AGU FALL MEETING
San Francisco | 12–16 December 2016

PP23A-2310: How wet is wet? Strontium isotopes as paleo-lake level indicators in the Chew Bahir basin (S-Ethiopia)

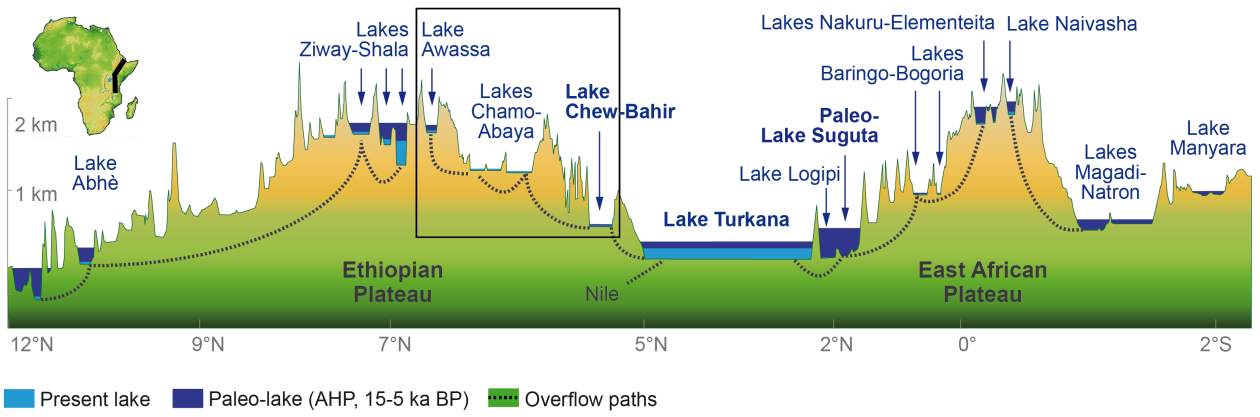
Tuesday, 13 December 2016
13:40 - 18:00
Moscone South - Poster Hall

A major challenge in paleo-anthropology is to understand the impact of climatic changes on human evolution. The Hominin Sites and Paleo-lakes Drilling Project (HSPDP) is currently meeting that challenge by providing records that cover the last ~3.7 Ma of paleoenvironmental change all located in close proximity to key paleo-anthropological findings in East Africa. One of the cored climatic archives comes from the dried up Chew Bahir basin in southern Ethiopia, where duplicate sediment cores, each ~280 m long, are expected to provide valuable insights about East African environmental variability during the last >500 ka.

The lake basins in the eastern branch of the East African Rift System today contain mainly shallow and alkaline lakes. However, paleo-shorelines in the form of wave cut notches, shell beds, and beach ridges are common morphological evidences for deep freshwater lakes that have filled the basins up to their overflow level during pronounced humid episodes, such as the African Humid Period (AHP, 15-5 ka). Unfortunately, further back in time, many of those morphological features disappear due to erosion and the estimation of paleo-water depths depend merely on qualitative proxies from core analyses.

We here present a new method that shows high potential to translate qualitative proxy signals from sediment core analyses to quantitative climate signals in the Ethiopian Rift. The method aims at water level reconstruction of multiple paleo-lake episodes in the Chew Bahir basin using strontium isotope ratios ($^{87}Sr/^{86}Sr$, SIR) in lacustrine fossils and microfossils. SIR preserved in lacustrine fossils reflect the lithology of the drained catchment. The catchment of Chew Bahir consists mainly of Precambrian basement rocks producing high SIR in the lake waters. During humid periods, its catchment enlarged when higher elevated paleo-lakes Abaya, Chamo and Awassa were cascading down into Chew Bahir. These basins drain mainly volcanic rocks producing low SIR. First results show such an onset of hydrological connectivity in a pronounced reduction of SIR in the lacustrine fossils of Chew Bahir when the last AHP set in. This new method may help to quantify paleo-lake levels beyond the past 20 ka and may also detect migrational barriers or routes

due to the occurrence of synchronous large, connected and deep paleo-lakes.



North-South cross section of the eastern branch of the East African Rift System, with both modern and paleo-water depths during the African Humid Period (AHP, 15-5 ka BP). Box indicates the study area. (Figure modified after Junginger et al., 2014).

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