INFLUENCE OF CHAOBORUS MIGRATION ON METHANE EMISSIONS IN LAKES OF QUEBEC : A RESEARCH PROPOSAL

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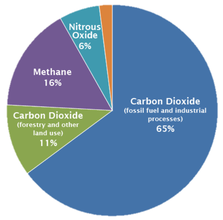
INTRODUCTION

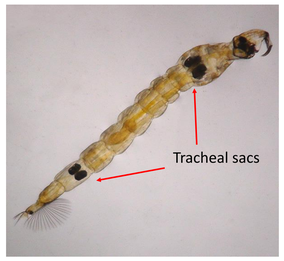
- Lakes are important emitters of methane (CH_4), a powerful greenhouse gas[1], but the magnitude of their emissions remains uncertain.



Global greenhouse gas emissions by gas[5]

- CH_4 is produced in lake sediments[1] and some benthic macroinvertebrates can strongly influence the CH_4 dynamics in lake ecosystems by increasing exchange between sediments and the water column[12].

- *Chaoborus* larvae (Diptera-Chaoboridae) are important bioturbation agents in lakes owing to their diel vertical migration (DVM) from sediments to the water column. In addition, these larvae use the CH_4 in sediments to inflate their tracheal sacs[2,4,8].

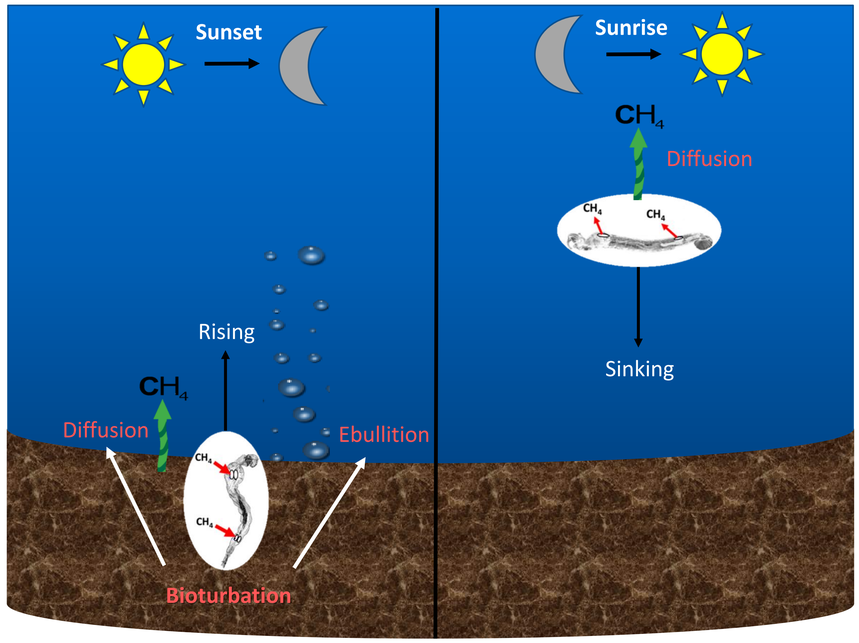


Chaoborus punctipennis

- *Chaoborus* is very common in north temperate lakes[3] and its distribution will increase with climate change[10]. Only few information exist about the quantitative contribution of *Chaoborus* on the CH_4 emissions in lakes.

OBJECTIVES

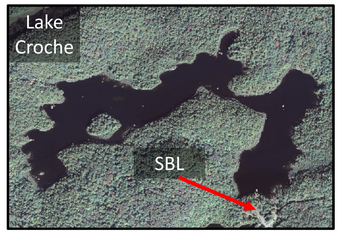
Quantify the effects of *Chaoborus* larvae on **methane emissions** in lakes, more specifically **3 components** : Sediments diffusion, Sediments ebullition and Sacs diffusion.

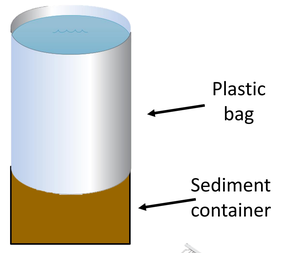


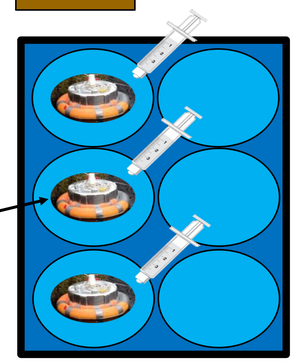
Schematic of the link between *Chaoborus* migration in lakes and methane emissions[2,4,6,7,8,9,11]

PROPOSED METHODS (MESOCOSMS)

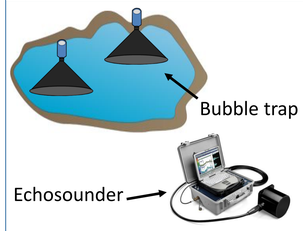
- Lake Croche at Station Biologique des Laurentides (SBL)
- Collect sediments and put in the mesocosms
- 4 *Chaoborus* density treatments x 3 replicates (12 mesocosms total)
- Measuring CH_4 flux and epilimnetic CH_4 concentration during the sinking of the larvae at sunrise
- One week per month from June to August



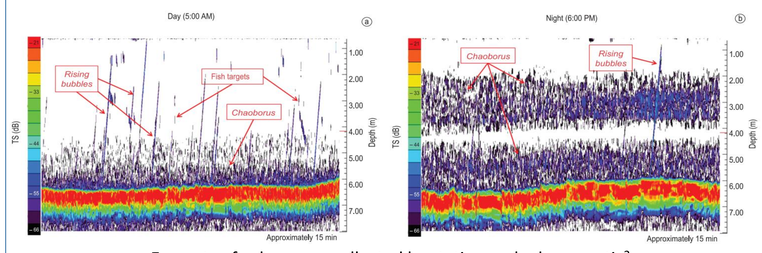




PROPOSED METHODS (NATURAL ENVIRONMENT)

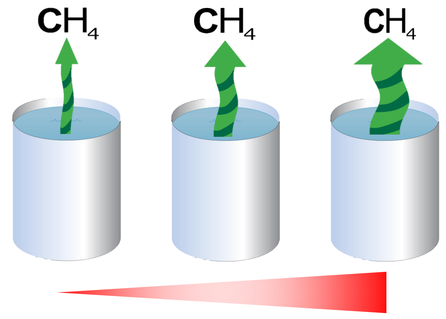


- Lakes Croche and Cromwell at SBL
- 4 stations per lake at different depths
- Measuring bubbles and *Chaoborus* density and CH_4 concentration in the hypolimnion at sunrise and sunset
- One week per month from June to August



Excerpts of echograms collected by stationary hydroacoustic[2]

HYPOTHESES

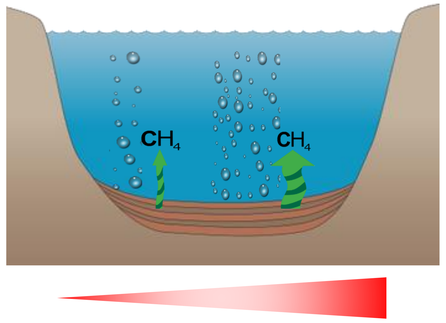


Mesocosms

H1: ↑ *Chaoborus* → ↑ CH_4 flux + ↑ CH_4 concentration epilimnion

Natural environment

H2: ↑ *Chaoborus* → ↑ CH_4 bubbles volume + ↑ CH_4 concentration hypolimnion



Less *Chaoborus* — More *Chaoborus*

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