DATE: 01.11.2021

WHAT: Atmosphere Flagship hybrid meeting

BY: Christina A. Pedersen, NPI

Summary from the Atmosphere Flagship meeting 1. Nov 2021

Selected info and follow ups from the science talks

- Platt informed about the joint publication "*Atmospheric composition in the European Arctic and 30 years of the Zeppelin Observatory, Ny-Ålesund"* with 43 co-authors from 10 institutions involved in monitoring at Zeppelin Observatory which is currently under review for ACP.
- Sodemann informed about several coordinated aircraft campaigns that will take place in the Svalbard areas in March-April 2022. These include:
    - ACAO (S. Abel, UK Met Office): 7 March-1 April 2022
    - $(AC)^3$ (M. Wendish, AWI): 5 March-14 April
    - MC2 (R. David): 9 March-1 April 2022
    - ISLAS (H. Sodermann): 15 March-9 April 2022

  Sodemann informed that during the fligh campaigns there will be additional instruments/instruments campaigns in Ny-Ålesund also.
- Pedersen will include references to the work on local pollution done by Kallenbron and Dekhtyreva on the Ny-Ålesund research station webpage on EIA.

Discussions

SSF grant: Discussion & planning how to achieve what we promised

In 2020 the Atmosphere Flagship was granted a proposal in the Svalbard Strategic Grant call administered by SSF/The Research Council of Norway. The full project proposal can be found here.
Due to the pandemic, the project activities were put on hold. This fall NPI, as the project leader of the project, applied to RCN to have the project prolonged until June 2023, which we got approved.
The project contains a list of various project activities that will be carried out during the next two years. Below is a list of these activities including the persin in charge of this activity, together with a summary of the discussion during the meeting on how to plan for and carry out these activities:

1. Atmospheric observations and join data analysis from the MOSAiC IOP 2019-2020 (lead: M. Maturilli, AWI)
    - Long-term observation at Svalbard and in Ny-Ålesund complement the MOSAiC observational program and provide unique long-term perspective. Atmospheric observational program in Ny-Ålesund has been increased and intensified for the MOSAIC time-period 2019-2020 to fill the known gaps. As a result, there will be available unique comprehensive data set on atmospheric composition, aerosols, clouds and meteorology. Our plan is to carry out joint analysis within the Atmospheric Flagship and on a later stage together with the MOSAiC team.
    - Step 1: We need to identify the key people to work on this issue: these are scientists already working in Ny-Ålesund which are responsible for the relevant Ny-Ålesund data, but they can also be young students, or remote sensing/modelling people. How can we involve the right people?

        i. Radovan Krejci (SU) has an overview of intensive measurements taking place in Ny-Ålesund during the MOSAIC campaign.
        ii. Stephen PLATT and Alena DEKHTYAREVA already express interest.
    - Step 2: Connect the relevant Ny-Ålesund people to the relevant MOSAIC people. Some persons already have the necessary links between relevant scientists, but some may not have it. How can we help the latter group?
        i. MOSAIC have several workshops planned already (both online and physical)
        ii. Next week some young researchers are arranging a workshop on connection Svalbard measurements to MOSAIC together with IASC. They also set up an email: SvalbardMOSAiC@gmail.com
    - Question about which times it is most relevant to compare Ny-Ålesund and MOSAIC data. Model trajectories have been calculated and are available.
    - The MOSAIC science plan is available here. All MoSAIC data will be available from Pangea. From 1 January 2023 all MOSAiC data will be freely available to everyone.
    - Follow up: Focus on data exchange, channels how to keep both communities informed on progress and directions of data analysis and science
2. Artic winter atmospheric composition, aerosol and cloud properties (lead: C Ritter, AWI, is taking over the lead)
    - We want to focus on data analysis of wintertime observations of aerosols, clouds, meteorology and long-wave radiation to better understand the aerosol-cloud-radiation interactions in winter and develop a process understanding of main driving mechanisms of accelerated winter warming in Svalbard region.
    - Follow up: C. Ritter will take initiative for an online meeting on this topic early next year (Jan/Feb. 2022).
3. Emerging new pollutants in the Arctic (lead: R. Kallenbron, NMBU & UNIS)
    - There is an increasing need to quantify and understand the behavior of persistent organic pollutants (POPs) and new emerging pollutants in the Arctic environment. AMAP Assessment report from 2016 “Chemicals of Emerging Arctic Concern (CEAC)” and the new from 2021 “Impacts of Short-lived Climate Forcers on Arctic Climate, Air Quality, and Human Health“ has identified a number of organic pollutants important for the Arctic environment.
    - Ongoing calibration work in Barentsburg and Hornsund, but Ny-Ålesund measurements needs to be linked to this work
    - Follow up: R. Kallenborn will invite for an online meeting to coordinate this work in early 2022.
4. Quantification and uncertainties in precipitation observations (lead: H-W Jacobi, UGA/CNRS)
    - Quantification of precipitation is one of the key parameters to understand process of atmospheric deposition of water, nutrients and air pollutants. It is exceptionally demanding task at high latitudes where large fraction of precipitation is in a form of snow. This will be addressed by following actions: There is a number of precipitation measurements in Ny-Ålesund and results from different instruments and methodology will be

compared to assess the variability. Based on the available data correction adjustment parameters for losses and sampling efficiency will be derived.
    - Norwegian Met Office also have a great interest in this work, and must be included in the loop; and H. Sodemann also express interest regarding isotop in precipitation
    - Follow up: Radovan will be in contact with the lead Hans-Werner and discuss how this task should be continued.
5. New observing platforms -ForskAIR (lead: Andøya Space)
    - Together with the proposed new Norwegian Airborne Research Facility ForskAIR we planned to explore new possibilities in a field of airborne in-situ and remote observations relevant to science within Atmospheric Flagship.
    - This proposal has not been submitted by AS, and the task is put on hold.
6. Further development of metrology laboratory and standardization of meteorological observations (lead: A. Merlone, INRIM)
    - The plan is to promote and use the existing metrology laboratory at Vaskerilabet at Ny Ålesund. Currently it is equipped with tools for calibration of temperature and atmospheric pressure sensors. So far the metrology laboratory was used mainly to calibrate sensors at Climate tower operated by CNR. Within this project we plan intercalibration of air temperature sensors across the whole Ny Ålesund Research Station. We also plan to exploit possibility to develop also precipitation gauge calibration toolkit
    - The interest from the science community to utilize the facilities have up till now been limited.
    - The plan is to focus on temperature measurements as Ny-Ålesund have a very high density of these compared to any other research station.
    - In SIOS workplan for next year are workshop and training courses on metrology. How could we in Ny-Ålesund community benefit from this?
    - Follow up: Launch the possibility to calibrate temperature measurements, by setting up protocols and a time schedule.
7. UV observations and network (lead: B. Petkov, CNR)
    - Svalbard provides a great opportunity for studying the short- and median-term variations in the ozone column since the polar day allows obtaining continuous time series within a period of several months.
    - The main goal of the planned collaboration is to study the relationship between the UV variations and the changes in the ozone column and the meteorological factors. The time-series from Ny-Ålesund, Barentsburg and Hornsund, in operation for more than 20 years, provide datasets. Following the UV observations intercomparison in 2018 the plan is to continue harmonization of the UV measurements and in join data analysis.
    - The work is now focused on collecting data in databases to share it with the community.
    - Contribution from this group to the 2021 SIOS SESS report: Update of Observations of the solar UV irradiance and ozone column at Svalbard (UV Ozone, SESS report 2018), lead author. Boyan Petkov, ISAC-CNR
8. Work towards establishment of snow, precipitationand aerosol sample archive for future studies (lead O. Hermansen, NILU)

- Scientific and instrumental development together with changes in air pollution sources and emissions brings the need and interest in characterization of new pollutants and compounds in the environment. One of the limiting factors is that it seldom is available samples for retrospective analysis to assess the pollutants concentration in past. Currently there is an archive sampling program at Zeppelin Observatory using simple passive sampling method. We would like to do feasibility and methodological study to see if it possible to extend the sample archive with routine samples of atmospheric aerosol, precipitation and snow together with the Environment Specimen Bank
- Follow up: Ove Hermansen will initiate the discussion within a smaller group. This will be an online meeting. Next step will be a physical meeting. Ove will return to the flagship science committee with some suggestions.

9. Open atmospheric flagship bi-annual workshop in 2021 (lead R. Krejci; SU, and Y. J. Yoon, KOPRI)
    - The past atmospheric flagship workshops in 2014, 2016 and 2018 established a key scientific forum where the atmospheric research community meet every two years. The workshops have been a week-long event providing enough space for plenary talks and discussion, sub-meetings within the different workgroups or on specific topics or project objectives. This arrangement offers possibilities for the individual scientists to pop in and out of the themes of interest. Within this project we plan to organize an open Atmospheric Flagship workshop in spring 2021 at KOPRI, The Republic of Korea. So far all workshops have been arranged in Europe and we believe that the meeting in The Republic of Korea will strengthen collaboration and involvement of scientists from Asia. The workshop will be organized back-to-back to The Polar Symposium organized by KOPRI.
    - Follow up: Radovan will initiate a doodle to investigate if enough people would be interested in travelling to Korea for this meeting in fall 2022. The project has funds for this workshop

Development of Gruvebadet and links to Zeppelin Observatory

There have been three meetings between the partners to discuss how to increase collaboration and coordination of activities in Gruvebadet Atmosphere Observatory and Laboratory, and a House-meeting/Lab-meeting for Gruvebadet has been established following the concept of House Meeting for the Zeppelin Observatory.

Members of Gruvebadet House meeting are: CNR, NCPOR, NIPR, KOPRI, KB, NPI. There will be additional two representatives, one for ensuring good links between Gruvebadet and Zeppelin Observatory (currently Radovan Krejci, SU) and one for ensuring good links between Gruvebadet and the snow-activities outside Gruvebadet (currently JC Gallet, NPI).

The scientific priorities for Gruvebadet will be part of the scientific discussion and update of strategy document in the Atmosphere flagship, while the implementation of the strategy plan and practical arrangements for Gruvebadet will be organized under Gruvebadet House-meeting.

Gruvebadet House-meeting is currently in the process to establish:

- the terms of reference document, which will describe what the committee shall manage and the practicalities on how this should be done.
- a *Request for research activity*-form to be completed by all who would like to initiate new activities at Gruvebadet.
- agree on a *point-of-contact* that will coordinate the House-meeting and make sure information flows between the partners.

The overview of current activities in Gruvebadet is part of the Ny-Ålesund GIS system, and changes to the ongoing activities needs to be updated in this system.

Needs for atmosphere research infrastructure in the coming decade

This is a summary of the process so far.

NySMAC is running a process to identify, discuss and prioritise Ny-Ålesund Research Station infrastructure gaps and future development. The two-step process will include an initial discussion in each of the four flagships, followed by discussions in NySMAC.

In short, the Norwegian Polar Institute (as the Norwegian directorate tasked with following up the majority of the action points in the research strategy for Ny-Ålesund) in close dialogue with Kings Bay AS (as owner of most of the research infrastructure in Ny-Ålesund, and tasked with further developing the infrastructure) have initiated and would like to facilitate a process with the aim of identifying, discussing and prioritising research infrastructure needs based on the present and planned research and monitoring activities in Ny-Ålesund.

The two-step process will include an initial discussion in each of the four flagships, and a follow up discussion in NySMAC, which is the appropriate arena to discuss and weigh priorities and recommendations across flagships.

The Atmosphere flagship (as the other three flagships) are invited to discuss, identify and prioritise research infrastructure needs based on the present and planned research and monitoring activity in Ny-Ålesund. This process could take as a starting point the summary of the common research infrastructure discussions made at the flagship workshop in Potsdam in 2018, and presented at the 49th NySMAC meeting. This document is attached. The summary from then is somewhat outdated, and needs updates and should be focused/streamlined.

Given the constraints, both financial (no extra funds available at the time) and practical (land-use plan, etc), building new infrastructure in the form of new buildings is not a likely outcome of this process. Rather, the further development and upgrading of current infrastructure and/or new use of existing buildings (Marine Lab, Veksthus, Zeppelin Observatory, Gruvebadet, Kongsfjordhallen, etc.) is seen as the likely solutions, and plans should be developed accordingly.

The chair and co-chair (Radovan Krejci and Steve Hudson) requested your initial input to this process in an email to the entire flagship community in June 2020, with deadline for input end of August 2022.

An overview of the received input is listed here:

1. Tethered balloon platform – This would be a site, possibly near Gruvebadet, with ground anchors, power supply and possibly network connection that could be used by all (or most) groups wishing to carry out tethered balloon projects, removing the need for each group to find a location and solution.
2. UPS for Gruvebadet – While the power supply in Ny-Ålesund is reasonably reliable, it would be useful for continuous measurements to have a UPS backup for the instruments and computers, for the occasional power failure. One UPS for the whole building would be more practical than one for each instrument.
3. Offshore atmospheric observatory – Measurements of the surface meteorology and other atmospheric variables over the open fjord would be an excellent complement to the extensive onshore measurements going today. This would involve installing a mooring or other platform in the fjord (not on the “new” Old Pier or similar), and instrumenting it for atmospheric measurements. It would likely be a new shared platform.
4. Clean access to Gruvebadet – This has been largely taken care of by both NPI and Kings Bay each purchasing a fully electric car for use to Gruvebadet and Zeppelin. The remaining challenge is the plowing of the road. Investigate electric alternatives to cover most daily plowing, reserving the large loader for extreme days.
5. Logistics support – New and guest users of facilities in Ny-Ålesund would benefit from a thorough general protocol and guidance for safe shipment to the research station. This would include both the contractors to transport the equipment and handling the customs issues.
6. IT infrastructure – Having a shared supply of spare IT equipment on hand in Ny-Ålesund would help ensure continuous operations in case of computer failure or similar. Today, it is common to have to order and ship up new parts or equipment for each IT failure, delaying the restart of measurements.
7. Data sharing – Possibility for better local data sharing, in addition to SIOS. Along the same lines, a better infrastructure for sharing data specifically with modellers would improve the use of data from Zeppelin, Gruvebadet and elsewhere in Ny-Ålesund.
8. Automate weekly snow sampling – Implement techniques to acquire much of the weekly snow-pit data automatically, e.g. snow height, snow and surface temperature, SWE, etc.

The flagship chair and co-chair have done the following assessment:
We have assessed 1 and 2 (balloon platform and UPS) as highly relevant Kings Bay tasks that can be implemented in the short term (next 1-2 years) and would be beneficial to many. 3 (offshore) seems highly useful for research, but is likely a longer term implementation that would require project funding, not just Kings Bay. 4 (EV to Gruvebadet) has already made significant progress; investigating EV ploughing options would be useful, but 4WD EVs are still in the early phase and mostly luxury, so it likely needs to wait a few years. 5 (logistics/shipping guides) is certainly a relevant need, but it should be discussed if Kings Bay should do this for the whole of Ny-Ålesund or if it makes more sense for each institution to have a good guide, since many things vary from country to country; it is probably somewhat outside NySMAC’s infrastructure idea though. We see the benefit of 6 (IT equipment), but with so many different needs (platforms, brands, hardware details, etc.) it seems challenging to have a useful reserve stock that would serve all; something to discuss more at a flagship meeting. 7 (data sharing) and 8 (snow sampling) are both important and useful, but seem to us to be outside of the Kings Bay infrastructure arena, with the possible exception of a Ny-Ålesund – wide server for storing and sharing data. The possibility for such a server and whether scientists would be willing to share so openly should be discussed at flagship meetings before prioritizing it.

The Gruvebadet Lab meeting has also identified some areas and issues that should be prioritized in order to have Gruvebadet function in a better way for all users. This list was also submitted:

- Scientific equipment
    - Milli-q system
- Furnitures and fixtures
    - Freezer capacity
    - Tables and chairs
    - Uninterrupted power supply UPS for Gruvebadet – While the power supply in Ny-Ålesund is reasonably reliable, it would be useful for continuous measurements to have a UPS backup for the instruments and computers, for the occasional power failure. One UPS for the whole building would be more practical than one for each instrument.
    - The snow community would like to have access, power and internet from the building and out, and need passages in the wall
- Building structure needs
    - Review the ventilation system to ensure it is sufficient to avoid over-heating in specific rooms
    - Some doors and windows are difficult to open and close. Some doors can not be closed.
    - New air-intakes in room 3 and 4 (room 1 and 2: most are already in use)
    - Sink, running water
    - Toilet
- Clean access to Gruvebadet – This has been largely taken care of by both NPI and Kings Bay each purchasing a fully electric car for use to Gruvebadet and Zeppelin. The remaining challenge is the plowing of the road. Investigate electric alternatives to cover most daily plowing, reserving the large loader for extreme days.
- Technical status of the building and the ground around: Gruvebadet Lab meeting ask Kings Bay for a status on the technical building and ground around it to assess the possibility for long-term use of Gruvebadet.

AOB

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Attachment 1: Meeting Agenda

Welcome

13:00 – 13:15: Welcome after 2 years in virtual space (Radek & Stephen)

Science talks

13:15 – 13:30: Stephen PLATT, NILU: Atmospheric composition in the European Arctic and 30 years of the Zeppelin Observatory, Ny-Ålesund

13:30 – 13:45: Sandro DAHLKE, AWI: The observed recent surface air temperature development across Svalbard and concurring footprints in local sea ice cover

13:45 – 14:00: Xie ZHYIONG, Hereon: Long-range transport and air-snow exchange of emerging organic contaminants in the Arctic

14:00 – 14:15: Roland KALLENBRON, NMBU & UNIS: PFAS in the Ny-Ålesund environment

14:15 – 14:30: Alena DEKHTYAREVA, Uni Bergen: Nitrogen oxides and tropospheric ozone in Svalbard: measurements in Ny-Ålesund, Barentsburg and Longyearbyen

14:30 – 14:45: Coffee break

14:45 – 15:00: Ann-Marie FJAERA, NILU: Recent results for Svalbard Pandora Spectrometer instrument and opportunities for future Atmospheric Cal/Val activities in Arctic areas

15:00 – 15:15: Thomas Y CHEN, Academy for Mathematics, Science & Engineering Forecasting Atmospheric Change via Machine Learning

15:15 – 15:30: Harald SODEMANN, Uni Bergen: Coordinated aircraft campaigns in March 2022

15:30 – 15:45: Christina PEDERSEN, NPI: Ny Ålesund GIS

Discussions

15:45 – 18:00: Atmospheric Flagship activities 2021 – 2023

- SSF grant: Discussion & planning how to achieve what we promised
- Atmospheric flagship workshop – KOPRI 2022
- Join data analysis with MOSAiC. Data exchange, channels how to keep both communities informed on progress and directions of data analysis and science
- Studies focused on microplastics
- Intercalibration/standardization of measurements – Ny Ålesund lab
- Upcoming campaigns and experiments, new national and international projects in coming year(s)
- New emerging pollutants, surveys, screening, targeted analysis

- Better integration of resources and measurements: BL meteorology, air-snow exchange
- Development of Gruvbadet and Zeppelin
- AOB

Attachment 2: Registered participants

Name	Surname	Organization	Country
Libo	Zhou	Institute of Atmospheric Physics, CAS	China
Jeff	Welker	Univ of Oulu Finland & Univ of Alaska Anchorage	Finland and USA
Marion	Maturilli	Alfred Wegener Institute	Germany
Sandro	Dahlke	AWI	Germany
Xie	Zhiyong	Helmholtz-Zentrum Hereon	Germany
Kerstin	Ebell	University of Cologne	Germany
Rosa	Gierens	University of Cologne	Germany
vito	vitale	cnr-isp	Italy
Angelo Pietro	Viola	ISP - CNR	Italy
Harald	Sodemann	Geophysical Institute, University of Bergen	Norway
Herdis Motrøen	Gjelten	MET Norway	Norway
Sabine	Eckhardt	NILU	Norway
Nikolaos	Evangeliou	NILU	Norway
Ann Mari	Fjæraa	NILU	Norway
Wenche	Aas	NILU - Norwegian Institute for Air Research	Norway
Ove	Hermansen	NILU - Norwegian Institute for Air Research	Norway
Stephen	Platt	NILU - STIFTELSEN NORSK INSTITUTT FOR LUFTFORSKNING	Norway
Kallenborn	Roland	NMBU & UNIS	Norway
Elisabeth	Isaksson	Norsk Polarinstitutt	Norway
Ketil	Isaksen	Norwegian Meteorological Institute	Norway
Stephen	Hudson	Norwegian Polar Institute	Norway
Pierre-Marie	Lefeuvre	Norwegian Polar Institute	Norway
Christina A.	Pedersen	Norwegian Polar Institute	Norway
Alena	Dekhtyareva	University of Bergen	Norway
Dominic	Heslin-Rees	Stockholm University (ACESl)	Sweden
Krejci	Radovan	Stockholm University (ACESl)	Sweden
Thomas Y.	Chen	Academy for Mathematics, Science, and Engineering	USA


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