Geophysical Research Abstracts
Vol. 18, EGU2016-8059, 2016
EGU General Assembly 2016

Southern African continental climate since the late Pleistocene: Insights from biomarker analyses of Kalahari salt pan sediments

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The climate system of sub-tropical southern Africa is mainly controlled by large scale atmospheric and marine circulation processes and, therefore, very sensitive to global climate change. This underlines the importance of paleoenvironmental reconstructions in order to estimate regional implications of current global changes. However, the majority of studies on southern African paleoclimate are based on the investigation of marine sedimentary archives and past climate development especially in continental areas is still poorly understood. This emphasizes the necessity of continental proxy-data from this area. Proxy datasets from local geoarchives especially of the southwestern Kalahari region are still scarce. A main problem is the absence of conventional continental climatic archives, due to the lack of lacustrine systems.

In this study we are exploring the utility of sediments from western Kalahari salt pans, i.e. local depressions which are flooded temporarily during rainfall events. An age model based on ^{14}C dating of total organic carbon (TOC) shows evidence that sedimentation predominates over erosional processes with respect to pan formation. Besides the analyses of basic geochemical bulk parameters including TOC, $\delta^{13}C_{TOC}$, total inorganic carbon, $\delta^{13}C_{TIC}$, $\delta^{18}O_{TIC}$, total nitrogen and $\delta^{15}N$, our paleo-climatic approach focuses on reconstruction of local vegetation assemblages to identify changes in the ecosystem. This is pursued using plant biomarkers, particularly leaf wax n-alkanes and n-alcohols and their stable carbon and hydrogen isotopic signatures. Results show prominent shifts in n-alkane and n-alkanol distributions and compound specific carbon isotope values, pointing to changes to a more grass dominated environment during Heinrich Stadial 1 (18.5-14.6 ka BP), while hydrogen isotope values suggest wetter phases during Holocene and LGM. This high variability indicates the local vulnerability to global change.