

## Master thesis in aquatic photochemistry:

### Regulation of the apparent quantum yields for the photoproduction of dissolved inorganic carbon in lakes

During passage from the terrestrial catchments towards the sea about half of the dissolved organic carbon (DOC) is mineralized in inland waters, making them a net source of carbon dioxide to the atmosphere with global emissions of 1.2-1.4 Gt CO<sub>2</sub>-C yr<sup>-1</sup>. Two fundamentally different processes contribute to DOC mineralization in inland waters: Microbial mineralization where DOC is used as an energy source, and photochemical mineralization following photon absorption of solar irradiance transmitted into the water. Despite its fundamental importance for our understanding of inland water C cycling assumptions about the importance of photomineralization for the overall lake C cycling remain largely speculative. In order to improve our understanding of the importance of photochemistry for inland water C cycling we need to conduct measurements of apparent quantum yields of the studied reaction, which determine the wavelength-specific efficiency of DIC photoproduction per absorbed photon. These apparent quantum yields are needed to parameterize mathematical models used to simulate photochemical reactions in inland waters.

A recent pilot-study has shown that there is quite a high variability of these apparent quantum yields in freshwater systems. The objective of the proposed master thesis study is to determine apparent quantum yields for a range of lake waters in dependency of potential water chemical explanatory variables, aiming to come up with wavelength-specific predictive equations. The study will involve water sampling from a range of boreal lakes in Sweden. Further lake water samples will be shipped from collaborators e.g. in Brazil and Canada. The measurements of apparent quantum yields will be conducted in the laboratory, using a solar simulator and a set of cut-off filters which allow passage of certain wavelength ranges of the irradiance spectrum. Methods that can be learned and applied include measurements of absorbance, concentrations of dissolved organic and inorganic carbon, irradiance spectra, use of the solar simulator, calculation of the apparent quantum yields using the program R and statistical analyses.

The master student will be situated at the Department of Limnology in the Evolutionary Biology Centre, Uppsala University. The supervision will be jointly conducted by Birgit Koehler and Lars Tranvik. The starting date is as soon as possible after the summer, i.e. earliest in the beginning of August.

Interested candidates please contact Birgit Koehler by email: [birgit.koehler@ebc.uu.se](mailto:birgit.koehler@ebc.uu.se)

