STATEMENT OF INTEREST FOR THE GEOTRACES TAHITI TO ALASKA SECTION

Silicon isotopes

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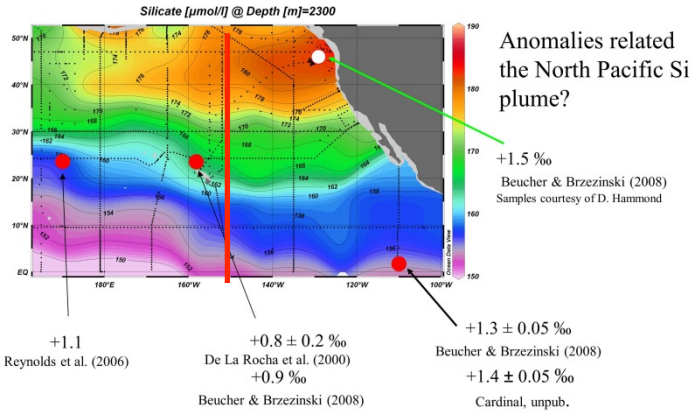
RELEVANCE & RESEARCH GOALS: The silicon isotope proxy is increasingly being used to assess the role of diatoms and silicic acid in past shifts in ocean productivity and their implication for climate. Application of the proxy requires a mechanistic understanding of how the silicon isotopic composition of ventilating waters masses varies in time and space. Model results suggest control through the fractionation of isotopes of Si during silica production coupled to the movement of Si by the biological pump and the meridional overturning circulation. Empirical support for model predictions is equivocal. Model and empirical results for the Atlantic are congruent, but a far greater variance in $\delta^{30}Si(OH)_4$ is observed in Pacific deep waters than predicted by models with trends that run counter to model predictions.

The Pacific contains the largest $\delta^{30}Si(OH)_4$ anomalies relative to model predictions of any ocean basin. Whereas models predict decreasing $\delta^{30}Si(OH)_4$ with increasing $[Si(OH)_4]$ within the MOC the opposite trend is seen in the north Pacific (see insert). One hypothesis to explain these trends is the presence of the North Pacific Silicic Acid plume which originates in the Cascadian Basin in the eastern North Pacific and spreads at ~2300m depth across much of north Pacific strongly influencing silicic acid concentrations along the proposed section. The Tahiti to Alaska transect along 150°W (vertical red line in insert) will cut directly across the anomaly providing a means to test this hypothesis.

Large 0.7 ‰ Variation in $\delta^{30}Si(OH)_4$ in the deep North Pacific (>3,500 m)



SAMPLE REQUIREMENTS: 2L seawater samples from 10-15 stations. Subamples of particles from pumps from selected stations would be an added benefit.

BERTHS REQUIRED: None, will use supertechs