Water Mass Contributions to the Central Arctic – New Insights from Rare Earth Elements and Nd Isotopes

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The upper water column (< 500m) in the central Arctic Ocean was sampled during European GEOTRACES cruise GP04 in 2015 (Polarstern cruise ARK-XXIX/3). Dissolved rare earth elements (REE) and Nd isotopes (ε_{Nd}) exhibit strongly enriched concentrations and highly diverse ε_{Nd} compositions due to REE input from the various Arctic rivers and inflow from the Atlantic and Pacific oceans. Both dissolved REE concentrations and the ε_{Nd} signatures behave conservatively in this area, allowing their use, in combination with salinity and $\delta^{18}O$, to determine the relative contributions of the different source waters to the central Arctic surface layer: Siberian river water (up to 18 %) can be found and separated into Lena and Yenisei/Ob contributions in the upper surface waters within the Transpolar Drift. A subsurface layer (~100m) of Pacific water is dominating in the Makarov and Amundsen Basins with contributions of up to 73 %, whereas the remaining locations, including surface waters of the Transpolar Drift, are characterized by a dominance of Atlantic water.

These observations and estimates differ markedly from the distribution of Pacific water based on nutrients (N, P), which is marked by high fractions in surface waters of the Transpolar Drift, where in contrast contributions from Siberian rivers are elevated based on Nd isotopes and $\delta^{18}O$. This confirms and highlights the previous suggestion of a strong shelf-derived component in the waters identified by nutrient relationships as ‘Pacific water’ [1].

[1] Bauch *et al*. (2011) *Prog*. *Oceanogr*. **91**, 482-495.