Early preservation of sedimentary organic matter in an anoxic, sulfidic lake (Lake Dziani Dzaha, Mayotte)

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During the Meso- and Neoproterozoic (1800-700 My ago), the oceans and the atmosphere would have been mostly euxinic, and aquatic systems would have been dominated by prokaryote communities.

The dynamics and the biogeochemistry of these anoxic aquatic systems, as well as the early diagenetic processes going along with sedimentary organic matter deposition and preservation, can be better understood by the study of modern analogues. This is the case of Lake Dziani Dzaha (Mayotte), a tropical saline crater lake. This lake is anoxic below 1.5m depth all year round, and fully stratified and highly sulfidic (H_2S>3mM) part of the year. Most of its organic carbon derives from the strong Cyanobacterial primary production [1].

Our study aims at investigating early biotic and diagenetic processes affecting the organic matter in Lake Dziani in order to understand the mechanisms involved in the formation of protokerogen and, more generally, in the preservation of organic matter deposited in anoxic, sulfur-rich environments. We, therefore, analyzed a series of samples from a 1-meter sediment core collected from the water-sediment interface of Lake Dziani.

We highlight high organic carbon contents (TOC=11.7±4.2%) and enriched stable carbon isotope signatures ($\delta^{13}C_{org.\ matter}$=-15.4±1.5‰), consistent with the highly-enriched isotopic composition of the inorganic carbon sources in the current lake water ($\delta^{13}C_{inorganic}$≈13‰). Preliminary molecular analysis of organic sulfur compounds formed during the early stages of burial, which are postulated to play a key role in the preservation of sedimentary organic matter, will also be shown [2].

[1] Leboulanger *et al.* (2017) PLoS ONE 12(1) pp.e0168879.
[2] Hebting *et al.* (2006) *Science* 312, 1627-1631.