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Submarine Groundwater Discharge in the Arctic Regions: A Multi-parameter Approach

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Submarine groundwater discharge (SGD) has been recognized as a significant source of freshwater and accompanying trace elements and nutrients as well as dissolved organic carbon (DOC) and dissolved inorganic carbon (DIC) to the marine environment. Limited investigations have been conducted in high latitudes regions and have mostly been restricted to the North American side of the Arctic Ocean with only a few studies dedicated to the European side. SGD in the polar regions can play an important role as it is associated with the state of permafrost and glaciers. For example, warming of the Arctic, due to climate change, leading to the melting of permafrost and retreat of glaciers that may both enhance or retard the movement of groundwater. Therefore, the ArcticSGD project aims to identify quantitatively and qualitatively fresh SGD in offshore and onshore areas within the Spitsbergen Fjords, including Isfjorden, Kongsfjorden, Krossfjorden, and Hornsund, and determine its influence on the seawater elemental cycling using geochemical tracers. In addition, we want to compare the SGD mechanism between the Spitsbergen Fjords (400 m water depth) and the Lofoten-Vesterålen (LV) seep (800 m water depth). Within two cruises in summer 2021 to Svalbard with r/y OCEANIA and in December 2021 to LV area with r/v G.O. SARS, 37 sites were visited and water column and porewater samples were taken for the analysis of major and trace elements, DIC and DOC (concentration and stable isotopes), total alkalinity, pH, nutrients, Radium and Radon isotopes, stable water isotopes, besides physical characterization. Here we would like to present our preliminary findings. The presence of meteoric groundwater in the sediments of both Spitsbergen Fjords and LV sites was found. Bottom water and porewater chloride and major cations distribution anomalies indicate that SGD can contribute substantially to seawater. Future analyses of collected samples will allow for an estimate of the SGD distribution and its biogeochemical impact on the marine ecosystems of the Arctic regions.