

Methane cycle and methane oxidation in Lake Kivu and Kabuno bay

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Huge amounts of methane (CH_4) (60 km^3 at 0°C and 1 atm) are dissolved in deep waters of Lake Kivu. Factors controlling its production and consumption have to be well understood for its sustainable exploitation. CH_4 is produced in the anoxic deep waters (monimolimnion) by reduction of CO_2 and degradation of settling organic material. This CH_4 then diffuses from the monimolimnion to surface waters, but little is emitted to the atmosphere due to the strong stratification of the lake (which is a limiting factor for diffusion) and CH_4 consumption. CH_4 is consumed by aerobic or anaerobic oxidation in surface waters. In particular, anaerobic CH_4 oxidation can occur with different electron acceptors: nitrate or nitrite, sulfate, iron or manganese. The aim of this project is to study factors controlling aerobic and anaerobic CH_4 oxidation in Lake Kivu. Two field campaigns have been conducted in May (rainy season) and August (dry season) 2013. Field stations were located in the great basin (off Gisenyi, Rwanda) and in the Kabuno Bay (in the Democratic Republic of the Congo). The Kabuno Bay is a particular bay isolated from the main basin and characterized by high CH_4 concentrations near surface. Samples were collected for the measurements of CH_4 , nutrients, iron, manganese, sulfate and sulfide concentrations. Rates of aerobic and anaerobic CH_4 oxidation coupled to denitrification and sulfate reduction were also measured. First results indicate high CH_4 oxidation rates in both main basin and Kabuno bay. CH_4 and N_2O vertical profiles have also been designed with high resolution, for the first time below the depth of 15 m in the Kabuno Bay.