Report from the SSF funded workshop in Potsdam, October 2014

Collaboration and coordination within the Ny-Ålesund Atmospheric Flagship Programme

by
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Ove Hermansen (Norwegian Institute for Air Research),
Johan Ström (Stockholm University),
Vito Vitale (Italian National Research Council),
Boris Ivanov (Arctic and Antarctic Research Institute), and
Grzegorz Karasiński (Polish Academy of Sciences)

February 2015

Report from the workshop on Collaboration and coordination within the
Ny-Ålesund Atmospheric Flagship Programme, 8-9 October 2014, Potsdam
The workshop was funded by Svalbard Scince Forum,
Norwegian Polar Institute and Alfred Wegner Institute for Polar and Marine Research

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Cover photo by Ove Hermannsen, NILU

Summary

The Atmosphere Flagship workshop 2014 was held at Alfred Wegener Institute in Potsdam, Germany on 8.-9. October 2014. 25 participants convened, representing all fields of atmosphere research taking place in Ny-Ålesund, plus representing research work performed at Barentsburg, Hornsund and Station Nord (Villum Station) on Greenland. Before travelling to Potsdam, the participants had submitted their answers to five questions about their ongoing measurements, observational gaps, and further plans (see the compilation of answers in the annex). This overview of ongoing monitoring and research work and requirements formed the basis for the discussions at the workshop, the follow-up work, and the development of the Atmosphere Flagship Program.

The workshop provided the following results:

- The Atmosphere Flagship Program is an important coordination tool
- An Atmosphere Research symposium shall be organized soon, tentative autumn 2015
- A dedicated flagship webpage and mailing list shall be developed.
- A flagship science steering committee was nominated (10 persons).
- A list of 9 immediate flagship research topics was compiled (see below).

The results from the workshop were utilized quickly within two follow-up activities. On the 4.-5. November 2014 a Ny-Ålesund Atmosphere Flagship Gap – Analysis Workshop was held by the Indian National Centre for Antarctic and Ocean Research in Goa, India. The new atmosphere research program of India in Spitsbergen was discussed and developed building on the Atmosphere Flagship outcome and providing future contributions to the flagship program. On 8.-9. January 2015 the Workshop: Towards a coordinated Research and Monitoring Program for Ny-Ålesund took place at Norwegian Polar Institutes locations in the Fram Centre in Tromsø. The Atmosphere Flagship monitoring activities were, as one of four flagships, an important part of the agenda, and it was discussed how the activities can contribute to and be an integrated part of the future coordinated Ny-Ålesund Monitoring Program.

In the immediate future, the Atmosphere Flagship program activities will comprise some coordinated field work in 2015, contributions to the development of the Indian atmosphere research program, presentation of the Atmosphere Flagship program at the ASSW's ICARP III conference in Toyama, Japan, organization of the Atmosphere Research Symposium, and further coordination work of the atmosphere research on Svalbard and in connection to Greenland.

Introduction

Building on a Svalbard Science Forum (SSF) workshop about atmospheric research in Ny-Ålesund from 2008, the Atmospheric Research Flagship programme was initiated as part of the NySMAC science plan for Ny-Ålesund. The Flagship Program document describes the general flagship goals, the future research priorities and gives an overview of atmospheric stations in Ny-Ålesund, atmospheric parameters measured in Ny-Ålesund, as well as atmospheric monitoring satellites in operation in 2010–2020. The overall goals of the flagship include the optimal utilization of available instruments and data sets, the establishment and further development of common research infrastructures, and a programme to investigate the representativeness of measurements in Ny-Ålesund for climate change research and atmospheric process studies.

Six years after the flagship initiative it was timely to revisit the flagship agenda, and a workshop on collaboration and coordination within the Ny-Ålesund Atmospheric Flagship Programme was arranged in Potsdam in October 2014, also this time with funding from SSF. The workshop aimed at creating better and more productive collaborations, both between atmospheric researchers in Ny-Ålesund from different institutions (revisiting the first flagship goal), and also between atmospheric researchers at different sites in Svalbard and beyond (revisiting the third flagship goal).

The workshop brought key scientists studying the lower atmosphere in Ny-Ålesund together to establish and develop collaborations and joint research actions. The workshop aimed at producing plans for new activities, not only new measurements, but also detailed plans for new international and cross-station research building on existing data, plans for better using of ongoing measurements, and new observational needs. The workshop also provided an opportunity to frame the activities in Ny-Ålesund in a Svalbard perspective, by invititing key atmospheric scientists from Barentsburg and Hornsund to the workshop.

Workshop arrangements

The workshop was arranged at Alfred Wegener Institute in Potsdam, 8-9 October 2014. 25 scientists participated (participants list in Annex 1). A workshop web page was prepared in advance of the workshop, at
http://www.npolar.no/en/events/2014/10-08-workshop-ny-alesund-atmospheric-flagship/
The detailed workshop agenda is given in Annex 2.

Before the workshop, the participants were asked to provide input to the following four questions:

1. Plans & Timelines
    - Provide lists of ongoing and planned measurements, expeditions
    - Provide times of planned field activities / campaigns
2. Gaps. Which observations/measurements do you miss, which might be provided by others in Ny- Ålesund or on Svalbard?
3. What are your specific contributions to the flagship programme?
4. How do you want the Flagship Programme to be active?
5. Please provide plans for
    - common publications
    - common applications to funding calls (SSF, EU, SIOS?, others)
    - development of satellite cal/val activities
    - common activities across institutions/stations to enlarge the analysis to a regional level

The compiled answers are given in Annex 3.

The workshop started out with some overview presentations on the Flagship status, SSF expectations, the status of SIOS, educational issues, and short presentations of the atmosphere programmes at Barentsburg and Hornsund, as well as Villum Station / Station Nord on Greenland. The time after lunch the first day and before lunch the second day was set aside for working groups. The participants were separated in three predefined thematic groups:

- Meteorology and planetary boundary layer process including fluxes / Eddy and snow – atmosphere interactions/climate change, long-time climate series, comparison observation (precipitation)
- Radiation – Aerosol - Clouds interactions, including water vapor
- Large scale dynamics and atmospheric transport mechanisms, including Atmospheric chemistry, long range transport, pollutants.

The working groups were asked to compile and discuss the same questions that were asked to each individual before the workshop and given above.

The second part of the second day was used for reports from each working group and discussions. In addition we had discussions about how the flagship should evolve; which Flagship activities are wanted/needed, formal structure needed for the flagship work, and requirements for meeting arenas.

The Atmosphere Flagship research topics

Based on the outcome from the three working groups a list of topics to be worked on in the near future was compiled. The list can neither be comprehensive of all atmosphere research work going on, nor can it be exclusive, that is other atmosphere research activities not yet included in the programme are invited to join.

We summarized the basic question of Atmosphere Flagship research programme as “Climate change in the Arctic: How do we tackle the challenge?” and provided the general answer “Develop collaboration and joint research actions”.

With this background the following activities were pointed out as prioritized for the future:

- Plan for joint expeditions, observational periods, campaigns
- Develop cross-station field activities
- Develop cross-station utilisation and analyses of available data and ongoing measurements, plan joint publications,
- Provide recommendations, e.g. for standard data processing, new lab facilities, etc.
- List new observational needs
- Provide timeline for future activities

The research topics were grouped in three major fields: (i) lowest atmosphere, (ii) aerosols, (iii) modelling, and cover the following nine activities:

- Boundary Layer Properties
- Interaction of snow and atmosphere
- Meteorology network and long-term data sets on Svalbard
- Clouds, Humidity, Precipitation
- Aerosol Direct Effect: a Clear Sky Closure Study
- Aerosol Indirect Effects (relating to clouds etc.)
- Investigate Regional Representativeness, including Satellite Validation
- Long range transport and modelling activities
- Comparison & analysis of duplicate measurements (e.g. trace elements)

Future plans and developments for the Flagship

The results from the workshop were utilized quickly within two follow-up activities. On the 4.-5. November 2014 a Ny-Ålesund Atmosphere Flagship Gap – Analysis Workshop was held by the Indian National Centre for Antarctic and Ocean Research in Goa, India. The new atmosphere research program of India in Spitsbergen was discussed and developed building on the Atmosphere Flagship outcome and providing future contributions to the flagship program.
On 8.-9. January 2015 the Workshop: Towards a coordinated Research and Monitoring Program for Ny-Ålesund took place at Norwegian Polar Institutes locations in the Fram Centre in Tromsø. The Atmosphere Flagship monitoring activities were, as one of four flagships, an important part of the agenda, and it was discussed how the activities can contribute to and be an integrated part of the future coordinated Ny-Ålesund Monitoring Program.

The Atmosphere Flagship program activities will comprise some coordinated field work in 2015, and contributions to the development of the Indian atmosphere research program. At the ASSW's ICARP III conference in Toyama, Japan, the Flagship Program will be presented. The Atmosphere Research Symposium will be arranged in Tromsø, Norway tentative in September 2015.

Feedbacks from the participants concluded in a great need for the Atmospheric Flagship Program to continue to be active to promote collaboration and coordination of atmospheric research in Ny-Ålesund. It was decided the Flagship will have its own designated webpage, with information on the Flagship goals, research topics, timeline of activities and field work, list of ongoing measurements/parameters, with details on data owner and data availability.

A scientific committee for the flagship was established and consists of the following ten persons:

- Christina A. Pedersen, Norwegian Polar institute
- Roland Neuber, Alfred-Wegener Institute
- Vito Vitale, NRC
- Ove Hermansen, Norwegian Institute for Air Research
- Hans-Christian Hansson, Stockholm University
- Masataka Shiobara , NIPR
- Young Jun Yoon , KOPRI
- Satheesan Karathazhiyath , NCAOR
- Boris Ivanov, Arctic and Antarctic Research Institute
- Grzegorz Karasiński, Polish Academy of Sciences

Annex

- List of participants
- Detailed agenda
- Pre-workshop contributions from participants

Annex 1 Participants list

Name	Institute
Marion Maturilli	Alfred Wegener Institute (DE)
Christoph Ritter	Alfred Wegener Institute (DE)
Roland Neuber	Alfred Wegener Institute (DE)
Mathias Palm	University of Bremen (DE)
Zhiyong Xie	Helmholtz-Zentrum Geesthacht (DE)
Hans-Werner Jacobi	LGGE University of Grenoble (F)
Jean-Louis Bonne	LSCE (F)
Satheesan Karathazhiyath	National Centre for Antarctic and Ocean Research (IN)
Vito Vitale	Institute of Atmospheric Sciences and Climate, CNR (IT)
Angelo Viola	Institute of Atmospheric Sciences and Climate, CNR (IT)
Rosamaria Salvatori	Institute of Atmospheric Pollution Research, CNR (IT)
Silvia Becagli	University of Florence (IT)
Young Jun Yoon	Korea Polar Research Institute (KO)
Ove Hermannsen	Norwegian Institute for Air Research (NO)
Kerstin Stebel	Norwegian Institute for Air Research (NO)
Stephen Hudson	Norwegian Polar institute (NO)
Christina A. Pedersen	Norwegian Polar Institute (NO)
Grzegorz Karasiński	Polish Academy of Sciences (PO)
Piotr Sobolewski	Polish Academy of Sciences (PO)
Boris Ivanov	Arctic and Antarctic Research Institute (RU)
Hans-Christen Hansson	Stockholm University (SE)
Len Barrie	Stockholm University (SE)
Radovan Krejci	Stockholm University (SE)
Andreas Massling	Aarhus University (DK)

Annex 2 Detailed timetable

Venue: Science Park "Albert Einstein", Community Building House H

1. Day (Wednesday, 8. October 2014)
09:00 Introductory talks
- The atmosphere flagship: status, outlook and goals for the workshop (R. Neuber)
- SSF motivation and wishes to the workshop (R. Neuber for SSF)
- The flagship programmes and SIOS (V. Vitale)

Short presentations of the atmosphere programmes at other locations:
- Barentsburg/Pyramiden (B. Ivanov)

10:30 Coffee Break
10:45 Cont. introductory talks
- Hornsund (G. Karasinski)
- Station Nord (A. Massling)
- Educational issues (B. Ivanov)

Arrangement of working groups (WG) (C. Pedersen & R. Neuber)
- Define topics for all WG, and their specific science questions
- Select participants to each WG

12:30 – 14:00 Lunch Break
13:30 – 14:00 Guided Tour of Telegrafenberg Campus

14:00 – 18:00
- Separate WG meetings

WG1 Meteorology and planetary boundary layer process including fluxes / Eddy and snow – atmosphere interactions/climate change, long-time climate series, comparison observation (precipitation)
WG2 Radiation – Aerosol - Clouds interactions, including water vapor
WG3 Large scale dynamics and atmospheric transport mechanisms, including Atmospheric chemistry, long range transport, pollutants

15:00 Joint Coffee Break

15:30 Working Groups cont'd

19:30 Workshop Dinner

2. Day (Thursday, 9. October)
09:00 Start / goals of the day (plenary)
Continue WG work
10:30 Joint Coffee Break
Continue and finalize WG work

12:30 – 14:00 Lunch break

14:00 Plenary:
- Reports from each WG discussion:

- Which Flagship activities are wanted/needed?
- Any formal structure needed? WG coordinators? Science Guiding Group? Web page?
- Regular (annual?) WG or flagship meetings?

15:00 Coffee Break

15:15 Plenary

- Updated list of future activities: within each WG, for the flagship, for pan-Svalbard collaboration

16:30 Adjourn

Annex 3 Compilation of pre-Workshop contributions

Contents

List of Contributions

Country	Institute	Author
Germany	AWI	Maturilli, Ritter
	U. Bremen	Palm
France	LGGE	Jacobi
	LSCE	Bonne
India	NCAOR	Satheesan Karathazhiyath
Italy	CNR/U. Fi.	Viola et al.
Japan	NIPR	Shiobara
Korea	KOPRI	Yoon
Norway	NILU	Hermansen
	NPI	Pedersen
Sweden	SU	Krejci et al.
Russia	AARI	Ivanov et al.
Poland	IGF	Karasinski&Sobolweski
Greenland	U. Aarhus	Massling

AWI Potsdam
Christoph Ritter

1. Plans & Timelines

aerosol: increased measurement with KARL lidar from end March - end April.
aim: collect data suitable for closure experiments. Partners from Poland (IOPAN, Sopot and Univ. of Warsaw) will come with (among others) a scanning ceilometer and an additional nephelometer at Gruvebadet
times not entirely fixed, but during haze season.
Any cooperation (aerosol in-situ at Gruvebadet, Zeppelin, Corbel ...) highly welcome!

clouds: AWI will provide logistics to a Japanese validation campaign on mixed phases clouds.(tethered balloon, data from sounding, wind lidar, radiometer, BSRN).
Main partners are NIPR and Niigata Univ. This campaign might take place end April - Mid May, dates not fixed.
Meteor. data from Zeppelin or aerosol or trace gas measurements that give a hint of cloud-aerosol feedbacks or the air backtrajecorry is highly welcome

boundary layer: July 22 - July 29 visit of Prof. Thomas Foken (expert on Eddy covariance and micrometeorology) in Ny-Alesund. Aim: improve existing BL measurement sites, judge small scale disturbances (dependencies of footprint, albedo, katabatic flows, etc.) The long-term aim is a better combination of all BL measurement sites in Kongsfjord hence participation of all over groups who perform according measurements at the site is highly welcome!

2. gaps:

instrumentation: disdrometers (for precipitation?) 2? For village and Zeppelin mountain?
men power: is a gap. I would not be surprised if everybody looks into his own data first.
platforms: how to improve Ny-Alesund for cloud in-situ measurements? (icing on UAV, planes, tethered balloons, increased restrictions and air traffic?)
models: do we want to agree on (a set of) model(s) e.g. for radiative transfer, air backtrajectories, large eddy simulations and regional climate modeling?
Or not? Too early?

3. contribution:
aerosol closure! One aim for Ny Alesund should be a better interconnection of aerosol measuring groups to obtain more (regular) closure experiments.

4. wish list Flagship:
no additional bureaucracy!
But, what about a web-page where the planned times for which project in Ny-Alesund are announced?
a web-page where preliminary plots and warnings (technical, environmental) can be shared?
the emerge of overall scientific questions under which most of us can gather voluntarily

do we need more common (more than 2 stations / countries) projects? Does this mean common funding**?**

5. plans for papers:

a) (little more precise) paper about haze event late March / early April 2014 with Univ. Florence, IOPAN, Uni. Warsaw

open to everybody who measured aerosol at that time

b) (less precise) a paper of a typical haze season from an overall view, or maybe better, the discussion of a clearer vs. a more polluted season including all aerosol measurements in Ny-Alesund should be realized some day.

Univ. Bremen
Mathias Palm

1.

ongoing experiments:
MW measurements of O3
FTIR measurements of
- CO2
- MIR species
- OH temperatures using FTIR
- polar night observation using the moon

planned experiments:
proposed for 2015 - 2017
MW measurement of H2O, O3, CO and wind in cooperation with U Bern, experiments are proposed for 2015-2017
future
MW measurements of mesospheric CO to study the residual circulation
- new MW instrument planned in Spitsbergen
- in cooperation with CO measurements in Kiruna

2.

interesting observations:
airglow observations using a all-sky camera
mesospheric observations in general

3.

contribution to the flag ship program

continuation of existing time series
installation of a newly developed CO radiometer (funding already approved)
campaign measurements of stratospheric and mesospheric CO and H2O in cooperation with U Bern
measurements are part of the joint proposal AC3

5.

common publications:
results of campaign in cooperation with U Bern

common applications to funding: - AC3 DFG-Proposal

CAL/VAL activities
measurements are made available on request and submitted to the NDACC data base

common activities:
cooperation with MW measurements in Kiruna
cooperation within the NDACC and TCCON network (measurements distributed worlwide)

LGGE Grenoble
Hans-Werner Jacobi,

1 Plans & Timelines:
- Provide lists of ongoing and planned measurements, expeditions

- Provide times of planned field activities/campaigns
Measurements of chemical and biological properties of the snow planned, but in north and west Greenland.

2 Gaps: Which observations/measurements do You miss, which might be provided by others in Ny-Ålesund or on Svalbard?

3 What are your specific **contributions** to the flagship programme?
We can imagine contributing to measurements of the atmosphere and the snow.
1. Atmosphere
We can monitor S and N isotopes of sulfate, nitrate, and ammonium in aerosols and precipitation. This information helps to study sources and transformation processes during long-range transport of these compounds. A further parameter is the analysis of levoglucosan in aerosols. Levoglucosan is used as a proxy for biomass burning and can be used to analyze the impact of emissions from burning processes.
An effort could be conducted on determining the sources of biotic and abiotic inputs to snowpacks, how they vary seasonally and how they interact.

2. Snow
The presence or absence of snow plays a key role determining all kinds of fluxes between the atmosphere and the Earth surface. The snow and its chemical composition also plays a key role in the chemical composition of the run off in the Arctic region. We propose to establish a dedicated field site to monitor physical, chemical, and microbiological processes in the snow close to Ny-Alesund. This site should be located at (or nearby) already installed stations or towers related to atmospheric and/or soil processes. At the moment, several locations exist to study certain compartments. We believe that a better coordination of these measurements in Ny-Alesund is needed to establish long-term observations of snow properties. This field site would provide a consistent time series of physical, chemical, and microbiological properties of the snow and its behavior during the winter season. Together with the already established measurements in the atmosphere and the soil, this data could be exploited to study the role of snow regarding the transfer and fluxes of energy, radiation, water, GHG, aerosols, reactive gases, and heavy metals within the atmosphere-snow-soil system and to estimate the role of the Arctic snow on ecosystem functioning . Such long-term data sets regarding the snow are urgently needed to study changes in snow properties and how they are impacted by changes in the regional climate and also by local processes. Moreover, the observation will help to better understand the impact of snow on soil properties like permafrost, on local exchange processes between the snow and the atmosphere, and the role of snow microbiota in transforming different compounds and contaminants.
Besides atmospheric and soil measurements, the observations require continuous measurements of physical snow properties like temperature and albedo. Furthermore, regular sampling of the snow is needed for further physical (e.g. density, specific surface area), chemical, and microbial characterization (function and activity) of the snowpack. Such a sampling program requires the continuous support by station personnel, the storage of frozen samples, the transport of frozen samples back to European institutes, and chemical and biological analysis of the samples. A comparable program exists already for the regular chemical analysis of the precipitation at Ny-Alesund.

4 How do you want the **Flagship Programme** to be active?

1. The Flagship Programme could contribute to a better coordination of atmospheric, soil, and snow measurements to obtain consistent observations and data sets for all three compartments. Due to the high spatial variability of the properties of the atmosphere, snow, and soil, the observations need to be performed in a defined and constrained area. Moreover, the Flagship Programme could help to establish a coherent and quality-controlled data set of past observation related to the local atmosphere-snow-soil system.
2. Make results of regional model runs for the Svalbard region available.

5 Please provide **plans** for
- common publications

- common applications to funding calls (SSF, EU, SIOS?, others)

- development of satellite cal/val activities

- common activities across institutions/stations to enlarge the analysis to a regional level
We will perform WRF-Chem simulations for a period in March/April 2012 to compare simulated results with observations of BC in the atmosphere and in the snow. The results of these simulations and the experience can be shared with other groups.

LSCE-IPSL (France)
Jean-Louis Bonne

1

Since June 2014, in situ surface continuous measurements of water vapour isotopic composition and analysis of isotopic composition in precipitation samples are performed at Ny-Ålesund.

The isotopic composition of water vapour reflects the history of air mass trajectories, in relationship with evaporation conditions and distillation occurring along transportation, itself affected by cloud microphysical processes. Measurements in Ny Alesund are related to studies performed in different sites located in the North Atlantic (Bermuda, Iceland, south and north-west Greenland), in the Arctic (Ural, Siberia) complemented by transects (ACTIV ship from Denmark to Greenland, PolarStern). These measurements will allow us to better understand the processes controlling water vapour isotopic composition, especially near the sea ice margin, to assess the ability of atmospheric models to resolve these processes, especially for deuterium excess. Together with backtrajectory and moisture transport calculations, these measurements will allow to estimate the fraction of moisture of local (Arctic) origin and the fraction of moisture which has been transported over long distance. In the context of an intensification of the Arctic water cycle, this fraction remains an important source of uncertainty. Finally, better understanding the processes controlling the water vapor isotopic composition will improve the interpretation of paleoclimate records such as those obtained from ice cores.

2

For further analyses of the water vapour and precipitation isotopic composition, meteorological observations would be needed (at least temperature). Complementary observations could also be derived from FTIR measurements, giving access to δD profiles integrated integrated on the atmospheric column.

3

The isotopic composition of water vapour reflects the history of air mass trajectories, in relationship with evaporation conditions and distillation occurring along transportation, itself affected by cloud microphysical processes. Measurements in Ny-Ålesund are related to studies performed in different sites located in the North Atlantic (Bermuda, Iceland, south and north-west Greenland), in the Arctic (Ural, Siberia) complemented by transects (ACTIV ship from Denmark to Greenland, PolarStern).
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4

We are interested in the elaboration of a coordinated international observation network of water vapour isotopic composition. Which e.g. European framework for such project? Take advantage of the diversified observations available at Ny-Ålesund to address questions related with e.g. planetary boundary layer processes, aerosols, cloud microphysics.

5

- Pending proposal to IPEV to expand Svalbard monitoring for 2 years
- Pending proposal to ANR for science funding for Svalbard and Greenland monitoring
- Pending proposal for ERA-Net (Germany-Russia-France) for Siberia collaboration
- Comparison between measurements at AWIPEV and Zeppelin
- Possibility for light aircraft measurements in spring 2015 (wingsforscience)

NCAOR, India
Satheesan Karathazhiyath

1 Plans & Timelines:

NCAOR has installed following instruments

1. Micro Rain Radar

2. Microwave Radiometer Profiler

3. Aethelometer

4. Nephelometer

Planning for expeditions twice every year (summer and winter once each)

5. Ceilometer will be installed in the coming season

2 Gaps:

We don't have surface meteorology, radiation and accoustic depth guage measurements. Wind Profiler data will be useful which are also not available.

3 What are your specific contributions to the flagship programme?

We will be contributing to the study of aerosols, clouds, and precipitation.

4 How do you want the Flagship Programme to be active?

There should be co-exploration, co-design and co-development of scientific projects on common objects of interest. This should be the cornerstone of proposed research activities. Also, we should have coordinated research plans for joint expeditions, observational periods, campaigns and the data need to be shared between the researchers.

5 Please provide plans for

- common publications:

Common Publications will follow once we undertake 3.4

- common applications to funding calls (SSF, EU, SIOS?, others)

- development of satellite cal/val activities

Development of satellite cal/val activities is important especially for temperature and humidity in polar regions. Reproduction of water-vapour inversions by satellite data is important for constraining the models and model evaluations.

- common activities across institutions/stations to enlarge the analysis to a regional level

CNR and Univ. Florence, Italy
S.Begagli, R.Salvatori, A. Viola, V.Vitale
and
C. Lanconelli, , M.Mazzola, R. Salzano, R. Udisti

1 Plans & Timelines:

- Provide lists of ongoing and planned measurements, expeditions

Long-term activities

Continuous monitoring of the meteorological profiles up to 34 m at CCT,
Temperature profile into snow layer and heat flux at the soil interface

Turbulence vertical profiles using three sonic anemometer (heat and momentum flux, TKE)

Radiative budget at the surface , albedo monitoring and cloudiness observation by sky cam

Gaseous fluxes (CO2, CH4) in cooperation with KOPRI

Monitoring, of the soil coverage: characterization of snow coverage, vegetation, active layer and underlying permafrost, CO2 fluxes measurements of the analysed ecosystems.

Snow broadband and spectral albedo measurements from the CCT

Aerosol Characterization at Gruvebadet (chemical speciation, size distribution, optical properties): size distribution (106 size classes from 6 nm to 20 um), chemical characterization (ions, metals, EC-OC) of size segregated (PM10, 4-stage and 12-stage impactors), optical properties (PSAP and nephelometric measurements).

On field campaign basis

Profiling with tethered balloon of aerosol properties in the ABL up to 600 m.

Snow-air interactions: reactive nitrogen species fluxes, snow characteristics

- Provide times of planned field activities/campaigns

Year-round for measurements performed at CCT (meteo, radiation, snow, permafrost, soil coverage, CO2 an CH4 fluxes)

Up to now, March to September for activities at Dirigibile Italia with perspective of year-round measurements also at Gruvebadet (with intensive spring-summer sub-set of measurements of physical and optical aerosol properties)

Data integration and sensor calibration 1-2 times per years (linked to other on going activities)

Spring/ summer /autumn for Aerosol profiling campaign.

From March to whole snow melting season for surface reflectance spectral measurements

April-May for snow-air interactions activities

June-July for routine monitoring of vegetation and ecosystems (vegetation + active layer) CO2 fluxes.

2 Gaps:

Which observations/measurements do You miss, which might be provided by others in Ny-Ålesund or on Svalbard?

Precipitation, present weather measurements,

Daily characterization of the snow cover surface

Aerosol Optical Depth (NIPR, AWI)

Diffuse component of shortwave radiation (BSRN)

Vertical profiles of aerosol (lidar - AWI)

Temperature and humidity vertical profile in the ABL (microwave radiometers, AWI, NCAOR)

Cloud height, cloud classification

Vertical wind profiles ad different resolution (lidar windcube, sodar, tethered balloon sounding)

3 What are your specific contributions to the flagship programme?

Continuous acquisition of the atmospheric parameters up to 34 meters at CCT

New parameterization of the turbulence scheme into regional atmospheric model

Albedo variability and radiation balance, with a specific assessment of the effects of cloudiness on these quantities.

Integration of measurements at CCT with the local ones in the area

Real-time continuous monitoring of the snow cover surface in terms of specific surface area and snow/vegetation covered area.

Investigation of coupling processes between atmosphere and surface

Closure of energy budget at the surface

Possibility to contribute to closure experiments related to radiation and energy budget, aerosol effects, etc.

Study of the sources, atmospheric reactions, transport processes and depositional effects of natural and anthropic aerosol components, with particular attention to Carbon-, Sulphur- and Nitrogen-Cycle compounds and heavy metals from long-range industrial and continental dust emissions.

Contribution to long-term changes of aerosol physical and chemical properties and of their transport processes as a consequence of the climate change in the Arctic.

4 How do you want the Flagship Programme to be active?

Routine exchange of information to facilitate joint (bilateral/multilateral) activities

Identifying cases/topics of common scientific interest and increase the critical mass (between partners) for common project in the atmospheric research .

Promote and partially supporting these initiatives (through SSF Flagship grant)

5 Please provide plans for

- common publications

Organize workshop dedicated to promote and define common publication (arguments, contributions, schedule) : there are already ideas for joint papers related to aerosols (e.g. Gruvebadet - vs. Zeppelin), to mean and turbulent characterisitcs of the ABL (by measurements at CCT , and ground-based meaurements performed by AWI and NCAOR) as well as on case studies of abrut arrival of natural or anthropic aerosol components by comparing optical properties, lidar profiling, size distribution and chemical composition

- common applications to funding calls (SSF, EU, SIOS, others)

Contribute to SIOS for what concern data dissemination and the scientific facilities access

Improve the development of satellite cal/val activities and joint proposal together with other arctic sites like Sodankyla, Andoya, (e.g. USA, Russia)

ISAC is already in touch with MODIS albedo team (Dr. Chrystal B. Schaaf) for what concerns cal/val activities at Dome-C, with possible extension in Svalbard at Ny Alesund

ISAC is applying for an SSF field grant to improve the atmospheric aerosol profiling technique.

- common activities across institutions/stations to enlarge the analysis to a regional level

Aerosol closure experiments involving Hornsund and Barentsburg

National Institute of Polar Research, Japan
Masataka Shiobara

1:

Current status of aerosol, cloud, water vapor and precipitation measurements operated by Japanese scientists:

1. Remote-sensing of cloud and aerosol by Compact Lidar System at Rabben (Nagoya U)

2. Remote-sensing of cloud and aerosol by Micro-pulse Lidar at AWIPEV Observatory (NIPR)

3. Remote-sensing of cloud by 95GHz Cloud Radar at Rabben (Chiba U)

4. Remote-sensing of cloud fraction by All-sky Camera at Rabben (NIPR)

5. Remote-sensing of precipitable water and liquid water path by Microwave Radiometer at Rabben (NIPR)

6. Remote-sensing of aerosol optical properties by Sky-radiometer at Rabben (NIPR)

7. In-situ measurement of cloud droplet by Fog Monitor at Zeppelin Observatory (U Tokyo)

8. In-situ measurement of cloud and precipitation by Meteorological Particle Spectrometer at Zeppelin (U Tokyo)

9. In-situ measurement of black carbon by COSMOS at Zeppelin (U Tokyo)

10. Snow reflectance measurement by Ground-based Spectral Radiometer for Albedo and Flux at AWIPEV Observatory (MRI)

Intensive field experiment for mixed-phase clouds at Ny-Alesund is tentatively planned for three-four weeks in April-May 2015 as part of Japanese GRENE Arctic programme for cloud-aerosol-radiation interaction studies. Cooperation with AWI is planned for tethered balloon experiment in Ny-Alesund

See attachment for additional information on measurement activities by Japanese scientists in Ny-Alesund

2:

In-situ measurements of aerosol and clouds are expected to contribute for our planned experiment in Ny-Alesund

3:

Exchange of data from our experiment for aerosol-cloud-interaction study

5:

Ground validation experiment is planned for the Earth-CARE satellite to be launched in 2017.

Korea Polar Research Institute
Young Jun YOON,

1 Plans & Timelines:

List of ongoing and planned measurements, expeditions

Planned measurements

Derived parameter	Instrument/System	Time resolution	Frequency of operation	Location/ Altitude	Availability	Contact/RiS ID/ Website
Neutral wind (87km, 97km, 250km)	FPI (operation scheduled in Aug 2015)	60 min	Continuous (night time)	New facility in NYA	Access with time lag	KOPRI/ Jeong Han Kim/ jhkim@kopri.re.kr
All sky image (Gravity wave at 87km, 97km, 250km)	All Sky Camera (operation scheduled in Aug. 2015)	25 min.	Continuous (night time)	New facility in NYA	Access with time lag	KOPRI/ Jeong Han Kim/ jhkim@kopri.re.kr

Ongoing measurements

Derived parameter	Instrument/System	Time resolution	Frequency of operation	Location/ Altitude	Availability	Contact/RiS ID/ Website
Mesospheric temperature (OH layer)	FTIR spectrometer (operated since 2002)	5 min	Continuous (night time)	Dasan Station	Access with time lag	KOPRI/ Jeong Han Kim/ jhkim@kopri.re.kr
Cloud Condensation Nuclei concentration	CCN counter (DMT)	30 min/1 SS cycle	Continuous	Zeppelin station	Access with time lag	KOPRI/ Young Jun YOON/ yjyoon@kopri.re.kr
Dimethylsulfide (DMS)	GC + PFPD (Pulsed Flame Photometric Detector)	60 min/1 SS cycle	Continuous	Zeppelin station	Access with time lag	POSTEC/ Ki-Tae PARK KOPRI/ Young Jun YOON/ yjyoon@kopri.re.kr
Sensible heat	3-D sonic anemometer (CSAT3,	30 min	Continuous	78°55.408' N/	Access with	KOPRI/Dr. Taejin Choi/

Derived parameter	Instrument/System	Time resolution	Frequency of operation	Location/ Altitude	Availability	Contact/RiS ID/ Website
flux (W/m2)	Campbell)			11°55.927' E	time lag	ctjin@kopri.re.kr
Momentum flux (kg/m/s2)	3-D sonic anemometer (CSAT3, Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Wind speed (m/s)	3-D sonic anemometer (CSAT3, Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Wind direction (Deg)	3-D sonic anemometer (CSAT3, Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
T (DegC)	3-D sonic anemometer (CSAT3, Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
RSDN (W/m2)	Net radiometer (CNR1, Kipp & Zonen)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
RLDN (W/m2)	Net radiometer (CNR1, Kipp & Zonen)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
RSUP (W/m2)	Net radiometer (CNR1, Kipp & Zonen)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
RLUP (W/m2)	Net radiometer (CNR1, Kipp & Zonen)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Rn (W/m2)	Net radiometer (CNR1, Kipp & Zonen)	30 min	Continuous	78°55.408' N/ 11°55.927'	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr

Derived parameter	Instrument/System	Time resolution	Frequency of operation	Location/ Altitude	Availability	Contact/RiS ID/ Website
				E		
T_soil (DegC)	TCAV (Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E (-0.1 m)	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Soil water content (m3/m3)	CS616-L (Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Soil heat flux (W/m2)	Soil heat flux plate (HFP01, Campbell)	30 min	Continuous	78°55.408' N/ 11°55.927' E	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Wind speed (m/s) & Wind direction (Deg)	2-D Sonic anemometer (FT702LM, FT Technologies, Ltd)	10 min	Continuous	78°55.408' N/ 11°55.927' E **(DASAN station)**	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
T_air (DegC)	HMP45C (Vaisala)	10 min	Continuous	78°55.408' N/ 11°55.927' E**(DASAN station**	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
RH (%)	HMP45C (Vaisala)	10 min	Continuous	78°55.408' N/ 11°55.927' E**(DASAN station**	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
CO2 flux (mg/m2/s)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
CH4 flux (mg/m2/s)	Eddy Covariance System: 3-D sonic	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/

Derived parameter	Instrument/System	Time resolution	Frequency of operation	Location/ Altitude	Availability	Contact/RiS ID/ Website
	anemometer (CSAT3, Campbell) + Cavity Ring-down Spectroscopy (G2301-f, Picarro)					ctjin@kopri.re.kr
Sensible heat flux (W/m2)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Latent heat flux (W/m2)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Momentum flux (kg/m/s2)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Wind speed (m/s)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
Wind direction (Deg)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr

Derived parameter	Instrument/System	Time resolution	Frequency of operation	Location/ Altitude	Availability	Contact/RiS ID/ Website
T (DegC)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
H2O (g/m3)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
CO2 (mg/m3)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Open path gas analyzer (LI7500, LICOR / EC150, Campbell)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr
CH4 (ppm)	Eddy Covariance System: 3-D sonic anemometer (CSAT3, Campbell) + Cavity Ring-down Spectroscopy (G2301-f, Picarro)	30 min	Continuous	CCT	Access with time lag	KOPRI/Dr. Taejin Choi/ ctjin@kopri.re.kr

Times of planned field activities/campaigns

-Not specified

2 Gaps

(1) wind and temperature data from METEOR RADAR (70 – 110 km), if available

(2) Marine phyto-plankton species composition data to understand DMS data

(3) sulfur composition information from aerosol impact data

(4) SO2(g), SO_4^{2-} data

(5) micro-biology and soil physics information of permafrost, to understand measured methane emission data (nearby the CCT)

3 Specific contribution to the flagship program

- Provide measurements data to other ongoing projects if requested
- Design an integrated measurement program from surface to thermosphere in conjunction with other inter national projects

4 How should be the flagship program to be active?

- Design a multidisciplinary program which deals with the total column of atmospheric parameters from surf ace to thermosphere
- Establish a common DB which all measurements list and data can be housed, which is open to NYA researc h community

5 Plans

- common publications

- New upper atmosphere measurement data (2016 and onward) will be published in 2017 or later
- The effects of marine biota on the cloud formation via DMS emission will be analyzed and published.
- The long-term measurements of the first methane flux from NYA permafrost are being analyzed.

-applications to funding calls

- KOPRI's own program

-development of satellite cal/val activities

- Upper atmosphere data had been validated using satellite data such as Aura/MLS, TIMED/SABER
- DMS data from Zeppelin measurement will be compared and explained using satellite derived biomass dat a
- KOPRI's carbon flux measurements program will/can be used to calibrate/validate against various satellite carbon flux prediction programs

-common activity across institutions/stations to enlarge the analysis to a regional level

- KOPRI will be joining EISCAT (European Incoherent Scatter Scientific Association) program.
- KOPRI's carbon flux monitoring program has been expanded over some other Arctic locations, including N ome (Alaska, USA), Cambridge Bay (Canada). In addition, Nord (Greenland) has become an important cand idate to operate the same flux measurement system as Dasan. The research team of KOPRI will be initiatin g discussions with the Nord science steering group in 2015.

NILU, Norway
Ove Hermansen

1 Plans and timelines:

NILU monitoring at the Zeppelin station, permanent measurement programme

(measurements that will continue in the foreseeable future)**:**

Persistent organic pollutants (POP's)

PCB A total of 33 PCB's, weekly samples, (48 hours sample)

Pesticides, insecticides etc. HCB, HCH's chlordanes and DDT-group, weekly (48 hrs) Brominated Flame Retardants PBDE, 15 comp's, HBCD, 3 isomeres, weekly

Poly aromatic hydrocarbons (PAH) ~ 40 comp's weekly (48 hrs) + Oxy Nitro PAH

Perfluorinated Alkylated Substance 6 components, once a week (48 hrs sample)

Inorganic compounds

Heavy metals;

Hg (5 min)

As, Cd, Co, Cr, Cu, Pb, Mn, Ni, V, Zn 1/week (72 hrs)

Acidification/nitrification;

HNO_3/NO_3^-, NH_4^+/NH_3, SO_2, SO_4^{2-} gases and particles, daily (24 hr sample)

Inorganic Particle Bound;

Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^- daily (24 hr sample)

Nitroxides;

NO, NO2, NOx (new) continuously

Greenhouse gasses

CH_4 Methane continuously (CRDS)

CFC's, HCFC's, HFC's, PFc's (30 compounds) semi-continuously (GCMS), every 2 hour

CO Carbon Monoxide continuously (CRDS)

CO_2 Carbon Dioxide continuously (CRDS), in cooperation with SU

H_2 Hydrogen semi-continuously, every 20 minutes

N_2O Nitrous oxide every 30 minutes

Tropospheric ozone continuously

NM-Hydrocarbons (C2-C8) semi-continuously (GCMS), every 2 hour

CH_4 CO_2 – isotopes flask sampling, daily

Meteorological data

Wind speed and direction

Temperature

Rel. humidity

Monitoring in Ny-Ålesund (Sverdrup station), permanent measurements:

Total ozone: Continuously UV/ VIS absorption instrument (Feb-Apr, Aug-Oct)

Stratospheric NO_2: Continuously UV/ VIS absorption instrument (Feb-Apr, Aug-Oct)

UV – irradiation: Continuously UV-irradiance measurements (Apr – Sep)

Particles/aerosols: Continuously, Aerosol optical depth (AOD) (Apr – Sep).

Precipitation: pH, conductivity, SO_4^{2-}, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3^-, NH_4^+ (weekly avg.)

Measurements of local air quality in Ny-Ålesund 2014-2015

These measurements are a continuation of the the local air quality measurements 2008-2010 to look at the impact from activities in Ny-Ålesund, local emissions, emissions from ship traffic etc.

2 Gaps

Continous boundary layer measurements

Measurements that can tell the height of the boundary layer around the Zeppelin station. This would be a good indicator of the influence on the station from local emissions.

AWIPEV and CNR are/have been doing measurements and studies. It would however have been useful to have measurements closer to the mountain (tiltable lidar?).

More comparisons of existing measurements

Some parameters are measured at several locations in Ny-Ålesund (e.g. CO2, CH4 at the CNR-tower (CNR/KOPRI) and at Rabben (NIPR). Combining data would be useful to look at local emissions, local meteorology and height profiles. Maybe also intercomparisions.

3 Contributions

Ongoing continuous measurements of an extensive range of compounds

Extensive database, long time series

All data from NILU in Ny-Ålesund are reported yearly and available for anyone to download for free (EBAS ebas.nilu.no).

4 How do you want the Flagship Programme to be active?

Initiate cooperation between stations, leading to new projects.

Arrange regular workshops/seminars.

5 Plans for

Publications

Approximately 10-20 p.r. publications every year presenting research based on measurement data from NILU measurements from Zeppelin/ Ny-Ålesund, most of which are joint publications with other NySMAC members.

Applications

At the moment: SIOS, ICOS,

Activities across institutions/stations

Continue the joint work on POP's and biological effects (mainly with NPI)

Vertical distribution of aerosol properties, with CNR and SU

Norwegian Polar Institute,
Stephen R. Hudson and Christina A. Pedersen,

1 Plans & Timelines:

- Ongoing measurements

-Incident direct, diffuse and total solar radiation and total infrared radiation at Zeppelin Observatory, continuous since early 2014.

-Stable water isotopes from fresh snow samples; data since 2010.

-Automatic weather stations, one at Pynten, 2 on Kongsvegen, 2 on Holtedahlfonna; data since 2009 (2006 at equilibrium line on Kongsvegen), T, RH, wind and 4-component radiation, plus snow depth on the 4 glacier sites

-Ice thickness monitoring in Kongsfjorden (data since 1997), including irregular spectral solar radiation observations, albedo and transmittance on sea ice, spring campaigns in some years.

-Black carbon concentration in snow in town and on Austre Brøggerbreen, weekly during the snow season since 2008. Additional campaign based radiation and snow measurements.

-Web cameras at Zeppelin Observatory

- Planned field activities/campaigns

-Glacier mass balance and AWS servicing, April and September each year

-Sea ice campaign, often with radiation, April each year

2 Gaps: Which observations/measurements do You miss, which might be provided by others in Ny-Ålesund or on Svalbard?

-Lower atmosphere cloud and aerosol properties for interpreting changes in the radiation components between 500 m (Zeppelin) and the surface (AWI's station).

-Measurements of cloud properties (in addition to the measurements NIPR is now doing, also observe phase, shape, aerosol/chemical content in cloud particles, particle growth rate, supersaturation) at Zeppelin and of aerosol properties there under in-situ (i.e. not dry) conditions. Cloud-aerosol interactions, cloud radiative forcing and aerosol deposition.

-Measurements of spectral solar fluxes (and spectral longwave? not sure about coverage and resolution of the currently operated FTIRs).

-More complete and regular atmospheric data over glaciers in the area.

3 What are your specific contributions to the flagship programme?

-Radiation at Zeppelin Observatory

-Snow and Black Carbon

-AWS, radiation and snow

4 How do you want the Flagship Programme to be active?

NPI encourage and support the flagship program to be more active. Suggestions on how this can be done:

-a scientific committee

-updated webpage with plans for activities (similar as point 3.1 and 3.5), and annually updated instrument/parameter- and publication list.

-Information on all the flagships should be incorporated into the database Research in Svalbard (RiS). When you register your project, you should have to confirm that you have read the flagship document/webpage, and have discussed your project with the scientific committee (including specifying your specific contribution to the flagship, and how it complements the ongoing activities).

If your project require a NySMAC hearing the scientific committee should be consulted and give advice.

-More and better contact between the partners, with e.g. meetings every other year (would SSF fund something like that regularly?)

5 Please provide plans for

- common publications

These are more suggestions than concrete plans.

Publications:

-Impact of low-level clouds and aerosols (Arctic haze focus?) on incoming atmospheric radiation at Ny-Ålesund

-An extended record of radiative fluxes at Ny-Ålesung (combining AWI's radiation data with the NPI radiation data from before that, with good overlap)

- common applications to funding calls (SSF, EU, SIOS?, others)

-National coordinated SIOS application to Research Council of Norway (due 15. Oct).

-Proposal submitted to RCN in Sept. 2014: Sea-Ice Data Comparison for Reflectometry Evaluation. Collaboration between NPI and GFZ, Potsdam.

-Regular support from SSF for atmospheric meetings every other year.

- development of satellite cal/val activities

Increased activities planned through SIOS, but with the primary focus on Austfonna, including several new AWSs.

- common activities across institutions/stations to enlarge the analysis to a regional level

Stockholm University , ITM
Radovan Krejci

1:

Ongoing: Long-term observations of aerosol number density, size distribution, light scattering and absorption, OC/EC analysis. CCN observations in collaboration with KOPRI.

Planned: Study of aerosol-cloud interactions using CVI, number and size distribution of cloud residuals, mixing state, partitioning of absorbing aerosol (BC) between interstitial and activated fractions, Cloud water content.

2

Routine observations of cloud microphysical properties (number, cloud/ice droplet size distributions, cloud water content, vertical structure of the lower troposphere including T, RH, 3D wind, cloud fraction, high temporal observations of aerosol composition (AMS), spectral radiation. Trace gases.

3

Long term observations of aerosol microphysical and optical properties, OC/EC
Aerosol-cloud interactions and associated influence on radiation budget
New particle formation in the Arctic
Role of transport and removal processes on aerosol and CCN properties in the Arctic

4.

The role of Atmospheric Flagship Program should be

1) Forming major research directions in atmospheric research carried out at Ny Ålesund.
2) Identifying the infrastructure and observational needs currently missing
3) Provide platform for close collaboration and full exploitation of observations available.

5.

Planned publications:

CCN properties at Ny Ålesund (KOPRI + SU)
New aerosol particle formation in the Arctic based on 10+ years of observations at Zeppelin (SU)
The boundary layer/lowermost free tropospheric influence on aerosol properties observed at Zeppelin (SU+AWI)
Combining aerosol observations at Gruvbadet, Zeppelin and local meteorology (SU, CNR, AWI)

Common funding applications:

Study aerosol properties and local boundary layer structure on high temporal resolution campaign basis (CNR, AWI, SU): SSF
Aerosol-cloud interactions focused on study of cloud residuals properties and links to CCN population (Swedish Research Council)
Renewal of existing and extension of aerosol in situ observations during SIOS

Common activities across institutions:

Aerosol/CCN studies together with KOPRI
Links between local atmospheric dynamics, radiation and aerosol and cloud properties (together AWI, NIPR, CNR)

For a future we propose to have a join research initiative **"Trends and Interactions of Water Vapor, Clouds, Aerosols and Radiation in the Greater Svalbard Arctic Region (TIWCARS)"**, which will involve several groups active at Ny Ålesund, namely SU, AWI, NIPR, CNR, NILU). *Rationale:* Arctic weather, climate and environment is affected by human activity regionally and globally. The IPCC 2014 has confirmed that amplification of global warming in the Arctic is occurring now and will continue in the future. In turn, changes in Arctic weather, climate and environment have resounding effects outside the northern polar region. The vision of the Svalbard Integrated Arctic Earth Observing System (SIOS) http://www.sios-svalbard.org/ is to "Establish a cooperating and transparent research infrastructure which will give better estimates of the future environmental and climate changes in the Arctic." This proposal concerns the SIOS atmospheric component related to feedbacks on weather, climate and biogeochemical cycles associated with the interaction of atmospheric water vapor, clouds, aerosols, short/long wave radiation and atmospheric circulation in a highly variable and changing northern polar hydrosphere, cryosphere and atmosphere. It is proposed to consolidate and strengthen the research and routine observations at Svalbard related to this topic through an international consortium of researchers focused on this theme.

AARI - SPb University - MET-Norway
Boris Ivanov, Pavel Sviashchennikov, Ketil Isaksen, Eirik Forland

Plans & Timelines:

Ongoing observation:

- Ongoing routine meteorological measurements (Barentsburg), from 1932

- Incoming global radiation (Barentsburg), from 1985

- Sea surface temperature and salinity, from 1947

- Automatic weather stations (AWS), one at Pyramiden (met.no, since 2012), one at Finneset Cape (Barentsburg area, since 2013), one at Barentsburg meteo site (since 2013), GEONOR (precipitation system) – one at Barentsburg meteo site (since 2014)

-Ice thickness monitoring in Greenfjorden (data since 1947, irregular), including visual observation; irregular spectral solar radiation and albedo observations (Aldegonda glacier, town); transmittance on fast ice (spring campaigns in some years).

-Black carbon concentration in snow in town (Barentsburg) and surrounding area – Aldegonda glacier, fast-ice (irregular, since 2009).

Planned field activities/campaigns (2015, spring, summer):

- Expansion of surface net of meteorological observation by AWS including Aldegonda glacier (met.no)

- Albedo and black carbon observation at Aldegonda glacier, fast ice, snow (including Barentsburg and Pyramiden settlements and surrounding area)

- Sea ice campaign, often with radiation observation (over and under fast ice)

- More complete and regular radiation and ice/snow data over glaciers (Aldegonda)

What are your specific contributions to the flagship programme?

- Radiation at Barentsburg and Pyramiden area

- Snow and Black Carbon (Barentsburg, Pyramiden, Aldegonda glacier (“reference’ area)

- AWS

How do you want the Flagship Programme to be active?

AARI, SPbSU, MET-Norway encourage and support the atmospheric flagship program to be more active. Suggestions on how this can be done:

- a scientific cooperation and involving young scientists (school children’s, students, bachelors, masters et.) committee

- updated webpage with plans for activities and annually updated instrument/parameter, recent publication list.

- information on all the flagships should be incorporated into the database Research in Svalbard (RiS).

- when you register your project, you should have to confirm that you have read the flagship document/webpage, and have discussed your project with the scientific committee (including specifying your specific contribution to the flagship, and how it complements the ongoing activities).

- more and better contact between the partners, with e.g. meetings every other year (would SSF

fund something like that regularly?)

Hornsund contributions
Grzegorz Karasiński, Piotr Sobolewski

1 Plans & Timelines: - Provide lists of ongoing and planned measurements, expeditions

- Provide times of planned field activities / campaigns

The Hornsund Station performs systematic observation of atmospheric parameters:

- AOD and other aerosol parameters within AERONET;
- optical properties of atmospheric aerosol provided by multiwavelength aerosol lidar;
- water vapour mixing ratio provided from raman lidar;
- sunshine duration, total radiation, UV-A and erythemal radiation
- biological effective solar UV radiation, solar UVA radiation, total solar radiation, sunshine duration.
- there is operating manned weather station WMO 011003 which provides useful meteorological data and observations
- tracking of air masses inflow to Hornsund area using HYSPLIT model and GDAS1 reanalysis of meteorological data

Planed observations\measurement

- ground albedo (total irradiation and UV)
- in situ aerosol concentration measurements by aerosol particle counter
- cloud cover and weather condition registered by All Sky Camera
- meteorological measurements on nearby (~1km) mountain Fugleberget 568m

2 Gaps: Which observations / measurements do You miss, which might be provided by others in

Ny-Ålesund or on Svalbard?

The total amount of ozone observation

We have little experiences with satellite data. Mainly we are basing on data provided by Giovanni portal. Our main problem is lack of man power.

3 What are your specific **contributions** to the flagship programme?

Hornsund can take a part in pan-Svalbard activities. Our input can be significant in global-Svalbard atmospheric observations especially in aerosol/pollution inflow and optical properties of the atmosphere. We can easily expand computational (HYSPLIT GDAS1) monitoring of air masses inflow on Ny-Ålesund site and other important sites for the Flagship Programme.

Since Hornsund Station rents for its own logistic/scientific purposes r/s vessel Horyzont II it is possible to use her to support other sites, also Ny-Ålesund. She visits Longyearbyen twice in the summer each year.

4 How do you want the **Flagship Programme** to be active?

We expect participating in global-Svalbard activities\measurements\observation. Also providing the road map of needed future atmospheric observation in Svalbard, establishing or acceptance of SIOS provisions of standards of observations e.g. star\lunar photometry.

Providing, at least, meta-data base of available atmospheric data from all institutions will be great yield.

5 Please provide **plans** for – common publications - common applications to funding calls (SSF, EU, SIOS?, others) - development of satellite cal/val activities - common activities across institutions/stations to enlarge the analysis to a regional level

Hornsund counts on expanding collaboration with other Svalbard partners. Example of the cooperation is participating in Research Council grant: **Lunar Arctic-coordinated remote sensing of aerosols: LUNAR photometry close the gap in ARCTIC aerosol climatology and satellite validation.**

VILLUM RESEARCH STATION (VRS), STATION NORD
Andi Massling

1 Plans & Timelines:

Station Nord is a military camp located at ~81^{o} N in North Greenland. In the past a measurement hut located about 2 km outside the camp ("Flygers hut") has been used for scientific monitoring.

From the beginning of 2015, the VILLUM RESEARCH STATION is established at Station Nord including:

- An Atmospheric Observatory, 108 m², heated
- A Garage and A Storage Facility, app. 110 m². heated
- Accommodation and laboratory facilities, app. 360 m², heated

The station is operated by Aarhus University and researchers from all countries are welcome to carry out research at the facilities.

- Provide lists of ongoing and planned measurements, expeditions

Meteorology (by AU-ENVS and DMI):
- T, RH
- WD, WS (Sonic)
- Precipitation (electronic sensor)
- Radiation

Other (by AU-ENVS and DMI):
Snow depth
Gasses (by AU-ENVS):
Ozone, Gaseous Elemental Mercury (GEM), NOx, CO, CH_4, CO_2, H_2
Fluxes of mercury fractions (Gaseous Elementary Mercury GEM, Total Atmospheric Mercury TAM)

Remote sensing (DTU-RISØ):
Ceilometer measurements for boundary layer height

Chemistry (by AU-ENVS and AU-CHEM) – weekly time resolution:
Filter Pack Sampler (Inorganics: Elements (ICP-MS), SO_4^{2-}, NO_3^-, NH_4^+ (IC))
High Volume Sampler (Carbonaceous: EC/OC, Thermo-optical method and Identification of organo sulfates)
High Volume Sampler (POPs)

Particle physics (by AU-ENVS):
Particle number size distribution (10 - 900nm, SMPS)
Particle number size distribution (0.5 - 32µm, OPC)
Absorption coefficient / Black carbon mass concentration (MAAP)
Scattering coefficient at three wavelengths (Nephelometer)

Modelling (by AU-ENVS):
COPREM (COnstrained Physical REceptor Model) and PMF (Positive Matrix Factorization) for source apportionment
DEHM (Danish Eulerian Hemispheric Model) for estimate of various gas phase and particle compounds

- Provide times of planned field activities/campaigns

In late winter in 2015 the NCoE (Nordic Centre of Excellence) CRAICC (CRyosphere-Atmosphere Interaction in a Changing Arctic Climate) will carry out a campaign at the Villum Research Station (VRS), Station Nord, lasting up to the summer in 2015.

Objectives are:

- Identification and characterization of changes in atmospheric chemistry from dark to sunlight period
- Arctic Haze Characterization
- Identification of nucleation processes

Parameters provided at VRS, Station Nord, during CRAICC campaign 2015 by
Aarhus University
Denmarks Technical University
Finnish Meteorological Institute
Helsinki University
Gothenburg University
Lund University

Chemistry (by AU-ENVS and AU-CHEM):
Chemical speciation of aerosols using a SP-TOF-MS
Speciation of gas phase compounds using a PTR-TOF-MS

Remote Sensing (by FMI):
LIDAR measurements
BC investigation in snow samples

Geology (by UH-ECRU and UH-GEO):
Lake sediment core sampling

Geology (by GU-CHEM):
Ice nucleation activity in snow samples

Physics (by UH-Phys):
UFP (Ultrafine particles) CPC (size range > 3nm)
Airmodus CPC (size range > 6 nm)
CI-APITOF Chemical Ionization - Atmospheric Pressure Interface - Time-Of-Flight mass spectrometer (measures sulfuric acid and neutral clusters)
PSM Particle Size Magnifier (particle/cluster number size distribution: size range between 1 and 4 nm)

2 Gaps:

-

3 What are your specific **contributions** to the flagship programme?

We can offer a number of parameters measured at VRS, Station Nord, for different time periods. These can be compared to Svalbard measurements and result in common publications. The parameters are listed above.

4 How do you want the **Flagship Programme** to be active?

I could think of the exchange of students working on the different comparison studies. This could be master students, PHD students or also postdocs.

5 Please provide **plans** for

- common publications

AU-ENVS (Aarhus University, Department of Environmental Science) and SU-ITM (Stockholm University, Department of Applied Environmental Science) is planning a joint publication on comparisons of particle number size distributions at Svalbard and VRS, Station Nord.

- common applications to funding calls (SSF, EU, SIOS?, others) - development of satellite cal/val activities - common activities across institutions/stations to enlarge the analysis to a regional level

Marion Maturilli
Alfred Wegener Institute

1 Plans and timeline

Continuous surface measurements:
- surface net radiation (SW down, SW up, LW down, LW up)
- surface meteorology (T, rel.hum., pressure, wind)
- cloud base (ceilometer)

Balloon-borne vertical profiles:
- T, humidity, wind, pressure (1 x daily radiosonde)
- O3 (1 x weekly ozonesonde, in winter more frequent)
- stratospheric H2O (1 x cryogenic frostpoint hygrometer every 2 months)

Ongoing measurements/campaign activity
Sept. 2013 (6 x daily) and Sept. 2014 (4 x daily): intensive radiosonde campaign

Planned campaign activity (2015)
- vertical profile of net radiation balance (SW down, SW up, LW down, LW up)
- BSRN similar radiation sensors deployed on a tethered balloon to study the altitude-dependent radiation balance
    - in inversion situations
    - below / above clouds

    (3-4 weeks in May/June/July 2015)

2 Gaps

- Precipitation measurements
  registering the quantification of precipitation + phase of precipitation
- Climate model activities with scale optimized for the Kongsfjord area and Svalbard
  (Could a 'central Ny-Ålesund model' be used to bring together various meteorological measurements?)

3 Spesific Contribution to the Flagship Program

Longterm observations of
- Surface net radiation (SW down, SW up, LW down, LW up)
- Surface meteorology (T, rel. hum., pressure, wind)
- Cloud base
- Vertical profile of T, humidity, wind (radiosonde)

- Interest in gathering (longterm) measurements of humidity to assess increase in humidity
  Link between meteorology – clouds – radiation

  I propose to assemble a list of all available water vapor measurements in Ny-Ålesund and would offer to become a key person for the topic "humidity".
- I propose to assemble a list of all available met-stations in and around Ny-Ålesund.

BSRN - Baseline Surface Radiation Network
GCOS - Reference Upper-Air Network

Involvement of Ny-Ålesund in international networks -> monitoring

Active in IASOA (iasoa.org) -> connecting with other stations in the Arctic

Process studies using
- Surface net radiation (SW down, SW up, LW down, LW up)
- Surface meteorology (T, rel. hum., pressure, wind)
- Cloud base
- Vertical profile of T, humidity, wind (radiosonde)

Basic measurements for any campaign activity

Link between
planetary boundary layer - meteorology – clouds – aerosol – radiation

4 Activity of Flagship Program

- Define key scientific questions
- Form small working subgroups of people/stations contributing to each question (potential financial support by SIOS)
    - meetings to coordinate specific campaigns or joint projects
    - exchange of scientists (exchange of data is good, but joint interpretation may help)
- Have 'general meetings' bringing together the small working subgroups, reporting on their contribution to their attributed key scientific question to the larger community (e.g. "Atmospheric Flagship Day" at the NySMAC Seminars)

5 Plans

Common publications
- Assessment of humidity from all available observations
    - longterm changes
    - case studies

  ➔ Join with working group on long range transport to analyse the source of increasing humidity

Common activities across institutions/stations
- Already active in the Radiation Working Group of IASOA to jointly analyse surface radiation changes at stations across the Arctic (Summit/Greenland, Eureka, Alert, Barrow , Tiksi…)