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Spatial and temporal variation in the meltwater discharge of organic matter and major elements in coastal Antarctica

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Glacier meltwater discharge into fjords in coastal Antarctica during summer raises questions about the potential downstream effects of the associated release of nutrients and organic carbon. We present chemical changes in supraglacial meltwater stream and surface sediment along a 3.0 km transect at the coast of Thala fjord (both North and South Grovnes) in Larsemann Hills. Dissolved organic matter (DOM) in the meltwater stream was dominated by the marine humic-like matter, while UV-Visible humic matter and protein (tyrosine) was also found. Meltwater-sediment interactions contributed to enhanced concentrations of Ca^{2+} and K^{+}, which was consistent with presence of Ca-rich feldspar and also the presence of Ca^{2+} and K^{+} in the surface sediments in the coastal areas of Grovnes peninsula in Larsemann Hills. The presence of other minerals, observed through EPMA analysis showed the presence of pyroxene and biotite supporting the presence of Fe in the clay minerals which may further contribute to the elemental composition in the fjords upon discharge through meltwater. Sampling points like meltpools with higher residence time of meltwater showed an increase in clay minerals as a result of either transport through meltwater stream and weathering of minerals like pyroxene and feldspar. An increase in temporal DOC concentration in the sediment and meltwater further probably suggest microbial activity. DOM composition in the meltwater shifted from high molecular weight and protein-like (tyrosine) to low molecular weight and humic-like as the summer progressed. The preliminary data suggests that the glacier meltwater discharge could have important biogeochemical implications for downstream ecosystems like fjords.