UNIL | Université de Lausanne
Faculté des géosciences et de l'environnement
Master in Environmental Geoscience
bâtiment Géopolis bureau 4606
CH-1015 Lausanne

Methane cycle in Lake Geneva

Contact persons: *Marie-Elodie Perga (marie-elodie.perga @unil.ch), Pascal Perolo (pascal.perolo@unil.ch)*

Context

All lakes release methane, a powerful greenhouse gas, to the atmosphere, contributing up to 20% of global emissions [1, 2] . Although part of the lacustrine methane may arise from geologic sources at specific sites, biotic processes dominate methane production at a global scale [1-3]. Because anoxic bottom waters and sediments are typical features of productive or organic-rich lakes, methanogenetic processes have historically been investigated at lake greater depths and closed to bottom sediments. Whether this deep-produced methane finally reaches the lake surface depends on the mechanisms by which it is transferred upwards (vertical diffusion, water mixing, direct transfer through submerged plant roots and ebullition, [1], but also on the efficiency of the filter that aerobic methane oxidizing microbes exert during vertical diffusion [5]. In shallow, unstratified and littoral-dominated lakes, all transfer mechanisms are highly effective, while oxidative loss during transit are low. In contrast, in deep stratified monomictic lakes, fall-winter turnover is the only mechanism by which deep–produced methane might finally outgas to the atmosphere, while ebullition and vertical diffusion are generally negligible [5]. Most of the deep-produced methane is oxidized as it diffuses upwards and very little of the epilimnetic methane originates from deep methanogenesis during stratification [6]. However, at a global scale, the surface CH_4 concentrations does not depend on lake size ([2], suggesting that large and deep lakes are not necessarily smaller methane emitters the atmosphere.

Objectives and Methods

This topic aims at documenting the methane production and outgassing in Lake Geneva over an annual cycle in order to quantify CH_4 emissions from water as well as discover the origin of the methane at lake surface. This study will be performed on the Lexplore platform at Pully with different kinds of measurements (physical, chemical and isotopic analysis). There is the possibility to focus on a specific period or specific processes in this master's thesis.

Literature

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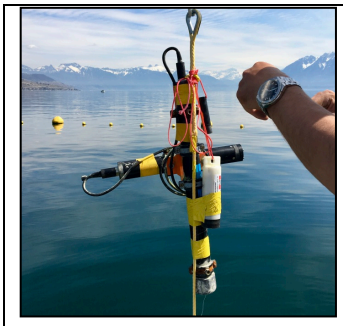

WEBSITES

http://wp.unil.ch/lakes

Tél.+41 21 692 35 46 | Fax.+41 21 692 35 05 | christina.stauffer@unil.ch