Investigation of virga with active remote sensing in Ny-Ålesund

Andreas Foth[1], Lukas Monrad-Krohn[1], Beril Aydin[1], Mario Mech[2], Kerstin Ebell[2], Marion Maturilli[3], Maximilian Maahn[1], Heike Kalesse-Los[1]

[1] Leipzig Institute for Meteorology, Leipzig University, Leipzig, Germany
[2] Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany
[3] Alfred Wegener Institute, Potsdam, Germany

presenting Author: Andreas Foth, andreas.foth@uni-leipzig.de

The focus of this work is on sublimation and evaporation of precipitation. Precipitation is an essential component of the Arctic climate system as part of the hydrological cycle, linking the atmosphere and cryosphere. Much of the Arctic precipitation sublimates or evaporates before it reaches the ground due to dry sub-cloud layers.

We use long-term atmospheric observations at Ny-Ålesund with vertically-pointing cloud radars and backscattering lidars to identify and quantify atmospheric sublimation/evaporation. Radar observation-based sub-cloud precipitation profiles are studied by employing a virga detection tool, the so-called Virga-Sniffer (Kalesse-Los et al., 2023). The quantification of the sublimation/ evaporation is based on sub-cloud vertical gradients of radar moments. First statistical results of precipitation phase, virga depth, and full sublimation/ evaporation altitude above ground will be shown. Misclassification by the Cloudnet target classification within virga at precipitation edges will be discussed in detail.

We will also show investigations on wind direction dependence on virga statistics. Air masses advected from the Arctic Ocean are more humid and lead to more precipitation reaching the ground and thus less virga. Air masses advected over Ny-Ålesund from Easterly directions (i.e. the island of Svalbard itself) are often characeterized by low-humidity subcloud layers leading to more evaporation/sublimation and hence a higher fraction of virga.

Refernces:

Kalesse-Los, H., Kötsche, A., Foth, A., Röttenbacher, J., Vogl, T., and Witthuhn, J.: The Virga-Sniffer – a new tool to identify precipitation evaporation using ground-based remote-sensing observations, Atmos. Meas. Tech., 16, 1683–1704, https://doi.org/10.5194/amt-16-1683-2023, 2023.