Statement of intent

Determination of iodine speciation and Fe(II) on the Chile-Amundsen-Chile leg of the US GEOTRACES Cruise.

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Iron(II) and iodide/iodate will be measured to study transport processes from the shelf to the Southern Ocean. Previously, our group in collaboration with Greg Cutter made the case that excess iodine is a valuable tracer of lateral advection of materials from the sediment/water interface (Cutter et al., 2018). Excess iodine can constrain the relative importance of lateral transport for iron relative to other sources, such as remineralization of sinking particles or sea-ice-derived materials. We anticipate that a significant fraction of iron will be present as Fe(II) in waters overlying the shelf because oxidation kinetics are slow in these exceedingly cold waters. Persistence of Fe(II) is likely a key determinant influencing Fe advection offshore. By analogy, Japanese workers showed exceptionally high Fe(II) accumulation in bottom waters of the Chukchi shelf (Obata and Kondo, unpublished). We will use a modified method that is highly specific for Fe(II) in aerobic conditions (Bolster et al., 2018). We plan to measure iodine on the Tahiti- Antarctica – Chile leg (or collaborate with others) in order to track the advection of iodine into the interior of the Southern Ocean. We anticipate requiring a single berth for Fe(II) analysis, which must be performed shipboard. We will also selectively extract Fe(II) samples for stable isotope analysis. We will freeze samples for iodine analysis ashore. We are also proposing to perform a water mass analysis (WMA) for the section, analogous to the analysis published by Peters et al. (2018). We have just published a similar WMA for the Eastern Tropical North Pacific (Evans et al., 2020) based on a survey of iodine geochemistry (Moriyasu et al., 2019). Our analyses will compliment measurements of dissolved iron, radium and thorium isotopes and manganese made by other workers. We are requesting support for Moffett and Ph.D. student Zach Evans to attend the Florida workshop. Moffett will stay on for the SSC meeting afterwards.

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Moriyasu, R., Z. C. Evans, K. Bolster, D. S. Hardisty, and J. W. Moffett. 2019. The distribution and redox speciation of iodine in the Eastern Tropical North Pacific Ocean. Global Biogeochem. Cycles. doi:10.1029/2019GB006302

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