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# *Spatial variability of surface $CO_2$ in Lake Geneva*

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**Context**

If inland waters have recently been acknowledged as significant reactors of the global carbon cycle, light has been essentially shed on wetlands, permafrost and humic lakes, under the overwhelming paradigm that lake supersaturation with CO2 arises from metabolic processes. Within this picture, large and clearwater lakes have been largely overlooked, considered as neutral to the atmosphere. As a result, our knowledge about the carbon cycle in such lakes is clearly deficient. For instance, in Switzerland, a heuristic carbon budget attempted on the heavily studied and highly monitored Lake Geneva ended up unbalanced, C outputs being twice higher than the inputs. Estimated CO2 outgassing reaches surprisingly high numbers. Rough estimates suggest that the 10 largest Swiss lakes emit as much CO2 as fossil fuel combustion of total Swiss agriculture. The example of Switzerland shows that large and clearwater lakes could be a central feature of a national carbon budget and plead for a revision of our C conception in such environments.

Project CARBOGEN assumes that (1) key processes in lake carbon cycling are unaccurately scaled or remain missing, (2) C is controlled by embedded physical and biogeochemical processes which relative contributions depend on the time and space scales of observation, (3) lakes carbon cycling is highly sensitive to human and climate disturbances. Yet, the mechanisms and scales at which environmental forcings act on the lake carbon cycle are poorly understood, neither predictable. Because Lake Geneva benefits from an exceptional wealth of data, modelling tools and high-frequency monitoring structures, it has been chosen as a worldwide model system to address these assumptions. The motive of CARBOGEN is therefore to address the carbon cycle of Lake Geneva through two objectives. The first one is to close the lake carbon budget by refining flux estimates accounting for the large temporal and spatial variability of the carbon processes and by identifying and quantifying the missing sources. The second aims at untying the mechanisms behind the long-term C variability, and therefore to quantify the human contribution to such changes. For that purpose, CARBOGEN relies on an integrated, process oriented perspective on the carbon cycle of Lake Geneva, combining field surveys, high-frequency monitoring, bioassays and modelling

**Objectives and Methods**

This topic aims at evaluating the spatial variability of surface $CO_2$ in Lake Geneva. Three specific areas will be investigated (littoral, pelagic and Rhone river mouth) during this master's thesis. This study will be done using physical and chemical measurements during field campaigns at different seasons. These data will be coupled with continuous measurements at single point (Lexplore) in order to estimate the importance of the spatial variability on the temporal variability

**Literature**

*Marcé, R., B. Obrador, J. A. Morgui, J. L. Riera, P. Lopez, and J. Armengol. 2015. Carbonate weathering as a driver of CO2 supersaturation in lakes. Nature Geoscience.*

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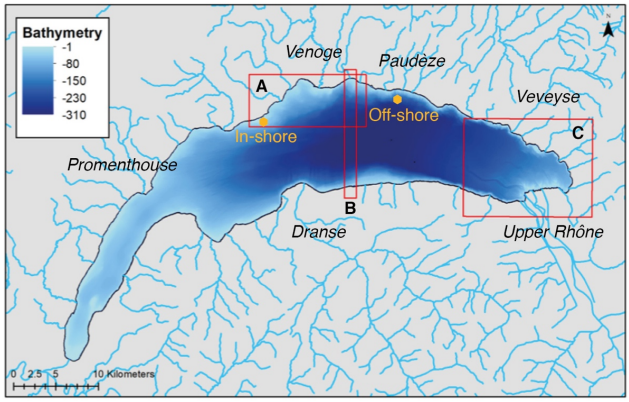


**WEBSITES**

http://wp.unil.ch/lakes



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