Greenland-sourced freshwater traced by radiogenic neodymium isotopes and rare earth elements on the North-East Greenland Shelf

G. LAUKERT[1]*, J. DREYER[1], M. FRANK[1], E.C. HATHORNE[1], AND K. MEULENBROEK[1]

[1] GEOMAR Helmholtz Centre for Ocean Research Kiel, Wischhofstr. 1-3, 24148 Kiel, Germany (*correspondence: glaukert@geomar.de)

Greenland-sourced freshwater (GFW, including meltwater and runoff) increasingly supplied to the North-East Greenland (NEG) Shelf not only drives significant hydrographic changes in this climatically highly sensitive sub-Arctic region, but eventually also reaches sites of deep convection in the North Atlantic thus potentially contributing to a weakening of the thermohaline overturning circulation. Using dissolved neodymium (Nd) isotope (ε_{Nd}) and rare earth element (REE) compositions in conjunction with standard hydrographic parameters of samples taken during Polarstern cruise PS100 in summer 2016 (GEOTRACES cruise GN05) we investigate the supply, distribution and fate of GFW on the NEG Shelf. In agreement with previous observations[1] we find that admixture of GFW with its highly unradiogenic Nd isotopic compositions to Arctic-sourced Polar Water (PW, $\varepsilon_{Nd} \approx -9$) accounts for the ε_{Nd} signatures prevailing in locally formed NEG Shelf Shallow Water ($-18 > \varepsilon_{Nd} > -10$). The GFW fractions cannot be precisely determined based on Nd isotopes and salinity alone due to uncertainties in the GFW end-members and due to sea-ice processes changing salinity independently of water mass advection and mixing. However, a qualitative assessment of the surface ε_{Nd} distribution confirms the anticyclonic near surface circulation on the NEG Shelf[2,3] and indicates that most of the 79°N-Glacier-sourced GFW is transported to the north where it mixes with Arctic-sourced PW. While we find no evidence for release of particulate Nd in NEG Shelf Shallow Water, such seawater-particle interaction would cause elevated light REE concentrations and highly unradiogenic ε_{Nd} values (reaching ≈ -24 close to the 79°N-Glacier) in NEG Shelf Bottom Water. Such ε_{Nd} signatures are not observed in NEG Shelf Shallow Water. The REE release is thus likely caused by dissolution of detrital particles with similar signatures rather than remobilization of REEs from nanoparticles/colloids previously formed in the upper water column.

[1] Laukert *et al.* (2017) *Geochim. Cosmochim. Acta* **202**, 285-309. [2] Budéus *et al.* (1997) *J. Mar. Sys.* **10**, 123-138. [3] Rabe *et al.* (2009) *Ocean Sci.* **5**, 219-233.