# Vertical POC Flux Profiles and Oxygen Utilization Rates from Particulate $^{230}$Th-normalization

FRANK J. PAVIA[1,2]*, ROBERT F. ANDERSON[1,2], PHOEBE LAM[3], MOLLY MARTIN[4], RANA FINE[4], SEBASTIAN M. VIVANCOS[1,2], MARTIN Q. FLEISHER[1], PU ZHANG[5], YANBIN LU[5], HAI CHENG[5], LARRY EDWARDS[5]

[1]Lamont-Doherty Earth Observatory, Palisades, NY 10964, USA (*correspondence: fpavia@ldeo.columbia.edu)
[2]Columbia University, New York, NY, USA 10027
[3]UC-Santa Cruz Department of Ocean Sciences, USA, 95064
[4]Rosentiel School of Marine and Atmospheric Sciences, Miami, USA, 33149
[5]University of Minnesota Department of Earth Sciences, Minnesota, USA, 55455

In 1987, John Martin showed that vertical gradients of carbon fluxes from sediment traps could be used to determine organic carbon (POC), nitrogen, and phosphorus regeneration rates as well as oxygen utilization rates. Since then, immense time, effort, and money have been invested in developing neutrally buoyant sediment traps to measure remineralization rates and length-scales in the thermocline. However, sediment traps can only provide limited spatial coverage.

We present a new method for generating vertical flux profiles based on measurements of particulate $^{230}$Th and particle composition (C, N, bSi) from *in situ* filtration aboard the GEOTRACES East Pacific Zonal Transect. Our approach is a water column adaptation of the widely used $^{230}$Th-normalization method for determing fluxes in ocean sediments.

We find that POC flux depth profiles match the power law shape of the Martin Curve. Peak POC fluxes are 4 mmol C/m$^2$/day at 35 meters depth in the the Peru-Chile upwelling region, and decrease to a peak of 2 mmol C/m$^2$/day at 100 meters depth in the open ocean. POC fluxes are consistent between two particle size classes, 0.8-51 μm and >51μm.

The POC fluxes we derive are in good agreement with historical data from sediment traps deployed during the JGOFS program. Oxygen utilization rates (OUR) derived from taking vertical derivatives of our flux profiles are comparable to OUR values calculated using $SF_6$.

Our method of using particulate $^{230}$Th to calculate vertical flux profiles has far-reaching implications for future studies of the ocean carbon cycle. In addition to carbon, the method may be used to calculate vertical flux profiles of any particulate constituent, although further testing is required. We also discuss the potential applications of our method beyond the data presented in this study.