Supplement of CO₂ and CH₄ exchanges between moist moss tundra and atmosphere on Kapp Linné, Svalbard

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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 S4. 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:

\[ R_{\text{eco}} = a \cdot e^{b(\frac{1}{T_0.02} - \frac{1}{T_a+4.602})} \]  

(S1)

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

\[ GPP_m = c_1 + c_2 \cdot c_3 / (c_2 + R_g) \]  

(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:

\[ NEE_m = R_{\text{eco}} + GPP_m \]  

(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.