Dissolved Nd isotope and REE distributions trace interannual variability of water mass mixing and water-sediment interaction in the Laptev Sea

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We present Nd isotope compositions (εNd) and rare earth element (REE) concentrations of filtered seawater from the Laptev Sea obtained during the Transdrift XXI (2013) and XXII (2014) cruises within the Russian-German cooperation project TRANSDRIFT to trace changes in water mass sources and their mixing. The Laptev Sea is a shallow Siberian shelf sea characterized by extensive river-runoff, sea ice production and sea ice transport into the Arctic Ocean. The spatial and temporal variability of water mass distribution and matter transport within this area is crucial for the understanding of the dynamic response of the Arctic region to climate forcing.

In summer 2013, the SE Laptev Sea was characterized by high Nd concentrations ([Nd]) (< ~550 pmol/kg), low εNd values (> ~ -16) and low salinities (reaching ~7 psu), which documents dominating freshwater contributions from the Lena River. In summer 2014, significantly lower [Nd], a more radiogenic εNd signature and overall higher salinities suggest reduced contributions from the Lena River in this area. The NW Laptev Sea close to Vilkitsky Strait was governed by relatively low [Nd] (< ~50 pmol/kg), higher εNd values (< ~ -6) and intermediate salinities (25-30 psu) in 2013 and 2014, but waters with such properties extended further into the central Laptev Sea in 2014. These waters clearly originated in the Kara Sea, where they had aquired the Nd isotopic signature of the Yenisei/Ob Rivers (~ -5 to -6).

While the εNd signature of the Yenisei/Ob Rivers is preserved during advection, most of the riverine Nd content was removed from the water column before reaching the Laptev Sea. This is supported by the high ratio of heavy to light REEs caused by the preferential removal of LREEs. The HREE to LREE ratio increases from ~1 in the SE Laptev Sea to ~5 in the NW Laptev Sea likely reflecting the difference between relatively young Lena water and older Yensei/Ob waters.