

Paleolake sediments in the Northern Awash Valley, Ethiopia, can help us understand how the morphology of pyrite might be used as an environmental indicator. With the advantage of an intact mineralogical record in the ~3 million year old Hadar Formation, the Hominin Sites and Paleolakes Drilling Project (HSPDP) obtained two ~250m thick sediment cores - NAO and NAW - located ~3 kilometers in proximity to each other. In NAW, pyrite and gypsum occurred at irregular intervals while NAO only showed abundant gypsum. NAW contains pyrite in the form of framboidal and euhedral crystals. The morphology of pyrite gives insight on the effects of later rates of oxidation. Based on literature from the deep sea, framboidal pyrite suggests rapid Fe-reduction and pyrite precipitation, whereas euhedral pyrite crystals suggest slower reduction and precipitation rates. Through scanning electron microscopy (SEM) imaging and energy-dispersive X-ray spectroscopy (EDS) of samples throughout NAW, we analyzed the framboidal and euhedral crystals in pyrite. We found peaks in iron, sulfur, calcium, and carbon indicating the presence of pyrite and gypsum in select samples. Additionally, calcite is present which may have formed due to alteration of other minerals. In these samples, gypsum likely precipitated in oxidizing waters consuming sulfate produced by pyrite oxidation. Samples containing framboidal pyrite suggest an increased rate of pyrite formation toward the bottom of the core. Euhedral crystals were present toward the top of the core indicating a dwindling amount of pyrite being precipitated with time. This suggests that an environmental shift occurred that favored slower precipitation rates. The oxygenated bottom waters were most likely due to an abiotic conversion due to free oxygen. This can be a result of tectonic and/or climatic influences. Future analysis on the morphology of pyrite in NAW will provide a distinct resolution as to why there are differing amounts of pyrite in NAO and NAW.