East Africa's Western Rift: Lessons Learned and Drilling Opportunities

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The chain of lakes in the western arm of East Africa's Rift Valley (Albert, Edward, Kivu, Tanganyika, and Malawi) are some of the best drilling targets in the East African tropics due to their age, current water depths, and the presumed continuity of their sedimentary records. Studies of the late Pleistocene to Holocene records of these lakes have provided a regionally consistent record of environmental changes in the western rift valley. Two results emerge from these studies that are critical to testing hypotheses of hominin evolution. First, several of the lakes (Edward, Malawi, and Tanganyika) clearly respond to and record environmental changes at decade- to orbital timescales. Thus, the lakes provide a range of sensitivities and resolution essential to testing hypothesis of human evolution. Secondly, comparison of the climate history of the western rift with other regions in tropical and subtropical Africa documents spatial variability, both latitudinal and longitudinal, in past climate changes in Africa. This spatial complexity can be coherently interpreted within the regional weather systems controlling climate in East Africa; however, such complexity necessitates a multi-site approach to African paleoclimatic reconstruction. Regardless, this result shows that the western rift lakes could be used to test spatial aspects of past habitat fragmentation in tropical Africa, also key to understanding mechanisms of human evolution, and in particular, the 'variability selection' hypothesis.

Lake Malawi has been recently drilled, and a ~1.5 Myr paleoenvironmental record is expected to emerge from that lake. Drilling Lake Edward remains a logistical challenge. Recent field studies of Lake Tanganyika targeting offshore structural highs indicate the existence of potential drilling sites that could yield continuous records of tropical African climate change from the late Miocene to the present, given a sufficiently long (500-1000m) drill coring campaign. Such a long, continuous record seems unlikely elsewhere on the continent, and could provide critical testing grounds for spatial and temporal environmental variability spanning the major phases of hominin evolution.