

## Silver distributions along the GEOTRACES Pacific GP16 section

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### Project Summary:

Silver was not included in the original GEOTRACES list of trace elements of interest because it is neither a nutrient nor a commonly used tracer in sea water. Nevertheless, preliminary data indicate that this trace element may be used as a tracer of both nutrients and anthropogenic fluxes in the oceans. These applications are however qualified by the relatively poor understanding we still have of the oceanic cycling of silver - especially with the near absence of silver data in the South Pacific<sup>1</sup>.

Parallels observed between silver and silica distribution in waters across other ocean basins suggest that both geochemical cycles are linked, and that silver is being sequestered within a refractory organic phase associated with biogenic silica<sup>2</sup>. However departures from the linear correlation between the two metals in the North Pacific have implied that other factors influence silver marine cycle. Hypothesis have included increasing anthropogenic inputs of silver<sup>3</sup> and scavenging/regeneration processes<sup>4</sup>. Most recently, it was proposed that silver is removed from oxygen-depleted waters by scavenging and/or precipitation of AgS species<sup>5</sup>.

The latter hypothesis could be tested within the GEOTRACES GP16 transect, since it will include Peru's highly productive upwelling region and its associated extensive oxygen minimum zone (OMZ). Measuring silver concentrations in this transect will help resolve the proposed correlation between oxygen, silica and silver marine chemistry, and will complement previous data from sediments underneath the OMZ off Peru<sup>6</sup>. This will contribute to the second scientific objective of the cruise, to *evaluate the mobilization (or sequestration) of trace elements by processes associated with the intense oxygen minimum zone*.

Few studies of silver in oceanic hydrothermal plumes, including those in the MidAtlantic Ridge<sup>7</sup>, revealed anomalously high concentrations of silver compared to the concentrations in oceanic waters. Measurements of silver in waters influenced by hydrothermal plumes derived from the East Pacific Rise will help quantify the relative importance of this source in the budget and cycling of silver in the oceans. This will contribute to the fourth scientific objective of the cruise, to *quantify sources and sinks of trace elements in hydrothermal plumes*.

### References:

- 1 Gallon, C. & Flegal, A. R. *Environ. Sci. Technol.*, in review (2011).
- 2 Ndung'u, K. *et al. Deep Sea Res. II: Topical Studies in Oceanography* **48**, 2933-2945 (2001).
- 3 Ranville, M. A. & Flegal, A. R. *Geochem. Geophys. Geosyst.* **6**, Q03M01 (2005).
- 4 Zhang, Y. *et al. Geochem. J.* **38**, 623-633 (2004).
- 5 Kramer, D. *et al. Mar. Chem.* **123**, 133-142 (2011).
- 6 Boning, P. *et al. Geochim. Cosmochim. Acta* **68**, 4429-4451 (2004).
- 7 Douville, E. *et al. Chem. Geol.* **184**, 37-48 (2002).