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Lake Tanganyika Hydroclimate in the Pleistocene: Insights from New Seismic Reflection Data

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Lake Tanganyika, in the western branch of the East African Rift, is one of the world's largest and oldest extant lakes, and undoubtedly holds a tropical paleoclimate record of unparalleled antiquity and fidelity. In anticipation of future scientific drilling in Lake Tanganyika, we present new analyses of basin-scale seismic reflection data from the central-southeastern parts of the lake. These analyses incorporate both newly reprocessed legacy multichannel data, as well as recently acquired commercial data sets from the region near Karema, Tanzania. The new analyses confirm the presence of thick sedimentary sections, in excess of 5 km in some localities, though the section in the immediate vicinity of Karema is thinner. Data from the southern part of the lake reveal a series of marked seismic-facies transitions, including the presence of older sediment packages that underlie previously identified "pre-rift" basement (the "Nyanja Event"). These older sediment packages may substantially predate the modern lake. The high-amplitude Nyanja Event is interpreted as the onset of late-Cenozoic rifting, and the changing character of the overlying depositional sequences reflects increasing relief in the rift valley, the variability of fluvial inputs, and the intermittent connectivity of upstream lake catchments. Earlier Tanganyika sequences are dominated by shallow lake and fluvial-lacustrine facies, whereas later sequences are characterized by extensive gravity flow deposition in deep water, and pronounced erosion and incision in shallow water depths and on littoral platforms. Extensive, well-defined progradational clinoform packages are observed in the Karema area, and are interpreted as paleodeltas of the Ifume River. These deposits are interpreted as Pleistocene in age due to their shallow position in the sedimentary section, and burial depths of less than 600 m. These deposits were laid down when the level of Lake Tanganyika was 250 m or more lower than present. The extensive littoral zone deposits suggest a complex hydrologic linkage between Lakes Tanganyika and Rukwa, which may have persisted for much of the Pleistocene. It is possible that at times Rukwa overflows may have contributed substantial hydrologic inputs into much larger Lake Tanganyika.