Towards operational assimilation of surface based microwave radiometer and Raman lidar data at MeteoSwiss

Claire Merker*†[1], Bas Crezee[1], Daniel Leuenberger[1], Alexander Haefele[2], Jasmin Vural[3], Maxime Hervo[2], Giovanni Martucci[2], and Marco Arpagaus[1]

[1]MeteoSwiss – Zürich, Switzerland
[2]MeteoSwiss – Payerne, Switzerland
[3]Deutscher Wetterdienst – Offenbach am Main, Germany

Abstract

The current atmospheric observing systems fail to provide observations in the planetary boundary layer (PBL) with satisfactory spatial and temporal resolutions despite their potential positive impact on numerical weather prediction. This is particularly critical for humidity, which exhibits a very high variability in space and time, and for the vertical profile of temperature, which determines the atmospheric stability. Hence, the analyzed thermodynamic structure of the PBL can be prone to errors, leading to poor forecasts for relevant phenomena, such as severe storms or winter fog and low stratus.
One approach to improve the model's representation of the PBL is to include novel, ground-based remote sensing profiler observations in the data assimilation system to improve the forecast initial conditions. This also improves the quality of downstream applications relying on a good representation of the PBL.
In this contribution, we present our efforts to include observations from microwave radiometers and a Raman lidar into the 1km mesh-size ensemble data assimilation system KENDA-1. Brightness temperatures from the microwave radiometers are assimilated using the RTTOV-gb forward operator. The Raman lidar data is assimilated using a forward operator for water vapor mixing ratio and temperature. We show the evaluation of extensive observation-minus-background statistics and results from data assimilation cycling experiments during summer-time convective situations.

Keywords: remote, sensing, microwave radiometer, raman lidar, ensemble data assimilation, convective scale

*Speaker
†Corresponding author: claire.merker@meteoswiss.ch