

# National Radio Science Meeting

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## Sixth Hans Liebe Lecture

Friday, January 11, 2019

Math Auditorium (Room 100 Math)

### Fostering Ground-Based Microwave Radiometry: From Uncertainty to Networking

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#### Abstract:

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.



**Biography:** Domenico Cimini is a researcher at the National Research Council of Italy, Institute of Methodologies for the Environmental Monitoring (CNR-IMAA). He received the laurea and Ph.D. degrees in Physics from the University of L'Aquila, Italy. Since 2002, he has been a researcher at the Center of Excellence for Remote Sensing and Modeling of Severe Weather (CETEMPS, L'Aquila, Italy), Research assistant at the Cooperative Institute for Research in Environmental Sciences (CIRES, University of Colorado, Boulder, USA), Adjunct Professor at the Department of Electrical and Computer Engineering (University of Colorado, Boulder, USA). He has more than fifteen-year experience with ground- and satellite-based passive remote sensing, particularly microwave radiometry. Dr. Cimini participated in several international projects funded by the EU, the European Space Agency, and the U.S. Atmospheric Radiation Measurement (ARM) program.

Currently Dr. Cimini is sharing the coordination of an International Microwave Radiometer Network (MWRnet), grouping more than 20 meteorological institutions. He was co-chair of the Microwave Radiometer working group of the EU COST Action ES1303 TOPROF, aiming at assimilating non-conventional ground-based remote sensing observations for improving weather forecast. He was the Task leader for the Microwave Radiometer uncertainty characterization for the EU H2020 GAIA-CLIM project, aiming at the characterization of reference-quality climate monitoring instrumentation. He is the editor of the Microwave Radiometer User Guide for the WMO Global Climate Observing System (GCOS) Reference Upper-air Network (GRUAN).

Dr. Cimini serves as an Associate Editor for *Atmospheric Measurement Techniques* (since 2013) and *Remote Sensing* (since 2018).