Exploring the controls on authigenic Nd and Pb isotope tracers in the Indian and Southern Oceans

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Seawater neodymium (Nd) and lead (Pb) isotope reconstructions provide unique evidence on both mixing between ocean currents and past changes in weathering inputs [1]. While existing records from the deep central Indian Ocean indicate differing sensitivities of Nd and Pb isotopes to those processes [2,3], the potential of combining these two tracers has so far been under-exploited in paleoceanography.

Here we synthesise both new and existing Nd and Pb isotope data, from reductive sediment leachates in the deep western and central Indian Ocean, and from deep-sea coral skeletons in the mid-depth Southern Ocean. By comparing the two tracers across different sedimentary and oceanographic settings, we aim to (i) gain new insights into the oceanic cycling of these two elements, and (ii) provide better constraints on changes in ocean circulation and continental weathering through Quaternary glacial cycles.

In the deep western Indian Ocean, authigenic Pb isotope data are spatially coupled to Nd isotopes in Holocene coretops, implicating a control by local Madagascan inputs, as previously shown for Nd in this region [4]. Using both isotope systems together allows us to better investigate the mechanisms responsible, including potential pore water and boundary exchange processes. We also evaluate the potential for Pb isotope fractionation during tropical weathering, and further explore why, despite the apparent spatial coupling, there was a temporal decoupling during the last deglaciation.

In the mid-depth Southern Ocean near Tasmania, striking glacial-interglacial changes in Nd isotopes occurred independently of Pb isotope variability. That scenario supports a change in large-scale ocean circulation, rather than local controls, on that Nd isotope record, which provides new evidence for understanding the structure of the glacial ocean and the sequence of changes during the last deglaciation.

[1] Frank, M. (2002) *Rev. Geophys.* 40; [2] Wilson, D.J. et al. (2015) *Paleoceanography* 30, 621-641; [3] Wilson, D.J. et al. (2015) *EPSL* 424, 256-268; [4] Wilson, D.J. et al. (2012) *EPSL* 341, 35-47