9 August 2017

Dear Dr. Subke,

Thank you for your helpful comments and edits. Please find our responses below in italics following your comments and on the attached revised manuscript, which has this last round of edits tracked. Please let me know if additional changes are needed. Thank you for your time.

Sincerely,
Sue Natali

Responses to editor's comments:
I have a remaining issue that has to be clarified before this is publishable (also raised by referee 2). There is some circularity in arguing that vegetation and/or moisture drive belowground C stores, as these parameters are all linked. Correlations are not clearly supported statistically (please see my comments on lines 327/328 below), and you should discuss more carefully the possibility that explaining soil C stores by vegetation and moisture alone is likely to be simplistic.
We clarified the discussion regarding the patterns of soil C storage and its relationship to soil moisture and vegetation, and adjusted text throughout to clarify that these environmental variables are interconnected and that soil C is not likely a simple function of a single environmental control or a single directional effect.

264-266: I can't see how you can apply a parametric test with a sample size of 1. Using depth increments within 1 m sections is at best pseudo replication, and not a robust method to determine soil parameters, when true replication is n=1 per soil type. Your figure 5 shows no error bars (which is I think correct), but you can't present differences between these two profiles as either statistically significantly different or not.
We agree. We have removed the statistical comparison from the manuscript. Text was deleted from the methods and from the results.

305: Remove space after commas within figures for tree biomass.
Done.

307: Do you mean "mostly highly correlated", or "showed the highest (or best?) correlation"?
Corrected to read: "showed the highest correlation".

327/328: There is a tendency to treat significant correlation between scalars as explanatory variables (distinction of correlation an causation). Here, you suggest that moss and lichen cover "control" soil C content in the top 10 cm, even though the causal link is not clear. It's possible that soil moisture influences both

parameters creating the observed correlation without a direct dependence of these on one another. I also miss an indication of whether the correlations with moisture and moss/lichen cover were significant. Table S3 gives parameter values, but no statistical significance. From Figure 4, it looks as though any correlation would be weak. This is a central point in your results, and has to be supported robustly by statistics. If the correlation is weak (or indeed not significant), then you can not make some of the statements (including in the abstract).

We changed these lines to read: "The distribution of soil C density in the top 10 cm was best explained by soil moisture, percent moss, and percent lichen cover", which more accurately reflects the statistical analysis and results. We didn't originally include the p-values because we felt that in the mixed model analysis that was conducted, p values were not as meaningful to report as the best fitting model, which was selected through robust model selection. That said, we understand that p-values will clarify the results, and we have added them to the supplemental table (which was Table S3, but now is S2 because I adjusted to follow the order of the text).

357: You described belowground C pools (to 1 m) as representing 92% of C pools; aboveground C pools should hence represent 8%, not 9%. I know it's a small (and statistically probably not significant) difference, but for consistency I think these figures should match.

Corrected.

Figure 3: Indicate in the figure caption that thaw depth was measured in July/August.

Done.

Table 4: Should the unit for C in permafrost cores not be kg C m-3?

Yes, thank you for catching that mistake.

Supplement tables are not well formatted. Please remove horizontal and vertical lines as appropriate. Some lines to separate e.g. sites (or possible cores within sites) are ok.

These have been reformatted. I also added another Supplemental table (S5) with the data from the 15-m-deep cores; we previously had only included data from the 1-m cores.