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Seawater-derived neodymium isotope records in the Chukchi Sea, western Arctic Ocean during Holocene: implications for oceanographic circulation

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Changes in oceanographic circulation in the Artic have a large influence on the global oceanic and climate system of the Earth through the geological times. In particular, freshwater input from the North Pacific to the western Arctic Ocean affects the Atlantic meridional overturning circulation (AMOC) after the opening of the Bering Strait. Seawater-derived neodymium isotope in marine sediments has been used as a proxy to trace the origin of water masses and oceanic circulation system. The global average residence time of Nd is shorter than the global ocean mixing time and dissolved Nd in seawater behaves quasi-conservatively. In the modern Arctic Ocean, the Nd isotope distribution is dominated by Atlantic source water, although the circum-Arctic riverine discharge and Pacific-derived waters also have noticeable impacts.

In this study, we investigated seawater-derived neodymium isotope records from a sediment core recovered from the Chukchi Sea to understand the changes in hydrograhic circulation of the western Arctic during the Holocene. A gravity core, ARA02B 01A, was collected on the northern shelf of the Chukchi Sea (73°37.8939'N, 166°30.9838'W, ca. 111 m in water depth) during the RV Araon expedition in 2011.

To obtain seawater-derived Nd records, we extracted Fe-Mn oxide coatings as an authigenic fraction from bulk sediments by leaching with acid-reducing solution after removing carbonate by leaching with acetic acid. Our preliminary results might show a general pattern of increasing radiogenic εNd values through Holocene intervals. Therefore, it implies that εNd results may be related with variations in the intensity of Bering Strait inflow during the last $\sim$9.31 ka BP. The radiogenic trend was strongly pronounced from the late Holocene (εNd -7.23; ca. 8.84 ka BP) to the middle Holocene (εNd -4.78; ca. 6.18 ka BP) and vaguely during the middle Holocene. After 4.13 ka BP, εNd values were increased again from -4.86 to -4.03 at 0.57 ka BP. But 87Sr/86Sr values vary from 0.70929 to 0.70991 throughout the whole sediment core and they might be higher than the Sr isotopic value of modern seawater (0.70918). This implies that the leachates may not be preserved past seawater signal. Thus, our preliminary results indicate that further studies for assessment of leaching methods and for other reliable seawater-derived records (including authigenic carbonates, i.e. foraminiferal and bivalve shells which are found in sediment cores) are necessary.