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Linear and non-linear Time Series Analysis of pan-African Hydroclimate spanning the past 1,200 kyr

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The time between 1,200 kyr BP and today includes the Mid-Pleistocene Transition, the Mid-Bruhnes Event, and the late Pleistocene. The Early-Mid Pleistocene Transition (~920 kyrs BP) is one of the most dramatic shifts in high-latitude climate and marked by the onset of the strong 100 kyr glacial-interglacial cycles. The Mid-Bruhnes Event marks a significant increase in the amplitude of the glacial-interglacial cycles. It has been identified mostly in marine sediments and Antarctic ice cores, but it is currently discussed whether it was a globally synchronous phenomenon, including the African continent. Marine records suggest a shift towards increased aridity in parts of Africa, and terrestrial records from eastern Africa indicate a generally wet climate, possibly with a transition from stable to unstable, as suggested by the Olorgesailie record.
At this time, robust Australopithecines went extinct, and only the genus Homo survived as *H. ergaster*, which ultimately led to the emergence of our own species, *H. sapiens*. The time vector also includes the second major expansion wave of *H. ergaster* out of Africa (1.39–0.9 Ma, after the first wave at ~1.9–1.4 Ma), possibly through the Sinai land bridge, but expansions through the Gibraltar strait and via the Bab el- Mandeb strait and into the southern Arabian Peninsula are also subject to lively discussed.
Here, we present the first insights into a comprehensive linear and non-linear analysis of five prominent records, which are (1) the dust record from ODP site 659 from western Africa, (2) the dust record from the Arabian Sea from ODP site 721/722, (3) the river runoff record from MD96-2048, (4) the combined dust and river runoff wetness index from ODP site 967, and (5) the south-western European ICDP record from Lake Ohrid. We use correlation metrics, such as the windowed Spearman correlation coefficient, to test for spatiotemporal synchronicity, asynchronicity, and possible interferences with the hominin fossil record. Furthermore, we use non-linear analysis, such as recurrence plots and recurrence quantification analysis, to test whether prominent climate transitions or spatiotemporal shifts in the fossil record are in temporal alignment with recurrence-based insights.