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Supplement of

CO_2 and CH_4 exchanges between moist moss tundra and atmosphere on Kapp Linné, Svalbard

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Contents of this file

The information provided here is aimed at giving the reader a better overview of the measurement location and with some pictures of the used equipment and vegetation in the chamber frames. The estimated greenness index (GI) for each chamber frame is specified in the legend of the figures S4a-y. It also contains a comparison of the diurnal course of NEE during August using the Wutzler et al. (2018) gap filling of EC data and the corresponding diurnal course estimated by modelling.

Figure S1. Left: Overview of the Svalbard archipelago showing the location of Kapp Linné (red dot) at the mouth of the Isfjord. Right: The eddy covariance system at the measurement site.

Figure S2. Left: Detail of the soil efflux chamber for CO_2 and CH_4 measurements. Right: Overview of the chamber system with frame, chamber, gas analyser, power supply and laptop.

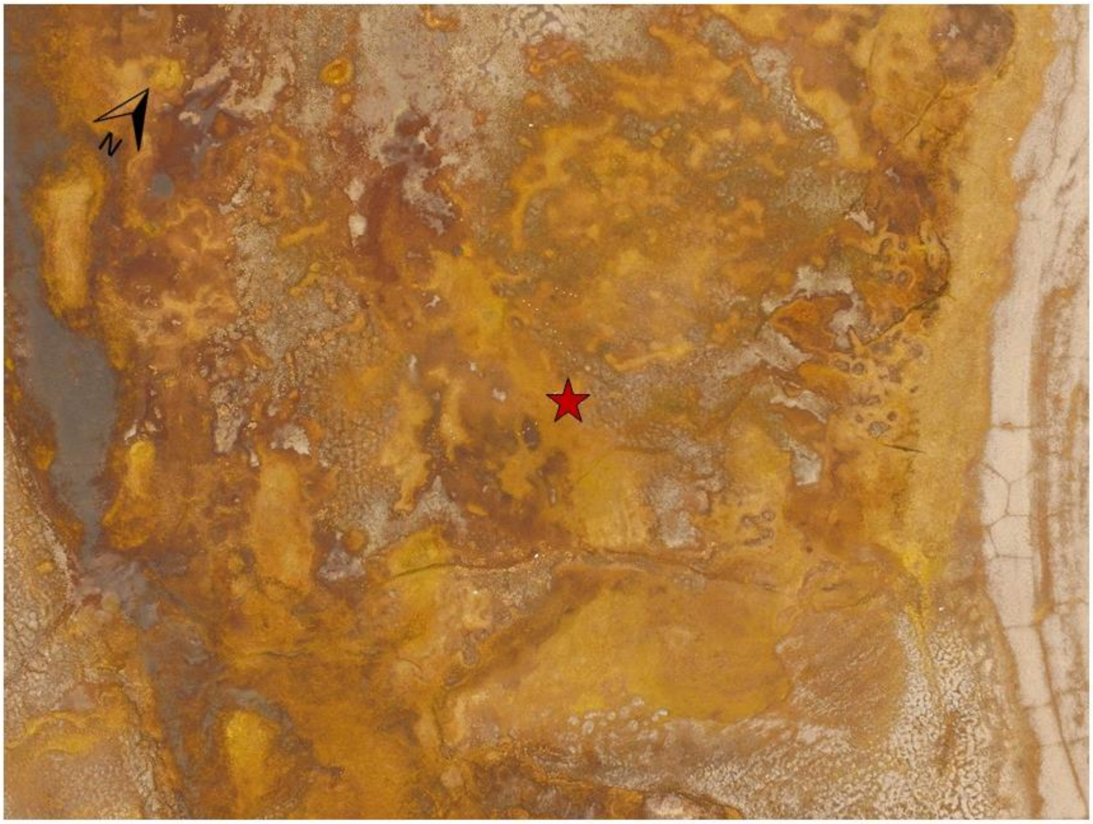

Figure S3. Overview of the moss tundra study site. The location of the eddy covariance system is marked by the red star. The whole area is ca 5 ha in size.

Figure S4a. Picture of vegetation in chamber frame (Frame N1:1; GI=0.334) that was used to estimate the greenness index, GI. The following pictures (Fig. S4b-S4y) are showing vegetation for the remaining 23 frames.

Figure S4b. Frame N1:2. GI=0.336

Figure S4c. Frame N1:3. GI=0.333

Figure S4d. Frame N1:4. GI=0.345

Figure S4e. Frame N2:1. GI=0.350

Figure S4f. Frame N2:2. GI=0.369

Figure S4g. Frame N2:3. GI=0.343

Figure S4h. Frame N2:4. GI=0.347

Figure S4i. Frame N3:1. GI=0.334

Figure S4j. Frame N3:2. GI=0.323

Figure S4k. Frame N3:3. GI=0.335

Figure S4l. Frame N3:4. GI=0.336

Figure S4m. Frame S1:1. GI=0.326

Figure S4n. Frame S1:2. GI=0.316

Figure S4o. Frame S1:3. GI=0.319

Figure S4p. Frame S1:4. GI=0.337

Figure S4q. Frame S2:1. GI=0.354

Figure S4r. Frame S2:2. GI=0.348

Figure S4s. Frame S2:3. GI=0.351

Figure S4t. Frame S2:4. GI=0.353

Figure S4u. Frame S3:1. GI=0.342

Figure S4v. Frame S3:2. GI=0.340

Figure S4x. Frame S3:3. GI=0.339

Figure S4y. Frame S3:4. GI=0.338

Gap filling vs modelling

The gap filling of the EC data was made according to Wutzler et al. (2018) using the well-known online tool REddyProc. The ecosystem respiration was modelled by the Lloyd & Taylor (1994) model:

$$R_{eco} = a \cdot e^{b\left(\frac{1}{56.02} - \frac{1}{T_a + 46.02}\right)} \quad \text{(S1)}$$

with parameters fitted to the dark chamber measured fluxes (Fig. 6). The gross primary productivity was modelled with a light response function:

$$GPP_m = c1 + c2 \cdot c3/(c2 + R_g) \quad \text{(S2)}$$

With parameters fitted to the measured EC data (Fig. 7) and adjusted for the offset at zero global radiation. The modelled NEE was calculated as:

$$NEE_m = R_{eco} + GPP_m \quad \text{(S3)}$$

The shape of the two diurnal curves are very similar, though with a tendency to slightly higher NEE during nighttime. However, error bars are overlapping so conclusion is that there are no significant differences between the two curves.

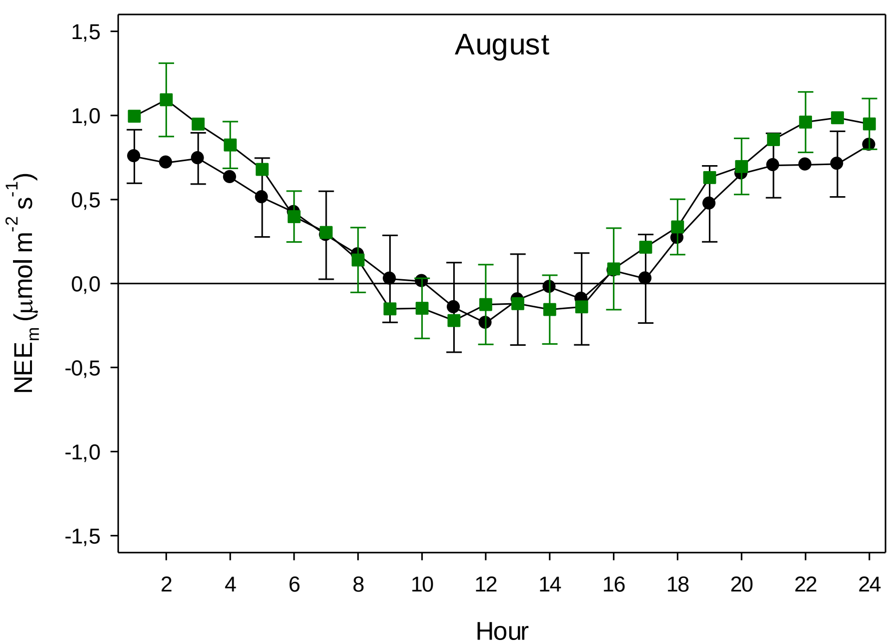

Fig. S5. The diurnal course of NEE during August. The black symbols are gap filled data and green are modelled ones. Only every second error bar (95% confidence interval) are shown for clarity.