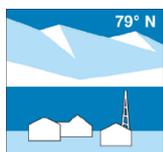




Photo: Helge T. Markusen, NPI.

**Report from the
Ny-Ålesund Atmosphere Flagship open workshop
4 November 2019 in Oslo, Norway**



The Ny-Ålesund Atmosphere Flagship arranged a workshop 4. November 2019 at Scandic Fornebu in Oslo, Norway.

The workshop took advantage of the [Svalbard Science Conference](#), venue the following two days.

Program 4 Nov 2019

12:00 – 13:00 Lunch

13:00 – 13:15 Welcome, agenda, logistics, latest news (flagship chair: Radovan Krejci)

Presentations

13:15 – 13:30 Metrology, calibrations and traceability of climatological observations (Andrea Merlone)

13:30 – 13:45 Impact of rocket launch on snowpack in Ny Ålesund (Andrea Spolaor)

13:45 – 14:00 Precipitation and snow monitoring at Ny Ålesund (Hans-Werner Jacobi)

14:00 – 14:15 New Norwegian airborne research facility (Ida Marie Larsen)

14:15 – 14:30 Albedo observations using drone at Esmark and Aldegonda glaciers (Boris Ivanov)

14:30 – 14:45 Atmospheric transport and deposition of emerging organic contaminants in the Arctic (Zhiyong Xie)

14:45 – 15:00 New pollutants in Arctic air: Focus on CEACs and Plastics (Roland Kallenborn)

15:00 – 15:15 UV radiation network (Vito Vitale)

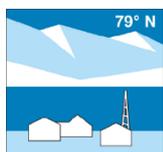
15:15 – 15:45 Coffee break

Discussions (15:45 – dinner)

Items to be discussed:

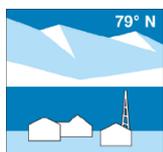
- Links between ground based and airborne observations including planned and past campaigns involving drones, UAVs, tethered balloons
- Links and use of remote sensing and in-situ data (lidars, radars, platforms and Ny-Ålesund and Zeppelin Observatory) for atmospheric composition and boundary layer research
- New “snow supersite” close to Gruvebadet and links with atmospheric observations & what we have learned from rocket launch
- Development of Gruvebadet as open access “Ny Ålesund atmospheric laboratory”
- Ny-Ålesund & MOSAiC – intensive IOP 2019 – 2020
- Emerging pollutants & microplastics – continuation of discussion if needed
- Bioaerosols
- Future of the Atmospheric flagship (on-site integration, joint analysis of 2019-2020 IOP, Atmosphere Flagship workshop 2021, flagships integration and joint application to SSG, intensive “summer school” under umbrella of Flagship program).

19:00 Flagship common dinner at Scandic Fornebu Restaurant



Participants list

First name	Last name	Institution	Country
Jeff	Welker	University of Oulu	Finland
Hans-Werner	Jacobi	IGE Grenoble	France
Christoph	Ritter	Alfred Wegener Institut	Germany
Konstantina	Nakoudi	Alfred Wegener Institute	Germany
Alexander	Schulz	Alfred Wegener Institute	Germany
Zhiyong	Xie	Helmholtz-Zentrum Geesthacht	Germany
Birgit	Wehner	TROPOS	Germany
Kerstin	Ebell	University of Cologne	Germany
Andrea	Spolaor	CNR-ISP	Italy
vito	vitale	cnr-isp	Italy
Graziano	Coppa	INRiM	Italy
David	Cappelletti	University of Perugia	Italy
angelo pietro	Viola	institute of polar sciences	Italy
Michael	Gausa	Andøya Space Center	Norway
Ida Marie	Larsen	Andøya Space Center	Norway
Pernilla	Bohlin-Nizzetto	NILU	Norway
Roland	Kallenborn	NMBU & UNIS	Norway
Mareile	Wolff	Norwegian Meteorological Institute	Norway
Stephen	Hudson	Norwegian Polar Institute	Norway
Christina A.	Pedersen	Norwegian Polar Institute	Norway
Robin Benjamin	Zweigel	Uni. Oslo, dept. of Geosciences	Norway
Andrew	Seidl	Univeristy of Bergen	Norway
Boris	Ivanov	AARI	Russia
David	Mateos	University of Valladolid	Spain
Radovan	Krejci	Stockholm University	Sweden
Rob	Modini	Paul Scherrer Institute	Switzerland
Libo	Zhou	Institute of Atmospheric Physics, CAS	China
Marco	Zanatta	Alfred Wegener Institute	Germany
Herdis M	Gjeltén	MET	Norway
William	Hartz	UNIS	Norway



Workshop report

Presentations

The given presentations are available by request to the responsible scientist or christina.pedersen@npolar.no.

Metrology, calibrations and traceability of climatological observations (Andrea Merlone. Given by Graziano Coppa)

- New SI was adapted in May 2019 based on fundamental constants.
- Traceability. Key condition for comparability
- WMO guide to observations and instrumentation. Inclusion of a chapter on cryosphere observations
- New publication: RMetS: An experimental method for evaluation of the snow albedo effect on near-surface air temperature measurements. <https://doi.org/10.1002/met.1756>
- METEOMET - Metrology for meteorology project. METEOMET is the larger EURAMET consortium (70 partners, 300 deliverables). Task 3.5: Construction of a facility for in situ traceable calibration of weather stations including for special purposes and under extreme environmental conditions (high mountains, polar regions)
- New metrology lab opened in NyÅ (May 2017). Available for all, and calibrations can be done by the scientist themselves, as the lab has detailed manuals available. Calibrations to be performed here include: temperature and pressure (thermometer is not ready per now). If needed, the infrastructure can be moved with some cautions (portable calibration chamber). Contact person is CNR leader locally.
- Arctic metrology 4th workshop here in Oslo in Nov 2019.

Impact of rocket launch on snowpack in Ny Ålesund (Andrea Spolaor)

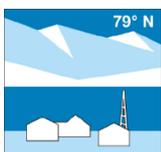
- Propellant composition. Lots of local ammonium, so focuses on aluminum and iron.
- Several sampling sites, samples taken before and 0-300h after missile launch.
- Ny-Ålesund/Gruvebadet: Increase AI in surface snow layer (7 to 10 hours after launching)
- Different results when moving to the glaciers
 - Austre Brøggerbreen and Edith Breen had an estimate rocket impact of 35% and 20% of annual AI load, respectively. For Midtre Lovenbreen, Kongsvegen and Holtedaahlsfonna the estimate rocket impact was below detection threshold.

Precipitation and snow monitoring at Ny Ålesund (Hans-Werner Jacobi)

- Importance of the snow and precipitation measurements in the Arctic, and its impact
- Jacobi shows a map of snow and prec. measurements in Ny-Ålesund.
- Gruvebadet coordinated snow sampling started 2017. Year round sampling. Weekly wet deposition sampling
- Comparison of parallel precipitation measurements in NyÅ with three different instruments.

Summary:

- High density of instruments, but data availability is less developed
- Correction of observed (solid) precipitation not resolved
- Recent trends in precipitation: Strong increase in liquid precipitation
- Growing interest in snow chemistry and biology: Need to recover historic snow pit data



New Norwegian airborne research facility (Ida Marie Larsen)

- New initiative from Andøya Space Centre: ForskAIR – New Norwegian Airborne Research Facility. Will try to develop this as a facility through the Norwegian Research Council Infrastructure Call for large research infrastructures.
 - ASC reach out to the research communities and asks for input on user needs.
 - The infrastructure is thought to include: aircraft, drones, kites and balloons.
 - Relevant uses includes: cal/val activities
 - PionAIR is a feature of ForskAIR and cal&val: Instrument bank allowing researchers to use basic sensors and unique instruments developed by/with ASC.
- ➔ Need input on our needs. ForskAIR have developed an Questionnaire they would like the flagship researchers to answer.

Albedo observations using drone at Esmark and Aldegonda glaciers (Boris Ivanov)

- Drone observations versus ground truth albedo measurements on ground
- Drone observations could also be used for orthophotomap and 3D model.
- Publication: D. Zhuravsky et al. Remote Evaluation of Albedo Using Photorecording Equipment. <https://link.springer.com/article/10.1134/S0001433818090463>

Atmospheric transport and deposition of emerging organic contaminants in the Arctic (Zhiyong Xie)

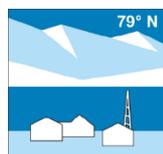
- Background and Stockholm convention.
- Measurements of Emerging organic contaminants Group 1 (PBDEs, BFRs and DPs), Group 2 (OPE), and Group 3 (PEs).
- **Occurrence**, many new EOCs, such as alternative flame retardants, and phthalate plasticizers have been determined in air and snow in Ny-Alesund.
- **Secondary source in the Arctic**, melting snow and ice in summer can release EOCs into air and seawater
- **Air-water/snow exchange**, Atmospheric particle dry deposition and air-water/snow exchange processes may drive the remobilization of OPEs in the Arctic, which will be evaluated in following study.
- **Suggestion**, some alternative flame retardants, e.g. TCEP, TCPP, TiBP, TnBP might be new candidates for POPs or Semi-POPs, and require further attention and research for their bioaccumulation and toxicity in the Arctic ecosystem.

New pollutants in Arctic air: Focus on CEACs and Plastics (Roland Kallenborn)

- Comprehensive long-term trend data (organic & i organic LRTAP pollutants) are available and published for statistical evaluation since the late 1970s. **ebas**: <http://ebas.nilu.no/>; AMAP: <http://www.amap.no>. Scientific literature(available on request)
- New pollutant groups (CEAC) are identified in Arctic environments, many associated with Arctic settlements/ activities (local sources).
- Level can reach mg range in contaminated sites.
- For most of the CEACs, no spatial trends identified in the registered studies. For selected CEACs level can be higher than for middle latitude regions. Concentration range depends on usage and distribution patterns also from regions outside the Arctic.

UV radiation network (Vito Vitale)

Local Svalbard network for solar UV monitoring



- Connecting available measurements sites, a more comprehensive description of UV and ozone related parameters and their evolution can be achieved
- Instruments in Ny-Ålesund, Longyearbyen, Hornsund. Also instruments in Barentsburg, which are not yet integrated.
- Testing potentiality for the network: the 2018 inter-comparison campaign (UV-ICARE)
 - The results showed very good agreement ($\pm 5\%$) of the instruments involved, over most of solar zenith angles and weather conditions sampled, despite different technical specifications. On the basis of this campaign, it can be stated that all measurements in Ny-Ålesund, Hornsund and Longyearbyen are directly comparable at solar zenith angles $< 80^\circ$.
- Future work to create conditions for continuous work and improvement of the network
 - Ensuring the data-flow from network sites, their storing and distribution, also through SIOS SDMS and Italian Arctic Data Centre (IADC);

Discussions

Snow sample specimen bank for later analysis

Propose to Norwegian specimen bank. NILU and Roland Kallenborn (NMBU), will follow up on this. Need to agree on standard protocol for collection and storage.

POPs and local source

Could summer maximum in POPs be due to population density in summer? Compare ratios of different compounds in Ny-Ålesund and in a normal populated place—should be different if the POPs are not locally sourced. Adding measurements at Zeppelin expected to help.

Links between ground based and airborne observations including planned and past campaigns involving drones, UAVs, tethered balloons

Suggestion for SSG proposal for a pilot study: Sample pool, intercomparison of methods.

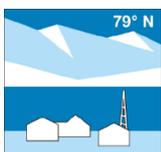
Links and use of remote sensing and in-situ data (lidars, radars, platforms and Ny-Ålesund and Zeppelin Observatory) for atmospheric composition and boundary layer research

- Precip measurements – use radar data to improve ground measurements?
- Efforts under way to work on the problem – Timo Vihma
- Vito and Radek suggests NyÅ as a test site for WMO.
- Connection to Global Cryosphere Watch? How should we contribute as a flagship and across flagships?
- Cryonet – is N-Å a part?

Temperature measurements- calibrations

Metrology/calibration facility by CNR at Vaskerti lab. Calibration unit can be brought to instruments site or the other way around. Usually better to bring the instruments and keep the system stable. Radek suggests a common calibration for all NyÅ temperature measurements, even most have own standards to calibrate against. Radek will follow up towards the metrology community in NyÅ and ask how this can be carried out in NyÅ.

Gruvebadet - Development of Gruvebadet as open access "Ny Ålesund atmospheric laboratory"



Gruvebadet complements Zeppelin observatory, and can also be used as a site for testing atmosphere instrument.

Little difference between measurements at ZEP and GRUV when we look at the weekly samples, but for the diurnal cycle there are. When ZEP was renovated in 1990, the measurements were moved to GRUV. For some components the measurements were different, for some they were not.

New "snow supersite" close to Gruvebadet and links with atmospheric observations & what we have learned from rocket launch

- Very little snow made it difficult last year.
- Need more than one point at Zeppelin, coordinate between institutions – data sharing interoperability and planning timing of sampling
- Also a long-term effect accumulated on glaciers and in ecosystem
- Have passive sampling in all 4 directions around the launch site
- Sample from the launch site right afterwards (requires enough snow)
- What to look for in the snow after rocket launch?
 - Dioxins (Ove/NILU)
 - PHs (Roland K)
 - Particles – increase in small particles, newly formed.
 - Components in fuel, any stable tracers? Secret
 - Isotopic concentration of the iron
 - We have no baseline for organics, so it is difficult to attribute what is found to the rocket or natural; should be no launches from Ny-Ålesund; should be existing studies of the emissions of rocket launches
 - Differentiate between rocket fuel aluminum and Al from the rocket construction, also consider increased activity in town on the rocket launch day
 - Measurements only sensitive to soluble Al, which is from the rocket, not minerals

Drone proposal (building up research infrastructure) from Andøya Space Centre

Several research planes in Europe; not competing with those, but flexible platform for smaller campaigns with flexible instrument packages to serve specific needs of the researcher

Need to know how many instruments and weight from researchers

Best impact will be if it can be routinely used to get long-term measurements since large aerial campaigns do short observations. Ability to fly over a diurnal cycle would be an interesting niche

Will build up capacity for kite, drone up to twin-engine prop plane

Emerging pollutants & microplastics

Is microplastic actually transported to the Arctic through the air?

Previous work have shown that pollen is transported from Europe to Svalbard

Collaborate with ecosystem communities

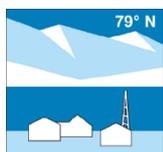
Difficult sampling procedures (difficult to distinguish long-range transport micro plastic)– high risk for contamination

German group (Xie) beginning sampling in air next year

Ny-Ålesund & MOSAiC – intensive IOP 2019 – 2020

Future of the Atmospheric flagship

Next Atmos FS meeting will be a scientific conference at KOPRI in May 2021, together with Asian Polar conference



No funds for next year, so need to develop a new project proposal for SSG for the next two years. Proposal now for smaller group meetings in 2020 and workshop at KOPRI in 2021. Focus on MOSAiC analysis? Can highlight new collaborations in FS. Integrate different work groups through scientific questions related to precipitation, snow sampling bank, intercalibration effort, organic/emerging pollutants... Visits/small workshops 2020. Not fixed from the beginning, but bottom up needs can be met throughout the period. Should be able to cover travel and hotel for international participants as well.

NPI proposing to coordinate a cross-flagship proposal also. Theme to be decided later this week.

Future of Atmos FS:

- The flagship should strengthen connections with other communities (Barentsburg, Hornsund...).
- Link to SIOS for better regional vision.
- Network well established in Ny-Ålesund, so the future should be something new.
- How is Ny-Ålesund connected to the rest of Svalbard and the Arctic?
- More collaboration with other FSs, maybe starting with one in specific.
- Artificial barrier, need more atmos-soil/snow/ocean/ice exchange.
- Ny-Ålesund is already a leading observing site in the Arctic.
- More coordination of international research proposals—EU, etc.
- Test a summer school in 2022 on long term trends. If successful at getting groups involved, consider ITN proposal for longer term PhD program. Summer school should be very hands on with data mining. Involve other FSs. AARI/SPU have good success with winter schools in Barentsburg, focus on field and lab activities. Announce summer 2020, plan for 2021-2022.

Cross flagship themes:

- Pollutant transport, deposition and movement in the ecosystem – Roland and Geir W
- Hydrological cycle links all 4 systems – Hans Werner
- Nitrogen cycle
- UV radiation impacts on biological system – Vito
- Bioaerosols – Roland, Radek
- Emerging organic contaminants
- Pollutions released from glacier and snow

