

Interactive comment on “Low soil organic carbon storage in a subarctic alpine permafrost environment” by M. Fuchs et al.

Anonymous Referee #1

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This article discusses the soil organic carbon storage of an alpine site in northern Sweden. This research is important in that few alpine SOC assessments have been done and our understanding of circumpolar arctic SOC storage is lacking in alpine regions. It is a well-written paper with nicely composed graphics and tables. With a few modifications and clarifications, it will make an excellent contribution to the literature on arctic SOC storage.

Page 3497 lines 24-26: were these samples collected from the pit face (horizontal sampling) or vertically? Was soil of uniform nature (sans cryoturbation) such that one sample per 5-10cm was sufficient to capture any variation? What horizonation is present?

Page 3498: Are your LCC based on a standard class scheme used by others? Define how you came up with the 9 classes.

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Page 3499 lines 20-22: Again it looks like you are assuming carbon uniformity for each depth sample. Is that the case? You should note to the reader the degree (qualitative) of cryoturbation (or lack of) so that you are not over/underestimating SOC storage at each site. If you have patterned ground at the surface, you likely have visible cryoturbation in the subsurface which complicates quantification. Was it simply visually assessed? You note something to this affect in the abstract (absence of cryoturbation), but it would be worth noting again in the main body (methods). I do see note of it again on 3503 lines 4-6, but would love clarification of this earlier in the main body.

Page 3502 lines 6-8: “This low SOC storage is a result of the large percentage of bare rock and stones, which cover almost 60 % in the study area.” Are you stating that the low subsurface SOC storage is a result of high surface rock coverage? While this may be true (i.e. current lack of carbon-containing plants), it is jumping to a conclusion a bit too soon in the paper. Save that for the discussion after you have provided more detailed data. Older carbon from older plants could still be there even with current surface rock coverage (we don’t know the contrary yet at this point in the paper).

Page 3502 lines 21-22. The within class SOC variability seems important here. Can you expand on it? What are some of the possible reasons for it if cryoturbation is not a factor?

Page 3504 line 5-10. In future studies I would recommend doing radiocarbon dating also on deeper soils even if they don’t have thick organic-rich surface horizons.

Page 3507 line 17: “More abundant stone cover” than what? Important to clarify this.

Page 3507 lines 19-21: While shallow soils might accumulate less SOC than a deeper profile, it is not necessarily the primary (or secondary) cause of low overall SOC storage (some shallow peat soils have very high SOC storage). I would move the cryoturbation statement (line 20-21) in front of the shallow soil statement to indicate the greater importance of cryoturbation in potentially burying carbon (rather than its third place position (currently) which feels a bit of an afterthought.)

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Figure 1. Hard to distinguish between the shades of gray in sand/gravel and stones category.

Figure 2. Use of X to indicate area coverage of each class is a bit awkward. I wonder if the percentage written as text above each column would be better.

Supplement Fig 1. Color classes difficult to distinguish between. Suggest user selected color classes rather than software default color palette.

Table S1: Nice to show what the surface cover looks like, but I would love to see a representative subsurface (pit profile) from each class too. Visual evidence to show that there is a lack of cryoturbation.

Interactive comment on The Cryosphere Discuss., 8, 3493, 2014.