Tracing paleoceanographic sources of Fe to the central equatorial Pacific Ocean

C.L. ZIEGLER[1], R.W. MURRAY[1], T. PLANK[1] AND S.R. HEMMING[2]

[1]Department of Earth Sciences, Boston University, 685 Commonwealth Avenue, Boston, MA 02215 (ziegler@bu.edu, rickm@bu.edu, tplank@bu.edu)

[2]Lamont-Doherty Earth Observatory, 61 Route 9W, Palisades, NY 10964 (sidney@ldeo.columbia.edu)

The composition of the detrital material in marine sediments from the 140W JGOFS transect in the central equatorial Pacific Ocean plays a critical role in determining the sources of Fe to this high-nutrient low-chlorophyll (HNLC) region during the Holocene and through Pleistocene glacial-interglacial. Assuming that the source of dissolved Fe at any given time period parallels the source of the particulate material during the same period, tracing the changes in detrital provenance will provide insight into the different sources of dissolved Fe as a function of climate state. A newly modified series of chemical extractions has enabled us to isolate the detrital component in these ultra-high carbonate sediments, and perform a comprehensive chemical study of the major, trace, REE, and radiogenic isotopic composition of this isolated terrigenous component. Initial results of the new extraction, based on absolute abundances and elemental ratios of P, Ca, Si, Fe, Al, and REEs, confirm the improved effectiveness of the extraction methodology. We will show that these comprehensive analyses have the potential to resolve the contributions of Asian loess, Andean ash, the Equatorial Undercurrent (EUC, sourced from Papua New Guinea), and other locally derived ocean island basalts (OIBs such as the Marquesas Islands) as sources of Fe to this region. Preliminary findings integrating these chemical results with the radiogenic isotopic signatures will be presented.

Climate change and organic carbon deposition in Eocene marine sediments

A.M. OLIVAREZ LYLE AND MITCHELL W. LYLE

Boise State University, Boise, Idaho (aml@cgiss.boisestate.edu, mlyle@cgiss.boisestate.edu)

We report findings related to global cooling from the first high-resolution organic carbon mass accumulation rate (MAR) dataset of the Eocene equatorial Pacific upwelling region (Sites 1218 and 1219, Leg 199 of the Ocean Drilling Program.) Significant results from these data include: organic carbon MAR's that are an order of magnitude lower than Holocene rates. Yet, the *expected* organic carbon flux and the biogenic-barium flux, commonly used as a proxy indicator of productivity, is roughly equal to modern. This discrepancy between the expected and observed organic carbon sediment flux begs the question of what happened to the 'missing' sedimentary organic carbon. Clues are provided by sedimentation changes that occurred during a time of rapid cooling (41 Ma) in the warm Eocene world. These changes include: increased productivity as evidenced by higher Bio-Ba MAR, higher bulk MAR's, higher carbonate accumulation, increased diatom sedimentation, increased C_{org} sedimentation and C_{org} Rain. We suggest that the discrepancy and anomaly in C_{org} sedimentation is a direct consequence of changes in temperature that, in turn, affected the ecological structure and dynamics and hence, organic carbon and nutrient utilization, of all organisms in the Eocene oceans and sediments beneath the equatorial upwelling region. Our interpretation is based on recent advances in ecology and biochemical kinetics that views the fundamental basis of the ecology of all organisms, marine and terrestrial, as following from first principles in chemistry, biology, and physics.