Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.14908

Impact of volcanism on sedimentary diagenesis

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Since 2018, a new volcanic edifice, Fani Maore, has grown on the volcanic ridge located on the eastern submarine flank of Mayotte (Comoros archipelago, Indian Ocean). Fani Maore lies at 3500m deep, is 820m high and is located 50km east of Mayotte. The eruption that gave birth to Fani Maore led to lava flows emplacements on its flanks as well as deposits of tephra and iron oxides in the surrounding sediments. However, the amount and impact of such inputs on the local sediment biogeochemistry, and in particular on early diagenetic processes, is yet to be quantified.

To tackle these questions, the multidisciplinary GEOFLAMME cruise (10.17600/18001297) conducted in May 2021on board the R/V Pourquoi Pas? allowed us to sample sediment cores along several eastward transects from the Fani Maore edifice towards the open Indian Ocean.

Solid phase characterization using X-ray fluorescence and diffraction, particulate organic carbon content and carbon isotopic signature (POC;^{13}C-COP; Δ^{14}C-POC), pore water analysis including Inductive Coupled Plasma Mass Spectrometry (ICP-MS) and ^{13}C/Δ^{14}C of dissolved inorganic carbon (DIC) reveals low organic matter mineralization throughout the area. Closest to the lava flows, DIC and alkalinity in the sediment show a strong increase at depth, which cannot be explained by organic matter remineralization through early diagenetic processes. We compare the concentration of major and trace elements and the ^{14}C isotopic composition (Δ^{14}C-DIC) of porewaters with fluid emitted from the Fani Maore volcano. Results indicate that the composition of sediment pore waters closest to the edifice is influenced by volcanic fluids in this area, although questions remain regarding the pathways and residence times of these fluids. This study therefore allows for a better understanding of the sediment biogeochemistry in a volcanic eruptive context, and offers perspective for a better use and development of new volcanic proxies in marine sediments.