The pace of African monsoon evolution during the Holocene

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The notion of a vast landscape with a lavish grassland and seasonally migrating megafauna in today's most hostile, hyperarid Sahara just 4000-5000 years ago captivates the general public and scientists alike [1]. The pace with which the African monsoon shifted from a strong early-mid to a weak late Holocene is critical for our understanding of climate dynamics, hydroclimate-vegetation interaction, and shifts of pre-historic human settlements, yet it is controversially debated [2,3]. Inconsistency between various climate records and the associated debate is not limited to the marginal area of the monsoon system but includes the core area of the African monsoon [4,5].

Here we introduce Ba/Ca in *Globigerinoides ruber*, a surface-dwelling and low-salinity tolerating species, as a novel proxy for runoff-induced surface freshening and hence hydroclimate reconstruction of riverine basins. Despite varying geology of the catchments, vegetation cover, and weathering type, data compilation shows that dissolved Ba (Ba_{dis}) off several tropical river systems is primarily controlled by the amount of runoff [6]. The uptake of Ba_{dis} into foraminiferal calcite is linearly correlated to the amount of dissolved Ba in the water in which the species calcify [7].

On the basis of $Ba/Ca_{G.ruber}$ time-series from the Eastern Mediterranean Sea and the Gulf of Guinea (West Africa), we present spatially integrated insights into African monsoon evolution. Our findings [8,9] demonstrate that the wet-dry Holocene hydroclimate transition in East and West Africa was markedly progressive and occurred in synchrony with that of the Indian Ocean monsoon climate, pointing to orbital-forced changes in NH summer insolation as the main driver. The pace of hydroclimatic changes in the Nile basin and resulting variation of Nile River level provides an East African climatic context to understand and refine the timing of occupation and abandonment of the settlements in the Nile Valley (Egypt).

[1] Claussen, M., and V. Gayler (1997), *Gl. Eco, & Biogeogr. Let.*, **6**, 369 [2] Claussen *et al* (2013) *Nat. Geosc.* **6**, 954 [3] Kroepelin *et al* (2008) *Science* **320**, 765 [4] Foerster *et al* (2012) **273**, 25 [5] Tiernet and deMenocal (2013) *Science* **342**, 842 [6] Bahr *et al* (2013) *EPSL* 383, 45 [7] Hönisch *et al* (2011) *Mar. Mircopal.* **79**, 52 [8] Weldeab *et al* (2007) *Science* **316**, 1303; [9] Weldeab *et al* (in print) *GRL*.