Interactive comment on "Vegetation Influence and Environmental Controls on Greenhouse Gas Fluxes from a Drained Thermokarst Lake in the Western Canadian Arctic" *by* June Skeeter et al.

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General comments

The paper "Vegetation Influence and Environmental Controls on Greenhouse Gas Fluxes from a Drained Thermokarst Lake in the Western Canadian Arctic" by June Skeeter et al. reports CO_2 and CH_4 flux measurements from a permafrost tundra site in Western Canada. Eddy covariance and chamber flux measurements were taken during the growing season 2016, and analysed accounting for the spatial variability of vegetation cover. Statistical gap-filling and an analysis of the environmental controls of the fluxes is performed using artificial neural networks. I think the chosen methods are

properly applied and explained. The results are presented clearly and the conclusions are supported by the results. Also, the paper is very well written.

Given the remote and rather special site location, this study should be very valuable for the arctic carbon flux community. As the flux time series collected in your study may be used and referred to in future studies, it would be nice if you could present the time series in a more raw format than you do in Figure 2. For example, a plot of the 30-minute flux time series would help to understand the character of the data. This is also relevant, because I guess the performance and output of your NNs could be susceptible to noise or outliers in the EC time series. Also, several of your results (cf. Line 221 and Line 342) are based on extrapolations into parts of the parameter space where the flux response could be governed by processed not captured in your NNs. Perhaps these statistical uncertainties could be discussed.

I understand there is little research from DTLB sites, but it would be good in your discussion to relate your findings to those from other tundra sites with (and without) thermokarst. In this discussion, it would be good to elaborate further on the peculiarities of the artificial draining performed at your site. Given the title of this paper, readers will probably expect more of these aspects discussed.

Specific comments

Line 16: "During the study period". Please be more specific here, because the up-scaled average fluxes you mention in lines 18 and 20/21 don't tell much if you don't know the study period.

Line 24: Your abstract lacks a broader conclusion

Line 100: Could the grazing have a measurable effect on e.g. NEE? It could be a point to add to your discussion.

Line 116: You discarded a sector because its flow could be disturbed by the tower. But did you see this effect in any of your quality checks? Maybe it's not necessary to

discard this data.

Line 146: Maybe be more specific about the Python modules you used, otherwise this sentence adds very little to the understanding of your analysis.

Line 182: Shouldn't there be five times more vials than flux estimates, if you used 5 gas samples per flux measurement?

Line 292: "Random forest regression tree". Did you use only one decision tree, or the ensemble mean of several?

Line 296: Maybe refer to an equation defining alpha.

Technical corrections

Line 75: Did you really mean 100 m, or maybe km?

Lines 302/303: Pa, with a capital P

Line 310: "both"?

Please check and correct the names of your references in the text, as several have spelling mistakes ("Whalen and Reedburgh", "Merbould", "Meyer-Smith")

Figure 3b: Can you add a little bit of horizontal white space between the the Sedge plot and the rest? I think this could prevent confusion and make it clear that the y-axis for this box has a different scale

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