

Partial dissolution of lithogenic Nd and global isotopic distribution in the ocean

K. Tachikawa
C. Jeandel

LEGOS (CNES/CNRS/UPS), Observatoire Midi-Pyrénées, 14 av.
E. Belin, 31400 Toulouse, France

In marine geochemistry, Nd isotopic ratios are used as water mass tracer, scavenging tracer and source tracer of lithogenic component in the sediment. In spite of its usefulness, Nd behaviour in the marine environment has not clearly been understood yet. The Nd residence time estimated from concentration gradient (10^4 yr.) does not agree with the one based on a heterogeneous isotopic distribution in the world ocean (< 1500 yr.). Dissolved-particulate Nd exchange is likely to be a key term to solve this 'Nd paradox'. The local scale studies suggest that exchange occurs intensively at the continental margin and atmosphere/ocean interface: Mediterranean Sea (Henry *et al.*, 1994); Sargasso Sea (Jeandel *et al.*, 1995); tropical NE Atlantic (Tachikawa *et al.*, 1997). The purpose of this paper is to clarify the mechanism of this exchange and impact of the exchange to Nd isotopic distribution in the world ocean.

The Nd exchange includes a partial dissolution (and desorption) of lithogenic Nd and replacement by scavenged Nd from seawater (authigenic Nd). On the basis of the measurements of marine particles from the tropical NE Atlantic (Tachikawa *et al.*, 1997) and Nd budget in the Mediterranean Sea (Henry *et al.*, 1994), we estimate lithogenic Nd dissolution at $\sim 30\%$. This value is surprisingly higher compared to

the previous estimate (2%) based on a laboratory experience (Greaves *et al.*, 1994). Biological activity may play a significant role in dissolution of lithogenic material. It is well known that desorption of Rare Earth Elements (including Nd) from particulate matter occurs intensively under acid condition. The higher dissolution is probably due to a passage through the guts of zooplankton. The scavenging of dissolved Nd is related to occurrence of Mn oxides which are produced microbially (Sunda and Huntsman, 1987). We will discuss how Nd isotopic distribution varies in the global ocean if this exchange is under consideration.

References

- Henry, F., Jeandel, C. and Minster, J.-F. (1994) *Mar. Chem.*, **45**, 283–305.
- Jeandel, C., Bishop J.K. and Zindler, A. (1995) *Geochim. Cosmochim. Acta*, **59**, 535–47.
- Greaves, M.J., Statham, P.J. and Elderfield, H. (1994) *Mar. Chem.*, **46**, 255–60.
- Tachikawa, K., Jeandel, C. and Dupré, B. (1997) *Deep Sea Res.*, **44**, 1769–92.
- Sunda, W.G. and Huntsman, S. (1987) *Deep Sea Res.*, **35**, 1297–317.