Status of AMSR2 Level-2 Products (Algorithm Ver. 2.00)

Japan Aerospace Exploration Agency
Earth Observation Research Center

March 25, 2015

Contents

These geophysical products in version 2.0 have the same caveats as those in version 1.0. Please check the following file:

http://suzaku.eorc.jaxa.jp/GCOM_W/materials/product/AMSR2_L2.pdf.

1. Total Precipitable Water

- Principal Investigator
  - Masahiro Kazumori (Numerical Prediction Division, Japan Meteorological Agency)
- Update Highlights
  - Smoothing between the highest T850 table column and other column in the look up table (T850, transmittance to mean emission temperature).
  - Update the look up table (Precipitable Water Index (PWI) to Total Precipitable Water (TPW)) based on relationship between GPS TPW and AMSR2 PWI.
- Improvement Highlights
  - Reductions of discontinuity in retrieved TPW field.
  - Improvements in low and high TPW range against radio sonde (RAOB) and GPS TPW.
- Validation Method
  - Comparison of AMSR2 TPW with RAOB temperature and humidity profiles and GPS TPW over the global ocean, and evaluation of root-mean-square-error (RMSE) of instantaneous values in 15 km spatial resolution.

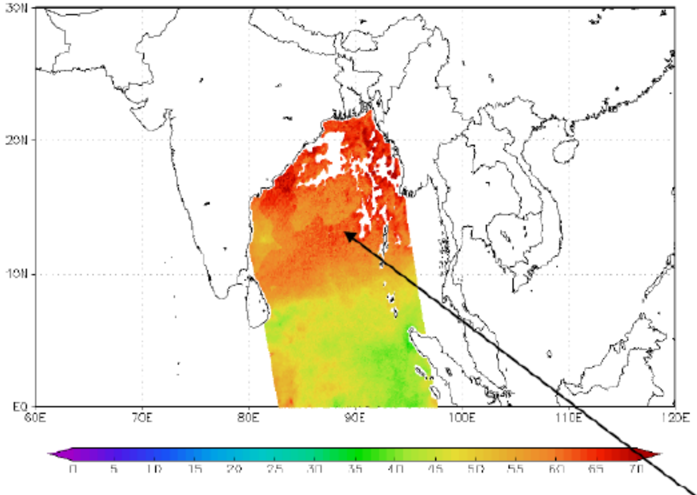
1. Total Precipitable Water

- Validation Data and Matchup Condition
  - Matchup AMSR2 and RAOB data included in JMA GTS with time difference within 1 hour and distance less than 30 km.
  - Matchup AMSR2 and GPS TPW with time difference within 5 minutes and distance less than 30 km.
- Validation Period
  - From July 24, 2012 to September 30, 2014.

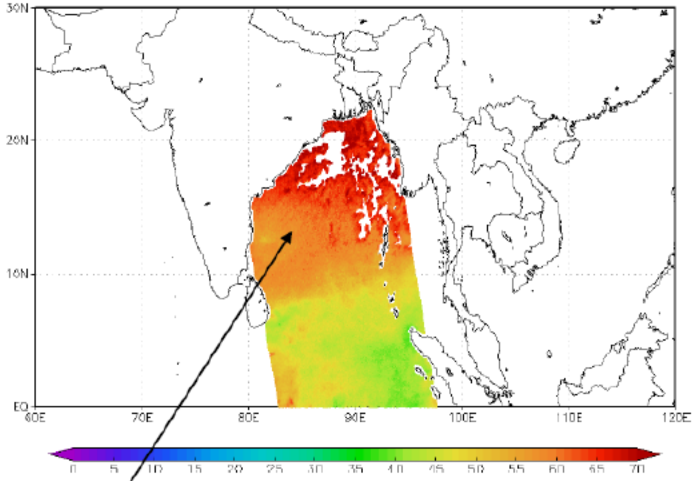
1. Total Precipitable Water

- ## Validation Results

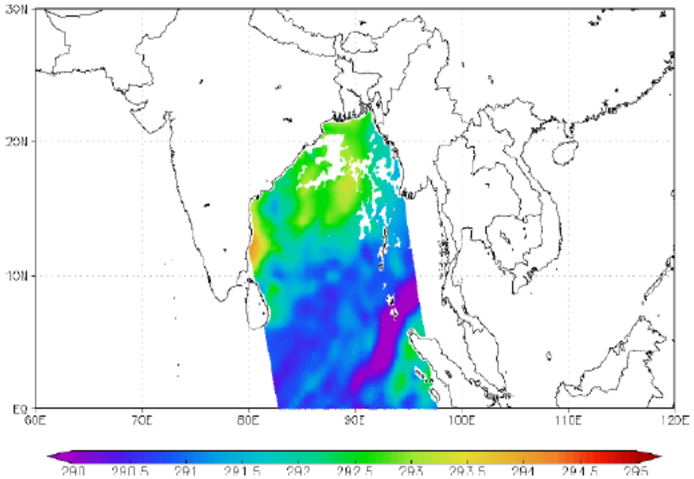
Current Ver.



New Ver.



T850



In high temperature scene, current algorithm has discontinuity in retrieved TPW field. This is due to an issue in LUT for conversion from Temperature at 850 hPa, AMSR2 channels' atmospheric transmittance to mean atmospheric temperature.

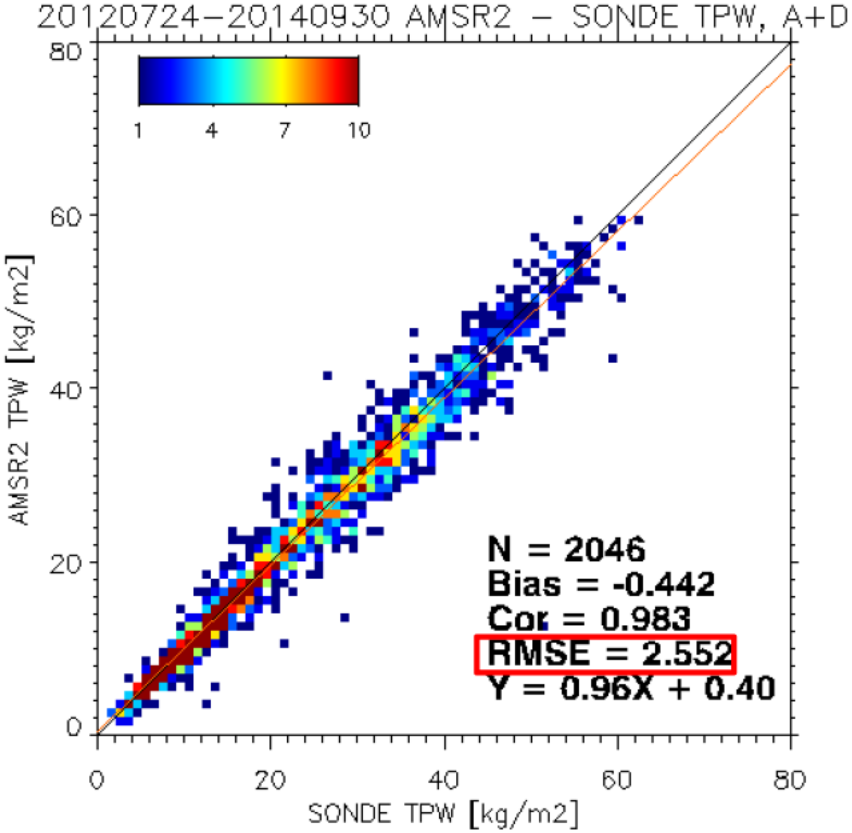
Updated LUT can produce improved TPW field.

1. Total Precipitable Water

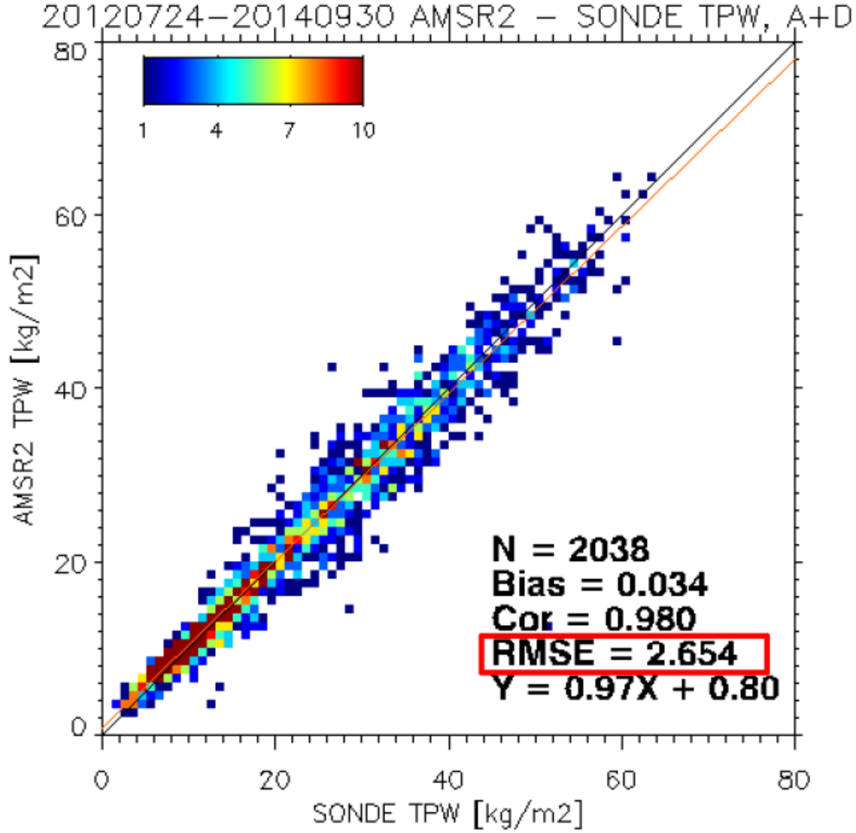
GCOM-W1
Global Change Observation Mission 1st-Water

- Validation Results (Comparison with Radio Sonde)

New version (v2.0)
Ascending + Descending



Current version (v1.0)
Ascending + Descending

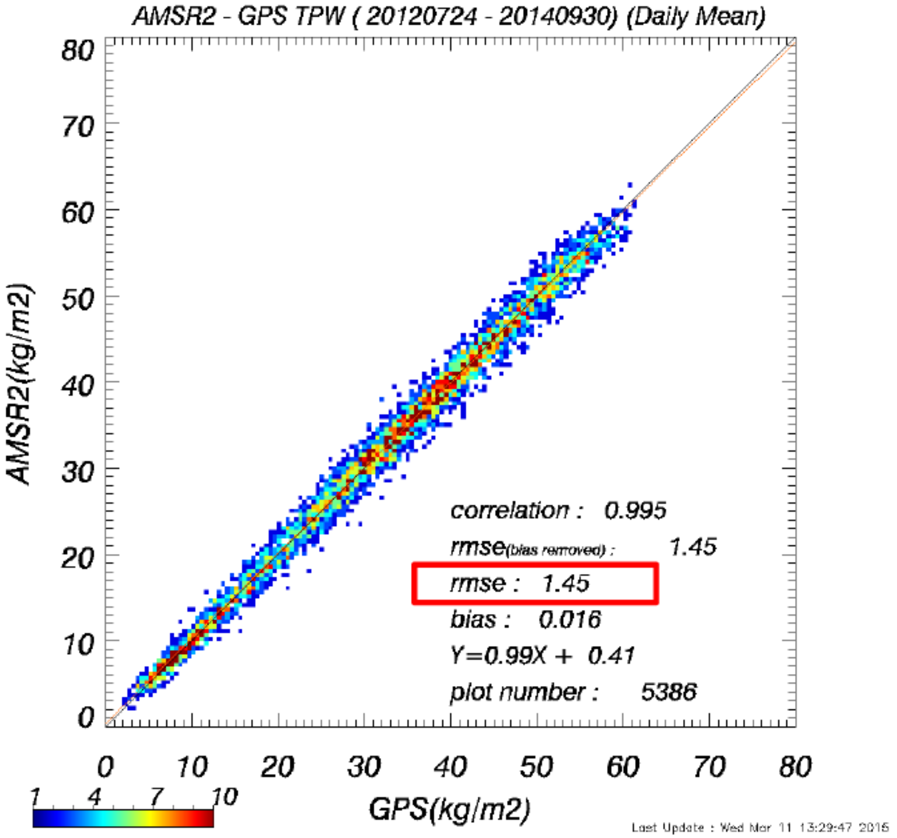


Validation results (V2/V1)	Release and standard accuracy
V2: 2.52 kg/m^2 / V1: 2.65 kg/m^2	3.6 kg/m^2

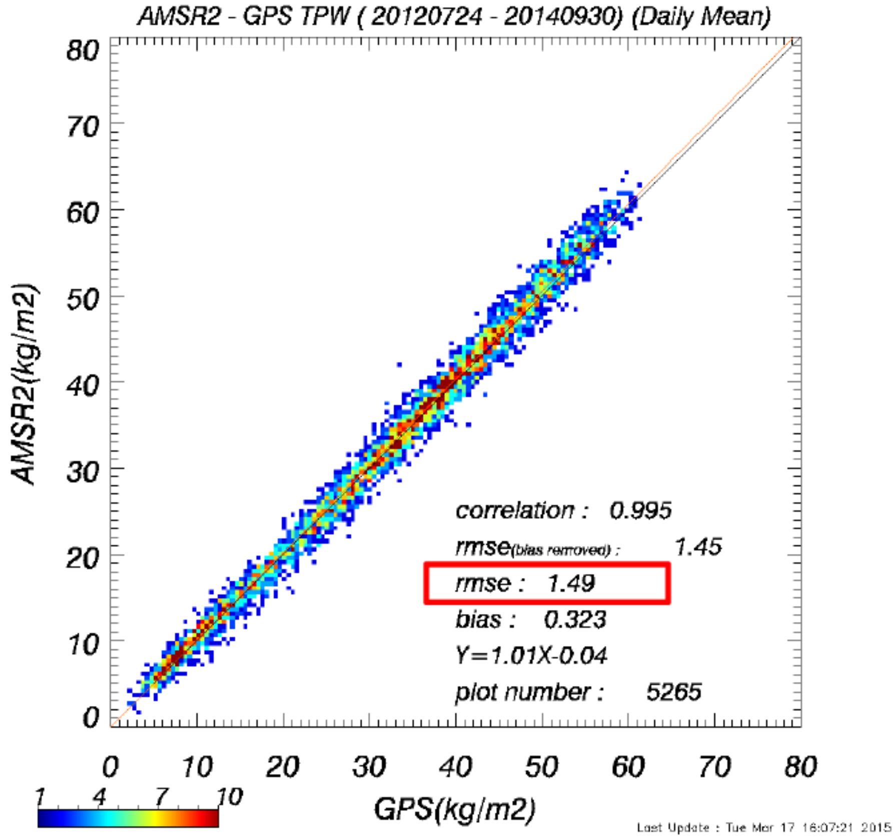
1. Total Precipitable Water

- Validation Results (Comparison with GPS)

New version (v2.0)
Ascending + Descending



Current version (v1.0)
Ascending + Descending



Validation results (V2/V1)	Release and standard accuracy
V2: 1.45 kg/m^2 / V1: 1.49 kg/m^2	3.6 kg/m^2

1. Total Precipitable Water

- Conclusion
  - RMSE compared with RAOB data is 2.6 kg/m^2.
  - RMSE compared with GPS TPW is 1.5 kg/m^2 .
  - Retrieved accuracy is improved compared to current version.
  - Both validation results showed less RMSE than standard accuracy of 3.5 kg/m^2, especially, RMSE compared with GPS TPW, which enable to matchup with AMSR2 in shorter time differences, achieved target accuracy of 2.0kg/m^2.
- Future Works
  - Comparison with other AMSR2 total precipitable water products provided by other agencies, such as RSS, NOAA/NESDIS, etc.
  - Applying this algorithm to other microwave imagers, such as GMI, SSMIS, etc.

2. Cloud Liquid Water

- Principal Investigator
  - Masahiro Kazumori (Numerical Prediction Division, Japan Meteorological Agency)
- Update Highlights
  - Smoothing between the highest T850 table column and other column in the look up table (T850, transmittance to mean emission temperature).
  - Update the look up table (PWI to TPW) based on relationship between GPS TPW and AMSR2 PWI, and improve Cloud Liquid Water (CLW) accuracy.
  - Empirical correction of water vapor effect on CLW.
- Improvement Highlights
  - Error reduction in other geophysical parameter dependence.
- Validation Method
  - Evaluation of CLW errors as variation of microwave radiometer observation over the clear sky areas. AMSR2 CLW is compared with clear sky information (cloud flag information) obtained from optical imagers on board the other satellites using probability density functions (PDFs).

2. Cloud Liquid Water

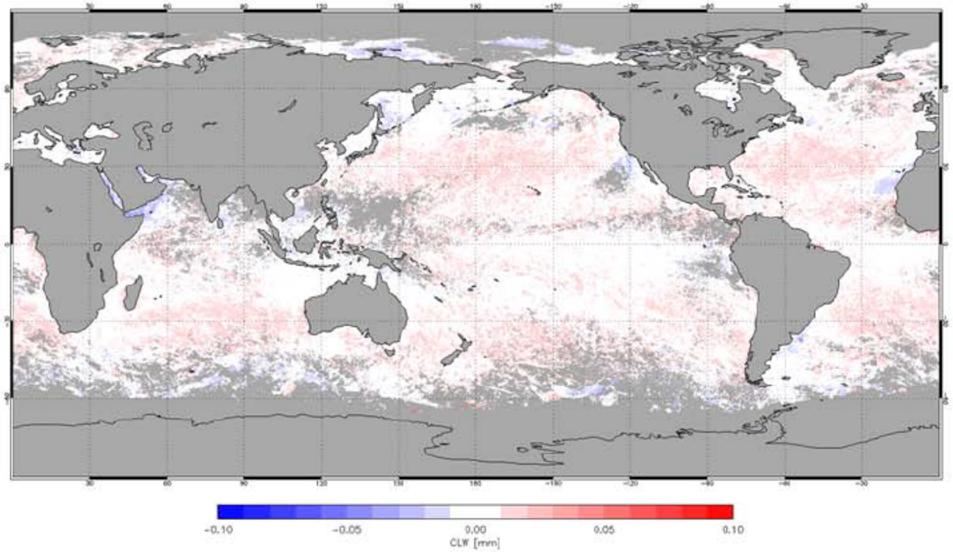
- Validation Data and Matchup Condition
  - Detection of clear sky areas by using MODIS cloud flag data, and calculation of monthly biases and noises (standard deviation) from the probability density functions (PDFs).
  - Evaluation of CLW total error, including geophysical parameter dependency, as linear sum of the biggest noise (worst standard deviation) and bias (worst bias) over clear sky areas.
  - Those errors were also evaluated for various environmental conditions such as under different SST, sea surface wind speed, and TPW observed by AMSR2.
- Validation Period
  - From August 1, 2012 to September 30, 2014.

2. Cloud Liquid Water

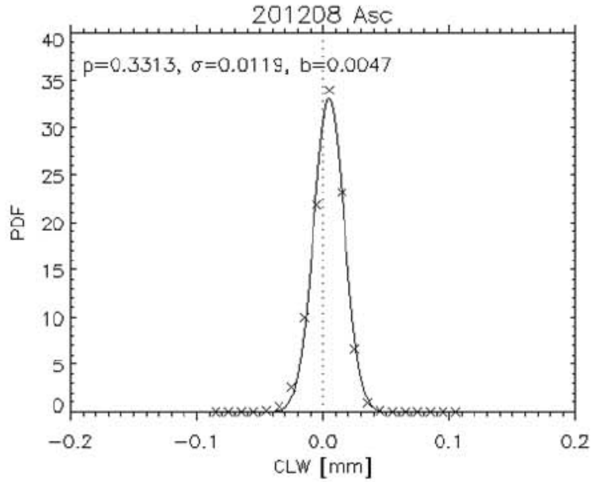
GCOM-W1
Global Change Observation Mission 1st-Water

- Validation Results (New version (v2.0))

AMSR2 CLW over clear sky areas (August 2012)

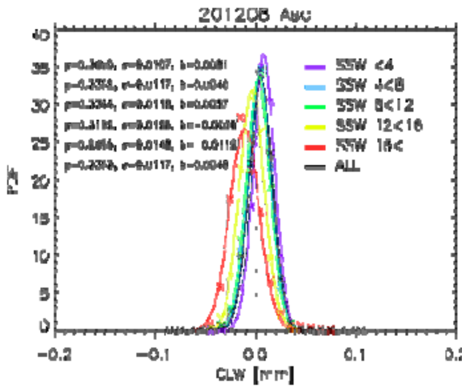


CLW PDF over clear sky areas (August 2012)

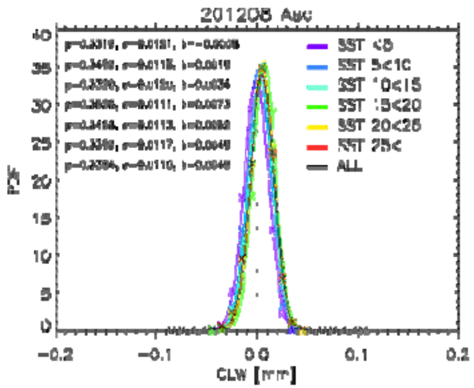


CLW PDF for various environmental conditions (August 2012)

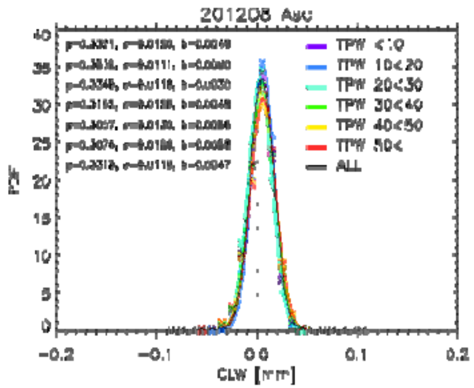
SSW dependency



SST dependency



TPW dependency

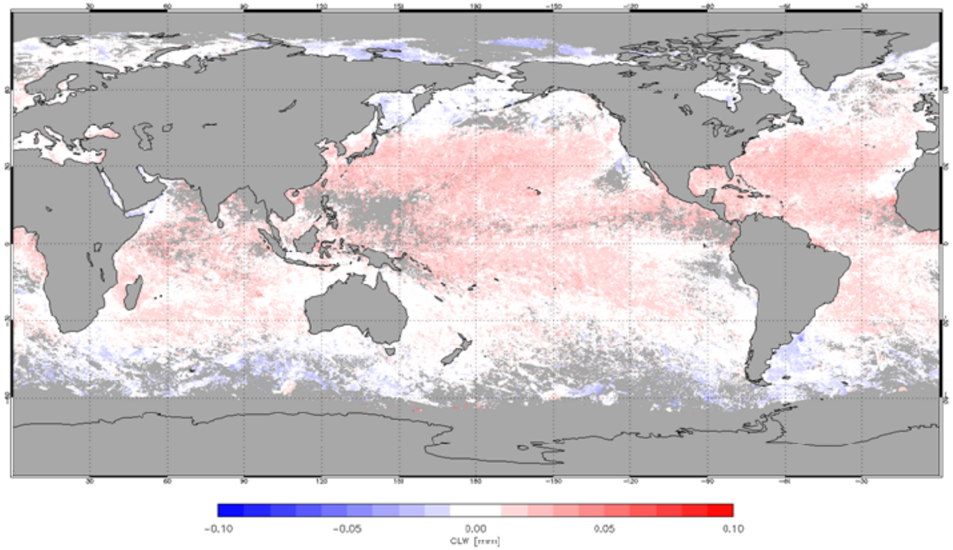


2. Cloud Liquid Water

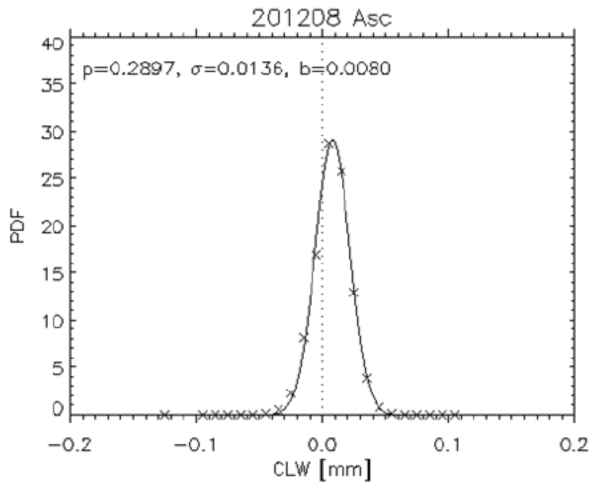
GCOM-W1
Global Change Observation Mission 1st-Water

- Validation Results (Current version (v1.0))

AMSR2 CLW over clear sky areas (August 2012)

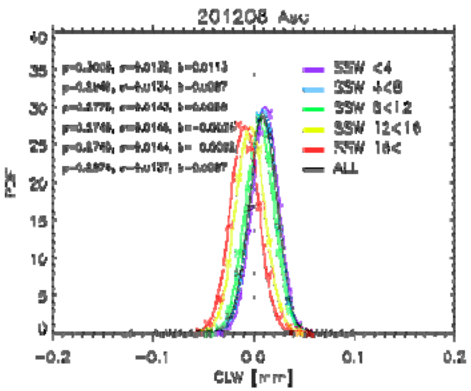


CLW PDF over clear sky areas (August 2012)

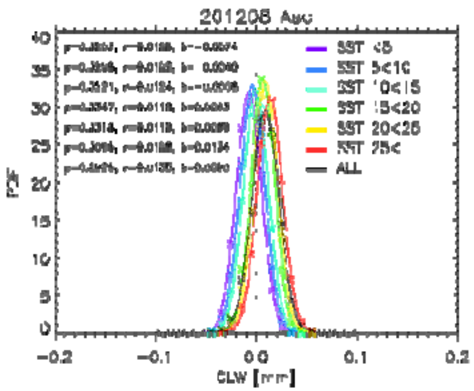


CLW PDF for various environmental conditions (August 2012)

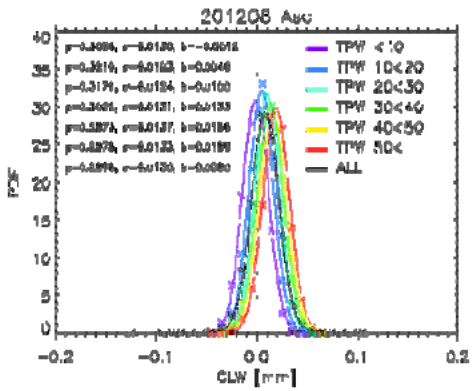
SSW dependency



SST dependency



TPW dependency

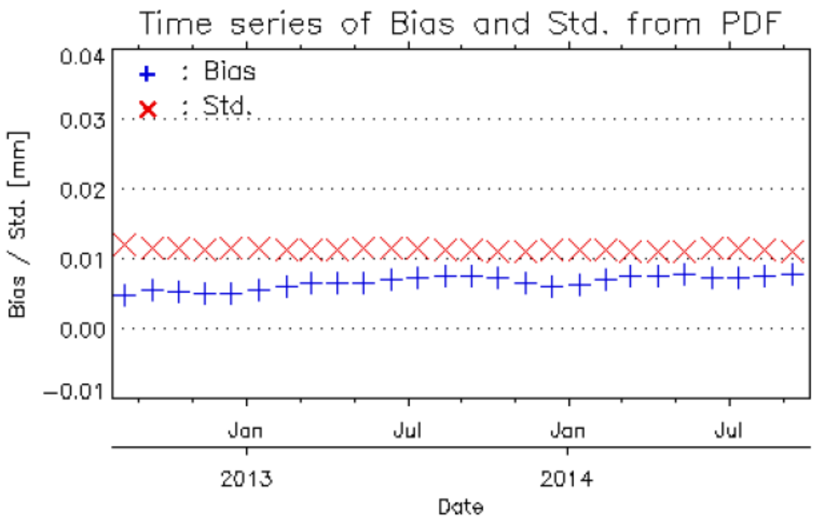


2. Cloud Liquid Water

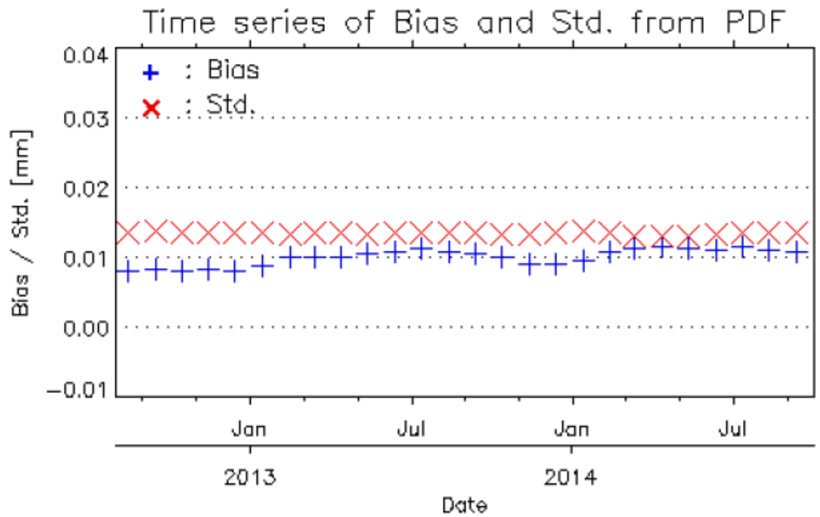
GCOM-W1
Global Change Observation Mission 1st-Water

- Validation results

New version (v2.0)



Current version (v1.0)



Temporal variation of monthly biases and noises obtained from CLW PDFs.
Biases and noises for new version show less values compared to those for current version.
Biases and noises of both versions show similar temporal variation.

Validation results (V2/V1)	Release and standard accuracy
V2: 0.038 kg/m^2 / V1: 0.042 kg/m^2	0.05 kg/m^2

2. Cloud Liquid Water

- Conclusion
  - Comparison with MODIS CLW in PDF over clear sky areas shows the worst standard deviation of 0.023 kg/m^2 and worst bias of 0.015 kg/m^2 .
  - Linear sum of the worst bias and noise, which is defined as total accuracy, is 0.038 kg/m^2. Temporal variation of monthly bias and noise also shows lower values in new version than those of current version.
  - Evaluation of error dependency to other geophysical parameters shows improvements in new version, and especially, dependencies to TPW and SST are reduced.
  - Validation results achieved standard accuracy of 0.05kg/m^2.
- Future Works
  - Comparison with direct observation data, such as ARM sites data in islands.
  - Comparison with MODIS CLW product
  - Applying this algorithm to other microwave imagers, such as GMI, SSMIS.

3. Precipitation

- Principal Investigator
  - Kazumasa Aonashi (Meteorological Research Institute, Japan Meteorological Agency)
- Update Highlights
  - Modification of correction coefficients for AMSR2 L1 brightness temperature.
  - Introduction of orographic rainfall correction scheme (Yamamoto and Shige, 2014)
  - Bug fix in handling of missing values in merging 89GHz A/B.
- Improvement Highlights
  - Heavy rainfall caused by orographic effect over mountainous areas along the coast, which is under estimated by microwave imagers, are well captured.
- Validation Method
  - Simultaneous observation by TRMM Precipitation Radar (PR) and AMSR2 are averaged in 50 km spatial resolution, and calculate relative error (ratio of RMSE against average rain rate).

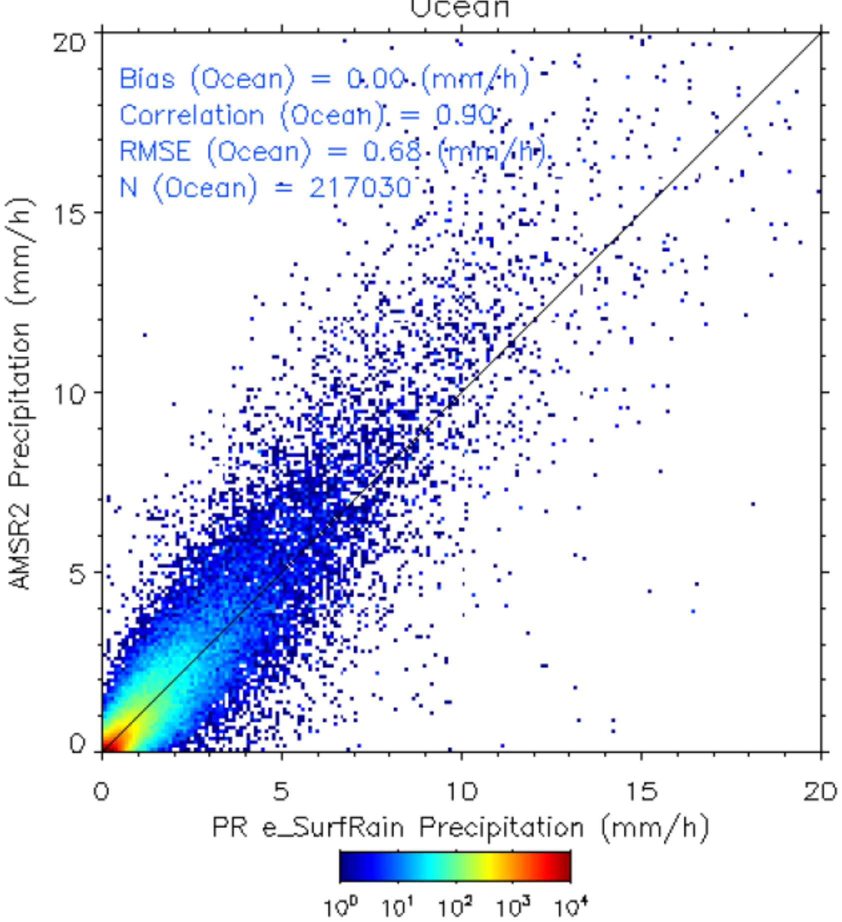
3. Precipitation

- Validation Data and Matchup Condition
  - Comparison of AMSR2 PRC and PR estimated surface rain rate data when orbit crossing time difference of the GCOM-W and TRMM satellites is within 10 minutes.
  - Comparison of those data with average of 10GHz footprint size (about 約50km).
- Validation Period
  - From July 24, 2012 to October 7, 2014.

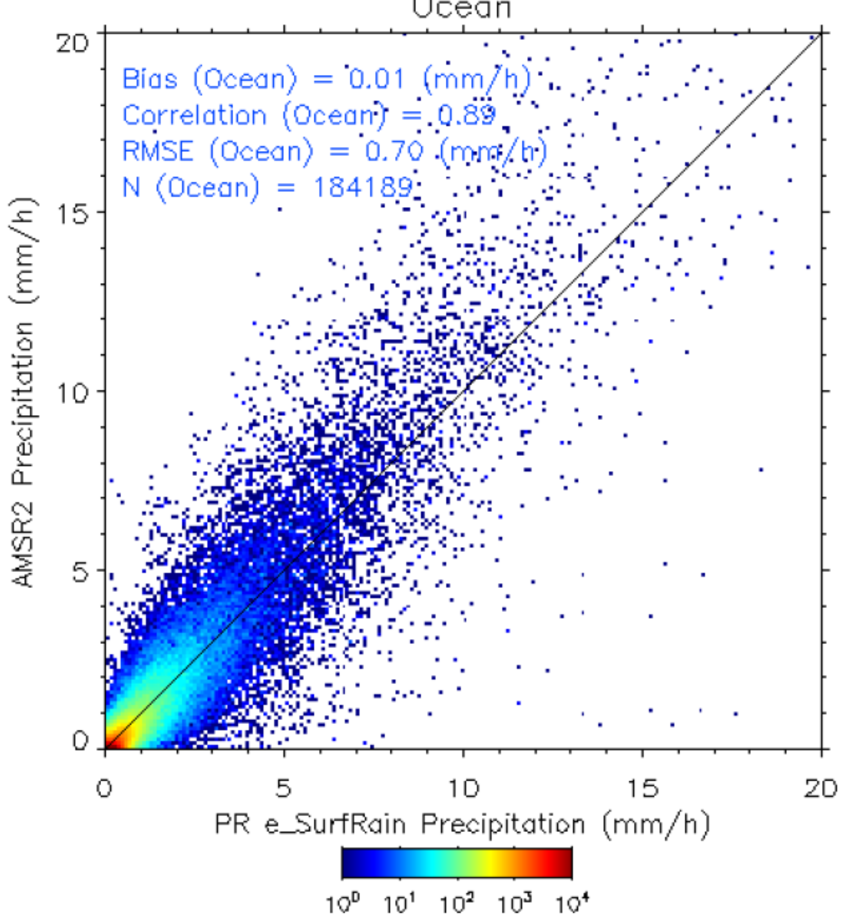
3. Precipitation

- Validation Results (over the ocean)

New Version (v2.0)



Current Version (v1.0)

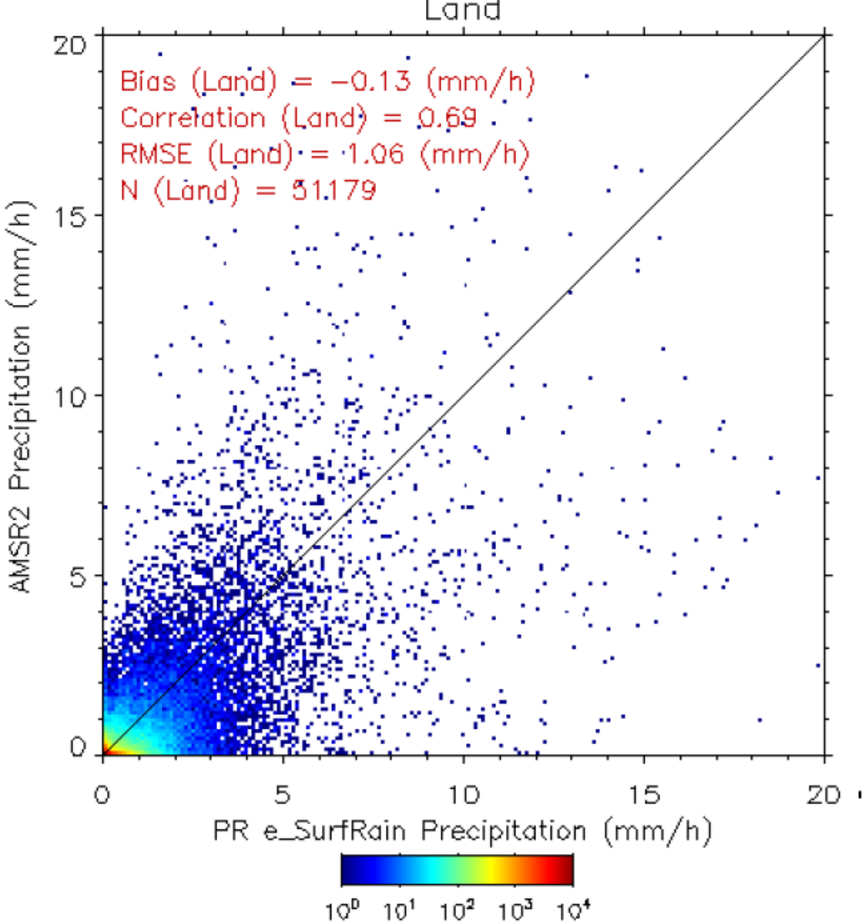


	Validation results (V2/V1)	Release and standard accuracy
Ocean	**V2: 48 %** / V1: 49 %	50 %

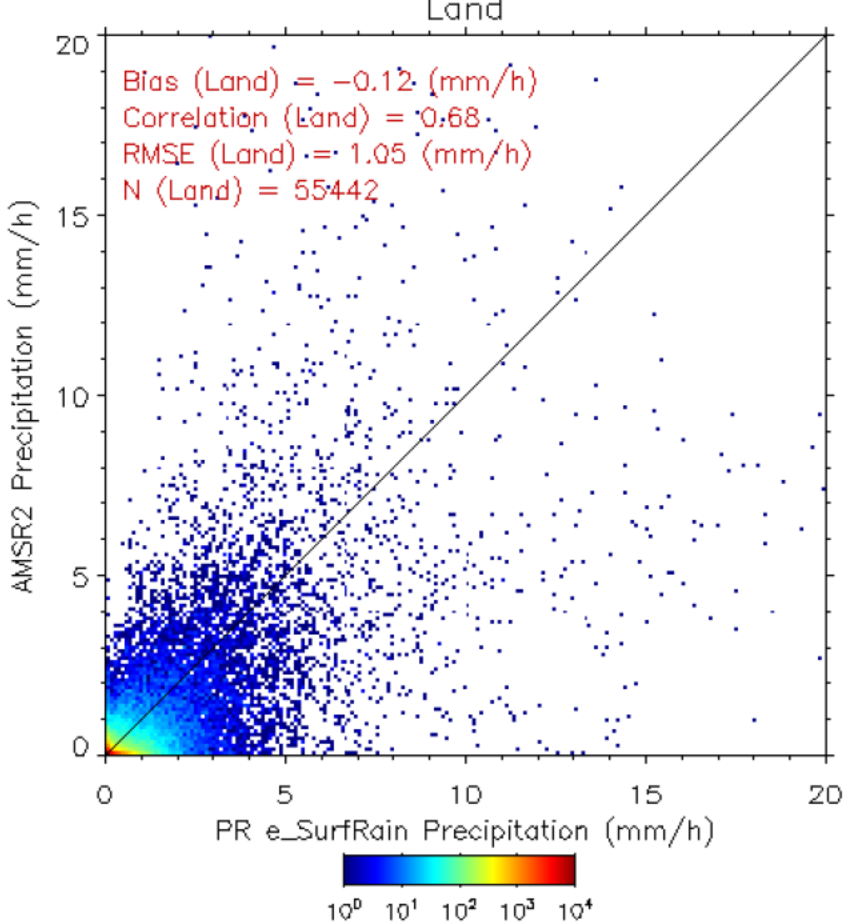
3. Precipitation

- Validation Results (over land)

New Version (v2.0)



Current Version (v1.0)

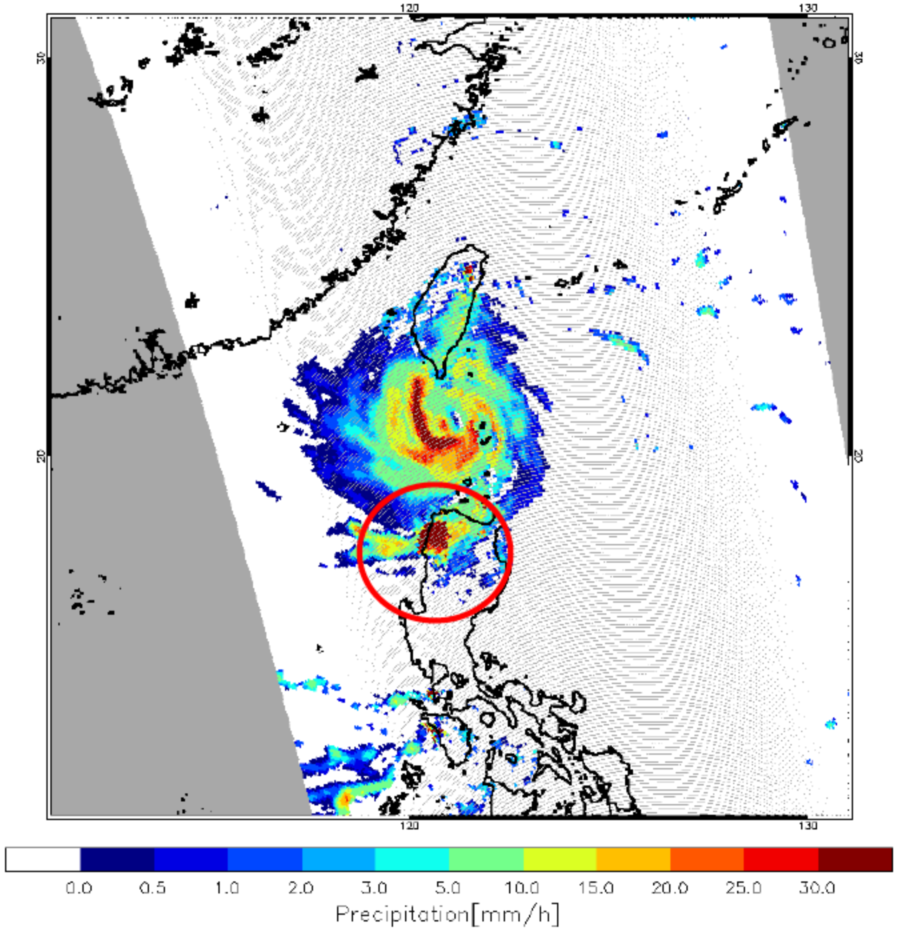


	Validation results (V2/V1)	Release and standard accuracy
Land	**V2: 84 %** / V1: 86 %	120 %

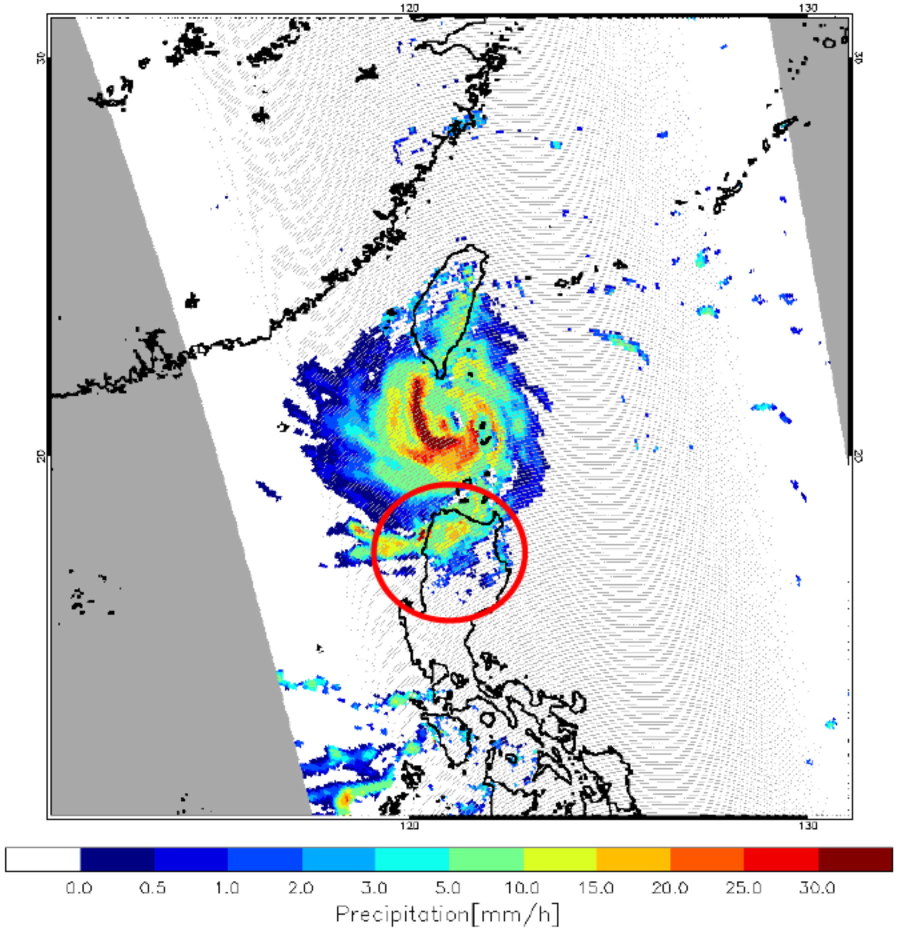
3. Precipitation

- Validation Results (orographic rainfall correction)

New Version (v2.0)



Current Version (v1.0)



Introduction of orographic rainfall correction scheme enables to capture heavy rainfall caused by orographic effect.

3. Precipitation

- Conclusion
  - Relative errors compared by TRMM/PR matchup data are 48% for over the ocean and 84% for over land.
  - New version shows smaller error compared to current version.
  - Validation result achieves standard accuracy of 50% for over the ocean and 120% for over land.
- Future Works
  - Collaboration with the GPM/GSMaP team for algorithm improvements and validation.
  - Overestimation and false-positive of orographic rainfall remained and should be improved in future algorithm updates.
  - Transition from TRMM/PR-based to GPM/DPR-based database.

4. Sea Surface Temperature

- Principal Investigator
  - Akira Shibata (Meteorological Satellite Center, Japan Meteorological Agency)
- Update Highlights
  - Addition of RFI removal method.
  - Refining 6GHz Vertical polarization brightness temperature correction table.
  - Refining sea surface wind speed correction method.
  - Addition of 10GHz observed SST (research product, missing values stores SST less than 9 ºC) to the second layer in the SST product.
- Improvement Highlights
  - Improvements in RFI error removal.
  - Improvements in brightness temperature error correction.
  - Improvements in sea surface wind speed error removal.
- Validation Method
  - Comparison of buoy SST and AMSR2 SST using iQuam buoy dataset, which is compiled and quality controlled by NOAA, and obtain monthly RMSE.

4. Sea Surface Temperature

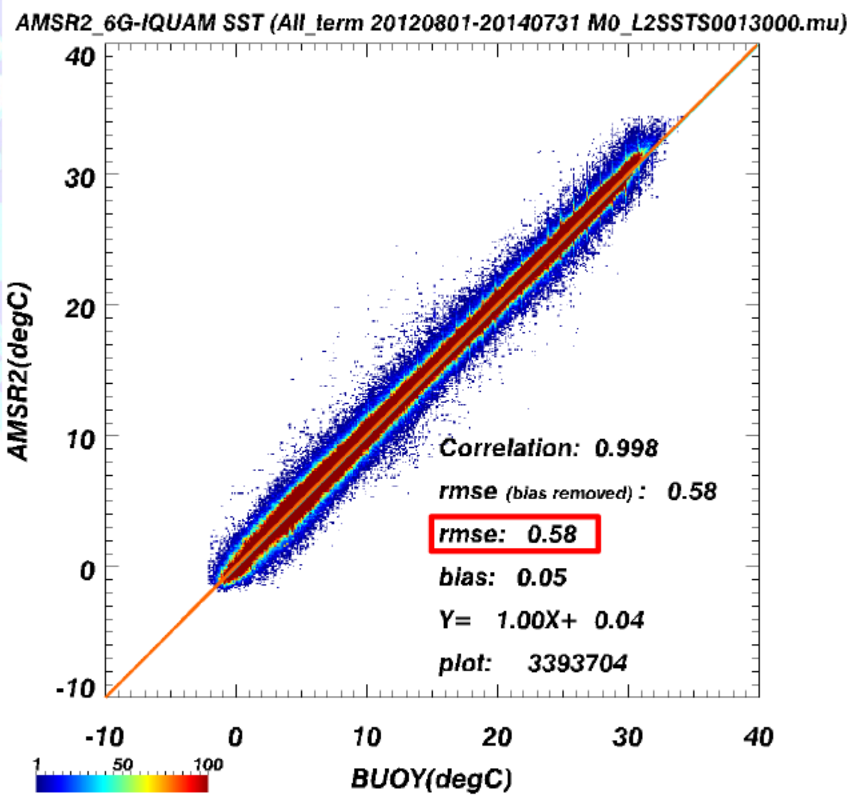
- Validation Data and Matchup Condition
  - Matchup AMSR2 and buoy data included in NOAA's iQuam dataset with time difference within 2 hour and distance less than 30 km.
- Validation Period
  - From August 1, 2012 to July 31, 2014.

4. Sea Surface Temperature

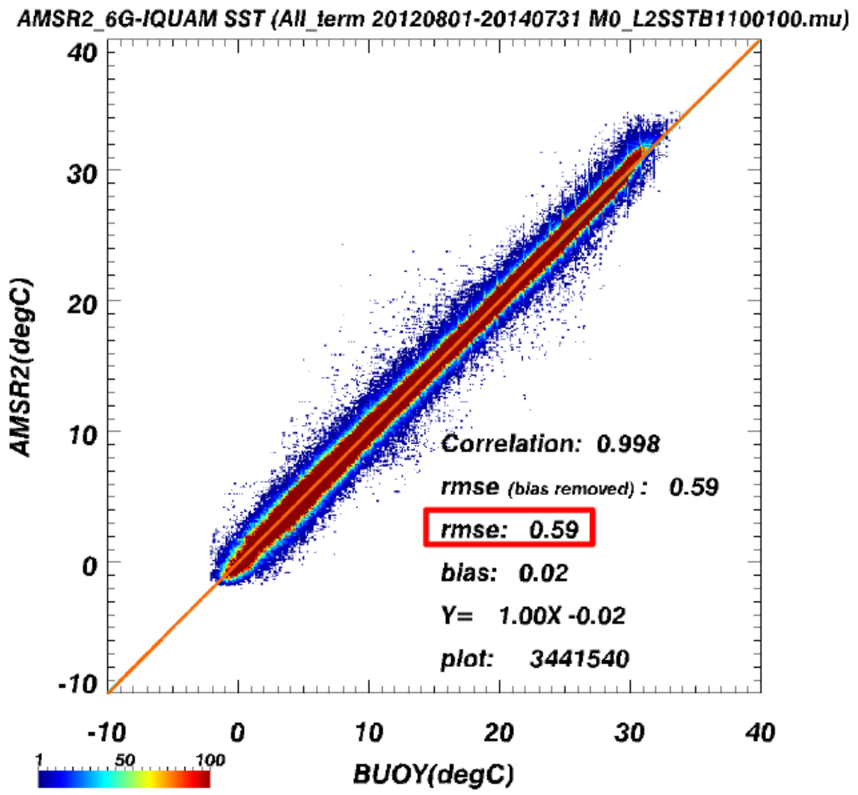
GCOM-W1
Global Change Observation Mission 1st-Water

- Validation Results

New Version (v2.0)



Current Version (v1.0)



Validation results (V2/V1)	Release accuracy
V2: 0.58 °C / V1: 0.59 °C	0.8 °C

4. Sea Surface Temperature

- Conclusion
  - Comparison with quality controlled iQuam buoy SST data shows RMSE of 0.58 ºC.
  - New version shows smaller error compared to current version.
  - This value also satisfied release accuracy of 0.8 ºC.
- Future Works
  - Correction of long-term trend in 6GHz V-polarization and 10GHz V-polarization brightness temperature.
  - Intercomparison with GPM/GMI.

4. Sea Surface Temperature

- 10GHz Sea Surface Temperature (Research Product)
  - Standard SST algorithm uses 6GHz channel for SST retrieval.
  - 10GHz channel also has sensitivity to SST higher than 10-12 ºC, and has finer spatial resolution (about 30km) than 6GHz channel (about 50km). It is defined as one of AMSR2 research products in March 2015.
  - From Ver.2.0 product, 10GHz observed SST is included in the AMSR2 SST product file in addition to standard 6GHz SST, in order to provide complementary information to users.
  - In Ver.2.0 product, 10GHz SST that is less than 9 ºC is set to missing value since 10GHz channel has poor sensitivity to low temperature range. Retrieval error of 10GHz SST becomes bigger where 10GHz SST is less than 10 ºC.
  - Validation of 10GHz SST uses same method and data to those of 6GHz SST. RMSE of 10GHz SST to iQuam buoy SST is 0.61 ºC, and 10GHz SST more than 10 ºC shows almost equal performance to that of 6GHz SST.

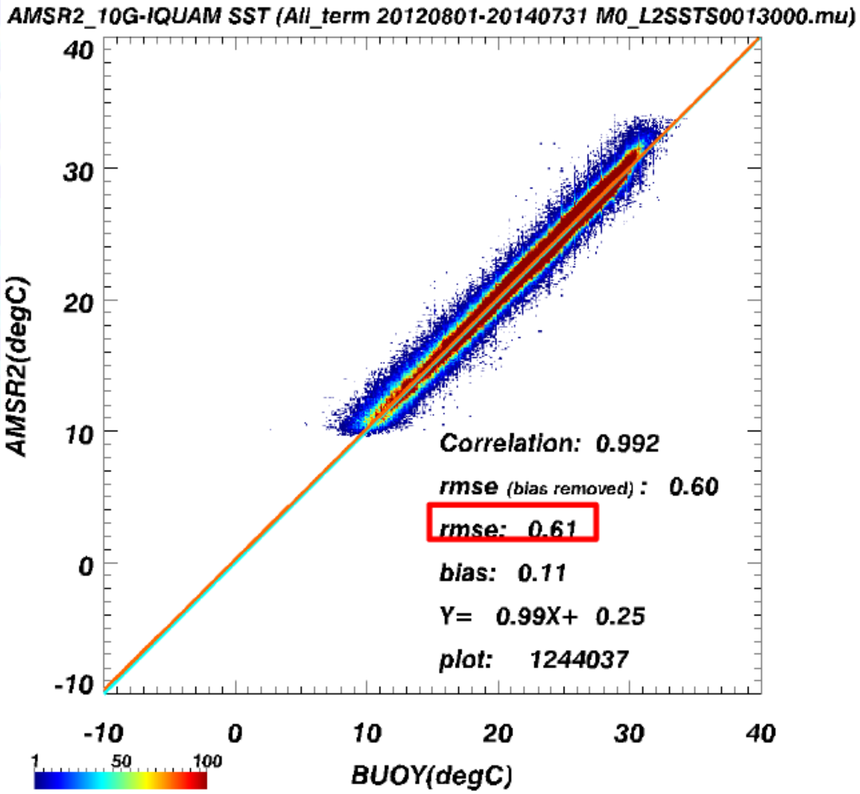
4. Sea Surface Temperature

GCOM-W1

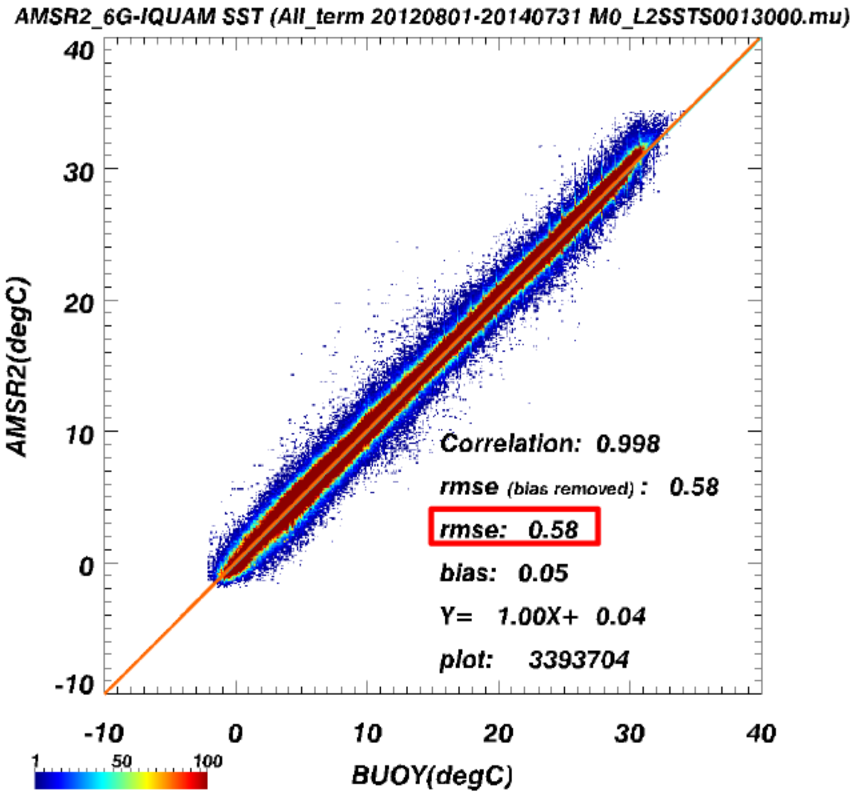
Global Change Observation Mission 1st-Water

- Validation Results (10GHz SST)

Research 10GHz SST



Standard 6GHz SST (ver.2.0)



Validation results	Target accuracy
V2: 0.61 °C	0.8 °C

5. Sea Surface Wind Speed

- Principal Investigator
  - Akira Shibata (Meteorological Satellite Center, Japan Meteorological Agency)
- Update Highlights
  - Improvements in wind direction correction.
  - Improvements in wind speed conversion table.
- Improvement Highlights
  - Improvements in positive biases of AMSR2 in weak wind speed range.
  - Improvements in positive biases of AMSR2 in strong wind speed range.
- Validation Method
  - Comparison with buoy wind speed data available via internet, and obtain monthly RMSE between AMSR2 and buoy wind speed.

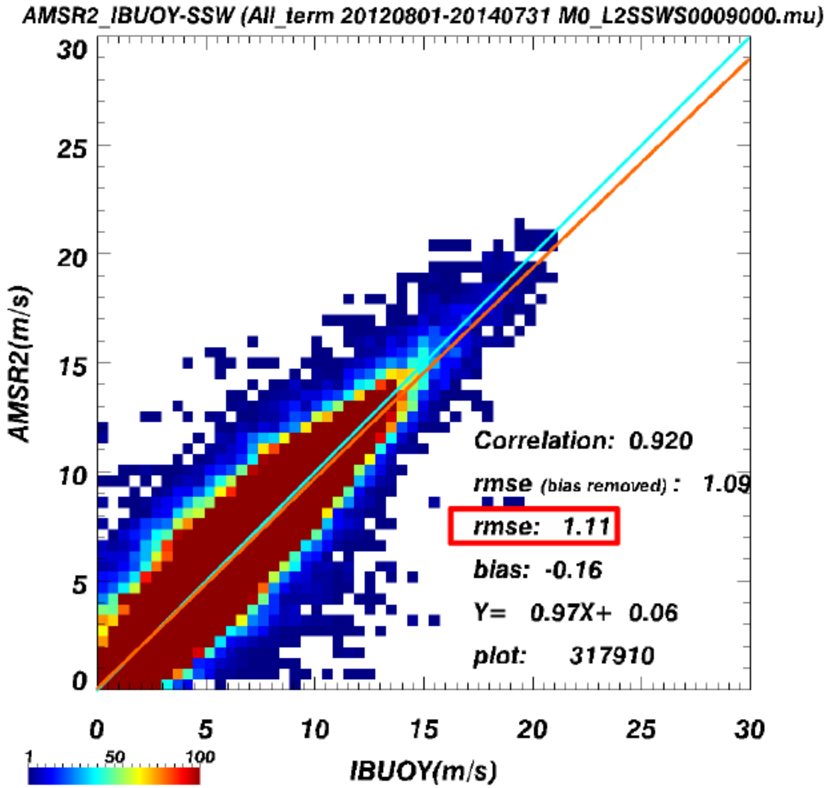
5. Sea Surface Wind Speed

- Validation Data and Matchup Condition
  - Quality control of buoy data, such as moving speed check, time continuity check, and comparison with numerical models.
  - Matchup AMSR2 and buoy data included in NOAA's iQuam dataset with time difference within 2 hour and distance less than 30 km.
- Validation Period
  - From July 23, 2012 to July 31, 2014.

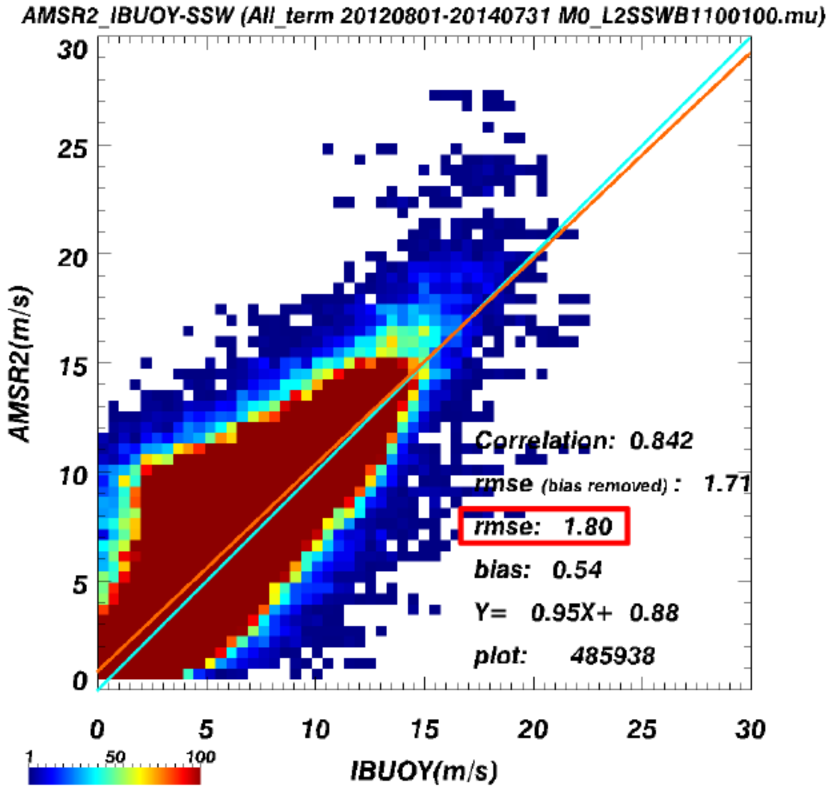
5. Sea Surface Wind Speed

- Validation Results

New Version (v2.0)



Current Version (v1.0)



Validation results (V2/V1)	Release accuracy
V2: 1.1 m/s / V1: 1.8 m/s	1.5 m/s

5. Sea Surface Wind Speed

- Conclusion
  - Comparison with quality controlled buoy SST data shows RMSE of 1.1 m/s.
  - New version shows smaller error compared to current version.
- Future Works
  - Evaluation of error in 36GHz brightness temperature.
  - Intercomparison with GPM/GMI.

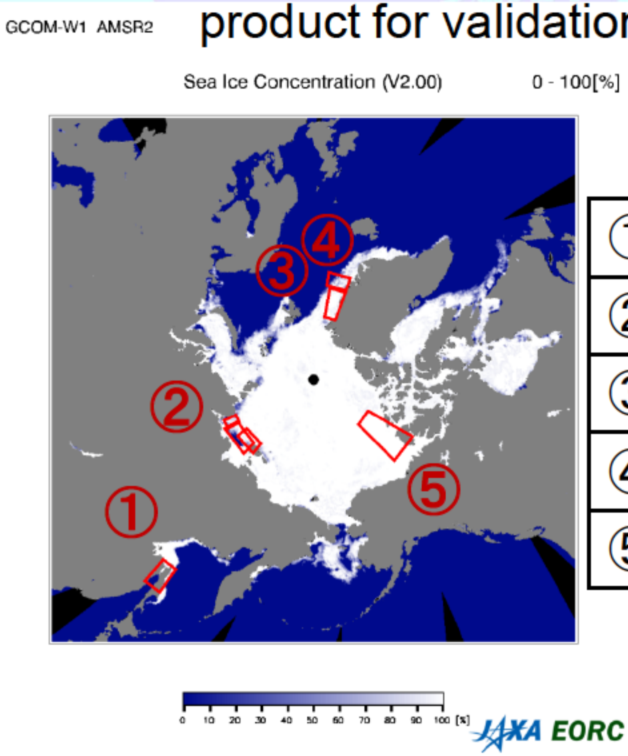
6. Sea Ice Concentration

- Principal Investigators
  - Josefino Comiso (NASA/GSFC)
  - Kohei Cho (Tokai Univ.)
- Update Highlights
  - The algorithm was updated as it retrieves SIC values directly using AMSR2 brightness temperatures. (cf. The old algorithm retrieved SIC values using AMSR-E brightness temperatures, so it required the conversion table from AMSR2 to AMSR-E brightness temperatures based on the intercalibration results.)
  - Tie points were updated.
  - Parameters for the atmosphere filter to detect clear and cloudy areas were changed.
  - The SST base map as an ancillary data was updated.
- Improvement Highlight
  - According to the above update highlights, detection of quasi-sea ices was reduced.

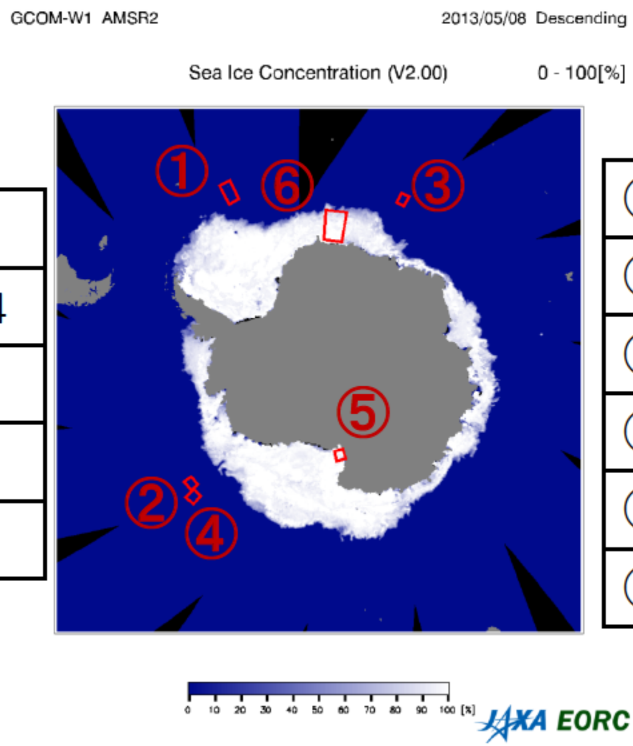
6. Sea Ice Concentration

GCOM-W1
Global Change Observation Mission 1st-Water

- Validation method
  - SIC values in the validation areas indicated by the below red rectangles were retrieved from the reflectance data of MODIS BAND1 (620nm-670nm), BAND3 (459nm-479nm) and BAND4 (545nm-565nm) to be compared with those retrieved by AMSR2.
- Validation areas and dates
  - The below red rectangle areas were extracted using MODIS cloud product for validation.



①2014.1.6
②2014.5.22-24
③2014.6.10
④2014.6.14
⑤2014.6.21

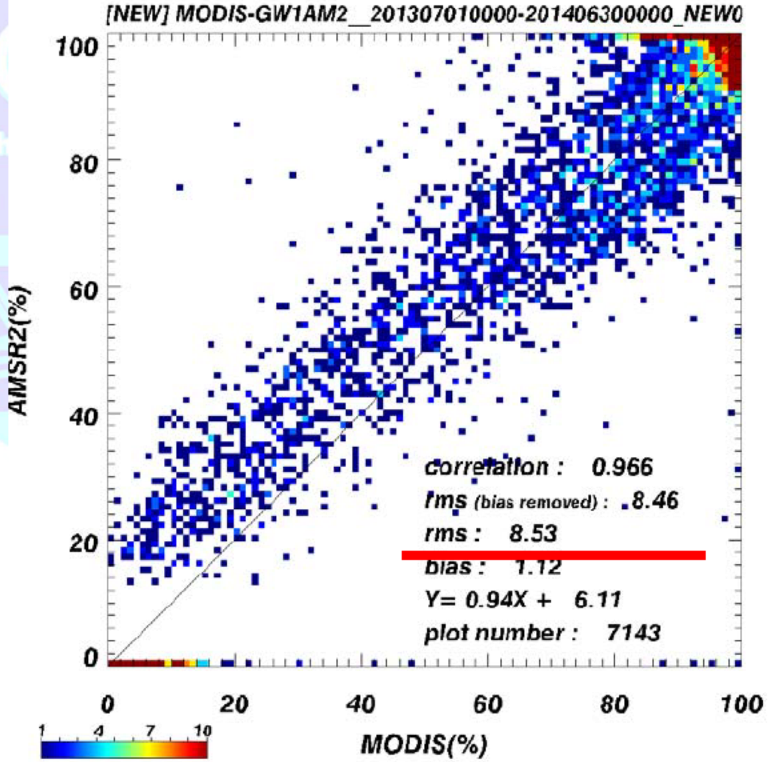


①2013.8.6
②2013.8.14
③2013.8.15
④2013.8.16
⑤2013.12.11
⑥2014.3.30

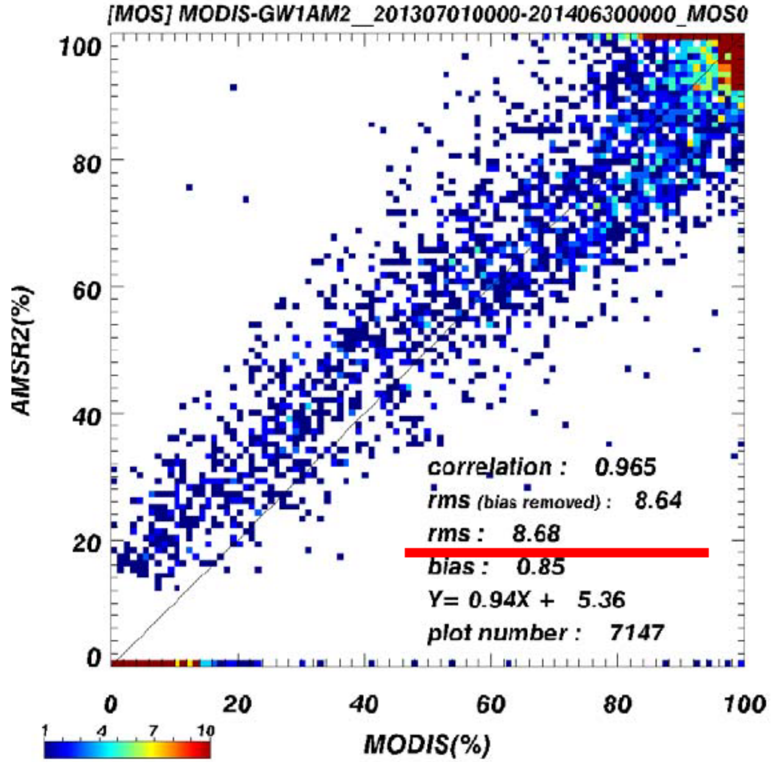
6. Sea Ice Concentration

- Validation results in the Arctic region

AMSR2 (V2)



AMSR2 (V1)

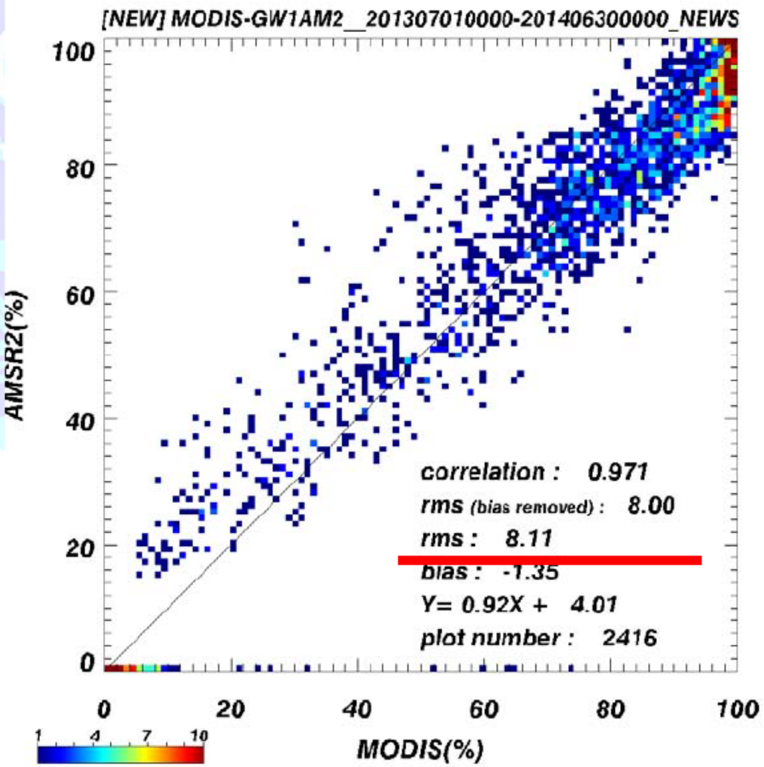


Validation results (V2/V1)	Release and standard accuracy
V2: 8.5% / V1: 8.7%	10%

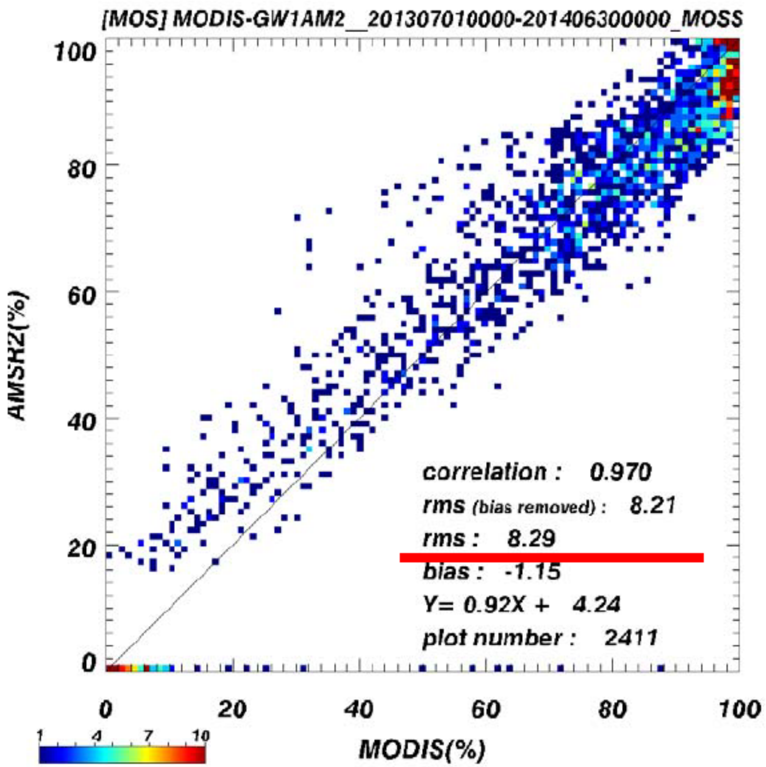
6. Sea Ice Concentration

- Validation results in the Antarctic region

AMSR2 (V2)



AMSR2 (V1)

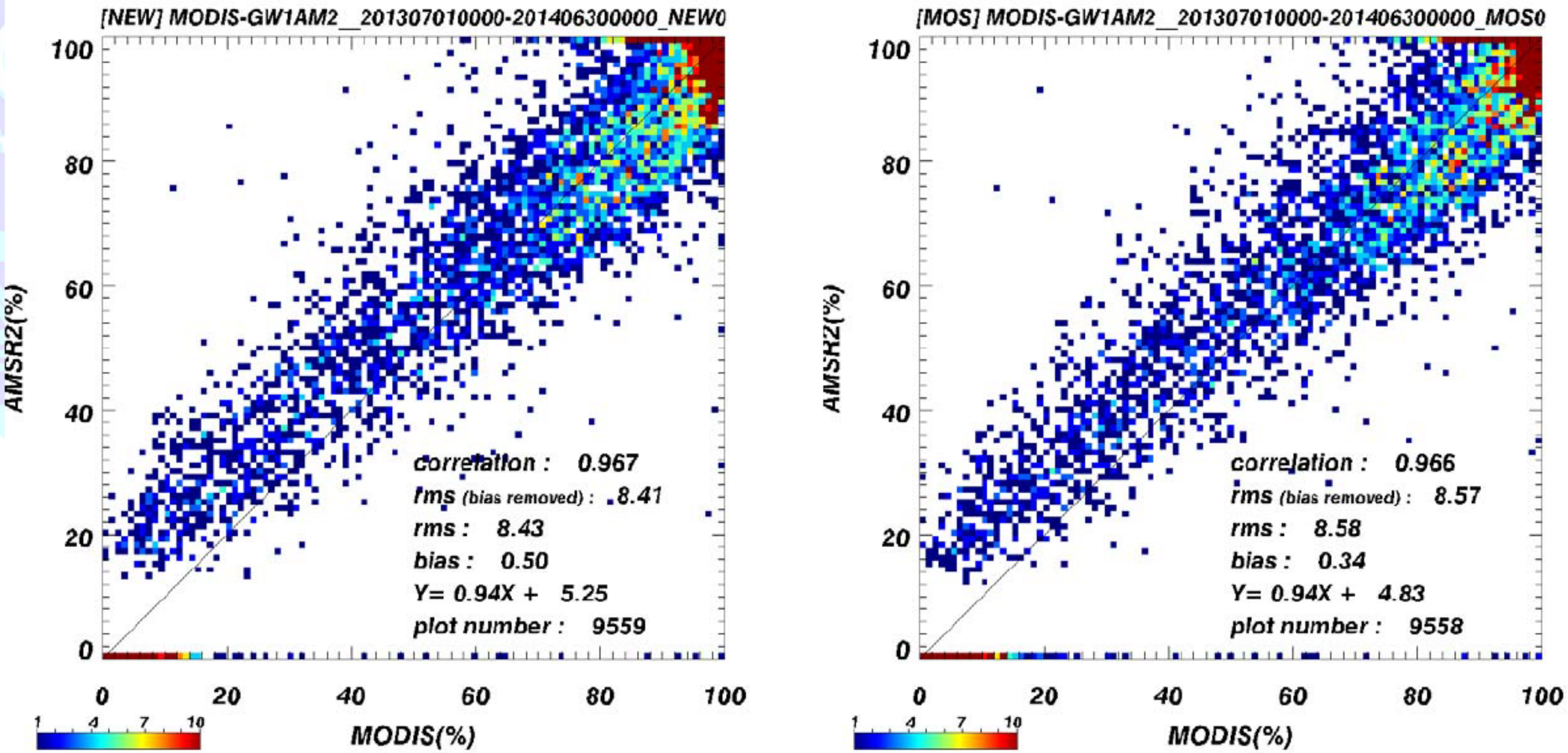


Validation results (V2/V1)	Release and standard accuracy
V2: 8.1% / V1: 8.3%	10%

6. Sea Ice Concentration

- Validation results in the Arctic and Antarctic regions

AMSR2 (V2) AMSR2 (V1)



Validation results (V2/V1)	Release and standard accuracy
V2: 8.4% / V1: 8.6%	10%

6. Sea Ice Concentration

- Conclusion
  - The SIC product of version 2 achieved the release and standard accuracies (10%). Additionally, its accuracy improved slightly than that of version 1.

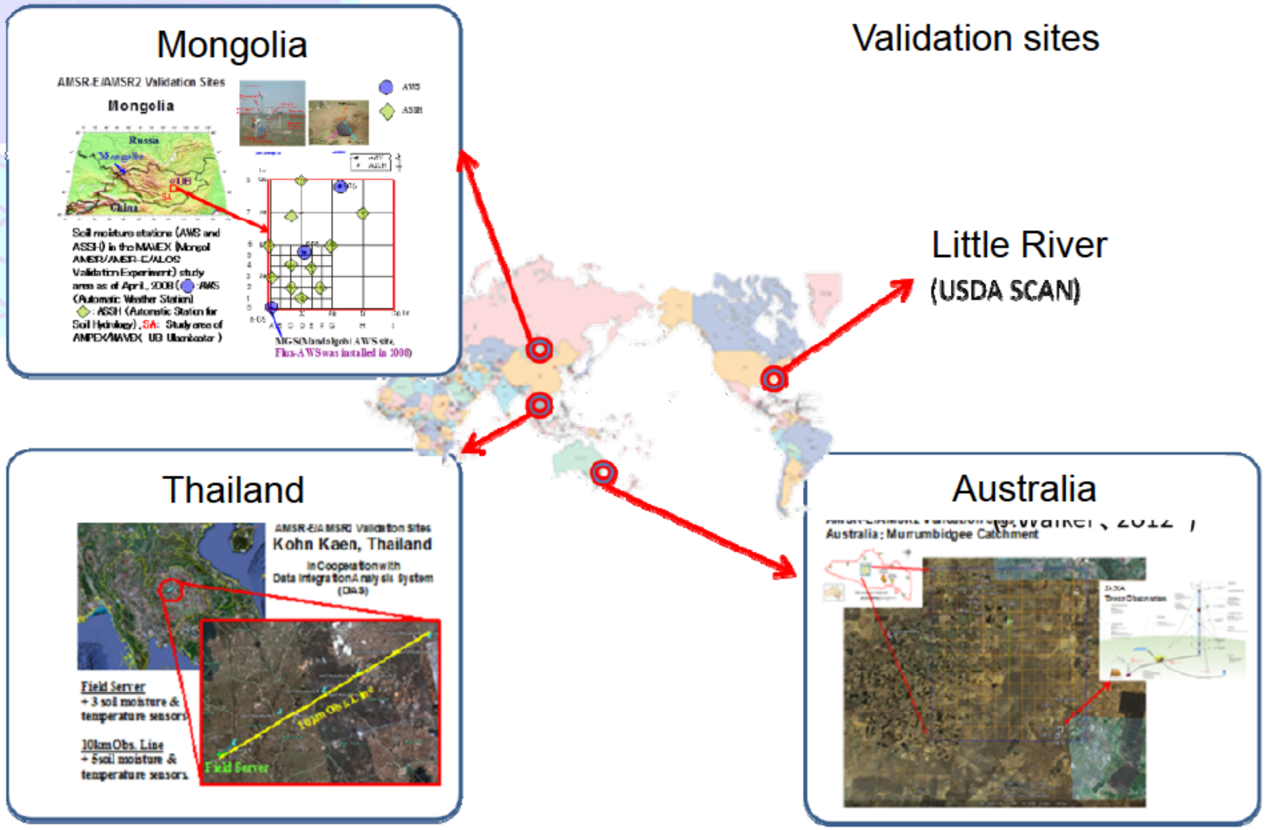
- Future works
  - Improvement of the tie points and the atmosphere filter is required to reduce detection of quasi sea ices more adequately.
  - Improvement of the quality of the validation data created by the MODIS reflectance data is required; because the MODIS's footprint size is much different from the AMSR2's, we will have to simulate the MODIS reflectance data observed by AMSR2's footprint by introducing the technique of weighted mean in the L1R product.

7. Soil Moisture Content

- Principal Investigators
  - Toshio Koike (Univ. of Tokyo)
- Update Highlights
  - Vegetation database was updated.
  - The difference between vertical and horizontal polarized microwave signals are lost in a strong precipitation area to become the identical response to the dry area. To prevent wrong retrievals in such strong precipitation areas, a precipitation flag was additionally defined.
- Improvement Highlight
  - According to the precipitation flag, wrong retrievals as the strong precipitation areas are recognized as the dry areas were reduced.
- Validation method
  - The SMC values observed in validation sites at Mongolia, Australia and Thailand were compared with those retrieved by AMSR2 data. Additionally, the SMC values observed in Little River, US, one of the USDA/SCAN sites was also compared with those retrieved by AMSR2 data.

7. Soil Moisture Content

- Validation period
  - Mongolia: Jul. 2012 - Aug. 2014
  - Australia: Jul. 2012 - Jun. 2014
  - Thailand: Jul. 2012 - Oct. 2012
  - Little River: Jul. 2012 - Sep. 2014



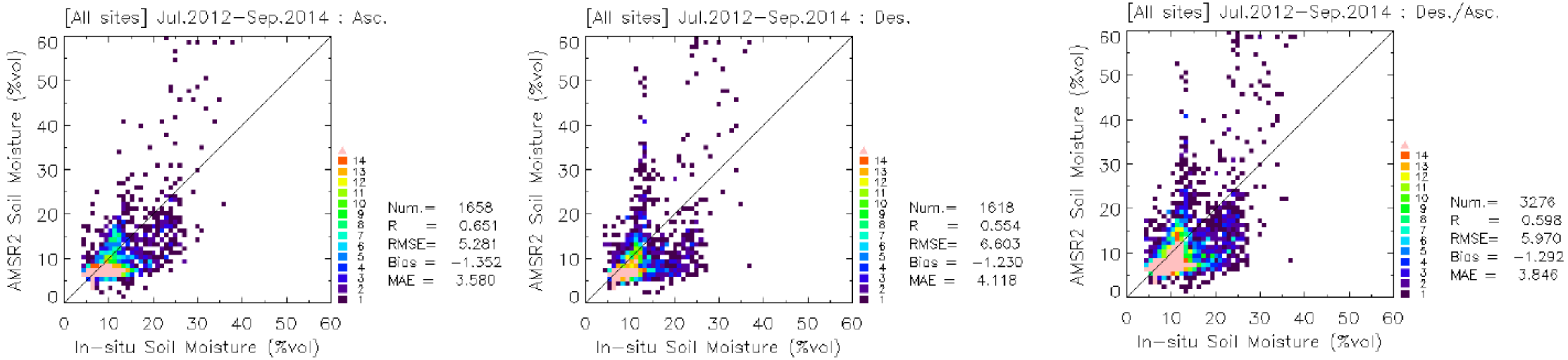
7. Soil Moisture Content

GCOM-W1
Global Change Observation Mission 1st-Water

- Validation results in version 1

Validation over ALL sites (AUST+MONG+THAI+SCAN2027)

Asc. Dsc. Asc. + Dsc.



Validation Results

[All sites] Jul.2012-Sep.2014

	Num.	R	RMSE [%]	Bias [%]	MAE [%]
Des.	1618	0.554	6.603	-1.230	4.118
Asc.	1658	0.651	5.281	-1.352	3.580
Des./Asc.	3276	0.598	5.970	-1.292	3.846

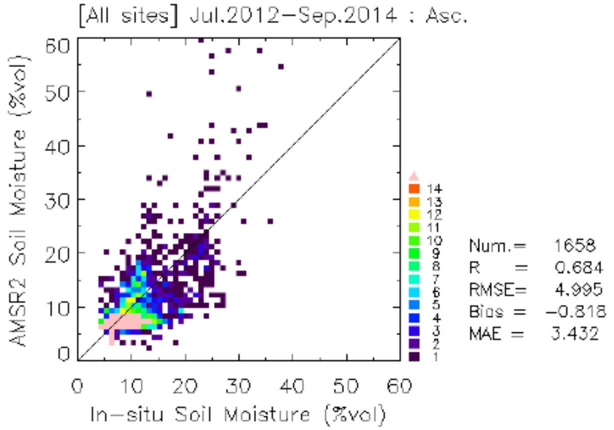
7. Soil Moisture Content

- Validation results in version 2

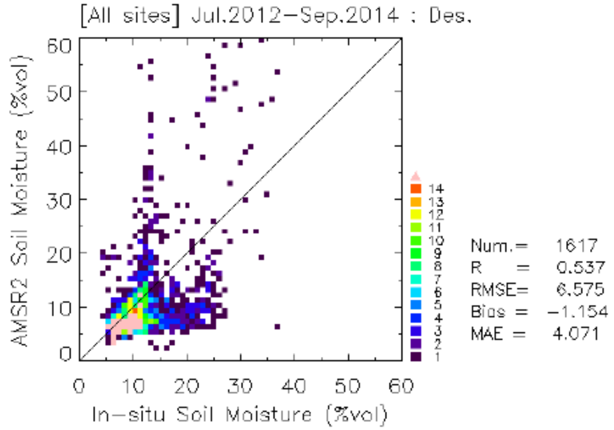
(Pixels discriminated by precipitation flag are **NOT** removed.)

Validation over ALL sites (AUST+MONG+THAI+SCAN2027)

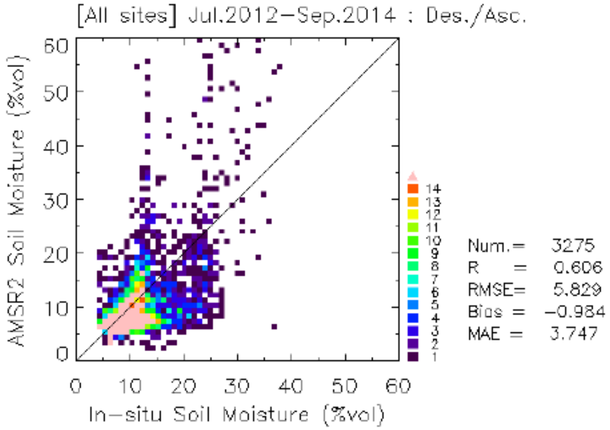
Asc.



Dsc.



Asc. + Dsc.



Validation Results

[All sites] Jul.2012-Sep.2014

	Num.	R	RMSE [%]	Bias [%]	MAE [%]
Des.	1617	0.537	6.575	-1.154	4.071
Asc.	1658	0.684	4.995	-0.818	3.432
Des./Asc.	3275	0.606	5.829	-0.984	3.747

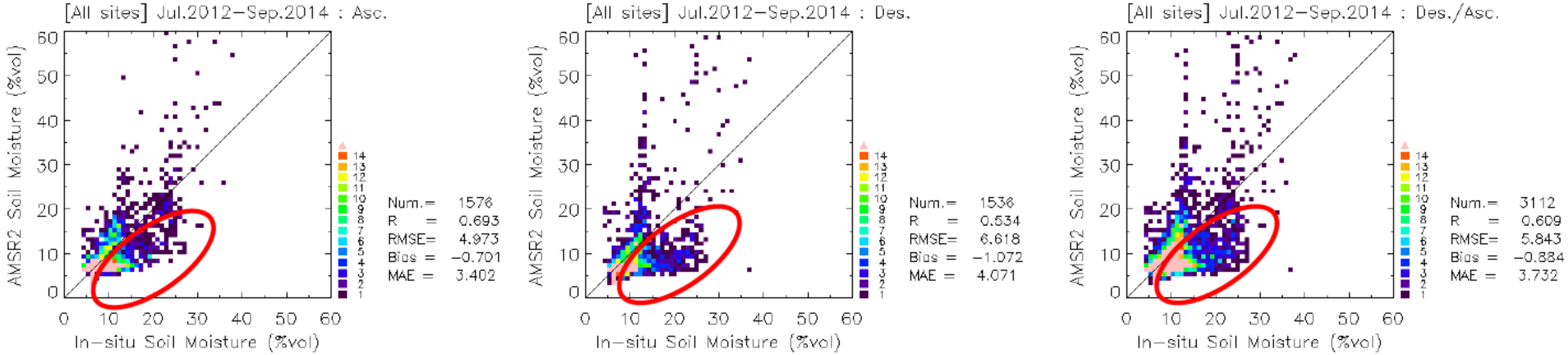
7. Soil Moisture Content

- Validation results in version 2

(Pixels discriminated by precipitation flag are removed.)

Validation over ALL sites (AUST+MONG+THAI+SCAN2027)

Asc. | Dsc. | Asc. + Dsc.



Validation Results

[All sites] Jul.2012-Sep.2014

	Num.	R	RMSE [%]	Bias [%]	MAE [%]
Des.	1536	0.534	6.618	-1.072	4.071
Asc.	1576	0.693	4.973	-0.701	3.402
Des./Asc.	3112	0.609	5.843	-0.884	3.732

7. Soil Moisture Content

GCOM-W1
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- Conclusion
  - Validation results:
    - V1: MAE 3.846 (Ascending + Descending)
    - V2: **MAE 3.732** (Ascending + Descending)
  - The SMC product of version 2 achieved not only the release and standard accuracies (MAE 10) but also the goal accuracy (MAE 5). Additionally, its actual accuracy improved slightly than that of vertion 1.
- Future work
  - Improvement of overestimation of SMC values in desert areas.

8. Snow depth

- Principal Investigator
  - Richard Kelly, University of Waterloo
- Update Highlights
  - Forest transmissivity data was implemented, and the AMSR2 brightness temperature was corrected using the forest correction factors based on this data.
  - Snow depth detection flag and land surface temperature estimation were updated.
  - Water fraction data was updated based on the WWF GIS dataset.
  - Snow depth detection was improved over the Tibetan Plateau.
- Improvement Highlights
  - Improvement of the dense forest region by updated forest improvement.
  - Improvement over the coast region and Siberia region by the improvement of the water fraction data using the updated L1R AMSR2 data.
  - Improvement of snow depth distribution over the Tibetan Plateau.

8. Snow depth

- Validation method
  - AMSR2's estimated snow depth is compared with the in situ snow depth at the WMO GSOD 1,007 stations, and the momentary absolute average error (MAE) is calculated within 30 km spatial resolution. And then, the estimation accuracy is evaluated by MAE.
- Validation data and comparison requirements
  - Area within 40 km around the WMO GSOD station, which has water fraction less than 10 %, was checked. In consequence, the WMO GSOD 1,007 stations were selected. And then, the AMSR2's estimated snow depth, which is within 7 km in distance and 1 day in time, was compared with the in situ snow depth at the WMO GSOD 1,007 stations.
  - Estimated accuracy is evaluated in the mid-winter season from October to February.
  - Estimation range of algorithm: 5 - 100 cm
- Validation period
  - July 23, 2012 – September 30, 2014

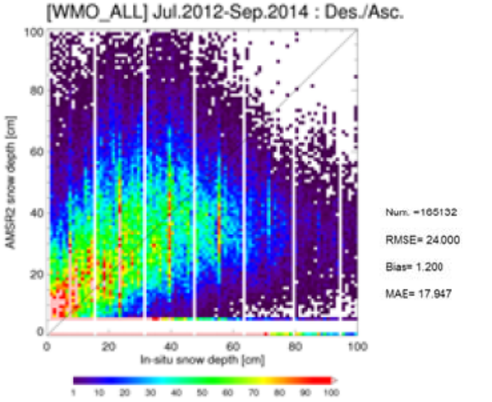
8. Snow depth

GCOM-W1
Global Change Observation Mission 1st-Water

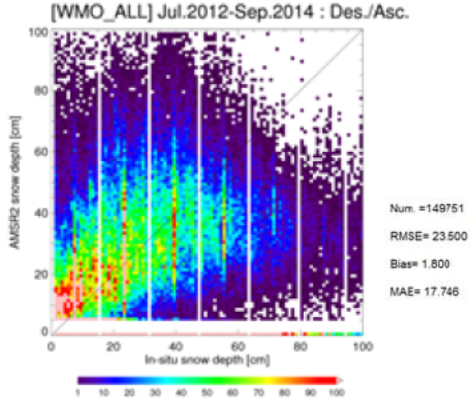
- ## Validation result

Whole period

Current Ver.



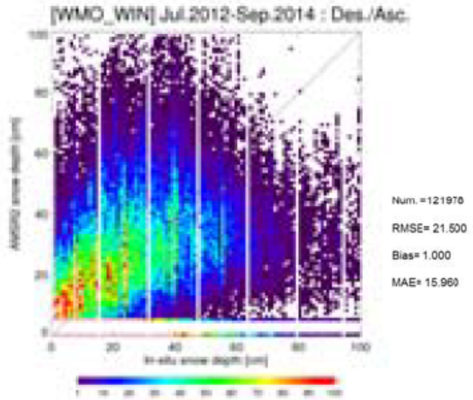
New Ver.



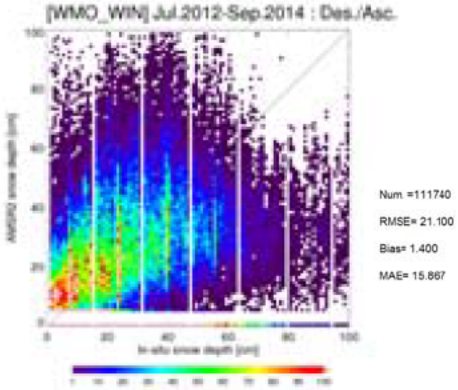
Whole period	MAE
Current Ver.	17.9cm
New Ver.	17.7cm

Mid-Winter（Oct. – Feb.）

Current Ver.



New Ver.



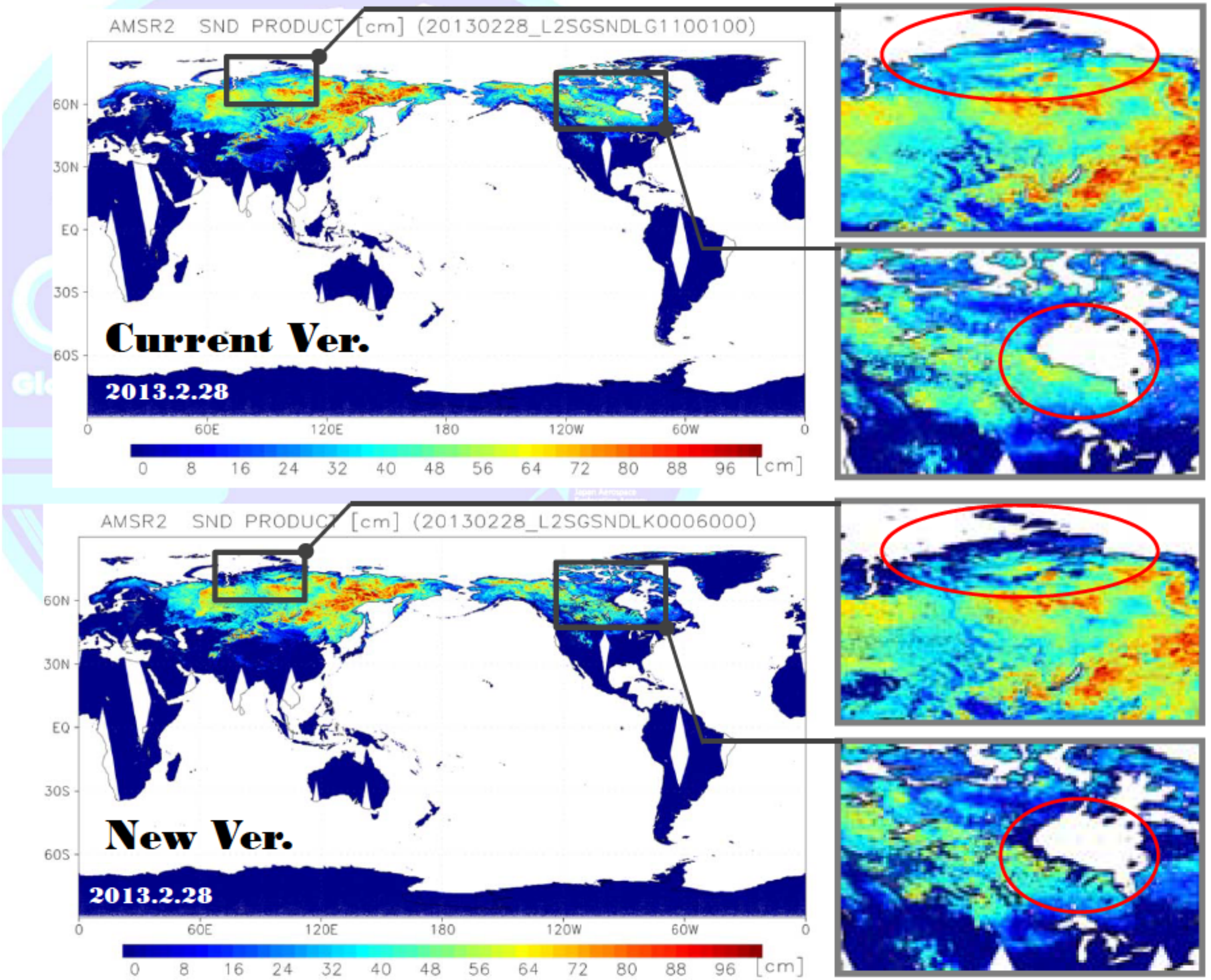
Mid-Winter	MAE
Current Ver.	16.0cm
New Ver.	15.9cm

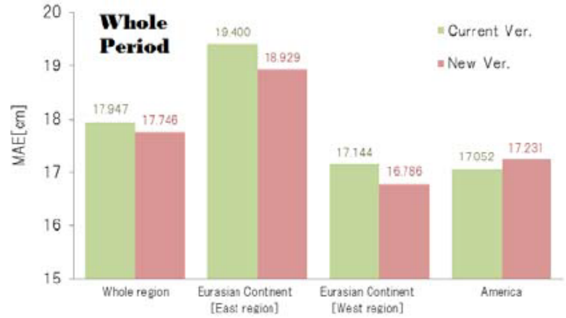
Accuracy

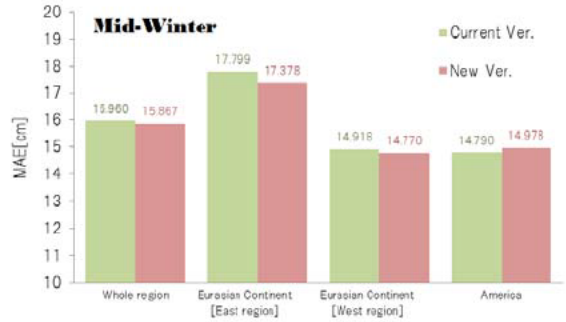
Release	20cm
Standard	20cm
Goal	10cm

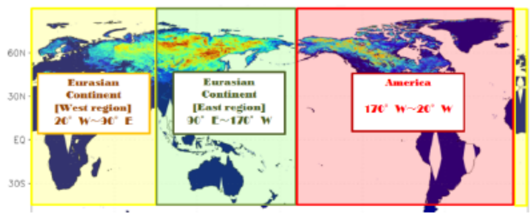
Release and Standard accuracy (±20cm) has been satisfied.

8. Snow depth









		Whole region	Eurasian Continent [East region]	Eurasian Continent [West region]	America
Whole period	Current Ver.	17.947	19.400	17.144	17.052
	New Ver.	17.746	18.929	16.786	17.231

		Whole region	Eurasian Continent [East region]	Eurasian Continent [West region]	America
Mid-Winter [Oct.-Feb.]	Current Ver.	15.960	17.799	14.918	14.790
	New Ver.	15.867	17.378	14.770	14.978

Accuracy over the coast region and Siberia region were improved by the improvement of the water fraction data using the updated L1R AMSR2 data.

8. Snow depth

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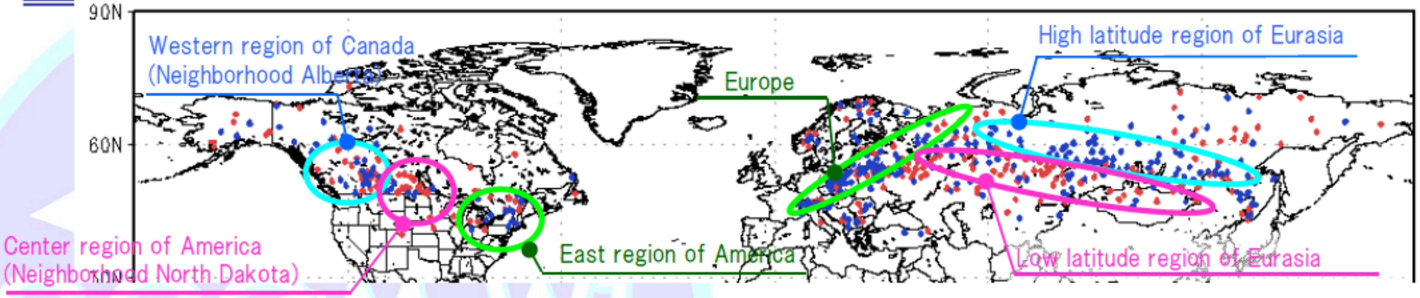
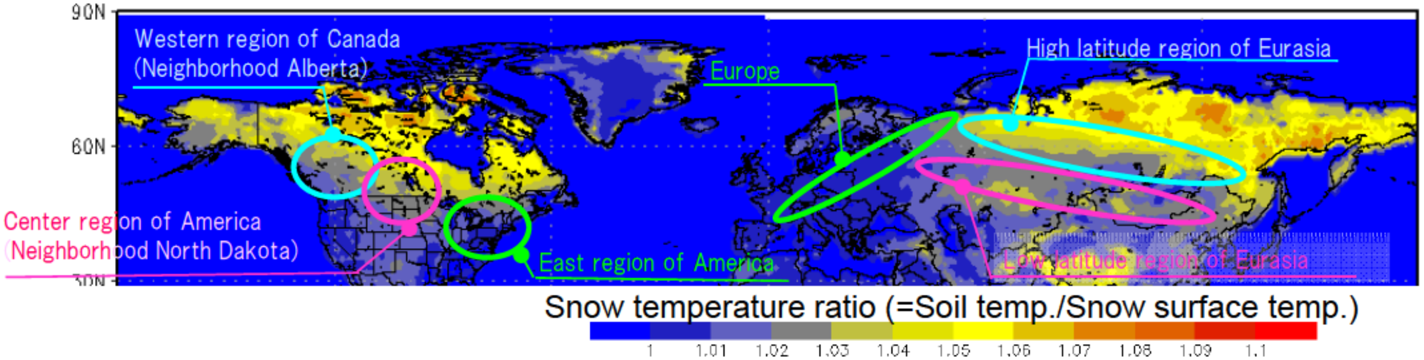


●: Decrement of accuracy (MAE) ●: Increment of accuracy (MAE)

MAE for the WMO GSOD station over the improvement area for forest

(Reference) Vegetation type map based on the ESA Glob Cover



(Reference) Snow temperature ratio based on the GLDAS: Soil temp./Snow surface temp., Average from Oct., 2013 to May, 2014.

Over the dense forest region, which is composed by acicular tree and broad-leaf tree, the forest improvement shows a great effect on snow depth estimation. Furthermore, the estimation accuracy has improved by the suitable evaluation for rapid snow grain growth associated with big snow temperature gradient.

This region is the sparse forest region, which is composed by forest, bushy tree and grass, and is slow snow grain growth region, which is associated with a low temperature gradient, and wet snow region. Hence, the advantageous effect of forest improvement is weak and it is difficult to detect to a snow grain growth.

8. Snow depth

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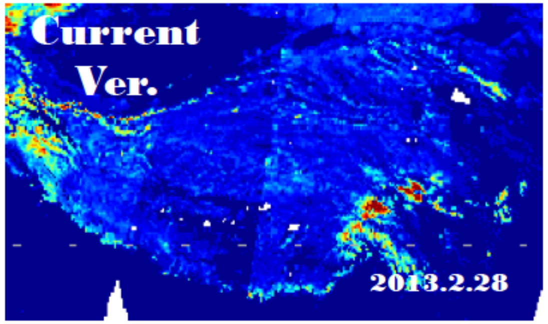
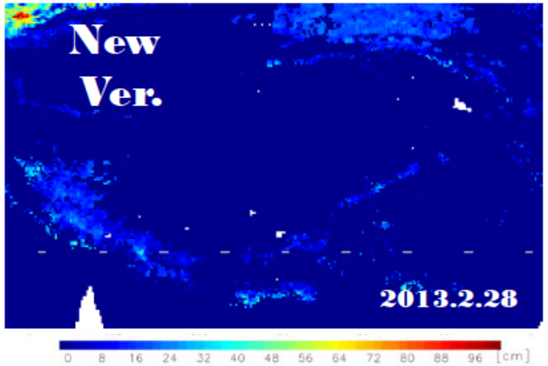
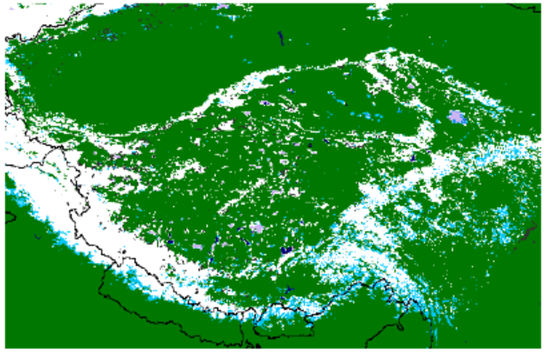
Actual snow distribution over the Tibetan Plateau in the Winter season:
At the land surface observation in the 2004 mid-winter and the 2008 snow melting season, an actual snow distribution was observed as shown in these photographs. As shown in these photographs, the land surface almost has not snow cover over the Tibetan Plateau in the Winter season.



Homogeneous snow depth distribution has been estimated by the current version.



Snow overestimation over the Tibetan Plateau was improved in new version.



(Reference) JAXA JASMES SCA: 15 days average (Feb. 16 - 28, 2013).
http://kuroshio.eorc.jaxa.jp/JASMES/monthly/global/index_j.html

Snow distribution was overestimated slightly more than new version in order to evaluate temporal snow cover from Feb. 16 to 27 because this is 15 days average.

8. Snow depth

- Conclusion
  - Validation result is as follows:
  - Comparison with the in situ snow depth data at the WMO GSOD 1,007 stations (July 23, 2012 – September 30, 2014)
    - Whole period MAE 17.7 cm
    - Mid-Winter (Oct.-Feb.) MAE 15.9 cm
  - Release and Standard accuracy (±20cm) has been satisfied at the WMO GSOD 1,007 stations.
  - Snow depth distribution over the Tibetan Plateau was improved.
  - Estimation accuracy was improved over the dense forest region by the correction of the AMSR2 brightness temperature by the forest correction factors based on the forest transmissivity.
  - Estimation accuracy over the coast region and Siberia region were improved by the improvement of the water fraction data using the updated L1R AMSR2 data.
- Future Works
  - Developer has tried the improvement of an influential forest for achievement of goal accuracy (±10cm) this time. However, the SND algorithm still has a problem for the evaluation of snow grain growth.
  - Developer has perfect awareness of this problem. He already began to improving the estimation process for snow grain growth.

9. Summary of Accuracies

GCOM-W1
Global Change Observation Mission 1st-Water

	Product	Release Accuracy	Standard Accuracy	Target Accuracy	At Ver.1 Release	Current Version	New Version
GEO	Total Precipitable Water	±3.5 kg/m^2	±3.5 kg/m^2	±2.0 kg/m^2	2.9 kg/m^2	ROB:2.7 kg/m^2 GPS:1.5 kg/m^2	ROB:2.6 kg/m^2 GPS:1.5 kg/m^2
	Cloud Liquid Water	±0.10 kg/m^2	±0.05 kg/m^2	±0.02 kg/m^2	0.05 kg/m^2	0.04 kg/m^2	0.04 kg/m^2
	Precipitation	Ocean ±50 % Land ±120 %	Ocean ±50 % Land ±120 %	Ocean ±20 % Land ±80 %	Ocean 47 % Land 91 %	Ocean 49% Land 86%	Ocean 48% Land 84%
	Sea Surface Temperature	±0.8 °C	±0.5 °C	±0.2 °C	0.6 °C	0.6 °C	0.6 °C
	Sea Surface Wind Speed	±1.5 m/s	±1.0 m/s	±1.0 m/s	1.1 m/s	1.8 m/s	1.1 m/s
	Sea Ice Concentration	±10 %	±10 %	±5%	9 %	9 %	8 %
	Snow Depth	±20 cm	±20 cm	±10 cm	16 cm	16 cm	16 cm
	Soil Moisture	±10 %	±10 %	±5 %	4 %	4 %	4 %

Achieve Release Accuracy | Achieve Standard Accuracy | Achieve Target Accuracy