Annual report 2019

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WP 0, Management

Task 0.2, D 0.2.3

Version 1

Work Package 1

Publications

Publications – peer-reviewed articles

Dall'Osto, M., Simo, R., Saiz-Lopez, A., Harrison, R. M., Beddows, D. C. S., Lange, R., Skov, H., Nøjgaard, J. K., Nielsen, I. E., Massling, A. (2018) Abiotic and biotic sources influencing spring new particle formation in North East Greenland, Atmos. Environ., 190, 126-134.

Dall'Osto, M., Lange, R., Geels, C., Beddows, D. C. S., Harrison, R. M., Simo, R., Nøjgaard, J. K., Boertmann, D., Skov, H., Massling, A. (2018) Regions of open water and melting sea ice drive new particle formation in North East Greenland, Scientific Reports, 8, Art. Nr. 6109, 1-10.

Lange, R., Dall'Osto, M., Skov, H., Nøjgaard, J. K, Nielsen, E., Beddows, D. C. S., Simo, Harrison, R. M., Massling, A. (2018) Characterization of distinct Arctic aerosol accumulation modes and their sources, Atmos. Environ., 183, 1-10.

Moschos, V.; Kumar, N. K.; Daellenbach, K. R.; Baltensperger, U.; Prévôt, A. S. H.; El Haddad, I. Source Apportionment of Brown Carbon Absorption by Coupling Ultraviolet-Visible Spectroscopy with Aerosol Mass Spectrometry. Environ. Sci. Technol. Lett. 2018, 5, 302-308.

Popovicheva, O., Diapouli, E., Makshtas, A., Shonija, N., Manousakas, M., Saraga, D., Uttal, T., Eleftheriadis, K., East Siberian Arctic background and black carbon polluted aerosols at HMO Tiksi, (2019), Science of The Total Environment, 655, Pages 924-938, DOI: 10.1016/j.scitotenv.2018.11.165.

Dall'Osto, M., Beddows, D. C. S., Tunved, P., Harrison, R. M., Lupi, A., Vitale, V., Becagli, S., Traversi, R., Park, K.-T., Yoon, Y. J., Massling, A., Skov, H., Lange, R., Strom, J., and Krejci, R.: Simultaneous measurements of aerosol size distributions at three sites in the European high Arctic, Atmos. Chem. Phys., 19, 7377–7395, https://doi.org/10.5194/acp-19-7377-2019, 2019.

Lange, R., Dall´Osto, M., Wex, H., Skov, H., & Massling, A. (2019). Large summer contribution of organic biogenic aerosols to Arctic cloud condensation nuclei. *Geophysical Research Letters*, 46. https://doi.org/10.1029/2019GL084142

Nielsen, I. E., Skov, H., Massling, A., Eriksson, A. C., Dall'Osto, M., Junninen, H., Sarnela, N., Lange, R., Collier, S., Zhan, Q., Cappa, C. D., Nøjgaard, J. K. (2019) Biogenic and anthropogenic sources of Arctic aerosols, accepted by Atmos. Chem. and Phys..

Schacht, J., Heinold, B., Quaas, J., Cherian, R., Backman, J., Massling, A., Herber, A., Sinha, P. R., Kondo, Y., Weinzierl, B., Zanatta, M., Ehrlich, A., Tegen, I. (2019) The importance of the representation of air pollution emissions for the modeled distribution and radiative effects of black carbon in the Arctic, accepted by Atmos. Chem. and Phys..

Conference abstracts

Šantl-Temkiv, T., Lange, R., Rautar, U., Pilgaard, S., Gunde-Cimerman, N., Dall'Osto, M., Wex, H., Massling, A., Finster, K. (2018) Bioaerosols and biogenic ice nucleation particles at the high Arctic site Villum Research Station: concentrations, sources and seasonal variability, European Geosciences Union General Assembly 2018, Vienna, Austria, Poster.

V. Stathopoulos, M. Mazzola, C. Matsoukas, K. EFTHERIADIS (2018) Aerosol Light Absorption at Different Altitudes in the European Arctic, Svalbard: The Effect of Boundary Layer Height., IAC St Louis, USAQ.

Other Publications

Skov, H., Herber, H., Massling, A., Zou, Z., Michiel in 't Veld, M., Holzinger, R., Siebert, H., Stratmann, F., Vogtländer, J., Donth, T., Ehrlich, A., Zanatta, M., Yoshida, A., Koike, M., Ohata, S., Eppers, O., Egerer, U., Fried, N., Pohl, C., Birnbaum, G., Horvath, E., Sellmann, M., Rohde, J., Madsen, K., Christoffersen, C., Jäkel, E., Raven, B., Houghton, B., Marshall, J., Riehl, K., Sans-Coll, C., Bär, K., Skafte, J. (2018) Klimaeffekt af sod i luft og i sne i Arktis: En stor international kampagne i Arktis, Dansk Kemi, 99, No. 6., p. 16-20.

Conference presentations (talks and posters)

Altstädter, B., M. Schön, Peuker, A., L. Bretschneider, K. Bärfuss, F. Pätzold, A. Lampert, R. Käthner, M. Hermann, A. Platis, J. Bange and B. Wehner (2018), Horizontal and vertical variability of aerosol

particles observed in the atmospheric boundary layer with UAV: A late spring study in Ny-Alesund 2018, oral presentation at Atmospheric Ny Ålesund Flagship meeting, Potsdam, Germany, 15th-19th October 2018.

K. Eleftheriadis, (2018), Volatility study on the state of mixing of nucleation mode atmospheric particles in the high Arctic, Ny-Ålesund Atmosphere Flagship open workshop, 15-19 October 2018 at AWI Potsdam, Germany.

Massling, A., Hendriksen, N. B., Nøjgaard, J. K., Bossi, R., Sørensen, L. L., Skov, H., Jensen, B., Christofferson, C., Mortensen, K., Skafte, J. (2018) Activities at Villum Research Station in North Greenland, 15th-19th October, Atmospheric Ny Ålesund Flagship meeting, Potsdam, Germany.

Moschos, V.; Kumar, N. K.; Daellenbach, K. R.; Baltensperger, U.; Prévôt, A. S. H.; El Haddad, I. Source Apportionment of Brown Carbon Absorption by Coupling Ultraviolet-Visible Spectroscopy with Aerosol Mass Spectrometry. International Aerosol Conference 2018, St Louis, Missouri, USA (talk).

Moschos, V.; Kumar, N. K.; Daellenbach, K. R.; et al. Determination of component-specific optical absorption properties for brown carbon in atmospheric aerosols. Aerosol Technology 2018, Bilbao, Spain (poster).

Moschos, V.; Modini, R. L.; Corbin, J. C.; Massabò, D.; Danelll, S. G.; Costa, C.; Vlachou, A.; Daellenbach, K. R.; Prati, P.; Gysel-Beer, M.; Baltensperger, U.; Prévôt, A. S. H.; El Haddad, I. Observational constraints on the light absorption characteristics of chemically-speciated soluble and insoluble atmospheric carbonaceous aerosols by filter-based techniques. European Aerosol Conference 2019, Gothenburg, Sweden (poster).

Peuker, A., B. Altstädter, L. Bretschneider, K. Bärfuss, F. Pätzold, A. Lampert, R. Käthner, M. Hermann, C. Crazzolara, A. Platis, J. Bange and B. Wehner, Investigating the polar boundary layer and aerosol particles with ALADINA, poster presentation at ISARRA 2018, Boulder, http://www.isarra.org/wp-content/uploads/2018/09/Poster_Peuker.pdf

Pilz, C., M. Lonardi, U. Egerer, A. Ehrlich, M. Gottschalk, C. Jentzsch, A. Macke, M. v. Pinxteren, M. Salter, C. Schmitt, H. Siebert, F. Stratmann, B. Wehner, M. Wendisch, S. Zeppenfeld, P. Zieger, Balloon-Borne Measurements of Radiation, Aerosol, Turbulence, and Clouds in the Arctic Boundary Layer with BELUGA, Poster presentation at MOSAIC Meeting Potsdam, Germany, March 11 - 15, 2019.

Pilz, C., M. Lonardi, S. Düsing, H. Siebert, J. Voigtländer, B. Wehner, A. Wiedensohler, Balloon-Borne In-Situ Aerosol Measurements in the Arctic Atmospheric Boundary Layer during MOSAiC, Poster presentation at European Aerosol Conference 26.-30.08.2019 in Gothenburg, Sweden.

Schön, M., B. Altstädter, L. Bretschneider, K. Bärfuss, R. Käthner, A. Peuker, F. Pätzold, C. Crazzolara, A. Platis, J. Bange, A. Lampert, and B. Wehner (2019) Linking boundary layer aerosol particles and dynamics between different measurement sites with unmanned aerial systems in Ny-Ålesund, Oral presentation at European Aerosol Conference 26.-30.08.2019 in Gothenburg, Sweden.

Pernov, J.P; Beddows, D.; Skov, H.; Dall´Osto, M.; Lange, R.; and Massling, A. Correlation of aerosol cluster types in the High Arctic with climate-relevant parameters. Poster presentation at European Aerosol Conference 26-30 August, 2019, Gothenburg, Sweden and PACES Open Science Meeting 18-20, September, 2019 Oslo, Norway.

Pernov, J.P; Beddows, D.; Skov, H.; Dall´Osto, M.; Lange, R.; and Massling, A. Correlation of aerosol cluster types in the High Arctic with meteorological parameters. Poster presentation at European Meteorological Society meeting 9-13 September, 2019 Lyngby, Denmark.

Thomas, D.C.; Beddows, D.; Skov, H.; Harrison, R.M.; Dall´Osto, M.; Massling, A. Optical properties of different aerosol types in the High Arctic using k-means clustering. Oral presentation at the European Meteorological Society Annual Meeting 9.-13.09.2019 in Lyngby, Denmark. Poster presentation at the European Aerosol Conference 26.-30.08.2019 in Gothenburg, Sweden.

Lange, R., Skov, H., Gosewinkel, U., Dall'Osto, M., Massling, A. (2019) Hygroscopic growth and CCN properties of Arctic aerosols, European Aerosol Conference, Gothenburg, Sweden, Poster.

Im, U., Tsigaridis, K., Christensen, J. H., Nøjgaard, J. K., Massling, A., Skov, H. (2019) Sensitivity of Radiative Forcing to Black Carbon Concentrations over the Arctic, European Aerosol Conference, Gothenburg, Sweden, Poster/Talk.

Lange, R., Skov, H., Gosewinkel, U., Dall'Osto, M., Massling, A. (2019) Subsaturated and supersaturated hygroscopic properties of Arctic aerosols, Annual meeting, European Meteorological Society, Copenhagen, Denmark, Poster.

Im, U., Tsigaridis, K., Christensen, J. H., Hansen, K. M., Nøjgaard, J. K., Massling, A., Skov, H. (2019) Black Carbon Radiative Forcing over the Arctic, Annual meeting, European Meteorological Society, Copenhagen, Denmark, Poster/Talk.

Work progress and achievements

- Construction and testing of a new-balloon-borne box to measure vertical profiles of aerosol parameters during the MOSAIC cruise.
- Mosaic test campaign for all balloon-borne measurements was performed in January/ February 2019 in Melpitz, the TROPOS measurement site, 40 km NE from Leipzig

- Coordination with other MOSAIC partners: comparison of instruments in the World Calibration Center for aerosol physics: Absorption photometers and condensation particle counters are currently compared. The instruments will be operated at the balloon and at the helicopter-borne platform helipod during the same time during MOSAIC.
- Measurements of particle number size distributions, black carbon mass concentrations and ozone were continued throughout the years 2018 and 2019 at Villum Research Station in North Greenland.
- Measurements of black carbon mass concentrations in snow samples were continued throughout the years 2018 and 2019 at Villum Research Station in North Greenland.

Activities completed by PSI until September 2019:

- Received by collaborators filter samples from the following ground-based (High) Arctic sites: Zeppelin (ZEP – 475 m a.s.l.), Gruvebadet (GRU – 10 m a.s.l.), Villum (VRS – 0 m a.s.l.), Alert (ALT – 30 m a.s.l.), Utqiaġvik/Barrow (BRW – 8 m a.s.l.), Tiksi (TIK – 1 m a.s.l.), Cape Baranova (n.a. – 30 m a.s.l.).
- PSI has also initiated aerosol sampling at Pallas (Matorova) in Finland since Aug'18 (PAL – 565 m a.s.l.) in collaboration with the Finnish Meteorological Institute.
- Performed preliminary offline AMS measurements/data analyses at PSI on 50 filter samples from 7 Arctic sites (~300 composites remaining) and received first supporting external data from Arctic collaborators.
- Acquired additional funding from the Swiss Polar Institute (SPI) to visit Chersky for atmospheric aerosol filter sampling in collaboration with the Lomonosov Moscow State University.
- Acquired additional funding from the Swiss National Science Foundation (SNSF) for a Russian scientist (O. Popovicheva) to visit PSI for joint Russian filter analyses from the Arctic (summer'19 to summer'20).
- Snow sampling carried out at VRS can provide insights into contaminants in snow (dissolved vs airborne OA characterization, possibilities for source apportionment).

Work Package 2

Publications

Publications – peer-reviewed articles

Li, J., Xie, Z., Mi, W., Lai, S., Tian, C., Emeis, K., Ebinghaus, R. (2017): Organophosphate Esters in Air, Snow and Seawater in the North Atlantic and the Arctic. Environmental Science and Technology, 51, 6887-6896.

Jeroen E. Sonke, Roman Teisserenc, Lars-Eric Heimbürger, Mariia V. Petrova, Nicolas Marusczak, Theo Le Dantec, Artem V. Chupakov, Chuxian Li, Colin P. Thackray, Elsie M. Sunderland, Nikita Tananaev, Oleg S. Pokrovski, (2018), Eurasian river spring flood observations support net Arctic Ocean mercury export to the atmosphere and Atlantic Ocean. PNAS, doi/10.1073/pnas.1811957115

J.-C. Gallet, M.P. Björkman, C.P. Borstad A.J. Hodson, H.-W. Jacobi, C. Larose, B. Luks, A. Spolaor, T.V. Schuler, C. Zdanowicz. Snow research in Svalbard, in SEES Report 2018 - An annual report on the State of Environmental Science, Orr et al (eds) 2019: SESS report 2018, Longyearbyen, Svalbard Integrated Arctic Earth Observing System.

Spolaor, A., E. Barbaro, D. Cappelletti, C. Turetta, M. Mazzola, F. Giardi, M. P. Björkman, F. Lucchetta, F. Dallo, K. A. Pfaffhuber, H. Angot, A. Dommergue, M. Maturilli, A. Saiz-Lopez, C. Barbante and W. R. L. Cairns (2019). "Diurnal cycle of iodine and mercury concentrations in Svalbard surface snow." Atmos. Chem. Phys. Discuss. 2019: 1-25.

Kamp, J. Skov, H. Jensen, B. and Sørensen, S.S. (2018) Fluxes of Gaseous Elemental Mercury (GEM) in High Arctic during Atmospheric Mercury Depletion Events (AMDEs). ACP. Vol. 18, 6923–6938. https://doi.org/10.5194/acp-18-6923-2018.

Other Publications

Characterization of Trace elements deposition flux in Hornsund region. Andrea Spolaor, Bartek Luks, Adam Nawrot, Marco Roman, Catherine Larose, Łukasz Stachnik, David Cappelletti, Krystyna Kozioł, Filip Pawlak, Elena Barbaro, Jean-Charles Gallet. Abstract submitted for *Impure Snow and Ice in Remote Areas: Arctic, Antarctica in Frontiers in Earth Science - article collection*

Conference presentations (talks and posters)

In-situ component for organic contaminants, mercury and other heavy metals. PEEX Working Group & iCUPE Meeting, Helsinki, Finland, 1 - 2 November 2018

Are the climate archives preserved in Svalbard ice threatened? Ny-Alesund Flagship open workshop, Potsdam, Germany. October 2018

Degradation of the climate signal preserved in Svalbard ice. Have the high Svalbard ice fields reached a tipping point? A. Spolaor, E. Barbaro, F. Burgay, M.P. Bjorkman, D. Cappelletti, F. De Blasi, D. Divine, G. Dreossi, J.C. Gallet, E. Isaksson, D. Iovino, T. Martma, M. Maturilli, T.V. Shuler, B. Stenni. IUGG 2019, Montreal, Canada

Mercury in precipitated and surface snow at Dome C, a first estimate of mercury depositional fluxes during the Austral summer on the high Antarctic plateau. Warren RL Cairns, Andrea Spolaor, Clara Turetta, Niccolò Maffezzoli, Aurélien Dommergue, Olivier Magand, Hélène Angot, Francesca Sprovieri, Massimo Del Guasta and Carlo Barbante. ICMGP 2019, Warsaw, Poland

Evidenze di un recente cambio di regime climatico nell'arcipelago delle isole Svalbard Andrea Spolaor, Carlo Barbante, Elena Barbaro, Francois Burgay, Mats P. Bjorkman, David Cappelletti, Giulio Cozzi, Federico Dallo, Fabrizio De Blasi, Dmitry Divine, Giuliano Dreossi, Jacopo Gabrieli, Jean-Charles Gallet, Jack Kohler, Elisabeth Isaksson, Doroteaciro Iovino, Tonu Martma, Marion Maturilli, Thomas V. Shuler, Barbara Stenni, Clara Turetta. *La dinamica del clima nell'ultimo ciclo glaciale-interglaciale, National workshop on paleoclimate, Bologna*

Work progress and achievements

- Three-week campaign at Villum Research Station in August 2019 investigating reactive gaseous mercury (RGM) formation in connection with snowpack and halogen oxides.
- Planned campaign at Villum Research Station for March-April 2020 investigating fluxes of total atmospheric mercury, mercury speciation distribution, and snowpack concentrations.
- Planned campaign at Ny-Alesund Research Station for March-April 2020 investigating mercury, heavy metals and organic contaminants concentration in surface snow
- Analysis of the surface snow samples collect during the 2018\2019 winter and spring campaign in Ny-Alesund

Work Package 3

Publications

Publications – peer-reviewed articles

Rückamp, M., Neckel, N., Berger, S., Humbert, A., & Helm, V. (2019). Calving induced speedup of Petermann glacier. Journal of Geophysical Research: Earth Surface, 124. https://doi.org/10.1029/2018JF004775

Beamish, A.L., Coops, N., Hermosilla, T., Chabrillat S. and Heim, B. (2018), Monitoring pigment-driven vegetation changes in a low-Arctic tundra ecosystem using digital cameras. Ecosphere 9(2): e02123. DOI: 10.1002/ecs2.2123

Conference abstracts

Moisander, Törmä and Strahlendorff – Sentinels for the Finnish Spatial data platform – Living Planet Symposium

R.Salzano, R.Salvatori, M.Mazzola, C.A.Pedersen, 2019. Evolution of the fraction of snow cover over the last decade in an Arctic site (Ny Alesund, Norway) using ground-based cameras. EGU 2019

R.Salzano, R.Salvatori, 2018. Fractional snow cover area from terrestrial photography in Svalbard Islands (Norway). 15th International Circumpolar Remote Sensing Symposium — September 10-14, 2018 - Potsdam, Germany.

Beamish, A., Brell, M., Chabrillat, S., Coops, N. and Heim, B. (2018), Influence of litter and non-vascular components on the spatial aggregation of hyperspectral data in a low-Arctic ecosystem, Abstract submitted to the International Circumpolar Remote Sensing Symposium, September 10-14 2018, Potsdam, Germany

Beamish, A., Daskalova, G., Myers-Smith, I., Heim, B. and Chabrillat, S. (2018), Using visible and near-infrared spectral reflectance to estimate tundra vegetation biodiversity, Qikiqtaruk – Herschel Island, Canada, Abstract submitted to the Arctic Change ASM, December 10-14 2018, Ottawa, Ontario, Canada

Supraglacial lake drainage and englacial channels at 79°N Glacier, Greenland, Angelika Humbert, Niklas Neckel, Tobias Binder, and Sebastian Beyer, EGU General Assembly 2018, EGU2018-16246

Niklas Neckel & Angelika Humbert (2019). Seasonal observations at 79°N Glacier from Sentinel-1 data. ESA living planet Symposium 2019, 13-17 May 2019, Milan, Italy.

Niklas Neckel, Philipp Hochreuther, Ole Zeising, Angelika Humbert & Veit Helm (2019). Seasonal observations at 79°N Glacier from remote sensing and in-situ data. EGU General Assembly, 7-12 April 2019, Vienna, Austria.

Philipp Hochreuther, Niklas Neckel, Jenny Turton, Nathalie Reimann & Matthias Braun (2019). Variations in the inter-annual melt cycles at 79°N Glacier inferred from remote sensing data. EGU General Assembly, 7-12 April 2019, Vienna, Austria.

Other Publications

Strahlendorff, Mikko; Veijola, Katriina; Gallo, Jason; Vitale, Vito; Hannele, Savela; Smirnov, Alexander; Tanaka, Hajime; Sueyoshi, Tetsuo; Nitu, Rodica; Larsen, Jan René (2019). Value tree for physical atmosphere and ocean observations in the Arctic. FMI Reports 2019:3 http://hdl.handle.net/10138/300768

Conference presentations (talks and posters)

M. Strahlendorff - EuroGEOSS workshop Nov2018 Geneva – oral presentation for Arctic/climate showcases

M.Strahlendorff - Polar Data Architecture Workshop Sep2018 Geneva –oral national report

R.Salzano, R.Salvatori, 2018. Fractional snow cover area from terrestrial photography in Svalbard Islands (Norway). 15th International Circumpolar Remote Sensing Symposium — September 10-14, 2018 - Potsdam, Germany

Beamish, A., Brell, M., Chabrillat, S., Coops, N. and Heim, B. (2018), Influence of litter and non-vascular components on the spatial aggregation of hyperspectral data in a low-Arctic ecosystem. 15th International Circumpolar Remote Sensing Symposium, September 10-14 2018, Potsdam, Germany

Beamish, A., Daskalova, G., Myers-Smith, I., Heim, B. and Chabrillat, S. (2018), Using visible and near-infrared spectral reflectance to estimate tundra vegetation biodiversity, Qikiqtaruk – Herschel Island, Canada. Arctic Change ASM, December 10-14 2018, Ottawa, Ontario, Canada

Angelika Humbert, Niklas Neckel, Tobias Binder, and Sebastian Beyer, Supraglacial lake drainage and englacial channels at 79°N Glacier, Greenland , EGU General Assembly 2018, EGU2018-16246

Niklas Neckel & Angelika Humbert (2019). Seasonal observations at 79°N Glacier from Sentinel-1 data. ESA living planet Symposium 2019, 13-17 May 2019, Milan, Italy.

Niklas Neckel, Philipp Hochreuther, Ole Zeising, Angelika Humbert & Veit Helm (2019). Seasonal observations at 79°N Glacier from remote sensing and in-situ data. EGU General Assembly, 7-12 April 2019, Vienna, Austria.

Philipp Hochreuther, Niklas Neckel, Jenny Turton, Nathalie Reimann & Matthias Braun (2019). Variations in the inter-annual melt cycles at 79°N Glacier inferred from remote sensing data. EGU General Assembly, 7-12 April 2019, Vienna, Austria.

Work progress and achievements

- Polarimetric measurements with pRES performed in Greenland (AWI, Ex-NGT) and in addition black carbon samples from various inland ice regions retrieved (AWI)
- Polarimetric processing of X, C, and L-band data established, first time series for surface melt derived (AWI)
- Supraglacial lake time series processing completed, new manuscript submitted (AWI)
- Arctic Observations Value tree for physical atmosphere and ocean variables (FMI) http://arctic-obs.fmi.fi/
- Definition of the data-chain useful for the retrieval of the snow cover area from terrestrial imagery in different sites located in Svalbard islands (CNR).
- Definition of the data processing useful for the integration between different remotely sensed data (Sentinel, Landsat and MODIS platforms) and fractional snow cover obtained by terrestrial imagery (CNR).
- Development of an application deployable in the VLAB platform (CNR).
- Successful field spectrometer measurements performed in Western Canadian Arctic in collaboration with Uni Edinburgh and AWI Potsdam, as well as acquisition of two hyperspectral images as part of the NASA ABoVE campaign over Qikiqtaruk-Herschel Island (GFZ)
- Processing of Sentinel-2 data from Lena Delta, Siberia and corresponding biomass and biodiversity data compiled in cooperation with AWI Potsdam (GFZ)
- Multiscale hyperspectral (field, airborne, EnMAP simulation) and biodiversity data processing completed in collaboration with AWI Potsdam, new manuscript submitted to International Journal of Applied Earth Observation and Geoinformation (GFZ)
- Review position paper compiled on recent trends of optical remote sensing for Arctic tundra vegetation (GFZ)

Work Package 4

Publications

Publications – peer-reviewed articles

Ancellet, G., I.E. Penner, J. Pelon, V. Mariage, A. Zabukovec, J.-C. Raut, G. Kokhanenko, and Y.S. Balin, Aerosol monitoring in Siberia using an 808 nm automatic compact lidar, Atmos. Meas, Tech., in revision, 2018.

Konovalov, I. B., Lvova, D. A., Beekmann, M., Jethva, H., Mikhailov, E. F., Paris, J.-D., Belan, B. D., Kozlov, V. S., Ciais, P., and Andreae, M. O.: Estimation of black carbon emissions from Siberian fires using satellite observations of absorption and extinction optical depths, Atmos. Chem. Phys., 18, 14889-14924, https://doi.org/10.5194/acp-18-14889-2018, 2018.

Dada, L., Chellapermal, R., Buenrostro Mazon, S., Paasonen, P., Lampilahti, J., Manninen, H. E., Junninen, H., Petäjä, T., Kerminen, V.-M., and Kulmala, M.: Refined classification and characterization of atmospheric new-particle formation events using air ions, Atmos. Chem. Phys., 18, 17883–17893, 2018.

Falconi, M. T., von Lerber, A., Ori, D., Marzano, F. S., and Moisseev, D., 2018: Snowfall retrieval at X, Ka and W bands: consistency of backscattering and microphysical properties using BAECC ground-based measurements, Atmos. Meas. Tech., 11, 3059-3079, https://doi.org/10.5194/amt-11-3059-2018.

Law, K.S., A. Roiger, J. L. Thomas, L. Marelle, J.-C. Raut, S. Dalsøren, J. Fuglestvedt, P. Tuccella, B. Weinzeirl, H. Schalger, Local Arctic air pollution: sources and impacts, Ambio, 2017.

Leinonen, J., Lebsock, M. D., Tanelli, S., Sy, O. O., Dolan, B., Chase, R. J., Finlon, J. A., von Lerber, A., and Moisseev, D., 2018: Retrieval of snowflake microphysical properties from multifrequency radar observations, Atmos. Meas. Tech., 11, 5471-5488, https://doi.org/10.5194/amt-11-5471-2018.

Li, H., Moisseev, D., & von Lerber, A., 2018: How does riming affect dual-polarization radar observations and snowflake shape? J. Geophys. Res. Atmos., 123, 6070–6081. https://doi.org/10.1029/2017JD028186

Marelle, L., J.-C. Raut, K.S. Law, O. Duclaux, Current and future Arctic aerosols and ozone from remote emissions and emerging local sources - modeled source contributions and radiative effects, J. Geophys. Res,https://doi.org/10.1029/2018JD028863, 2018.

Mason, S. L., Chiu, C. J., Hogan, R. J., Moisseev, D., & Kneifel, S., 2018: Retrievals of riming and snow density from vertically pointing Doppler radars. J. Geophys. Res. Atmos., 123, 13,807–13,834. https://doi.org/10.1029/2018JD028603

McLachlan, M., Undeman, E., Zhao, F., MacLeod, M., 2018: Predicting global scale exposure of humans to PCB 153 from historical emissions, Environmental Science: Processes & Impacts, 20, 747-756. https://doi.org/10.1039/C8EM00023A

Nikandrova, A., Tabakova, K., Manninen, A., Väänänen, R., Petäjä, T., Kulmala, M., Kerminen, V.M. and O'Connor, E.: Combining airborne in situ and ground-based lidar measurements for attribution of aerosol layers, Atmos. Chem. Phys., 2018. https://doi.org/10.5194/acp-18-10575-2018

Raut, J.-C., L. Marelle, J. Fast, J. L. Thomas, B. Weinzierl, K.S. Law, L. Berg, A. Roiger, R. Easter, K. Heimerl, T. Onishi, J. Delanoe, and H. Schlager, Cross-polar transport and scavenging of aerosols containing black carbon from Siberian sources during the 2012 ACCESS summer campaign, Atmos. Chem. Phys., 2017.

Schmale, J., Arnold, S.R., Law, K.S., Thorp, T., Anenberg, S., Simpson, W.R., et al., Local Arctic air pollution: A neglected but serious problem. Earth's Future, 6, 1385–1412. https://doi.org/10.1029/2018EF000952. 2018.

von Lerber, A., D. Moisseev, D.A. Marks, W. Petersen, A. Harri, and V. Chandrasekar, 2018: Validation of GMI Snowfall Observations by Using a Combination of Weather Radar and Surface Measurements. J. Appl. Meteor. Climatol., 57, 797–820, https://doi.org/10.1175/JAMC-D-17-0176.1

Other Publications

Alaskan Layered Pollution And Chemical Analysis (ALPACA) White Paper (2018). Lead Authors: W. Simpson, K. Law, J. Schmale, K. Pratt, S. Arnold, and J. Mao (co-authors inc. T. Petäjä), https://alpaca.community.uaf.edu/files/2018/11/ALPACA-whitepaper-30Nov2018.pdf.

Conference presentations (talks and posters)

Nikandrova, A., Tabakova, K., Manninen, A., Väänänen, R., Petäjä, T., Kulmala, M., Kerminen, V.M. and O'Connor, E.: Combining airborne in situ and ground-based lidar measurements for attribution of aerosol layers. Poster presentation at the European Geosciences Union General Assembly, 8–13 April 2018, Vienna, Austria.

Law, K.S., T. Onishi, J.-D. Paris, G. Ancellet, J.-C. Raut, P. Nedelec, M. Panchenko, D. Chernov, M. Arshinov, B. Belan, Towards improved quantification of Russian oil and gas extraction emissions based on analysis of YAK-AEROSIB aircraft data, IGAC conference (oral), Takamatsu, Japan, Sept. 2018.

Zhao, F., Riipinen, I., MacLeod, M. A kinetic mass balance model for predicting gas-particle partitioning of low volatility organic contaminants. Poster presentation at the Society of Environmental Toxicology and Chemistry (SETAC) 39th Annual Meeting, November 4-8, 2018. Sacramento, California, USA.

Work progress and achievements

- Proxy for mixing layer height (MLH) derived from SMEAR II data (Hyytiälä, observed MLH from Doppler-LIDAR). Proxy parameters global radiation and wind speed. Other tested variables did not improve the proxy.
- Proxy for condensation sink (CS) at SMEAR II, SMEAR I (Värriö) and Pallas. Clear observations on the temperature-dependent biogenic contribution to CS and anthropogenic or forest fire related contribution, which correlates with CO concentration. Proxy improved further by taking into account the annual cycle of CO concentrations: relatively high polar background CO-concentration during winter and spring associated with low CS, only CO-peaks associate with elevated CS. Effect of MLH seems not significant. Differences between sites are under investigation. Inspecting Villum data later is on the to-do list.

Work Package 5

Publications

Publications – peer-reviewed articles

Pankratov, F., Mahura, A., Petäjä, T., Popov, V., and Masloboev, V.: Elevated atmospheric mercury concentrations at the Russian polar station Amderma during Icelandic volcanoes' eruptions, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-1228, 2018. https://www.atmos-chem-phys-discuss.net/acp-2018-1228/

Conference abstracts

Mahura A., T. Petäjä, H.K. Lappalainen, E-M. Duplissy, S.M. Noe, R. Salzano, R. Salvatori, D. Moisseev, P. Paasonen, F. Pankratov, V. Shevchenko (2018): iCUPE datasets as products for the research, decision-making, stakeholders and end-users communities. Proceedings of the UArctic Congress 2018 (3-7 Sep 2018, Oulu-Helsinki, Finland), ID-237

Mahura A., T. Petäjä, H.K. Lappalainen, G. Oblogov, A. Vasiliev, A. Borisova, I. Bashmakova, N. Altimir, S. Chalov, P. Konstantinov, J. Bäck, L. Järvi, A. Ojala, J. Pumpanen, S.M. Noe, E-M. Duplissy, F. Pankratov, V. Shevchenko, M. Varentsov, A. Baklanov, I. Ezau, S. Zilitinkevich, and M. Kulmala (2019): Linking PEEX with Russian Arctic observations and datasets. Abstracts Book of the Arctic Year of Polar Prediction (YOPP) Science Workshop (14-16 Jan 2019, Helsinki, Finland), pp. 50-51

Mahura A., H.K. Lappalainen, G. Oblogov, A. Vasiliev, A. Borisova, I. Bashmakova, N. Altimir, S. Chalov, P. Konstantinov, J. Back, T. Petäjä, S. Zilitinkevich, and M. Kulmala (2019): Russian Arctic in the PEEX Observational System. Geophysical Research Abstracts, Vol. 21, EGU2019-10987

Mahura A., R. Makkonen, P. Poutanen, H.K. Lappalainen, T. Petäjä, M. Boy, M. Kulmala, S. Zilitinkevich (2019): TRAnsferable Knowledge and Technologies: Measuring Ecosystem-Atmosphere Relations and Multi-Scale Modelling for Assessment and Management of Environmental Impact. Geophysical Research Abstracts, Vol. 21, EGU2019-12584

Conference presentations (talks and posters)

Assessing Ecosystem-Atmosphere Relations of Hemiboreal Mixed Forests. ISREIE 2018, Arad, Romania, 16-21 May 2018.

Emissions, transitions and feedbacks. IBFRA18 – Cool forests at risk? Laxenburg, Austria, 17-20 September 2018.

The Estonian flux story. Euroflux 20th anniversary workshop, Hyytiälä, Finland, 10-14 December 2018.

Poster: iCUPE datasets as products for the research, decision-making, stakeholders and end-users communities (presented at the UArctic Congress 2018; 3-7 Sep 2018, Oulu-Helsinki, Finland)

Poster: iCUPE datasets as products for the research, decision-making, stakeholders and end-users communities (presented at the PEEX/iCUPE-ERAPLANET Workshop in collaboration with Global-SMEAR-ClimateKIC and TRAKT projects; 1-2 Nov 2018, Helsinki, Finland)

Poster: Linking PEEX with Russian Arctic observations and datasets (presented at the Arctic YOPP Science Workshop, Session E: Atmosphere; 14-16 Jan 2019, Helsinki, Finland)

Poster: Russian Arctic in the PEEX Observational System (presented at the EGU-2019 General Assembly; Session: Evaluation, exploitation and enhancement of Arctic observing systems across disciplines; 7-12 Apr 2019, Vienna, Austria)

Poster: TRAnsferable Knowledge and Technologies: Measuring Ecosystem-Atmosphere Relations and Multi-Scale Modelling for Assessment and Management of Environmental Impact (presented at the EGU-2019 General Assembly; Session: Coupled modelling and data assimilation of dynamics and chemistry of the atmosphere; 7-12 Apr 2019, Vienna, Austria)

Work progress and achievements

- Task 5.1: 3rd version of the Data Management Plan, DMP is in preparation (expected Nov 2019); to be updated with information for delivered iCUPE datasets, teasers, and ERA-PLANET surveys as well as updated information for DS contact persons.

- Datasets, DS (status on 23 Sep 2019): from 18 planned DSs (https://www.atm.helsinki.fi/icupe/index.php/datasets/list-of-datasets-as-deliverables) for 11 DSs teasers (and 4 DSs from Russian collaborators) were delivered (https://www.atm.helsinki.fi/icupe/index.php/datasets/submitted-datasets); 5 DSs were delivered, inked at the iCUPE website and publicly available (https://www.atm.helsinki.fi/icupe/index.php/datasets/delivered-datasets) with direct link to archived DS and read-me file with metadata including contact information; 9 ERA-PLANET surveys for DSs were delivered (these include description and identification info).

- 12 Sep 2019 - WP5 meeting (Steffen Noe & Alexander Mahura) took place at Univ Helsinki (Helsinki, Finland); topics discussed: reporting to Annual Meeting; milestones and deliverables; ERA-PLANET surveys for datasets; datasets as products accessibility through iCUPE website, EarthEngine, VLab, Copernicus services, etc. during the project and after; direct links to archived datasets, their teasers and read-me files with metadata; updating 2nd version of DMP; DSs info contribution to iCUPE concept paper.

Work Package 6

Publications

Publications – peer-reviewed articles

Jokinen, T., Sipilä, M., Kontkanen, J., Vakkari, V., Tisler, P., Duplissy, E.-M., Junninen, H., Kangasluoma, J., Manninen, H.E., Petäjä, T., Kulmala, M., Worsnop, D.R., Kirkby, J., Virkkula, A. and Kerminen, V.-M. (2018) Ion-induced sulfuric acid–ammonia nucleation drives particle formation in coastal Antarctica, Sci. Adv. 4, eaat9744.

Kerminen, V.-M., Chen, X., Vakkari, V., Petäjä, T., Kulmala, M. and Bianchi, F. (2018) Atmospheric new particle formation and growth: review of field observations, Environ. Res. Lett. 13, 103003.

Lappalainen, H.K., Altimir, N., Kerminen, V.-M., Petäjä, T., Makkonen, R., Alekseychik, P., Zaitseva, N., Basmakova, I., Kujansuu, J., Ruuskanen, T., Lauri, A., Haapanala, P., Mazon, S.B., Borisova, A., Konstantinov, P., Chalov, S., Laurila, T., Bäck, J., Arshinov, M., Mahura, A., Arnold, S., Vihma, T., Uotila, P., de Leeuw, G., Kukkonen, I., Malkatsova, S., Tynkkynen, V.-P., Ding, A.J., Hansson, H.-C., Melnikov,

V., Tikunov, V., Matvienko, G., Baklanov, A., Viisanen, Y., Kasimov, N., Guo, H., Bondur, V., Kabat, P., Zilitinkevich, S. and Kulmala, M. (2018) Pan-Eurasian Experiment (PEEX) Program: an overview of the first 5 years in operation and future prospects. J. Geogr. Sust. 11, 6-19.

Conference abstracts

Mahura A., T. Petäjä, H.K. Lappalainen, E-M. Duplissy, S.M. Noe, R. Salzano, R. Salvatori, D. Moisseev, P. Paasonen, F. Pankratov, V. Shevchenko (2018): iCUPE datasets as products for the research, decision-making, stakeholders and end-users communities. Proceedings of the UArctic Congress 2018 (3-7 Sep 2018, Oulu-Helsinki, Finland), ID-237

Mahura A., T. Petäjä, H.K. Lappalainen, G. Oblogov, A. Vasiliev, A. Borisova, I. Bashmakova, N. Altimir, S. Chalov, P. Konstantinov, J. Bäck, L. Järvi, A. Ojala, J. Pumpanen, S.M. Noe, E-M. Duplissy, F. Pankratov, V. Shevchenko, M. Varentsov, A. Baklanov, I. Ezau, S. Zilitinkevich, and M. Kulmala (2019): Linking PEEX with Russian Arctic observations and datasets. Abstracts Book of the Arctic Year of Polar Prediction (YOPP) Science Workshop (14-16 Jan 2019, Helsinki, Finland), pp. 50-51

Petäjä, T., Duplissy, E.-M., Paasonen, P., Lappalainen, H. K., and iCUPE Consortium: iCUPE – Integrative and Comprehensive Understanding on Polar Climates; general abstract submitted to several meetings and conferences.

Mahura A., H.K. Lappalainen, P. Haapanala, G. Oblogov, A. Vasiliev, A. Borisova, I. Bashmakova, N. Altimir, S. Chalov, P. Konstantinov, J. Back, T. Petäjä, S. Zilitinkevich, and M. Kulmala (2019): Russian Arctic in the PEEX Observational System. Geophysical Research Abstracts, Vol. 21, EGU2019-10987

Conference presentations (talks and posters)

Poster: iCUPE datasets as products for the research, decision-making, stakeholders and end-users communities (presented at the UArctic Congress 2018; 3-7 Sep 2018, Oulu-Helsinki, Finland)

Poster: iCUPE datasets as products for the research, decision-making, stakeholders and end-users communities (presented at the PEEX/iCUPE-ERAPLANET Workshop in collaboration with Global-SMEAR-ClimateKIC and TRAKT projects; 1-2 Nov 2018, Helsinki, Finland)

Poster: Linking PEEX with Russian Arctic observations and datasets (presented at the Arctic YOPP Science Workshop, Session E: Atmosphere; 14-16 Jan 2019, Helsinki, Finland)

Poster: Russian Arctic in the PEEX Observational System (presented at the EGU-2019 General Assembly; Session: Evaluation, exploitation and enhancement of Arctic observing systems across disciplines; 7-12 Apr 2019, Vienna, Austria)

Work progress

Meetings attended (iCUPE presented) or performed by iCUPE Project Office.

- Kick-off meeting in Rome, Italy, 9.-11.10.2017
- iCUPE General Assembly, Rome, Italy, 10.10.2017
- iCUPE Project Meeting, Oslo, Norway, 9.2.2018
- LTER Data workshop, Hyytiälä, Finland, 26.-27.4.2018
- GEO Workshop, Frascatti, Italy, 2.-4.5.2018
- MOSAIC workshop, Potsdam, Germany, 28.5.-1.6.2018
- POLAR2018 conference, 18.-23.6.2018
- UArctic Congress, 3.-7.9.2018
- ERA-PLANET Workshop, Geneve, Switzerland, 11.9.2018
- E-SHAPE (EuroGEOSS Showcases) Workshop, Geneve, Switzerland, 12.-14.9.2018
- GEO Plenary, Kyoto, Japan, 29.10.-2.11.2018
- iCUPE & PEEX joint Workshop, Helsinki, Finland, 1.-2.11.2018
- COOP+ conference, Brussels, Belgium, 20.-21.11.2018
- FCoE meeting, Kuopio, Finland, 27.-29.11.2018
- EGU-2019 General Assembly, Vienna, Austria, 7.-12.04.2019

Cooperation activities:

- PEEX Implementation Meeting, 23.-24.04.2019
- Part of EU Arctic Cluster, 16.4.2018
- PEEX joint workshop 1.-2.11.2018
- Mapping out in-situ measurements for meteorology, atmospheric composition and ecosystem changes for selected stations in the Arctic and sub-Arctic regions in collaboration with Horizon-2020 INTAROS “Integrated Arctic Observation System” project

- Collaboration with Nordic TRAKT-2018 “TRAnsferable Knowledge and Technologies for high-resolution environmental impact assessment and management” project to identify unfavorable meteorological and air quality conditions linked to atmospheric transport from Kola Peninsula (Russia) industrial pollution sources.
- Meeting with PolarTEP 1.12.2017
- Part of the members of the consortium also involved with E-SHAPE

Tasks activities:

- Sep 2019 - responsibility for Task 6.4 “Future strategies and contingency plans” was shifted from FMI to UHEL partner; work is in progress in collaboration with WP5 tasks on data management and data provision in order to assure legacy of iCUPE and continuation of work after project ended, and in particular, how data products are linked with other larger data storages and data services.

Integrative and Comprehensive Understanding on Polar Environments

ERA-PLANET Strand 4

iCUPE Workshop, March 26th, 09:00 – March 27th 16:00

Agenda Draft

Place: Potsdam, GFZ, Germany

Invited parties: Project coordinator and project office, representatives from each institute

26th of March, Day 1

09:00-09:05 START OF THE MEETING

- Welcome to the meeting
- Coffee available during the meeting

09:05-10:30 DISCUSSION ON DATA WP

- WP5
- Recap of the previous workshop

10:30-11:00 GENERAL STATUS OF THE WORK

- Tuukka Petäjä: general words about the status of the work
- Ksenia Tabakova / Ella-Maria Duplissy: state of the deliverables, timetable for the coming months, practicalities.

11:00-12:30 CURRENT STATUS IN WPS

WP leaders (or representatives) describe the status of each WP and plans for this year, and 3-4 scientific presentations

11:00-12:30 WP 1

Andreas Massling, **AU**, *"Overview of iCUPE WP1 objectives and goals; achievements and plans in tasks 1-4"*

Jakob Pernov, **AU**, *"Preliminary title: Short-lived climate forcers at Villum Research Station (VRS)"*

Barbara Altstaedter, **TU Braunschweig**, *"Boundary layer aerosol particles measured with unmanned research aircraft in Ny-Ålesund"*

12:30-13:30 LUNCH AT GFZ

13:30-18:15 CURRENT STATUS IN WPs continues

Integrative and Comprehensive Understanding on Polar Environments

ERA-PLANET Strand 4

WP leaders (or representatives) describe the status of each WP and plans for this year, and 3-4 scientific presentations

13:30-15:00 WP3

Angelika Humbert, **AWI**, *"Overview of iCUPE WP3 work"*

Niklas Neckel, Ludwig Schröder, Angelika Humber, **AWI**, *"Radar remote sensing: Supraglacial lake monitoring at 79N Glacier, Greenland"*

Christopher Kyba, **GFZ**, and Rosamaria Salvatori, CNR, *"Optical satellite remote sensing: some short appetizers on current work on light pollution and snow"*

Bonus talk: Alison Beamish, **GMZ**, *"Identifying plant functional types and biomass using hyperspectral data at multiple scales"*

15:00-15:15 COFFEE BREAK

To be confirmed: Extra WP3 Talk: Andreas Jechow, *"Light pollution in Arctic areas"*

15:15-16:45 WP2

Warren Cairns, **CNR-IDPA**, *"Activity overview of work in iCUPE WP2: In-situ component for organic contaminants, mercury and other heavy metals"*

Jennie Thomas – **IGE** and Louis Marelle - **LATMOS & IGE**: "Modeling Arctic halogen and ozone chemistry - regional modeling using WRF-Chem"

16:45-18:15 WP5

Steffen Noe, **EULS**, *"Overview of iCUPE WP5 work"*

Robert Salzano, **CNR-IIA**, *"Overview on VLab platform - major building block for the ERA-PLANET Knowledge Platform"*

19:00- DINNER

Restaurant & Café Heider, Friedrich-Ebert-Str. 29, 14467 Potsdam, https://cafeheider.de/

Integrative and Comprehensive Understanding on Polar Environments

ERA-PLANET Strand 4

27th of March, Day 2

09:00-10:30 CURRENT STATUS IN WPs, continuation

Coffee available

09:00-10:30 WP4

Kathy Law, **CNRS**, *"Overview of iCUPE WP4 work and plans"*

Tuukka Petäjä, **UHEL**, *"Summary on WP4 activities in Helsinki (precipitation verification, proxy development, Lidar work)"*

10:30-12:30 WP GROUP SESSIONS (START)

12:30-13:30 LUNCH AT GFZ

13:30-14:45 WP GROUP SESSIONS (CONTINUATION)

14:45-15:00 COFFEE BREAK

15:00-16:00 DISCUSSION ON WP GROUP SESSION RESULTS AND SUMMARY

16:00 – END OF THE MEETING