ABSTRACT

The water-level record from the 300 m deep paleo-lake Suguta (Northern Kenya Rift) during the African Humid Period (AHP, 15–5 ka BP) helps to explain decadal to centennial intensity variations in the West African Monsoon (WAM) and the Indian Summer Monsoon (ISM). This water-level record was derived from three different sources: (1) grainsize variations in radiocarbon dated and reservoir corrected lacustrine sediments, (2) the altitudes and ages of paleo-shorelines within the basin, and (3) the results of hydro-balance modeling, providing important insights into the character of water level variations (abrupt or gradual) in the amplifier paleo-Lake Suguta. The results of this comprehensive analyses suggest that the AHP highstand in the Suguta Valley was the direct consequence of a northeastwards shift in the Congo Air Boundary (CAB), which was in turn caused by an enhanced atmospheric pressure gradient between East Africa and India during a northern hemisphere insolation maximum. Rapidly decreasing water levels of up to 90 m over less than a hundred years are best explained by changes in solar irradiation either reducing the East African-Indian atmospheric pressure gradient and preventing the CAB from reaching the study area, or reducing the overall humidity in the atmosphere, or a combination of both these effects. In contrast, although not well documented in our record we hypothesize a gradual end of the AHP despite an abrupt change in the source of precipitation when a decreasing pressure gradient between Asia and Africa prevented the CAB from reaching the Suguta Valley. The abruptness was probably buffered by a contemporaneous change in precession producing an insolation maximum at the equator during October. Whether or not this is the case, the water-level record from the Suguta Valley demonstrates the importance of both orbitally-controlled insolation variations and short-term changes in solar irradiation as factors affecting the significant water level variations in East African rift lakes.