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UNIVERSITÄT
BERN

Seminar über Microwave Physics and Atmospheric Physics

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Titel: A Multi-Instrumental Variational Retrieval of Atmospheric Profiles in Foggy Conditions

The formation and dissipation of fog is poorly represented in even the highest resolution operational numerical weather prediction (NWP) models, causing large economic costs in the aviation industry. Continuous transmission, 95 GHz cloud radars, sensitive to cloud and fog droplets, open up the possibility of retrieving vertical profiles of fog microphysical properties with unprecedented capabilities. The assimilation of these profiles into a high resolution NWP model is hoped to improve the quality of fog forecasts. In this work, retrievals of fog thermodynamics, made through a one dimensional variational (1DVAR) approach, are presented.

Developments have been made to an existing 1DVAR algorithm designed to retrieve temperature and humidity from microwave radiometer brightness temperatures. This algorithm, which uses a high-resolution operational model (AROME) information as an a-priori, was extended to make use of radar observations and give retrievals of liquid water content in addition to temperature and humidity. A methodology of selecting an a priori profile based on the best resemblance to the observation, which aims to reduce time-space displacement errors, is presented. This has previously been shown to vastly reduce innovation errors and was expected to improve the quality of retrievals.

The algorithm was initially tested on artificial observations, made by simulating brightness temperatures and radar reflectivities from the AROME model forecast. By perturbing both the synthetic observations and the a-priori profiles by their expected errors, and comparing retrieved profiles to the initial values, the algorithm was verified.

During the winter 2019/2020, an observational field campaign was conducted in the south-west of France (SOFOG-3D). A radar and radiometer were collocated at a site from which in-situ observations of cloud microphysics were made during fog events. Radiosondes, making temperature and humidity observations were also launched at a high frequency from the same location during fog events.

Making use of the radar and radiometer observations from the SOFOG-3D field campaign, retrievals were made for two fog events in winter 2019/20. An inter-comparison could then be made between the retrievals and in-situ measurements. The quality of the retrievals for the field campaign will be presented.

Zeit: Freitag, 29. Oktober 2021, 10:15 Uhr

Ort: https://unibe-ch.zoom.us/j/97081325603?pwd=d0ozME5xOS9pQVNxalILem81VHQyZz09
Meeting ID: 970 8132 5603
Passcode: iapmw