

Project acronym: BIOSOIL

Project title: Biological crusts of different Arctic extreme environments and their impact on the soil ecosystem (biodiversity, gas exchange and nutrient cycling)

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Discipline: Earth Sciences & Environment

Station(s): Villum Research Station (Greenland)

The main purpose of the research is to assess how the development of the biological soil crusts (BSC) in their primary colonization may affect the ecosystem in extreme terrestrial environments in order to define the extent to which the biological activity may interact with this type of environment at pedosphere (soil nutrient cycling, C sequestration, biodiversity) and atmosphere (gas exchange – CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> – between soil and atmosphere) level. Study site: Villum Research Station (Greenland/Denmark).

Field work: survey and selection of the study areas, soil and BSC sampling, measurements of gas emission from soil by CO<sub>2</sub> infrared analyzer, and by sampling the gases through chambers. Lab work: Molecular fingerprint will be used to assess biodiversity indicators. Microbial communities will be described through metagenomic approach. Physical-chemical (texture, pH, C tot, C org, N, available nutrients) and mineralogical (x-ray diffractometry) characterization of the mineral phase will be performed. Soil organic matter (SOM) will be fractionated by density and the C in the different pools quantified and characterized for their isotopic signature (<sup>13</sup>C and <sup>14</sup>C). By means the use of spectroscopic techniques within the mid-infrared coupled with chemometrics, the "spectral fingerprint" of the mineral substrate or soil (MIR-DRIFT-PLS) and "spectral fingerprint" of SOM constituents (PAS) will be determined in order to make possible comparisons between different environments. The collected gas samples will be analyzed for their natural abundance of <sup>13</sup>C and <sup>14</sup>C, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O concentrations, and their fluxes calculated. The integrated approach developed through such methodologies will allow a better understanding of the functioning of the polar ecosystem.