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Quantifying Riming by Combining the Video In Situ Snowfall Sensor with Cloud Radar Observations

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We do not know the exact pathways through which ice, liquid, cloud dynamics, and aerosols are interacting in clouds while forming snowfall. Riming, the freezing of droplets onto ice crystals, is likely one of the most important snowfall formation mechanisms. This is not only because riming is an efficient particle mass growth mechanism, but also because riming is related to secondary ice processes that increase the number of ice particles. Further, riming changes the density of ice particles impacting the particle scattering properties so that implicit or explicit assumptions about riming are required when using passive or active microwave observations of snowfall. Quantifying the riming process is challenging because it requires separating riming from other particle growth mechanisms and snowfall is generally difficult to observe. Various methods based on in situ and cloud radar observations have been proposed, but uncertainties are generally high. Here, we present a method to estimate riming by combining Video In Situ Snowfall Sensor (VISSS) and W-band cloud radar observations. The VISSS was developed to determine particle shape, size, and velocity distributions. Different from other sensors, the VISSS minimizes uncertainties by using two-dimensional high-resolution images, a large measurement volume, and a design limiting the impact of wind. We will apply the retrieval to various datasets to explore the relation between riming and liquid water path and turbulence.

VAT

Session

From Classical to Integrated Remote Sensing: New observation strategies for clouds and precipitation (multi-frequency, spectral polarimetry, multi-sensor)

Preferred Contribution Type

Oral Presentation

Presenting Author

Maximilian Maahn

Email Address of Presenting Author

maximilian.maahn@uni-leipzig.de

Affiliation of Presenting Author

Leipzig University

Address of Presenting Author

Stephanstr. 3, 04103 Leipzig

Author: MAAHN, Maximilian (Leipzig University)

Co-authors: Mr PFEIFER, Nils (Leipzig Insitute for Meteorology); MAHERNDL, Nina (LIM)

Presenter: MAAHN, Maximilian (Leipzig University)