A Holocene perspective of seasonality and ENSO in the eastern tropical Pacific from oxygen isotopes of individual foraminifera *Globigerinoides ruber*

Principal Investigator: Athanasios Koutavas (athan@ldeo.columbia.edu)
(Columbia Science Fellow/DEES Lecturer, LDEO)

Abstract

Large changes in ENSO over the course of the Holocene have been proposed based on indirect paleoclimatic evidence from ENSO-sensitive regions (Rodbell et al., 1999; Tudhope et al., 2001). A widely held view that's gaining ground asserts that early to middle Holocene ENSO was drastically weaker (Clement et al., 2000), and that the background (annual mean) climate state in the equatorial Pacific resembled the spatial pattern of a La Nina (Koutavas et al., 2002). The culprit for this anomalous state is in part ascribed to a reduction in seasonal SST range in the eastern tropical Pacific, brought about by the summer insolation maximum of 10-5 ky BP, which (a) led to a northward displacement of the Intertropical Convergence Zone and (b) strengthened the equatorial easterlies during September-October, arresting the development of El Nino events. Direct evidence from the equatorial central and eastern Pacific for this scenario is lacking because ENSO-resolving records (corals, mollusks, or high resolution sediments) of appropriate age have yet to be discovered. Here, I propose an alternative approach, which utilizes analyses of individual specimens of *G. ruber*, a tropical mixed-layer dwelling foraminifer, in deep-sea sediments. While such sediments cannot resolve ENSO events, individual foraminifera have a mean life span of 2-4 weeks and therefore record monthly temperatures. Sediment samples preserve large numbers (hundreds) of specimens, which, if analyzed individually, can provide an estimate of monthly SST variance within a sample, related to the strength of the seasonal cycle and ENSO. I seek here to demonstrate the feasibility of this approach in the eastern equatorial Pacific as a pilot for a follow-up grant proposal to NSF to conduct a larger scope downcore study aimed at constraining ENSO variability through the last 30 ky.