Comparison between seawater and archive Nd isotope compositions using multi-scatter plots: A new global data compilation

KAZUYO TACHIKAWA¹ AND NEOSYMPA MEMBERS

¹CEREGE, UM 34 Aix-Marseille Université-CNRS (UMR 7330), Europole de l’Arbois, BP80 13545 Aix-en-Provence, France, kazuyo@cerege.fr

Neodymium isotopic ratios (εNd) have been used as a tracer of water mass and continental inputs to the ocean. To further evaluate the faithfulness of this tracer and better constrain areas strongly affected by local/regional continental inputs, we have updated a global seawater εNd database (Lacan et al., 2012) and combined it with present-day water mass tracers including temperature, salinity, concentration of silica, phosphate, nitrate and oxygen of WOA09, δ13C values of dissolved inorganic carbon (Schmittner et al., 2013), and natural seawater ¹⁴C values of GLODAP database (Key et al., 2004). In addition, we compiled εNd data of sedimentary oxyhydroxide coatings, foraminiferal tests, deep-sea corals and fish teeth/debris from the Holocene period (≤10ka).

For water masses at water depth ≥ 1500m, multi-scatter plots between seawater εNd values and other water mass tracers present clear correlations, attesting that a primary control of seawater εNd values is large-scale deep water mixing. Noticeable exceptions are found in the northern northwest Atlantic where local/regional sources have highly contrasted Nd isotopic signatures. At 600-1500m water depths, the correlations become loose and virtually disappear for 0-200m. The surface seawater Nd concentration tends to be higher at stations within 1,000 km from the continents, reflecting contribution from local sources. Archive εNd data generally agree with seawater values expected from the multi-scatter plots. However, the relationships are more scattered, in particular for oxyhydroxide coatings. In spite of these complications, both seawater and archive εNd values clearly show latitudinal gradients at water depths ≥ 600m in the Atlantic and Pacific, confirming the usefulness of Nd isotopes to distinguish northern and southern source intermediate and deep water masses.