Project acronym: GHOST

Project title: Greenland hot spring microbial diversity contribution to biogeochemical cycling

Project leader: Donato Giovannelli, University of Naples Federico II, Italy

Discipline: Earth Sciences & Environment: Other - Earth Sciences

Station(s): Arctic Station (Greenland/Denmark)

The main aim of this project is to characterize the Disko Island geothermal springs to understand the relationship between the continental subsurface microbial communities and the spring geochemistry to understand the role played by subsurface microbes in impacting volatile cycling in the left over basalt of the Icelandic hot spot. Despite the large number of springs present, our knowledge of the microbiology of these springs as well as how they relate to volatile cycling and contribution to biogeochemistry is limited. Our long term plan is to combine data from this expedition with data from Icelandic hot springs collected in 2021 and in 2023 with samples from Greenland East Coast (an expedition currently expected in 2023-2024) to provide a transect applying a “space for time” approach to the effects of the Iceland hot spot in influencing subsurface microbial communities. Having the opportunity to sample the hot springs of Greenland west coast would provide a unique opportunity to contrast springs influenced directly by the Icelandic hot spot against springs generated by old hot spot basalts that have drifted together with the North American plate.

We will sample a number of different hot springs in the proximity of the Arctic Station, trying to maximize the number of spring sampled as well as the geochemical diversity of the springs. Our approach combines molecular microbiology techniques with geochemistry, noble gas geochemistry and mineralogy to investigate the role of microbial communities in altering volatile fluxes. We will conduct a comprehensive investigation into microbial taxonomic and functional diversity of subsurface microbial communities in fluids, sediments and surrounding soils together with a complete analysis of the geochemical, biochemical and microbiological variables, to provide unprecedented insight into the role of subsurface microbial communities in interacting with deeply derived volatiles. Given the intense nature of the sampling protocols used that comprehensively cover the microbiology and geochemistry of the spring we request a team of four people in the field.