



HAL
open science

Dynamic of dissolved organic matter and trace elements in a steady state lake bottom layer : molecular size fractionation.

Patrick Albéric, Didier Jezequel, Eric Viollier, Christian Défarge, Pascale
Gautret

► To cite this version:

Patrick Albéric, Didier Jezequel, Eric Viollier, Christian Défarge, Pascale Gautret. Dynamic of dissolved organic matter and trace elements in a steady state lake bottom layer : molecular size fractionation.. IMOG 2007, Sep 2007, Torquay, United Kingdom. pp.P78-MO. insu-00189196

HAL Id: insu-00189196

<https://insu.hal.science/insu-00189196>

Submitted on 20 Nov 2007

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

DYNAMIC OF DISSOLVED ORGANIC MATTER AND TRACE ELEMENTS IN A STEADY STATE LAKE BOTTOM LAYER: MOLECULAR SIZE FRACTIONATION

Patrick ALBERIC¹, Didier JEZEQUEL², Eric VIOLLIER², Christian DEFARGE¹ and Pascale GAUTRET¹

1. Institut des Sciences de la Terre d'Orléans (ISTO), UMR 6113 CNRS-Université d'Orléans, 45067 Orléans cedex2, France.

2. Laboratoire de Géochimie des eaux, UMR CNRS 7154 Université Paris 7 - Denis Diderot & Institut de Physique du Globe de Paris, 75251 Paris cedex 05, France.

Dissolved organic matter (DOM) in aquatic systems interacts with most processes including redox reactions, trace elements complexation, sorption and sedimentation. The complex nature of DOM in natural waters suggests that all the fractions constituting it do not contribute in the same way to its reactivity. The total stock of DOM can be split by various means like the difference in size of the molecules or the difference in affinity for adsorbent phases. The deep and stable layers of meromictic lakes are of a particular interest for the study of the mechanisms controlling the behaviour of chemical elements in natural systems. Quasi stationary conditions unroll and stratify the processes through a certain thickness of the water column. In the deep layer of the lake Pavin (Massif-Central, France), solutes dispersing from the water-sediment interface (92 meter depth) cross a succession of levels characterized by different physicochemical and microbiological conditions (redox conditions, interactions with neoformed or settling particles, bacterial metabolic types) before to reach the oxic layer around 60 meter depth (Viollier *et al.*, 1995, 1997, Lehours *et al.*, 2003). In the layer 70-90 m (monimolimnion), trace elements can be schematically divided into two groups; one disperses upwards with mostly no interaction with the medium (Li, Cs), while the other undergoes a strong recycling sedimentation (Ba, U, Mo, V, Sb, La) (Viollier *et al.*, 1995; 1997). It was shown that many elements undergoing this recycling were associated (at 85 m depth) to organic fractions higher than 1 KD, hydrophobic enough to be adsorbed onto XAD-8 and XAD-4 resins (Albéric *et al.*, 2000). The dissolved organic carbon profiles (Fig. 1) recently obtained by in-situ pumping and on-line tangential ultrafiltration of the anoxic water of the monimolimnion, demonstrate the contrasted dynamics of the different DOM fractions according to their size. Less than 1 KD DOM presents a dispersion profile similar to those of the first group trace elements (“no reactive”) while the fractions ranging between 1 to 10 KD and 10 KD to 0.45 μm conversely show profiles which testify to their reactivity in the deep layer of the lake. The ultrafiltration profiles carried out there have confirmed the essential role of the colloidal fractions on the recycling of certain elements like Mo and V (Thiam *et al.*,

2007). Microscopic observations (SEM, cryo-SEM) of the colloidal fractions, suggests the interaction of iron phosphate in the processes of coagulation and scavenging of certain forms of DOM in the deep layer.

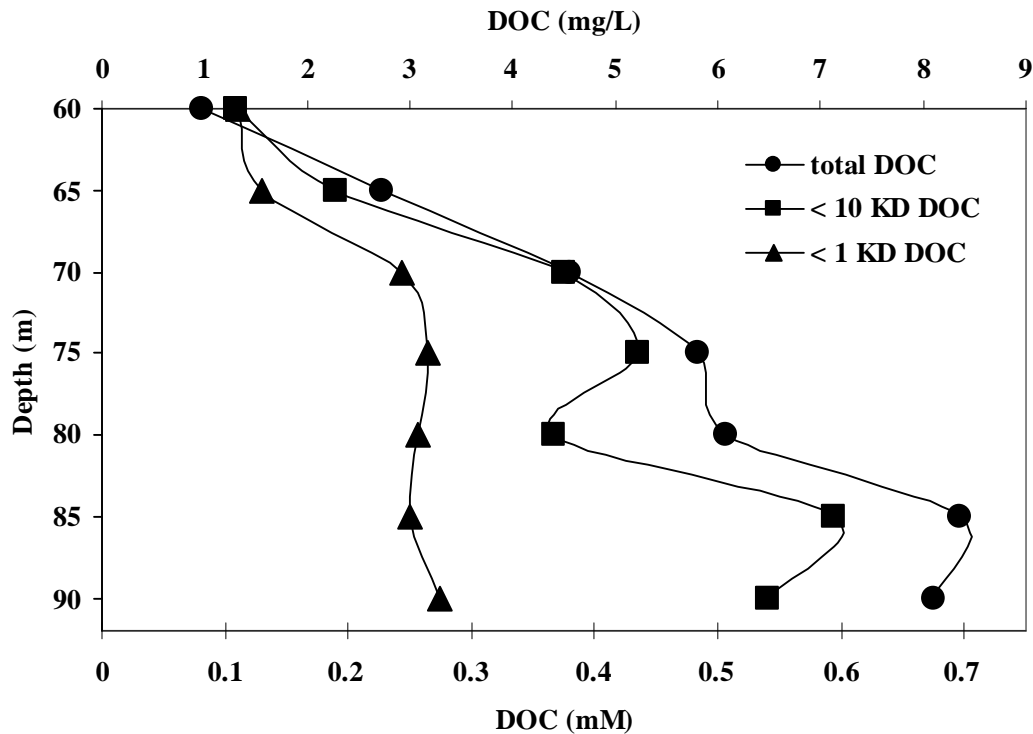


Figure 1. Depth profiles of dissolved organic carbon fractions in the monimolimnion of Lake Pavin.

REFERENCES

- Albéric P., Viollier E., Jézéquel D., Grosbois C., Michard G. (2000). Interactions between trace elements and dissolved organic matter in the stagnant anoxic deep layer of a meromictic lake. *Limnology and Oceanography* 45: 1088-1096.
- Lehours A.C., Bardot C., Debroas D., Fonty. G. (2003) Etude des communautés microbiennes de la zone anoxique d'un lac méromictique (lac Pavin): Approches moléculaires. Colloque SFM " Anaérobies 2003 " Marseille.
- Viollier E., Jézéquel D., Michard G., Pèpe M. Sarazin G., Albéric P. (1995) Geochemical study of a crater lake (Pavin Lake, France): Trace-element behaviour in the monimolimnion. *Chemical Geology* 125: 61-72.
- Viollier E., Michard G., Jézéquel D., Pèpe M., Sarazin G. (1997) Geochemical study of a crater lake: Lake Pavin, Puy-de-Dôme, France. Constraints afforded by the particulate matter distribution in element cycling within the lake. *Chemical Geology* 142: 225-241.
- Thiam A., Viollier E., Jézéquel D., Albéric P. (2007) Seasonal dynamics of molybdenum in a crater lake. ILIC2007, Barcelona.