



## Variability of methane in the epilimnion of Lake Kivu

A. V. Borges (1), G. Abril (2), C. Morana (3), S. Bouillon (3), and F. Darchambeau (1)

(1) University of Liège, Institut de Physique (B5), Chemical Oceanography Unit, Liège, Belgium (alberto.borges@ulg.ac.be, +32-(0)4-3663367), (2) Laboratoire Environnements et Paléoenvironnements Océaniques, Université de Bordeaux 1, CNRS-UMR 5805, Avenue des Facultés, F-33405 Talence, France, (3) Department Earth and Environmental Sciences, K.U.Leuven, Leuven, Belgium

We report a data-set of methane (CH<sub>4</sub>) concentrations in the surface waters of Lake Kivu obtained during four cruises (March 2007, September 2007, June 2008, April 2009) covering the two main seasons, rainy (October to May) and dry (June to September). Spatial gradients of CH<sub>4</sub> concentrations were modest in the surface waters of the main basin. In Kabuno Bay (a small sub-basin), CH<sub>4</sub> concentrations in surface waters were significantly higher than in the main basin. Seasonal variations of CH<sub>4</sub> in the main basin were strongly driven by deepening of the mixolimnion and mixing of surface waters with deeper waters rich in CH<sub>4</sub>. On an annual basis, both Kabuno Bay and the main basin of Lake Kivu were over-saturated in CH<sub>4</sub> with respect to atmospheric equilibrium (7330% and 2510%, respectively), and emitted CH<sub>4</sub> to the atmosphere (39 mmol m<sup>-2</sup> yr<sup>-1</sup> and 13 mmol m<sup>-2</sup> yr<sup>-1</sup>, respectively). The source of CH<sub>4</sub> to atmosphere was two orders of magnitude lower than the CH<sub>4</sub> upward flux. The source of CH<sub>4</sub> to the atmosphere from Lake Kivu corresponded to ~60% of the terrestrial sink of atmospheric CH<sub>4</sub> over the lake's catchment. A global cross-system comparison of CH<sub>4</sub> in surface waters of lakes shows that both Kabuno Bay and the main basin are at the lower end of values in lakes globally, despite the huge amounts of CH<sub>4</sub> in the deeper layers of the lake. This is related to the strongly meromictic nature of the lake that promotes an intense removal of CH<sub>4</sub> by bacterial oxidation.