

Biogeosciences Discuss., author comment AC3
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Reply on RC3

Niel Verbrigghe et al.

Author comment on "Soil carbon loss in warmed subarctic grasslands is rapid and restricted to topsoil" by Niel Verbrigghe et al., Biogeosciences Discuss.,
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This manuscript represents a well-planned and well thought study of soil warming on the SOC changes in both "topsoils and subsoils" in Andosols in Iceland. The field study and sampling scheme are well organized, and methods of analysis are clearly described. The interpretations of the results are reasonable. This study would certainly contribute to global models to accurately project future SOC stocks for Andosols in similar climate regimes.

Thus, I would recommend this manuscript be accepted with very minor revisions.

As the authors mentioned at the end of the abstract that "for this soils type and should be investigated for soils with other mineralogy". I cannot agree anymore. But as a pedologist, I like to point out that from the information provided in the manuscript, the "topsoil" (I prefer to call it the surface horizon) is an A horizon, and the 10-30 cm is more likely a Bw horizon. In the A horizon, the dominant process is biochemical (breakdown decomposition of raw organic matter such as fine roots) whereas in the subsurface horizon is biogeochemical weathering. If this Andosol is moderately or highly weathered, then the clay mineralogy is dominated by allophanic or poorly crystallized clay minerals. This fraction usually forms strong bounding with colloidal organic compound. The authors cited Lin et al. work that was conducted in a subtropic forest. Please note that the soil profile arrangement of the grassland and the forest is different. In the forest soil, there is an organic horizon with different degree of decomposition. Then beneath the O horizon there is usually an eluvial horizon (E horizon, surface mineral horizon) and the roots in this horizon are usually dominated by coarse (big) and medium roots. The fine roots are distributed in the subsoils, or B horizon). So, the results from a grassland soil may not well applied to a forest soil. When you say "soils with other mineralogy", you actually mean non-Andosols; soils not formed from tephra. Most grass land soils in the temperate and cold temperate and subarctic regions are formed in loess with mixed mineralogy.

We thank the reviewer for the positive feedback on our manuscript, and for the valuable input to the discussion on soil mineralogy and pedology of the investigated soil.

L. 42. "The soil type on both study sites is Andosol". Suggest revising as "Soils

on both study sites are classified as Andosols according to World Reference Base (WRB):

IUSS Working Group WRB. 2015. World Reference Base for Soil Resources 2014, update 2015 International soil classification system for naming soils and creating legends for soil maps. World Soil Resources Reports No. 106. FAO, Rome

We thank the reviewer for the suggestion. The phrasing and citation were edited accordingly.

L. 258. Capitalize: Soil Survey Staff, 1999, Soil Taxonomy. Soil Taxonomy has been updated. See the 2014 version. But, where was this publication cited in the manuscript?

We thank the reviewer for the suggestion. The most recent version published on the USDA website (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/taxonomy/?cid=nrcs142p2_053577) is the one we cited and we extracted the Andosol coverage of 0.8 % from. The most recent version of the 'Keys to soil taxonomy', which unfortunately does not indicate a coverage of Andosols, was indeed published in 2014.

The citation was edited according to the reviewer's suggestion and to the guidelines on the USDA website: "Soil Survey Staff: Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys., Natural Resources Conservation Service. U.S. Department of Agriculture, 2nd edn., 1999."