SSEC/CIMSS
Seminar

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Multi-instrument retrievals of atmospheric state: the Integrated Profiling Technique
Talk #4: Using Passive Microwave and Infrared Observations

Spectrally resolved passive microwave and infrared observations contain information on both the properties of clouds and the thermodynamic (temperature and humidity) profile. A clear-sky retrieval procedure is presented that utilizes measurements from a standard microwave profiler (HATPRO) and an infrared spectrometer (AERI) by applying the unified Integrated Profiling Technique (IPT) to each instrument separately. This optimal estimation based technique has additionally been applied simultaneously to the combination of both AERI and HATPRO measurements. Retrieval accuracies and information content in clear sky scenes are discussed. The anticipated benefit from the multi-instrument IPT retrievals in cloudy scenes will also be discussed.

The IPT retrieval framework is very flexible, and can easily accommodate other instruments (measurements) as long as an accurate forward model is available and the uncertainties in the observations are well characterized. Microwave observations at 90 and 150 GHz provide approximately 3 times more sensitivity to liquid water path (LWP) than the standard microwave observations at 31 GHz, and thus incorporating 90/150 GHz observations into the IPT framework will provide a better constraint on the retrieved LWP when the cloud is opaque in the infrared. However, microwave absorption (forward) models at frequencies above 60 GHz have significant uncertainties. A unique data set of microwave observations at 150 GHz taken during the ARM Mobile Facility deployment to the Black Forest (Germany) in 2007 is presented and compared to simulated brightness temperatures from co-located radiosonde ascents. By adjusting the water vapor continuum contributions of three standard absorption models to meet the measurements at 150 GHz, the model differences, not only at 150 GHz, but across the microwave spectrum can be significantly reduced.

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11:00 a.m.
Room AOSS 351