

Tracing zinc bioavailability in the Tasman Sea using zinc isotopes

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The uptake of zinc by phytoplankton is complex and dependent on the concentration and chemical speciation of dissolved zinc; both of which affect zinc bio-availability. In some parts of the surface ocean dissolved zinc concentrations are sufficiently low, in the picomolar range, to potentially limit the growth of certain phytoplankton species. This research investigates the relationship between zinc availability and primary production using the zinc isotopic composition of dissolved and particulate samples collected from the Tasman Sea, SW Pacific Ocean. Variability in the isotope composition of dissolved zinc is observed in the upper ocean (0-200 m), with the positive values at the chlorophyll maxima suggesting preferential uptake of lighter zinc isotopes by phytoplankton. Immediately below the chlorophyll maxima we see low isotope values indicating the regeneration of lighter zinc isotopes from particulate organic material. Based on the degree of zinc isotope fractionation (~ 0.5 ‰), phytoplankton in the Tasman Sea are not likely to be zinc-limited even though free zinc ion concentrations (0.4 to 22 pmol L⁻¹; surface to 200 m) are in the low picomolar concentration range.