Goldschmidt 2000
September 3rd–8th, 2000
Oxford, UK.

Journal of Conference Abstracts
Volume 5(2), 515

Western Boundary Undercurrent Control of Th-Isotope Fluxes in the Labrador Sea Based on MC-ICP-MS Measurements of Total ^{230}Th and ^{232}Th in 5-Litre Water Samples

Claude Hillaire-Marcel, **Bassam Ghaleb**, **Antonio Simonetti** & **Clement Griepy**

GEOTOP-Universite du Quebec a Montreal, Case Postale 8888, Scc Centre Ville, Montreal, Que, H3C 3P8, Canada

Large discrepancies have been observed between ^{230}Th fluxes calculated from water column data vs those based on sediment core studies (e.g. reference 1). In this regard, deep currents such as the Western Boundary Under Current (WBUC), which carries the North Atlantic Deep Water (NADW) masses into their gyre in the deep Labrador Sea, are likely to control sedimentary focussing processes of ^{230}Th. In this study, we report on the vertical distribution of ^{230}Th and ^{232}Th in the Labrador Sea, notably at sites characterized by strong outflow rates of the WBUC and by maximum production rates of intermediate Labrador Sea Water (LSW) through winter convection. Samples were collected in PVC Niskin bottles and transferred to acid-cleaned polypropylene jerricans of 20L, and acidified with double-distilled HCl. In the laboratory, sub-samples ranging from 3 to 6L were used for Th isotope analysis. ^{229}Th-spike and Fe-carrier were added each sub-sample, then left to equilibrate for 24 hours. Fe(+Th) was precipitated with NH_4OH and was recovered by centrifugation. Thorium was extracted using ion exchange chromatography and the final fraction was redissolved in 0.75ml of 2% HNO_3. Measurement of Th isotopes was conducted using a magnetic sector MC-ICP-MS equipped with a warp filter (an Isoprobe™ instrument from Micromass). We used a collector configuration faraday (High-1), daly (axial) and faraday (Low-1) to measure the ^{232}Th, ^{230}Th, and ^{229}Th masses, respectively. Samples were introduced into the ICP-source by free aspiration at a rate ~ 40-50 µL/min using the Aridus™ micro-concentric nebuliser. The external reproducibility, as estimated based on repeated measurements (n=15) of a 25 ppb UCSC Th A standard, is better than 2% (2 sigma). As illustrated in the example of a western Labrador Sea site (Figure 1), two major features are generally observed in the vertical distribution of Th-isotopes. Firstly, relatively low, almost constant concentrations and activity ratios of ^{230}Th and ^{232}Th are observed in the intermediate water mass, which corresponds to the newly formed LSW. These low values are in the range of those reported for Bravo Station in the central Labrador Sea (2). Secondly, below the LSW water mass, strong peaks in both isotope concentrations (with a slight relative enrichment in ^{232}Th) seem to characterize the high velocity axis of the WBUC. Therefore, this current, which is responsible for long distance transport of clay minerals and of fine biogenic carbonates (3), seems also to channelize Th-isotope fluxes along the continental margin. The WBUC control on sedimentary fluxes of Th-isotopes explains notably previous observations from box-core sediment studies, showing almost null ^{230}Th-fluxes downslope, in contrast with ^{230}Th-fluxes representing about 5 times the overlying water column production, on the upper rise, below the high velocity axis of the WBUC (4).

Lao Y, Anderson RF, Broecker WS, Hofmann HJ & Wolfi W, *Geochim. Cosmochim. Acta*, **57**, 205-217, (1993).

Moran SB, Charette MA, Hoff RL, Edwards RL & Landing WM, *Earth Planet. Sci. Lett*, **150**, 151-160, (1997).

Fagel N, Robert C & Hillaire-Marcel C, *Marine Geology*, **130**, 19-28, (1996).

Hillaire-Marcel C, Veiga-Pires C, Vallieres S & Ghaleb B, *Mineral. Magazine*, **62A**, 622-623, (1998).

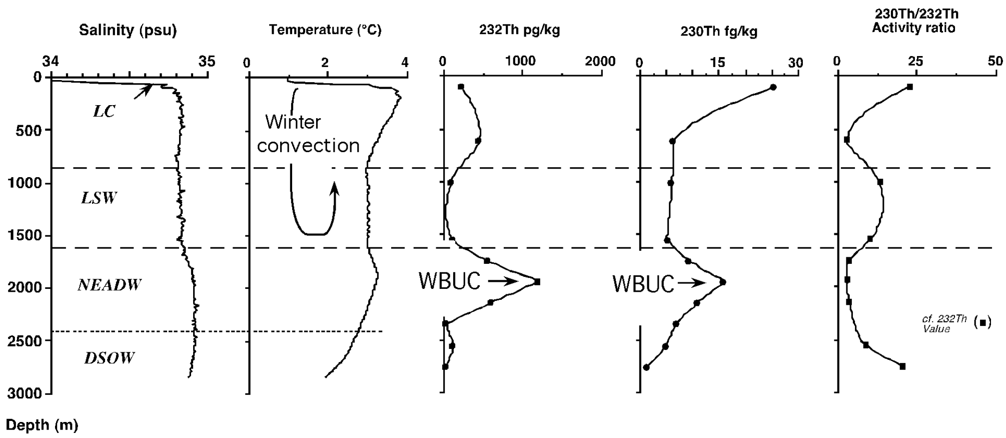

Figure 1: Water masses (June 1990) and Th-isotope distribution (October 1998) in the water column of a western Labrador Sea site (HU-90-13-028; $58^0$21.55N, $57^0$27.38W, 2865m).