ELECTRICAL & COMPUTER ENGINEERING SEMINAR

"Evaluation of Water Vapor Retrievals from COSMIC, SSM/I, and AMSU"

by

Dr. Gary A. Wick

National Oceanic and Atmospheric Administration
Earth System Research Laboratory
Boulder, Colorado

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Abstract

This talk reviews the evaluation and intercomparison of recent efforts to retrieve both the integrated water vapor content and near-surface specific humidity over the oceans. In the first portion, integrated water vapor (IWV) retrievals from four different Special Sensor Microwave Imager (SSM/I) algorithms are collocated and compared with new IWV retrievals using Global Positioning System (GPS) radio occultation soundings from the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) mission. The retrievals exhibit strong agreement and demonstrate that the COSMIC data may be an important new independent validation source for traditional passive microwave IWV retrievals. Three of the SSM/I retrieval algorithms have essentially no overall bias relative to the COSMIC retrievals and rms differences of less than 0.3 cm. Differences among the retrievals are shown to be functions of position (latitude), cloud liquid water content, rain rate, and effective spatial resolution. Comparisons with SSM/I data averaged over different spatial domains demonstrate the effective average spatial resolution of the COSMIC retrievals and show the contribution of spatial IWV gradients to the differences. The results suggest a new method of quantifying the uncertainty in individual IWV retrievals as functions of coincident environmental parameters for application to data assimilation and numerical weather prediction applications.

While the surface humidity has been observed to be correlated with the total column water content on time scales of a month, accurate high temporal resolution estimates of the air-sea heat flux require improved estimates of the specific humidity. In the second portion of the talk, a new method to retrieve the near-surface specific humidity from a combination of microwave imagers and sounders is described. The sounder data are shown to improve the retrievals by accounting for moisture variations aloft that can decouple the surface humidity from the integrated water vapor content. Comparisons with direct surface measurements enable regional and seasonal bias corrections and provide independent accuracy estimates.

Bio

Gary Wick obtained his Ph.D. in 1995 from the University of Colorado in Boulder studying the thermal evolution of the near-surface layer of the ocean and its impact on satellite-based retrievals of sea surface temperature. He has been employed since 1997 by the NOAA Earth System Research Laboratory (and its predecessor laboratories) where he leads a group on satellite applications. His research interests include remote sensing of ocean surface processes, air-sea interactions, and atmospheric characteristics over the ocean using a combination of infrared and passive microwave sensors. Dr. Wick was recently named co-lead of the Pacific Testbed within the new NOAA Unmanned Aircraft Systems (UAS) program.

Please contact Prof. Steve Reising, reising@engr.colostate.edu, with any questions.