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IPY-KINNVIKA:
Arctic Warming and Impact Research at 80°N

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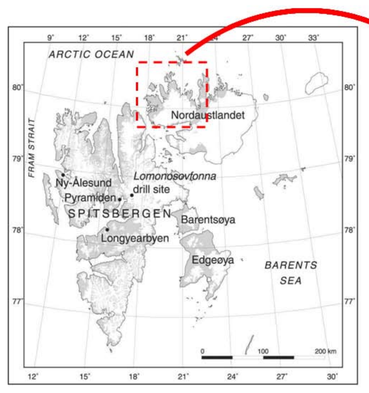
1. BACKGROUND

IPY-KINNVIKA 07-09 was an international and multidisciplinary research consorting aimed at understanding the past, present and future environmental changes in the High Arctic. It consisted in a cluster of scientific expeditions during springs and summers 2007, 2008, 2009 to the still today fairly unexplored Nordaustlandet area. This project was named after the Swedish-Finnish-Swiss research station built during the last IGY 57-58 at 80°N on the western shore of Nordaustlandet. The long-abandoned Kinnvika installations were chosen as a nucleus for the IPY 07-09 camp. Besides the dimension of exploration, the Nordaustlandet initiative brought substantial improvements to the knowledge about arctic processes by:

- Filling the gaps of data in the wide suit of records from high arctic regions by the Arctic basin.
- Providing a base for:
  - monitoring of parameters indicative of global and environmental changes.
  - the study of the full bandwidth of Polar Issues and for research over the scientific borders.
- Bringing science on-line to schools and the public audience.



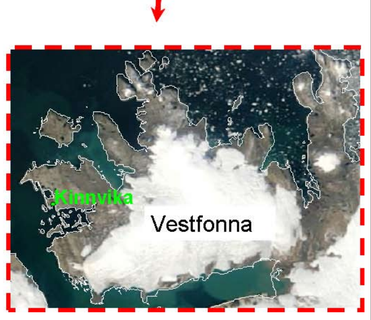


Fig.1 : Map of Svalbard. The red box area shows the Western part of Nordaustlandet island. Image from NASA.

2. RESEARCH TEAMS AND OBJECTIVES

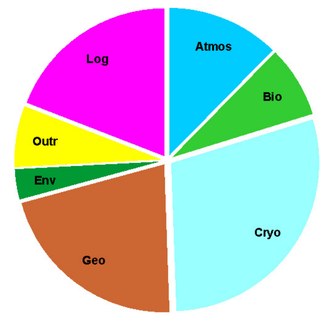


Fig.2 : Disciplines in field.

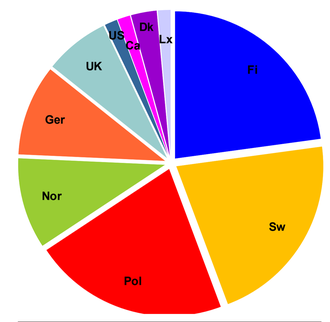


Fig.3: participants by country.

The scientific topics of KINNVIKA project range from Humanities to Earth Sciences, from archaeological work to aerosol chemistry and focus on:

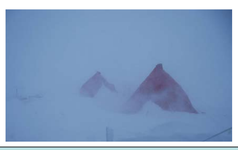
- climate change and impact research
- environmental monitoring
- mapping of bio- and geosystems

Totally, 69 scientific programs were carried out by 70 researchers and technicians from 10 countries. 1305 man days were spent in Murchinson Bay area in 2007-2009.

3. LOGISTICS AND IMPLEMENTATION: 1305 man days

Sweden, Finland, Switzerland

IGY 1957-1958 BUILDING OF THE STATION



4 researchers
Fin, Swe

- new routes to glacier
- snow pits, ice cores
- AWS
- mass balance stakes
- GPS

Airlift Dauphin
2 scooters
RV Lance

17 researchers + logisticians
Fin, Swe, UK, Poland, Nor, Can

- ice dynamic:GPS,
- ice radar
- snow pits, chemistry
- ice coring attempt

Airlift superpuma, squirel
8 scooters + ATV

4 researchers
Germany

- 6 AWS climatology
- snow pits

Airlift Squirel
4 scooters

Norwegian Coast Guards

Broken equipement rescue operation

KV Svalbard + Lynx

8 researchers + logisticians
Fin, Swe, US

- ice dynamic: GPS, radar, time lapse cameras
- snow pits, ice cores
- AWS download

KV Svalbard + Lynx
Airlift Dauphin
11 scooters

6 researchers + 2 logisticians
Ger, Pol, Swe

- mass balance
- snow stratigraphy
- ground truth radar
- meteorology

Airlift Dauphin
8 scooters

1957 — 2005 — 2007 — 2008 — 2009

8 researchers
Fin, Swe, Nor

Feasibility study

MS Farm
Zodiac

22 researchers + logisticians
4 journalists
Fin, Swe, UK, Poland, Nor

- download AWS data, new sensors
- stakes measurements
- POPs concentration
- cryoconites, black soot
- soil invertebrates, plants
- cartography, aerial photos
- glacial deposits study

RV Horyzont II Rib boat, ATV
8 scooters + ATV

18 researchers
Fin, Lux, UK, Poland, Nor, Swe

CANCELLED
(bad weather + thick ice pack)

RV Horyzont II
RV Lance

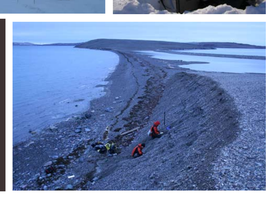
4 researchers
Germany

- climatology
- mass balance

SS Arctica

Fuel supply

RV Lance



29 researchers + logisticians
Fin, Swe, Pol, Ger, US

- fuel supply
- quaternary geology
- paleontology
- AWS, photos downloading
- CLOSING KINNVIKA

RV Lance
RV Horyzont II
MS Farm

4. RESULTS: Science and outreach

During the 6 major expeditions between 2007 and 2009, atmospheric, biospheric, cryospheric and geospheric data were monitored and contributed to improve the knowledge of:

- natural climatic variations during one glacial cycle at the northwestern edge of the Barents ice sheet.
- dynamics of arctic ice sheets during the last glacial, in particular western Nordaustlandet
- mass status, mass transfer, the dynamic ice flow and calving processes of arctic ice caps and prognostics of the future of these ice caps, in particular Vestfonna
- atmospheric transfer of chemical and physical constituents to the High Arctic
- the Lower Palaeozoic geological succession in Nordaustlandet
- taxonometry of flora, fauna and micro-organism communities on ice caps
- geodetical, terrestrial and bathymetrical maps of Nordaustlandet

Example 1:

Short time series of surface mass balance of Vestfonna ice cap (June 2008 to July 2009). Results are based on a very simple degree-day model. The overall surface mass balance for period 06/2008-05/2009: +0.23 mwe.

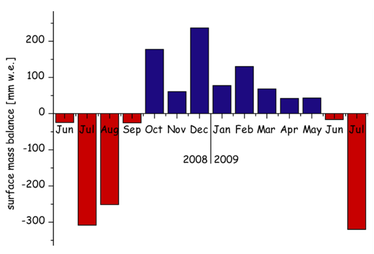


Fig.4 : Surface mass balance of Vestfonna ice cap. Source: Marco Möller.

Example 2:

From glacial geological, sedimentological and chronological studies in the southern Murchisonfjorden area combined with OSL and AMS age determinations, it was found evidence of three successive Weichselian sequences, each represented by the deposition of till followed by the accumulation of shallow marine deposits (Figure 5).
We suggest that the Late Weichselian glacier was relatively inactive, and remained mainly cold-based until the deglaciation. The Isvika sections can be considered a new key site that offers further potential to improve our understanding of the Weichselian stage within the northwestern sector of the Barents-Kara Ice Sheet.

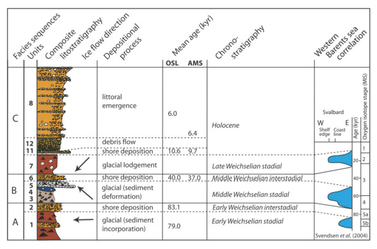


Fig.5: Composite lithostratigraphy of the Isvika sections, Nordaustlandet. The sequences have been correlated with standard chronostratigraphy and with the time-distance curve for the growth and decay of the Western Barents Sea ice sheet. Source: Veli-Pekka Salonen.

Kinnvika publications (so far):

- Beaudon, E. and Moore, J. 2009: Frost flower chemical signature in winter snow on Vestfonna ice cap, Nordaustlandet, Svalbard, The Cryosphere, 3, 147-154.
- Kaakinen, A., Salonen, V.-P., Kubischta, F., Eskola, K.O. & Oinonen, M. 2009: Weichselian glacial stage in Murchisonfjorden, Nordaustlandet, Svalbard. Boreas 38, 718-729.
- Kubischta, F., Knudsen, K.L., Kaakinen, A. & Salonen, V.-P. (in press). Late Quaternary foraminiferal record in Murchinsonfjorden, Nordaustlandet, Svalbard. Polar Research.

Outreach:

- Arctic in Change exhibition, Arktikum museum, Rovaniemi, Finland
- Kinnvika website and Arctic Centre database: www.kinnvika.net
- Finnish Kinnvika web school: www.kinnvikannettikoulu.wordpress.com
- IPY-Kinnvika: 8 minutes clip by the Finnish TV channel YLE Teema.
- Kinnvika summer expedition 2005, Swedish TV4
- Geografiska Annaler, Kinnvika special volume, September 2010
- IPY Databases: www.biblioline.nisc.com
- Coffee table book about KINNVIKA 07-09

5. FUNDING

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