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Nd/Ca ratios in plankton-towed and core-top foraminifera confirm the water column acquisition of Nd

M.A. Martínez-Botí (1), D. Vance (2), P.G. Mortyn (1)

(1) Institute of Environmental Science and Technology (ICTA), Universitat Autònoma de Barcelona, Spain, (2) Department of Earth Sciences, University of Bristol, UK (miquelangel.martinez@uab.cat / Fax: +34935813331 / Phone: +34935812503)

The study of Nd isotopes on various marine sedimentary substrates has proven to be a useful tool for the study of past changes in continental weathering and ocean circulation. Planktonic foraminifera are one of these substrates, and present three main advantages over the others: unlike other substrates for seawater Nd isotopes they record a surface ocean signal, they do so at high resolution, and the information obtained is directly-relatable to a wealth of other proxy information from the same material. However, there are still uncertainties about the precise provenance of the Nd signal recorded by sedimentary planktonic foraminifera. It has been shown that the Nd isotopic composition of sedimentary foraminifera is identical to that of surface seawater. But it has been suggested that the very high concentrations of Nd in sedimentary foraminifera, equivalent to Nd/Ca ratios up to 500 times higher than seawater, casts doubt on the use of planktonic foraminifera as signal-carriers for surface water Nd isotopes. The concern is that planktonic foraminifera may pick up Nd post-mortem, on their way through the water column and in the sediment.

Thus, there is a need for plankton tow data in order to address this issue, which allows acquisition of Nd/Ca ratios from living planktonic foraminifera, as well as calculation of the distribution coefficients between their calcite and modern seawater. Here we present the first extensive plankton tow Nd/Ca data set from a variety of different geographic locations (NE and SE Atlantic, W Mediterranean and Arctic Ocean), together

with core-top samples from the Mediterranean region. Results show that the range of Nd/Ca ratios in plankton-towed foraminifera from all regions (0.01-0.7 μmol/mol) is little different from that recorded in sedimentary foraminifera. Furthermore, for the Mediterranean, where core-top and plankton tow data are both available, the range for plankton tows (0.15-0.7 μmol/mol) is essentially identical to that for the core-tops (0.1-0.5 μmol/mol).

There are also additional subtle, but systematic, features of the data at a genus level. For example, deeper-dwelling globorotaliid species (*Globorotalia inflata*, *G. hirsuta*, *G. truncatulinoides*) present consistently higher values than the non-globorotaliid shallow living species (*Globigerina bulloides*, *Neogloboquadrina pachyderma*, *N. incompta*, *Turborotalia quinqueloba*). We will expand on the implications of these collective findings, especially regarding the application of Nd isotopes to water mass formation and circulation studies, and how interspecies differences in Nd/Ca may be exploited.