

## ***Interactive comment on “Can C-Band SAR be used to estimate soil organic carbon storage in tundra?” by Annett Bartsch et al.***

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We would like to thank referee #2 for the valuable comments.

On panarctic scale the method and dataset created currently provides in the first place a means to assess the consistency of maps from conventional sources (soil maps). In order to produce a reliable panarctic-map which fully accounts for peat, a combination with other sources (e.g. NCSCD) is required. To use the current version, areas with high SOC content (e.g.  $>35 \text{ kg/m}^2$  for 100cm) should be masked (replaced with other estimates if available). This version will be therefore made available together with a flag (based on NCSCD) which can be used for that. For future studies, we propose in addition a fusion with other land cover information (especially peatland extent from remotely sensed data to spatially confine the high SOC area better). This requires a

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reliable circumpolar peatland map, which is to date not yet available.

Figure 2: Many thanks for pointing this out. The length of the arrows represents indeed the backscatter intensity. A higher number of arrows is used when the signal interaction is more complex, when scattering in different directions, with differing intensity occurs.

Choice of backscatter statistics: A mean value could be used in order to account for noise alone. There are however also other effects that need to be accounted for, especially snow related effects such the formation of ice layers due to rain on snow. They would increase the backscatter, but are not expected to be present in all years at that time of the year. The minimum backscatter value (from several years) is used in order to reduce the probability that they affect the backscatter dataset used for SOC retrieval.

Effect of shallow rivers: There is interaction of microwaves at the water – ice boundary of floating ice. If ice on water bodies is freezing to the ground, the backscatter mechanisms change and the backscatter intensity recorded at the sensor drops significantly. This has an effect on SOC retrieval in case of pixels which include very shallow water which is freezing to the bed already in early winter. At circumpolar scale, a river database at 1km like Hydro1k as suggested by the reviewer could be theoretically used for masking pixels which include river courses. The quality of Hydro1k is however in high latitudes rather low.

Figure 14: It corresponds to samples. They are much higher than in figure 9 since the used datasets have a better spatial resolution (more pixels).

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