Fostering Ground-Based Microwave Radiometry: From Uncertainty to Networking

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Nowadays, ground-based microwave radiometers (MWR) are robust instruments providing continuous unattended operations and real-time atmospheric observations under nearly all-weather conditions.

Ground-based MWR observations have the potential to help fill the observational gap in the atmospheric boundary layer, which is crucial for several applications including Numerical Weather Prediction (NWP). In addition, long-term MWR observations are useful to complement radiosonde observations for reference-quality climate monitoring of upper-air.

This lecture will review analyses and tools developed in the last five years to foster the use of ground- based MWR networks for NWP and climate applications, including:

- a fast radiative transfer model to assimilate MWR observations into NWP;

- a one-dimensional variational (1DVAR) code to retrieve atmospheric temperature and humidity

profiles and their uncertainties from ground-based MWR observations;

- a network 1DVAR (Net1D) software developed to uniformly perform 1DVAR retrievals over a network of ground-based MWR;

- a characterization of the uncertainty affecting atmospheric microwave absorption models used to simulate the absorption/emission of electromagnetic radiation by atmospheric constituents; and

- plans for implementing MWR network observations into operational NWP data assimilation and upper-air climate monitoring.

Most of the activities above have been pursued building on the legacy of Dr. Liebe's work and in close cooperation with scientists that worked and shared several scientific achievements with Dr. Hans Joachim Liebe.