Unexpected Nitrogen isotope behavior associated to OM recycling in the Dziani Dzaha Lake

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Nitrogen isotope composition ($\delta^{15}N$) of sedimentary rocks is increasingly used as a tracer of the nitrogen biogeochemical cycle over geological times. This use strongly relies on the fact that in modern lacustrine and continental platform systems, the $\delta^{15}N$ of sediments faithfully records that of primary producers, even though these systems may not be good analogs for all types of ancient environments.

Our ongoing study of the Dziani Dzaha, a saline and alkaline tropical volcanic crater lake located in Mayotte (Indian Ocean, France) revealed a unique combination of analogies with some marine Precambrian and lacustrine source rocks environments (Leboulanger et al., 2017). It is sulfate poor and permanently anoxic below 1.5 m depth in spite of seasonal mixing. The planktonic biomass is dominated by cyanobacteria, stromatolites develop on shallow parts of the lake, and the sediments are rich in carbonates and organic matter.

The $\delta^{15}N$ values of suspended particles ($\delta^{15}N_{SP}$) are on average of 6±1‰ and homogeneous with depth during the dry season when the lake is mixed and cyanobacteria are alive in the whole water column. During the rainy season, stratification results in an increase of $\delta^{15}N$ up to 12‰ below the chemocline where cyanobacteria are dead, whereas the upper part of the water column where cyanobacteria are alive remains at 6±1‰. Most importantly, the $\delta^{15}N$ values of surface sediments seem to preferentially record the isotopic signatures of suspended particles below the chemocline when the lake is stratified ($\delta^{15}N_{sed}$ = 11±1‰), rather than that of the primary producers.

The possible reasons for this unexpected behavior will be discussed along with their respective implications for interpretations of ancient $\delta^{15}N_{sed}$.

Leboulanger et al. 2017, *PLoS One* **12**(1)