AMSR2 calibration/characterization

- Performance evaluation and characterization
  - Radiometer sensitivity, gain stability, and parameter optimization.
  - Characterization such as scan biases and RFI condition.
- Radiometric calibration
  - Calibration data quality assessment and prescreening.
  - Deep space calibration maneuver was cancelled to avoid potential RFI damages to receivers.
  - Intercalibration with:
    - Non-sun-synchronous TRMM/TMI, and with polar orbiting radiometers through TMI as a on-orbit transfer radiometer.
    - AMSR-E past records and slow rotation mode data.
    - Polar orbiting radiometers over polar regions.
    - Computed brightness temperatures using global objective analysis data and radiative transfer models.
- Geometric calibration
  - Assessment of geometric errors and determination of geometric calibration coefficients such as sensor alignment offsets.

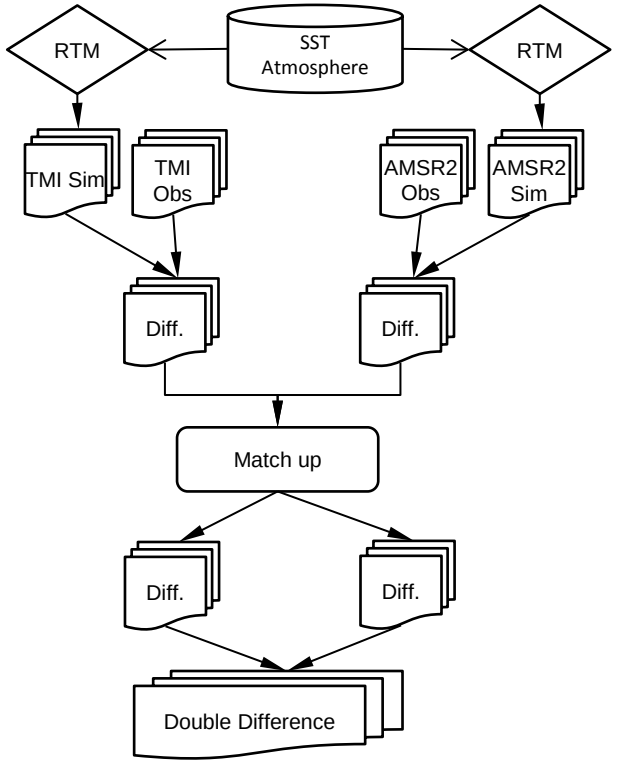
Status of AMSR2 intercalibration

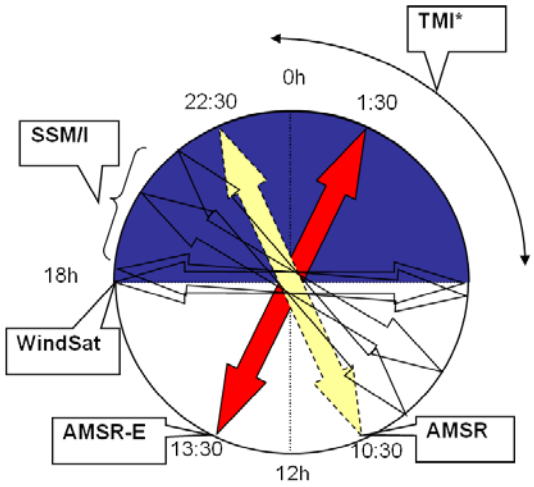
- Brightness temperatures (Tbs) of AMSR2 (Version 1.1) were intercalibrated with those of TMI and AMSR-E.
- Differences were found between the calibration of AMSR2 and TMI/AMSR-E. The differences seem to be Tb-dependent.
- Intercalibration coefficients (slope and intercept) were derived to compensate the calibration differences.

  * Note that these coefficients are just to cancel out calibration differences. Differences originated from instrument's characteristics (e.g., center frequency and incidence angle) should be handled by users.
- Investigation of the causes of the calibration differences are underway.
- Further intercalibrations are in progress, including comparison with polar orbiting radiometers through TMI or by polar region match-ups, and direct comparison with AMSR-E Tbs obtained by slow rotation observation (from December 2012).

TMI intercalibration: Method

- TMI intercalibration
  - Create collocation dataset from AMSR2 and TMI (15 minutes and 0.1 degrees grid).
  - Compute differences between observed- and calculated-Tb (O-C) for both AMSR2 and TMI, over rainforest and cloud-free/calm ocean areas. Global analysis data and RTM are used to derive calculated-Tbs.
  - Further create “double difference” to cancel out the differences in frequency and incidence angle: AMSR2(O-C) – TMI(O-C).

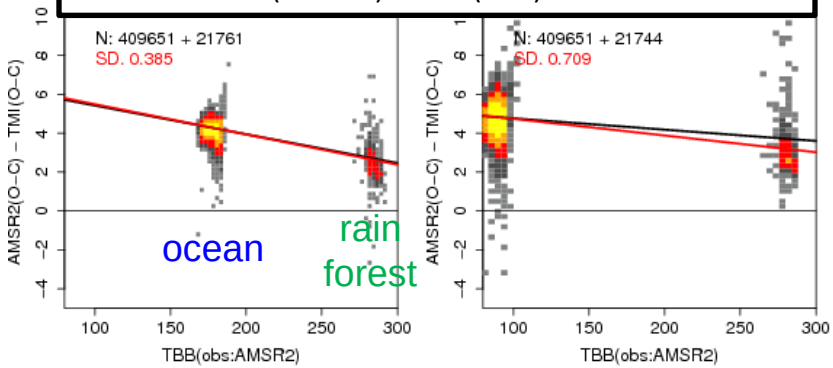




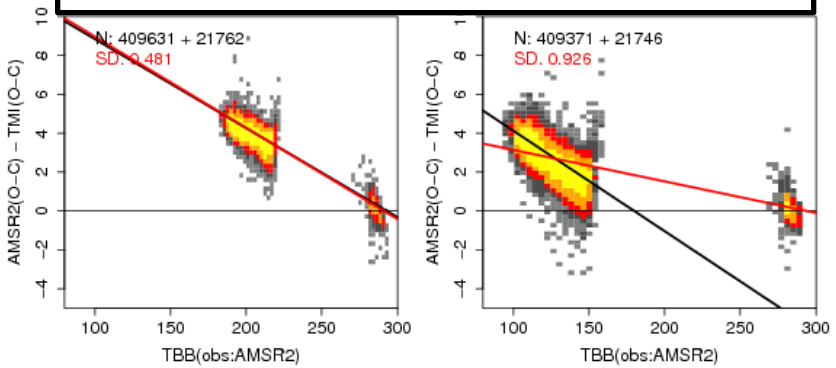
Tb-dependent calibration differences

AMSR2 Ascending Passes

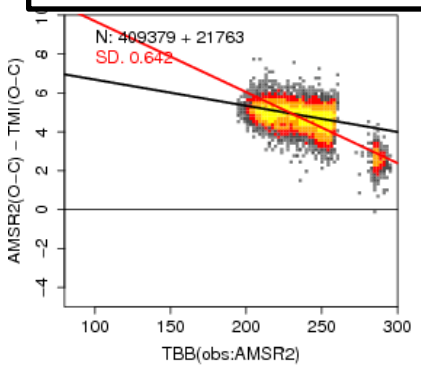
10.6(AMSR2) – 10.7(TMI): V and H



18.7(AMSR2) – 19.4(TMI): V and H



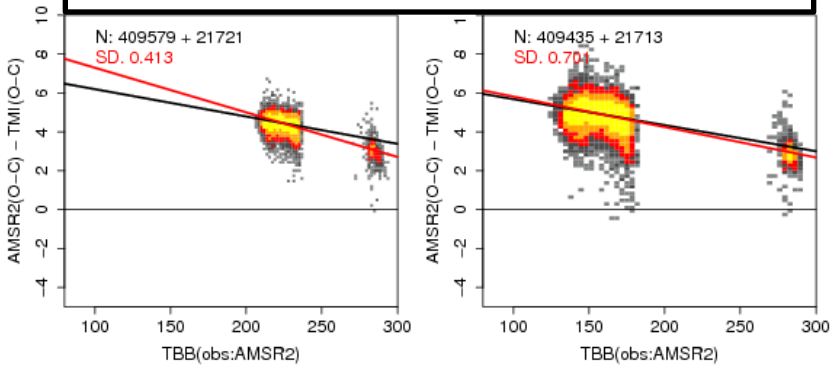
23.8(AMSR2) – 21.3(TMI): V



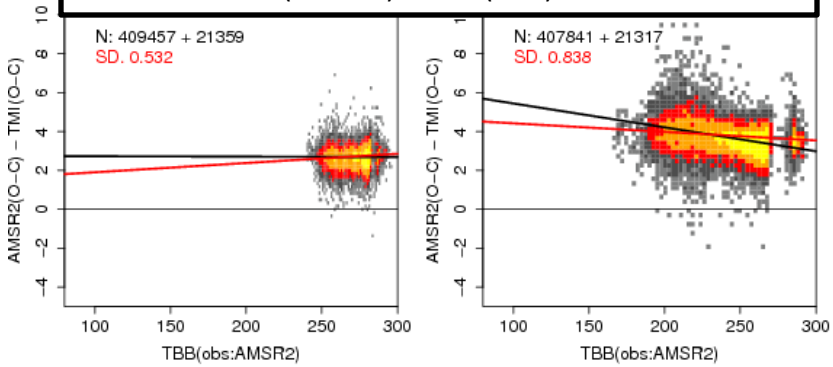
H:23.8(AMSR2) – NA(TMI)

Black: regression line for Tb differences over ocean
Red: regression line for Tb differences over both ocean and rainforests.

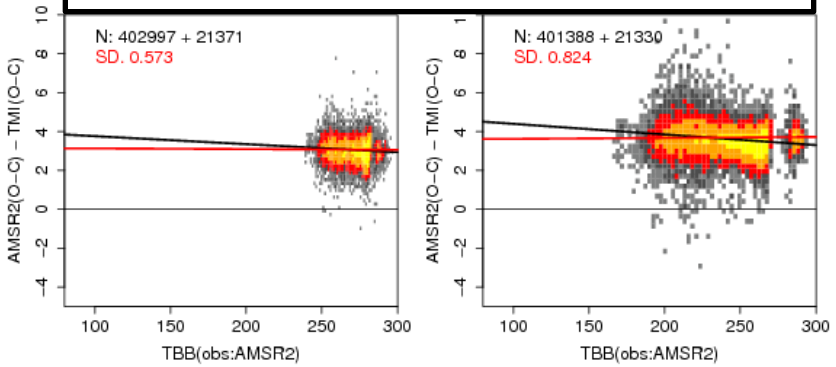
36.5(AMSR2) – 37.0(TMI): V and H



89.0A(AMSR2) – 85.5(TMI): V and H

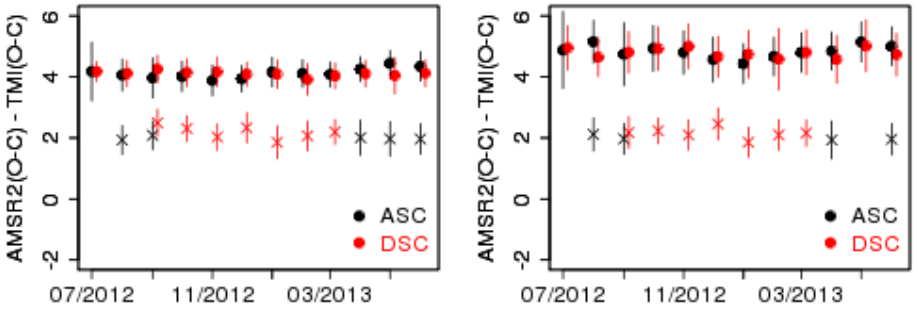


89.0B(AMSR2) – 85.5(TMI): V and H

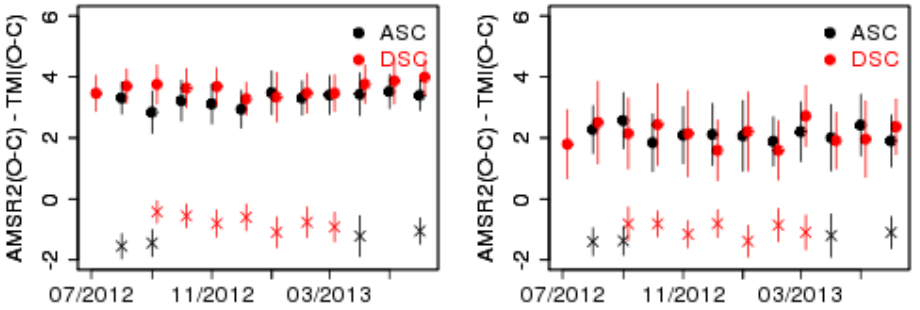


Trend of the calibration differences

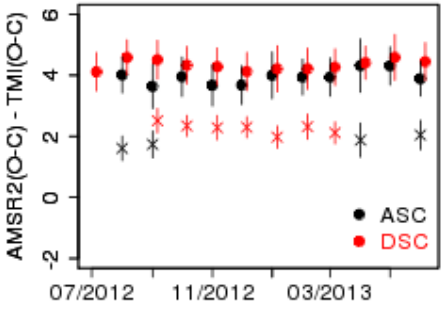
10.6(AMSR2) – 10.7(TMI): V and H



18.7(AMSR2) – 19.4(TMI): V and H

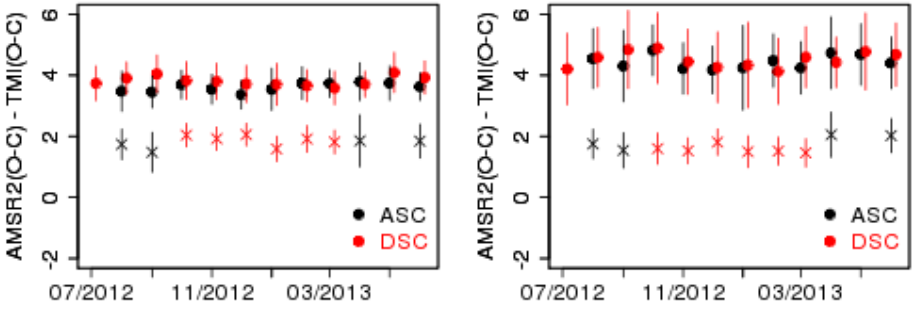


23.8(AMSR2) – 21.3(TMI): V

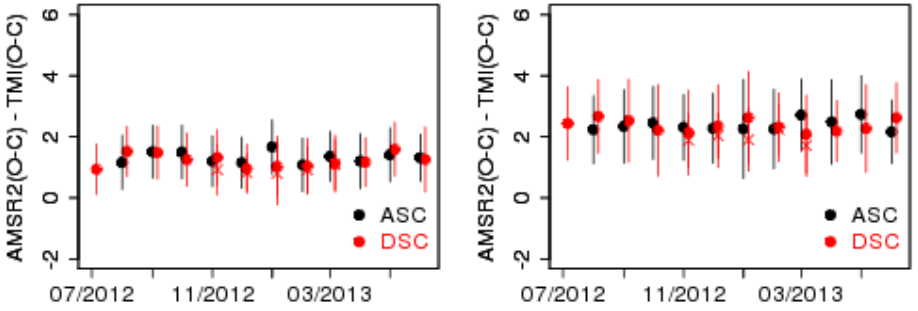


Black: Calibration difference of AMSR2 for ascending orbit.
Red: The calibration difference for descending orbit.
Circle(o): on calm and rain-free ocean area.
Cross(x): on rainforest area.

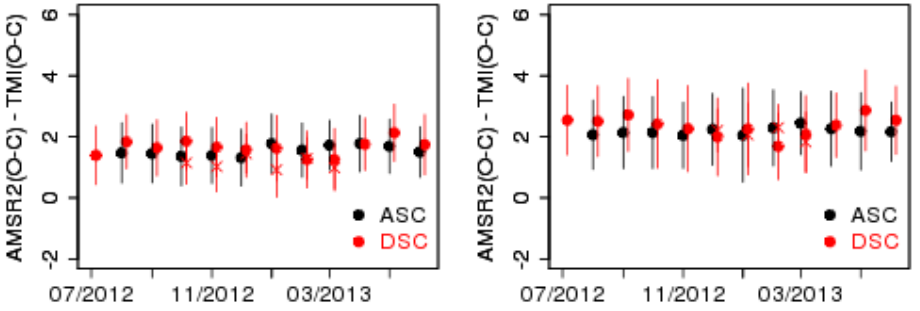
36.5(AMSR2) – 37.0(TMI): V and H



89.0A(AMSR2) – 85.5(TMI): V and H



89.0B(AMSR2) – 85.5(TMI): V and H

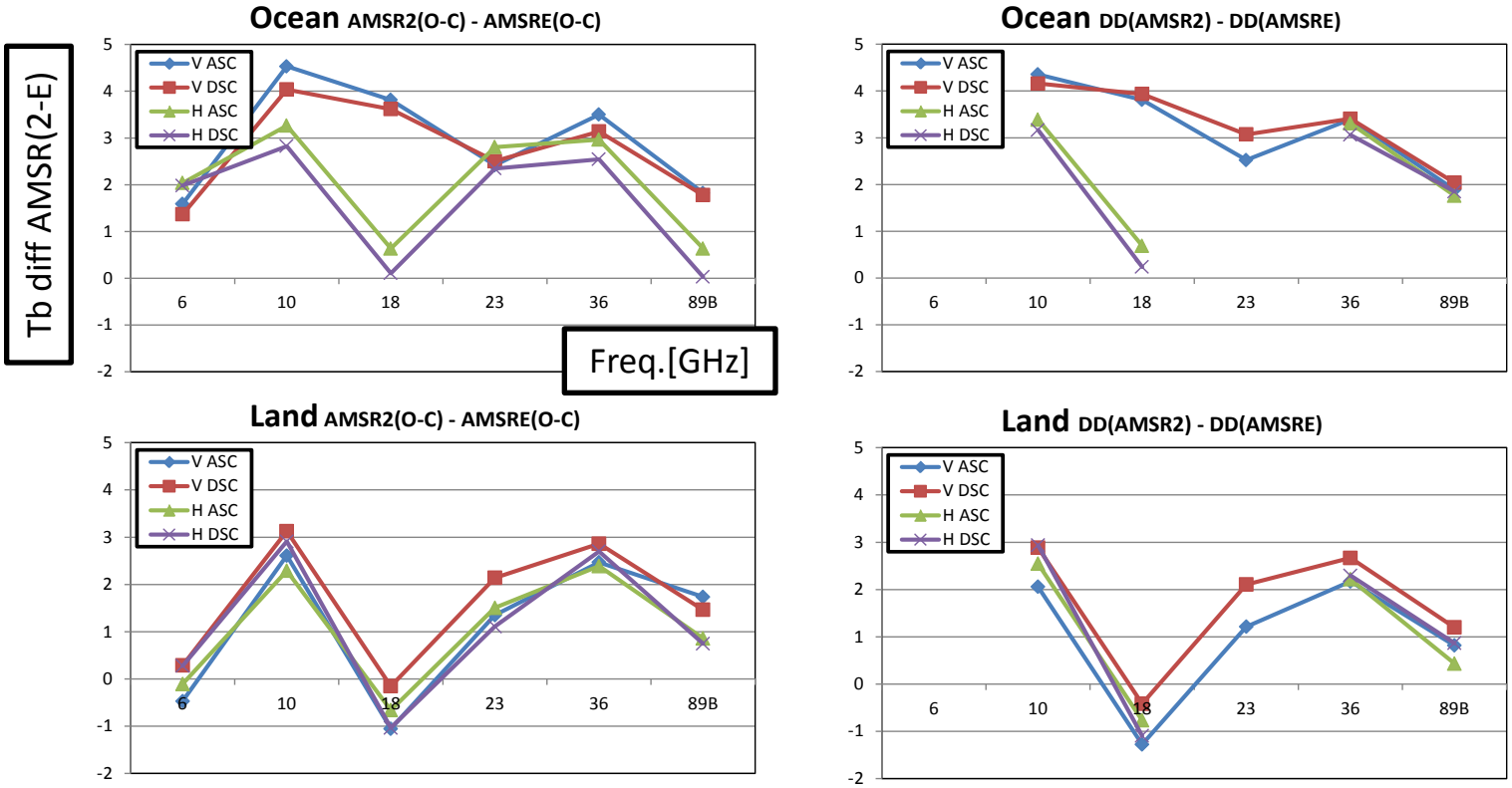


Consistency among methodologies

- Calibration differences between AMSR2 and AMSR-E show (almost) consistent values between two approaches.

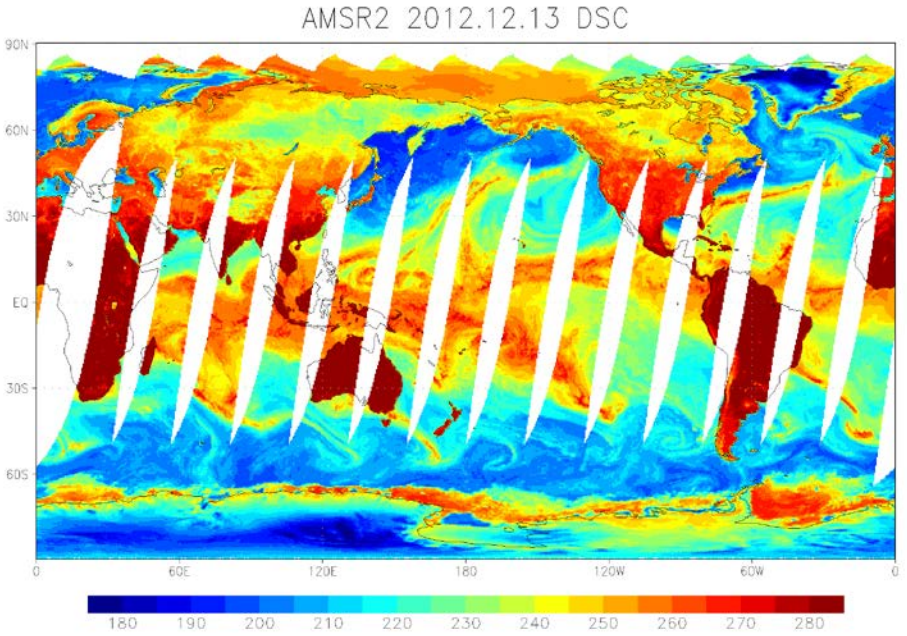
AMSR2 2012(O-C) – AMSRE 2011(O-C)

DD(AMSR2-TMI) – DD(AMSRE-TMI)

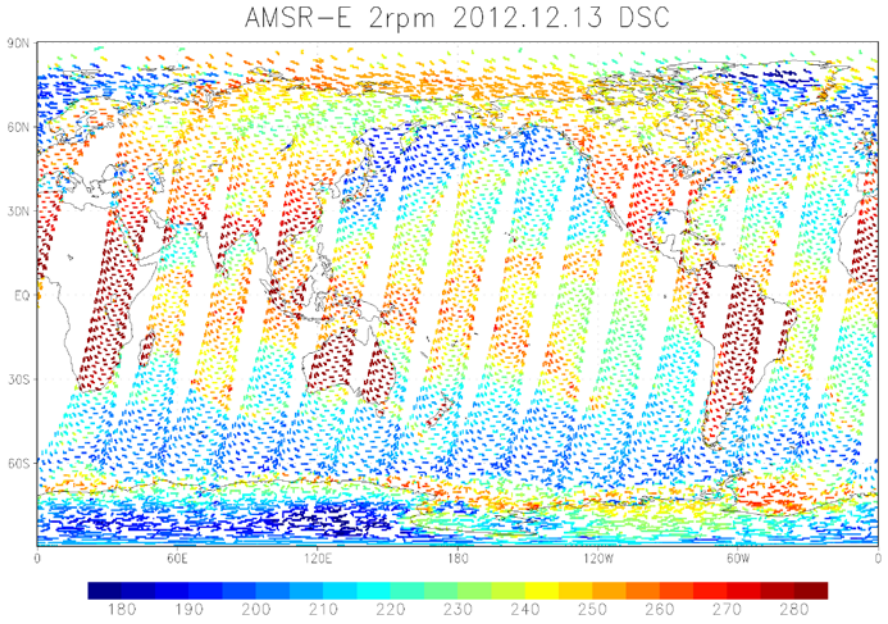


Direct comparison with AMSR-E

- Orbits and frequency channel sets are almost identical: no corrections are needed for center frequency, incidence angle, and observing local time. It enables cross calibration in wide range of Tbs over land, ice, and ocean.
- AMSR-E observations resumed from December 4, 2012 with 2rpm rotation speed. Geolocation and Tbs are computed by modified software.
- Observation is sparse, but reasonable for global-scale comparison.
- Calibration improvement of 2rpm mode data is underway.

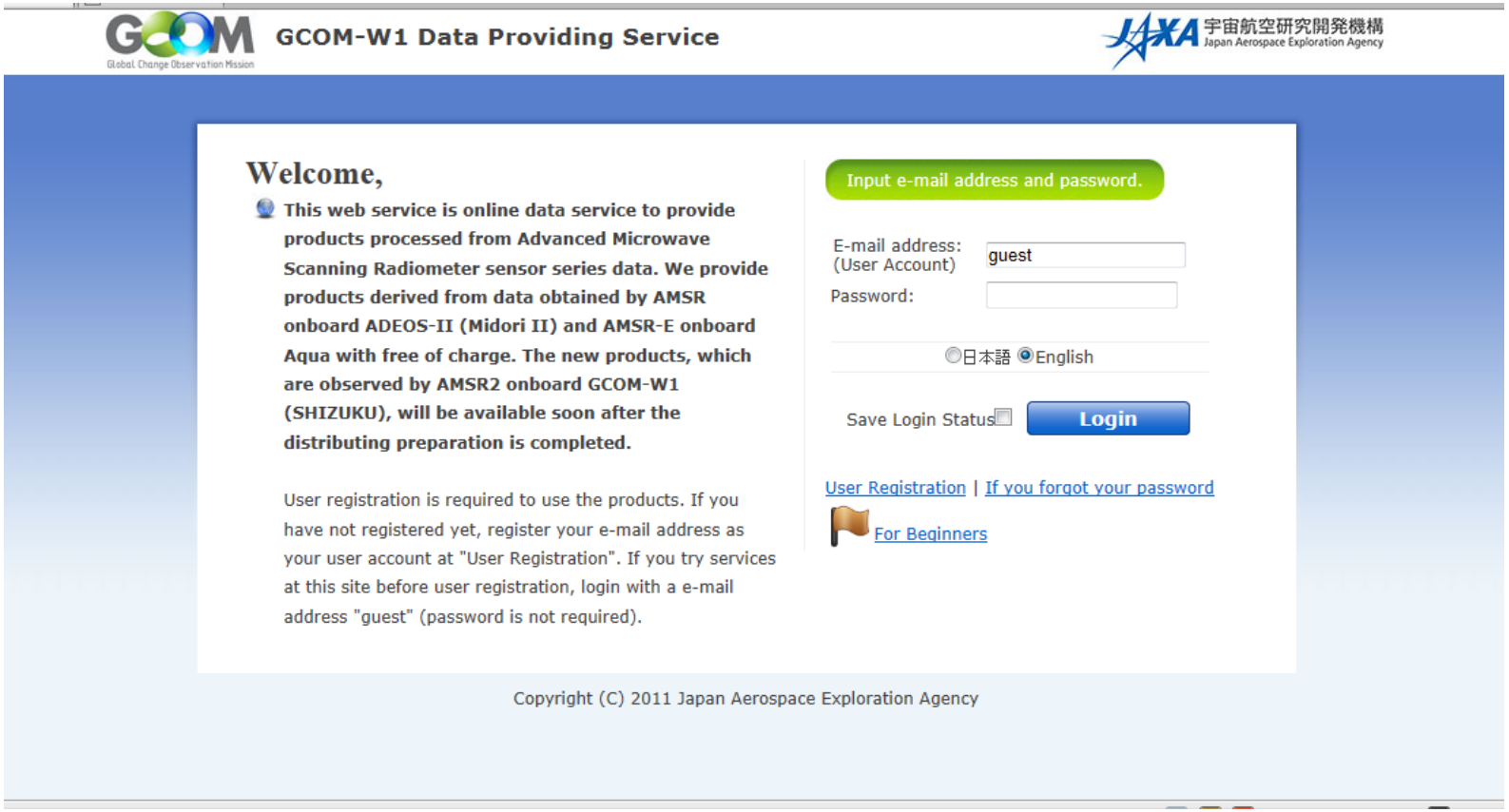


AMSR2 23V Descending



AMSR-E 2rpm 23V Descending

GCOM-W1 Data Providing Service



- **https://gcom-w1.jaxa.jp/**
- Standard products of AMSR2, AMSR-E, and AMSR.
- AMSR2 brightness temperatures and geophysical parameters were already released in January and May 2013, respectively.

Backup Slides

AMSR2 instrument

- ✓Successor of AMSR-E on Aqua and AMSR on ADEOS-II.
- ✓Deployable main reflector system with 2.0m diameter (1.6m for AMSR-E).
- ✓Frequency channel set is identical to that of AMSR-E except 7.3GHz channel for RFI mitigation.
- ✓Two-point external calibration with improved HTS (hot-load).
- ✓Add a redundant momentum wheel to increase reliability.

GCOM-W1/AMSR2 characteristics	
Scan and rate	Conical scan at 40 rpm
Antenna	Offset parabola with 2.0m dia.
Swath width	1450km (effective > 1600km)
Incidence angle	Nominal 55 degrees
Digitization	12bits
Dynamic range	2.7-340K
Polarization	Vertical and horizontal

AMSR2 Channel Set				
Center Freq. [GHz]	Band width [MHz]	Pol.	Beam width [deg] (Ground res. [km])	Sampling interval [km]
6.925/ 7.3	350	V and H	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