Svalbard Integrated Arctic Earth Observing System (SIOS)

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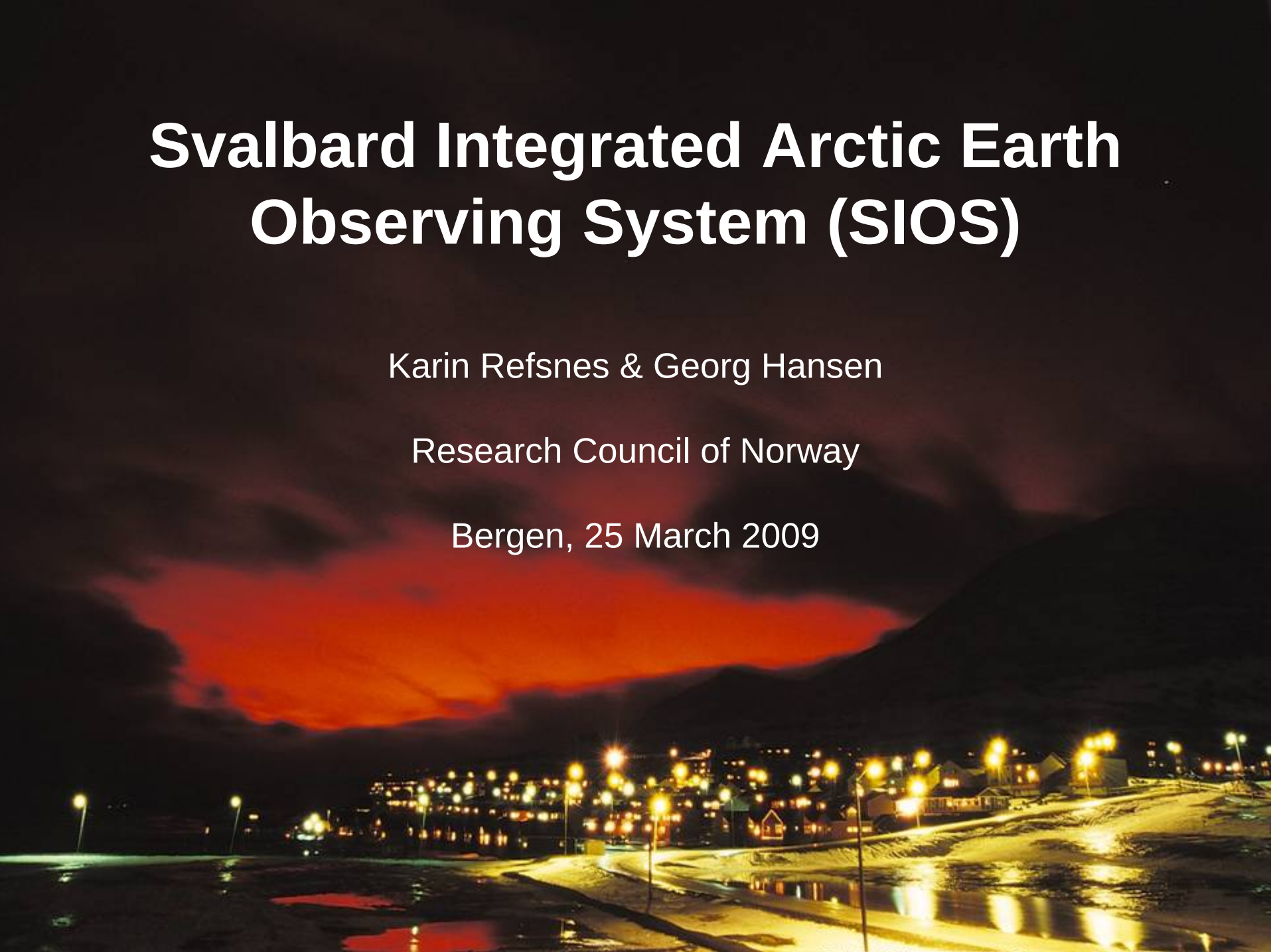

The goal of SIOS

Establish an Arctic Earth Observing System in and around Svalbard that integrates the studies of geophysical, chemical, hydrological and biological processes from all research and monitoring platforms.

SIOS is an opportunity for Europe to establish the central node in the global monitoring of the High Arctic.

To achieve this we will:

1. Organize all infrastructure and all research and monitoring activities into adequate observation platforms, e.g., atmosphere – ocean – cryosphere - land.
2. Assess the present infrastructure and activities to identify gaps and weaknesses in the system. Invest in additional infrastructure and activities to close these gaps.
3. Establish a Knowledge Centre in Longyearbyen for data assessment, integration, storage and delivery, education and outreach, cooperative efforts, and input to Earth System modeling.
4. Take actions to coordinate the SIOS initiative with complementary ESFRI efforts as well as other Earth and Arctic Observation Systems and related modelling efforts.

Why SIOS?

- Environmental and climate related challenges require an Earth System approach.
- Observation systems have not been developed with the same systematic approach as Earth System modeling.
- SIOS will secure the heritage of IPY and further develop the data series of the High Arctic
- SIOS will follow up the EU Arctic Communication (November 2008)
- SIOS will be a central node in SAON (Sustained Arctic Observing Network)

Extensive infrastructure in place

- Research organizations from 20 countries are present on a regular basis, operating a wide variety of land and sea-based facilities.
- Norway has established an international university in Longyearbyen with students and staff from 25 countries.
- Ny-Ålesund has been developed into an international, high standard field station focusing on environmental and climate research.
- Svalbard is accessible all year round because of its advanced community infrastructure and its relatively mild climate.
- Svalbard has the highest available data bandwidth in the High Arctic.

Major research facilities

- SvalSat/SvalRak
- EISCAT
- Aurora Observatory
- SPEAR
- Marine Laboratory
- Zeppelin Observatory
- AWIPEV Atmospheric Observatory
- Sverdrup Station
- Svalbard Science Centre
- Research stations in Ny-Ålesund, Barentsburg Hornsund and Svea
- Numerous field stations
- Research vessels

Sval Sat facilities

Ny-Ålesund – Svalbard in miniature

EU research infrastructure (ARCFAC) since 1996

Kjell Henriksen Aurora Observatory, Longyearbyen

Foto: Olli Jokiaho

- The Aurora Observatory officially opens in Longyearbyen by Norwegian Minister of Research and Education.
- Fully financed by the Norwegian government (3,5 mill. Euro).
- Complements the EISCAT and SPEAR facilities on Mine 7 Mountain.
- Offers a valuable contribution to atmospheric based observation platform.

Polish Polar Station at Hornsund

Themes:

Atmosphere/ionosphere

meteorology

Glaciology

Biology

Geology

Natural environment

Active institutions in Svalbard

- University Centre in Svalbard
- Norwegian Polar Institute
- Alfred-Wegener-Institute
- Institute Polaire Français
- British Antarctic Survey
- National Research Council of Italy
- National Institute for Polar Research, Japan
- Korea Polar Research Institute
- Chinese Arctic and Antarctic Administration
- Arctic Centre, Univ. of Groningen, Holland
- EISCAT Scientific Association
- Arctic Antarctic Research Institute, Russia
- Polish Academy of Sciences
- Norwegian Mapping Authority
- SINTEF Group
- Norwegian Institute for Air Research
- Stockholm University, Sweden
- Andøya Rocket Range
- Norwegian Space Centre
- University of Tromsø
- Nagoya University, Japan
- University of Leicester, UK

AWI-UNIS signing ceremony

Supporting institutions

- Alfred Wegener Institute (AWI), Germany
- French Polar Institute Paul Emil Victor (IPEV), France
- Polish Academy of Sciences, Institute of Geophysics, Poland
- Natural Environment Research Council (NERC), UK
- Finnish Meteorological Institute, Finland
- University of Groningen and The Willem Barentz Polar Institute, NL
- University of Rostock - Leibniz-Institute of Atmospheric Physics, Germany
- Arctic and Antarctic Research Institute of Roshydromet. St. Petersburg (AARI), Russia
- EISCAT Scientific Association
- Norwegian University of Science and Technology (NTNU)
- University of Oslo
- University of Tromsø
- University of Bergen
- Norwegian Institute for Air Research (NILU)
- Norwegian National Committee on Polar Research, with members representing:
  - Norwegian Institute of Marine Research, Norwegian Space Centre
  - Norwegian Institute for Nature Research, Norwegian World Heritage
  - Norwegian Meteorological Institute, Norwegian Polar Institute,
  - University of Tromsø, Danish Polar Center
  - University Centre in Svalbard, StatoilHydro

SIOS

- 9 December, 2008: SIOS on revised ESFRI Roadmap
- Steering comittee
  - Research Council of Norway (chair) – Karin Refsnes and Georg Hansen (coordinator)
  - University Centre in Svalbard – Gunnar Sand
  - Norwegian Polar Institute – Kim Holmen
  - Norwegian Space Centre – Bo Andersen
  - Bjerknes Climate Research Centre – Peter Haugan
  - To be extended by 3 -4 international members
- Project work
  - National meeting 19 December, 2008 (> 20 institutions)
  - International meeting 4-5 february 2009 (22 foreign institutions)
  - Establishment of consortium envisaged after Easter
  - Scientific and infrastructure gap analysis started
  - Work on knowledge centre started
- ”Preparatory Phase” Proposal 1 December 2009

>Environmental Sciences

SIAEOS – the Svalbard Integrated Arctic Earth Observing System

The facility:

SIAEOS is the upgrade of the present infrastructure and research activities on Svalbard to become an Integrated Arctic Earth Observing System. SIAEOS integrates the studies of geophysical, chemical and biological processes from all research and monitoring platforms – land, sea, ice/glacier and atmosphere/space based - thus responding to a highly relevant need to monitor global environmental change. The research infrastructure is mainly European, with the presence of a large number of research institutes and a broad and interdisciplinary user community from all over the world. SIAEOS offers unique opportunities for education and training of young scientists, since the operational centre will be integrated with the international University Centre in Svalbard (UNIS).

Background.

Svalbard's geographical location and extensive research infrastructure provides excellent opportunities for studies of ecosystem changes and their effects on the food chain, oceanic and atmospheric transport patterns which prevail in the Arctic region, integrating observations and analysis of the changing Arctic ice cover, unique studies of the energy balance between layers of the atmosphere, from the borders of space to the surface of Earth and for dense satellite monitoring. The impact of climate change, pollution and other pressures on the environment appear sooner and with more severe consequences in the high Arctic than in regions at lower latitudes. The high Arctic can therefore be seen as an early warning region.

What's new? Impact foreseen?

As an observation platform, SIAEOS will be complementary to projects like SAON (Sustaining Arctic Observing Networks), and could be developed as a major hub in the SAON system. SIAEOS will establish a framework of database and meta-database tools offered to the circum-arctic and European research communities. The database services will aim at the full and open access and exchange of the temporal and spatial resolved data within multiple disciplines which constitute the 4 dimensional SIAEOS knowledge base. A portal for online earth observation system (EOS) data in Svalbard will be offered in close collaboration with the European and circum-arctic research community, as well as in close coordination with and links to global and circum-arctic initiatives and databases like AMAP Thematic Data Centres, GEOSS and a number of other relevant networks and repositories for arctic environmental data.

Svalbard is already a strong research site with large scale research facilities and many medium-size laboratories, the international university and the necessary support structure to host international research consortia. The proposed "link" would not only underline the leading role of European institutes in polar research, but it would also highlight a successful EU-Research policy. The global research presence is based on a general open-door policy and the Spitzbergen-Status.

ESFRI roadmap, 9 December 2008: Information about SI(AE)OS

SIOS Gap Analysis Working Groups

- **Group 1:** Magnetosphere, ionosphere and connection to climate (Kjellmar Oksavik, UNIS)
- **Group 2:** The coupled Arctic climate system: atmosphere - ocean –ice (Georg Hansen, RCN)
- **Group 3:** Environmental change and marine ecosystems (Stig Falk-Petersen, NP)
- **Group 4:** Environmental change and terrestrial ecosystems (Maarten Loonen, Univ. of Groningen)
- **Group 5:** Solid earth and large time-scale processes (Tormod Kværna, NORSAR)

SIOS Gap Analysis Working Groups

- The main task of all the working groups will be to identify the most crucial and pressing scientific questions in their respective field, and for which of them Svalbard is best suited as a research platform
- Based on this analysis the groups are asked to make an assessment of existing research infrastructure/instrumentation and what is needed in addition to cover the scientific issues in a satisfactory way. The groups are in particular asked to consider the role of (satellite) remote sensing in their field.

Institutions joined the SIOS consortium so far (23 March)

- AWI, Germany
- IPEV, France
- Korea Polar Research Institute
- Chinese Arctic and Antarctic Administration
- Polar Geophysical Institute, Academy of Science, Apatity,Russia
- Arctic and Antarctic Research Institute (AARI), Russia
- Arctic Centre, University of Lapland, Finland
- Institute of Geophysics, Polish Academy of Sciences
- National Research Council of Italy
- ITM, University of Stockholm, Sweden

- We hope to have
  - UK
  - Denmark/Greenland
  - India
  - Japan

Norwegian institutions in the SIOS consortium

- Norwegian Polar Institute
- University Centre in Svalbard
- Research Council of Norway
- Institute of Marine Research
- NORSAR
- Nansen Environmental and Remote Sensing Center (NERSC)
- Geodetic Institute at the Norwegian Mapping and Cadastre Authority
- Akvaplan-niva
- Andøya Rocket Range
- Norwegian Institute of Air Research (NILU)
- Norwegian Institute of Water Research (NIVA)
- University of Tromsø
- University of Bergen
- Kings Bay AS

Extended steering board

- Norwegian institutions
  - NP (Kim Holmen)
  - UNIS (Gunnar Sand)
  - Norwegian Space Centre (Bo Andersen)
  - Bjerknes Centre (Peter Haugan)
  - RCN (Karin Refsnes, chair and Georg Hansen)
- Foreign institutions
  - AWI, Michael Klages
  - Polish Academy of Sciences,
  - AARI, Sergej Priamikov
  - IPEV ?

Preliminary costs SIOS

- Preproject June 2008 – December 2009; 4 mill NOK (450.000 EURO)
- Preparatory Phase – funding from EU 7. Framework Programme, max 5 mill EURO
- Investment in research infrastructure, appr. 400 mill NOK (45 mill EURO), all participating countries contribute, Norway as a host country appr. 30% of this
- Operating costs of infrastructure and Joint knowledge centre; 50 – 70 mill NOK (5.5 – 8 mill EURO) per year, all participating countries contribute, Norway as a host country appr. 30% of this
  - Data collection, handling, storage and delivery
  - Data assimilation including integration of satellite and field data
  - Space and timing integrating facility
  - Input to Earth Modelling Systems
  - Outreach and communication

Further process

- Secretariat will start to prepare the proposal (by 1 December 2009)
- Steering board meetings (every month)
- Working groups have started or are about to start (will finish by the end of August)
- Consortium meetings (2 -3 meetings; June, September/October, November ?)