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UNDERSTANDING MECHANISMS CONTROLLING THE ARCTIC ENVIRONMENT IN THE LAPTEV SEA – IMPLICATIONS FROM ND ISOTOPES AND RARE EARTH ELEMENTS

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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 study of the variability of lateral and vertical water mass distribution and matter transport within this area is important for our understanding of the mechanisms controlling the sensitive Arctic marine environment and its future changes. To trace sources of waters and the influence of vertical processes related to particle fluxes we determined the Nd isotope compositions (εNd) and rare earth element (REE) concentrations of filtered seawater obtained during the Transdrift XXI cruise in 2013 within the Russian-German cooperation TRANSDRIFT.

The eastern Laptev Sea is characterized by high REE concentrations with maximum surface Nd concentrations ([Nd]) of 296 pmol/kg close to the Lena River mouth, similar to data reported previously. REE concentrations decrease towards the North and reach surface [Nd] = 103 pmol/kg at the shelf margin. Surface εNd signatures are constant and range from -14 to almost -16 throughout the whole southeastern Laptev Sea. All normalized REE patterns are characterized by a negative Ce anomaly and variable enrichment of heavy REEs over the light REEs with surface heavy to light REE ratio (HREE/LREE) close to 1 at the Lena River mouth and increasing HREE/LREE towards the North, reaching values of 2.7 at the shelf margin. This reflects the dominating freshwater contributions from the Lena River during the sampling period in summer 2013. Below the pycnocline, the REE concentrations are lower and accompanied by more radiogenic Nd isotopic signatures around -12 and HREE/LREE near 2.

REE concentrations and patterns in the western Laptev Sea differ significantly from those of the eastern Laptev in that all [Nd] are below 80 pmol/kg and the REE patterns show higher HREE/LREE ratios above 3.5 and highest values observed at the shelf margin close to the Vilkitsky Strait. The isotopic signatures of this area are 6 to 8 εNd-units higher indicating the inflow of waters with more radiogenic Nd isotope signatures from the Kara Sea.

Our results will be compared with other hydrographic and hydrochemical parameters and we will discuss their potential for the quantification of the export of waters from the Laptev Sea into the Transpolar Drift and the Arctic basin. The investigation of new tracers such as Nd isotopes and REE concentrations and the comparison with established parameters in future will help us to get a holistic picture of complex processes taking place over different timescales.