PARTICIPATION OF THE ADMIRARI RADIOMETER AT THE GPM/GV 2010

BRAZILIAN CHUVA CAMPAIGN

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Introduction

In the frame of the NASA Global Precipitation Measurement, Ground Validation program (GPM/GV) the ADvanced Microwave Radiometer for Rain Identification (ADMIRARI) was deployed to participate at the Brazilian pre-Chuva experiment at the Alcântara Launching Center (CLA) located on the northeastern Brazil (Lat. = -2°, Lon. = -45°). The present contribution shows an overview on the measurements made by ADMIRARI, preliminary retrievals and unprecedented observations.

ADMIRARI Radiometer

ADMIRARI is a multi-frequency dual-polarized microwave radiometer capable to discriminate the liquid water path into the cloud and rain components [4].

- Frequencies 10.7, 21.0 and 36.5 GHz
- Vertical and Horizontal Polarization
- Steerable, deployable
- 6 degrees beam-width
- 0.5K RMS sensibility @ 1 second integration time
- Direct detection auto-calibrating receivers: Noise injection, Dicke switching
- absolute system stability 1.0 K
- co-located Micro Rain Radar 24.1 GHz (MRR).

The radiometer measures Brightness Temperature (TB = 1/2(TBv + TBh)) and Polarization difference (PD = TBv - TBh) at its three frequencies.

A Bayesian inversion algorithm retrieves Integrated Water Vapor (IWV), Cloud and Rain Liquid Water Path (CLWP and R_LWP) simultaneously. [1, 2, 3]

CHUVA Experiment

The experiment was taken place at the Brazilian launching facility near Alcântara from 25th February to 25th March 2010 and it was especially focused on the tropical warm cloud precipitation produced by different types of convection. Several instruments were installed along four observation points (VILLAGE, RADAR, AIRPORT and INPE sites).

- The measurement strategy was focused on the area between the X-Band Radar (RADAR SITE) and ADMIRARI radiometer (VILLAGE SITE). The RADAR performed RHI and PPI scans, ADMIRARI measured at 30 degrees elevation and bearing to RADAR site.
- Auxiliary instrumentation was located at the other sites.

One of the first rain events during CHUVA is showed below: ADMIRARI measurements and retrievals at 30° elevation.

- The figures above represent the standard ADMIRARI measurements, e.g. the MRR reflectivity profiles and below the Brightness temperatures, their corresponding Polarization difference for the three frequencies. At the right the preliminary retrieval results (i.e. Integrated water vapor, cloud and rain LWP). Due to the different rain regime in Brazil, new representative a-priori information must be included in the inversion algorithm [2, 3].

Measurements on March 13th

One of the first rain events during CHUVA experiments is showed below: ADMIRARI measurements and retrievals at 30° elevation.

- The measurement strategy was focused on the area between the X-Band Radar and ADMIRARI radiometer.
- Along the experiment the last two weeks were the most rainy period, overall reaching a total amount of rain of 350 mm at INPE site, and 200 mm at the ADMIRARI site.

Extreme Microwave Signature

On March 24th from 2:48 to 2:51 UTC, an amazing observation was made when all ADMIRARI channels reached saturation, i.e. the deepest microwave signature ever observed by ADMIRARI so far.

- The radiative transfer simulations used as a-priori information in the inversion algorithm are not able to reproduce such extreme event, new simulation will be performed in order to retrieve those measurements, which are important to validate cloud resolving and weather forecast models.
- A new retrieval scheme including the X-Band radar and the auxiliary data will be developed and the resulting database of CLOUD/RAIN LWP partition will represent the major contribution of ADMIRARI to GPM/GV.

Acknowledgments

The authors would like to thank: NASA GPM/GV for funding the participation in CHUVA, to all Brazilian staff for the cooperation during the experiment and for the auxiliary data. The ADMIRARI project is funded by the Deutsche Forschungsgemeinschaft (DFG) under grant BA 3485/1-1.

References