Joint IPRC/Oceanography Seminar

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"More then Mud: What we can learn about past climate from lake sediments"

Lakes accumulate sediments continually, a process that has been ongoing since their formation, in many cases for several thousand years or even longer. The sediment consists of biological remains from the lake itself and its surroundings, as well as soil particles and other non-biological material originating from the lake catchment and also the atmosphere. Hence, the sediment sequence in each lake is a continuous environmental archive, which contains information about the history of the lake and its surroundings. In contrast to the data-rich middle and high latitudes, high-quality climate-proxy records from equatorial regions are relatively few, especially from regions experiencing the bimodal seasonal rainfall distribution associated with twice-annual passage of the Intertropical Convergence Zone (ITCZ). Here we present a continuous and well-resolved climate-proxy record of hydrological variability during the past 25,000 years from equatorial East Africa. Our results, based on complementary evidence from seismic-reflection stratigraphy and organic biomarker molecules as well as isotope and annual varve thickness records of sedimentation in Lake Challa (a freshwater crater lake on the lower east slope of Mount Kilimanjaro) reveal that monsoon rainfall in this region varied at half-precessional (11,500-year) intervals in phase with orbitally controlled insolation forcing.

Interannual rainfall variations in equatorial East Africa are tightly linked to the El Niño Southern Oscillation (ENSO), with more rain and flooding during El Niño and droughts in La Niña years, both having severe impacts on human habitation and food security. Here we report evidence for interannual to centennial-scale changes in ENSO-related rainfall variability during the last three millennia and for reductions in both the mean rate and the variability of rainfall in East Africa during the Last Glacial period. Climate model simulations support forward extrapolation from these lake sediment data that future warming will intensify the interannual variability of East Africa’s rainfall.

Thursday April 20th, 2017 3:00 p.m. MSB 100