**Goldschmidt 2000**
**September 3rd–8th, 2000**
**Oxford, UK.**

**Journal of Conference Abstracts**
**Volume 5(2), 1042**


# Neodymium in Sedimentary Foraminifera Records the Isotopic Composition of Surface Seawater

**Derek Vance** (d.vance@gl.rhbnc.ac.uk)[1], **Gideon M. Henderson** (gideon.henderson@earth.ox.ac.uk)[2], **Kevin W. Burton** (burton@opgc15.univ-bpclermont.fr)[3] & **Niall C. Slowey** (nslowey@ocean.tamu.edu)[4]

[1] Department of Geology, Royal Holloway, University of London, Egham, Surrey TW20 OEX, UK
[2] Department of Earth Sciences, University of Oxford, Parks Road, Oxford OX1 3PR, UK
[3] Lab. Magmas et Volcans, Universite Blaise-Pascal, Clermont-Ferrand 63038, France
[4] Dept. of Oceanography, Texas A&M University, College Station, TX 77843-3146, USA

It has recently been demonstrated (Vance and Burton 1999; Burton and Vance 2000) that the isotope composition of neodymium (Nd) in sedimentary planktic foraminifera displays variations on glacial-interglacial and longer timescales. These variations have been attributed to past changes in seawater Nd reflecting variations in continental weathering rates and ocean circulation. The principal advantages of using forams in this way are that: 1) the resulting records can have time resolutions much greater than available from other substrates (e.g. Mn-crusts) and; 2) the data can be directly related to other foram-derived measurements. The most serious potential problem with the approach is that foram tests acquire diagenetic Fe-Mn coatings with trace-element inventories that may overwhelm any Nd acquired in seawater. Indeed, the measured Nd/Ca ratios of sedimentary foraminifera are much higher than seawater values. To test whether sedimentary forams accurately preserve a surface-water Nd isotope signal, despite their high Nd/Ca ratios, we have studied both core-top and water-column foraminifera from the Pacific Ocean and we compare these data with measurements from modern seawater and core-top bulk sediment from the same site. The data demonstrate, in common with previous data from the Indian and Atlantic oceans, that no local source of Nd can supply that preserved in the forams other than surface seawater. This provides clear support for the use of forams to reconstruct past surface-water Nd isotope composition.

Sm-Nd isotopic and concentration data have been obtained from the water column to depths of 3000 m as well as from core-top *G. ruber* and *G. sacculifer* foraminifera and bulk sediment at closely spaced sites on the slopes of Hawaii (around 20 N and 157 W). In addition, Nd concentration data have been obtained for plankton-tow foraminifera from the same area. All the sedimentary foraminifera have been cleaned of Fe-Mn coatings, and modern plankton tow samples of organic material, using techniques described previously (Boyle and Keigwin 1985/1986;Vance and Burton 1999). Nd/Ca ratios in two plankton-tow samples are 0.35 and 0.72 μmol/mol. Four core-top samples have Nd/Ca ratios ranging from 0.33 to 0.94 and residual Mn/Ca ratios of 19 to 46 μmol/mol. Two other core-top samples have Nd/Ca ratios of 1.15 and 1.29 at much higher Mn/Ca of 171 and 210 μmol/mol. The Nd/Ca ratios of the plankton-tow forams are 580 to 1200 times that of local seawater at a depth of 50 m. Nd/Ca ratios in the low-Mn/Ca core-top forams are very similar and range from 550 to 1560.

The Nd isotopic composition of the water column and the core-top sedimentary forams is illustrated in Figure 1, with similar data for the other sites for which foram Nd isotopic data are available. In all three cases core-top planktonic foraminifera have Nd isotopic compositions that are distinct from possible sources of Fe-Mn coatings - bottom water and bulk sediment - and are identical to shallow water. In detail, while the Pacific *ruber* have $\varepsilon_{Nd}$. identical to seawater at 50 m, the *sacculifer* have values that are closer to seawater at 150 m.

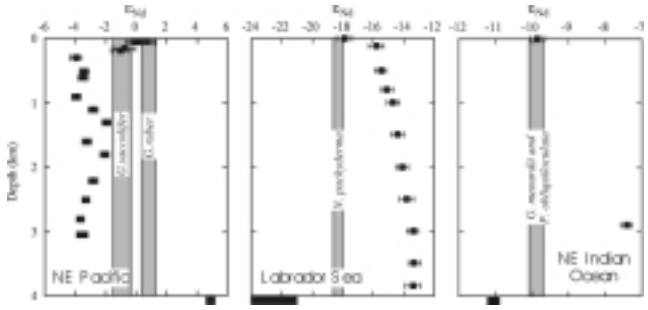


Figure 1: Seawater Nd isotopic profiles (squares: this study, Piepgras and Wasserburg 1987; Frank and O'Nions 1998; Amakawa and Nozaki 1998) compared to Nd isotopes in core-top forams (stippled bands: this study, Vance and Burton 1999; Burton and Vance 2000).

Amakawa H. & Nozaki Y, *Mineral. Mag.*, **62A**, 47-48, (1998).

Boyle EA & Keigwin, *Earth Planet. Sci. Lett.*, **76**, 135-150, (1985/1986).

Burton KW & Vance D, *Earth Planet. Sci. Lett.*, **176**, 425-441, (2000).

Frank M & O'Nions RK, *Earth Planet. Sci. Lett.*, **158**, 121-130, (1998).

Piepgras DJ & Wasserburg GJ, *Geochim. Cosmochim. Acta.*, **51**, 1257-1271, (1987).

Vance D & Burton KW, *Earth Planet. Sci. Lett*, **173**, 365-379, (1999).