Optical characterization of particulate distributions during the GEOTRACES Alaska – Tahiti Transect. PI, Jim Bishop, UC Berkeley, jkbishop@berkeley.edu, (510) 642-6110.

Optical sensors are capable of delivering high precision, high accuracy profiles of particle abundances in the water column, yet the calibration of derived optical proxies of major particle phases (e.g. POC and PIC) would benefit greatly from simultaneous co-deployment of in-situ filtration systems during GEOTRACES (Boss et al., 2015, Bishop et al., 2012, Bishop and Wood, 2008). Science questions we'd like to consider are (see attached figure):

Q: Are POC and PIC variations consistent with their optical proxies?
Q: How deep is the penetration of the particulate signature of export?
Q: Does PIC follow the carbonate saturation horizon or is there a water column 'lysocline'?
Q: What is the influence of surface PIC/POC ratio on subsurface concentrations of particles?

UC Berkeley proposes to add optical sensors to the trace metal CTD, ship's' CTD, and logging CTD deployed during McLane pump casts:

(1) C-Star transmissometer (a well calibrated instrument with absolute beam attenuation coefficient accuracy to +/- 0.001 $m^{-1}$).
(2) a birefringence sensor (C-Star embodiment) capable of measuring PIC variations in the water column to +/- 10 nM concentrations.
(3) a Seapoint scattering sensor.

We have run such sensor suites during the 2008 and 2009 inter-calibration cruises with zero impact on the quality of TEI measurements in TM rosette samples.

The PIC sensor, although not commercially available, has performed well on CTD casts. It is being perfected under current NSF support to the PI and WETLabs, Inc.. While transmissometers have been routinely deployed on CTD's and are usually funded as part of the management proposal, they are not generally well characterized and calibrated.

We request 1 bunk at sea. That person will that ensure sensors are properly maintained in a clean state, monitor real time performance, and will be able to assist other programs – particularly the in-situ filtration group. We request (or can generate) in-situ filtration data on major particle phase composition in all particle size fractions.

## References:

Boss, E., L. Guidi, M.J. Richardson, L. Stemman, W.D. Gardner, J. K. B. Bishop, R.F. Anderson, R. Sherrell. (2015) Optical techniques for in-situ characterization of particles pertinent to GEOTRACES. Progress in Oceanography. 133 (2015) 43–54. Doi:10.1016/j.pocean.2014.09.007.

Bishop, J. K. B., P. J. Lam and T. J. Wood (2012), Getting good particles: Accurate sampling of particles by large volume in-situ filtration. *Limnol. Oceanogr. Methods* 10, 681-710; DOI: 10.4319/lom.2012.10.681

Bishop, J.K.B.and Wood, T.J. (2008) Particulate Matter Chemistry and Dynamics in the Twilight Zone at VERTIGO ALOHA and K2 Sites. *Deep-Sea Research I 55*, 1684-1706. 10.1016/j.dsr.2008.07.012

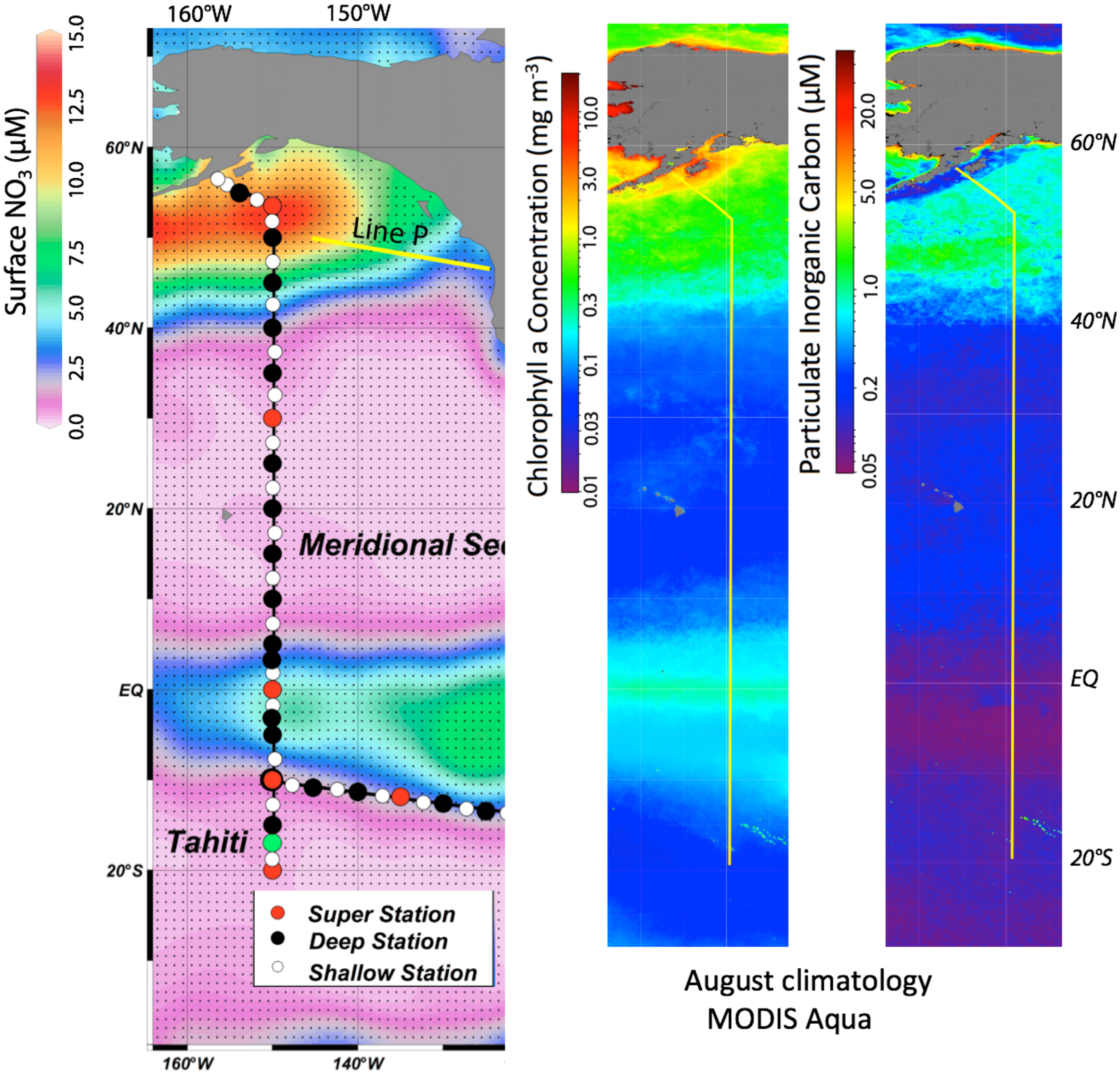


*Figure 1. Maps of surface $NO_3$, Chlorphyll, and PIC along proposed Pacific Meridional Section. Although Chlorophyll is almost invariant in the subarctic north Pacific, PIC exhibits strong meridional variation. The Equatorial Pacific chlorophyll High, is not matched by a corresponding band of high PIC. If PIC contributes to the ballasting of sinking particles, one would expect a meridional variation in the concentrations of particles at depth. Our optical assessment of particles will investigate this question.*