Geophysical Research Abstracts
Vol. 21, EGU2019-15976, 2019
EGU General Assembly 2019
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Fluxes of methane from Norway spruce stems and canopy in hemi-boreal peatland forest

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Recent studies have demonstrated that trees play a role in methane (CH_4) dynamics of forest ecosystems by emitting CH_4 through tree stems and possibly from the canopy. Boreal forests are traditionally considered as a net sink of atmospheric CH_4 due to the high methanothrophic activity within the aerobic soil layers. Trees as a potential source of CH_4 raise the question whether CH_4 dynamics of boreal forests is understood well enough and if trees should be accounted into CH_4 budgets. In this study we evaluate stem and shoot CH_4 fluxes of Norway spruce (*Picea abies*), one of the most dominant evergreen tree species in the boreal vegetation zone.

We measured CH_4 fluxes from tree stems, shoots and forest soil by using closed chamber method with a portable greenhouse gas analyser. Measurements were conducted during summer 2018 (2.6. – 13.6. & 25.7. – 5.8.) in a forestry drained peatland site located at Skogaryd research catchment, southern Sweden (hemi-boreal, 58˚23'N, 12˚09'E). Tree stem chambers were installed on the base of ten Norway spruce tree stems *c.* 30 cm above the soil surface. Five of the selected trees had stem chambers installed also in the vertical profile of the stem to study the difference of CH_4 flux rate according to the stem height. Nine manual soil chambers were used to measure CH_4 fluxes from soil. The sample trees and soil chambers were oriented to form a gradient in relation to the main ditch of the peatland. This was done to study the effect of soil water conditions (e.g. water table level) on CH_4 fluxes from the trees or soil surface. Methane fluxes from the shoots were measured from 10–18 m height of three sample trees. Water table level, soil redox potential, soil CH_4 gas concentrations, temperature of air and soil were monitored throughout the season. Photosynthetically active radiation was measured simultaneously with the shoot CH_4 flux measurements.

The growing season in 2018 was extremely dry and led to significantly decreased water table level during the measurement period. Preliminary results from the flux measurements show low net emissions of CH_4 from the tree stems while soil and shoots showed mostly negative CH_4 flux. Observation of negative shoot fluxes creates contrast to other field studies. The results did not show clear dynamic in CH_4 fluxes from different soil and tree stem locations in relation to main ditch on the site.