Microwave radiometers are able to measure blackbody microwave emissions emitted by natural targets. Radiative transfer theory provides a well-founded physical relationship between the atmosphere and surface geophysical parameters and the brightness temperature measured by these radiometers. The atmospheric brightness temperature is proportional to the integral of the microwave absorption of water vapor, oxygen, and liquid water between the top of the atmosphere and the surface. Inverse radiative transfer models use to retrieve the water vapor, cloud liquid and oxygen content in the atmosphere are very well known; however, the retrieval of rain rate in the atmosphere is still a challenge.

This project presents a theoretical basis for the rain rate retrieval algorithm, which will be implemented in the Aquarius/SAC-D Microwave Radiometer (MWR). This algorithm was developed based on the radiative transfer model theory for a single layer atmosphere using three WindSat channels. Transmissivity due to liquid water (rain and cloud liquid water) is retrieved from the three channel brightness temperatures, and a statistical regression is performed to relate the rain rate, rain physical temperature and rain height to the liquid water transmissivities at 24 GHz and 37 GHz. Empirical validation results are presented using the WindSat radiometer observations.

Major: Electrical Engineering

Educational Career:
Bachelor's of Electrical Engineering, BS, 2000, University of Central Florida

Committee in Charge:
Dr. W. Linwood Jones, Chair, Electrical Engineering and Computer Science
Dr. Takis Kasparis, Electrical Engineering and Computer Science
Dr. Parveen Wahid, Electrical Engineering and Computer Science

Approved for distribution by Dr. W. Linwood Jones, Committee Chair, on October 15, 2010.

The public is welcome to attend.