



Spatial variability of soil organic carbon at different scales in West Greenland

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The soil organic carbon (SOC) pool of the Northern Hemisphere contains about half of the global SOC stored in soils. As the Arctic is exceptionally sensitive to global warming, permafrost-affected soils thaw to greater depth and might contribute to increasing greenhouse gas emissions progressively. To assess their overall impact on global warming in permafrost-affected regions the spatial variability of SOC stocks at different environmental scales is of great interest. However, sparse and unequally distributed soil data sets result in highly uncertain estimations of SOC stocks of the Northern Hemisphere and here particularly in Greenland. This study focuses on three environmental scales, (i) large (climate conditions at the coastal and at the ice margin area), (ii) intermediate (soil-landscape variation of different study areas), and (iii) local (vegetation cover and aspect at the sampling locations). On the large-scale level, the comparison between the coastal (SISI) and the ice margin area (RUSS) show similar results with SOC stocks of 7.90 kg m^{-2} from 0-25 cm and 17.57 kg m^{-2} from 0-100 cm. This is about 50 % higher compared to other predictions of SOC stocks in West Greenland. However, the SOC stocks vary greatly on the intermediate-scale level by about 40 % over different landscape units (LU). The influence of katabatic winds to the SOC stock distribution is connected to both LU on the intermediate-scale and to the aspect on the local scale level. On the local-scale level, SOC stocks of 0-25 cm are lowest at east facing locations (SISI: 4.54 kg m^{-2} ; RUSS: 4.95 kg m^{-2}) in both study areas. Southeast facing locations store 12.95 kg m^{-2} SOC in SISI which is more than twice than in RUSS (5.39 kg m^{-2}). In both study areas, SOC stocks are highest with tall shrub tundra (SISI 12.20 kg m^{-2} ; RUSS: 11.56 kg m^{-2}).