

2004-03-15

**CLIMATE CHANGE AND HUMAN IMPACTS IN HIGH ARCTIC DESERT AREA,  
NORDAUSTLAND, SVALBARD**

An expression of interest to ICSU/ International Polar Year 2007/08

A multidisciplinary project prepared by fifty Finnish scientists from nine major research institutes or universities together with their international partners. The project is open for co-operation and it has strong links especially to Nordic partners.

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*This expression of interest is coordinated with the Swedish initiative prepared by 60 scientists from 14 nationalities: "An initiative of coordinated activities on Nordaustlandet, Svalbard during the International Polar Year 2007" separately submitted by Dr Veijo Pohjola, University of Uppsala, Sweden.*

### Summary

It is proposed that a multidisciplinary research project concentrating on climate change and human impacts in high arctic desert area will be launched. The research area is the Nordaustland of Svalbard and the ocean areas north of it. The area is ideal for the proposed studies and it is logistically relatively accessible. A historical Finnish-Swedish-Swiss research station in Kinnvika is planned to serve as a base for terrestrial observations while a ship will provide a platform for marine studies. The timeline of the project is 2006-2008, the main emphasis being in 2007.

### 1. Proposal

A multidisciplinary research project about human impacts to high arctic desert environment will be launched. The research area is the Nordausland in Svalbard and its adjacent northern ocean areas which belong within the high arctic desert climatologic zone. The idea of the project is (1) to make a multidisciplinary analysis about human impacts to the area throughout the history by using earlier data together with satellite images, (2) make a state-of-art base line study about the current situation and (3) prepare a strategy and implement needed research in order to monitor the ongoing changes in future. The main research efforts will be concentrated to the International Polar Year 2007/2008 by organizing an expedition that includes both marine and terrestrial operations. The base of terrestrial activities is the old Kinnvika research station while a ship will provide a platform for marine studies. Smaller research groups that need to make studies in different times of a year will make their measurements also outside of the main expedition timeline in 2006-2008. The project is logistically realistic which means that its costs should not become too high.

### 2. Background

There are strong scientific needs to make studies about global change in the high arctic desert area which is the most sensitive environment on any human induced impacts. Nordaustlandet of Svalbard is a relatively accessible for implementation of a multidisciplinary research in the high arctic region. The Finnish-Swedish-Swiss research station that established during the International Geophysical Year 1957/58 has not been in active use since then. On top of scientific interests the area has also historical value that likely interests also media and wide public.

Nordaustland is the largest island in Svalbard. Kinnvika is a small bay of the northern side of Murchison-fjord of Storstein in Nordsaustland. The area is situated in scientifically interesting remote high arctic region. The climate in Nordaustlandet is typical of dry and cold regions called arctic desert. The ocean is always ice free in west side of Svalbard, but it freezes around Nordaustland in winter. The biggest glacier of Norway, Vestfonna is situated in Nordaustlandet. The mass balance of glaciers in the area is slightly negative and they are shrinking (Hagen *et al.* 1993). The mean temperature per year has increased 2.8°C since the year 1912 to 2000. Also precipitation has an increasing trend. The mean temperature is predicted to increase still 1.4°C by 2050 but the precipitation is not predicted to change considerably (Hansen-Bauer 2002). The permafrost is continuous and its thickness is between 100 m at the sea level up to 400 m in high mountain areas (Liestøl 1977).

The area of -fjord has been studied relatively little although many research expeditions have been directed there the most famous of which was led by N.E Nordenskiöld in 1872-73. Later, there has been few expeditions made by Swedish, Russian Norwegian and British scientists (1924, -31, -35, -49, -55). In the geophysical year 1957/58 a Finnish-Swedish-Swiss "IGY" –research station was established in Kinnvika. After that the station has not been in active use. However, especially geological and glaciological studies has been made in the region especially in 1960's and 70's.

The Kinnvika station is based on shore of a fjord which is scientifically interesting in geological, biological and sea ice science point of views and it has good access to the western and south-western ice-cap drainage basins of Vestfonna. There are also excellent possibilities to do oceanographic, sea ice, bottom sediment and marine biology studies in the ocean region north of Nordaustlandet.

### 3. Proposed research themes

The following themes have been proposed for the project. Each of them has international links.

*Climate change:* Glaciology studies on Vestfonna; Snow cover and its changes; Climate and sea ice/iceberg transport variability during Late Pleistocene and Holocene – submarine records; Dynamics of plankton populations and secondary production of marginal ice areas in sea areas between Svalbard and Greenland in August; Weather observations from both lower and upper atmosphere.

*Human impacts:* Terrestrial biology - impacts of human activities and climate change on biological diversity;

*Pollution:* Biogeochemical Cycling of carbon and mercury in permanently cold regions; Formation process of aerosol and small particles in arctic air; Long range air born transportation of heavy metals to Arctic region;

*Geology:* Stratigraphic analysis of stadial/litoral sediments in the Murchison –bay; Tectonic movements measured by paleomagnetic studies HALIP-basalts of the Cretaceous period; Glacial geology and geophysical soil studies;

*Technology:* Permafrost thickness measurements; Ship operations in ice conditions.

#### The Finnish institutes and participants of the proposal:

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