# Status of AMSR2 Level-1 Products (Ver. 2.0)

Japan Aerospace Exploration Agency
Earth Observation Research Center

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# 1. L1A and L1B products

GCOM-W1
Global Change Observation Mission 1st-Water

- Update highlights - Cold load (CSM) correction

| No. | Item | Modification | Impact on TB |
|---|---|---|---|
| 1 | Correction for increase in CSM Antenna Temperature due to Earth Radiation from Main Reflector (6.9 GHz H/V and 7.3 GHz H/V) | Error in formula for computing position of reflected observation data is corrected. | Negligibly small (<0.03K) |
| 2 | RFI Removal | Algorithm details for detection and interpolation is improved. | Near the area where RFI happens |
| 3 | False RFI detection (10GHz) | Rapid variation in receiver output level due to periodical thermal change leads to fault RFI detection. One out of two method for RFI detection is disabled and parameter used in another valid method is revised | 3K max. (@10GHz V-pol, noticeable between August 2013 and July 2014) |
| 4 | Average sample number (10GHz V-pol.) | Number of scans for averaging is changed from 21 to 11 in order to mitigate the error due to rapid change in receiver output level. | Less than 0.2K |
| 5 | False RFI detection (18GHz V-pol.) | Rapid variation in receiver output level leads to fault RFI detection in southern high latitude area. One out of two method for RFI detection is disabled and parameter used in another valid method is revised | 0.1K max. |

- Update Highlights - Hot load (HTS) correction

| No. | Item | Modification | Impact on TB |
|---|---|---|---|
| 1 | RFI Removal | Algorithm details for detection and interpolation is improved. | Near the area where RFI happens |

- # Update highlights - Observation data correction

| No. | Item | Modification | Impact on TB |
|---|---|---|---|
| 1 | Scan-bias correction (6.9GHz,7.3GHz, 10GHz) | Formula and parameters are revised in order to resolve residual bias error in high TB area | 2.5K max.<br>Only in scan-edge samples. |
| 2 | Geometric calibration | Geolocation parameters are revised by using long-term data more than one years. | Geometric accuracy is improved. |

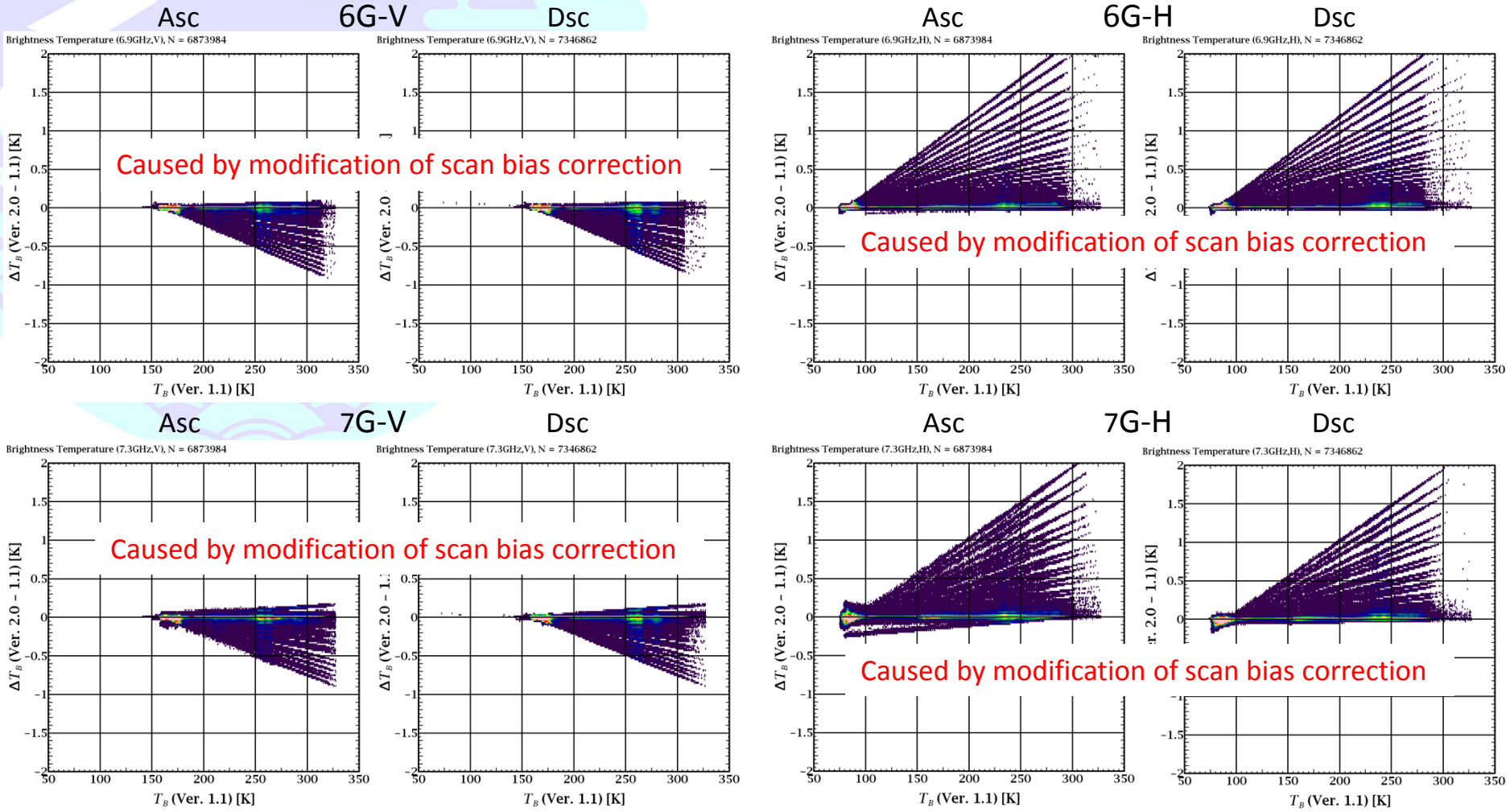
- # Update highlights - Others

| No. | Item | Modification | Impact on TB |
|---|---|---|---|
| 1 | Allocation of " interpolation flag" | Mistake in flag setting is corrected. | None<br>(Format specification is revised) |
| 2 | Addition of RFI flag (6.9 GHz, 7.3 GHz) | Processing to set C-band RFI flag on "pixel data quality" is added. | None<br>(Format specification is revised) |
| 3 | L1R weighting coefficients | Only the source antenna patterns which convers a target antenna pattern are selected and synthesized. The smoothing factor is dynamically modified. | Negligible small when a low frequency channel is used as a source. ~2K max when a high frequency channel (≧36.5 GHz) is used as a source. |
| 4 | Scan-line number | **Since L1R processing always requires ±30 scans, pre and post extra scans are extended from 20 to 30.** As a result, the total scan-line number of L1B/L1R products increases from 40 to 60. | Negligible small. However L1R TB is calculated as intended at every scan except the extra ones. |
| | | **CAUTION:** L1R TBs in the extra scans (pre and post 30 scans) are not calculated as intended. The pre and post extra scans overlap with the tail of the previous product and the head of the next product, respectively. Usage of the next or previous product is recommended instead of the extra scans. | |
| 5 | Land ocean flag | Partial absence (abnormal value) from Oct.to Nov. in 2013 and from May to Sep. in 2014. is corrected | None |

# 1. L1A and L1B products

- Validation results

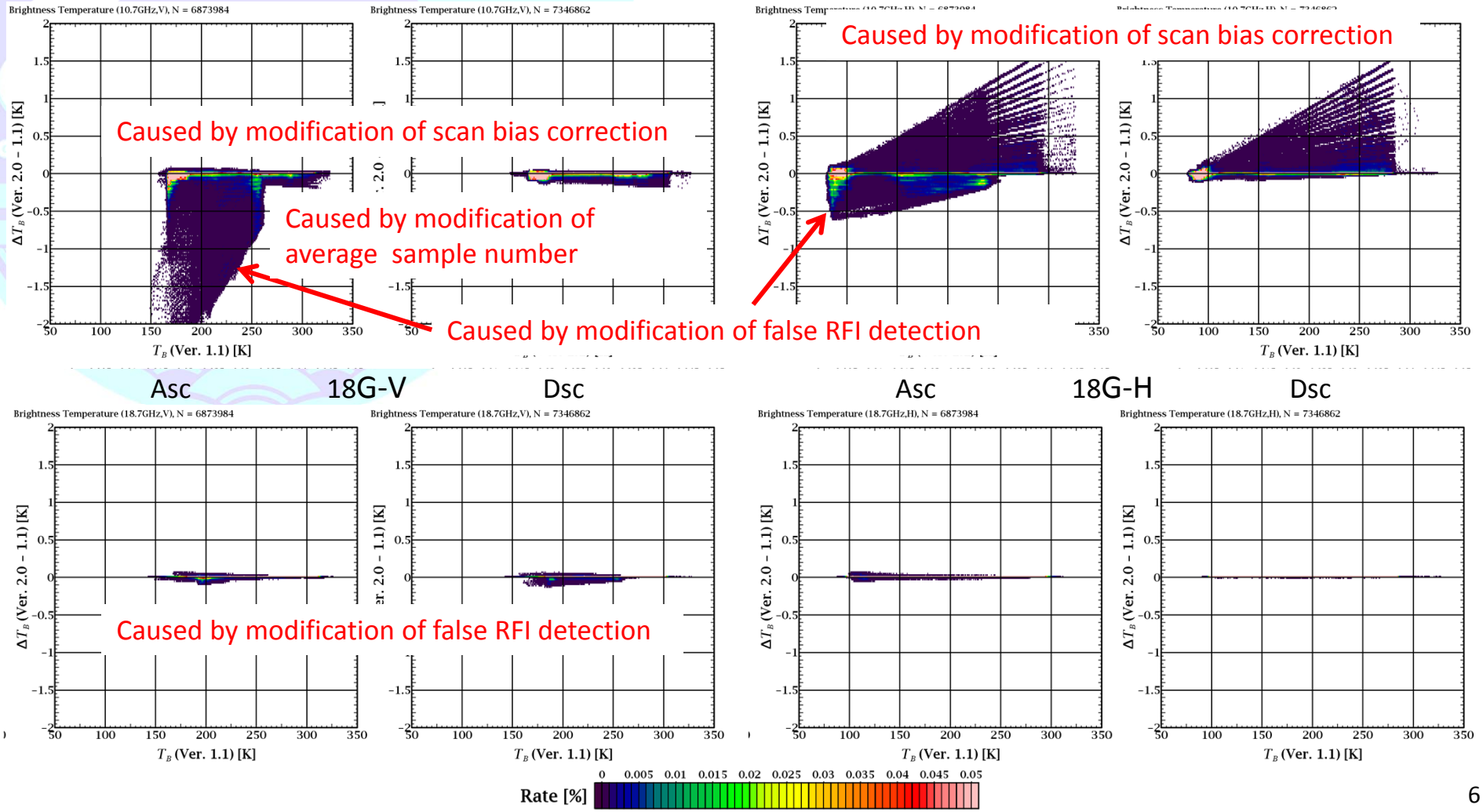
Tb of version 1.1 vs ΔTb = Tb of version 2.0 - 1.1



# 1. L1A and L1B products

- Validation results

Tb of version 1.1 vs ΔTb = Tb of version 2.0 - 1.1

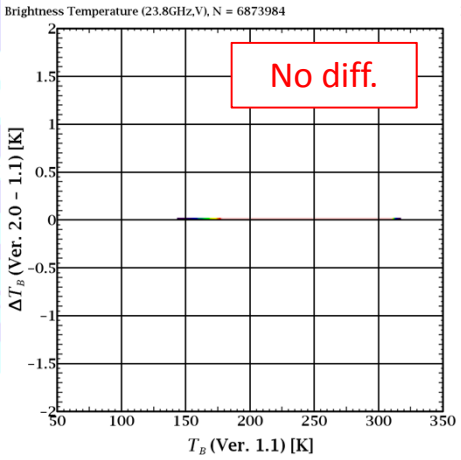


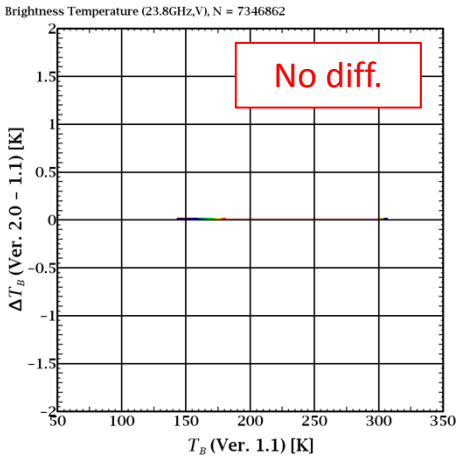
# 1. L1A and L1B products

- Validation results

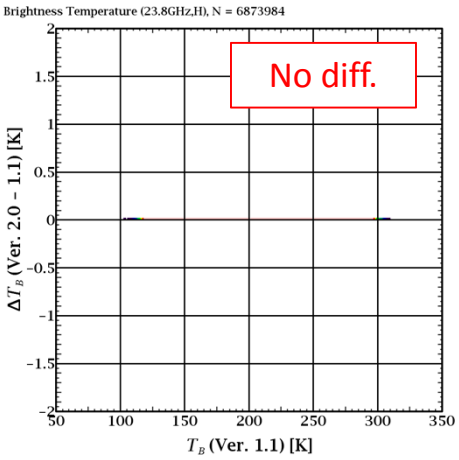
Tb of version 1.1 vs ΔTb = Tb of version 2.0 - 1.1

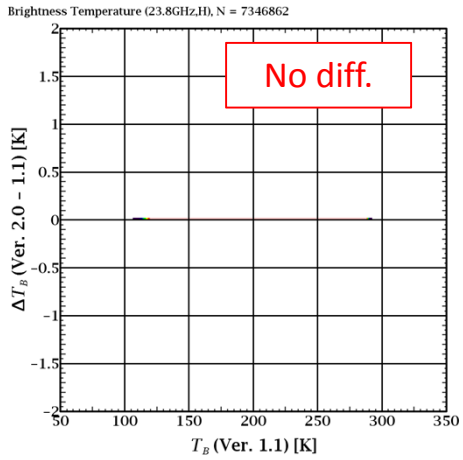
Asc 23G-V Dsc



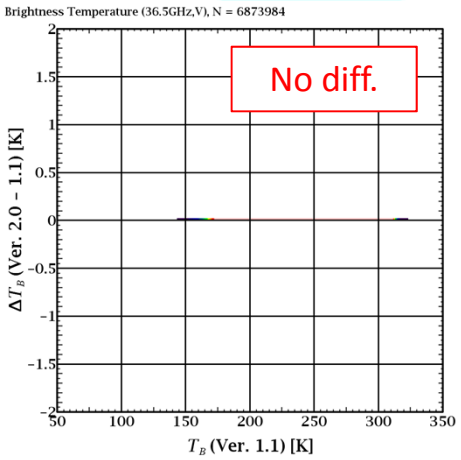



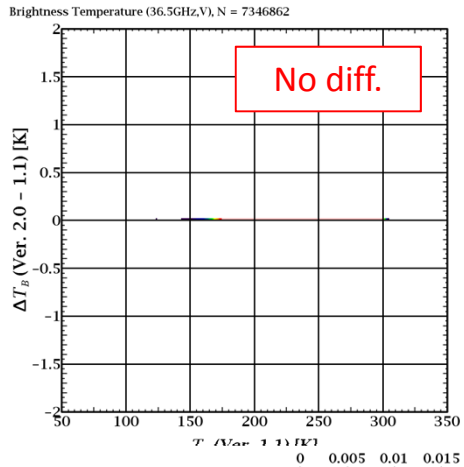

Asc 23G-H Dsc




Asc 36G-V Dsc

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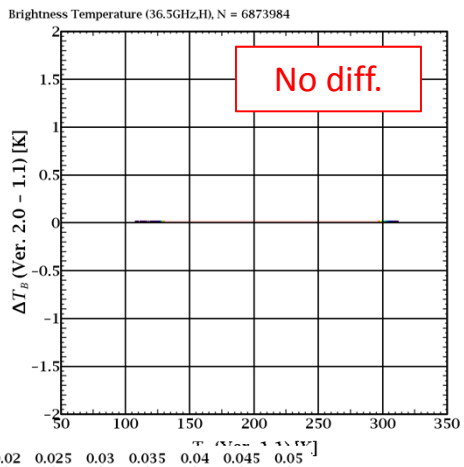
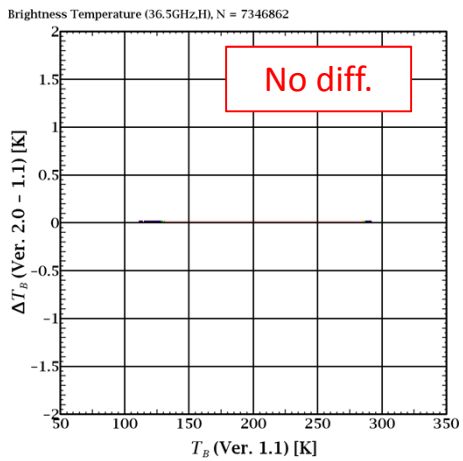
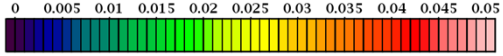


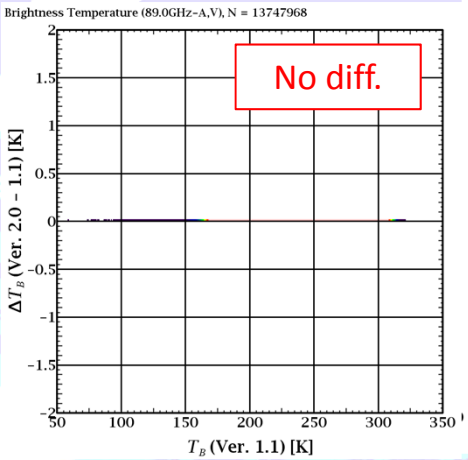
# 1. L1A and L1B products

- Validation results

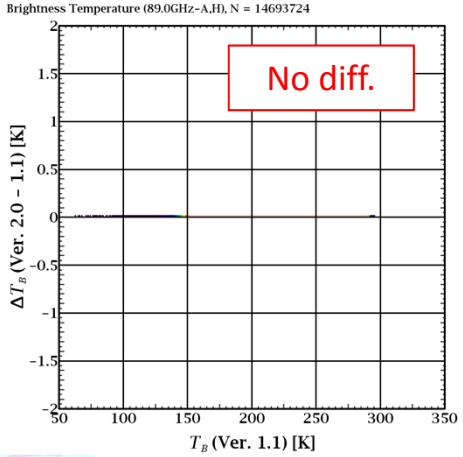
Tb of version 1.1 vs ΔTb = Tb of version 2.0 - 1.1

89GA-V

Asc

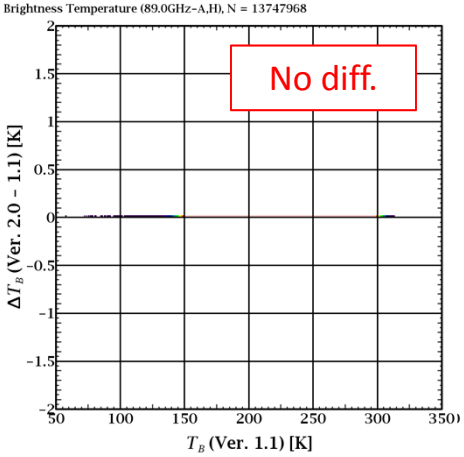



Dsc

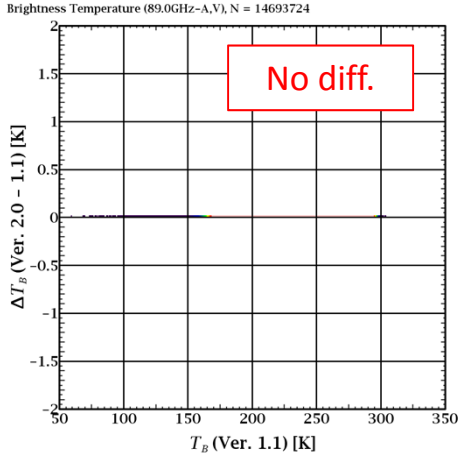



89GA-H

Asc

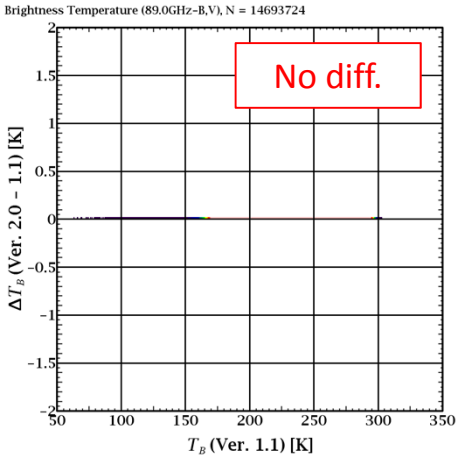



Dsc

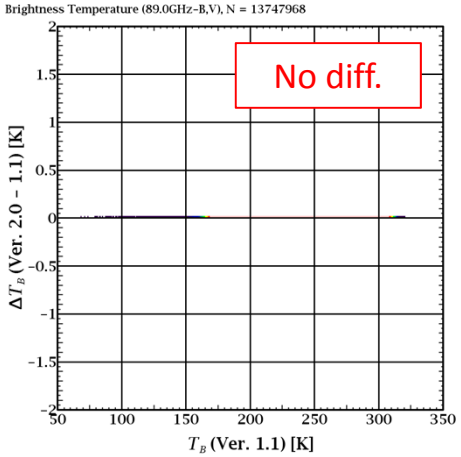



89GB-V

Asc

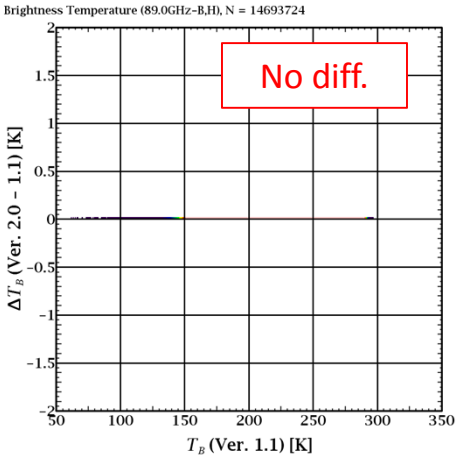



Dsc

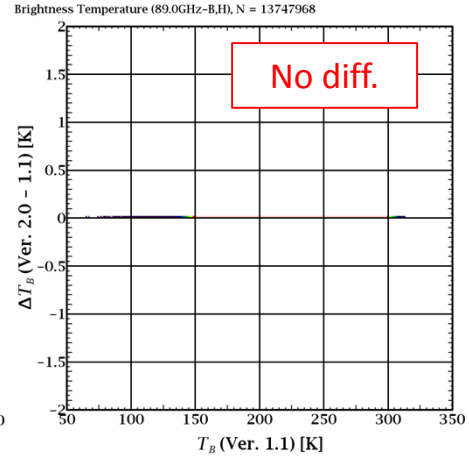


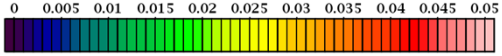

89GB-H

Asc




Dsc

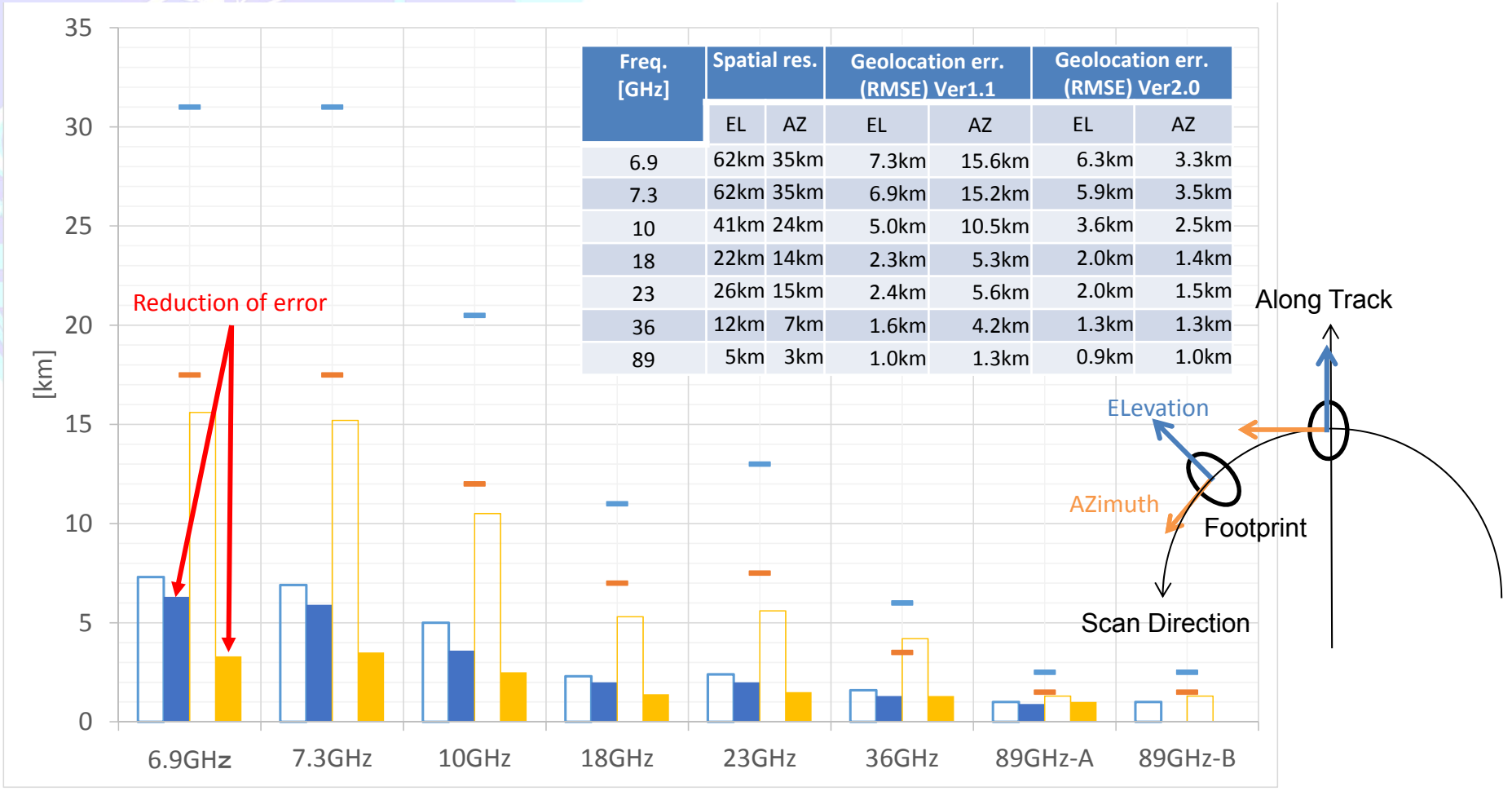


# 1. L1A and L1B products

- Validation results for the geolocation error

| Freq. [GHz] | Spatial res. | | Geolocation err. (RMSE) Ver1.1 | | Geolocation err. (RMSE) Ver2.0 | |
|---|---|---|---|---|---|---|
| | EL | AZ | EL | AZ | EL | AZ |
| 6.9 | 62km | 35km | 7.3km | 15.6km | 6.3km | 3.3km |
| 7.3 | 62km | 35km | 6.9km | 15.2km | 5.9km | 3.5km |
| 10 | 41km | 24km | 5.0km | 10.5km | 3.6km | 2.5km |
| 18 | 22km | 14km | 2.3km | 5.3km | 2.0km | 1.4km |
| 23 | 26km | 15km | 2.4km | 5.6km | 2.0km | 1.5km |
| 36 | 12km | 7km | 1.6km | 4.2km | 1.3km | 1.3km |
| 89 | 5km | 3km | 1.0km | 1.3km | 0.9km | 1.0km |



# 2. L1R product

- Update highlights

  In the new version of the L1R product, logics to calculate weighting coefficients for antenna pattern synthesis were improved.

  – More accurate simulation of AMSR2's antenna patterns in orbit.

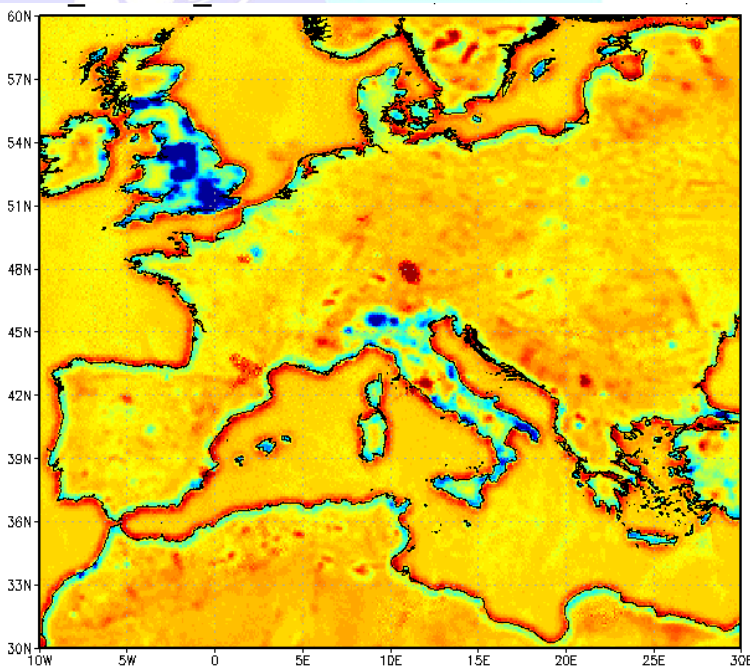
  – Optimization of the source antenna patterns' distribution covering the target antenna pattern.

  – Individual calculation of weighting coefficients for V and H channels.

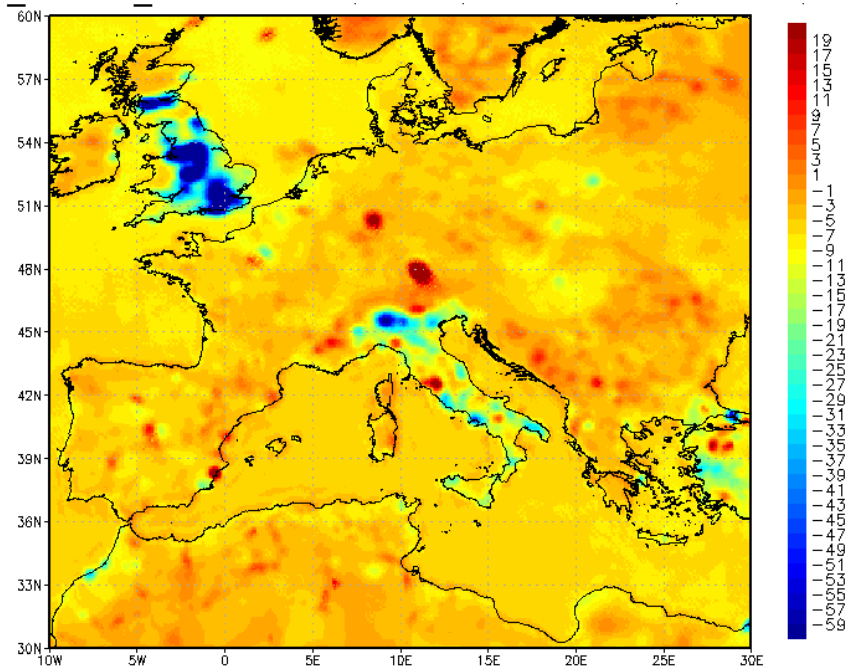
  – Optimization of parameters (smoothing factors) used to calculate weighting coefficients.

# 2. L1R product

- Validation results




L1B 6.9H - 10.7H



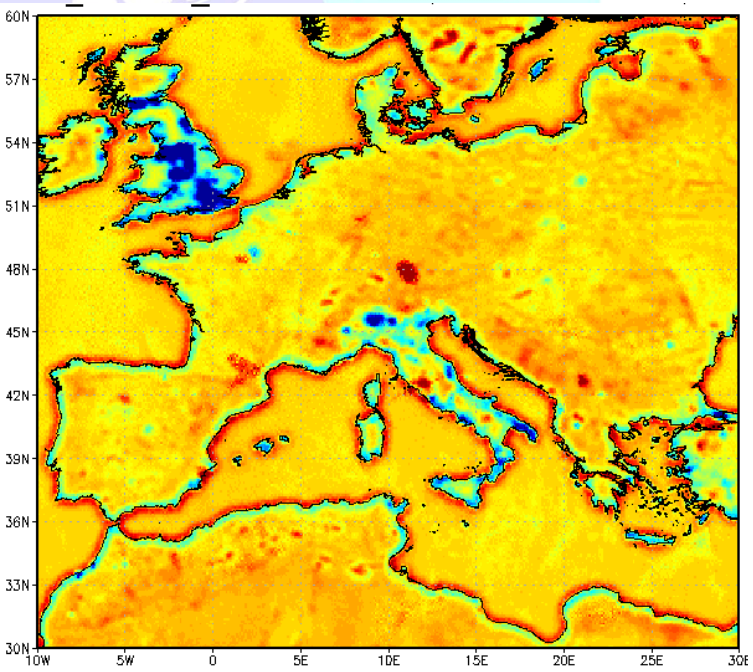

L1R **V2** 6.9H - 10.7H (fit to 6.9-GHz footprints)

If we take the difference between the **L1B** $T_B$ values of two channels (6.9- and 10.7-GHz H in the below example), **striped (blue and red) coastlines appear** because their antenna patterns are not identical.

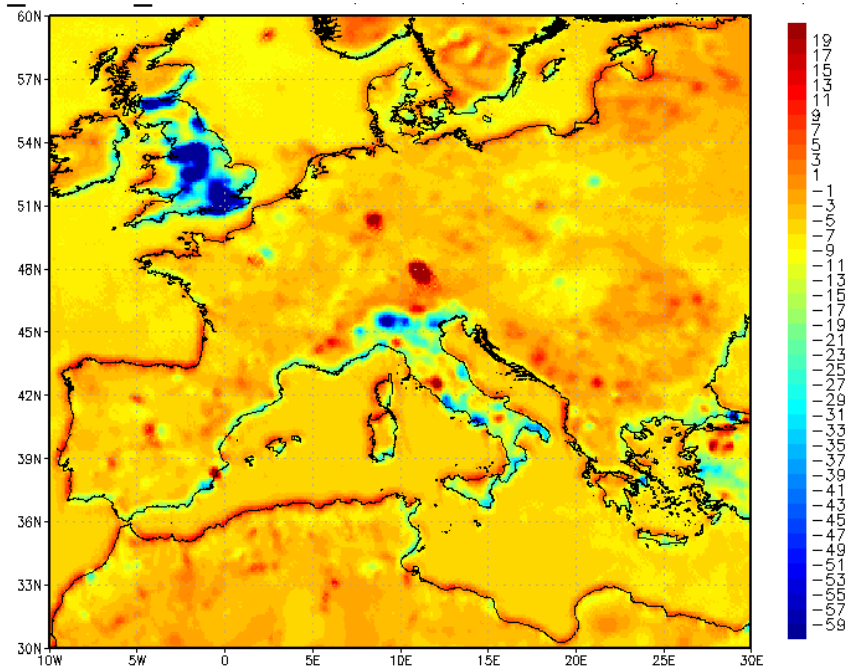
Meanwhile, if we take the difference between the **L1R** $T_B$ values of these two channels whose target antenna patterns (6.9 GHz H) are identical, **such striped coastlines must not appear.** **Actually, such striped coastlines do not appear completely in the L1R V2.**

# 2. L1R product

- Validation results in version 1.1




L1B 6.9H - 10.7H

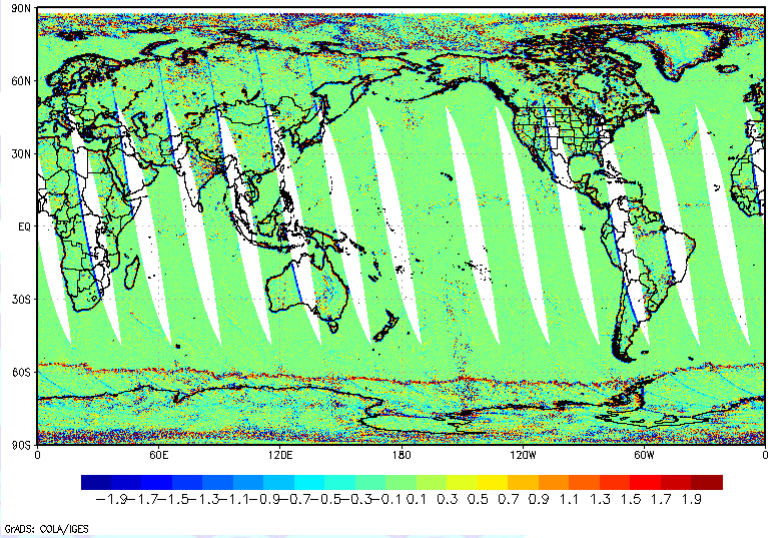



L1R **V1.1** 6.9H - 10.7H (fit to 6.9-GHz footprints)

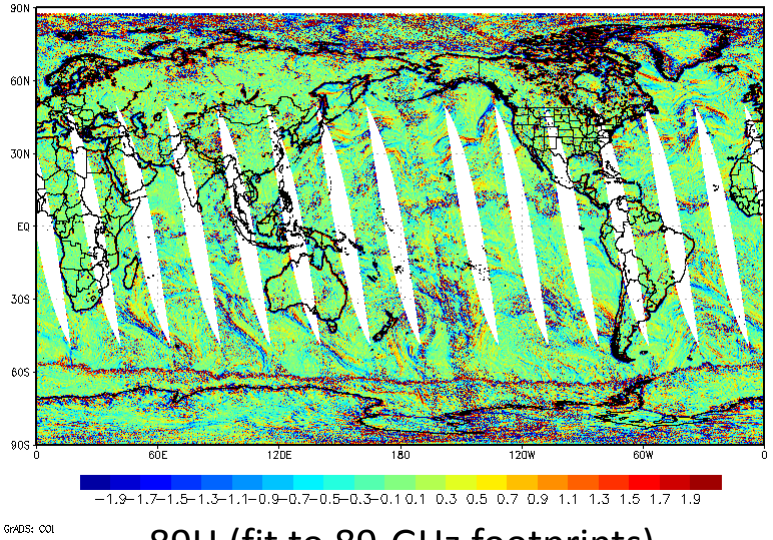
Remaining striped coastlines indicate that the weighting coefficients do not calculate correctly.

# 2. L1R product

6.9H

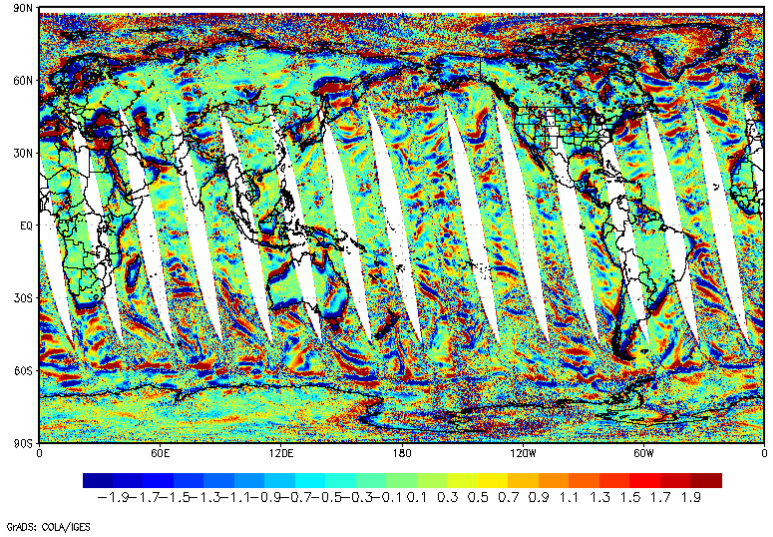



23.8H (fit to 6.9-GHz footprints)




L1R Tb Version 1.1 - Version 2.0 in Aug. 2014

89H (fit to 89-GHz footprints)




When a higher frequency channel's antenna pattern is used as a source, and a lower frequency channel's antenna pattern is used as a target, the difference between the L1R Tb Version 1.1 and Version 2.0 appears **up to 2 K**. However, because the weighting coefficients in version 2.0 are more reasonably calculated, we think the L1R Tb values in version 2.0 approach the true value.