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Carbon stable carbon isotopes in the lake Dziani Dzaha

MAGALI ADER

Université Paris Cité, Institut de Physique du Globe de Paris, CNRS, Paris, France

Since 2010, a series of projects involving biologists, limnologists, geochemists, volcanologists, hydrogeologists, and hopefully soon social scientists allowed a nearly continuous monitoring of the biogeochemical functioning of the lake Dziani Dzaha (Indian ocean, Mayotte). The carbon stable isotope composition has been central in this endeavor as it allowed to characterize its carbon cycle and to identify a drastic change in its functioning. Up until 2020, the lake carbon cycle has been strongly driven by methanogenesis and methane escape to the atmosphere, resulting in strongly positive d13C values (10 to 13‰). By analogy this allowed us to propose that this mechanism may have been responsible for some of the positive Carbon isotope excursions of the Lomagundi Jatuli event (Between 2.3 and 2.0 Ga), with strong implications for the hypothesis that they reflect an increased organic carbon burial and are therefore in part responsible for the great oxygenation event. In 2021 the carbon isotope compositions decreased to 9,5‰ while the flux of magmatic CO_2 flux in the lake increased following the emplacement of the nearby underwater volcano, the Fani Maore, pointing to CO_2 dissolution as the main drivers of the lake carbon cycle. The study of the carbon isotope composition in a sediment core is now providing information on past changes in the intensity of magmatic CO2 degassing into the lake and in the methanogenesis activity, which might help better resolve the volcanic activity in the region in the recent past and help understand the central place of the lake in the indigenous culture.