ORAL PRESENTATION

LATE-PLEISTOCENE DIATOM PALEOECOLOGY OF LAKE MALAWI: EVIDENCE OF EXTREME SHIFTS IN DEPTH AND MIXING REGIME

Jeffery R. Stone[1, 2] and Andrew S. Cohen[2]

[1]Department of Geosciences, University of Nebraska, Lincoln, NE 68588 USA
[2]Department of Geosciences University of Arizona, Tucson, Arizona 85721 USA

A high-resolution lake level reconstruction (10,000 to 144,000 years BP) was generated by a principle component analysis of fossil diatoms and additional fossil and mineralogical residues from sediments recovered from the central basin of Lake Malawi. Lake-level fluctuations on the order of hundreds of meters were inferred from dramatic changes in the fossil and sedimentary archives and supported by seismic evidence of ancient shorelines. Significant paleohydrographic variability, including changes in lake stratification, nutrient cycling, and water chemistry, were also inferred from the diatom paleoecology. Prior to 70 ka, fossil assemblages suggest that the central basin was periodically a much shallower, more saline and/or alkaline, well-mixed environment. This contrasts starkly with the deep, dilute, dysaerobic environments of the modern central basin. After 70 ka, our reconstruction indicates sustained deeper-water environments were common, marked by a few brief, but significant, lowstands.

Many of the diatom taxa we observed are endemic to Lake Malawi or commonly confined to deep East African lakes. In many cases the fossil assemblages have no modern analog in Lake Malawi; hence, our paleoecological inferences rely on diatom autecology and other indicators of ancient depth and lake setting. Assemblages found in the open waters of the central basin today are associated with deep-water indicators and are minor components during inferred shallow intervals. Similarly, diatom species which are only observed in the shallow southern basin today are typically associated with shallow-water indicators. Interestingly, the standard interpretation of shifts in tychoplankton and periphyton (i.e., increased relative abundances suggest shallower conditions) is often not congruent with our interpretation of past lake levels. For example, while both groups are abundant in some diatom zones interpreted to be shallow, they are present in relatively low abundances throughout an unambiguous prolonged lowstand. Also, when deeper lake environments are indicated by other lines of evidence, tychoplankton and periphyton often have relatively high values. A substantial change in diatom flux rates across zones might produce a similar pattern, but our estimates of diatom productivity do not support this explanation. A more probable explanation is that flooding of the southern basin and increases in nepheloid flows from river flooding results in a greater contribution of nearshore silt to the central basin during deeper lake settings. During prolonged lowstands, the basin configuration, or perhaps greater turbidity, may have resulted in a proportional loss of benthic habitat area near the coring site.