

DK-Proposal 24*Submitted by**Susanne Juul Lassen & Antoon Kuijpers sl@geus.dk & aku@geus.dk**GEUS**Øster Voldgade 10**DK-1350 Copenhagen K, Denmark***Paleo-oceanography of the Nares Strait – Davis Strait Arctic gateway with special reference to iceberg drift patterns**

Place:

Arctic Ocean, Nares Strait, Davis Strait

Disciplines:

Paleontology, stratigraphy, geochemistry, petrography, sedimentology

Motivation:

In the puzzle of understanding the climate system, its sensitivity and the major consequences of climate change, focus has now turned towards the Arctic. One of the most spectacular predictions for the near future suggests an ice-free Northwest Passage during summers to be a reality already within the next 30-40 years. In that respect our knowledge of ocean circulation and ice drift in the seas off (north)west Greenland becomes crucial. By studying paleoceanographic changes in this area important knowledge about long-term variability in Arctic-North Atlantic Ocean water mass exchange can be gained together with information on regional climate interaction affecting, amongst others, iceberg calving along the Greenland coast. Altogether essential knowledge contributing to predict future modes of ocean circulation and iceberg drift in this region. It should be noted that proxy data records from this area are very sparse and thus regional climate prediction models can not be made with confidence. The present day ocean circulation in the region is characterised by outflow from the Arctic Ocean through the Nares Strait advecting southwards via the Baffin Current and Labrador Current ice-loaded Polar Water towards the Newfoundland region. In contrast, inflow of the relatively warm and saline (subsurface) waters from the Irminger Sea prevails in the West Greenland Current concentrated along the west coast of Greenland, where at the present most productive glaciers are concentrated between Disko Bugt and Nares Strait. In glacial times significant iceberg calving also occurred along the east Canadian coast. It should be emphasised that the region in question is also of interest for hydrocarbon exploration. Analyses of ice-rafted detritus (IRD) from this area may reveal highly relevant and important information with regard to the latter interest. However, detailed studies on past iceberg drift patterns and IRD provenance in this area have so far been virtually lacking.

Research:

Aim - The aim of this project is two-fold. First of all, we will focus on the paleoceanographic and climatic changes in the region from the Nares Strait in the North to Davis Strait in the South, and link these to the paleoceanographic history of the Arctic Ocean and adjacent fjord systems, the Greenland ice cores as well as terrestrial records. This will not only add to the general understanding of the climate changes but also allow for possible links to (late Holocene) human responses to climate change in the West Greenland area. Furthermore, in this way data will be provided for future climate models. The second aim is to map the IRD patterns in this area through time, to carry out mineralogical and stratigraphic analyses, and determine the corresponding provenance

areas. By combining the drop stone stratigraphy and provenance data with relevant paleoceanographic information we hope to add to the general understanding of the origin of the icebergs and calving history of the respective ice-sheet margins. Eventually, these studies could further enhance the interest and contribute focusing interest for hydrocarbon exploration activity towards the West Greenland margin with benefit for the Greenlandic society and economy.

Material and methods

The project depends on high-resolution sediment cores through a transect from Nares Strait, through Baffin Bay, Davis Strait and into the northern Labrador Sea. A multi disciplinary approach comprising paleontology and stratigraphy, geochemistry, petrography and sedimentology will be required in order to meet the objectives.

Partners and related projects

The proposed studies will be linked to other actual research fields in the Arctic realm, i.e. investigations related to sea-ice distribution, changes of the Greenland Ice sheet and meteorological studies herein as well as historic studies. A close collaboration with other geoscience projects involving ship time is essential in order to collect suitable core material. Collaboration between the Geological Survey of Denmark and Greenland and international partners, amongst others in Canada, USA, UK, Germany and Russia, have already been established regarding relevant research in this region.