GCOM-W1 AMSR2 SST

Chelle Gentemann, Frank Wentz, & Marty Brewer

GHRSST Science Team Meeting, Cape Town

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Background

- GCOM-W1
  - Launched by JAXA 18 May 2012
  - Data starts 23 July 2012
  - Several key differences from AMSR-E
    - New hot load thermal control system
    - Addition of 7.3 GHz channel
    - 2.0m reflector
      - AMSR2 6.9 GHz footprint size 62x35km (18% increase in resolution)
      - AMSR-E 6.9 GHz footprint size 75x43km

Widely used data

- AMSR-E is widely used in NWP, ocean forecasting, fisheries, and scientific research. We expect that AMSR2 will also be widely used if as accurate as AMSR-E.
- AMSR-E and AMSR2 are considered a sub-skin retrieval

Calibration of AMSR2

- Jan 2014 JAXA science team meeting, “current JAXA L1B have large errors that can be accounted for via regression algorithms or individual adjustments by algorithm developers”
- Our approach is to go from L1B to L1A then calibrate it as we do all other PMW sensors from RSS. This approach leads to geophysical variables that are intrinsically cross-calibrated with other PMW sensors for climate continuity

RTM Calibration Methodology

Ocean Radiative Transfer Model (RTM) is Calibration Reference for all MW Radio

- 0.2 K absolute (TBD), and 0.1 K relative
- Meissner and Wentz (2012): IGARSS Paper of the Year Award
- Publicly available

Inputs for RTM are the WindSat Retrievals of SST, Wind, Vapor, and Cloud (Rain e

- WindSat is highly stable
- Observation period from 2003 to present
- Overlaps both AMSR-E and AMSR-2 and hence serves as a Calibration Bridge
- Ocean retrievals have been thoroughly validated
- Co-location window (6:00 AM -> (~4.5 hours) -> 1:30 AM)
  - 1:30 PM <-> 6:00 PM not used (large diurnal variability)

RTM[T,W,V,L from WindSat] ➔ Simulated AMSR-2 Brightness Temperatures

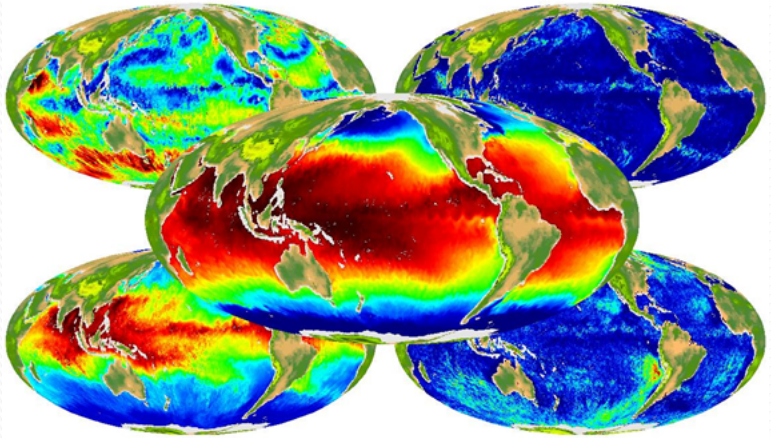
Amazon Forest calibration needed because of Receiver Non-Linearity.

Radiative Transfer Model (RTM) Inversion (RTM^{-1})

SST

Wind Speed

Water Vapor

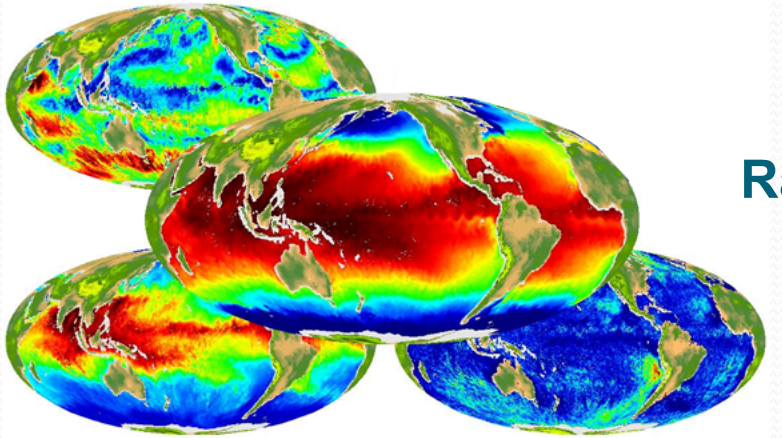


Rain Rate

Cloud Liquid

SST

Wind Speed



~~Rain Rate~~

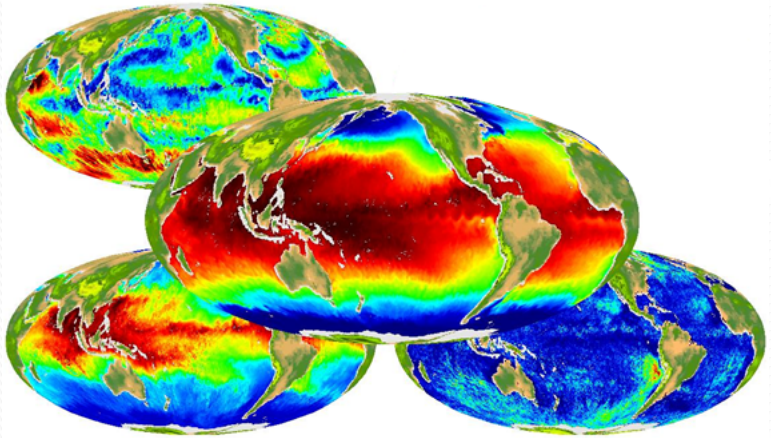
Rain Free Scenes

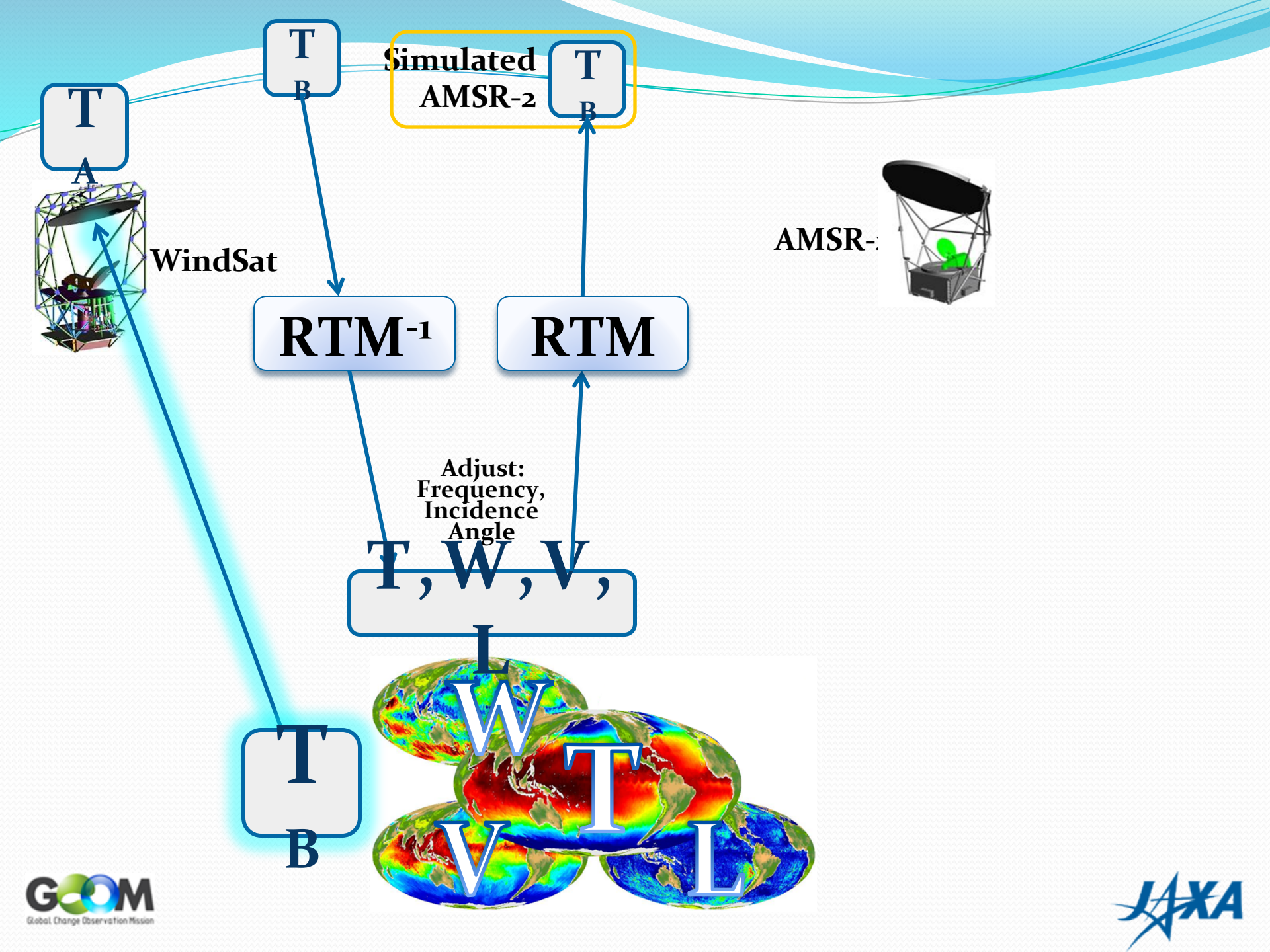
Water Vapor

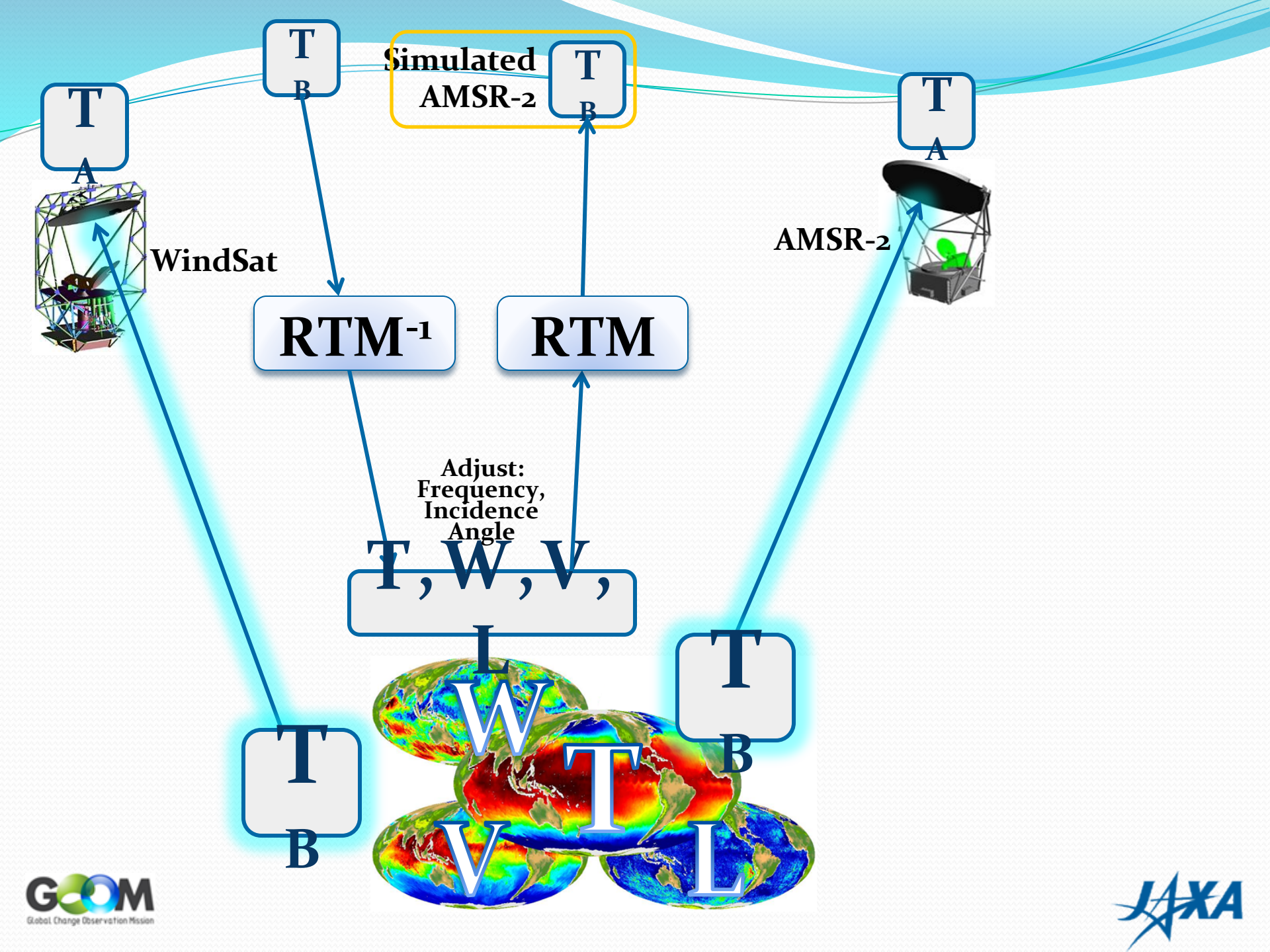
Cloud Liquid

GOOM
Global Change Observation Mission

JAXA




T B
Simulated AMSR-2
T B
T A
WindSat
AMSR-
RTM-1
RTM
Adjust: Frequency, Incidence Angle
T, W, V, L
T B
W
T
V
L


T B
Simulated AMSR-2
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RTM-1
RTM
Adjust: Frequency, Incidence Angle
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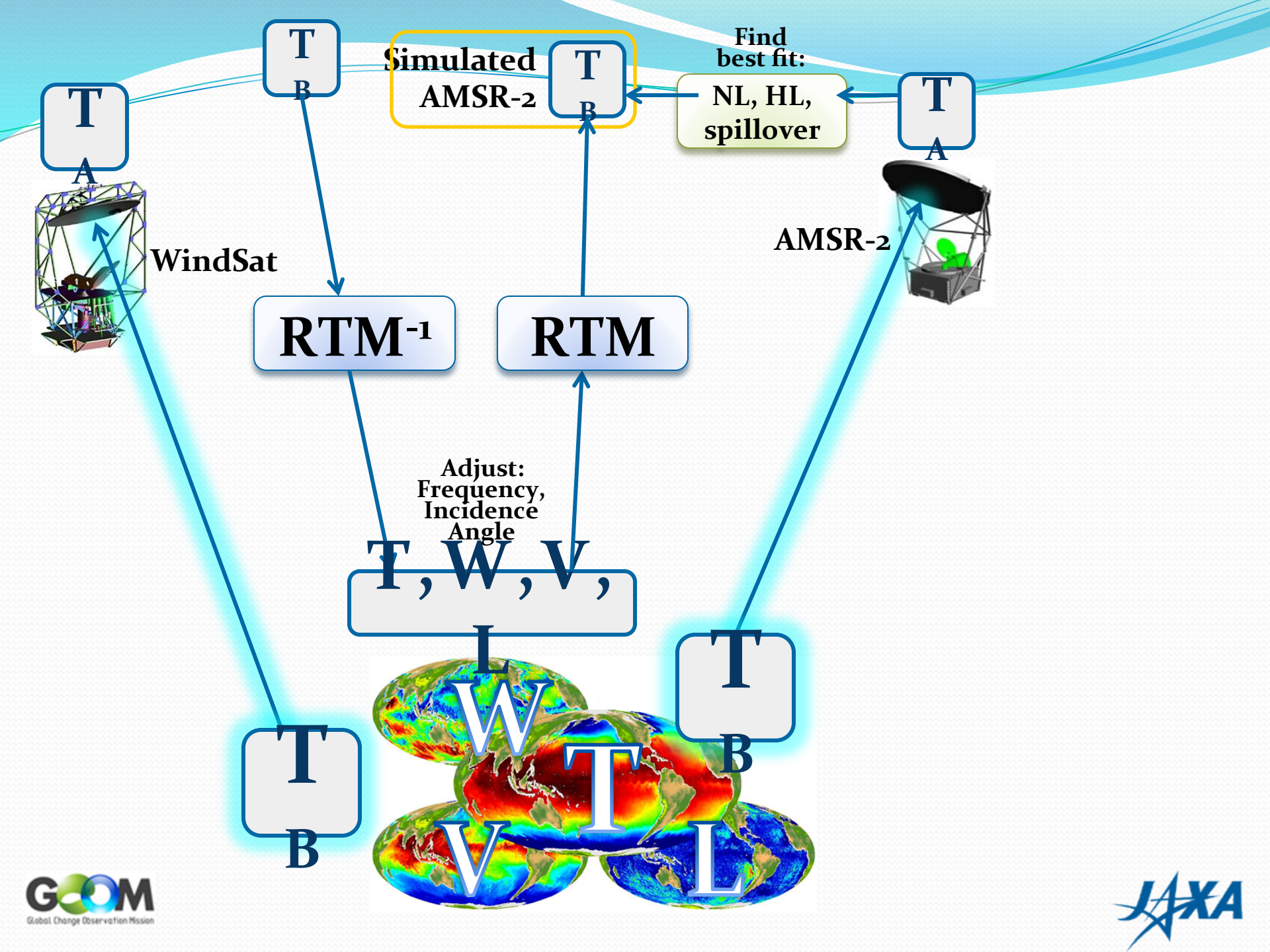
T A
T B
Simulated AMSR-2
T B
Find best fit:
NL, HL, spillover
T A
WindSat
AMSR-2
RTM-1
RTM
Adjust: Frequency, Incidence Angle
T, W, V, L
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T B
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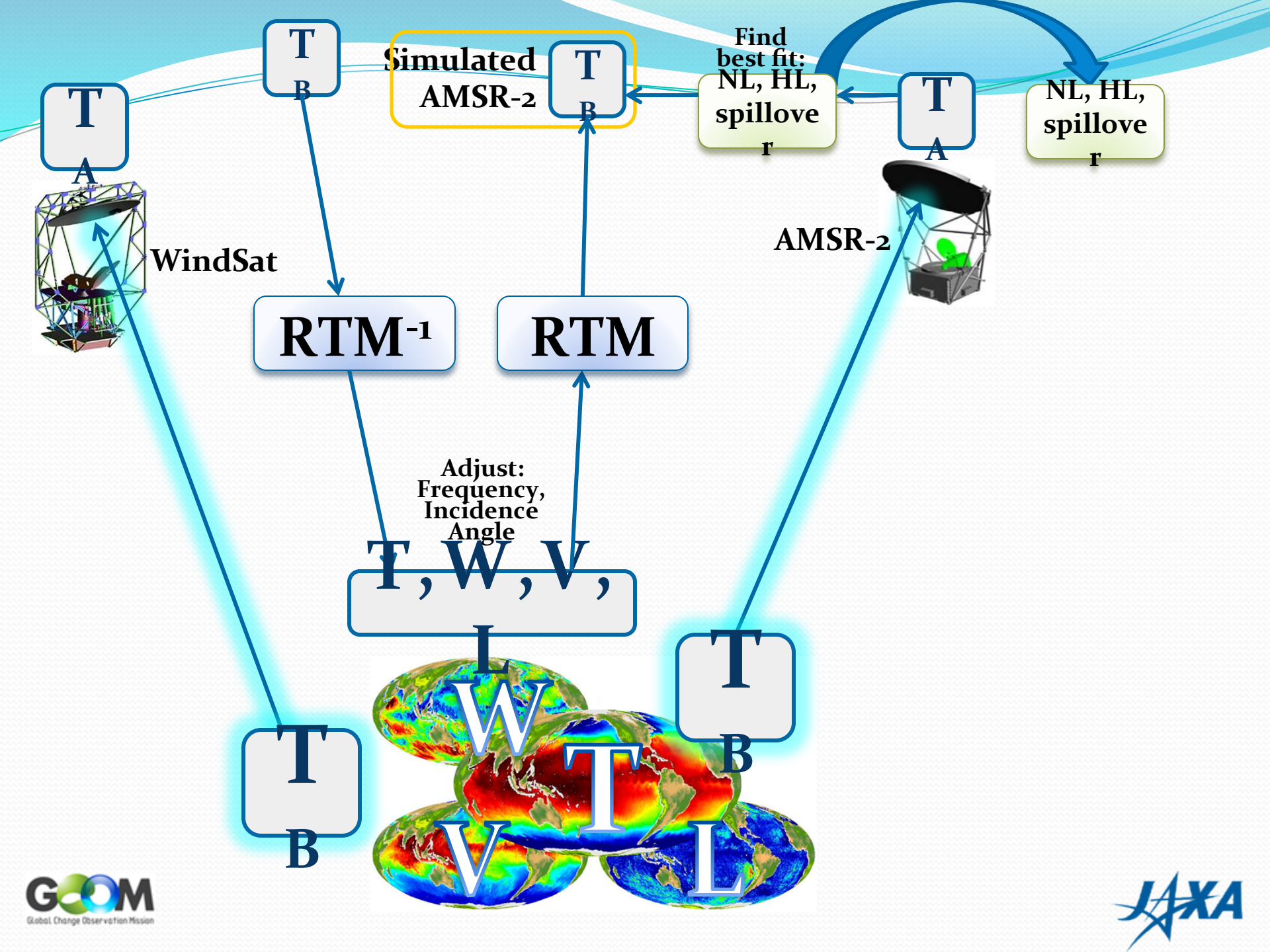
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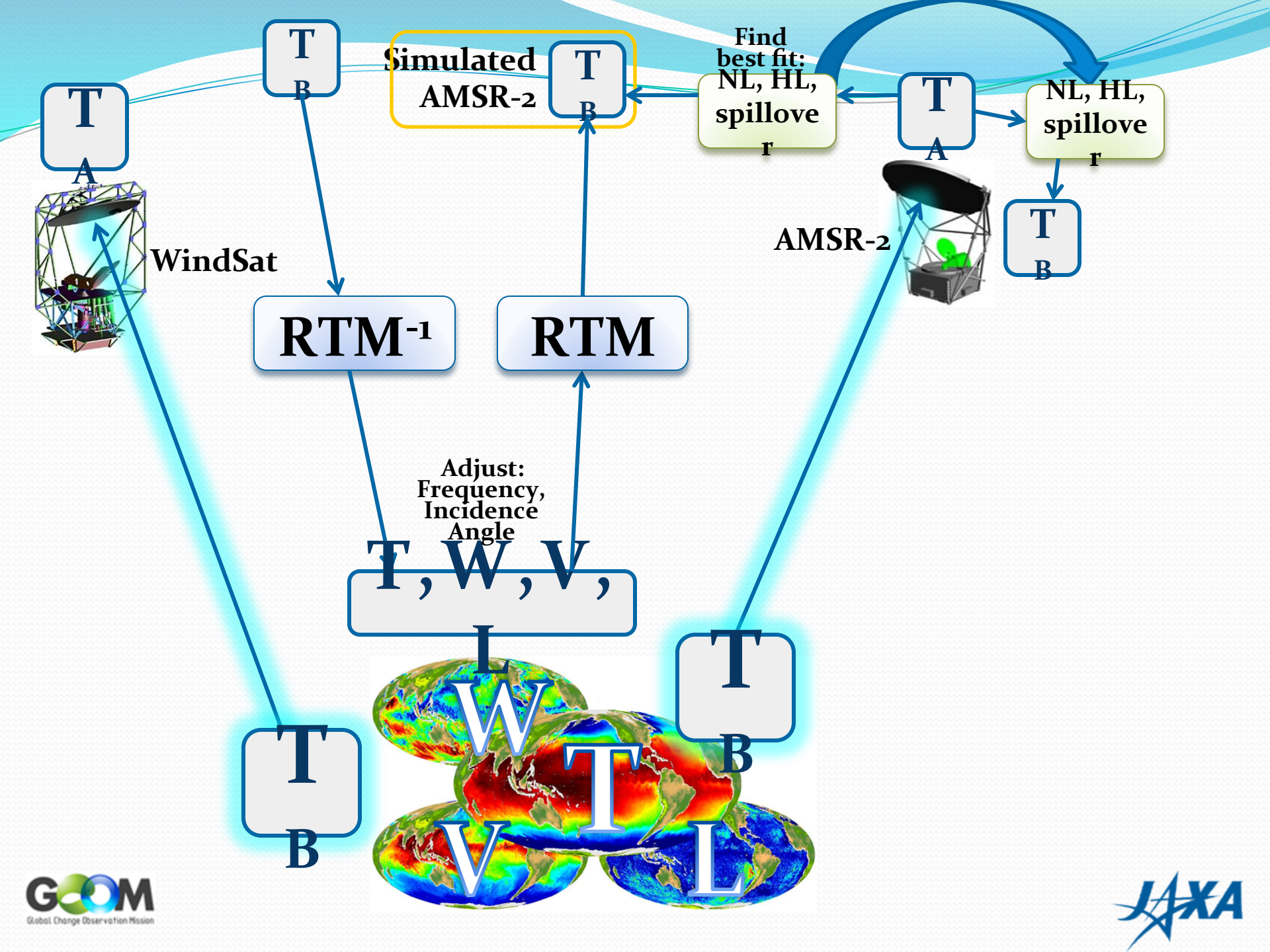
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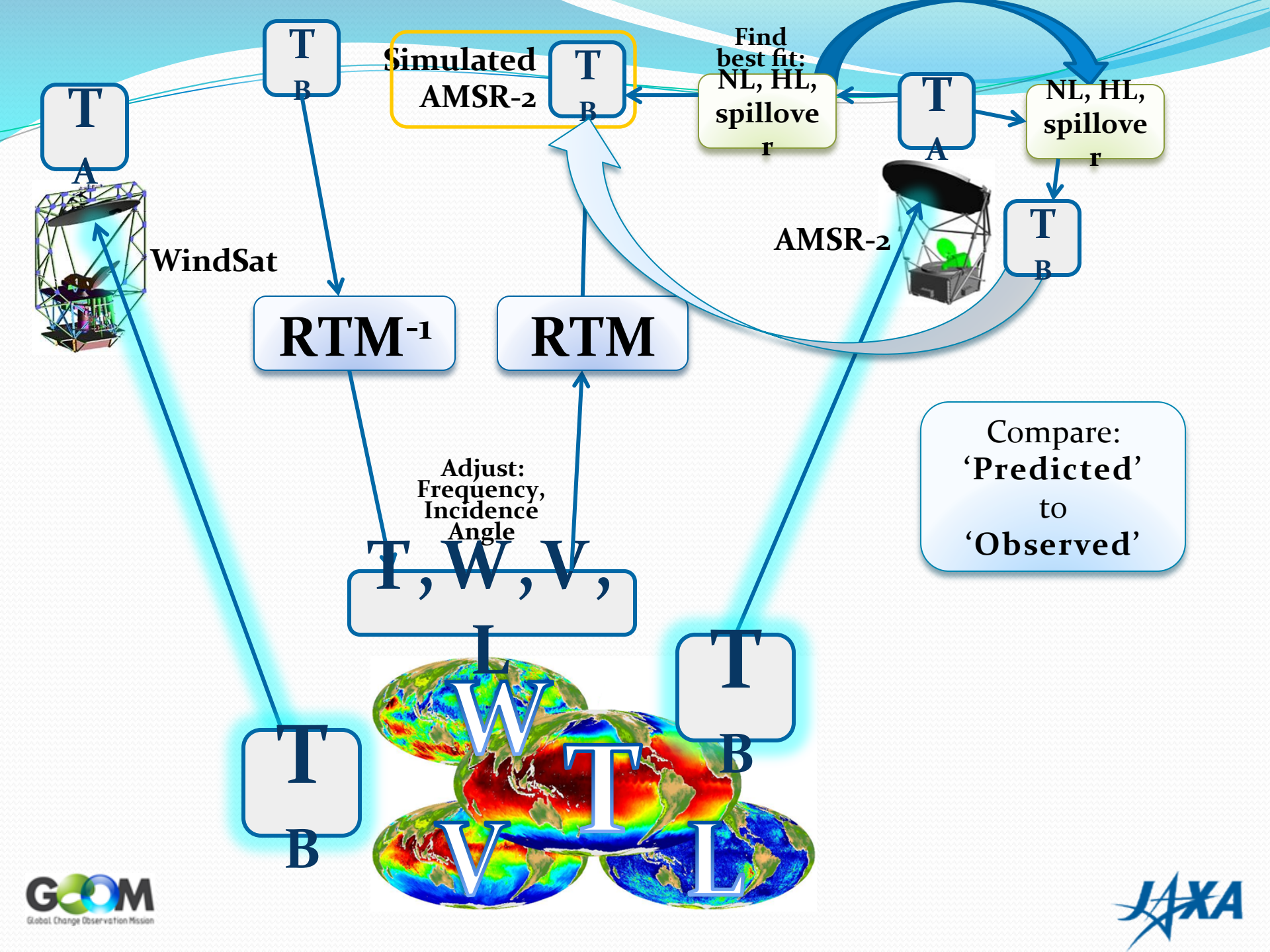
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Find best fit:
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T A
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T B
RTM-1
RTM
Adjust: Frequency, Incidence Angle
T, W, V, L
T B
T B
W
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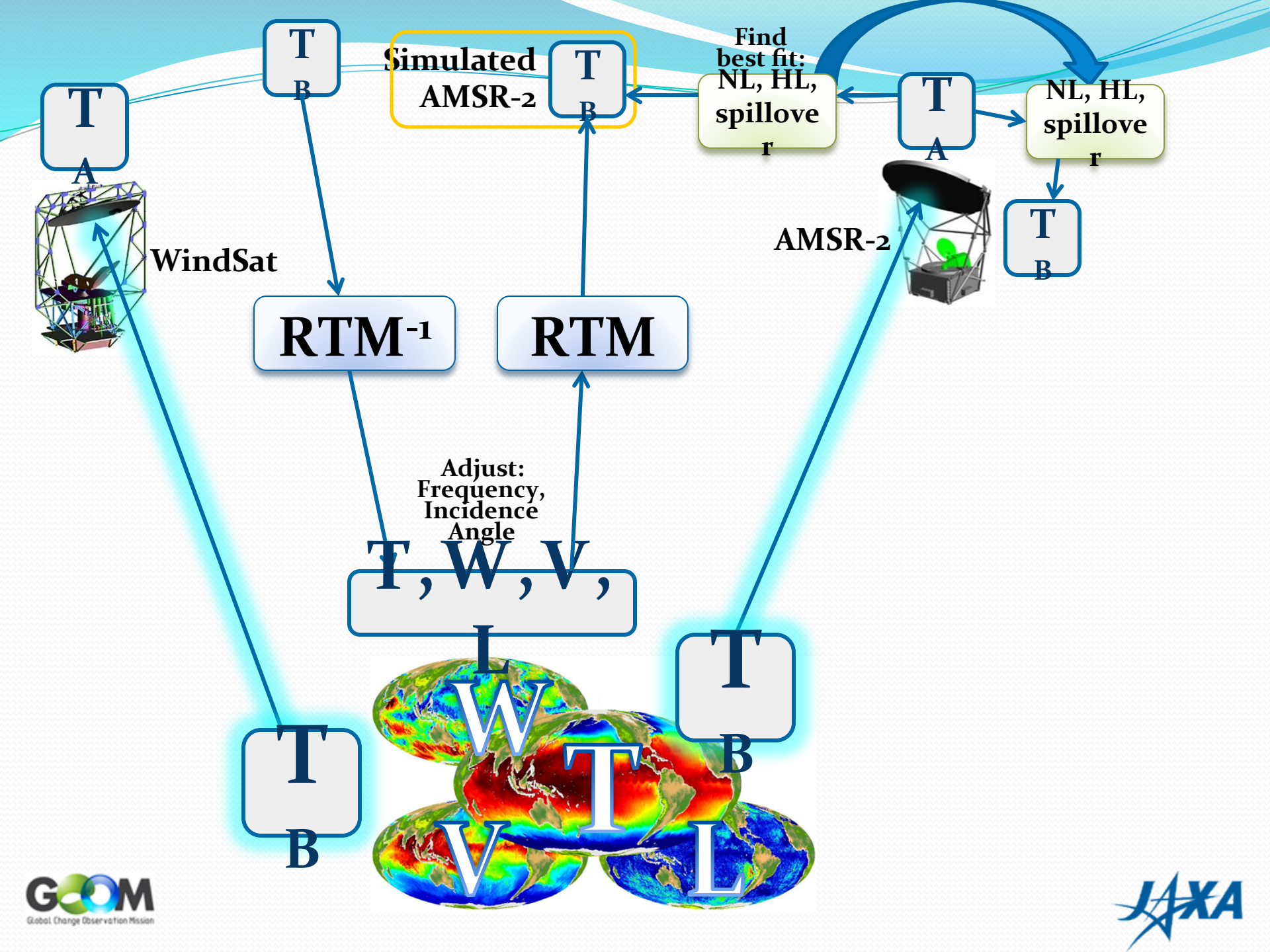
Compare: 'Predicted' to 'Observed'


T A
T B
Simulated AMSR-2
T B
Find best fit:
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T A
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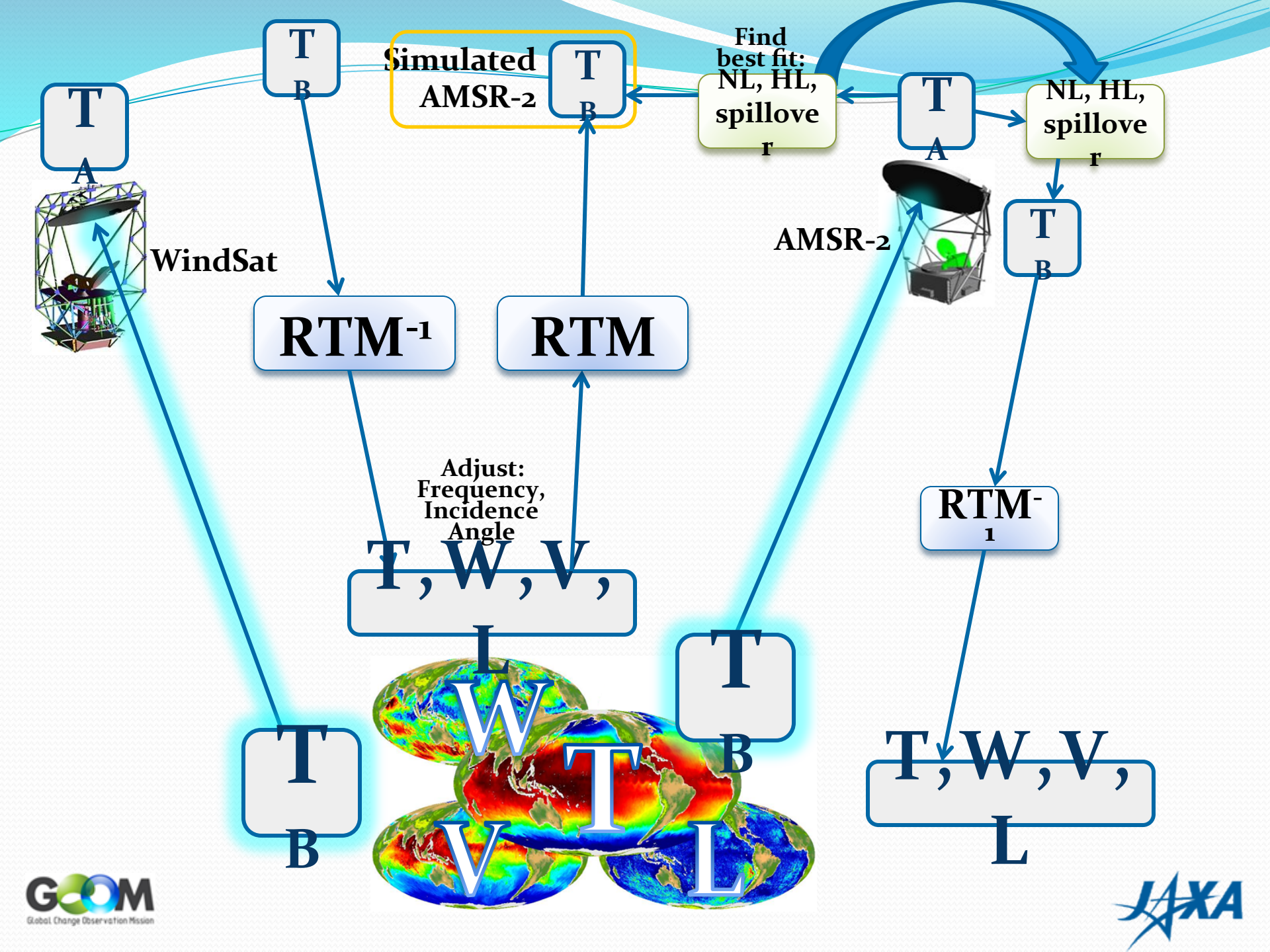
TA
TB
Simulated AMSR-2
TB
Find best fit:
NL, HL, spillover
TA
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TB
WindSat
AMSR-2
RTM-1
RTM
Adjust: Frequency, Incidence Angle
T, W, V, L
TB
TB
RTM-1
T, W, V, L
W
T
V
L

Hot Load Offset and Antenna Spillover Adjustments

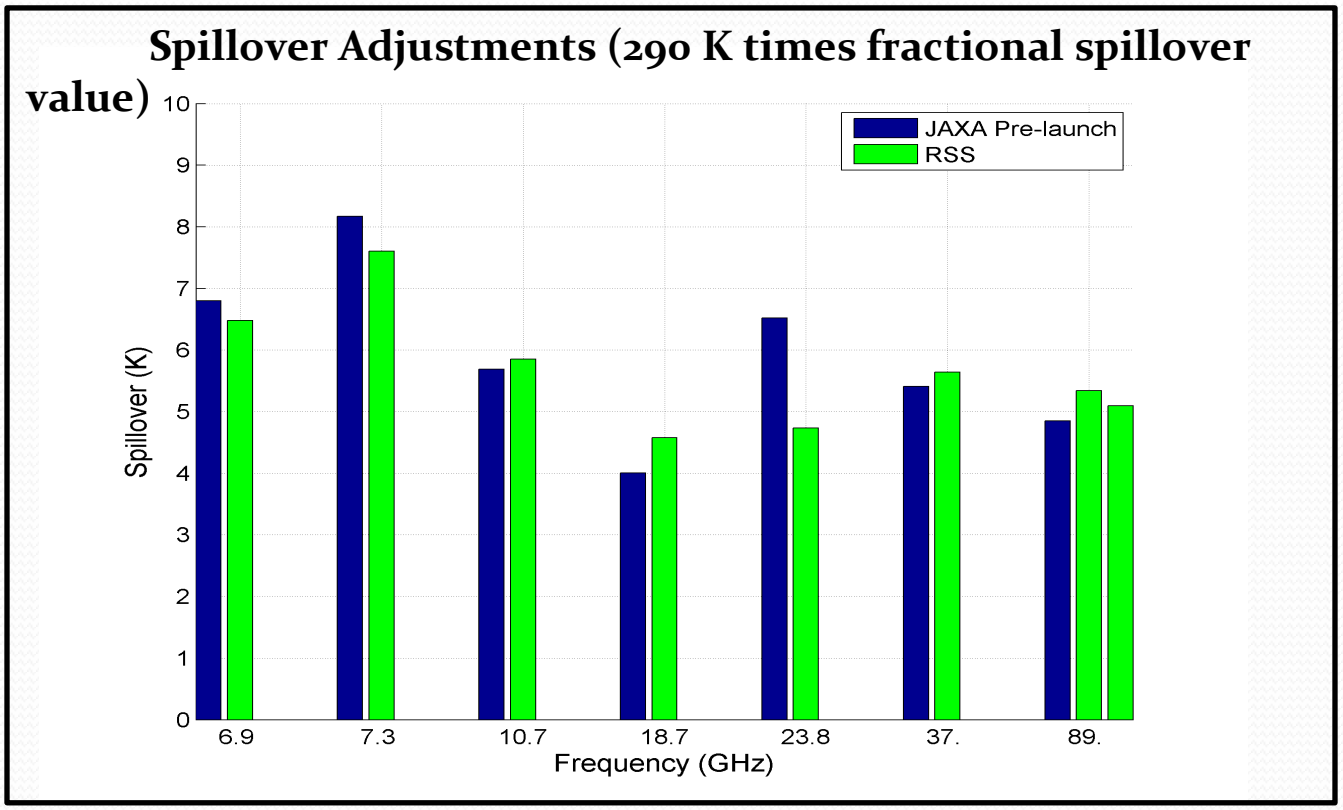
Hot Load Temperature Offset: -1.3 K

Adjustments to the antenna spillover value has the same effect as adding an offset to the hot load temperature.

A single hot load offset for all channels is found that minimizes the required changes to the spillover values.

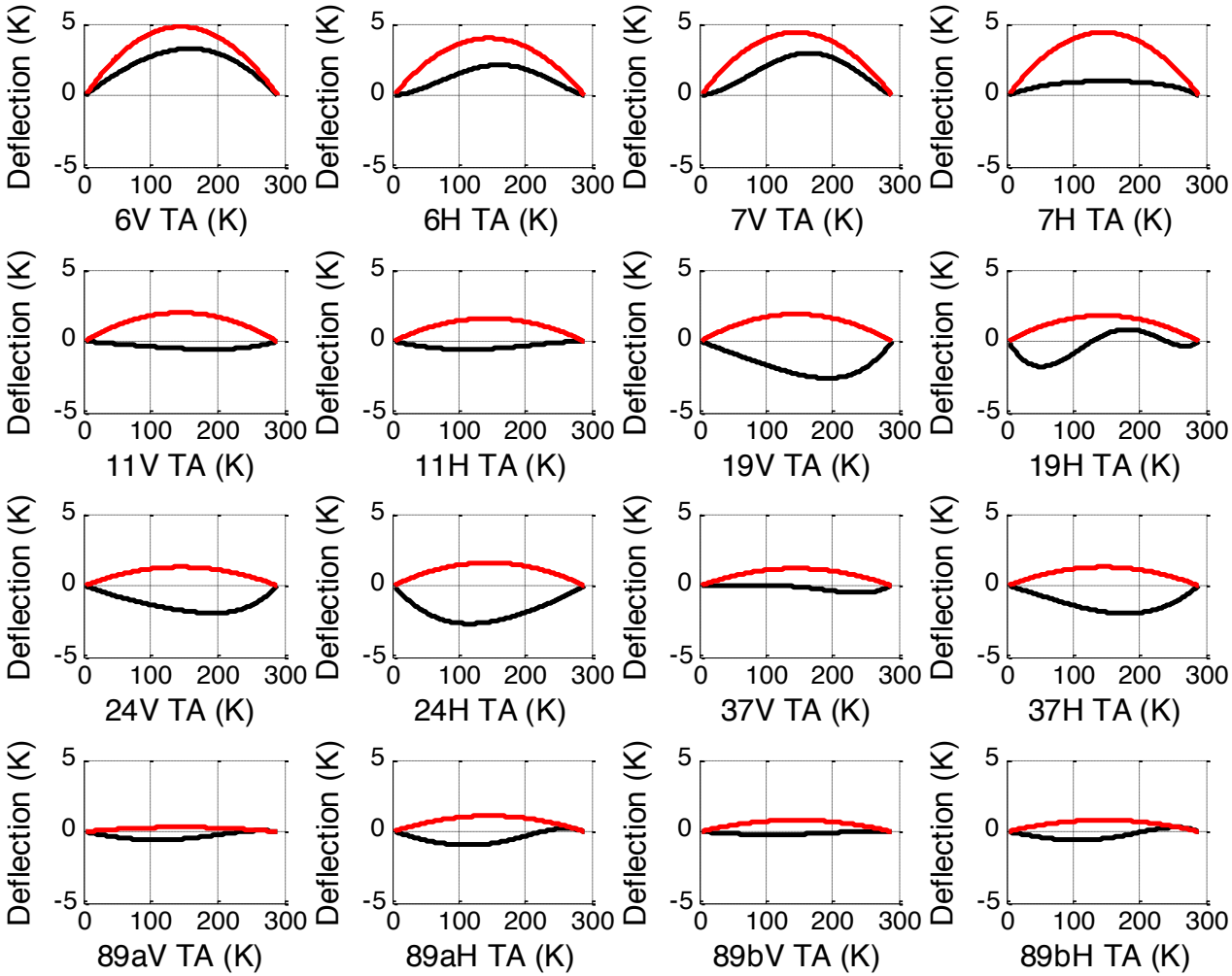
The adjustment for AMSR2 is to subtract 1.3 K from the temperature reported by the hot load thermistors.

This adjustment is consistent with the -1.0 K offset found for previous radiometers



Non-Linear Correction: $\sum_{i=1}^{5} a_i x^i$

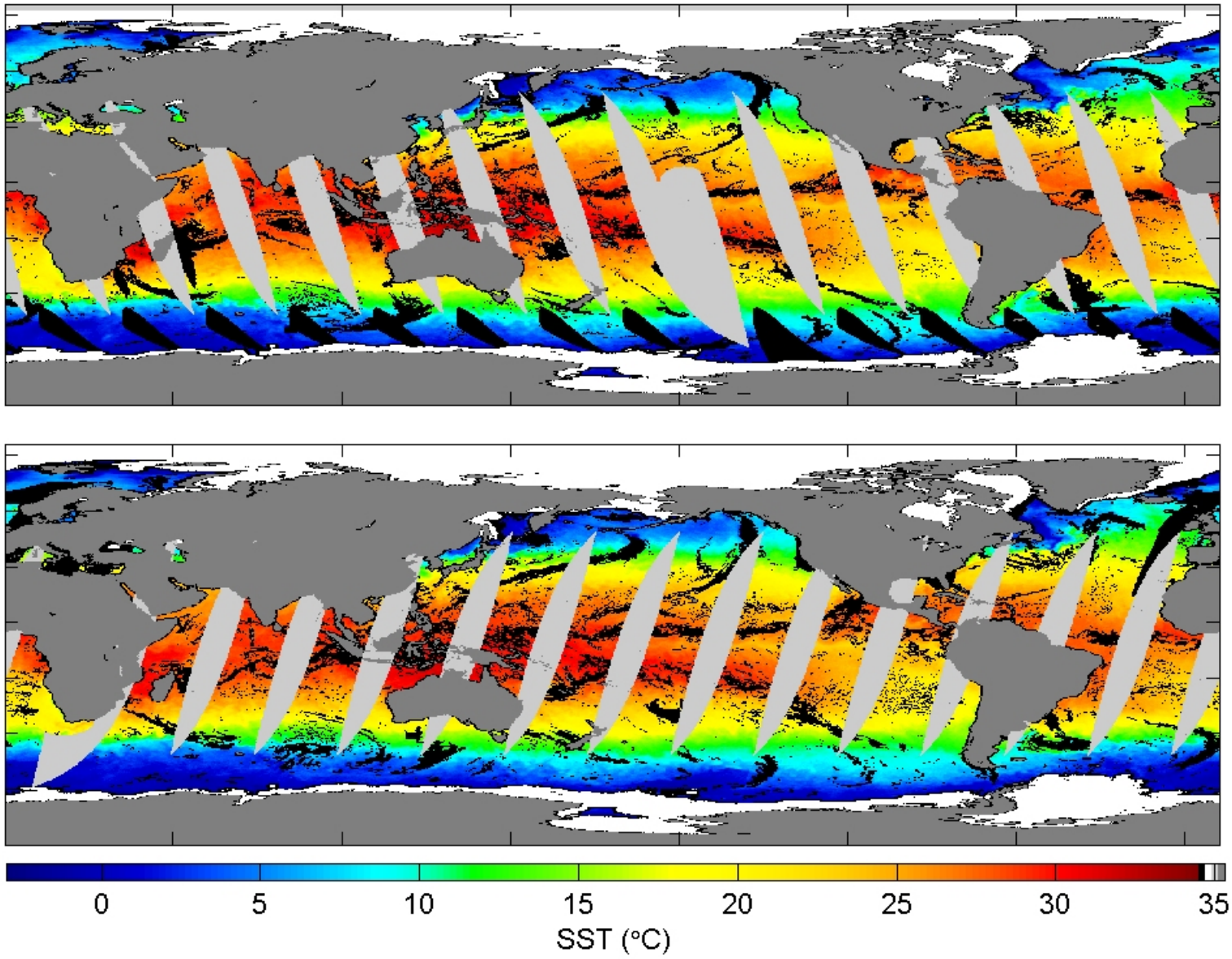
Red Curves are JAXA Non-Linear Correction (Marehito Kasahara 21 Feb 2013 X-Cal presentation)
Black Curves are values coming from our analysis.



RTM based retrieval

- AMSR2 geophysical algorithm is based on RTM simulations
- Only input data is NCEP wind direction
- Independent of buoys, IR SSTs, etc.

AMSR2 SST 1 Jan 2013



In situ dataset

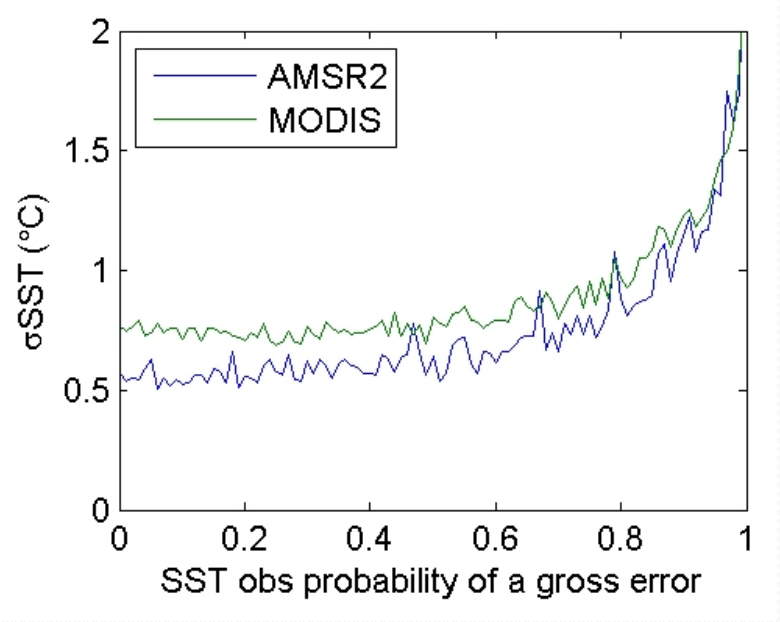
- USGODAE SFCOBS datasets available from USGODAE server in Monterey
- Daily files contain the number of observations followed by the observation date, time, latitude, longitude, SST, probability of a gross error (assumes normal probability density function for SST errors), call sign, and data type (fixed buoy, drifting buoy, ship, etc.)

Methodology

- AMSR2, and in situ data are collocated with each other. All observations must be valid and present. Data must be within 3 hours to be included in dataset

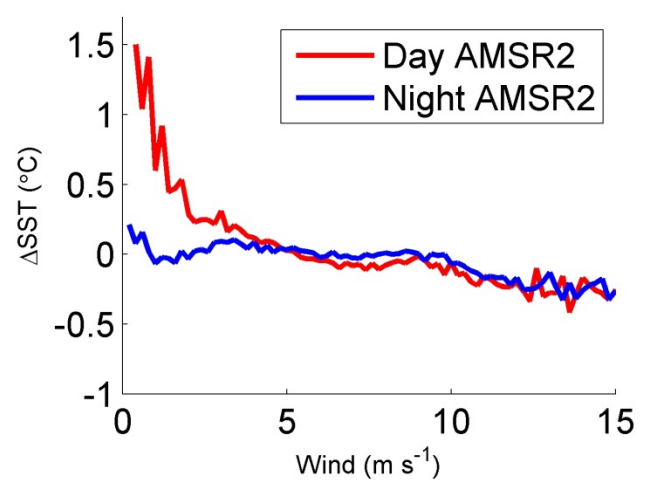
Flagging erroneous in situ

- The in situ database has ‘gross probability of error’ based on a Gaussian distribution of errors, basically a PDF of historical values
- Based on figure, we excluded all collocations with an error > 0.6



Diurnal warming

- Heating of surface layer during day can de-couple sub-skin SSTs from 1 m in situ SSTs
- Looked at day/night dependencies on wind speed and found classic diurnal warming signature in both AMSR-E
- Excluded 10AM-4PM, u<6 m/s



Errors by in situ data type & Day/Night

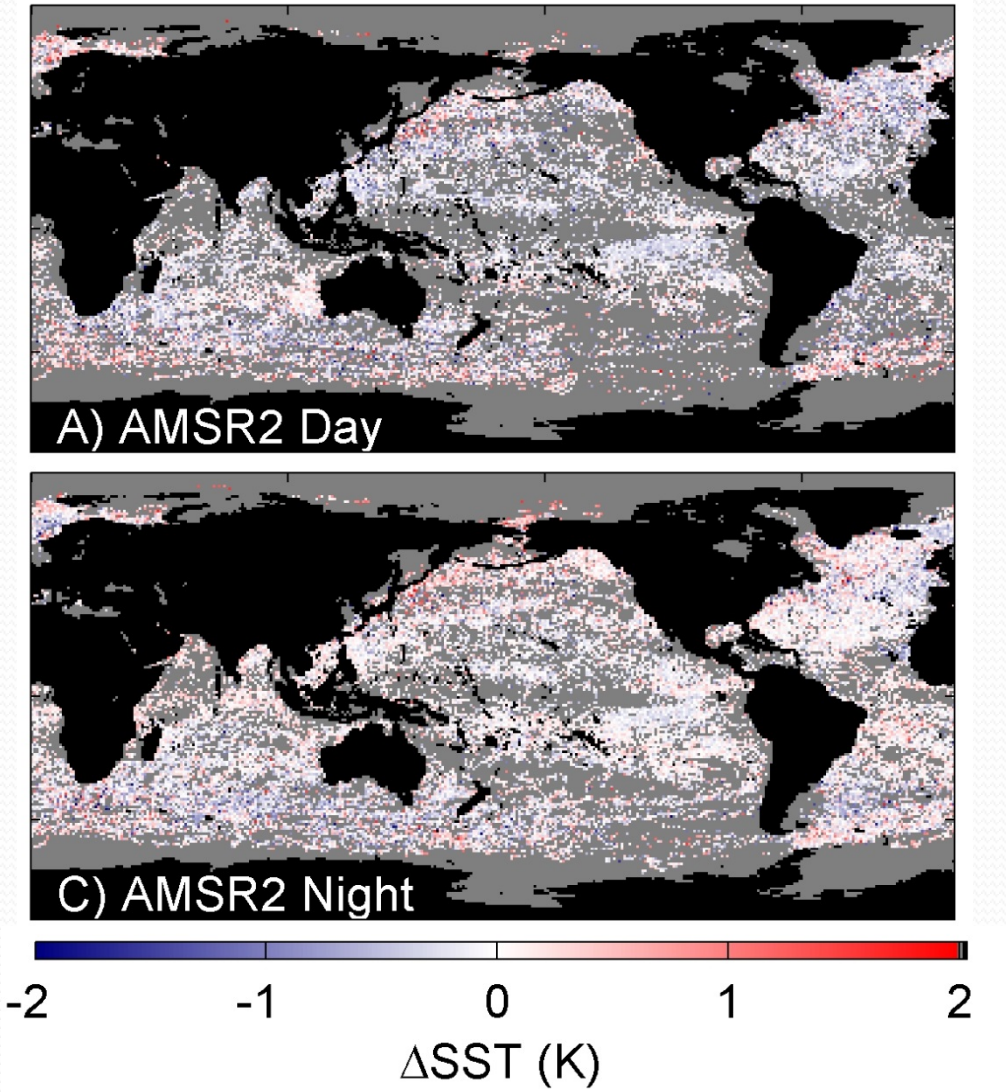
- # collocations per day ~10 for fixed and 112 for drifting

	AMSR2 – in situ		
	bias	σ	#
Ship engine intake	0.18	0.88	2172
Fixed buoy	**-0.02**	**0.57**	**6759**
Drifting buoy	**-0.04**	**0.56**	**83603**
Ship bucket	0.07	0.83	176
Ship hull sensor	0.07	0.72	1964
CMAN	-0.01	1.03	23

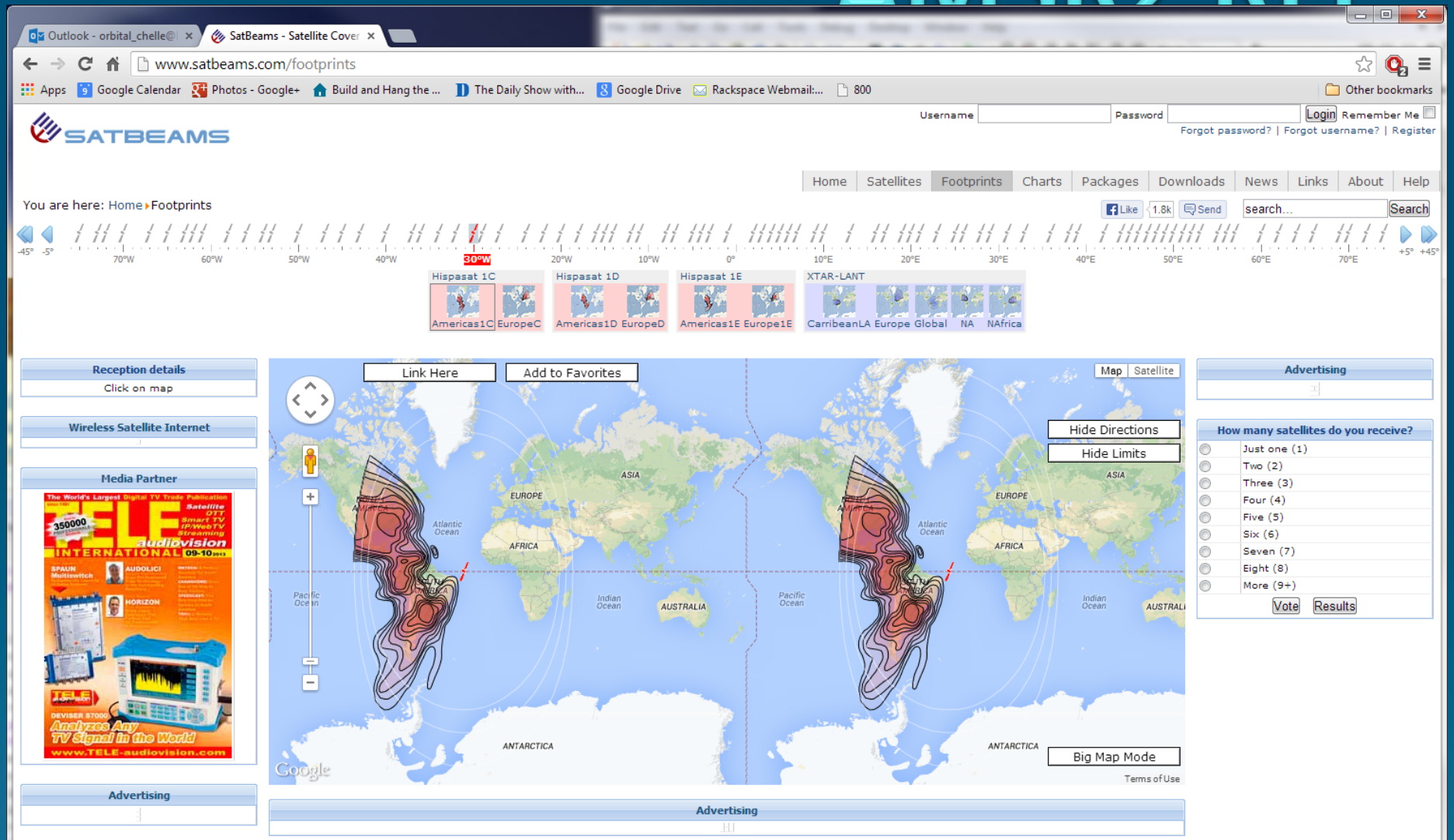
	AMSR2 – buoy		
	Bias	σ	#
Day	-0.07	0.58	35941
Night	-0.01	0.57	58756
All	**-0.04**	**0.56**	**90385**

Global mean bias

- Global mean bias for day and night collocations
- Less biasing in day then night



AMSR2 RFI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Google Calendar
Photos - Google+
Build and Hang the ...
The Daily Show with...
Google Drive
Rackspace Webmail:...
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Forgot password? | Forgot username? | Register
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Footprints
Charts
Packages
Downloads
News
Links
About
Help
You are here: Home ▸ Footprints
Like 1.8k
Send
search...
Search
-45° -5° 70°W 60°W 50°W 40°W 30°W 20°W 10°W 0° 10°E 20°E 30°E 40°E 50°E 60°E 70°E +5° +45°
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Big Map Mode
Terms of Use
EUROPE
ASIA
AFRICA
AUSTRALIA
ANTARCTICA
Atlantic Ocean
Pacific Ocean
Indian Ocean
Google
Advertising
Advertising
How many satellites do you receive?
Just one (1)
Two (2)
Three (3)
Four (4)
Five (5)
Six (6)
Seven (7)
Eight (8)
More (9+)
Vote
Results
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AMSR2 new RFI map

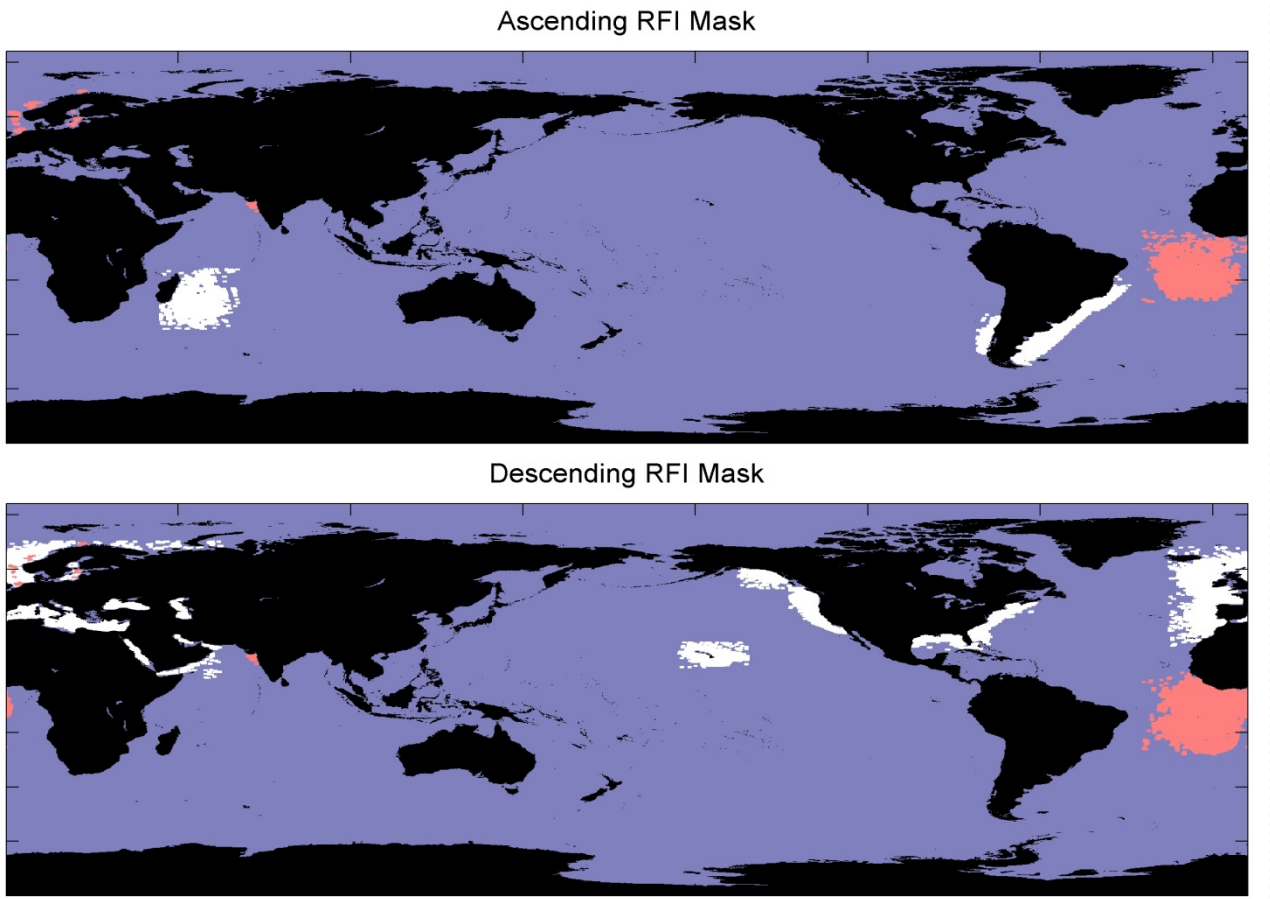
1) Uses reflat and reflon (reflected lat,lon at geostationary altitude)
   a) Can use channel differences for less filtering, or not for more filtering
2) RFI mask: developed by the data, looking at all data, several differences > value, mask, then erode mask into nearby 4 cells. This simply requires running 1 fortran routine and then 1 matlab routine.

- Inputs for rfi subroutine are from a text file that is created from a simple fortran program. New RFI do not require recompilation of the AMSR2 L2 Processor, simply an update to the text file.
- Handles both ground-based and geo-sat based RFI

2) RFI mask

Created from 3 programs

1) X:\chelle\amsr2\rfiamsr2_rfi_orbital.f
   - reads l2b, outputs just info needed for rfi research
2) X:\chelle\amsr2\rfiamsr2_rfi_orbital_step2.f
   - processes data
3) D:\matlab\amsr2\make_rfi_mask_regions.m



Conclusions

- AMSR2 SST data bias -0.06C STD 0.50 C
- Currently working on improved RFI
- Data at www.remss.com
- Email support@remss.com to get on list for announcement of SST data
- GDS 2.0 this month