The role of the polar oceans in controlling the distribution of Cd isotopes at lower latitudes in the South West Pacific

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Cadmium (Cd) is a trace metal that exhibits a nutrient-type dissolved distribution with a close linear correlation to dissolved phosphate throughout the global oceans [1]. Under Fe limiting conditions, this relationship changes as Cd is apparently taken up by phytoplankton preferentially to phosphate, resulting in a 'kink' in the Cd:P relationship. Studies have highlighted the influence of biogeochemical processes in the Southern Ocean on basin-wide distributions of Cd throughout the lower-latitude oceans [2, 3].

Dissolved Cd stable isotope ratios (δ^{114}Cd) can inform understanding of these source processes, which impart the distinctive δ^{114}Cd and Cd:P signatures to southern-sourced water masses that are then transported northwards. Although the deep oceans are homogeneous for δ^{114}Cd (~+0.3‰), Antarctic Intermediate Water carries a depleted δ^{114}Cd signal (+0.45‰) into the far North Atlantic, whilst such a signal is apparently absent at 30°N in the Pacific [4, 5].

Here we present new seawater dissolved Cd stable isotope ratios obtained by double-spike MC-ICPMS. The method uses Nobias PA-1 chelating resin to extract metals from seawater, purification by anion exchange chromatography, and analysis by ^{111}Cd-^{113}Cd double-spike Neptune MC-ICPMS [6]. We present further method development as well as the first water-column profiles of dissolved δ^{114}Cd from the SW Pacific Ocean, using samples collected during the recent Japanese GEOTRACES GP19 transect along 170°W. We use our new data to investigate the transport of Cd in water masses as they move northward from the Antarctic to the Equatorial Pacific Ocean, in order to gain insights into how southern-sourced water masses influence the Cd cycle in the Pacific, compared to the Atlantic.

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