Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.29360

# Paired dissolved and particulate nickel isotopes in the Southern Ocean

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Nickel is a bio-essential trace metal for marine phytoplankton, serving as a cofactor for several key enzymes [1]. Its long-recognized nutrient-type profile in oceans hints at its potential as a proxy for past productivity [2]. Recent studies on the distribution of Ni and its isotopes have significantly advanced our understanding of its biogeochemical cycling but have also raised new questions, such as the lack of isotope fractionation in high-latitude photic zones and the absence of complete depletion of dissolved Ni [3, 4]. Additionally, the vertical distribution of Ni is intermediate between those of phosphorus and silicon [5], yet the underlying processes remain poorly understood. Particles play a crucial role in trace metal cycling, acting as both sources and sinks through exchange with seawater, as well as transport vectors in the ocean. Particulate Ni stable isotope data, however, remain scarce, mostly because of the difficulties with sampling and analysis.

Here we present profiles of paired dissolved and particulate Ni stable isotope composition ($\delta^{60}$Ni), among the first such profiles in the open ocean. Samples were collected from three stations near the Subtropical Front in the Australian sector of the Southern Ocean (RV Investigator cruise *IN2018V04*, GEOTRACES GPpr13). The positioning of these stations across biogeochemical regimes (subtropical and subantarctic) allows analysis of Ni isotope cycling in different settings. Higher surface productivity is observed in the subtropics, with elevated particulate Ni concentrations; however, particulate $\delta^{60}$Ni shows minimal variation with depth. This pattern contrasts with the subantarctic stations, where particulate Ni concentrations remain relatively constant, while $\delta^{60}$Ni shows a distinct vertical trend of decreasing $\delta^{60}$Ni with increasing depth. We will use these data to assess the potential mechanisms driving Ni isotope fractionation and discuss their implications in marine Ni distribution. These data help to improve the holistic insights into the marine cycling of Ni and its isotopes.

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