Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.30455

Signs of clay formation in the surficial sediments of Victoria and Petermann fjords, northern Greenland

BELLA SHELY DILLAN[1], JIYEONG LEE[2], JONG-SIK RYU[3], NAI-CHEN CHEN[4], MR. SARATH PULLYOTTUM KAVIL, MSC[5], SOPHIE TEN HIETBRINK[6], TZU-HAO HUANG[5] AND DR. WEI-LI HONG, PHD[5]

[1]Institution of Geological Sciences, Stockholm University
[2]Institute of Integrated Analytical Center for Environmental Sciences, Pukyong National University
[3]Institution of Integrated Analytical Center for Earth and Environmental Sciences, Pukyong National University
[4]Department of Geological Sciences
[5]Stockholm University
[6]Stockholm university

Silica (Si) inventory and turnover in the ocean play a critical role in the overall fate of carbon dioxide ($_2$) in the ocean. As sea ice melts, polar fjord systems are expected to become potential hotspots for $_2$ uptake with silica supplied from the degrading ice sheets. However, silica dynamics in polar regions has only been studied in a few locations. To improve our understanding of silica dynamics in polar fjord systems, this study investigates two northern Greenland fjords: Viktoria and Petermann fjords sampled during the 2024 GEOEO expedition onboard the Swedish icebreaker I/B Oden. This study aims to quantitatively assess clay formation in the surficial sediments of these two fjords by combing shipboard incubation experiments, porewater profiles, and sediment leaching. Initial shipboard incubation experiments show that Si concentration in the bottom water increases at a rate much smaller than Si fluxes calculated from porewater profiles, which is attributed to Si consumption in surficial sediments through clay formation. To quantify this, surface sediment from the top 3-5 centimeters of two transects in these two fjords (a total of eight sites) were leached with hydrochloride acid for the clay fraction. Magnesium (Mg) is being used as a tracer for clay formation, allowing separation of Si associated with clay from the total Si in the sediments. We measure Mg concentration and isotopic composition in both the leachate and porewater. These results are interpreted collectively with shipboard incubation results to derive a quantitative understanding of Si turnover across the sediment-water interface.