

Announcing the Final Examination of Sayak Biswas for the degree of Doctor of Philosophy

Time & Location: October 31, 2011 at 2:30 PM in HEC 450

Title: BRIGHTNESS TEMPERATURE CALIBRATION OF AQUARIUS/SAC-D MICROWAVE RADIOMETER (MWR)

The Aquarius/SAC-D joint international science mission, between the National Aeronautics and Space Administration (NASA) of United States and the Argentine Space Agency (Comision Nacional de Actividades Espaciales, CONAE), was launched on a polar-orbiting satellite on June 10, 2011. This mission of discovery will provide measurements of the global sea surface salinity, which contributes to understanding climatic changes in the global water cycle and how these variations influence the general ocean circulation. The Microwave Radiometer (MWR), a three channel Dicke radiometer operating at 23.8 GHz H-Pol and 36.5 GHz V-& H-Pol provided by CONAE, will complement Aquarius (NASA's L-band radiometer/scatterometer) by providing simultaneous spatially collocated environmental measurements such as water vapor, cloud liquid water, surface wind speed, rain rate and sea ice concentration.

This dissertation focuses on the overall radiometric calibration of MWR instrument. Which means establishing a transfer function that relates the instrument output to the antenna brightness temperature (T_b). To achieve this goal, the dissertation describes a microwave radiative transfer model of the instrument and validates it using the laboratory and thermal-vacuum test data. This involves estimation of the losses and physical temperature profile in the path from the receiver to each antenna feed-horn for all the receivers. As the pre-launch laboratory tests can only provide a simulated environment which is very different from the operational environment in space, an on-orbit calibration of the instrument is very important. Analysis of the on-orbit deep-space calibration to estimate the front-end losses is presented in details. Inter-satellite radiometric cross-calibration of MWR using the Naval Research Laboratory's multi-frequency polarimetric microwave radiometer, WindSat, on board the Coriolis satellite is also an important part of this dissertation. Cross-calibration between two different satellite instruments require normalization of T_b 's to account for the frequency and incidence angle difference between the instruments. Also inter-satellite calibration helps to determine accurate antenna pattern correction coefficients and other small instrument biases.

Major: Electrical Engineering

Educational Career:

Bachelor's of Electronics & Communication Engineering, 2005, National Institute of Technology, Calicut

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Committee in Charge:

Dr. W. Linwood Jones, Chair, Electrical Engineering & Computer Science

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Dr. Parveen F. Wahid, Professor, Electrical Engineering & Computer Science

Approved for distribution by Dr. W. Linwood Jones, Committee Chair, on October 13, 2011.

The public is welcome to attend.