Variability of methane in the epilimnion of Lake Kivu

Borges A.V.1, G. Abril2, B. Delille1, J.-P. Descy3 & F. Darchambeau1
1 University of Liège (BE), 2 University of Bordeaux 1 (FR), 3 University of Namur (BE)
* alberto.borges@ulg.ac.be

We report a data-set of methane concentrations (CH₄) in the surface waters of Lake Kivu obtained during four cruises covering the two main seasons (rainy and dry). Spatial gradients of CH₄ concentrations were modest in the surface waters of the main basin. In Kabuno Bay (a small sub-basin), CH₄ concentrations in surface waters were significantly higher than in the main basin. The likely higher contribution of deepwater springs in Kabuno Bay than in the main basin increases the upward flux of solutes and might explain the higher CH₄ concentrations we observed in Kabuno Bay than in the main basin. Seasonal variations of CH₄ in the main basin were strongly driven by deepening of the mixolimnion and mixing of surface waters with deeper waters rich in CH₄. On an annual basis, both Kabuno Bay and the main basin of Lake Kivu were over-saturated in CH₄ with respect to atmospheric equilibrium (7330% and 2510%, respectively), and emitted CH₄ to the atmosphere (39 mmol m⁻² yr⁻¹ and 13 mmol m⁻² yr⁻¹, respectively). A global cross-system comparison of CH₄ 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 CH₄ in the deeper layers of the lake (concentrations 10⁶ higher than in surface). This is related to the strongly meromictic nature of the lake that promotes an intense removal of CH₄ by bacterial oxidation. Indeed, the average CH₄ oxidation rate (7200 µmol m⁻² d⁻¹) in the main basin of lake Kivu is 200 times higher than the average CH₄ emission to the atmosphere in the main basin.

European Geosciences Union General Assembly, 4-8 April 2011