

## ***Interactive comment on “Variability in Above and Belowground Carbon Stocks in a Siberian Larch Watershed” by Elizabeth E. Webb et al.***

### **Anonymous Referee #2**

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This article by Webb and colleagues provides insights in the above and belowground carbon storage at a site in Far East Russia. The site is forested with larch stands and located on Yedomá. The authors present interesting data and find a high variability in C stocks, which they attribute primarily to variations in vegetation.

Overall this is a well written manuscript and there is no doubt that the authors have done a good job at in the writing process. The amount of carbon stored in permafrost regions is an important topic and valuable field data as presented in this article (contrasting above and belowground C stocks) deserves more attention.

The weak points in the manuscript are in my opinion a somewhat confusing sampling scheme or its description, and an underdeveloped discussion that does not challenge the perspective of the authors. In particular, the authors see vegetation as a primary

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driver for total C storage, despite the fact that the vast majority of the C is stored in soil and moisture is identified as a major driver of C stocks. To round up the discussion, the authors should also consider that vegetation is merely a reaction to ground conditions and soil forming processes or topographic drivers. Further there is clearly a bias towards the description of vegetation analysis, while the description of the soil sampling and the discussion on soil related aspects is underdeveloped. Please rewrite the sampling description and/or provide a graph outlining the sampling procedure. This is important, because the C variability is one of your major conclusions.

Minor comments:

L 22 What is snag?

L 23- 24 rephrase

L 45 – 50 How about thermokarst?

L 58 See also Vitharana et al. (2017) AGU:bgs

L 63 – 65 What do you mean by high resolution sampling and what does this have to do with circumpolar estimates? Also, Walter Anthony et al. (2014) is a paper on thermokarst lake deposits and C accumulation over the Holocene and has nothing to do with soil.

L 70 Yedoma is a sedimentological Suite and not soil, or do you mean the soil developed on top of these Yedoma deposits?

L 72 25m: clearly you cite a number that in Tarnocai et al. 1999 is cited as Zimov et al. 2006 → then cite Zimov et al 2006, or find a more up-to-date number

Section 2.2

I am sorry, but this section is a bit confusing.

Add reference to Fig 1.

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Did you sample random? If not, then please justify why not and how this could be a bias in your study.

L 142 what is the logic behind this? Please explain.

L 145 – 147 Please rewrite and provide a figure that explains your sampling scheme.

Section 2.3 what is the motivation for this?

L 171 Did you correct your allometric functions for reduced C content in decomposed dead trees? (see for instance Smith et al 2003 GTR report:Forest volume-to-biomass models ...)

L 193 Are these values also valid for Larch trees?

L 218 What soil types did you encounter? How did you select the sampling location with regard to microtopography. Did you have hummocks in the soil? See also Ping (2013) Soil Horiz.

L 213 Please provide more precise constraining dates for the active layer thickness

L 222 again, it is very unclear how you sampled this and how many samples and soil profiles go into one site. This is important to be clarified because an important part of your discussion and your conclusions are based on the variability of these values. What do you mean by 6 samples one at each end of a transect?

L 224 If you only collected the top 10 cm of mineral soil you have a bias towards C enriched upper soil. This can be problematic if you interpolated to deeper depths. If this is the case, please discuss this and outline potential impacts on your statistics.

L 239 Which guidelines did you follow for this?

L 297 and 301 Please use the same units for masses throughout the article. I suggest kg C m<sup>-2</sup>

L 304 what could this variability be related to?

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L 319 Do you mean you started sampling at 0 cm from the top to 10 cm depth or the top 10 cm of the mineral soil?

L 352 I don't see this.

L 406 Also have a look at Siewert et al (2015) AGU:bgs for a comparable study to yours.

L 407 What explains this high variation in your case?

L 420 Please mention that Yakutia spans over a large area with many ecosystem types.

L 428 again, Yedoma is not a soil type

L 448 What do you mean by geophysical controls? You should also discuss these and support your discussions with literature as you did for vegetation related dynamics.

L 459 Please also consider the notion that moist sites support more vegetation that is more productive and stores more C, rather than vegetation driven differences in moisture and thus C

L 471 related -to- stand age

Fig 2: Organic Layer stocks would also be interesting

Table 4 What do you mean by soil classification? Mineral or organic? Or soil type (Podsol, etc...)

Please use the same units thorough the paper! Here it is g Cm <sup>-2</sup> before it was kg cm<sup>-2</sup>

Why is the standard error the same for both columns of the permafrost cores? Are the permafrost cores also including the active layer?

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