EGU2020-4660
https://doi.org/10.5194/egusphere-egu2020-4660
EGU General Assembly 2020

Recurrence quantification analysis of the ~620 kyr record of climate change from the Chew Bahir basin, southern Ethiopia

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The Chew Bahir Drilling Project (CBDP) aims to test possible linkages between climate and evolution in Africa through the analysis of sediment cores that record Quaternary environmental changes in the Chew Bahir basin. In this statistical project we used recurrence plots (PRs) together with a recurrence quantification analysis (RQA) to distinguish two types of variability and transitions in Chew Bahir and compare them with the ODP 967 wetness index from the eastern Mediterranean. The first type of variability are slow variations with cycles of ~20 kyr and subharmonics of this cycle. In addition to the these cyclical wet-dry fluctuations in the area, extreme events often occur, i.e. short wet or dry episodes, lasting for several centuries or even millennia, with rapid transitions between wet and dry episodes. The second type of variability is characterized by relatively low variation on orbital time scales, but significant century-to-millennium-scale variations with increasing frequency in the course of an episode of type 2 variability. Within this type of variability there are extremely fast transitions between dry and wet, and vice versa, within a few decades or years, in contrast to those within type 1 which have transitions lasting several hundred years. Type 1 variability probably reflects the influence of precessional forcing in the lower latitudes at times of increased eccentricity, with the tendency towards extreme events, whereas type 2 variability seems to be linked with minimum values of the long (400 kyr) eccentricity cycle, and there does not seem to be a link with atmospheric CO_2 levels. The different types of variability and transitions certainly had a completely different influence on the availability of water, food and shelter, and hence eastern Africa's biotic environment, including the habitat of *H. sapiens*.