



Estimations of Soil organic carbons pools in Southern Greenland

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Terrestrial areas hold large pools of soil organic carbon (SOC), which is a fundamental soil feature. It is known that SOC can be destabilized due to climate changes and land use, what can lead to accelerated emissions of greenhouse gasses into the atmosphere. Arctic soil, which is strongly sensitive to climate changes, stores about 14% of the Earth's organic carbon (Elberling et al., 2004). Therefore, the high-latitude soils are an important factor for investigation and determination of carbon pools. Recent advances in analytical methods offer various improvements regarding data acquisition. For example, near-infrared spectroscopy (NIRS) analyses of soils is often cost-effective and faster as compared to traditional wet-chemical methods for C and N determination, while it also gives reliable results.

The aim of this study is i) to estimate the SOC pool in a remote area with poor soil data, i.e. Southern Greenland, and ii) to compare estimation techniques based on two independent SOC analytical approaches.

The study area comprises approx. 17,500 km² large non-glaciated land in south Greenland, from the Labrador Sea coast line to the margins of the Greenland Ice Sheet (46°47'W-44°16'W and 60°07'N-61°24'N). A large number of the abandoned Norse Viking Age settlements, i.e. Gardar, Hvalsø and Igaliku, are found here.

A soil resource database was compiled from existing sources and recently collected soil samples to improve the data density for the area. The majority of the dataset represents 233 soil samples, which were collected in summer 2013 following Globalsoilmap.net specifications (Ogric et al., 2014). The focus of the investigation was on the top soil (down to 25 cm depth). These samples were analyzed for total soil carbon, nitrogen, and sulphur contents. The NIRS method was used on the same soil samples in an attempt to improve the data interpretation. Chemometric methods of NIRS data were applied with The Unscrambler X (Camo, 2014). Next, all known available published and unpublished SOC data from the area were included.

An upscaled model for SOC prediction developed for the study area is based on the SOC analytical data and recently created land use maps. ArcGIS 10.2 (Esri, 2014) was used for the spatial analysis and its visualization. The created maps form the basis for a re-assessment of SOC pools. We will present novel maps and compare them with published estimations based on datasets with considerably lower sampling density from Southern Greenland, as well as relate our findings to SOC pool estimations from comparable subarctic settings in the circumpolar region.

References:

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