

Calibration and standardization efforts for a network operation of ground-based microwave radiometers

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Ground-based microwave radiometers (MWR) are already widely used by research institutions as well as national weather services all around the world. Most of the instruments operate continuously which makes them a valuable tool for data assimilation in atmospheric models. Recent studies show that a network of MWR observations has a positive impact on model performance, especially regarding boundary-layer temperature profiles as well as integrated water vapor and cloud liquid water path.

However, most MWR are operated as stand-alone instruments. In order to benefit from a network of these instruments, some standardization of calibration, operation and data formats is necessary. In the frame of TOPROF (COST Action ES1303) several efforts have been taken, such as uncertainty and bias assessment, and calibration intercomparison campaigns. The goal was to establish protocols for providing quality controlled MWR data and their uncertainties. This work will be continued in the frame of the JOYCE-CF (Jülich Observatory for Cloud Evolution) which is currently set up as a core facility for ground-based microwave remote sensing where standardized calibration procedures for MWR are developed and best practice recommendations for MWR operators in networks are compiled.

To reduce calibration uncertainties, a new calibration load has been introduced for MWR manufactured by Radiometer Physics GmbH (RPG). This new tool improves the accuracy of the measurements considerably and will lead to even more reliable atmospheric observations. Furthermore, a common data format is being developed in order to provide homogeneous MWR data including error characterization to external users, e.g. data assimilation or satellite validation.

Besides the recommendations for ground-based MWR networks, we will present methods to determine the accuracy of the calibration as well as means for automatic data quality control. In addition, the current state of the MWR operations will be discussed.