INTER-ANNUAL VARIABILITY OF HF-ND ISOTOPE COMPOSITIONS AND REE DISTRIBUTIONS IN THE LABRADOR SEA

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The formation of Labrador Sea Water (LSW) is one of the key components driving the Atlantic thermohaline circulation. Its variability has the potential to significantly impact global climate on seasonal to multi-millennial timescales. However, to date the impact of inter-annual variability in LSW formation on geochemical parameters has not been systematically investigated. A previous study based on combined dissolved Hf-Nd isotope compositions and REE distributions of deep and intermediate waters from the Labrador Sea [1] suggested that the higher variability of the εHf signatures than those of εNd and REE may allow its application as a sensitive tracer of changes in water mass composition and their mixing in the restricted Labrador Sea basin on time scales of years to decades.

Here we present new combined seawater Nd and Hf isotope compositions and REE distributions obtained in the Labrador Sea over the course of three years (2013 [1], 2014, and 2015). While the εNd data are consistent with previously published values for the main water masses present in the Labrador Sea, the new εHf data from 2014 and 2015 show a large variability suggesting a highly radiogenic inflow present on the western side of the Labrador Sea (εHf up to +3.9) not recorded in the data from 2013. Much higher concentrations of heavy, middle and light REE's were recorded in years 2014 and 2015, reflecting not only the higher spatial sampling resolution but potentially a larger range of input sources and more complex water mass circulation patterns in the Labrador Sea. The new data support the use of εHf as a sensitive tracer of changes in water mass mixing in the restricted Labrador Sea Basin on annual time scales.

[1] Filippova A., Frank M., Kienast M., Rickli J., Hathorne E., Yashayaev I.M., Pahnke, K. (2017) Geochimica et Cosmochimica Acta, 199, 164-184.