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# Soil development on a High Arctic glacier forefield: how is the microbial community limited by nutrient availability?

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High Arctic glaciers and ice sheets are melting at an accelerating rate, resulting in new proglacial habitats being exposed by glacial recession. At receding glacier fronts, materials of supraglacial (mostly cryoconite) and subglacial origin are being mixed, forming initial soils subject to microbial community assembly and soil development. The ecological succession of young soils in front of receding glaciers has been studied intensively in recent years; however, little is known about the physicochemical constraints of microbial growth, which determines the rate of initial soil development. In the summer 2017, we sampled distinct age zones along a chronosequence at the 10 km long forefield of the surge-type glacier Sefströmbreen in Svalbard, comprising of up to 120 years of soil development. We hypothesized that nutrient limitation is a key factor in shaping the microbial community assembly and microbial growth in these bare proglacial soils, where the establishment of continuous plant coverage takes much longer time compared to lower latitudes. Here, microbes rule the environment for decades, only constrained by simple physical variables, such as temperature, and by nutrient availability. To assess which nutrients are limiting the forefield soil microbial community, we measured the available nutrients at in-situ conditions and complemented these measurements with laboratory incubation experiments focusing on (1) the changes in microbial growth after nutrient addition, and (2) atmospheric nitrogen fixing potential of the soils from different age zones. In addition, sediments from all the zones were subsampled in the field, and preserved in order to assess the potentially active part of the microbial community. The results of this work will contribute to our understanding of how nutrient availability controls proglacial community assembly and soil development during the current period of deglaciation.