

Neodymium isotopes (ϵ_{Nd}) in the Denmark Strait: insights into water mass processes

SARA ESPINOSA-PAZ¹, IGNASI REGADA¹, SARA
CAMPDERRÓS¹, MARA NAVARRO-BUIGUES², ESTER
GARCIA-SOLSONA¹, EDUARDO PAREDES-PAREDES¹,
MARTA ARJONA-CAMAS¹, MARC CERDÀ-DOMÈNECH¹,
JAIME FRIGOLA¹, GALDERIC LASTRAS¹, M. DOLORES
PÉREZ-HERNÁNDEZ², ANNA SANCHEZ-VIDAL¹, DAVID
AMBLAS¹ AND LEOPOLDO D. PENA³

¹Universitat de Barcelona

²Universidad de las Palmas de Gran Canaria

³University of Barcelona

Seawater Neodymium isotopes (ϵ_{Nd}) have been consolidated as key tools for tracing ocean circulation, water mass origins, and mixing processes, providing valuable understanding of ocean dynamics. Their potential lies in their quasi-conservative behaviour as geochemical fingerprints for each water mass source region. Combining traditional tracers such as temperature and salinity with ϵ_{Nd} , offers additional constraints on source area formation and transport pathways. This study applies an unprecedented high-resolution seawater ϵ_{Nd} dataset from Denmark Strait, a crucial oceanic gateway between the Arctic and Atlantic oceans. During the FAR-DWO-DS1 cruise (2023), 250 seawater samples were collected across different oceanographic sections aiming for a detailed characterization of the different water masses present in the study area. Preliminary results reveal four distinctive radiogenic signatures: (i) Atlantic waters transported by the Irminger Current (IC) ($\epsilon_{\text{Nd}} = -14.1 \pm 0.6$), (ii) Arctic surface waters carried by the East Greenland Current (EGC) on the Greenland shelf ($\epsilon_{\text{Nd}} = -11.7 \pm 0.5$), (iii) Denmark Strait Overflow Water (DSOW) ($\epsilon_{\text{Nd}} = -10.9 \pm 0.5$), and (iv) Iceland shelf waters ($\epsilon_{\text{Nd}} = -5.8 \pm 2.5$). These differences highlight the more radiogenic nature of Arctic-derived waters, in contrast to the less radiogenic Atlantic inflow. Additionally, our results provide evidence of boundary exchange processes on the Icelandic shelf, with the highly radiogenic values likely driven by its volcanic nature. To quantify the relative contributions of each water mass and assess the conservativeness of ϵ_{Nd} near continental margins, we integrate these results into a newly developed Monte Carlo Optimum Multi-Parameter Analysis (MC-OMPA). This multi-proxy approach allows to distinguish boundary exchange effects that could potentially mask water mass mixing, providing new insights into oceanic TEIs (trace elements and isotopes) cycling in this key oceanic region.