Phototransformation of dissolved organic carbon on the Greenland Ice Sheet

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Supraglacial environments of ice sheets are active sites for the storage, transformation and transport of carbon. Blooms of Streptophyte microalgae on the Greenland Ice Sheet (GrIS) excrete dissolved organic carbon (DOC), supporting secondary production of up to 1 μg C L^{-1} h^{-1}. The GrIS surface is exposed to high levels of solar radiation, but little is known of the potential impact on DOC. Investigations on freshwater environments with comparable levels of radiation found that UV exposure degraded DOC compounds. We hypothesise that photo-transformations alter the chemical composition of supraglacial DOC which affects bioavailability and heterotrophic consumption. We conducted experiments in which surface ice DOC and purpurogallin pigments extracted from the Streptophyte microalgae were exposed to four different light conditions (UV, UV + PAR, PAR, darkness) and then incubated with bacteria isolated from surface ice. Bacterial abundance and production were measured over 31 days, along with DOC concentrations and spectrofluorescence signatures. Preliminary results indicate that photo-modified DOC has varying bioavailability and UV exposure may be an important factor regulating heterotrophic consumption, particularly in aquatic environments downstream from the GrIS.