

# Antimony Isotope Ratio Measurements Using a Desolvating Nebulizer System with Multicollector ICP-MS Detection: A Study with an Atlantic Ocean Mn Nodule

FRED SMITH<sup>1</sup> AND MATTHEW JERRAM<sup>2</sup>

<sup>1</sup>Teledyne LABS

<sup>2</sup>Columbia University

Presenting Author: fred.smith@teledyne.com

Antimony is a redox sensitive element (with two oxidation states under terrestrial conditions  $\text{Sb}^{3+}$  and  $\text{Sb}^{5+}$ ), that may be sensitive to past environmental conditions. The long residence time of Sb in the oceans (35 kyrs)<sup>1</sup> is long compared to that of ocean overturning times (1.5 kyrs)<sup>2,3</sup>; therefore, Sb will reflect ocean wide events. Differences in the Sb isotopic composition can reflect numerous changes in the Earth's past environment such as hydrothermal inputs<sup>4</sup>, rate of marine organic burial<sup>5</sup> and weathering<sup>6</sup>.

Modern day variations of Sb isotopes on the Earth's surface show  $((^{123}\text{Sb}/^{121}\text{Sb})_{\text{samp}} / (^{123}\text{Sb}/^{121}\text{Sb})_{\text{std}} - 1) < 0.5\%$  variations<sup>7</sup>, so a high level of measurement precision is needed to investigate these past processes. This requirement is achieved using multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) with a specialized desolvating nebulizer accessory. These studies will also help to better explain Sb geochemical cycling, as this information may improve understanding of Sb inputs in oceans.

## References

1. Hem J.D. *Study and Interpretation of the Chemical Characteristics of Natural Water*. 1985, US Geological Survey, Reston, VA.
2. Broecker, W.S. and Peng, T.H., 1982. *Tracers in the Sea*. 1982, Eldigio Press, Palisades, NY.
3. Elderfield, H. and Greaves, M.J. *Nature*, 1982, **296**, 214.
4. Gall L., Williams H.M., Siebert C., Halliday A.N., Herrington R.J., and Hein J.R. *Earth Planet Sci. Lett.*, 2013, **375**, 148.
5. Nielsen S.G., Mar-Gerrison S., Gannoun A., LaRowe D., Klemm V., Halliday A.N., Burton K.W. and Hein J.R. *Earth Planet Sci. Lett.*, 2009, **278**, 297.
6. David K., Frank M., O'Nions R.K., Belshaw N.S., and Arden J.W. *Geol.*, 2001, **178**, 23.
7. Sun G., Wu Y., Feng X., Wu X., Li X., Deng Q., Wang F. and Fu X. *Geol.*, 2021, **582**, 120459.