Trace element geochemistry of micas by laser ablation ICP-MS in the Moose II lithium-tantalum pegmatite deposit, NWT

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The Moose II zoned LCT-type pegmatite is located ~115 km east-southeast of Yellowknife, NWT, Canada, and measures 430 m long and up to 61 m wide. This deposit is a historical producer of lithium and tantalum (1946 – 1954).

Fractionation trends of micas have often been studied as petrogenetic indicators of pegmatite evolution. This study uses laser ablation ICP-MS to explore the fractionation patterns, mechanisms for emplacement, and processes leading to mineralization (e.g., Van Lichtervelde *et al*. [2]). Preliminary results indicate that the Moose II pegmatite has highly evolved compositions, typical of advanced fractionation. This is complemented by analyses of 24 muscovite mineral separates by ICP-MS and XRF, and is comparable to regional studies of muscovite in the Faulkner Lake pegmatites series [2].

	Faulkner Lake Series [2]			Moose II Pegmatite		
	Avg	**Range**	**n**	**Avg**	**Range**	**n**
Li_2O	0.032	0.018-0.052	14	0.039	0.017-0.073	24
Rb	5560	2380-10200	14	1955	720-4350	24
Cs	127	40-310	14	83	24-233	24
Be	19	11-25	14	30	21-47	24
Sn	-	-	-	249	100-437	24
Nb	92	40-170	8	77	32-156	24
Ta	124	78-207	8	13	2-74	24
Nb/Ta	0.8	0.4-1.4	8	8.9	1.9-18.5	24
K/Rb	15.9	7.1-322	14	2.8	0.9-6.3	24

Table 1: Compositional characteristics of muscovite mineral separates for the Faulkner Lake pegmatite series and the Moose II pegmatite (ICP-MS & XRF). Elements – ppm, oxides – wt.%.

[1] Van Lichtervelde *et al*. (2008) *Contrib Mineral Petrol* **155**, 791-806. [2] Wise (1987) Ph.D Thesis, 368 p.

Was Atlantic deepwater flow reversed during the Last Glacial Maximum?

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Negre *et al*. [1] inferred northward flow of deep water in the Atlantic Ocean during the Last Glacial Maximum (LGM) based on the north-south gradient in sedimentary $^{231}Pa/^{230}Th$ ratios. The southern end member record of Negre *et al*. was derived from core MD02-2594 in the SE Atlantic (34° 43' S, 17° 20' E; 2,440 m).

New results will be presented from core PS2498-1 in the SW Atlantic (44.1533°S, 14.2283°W; 3783m) that exibit a pattern of sedimentary $^{231}Pa/^{230}Th$ ratios opposite of that in MD02-2594. Whereas $^{231}Pa/^{230}Th$ ratios increase from ~0.045 in the LGM to ~0.07 in the Holocene in MD02-2594, they decrease from ~0.10 in the LGM to ~0.055 during the Holocene in PS2498-1.

Sedimentary $^{231}Pa/^{230}Th$ ratios in PS2498-1 are highly correlated with the opal content of the sediments. Furthermore, the relationship between sedimentary $^{231}Pa/^{230}Th$ ratios and opal content (and with opal flux) in PS2498-1 is continuous with the relationship exhibited in TN057-13-PC4, from a site south of the Antarctic Polar Front in a region of greater average opal abundance.

Based on the observed uniform relationship between sedimentary $^{231}Pa/^{230}Th$ ratios and opal, we conclude that the abundance of opal is the master variable regulating sedimentary $^{231}Pa/^{230}Th$ ratios in the South Atlantic. This is consistent with the global data from sediment traps showing a strong correlation between particulate $^{231}Pa/^{230}Th$ ratios and the opal content of particles [2], reflecting the high affinity of Pa for sorption to opal. Finally, we further conclude that sedimentary $^{231}Pa/^{230}Th$ ratios cannot be used to infer the direction of deepwater flow in the past without a level of control on the spatial and temporal variability of opal flux that is beyond the present capabilities of the field of paleoceanography.

[1] Negre *et al*. (2010) *Nature* **468**, 84-88. [2] Chase *et al*. (2002) *Earth. Planet. Sci. Lett*. **204**, 215-229.