Model-based assessment of the sources of the North Atlantic Si isotope signature

G. F. DE SOUZA[1]*, M. A. BRZEZINSKI[2], R. D. SLATER[1] AND J. L. SARMIENTO[1]

[1]AOS Program, Princeton University, Princeton NJ 08544, USA (correspondence: gfds@princeton.edu)
[2]Marine Science Institute, University of California, Santa Barbara, Santa Barbara CA 93106-6150, USA

The most striking feature of the global oceanic distribution of the stable isotope composition of dissolved silicon (expressed as $\delta^{30}Si$) is the systematic basin-scale gradient in $\delta^{30}Si$ values observed in the deep Atlantic Ocean. Observational studies [1, 2] show that this deep water $\delta^{30}Si$ variability is strongly controlled by the circulation of Atlantic deep waters: whilst Si-rich Antarctic Bottom Water bears a low $\delta^{30}Si$ value, dissolved Si in Si-poor North Atlantic Deep Water is characterised by an elevated $\delta^{30}Si$ signature otherwise only seen in the surface or near-surface ocean.

Although the water-mass control on the deep Atlantic $\delta^{30}Si$ distribution is clearly evinced by the data, there remains some disagreement as to the source of the North Atlantic $\delta^{30}Si$ signature. Given what we know of the marine Si cycle, this signal must have its origins in the polar oceans – but at which pole, south [1] or north [2]?

We utilise a series of ocean general circulation models [3] that trace the stable isotopic composition of dissolved Si as well as the sources of Si to the deep North Atlantic [e.g. 4] in order to assess the possible origins of this globally unique deep water isotopic signature, and present our results in comparison with the growing observational dataset from GEOTRACES [1, 2].

[1] de Souza *et al* (2012) *Glob. Biogeochem. Cyc.* **26**, doi: 10.1029/2011GB004141 [2] Brzezinski & Jones (submitted) *submitted to Deep. Sea Res. II* [3] Gnanadesikan *et al* (2004) *Glob. Biogeochem. Cyc.* **18**, doi:10.1029/2003GB002097 [4] Palter *et al* (2010), *Biogeosci.* **7**, 3549-3568