Hofmann, 1988, Chemical differentiation of the Earth: ... , Earth Planet. Sci. Lett., 90, 297 - 314 (PRIMA, N-MORB, CC)

TABLE 1

Major and trace element abundances in the Earth's primitive mantle, the continental crust and MORB

Element	Primitive mantle	MORB			Estimated bulk continental crust		
		N-MORB avg. (n)	N-MORB normalized	percent std. dev.	TM1	TM1 normalized	TM2 normalized
SiO_2 (%)	45.96	50.45	1.098	1.8	57.3	1.247	1.262
Al_2O_3	4.06	15.255	3.757	8.0	15.9	3.916	4.433
FeO	7.54	10.426	1.383	14.8	9.1	1.207	0.995
MgO	37.78	7.576	0.201	12.2	5.3	0.140	0.093
CaO	3.21	11.303	3.521	7.2	7.4	2.305	2.336
Na_2O	0.332	2.679	8.070	13.3	3.1	9.337	10.542
Na_2O (MgO = 8.0%)	0.332	2.526	7.608	15.2			
TiO_2	0.181	1.615	8.925	34.0	0.901	4.978	4.420
La (ppm)	0.6139	3.895	6.345	41.4	16	26.06	30.95
Ce	1.6011	12.001	7.496	40.1	33	20.61	23.73
Pr	0.2419	2.074	8.574	39.0	3.9	16.12	17.78
Nd	1.1892	11.179	9.401	37.8	16	13.45	13.45
Sm	0.3865	3.752	9.708	37.0	3.5	9.06	9.57
Eu	0.1456	1.335	9.167	30.1	1.1	7.56	7.56
Gd	0.5128	5.077	9.901	36.5	3.3	6.44	7.02
Tb	0.0940	0.885	9.412	38.1	0.60	6.38	6.81
Dy	0.6378	6.304	9.884	34.5	3.7	5.81	5.80
Ho	0.1423	1.342	9.433	36.6	0.78	5.48	5.76
Er	0.4167	4.143	9.944	34.3	2.2	5.28	5.52
Tm	0.0643	0.621	9.663	34.7	0.32	4.98	4.98
Yb	0.4144	3.900	9.411	33.8	2.2	5.31	5.31
Lu	0.0637	0.589	9.246	33.8	0.30	4.71	4.71
K	258.2	883.7	3.422	46.0	9100	35.24	48.41
Rb	0.5353	1.262	2.357	76.2	32	59.78	78.46
Cs	(0.0268)	0.01408	(0.53)	71.9	1.0	(37.3)	(63.43)
Sr	18.21	113.2	6.216	24.1	260	14.28	21.97
Ba	6.049	13.87	2.293	71.9	250	41.33	57.86
Hf	0.2676	2.974	11.116	42.7	3.0	11.21	11.21
Zr	9.714	104.24	10.705	40.0	100	10.29	10.29
Ta	0.0351	0.192	5.467	55.0	(1.0)	(28.49)	–
Nb	0.6175	3.507	5.679	55.1	11.0	17.82	17.82
U	0.0203	0.0711	3.496	52.3	0.91	44.76	61.49
Th	0.0813	0.1871	2.300	69.3	3.5	43.04	59.03
Pb	0.175	0.489	2.794	30.7	8.0	45.71	57.14
Y	3.940	35.82	9.091	31.2	20.0	5.08	5.58
Sc	14.88	41.37	2.784	9.8	30.0	2.02	2.02
Co	104	47.07	0.453	7.9	29.0	0.279	0.24
Ni	2080	149.5	0.072		105	0.050	0.014
Cu	28.0	74.4	2.657	29.1	75	2.679	2.14
Sn	0.150	1.382	9.213	32.4	2.5	16.67	–

The data for the primitive mantle and N-MORB average are taken from Jochum et al. [4]. The N-MORB average represents 26 fresh MORB glasses, defined as N-type MORB by their light-REE depletion [5]. The values for the primitive mantle are taken from Hart and Zindler [6] for the major elements, and their factor of 2.51 is used to obtain the mantle values of the refractory trace elements from the abundances in C1 charbonacous chondrites. The sources of the C1 chondrite data are: REE [7], Ba, Sr, Hf [8], Zr, Ta, Nb, Y, Sc [9], U [10]. Other elements were obtained as follows: Th = 4·U; Cu, Ni, Co [11], K = 12,700·U [12], Rb = Ba/12.3 [13], Cs = Rb/20 [14], Sn [15], and Pb from $\mu = 8.88$ [1]. Most of these values are believed to be correct within about 10%, except for Cs, for which different estimates differ by a factor of 4 [13,14,16].

The data sources for the two continental crust averages are: TM1 [17, table 3.5, p. 67]; TM2 [17, table 3.3, p. 62] (this is the so-called andesite model).

All normalized values are derived by division of the concentration through the primitive mantle value.

McDonough & Sun, 1995, The composition of the Earth, Chem. Geol., 120, 223 - 253 (PRIMA)

Table 5
Recommended chemical composition of the Silicate Earth–"Pyrolite"

Element	CI	Pyrolite	Pyrolite (normalized to Mg and CI)	±	Element	CI	Pyrolite	Pyrolite (normalized to Mg and CI)	±
Li (ppm)	1.5	1.6	0.45	30	Pd	550	3.9	0.003	80
Be	0.025	0.068	1.16	20	Ag	200	8	0.017	*F*3
B	0.9	0.30	0.14	*F*2	Cd	710	40	0.024	30
C	35,000	120	0.0015	*F*2	In	80	11	0.058	40
N	3,180	2	0.0003	*F*2	Sn	1,650	130	0.033	30
F	60	25	0.17	*F*2	Sb	140	5.5	0.017	50
Na	5,100	2,670	0.22	15	Te	2,330	12	0.002	*F*2
Mg (%)	9.65	22.8	1.00	10	I	450	10	0.009	*F*3
Al (%)	0.860	2.35	1.16	10	Cs	190	21	0.047	40
Si (%)	10.65	21.0	0.83	10	Ba	2,410	6600	1.16	10
P (ppm)	1,080	90	0.035	15	La	237	648	1.16	10
S	54,000	250	0.002	20	Ce	613	1,675	1.16	10
Cl	680	17	0.011	*F*2	Pr	92.8	254	1.16	10
K	550	240	0.18	20	Nd	457	1,250	1.16	10
Ca (%)	0.925	2.53	1.16	10	Sm	148	406	1.16	10
Sc	5.92	16.2	1.16	10	Eu	56.3	154	1.16	10
Ti	440	1,205	1.16	10	Gd	199	544	1.16	10
V	56	82	0.62	15	Tb	36.1	99	1.16	10
Cr	2,650	2,625	0.42	15	Dy	246	674	1.16	10
Mn	1,920	1,045	0.23	10	Ho	54.6	149	1.16	10
Fe (%)	18.1	6.26	0.15	10	Er	160	438	1.16	10
Co	500	105	0.089	10	Tm	24.7	68	1.16	10
Ni	10,500	1,960	0.079	10	Yb	161	441	1.16	10
Cu	120	30	0.11	15	Lu	24.6	67.5	1.16	10
Zn	310	55	0.075	15	Hf	103	283	1.16	10
Ga	9.2	4.0	0.18	10	Ta	13.6	37	1.16	15
Ge	31	1.1	0.015	15	W	93	29	0.13	*F*2
As	1.85	0.05	0.011	*F*2	Re	40	0.28	0.003	30
Se	21	0.075	0.002	70	Os	490	3.4	0.003	30
Br	3.57	0.050	0.006	*F*2	Ir	455	3.2	0.003	30
Rb	2.30	0.600	0.11	30	Pt	1,010	7.1	0.003	30
Sr	7.25	19.9	1.16	10	Au	140	1.0	0.003	*F*2
Y	1.57	4.30	1.16	10	Hg	300	10	0.014	*F*4
Zr	3.82	10.5	1.16	10	Tl	140	3.5	0.011	40
Nb (ppb)	240	658	1.16	15	Pb	2,470	150	0.026	20
Mo	900	50	0.024	40	Bi	110	2.5	0.010	30
Ru	710	5.0	0.003	30	Th	29	79.5	1.16	15
Rh	130	0.9	0.003	40	U	7.4	20.3	1.16	20

From Li to Zr element concentrations are given in ppm; Nb to U are given in ppb; and Mg, Al, Si, Ca and Fe are in wt%. The ± column is a subjective judgement of the uncertainty of this estimate. Uncertainties are expressed in %, unless otherwise stated; *F* = factor (*F*2 = we know this estimate to within a factor of 2). Most of the major and minor elements and a number of the refractory lithophile elements are known to within ±10% or better.

Sun & McDonough, 1989, Chemical and isotopic systematics of oceanic basalts: ....., Geol. Soc. London, Spec. Publ., 42, 313 - 345 (PRIMA, "OIB", usw.)

TABLE 1. *Element concentrations (ppm) in C1 chondrite, primitive mantle, N-type MORB, E-type MORB and ocean island basalts (OIB)*

Element	C1 chondrite[a]	Primitive mantle[a]	N-type MORB	E-type MORB	OIB
Cs	0.188	0.032[b]	0.0070	0.063	0.387
Tl	0.140	0.005	0.0014	0.013	0.077
Rb	2.32	0.635	0.56	5.04	31.0
Ba	2.41	6.989	6.30	57	350
W	0.095	0.020	0.010	0.092	0.560
Th	0.029	0.085	0.120	0.60	4.00
U	0.008	0.021	0.047	0.18	1.02
Nb	0.246	0.713	2.33	8.30	48.0
Ta	0.014	0.041	0.132	0.47	2.70
K	545	250	600	2100	12000
La	0.237	0.687	2.50	6.30	37.0
Ce	0.612	1.775	7.50	15.0	80.0
Pb	2.47	0.185[b]	0.30	0.60	3.20
Pr	0.095	0.276	1.32	2.05	9.70
Mo	0.92	0.063	0.31	0.47	2.40
Sr	7.26	21.1	90	155	660
P	1220	95	510	620	2700
Nd	0.467	1.354	7.30	9.00	38.5
F	60.7	26	210	250	1150
Sm	0.153	0.444	2.63	2.60	10.0
Zr	3.87	11.2	74	73	280
Hf	0.1066	0.309	2.05	2.03	7.80
Eu	0.058	0.168	1.02	0.91	3.00
Sn	1.72	0.170	1.1	0.8	2.7
Sb	0.16	0.005	0.01	0.01	0.03
Ti	445	1300	7600	6000	17200
Gd	0.2055	0.596	3.680	2.970	7.620
Tb	0.0374	0.108	0.670	0.530	1.050
Dy	0.2540	0.737	4.550	3.550	5.600
Li	1.57	1.60	4.3	3.5	5.6
Y	1.57	4.55	28	22	29
Ho	0.0566	0.164	1.01	0.790	1.06
Er	0.1655	0.480	2.97	2.31	2.62
Tm	0.0255	0.074	0.456	0.356	0.350
Yb	0.170	0.493	3.05	2.37	2.16
Lu	0.0254	0.074	0.455	0.354	0.300

[a] The compositions of C1 chondrite and primitive mantle are from McDonough & Sun (in prep.)
Values for N-type and E-type MORB and OIB are based on a literature survey and internal consistency of elemental ratios.
[b] For mantle-normalized diagrams, the recommended normalizing values for lead and caesium are 0.071 and 0.0079, respectively.

Salters & Stracke, 2004, Composition of the depleted mantle, Geochem. Geophys. Geosyst., Vol. 5 (DM)

Table 6. Estimate of the Composition of the Depleted Mantle

Element	Model	Unit	Constraint	Uncertainty in %	Element	Model	Unit	Constraint	Uncertainty in %
H_2O	116	ppm	H_2O/Ce	50	Ru	5.7	ppb	Ir/Ru	16
He	157	ppt	C/He	46	Rh	1.0	ppb	Ir/Rh	15
Li	0.70	ppm	Yb/Li	8	Pd	5.2	ppb	Ir/Pd	24
Be	25	ppb	Be/Ta	100	Ag	6	ppb	Ag-CaO	50
B	0.060	ppm	B/K	91	Cd	0.014	ppm	Cd/Dy	30
CO_2	50.3	ppm	CO_2/Nb	24	In	12.2	ppb	In/Y	25
N_2	40	ppb	C/N	30	Sn	0.10	ppm	Sn/Sm	22
F	11.0	ppm	F/P	41	Sb	2.6	ppb	Sb/Pr	42
Ne	30.7	ppq	He/Ne	40	Te	15.1	ppb	Te/Ni	80
Na_2O	0.29	wt%	MMM	10	Xe	0.79	ppq	He/Xe	40
MgO	38.22	wt%	MMM	1	Cs	1.32	ppb	Cs/Rb	42
Al_2O_3	4.28	wt%	MMM	2	Ba	1.20	ppm	Rb/Ba	49
SiO_2	44.9	wt%	MMM	1	La	0.234	ppm	La/Ce	14
P	40.7	ppm	Ce/P	25	Ce	0.772	ppm	Ce/Nd	15
S	119	ppm	S/Dy	25	Pr	0.131	ppm	Nd/Pr	10
Cl	0.51	ppm	Cl/K	18	Nd	0.713	ppm	Sm/Nd	7
Ar	1.21	ppb	He/Ar	38	Sm	0.270	ppm	Sm/Hf	10
K	60	ppm	K/U	28	Eu	0.107	ppm	Eu/Lu-Sm	10
CaO	3.5	wt%	MMM	1	Gd	0.395	ppm	Gd/Lu-Sm	10
Sc	16.3	ppm	Sc-CaO	13	Tb	0.075	ppm	Tb/Lu-Sm	10
Ti	798	ppm	Ti/Gd	12	Dy	0.531	ppm	Dy/Lu-Sm	10
V	79	ppm	CaO-V	7	Ho	0.122	ppm	Ho/Lu-Sm	10
Cr	2500	ppm	CaO-Cr	40	Er	0.371	ppm	Er/Lu-Sm	10
Mn	1045	ppm	Fe/Mn	17	Tm	0.060	ppm	Tm/Lu-Sm	10
FeO	8.07	wt%	MMM	2	Yb	0.401	ppm	Yb/Lu-Sm	7
Co	106	ppm	Co-CaO	14	Lu	0.063	ppm	Lu-CaO	9
Ni	1960	ppm	MgO/Ni	10	Hf	0.199	ppm	Lu/Hf	8
Cu	30	ppm	Cu/Sc		Ta	13.8	ppb	Nb/Ta	33
Zn	56	ppm	Zn/Sc		W	3.5	ppb	W/Ba	52
Ga	3.2	ppm	CaO	16	Re	0.157	ppb	Re/Os	25
Ge	1.0	ppm	Ge/Si	200	Os	2.99	ppb	Os/Ir	15
As	7.4	ppb	As/Ce	28	Ir	2.9	ppb	Per	20
Se	72	ppb	Se/V		Pt	6.2	ppb	Ir/Pt	27
Kr	2	ppq	He/Kr	40	Au	1.0	ppb	Ir/Au	48
Rb	0.088	ppm	Rb/Sr	25	Hg	10	ppb	Hg/Mn	
Sr	9.80	ppm	Sr/Nd	19	Tl	0.38	ppb	Rb/Tl	
Y	4.07	ppm	Y/Yb	12	Pb	23.2	ppb	Th/Pb	30
Zr	7.94	ppm	Zr/Hf	22	Bi	0.39	ppb	Bi/Pb	
Nb	210	ppb	U/Nb	35	Th	13.7	ppb	Ba/Th	30
Mo	25	ppb	Mo/Ce	28	U	4.7	ppb	Th/U	30

McCulloch & Gamble, 1991, Geochemical and geodynamical constraints on subduction zone magmatism, Earth Planet. Sci. Lett, 102, 358 - 374 (pacific rim arc basalts)

TABLE 1

Trace element data for Pacific rim island-arc basalts

	New Britain			Kermadec			Marianas			Aleutians			Vanuatu			Average arc basalt
	IA-5	IA-9	Avg. (13)	36982	7128	Avg. (17)	Pa2	Paf3b	Avg. (25)	Ak4ej	54-445	Avg. (9)	516	697	Avg. (12)	
SiO_2	49.2	49.9	50.7	50.8	48.6	50.7	52.2	49.2	51.9	52.7	49.3	49.6	50.8	49.4	49.8	50.54
Mg#	69.0	68.0	59.9	69.0		59.5				45.9	70.7	58.3	54.6	64.6	63.4	
Rb		3.0	5.4	9.0	2.3	4.3	16.0	10.0	11.5	10.0	3.0	11.0	20.2	35.5	21.2	10.7
Ba	33	31	63	263	47	104	247	171	192	230	166	330	430	160	302	200
Th	0.13	0.25	0.31	1.29	0.21	0.47	0.92	0.36	0.65	0.92	0.33	1.16	1.18	1.67	1.43	0.80
K%	0.14	0.17	0.32	0.44	0.11	0.22	0.74	0.40	0.51	0.50	0.37	0.60	0.98	1.21	1.00	0.53
U	0.07	0.11	0.21	0.45	0.11	0.24	0.36	0.14	0.25	0.64	0.19	0.52	0.41	0.60	0.46	0.34
Nb	0.37	1.77	1.64	0.73	0.45	1.06	1.45	0.62	1.05	1.50	1.29	2.07	2.06	1.15	1.95	1.5
Ce	4.49	7.97	12.2	15.9	3.00	7.12	17.6	9.30	12.8	14.4	11.9	19.9	30.7	20.7	23.3	15.1
Pb	1.4	1.4	2.4	2.0	1.0	1.9	1.8	1.5	1.6	15.2	1.5	9.3			4.0	3.8
Sr	228	189	337	353	175	200	317	311	320	397	286	440	538	539	560	370
Nd	3.72	6.70	8.22	9.98	2.80	5.80	13.4	7.4	9.9	11.4	9.54	14.0	12.8	12.3	13.8	10.3
Sm	1.21	2.18	2.21	2.10	0.96	1.80	3.95	2.28	3.05	3.53	2.56	3.54	3.16	2.65	3.10	2.74
Zr	20	45	41	32	16	32	70	42	59	59	61	70	63	57	56	52
Ti%	0.52	0.61	0.49	0.37	0.41	0.44	0.61	0.39	0.50	0.75	0.49	0.61	0.53	0.36	0.47	0.50
Y	13	21	17	15	9.4	17	25	15	22	26	16	21	26.5	17.1	20	19
Yb	1.4	2.14	1.77	1.17	1.18	1.82	1.86	0.89	1.79	2.81	1.29	1.91	2.18	1.07	1.75	1.81
Sc	42	35	34	41		39			37			37	35	31	33	36
Ni	119	152	69	69	33	38	16	35	15	6	150	55	32	46	130	61

Rudnick & Fountain, 1995, Nature and composition of the continental crust: ..., Rev. Geophys., 33, 267 - 309 (CC)

TABLE 9. Major and Trace Element Composition of the Continental Crust

	Lower	*Middle*	*Upper*[a]	*Total*
	Major Elements			
SiO_2, wt. %	52.3	60.6	66.0	59.1
TiO_2, wt. %	0.8	0.7	0.5	0.7
Al_2O_3, wt. %	16.6	15.5	15.2	15.8
FeO_T, wt. %	8.4	6.4	4.5	6.6
MnO, wt. %	0.1	0.10	0.08	0.11
MgO, wt. %	7.1	3.4	2.2	4.4
CaO, wt. %	9.4	5.1	4.2	6.4
Na_2O, wt. %	2.6	3.2	3.9	3.2
K_2O, wt. %	0.6	2.01	3.40	1.88
P_2O_5, wt. %	0.1	0.1	0.4	0.2
Mg #, mol	60	48	47	54
	Trace Elements			
Li, ppm	6	7	20	11
Sc, ppm	31	22	11	22
V, ppm	196	118	60	131
Cr, ppm	215	83	35	119
Co, ppm	38	25	10	25
Ni, ppm	88	33	20	51
Cu, ppm	26	20	25	24
Zn, ppm	78	70	71	73
Ga, ppm	13	17	17	16
Rb, ppm	11	62	112	58
Sr, ppm	348	281	350	325
Y, ppm	16	22	22	20
Zr, ppm	68	125	190	123
Nb, ppm	5	8	25	12
Cs, ppm	0.3	2.4	5.6	2.6
Ba, ppm	259	402	550	390
La, ppm	8	17	30	18
Ce, ppm	20	45	64	42
Pr, ppm	2.6	5.8	7.1	5.0
Nd, ppm	11	24	26	20
Sm, ppm	2.8	4.4	4.5	3.9
Eu, ppm	1.1	1.5	0.9	1.2
Gd, ppm	3.1	4.0	3.8	3.6
Tb, ppm	0.48	0.58	0.64	0.56
Dy, ppm	3.1	3.8	3.5	3.5
Ho, ppm	0.68	0.82	0.80	0.76
Er, ppm	1.9	2.3	2.3	2.2
Yb, ppm	1.5	2.3	2.2	2.0
Lu, ppm	0.25	0.41	0.32	0.33
Hf, ppm	1.9	4.0	5.8	3.7
Ta, ppm	0.6	0.6	2.2	1.1
Pb, ppm	4.2	15.3	20	12.6
Th, ppm	1.2	6.1	10.7	5.6
U, ppm	0.2	1.6	2.8	1.42

[a]From *Taylor and McLennan* [1985], phosphorus data estimated, cesium from *McDonough et al.* [1992].

Table 11 Comparison of the upper, middle, lower and total continental crust compositions recommended here.

Element	*Upper crust*	*Middle crust*	*Lower crust*	*Total crust*
SiO_2	66.6	63.5	53.4	60.6
TiO_2	0.64	0.69	0.82	0.72
Al_2O_3	15.4	15.0	16.9	15.9
FeO_T	5.04	6.02	8.57	6.71
MnO	0.10	0.10	0.10	0.10
MgO	2.48	3.59	7.24	4.66
CaO	3.59	5.25	9.59	6.41
Na_2O	3.27	3.39	2.65	3.07
K_2O	2.80	2.30	0.61	1.81
P_2O_5	0.15	0.15	0.10	0.13
Total	100.05	100.00	100.00	100.12
Mg#	46.7	51.5	60.1	55.3
Li	24	12	13	16
Be	2.1	2.3	1.4	1.9
B	17	17	2	11
N	83		34	56
F	557	524	570	553
S	621	249	345	404
Cl	294	182	250	244
Sc	14.0	19	31	21.9
V	97	107	196	138
Cr	92	76	215	135
Co	17.3	22	38	26.6
Ni	47	33.5	88	59
Cu	28	26	26	27
Zn	67	69.5	78	72
Ga	17.5	17.5	13	16
Ge	1.4	1.1	1.3	1.3
As	4.8	3.1	0.2	2.5
Se	0.09	0.064	0.2	0.13
Br	1.6		0.3	0.88
Rb	82	65	11	49
Sr	320	282	348	320
Y	21	20	16	19
Zr	193	149	68	132
Nb	12	10	5	8
Mo	1.1	0.60	0.6	0.8
Ru	0.34		0.75	0.57
Pd	0.52	0.76	2.8	1.5
Ag	53	48	65	56
Cd	0.09	0.061	0.10	0.08
In	0.056		0.05	0.052
Sn	2.1	1.30	1.7	1.7
Sb	0.4	0.28	0.10	0.2
I	1.4		0.14	0.71
Cs	4.9	2.2	0.3	2
Ba	628	532	259	456
La	31	24	8	20
Ce	63	53	20	43
Pr	7.1	5.8	2.4	4.9
Nd	27	25	11	20
Sm	4.7	4.6	2.8	3.9
Eu	1.0	1.4	1.1	1.1
Gd	4.0	4.0	3.1	3.7
Tb	0.7	0.7	0.48	0.6
Dy	3.9	3.8	3.1	3.6
Ho	0.83	0.82	0.68	0.77
Er	2.3	2.3	1.9	2.1
Tm	0.30	0.32	0.24	0.28
Yb	2.0	2.2	1.5	1.9
Lu	0.31	0.4	0.25	0.30
Hf	5.3	4.4	1.9	3.7
Ta	0.9	0.6	0.6	0.7
W	1.9	0.60	0.60	1
Re	0.198		0.18	0.188
Os	0.031		0.05	0.041
Ir	0.022		0.05	0.037
Pt	0.5	0.85	2.7	1.5
Au	1.5	0.66	1.6	1.3
Hg	0.05	0.0079	0.014	0.03
Tl	0.9	0.27	0.32	0.5
Pb	17	15.2	4	11
Bi	0.16	0.17	0.2	0.18
Th	10.5	6.5	1.2	5.6
U	2.7	1.3	0.2	1.3
Eu/Eu^*	0.72	0.96	1.14	0.93
Heat production ($\mu W\ m^{-3}$)	1.65	1.00	0.19	0.89
Nb/Ta	13.4	16.5	8.3	12.4
Zr/Hf	36.7	33.9	35.8	35.5
Th/U	3.8	4.9	6.0	4.3
K/U	9475	15607	27245	12367
La/Yb	15.4	10.7	5.3	10.6
Rb/Cs	20	30	37	24
K/Rb	283	296	462	304
La/Ta	36	42	13	29

Plank & Langmuir, 1998, The chemical composition of subducting sediment and its consequences for the crust and mantle, Chem. Geol., 145, 325 - 394

"GLOSS"

Table 3
Global Subducting Sediment (GLOSS) composition and flux

	GLOSS ave	GLOSS std dev	GLOSS flux	UCC T and M	BCC R and F
Material flux (g/year)			1.30E + 15		
Trench length (km)			2.97E + 04		
SiO_2	**58.57**	*2.49*	7.62E + 14	66.00	59.10
TiO_2	**0.62**	*0.04*	8.07E + 12	0.50	0.70
Al_2O_3	**11.91**	*0.94*	1.55E + 14	15.20	15.80
FeO	**5.21**	*0.42*	6.78E + 13	4.50	6.60
MnO	**0.32**	*0.13*	4.19E + 12	0.08	0.11
MgO	**2.48**	*0.16*	3.22E + 13	2.20	4.40
CaO	**5.95**	*1.75*	7.74E + 13	4.20	6.40
Na_2O	**2.43**	*0.20*	3.16E + 13	3.90	3.20
K_2O	**2.04**	*0.16*	2.65E + 13	3.40	1.88
P_2O_5	**0.19**	*0.05*	2.45E + 12	0.40	0.20
CO_2	**3.01**	*1.44*	3.92E + 13		
H_2O	**7.29**	*0.41*	9.49E + 13		
Sc	**13.1**	*1.03*	1.70E + 10	11	22
V	**110**	*10.7*	1.43E + 11	60	131
Cr	**78.9**	*7.06*	1.03E + 11	35	119
Co	**21.9**	*9.48*	2.85E + 10	10	25
Ni	**70.5**	*14.73*	9.18E + 10	20	51
Cu	**75.0**	*16.07*	9.76E + 10	25	24
Zn	**86.4**	*8.88*	1.12E + 11	71	73
Rb	**57.2**	*6.66*	7.44E + 10	112	58
Cs	**3.48**	*0.50*	4.53E + 09	3.70	2.60
Sr	**327**	*53.8*	4.26E + 11	350	325
Ba	**776**	*137.1*	1.01E + 12	550	390
Y	**29.8**	*9.92*	3.88E + 10	22	20
Zr	**130**	*8.5*	1.69E + 11	190	123
Hf	**4.06**	*0.30*	5.28E + 09	5.80	3.70
Nb	**8.94**	*0.94*	1.16E + 10	25	12
Ta	**0.63**	*0.06*	8.20E + 08	2.20	1.10
La	**28.8**	*6.8*	3.75E + 10	30.0	18.0
Ce	**57.3**	*10.3*	7.46E − 10	64.0	42.0
Nd	**27.0**	*8.3*	3.52E + 10	26.0	20.0
Sm	**5.78**	*1.83*	7.52E + 09	4.50	3.90
Eu	**1.31**	*0.44*	1.70E + 09	0.88	1.20
Gd	**5.26**	*2.04*	6.85E + 09	3.80	3.60
Dy	**4.99**	*1.86*	6.49E + 09	3.50	3.50
Er	**2.92**	*1.06*	3.80E + 09	2.30	2.20
Yb	**2.76**	*0.88*	3.59E + 09	2.20	2.00
Lu	**0.413**	*0.133*	5.37E + 08	0.320	0.330
Pb	**19.9**	*5.4*	2.59E + 10	20.0	12.6
Th	**6.91**	*0.80*	8.99E + 09	10.70	5.60
U	**1.68**	*0.18*	2.19E + 09	2.80	1.40
87Sr/86Sr	**0.71730**				
143Nd/144Nd	**0.51218**				
206Pb/204Pb	**18.913**				
207Pb/204Pb	**15.673**				
208Pb/204Pb	**38.899**				

Upper Continental Crust (UCC) from Taylor and McLennan (1985) (T and M); Bulk Continental Crust (BCC) from Rudnick and Fountain (1995) (R and F); Oxides in wt%, others in ppm.

Taylor & McLennan, 1985, The composition of the continental crust, Blackwell Scientific

Table 2.7 *(footnotes)*
1. 54943, Fortescue Gp., Hamersley Basin (2.6–2.4 Ae)
2. 46436, Earaheedy Gp., Nabberu Basin (*c.* 1.7 Ae)
3. MI5, Mount Isa Gp. (*c.* 1.7 Ae)
4. A010, Pertatataka Fm., Amadeus Basin (*c.* 0.85 Ae)
5. SC8, State Circle Shale (Silurian)
6. PL6, Laurel Fm., Canning Basin (Carboniferous)
7. PL1, Poole Sst., Canning Basin (Permian)
8. PW5, Kockatea Shale, Perth Basin (Triassic)

Table 2.7. Chemical composition of some typical post-Archean shales from Australia [49, 50].

	1	2	3	4	5	6	7	8
SiO_2	57.98	69.25	69.66	67.39	68.01	66.03	67.20	59.52
TiO_2	0.81	0.64	0.79	0.86	0.75	0.74	0.77	1.03
Al_2O_3	23.28	18.76	15.55	16.95	17.12	16.94	19.85	23.75
FeO	6.51	5.99	6.20	6.82	5.90	4.80	5.53	8.54
MnO	0.08	0.02	0.04	0.09	0.23	0.05	0.04	0.16
MgO	4.33	0.56	2.60	2.05	2.73	2.01	1.62	1.81
CaO	0.44	0.03	0.51	0.27	0.22	5.11	0.39	0.57
Na_2O	0.66	0.75	0.42	1.01	0.66	0.46	0.18	0.95
K_2O	5.92	4.00	3.90	4.45	4.24	3.75	4.33	3.44
P_2O_5	—	—	0.32	0.12	0.15	0.11	0.08	0.23
Σ	100.01	100.00	99.96	100.01	100.01	100.00	99.99	100.00
LOI	5.88	3.75	4.29	5.57	3.12	7.31	4.34	5.50
Cs	13.4	4.65	16	17	13	18	17	10
Ba	879	1051	310	240	470	500	590	580
Rb	—	—	215	198	180	194	175	185
Sr	—	—	48	86	34	269	67	120
Pb	18.0	17.1	10	43	6.2	24	35	32
La	42.3	51.0	27	34	44	52	40	50
Ce	88.9	102.9	57	63	94	132	86	104
Pr	9.87	12.8	8.8	7.0	8.1	12	9.1	13
Nd	35.2	48.2	32	24	29	37	30	43
Sm	7.18	7.39	4.9	5.3	5.0	6.5	6.0	8.2
Eu	1.14	1.23	0.94	1.0	0.95	1.2	1.1	1.7
Gd	4.63	4.19	4.0	4.8	4.7	5.2	4.7	6.7
Tb	0.81	0.68	0.68	0.71	0.74	0.84	0.82	1.2
Dy	5.08	3.80	3.8	3.7	4.0	4.6	5.0	6.2
Ho	1.07	0.83	0.86	0.87	0.89	1.1	1.2	1.4
Er	3.01	2.15	2.3	2.6	2.5	3.2	3.6	3.8
Yb	3.03	2.10	2.4	2.5	2.4	2.8	3.6	3.7
ΣREE	203	238	145	149	196	258	192	242
La_N/Yb_N	9.4	16.4	7.6	9.2	12.4	12.6	7.5	9.2
Eu/Eu*	0.60	0.67	0.65	0.61	0.60	0.63	0.63	0.70
Y	29.9	30.0	18	20	34	36	29	38
Th	15.8	19.9	12	15	16	15	18	19
U	3.58	2.62	2.7	2.6	2.7	2.5	2.9	3.3
Zr	148	189	219	202	155	210	245	185
Hf	4.28	4.59	4.1	4.3	3.0	3.1	4.9	4.3
Sn	7.48	5.08	3.4	4.3	2.6	3.6	3.9	3.9
Nb	15.3	12.2	13	16	18	23	24	30
Mo	1.34	0.35	—	—	—	—	—	—
W	1.32	0.90	0.75	1.1	0.76	0.71	1.1	0.94
Th/U	4.4	7.6	4.4	5.8	5.9	6.0	6.2	5.8
La/Th	2.7	2.6	2.3	2.3	2.8	3.5	2.2	2.6
Cr	395	151	67	79	99	61	78	110
V	190	69	55	105	110	70	125	100
Sc	21	17	13	19	20	15	19	21
Ni	211	19	29	40	49	31	36	54
Co	23	*	16	14	19	14	14	27
Cu	65	3.2	—	25	110	35	27	52
Ga	21	12	13	22	14	25	25	30
La/Sc	2.0	3.0	2.1	1.8	2.2	3.5	2.1	2.4
Th/Sc	0.75	1.2	0.92	0.79	0.80	1.0	0.95	0.90
Bi	0.84	0.25	0.19	0.40	0.09	0.30	0.39	0.23
B	28	98	95	210	96	75	56	41

Taylor & McLennan, 1985, The composition of the continental crust, Blackwell Scientific

Table 2.12. REE content of some common rock-forming minerals.

	A	B	C	D	E	F	G	H	I
La	—	—	—	—	—	—	—	86.0	—
Ce	0.569	5.94	0.442	22.5	1.36	0.264	2.20	127.3	20.0
Nd	0.365	7.23	0.645	27.5	0.252	0.0769	1.03	—	15.0
Sm	0.090	3.3	0.347	8.67	0.0200	0.0112	0.221	20.91	15.1
Eu	0.024	0.554	0.064	1.375	0.155	0.0821	0.0377	1.14	1.42
Gd	0.084	—	—	9.74	—	—	0.213	—	53.6
Tb	—	—	—	—	—	—	—	2.73	—
Dy	0.079	6.75	1.35	8.29	0.00552	0.0060	0.170	—	122
Er	0.046	4.04	1.40	4.18	0.00308	0.0029	0.0913	—	77.9
Yb	—	—	2.10	3.18	0.00301	0.0033	0.0792	14.48	70.3
Lu	0.0094	—	0.414	—	—	—	—	2.12	10.1
Ref.	[73]	[73]	[73]	[74]	[74]	[74]	[74]	[75]	[73]

A. Olivine, basalt
B. Clinopyroxene, andesite
C. Orthopyroxene, andesite
D. Hornblende, granodiorite
E. Plagioclase, granodiorite
F. Alkali feldspar, granodiorite
G. Biotite, granodiorite
H. Muscovite, granite
I. Garnet, dacite

Table 2.13. REE content of some common heavy minerals.

	A	B	C	D	E	F	G	H
La	—	—	—	119,000	—	—	—	10.3
Ce	42.3	20.0	509	195,000	66,560	152	3305	13.7
Pr	—	—	—	32,100	—	—	—	—
Nd	14.9	15.0	302	98,000	16,060	58.2	2680	—
Sm	5.40	15.1	52.9	24,500	1,260	9.45	655	1.86
Eu	1.27	1.42	15.2	635	133.3	3.38	165	0.11
Gd	17.4	53.6	—	14,700	460	8.15	564	—
Tb	—	—	—	1,960	—	—	—	0.16
Dy	56.9	122	31.7	7,710	118.4	5.67	470	—
Ho	—	—	—	1,400	—	—	—	—
Er	116	77.9	17.1	—	28.5	2.69	237	—
Yb	253	70.3	13.9	540	17.4	2.10	207	0.59
Lu	—	10.1	—	—	—	—	—	0.10
Ref.	[74]	[73]	[74]	[76]	[74]	[74]	[74]	[75]

A. Zircon, granodiorite
B. Garnet, dacite
C. Apatite, granodiorite
D. Monazite, granite
E. Allanite, granodiorite
F. Epidote, granodiorite
G. Sphene, granodiorite
H. Tourmaline, granite

Taylor & McLennan, 1985, The composition of the continental crust, Blackwell Scientific

Table 2.14. Rare earth elements in various size fractions of sedimentary rocks [59].

	Whole rock	Sand	Sand less heavy minerals	Silt	Silt less heavy minerals	<2 micron	Weighted sum of fractions
Havensville shale—W2							
La	30.0	4.2	4.0	27.9	19.1	55.3	34.2
Ce	58.1	10.6	6.5	61.7	38.6	100	65.8
Sm	5.0	0.79	0.59	5.17	3.11	5.85	4.33
Eu	1.01	0.16	0.10	0.85	0.61	1.08	0.77
Tb	0.93	—	0.068	0.70	0.47	0.82	0.62
Yb	2.6	0.65	0.32	2.60	1.67	3.81	2.64
Lu	0.44	0.084	0.053	0.41	0.29	0.54	0.38
ΣREE	142	25	19	145	92	250	—
La_N/Yb_N	7.8	4.4	8.4	7.3	7.7	9.8	—
Eu/Eu*	0.59	—	0.59	0.53	0.61	0.59	—
Weight % of rock		24.7		28.1		45.8	
Okaloosa shale—ELK6AII							
La	7.3	4.4	3.0	31.5	22.6	27.8	8.05
Ce	15	9.2	6.3	73.1	48	61.6	17.7
Sm	1.53	0.98	0.45	7.48	4.31	4.62	1.78
Eu	0.29	0.17	0.077	1.42	0.78	0.80	0.32
Tb	0.25	0.20	0.05	1.19	0.59	0.61	0.32
Yb	1.50	1.25	0.31	4.5	2.22	2.2	1.62
Lu	0.23	0.20	0.052	0.84	0.36	0.40	0.27
ΣREE	40	25	14	178	115	135	—
La_N/Yb_N	3.3	2.4	6.5	4.7	6.9	8.5	—
Eu/Eu*	0.58	0.50	0.60	0.59	0.59	0.57	—
Weight % of rock		86.0		10.2		3.8	

Taylor & McLennan, 1985, The composition of the continental crust, Blackwell Scientific

Table 6.9. Chemical composition of selected Phanerozoic greywackes.

	Quartz-poor		Quartz-intermediate			Quartz-rich	
	M277	M285	P40136	MK64	T82/324	P39803	MK97
SiO_2	56.35	60.78	71.08	68.28	67.5	75.65	81.13
TiO_2	1.39	0.82	0.71	1.00	0.62	0.77	0.62
Al_2O_3	16.19	17.51	14.59	12.95	16.67	12.08	10.01
FeO	11.22	6.17	4.70	6.94	4.94	4.19	2.76
MnO	0.19	0.11	—	0.21	0.13	—	0.03
MgO	4.06	2.46	2.57	2.22	2.31	2.20	1.44
CaO	5.22	5.52	0.86	4.50	2.27	0.32	0.26
Na_2O	4.59	5.74	1.34	2.96	3.41	2.05	1.69
K_2O	0.55	0.74	3.99	0.83	1.91	2.57	1.93
P_2O_5	0.24	0.15	0.15	0.12	0.17	0.18	0.14
Σ	100.0	100.0	99.99	100.01	99.93	100.01	100.01
LOI	3.50	2.83	3.00	6.10	—	3.00	1.85
Cs	0.41	0.80	5.4	—	4.0	4.9	—
Ba	85	100	588	150	416	347	400
Rb	—	8.5	165	36	—	121	91
Sr	190	266	75	222	—	52	44
Pb	—	4.7	—	13	5.2	—	16
La	10	6.8	35.5	25	25.1	35.8	43
Ce	18	15	80.7	53	53.6	69.1	83
Pr	2.2	2.0	—	5.8	6.81	—	12
Nd	10	8.2	—	22	25.9	45	42
Sm	2.8	2.2	5.33	4.5	4.82	8.09	7.1
Eu	0.97	1.1	1.11	0.9	1.04	1.31	1.0
Gd	3.4	2.6	—	3.5	3.74	—	5.6
Tb	0.52	0.39	0.65	0.6	0.59	0.64	0.88
Dy	3.1	2.7	—	3.6	3.46	—	4.7
Ho	0.79	0.59	—	0.8	0.64	—	1.0
Er	2.2	1.9	—	2.2	1.72	—	2.9
Yb	2.3	1.8	1.62	2.0	1.68	2.85	2.9
Lu	—	—	0.34	—	—	0.48	—
ΣREE	56	45	176	124	130	186	207
La_N/Yb_N	2.9	2.6	14.8	8.4	10.1	8.5	10.0
Eu/Eu*	0.96	1.41	0.70	0.69	0.75	0.63	0.48
Y	19	15	—	22	21	—	32
Th	0.88	1.4	16.1	6.96	7.8	12.8	16.4
U	0.32	0.84	—	1.33	1.81	3.0	3.42
Zr	105	68	112	175	140	—	384
Hf	1.8	1.2	2.6	3.8	3.8	6.2	10.1
Nb	—	0.8	—	10	10.3	—	11
Th/U	2.8	1.7	—	5.2	4.3	4.3	4.8
La/Th	11.4	4.9	2.2	3.6	3.2	2.8	2.6
Cr	31	36	90	109	40	63	51
V	350	150	—	172	114	—	57
Sc	37	25	16.3	25	15	10.1	10
Ni	14	13	—	20	19	—	19
Co	31	17	13.3	11	10	10.5	13
Cu	190	35	—	9	31	—	11
Zn	—	—	—	95	—	—	53
Ga	23	20	—	15	19	—	13
La/Sc	0.27	0.27	2.2	1.0	1.7	3.5	4.3
Th/Sc	0.02	0.06	0.99	0.28	0.52	1.3	1.6
B	18	22	—	—	—	—	—

Table 6.13. Chemical composition of selected Archean greywackes.

	DD9	YK2	KH44	C28	G21
SiO_2	65.8	67.79	69.76	67.5	69.35
TiO_2	0.52	0.56	0.52	0.42	0.59
Al_2O_3	15.9	15.44	13.79	11.8	14.98
FeO	5.36	5.94	7.79	4.72	4.52
MnO	0.07	0.07	0.02	0.14	0.05
MgO	3.56	2.54	2.91	4.9	1.89
CaO	2.87	1.90	1.27	5.54	2.13
Na_2O	3.65	4.26	1.78	2.75	4.26
K_2O	2.17	1.40	2.11	2.22	2.24
P_2O_5	0.11	0.09	0.05	—	—
Σ	100.0	99.99	100.00	99.99	100.01
LOI	2.88	1.62	6.23	—	—
Cs	—	—	1.3	—	—
Ba	566	418	790	489	—
Rb	—	50	52	81	73
Sr	457	357	93	318	324
La	—	18	17	22	25
Ce	32.6	41	33	45	41
Pr	—	4.7	4.4	—	5.8
Nd	14.8	19	17	17.2	25
Sm	2.68	3.9	3.1	3.1	4.4
Eu	0.785	1.1	1.1	0.80	1.28
Gd	2.24	3.0	3.2	2.6	4.1
Tb	—	—	0.49	0.4	0.54
Dy	1.74	2.4	3.1	2.3	—
Ho	—	—	0.64	0.49	0.54
Er	0.913	1.2	1.8	0.93	1.5
Tm	—	—	—	—	0.24
Yb	0.845	1.0	1.6	1.27	1.4
Lu	0.140	—	—	0.19	0.28
ΣREE	77.2	97	84	101	114
La_N/Yb_N	≈13	12.2	7.2	11.7	12.1
Eu/Eu*	0.98	0.98	1.07	0.86	0.92
Y	—	17	12	—	14.8
Th	—	9.6	6.3	—	—
U	—	—	1.6	—	—
Zr	—	130	113	153	171
Hf	—	—	2.8	—	—
Nb	—	7	6	—	—
Th/U	—	—	3.9	—	—
La/Th	—	1.9	2.7	—	—
Cr	—	144	110	—	—
V	—	116	72	—	—
Sc	—	—	16	10	—
Ni	—	59	95	234	64
Co	—	—	30	—	—
Cu	—	46	680	—	—
Zn	—	72	—	—	—
Ga	—	20	19	—	—
La/Sc	—	—	1.1	2.2	—
Th/Sc	—	—	0.39	—	—
B	—	—	38	—	—

Taylor & McLennan, 1985, The composition of the continental crust, Blackwell Scientific

Table 9.2. Average chemical composition of I- and S-type granites [51].

	I-type	S-type
n	532	316
SiO_2	69.1	70.5
TiO_2	0.46	0.56
Al_2O_3	14.8	14.6
FeO	3.78	3.97
MgO	1.78	1.86
CaO	3.85	2.54
Na_2O	3.00	2.24
K_2O	3.11	3.70
Σ	99.9	100.0
	ppm	ppm
Ba	520	480
Rb	132	180
Sr	253	139
Pb	16	27
La	29	31
Ce	63	69
Nd	23	25
Y	27	32
Zr	143	170
Nb	9	11
Cr	27	46
V	74	72
Sc	15	14
Ni	9	17
Co	12	13
Cu	11	12
Zn	52	64
Ga	16	17

Taylor & McLennan, 1985, The composition of the continental crust, Blackwell Scientific

3 Ionic radii for cations in Angstrom units

	Radius			Radius			Radius	
	Å	CN		Å	CN		Å	CN
Cs^{+}	1.88	12	Ho^{3+}	1.015	8	Sn^{4+}	0.68	6
Rb^{+}	1.72	12	Er^{3+}	1.004	8	Nb^{5+}	0.64	6
Tl^{+}	1.70	12	Tm^{3+}	0.994	8	Ti^{4+}	0.61	6
K^{+}	1.64	12	Yb^{3+}	0.985	8	Mo^{6+}	0.59	6
Ba^{2+}	1.61	12	Lu^{3+}	0.977	8	W^{6+}	0.60	6
			Y^{3+}	1.019	8			
Pb^{2+}	1.29	8				Cr^{3+}	0.62	6
Sr^{2+}	1.26	8	Ge^{4+}	0.39	4	V^{3+}	0.64	6
Eu^{2+}	1.25	8	Si^{4+}	0.26	4	Fe^{3+}	0.65	6
Na^{+}	1.18	8	P^{5+}	0.17	4	Sc^{3+}	0.75	6
Ca^{2+}	1.12	8	Be^{2+}	0.27	4	Ti^{4+}	0.61	6
			B^{3+}	0.27	6	Ni^{2+}	0.69	6
La^{3+}	1.160	8				Co^{2+}	0.75	6
Ce^{3+}	1.143	8	Th^{4+}	1.05	8	Cu^{2+}	0.73	6
Pr^{3+}	1.126	8	U^{4+}	1.00	8	Fe^{2+}	0.78	6
Nd^{3+}	1.109	8	Ce^{4+}	0.97	8	Mn^{2+}	0.83	6
Sm^{3+}	1.079	8	U^{6+}	0.86	8	Zn^{2+}	0.74	6
Eu^{3+}	1.066	8	Zr^{4+}	0.84	8	Mg^{2+}	0.72	6
Gd^{3+}	1.053	8	Hf^{4+}	0.83	8	Li^{+}	0.76	6
Tb^{3+}	1.040	8				Ga^{3+}	0.62	6
Dy^{3+}	1.027	8	Nb^{3+}	0.72	6	Al^{3+}	0.54	6

Data from Shannon, R.D. (1976) *Acta Cryst.*, **32**, 751.

CN=co-ordination number.

For O^{2-} =1.26 Å, 4-fold co-ordination is favoured for cation radii less than 0.52 Å, 6-fold for the range 0.52–0.92 Å, 8-fold for the range 0.92–1.26 Å and 12-fold for the cation radii greater than 1.26 Å.

Bédard, 1994, A procedure for calculating the eqilibrium distribution of trace elements ...., Chem. Geol., 118, 143 - 153

Table 1

D-values used in calculations for Figs. 1–4 and A-1–A-3

	CPX	Reference	OPX	Reference	Olivine	Reference	PLAG	Reference	Spinel	Reference	ILM	Reference	MT	Reference	AMP	Reference
La	0.0536	[*1*]	0.016	[*22*]	0.00044	[*7*]	0.042	[*23*]	0.0006	[*8*]	0.0072	[*15*]	0.029	[*15*]	0.17	[*5*]
Ce	0.0858	[*1*]	0.04	[*22*]	0.0003	[*7*]	0.036	[*23*]	0.0006	[*8*]	0.00783	A	0.0217	A	0.26	[*5*]
Nd	0.1873	[*1*]	0.037	[*22*]	0.0002	[*7*]	0.029	[*23*]	0.0006	[*8*]	0.00847	A	0.0145	A	0.44	[*5*]
Sm	0.291	[*1*]	0.054	[*22*]	0.00018	[*7*]	0.022	[*23*]	0.0006	[*8*]	0.0091	[*15*]	0.0072	[*15*]	0.76	[*5*]
Eu	0.3288	A	0.063	[*22*]	0.0002	[*7*]	0.22	[*23*]	0.0006	[*8*]	0.0084	A	0.00635	A	0.88	[*5*]
Gd	0.367	A	0.097	[*22*]	0.00025	[*7*]	0.014	[*23*]	0.0006	[*8*]	0.0077	[*15*]	0.0055	[*15*]	0.86	[*5*]
Tb	0.404	A	0.094	[*22*]	0.000475	A	0.013	[*23*]	0.00105	A	0.00913	A	0.0063	A	0.83	[*5*]
Dy	0.442	[*1*]	0.1621	[*22*]	0.0007	[*7*]	0.013	[*23*]	0.0015	[*8*]	0.0106	A	0.0071	A	0.78	[*5*]
Ho	0.4145	A	0.1633	[*22*]	0.00122	A	0.013	[*23*]	0.0023	A	0.012	[*15*]	0.0079	[*15*]	0.73	A
Er	0.387	[*1*]	0.1816	[*22*]	0.00174	[*7*]	0.012	[*23*]	0.003	[*8*]	0.01625	A	0.0117	A	0.68	[*5*]
Tm	0.4085	A	0.259	[*22*]	0.00348	A	0.012	[*23*]	0.00375	A	0.0205	A	0.0155	A	0.64	A
Yb	0.43	[*1*]	0.2605	[*22*]	0.00522	[*7*]	0.012	[*23*]	0.0045	[*8*]	0.02475	A	0.01923	A	0.59	[*5*]
Lu	0.433	[*1*]	0.318	[*22*]	0.00852	[*7*]	0.012	[*23*]	0.0045	A	0.029	[*15*]	0.023	[*15*]	0.51	[*5*]
Ba	0.00068	[*1*]	0.0006	A	0.0005	A	Eq. I	[*18*]	0.0005	[*3*]	0.01	[*13*]	0.001	[*16*]	0.71	[*5*]
Sr	0.1283	[*1*]	0.062	[*22*]	0.016	[*2*]	Eq. II	[*18*]	0.0005	[*3*]	0.7	[*14*]	0.4	[*13*]	0.64	[*5*]
Sc	3.9	[*1*]	1.4	[*4*]	0.25	[*2*]	0.02	[*11*]	0.048	[*4*]	1	A	1.3	[*13*]	1.6	[*5*]
V	3.1	[*1*]	0.3	[*2*]	0.09	[*2*]	0.01	[*13*]	38	[*4*]	12	[*4*]	24	[*13*]	7	[*21*]
Cr	3.8	[*1*]	1.9	[*8*]	0.6	A	0.02	[*13*]	200	[*8*]	4	[*14*]	20	16	0.34	[*5*]
Co	1.2	[*2*]	2	[*4*]	4	[*4*]	0.05	[*11*]	2	[*4*]	4	[*14*]	8	17	1.4	[*5*]
Ti	0.384	[*1*]	0.162	[*9*]	0.007	[*9*]	0.045	[*4*]	0.07	[*9*]	16	([a])	1	A	1	[*20*][b]
Ni	3	[*2*]	3.5	[*8*]	Eq. III	[*8*]	0.04	[*4*]	10	[*8*]	4	[*14*]	12	[*4*]	1.6	[*5*]
Zr	0.1234	[*1*]	0.16	[*22*]	0.003	[*9*]	0.09	[*11*]	0.04	[*9*]	0.4	A	0.2	[*13*]	0.37	[*11*]
Hf	0.256	[*1*]	0.248	[*22*]	0.024	[*4*]	0.04	[*11*]	0.08	[*6*]	0.42	[*13*]	0.2	[*13*]	0.38	[*5*]
Nb	0.0077	[*1*]	0.004	A	0.01	[*3*]	0.001	[*13*]	0.01	[*3*]	2.3	[*13*]	0.7	[*13*]	0.1	[*20*]
Ta	0.07	[*5*]	0.07	[*22*]	0.02	[*11*]	0.03	[*11*]	0.0001	[*6*]	2.7	[*13*]	0.8	[*13*]	0.1	[*20*]
Th	0.00026	[*3*]	0.0001	[*3*]	0.02	[*11*]	0.05	[*11*]	0.001	[*3*]	0.1	A	0.19	[*11*]	0.038	[*5*]
U	0.00036	[*3*]	0.0001	[*3*]	0.03	[*11*]	0.05	[*11*]	0.001	[*3*]	0.1	A	0.26	[*11*]	0.08	[*11*]
Y	0.467	[*1*]	0.17	A	0.002	[*2*]	0.01	[*4*]	0.01	[*3*]	0.0045	[*15*]	0.0039	[*15*]	0.73	A, [*20*]
Rb	0.011	[*3*]	0.005	A	0.0005	A	0.08	[*4*]	0.0005	[*3*]	0.001	A	0.32	[*11*]	0.2	[*5*]
Cs	0.002	[*4*]	0.001	A	0.0001	A	0.1	[*19*]	0	A	0.0001	A	0.001	[*16*]	0.1	A

CPX = clinopyroxene; OPX = orthopyroxene; PLAG = plagioclase; ILM = ilmenite; MT = magnetite; AMP = amphibole. Most values are appropriate for liquidus-temperature basaltic liquids. Where nothing else was available, data from other magma types were used. *Sources*: [*1*] = Hart and Dunn (1993); [*2*] = Frey et al. (1978); [*3*] = Hawkesworth et al. (1993); [*4*] = Irving (1978); [*5*] = Irving and Frey (1984); [*6*] = Kostopoulos and James (1992); [*7*] = Prinzhofer and Allègre (1985); [*8*] = Kelemen et al. (1990); [*9*] = Johnson and Dick (1992); [*10*] = Fujimaki et al. (1984); [*11*] = LeMarchand et al. (1987); [*12*] = Nakada and Kamata (1991); [*13*] = Furman et al. (1991); [*14*] = Villemant et al. (1981); [*15*] = Nielsen et al. (1992); [*16*] = Smith and Leeman (1987); [*17*] = Gill (1978); [*18*] = Blundy and Shimizu (1991); [*19*] = Romick et al. (1992); [*20*] = Adam et al. (1992); [*21*] = calculated from data in Bédard et al. (1987); [*22*] = calculated from data in Lightfoot et al. (1993). A = assumed, calculated, or interpolated to give smooth profiles. By fitting a straight line through a plot of available micro-probe data on TiO_2 from coexisting CPX and OPX in several hundred cumulate rocks of the Bay of Islands Complex, the following values were calculated: ${}^{opx/liq}D_{Cr} = {}^{cpx/liq}D_{Cr}/2$ and ${}^{opx/liq}D_{Ti} = {}^{cpx/liq}D_{Ti}/2.4$. No Cr was detected in microprobe analyses of olivine. The value of ${}^{ol/liq}D_{Cr}$ was fixed so that it would yield abundances just below the detection limit on the microprobe, and is therefore a maximum value. ${}^{ol/liq}D_{Ba}$ and ${}^{ol/liq}D_{Rb}$ were fixed at values inferior to those in OPX. ${}^{opx/liq}D_{Nb}$ was arbitrarily fixed at half of ${}^{cpx/liq}D_{Nb}$. The ${}^{plag/liq}D_{REE}$ were derived as follows. The ratio of ${}^{cpx/liq}D_{REE}/{}^{plag/liq}D_{REE}$ was calculated from the analyses of mineral separates of Komor and Elthon (1990), assuming that CPX and PLAG crystallized together at equilibrium. ${}^{plag/liq}D_{REE}$ was calculated from these ratios and the ${}^{cpx/liq}D_{REE}$ data of Hart and Dunn (1993). The resulting values were then corrected upward slightly to force ${}^{plag/liq}D_{La}$ into the range of data found in the literature. The calculated ${}^{plag/liq}D_{HREE}$-values are lower than most data found in the literature. The problems of inheritance of phenocrysts (Blundy and Shimizu, 1991), and the slow equilibration of REE in plagioclase, lead me to favour the calculated values given here. The problem is particularly acute in the choice of ${}^{plag/liq}D_{Eu}$, since this value is a composite of two *D*-values (${}^{plag/liq}D_{Eu^{3+}}$ and ${}^{plag/liq}D_{Eu^{2+}}$), and depends on the temperature, the composition and the oxidation state of the melt (e.g., Philpotts, 1970; Drake and Weill, 1975). Not surprisingly, the range of ${}^{plag/liq}D_{Eu}/{}^{plag/liq}D_{Sm}$ in published tabulations varies widely (1.6–290). ${}^{opx/liq}D_{REE,\text{-}Zr,\text{-}Hf,\text{-}Ta,\text{-}Y,\text{-}Rb\ and\ \text{-}Cs}$ were calculated the same way as ${}^{plag/liq}D_{REE}$, using the data in Lightfoot et al. (1993). The ${}^{ol/liq}D_{Ni}$ was linked to the content of Fo in olivine (eq.) as follows. ${}^{ol/liq}D_{Ni}$ is a function of liquid composition, principally the MgO content (Budahn, 1986). His equation 5, based on the data of Hart and Davies (1978), was used to link MgO in the liquid and ${}^{ol/liq}D_{Ni}$. The FeO and MgO of the liquid line of descent for Bay of Islands rocks was estimated from plots of analyses of the sheeted dykes and lavas (Siroky et al., 1985; Jenner et al., 1991) together with reasonable extensions to higher MgO contents. Liquid and olivine FeO and MgO contents were linked by assuming an exchange reaction coefficient of 0.3 (Roeder and Emslie, 1970). Eq. I, for Fo > 0.65, ${}^{ol}D_{Ni} = -0.8480769 \times (100 \times Fo_{ol}) + 87.37307692$ (Fo_{ol} is in molar fractions). Eq. II: ${}^{plag}D_{Ba} = \exp[(10.2 - (38.2 \times 100 \times An)]/(T \times 0.008314)$ (Blundy and Shimizu, 1991; An is in molar fractions, *T* is in K). Eq. III: ${}^{plag}D_{Sr}$ $\exp[(26.8 - (26.7 \times 100 \times An)]/(T \times 0.008314)$ (Blundy and Shimizu, 1991; An is in molar fractions, *T* is in K).

[a] Stoichiometric.

[b] Interpreted.