



## **Soil organic carbon stocks and physical fractions of soil organic matter in permafrost affected soils in West Greenland**

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The occurrence and the stocks of soil organic carbon in permafrost affected soils were underestimated for many years. Therefore, the gathered knowledge about soil organic carbon in periglacial arctic soils is little compared to the assumed dimension of the influence of carbon dynamics on global warming and global change. 59 soil samples were used to study the distribution of soil organic carbon (SOC) and the fractions of soil organic matter (SOM) to get a better understanding about SOC stocks, the depth function and spatial distribution of different fractions of SOM in permafrost affected soils.

The study area is situated in a valley in West Greenland near Kangerlussuaq (66°56'66.6" N; 50°05'32.4"W). The mean annual air temperature is about -5.7°C and the mean annual precipitation 149mm (1961 to 1990). More recent data show a higher average temperature and around 100mm higher precipitation. The valley is characterized by a high pedological variance mainly caused by the different aspect of hillslopes, the topographic position and the distance to the ice margin. These factors determine the active layer thickness in summer which again influences soil formation and vegetative cover. North facing (moist) slopes have dense vegetation whereas south facing (dry) slopes or hilltops have little to no vegetation cover. Depending on the soil type (e.g. Cryosol, Regosol, Histosol) the organic carbon content and organic carbon stocks are variable. In the upper 30cm of the soil north facing slopes have around 26.9kg C m<sup>-2</sup>, soils on south facing slopes around 15kg C m<sup>-2</sup> SOC and soils in the valley bottom have around 20.2kg C m<sup>-2</sup>. Little SOC stocks were found under abrasion fields particularly on hilltops and moraine ridges with around 6.5kg C m<sup>-2</sup>. The shallow depth of the active layer on north facing slopes can be assumed being one of the main causes for the high SOC stocks. Soils on south facing slopes usually have very little SOC contents in deeper soil horizons except of organic rich horizons in rarely occurring paleosols. North facing soils more often have high SOC stocks in >30cm deep soil horizons.

The distributions of physical fractions of soil organic matter are as follows: in moist soils with a high permafrost table and a high amount of scarcely decomposed organic matter the free and occluded organic matter fractions (FPOM and OPOM) have a higher portion compared to dry sites (e.g. south facing slopes). Mineral associated organic matter (MOM) is always the dominant part but holds the least carbon concentration. OPOM has the highest concentration (around 34%) of the SOC.