New Results of Scientific Drilling on Lakes Malawi and Bosumtwi, and Implications for Human Evolution, and Early Modern Human Migrations and Population Dynamics

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Between June 2004 and April 2005 two new sets of sediment-based climate records were recovered from two important sites in tropical Africa: Lake Bosumtwi (5˚ N) located in Ghana and sampling the West African monsoon; and Lake Malawi, East Africa (9˚-14˚ S), which samples the SE African monsoon system. Initial processing is complete on one of the deep site cores from Lake Bosumtwi, revealing details of the 300 m-deep, 1.1 million year-old sediment section. Much of the record is laminated and likely varved, suggesting that annual-decadal temporal resolution is possible over select intervals. Lake Malawi core processing is still underway on the deep site sediment samples, but the material processed to date (extending back to ~400 kyr) also indicates intervals of laminated sediment, portending a record of decadal-resolution or better. The base of the Lake Malawi deep core site is dated at 1.5 million years in age.

Initial analyses of lithology, seismic-stratigraphy, physical properties, sediment geochemistry and paleoecology indicate dramatic fluctuations in lake level in both basins. Lake Bosumtwi, currently 70 m deep, was completely desiccated on several occasions since the formation of the basin by a meteorite impact at 1.1 Ma. Lake Malawi water levels (presently 700 m deep) dropped 500 m on at least two occasions, and were dramatically lower at numerous times over the past 500 kyr. During the -500 m lowstands Malawi separated into two much smaller basins with a total hydraulic drawdown of 97%. Ostracode and other microfossils indicate a series of lowstands that produced lakes that were well-oxygenated at the deep drill site (currently in 600 m of water). These lowstands, driven by radically fluctuating tropical climate, profoundly altered the local landscapes and would have severely impacted the surrounding populations.

The Malawi and Bosumtwi drillcore records are revealing remarkable histories of climate change over the past 1-1.5 million years. Both projects were costly, and technically and logistically demanding. New drillcore records will be required for extending these high-resolution records back in time, to recover continuous records over other timeframes of interest to the human evolution community. Our research group has acquired or worked with site survey data from most of the large, ancient lakes of Africa, and can offer perspectives on the quality and temporal extent of other possible drillsites. This presentation will put forward examples of potential sites for consideration for extending the high-resolution tropical continental climate history further back in time, and also address the various technical, logistical and financial challenges that would need to be overcome to complete the recovery of these longer records.