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# Inter-Calibration for AMSR-2/GCOM

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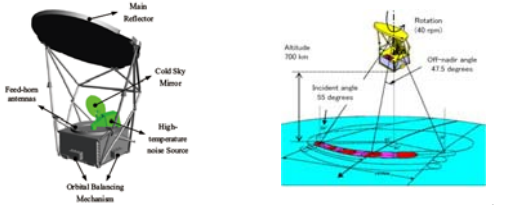
## Inter-Satellite Calibration?

- Techniques for comparing similar, but not identical, microwave imagers to remove relative biases
- Calibrated/stable Tbs significantly improve performance and accuracy of retrieved geophysical parameters

## GCOM-W1/AMSR-2

The AMSR-2 (Advanced Microwave Scanning Radiometer 2) instrument onboard the GCOM-W1 (Global Change Observing Mission-Water 1) satellite



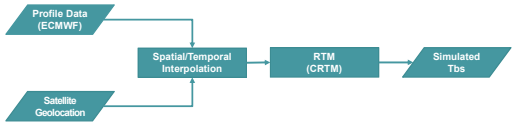

*Images courtesy of JAXA*

Table 2. AMSR2 characteristics and performance

| Center Freq. (GHz) | Band Width (MHz) | Beam Width (3dB, deg) | Ground IFOV (scan x along track, km) | Sampling Interval (km) |
|---|---|---|---|---|
| 6.925/7.3 | 350 | 1.8 | 35 x 62 | 10 |
| 10.65 | 100 | 1.2 | 24 x 42 | |
| 18.7 | 200 | 0.65 | 14 x 22 | |
| 23.8 | 400 | 0.75 | 15 x 26 | |
| 36.5 | 1000 | 0.35 | 7 x 12 | |
| 89.0 | 3000 | 0.15 | 3 x 5 | 5 |

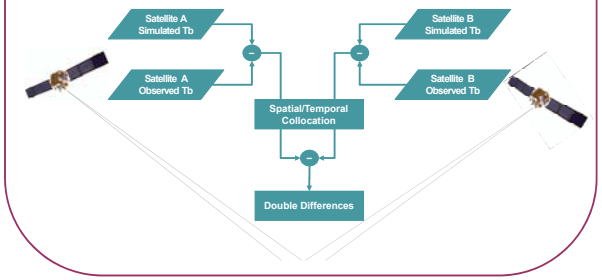
## Inter-Satellite Methodology

1. Simulated Tb




2. Double Difference

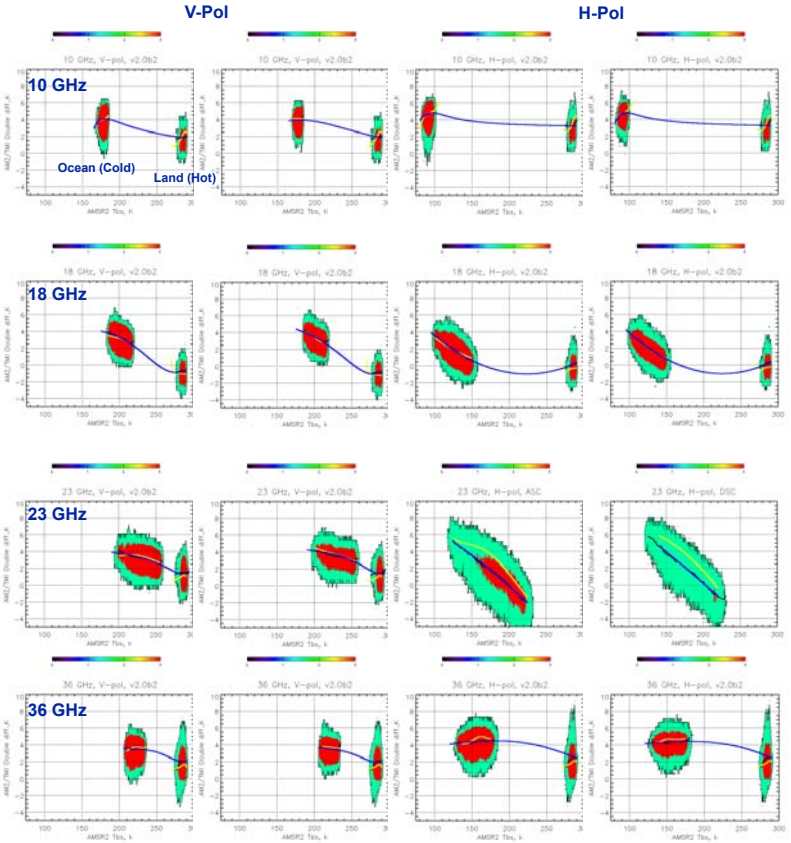
$$DD_{obs} = SD_{obs} - SD_{sim} = (Tb_{A,obs} - Tb_{B,obs}) - (Tb_{A,sim} - Tb_{B,sim})$$




## Description

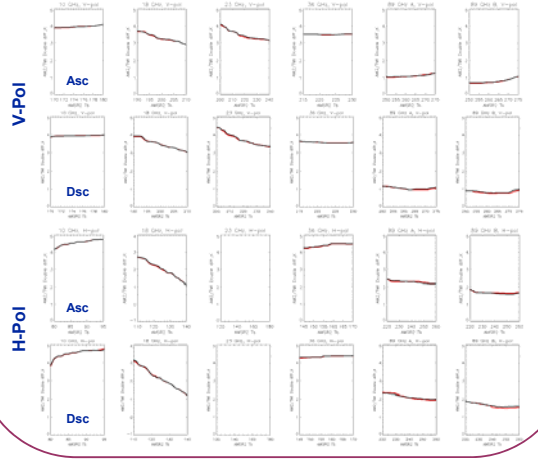
- AMSR2 L1B v2.0 beta 2 has been used to inter-satellite calibration
- TMI/TRMM used as the reference radiometer
  - Period: January 2013 – June 2013 (6-month)
  - TMI: 1B11 V7 calibrated Tbs
- Collocated for 15-min temporal/10-km spatial difference
- Exclude rain pixels using TRMM 2A12 rain rate, Sun glint, and RFI regions
- Tb simulation using CRTM v2.1 with FASTEM-X (ocean) and CSEM-MW (land)
- Atmospheric profile: ECMWF grid data (0.25-deg resolution)
- Land target: Amazon rain forest area
  - High emissivity (relatively isotropic), non polarized

## Tb correction using Inter-Satellite calibration




## AMSR2-TMI Mean Double Difference

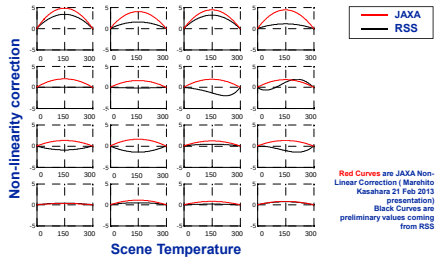
| Channel | Ocean | Land |
|---|---|---|
| 10V | 4.21 | 1.9 |
| 10H | 4.67 | 3.4 |
| 18V | 3.24 | -0.7 |
| 18H | 1.94 | 0.2 |
| 23V | 3.34 | 1.6 |
| 23H | - - | - - |
| 36V | 3.52 | 2.0 |
| 36H | 4.37 | 2.4 |




## Non-Linearity Issues

Each image shows a separate channel.

All 16 channels are shown.




## Summary and Future Work

- GCOM-W1 AMSR-2 inter-satellite calibration performed
  - » Tb correction function using this analysis will apply for each channel (5th order rational polynomial function)
- Non-linearity issues:
  - » All AMSR-2 channels has receiver non-linearity
  - » Need to understand what makes JAXA/RSS analysis different