Project acronym: QCEE

Project title: Quantifying Components of Energy Exchange in a composite boreal landscape

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Discipline: Earth Sciences & Environment: Global change & Climate observation

Station(s): Oulanka Research Station (Finland)

This research was conducted at the newly established energy exchange tower sites close to the Oulanka station. We were testing and conducting manual measurements at these sites and are now handling data from them. Some cross-calibrations have been made manually and was done on site or at the station.

As a companion project to the BEFLUX the energy exchange and eddy covariance measurements were also established in October 2020. These measurements has been ongoing since and evaluation of a full year of data will be available soon. This will support the modeling efforts detailed in the BEFLUX part. The preliminary runs quoted below will be much improved in the coming months with the use of the energy and flux data from the micrometeorological measurements initiated by QCEE during the October 2020 stay.

During our stay at Oulanka RS in October 2020 we set up and tested several initial process-based model runs. Preliminary outputs from SPA and TECO can be found in Figure 1 and 2, respectively. These model runs have been set using the very same model parameterization applied for Nuuk-Kobbefjord (López-Blanco et al., 2018 | JGR).

Figure 1.Preliminary modelled NEE, GPP and Reco for the 2019-2020 period in Puukkosuo fen.

Figure 2. Preliminary modelled CH4 (including diffusion, ebullition and plant mediated pathways) for the 2019-2020 period in Puukkosuo fen (right figure) and for the 2011-2015 period in Nuuk-Kobbefjord fen (left figure).

Overall, the model suggests that Puukkosuo fen is a year-round net C sink (dominated by photosynthesis over respiration):

Year	NEE (gC m-2 y-1)	GPP (gC m-2 y-1)	Reco (gC m-2 y-1)
2019	-49	-229	180
2020	-31	-216	185

We expect that Puukkosuo stores more carbon and nitrogen (see e.g. Palmer and Horn, 2015) than Kobbefjord, therefore our guess according to these preliminary results is that SPA underestimates both NEE of CO2, but also CH4. In other words, we hypothesize an intensified C sink strength (of NEE) and larger CH4 emissions in Puukkosuo fen. Therefore, an extension of in-situ measurements from the eddy covariance and manual chamber systems deployed in 2020 will help us tackle these uncertainties.