CONAE Microwave Radiometer (MWR) Counts to Tb Algorithm and On orbit Validation

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Abstract

The CFRSL, in collaboration with CONAE, have developed two improved algorithms (V5.0 & V7.0) to convert the radiometric counts to brightness temperature (Tb) for production of MWR level-1 science data. This poster presents a description of these algorithms and shows results for MWR Cal/Val activities during the past 15 months.

Mission Status

- MWR experience a power subsystem failure and ceased science operations on 04-18-14
- However, there exists 29 months of high quality brightness temperatures that are collocated with AQ and associated geophysical retrievals:
  - Wind Speed, Water Vapor, Rain Rate & Sea Ice Cone
  - Improved MWR Counts-to-Tb algorithm V6.0 & V7.0 developed and validated
  - Legacy data archive to be released by mid-2015

MWR History

- MWR on-orbit commissioning Aug 29th, 2011
- Counts to Tb V5.0 – March 2012
- Used 6 mo of MWR on-orbit collocation with WindSat
  - Ocean Tb’s exhibited small and acceptable Tb biases
  - Anomalous Tb’s near Land/water boundaries
- Counts to Tb V5.0s – April 2012
  - CONAE implements ”Smea” correction algorithm
  - Discovery of small Tb non-linearity
- Counts to Tb V6.0 beta – September 2013
  - Corrects non-linearity and other problems with V5.0s
  - V6.0 Validation & V7.0 beta – February 2014

V6.0 Attributes

- Builds on V5.0s and incorporates:
  - System gain non-linearity correction
  - Reanalysis of pre-launch TV radiometric calibration test for improved Antenna Switch Matrix losses
  - Empirically derived coefficients to match on-orbit observations:
    - Inter-satellite cross calibration (XCAL) with WindSat
    - Deep space calibrations
    - Noise dome injected Tb
  - Represents most rigorous MWR radiometric calibration available

V7.0 Attributes

- Builds on V6.0 and incorporates:
  - Normalization to WindSat radiometric calibration
  - Introduces a small time-variable Tb bias adjustment by antenna beam
  - Tb calibration consistent with XCAL standard
  - Based on 5-day “Double Difference” XCAL for entire MWR time series
  - Used to produce MWR L2 geophysical retrievals
  - Recommended Tb data product for AQ science users

Conclusions

- Improved MWR counts to Tb algorithms V6.0 & V7.0 developed
- V6.0 is the best radiometric calibration available using MWR pre-& post-launch CAL/Val datasets V7.0 is adjusted to match WindSat radiometric standard
- Near-zero inter-beam Tb biases that are stable (± 0.1 – 0.2 K) over the entire data time series
- Beta versions of V6.0 & V7.0 available on PODAAC
- Final archive Tb datasets will be available mid-2015