Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.4404

Global continental and marine detrital ε_{Nd}: an updated compilation for use in understanding marine Nd cycling

SUZANNE MARY ROBINSON[1], RUZA IVANOVIC[2], TINA VAN DE FLIERDT[3], CECILE LARA BLANCHET[4], KAZUYO TACHIKAWA[5], ELLEN MARTIN[6], CARYS COOK (FALCO)[6], TREVOR WILLIAMS[7], LAUREN GREGOIRE[2], YVES PLANCHEREL[3], CATHERINE JEANDEL[8] AND THOMAS ARSOUZE[9]

[1]School of Earth and Environment
[2]University of Leeds
[3]Imperial College London
[4]GeoForschungszentrum GFZ
[5]Aix Marseille Univ, CNRS, IRD, INRAE, Coll France, CEREGE
[6]University of Florida
[7]Texas A&M University
[8]LEGOS (Université de Toulouse, CNRS/CNES/IRD/UPS)
[9]BSC-CNS, Barcelona

Presenting Author: ee14s2r@leeds.ac.uk

Understanding the role of sediment-seawater exchange in the marine cycling of neodymium (Nd) isotopes is central for its reliable and continued use as a modern and palaeoceanographic tracer of ocean circulation. However, the exact processes that govern global Nd cycling, especially at the sediment-water interface remain poorly constrained. With a benthic flux, and a sediment source at depth now proposed as a major global source of Nd into the oceans, there is a need for up-to-date knowledge of the sources, sinks and transformation of this tracer to and within the ocean (e.g., aligned with the GEOTRACES core mission). We present here an extensive compilation of published terrestrial and marine sedimentary Nd isotopic (ε_{Nd}) measurements. From this, we have constructed high resolution (0.5 °× 0.5°), gridded, global maps characterising ε_{Nd} distributions at the entire sediment-ocean interface, building substantially upon the previous work of Jeandel et al. (2007)[1]. Here, we describe the database, interpolation methods and present the final ε_{Nd} maps of the continental margins and seafloor. These data products are particularly designed for investigating marine Nd cycling, and enables specifically the application of isotope-enabled ocean models to understand targeted Nd behaviours in the oceans. Such applications include, but are not limited to: further quantifying the nature and magnitude of a benthic flux required to reconcile global Nd budgets, establishing the potential role of Nd isotopes as tracers of weathering regimes and even as a kinematic tracer of ocean circulation. We finally present the new global marine Nd-isotope scheme we are developing, extending upon previous Nd modelling efforts, to simulate Nd isotopes in a fast-coupled atmosphere-ocean General Circulation Model (FAMOUS). We utilise these new sediment ε_{Nd} maps as boundary conditions, further constraining the major sources, sinks and cycling of Nd isotopes and exploring instances of non-conservative behaviour related to changes in sedimentary processes.

[1] Jeandel, C., Arsouze, T., Lacan, F., Téchiné, P., Dutay, J.C., 2007. Isotopic Nd compositions and concentrations of the lithogenic inputs into the ocean: a compilation, with an emphasis on the margins. Chem. Geol. 239, 156–164. https://doi.org/10.1016/j.chemgeo.2006.11.013.