



## High Arctic Polynyas in a Changing Climate

**Rebecca Jackson**<sup>1</sup>, Anna Bang Kvorning<sup>2</sup>, Christof Pearce<sup>3</sup>, Marit-Solveig Seidenkrantz<sup>3</sup>, and Sofia Ribeiro<sup>1</sup>

<sup>1</sup>Department of Glaciology and Climate, Geological Survey of Denmark and Greenland, , Copenhagen, Denmark

<sup>2</sup>Department of Geosciences and Natural Resource Management, University of Copenhagen, Copenhagen, Denmark

<sup>3</sup>Department of Geoscience, Aarhus University, Aarhus, Denmark

Polynyas, areas of open water in the otherwise sea-ice dominated high Arctic, are vital oases for biological productivity, supporting a plethora of marine mammals and birds that in turn sustain indigenous communities. Polynyas are not, however, consistent features. Beyond the observational era, little to nothing is known about their past dynamics and equally, about their resilience to emerging changes in Arctic sea-ice conditions.

Recent paleoceanographic reconstructions of the North Water in northern Baffin Bay, the largest of the high Arctic polynyas, indicate that the polynya contracted in response to warm climatic intervals during the Holocene (e.g. Roman Warm Period). In contrast, the onset of stable North Water polynya formation acted to suppress northward incursion of warm Atlantic-sourced waters. This highlighted not only the sensitivity of polynyas to past climatic changes, but the role their formation plays in mediating water column dynamics and ocean circulation.

These new findings provided the rationale for the MSCA project 'POLARC: High Arctic Polynyas in a Changing Climate', to investigate the Holocene dynamics of other high Arctic polynyas forming off the east Greenland coast. New marine sedimentary archives and a multiproxy approach will be used to reconstruct productivity, sea-ice conditions and bottom water conditions, capturing a holistic view of these systems and their interaction with climatic and oceanographic variation during the Holocene (11,700 years BP to present). We present here preliminary paleoceanographic reconstructions of the Sirius Water, the first Holocene record from this polynya region, as well as plans for model-data comparisons in key polynya regions with the aim of constraining the past and better predicting the future of these phenomena.