P442-TH

BULK AND MOLECULAR EVIDENCE FOR A RAPID BIOGEOCHEMICAL EVOLUTION OF LAKE MASOKO (SOUTHERN TANZANIA) DURING THE LAST 500 YEARS

Romain de MESMAY[1,6], Vincent GROSSI[1,2], David WILLIAMSON[3], Stephen KAJULA[4], Gérard BARDOUX[5] and Sylvie DERENNE[6]

1. Laboratoire de Microbiologie, Géochimie et Ecologie Marines, UMR CNRS 6117, Centre d'Océanologie de Marseille (OSU), Faculté des sciences de Luminy - case 901, 13288 Marseille cedex 09, France
2. Present address: Paléoenvironnements et Paléobiosphère, CNRS-UMR 5125 PEPS, Université Lyon 1, Campus de la Doua - Bâtiment Géode, 69622 Villeurbanne cedex, France
3. Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement, UMR CNRS 6635, BP 80, 13545 Aix en Provence cedex 04, France
4. Institute of Resource Assessment, University of Dar es Salaam, P.O. Box 35097, Dar es Salaam, Tanzania
5. Laboratoire Biogéochimie et écologie des milieux continentaux, UMR CNRS 7618, Centre INRA Versailles-Grignon, 78850 Thivernal-Grignon, France
6. Laboratoire Biogéochimie et écologie des milieux continentaux, UMR CNRS 7618, Ecole Nationale Supérieure de Chimie de Paris, 75231 Paris cedex 05, France

Lake Masoko is a tropical oligotrophic Maar Lake (700 m diameter, 38 meters depth) strongly sensitive to climate changes and which constitutes a reference site for studying rapid variations in tropical environmental conditions (Garcin et al., 2007 and references therein). Previous studies have detailed Lake Masoko's hydrology, geochemistry, pollens, diatoms, charcoals and phytoliths assemblages, and some new structures of very long-chain *n*-alkenes have recently been described in this ecosystem (de Mesmay et al., in press). Here we present a high-resolution record of bulk organic matter proxies (TOC, TN, $\delta^{13}C$, $\delta^{15}N$, C/N) and the lipid biomarker molecular and isotopic ($\delta^{13}C$) composition of selected sedimentary horizons covering the last 500 years in Lake Masoko.

The TOC content of the sediment showed marked and regular fluctuations between 1500 A.D. and present days but consistently increased with time from *ca.* 4% to 10% (Figure 1). The $\delta^{13}C$ composition of the organic matter (OM) appeared remarkably anti-correlated with the TOC content, showing an overall depletion from *ca.* -24‰ in old sediments to *ca.* -29‰ in more recent deposits (figure 1). Down core profile of long-chain *n*-alkanes (C_{27}, C_{29}, C_{31}) from higher plants as well as their $\delta^{13}C$ composition could partly explain the evolution of the TOC-based parameters, indicating significant terrestrial inputs of organic matter to the lake sediment. However, this quasi regular shift to lower $\delta^{13}C$ values upwards were accompanied by low and decreasing (from 12 to 9) values of the C/N ratio indicative of an ecosystem more likely-based on aquatic organisms. This was confirmed by the quantitative distribution of some diagnostic algal biomarkers (e.g. HBIs, octahydrobotryococcenes, dinosterol) which suggested a rapid evolution of the phytoplanktonic communities, especially during the last two centuries.

Enhanced OM inputs to the sediments and autochthonous productivity likely stimulated the activity of the microbial community of the lake as shown by down core profiles of some hopanoid biomarkers (Figure 1). Moreover, $\delta^{15}N$ values of the sedimentary OM appeared strongly correlated to $\delta^{13}C$ values. They were close to atmospheric values and progressively decreased (from *ca.* +2.5 to -0.5‰) until present days suggesting a significant atmospheric nitrogen fixation by cyanobacteria in this ecosystem. The occurrence of an anoxic photic zone was suggested by the presence of two derivatives from isorenieratene.

The rapid (sometimes within a few decades) variations in OM content, and molecular and isotopic compositions of recent sediments from Lake Masoko clearly indicate that this ecosystem has been constantly and rapidly changing during the last 500 years. Links between this biogeochemical evolution and variations in environmental conditions in this tropical area are currently investigated.

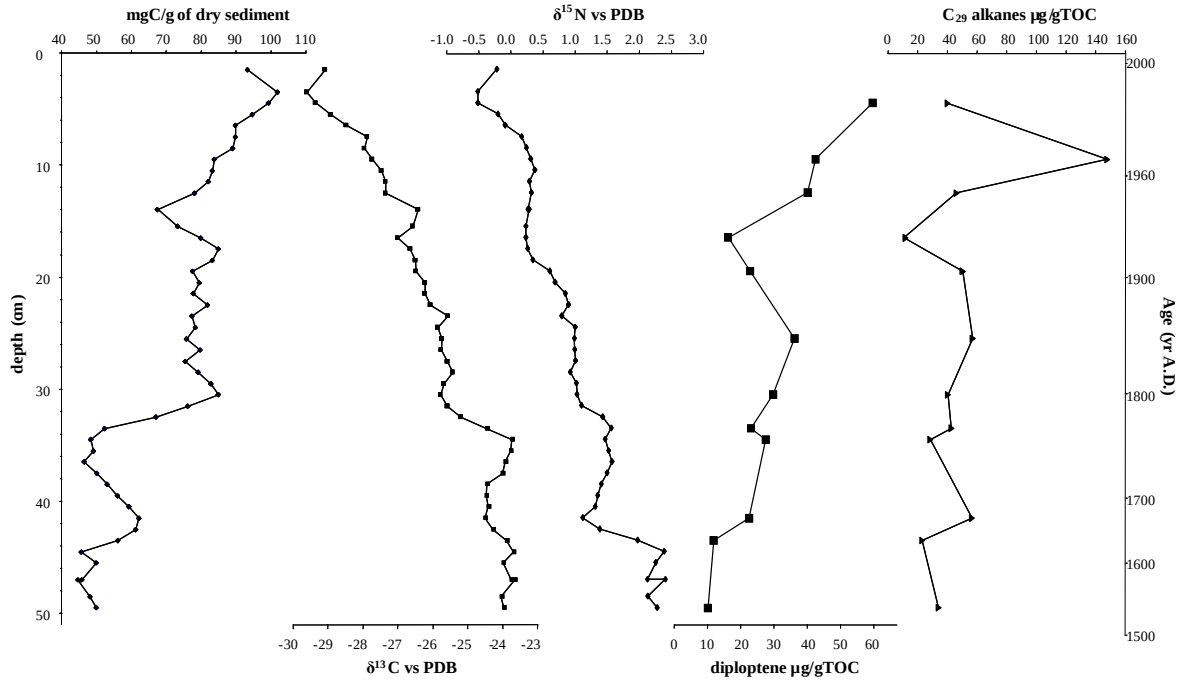

Figure 1. TOC content, $\delta^{13}C$ and $\delta^{15}N$ values, C_{29} alkane and diploptene profiles in core sediments from Lake Masoko covering the last 500 years.

REFERENCES

Garcin Y., Williamson D., Bergonzini L., Radakovitch O., Vincens A., Buchet G., Guiot J., Brewer S. , Mathé P.-E. and Majule A. (2007) Solar and anthropogenic imprints on Lake Masoko (southern Tanzania) during the last 500 years. *Journal of Paleolimnology*, doi:10.1007/s10933-006-9033-6.

de Mesmay R., Grossi V., Williamson D., Kajula S. and Derenne S. (in press) Novel mono-, di- and tri-unsaturated very long chain (C_{37}–C_{43}) n-alkenes in alkenone-free lacustrine sediments (Lake Masoko, Tanzania). *Organic Geochemistry*.