Master project: CH$_4$ regulation by aquatic plants
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Aim of the project
Inland waters have a strong effect on climate because they emit greenhouse gases (GHG) to the atmosphere, both carbon dioxide (CO$_2$) and the highly potent gas methane (CH$_4$). Aquatic ecosystems colonized by aquatic plants can be hotspots for CH$_4$ emission, however, the inclusion of aquatic plants in inland water carbon models is complicated by a poor mechanistic understanding of CH$_4$ regulation by aquatic plants. Indeed, vascular aquatic plants regulate CH$_4$ emissions by mediating different processes: they provide organic carbon fueling CH$_4$ production, they can efficiently transport CH$_4$ to the atmosphere through their tissues, but they can also be host for CH$_4$-oxidizing bacteria.

The aim of the project is to understand how aquatic plants regulate CH$_4$ emissions in lakes via quantifying CH$_4$ oxidation in the aquatic plant rhizosphere and CH$_4$ transport to the atmosphere through plant tissues (Figure 1). More particularly, the master student will help with field work at Lake Ånnsjön (Jämtland) and will carry out a laboratory experiment where aquatic plants are cultivated. CH$_4$ emissions will be measured with an ultraportable gas analyzer and the quantity of CH$_4$ oxidized and transported will be estimated with the stable isotope signature of CH$_4$ ($\delta^{13}$C-CH$_4$ and $\delta^2$H-CH$_4$) in situ and in the laboratory for different aquatic plant species.

![Figure 1. Processes involved in CH$_4$ emissions from vegetated lake sediments. The processes and fluxes underlined (net emission, oxidation and plant transport) will be quantified for the littoral zone of lake Ånnsjön.](image)

Time plan
The field work will last 4 days at the end of June or at the end of August (according to the master student schedule). The laboratory experiment will be set up right after the field work and will last approximately 3 months.