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Multiple-reaction geobarometry for olivine-bearing igneous rocks
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Supplementary Material 5

Electron microprobe analyses

Methods

Mineral compositions for the samples from Dominica, Lesser Antilles, were determined using a JEOL 8530F FEG electron microprobe, at the School of Earth Sciences, University of Bristol. Accelerating voltage was 20 kV, beam current 10 nA and beam size 1 μm . Mineral standards were sanidine for Si, Al and K, albite for Na, rutile for Ti, eskolaite for Cr, fayalite for Fe, Ni metal for Ni, Mn metal for Mn, olivine for Mg, wollastonite for Ca and apatite for P. Peak counting times were 20 s for Ca, 30 s for Si, Al, Cr, Ni and Mn, 40 s for Ti, Na and K, 50 s for Fe and Mg. Total background counting times (both sides of the peak) were always half the peak counting time. Analytical errors determined from counting statistics are reported in Table A2.

Table S5.1 Results of individual electron microprobe analyses used for the calculations of avP for the selected xenoliths from Dominica. Locations of the analyses are shown in Fig. 10. For comparison, the mean (m) and standard deviation (sd) of some compositional variables, calculated using multiple analyses on different crystals from the same samples, are also reported.

	DC90				DC91				DC93a				DC93b			
	ol	sp	cpx	pl	ol	sp	cpx	pl	ol	sp	cpx	pl	ol	sp	cpx	pl
SiO ₂	38.22	0.09	51.23	44.68	37.72	0.06	51.94	46.22	38.24	0.06	50.46	45.21	38.39	0.06	51.85	44.95
TiO ₂	0.05	7.64	0.60	0.02	0.00	7.73	0.41	0.00	0.02	9.20	0.79	0.00	0.00	9.18	0.58	0.00
Al ₂ O ₃	0.00	6.69	3.64	35.20	0.03	5.86	2.51	33.98	0.01	6.14	3.86	34.72	0.02	6.34	2.91	34.92
Cr ₂ O ₃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.49	0.00	0.00
FeO	26.08	77.52	7.69	0.80	28.64	78.66	8.39	0.54	24.66	76.17	7.87	0.57	24.77	76.00	7.64	0.57
MnO	0.51	0.34	0.22	0.00	0.66	0.43	0.29	0.02	0.56	0.41	0.29	0.00	0.53	0.43	0.29	0.00
MgO	36.58	4.03	14.69	0.04	34.19	3.24	14.98	0.05	37.54	4.29	14.31	0.05	37.25	4.27	15.02	0.04
NiO	0.01	0.00	-	-	0.01	0.02	-	-	0.02	0.01	-	-	0.03	0.03	-	-
CaO	0.15	0.00	22.31	18.88	0.14	0.07	21.24	17.81	0.18	0.01	21.89	18.55	0.13	0.00	21.45	18.61
Na ₂ O	0.01	0.00	0.23	0.76	0.00	0.00	0.28	1.48	0.00	0.08	0.24	0.95	0.05	0.00	0.25	0.89
K ₂ O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Tot	101.62	96.33	100.63	100.38	101.39	96.06	100.03	100.10	101.24	96.41	99.71	100.07	101.20	96.80	100.00	99.99
mg#	71.4	17.7	81.9	-	68.0	14.5	78.5	-	73.1	18.5	80.7	-	72.8	18.2	79.7	-
mg# _m	71.6	17.6	80.8	-	68.0	14.5	77.2	-	72.8	18.6	80.5	-	72.8	17.9	81.0	-
mg# _{sd}	0.2	0.2	0.8	-	0.1	0.4	1.3	-	0.1	0.4	0.6	-	0.1	0.9	0.5	-
Fe ³⁺	-	1.307	0.059	-	-	1.333	0.040	-	-	1.255	0.055	-	-	1.232	0.025	-
Fe ³⁺ _m	-	1.296	0.049	-	-	1.325	0.034	-	-	1.247	0.057	-	-	1.249	0.035	-
Fe ³⁺ _{sd}	-	0.009	0.008	-	-	0.016	0.009	-	-	0.017	0.003	-	-	0.035	0.009	-
Al ^{IV}	-	-	0.117	-	-	-	0.077	-	-	-	0.126	-	-	-	0.083	-
Al ^{IV} _m	-	-	0.116	-	-	-	0.074	-	-	-	0.132	-	-	-	0.090	-
Al ^{IV} _{sd}	-	-	0.004	-	-	-	0.018	-	-	-	0.005	-	-	-	0.017	-
An	-	-	-	93.2	-	-	-	89.4	-	-	-	91.5	-	-	-	92.0
An _m	-	-	-	93.0	-	-	-	88.2	-	-	-	90.8	-	-	-	91.1
An _{sd}	-	-	-	0.4	-	-	-	1.8	-	-	-	1.1	-	-	-	0.9
n	14	12	7	15	4	11	16	20	7	9	4	5	6	4	10	7

mg# = 100*Mg/[Mg+Fe²⁺]; Fe³⁺ calculated from stoichiometry; Al^{IV}: tetrahedral Al in Cpx (2-Si; apfu); An: Anorthite in Pl, mol %; n: number of analyses

Table S5.2 Relative errors on the oxides wt% determined from counting statistics of the JEOL 8530F FEG electron microprobe (School of Earth Science, University of Bristol) during the analyses of the xenoliths from Dominica. Errors from counting statistics are calculated for each individual analysis; since each oxide for the same phase showed very similar errors, here we reported an average of all the analyses.

	Relative errors (%)			
	olivine	spinel	cpx	plag
SiO ₂	0.6	20	0.5	0.5
TiO ₂	20	0.9	10	20
Al ₂ O ₃	20	8.0	7.0	1.2
Cr ₂ O ₃	10	10	20	20
FeO	0.4	2.0	0.7	3.5
MnO	4.0	4.8	5.9	20
MgO	0.5	4.1	0.6	20
NiO	10	20	n.a.	n.a.
CaO	10	20	0.8	0.8
Na ₂ O	20	20	11	5.0
K ₂ O	20	20	20	10

n.a.: not analyzed