

Supplementary material

Tables

Table S1. Manuscripts from which bulk rock and serpentine specific Fe chemical and redox data was obtained. Asteriks indicate manuscripts included in bulk rock FeIII/Fe_T vs. H₂O wt% plot presented in Evans 2008.

Table S2. Statistics for bulk rock Fe chemistry of serpentinites grouped by rock type, sample type, and measurement method.

Table S3. Statistics for serpentine mineral Fe chemistry grouped by rock type, sample type, and measurement method.

(Tables S2 and S3 include data from all categories regardless of the number of specimens in each category.)

Figure Captions

Figure S1. Histograms of bulk rock Fe chemistry of serpentinites. A) Total FeO abundance (wt%) by rock type. B) Total FeO wt% by sample type. C) Total FeO wt% by analytical method. D) Total FeIII abundance (wt%) by rock type. E) Total FeIII wt% by sample type. F) Total FeIII wt% by analytical method. G) FeIII/Fe_T by rock type. H) FeIII/Fe_T by sample type. I) FeIII/Fe_T by analytical method. Diamonds indicate mean values and filled circles indicate median values. F statistic and p-value results of ANOVA tests are shown at the top of each plot. Letters represent the results of pairwise comparison tests where each letter represents a statistically significantly different category. Categories sharing common letters are not statistically significantly different from one another.

Figure S2. Histograms of bulk rock Fe chemistry of serpentinites by geologic setting as described by the original source of the data (plots A, C, E) and inferred initial setting/process (plots (B, D, F). A and B) Total FeO abundance (wt%). C and D) Total FeIII abundance (wt%). E and F) FeIII/Fe_T. Diamonds indicate mean values and filled circles indicate median values. F statistic and p-value results of ANOVA tests are shown at the top of each plot. Letters represent the results of pairwise comparison tests where each letter represents a statistically significantly different category. Categories sharing common letters are not statistically significantly different from one another.

Figure S3. Bulk rock total FeO content as a function of the extent of serpentinization using LOI wt% as a proxy for extent of serpentinization. This data includes carbonated serpentinites that have LOI values up to ~50 wt%, much greater than typical serpentinites (max LOI ~15 wt%).

Figure S4. Histograms of the Fe chemistry of serpentine minerals. A) Total FeO abundance (wt%) by rock type. B) Total FeO wt% by sample type. C) Total FeIII abundance (wt%) by sample type. D) FeIII/Fe_T by sample type. E) FeIII/Fe_T by analytical method. Diamonds indicate mean values and filled circles indicate median values. F statistic and p-value results of ANOVA tests are shown at the top of each plot. Letters represent the results of pairwise

comparison tests where each letter represents a statistically significantly different category. Categories sharing common letters are not statistically significantly different from one another.

Figure S5. Histograms of Fe chemistry of serpentine minerals by geologic setting as described by the original source of the data (plots A, C, E) and inferred initial setting/process (plots (B, D, F). A and B) Total FeO abundance (wt%). C and D) Total FeIII abundance (wt%). E and F) FeIII/Fe_T. Diamonds indicate mean values and filled circles indicate median values. F statistic and p-value results of ANOVA tests are shown at the top of each plot. Letters represent the results of pairwise comparison tests where each letter represents a statistically significantly different category. Categories sharing common letters are not statistically significantly different from one another.

Figure S6. A) Total FeO abundance (wt%) of serpentine versus bulk rock total FeO abundance (wt%). B) Total FeO wt% versus bulk rock LOI wt% as a proxy for extent of serpentinization.

Table S1.

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Table S2.

Variable/Statistic	FeO ₇ (wt%)				Fe(III) (wt%)				Fe(III)/Fe _T				LOI (wt%)			
	mean	Std dev	median	n	mean	Std dev	median	n	mean	Std dev	median	n	mean	Std dev	median	n
<i>By published geologic setting</i>																
alpine ophiolite	7.24	0.79	7.16	77	3.39	1.13	3.38	68	0.62	0.19	0.66	68	10.59	2.69	11.84	66
alpine peridotite	7.44	0.64	7.58	52	2.52	1.44	2.22	52	0.43	0.24	0.41	52	6.94	4.42	5.96	31
alpine serpentinite	7.17	0.88	7.20	25	2.87	1.18	3.43	25	0.52	0.21	0.61	25	10.41	4.58	11.97	25
forearc	6.62	0.42	6.62	17	2.18	0.82	2.02	7	0.43	0.16	0.42	7	14.84	1.16	15.13	14
MOR	7.11	1.34	6.90	163	3.48	1.33	3.51	169	0.61	0.18	0.62	180	12.19	2.90	12.73	158
MOR hydrothermal field	7.71	2.48	7.10	24	4.20	2.03	4.48	7	0.63	0.12	0.63	7	13.77	0.94	13.50	24
OCC	8.13	1.23	7.83	47	NA	NA	NA	0	NA	NA	NA	0	11.68	2.85	12.60	46
ophiolite	7.06	1.82	7.31	215	3.25	1.32	2.98	168	0.59	0.21	0.58	170	11.94	6.47	11.59	205
passive margin	6.47	0.59	6.48	56	2.74	0.50	2.75	46	0.54	0.08	0.55	46	16.19	1.40	16.10	52
<i>By inferred initial setting/process</i>																
accretionary wedge	7.40	1.23	7.21	73	2.91	1.33	2.76	73	0.51	0.21	0.53	73	10.33	4.45	11.62	73
forearc	6.62	0.42	6.62	17	2.18	0.82	2.02	7	0.43	0.16	0.42	7	14.84	1.16	15.13	14
fracture zone	6.46	0.37	6.44	17	2.65	0.50	2.79	17	0.52	0.09	0.55	17	13.60	1.80	14.03	17
mantle wedge	7.06	0.78	7.10	28	2.48	0.62	2.49	28	0.46	0.12	0.46	28	10.65	2.83	10.70	28
MOR OCC	7.44	1.57	7.20	214	3.59	1.40	3.60	156	0.62	0.18	0.63	167	12.18	2.81	12.83	208
passive margin	6.43	0.70	6.48	74	2.92	0.63	2.83	64	0.59	0.11	0.58	64	15.20	2.11	15.70	70
subduction zone	7.65	0.60	7.60	44	2.87	1.19	2.97	32	0.49	0.18	0.50	32	8.89	3.41	10.50	33
<i>By rock type</i>																
Amphibole-Gabbro	4.48	NA	4.48	1	0.90	NA	0.90	1	0.26	NA	0.26	1	2.77	NA	2.77	1
antigorite serpentinite	7.13	0.76	7.20	13	3.33	1.04	2.99	9	0.61	0.17	0.57	9	11.80	0.31	11.60	9
Atg Chl Opx Ol rock	7.51	0.78	7.16	5	2.97	0.00	2.97	3	0.52	0.02	0.53	3	10.01	0.24	10.01	2
Atg Liz serpentinite	7.42	0.61	7.10	5	3.26	0.74	3.00	5	0.58	0.08	0.60	5	11.32	0.30	11.30	5
carbonated serpentinite	3.91	2.37	4.10	17	NA	NA	NA	0	NA	NA	NA	0	28.80	2.23	27.51	17
chrysotile lizardite serpentinite	3.69	NA	3.69	1	2.61	NA	2.61	1	0.91	NA	0.91	1	13.65	NA	13.65	1
Diabase	8.38	NA	8.38	1	1.27	NA	1.27	1	0.19	NA	0.19	1	0.88	NA	0.88	1
dunite	10.97	NA	10.97	1	8.20	NA	8.20	1	0.96	NA	0.96	1	13.90	NA	13.90	1
granofels chl harz	7.93	0.21	8.00	3	2.29	0.42	2.29	2	0.38	0.05	0.38	2	4.96	0.78	4.96	2
Liz serpentinite	7.15	0.21	7.15	2	3.70	0.14	3.70	2	0.65	0.07	0.65	2	12.65	0.55	12.65	2
ol opx serpentinite	7.16	0.86	7.16	2	2.15	0.00	2.15	2	0.39	0.04	0.39	2	7.29	0.43	7.29	2
Ol2 Atg serpentinite	7.95	0.49	7.95	2	2.10	1.56	2.10	2	0.35	0.21	0.35	2	8.90	1.00	8.90	2
Olivine-Gabbro	8.82	0.97	8.82	2	2.48	1.24	2.48	2	0.38	0.22	0.38	2	5.52	4.75	5.52	2
peridotite	7.29	3.34	7.42	3	3.31	1.76	4.14	3	0.57	0.15	0.55	3	7.98	1.07	6.91	3
serpentinite	7.30	1.31	7.12	352	3.36	1.28	3.26	296	0.59	0.19	0.60	309	12.20	0.18	12.57	330
serpentinized dunite	7.72	1.21	7.59	71	3.45	1.46	3.56	54	0.57	0.18	0.62	54	11.29	0.43	12.00	71
serpentinized harzburgite	6.92	1.32	6.99	212	3.01	1.36	3.02	184	0.57	0.23	0.60	184	10.94	0.26	12.35	191
serpentinized lherzolite	8.74	1.27	8.79	14	4.37	0.69	4.65	14	0.65	0.08	0.62	14	10.89	0.57	11.41	14
serpentinized troctolite	10.20	0.69	10.22	6	NA	NA	NA	0	NA	NA	NA	0	4.68	0.63	4.73	5
serpentinized websterite	4.83	NA	4.83	1	NA	NA	NA	0	NA	NA	NA	0	13.33	NA	13.33	1
serpentinized wehrlite	9.16	0.16	9.16	2	6.55	0.16	6.55	2	0.92	0.01	0.92	2	10.81	0.08	10.81	2
spinifex like chl harz	7.72	0.48	7.60	5	2.41	0.28	2.41	3	0.40	0.04	0.41	3	5.71	0.90	5.71	2
talc chlorite serpentinite	10.41	NA	10.41	1	2.39	NA	2.39	1	0.29	NA	0.29	1	7.16	NA	7.16	1
<i>By sample type</i>																
core	6.94	1.21	6.79	213	2.96	1.00	2.99	178	0.55	0.14	0.58	187	13.08	0.24	13.59	200
dive	8.67	4.65	7.37	6	4.02	2.20	3.44	6	0.59	0.11	0.57	6	13.74	0.49	13.77	6
dredge	7.60	1.28	7.46	67	4.44	1.28	4.27	42	0.75	0.15	0.75	42	12.77	0.22	13.02	67
drill hole	7.16	0.82	7.16	15	3.55	0.64	3.63	15	0.64	0.11	0.66	15	13.54	0.50	13.50	15
grab	7.36	1.24	6.90	17	NA	NA	NA	0	NA	NA	NA	0	13.71	0.21	13.50	17
outcrop	7.05	1.64	7.36	237	2.81	1.20	2.71	184	0.51	0.22	0.50	186	11.22	0.49	10.47	195
<i>By bulk rock method</i>																
electron microprobe	8.09	1.62	7.48	5	-	-	-	-	-	-	-	-	-	-	-	-
ICP	9.47	1.20	9.73	11	-	-	-	-	-	-	-	-	-	-	-	-
ICP-AES	7.06	0.84	7.09	97	-	-	-	-	-	-	-	-	-	-	-	-
ICP-OES	7.80	2.12	7.44	48	-	-	-	-	-	-	-	-	-	-	-	-
unknown	7.52	1.29	7.30	235	-	-	-	-	-	-	-	-	-	-	-	-
wet chemistry	7.49	1.24	7.31	23	-	-	-	-	-	-	-	-	-	-	-	-
XRF	6.82	1.55	6.89	303	-	-	-	-	-	-	-	-	-	-	-	-
<i>By Fe(II)/(III) method</i>																
Mossbauer	-	-	-	-	3.08	1.02	3.45	10	0.54	0.16	0.61	10	NA	NA	NA	NA
wet chemistry	-	-	-	-	2.97	1.20	2.87	338	0.55	0.19	0.56	343	NA	NA	NA	NA

Table S3.

Variable/Statistic	FeO _T (wt%)				Fe(III) (wt%)				Fe(III)/Fe _T			
	mean	Std dev	median	n	mean	Std dev	median	n	mean	Std dev	median	n
<i>By published geologic setting</i>												
alpine ophiolite	4.12	0.36	4.24	11	2.03	0.43	2.01	5	0.66	0.18	0.64	22
alpine serpentinite	2.40	1.31	2.40	19	0.49	0.12	0.45	11	0.47	0.18	0.41	11
forearc	6.83	3.67	5.68	159	NA	NA	NA	0	NA	NA	NA	0
iron formation	1.10	NA	1.10	1	NA	NA	NA	0	NA	NA	NA	0
layered mafic intrusion	8.87	4.13	9.60	23	NA	NA	NA	0	NA	NA	NA	0
MOR	4.68	1.94	4.38	261	1.78	0.72	1.63	10	0.57	0.17	0.61	24
MOR hydrothermal field	1.69	NA	1.69	1	NA	NA	NA	0	NA	NA	NA	0
OCC	4.30	2.13	3.73	270	NA	NA	NA	0	NA	NA	NA	0
ophiolite	4.23	2.36	3.52	284	1.06	0.55	1.01	78	0.50	0.26	0.51	78
passive margin	4.97	2.33	4.72	161	0.63	NA	0.63	1	0.79	NA	0.79	1
serpentine mud volcano	6.06	2.35	5.64	39	NA	NA	NA	0	NA	NA	NA	0
sill	NA	NA	NA	0	0.41	0.57	0.41	2	0.44	0.62	0.44	2
<i>By inferred initial setting/process</i>												
accretionary wedge	3.70	1.98	3.35	45	0.73	0.40	0.68	28	0.39	0.18	0.36	28
forearc	6.83	3.67	5.68	159	NA	NA	NA	0	NA	NA	NA	0
forearc mantle wedge	6.06	2.35	5.64	39	NA	NA	NA	0	NA	NA	NA	0
layered mafic intrusion	6.74	4.14	5.10	13	NA	NA	NA	0	NA	NA	NA	0
mantle wedge	6.16	1.22	6.00	21	NA	NA	NA	0	NA	NA	NA	0
MOR	4.86	2.39	3.98	8	NA	NA	NA	0	NA	NA	NA	0
MOR OCC	4.48	2.04	4.11	524	1.78	0.72	1.63	10	0.57	0.17	0.61	24
passive margin	4.97	2.30	4.72	167	0.63	NA	0.63	1	0.79	NA	0.79	1
subduction zone	4.36	1.94	4.03	20	2.03	0.43	2.01	5	0.66	0.18	0.65	21
<i>By rock type</i>												
antigorite serpentinite	3.57	0.30	3.49	4	0.95	0.57	0.95	2	0.40	0.17	0.48	3
Atg Chl Opx Ol rock	4.33	0.12	4.24	7	2.20	0.24	2.18	4	0.67	0.07	0.66	4
Atg Liz serpentinite	NA	NA	NA	0	NA	NA	NA	0	0.81	0.09	0.84	7
carbonated serpentinite	4.40	1.87	4.29	18	NA	NA	NA	0	NA	NA	NA	0
Liz serpentinite	NA	NA	NA	0	NA	NA	NA	0	0.93	NA	0.93	1
ol opx serpentinite	4.07	NA	4.07	1	NA	NA	NA	0	NA	NA	NA	0
O12 Atg serpentinite	NA	NA	NA	0	NA	NA	NA	0	0.54	0.13	0.54	2
olivine websterite	9.77	0.59	9.77	2	NA	NA	NA	0	NA	NA	NA	0
peridotite	4.40	0.42	4.40	2	NA	NA	NA	0	NA	NA	NA	0
serpentinite	4.94	2.51	5.05	237	0.68	0.47	0.48	50	0.41	0.26	0.38	62
serpentinized dunite	4.45	2.77	4.30	147	0.51	0.44	0.71	3	0.40	0.44	0.34	3
serpentinized harzburgite	4.87	2.68	4.34	778	1.21	0.63	1.07	67	0.56	0.24	0.61	72
serpentinized lherzolite	7.97	3.52	8.00	8	NA	NA	NA	0	NA	NA	NA	0
serpentinized troctolite	5.94	4.02	4.10	3	NA	NA	NA	0	NA	NA	NA	0
serpentinized websterite	5.47	3.57	4.53	31	NA	NA	NA	0	NA	NA	NA	0
serpentinized wehrlite	3.09	0.46	3.10	14	NA	NA	NA	0	NA	NA	NA	0
<i>By sample type</i>												
core	5.20	2.71	4.79	698	1.41	0.39	1.37	6	0.58	0.19	0.57	18
dredge	4.21	2.04	3.56	151	2.34	0.79	2.54	4	0.51	0.17	0.53	4
drill cuttings	7.46	0.66	7.46	2	NA	NA	NA	0	NA	NA	NA	0
drill hole	1.55	0.80	1.28	11	0.49	0.12	0.45	11	0.47	0.18	0.41	11
grab	1.69	NA	1.69	1	NA	NA	NA	0	NA	NA	NA	0
mud cores	6.06	2.35	5.64	39	NA	NA	NA	0	NA	NA	NA	0
outcrop	4.23	2.23	3.67	176	1.05	0.65	1.03	83	0.49	0.29	0.50	86
<i>By mineral chemistry method</i>												
EDS	4.87	1.24	4.65	6	-	-	-	-	-	-	-	-
electron microprobe	4.87	2.66	4.46	1231	-	-	-	-	-	-	-	-
unknown	2.64	3.76	1.53	13	-	-	-	-	-	-	-	-
<i>By Fe(II)/(III) method</i>												
Mossbauer	-	-	-	-	0.96	0.57	0.92	91	0.47	0.29	0.41	86
uXANES	-	-	-	-	2.20	0.24	2.18	4	0.60	0.20	0.61	43











