

The distribution of dissolved trace elements across a zonal section of the southwest Pacific Ocean

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Trace elements in the ocean play important roles as nutrients, as contaminants and as tracers for ocean processes now and in the past. In remote oligotrophic ocean waters, such as the South Pacific, the primary control on phytoplankton production is the supply of the macronutrient nitrogen into the euphotic zone, with secondary nutrient limitation associated with the supply of micronutrient trace elements (such as iron) as well as phosphorus.

Here we present a full water column section of dissolved trace elements, including iron, together with macronutrient concentrations, for the GEOTRACES zonal transect (GP13) along ~30°S in the southwest Pacific Ocean, from east of Australia (153°E) to south of Tahiti (150°W). We use a suite of trace metals and their ratios to fingerprint the sources and sinks in the region, focussing specifically on long range aerosol transport to surface waters and hydrothermal inputs to the deep sea. We also compare data from our Australian-New Zealand zonal section (GP13) with the US GEOTRACES Eastern Pacific Zonal Transect (GP16) of the southeast Pacific Ocean (along ~12°S west of Peru).

Our results show that surface dissolved iron (<0.2 nmol/L) and nutrient (<5 µmol/L) concentrations are very low along GP13, with the oligotrophic waters primarily limited by nitrogen. We observe distinct enrichments in trace elements such as iron and manganese in deep (>1000 m) waters above the Kermadec Ridge north of New Zealand, indicative of hydrothermal vent delivery, and enrichment in iron and lead close to the Australian continent, indicative of continental shelf/sediment and anthropogenic inputs.