

Nickel biogeochemistry in the subtropical Indian and Pacific Oceans: insights from dissolved and particulate isotopes

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Trace metals in the ocean, including nickel (Ni), are essential and often biolimiting micronutrients for oceanic phytoplankton, and thus crucial for the global carbon cycle. Many trace metals are depleted to near-zero concentrations in the surface ocean because of phytoplankton uptake. However, in the low latitude photic zone, Ni concentrations are never completely depleted, and dissolved Ni concentrations decrease to a ubiquitous minimum of about 2 nM. Such low concentrations are associated with a unique heavy isotope composition [1-4]. This peculiarity of the marine Ni cycle raises the question of the extent to which the photic zone pool of Ni is bioavailable, especially in nitrate-depleted oligotrophic gyres, where Ni is required for nitrogen metabolism [1-3].

Here, we present new dissolved and particulate Ni concentration and isotope data from the subtropical South Pacific (GEOTRACES GP21) and South Indian Ocean (GEOTRACES GI07, GEOTRACES GS02) with a focus on the photic zone. These new data confirm the particularly heavy isotope composition of the Ni-depleted low latitude upper ocean. These new dissolved data are paired with particulate Ni concentrations and isotope compositions, providing a more complete understanding of the [Ni] - $\delta^{60}\text{Ni}$ systematics in the oligotrophic ocean. This dataset will form the basis of further experimental investigations of biological and chemical processes controlling Ni bioavailability.

[1] Archer, C. et al. (2020) *Earth and Planetary Science Letters* 535, 116–118.

[2] John, S.G. et al. (2022) *Nat. Geosci.* 15, 906–912.

[3] Lemaitre, N. et al. (2022) *Earth and Planetary Science Letters* 584.

[4] Yang, S.C. et al. (2021) *Geochimica et Cosmochimica Acta* 309, 235–250.