

Table S1: Water Column Analytical Data, RV Melville Cruise MV1003 (2010)

Location	Cast#	Bottle #	Latitude	Longitude	Depth (m)	$\delta^3\text{He}$ (‰)	CH4 (nM)	TDFe (nM)	TDMn (nM)
Seg 2	2T	1	45°41.4'S	76°52.1'W	4142	26.80	0.5		
Seg 2	2T	2			3999	28.66	0.6		
Seg 2	2T	3			3798	26.74	0.4		
Seg 2	2T	4	45°41.6'S	76°51.8'W	3596	26.79	0.5		
Seg 2	2T	5	45°45.5'S	76°47.8'W	3775		0.6		
Seg 2	2T	6			3600		0.6		
Seg 2	2T	7			3450		0.4		
Seg 2	2T	8	45°45.8'S	76°47.7'W	3300		0.3		
Seg 2	2T	9	45°49.9'S	76°46.6'W	3600	27.35	0.6		
Seg 2	2T	10			3425	27.25	0.6		
Seg 2	2T	11			3250	27.21	0.3		
Seg 2	2T	12			3075	28.29	0.7		
Seg 2	2T	13	45°50.4'S	76°46.6'W	2902	28.16	0.4		
Seg 2	2T	14	45°56.6'S	76°45.8'W	3705		1.1		
Seg 2	2T	15			3600		1.5		
Seg 2	2T	16			3500		1.1		
Seg 2	2T	17			3400		0.7		
Seg 2	2T	18	45°54.1'S	76°45.5'W	3250		0.8		
Seg 2	2T	19	45°57.0'S	76°40.3'W	3950	27.44	0.9		
Seg 2	2T	20			3795	27.47	0.5		
Seg 2	2T	21			3652	27.47	0.3		
Seg 2	2T	22			3500	27.68	0.3		
Seg 2	2T	23	45°57.3'S	76°39.8'W	3350	27.99	0.3		
A	1T	1	45°51.1'S	75°58.3'W	3228	24.42	2.1		
A	1T	2			3000	24.35	1.0		
A	1T	3			2750	26.56	1.0		
A	1T	4	45°51.2'S	75°58.2'W	2499	26.64	1.5		
B	1T	6	46°01.2'S	75°54.3'W	3200	26.48	0.9		
B	1T	7			2999	26.09	0.3		
B	1T	8			2750	28.44	0.4		
B	1T	9			2700	27.65	0.4		
B	1T	10	46°01.7'S	75°54.1'W	2500	27.94	2.0		
C	1T	11	46°08.3'S	75°51.9'W	3007	26.86	0.8		
C	1T	12			2900	27.56	0.6		
C	1T	13			2799	27.99	-0.2		
C	1T	14	46°08.5'S	75°51.7'W	2701	28.36	0.8		
D	1T	16	46°12.8'S	75°49.8'W	2899	28.09	4.7		
D	1T	17			2801	28.43	5.8		
D	1T	18			2700	31.00	18.1		
D	1T	19	46°13.0'S	75°49.6'W	2600	28.56	1.8		
E	1T	20	46°16.4'S	75°47.9'W	2600	34.58	26.3		
E	1T	21			2700	38.92	52.2		
E	1T	22			2800	33.80	26.9		
E	1T	23			2895	28.66	4.4		
E	1T	24	46°16.5'S	75°47.8'W	2500	30.82	7.7		
F	12V	9	46°15.4'S	75°48.4'W	2500	28.21	2.3	25.4	2.9
F	12V	6			2600	29.09	2.3	59.8	2.8
F	12V	5			2700	30.51	13.5	75.6	4.6
F	12V	4			2790	33.55	25.5	53.9	4.7
F	12V	3			2850	29.83	12.1	95.4	5.5
F	12V	2			2900	29.50	10.5	70.6	4.9
F	12V	1	46°15.4'S	75°48.4'W	2954	28.88	8.0	79.5	5.2