REPLY TO GIRESSE ET AL.:
No evidence for climate variability during the late Holocene rainforest crisis in Western Central Africa

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Giresse et al. (1) criticize both our paleoclimatic reconstruction and our inferred anthropogenic origin of the late Holocene rainforest crisis (LHRC) (2). However, their argumentation, which is combined with alleged evidence for a climatic change during the LHRC, lacks strong support.

Citing studies describing both brief (weeklong) and limited periods of leaf wax production in deciduous trees, Giresse et al. (1) conclude that leaf waxes cannot record the environmental variability of a full season. However, this argument is flawed, as evergreen and subtropical deciduous trees produce leaf waxes over much longer timescales—their δD (δD_{wax}) values have been shown to capture environmental variability on even seasonal timescales (3, 4). In tropical Africa, the apparent decadal-scale covariation of sedimentary δD_{wax} records and instrumental records of mean annual precipitation (2, 5) proves that δD_{wax} accurately records hydrological changes. Any change in hydrological conditions (precipitation amount and/or seasonality) that would trigger the prominent vegetation change observed in Lake Barombi (Cameroon) during the LHRC is expected to be reflected in sedimentary δD_{wax}. Although our δD_{wax} record from Lake Barombi reveals a prominent drying trend during the Holocene, it shows no evidence for abrupt hydrological changes during the LHRC.

The arguments put forward by Giresse et al. (1) against human settlements in the Lake Barombi catchment during the LHRC contradict their own prior work. In their Letter (1), they posit that charcoal is absent in topsoils, but they previously reported on the abundance of charcoal fragments in the upper meters of soil sections in that area (6). Furthermore, the inferred absence of pottery fragments in topsoil samples (1) is merely a speculative argument against human impact as no rigorous archaeological survey has been carried out to date in the Lake Barombi catchment.

Giresse et al. (1) additionally point out the presence of savannah patches located 30 km southwest of Lake Barombi and use these to argue for a climatic driver for the LHRC. These presumably drier vegetation areas and the adjacent rainforest in the Lake Barombi area coexist under a rainfall regime with similar mean annual rainfall (of ~2,500 $mm \cdot y^{-1}$), but with a slightly shorter rainy season (9 mo >50 $mm \cdot mo^{-1}$) for the former compared with the latter (10 mo >50 $mm \cdot mo^{-1}$) (7). Based on the existence of these savannah patches, Giresse et al. (1) infer that the replacement of rainforest by a forest–savannah mosaic during the LHRC was associated with a shorter rainy season. However, the authors (1) ignore the fact that these savannah patches have been cultivated and impacted by anthropogenic activity for a long time (8), which has involved repeated burning of the vegetation cover. This makes these savannah patches modern analogs of human impact instead of climate change.

Finally, Giresse et al. ignore the regional hydrological and sea-surface temperature reconstructions derived from continental (9) and marine (10, 11)

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records. Similarly to our δD_{wax} record from Lake Barombi, these records do not display abrupt changes at the onset of the LHRC, which therefore puts the hypothesis of a regional climate crisis into question.

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