AMSR-E/AMSR2 Unified L3 Daily 6.25 km Polar Gridded 89 GHz Brightness Temperatures, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Meier, W. N., J. C. Comiso, and T. Markus. 2018. *AMSR-E/AMSR2 Unified L3 Daily 6.25 km Polar Gridded 89 GHz Brightness Temperatures, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/NX1R09ORNOZN. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/AU_SI6

National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Parameters

This data set consists of brightness temperature (Tb) observations at 89.0 GHz.

The following tables show the parameters associated with this data set. Missing or out-of-bounds grid cells have a value of 0. Data have a scale factor of 0.1. Multiply data values by 0.1 to obtain Tb in Kelvin (K). The valid range of Tb is approximately 50 K to 300 K.

Table 1. Northern Hemisphere Parameter Summary

Field Name	Description
SI_06km_NH_89V_ASC	89.0 GHz vertical daily average ascending T_b
SI_06km_NH_89V_DSC	89.0 GHz vertical daily average descending T_b
SI_06km_NH_89V_DAY	89.0 GHz vertical daily average T_b
SI_06km_NH_89H_ASC	89.0 GHz horizontal daily average ascending T_b
SI_06km_NH_89H_DSC	89.0 GHz horizontal daily average descending T_b
SI_06km_NH_89H_DAY	89.0 GHz horizontal daily average T_b

Table 2. Southern Hemisphere Parameter Summary

Field Name	Description
SI_06km_SH_89V_ASC	89.0 GHz vertical daily average ascending T_b
SI_06km_SH_89V_DSC	89.0 GHz vertical daily average descending T_b
SI_06km_SH_89V_DAY	89.0 GHz vertical daily average T_b
SI_06km_SH_89H_ASC	89.0 GHz horizontal daily average ascending T_b
SI_06km_SH_89H_DSC	89.0 GHz horizontal daily average descending T_b
SI_06km_SH_89H_DAY	89.0 GHz horizontal daily average T_b

1.2 File Information

1.2.1 Format

Data are stored in Hierarchical Data Format - Earth Observing System (HDF-EOS5) format. There are two ancillary text files (.qa and .ph) included with each day of data. The .qa text file provides a quality assessment summary. The .ph text file provides a list of the input data files.

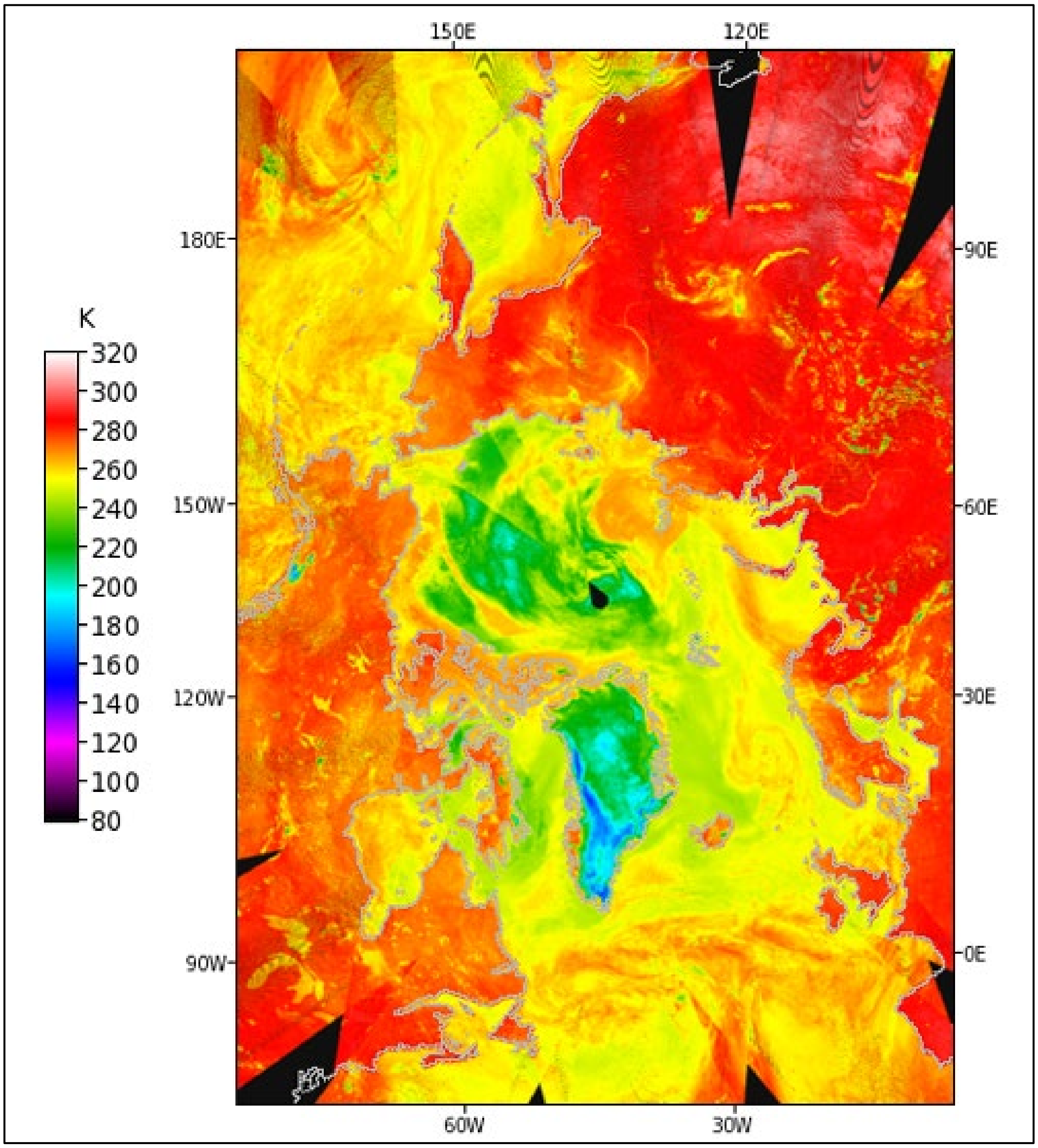

Figure 1. LANCE AMSR2 - NH - 6KM 89V AMSR_2_L3_SeaIce6km_P00_20160705_N_89V.png

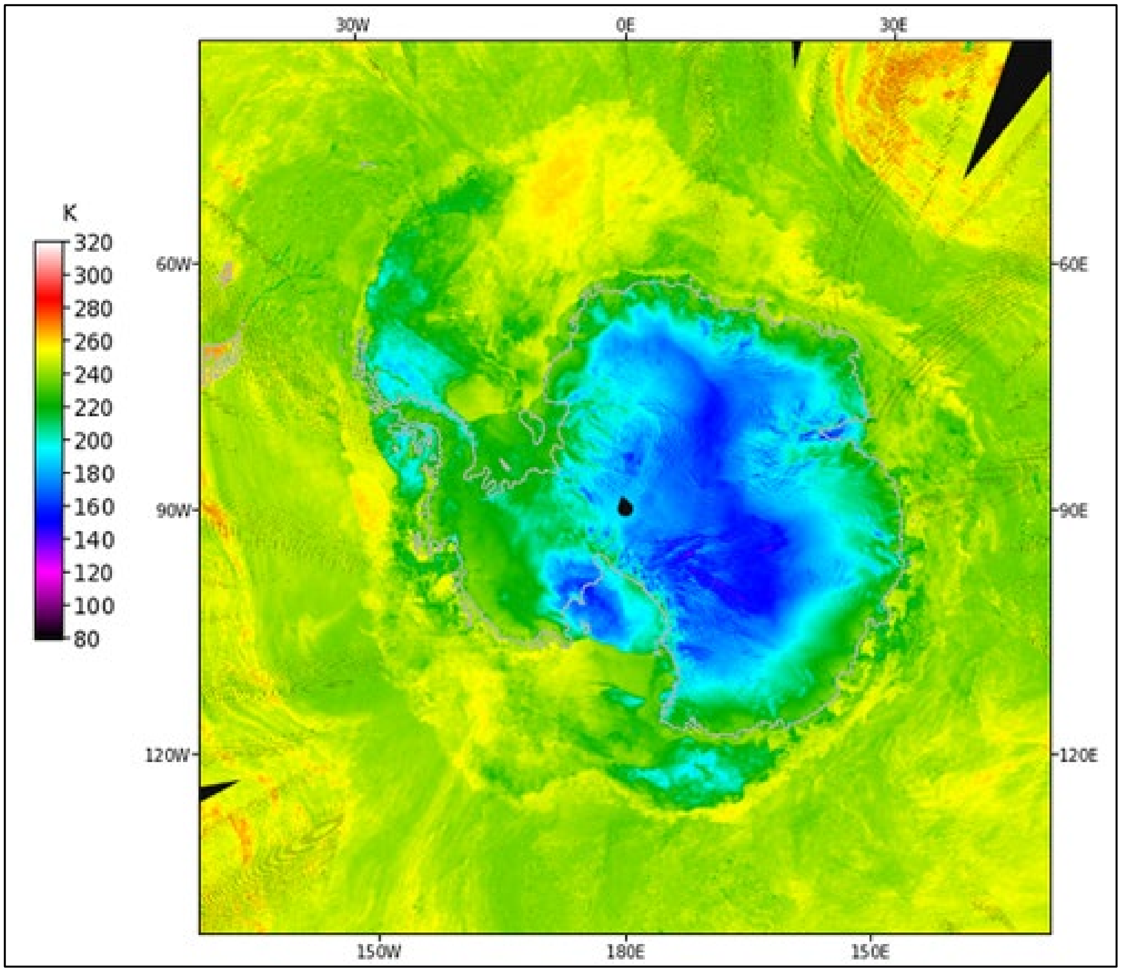

Figure 2. LANCE AMSR2 - SH - 6KM 89V AMSR_2_L3_SeaIce6km_P00_20160705_S_89V.png

1.2.2 Directory Structure

Each data file includes twelve parameter fields (six Northern Hemisphere and six Southern Hemisphere) and three metadata objects (CoreMetadata, StructMetadata, and Processing_Facility) in 32-bit signed integer format.

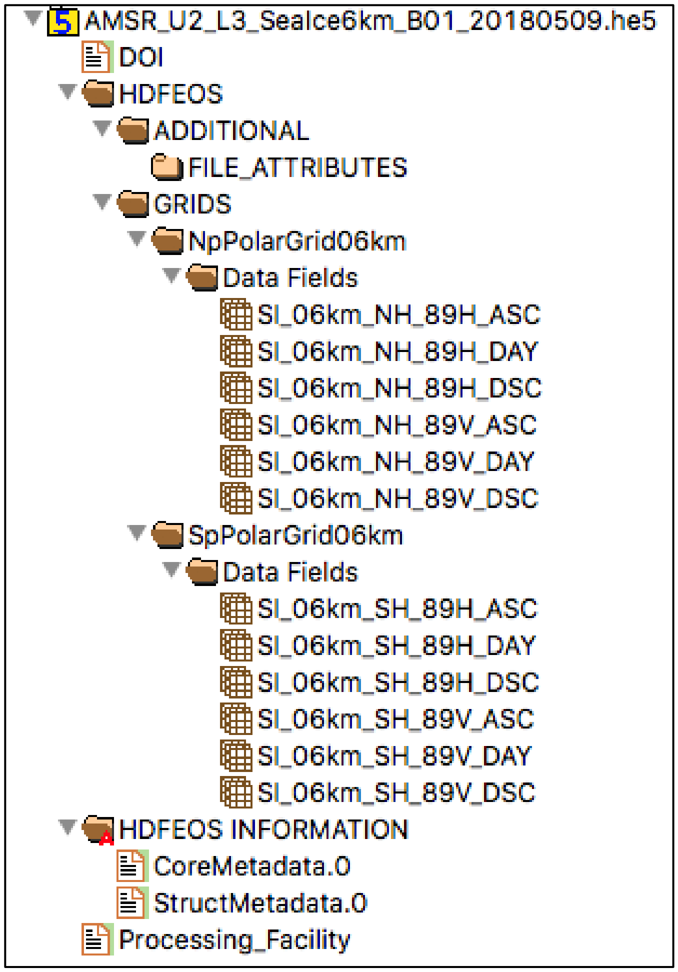

Figure 3. File Structure

1.2.3 Naming Convention

1.2.3.1 Parameter Naming Convention

The parameter name variable values use the convention example below.

Example parameter convention: `SI_6km_HE_PARAM_TIME`

Example parameter name: `SI_6km_NH_89H_ASC`

Table 3. Parameter Name Variables

Variable	Values
`SI`	Indicates sea ice.
`6km`	Indicates a nominal spatial resolution of 6 km.
`HE`	Indicates the observation hemisphere; NH: Northern Hemisphere, SH Southern Hemisphere.

Variable	Values
PARAM	Indicates the measured parameter; 6 GHz, 10 GHz, 18 GHz T_bs, 23 GHz T_bs, 36 GHz T_bs, and 89 GHz T_bs. Brightness Temperature parameters also include a polarization identifier; V: Vertical and H: Horizontal.
TIME	Indicates the observation time period; ASC: 12 hour ascending orbit, DSC: 12-hour descending orbit, DAY: Full orbit daily average

1.2.3.2 File Naming Convention

File name variable values use the file name convention example below.

Example file convention: `AMSR_U2_L3_SeaIce6km_X##_yyyymmdd.he5`

Example file name: `AMSR_U2_L3_SeaIce6km_B02_20180509.he5`

Table 4. Variable Values for the File Name

Variable	Description
AMSR	Advanced Microwave Sounding Radiometer
U	Unified
2	AMSR2
L3	Level 3
X	Product Maturity Code (Refer to Table 5)
##	File version number
yyyy	Four-digit year
mm	Two-digit month
dd	Two-digit day
he5	Hierarchical Data Format (HDF-EOS5)

Table 5. Product Maturity Code Variable Values

Variables	Description
B	Beta: indicates a developing algorithm with updates anticipated.
T	Transitional: period between Beta and Validated when the product is past the beta stage, but not quite ready for validation while the algorithm matures and stabilizes.
V	Validated: products are upgraded to Validated once the algorithm is verified by the algorithm team and validated by the validation team. Validated products have an associated validation stage. Refer to Table 2 in the Naming Conventions section of the AMSR Unified | Version History page for a description of the stages.

1.3 Spatial Information

1.3.1 Coverage

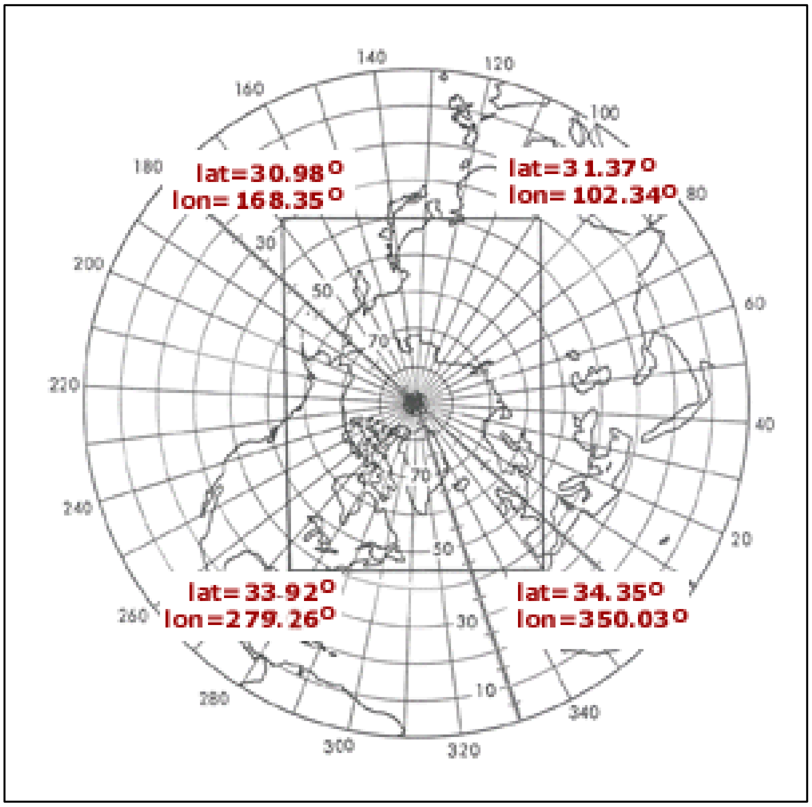

Figure 4. Northern Hemisphere Coverage Extent

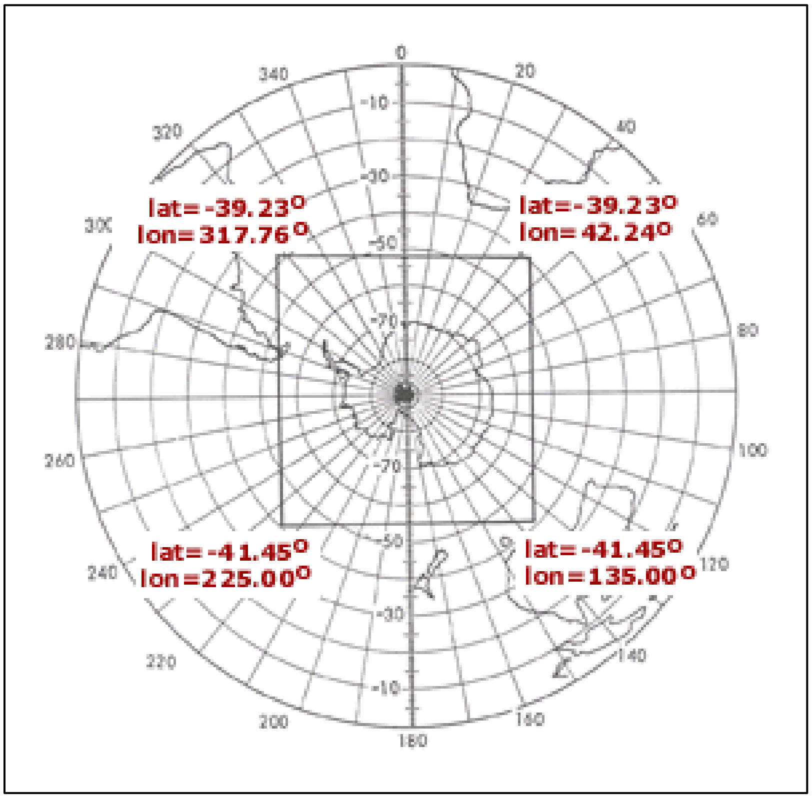

Figure 5. Southern Hemisphere Coverage Extent

A small gap in coverage exists at the poles due to the path of the ascending and descending orbits. Known as the pole hole, this gap is consistent for both AMSR2 and AMSR-E data sets. For additional information see the AMSR-E Pole Hole page.

1.3.2 Resolution

The nominal spatial resolution of the 89.0 GHz brightness temperature polar grids is 6.25 km. However, because the polar grids are not equal area, the actual resolution varies by latitude.

1.3.3 Geolocation

The following tables provide information for geolocating this data set.

Table 6. Projection Properties

	Northern Hemisphere	Southern Hemisphere
Geographic coordinate system	Unspecified (Based on Hughes 1980 ellipsoid)	Unspecified (Based on Hughes 1980 ellipsoid)
Projected coordinate system	NSIDC Sea Ice Polar Stereographic North	NSIDC Sea Ice Polar Stereographic South
Longitude of true origin	0	0
Latitude of true origin	70° N	70° S
Scale factor at longitude of true origin	1	1
Datum	Unspecified (Based on Hughes 1980 ellipsoid)	Unspecified (Based on Hughes 1980 ellipsoid)
Ellipsoid/spheroid	Hughes 1980	Hughes 1980
Units	Meter	Meter
False easting	0	0
False northing	0	0
EPSG code	3411	3412
PROJ4 string	+proj=stere +lat_0=90 +lat_ts=70 +lon_0=-45 +k=1 +x_0=0 +y_0=0 +a=6378273 +b=6356889.449 +units=m +no_defs	+proj=stere +lat_0=-90 +lat_ts=-70 +lon_0=0 +k=1 +x_0=0 +y_0=0 +a=6378273 +b=6356889.449 +units=m +no_defs
Reference	http://epsg.io/3411	http://epsg.io/3412

Table 7. Grid Properties

	Northern Hemisphere	Southern Hemisphere
Grid cell size (x, y pixel dimensions)	6.25 km	6.25 km
Number of rows	1792	1328
Number of columns	1216	1264
Geolocated lower left point in grid	-3850 E, -5350 S	-3950 E, -3950 S
Nominal gridded resolution	6.25 km	6.25 km
ulxmap – x-axis map coordinate of the center of the upper-left pixel (XLLCORNER for ASCII data)	-3850	-3950
ulymap – y-axis map coordinate of the center of the upper-left pixel (YLLCORNER for ASCII data)	5850	4350

The origin of each x, y grid is the pole. The following tables show the approximate outer boundaries for the Arctic and Antarctic grids. Corner points are listed starting from the upper left corner and progress clockwise. Interim rows define boundary midpoints.

Table 8. Grid Boundary Details - Arctic

X (km)	Y (km)	Latitude (deg)	Longitude (deg)	Pixel Location
-3850	5850	30.98	168.35	corner
0	5850	39.43	135.00	midpoint
3750	5850	31.37	102.34	corner
3750	0	56.35	45.00	midpoint
3750	-5350	34.35	350.03	corner
0	-5350	43.28	315.00	midpoint
-3850	-5350	33.92	279.26	corner
-3850	0	55.50	225.00	midpoint

Table 9. Grid Boundary Details - Antarctic

X (km)	Y (km)	Latitude (deg)	Longitude (deg)	Pixel Location
-3950	4350	-39.23	317.76	corner
0	4350	-51.32	0.00	midpoint
3950	4350	-39.23	42.24	corner
3950	0	-54.66	90.00	midpoint
3950	-3950	-41.45	135.00	corner
0	-3950	-54.66	180.00	midpoint
-3950	-3950	-41.45	225.00	corner
-3950	0	-54.66	270.00	midpoint

1.3.4 Geolocation Tools

NSIDC provides geolocation tools for polar stereographic data sets. See the Polar Stereo Tools page for more details.

1.3.5 Land Masks

A 6.25 km Northern Hemisphere land mask (amsr_gsfc_6n.hdf) and a 6.25 km Southern Hemisphere land mask (amsr_nic_6s.hdf) are available for use with these data.

1.4 Temporal Information

1.4.1 Coverage

02 July 2012 to the present.

1.4.2 Resolution

Brightness temperatures are provided in three daily-averaged composites: daily-averaged ascending orbits, daily-averaged descending orbits and a daily average of all orbits.

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

This product uses the JAXA AMSR2 Level-1R input T_b observations that are calibrated (unified) across the JAXA AMSR-E and AMSR2 Level-1R products. Note that the AMSR-E products at NSIDC currently only use the Level-2A T_b observations provided by Remote Sensing Systems. In the future, AMSR-E Tb observations may be reprocessed with the unified JAXA Level-1R Tb observations and archived at NSIDC.

The Level-1R input data consist of resampled brightness temperatures. The brightness temperature sensor footprints (instantaneous fields of view) vary with frequency. The resampling remaps the brightness temperatures to sets of consistent footprint sizes using a Backus-Gilbert method. Each resampled set corresponds to the footprint of one frequency and contains that frequency plus all higher-resolution frequencies. Therefore, the number of channels in each resampled set of brightness temperatures varies. In the AU_SI6 product, only 89 GHz data is included, so there is only one resampled set of brightness temperatures. See JAXA Level 1R documentation or Maeda et al. (2016) for more information.

2.2 Processing

Swath data from the 89 GHz channel are mapped onto the 6.25 km polar stereographic grid by converting the geodetic latitude and longitude for the center of each scene station, such as the observation footprint, into AMSR2 map grid coordinates. Scene station map grid coordinates determine grid cell assignments. Observations that fall outside the AMSR2 polar grid are ignored. For each grid cell, brightness temperatures observed over a 24-hour period (midnight to midnight GMT) are summed and then divided by the total number of observations to obtain a daily-averaged brightness temperature value. If no observations fall within a grid cell for a given day, the average brightness temperature is labeled 'missing'. The 24-hour averaging is done three ways: for all ascending orbits; all descending orbits; and a daily average of all orbits.

The daily average is not simply an average of ascending and descending orbits, because a given pixel could have, for example, three measurements from ascending orbits and two from descending orbits. Instead, the algorithm computes the daily average for that grid cell from daily ascending and descending averages. For example, if A = ascending and B = descending:

`((A1 + A2)/2 + (B1 + B2 + B3)/3)/2` (Equation 1)

However, this approach biases daytime (ascending) orbits over nighttime (descending) orbits.

2.3 Quality, Errors, and Limitations

2.3.1 Assessment

Each HDF-EOS5 data file contains core metadata with quality assessment (QA) metadata flags. These flags are set by the operational processing code run by the AMSR Science Investigator-led Processing System (SIPS) prior to delivery to NSIDC. A separate metadata file in XML format is also delivered to NSIDC with the HDF-EOS5 file. This file contains the same quality assessment (QA) metadata flags as the core metadata contained in the HDF-EOS5 file. Three levels of QA are applied to AMSR2 files: automatic, operational, and science. Please note that if a granule passes automatic QA and operational QA, the granule is forwarded to NSIDC for archive and distribution. If not, the issue is resolved and the granule is reprocessed. Science QA is performed automatically during nominal processing but only reviewed closely after the fact in conjunction with questions that arise post-processing.

2.3.2 Automatic QA

Out-of-bounds Level-1R brightness temperatures are screened out before brightness temperatures are interpolated to the 6.25 km grid.

2.3.3 Operational QA

AMSR2 L1R data are subject to operational QA by JAXA prior to arriving at the AMSR SIPS for processing to higher level products. Operational QA varies by product, but it typically checks for the following criteria in a given file (Conway 2002):

- File is correctly named and sized
- File contains all expected elements
- File is in the expected format
- Required EOS fields of time, latitude, and longitude are present and populated
- Structural metadata are correct and complete
- File is not a duplicate
- HDF-EOS5 version number is provided in the global attributes
- Correct number of input files were available and processed

2.3.4 Science QA

In the SIPS environment, as part of the processing code, the science QA includes checking the maximum and minimum variable values, and percent of missing data and out-of-bounds data per variable value. At the Science Computing Facility (SCF), co-located with the SIPS, post-processing science QA involves reviewing the operational QA files and browse images, and performing the following additional QA procedures (Conway 2002):

- Comparisons with historical data
- Detection of errors in geolocation
- Verification of calibration data
- Detection of trends in calibration data
- Detection of large scatter among data points that should be consistent.

Several tools have been developed to aid in the QA process of the Level 3 AMSR2 products. The AMSR SIPS provides software that creates a QA browse image in Portable Network Graphics (PNG) format that can be used for visual QA. The team lead SCF (TLSCF) provides metadata and QA software specific to each product that generate the metadata files discussed above and a QA summary report in text format. The products of these tools are provided to NSIDC along with each data granule.

2.3.5 Accuracy and Precision

Refer to the Algorithm Theoretical Basis Document for information about data used to check the accuracy and precision of AMSR2 observations.

2.3.6 Anomalies

Refer to the AMSR2 LANCE Anomalies Page for information regarding data anomalies or gaps in coverage.

2.4 Instrumentation

2.4.1 Description

For a detailed description of the AMSR2 instrument, refer to the AMSR2 Channel Specification and Products page.

3 CONTACTS AND ACKNOWLEDGMENTS

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4 REFERENCES

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5 DOCUMENT INFORMATION

5.1 Publication Date

09 July 2018

5.2 Date Last Updated

15 March 2021