

**DK-Proposal 29**

Submitted by

Ole Bennike [ob@geus.dk](mailto:ob@geus.dk)

GEUS

Øster Voldgade 10

DK-1350 Copenhagen K, Denmark

**Quaternary environmental and climatic history of Peary Land**

Place:

Peary Land, North Greenland

Disciplines:

Quaternary geology, climatology, ecology, palaeontology, biology

Motivation:

In Peary Land broad lowlands with widespread Quaternary deposits are found. These deposits hold a large potential for solving some important issues about the Quaternary environmental and climatic history of North Greenland.

Research:

We propose to work on three problems:

1) Collecting of samples from the Kap København Formation for DNA analyses  
Preliminary analyses of samples from the Kap København Formation, which were collected 20 years ago, show that the sediments contain fossil DNA, but the DNA has degraded during the storage in Denmark. Therefore we need fresh material for further analyses. The Kap København Formation holds a unique potential for locating fossil DNA, as analyses of amino acids in bivalve shells show that the sediments became frozen shortly after they were deposited. The age of the Kap København Formation is about 2.5 million years.

2) The strongly controversial glacial history of the region

The central and northern part of Peary Land was covered by a local ice cap during the last ice age. This local ice cap was confluent with the Inland Ice towards the south. Along the north coast of Peary Land boulders of granites and gneiss are found. These originate from somewhere below the Inland Ice or from Canada.

The glacial history will be investigated using exposure dating. This is a new technique, where the concentration of cosmogenic isotopes in rocks and boulders is measured. The method has not previously been tried in Peary Land. We propose to work along a transect from south to north through Peary Land.

3) Long term changes in sea ice cover in the Arctic Ocean  
To be able to evaluate the sensitivity of the sea ice to climate changes, it is crucial to collect information about the variability of the sea ice cover after the last deglaciation. In particular, we need to investigate the sea ice extent during the Holocene temperature optimum, during which the mean annual temperature was a few degrees higher than at present. This is comparable to what the enhanced anthropogenic greenhouse effect can lead to over the next decades. This work will concentrate on the raised beaches in the northern part of Peary Land.

To be able to conduct these projects, transport is a crucial point. Some areas can be reached from Twin Otter airstrips, but helicopter support is also needed.

Fieldwork during two summers is needed. Subproject 1 must be conducted in collaboration with experts in fossil DNA, and we have begun to collaborate with Eske Willerslev from Oxford University. Subproject 2 must be conducted in collaboration with physicists, who can perform exposure dating using a variety of cosmogenic isotopes. We have started a collaboration with a research group from Bern University about a similar project in East Greenland. Subproject 3 depends

on the dating of drift wood samples, using the AMS radiocarbon dating technique. The fieldwork will be conducted by a small group of geologists from Geocenter Copenhagen and Lund University, with the undersigned from GEUS and Kurt Kjær from Lund University as the key persons. The proposed project could form an important component of a transect from the Inland Ice to the Arctic Ocean.