Geophysical Research Abstracts
Vol. 21, EGU2019-15855, 2019
EGU General Assembly 2019

High-resolution scanning of the optical water column properties of a large lake: interplay between biological and physical processes

Camille Minaudo (1), Hugo N Ulloa (1), Hannah Elisa Chmiel (1), Damien Bouffard (2), Théo Baracchini (1), Daniel Odermatt (3), Alfred Johny Wüest (1,2)

(1) EPFL, Physics of Aquatic Systems Laboratory, Lausanne, Switzerland (camille.minaudo@epfl.ch), (2) Eawag, Swiss Federal Institute of Aquatic Science and Technology, Surface Waters – Research and Management, Kastanienbaum, Switzerland, (3) Eawag, Swiss Federal Institute of Aquatic Science and Technology, Surface Waters – Research and Management, Dübendorf, Switzerland

Measuring primary production (PP) is of major importance to evaluate how lakes are recovering from eutrophication. The classical sampling method involves radiolabelled carbon incubated in bottles at selected depth. Yet the logistic associated with this method prevents scientists from sampling the high frequency dynamics of PP. Alternative methods are based on oxygen sensors and infer PP from diel oxygen variation.

To explore the interplay between biogeochemical and physical processes, and in particular PP in large lakes, we have deployed in October 2018 a sophisticated autonomous profiler mounted with optical sensors to measure inherent water optical properties in Lake Geneva. They record backscattering and fluorescence at specific wavelengths as proxies for the composition of suspended particles (phytoplankton and heterotrophic bacteria biomasses), light absorption, attenuation, and backscattering across the visible spectrum, and dissolved oxygen and temperature. The profiler records all parameters every three hours over the top 50 m of the water column with a 10 cm resolution, and provides unprecedented detailed information on temporal and vertical variability of biotic and abiotic processes.

Preliminary results show that primary producers' signature on optical properties is large at the sub-daily scale despite low primary production rates in winter. The high vertical resolution of temperature and oxygen profiles allows us to quantify heat and air-water gas fluxes. This in-situ data will be combined with three-dimensional hydrodynamic modelling of Lake Geneva (www.meteolakes.ch), and remotely sensed optical properties to upscale PP estimates from local to basin-scale.