High temporal resolution measurements of CO2, CH4 and N2O in a Norwegian mire ecosystem using automated light-dark chambers

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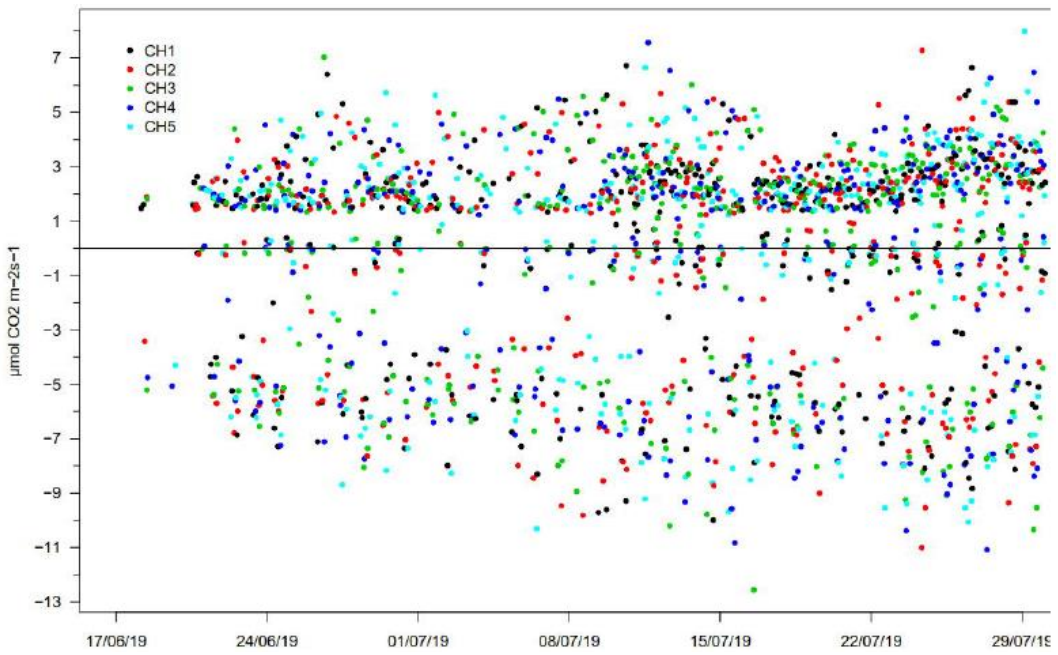
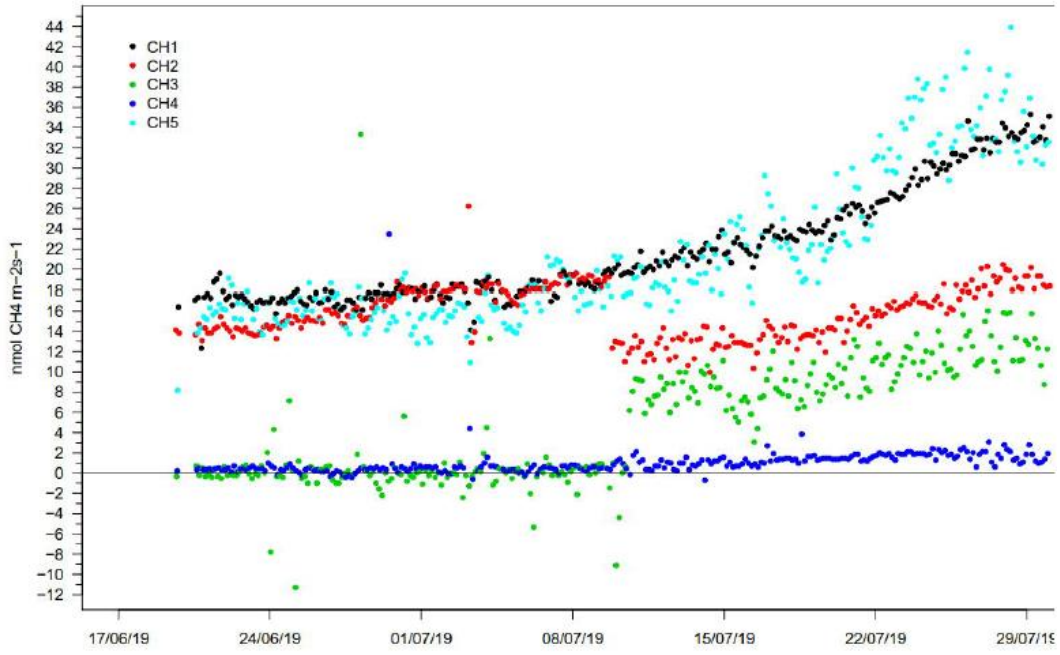
Materials & Methods

DMR ECO$_2$Flux Gas Flux Measurement Chamber & PLC Box

- Scope: Monitor total GHG balance of CO_2, CH_4, and N_2O for two years with eventual rewetting ditches after 2 years
- Automated light-dark chambers with LICOR 1800A and Picarro G2508 gas analyzers measuring CO_2, CH_4, and N_2O (2 eddy flux towers presented by Andreas Ibrom in this session)
- 5 minute measurements periods with the chamber closed and 15 minute purge period between measurements
- Soil water depth measurements to indicate water table depth with relation to distance from ditches
- Meteorological data including temperature (soil, air, chamber), air pressure, PAR

Preliminary Results

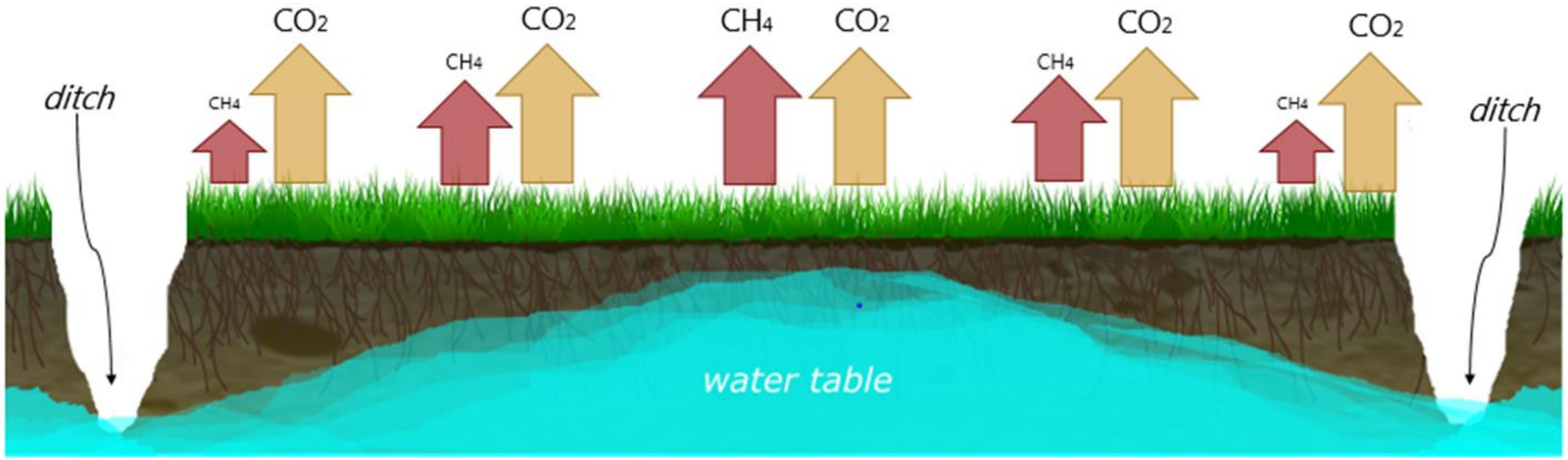




Figures depicts fluxes from the south site, with the left showing CO2 fluxes for each chamber, and figure to the right showing CH4 fluxes for each chamber.

- CO_2 fluxes showed little spatial heterogeneity
- Observed a significant spatial pattern of higher fluxes of CH_4 in plots where the water table was closer to the surface
  - The driest plots, i.e. the edges of the drain ditches, showed the lowest CH_4 emissions
  - The North site, which had more ditches, showed lower CH4 fluxes than the South site
- Planned rewetting after two years of the project may lead to enhanced production and emission of CH_4 in the area
- N_2O emissions below the detection limit of the system indicating that CO_2 and CH_4 are the major components of the GHG budget

Discussion



- Increased rates of methanogenesis and CH4 emissions with increasing water table level could have a detrimental effect on the GHG budget if the site were to be rewetted.
- While CO2 is predicted to stay relatively unchanged with reintroduction of soil water, the increase in CH4 could lead to a negative effect on atmospheric methane.
- This should be considered for future land management planning of this site, as well as, similar artificially drained peatlands (Is it worth it for the financial and environmental costs?)