

Project acronym: GlacCarb

Project title: Quantifying the impact of retreating Arctic glaciers on the global carbon cycle

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Discipline: Earth Sciences & Environment

Station(s): Tarfala Research Station (Sweden)

Glacier ice covers ~11% of Earth's land surface, and contains within it a globally significant reservoir of easily degradable glacial organic carbon (GOC). 21st century global glacier recession could, via release of GOC from melting ice and exposed sediments, be a positive feedback on global warming, accelerating temperature increase and thus further melting of the cryosphere and permafrost, with profound implications for global climate change and sea-level rise.

This project aims to: (1) quantify GOC export from receding glaciers; and (2) investigate biogeochemical organic compound transformation processes. This research is being undertaken at two different locations within the Arctic (Iceland and Sweden), one of the most rapidly warming regions on Earth.

The project includes identification, and determination of the degradation, of organic carbon compounds released from glaciers using a multi-proxy biogeochemical approach. In addition to state-of-the-art organic biomarker analyses, inorganic aqueous elemental and ionic techniques, as well as stable-isotope-ratio analyses and microbial DNA sequencing will be used, to provide a robust and holistic understanding of biogeochemical processes in receding Arctic glacial environments.

By comparing glacial systems at Tarfala, Sweden, with existing field-monitoring sites in Iceland, it will be possible to provide quantitative flux information about organic carbon discharged from melting glaciers across the Arctic region, thereby significantly improving understanding of the dynamic high northern latitude carbon cycle and its impact on global climate change.