# Geochemical characterization of glacial meltwater runoff from the Greenland Ice Sheet to the ocean

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Primary production in marine arctic waters follows a seasonal cycle, slowing in early summer as high-latitude microbial communities become limited by nitrate and iron. However, the influx of nutrients entrained in glacial meltwater coincides with large summer phytoplankton blooms in the Labrador Sea, and melting marine-terminating glaciers have been linked to increased primary productivity around Greenland. While the effects of glacially derived nutrients on downstream marine communities remains a subject of debate, characterizing meltwater and establishing the hydrological controls on nutrient export is the first step in answering larger ecological questions. Nutrient concentrations in meltwaters are dependent on seasonal supraglacial, subglacial, and marginal drainage development and release. Here we report measurements of trace metals, dissolved organic carbon, and a suite of other ancillary hydrochemical properties across supraglacial, subglacial, terrestrial, and marginal environments on Sarqardliup Sermia Glacier – a large marine-terminating glacier draining the western Greenland Ice Sheet. To better elucidate differences between these glacial sub-environments, we employed several multivariate statistical techniques. Using hierarchical cluster and non-metric multi-dimensional scaling analyses we show that different glacial environments are geochemically distinct. In particular, meltwater sampled from marginal lakes and streams is distinct from samples taken from terrestrial, subglacial, and supraglacial environments. This characterization and differentiation of sources of glacial runoff, and their mechanisms of release to the ocean, will be useful in further studies assessing meltwater impacts on downstream ecosystems.

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