EGU21-15775
https://doi.org/10.5194/egusphere-egu21-15775
EGU General Assembly 2021

In-situ observations of aerosol-cloud interactions in Ny-Ålesund, Svalbard, during fall 2019 and spring 2020

Ghislain Motos[1], Paraskevi Georgakaki[2], Paul Zieger[3], Jörg Wieder[4], Ulrike Lohmann[5], and Athanasios Nenes[6]

[1]Ecole Polytechnique Federale de Lausanne, School of Architecture, Civil & Environmental Engineering, Lausanne, Switzerland (ghislain.motos@epfl.ch)
[2]Ecole Polytechnique Federale de Lausanne, School of Architecture, Civil & Environmental Engineering, Lausanne, Switzerland (paraskevi.georgakaki@epfl.ch)
[3]Department of Environmental Science, Stockholm University, Stockholm, Sweden; Bolin Centre for Climate Research, Stockholm University, Stockholm, Sweden (paul.zieger@aces.su.se)
[4]Department of Environmental Systems Science, Institute for Atmospheric and Climate Science, ETH Zurich, Zurich, CH-8092, Switzerland (joerg.wieder@env.ethz.ch)
[5]Department of Environmental Systems Science, Institute for Atmospheric and Climate Science, ETH Zurich, Zurich, CH-8092, Switzerland (ulrike.lohmann@env.ethz.ch)
[6]Ecole Polytechnique Federale de Lausanne, School of Architecture, Civil & Environmental Engineering, Lausanne, Switzerland; Center for Studies of Air Quality and Climate Change, Institute of Chemical Engineering Sciences, Foundation for Research and Techn

The Arctic region suffers an extreme vulnerability to climate change, with an increase in surface air temperatures that have reached twice the global rate during several decades (McBean et al., 2005). The role of clouds, and in particular low-levels clouds and fog, in this arctic amplification by regulating the energy transport from and to space has recently gained interest among the scientific community. The NASCENT 2019-2020 campaign (Ny-Ålesund AeroSol Cloud ExperimeNT) based in Ny-Ålesund, Svalbard (79° North) aimed at studying the microphysical and chemical properties of low-level clouds using measurements both at the sea level and at the Zeppelin station (475 m a.s.l.). Specifically, the susceptibility of droplet formation, which has recently been shown to be highly dependent on aerosol levels in European alpine valleys (Georgakaki et al., under review), could strongly vary between the fall to winter months, with pristine-like conditions, and the higher particle concentrations generally found in spring, known as the arctic haze. First results using a scanning mobility particle sizer (SMPS) and a cloud condensation nuclei counter (CCNC) confirmed that aerosol concentrations in the range $10 < D_{part}$ [nm] < 500 were approximatively 4-5 times higher during the months of spring 2021 compared to those of fall 2020. In addition, we found relatively low values of the aerosol hygroscopic parameter κ, generally below 0.3, consistently with previous studies in the arctic region (Moore et al., 2011).

Georgakaki, P., Bougiatioti, A., Wieder, J., Mignani, C., Kanji, Z. A., Henneberger, J., Hervo, M., Berne, A. and Nenes, A.: On the drivers of droplet variability in Alpine mixed-phase clouds, , 34, under

review.

McBean, G., Alekseev, G., Chen, D., Førland, E., Fyfe, Groisman, J., P. Y., King, R., Melling, H., Voseand, R., Whitfield, P. H.: Arctic climate: past and present. Arctic Climate Impacts Assessment (ACIA), C. Symon, L. Arris and B. Heal, Eds., Cambridge University Press, Cambridge, 21-60, 2005.

Moore, R. H., Bahreini, R., Brock, C. A., Froyd, K. D., Cozic, J., Holloway, J. S., Middlebrook, A. M., Murphy, D. M. and Nenes, A.: Hygroscopicity and composition of Alaskan Arctic CCN during April 2008, Atmospheric Chemistry and Physics, 11(22), 11807–11825, https://doi.org/10.5194/acp-11-11807-2011, 2011.