

Lead concentrations and isotopes distributions in the South Pacific Ocean.

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Project Summary:

Although lead concentration and isotopic compositions have been extensively used to investigate lead sources and geochemistry in the environment, there is still a considerable lack of data for seawater. Because those lead data are considered to be *particularly fruitful to measure on all ocean sections and for which global coverage is highly desirable*, GEOTRACES designated lead concentrations and isotopic compositions as key parameters for the program.

In the South Pacific, only two lead concentration profiles have been published to date; only one of them also included lead isotopic data^{1,2}. The only other isotopic values available are for surface waters in the South Pacific that were sampled three decades ago³. We propose to add to this limited pool of data by measuring lead concentrations and isotopic compositions in seawater profiles that will be collected during the GEOTRACES Pacific GP16 section. This work will contribute to the program's scientific objective *to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes in the ocean* in several ways.

(1) It will provide a better understanding of anthropogenic inputs of lead in the South Pacific. Those are still poorly constrained, as increasing lead emissions from mining, smelting, and fossil fuel combustion in the Southern Hemisphere are becoming relatively more important sources of atmospheric contamination, as they appear to have in the North Pacific^{2,4,5}. This information will be combined with data from our past and ongoing studies of lead distributions in the North Pacific (e.g., GEOTRACES Japan, IOC-IV, California Upwelling Transition Zone cruises) and the Antarctic waters (Amundsen Sea Polynya International Research Expedition), as well as with existing⁶⁻⁸ and new lead isotopic records in South Pacific boundary end members (e.g., Chilean lake sediments, aerosols and ash; Australian aerosols and ash). This extensive data set will enable us to trace lead fluxes and cycling throughout the Pacific.

(2) Measurements in Peru's upwelling region and oxygen minimum zone (OMZ) will shed light on the processes governing the transport and scavenging/resuspension of lead of industrial and/or natural origin in this area, and will complement previous concentration data from sediments underneath the OMZ off Peru⁹. Those data will also be valuable for comparisons with our current study of lead concentrations and isotopic compositions in the regions northern hemisphere equivalent: the CCUZ.

(3) It was recently proposed that anthropogenic lead has invaded the North Pacific abyssal water, where it has become the predominant lead source². Measurements in deep waters will assess if this hypothesis applies to the South Pacific. And data from waters influenced by hydrothermal plumes derived from the East Pacific Rise will help quantify their relative contribution to the oceanic lead budget.

References:

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