

PhD proposal in biogeochemical limnology

**A balanced Carbon budget for Lake Geneva (Switzerland)**

**Location:** University of Lausanne, Institute of Earth Surface Dynamics, Lausanne, Switzerland.

The University of Lausanne is a higher teaching and research institution composed of seven faculties where approximately 14,300 students and nearly 3,900 collaborators, professors, and researchers work and study. Ideally situated along the lake of Geneva, near Lausanne's city center, its campus brings together over 120 nationalities.

**Keywords:** lakes, carbon cycle, biogeochemistry, CO2, dissolved inorganic and organic carbon, fluxes, metabolism.

**Research context of the CARBOGEN project**

Inland waters are widely acknowledged as significant reactors of the global carbon cycle, but the role of large and clearwater lakes has been largely overlooked within this picture relative to humic and terrestrial dominated lakes. While considered as neutral to the atmosphere, **a heuristic C budget of the Lake Geneva (Switzerland) and based on > 20 monitoring** **years ended up unbalanced C outputs being twice higher than the inputs**. 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 inaccurately 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, and (3) lakes carbon cycling is highly sensitive to human and climate disturbances. 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.

**Job description**

Supervision:Prof. Marie-Elodie Perga (UNIL), in collaboration with Dr. Thibault Lambert (UNIL).

Skills required:master in biogeochemistry/geochemistry/geosciences/environmental sciences. Skills in limnology and data analysis will be appreciated.

Description: The PhD candidate will address the first objective of the CARBOGEN project, namely the spatial and temporal variability of carbon fluxes and the underlying processes controlling them. The applicant will be expected to investigate the cycle of inorganic carbon in the lake (including among other dissolved inorganic carbon (DIC), dioxide carbon (CO2), carbonates…), and how it relates to environmental drivers (primary production, nutrient availability, hydrology…) both spatially (littoral *versus* pelagic) and temporally (from diurnal to seasonal scales). For this purpose, the PhD will rely on two exceptional high-frequency monitoring platforms, one inshore and one offshore, and exciting field surveys coupled with laboratory experiments.

The PhD candidate will be expected to work in strong collaboration with a second PhD candidate from the CARBOGEN project focusing on CO2 variability on short and long-time scales as well as collaborators from EAWAG/EPFL, Switzerland (Damien Bouffard) and the University of Liège, Belgium (A. V. Borges).

**Job information**

Funding: SNF funding (CARBOGEN project)

Duration: 4 years

Expected starting date: September 1st 2018

Activity rate: 100% (80% research + 20% teaching duty)

Deadline for application: June 1st 2018

Site web of the team: http://wp.unil.ch/lakes/

**Contact details and application**

For any question, contact marie-elodie.perga@unil.ch

Application are to be sent directly by e-mail and should include a motivation letter detailing your research interests and experience, a CV, a copy of the master thesis, and contact details for at least 2 referees.