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Differentiating local from regional climate signals using the ∼600 ka Chew Bahir paleoclimate record from South Ethiopia

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Cores from terrestrial archives, such as the lacustrine sediments from the Chew Bahir basin in southern Ethiopia, which cover the last ∼600 ka, often reflect both local, regional and global climate influences. In our analysis we were able to identify several time windows in which the Chew Bahir climate is in resonance with regional and global climate change.

As a contribution to understanding and differentiating these connections recorded in the Chew Bahir sediments, we have correlated the 2nd principal component of the MSCL based color reflectance values representing wet conditions in the Chew Bahir basin, with the wetness index from ocean core ODP 967 from the eastern Mediterranean Sea. The correlation between these two time series was calculated using the Spearman correlation coefficient in a sliding window. Episodes with high correlation between the two records of wetness could indicate a strong link between both regions, possibly through an increased outflow of the river Nile into the eastern Mediterranean Sea due to higher precipitation values on the Ethiopian plateau.

Our preliminary results show that when correlating the two records, two distinct temporal units can be distinguished. Between ∼570 ka and ∼350 ka the correlation is dominated by cycles that correspond with orbital precession whereas the second unit (after 350 ka) reveals a strong influence of atmospheric CO_2. This observation suggests that both orbital precession and atmospheric CO_2. may cause a synchronization of different regions in the African climate system, possibly depending on boundary conditions which are still to be identified.

As a next step we'll investigate the nonlinear relationships between the two records by focusing on the transition between the two main observed phases. The transition around ∼350 kyrs however, is not only highly interesting from a climatic perspective, but it is also a noteworthy period for human cultural evolution as a transition from Acheulean to Middle Stone Age (MSA) technologies takes place at this time. So far our results outline that during this climatically and evolutionary relevant episode a relatively stable, long-lasting, pan-African wet phase may have existed, with possible green corridors connecting the habitats of hominins, and ample resources supporting large population sizes.