EGU2020-14053: BG3.21 Peatland management

Soil-atmosphere CO_2 and CH_4 fluxes in a nutrient-poor drained peatland forest in boreal Sweden

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Study background

- Between 1.5 and 2.0 million ha of natural peatlands in Sweden (and >15 million ha globally) have been drained for forestry purposes
- Concern over the potentially large greenhouse gas (GHG) emissions from these areas has raised interest in exploring alternative management strategies, e.g. rewetting

Main research questions

- What is the GHG sink-source strength of a nutrient-poor drained peatland forest in boreal Sweden?
- What is the contribution of the individual component fluxes?
- What is the GHG mitigation potential of peatland rewetting practices?

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Methods and site description

Trollberget drained peatland forest
Drained ~100 years ago, moderately sparse cover of Scots pine, soil C:N ~45, WTL ~-25cm

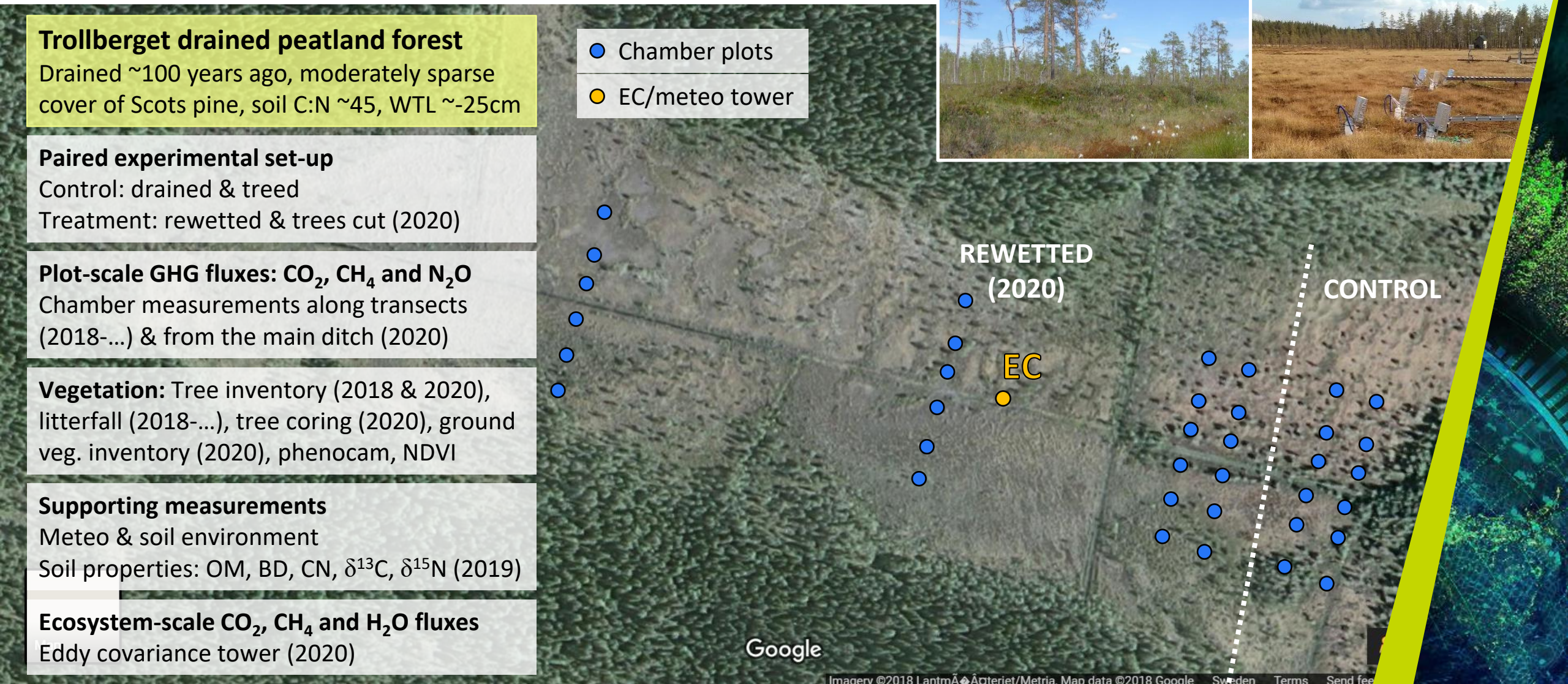
Paired experimental set-up
Control: drained & treed
Treatment: rewetted & trees cut (2020)

Plot-scale GHG fluxes: CO_2, CH_4 and N_2O
Chamber measurements along transects (2018-…) & from the main ditch (2020)

Vegetation: Tree inventory (2018 & 2020), litterfall (2018-…), tree coring (2020), ground veg. inventory (2020), phenocam, NDVI

Supporting measurements
Meteo & soil environment
Soil properties: OM, BD, CN, $\delta^{13}C$, $\delta^{15}N$ (2019)

Ecosystem-scale CO_2, CH_4 and H_2O fluxes
Eddy covariance tower (2020)



Results

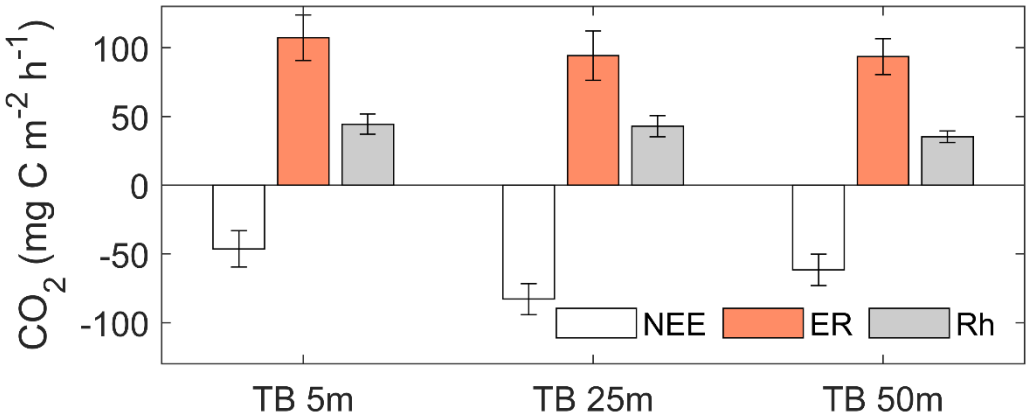


Fig 1. Daytime net CO_2 exchange (NEE), ecosystem and heterotrophic respiration (ER, Rh) at the drained Trollberget peatland forest (TB) for the 3 ditch distances

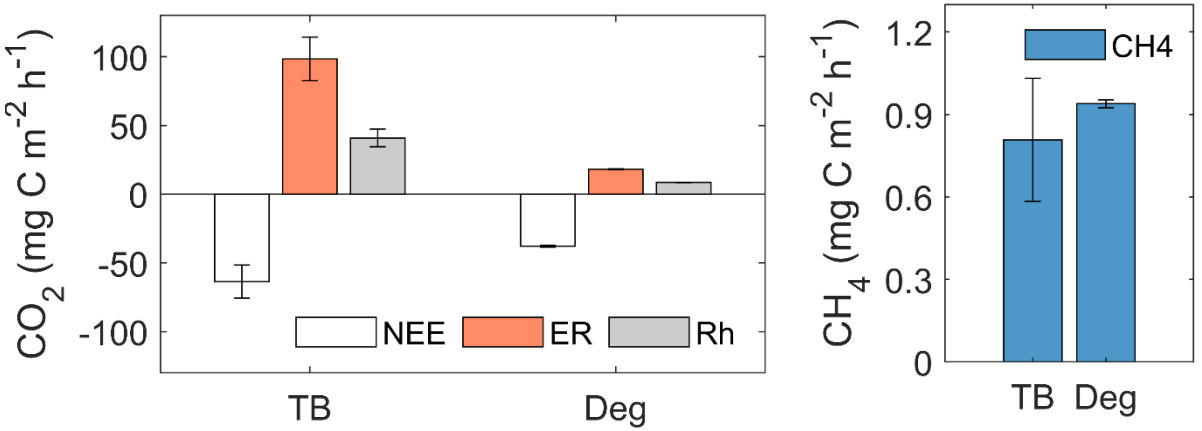


Fig 2. Comparison between the daytime fluxes of NEE, ER, Rh and methane (CH_4) at the drained Trollberget peatland forest (TB) and the natural Degerö mire (Deg)

Take home messages & Discussion points

- No clear ditch distance effect at the drained TB site but daytime net CO_2 uptake greatest at 25m distance – additional site properties masking ditch distance effects?
- Daytime net CO_2 uptake and respiration fluxes greater at the drained TB site compared to the natural mire (Deg) – preliminary modeling analysis suggests a close-to-zero annual GHG balance at TB
- Drainage increases the component fluxes, i.e. enhances the rate of C cycling – how will rewetting affect the GHG dynamics and balances?

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