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The Role of the Congo Air Boundary and Solar Variations during the Early Holocene East African Humid Period

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The nature and causes of intensity variations of the West-African (WAM) and Indian Summer monsoons (ISM) during the African Humid Period (AHP, 14.8-5.5 ka BP) on East African climate is currently intensely debated. The presently desiccated Suguta Valley, Kenya, was during the AHP filled by a 300 m deep and 2,200-km2 large lake, whose shorelines and lacustrine sediments allow us to contribute to three open questions regarding the AHP. Our multiproxy lake-level record explains the synchronous onset of large lakes in the East African Rift System with the longitudinal shift of the Congo Air Boundary (CAB), as the direct consequence of an enhanced atmospheric pressure gradient between East-Africa and India due to the northern hemisphere precessional forced insolation maximum that has also intensified the WAM and ISM. Pronounced abrupt lake-level regressions of 60-100 m on a centennial scale during the AHP are explained by small-scale solar irradiation changes weakening this pressure gradient and preventing the CAB from reaching the study area. The wet-dry transition at the end of the AHP has been the focus of substantial investigation, with debate mainly centred on the questions of whether its mid-Holocene ending was gradually or abrupt and also synchronous. We hypothesize that despite a precessional forced gradual weakening of the ISM, the termination occurred in a non-linear gradual manner due to a change towards an equatorial insolation maximum extending the AHP over large parts of Ethiopia and West-Africa.