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Iron isotopes in bottom waters from the Bransfield Strait: Implications for deep water Fe supply

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Iron (Fe) is an important micro-nutrient in the global ocean. However, its low bioavailability due to poor solubility in oxygenated waters, leads to a strongly limiting character of this trace metal as a nutrient. The major sources of Fe to seawater are largely known (i.e. aeolian dust deposition, riverine and groundwater input, seawater-sediment interaction, and hydrothermal vents) but the relative significance of these sources to the marine Fe supply are not yet well quantified. Areas with low atmospheric inputs, such as the Southern Ocean, are severely Fe limited in surface waters. Here, strong upwelling and a deeply penetrating surface mixed layer fuel one of the largest biogeochemical cycles of trace metals in the global ocean. One significant pathway to bottom waters is the benthic flux of trace metals from hydrothermal systems, where Fe can be stabilised in the water column by different dissolved species. For example, benthic fauna, such as tube-worms, may enhance transportation of dissolved trace metals from pore waters through oxic surface layers of sediments into the deep ocean. Concentrations of total dissolvable Fe (DFe) in these bottom waters have been reported to be significantly higher than surrounding seawater (Aquilina et al., 2014). Here we present DFe isotope composition of bottom water from the Hook Ridge, a shallow ($\sim$1100m) sediment covered volcanic feature within a rifted margin. On the basis of Fe isotopes we will determine whether Fe is released by non-reductive dissolution from poorly oxygenated sediments via the presence of tubeworms Sclerolinum spec. This will help to evaluate whether benthic fluxes from hydrothermal fields can be a major source of bioavailable Fe to the deep Southern Ocean.

References:

Aquilina, A., Homoky, W.B., Hawkes, J. A., Lyons, T.W., Mills, R. a., 2014. Hydrothermal sediments are a source of water column Fe and Mn in the Bransfield Strait, Antarctica. Geochim. Cosmochim. Acta 137, 64–80. doi:10.1016/j.gca.2014.04.003