Analytical methods (in repository dataset)

Sr isotopic compositions were determined using a Finnigan MAT 262 multicollector mass-spectrometer (at IGG-CNR, Pisa) after conventional ion-exchange procedures for Sr separation from the matrix. Measured $^{87}Sr/^{86}Sr$ ratios have been normalized to $^{86}Sr/^{88}Sr$ = 0.1194. During the collection of isotopic data, 18 replicate analyses of NIST SRM 987 ($SrCO_3$) standard gave an average value of 0.7102510 ± 12 (2SD). Sr blanks were on the order of 0.3 ng during the period of chemistry processing.

Boron concentrations were determined by isotope dilution using the NIST SRM 952 spike, after alkaline fusion and B separation and purification by ion-exchange procedures. The reproducibility is estimated about 2.5% (Tonarini et al., 2003). Boron isotopic compositions were determined using a VG Isomass 54E positive thermal ionization mass spectrometer, following separation of boron by ion-exchange procedures as described by Tonarini et al. (1997). The accuracy of the procedure was evaluated by repeated analyses of the NIST SRM 951 standard taken through the full chemistry and through replicate analysis of GSJ-JB2 basalt reference standard (Tonarini et al., 2003). Boron isotopic compositions of the samples are reported in the conventional delta notation ($\delta^{11}B$) as permil (‰) deviation from accepted composition of NIST SRM 951 (certified $^{11}B/^{10}B$ = 4.04362; Catanzaro et al., 1970). The reproducibility of isotopically homogenous samples treated with alkaline fusion chemistry is approximately ±0.5‰ (Tonarini et al., 2003) and this value is the analytical uncertainty assigned to data present in table 2.

References

Tonarini, S., Pennisi, M. and Leeman, W. P., 1997, Precise boron isotopic analysis of silicate (rock) samples using alkali carbonate fusion and ion-exchange separation, Chemical Geology, v. 142, 129–137.

Tonarini, S., Pennisi, M ., Adorni-Braccesi, A., Dini, A., Ferrara, G., Gonfiantini, R., Wiedenbeck, M. and Groning, M., 2003, Intercomparison of boron isotope and concentration measurements: Part I: Selection, preparation and homogeneity tests of the intercomparison materials, Geostandards Newsletters, v. 27, 21–39.

Catanzaro, E. J., Champion, C. E., Garner, E. L., Malinenko, G., Sappenfeld, K. M. and Shields, W. R., 1970, Boric acid, isotopic, and assay standard reference materials, U.S. National Bureau Standards Special Publication, 260, 17–70.

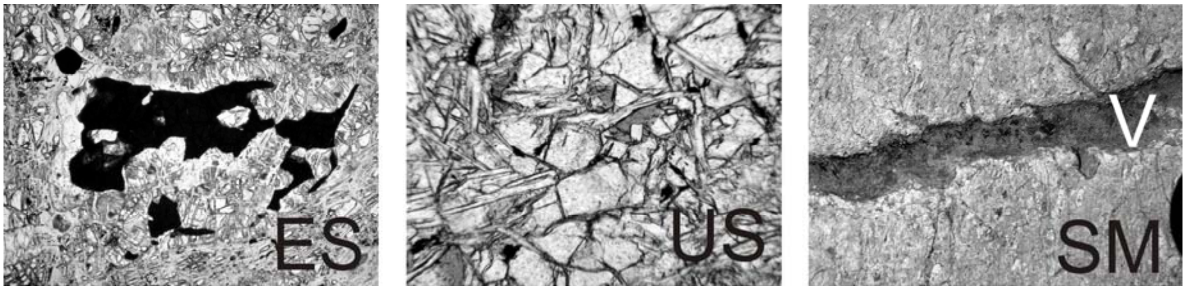

Figure 1. Meso and microstructures of studied samples. ES = early low-grade serpentinized peridotite showing mesh chrysotile on mantle olivine, magnetite-chlorite on spinel. US = undeformed high-pressure serpentinized peridotite showing an equilibrium static high-pressure asemblage with olivine (white crystals) + antigorite (acicular crystals) + Ti-clinohumite (grey crystals). SM = high-pressure serpentinite mylonite showing an antigorite foliation cut by olivine-vein (V).

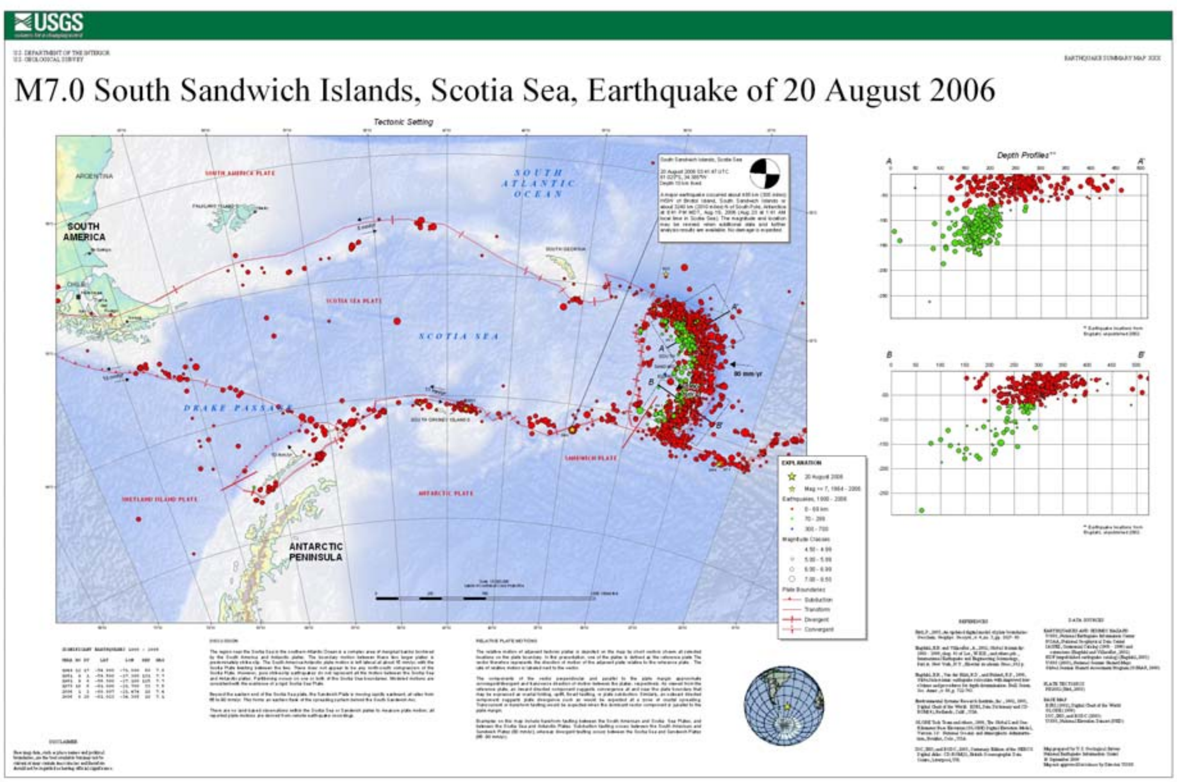

Figure 2. Earthquake distribution and location showing that the depth of the Benioff plane below the South Sandwich Arc is approximately 150 Km. Here serpentine should break down to release the ^{11}B-rich fluids fingerprinted by the ^{11}B-rich compositions of the arc lavas. Downloaded from the USGS web site (http://earthquake.usgs.gov/earthquakes/eqarchives/poster/2006/20060820.php).

Table 1. Boron and Sr contents (in ppm) and isotope compositions of Erro-Tobbio serpentinites

Sample	B	δ^{11}B‰	^{87}Sr/^{86}Sr	Sr $_{(1)}$	δ^{18}O‰ wr $_{(2)}$	δ^{18}O‰ serp $_{(2)}$	δD‰ $_{(2)}$	H_2O wt% $_{(1)}$
Low-grade serpentinites								
ET 11/27	14.2	10.5		3.98				8.23
ET 4/3	*10.3	*3.81	0.705377	4.55	5.7	*4.3	-77	8.30
ETA 46	22.7	23.3	0.705560	2.44	7.9	7.6	-91	6.70
ETF 2	12.9	13.9	0.706070	3.64				10.73
ETA 20	32.1	23.3		0.25	7.8	7.4	-102	6.19
ETF 1	13.5	18.9	0.705800	4.05	5.8	6.4	-91	9.10
ET 10/5	28.2	21.1		3.95	7.4	7.6	-97	5.50
ET 9/4				1.81	8.1	7.1	-90	6.60
Average	20.6	18.5		3.08	7.1	7.2	-91	7.7
1SD	8.3	5.3		1.5	1.1	0.5	8.4	1.7
HP undeformed serpentinites								
ETA 75A	27.3	11.2	0.704825	3.01	5.3	6.3		9.84
ETA 71	18.6	14.4		*38.8				2.56
ETA 47	*65.8	19.2	0.706520	4.06	6.9	7.1		10.68
ET 42A		6.8		5.56	7.6	7.1	-80	9.26
ETA 59	23.3	13.6			5.3	6.7	-79	
ETA 56	13.9	12.1			7.2	5	-83	
Average	20.8	12.9		4.21	6.5	6.4	-81	8.1
1SD	5.8	4.1		1.3	1.1	0.9	2.1	3.7
HP mylonitic serpentinites								
ET 11/4	38.5	23.2			6.7	6.6		
ETA 43	12.8	21.5			5.3	6	-63	
ETA 51	35.5	20.0	0.706040	8.80	6.5	6.6	-70	10.80
ETF 9	11.9	18.7	0.705545	8.70	6.1	5.7		12.61
ETA 50	30.0	16.7			6.5	6.6	-71	
ETF 6	14.7	17.9	0.705147	9.60	5.4	5.3	-57	11.20
ETF 5	12.1	23.4			6.4	5.7	-57	
ETA 44	16.9	17.9			6.2	6	-84	
Average	21.6	19.9		9.03	6.1	6.1	-67	11.5
1SD	11.2	2.6		0.5	0.5	0.5	10.3	1.0
HP veins								
ETA 42 vein	16.8	24.1			6.4	5.7	-59	
ETF 10 vein	13.7	20.5	0.705309	7.40	6.2	5.8	-67	11.31
ETA 75 vein	12.3	19.9	0.704584	6.12	4.4		-77	2.30
Average	14.3	21.5		6.8	5.7	5.8	-68	4.85
1SD	2.3	2.2		0.9	1.1	0.1	9.0	5.6
Eclogitic metagabbros								
E89-26	4.7	10.0	0.703470		5.3			
Mg 4/7	2.3				4.7			

(1) Data from Scambelluri et al., 2001; (2) data from Frueh Green et al., 2001; * data excluded

from average calculation