- Gebregiorgis, D., Deocampo, D., Foerster, V., Schaebitz, F., Junginger, A., and Asrat, A., 2019, - Mineralogy and Geochemistry of Recent Sediments in the Chew Bahir Basin: Implications for paleoclimatic interpretations of Pleistocene Paleorecords AGU Annual Fall Mtg., San Francisco, CA PP14B-03.

Reliable proxy records are particularly difficult to find in terrestrial environments, where depositional variability, hiatuses and erosion, diagenesis, and pedogenesis all work to obscure primary proxy signals. Lake sediments are valuable environmental archives and their geochemical records are potentially valuable in understanding climate driven processes such as chemical weathering. The Chew Bahir Basin was cored, as part of the Hominin Sites and Paleolakes Drilling Project (HSPDP), to reconstruct the paleoclimate and basin paleohydrology using geochemical proxy records in uniquely preserved lacustrine sediments to better understand links between climate, paleoecology, and hominin evolution in eastern Africa over the last ~3.5 Myr.
Here we present new mineralogical and geochemical data from modern sediments in the Chew Bahir basin and catchment to better understand the role of sedimentary processes in sediment proxy formation in the Chew Bahir paleolake. Modern analog data offer a new interpretive framework for understanding wet (e.g. African Humid Period or AHP) and dry periods (e.g. Last Glacial Maximum) of the late Quaternary. Modern samples collected between points of tributary confluences outside the currently dry playa lake floor have higher SiO_2 and Al_2O_3 (50–70%) concentration compared to mudflat samples collected from the currently desiccated lake floor. Mudflat sediment samples are enriched in Ca, Ce, Nd, Na, Fe, Mg, Rb, Sr, Yb and depleted in Cr, Hf, Al, and Zr relative to upper continental crust. Zeolite analcime is abundant on the mudflats, and clays are Mg-enriched, suggesting advanced evaporative concentration. Efflorescence of trona (Na-carbonate) in the modern mudflats also implies that surface sediments are exposed to alkaline conditions with pH values well over 9, at least episodically, which is an important evaporative driver of alkaline silicate reactions. These results show that sediments deposited during dry periods most similarly resemble modern saline mudflats in dry Lake Chew Bahir today. Conversely, sediments deposited during relatively wetter periods, such as the AHP, are more typical of modern detrital upstream sources.