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Determination of sources and transformation processes of organic carbon in Lake Geneva from daily to seasonal scales

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Context

The pool of dissolved organic matter (DOM) in aquatic ecosystems is a heterogeneous mixture of organic compounds that originate both from terrestrial sources (allochthonous DOM) and from primary production and processes of decomposition within water bodies (autochthonous DOM). Moving downstream along fluvial networks, DOM is continuously processed by bacterial communities with important ecological and biogeochemical consequences. For example, DOM can be either mineralized as CO_2 and thus contribute to the net heterotrophy observed in many freshwater ecosystems or it can be incorporated into microbial biomass and thus become available for higher trophic levels

Lake ecosystems are important features of the carbon cycle at both the regional and global scales. The level of internal transformation increases as their water residence time extends, attributing a greater role to large lakes. Large lakes are also highly dynamic from a hydrological perspective with complex circulation of water masses in both the lateral and vertical dimensions, generating water mixing events during which different DOM pools that have been primarily isolated in space and time get in contact and might create potential opportunities for non-conservative behavior of DOM degradation. For instance, littoral areas constitute important zones of primary production and, at the same time, receive substantial inputs of terrestrial DOM from tributaries. Terrestrial DOM is generally less bioavailable than DOM from algal or macrophyte origin and it has been suggested that the release of labile compounds from autochthonous sources may enhance the bacterial degradation of the more recalcitrant terrestrial DOM. Inputs of terrestrially derived DOM can affect the whole lake metabolism by stimulating bacterial respiration, and recent field observation coupled with laboratory experiments have shown that river-borne turbidity currents—that convey riverine DOM directly into the deep lacustrine waters—could lead to a stimulation of bacterial respiration in Lake Geneva. The effect of the mix between lake and river waters on DOM degradation has however not been investigated

Objectives and Methods

This research will assess and quantity the processes responsible for the transformation of organic matter in Lake Geneva, from daily to seasonal scales. It will involve sampling over different time cycles (24h hour, seasonally) from the Lexplore platform, lab measurements of organic matter nature (spectrophotometry, fluorescence) and fate (respiration, bacterial production). These analyses will be coupled *to in situ* bioessays.

WEBSITES

http://wp.unil.ch/lakes