

# **THE ACTIVE TEMPERATURE, OZONE AND MOISTURE MICROWAVE SPECTROMETER (ATOMMS) AIRCRAFT OCCULTATION DEMONSTRATION**

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Assessing and improving climate models requires precise and accurate measurements of the climate state that are independent from the models. We are developing a new remote sensing technique called the Active Temperature, Ozone and Moisture Microwave Spectrometer (ATOMMS) that addresses these fundamental observational needs as they relate to water vapor, ozone, temperature and pressure. ATOMMS combines key features of GPS Radio Occultations (RO) and NASAs Microwave Limb Sounder (MLS) by actively probing via satellite-to-satellite occultations the absorption lines that MLS probes passively. ATOMMS overcomes several limitations of GPSRO by profiling bending angle simultaneously with absorption to provide the information needed to profile water and temperature independent of other observations and climatologies. Probing via occultation offers several advantages over passive emission including an order of magnitude better vertical resolution, simple and unique retrievals, very high SNR and precision to capture variability and signatures of processes, all-weather sampling eliminating clear sky-only biases and self-calibration eliminating long term drift. ATOMMS profiles of temperature, geopotential height and moisture will extend from the lower troposphere to the mesopause with typical precisions over much of this altitude range of 0.4 K, 10 m and 1-3%. With additional signal frequencies, other trace constituents such as water isotopes can be measured in the upper troposphere and above with similar performance. ATOMMS will profile line of sight winds above the 10 mb level. ATOMMS also profile turbulence. With funding from NSF and aircraft time from NASA, we are building a prototype instrument to demonstrate the ATOMMS concept and performance using two NASA high altitude WB-57F aircraft in 2011. The long term goal is a constellation of microsattellites that will provide full global and diurnal cycle coverage. We will present the status of the ATOMMS development including recent measurements indicative of ATOMMS capabilities.