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Soil forming processes and microbial community structures in soils from James Ross Island after 100 artificial freeze-thaw cycles

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A significant question in Antarctic research is how changing environmental conditions such as higher temperatures and higher humidity affect soil properties and microbial communities. We address this topic together with the fundamental question how biotic and abiotic processes interact in a unique setting like James Ross Island, east of the Antarctic Peninsula. Microbial communities (bacteria, archaea and fungi) primarily control soil biological and chemical processes in the extreme environment of the eastern Antarctic Peninsula region, a landscape without higher plants and a mean annual air temperature < 0° C.
We are conducting an incubation experiment to evaluate possible effects of temperature and humidity shifts on soil forming processes and microbial community structures within soils from James Ross Island. Samples from two study sites (St. Martha Cove and Brandy Bay) that are similar in relief position and parent material, but differ in their position relative to the mostly south-western winds, were taken during a field campaign in 2016. In order to consider the spatial heterogeneity, we sampled a central profile and took 12 satellite samples at a distance of 2 m with a depth of 0-20 cm. The samples of each study site were bulked and partially sterilized to obtain control samples. All samples were exposed to 100 freezing and thawing cycles (-5°C - +5°C) at two different, constant soil moisture levels (40% and 80%). We will present the results of pH, EC, CNS, TIC, TOC, DNA content, microbial abundance and micromorphological analyses of freeze-thaw cycle 0 compared to the results after 100 freeze-thaw cycles.