SOIL ORGANIC CARBON STOCK IN THE GLACIER FORELAND OF MIDTRE LOVÉNBREIN, IN THE HIGH ARCTIC

Ji Young Jung1, Dominique Laffly3, Se-un Kim1, Hyeyoung Kwon4, Myrtill Moreau1, Yannick Le Nîre3, Lennart Nilsen5, Yoo Kyung Lee1,2

1 Korea Polar Research Institute, South Korea, 2 Université de Toulouse, France, 3 GEOREX, France, 4 École Internationale des Sciences de l’Information, France, 5 University of Tromsø, Norway

ykele@kopri.re.kr

Introduction

Global warming leads to rapid retreat of glaciers in the high Arctic, exposing new land. Soil organic carbon (SOC) accumulation in the proglacial environment has initiated after microorganisms and plants have settled down. Studies in glacier forelands mostly focused on consequent changes in soil, plants, and microorganisms after glacier recession. However, the quantity and rate of SOC accumulation over the glacier foreland are affected not only by time but also by several environmental factors. Furthermore, proglacial land is dynamically reshaped by runoff activity of glacier streams. Therefore, we are aiming to understand the distribution pattern of SOC and to produce a map of SOC stock in the foreland of the Midtre Lovénbrein, Spitsbergen, Norway (79°N, 12°W) with a consideration of the deglaciated years and several environmental factors such as microtopography, runoff activity, etc.

Materials and Methods

• Sampling sites selection: Stratified sampling with a consideration of X, Y coordinates, runoff age, slope, and wind among 300 sites of Moreau (2005)
• Soil sampling: 0-5, 5-10, 10-20, 20-30 cm depths
• Field measurement and environmental data acquisition from DEM
• Correspondence Factor Analysis (CFA) & Ascending Hierarchical Classification (AHC)

Results

• SOC stock for 30 cm depth ranged from 1.5 to 15.4 Mg ha⁻¹ in the foreland of Midtre Lovénbrein
• The amount of SOC stock was greatly affected by the proportion of gravel to soil (Table 1).
• SOC content among 5-10, 10-20, and 20-30 cm did not differ, and bulk density through all depths did not vary either. Thus, SOC stock was closely related to the SOC content of the top soil (0-5 cm) (Table 1).
• Among several vegetation-related parameters, the sum of vascular plants’ frequency showed the highest correlation with the SOC content of top soil and SOC stock (Fig. 1).
• The active and intermittent runoff sites showed significantly lower SOC content compared to no runoff sites (Fig. 2). Glacier/snow meltwater would have washed out previously established vegetation and accumulated SOC.

Table 1. Pearson correlation between measured variables

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<tr>
<th>Gravel</th>
<th>Sand</th>
<th>Clay</th>
<th>SOC15</th>
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<th>SOC50</th>
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<th>Li</th>
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### Research Approaches

- Factors affecting SOC distribution in the glacier foreland
- Soil age → Microtopography → Microclimate → Plant & Microbes → Runoff → SOC

### Acknowledgements

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