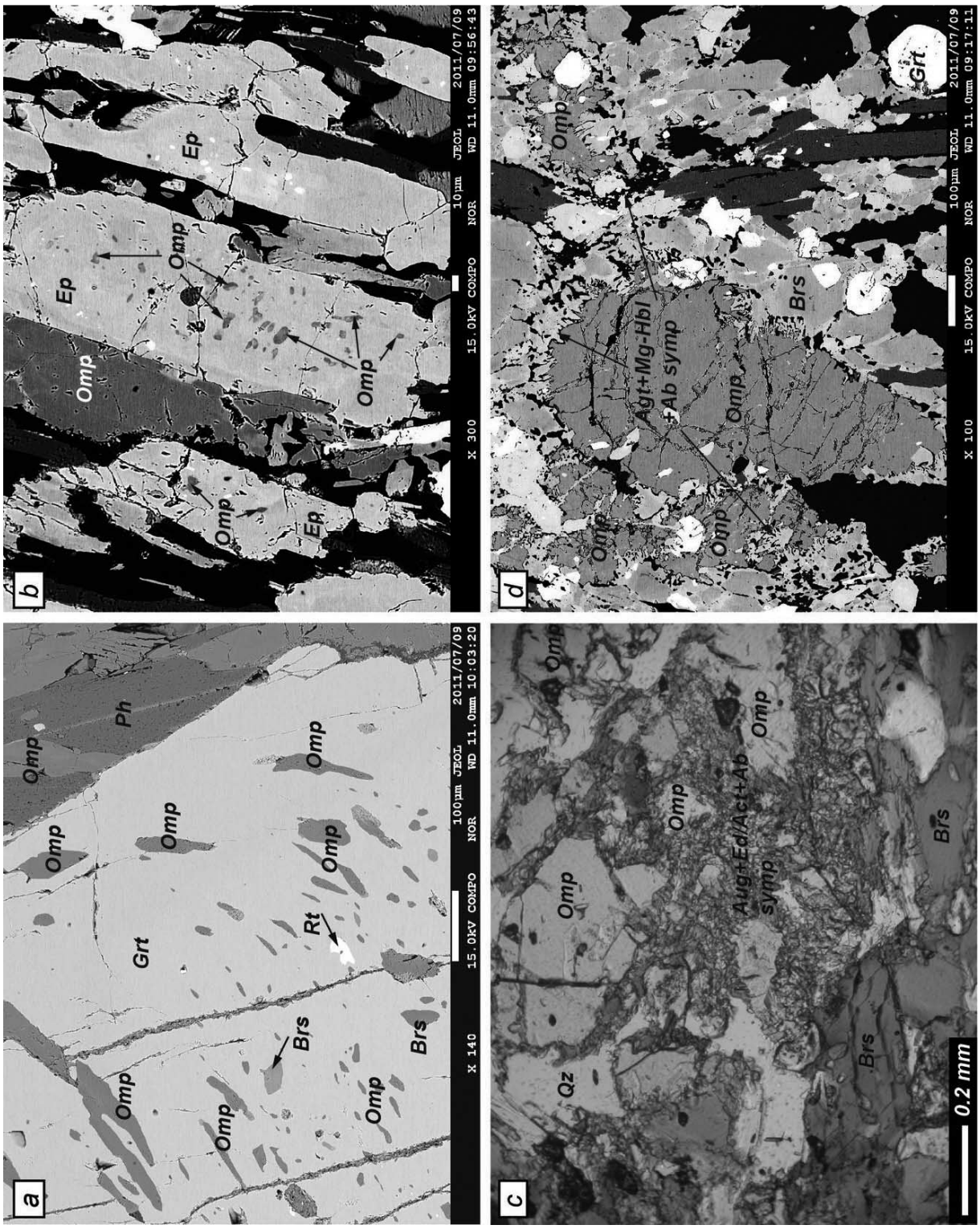

Figure 3. Backscattered electron images and photomicrograph of eclogites from the Seba eclogitic basic schists. (a) The garnet contains inclusions of omphacite (Cpx-1), barroisitic amphibole and rutile. (b) Large grains of matrix epidotes are coexisting with matrix omphacites (Cpx-3) containing inclusions of omphacite (Cpx-2). (c) Omphacites (Cpx-3) are replaced by symplectites of low-jadeite clinopyroxene (augite) (Cpx-5), edinitic/actinolitic amphibole and albite (An < 4) and (d) Aegirine-augite (Cpx-5), Mg-hornblende and albite (An < 3).

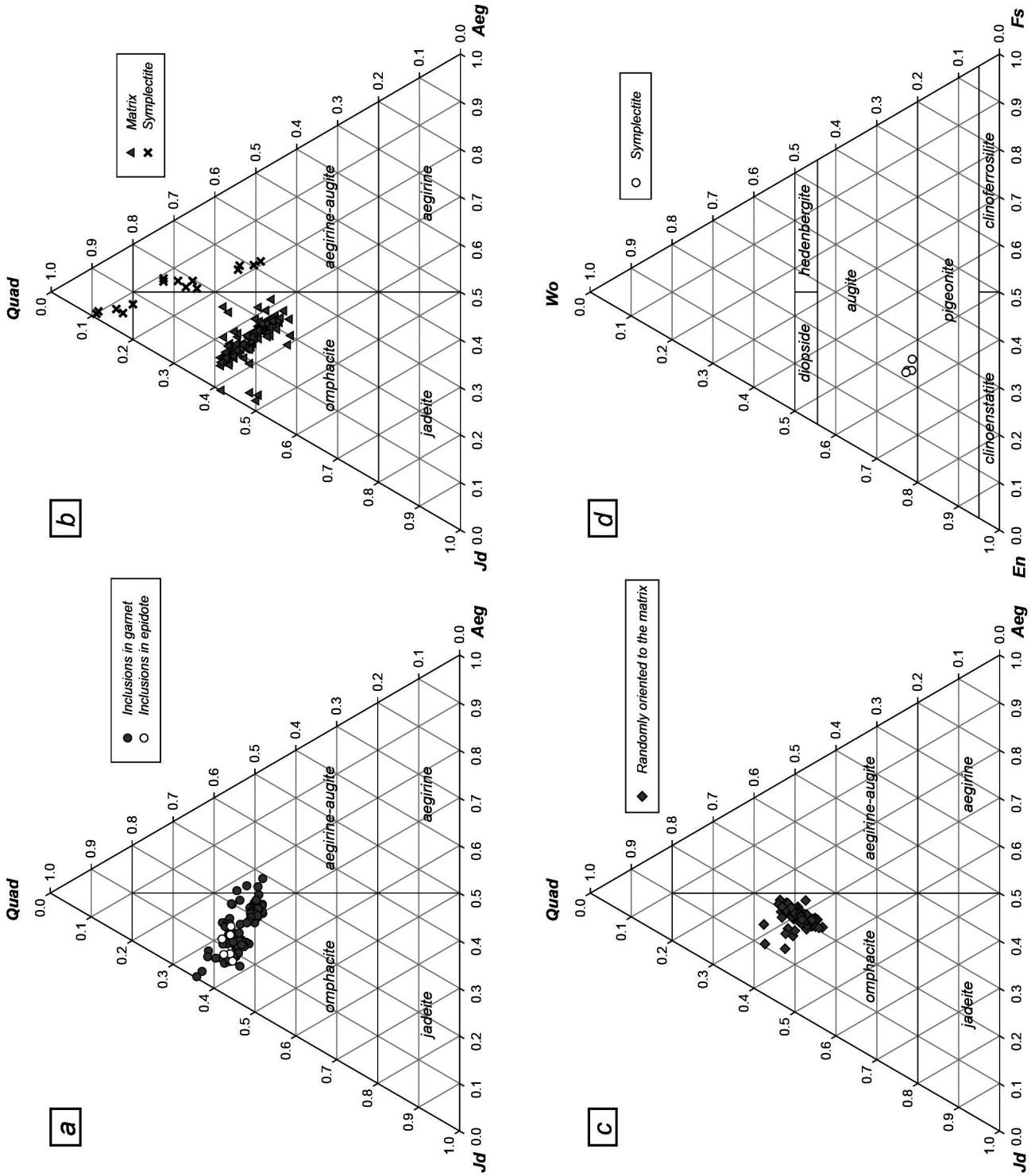

Figure 4. Variety of chemical compositions of clinopyroxenes from the Seba eclogitic basic schists (after Morimoto, 1989).

to the peak metamorphism of epidote–amphibolite and eclogite facies metamorphic conditions. X_{Jd} of Cpx-1 included in the mantle of the garnets increases from Cpx-1 included in the inner mantle to that included in the outermost mantle, ranging from 0.23 to 0.39. The Fe^{2+}–Mg partitioning between garnet and omphacite inclusion (K_D) ranges between 11 and 23, and X_{Jd} of the omphacite range from 0.23 to 0.39. The *P–T* conditions were estimated from the calibrations of the garnet-clinopyroxene Fe^{2+}–Mg exchange geothermometry, giving from 535 °C to 680 °C (Ellis and Green, 1979) from inner mantle pairs to the outermost mantle pairs. These suggest that metamorphic temperatures increase during the growth of garnets (Fig. 5). The clinopyroxene inclusions in the outermost mantle and their host garnets are crystallized close to the peak metamorphic conditions of the eclogite facies. Clinopyroxenes as inclusions in the large epidotes (Cpx-2) probably crystallized simultaneously with Cpx-1 during the prograde metamorphism, because matrix omphacites and epidotes are coexisted and the X_{Jd} of Cpx-1 and Cpx-2 are the similar.

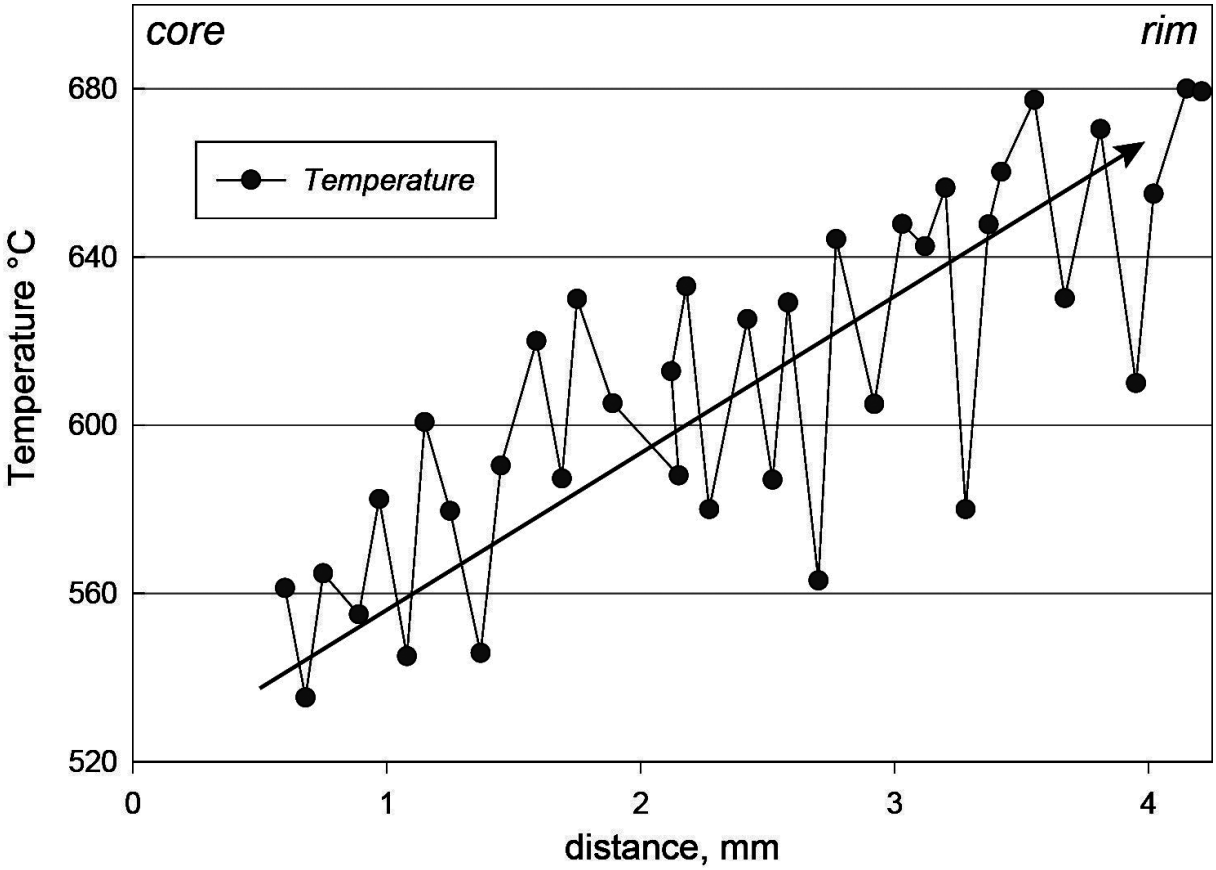

Figure 5. Estimated metamorphic temperature using Fe^{2+}/Mg exchange reaction between inclusions omphacite versus host garnet (Ellis and Green, 1979) represents metamorphic temperature increase from garnet core to the rim (solid arrow).

The peak metamorphic conditions of eclogite facies are defined by the schistosity forming minerals coexisting with the outermost mantle of porphyroblastic garnet, omphacite (Cpx-3), barroisitic amphibole, phengite (Si = 6.62–6.88 pfu), rutile and quartz (Kabir and Takasu, 2010b). The estimated peak metamorphic conditions of the eclogites are 12–24 kbar and 610–640 °C (Aoya, 2001; Kabir and Takasu, 2010c). Cpx-4 occurring as randomly oriented to the matrix foliation is similar to those of omphacites in R-type eclogites (Aoya and Wallis, 1999). Aoya and Wallis (1999) reported R-type eclogite have been found only in the area adjacent to the Sebadani metagabbro mass, while R-type eclogites were also reported 1 km away from the mass (Kabir and Takasu, 2010c). The eclogites in the Seba eclogitic basic schists were affected by deformation of varying degrees resulting in the formation of a variety of textural types of omphacites (e.g. lineated and randomly oriented) (Aoya and Wallis, 1999). The retrograde stage is defined by the phases replacing the minerals of the peak metamorphic

stage. The omphacites are replaced by symplectites of aegirine-augite (X_{Jd} = 0.11–0.19), sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, Mg-hornblende) and albite (An < 3) or symplectite of augite (X_{Jd} = 0.10–0.13), sodic-calcic/calcic-amphiboles (e.g. barroisite, edenite, actinolite) and albite (An < 4). Temperature of 420–490 °C and pressure of 6–7 kbar at the epidote-amphibolite facies conditions are obtained from the Cpx-5 (X_{Jd} = 0.10–0.19), sodic-calcic/calcic-amphiboles and albite by THERMOCALC (Holland and Powell, 1998) (Kabir and Takasu, 2010b).

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Table 1. Representative chemical compositions of clinopyroxenes from the Seba eclogitic basic schists.

Sample	S-9G																		
Analysis	11	12	13	17	21	48	65	66	67	73	74	78	83	84	85	88	96	11	54
	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4
SiO_2	53.54	53.69	53.93	53.50	54.28	54.26	53.70	54.11	54.66	54.34	54.38	54.15	53.83	53.78	53.81	53.79	53.77	54.72	55.25
TiO_2	0.08	0.08	0.08	0.07	0.05	0.05	0.04	0.04	0.04	0.06	0.05	0.10	0.12	0.18	0.06	0.08	0.04	0.05	0.07
Al_2O_3	7.28	8.38	7.73	7.93	7.87	7.88	6.17	7.75	7.44	7.32	6.68	8.10	6.79	7.49	7.35	6.24	6.40	6.76	8.02
FeO*	10.65	10.43	10.91	10.85	10.71	10.74	11.27	10.75	11.03	11.30	11.01	10.65	10.96	10.38	10.73	11.26	10.88	10.90	10.89
MnO	0.06	0.10	0.15	0.12	0.19	0.03	0.06	0.02	0.14	0.09	0.00	0.10	0.03	0.05	0.12	0.06	0.04	0.00	0.09
MgO	7.41	6.58	7.23	7.09	7.29	7.08	8.15	7.13	7.61	7.14	7.53	7.06	7.69	7.17	7.47	8.21	7.97	7.24	6.73
CaO	12.93	11.31	12.22	12.17	12.45	11.96	13.88	12.11	12.67	12.38	12.69	11.96	13.12	12.48	12.57	13.81	13.44	12.98	11.85
Na_2O	7.29	8.05	7.68	7.70	7.95	7.84	6.83	7.76	7.47	7.50	7.20	7.75	7.19	7.56	7.25	6.70	6.86	7.25	8.03
K_2O	0.04	0.04	0.02	0.02	0.05	0.02	0.02	0.03	0.03	0.03	0.01	0.05	0.03	0.05	0.03	0.04	0.03	0.04	0.02
Cr_2O_3	0.02	0.02	0.02	0.00	0.01	0.01	0.01	0.03	0.04	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.01	0.03	0.06
Total	99.29	98.68	99.96	99.46	100.84	99.86	100.12	99.72	101.12	100.16	99.56	99.92	99.75	99.14	99.38	100.20	99.42	99.96	101.01
Cations on the basis of 6 oxygens																			
Si	1.995	2.002	1.995	1.989	1.990	2.003	1.995	2.002	1.999	2.007	2.018	1.998	1.999	2.001	2.000	1.995	2.004	2.022	2.014
Ti	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.003	0.003	0.005	0.002	0.002	0.001	0.002	0.002
Al	0.319	0.368	0.337	0.348	0.340	0.343	0.270	0.338	0.321	0.319	0.292	0.352	0.297	0.328	0.322	0.273	0.281	0.294	0.344
Fe*	0.332	0.325	0.337	0.337	0.329	0.331	0.350	0.333	0.337	0.349	0.342	0.329	0.340	0.323	0.334	0.349	0.339	0.337	0.332
Mn	0.002	0.003	0.005	0.004	0.006	0.001	0.002	0.001	0.004	0.003	0.000	0.003	0.001	0.002	0.004	0.002	0.001	0.000	0.003
Mg	0.412	0.366	0.398	0.393	0.398	0.389	0.451	0.393	0.415	0.393	0.416	0.388	0.426	0.398	0.414	0.454	0.443	0.399	0.366
Ca	0.516	0.452	0.484	0.485	0.489	0.473	0.552	0.480	0.496	0.490	0.504	0.473	0.522	0.498	0.501	0.549	0.537	0.514	0.463
Na	0.527	0.582	0.550	0.555	0.565	0.561	0.492	0.557	0.529	0.537	0.518	0.554	0.517	0.546	0.523	0.482	0.495	0.519	0.567
K	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.001
Cr	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.002
Total	4.107	4.103	4.110	4.113	4.122	4.105	4.115	4.106	4.105	4.101	4.093	4.102	4.108	4.103	4.099	4.108	4.103	4.089	4.095

Sample	S-9G																	
Analysis	65	68	69	72	73	74	77	78	79	81	82	83	85	86	87	88	89	90
	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4
							Rim	←	←	←	←	←	←	Core	→	→	→	→
SiO_2	55.01	55.32	55.29	55.21	55.18	55.55	54.73	54.65	55.09	54.89	53.99	54.81	54.90	54.92	54.94	54.62	54.63	54.44
TiO_2	0.04	0.07	0.04	0.10	0.07	0.04	0.07	0.15	0.11	0.10	0.16	0.20	0.15	0.13	0.09	0.11	0.08	0.18
Al_2O_3	6.83	7.50	6.32	5.93	7.25	7.46	7.10	6.05	7.03	7.12	7.91	7.12	7.74	6.50	6.74	6.81	7.36	7.09
FeO*	10.67	10.60	10.84	11.04	10.67	10.90	10.65	11.00	10.52	10.43	10.92	10.78	10.62	10.62	10.89	10.85	10.34	10.95
MnO	0.07	0.04	0.03	0.05	0.08	0.04	0.06	0.03	0.03	0.02	0.07	0.14	0.01	0.00	0.01	0.03	0.02	0.10
MgO	7.46	7.21	7.79	8.16	7.32	7.06	7.38	7.98	7.49	7.48	7.06	7.38	7.04	7.84	7.74	7.50	7.27	7.44
CaO	13.24	12.52	14.05	14.39	13.13	12.95	13.32	14.40	13.14	13.45	11.78	13.37	12.70	14.02	13.65	13.47	12.85	12.99
Na_2O	7.26	7.49	6.97	6.69	7.35	7.40	7.37	6.59	7.14	7.25	7.86	7.37	7.64	6.67	7.05	7.22	7.47	7.11
K_2O	0.03	0.04	0.03	0.04	0.01	0.02	0.00	0.04	0.03	0.04	0.03	0.04	0.04	0.03	0.06	0.02	0.01	0.06
Cr_2O_3	0.03	0.00	0.02	0.00	0.04	0.05	0.05	0.04	0.02	0.05	0.05	0.07	0.03	0.00	0.04	0.07	0.02	0.01
Total	100.64	100.79	101.38	101.62	101.10	101.48	100.73	100.93	100.61	100.82	99.84	101.27	100.86	100.73	101.20	100.69	100.05	100.36
Cations on the basis of 6 oxygens																		
Si	2.018	2.019	2.018	2.014	2.013	2.018	2.008	2.009	2.018	2.009	1.997	2.003	2.006	2.014	2.009	2.007	2.012	2.006
Ti	0.001	0.002	0.001	0.003	0.002	0.001	0.002	0.004	0.003	0.003	0.005	0.005	0.004	0.004	0.002	0.003	0.002	0.005
Al	0.295	0.323	0.272	0.255	0.312	0.319	0.307	0.262	0.303	0.307	0.345	0.307	0.333	0.281	0.290	0.295	0.319	0.308
Fe*	0.327	0.324	0.331	0.337	0.326	0.331	0.327	0.338	0.322	0.319	0.338	0.330	0.324	0.326	0.333	0.333	0.318	0.337
Mn	0.002	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.001	0.002	0.004	0.000	0.000	0.000	0.001	0.000	0.003
Mg	0.408	0.393	0.424	0.444	0.398	0.382	0.404	0.437	0.409	0.408	0.389	0.402	0.384	0.428	0.422	0.411	0.399	0.408
Ca	0.520	0.490	0.550	0.563	0.513	0.504	0.523	0.567	0.516	0.527	0.467	0.523	0.497	0.551	0.535	0.530	0.507	0.513
Na	0.516	0.530	0.493	0.474	0.520	0.521	0.524	0.470	0.507	0.515	0.564	0.522	0.541	0.474	0.499	0.514	0.533	0.508
K	0.001	0.002	0.001	0.002	0.000	0.001	0.000	0.002	0.001	0.002	0.001	0.002	0.002	0.001	0.003	0.001	0.001	0.003
Cr	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.000	0.001	0.002	0.001	0.000
Total	4.091	4.083	4.092	4.093	4.089	4.081	4.098	4.091	4.082	4.092	4.108	4.100	4.094	4.080	4.094	4.099	4.093	4.091

Sample	S-9G																	
Analysis	92	93	94	95	96	97	3	5	10	14	17	18	41	42	43	44	46	47
	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-4
	→	→	→	→	→	Rim												
SiO_2	55.01	54.65	54.48	54.59	54.97	54.50	55.77	55.62	55.18	57.07	55.62	56.13	55.11	55.06	54.76	55.04	55.14	55.07
TiO_2	0.08	0.08	0.12	0.14	0.12	0.09	0.05	0.06	0.08	0.05	0.06	0.09	0.07	0.06	0.08	0.05	0.09	0.09
Al_2O_3	6.81	6.62	7.47	6.92	7.57	6.93	8.00	7.71	7.40	7.67	8.20	8.11	7.87	6.78	6.46	7.03	8.08	7.78
FeO*	10.78	10.84	10.72	10.69	10.78	11.15	11.21	11.54	10.98	11.00	11.06	9.90	10.54	10.32	10.15	10.22	10.30	10.71
MnO	0.05	0.04	0.05	0.04	0.06	0.06	0.04	0.06	0.07	0.09	0.05	0.10	0.08	0.01	0.06	0.07	0.10	0.13
MgO	7.51	7.69	7.22	7.47	7.12	7.53	6.75	6.91	7.33	6.33	6.64	7.06	6.91	7.75	7.79	7.59	6.93	7.05
CaO	13.39	13.52	12.65	13.31	12.97	13.29	12.08	12.47	12.70	11.75	11.77	12.45	12.01	13.62	13.50	13.02	11.78	11.95
Na_2O	7.23	6.99	7.42	7.20	7.47	7.19	7.69	7.58	7.35	7.37	7.87	7.28	7.52	6.68	6.73	7.04	7.74	7.52
K_2O	0.03	0.06	0.05	0.04	0.03	0.05	0.05	0.03	0.03	0.04	0.05	0.04	0.05	0.01	0.03	0.03	0.03	0.03
Cr_2O_3	0.01	0.02	0.01	0.00	0.03	0.00	0.02	0.01	0.03	0.03	0.02	0.00	0.04	0.02	0.00	0.00	0.04	0.01
Total	100.90	100.51	100.19	100.41	101.11	100.80	101.66	101.99	101.17	101.41	101.34	101.15	100.19	100.32	99.56	100.08	100.23	100.32
Cations on the basis of 6 oxygens																		
Si	2.015	2.012	2.007	2.009	2.007	2.003	2.020	2.014	2.012	2.059	2.019	2.028	2.021	2.021	2.025	2.023	2.018	2.018
Ti	0.002	0.002	0.003	0.004	0.003	0.003	0.001	0.002	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.003	0.002
Al	0.294	0.287	0.324	0.300	0.326	0.300	0.341	0.329	0.318	0.326	0.351	0.345	0.340	0.293	0.282	0.305	0.348	0.336
Fe*	0.330	0.334	0.330	0.329	0.329	0.343	0.339	0.350	0.335	0.332	0.336	0.299	0.323	0.317	0.314	0.314	0.315	0.328
Mn	0.002	0.001	0.002	0.001	0.002	0.002	0.001	0.002	0.002	0.003	0.002	0.003	0.003	0.000	0.002	0.002	0.003	0.004
Mg	0.410	0.422	0.397	0.410	0.387	0.413	0.365	0.373	0.399	0.341	0.359	0.380	0.378	0.424	0.430	0.416	0.378	0.385
Ca	0.526	0.533	0.499	0.525	0.507	0.523	0.469	0.484	0.496	0.454	0.458	0.482	0.472	0.535	0.535	0.513	0.462	0.469
Na	0.514	0.499	0.530	0.514	0.529	0.512	0.540	0.532	0.520	0.516	0.554	0.510	0.534	0.475	0.482	0.501	0.549	0.535
K	0.001	0.003	0.002	0.002	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.001	0.001
Cr	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.000
Total	4.094	4.093	4.094	4.095	4.092	4.101	4.079	4.087	4.087	4.035	4.082	4.052	4.075	4.069	4.074	4.075	4.080	4.079

**Total Fe as FeO*

Table 1. (continued)

Sample	S-9G				S 0605079														
Analysis	2	11	14	15	1	10	20	22	30	90	91	94	96	97	99	100	33	34	35
	Cpx-4	Cpx-4	Cpx-4	Cpx-4	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-5	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3
SiO_2	54.22	53.62	54.19	54.44	50.12	53.53	54.03	53.62	53.87	53.42	53.87	53.64	53.24	52.48	53.87	52.90	53.55	53.36	53.96
TiO_2	0.09	0.09	0.03	0.06	0.05	0.10	0.09	0.02	0.05	0.06	0.05	0.10	0.05	0.08	0.07	0.06	0.05	0.07	0.06
Al_2O_3	8.17	8.37	7.23	8.13	8.33	7.82	8.45	7.73	8.11	6.60	8.30	8.14	7.93	4.41	8.23	7.07	7.04	7.49	7.55
FeO*	9.97	8.88	10.42	8.33	16.99	12.04	11.34	12.53	11.78	13.75	12.25	13.10	12.12	15.60	11.60	12.47	12.05	11.58	11.46
MnO	0.12	0.05	0.10	0.00	0.29	0.03	0.08	0.01	0.04	0.05	0.06	0.02	0.05	0.10	0.14	0.11	0.00	0.09	0.09
MgO	6.94	7.70	7.48	7.99	5.76	6.41	6.19	6.05	6.30	5.85	5.82	5.44	6.10	6.28	6.15	6.26	6.66	6.25	6.20
CaO	11.64	13.60	13.80	13.39	11.61	12.10	11.47	11.46	11.66	11.25	11.10	10.23	11.62	12.21	11.81	12.26	12.06	11.80	11.36
Na_2O	7.82	6.75	6.37	6.70	5.95	7.44	7.62	7.66	7.76	7.53	7.83	8.23	7.52	7.09	7.52	6.97	7.42	7.46	7.73
K_2O	0.04	0.03	0.04	0.05	0.03	0.05	0.04	0.03	0.02	0.05	0.04	0.03	0.03	0.04	0.03	0.05	0.02	0.02	0.05
Cr_2O_3	0.04	0.01	0.00	0.05	0.04	0.03	0.03	0.04	0.02	0.02	0.04	0.01	0.00	0.08	0.01	0.04	0.00	0.03	0.00
Total	99.06	99.10	99.65	99.15	99.17	99.54	99.34	99.14	99.60	98.57	99.36	98.94	98.66	98.37	99.42	98.18	98.86	98.15	98.45
Cations on the basis of 6 oxygens																			
Si	2.009	1.983	2.005	2.002	1.924	1.996	2.005	2.008	2.002	2.025	2.007	2.013	2.001	2.026	2.003	2.006	2.011	2.012	2.024
Ti	0.002	0.003	0.001	0.002	0.001	0.003	0.003	0.001	0.001	0.002	0.001	0.003	0.001	0.002	0.002	0.002	0.001	0.002	0.002
Al	0.357	0.365	0.315	0.352	0.377	0.344	0.370	0.341	0.355	0.295	0.365	0.360	0.351	0.201	0.361	0.316	0.312	0.333	0.334
Fe*	0.309	0.274	0.322	0.256	0.545	0.376	0.352	0.393	0.366	0.436	0.382	0.411	0.381	0.504	0.361	0.396	0.379	0.365	0.360
Mn	0.004	0.002	0.003	0.000	0.009	0.001	0.002	0.000	0.001	0.002	0.002	0.001	0.001	0.003	0.004	0.004	0.000	0.003	0.003
Mg	0.384	0.424	0.413	0.438	0.329	0.356	0.342	0.338	0.349	0.331	0.323	0.304	0.342	0.361	0.341	0.354	0.373	0.352	0.347
Ca	0.462	0.539	0.547	0.528	0.477	0.483	0.456	0.460	0.464	0.457	0.443	0.411	0.468	0.505	0.470	0.498	0.485	0.477	0.456
Na	0.562	0.484	0.457	0.478	0.443	0.537	0.548	0.556	0.559	0.554	0.566	0.599	0.548	0.530	0.542	0.512	0.540	0.545	0.562
K	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.003
Cr	0.001	0.000	0.000	0.002	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.002	0.000	0.001	0.000	0.001	0.000
Total	4.091	4.075	4.066	4.059	4.109	4.099	4.082	4.099	4.099	4.104	4.092	4.104	4.096	4.136	4.086	4.091	4.102	4.092	4.089

Sample	S 0605079					S 06050701FS06													
Analysis	37	38	40	41	61	1	5	6	16	40	41	1	3	5	7	8	9	10	15
	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-5	Cpx-3	Cpx-3	Cpx-3	Cpx-5	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3
SiO_2	53.29	53.41	52.94	53.47	54.09	53.43	54.03	54.58	53.83	53.09	54.03	54.65	54.83	54.79	54.41	54.42	54.50	54.62	54.39
TiO_2	0.08	0.08	0.11	0.05	0.12	0.04	0.06	0.08	0.06	0.03	0.06	0.11	0.05	0.11	0.08	0.02	0.06	0.05	0.03
Al_2O_3	7.34	7.59	7.53	7.87	8.40	7.83	7.62	9.41	8.14	4.40	8.25	8.10	7.93	7.81	7.88	7.82	8.03	7.89	8.03
FeO*	11.62	11.46	11.73	11.47	11.24	12.16	11.95	11.43	11.13	15.85	11.20	11.80	11.89	11.65	11.42	11.87	11.92	12.24	11.73
MnO	0.03	0.06	0.03	0.05	0.01	0.13	0.07	0.08	0.02	0.08	0.13	0.08	0.11	0.13	0.04	0.08	0.03	0.10	0.07
MgO	6.50	6.20	6.36	6.35	6.28	5.98	6.32	5.32	6.19	6.41	6.22	6.03	6.37	6.51	6.58	6.40	6.45	6.19	6.10
CaO	12.16	11.83	12.06	11.74	11.51	11.55	11.90	10.14	11.79	12.01	11.84	11.10	11.84	12.20	11.95	11.81	11.74	11.65	11.59
Na_2O	7.13	7.58	7.26	7.51	7.51	7.01	7.15	8.23	7.11	6.87	6.94	7.98	7.54	7.31	7.27	7.40	7.36	7.49	7.61
K_2O	0.03	0.04	0.07	0.03	0.04	0.04	0.05	0.03	0.03	0.02	0.06	0.07	0.04	0.06	0.03	0.04	0.01	0.02	0.02
Cr_2O_3	0.00	0.02	0.01	0.02	0.05	0.01	0.00	0.01	0.02	0.04	0.00	0.04	0.01	0.04	0.00	0.00	0.00	0.03	0.02
Total	98.19	98.27	98.08	98.56	99.24	98.18	99.13	99.31	98.31	98.81	98.73	99.95	100.60	100.60	99.68	99.86	100.11	100.27	99.60
Cations on the basis of 6 oxygens																			
Si	2.010	2.012	2.002	2.006	2.007	2.014	2.016	2.017	2.015	2.036	2.014	2.019	2.014	2.013	2.013	2.015	2.011	2.015	2.017
Ti	0.002	0.002	0.003	0.001	0.003	0.001	0.002	0.002	0.002	0.001	0.002	0.003	0.001	0.003	0.002	0.001	0.002	0.001	0.001
Al	0.326	0.337	0.335	0.348	0.368	0.348	0.335	0.410	0.359	0.199	0.362	0.353	0.343	0.338	0.344	0.341	0.349	0.343	0.351
Fe*	0.367	0.361	0.371	0.360	0.349	0.383	0.373	0.353	0.348	0.508	0.349	0.365	0.365	0.358	0.353	0.367	0.368	0.378	0.364
Mn	0.001	0.002	0.001	0.001	0.000	0.004	0.002	0.002	0.001	0.003	0.004	0.002	0.003	0.004	0.001	0.002	0.001	0.003	0.002
Mg	0.365	0.348	0.358	0.355	0.347	0.336	0.351	0.293	0.346	0.367	0.346	0.332	0.349	0.356	0.363	0.353	0.355	0.341	0.337
Ca	0.492	0.477	0.489	0.472	0.458	0.466	0.476	0.402	0.473	0.493	0.473	0.439	0.466	0.480	0.474	0.468	0.464	0.460	0.460
Na	0.522	0.554	0.532	0.546	0.540	0.512	0.517	0.590	0.516	0.511	0.502	0.571	0.537	0.521	0.521	0.531	0.526	0.536	0.547
K	0.001	0.002	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.003	0.003	0.002	0.003	0.002	0.002	0.001	0.001	0.001
Cr	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.001
Total	4.086	4.095	4.095	4.092	4.076	4.068	4.075	4.071	4.062	4.119	4.055	4.088	4.082	4.076	4.074	4.081	4.076	4.079	4.081

Sample	S 06050701FS06																		
Analysis	17	18	19	20	22	24	12	13	14	18	19	20	4	9	11	16	3	6	7
	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-5	Cpx-5	Cpx-5	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-5	Cpx-5	Cpx-3	Cpx-3	Cpx-3
SiO_2	54.90	54.55	54.15	54.96	54.95	54.79	55.10	54.75	55.01	55.16	54.75	53.76	54.79	54.73	54.39	54.53	55.21	55.37	55.21
TiO_2	0.03	0.10	0.11	0.08	0.06	0.09	0.00	0.02	0.00	0.00	0.06	0.09	0.09	0.09	0.03	0.00	0.08	0.04	0.06
Al_2O_3	7.96	7.80	7.81	7.91	7.85	7.87	2.38	2.70	3.07	7.99	7.87	7.83	7.78	8.00	2.92	2.30	7.96	8.15	7.88
FeO*	11.91	11.37	11.93	11.56	11.31	11.29	12.55	13.19	14.62	12.39	12.24	11.56	12.11	11.88	14.77	12.45	11.55	11.16	11.91
MnO	0.02	0.07	0.01	0.04	0.01	0.08	0.18	0.12	0.10	0.17	0.10	0.06	0.13	0.08	0.11	0.12	0.05	0.00	0.11
MgO	5.96	6.56	6.62	6.62	6.64	6.57	17.08	16.19	14.60	6.04	5.99	6.73	6.21	6.43	15.18	17.11	6.41	6.63	6.09
CaO	11.10	12.09	12.07	12.08	11.91	12.11	9.61	8.60	7.28	11.16	11.69	12.07	11.79	12.00	7.25	9.73	11.99	11.61	11.61
Na_2O	7.92	7.40	7.56	7.35	7.29	7.19	2.23	2.87	3.63	8.10	7.77	6.89	7.08	7.23	3.42	2.13	7.11	7.19	7.31
K_2O	0.03	0.03	0.03	0.03	0.02	0.05	0.21	0.20	0.16	0.03	0.05	0.03	0.04	0.06	0.21	0.20	0.04	0.01	0.03
Cr_2O_3	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.02	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.01
Total	99.86	99.97	100.30	100.64	100.05	100.02	99.34	98.71	98.46	101.04	100.54	99.05	100.05	100.51	98.27	98.57	100.39	100.17	100.20
Cations on the basis of 6 oxygens																			
Si	2.028	2.014	2.000	2.014	2.022	2.018	2.027	2.031	2.051	2.021	2.017	2.004	2.023	2.012	2.036	2.023	2.024	2.028	2.031
Ti	0.001	0.003	0.003	0.002	0.002	0.002	0.000	0.000	0.000	0.000	0.002	0.003	0.003	0.003	0.001	0.000	0.002	0.001	0.002
Al	0.347	0.339	0.340	0.342	0.341	0.342	0.103	0.118	0.135	0.345	0.342	0.344	0.339	0.346	0.129	0.101	0.344	0.352	0.341
Fe*	0.368	0.351	0.369	0.354	0.348	0.348	0.386	0.409	0.456	0.379	0.377	0.361	0.374	0.365	0.462	0.386	0.354	0.342	0.366
Mn	0.001	0.002	0.000	0.001	0.000	0.003	0.006	0.004	0.003	0.005	0.003	0.002	0.004	0.002	0.003	0.004	0.002	0.000	0.003
Mg	0.328	0.361	0.365	0.362	0.364	0.361	0.936	0.895	0.811	0.330	0.329	0.374	0.342	0.352	0.847	0.946	0.350	0.362	0.334
Ca	0.439	0.478	0.478	0.475	0.469	0.478	0.379	0.342	0.291	0.438	0.462	0.482	0.466	0.473	0.291	0.386	0.471	0.455	0.458
Na	0.568	0.529	0.541	0.522	0.520	0.513	0.159	0.206	0.262	0.576	0.555	0.498	0.507	0.515	0.248	0.153	0.506	0.511	0.522
K	0.002	0.001	0.002	0.001	0.001	0.002	0.010	0.010	0.008	0.001	0.002	0.001	0.002	0.003	0.010	0.010	0.002	0.001	0.001
Cr	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.082	4.079	4.098	4.074	4.067	4.066	4.006	4.017	4.017	4.095	4.089	4.070	4.059	4.072	4.028	4.008	4.055	4.051	4.058

**Total Fe as FeO*

Table 1. (continued)

Sample	SEB 01																	
Analysis	46	48	50	52	54	56	58	61	63	65	67	69	71	73	75	77	79	82
	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1
SiO_2	54.80	54.30	54.22	54.40	54.34	53.88	54.57	54.47	54.32	53.61	54.41	54.37	54.36	54.05	54.46	55.23	54.51	54.40
TiO_2	0.03	0.03	0.05	0.03	0.00	0.12	0.06	0.02	0.05	0.06	0.09	0.02	0.00	0.06	0.08	0.08	0.10	0.01
Al_2O_3	6.51	6.57	5.25	7.19	6.78	5.65	6.38	6.48	6.84	6.43	7.17	6.93	6.11	6.70	6.69	6.58	6.66	5.41
FeO*	12.24	12.36	12.84	11.71	12.90	14.58	12.55	12.11	12.26	13.27	12.27	12.78	13.12	12.02	12.38	12.21	12.51	14.15
MnO	0.16	0.16	0.16	0.09	0.17	0.09	0.12	0.19	0.14	0.16	0.14	0.14	0.19	0.13	0.16	0.13	0.13	0.14
MgO	7.02	7.00	7.44	6.91	6.76	6.45	6.91	6.94	6.83	6.69	6.61	6.74	6.65	6.95	7.01	7.24	6.89	6.55
CaO	12.92	12.83	13.88	12.75	12.27	12.52	12.86	12.85	12.47	12.61	12.43	12.77	12.82	13.05	12.96	12.92	12.98	12.47
Na_2O	6.99	7.00	6.45	7.24	7.40	7.19	7.11	7.11	7.18	7.13	7.42	7.21	7.26	7.06	7.23	7.02	7.12	7.37
K_2O	0.01	0.00	0.00	0.00	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	0.00
Cr_2O_3	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.01	0.01	0.00	0.04	0.02	0.01	0.04	0.00	0.00
Total	100.66	100.24	100.28	100.33	100.62	100.47	100.56	100.19	100.08	99.98	100.54	100.95	100.56	100.03	100.98	101.44	100.89	100.50
Cations on the basis of 6 oxygens																		
Si	2.022	2.015	2.022	2.010	2.013	2.018	2.020	2.021	2.016	2.006	2.010	2.007	2.021	2.009	2.008	2.021	2.012	2.032
Ti	0.001	0.001	0.001	0.001	0.000	0.003	0.002	0.001	0.001	0.002	0.002	0.001	0.000	0.002	0.002	0.002	0.003	0.000
Al	0.283	0.287	0.231	0.313	0.296	0.250	0.279	0.283	0.299	0.284	0.312	0.301	0.268	0.293	0.291	0.284	0.290	0.238
Fe*	0.378	0.383	0.401	0.362	0.400	0.457	0.388	0.376	0.380	0.415	0.379	0.395	0.408	0.374	0.382	0.374	0.386	0.442
Mn	0.005	0.005	0.005	0.003	0.005	0.003	0.004	0.006	0.004	0.005	0.004	0.004	0.006	0.004	0.005	0.004	0.004	0.004
Mg	0.386	0.387	0.414	0.380	0.373	0.360	0.381	0.384	0.378	0.373	0.364	0.371	0.369	0.385	0.385	0.395	0.379	0.365
Ca	0.511	0.510	0.555	0.505	0.487	0.502	0.510	0.511	0.496	0.506	0.492	0.505	0.511	0.520	0.512	0.506	0.513	0.499
Na	0.500	0.504	0.467	0.518	0.531	0.522	0.510	0.511	0.516	0.518	0.532	0.516	0.523	0.509	0.517	0.498	0.510	0.534
K	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.001	0.000	0.000	0.001	0.000	0.000
Total	4.086	4.092	4.095	4.092	4.105	4.115	4.094	4.093	4.091	4.109	4.097	4.099	4.106	4.097	4.103	4.084	4.096	4.115

Sample	SEB 01																	
Analysis	86	88	90	94	96	98	100	102	104	106	108	110	112	114	116	118	120	2
	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-2
SiO_2	54.65	53.37	54.71	54.46	54.48	54.49	54.61	53.83	54.92	54.74	54.15	54.67	54.52	54.64	54.56	54.41	54.27	55.05
TiO_2	0.06	0.07	0.05	0.02	0.07	0.10	0.06	0.20	0.03	0.04	0.00	0.08	0.04	0.06	0.07	0.09	0.09	0.09
Al_2O_3	6.68	7.02	6.84	5.29	7.03	7.10	6.86	7.37	6.76	7.07	6.79	6.98	6.81	7.13	7.00	7.11	7.13	8.72
FeO*	11.91	12.88	12.27	13.44	11.79	11.81	11.52	11.83	12.50	11.95	12.07	11.77	12.14	11.75	12.07	11.36	11.16	7.87
MnO	0.15	0.11	0.06	0.08	0.13	0.07	0.15	0.12	0.13	0.11	0.10	0.08	0.17	0.09	0.11	0.08	0.08	0.02
MgO	6.82	7.33	7.08	7.02	6.91	7.08	6.90	7.05	6.84	6.88	7.05	7.19	7.03	6.97	7.07	7.20	7.33	8.02
CaO	13.16	12.97	12.86	13.23	12.92	12.77	12.82	12.56	12.84	12.55	12.78	12.71	12.78	12.50	12.61	12.81	12.88	14.15
Na_2O	7.11	6.59	7.22	6.80	7.28	7.45	7.27	7.11	7.02	7.14	7.24	7.17	6.98	7.24	6.99	6.90	6.82	6.40
K_2O	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Cr_2O_3	0.02	0.00	0.02	0.01	0.02	0.01	0.00	0.00	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.03
Total	100.57	100.33	101.11	100.35	100.62	100.88	100.17	100.06	101.07	100.51	100.18	100.65	100.47	100.38	100.49	99.99	99.76	100.35
Cations on the basis of 6 oxygens																		
Si	2.018	1.985	2.011	2.032	2.009	2.005	2.020	1.996	2.019	2.018	2.009	2.012	2.014	2.015	2.013	2.012	2.010	1.994
Ti	0.002	0.002	0.001	0.001	0.002	0.003	0.002	0.006	0.001	0.001	0.000	0.002	0.001	0.002	0.002	0.003	0.003	0.002
Al	0.291	0.308	0.296	0.232	0.305	0.308	0.299	0.322	0.293	0.307	0.297	0.303	0.297	0.310	0.304	0.310	0.311	0.372
Fe*	0.368	0.401	0.377	0.419	0.364	0.363	0.356	0.367	0.384	0.368	0.375	0.362	0.375	0.363	0.373	0.351	0.346	0.238
Mn	0.005	0.003	0.002	0.003	0.004	0.002	0.005	0.004	0.004	0.003	0.003	0.002	0.005	0.003	0.004	0.003	0.003	0.001
Mg	0.376	0.406	0.388	0.390	0.380	0.388	0.380	0.389	0.375	0.378	0.390	0.395	0.387	0.383	0.389	0.397	0.405	0.433
Ca	0.521	0.517	0.506	0.529	0.510	0.503	0.508	0.499	0.506	0.496	0.508	0.501	0.506	0.494	0.498	0.508	0.511	0.549
Na	0.509	0.475	0.514	0.492	0.521	0.531	0.521	0.511	0.501	0.510	0.521	0.512	0.500	0.518	0.500	0.495	0.489	0.450
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	0.000	0.000	0.000	0.000	0.000
Cr	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
Total	4.089	4.097	4.096	4.097	4.096	4.104	4.090	4.093	4.083	4.082	4.103	4.090	4.086	4.087	4.083	4.078	4.077	4.042

Sample	SEB-M-02																		
Analysis	21	169	124	113	116	118	119	1	3	4	5	6	7	8	9	10	11	12	13
	Cpx-5	Cpx-5	Cpx-5	Cpx-5	Cpx-5	Cpx-5	Cpx-5	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3
									Core	→	→	→	→	→	→	→	→	→	→
SiO_2	52.39	52.94	53.22	53.06	53.50	53.06	53.29	55.45	55.67	55.51	55.43	55.34	55.50	55.37	55.38	55.84	55.67	55.46	55.16
TiO_2	0.05	0.03	0.03	0.04	0.08	0.11	0.05	0.10	0.12	0.10	0.10	0.13	0.07	0.09	0.09	0.11	0.05	0.11	0.06
Al_2O_3	4.03	3.51	2.56	2.69	3.62	4.00	3.09	8.40	7.76	8.21	8.48	8.16	8.41	8.38	8.46	8.68	8.68	8.13	7.54
FeO*	15.37	11.26	9.39	9.48	9.45	10.88	9.73	9.32	8.83	8.46	8.43	8.98	8.53	8.46	8.26	8.27	8.87	10.08	10.26
MnO	1.18	0.33	0.38	0.32	0.29	0.36	0.34	0.00	0.05	0.03	0.07	0.03	0.05	0.04	0.02	0.00	0.00	0.06	0.05
MgO	6.93	9.67	11.28	11.10	10.50	9.61	10.94	7.25	8.03	7.94	7.93	8.20	8.05	8.18	8.09	7.95	7.60	6.90	7.36
CaO	12.75	16.91	18.34	18.42	17.13	16.38	17.42	13.35	14.33	13.89	14.08	14.25	14.51	14.45	14.53	14.05	13.67	13.14	14.14
Na_2O	6.39	4.86	3.85	3.84	4.64	5.01	4.36	7.11	6.64	6.76	6.76	6.55	6.55	6.55	6.64	6.71	7.00	7.10	6.59
K_2O	0.01	0.03	0.04	0.04	0.04	0.02	0.02	0.04	0.07	0.04	0.04	0.06	0.05	0.04	0.04	0.02	0.06	0.04	0.03
Cr_2O_3	0.00	0.04	0.02	0.02	0.00	0.04	0.08	0.00	0.03	0.03	0.01	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Total	99.10	99.58	99.09	99.00	99.23	99.45	99.30	101.01	101.53	100.97	101.33	101.70	101.72	101.56	101.51	101.62	101.60	101.01	101.19
Cations on the basis of 6 oxygens																			
Si	2.015	1.996	2.003	2.000	2.004	1.996	2.000	2.008	2.006	2.005	1.996	1.992	1.993	1.991	1.991	2.000	2.000	2.014	2.007
Ti	0.001	0.001	0.001	0.001	0.002	0.003	0.001	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.001	0.003	0.002
Al	0.183	0.156	0.113	0.120	0.160	0.177	0.137	0.358	0.330	0.349	0.360	0.346	0.356	0.355	0.359	0.366	0.367	0.348	0.323
Fe*	0.494	0.355	0.295	0.299	0.296	0.342	0.305	0.282	0.266	0.256	0.254	0.270	0.256	0.254	0.248	0.248	0.266	0.306	0.312
Mn	0.039	0.011	0.012	0.010	0.009	0.011	0.011	0.000	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.000	0.000	0.002	0.002
Mg	0.397	0.544	0.633	0.624	0.586	0.539	0.612	0.391	0.431	0.427	0.426	0.440	0.431	0.438	0.433	0.425	0.407	0.373	0.399
Ca	0.525	0.683	0.740	0.744	0.688	0.660	0.701	0.518	0.553	0.538	0.543	0.549	0.558	0.557	0.560	0.539	0.526	0.511	0.551
Na	0.476	0.356	0.281	0.280	0.337	0.365	0.317	0.499	0.464	0.473	0.472	0.457	0.456	0.457	0.463	0.466	0.488	0.500	0.465
K	0.000	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.003	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.003	0.002	0.001
Cr	0.000	0.001	0.001	0.001	0.000	0.001	0.002	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Total	4.131	4.103	4.080	4.080	4.083	4.095	4.088	4.061	4.059	4.055	4.058	4.061	4.056	4.058	4.059	4.048	4.060	4.060	4.063

**Total Fe as FeO*

Table 1. (continued)

Sample	SEB-M-02																		
Analysis	14	15	16	17	18	19	20	2	4	5	7	9	12	14	17	20	23	27	
	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	
	→	→	→	→	→	→	Rim												
SiO_2	55.90	55.18	55.51	53.39	55.57	55.49	55.26	55.16	55.28	51.01	54.83	54.98	55.13	53.88	51.09	54.02	53.78	53.58	
TiO_2	0.05	0.06	0.02	0.07	0.05	0.06	0.10	0.07	0.08	0.07	0.09	0.09	0.06	0.02	0.12	0.07	0.06	0.08	
Al_2O_3	8.26	6.18	8.38	10.68	8.62	8.57	8.77	8.22	8.07	8.02	7.98	8.07	8.13	6.34	8.99	6.49	7.41	7.60	
FeO*	8.92	11.12	9.28	8.34	9.23	8.68	8.50	8.40	9.20	15.82	10.16	10.36	10.04	11.05	16.41	12.12	11.32	10.66	
MnO	0.07	0.00	0.00	0.07	0.01	0.05	0.05	0.00	0.01	0.13	0.14	0.07	0.08	0.09	0.25	0.00	0.09	0.18	
MgO	7.85	7.83	7.37	6.66	7.16	7.70	8.34	8.47	7.73	6.25	7.15	7.04	7.17	7.61	6.34	7.18	7.82	7.62	
CaO	14.20	14.51	13.60	15.09	13.27	13.74	14.12	14.36	13.45	13.09	12.98	13.06	13.42	14.32	12.88	14.19	14.48	14.44	
Na_2O	6.47	6.24	6.88	5.96	7.09	6.93	6.55	5.98	6.48	5.12	6.43	6.73	6.53	5.90	5.01	6.13	5.47	5.40	
K_2O	0.02	0.04	0.04	0.02	0.05	0.04	0.07	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.05	
Cr_2O_3	0.00	0.00	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.04	0.04	
Total	101.74	101.15	101.11	100.28	101.06	101.30	101.77	100.69	100.34	99.54	99.80	100.44	100.60	99.23	101.11	100.22	100.50	99.63	
Cations on the basis of 6 oxygens																			
Si	2.006	2.019	2.007	1.945	2.009	2.000	1.982	1.996	2.012	1.938	2.014	2.010	2.009	2.011	1.912	2.006	1.981	1.985	
Ti	0.001	0.002	0.001	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.002	0.001	0.003	0.002	0.002	0.002	
Al	0.349	0.267	0.357	0.459	0.367	0.364	0.371	0.351	0.346	0.359	0.345	0.348	0.349	0.279	0.396	0.284	0.322	0.332	
Fe*	0.268	0.340	0.281	0.254	0.279	0.262	0.255	0.254	0.280	0.502	0.312	0.317	0.306	0.345	0.514	0.376	0.349	0.330	
Mn	0.002	0.000	0.000	0.002	0.000	0.001	0.002	0.000	0.000	0.004	0.004	0.002	0.003	0.003	0.008	0.000	0.003	0.005	
Mg	0.420	0.427	0.397	0.362	0.386	0.413	0.446	0.457	0.419	0.354	0.391	0.384	0.390	0.423	0.354	0.397	0.430	0.421	
Ca	0.546	0.569	0.527	0.589	0.514	0.531	0.543	0.557	0.524	0.533	0.511	0.511	0.524	0.573	0.517	0.564	0.572	0.573	
Na	0.450	0.443	0.482	0.421	0.497	0.484	0.456	0.419	0.457	0.377	0.458	0.477	0.462	0.427	0.364	0.441	0.391	0.388	
K	0.001	0.002	0.002	0.001	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	
Cr	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	
Total	4.043	4.068	4.055	4.034	4.056	4.059	4.059	4.037	4.042	4.070	4.040	4.053	4.046	4.062	4.069	4.072	4.051	4.041	

Sample	SEB-M-02																	
Analysis	31	33	36	38	40	42	44	46	48	62	1	2	3	4	7	9	11	14
	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-1	Cpx-1	Cpx-1
SiO_2	54.91	54.62	54.37	55.07	54.67	54.78	55.43	54.34	54.73	55.18	55.39	55.29	55.39	54.88	54.30	54.40	55.02	55.05
TiO_2	0.05	0.03	0.00	0.12	0.11	0.07	0.11	0.12	0.10	0.07	0.09	0.07	0.07	0.10	0.10	0.05	0.04	0.04
Al_2O_3	7.40	7.62	5.76	8.25	8.16	8.44	8.28	7.95	8.57	8.64	8.38	7.99	8.39	7.77	8.43	7.85	8.32	6.97
FeO*	10.01	10.92	12.15	8.73	8.29	7.94	8.07	8.61	8.46	7.39	8.21	8.42	8.38	8.49	8.26	10.74	9.88	10.52
MnO	0.11	0.16	0.14	0.04	0.00	0.01	0.00	0.04	0.03	0.00	0.05	0.00	0.04	0.02	0.01	0.05	0.10	0.04
MgO	7.52	7.07	7.32	7.99	8.22	8.14	8.52	8.19	8.17	8.25	7.76	7.96	7.97	8.16	8.25	6.99	7.08	7.55
CaO	14.05	13.33	13.88	14.26	14.40	14.17	14.39	14.39	14.13	14.24	13.80	14.00	13.89	14.44	14.53	13.59	13.11	14.34
Na_2O	6.26	6.56	6.26	6.15	6.01	6.17	6.03	5.72	6.10	6.29	6.71	6.53	6.37	6.27	6.08	6.66	6.97	6.23
K_2O	0.03	0.05	0.01	0.05	0.04	0.05	0.03	0.03	0.03	0.05	0.06	0.02	0.01	0.03	0.03	0.03	0.04	0.03
Cr_2O_3	0.00	0.01	0.00	0.02	0.00	0.02	0.00	0.00	0.02	0.00	0.01	0.00	0.02	0.02	0.01	0.00	0.03	0.00
Total	100.32	100.36	99.88	100.69	99.91	99.79	100.86	99.39	100.35	100.09	100.45	100.28	100.54	100.19	100.00	100.35	100.58	100.77
Cations on the basis of 6 oxygens																		
Si	2.012	2.007	2.026	1.997	1.995	1.997	1.999	1.996	1.989	1.999	2.008	2.010	2.005	2.001	1.982	2.000	2.006	2.014
Ti	0.001	0.001	0.000	0.003	0.003	0.002	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.001	0.001	0.001
Al	0.320	0.330	0.253	0.353	0.351	0.362	0.352	0.344	0.367	0.369	0.358	0.342	0.358	0.334	0.363	0.340	0.357	0.301
Fe*	0.307	0.336	0.379	0.265	0.253	0.242	0.243	0.265	0.257	0.224	0.249	0.256	0.254	0.259	0.252	0.330	0.301	0.322
Mn	0.003	0.005	0.004	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.001	0.001	0.000	0.001	0.003	0.001
Mg	0.411	0.388	0.406	0.432	0.447	0.442	0.458	0.448	0.443	0.446	0.419	0.432	0.430	0.443	0.449	0.383	0.385	0.412
Ca	0.551	0.525	0.554	0.554	0.563	0.554	0.556	0.566	0.550	0.553	0.536	0.545	0.539	0.564	0.568	0.535	0.512	0.562
Na	0.445	0.467	0.452	0.432	0.425	0.436	0.421	0.407	0.430	0.442	0.471	0.460	0.447	0.443	0.430	0.475	0.493	0.442
K	0.001	0.002	0.000	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.003	0.001	0.001	0.001	0.001	0.001	0.002	0.001
Cr	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
Total	4.050	4.061	4.074	4.040	4.040	4.039	4.034	4.033	4.041	4.036	4.048	4.048	4.037	4.051	4.049	4.067	4.061	4.056

Sample	SEB-M-02																		
Analysis	21	26	30	32	35	12	13	14	15	16	17	18	19	20	21	22	23	24	44
	Cpx-3	Cpx-3	Cpx-3	Cpx-2	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-1
						Rim	←	←	←	←	←	←	←	←	←	←	←	Core	
SiO_2	54.78	55.00	54.65	54.42	54.85	54.40	54.80	54.58	54.90	54.51	55.08	55.15	54.91	55.30	54.96	54.85	55.23	55.15	55.98
TiO_2	0.08	0.06	0.10	0.04	0.05	0.08	0.06	0.06	0.10	0.15	0.07	0.07	0.05	0.10	0.12	0.10	0.09	0.09	0.04
Al_2O_3	8.49	7.80	8.08	7.23	7.83	8.24	8.11	8.61	8.53	8.37	8.39	8.21	8.01	8.50	8.35	8.58	8.85	8.51	7.35
FeO*	8.25	8.30	8.18	10.06	10.02	9.05	8.38	8.55	8.32	8.80	8.63	8.38	9.07	8.28	8.45	8.55	7.87	7.46	9.92
MnO	0.04	0.07	0.02	0.09	0.04	0.03	0.00	0.07	0.01	0.00	0.05	0.04	0.04	0.03	0.08	0.03	0.08	0.03	0.05
MgO	8.13	7.89	8.17	7.30	6.96	7.85	7.87	7.63	8.12	8.02	7.92	7.95	7.67	8.05	7.85	8.10	8.12	8.75	8.37
CaO	14.31	14.20	14.43	14.33	13.63	14.01	13.85	13.87	14.20	14.25	13.71	13.75	13.88	14.12	14.13	14.06	13.97	14.68	13.75
Na_2O	6.27	6.18	6.19	6.22	6.86	6.02	6.06	6.23	6.10	6.09	6.17	6.14	6.08	6.07	6.14	5.95	6.29	6.02	6.32
K_2O	0.05	0.07	0.04	0.02	0.03	0.03	0.03	0.05	0.03	0.03	0.02	0.02	0.06	0.02	0.04	0.05	0.04	0.01	0.05
Cr_2O_3	0.03	0.03	0.03	0.00	0.00	0.00	0.04	0.03	0.06	0.04	0.01	0.01	0.00	0.04	0.02	0.00	0.00	0.03	0.00
Total	100.42	99.60	99.90	99.70	100.26	99.70	99.20	99.68	100.39	100.24	100.05	99.74	99.75	100.49	100.14	100.27	100.54	100.73	101.83
Cations on the basis of 6 oxygens																			
Si	1.989	2.013	1.996	2.010	2.011	1.995	2.011	1.997	1.992	1.987	2.005	2.011	2.010	2.001	2.000	1.993	1.995	1.989	2.015
Ti	0.002	0.002	0.003	0.001	0.001	0.002	0.002	0.002	0.003	0.004	0.002	0.002	0.001	0.003	0.003	0.003	0.002	0.002	0.001
Al	0.363	0.336	0.348	0.315	0.338	0.356	0.351	0.371	0.365	0.360	0.360	0.353	0.345	0.363	0.358	0.367	0.377	0.362	0.312
Fe*	0.251	0.254	0.250	0.311	0.307	0.277	0.257	0.262	0.253	0.268	0.263	0.255	0.278	0.251	0.257	0.260	0.238	0.225	0.298
Mn	0.001	0.002	0.001	0.003	0.001	0.001	0.000	0.002	0.000	0.000	0.002	0.001	0.001	0.001	0.002	0.001	0.003	0.001	0.002
Mg	0.440	0.430	0.445	0.402	0.380	0.429	0.430	0.416	0.439	0.436	0.430	0.432	0.418	0.434	0.426	0.439	0.437	0.470	0.449
Ca	0.557	0.557	0.565	0.567	0.535	0.550	0.544	0.544	0.552	0.557	0.534	0.537	0.545	0.548	0.551	0.547	0.541	0.567	0.530
Na	0.442	0.439	0.438	0.446	0.488	0.428	0.431	0.442	0.429	0.430	0.435	0.434	0.432	0.426	0.433	0.419	0.441	0.421	0.441
K	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.003	0.001	0.002	0.002	0.002	0.000	0.002
Cr	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
Total	4.048	4.038	4.047	4.055	4.063	4.040	4.028	4.038	4.037	4.044	4.032	4.028	4.033	4.028	4.034	4.031	4.035	4.038	4.050

**Total Fe as FeO*

Table 1. (continued)

Sample	SEB-M-02																		
Analysis	46	47	49	51	53	56	58	61	65	66	69	70	73	77	80	82	3	4	6
	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-3	Cpx-3	Cpx-3	Cpx-1	Cpx-1	Cpx-1	Cpx-2	Cpx-3	Cpx-2
SiO_2	54.57	54.50	54.05	54.19	54.37	52.72	53.47	54.83	53.45	52.53	53.52	54.02	55.20	53.57	54.05	54.05	54.71	55.59	55.31
TiO_2	0.02	0.07	0.03	0.05	0.04	0.04	0.05	0.09	0.07	0.01	0.11	0.03	0.02	0.05	0.00	0.06	0.05	0.05	0.13
Al_2O_3	7.37	8.08	7.60	8.00	7.55	8.95	5.64	8.02	6.61	7.33	6.28	8.28	7.57	5.74	7.74	7.77	6.88	8.97	8.34
FeO*	10.10	11.09	10.60	10.61	11.21	11.81	13.00	11.14	12.03	12.14	12.48	11.25	10.54	13.94	10.70	11.34	10.45	7.65	8.32
MnO	0.05	0.05	0.11	0.04	0.03	0.09	0.02	0.09	0.03	0.12	0.05	0.10	0.09	0.05	0.01	0.07	0.08	0.04	0.00
MgO	7.42	6.89	7.36	7.14	7.06	6.66	7.17	7.16	7.60	7.23	6.96	7.06	7.64	6.96	7.29	7.04	7.66	7.55	8.12
CaO	13.49	12.54	13.33	13.17	13.26	12.08	13.36	12.75	13.55	13.13	13.01	12.87	13.42	12.66	13.16	13.03	14.20	14.00	14.53
Na_2O	6.32	6.80	6.31	6.51	6.11	6.49	6.16	6.74	6.00	5.86	6.08	6.39	6.58	6.49	6.50	6.54	6.29	6.83	6.36
K_2O	0.02	0.01	0.03	0.06	0.04	0.02	0.03	0.04	0.03	0.04	0.01	0.03	0.04	0.04	0.05	0.04	0.07	0.02	0.04
Cr_2O_3	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.01	0.01	0.03	0.01	0.01	0.00	0.00	0.02	0.04	0.00	0.00	0.00
Total	99.37	100.05	99.42	99.76	99.66	98.86	98.93	100.86	99.37	98.43	98.51	100.04	101.11	99.50	99.51	99.97	100.39	100.71	101.15
Cations on the basis of 6 oxygens																			
Si	2.017	2.006	2.003	1.999	2.011	1.971	2.019	2.003	1.999	1.984	2.020	1.991	2.009	2.017	2.001	1.998	2.011	2.004	1.995
Ti	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.000	0.003	0.001	0.001	0.001	0.000	0.002	0.001	0.001	0.004
Al	0.321	0.350	0.332	0.348	0.329	0.394	0.251	0.345	0.291	0.326	0.279	0.360	0.325	0.255	0.338	0.339	0.298	0.381	0.354
Fe*	0.312	0.341	0.328	0.327	0.347	0.369	0.411	0.340	0.376	0.383	0.394	0.347	0.321	0.439	0.331	0.351	0.321	0.231	0.251
Mn	0.002	0.002	0.003	0.001	0.001	0.003	0.001	0.003	0.001	0.004	0.002	0.003	0.003	0.002	0.000	0.002	0.002	0.001	0.000
Mg	0.409	0.378	0.407	0.393	0.389	0.371	0.404	0.390	0.424	0.407	0.392	0.388	0.415	0.391	0.403	0.388	0.419	0.406	0.437
Ca	0.534	0.494	0.529	0.521	0.525	0.484	0.540	0.499	0.543	0.531	0.526	0.508	0.523	0.511	0.522	0.516	0.559	0.541	0.561
Na	0.453	0.485	0.454	0.465	0.438	0.471	0.451	0.477	0.435	0.429	0.445	0.457	0.464	0.474	0.467	0.469	0.448	0.478	0.445
K	0.001	0.001	0.001	0.003	0.002	0.001	0.001	0.002	0.001	0.002	0.000	0.001	0.002	0.002	0.002	0.002	0.003	0.001	0.002
Cr	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
Total	4.049	4.060	4.058	4.059	4.043	4.066	4.080	4.062	4.072	4.068	4.060	4.057	4.062	4.092	4.064	4.066	4.065	4.043	4.048

Sample	SEB-M-02																	
Analysis	15	16	25	34	138	28	29	30	36	42	45	61	62	16	34	25	138	139
	Cpx-2	Cpx-2	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-1	Cpx-3	Cpx-3	Cpx-3	Cpx-3	Cpx-3
SiO_2	55.32	55.24	54.80	55.72	55.21	54.60	54.97	54.52	55.39	55.22	55.66	55.34	54.82	54.24	55.72	54.80	55.21	54.03
TiO_2	0.14	0.07	0.06	0.05	0.05	0.10	0.03	0.07	0.03	0.06	0.03	0.09	0.06	0.07	0.05	0.06	0.05	0.03
Al_2O_3	8.17	5.75	10.91	11.20	11.40	8.26	8.37	6.77	7.29	7.80	8.26	8.61	7.54	5.75	11.20	10.91	11.40	7.20
FeO*	8.75	10.84	7.87	6.84	6.32	11.16	10.03	11.51	9.92	10.33	8.93	8.33	9.75	10.84	6.84	7.87	6.32	8.59
MnO	0.03	0.42	0.58	0.32	0.21	0.03	0.09	0.04	0.04	0.07	0.10	0.01	0.06	0.42	0.32	0.58	0.21	0.15
MgO	8.10	8.51	6.98	6.57	6.76	6.92	7.34	7.69	8.30	7.33	7.78	8.31	8.04	8.51	6.57	6.98	6.76	8.56
CaO	14.65	14.97	12.68	11.86	12.42	13.23	13.60	14.41	15.05	14.35	14.02	14.52	14.21	14.97	11.86	12.68	12.42	14.53
Na_2O	6.12	6.05	7.07	7.32	7.23	6.79	6.84	6.30	6.46	6.44	6.80	6.34	6.67	6.05	7.32	7.07	7.23	6.00
K_2O	0.04	0.04	0.04	0.04	0.03	0.04	0.02	0.04	0.02	0.02	0.03	0.02	0.03	0.04	0.04	0.04	0.03	0.04
Cr_2O_3	0.00	0.00	0.01	0.01	0.03	0.01	0.03	0.00	0.00	0.04	0.04	0.02	0.00	0.00	0.01	0.01	0.03	0.00
Total	101.33	100.89	100.98	99.92	99.64	101.12	101.32	101.35	102.50	101.66	101.66	101.60	101.16	100.89	99.92	100.98	99.64	99.13
Cations on the basis of 6 oxygens																		
Si	1.995	1.999	1.970	2.003	1.989	1.993	1.994	1.997	1.992	2.000	2.002	1.986	1.994	1.999	2.003	1.970	1.989	1.997
Ti	0.004	0.002	0.002	0.001	0.001	0.003	0.001	0.002	0.001	0.002	0.001	0.003	0.002	0.002	0.001	0.002	0.001	0.001
Al	0.347	0.250	0.462	0.474	0.484	0.355	0.358	0.292	0.309	0.333	0.350	0.364	0.323	0.250	0.474	0.462	0.484	0.314
Fe*	0.264	0.334	0.236	0.206	0.191	0.341	0.304	0.353	0.298	0.313	0.269	0.250	0.297	0.334	0.206	0.236	0.191	0.266
Mn	0.001	0.013	0.018	0.010	0.006	0.001	0.003	0.001	0.001	0.002	0.003	0.000	0.002	0.013	0.010	0.018	0.006	0.005
Mg	0.435	0.468	0.374	0.352	0.363	0.376	0.397	0.420	0.445	0.396	0.417	0.445	0.436	0.468	0.352	0.374	0.363	0.472
Ca	0.566	0.591	0.488	0.457	0.479	0.517	0.528	0.565	0.580	0.557	0.540	0.558	0.554	0.591	0.457	0.488	0.479	0.576
Na	0.428	0.432	0.492	0.510	0.505	0.481	0.481	0.447	0.450	0.452	0.474	0.441	0.470	0.432	0.510	0.492	0.505	0.430
K	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.001	0.002
Cr	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000
Total	4.043	4.091	4.044	4.015	4.020	4.068	4.067	4.079	4.078	4.058	4.059	4.050	4.079	4.091	4.015	4.044	4.020	4.061

**Total Fe as FeO*