We sincerely thank the reviewer for the comments, which helped us to substantially improve our manuscript. Please find the comments (black) and our reply (green) below.

The manuscript by Eckhardt et al., reports one growing season of CO2 flux data, not only NEE but its components GPP, RA, and RH, and their controlling factors in Lena Delta, Russia. It is extremely difficult to measure flux in such a remote area like Siberia and the result of this study will be highly valuable to flux community. Especially, measurement of in situ RA and RH is very rare especially in the Arctic region and this will be of great interest to readers of Biogeosciences. The manuscript is generally in good shape but several aspects should be addressed for the publication.

Comments:

Paragraph starting #78: warming effects on flux components are described in this paragraph but warming is not one of the main topics of this manuscript, e.g. warming manipulation experiment. Thus, it does not seem appropriate for introduction but rather for discussion that the results of this study imply xyz in the warming scenario.

Thank you for this comment. The introduction was substantially revised focusing rather on hydrology effects on CO_2 fluxes, which are actually reported in the current manuscript (see also comments of reviewer #2). However, warming effects are still considered in the introduction since they also affect changes in hydrology, e.g. through permafrost thaw.

Line #82-4: if GEP is less sensitive to temperature than Reco, carbon sink capacity will not be affected much by temperature instead of being reduced. Or carbon storage will be reduced because of a larger amount of C emission than C uptake. Please rephrase it.

We agree, the wording is misleading here. We have revised 'carbon sink capacity' to 'carbon storage'.

Paragraph starting #186: continuous regrowth of plants implies living roots and remaining RA in the measured RH. In addition, if some roots are dying after aboveground plant biomass is removed, can they add nutrients to soils and overestimate RH? It is written that there was no significant increase in RH, but continuous and slow decay of remaining roots may affect RH. Also, was there any difference in the plant regrowth rate between the center and the rim? If so, will they affect the results?

We addressed this question with different approaches. The continuous re-growth of plants implies living roots and remaining R_A in the measured flux which we define as R_H. However, we expect minor effects of additional decay of dead roots and release of nutrients to the measured respiration fluxes. There was only a very sparse re-growth of plants at the measurement plots where we have removed the photosynthetic active biomass, so we assume that it was negligible for the flux measurements. We also haven't seen any differences in the amount of plant re-growth between rim and center plots. It is possible that nutrients were released to the soil due to dying roots and that the decay of dead roots lead to an overestimation of R_H fluxes. However, we have removed the biomass from plots in 2014 and from other plots in 2015 to see if there are effects due to dying roots and nutrient addition (see response to reviewer #2). A Student's t-test revealed no significant differences between plots that were manipulated in 2014 and 2015. The lack in a significant difference between R_H in the plots clipped in 2014 and 2015 means that either no significant amounts of CO_2 from root biomass contribute to CO_2 fluxes or that the CO_2 release from decaying roots does not diminish over the period of one year, which seems unlikely. A lack of CO_2 release from the clipped root biomass is also *supported by a study of Biasi et al. (2014) who have compared the same partitioning approach with a non-disturbing ^{14}C partitioning approach and found no significant differences in the measured R_H fluxes between the two approaches.*

Paragraphs starting #227: when modeling fluxes (Reco, RH, and GPP), some constants (Q10, _) were adopted from EC data. One of the purposes of this research is to capture flux signals in microsite scale which EC cannot capture, and using constants from EC data that contain a mixture of polygon centers and rims may decrease model fit. Have you tried estimating Q10 and _ with chamber flux data? It seems plausible to estimate those values considering the number of data points.

We have tried intensively to run the models with solely chamber flux data as we also wanted to determine individual constants for polygon rim and center. However, parameter estimation during the fitting did not converge to reasonable values for Q_{10} when the fitting was made solely with chamber flux data (see response to reviewer #1). We attribute these findings to the relatively low number of samples available for fitting. Therefore, we have decided to run the models with site-specific constants obtained from EC data.

Line #308-44: what are the average values of NEE, Reco, GPP, and RH at the two microsites and how much are those differences? These will be more important than the highest and the lowest values, which took about half of this section space.

Thank you for this comment. We have substantially revised this section and decided, to forgo to show specific values of chamber fluxes (see response to reviewer #2). Instead, the differences between the microsites and the seasonality of the single fluxes were highlighted.

Line #325: RH seems correlated with Reco, but no seasonal trend in RH was observed? At least RH in the center seems to have seasonality in Figure 5. - Results of environmental controls on each flux component is not described. Please add which environmental factors did or did not affect flux components, which is one of the main objectives of this study.

There might be a slight seasonal trend of R_{eco} fluxes at the polygon rim, which may be also seen in the R_H fluxes from this microsite (see Fig. 5). However, at the polygon center no seasonality is seen for R_H fluxes (open symbols in panel d of Fig. 5 in original manuscript). We also expected a trend in the contribution of R_H on R_{eco} due to plant senescence and root mortality at the end of the growing season. However, neither at the rim nor at the center a seasonal trend of this contribution was observed. This is in contrast to the study from Segal and Sullivan (2014) where the contribution of R_H increased towards the end of the growing season, most likely due to deepening of the active layer which increases substrate availability for R_H production processes. This effect might be missed in this study because of smaller changes in thaw depth as well as lower soil temperatures throughout the growing season at the study site compared to other arctic tundra sites and due to a too short investigation period. The main environmental drivers of the CO_2 fluxes are PAR for GPP fluxes and the temperature for respiration fluxes (see Fig. 6 & 7 in revised manuscript). Furthermore, the hydrology is a main driver of the respiration fluxes, especially R_{eco} and R_A fluxes (see panel a & d of Fig. 4 in revised manuscript). These relationships have been shown with the good fitting of the flux models.

Paragraph starting #431: when discussing magnitude of fluxes and their explanatory factors, be more specific if the difference is between Arctic ecosystems and other ecosystems in the lower latitudes, or between this study site and other sites in the Arctic.

We have revised this paragraph accordingly and clarified, which ecosystems are compared.

Line #454: NEE ! Reco? The following sentences are describing Reco and RH. In the separate paragraph, the combined effects of GPP and Reco/RH can be described for NEE. -Environmental controls on RA is not discussed.

Thank you for this comment. We have changed NEE into R_{eco}, which is the right term here. The combined effects are discussed, as suggested, in a separate paragraph. The environmental controls of R_A fluxes are also discussed, but later in section 5.3.

Cited literature:

Biasi, C., Jokinen, S., Marushchak, M. E., Hämäläinen, K., Trubnikova, T., Oinonen, M., and Martikainen, P. J.: Microbial Respiration in Arctic Upland and Peat Soils as a Source of Atmospheric Carbon Dioxide, Ecosystems, 17, 112-126, 2014.

Segal, A. D. and Sullivan, P. F.: Identifying the sources and uncertainties of ecosystem respiration in Arctic tussock tundra, Biogeochemistry, 121, 489-503, 2014.