

Spatial and temporal patterns in methane emissions in a boreonemoral lake



Linköping University
expanding reality

Emma Jansson

Supervisors: David Bastviken & Per Milberg

Introduction

Methane (CH_4) is a greenhouse gas that have increase rapidly in the atmosphere. An often forgotten, yet important source of CH_4 is lakes and the factors controlling the emissions are not fully known. From lakes, CH_4 can

reach the atmosphere three ways; diffusion, ebullition and emergent aquatic plants. Previous studies show variations with time and space, however not with this high resolution in a boreonemoral lake.

Aims

This study aim to find how CH_4 emissions change spatially and temporally, how the proportion of ebullition and diffusion can be explained and if CH_4 emissions are different in two adjacent lakes.

Method

CH_4 emissions was measured from May to September (7 times) for 24 or 48 hours using floating chambers. The floating chambers were positioned along depth dependent transects.

Results

Spatial changes

- The CH_4 emissions are higher in the inlets and the shallow parts of Lake Erssjön
- After the fall overturn Lake Erssjöns CH_4 emissions become more homogenous

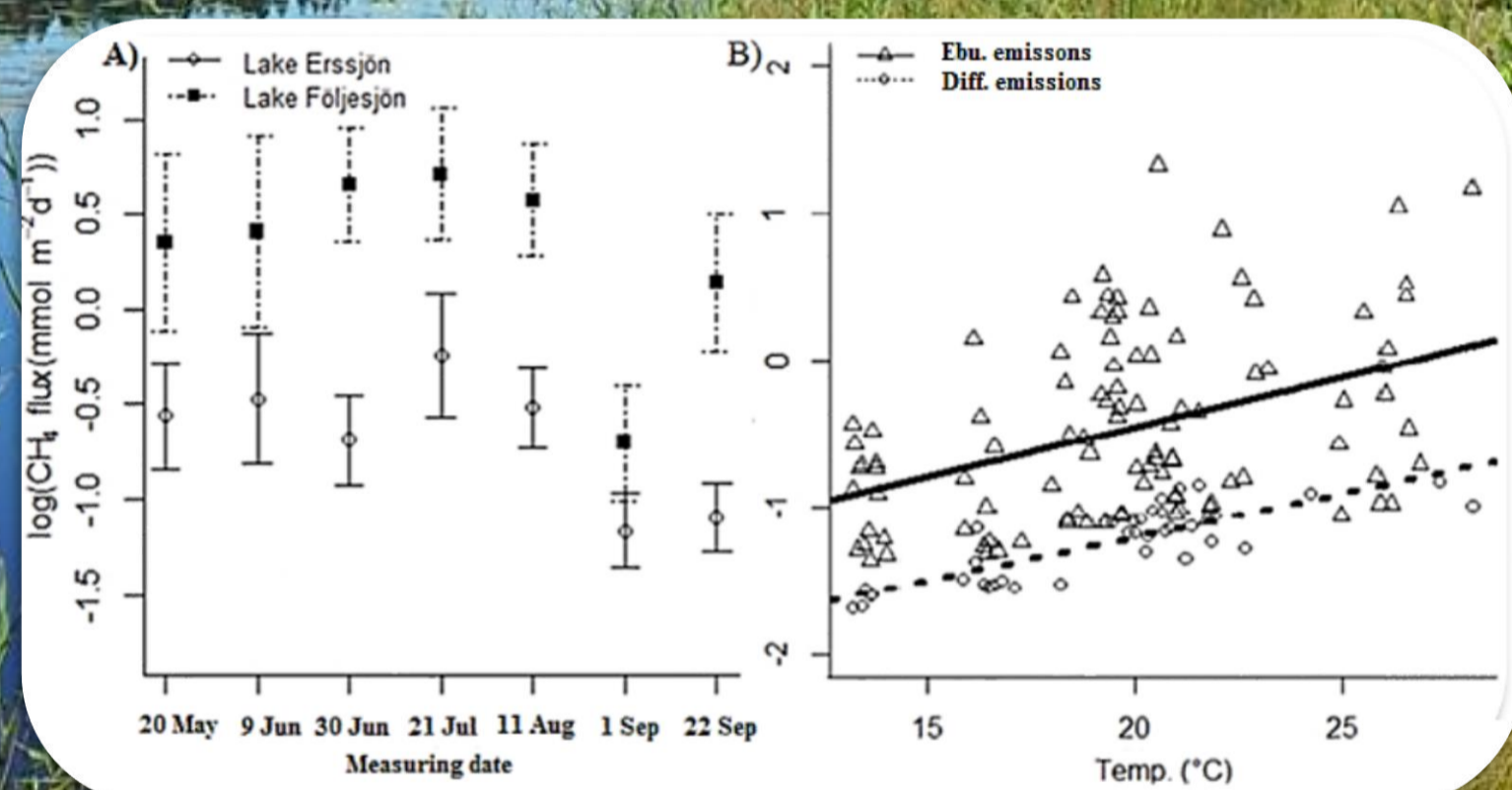
Temporal changes

- CH_4 accumulates in the water during the summer stratification (May-Aug) in Lake Erssjön and was significantly lower after the fall overturn (Sep)
- Lake Följesjön shows the same pattern as in

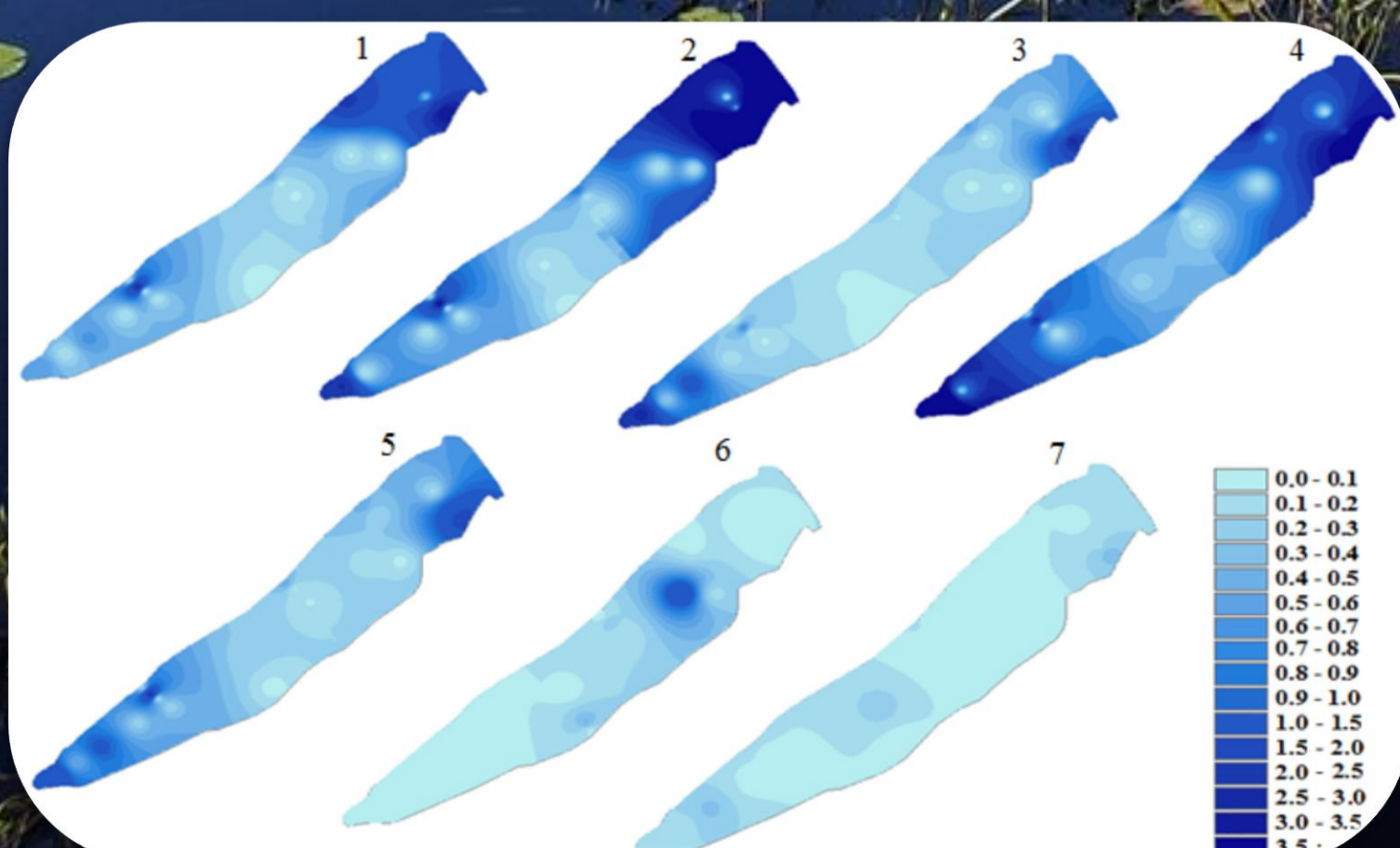
Lakes Erssjön until the last measurement (22 sep)

What causes changes in the CH_4 emissions in time and space?

- Water temperature
- Depth
- Oxygen saturation
- NH_4
- Conductivity
- Phosphorus
- Time of the year (such as stratification)
- Surrounding environment in the catchment area



A) CH_4 flux in Lake Erssjön and Lake Följesjön from May to September. B) Diffusive and ebullition emission (ebullition diffusion included) change with depth in Lake Erssjön



CH_4 flux in Lake Erssjön from May to September (Measuring date 1-7)

Conclusions

There are a lot of factors controlling CH_4 emissions from small molecules to surrounding environment to global aspects in space and time

The most **important** and significant factor controlling CH_4 emissions is **water temperature** - CH_4 emissions will increase the global warming and the global warming will increase the CH_4 emissions.