Supplementary Materials. Whole Rock Composition of Sediments of near the Chile Rise Obtained during the MIRAI Cruse (MR08-06 Leg 1)

We assumed that the boron content of subducting sediment is 58 ppm in the modeling of slab-derived fluid (Table 2). This value was obtained from the average of analysis of eight sediment samples collected from the ocean floor near the Chile Rise during the Mirai Cruise (MR08-06 Leg 1). Chemical compositions of the sediments are presented in Supplementary Table S1. Analytical procedures were the same as those for the volcanic rocks in this study. Sediment samples were collected by both the dredging and piston core. D03mud and D04mud were sampled by dredging at Segment 1 of the Chile ridge system to the north of Taitao Peninsula (46.04°S, 75.90°W, depth 3288 m and 46.07°S, 75.91°W, depth 3000 m, respectively; Orihashi *et al*., 2009). Piston core samples were obtained from two sites. PC3 were located on the ocean floor of Antarctic plate to the southwest of Taitao Peninsula (48.42°S, 80.47°W, depth 4098 m; Yamazaki *et al*., 2009). PC4 were located off Taitao Peninsula at the edge of the submarine fan that deposited sediments from NE (46.66°S, 75.90°W, depth 3345 m; Anma *et al*., 2009).

Supplementary Table S1. Whole rock chemical compositions of sediments obtained by Mirai MR08-06 cruise

Sample No	D03 mud	PC3-2	PC3-3	PC4-1 sec.7	PC4 sec8	PC4-1 sec2	PC4-2	D04 mud
(wt %)								
SiO_2	62.92	51.76	54.46	63.66	65.51	60.72	58.83	57.46
TiO_2	0.79	0.72	0.75	0.79	0.74	0.74	0.77	0.79
Al_2O_3	14.89	14.95	15.47	14.08	13.75	13.70	14.26	14.37
Fe_2O_3	6.45	7.26	7.65	5.52	5.33	6.00	6.25	6.71
MnO	0.09	0.42	0.13	0.08	0.07	0.07	0.08	0.10
MgO	2.65	3.11	3.40	3.11	2.48	2.59	2.86	2.93
CaO	4.26	5.69	2.76	4.96	4.18	4.02	4.44	4.14
Na_2O	3.50	4.24	4.70	3.82	3.57	3.99	3.66	4.39
K_2O	1.87	2.41	2.53	1.65	1.87	1.78	2.08	1.83
P_2O_5	0.21	0.17	0.15	0.14	0.16	0.18	0.18	0.21
Total	97.62	90.73	92.00	97.80	97.65	93.80	93.42	92.94
(ppm)								
B	44	71	79	25	36	79	57	71
Sc	16	18	15	15	13	15	16	16
V	125	121	162	108	100	110	116	125
Cr	54	48	48	87	60	58	63	58
Co	12	27	30	14	12	12	13	12
Ni	16	42	91	38	25	24	26	21
Zn	74	101	163	55	60	84	80	84
Ga	17	18	20	15	15	16	17	17
Rb	64	91	95	61	68	62	78	62
Sr	303	327	267	237	254	264	247	273
Y	25	26	25	22	24	24	25	24
Zr	171	98	114	197	183	167	161	143
Nb	8	10	10	8	9	8	10	8
Ba	428	1643	2518	354	381	859	604	667
La	22.5	25.3	25.8	19.2	23.2	21.3	25.5	20.9
Ce	46.4	53.3	57.5	39.2	45.8	43.1	51.2	46.6
Pr	5.4	6.3	6.3	4.5	5.2	5.0	5.8	5.3
Nd	22.9	25.8	25.9	17.7	22.0	21.3	24.4	21.4
Sm	4.89	5.42	5.61	3.93	4.69	4.52	5.10	4.51
Eu	1.30	1.30	1.37	1.05	1.10	1.15	1.29	1.18
Gd	4.22	4.58	4.48	3.56	4.50	3.86	4.27	3.79
Tb	0.71	0.75	0.73	0.60	0.69	0.62	0.73	0.60
Dy	4.27	4.48	4.46	3.60	4.06	4.02	4.33	3.59
Ho	0.92	0.90	0.89	0.74	0.81	0.83	0.89	0.74
Er	2.46	2.34	2.44	2.00	2.32	2.30	2.52	2.07
Tm	0.35	0.35	0.34	0.32	0.36	0.33	0.38	0.31
Yb	2.44	2.53	2.55	2.25	2.63	2.33	2.66	2.17
Lu	0.39	0.36	0.36	0.31	0.37	0.35	0.37	0.33
Hf	4.61	2.58	2.90	5.01	5.20	4.50	4.60	3.34
Ta	0.51	0.53	0.58	0.49	0.53	0.46	0.60	0.46
Pb	11.70	19.60	22.20	8.50	10.20	10.20	11.60	11.00
Th	6.72	8.40	8.80	6.16	7.56	6.58	8.44	6.00
U	1.68	1.26	1.38	1.93	1.98	2.83	3.14	1.95