

Nd & Hf concentrations and isotopic compositions in the Baltic Sea

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Abstract

Within a process study in the framework of the international GEOTRACES program and led by the Institute of Oceanology of the Polish Academy of Sciences (IOPAN) a two-week cruise on the R/V Oceania sailed in November 2011 to investigate the distribution of trace elements and their isotopes in the Baltic Sea. The scientific goals were particularly focused on compiling trace element budgets for the Baltic Sea including in- and outflow, as well as to investigate elemental behavior and isotopic fractionation associated with the redox gradients of the Baltic Sea water column and the permanently anoxic conditions within its deep basins (i.e. Gotland Deep, Landsort Deep).

The Baltic Sea is a shallow, brackish inland sea with an average salinity of ~7 psu in the mixed layer. It is fed by the Bothnian Sea in the north, by the Finland Sea in the east, as well as by numerous rivers from Scandinavia and the Baltic states, and it is drained through the Danish Strait into the North Sea. In the opposite direction, a denser bottom water mass enters the Baltic Sea through deeper channels from the Danish Strait successively filling the deep basins northward. Below 130 m water depth, the water column is permanently anoxic.

Here we present the first combined data set of Nd and Hf concentrations and isotopic compositions for the Baltic Sea. A total of 21 water samples (60L volume per sample) including two water column profiles from the deeper basins were filtered (0.45 µm) and Nd and Hf were extracted and analysed following the accepted GEOTRACES protocols. The distribution patterns of the two elements and their isotopic compositions are compared to hydrographic data and oxygen measurements and provide information on sources and mixing of water masses, as well as on exchange processes with the underlying sediments, which are influenced by the prevailing redox gradients.

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