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Solar Variations and Holocene East African Climate

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The nature and causes of intensity variations of the African and Indian monsoons during the African Humid Period (AHP, 14.8 - 5.5 kyr BP), especially their exact influence on regional climate relative to each other, is currently intensely debated. As an example, no consensus exists concerning the abrupt vs. gradual onset and termination of this event, as well as the character and style of the internal climate variability during the AHP. A potential source of dissent in the interpretation of paleo-archives of African climate change is the ambiguous interpretation of climate proxies, the insufficient understanding of the link between climate, geographical setting and proxies, and dating uncertainties. Here, we present the first high-resolution ^{14}C-dated, reservoir-corrected, multiproxy lake-level record from the remote Suguta Valley in the northern Kenya Rift. The presently desiccated valley was covered by a 300 m deep and 2,500 km^2 large paleo-lake that was, due to its extreme catchment size of 13,000 km^2 and amplifier-lake characteristic, highly sensitive to relatively moderate climate changes, providing a high signal-to-noise ratio of the lacustrine record and shoreline dataset extracted from the paleo-environmental inventory of the valley. This record, spanning the time interval from 14.8 to 5 kyr BP, from a valley located between the west-African and Indian monsoon systems, explains the onset of large lakes in East Africa with the longitudinal shift of the Congo Air Boundary (CAB) over the East African and Ethiopian Plateaus, as a direct consequence of the strengthening of the Indian monsoon. This teleconnection has possibly caused abrupt humidity shifts in East Africa during the AHP. Instead, the termination of the AHP was, despite the precessional forced Indian monsoon weakening, relatively gradual due to an equatorial insolation maximum. Abrupt internal lake level fluctuations up to 100 m on centennial time-scales were related to both a general monsoon weakening and displacement of the CAB away from the plateau regions from East Africa as a result of small-scale solar irradiation changes. The findings of this study contribute to our understanding of the influence and relationship between the two monsoon systems and highlights the importance of the knowledge about the geographical, geological and climatologically situation of the study site used for paleo-climate reconstruction.