SSF-JCI 1ST WORKSHOP, 17-21.8.2009: PAN-SVALBARD COOPERATION
ABSTRACTS OF ORAL PRESENTATIONS

17 AUG 2009

1. **Kirsten Broch Mathisen, Research Council of Norway (RCN), Oslo:** ***Polar research and funding opportunities through the Research Council of Norway***

The research Council of Norway (RCN) is an advisor to the government on research policy issues, and a funding agency for research and development. In addition RCN creates arenas for cooperation and knowledge distribution. Internationalization of research and international cooperation is important. Polar research is important globally, and of utmost importance to Norway. A Strategy for Norwegian Polar research will be put forward for the RCN board in September. The plan is ambitious on the level of Norwegian polar research and also on international cooperation in Polar research. There are some funding opportunities for international cooperation through the RCN.

2. **Marzena Kaczmarska, Svalbard Science Forum:** ***Svalbard Science Forum and Joint Cooperation Initiative (SSF-JCI)***

Svalbard Science Forum (SSF) is a body appointed to coordinate research in Svalbard and provide information about it. SSF is involved in scientific coordination, preparing and updating science plans, promotion of scientific interests, and gathering information about research projects through RiS (Research in Svalbard project database). It distributes funds for fieldwork (Arctic Field Grant), participates in outreach activities, as well as organizes meetings and workshops. SSF strives to streamline and integrate research as there are many research teams in various locations in Svalbard working separately on similar topics. Therefore, one of the most prominent functions of SSF is to build information and working networks and promoting joint initiatives across the whole of Svalbard. The expected outcome of such initiatives are stronger scientific connections between the research stations and groups, complementary research (and filling the knowledge gaps), better use of resources, increased mobility of researchers and students and open access to all research stations. SSF has arranged the first workshop under the Joint Cooperation Initiative (JCI) in order to establish links between 4 main research stations in Svalbard and provide an opportunity for researchers to find out what facilities, equipment and research programmes are run in each of them and what would be feasible and complementary to contribute with in the future. The long-term goal is to create an "umbrella" mechanism enabling joint projects to be run without administrative problems. The workshop is to identify pilot projects with potential for successful cooperation and to serve as starting point for future JCI projects. One large and well coordinated programme (e.g. SSF-JCI) gives a possibility for new, more effective research, has bigger impact within research community and policy makers and has higher success rate in competing for funding.

3. **Georg Hansen, Research Council of Norway (RCN):** ***Svalbard Integrated Arctic Earth Observing System (SIOS) – a new level of international research cooperation in Svalbard***

The Svalbard Integrated Arctic Earth Observing System (SIOS) is an initiative of the Norwegian government to develop all research infrastructure on Svalbard relevant for Earth System studies into a coordinated international observational system matching Earth System models. The initiative was accepted for the Updated Roadmap of the European Strategy Forum for Research Infrastructures (ESFRI) in 2008, and EU support is now applied for in order to establish the formal framework for the project during a 3-years preparatory phase. SIOS spans over a wide spectrum research fields, ranging from solar-terrestrial processes via atmosphere-ocean-land-cryosphere interaction processes to geophysical-biological coupling

and anthropogenic impacts, .e.g. long-range transported pollution. The project aims at reviewing the existing infrastructure in the light of the requirements put forward by models, propose necessary upgrading and building up an overarching infrastructure facilitating data access, exchange and utilization. Furthermore SIOS aims at building up a close regional cooperation in the European Arctic, function as an Arctic node for other environmental ESFRI initiatives and intends to function as a core element of the envisaged pan-Arctic Sustained Arctic Observing System (SAON). Institutions from 14 countries representing all the major platforms on- and offshore have joined the Preparatory Phase initiative, which is envisaged to start in the second half of 2010.

4. **Esa Turunen, EISCAT Scientific Association:** ***On future plans of EISCAT***

EISCAT Scientific Association operates 3 incoherent scatter radars in Northern Scandinavia. The radar sites include Tromsø, Norway, Kiruna, Sweden, Sodankylä, Finland and Longyearbyen, Svalbard, with a 2-dish monostatic radar ESR. The standard parameters analysed from the recorded scattered signals are the electron density, electron temperature, ion temperature and plasma velocity. Current applications include also interferometric studies of small-scale structures, meteroid orbits, space debris and radar reflectivity of the Moon surface. Data is analysed in real time. All measured data is accessible to researchers via the Madrigal database. EISCAT also runs an HF heating facility and a dynasonde, both in Tromsø, as well as a dynasonde on Svalbard, for routine ionospheric observations. The Svalbard dynasonde is running continuously. EISCAT plans to construct new antennas for receiving and transmitting. This is a major construction effort for 2010-2011.
An extended measurement was done during the international polar year 2007-2008 (IPY) at Svalbard. ESR was run 24 hours per day and 7 hours per week during the first year of IPY. Data from IPY have been analysed in order to improve modeling of the upper atmosphere in several workshops supported by the International Space Science Institute. However, the IPY 2007-2008 was run during a time of a solar minimum. This is why we present a proposal of a coordinated IPY-type mission during the next solar maximum time, probably in 2013. The proposal would support the Svalbard Integrated Arctic Earth Observation System proposal SIOS.
China is proposing a third, steerable antenna dish on Svalbard. If this proposal is accepted, it would use the ESR transmitter. This proposal is waiting for a funding decision in China, before relevant permit applications and detailed technical planning would be done.
In the near future, unprecedented science and technology application opportunities will open up with the construction of the new EISCAT 3D radar arrays on the mainland Norway. Some arrays are very large, in the scale of 30 000 individual antenna elements. The first design study was finished in 2009 and a modular construction of the facility would provide first measurements in 2013-2015.
Once the technology for EISCAT_3D is proven, one can start planning improving the measurement capacity of the EISCAT Svalbard radar by adding 2 remote sites with phased array receivers, in order to make a true 3-dimnsional plasma velocity measurement, simultaneously at several altitudes. This would be a future project to further enhance the current upper atmospheric plan of the SIOS proposal.

5. **Kjellmar Oksavik, UNIS: Overview of scientific activities and plans for near future: KHO & SOUSY**

This talk begins with a quick overview into the history of auroral research in Longyearbyen; from the first auroral measurements in Adventdalen in the 1970's to the opening in February 2008 of the new Kjell Henriksen Observatory (KHO). A detailed description is given of all current scientific instruments and collaboration partners at KHO. Some examples are shown of modern auroral and middle atmosphere research based on multi-instrument techniques (e.g.

in combination with radars and sounding rockets). There is also a description of our ongoing instrument development program and our optical calibration lab facilities at UNIS. The talk concludes with a few plans for the near future. Additional information about KHO can be found at: http://kho.unis.no/

6. **Lisa Baddeley, UNIS, Norway:** ***Space Plasma Exploration by Active Radar (SPEAR)***

The SPEAR (Space Plasma Exploration by Active Radar) facility is located on Svalbard at 75° CGM latitude and as such is 10° closer to a geomagnetic pole than any current facility of its type. It is one of only five such facilities in the world and the only one that can operate in the unique environment of the upper polar ionosphere.
The system works by emitting a high power electromagnetic beam into the upper atmosphere where it produces various effects by 'dumping' energy into it between ~60 – 500 km in altitude. These effects mimic the naturally occurring effects caused by the interaction of the Earth's magnetic field with that of the Sun's (i.e. the effects of space weather), although on a smaller and more controlled manner.
By conducting these experiments in such a manner it is possible to use the upper atmosphere as a laboratory for investigating how energy emitted from the Sun effects our upper atmosphere. The ability to be able to forecast and understand these effects as society becomes increasingly dependant on electronic systems such as satellites, is of paramount importance.
The facility has a detailed and successful research history, with results having already been presented at international scientific conferences and appeared in 13 peer-review papers in international journals.
Future plans, both experimentally and logistically will be discussed in additional to possibilities for future experimental collaborations.

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7. **Jacek Jania, University of Silesia, Poland:** ***On dynamics of Hansbreen in Hornsund***

Dynamics of Hans Glacier in Spitsbergen is presented. Importance of climate signal and local topography for glacier flow and calving intensity is considered. Repeated photos of different time and spatial resolution together with meteorological data, record of ice melting and subglacial water pressure have been used for these studies. Hans Glacier (56 sq. km) is a polythermal grounded tidewater glacier emptying into sea close to the Polish Polar Station. Its first photogrammetric record was done in 1936 (oblique air photos). Terrestrial photogrammetry has been used later in some years. More systematic monitoring has started in 1982. Digital time lapse cameras were mounted on the same tripods in July 2007. They take stereoscopic pictures at one hour interval. Comparison of photos from 1936 and 2007 shows the mean recession on the centerline by c. 25 m per year. Seasonal fluctuations of the front position were significantly higher more than hundred of meters. Advance has been observed in winter and retreat in summer and fall. Survey of glacier surface velocity has been done by time parallax method and GPS survey. Such data enabled calculation of calving flux from the ice-cliff. Mass loss due to calving constitutes 25 – 32% of the total annual mass loss and could be even equal to the mean net balance over last decade. Distinct seasonal inter annual fluctuations of glacier velocity were noted. Short period fluctuations of flow speed have been registered. Higher glacier flow accompany periods of intense melting. In the 2007 summer season, maximum speed of 0.92 m per day was recorded in periods 1-2 August, 9-10 August and 13-14 August, while it drop down close to zero immediately after. The speed up events were preceded by high subglacier water pressure and followed by appearance of turbid water outflows on the sea surface near the ice cliff. Aerial and satellite pictures of Hans Glacier and other Spitsbergen glaciers repeated in intervals of dozen of years document retreat and

thinning their tongues, thus a general trend of climate warming. Photos taken with high time resolution detect glacier velocity fluctuations related to changeable meteorological conditions during summer. Seasonal and inter annual glacier front dynamics is driven by climatic factors. Bedrock topography specifically at the glacier front and hydro-glaciological processes underneath of the tongue are driving factors of glacier dynamics in longer time scale.

8. **Doug Benn, Dept. Geology, UNIS:** ***Glaciological research at UNIS***

Glaciological research in the *Department of Geology* at UNIS focuses on three main themes: (1) calving processes and the dynamics of calving glaciers; (2) glacier hydrology; and (3) glacier surges. *Calving* is a major process of ice ablation worldwide, and can result in the rapid transfer of inland ice to the oceans. Despite this, calving is very poorly represented in most glacier models, limiting our ability to predict future ice losses and sea-level rise. We have developed a new physically based model of calving, which has been adopted by a number of groups working on prognostic ice sheet modelling. Field campaigns, partly funded by the IPY project Glaciodyn (Dynamic Response of Arctic Glaciers to Climate Change), are in progress at Kronebreen with the aim of developing a deeper understanding of calving and related calving processes. *Glacier hydrology* research at UNIS focuses on using speleological techniques to determine the morphology and characteristics of englacial and subglacial drainage systems, and to use this knowledge to constrain the interpretation of traditional data such as tracer returns and solute loads. Current research programs are being conducted in collaboration with the Polish Research Station at Hornsund, and the University of Cambridge. The location of UNIS provides a unique opportunity to study *glacier surges*, allowing researchers to respond rapidly when surges are first detected and to conduct ongoing monitoring programs. Studies were conducted on the 2005 surge of Paulabreen, and are currently in progress at Comfortlessbreen, Nathorstbreen, and other locations. Important glaciological research is also being conducted in the *Department of Geophysics* at UNIS, under Carl Bøggild. Studies include research into the effects of black carbon on glacier melting and the formation of supermposed ice from refrozen meltwater.

9. **Iwona Stanisławska, Space Research Centre, PAS:** ***Space weather at Hornsund station for RWC Warsaw service***

Hornsund station is situated in Spitsbergen. Its position varies in relation to the projection of magnetosphere magnetic field lines; the station may be situated under the auroral oval or under open magnetic field lines in the polar cap region. Permanent recordings at Hornsund consist of ground level electric field measured by both: radioactive collector and field mill, vertical air-earth current density measured by long wire antenna, meteorological parameters - since 1998 automatic Vaisala station, three components of geomagnetic field, aurora observations, ionosphere absorption by riometer, GPS – scintillations – spaced receivers drift measurements, ionosonde for vertical and oblique sounding, ionospheric characteristics and slant and vertical TEC. Station is used as data provider for RWC Warsaw service and for applied science development related to space weather data assessment, modeling and prediction. Station is involved in current collection of large portion of data supply directly to SRC where are stored and/or to international scientific nets as INTERMAGNET (magnetic data). It is continuously monitoring the ionosphere. The system of on-line availability is under development.

Service provided at present on the basis of Hornsund recordings of a continuous flow of data, daily expected influence of heliogeophysical activity on monthly and daily forecasts of radio-communication conditions through-out the polar region is prepared for Governmental and commercial customers by means of the special developed software package for data processing and system of prediction of HF communication. The stress is put to the ionosphere disturbances on short wave radio propagation, satellite-to-ground and ground-to-satellite

communications, signal fade and phase change on satellite up- and down-links, location errors and reception problems when using GPS navigation system, location errors in remote sensing of HF radio signals. To support the operational phase of selected needs arctic data will be very important for the space weather ionospheric corrections crucial for applications of GNSS signal in space and for quite new area for RWC – the attenuation and scintillation effects of atmospheric components on satcom conventional (C-band to Ka-band) and higher frequency bands on the base of Meteo-data (bridge to meteorology). This part of work is directly linked to the improvement and further development of the automated forecast and prediction of space weather effects in the important polar area.

Hornsund is an unique place for solar-terrestrial atmosphere research includes atmospheric electricity, ionospheric dynamics, magnetic storm and substorms. The space weather impact on terrestrial and Earth-space radio-communication is studied for years. However, there is no sufficient information from different kind of specialized services offered to support regional and global radio-communication needs.

The atmospheric impact on terrestrial and satellite radio-paths is now in particular EU concern. In that context, the exploitation of terrestrial weather parameters is still very far from efficient application. An information from ground based meteorological radars, data and pictures from METEOSAT, METOP, available from EUMETSAT are not effectively exploit for radio-communication. It is partly due to physical relations between space and terrestrial weather circumstances are still poorly known.

Present models for radio-communication are based on rough statistical approach and their space and terrestrial weather drivers are separate and uncorrelated. Here, we describe the detailed needs of related questions and try to define the possible response from the point of view of current availability of space weather services. In the future our focus will be on space weather as ”a space weather services” with well defined services recognized as joint space effect products - demand oriented and integrated application linked to GMES including meteorological effects (like Satcom).

10. **Nataly Blagoveshchenskaya, Dept. Geophysics, Arctic and Antarctic Research Institute (AARI):** ***Study of non-linear phenomena in the polar ionosphere induced by the SPEAR heating facility***

It is proposed to build up a close collaboration in Svalbard in upper atmosphere physics between the University Centre in Svalbard (UNIS) in Longyearbyen and the Arctic and Antarctic Research Institute (AARI) from St. Petersburg. The overall objective of the proposed project is the study of non-linear processes within the framework of ionospheric modification by HF powerful radio waves from the SPEAR heating facility. The UNIS operated the SPEAR heating facility will be used for ionospheric modification experiments to generate the artificial field-aligned ionospheric irregularities (AFAIs), and the EISCAT SVALBARD RADAR will be used to monitor the behaviour of plasma parameters. Russian radio equipment operated by Department of geophysics from AARI in Barentsburg will be used for studies of stimulated electromagnetic emission (SEE) phenomenology in the HF-modified polar ionosphere. Remote diagnostics will be performed with the use of long-distance diagnostic radio equipment at the AARI observatory near St. Petersburg. In 2010 – 2012 we plan to carry out several joint heating campaigns. in which we will use radio instruments in Longyearbyen, Barentsburg and St. Petersburg to study artificial field-aligned ionospheric irregularities (AFAIs) and stimulated electromagnetic emission (SEE) in the upper polar ionosphere above Svalbard. The research programme can be shortly summarized as follows: (1) non-linear structuring of the polar ionosphere and distinctive features of artificial field-aligned small-scale irregularities (striations) under different geophysical conditions; (2) experimental investigation of the expansion of HF-induced plasma perturbations along the magnetic field from the ESR radar observations; (3) establishing a link between individual SEE features and specific physical processes; (4) the features of HF

propagation on the SPEAR – St. Petersburg path and the spectral structure of the SPEAR signals received in St. Petersburg; (5) impact of powerful electromagnetic waves on the near-Earth space environment.

11. Piotr Głowacki, PAS, Warsaw, Poland: *Overview of current research activities/interests in Horsnund*

The Polish Polar Station located near the Hornsund fjord on Spitsbergen is a modern research facility that meets world standards. Its research of the natural environments' physical properties is crucial in determining the global processes studied by the international Global Change Programme, which has been given top priority by the European Science Foundation in Strasbourg and the European Commission in Brussels. Due to the valuable natural surroundings, research possibilities and the station's accomplishments, the Hornsund fjord and its polar station have been recognized as the European Marine Biodiversity Flagship Site. The logistic infrastructure and the station's laboratories allowed for extensive research in many fields of science and various interdisciplinary studies conducted in multinational teams and through international collaboration (projects PR 5, PR 6, PR 7 and various bilateral projects).

The station's significance and international status as well as possibilities of development are due to its: unique location, long-running history (since 1957), continous year-round activity (since 1978) and thus long-term observations, modern laboratories and equipment, logistic possibilities for field work in summer and winter, scientific achievements.

Location of the station is favorable for complex research of geophysical and environmental phenomena in the Arctic, significant for the entire Northern Hemisphere. This concerns especially the structures of the lithosphere and the biosphere, physical processes on land, in the atmosphere, the ocean, and the circumterrestrial space. Nearby glaciers constitute an international research site for tracing their interactions with the changing climate. Seismologic recordings are the basis for research of seismicity in the Arctic. They provide unique information on tremors in the area of Svalbard and the North Atlantic Ocean, as well as glacier seismic events. Spitsbergen is the best geographical location for research of physical phenomena in the region of the polar light – the "polar cusp". Measurements of the components of the geomagnetic field along with the measurements of the atmosphere's electricity and ionospheric absorption give essential data for the study of processes that occur in the magnetosphere and ionosphere. It is relevant to define physical parameters affecting the influx of solar radiation to the Earth's surface in the Arctic as well as to study aerosols, ozone and UV light. In the last decade intensive studies have been carried out on marine biology, biochemistry and genetics. It should be noted that the Polish facility is the only research station located in the National Park in Svalbard. This is a crucial advantage for the study of the environment and human contribution in contemporary biodiversity and climate change in the Arctic.

The station was built by Poland for the 3rd International Geophysical Year (1957/1958) and later it was used for expeditions in summer seasons. Its long-running tradition is the basis for its international recognition. It is the only station on Svalbard still in function since the 3rd International Geophysical Year. It had been renovated and thoroughly modernized (2002-2008). Year-round research allows for constant monitoring of the natural environment as well as geophysical and cosmic phenomena, which results in valuable long-term observations. These in turn are accessible in worldwide databases and constitute the basis for development of new research programs.

The Polish Polar Station is a model European research platform. It has the advantages of a logistics centre allowing for constant monitoring with broad possibilities for field observations, including the usage of equipment on distant glaciers. At the same time it is a research facility with laboratories.

Laboratories as well as housing, which meet the highest technical and operational standards in polar conditions are available. It is considered the most eco-friendly research facility in the Arctic. It has a complete sewage treatment plant as well as combustion and garbage disposal systems. Three independent systems of communication guarantee unlimited full-time access to the Internet via which data are transmitted to international databases and science centers worldwide. The station has been chosen by renowned research centers, such as NASA or WMO as their permanent measuring facility additionally equipping Hornsund with the latest measuring equipment and apparatus. The Polish Polar Station's infrastructure and equipment provide living and working conditions for 45 people at a time.
In recent years about 80 persons per year have been using the station or working in it, 20% of whom have been foreign scientists. Scientists who work at the station represent 22 scientific institutions. Furthermore, 18 foreign science centers have permanently joined in the realization of projects which led to the formation of "research schools" in particular fields. These "schools" gained international attention and can pride themselves on educating several graduates with master's and engineer's degrees and about 3 candidates for doctoral degree and 1 for postdoctoral degree every year.
The long-term research carried out mainly by Polish scientists in cooperation with several foreign institutions, contributed significantly to the fact that Hornsund region is one of the best known areas in the European sector of the Arctic. The activities and accomplishments of the Polish Polar Station Hornsund bring worldwide recognition to Polish science in the field of polar research.

12. Sebastian Sikora, University of Wroclaw, Poland: *Atmospheric Boundary Layer - thermal structure*

Investigations of Arctic Boundary Layer (ABL) are necessary as a background for understanding observed changing of glacier's mass balances. Inversions in vertical profile of air temperature and very stable ABL are observed while in meteorological stations (located close to coast and not high above sea level) typical air temperature is recorded.
In 2005 particulars investigations of ABL in Polish Polar Station (PPS; Wedel-Jarlsberg Land, SW Svalbard) were started. During the summer 2005 several sessions of ABL measuring were carried out with using following equipment:

- SODAR (acoustic sounding),
- tethered balloon (vertical air temperature and humidity profile),
- automatic weather station (located in PPS and on Hans glacier, 200m a.s.l.),
- air temperature microloggers (different locations, from 10m to 400m a.s.l.).

Observations of ABL afford several important information:

- ablation seasons are characterized by a high frequency of temperature inversions forced by atmospheric circulation,
- the back trajectories indicate that boundary layer air had a different origin than air above the ABL,
- Sodar monitoring of the ABL indicated:
    - the main structures observed by the sodar are a spiky layer connected with forced convection and stable stratification (modulated multilayer)
    - the summer boundary layer is shallow with the range of 200-350 m a.g.l.
    - the lowest part of the ABL is well mixed.

Monitoring of ABL is baffling to carry out especially in arctic region but new solution (as flying electrical RC models) are available for *in situ* investigations.

13. Tavi Murray and others, Swansea Glaciology Group, Swansea University, UK: *Themes in Svalbard glaciology*

Presentation covered three major research themes:

- *Glacier geophysics to determine ice structure and bed and ice properties*

We use a variety of geophysical techniques to investigate glacier bed and glacier ice properties, which are critical in determining ice dynamics. Within this theme I showed results of mapping the geometry and fill of englacial channels using surface ground-penetrating radar, as well as results that questioned simple 2-D interpretations of glacier thermal structure in some locations in Svalbard. We have developed new mixture models of the effect of water inclusions within glacier ice on geophysical properties that allow us to measure ice-water content and inclusion shape from radar and seismic velocity and attenuation using spatially coincident borehole and surface radar and seismic surveys.

- *Glacier volume change and Svalbard's contribution to sea-level rise*

We have been using digital photogrammetry based on lidar ground-control to measure volume changes from the archived Norwegian Polar Institute's historical aerial photographs. These photographs are available from the 1950s (vertical) and allow volume changes since that date to be measured. Our results show this method can produce high-quality DEMs, equivalent to those controlled using GPS measured ground-control points. The five glaciers spaced over the archipelago we have studied in our most recent project show an acceleration in thinning over the 20th century.

- *Glacier dynamics and glacier surging in the Svalbard archipelago*

Many glaciers in Svalbard are of surge-type and alternate between long periods of slow flow and shorter periods of fast flow, typically 10-1000 faster. In Svalbard, surge-type glaciers are associated with sedimentary beds beneath glaciers, polythermal regimes and the surges seem to be slower and more sluggish than in other regions. Detailed studies at a surging glacier in full flow have the potential for making a strong contribution to understanding of the surge process. However, because the events are unpredictable this would mean a project on "stand-by" until a suitable surge started. Collecting data prior to surging at a number of glaciers would also be required so that the project had pre, during and post surge data at a single site.

14. Marek Grześ, Nicholas Copernicus University, Toruń, Poland: *Polar station Spitsbergen – Kaffiöyra*

The station, built in 1975, has been a base camp for research Project In Oscar II Land – mainly Kaffiøyra. Once the station has had extension addend, it can host 10 – 15 people at any one time. The station is used 2 times per year: 1 month during spring time (March – April), and 2 months during summer time, but it is possible to stay there for as long as whole year. Kaffiøyra is a marine isostatic terraces. From the north the plain bordered by Hornbaek Bay and the barrier of Aavatsmarkbreen. From the south by the bay of the Dahlbreen. In the east Kaffiøyra borders with six glaciers. Big numbers of glaciers located on a relatively small area, various marginal zones, and the tundra of marine terrace levels all add up to the scientific curiosity of the Kaffiøyra. Arctic tundra makes up a very fragile ecosystem. Thanks to its huge natural diversity, the 14 – kilometer long and 4 – kilometer wide Kaffiøyra provides an excellent place for study. Glaciers pose the dominating feature of Kaffiøyra region. Since the 19th century their area has decreased by about 30%. Thus, one of the mainscientific issues studied there is the course and the reason for the change in the glaciers geometry. This can be archieved by studying mass balance of the glaciers. The research includes both the summer balance (ablation and outflow) and winter balance (snow accumulation and winter outflow- naledi). The detailed research plans also refer to large glaciers which end up in the sea (Aavatsmarkbreen, Dhalbreen). Currently, subaquatic glacial relief of the bays in the Forlandsundet regin is under scrupulous investigation (http://www.polish.polar.pan.pl/ppr30/PPR30-143.pdf). The results of the research can be obtained from the stations weside, World Glacier Monitoring Service publications, as well as the website of the Cirrumpolar Active Layer Monitoring (CALM-IPA).

15. Vladimir Safargaleev, Polar Geophysical Institute, RAS, Russia: *Polar Geophysical Institute in Svalbard: Scientific tasks and links to SIOS*

During day hours ionosphere over Spitsbergen is magnetically conjugated with magnetopause and adjusted magnetospheric domains. Dayside auroras, plasma irregularities, MHD-waves, plasma convection are the ionospheric display of a number of magnetopause processes, one of which, energy transfer through the magnetopause, is a key element of space weather investigations and prediction. Monitoring of the auroras, geomagnetic and ionospheric disturbances is the main scientific task of PGI research station in Barentsburg (BAB) in Spitsbergen. Energy transportation from the interplanetary space to the Earth's atmosphere has been announced as one of scientific topics of SIOS project. Artificial modification of the ionosphere by radio waves (i.e. ionosphere heating) is regarded as a power tool for study the physics of ionospheric plasma. In perspective, heating facilities may be used also for the probing the magnetospheric plasma. SPEAR facility near Longyearbyen is one of the instruments which will be involved in the SIOS project. BAB is well situated and properly equipped to detect and investigate SPEAR stimulated effects by radio, optical and magnetic methods. The talk gives short overview of PGI instrumental and scientific abilities in the light of the tasks which are suggesting for SIOS project.

16. Nikolai Osokin, Institute of Geography, Russian Academy of Sciences: *Russian glaciological research in Svalbard*

Our research in Svalbard began in 1965. The main directions of our research in the recent years were: 1. Radio-glaciological measurements of glacier internal structure; 2. glacier drainage system; 3. Interactions between snow cover, vegetation, soil and permafrost. We have obtained ice thickness data from 136 glaciers in Svalbard using specialized 620 MHz impulse radar system RLS-620 with higher potential (180 dB). The radar studies, conducted in 2003-2007, aimed at investigation of hydrothermal structure and regime of temperate and polythermal glaciers, using the low frequency (20 MHz) monopulse radar with digital recording system of radar and navigation GPS data and optofiber synchronization system. It allowed to collect data of ice thickness, internal structure, radiowave velocity (RWV) in glacier ice from common mid-point method (CMP) measurements with transmitter-receiver separation up to 500 m. We have estimated the water content in temperate ice, and measured strength of signal reflected from the bedrock (BRP) as well as we could track internal water inclusions (IRP). Study of glacier mass balance near Barentsburg showed that the positive air temperatures have been gradually decreasing while the snow cover has been thickening and the glaciers have been shrinking slower in the last decade. We have also produced a model for the influence of snow cover on soil freezing. Results from this model use with real data (test area near Barentsburg) have shown that the contribution of temperature of air and thermal resistance of a snow cover to the size of ground freezing is approximately identical, the difference about 4-8 %.

Plans for the future researches in Svalbard:

1. Radar and glacier internal drainage system studies will provide more data, which will helpl to better understand the mechanism of glacier surges and distribution, content and movement of water within and beneath temperate and polythemal glaciers.
2. Study of the thermal resistance in the system "snow cover-vegetation-soils-permafrost" in Svalbard to study variability of seasonal melting layer and its stability during global warming.

17. Georgiana de Francheschi (presentation by Lisa Baddeley) – *Space weather effects on GPS signals in the Scandinavian sector*

Perturbations in solar-terrestrial phenomena can propagate from high to middle latitudes and may seriously degrade technological systems relying on trans-ionospheric radio propagation. The reliability of some of these systems is vital for safety-of-life applications. Consequently,

upper atmosphere monitoring from ground base stations is needed to investigate and model ionospheric variability and to subsequently optimize forecasting techniques. Here the exiting network of specially modify GPS receivers for TEC and ionospheric scintillation monitoring (GISTM) over Northern Europe is presented. Data are structured in a proper data base and examples of data accessibility and treatment are shown. The importance and the amount of data collected are highlighted by original investigations on the formation of the ionospheric irregularities causing scintillations and on the dynamics of the high latitude plasma under disturbed conditions.

18. **Anna-Liisa Ylisirniö & Paula Kankaanpää, Arctic Centre, University of Lapland, Rovaniemi, Finland –** ***Arctic Centre and its research excellence. Arctic and cold climate research at Finnish research institutes and universities.***

Arctic and cold climate research has a long history in Finland. Arctic Centre, as a national institute for Arctic research and communication, aims at promoting Arctic research of all Finnish institutes and universities.
Arctic Centre is a separate institute of the University of Lapland, focused on multidisciplinary and participatory research on the impacts of development and climate change in the Arctic. It has an annual budget up to 4.5 million €, and a staff about 50-70 depending on project situation. The Centre has three focal points of research: social and environmental impacts of global and climate change, sustainable development, and environmental and minority law. Arctic Centre is also running an Arktis graduate school for 23 PhD students, financed by the Academy of Finland.
Since the beginning of 1990s, Arctic Centre has conducted glaciological research in Svalbard. The glaciology group, led by Professor John Moore, is doing ice core chemical analysis to extract past climate information, ground penetrating radar studies of glaciers to study their internal structure, and mathematical modeling and analysis of the climate records and glacier evolution. Arctic Centre has also had a central role in the Kinnvika expeditions of the International Polar Year, acting as a co-leader of the project together with the University of Uppsala. Arctic Centre has interests in being more active in Svalbard, and it is participating in Svalbard Integrated Arctic Earth Observing System
(SIOS) initiative, where the Centre aims at increasing scientific, educational and data management cooperation among the partners of the initiative.
For more information on Arctic research in Finland and Arctic Centre, see
http://www.arcticcentre.org/research

19. **Veijo Pohjola, Uppsala University, Sweden:** ***Ice dynamical work on Lomonosovfonna and Vestfonna: Overview of work done 1997-2009***

During the recently passed International Polar Year the 50 year old IGY (or IPY3) station Kinnvika on western Nordaustlandet was used as a platform for ca 70 scientist and logisticians from 7 nations to perform a study of change and variability in the High Arctic. The research done was dispersed between atmospherical, biological, geological, glaciological and oceanographical sciences. The Earth scientist mainly focused on the ice cap Vestfonna, studying its present status, as well as its past status during the last glacial, and they will do predictions of the future status of the ice cap, in cooperation with the Norwegian team that are working on the neighboring Austfonna. Biology has focused on floristic and faunistic taxonomy, and population density. A team of geologist / paleobiologists have investigated the 1-0.5 Myr old sediments in order to better understand the settings in the Svalbard – Greenland area at those ages. Oceanographers improved the bathymetric maps in the Murchinson Bay. Finally, results and illustrations of the glaciological work on Lomonosovfonna-Nordenskiöldbreen, and Vestfonna was presented in order to bring an update of the status and prediction of the future for these ice fields.

20. Thomas Schuler, Oslo University, Norway: *Ongoing research on Ausftfonna*

The polythermal Austfonna ice cap (8200 km2) on Nordaustlandet contains more than 25% of all ice on Svalbard and is a target glacier for a comprehensive field program within the IPY-project GLACIODYN and is co-sponsored by ESA for Cal-Val activities for the coming CryoSat 2 satellite. The project aims at reducing the uncertainties in Arctic Glaciers and Ice Cap (GIC) contribution to sea level changes by: i) including the calving flux in mass budget calculations, ii) improving process understanding of calving and basal sliding and including dynamics in modeling of future glacier response. In detail, our studies are focused on 1) Surface mass balance 2) Elevation changes (volume changes) by satellite data, airborne laser profiles and ground-based GPS and 3) Dynamics; surge and calving.

For the period 2004-2008, the net surface mass balance of Austfonna was close to zero (+0.05 m water eq. y-1). In addition, calving is important (2.5 km3 y-1)and stands for 30-40 % of the ablation. The combined surface elevation change observations reveal a marked thickening in the interior of the ice cap in the order of c. 0.5 my-1, and a thinning at the margins at about 1-2 my-1.

In an ongoing downscaling study, we exploit the ERA40 and ERAinterim archives to reconstruct a 50 year accumulation history. Using this dataset, we assess the possibility that the observed elevation increase of the interior was due to an increase in precipitation as a consequence of the decline of sea ice in the Barents sea and the associated increase of moisture availability. Preliminary results indicate that the downscaled winter precipitation agrees well with observed snow accumulation, however, the weak and non-significant trend found over the 50 years series does not support the hypothesis that the elevation increase was atmospherically driven. This is supported also by accumulation estimates derived from shallow ice cores.

The dynamics of Austfonna are investigated using a numerical model and accompanying, continuous GPS surveys of flowlines along some of the most active flow units. Preliminary results suggest that vast parts of Austfonna are dynamically inactive, and consequently, accumulated mass is not transported away but builds up in the interior. This behavior may be interpreted as the quiescent phase of a surge-cycle, which is typically ended by a surge, i.e. a flow instability that quickly discharges massive amounts of ice to the ablation area. In this case, calving and increased melting at low elevations would considerably increase the rate of mass loss of Austfonna within short time.

20 AUG 2009 (THURSDAY)

21. Bendik Halgunset, Kings Bay AS, Ny-Ålesund, Norway: *Research management in Ny-Ålesund*

- Research activity level in Ny-Ålesund:
  - Increase to app. 13500 overnight stays this year compared to last
- VIP-visits:
  - Ban Ki-moon (September)
  - Franco Frattini (April)
  - Ministry of Trade and Industry + Günter Verheugen (April)
  - Ministry of the Agriculture; Lars Peder Brekk (February)
  - Minister of Fisheries and Coastal Affairs; Helga Pedersen (March)
  - Board of directors from KOPRI (September)
    - Ms Hong Kum Lee
  - Visit from AWIPEV (this week)
    - IPEV: Director + deputy, Gérard Jugie + Yves Frenot (to replace Jugie next year). Dominique Fleury (replacement for Franck Delbart during his absence)

        - AWI: head of logistics, Hartwig Gerland + Dirk Mengedoth (logistics) + Eberhardt Kohlberg (safety + s. Equipment + medicines) + Roland Neuber (Potsdam)
- Projects:
    - Amundsen-Nobile Climate Change Tower
        - Completed a few weeks delayed according to schedule
        - Connected to the campus network
    - Information Centre. Opened in June.
    - New garage/washing hall. Under construction. To be completed in November.
    - The power station/energy solution
        - Power station project put on hold due to new information regarding cost-benefit ratios
        - Energy plan is available (summary)
        - In short: idea to utilize current power production more efficiently, by improving efficiency and management measures. Estimates show that the efficiency potential is app 3,7 GWh/year, og a total consumption of 10-12 GWh/year. The efficiency of today's system is 0,8.
        - Infrastructure and building maintenance
        - Applied for transfer of grant for power station to 2010, and permission to use these for energy efficiency measures
        - Some measures taken in 2009
    - General maintenance
        - Service building (sewage)
        - NERC station (sewage)
        - NCAOR station (roof)
        - Water pipes to Tvillingvann (prepared)
        - Sewage from London (new)
    - Teisten
        - Extention of work deck (2009)
    - Tank facility; ESSO
        - Investigations of ground and facility.
    - The Amundsen Villa; restoration
    - Web-based registration system
        - Connected to the RiS-database
- Participation:
    - MESOAQUA
    - ARCFAC
    - Pan-Svalbard Cooperation Workshop

22. **Paal Berg, NySMAC/NILU, Norway:** ***Overview of current research activities/interests in Ny-Ålesund from NySMAC perspective & NILU research activities in Ny-Ålesund.***

NySMAC is the short name for Ny-Ålesund science Managers' committee. The basic aim is to collaborate in order to reach the goals in the mission statement:

- Serve as an international station for scientific research and monitoring
- Encourage scientific cooperation and monitoring
- Give priority to scientific research and monitoring that is dependent on the nesr pristine environment or unique quqlities of the NyÅ area, in particular research related to climate change and ecology
- Preserve the near pristine environment of the Brøgger peninsula and the Kongsfjorden area as well as the cultural heritage of NyÅ

- Keep local human environment impacts at the lowest possible levelso as not to jeopardize scientific research an monitoring
- Give scientific research and monitoring priority over the local human acticvities such as tourism and commercial fishing
- Be a prime example of the sustainable operation and development of a research station in the polar region

A short introduction of the present members was given:

- Norwegian Mapping Authority
- Chinese Arctic and Antarctic Administration (CAAA)
- CNR Arctic station “Dirigibile Italia”
- GFZ German Research Centre for Geosciencies
- Korean Polar Research Institute (KOPRI)
- National Centre for Antarctic and Ocean Research (NCAOR), India
- National Institute of Polar Research (NIPR), Japan
- Natural Environment Research Council (NERC), UK
- Stockholm University (Sweden)
- University Centre in Svalbard (Norway)
- University of Tromsø (Norway)
- University of Groningen (The Nederlands)
- Andøya Rocket Range (ARR) Norway
- Alfred Wegener Institute (AWI), Germany
- Norwegian Institute of Air Research (NILU)
- Norwegian Polar Institute (NPI)

23. Roland Neuber, Alfred-Wegener Institute, Potsdam, Germany: *The joint French-German AWI-IPEV research base on Spitsbergen, a general introduction*

The AWIPEV Research Base is a joint operation of the French and German polar research institutes, IPEV and AWI. The base has a twofold function. It serves as a platform for long term observations in the Arctic atmosphere, the permafrost soil, and the marine ecosystem. Also, the base supports projects running on short, medium or long time scales. All year round an overwintering team of 3 staff provide field support, general logistics, and run continuous, (semi-)automated observations, like daily weather balloon launches. AWIPEV contributes to international networks like GAW, BSRN, NDACC, and to EU projects like ARCFAC and the upcoming SIOS. The base consists of several buildings in Ny-Ålesund. It can host up to 16 scientists simultaneously, with fully equipped lab and working space. In addition, a field site (Corbel Station) is located 6 km east of Ny-Ålesund. Research topics at the base generally contribute to investigations of Climate Change and its effect on the biota. The main fields of research are: Atmosphere, climate, meteorology; Glaciology & geophysics; Marine sciences; Terrestrial and marine biology; Ecosystem Kongsfjord.
The Corbel Station (6 km east from Ny-Ålesund into Kongsfjorden) is currently undergoing substantial renovation. It is used for glaciological and hydrological studies of the Loven glaciers as well as a Clean Air station for atmospheric research. Emission free power supplies by solar panels and wind turbine have been installed recently. A call for new research proposals for Corbel Station will be issued by IPEV in 2010.
For more information about AWIPEV base please visit http://www.awipev.eu or write to awipev@awi-potsdam.de

24. Roland Neuber, Alfred-Wegener Institute, Potsdam, Germany: *Upper Atmosphere Research at the AWIPEV Base Ny-Ålesund*

Research in the middle and upper atmosphere as conducted at the Joint French – German AWIPEV Base is concentrated on the following areas:

- Stratospheric research about the chemistry of the ozone layer and its relation to climate change
- The mesospheric OH layer
- Solar Particle Events, as monitored by a neutron flux spectrometer

For the first topic AWI and University of Bremen contribute to the Network for the Detection of Atmospheric Composition Change (NDACC). The Atmospheric Observatory in Ny-Ålesund is a Primary Site within this network. For more info contact Roland.Neuber@awi.de.

The mesospheric OH layer is investigated by spectrometers recording the OH* emission during polar night, as well as by a UV laser system, which can determine the mesospheric OH altitude distribution. A FTIR spectrometer is used by the University of Bremen (M. Palm), while a UV-vis spectrograph is employed by UNIS (F. Sigernes).

The Helmhotz Centre Munich has installed a so called Bonner spectrometer to monitor the energy distribution of the neutron flux, which is created in the earth's atmosphere by solar particles. The data is used for reference within the *European program package for the calculation of aviation route doses (EPCARD).*
More information is available from Prof. Herwig Paretzke (Helmholtz Zentrum München – Institute of Radiation Protection Ingolstädter Landstr. 1, D-85764 Neuherberg, paretzke@helmholtz-muenchen.de)

In addition the Geoforschungszentrum Potsdam (Helmholtz Centre for Geo Research) operates two satellite data receiving antennas in Ny-Ålesund. They are mainly used to receive data from the CHAMP and Grace satellites, which is further processed at the institute in Potsdam and at the DLR, e.g. for Space Weather applications. (For further details contact CHAMP Project Office, Helmholtz Centre Potsdam – GFZ, Telegrafenberg A17, D-14473 Potsdam, Tel: +49 331 288-1731, Fax: +49 331 288-1732, Email: champ@gfz-potsdam.de)

25. Knut Stanley Jacobsen & Jøran Moen, University of Oslo, Norway: *UiO Dayside Auroral Research Program*

Routine measurements of the Daytime Northern Light phenomenon started 30 years ago in Svalbard, and have grown to a big international enterprise. Svalbard is at daytime located underneath the polar cusp cleft region, ideal to study the direct coupling between the solar wind and the Earth's atmosphere. The University of Oslo has operated optical instruments at Ny-Ålesund, housed at the Norwegian Polar Institute, every winter since 1984, and has been in the forefront of the cusp auroral research since then.
The core instrumentation comprises:

1) Meridian Scanning Photometer (630.0nm, 557.7 nm, 427.8 nm).
2) All-sky imager (630.0nm, 557.7 nm).
3) A Steerable Polarization Photometer (630.0 nm).
4) We also have all-sky imagers at KHO in Longyearbyen (630.0nm, 557.7 nm, 427.8 nm, NIR), and at Andøya Rocket Range (630.0nm, 557.7 nm).

The UiO space research is highly international and multi-instrumental. Original research is conducted based on combined data sets from Ground-based optics, EISCAT and SuperDARN radars, the IMAGE magnetometer network, and several satellites (ACE, DMSP, NOAA, Polar, Cluster). We also take active part in NASA and JAXA sounding rocket projects, to provide auroral forecasts and diagnostics of launch conditions on campaign basis, and interpretation of data afterwards. The all-sky camera and SuperDARN radar data are particularly useful to frame the geophysical context of detail in-situ snapshot information from satellites and rockets. We successfully launched the ICI-2 sounding rocket (investigation

of cusp irregularities) December 5, 2008, a Norwegian payload with Japanese guest instruments onboard. This was the first sounding rocket mission dedicated to characterize and study the driving mechanisms behind the HF radar backscatter phenomenon. We plan a series of ICI-rockets and ICI-3 has now been funded. We are in the process to install 2 GSV4004B ionospheric scintillation and TEC monitors in Svalbard.

Key - science objectives for ongoing and future research:

Study the magnetic reconnection phenomenon with particular emphasis on the evolution in time and space. This can only be done from ground!!

Study boundary layer physics, Magnetosphere-Ionosphere coupling and current systems.

Study auroral acceleration regions.

Study flow structures and plasma structures.

Study generation of waves, instabilities, and turbulence.

Study formation of HF backscatter echoing targets.

Study thermospheric effects of particle precipitation and Joule heating.

Study the connection between plasma patches, plasma instabilities and disturbance of GPS signals.

Future campaign activities:

We will continue the optical programme at Ny-Ålesund at the same level as today.

We plan 3-5 more rockets in the ICI-series around the next solar maximum (2010-2014).

Svalbard is the only place in the world where daytime auroras can be explored by optics, radars, and sounding rockets. Sounding rockets will be critically needed to investigate plasma instabilities and turbulence, and energy transport through the ionosphere.

26. Ruiyuan Liu, Polar Research Institute of China, Shanghai 200136, China: ***Chinese UAP observations in Ny-Alesund***

The Chinese Yellow River Station was established in 2003 at Ny-Alesund of Svalbard. It is under the ionospheric projection of the magnetospheric cusp region at noon, and the polar cap region at midnight Yellow River Station is also closely magnetic conjugate with Chinese Zhongshan Station in Antarctica. Therefore the Yellow River Station has a unique place for studying solar terrestrial phenomena. At Yellow River Station there are mainly three kinds of instruments. The first one is a three wavelength all sky imager (ASIs) which were developed to measure the photo-emissions at 427.8 nm, 557.7 nm and 630.0 nm respectively. The temporal resolution is 10s. The second one is an imaging riometer with 8X8 receiving antennas working in 38.2 MHz, which was renovated in 2008. The third one is the GPS scintillation/TEC measurement system, which consists of 3 GPS receivers in separation of about 100 meters, enabling to measure the drift velocity of the ionospheric irregularities. At the conjugate station of Zhongshan in Antarctica a ground-based composite measurement system has been built, which contains following observations: a quarts photoelectric variometer (1992),a digisonde DPS-4 (1995), an induction magnetometer (1997), an all-sky TV camera (1995), a scanning photometer, a monochromatic CCD all sky camera (1998).

27. Ming Yan, Polar Research Institute of China, Shanghai 200136, China: **M*onitoring and studies of glaciers Austre Lovénbreen and Pedersenbreen, Ny-Ålesund, Svalbard***

Two glaciers: Austre Lovénbreen and Pedersenbreen neighboring Ny-Ålesund, Svalbard have been chosen for long-term monitoring and studies since 2004. The analyses of observation data of first year (2005/2006) on glaciers Austre Lovénbreen and Pedersenbreen show that the net mass balance of Austre Lovénbreen and Pedersenbreen is -0.44 and -0.20m w.e., respectively, and their annual ablation is -0.99 and -0.94m w.e., respectively, while corresponding ELA is 478.10 and 494.87m, respectively. GPS measurement of year 2005/2006 shows that level vectors of ice flow velocity are parallel or converge to central

lines of both glaciers, with slower velocities in the lower area and relatively faster ones at the middle and upper part of glaciers. Vertical vectors of ice flow velocity show that there is a mass output in ablation area, which weakens with the increase of altitude, however, there exists a mass input near ELA on Austre Lovénbreen. In July, 2007, an automatic weather station was setup at E2 point (near equilibrium line altitude) on Austre Lovénbreen for surface energy balance study. The measured parameters by this AWS include wind speed, wind direction, air temperature, air pressure, humidity, net radiation, and snow surface elevation. In April, 2009, three 20m-deep boreholes were drilled at B2, E2 and F points on Austre Lovénbreen for thermal regime detection, which respectively locate at ablation area, near ELA, and accumulation area of Austre Lovénbreen. In April, 2009, Austre Lovénbreen was measured for ice thickness and topography by ground penetrating radar (model: pulseEKKO; frequency: 100MHz) with accumulated mileage of 83.2 km and measuring points of over 23500; Pedersenbreen was measured in the same way with accumulated mileage of 47.4 km and measuring points of over 17200. Now all available data are still being processed and analyzed. Based on long-term monitoring of Austre Lovénbreen and Pedersenbreen, we will carry out comprehensive studies of physical process of polythermal glaciers at Svalbard, and explore glacial fluctuations and their relationship with climate change.

28. Madeleine Griselin and others, TheMa, CNRS, Université de Franche-Comté, Besançon, France: ***Hydro-glaciology research on the Austre Lovénbreen since the 60s to the last IPY***

Since the 60s, French Scientists undertook research in the Kongsfjord area. They survey the Austre Lovénbreen through hydrological balance. In the framework of the IPY program “Hydro-Sensor-FLOWS”, focused on the study of the response of the Austre Lovenbreen glacier to climate conditions, we analysed the longest meteorological data time-series available for this area (1969-2008), recorded at Ny Alesund (79°N).

The mean annual temperature increased of 2°C in 40 years and the annual amount of precipitation increased of 74 mm with a gradient of +2 mm/year. But what is hidden behind these global data? The annual air temperature of the last 10 years (1998-2008) is always above the long-term mean (1969-1999). We demonstrate that the increase of the air temperature is more linked to an increase of the temperature during the cold period than to an increase of the temperature during the summer time. Moreover, the analysis of daily data shows that the positive trend of the air temperature is related by an increase of the number of warm events during the cold periods, that is the most specific change in the present-day climate, compared to the beginning of the observed period, i.e the 70s.

To follows the reaction of the glacier to the recent climate change, we analysed front position and volume variation through aerial photos, maps ands DEM. In surface, the glacier loss in surface is 3 more important than for the period 1995-2007 (31 years), while in the loss in volume is 2.3 more important the last 12 years (1995-2007). In 2007, the Austre Lovénbreen represents 66% of its 1964 volume and 80% of its 1995 volume.

As a conclusion, the global annual variation of the air temperature and precipitation does not give an accurate idea of the climate evolution, as well as the response of the glacier, deduced from the front position, does not give any precise information of the past climate change. The example of the flood event of last fall shows how climate parameters and the glacier responses are linked and how the survey at local scale with a very small time step can highlight the actual interaction between climate change and glacier response.

29. Max König, Norwegian Polar Institute: NPI glaciology activities on Svalbard

This talk presents key projects and key areas of study in the field of glaciology at the Norwegian Polar Institute (NPI). There are about twelve glaciers on Svalbard with regular mass balance measurements, where NPI is in charge of five of them, most of them located in

the Kongsfjorden area. There, the longest time series go back to 1968 and are today maintained by Jack Kohler. In collaboration with the University of Oslo, the Glaciodyn project studied glacier elevation and volume on Austfonna to clarify conflicting results of earlier studies. A volume change map of all of Svalbard is compiled by Chris Nuth comparing IceSat and DEM data. Two methods for observing firn area and mass balance from space with synthetic aperture radar (SAR) satellite are being developed by Max König. Several people are conducting studies using ground penetrating radar (Jack Kohler, Kirsty Langley, Ola Brandt) for both surface characteristics and bottom topography. Ice Cores 121-289m deep have been drilled on Holtedalsfonna, Lomosovfonna and Austfonna (Elisabeth Isaksson) covering a time between 400 and 800 years before present . Finally, the NSINK project studies sources and sinks of atmospheric nitrogen, and glacier studies are a part of this project analyzing the nitrogen cycle.