GEOTRACES Atlantic Section: Oxygen isotope study of PO_4 biogeochemistry in the North Atlantic and near the TAG Hydrothermal Field

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We plan to submit a collaborative proposal to examine phosphorus biogeochemistry using the tool of phosphate oxygen isotopes (δ^{18}Op) to learn more about rates and mechanisms of phosphate uptake and remineralization. We will measure water column profiles of δ^{18}Op at each of the 22 full-depth 'superstations' in the N. Atlantic Transect cruise. We will also measure the δ^{18}O of phosphate extracted from particulate materials in the vicinity of the TAG Hydrothermal Field.

Samples (volumes sufficient to provide 6-10 umoles of PO_4) will be collected with the ship's Niskin rosette. This will generally involve 8-10 depths per profile, with half the samples from depths <1000m and the other half ≥ 1000m. Samples will be processed on board using a Mg(OH)2 coprecipitation coupled with gravitational settling of the resultant floc in order to reduce sample volumes by a factor of 10 to 20. Samples will then be frozen and distributed frozen post-cruise to the participating labs in the same manner as handled on the Intercalibration Cruises.

Principle research foci for the participating collaborators are:
a) New England margin; Atlantic Transect --> A. Paytan
b) TAG Hydrothermal System (dissolved & partic.) --> R. Blake
c) NW Africa upwelling plume; Mediterranean outflow --> A. Colman
All researchers will collaborate in the interpretation of results with the goal of characterizing the δ^{18}Op values of major water masses in the N. Atlantic and improving our understanding of the biological and mixing processes that impact these measured isotopic compositions.

We would make data available through the GEOTRACES program office immediately after QC checks and prior to publication. I would also measure the d18O of H2O and the concentration of total dissolved phosphorus (and by difference with soluble reactive phosphorus, determine DOP). These measurements would also be available to the entire GEOTRACES community following analysis.

A. Colman would participate in the cruise (1 berth only) to collect and process samples on board. The sampling schedule should permit him to oversee collection of samples for the δ^{30}Si group, too, if that would prove useful.