

Project acronym: BIOENGLA

Project title: The microbiome of englacial habitats

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Discipline: Earth Sciences & Environment

Station(s): Tarfala Research Station (Sweden)

Glaciers and Ice Sheets, like other biomes, occupy a significant area of our planet and harbour biological communities with distinct interactions and feedbacks with their physical and chemical environment. In the case of the terrestrial icy biome, the biological processes are dominated almost exclusively by microbial communities. At the surface of glaciers, cyanobacteria dominate the carbon production in aquatic/sediment systems such as cryoconite holes, while eukaryotic desmids and *Chlamydomonas/Chloromonas* dominate on ice surfaces and snow, respectively.

Microbially driven chemolithotrophic processes and C transformations in subglacial ecosystems, including methane production, provide the basis for chemical transformations at the rock interface under the ice that underpin an important mechanism for the delivery of nutrients to downstream ecosystems. Microbial processes in englacial habitats (i.e., the body of a glacier between the surface and the bed) are, nevertheless, barely known, but prokaryotic organisms have also been found there. This means that most knowledge about the icy microbiome comes from a 2-dimensional perspective, either the surface or the subglacial.

Our proposed project will trigger a step jump in understanding glacial ecosystems by providing a third dimension of microbial processes in the englacial region of a glacier that connects the surface to the subglacial. Much of the surface melt, along with carbon, is routed through the englacial system, which often contains an extensive water-filled fracture system. This fracture system is highly likely to contain an active microbial community. Hence, our guiding hypothesis is that the englacial system is a hot spot for biogeochemical and microbial processes that provides a substantial glacial habitat for nutrient and organic carbon transformation. We aim to sample water in the englacial fractures of Storglaciären using a hot water drill system adapted to collect clean samples in order to characterise the chemical composition (i.e., major ions, nutrients and organic carbon characteristics), and determine microbial biomass, activity and diversity of water collected within the englacial fractures.