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Glacial/interglacial variations in marine osmium isotopes

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Variations in the Osmium (Os) isotope composition of seawater, over time, largely reflect a change in the balance of input from continental weathering and seafloor hydrothermal exchange. The great utility of Os is that its residence time in the oceans is sufficiently short to respond, in phase, with short-term fluctuations in input (like, Nd or Pb) but long enough for the signal to be global in extent (like Sr). However, the application of this system is hindered by the low concentration of Os in most sedimentary materials. This study uses ultra-low blank chemical techniques and presents Os isotope data for 'bulk' pelagic carbonate, foraminifera and Fe-Mn oxyhdroxides for a 140 ka record from ODP site 758A in the SE Indian Ocean.

Bulk carbonate data appear to show glacial isotope excursions, however, the largest excursion is coincident with the Toba eruption at 74 ka, and it is difficult to deconvolve the hydrogeneous signal from that from volcanic ash using the available data. In contrast, core-top foraminifera yield an Os isotope composition indistinguishable from modern seawater, and appear to show excursions to less radiogenic Os during glacial intervals, consistent with those observed elsewhere (Oxburgh, 1998; Williams & Turekian 2004; Dalai et al., 2005). Fe-Mn oxyhydroxides, considered to sample deep-water, show similar shifts for the last glacial, but no resolvable shift for the penultimate glaciation, indicating either that deep-water at this site was not affected at that time or else that Os isotopes in the sub-oxic part of this core have been perturbed.

Changes in the Nd isotope composition of seawater during glaciation at this site appear to be climatically driven by local changes in the composition of riverine input (Burton & Vance, 2000), whereas Os variations post-date those of Nd and appear to reflect a

global change in the balance of continental weathering. High resolution records may reveal the precise timing of the Os variations, and in particular whether they relate to reduced input of continental Os during periods of global aridity (Oxburgh, 1998) or else to a change in the composition of material being delivered to the oceans during post-glacial weathering.

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