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 reports 6.25 km resolution, average daily 89.0 GHz horizontally (H) and vertically (V) polarized brightness temperatures (T_bs) for the AMSR-E[1] and AMSR2 instruments. The data are provided on north and south polar stereographic grids.

The T_bs are derived from Level 1R (L1R) data that has been spatially resampled by the Japan Aerospace Exploration Agency (JAXA) to unify AMSR-E and AMSR2 observations.

1.2 File Information

1.2.1 Format

Data are provided in Hierarchical Data Format - Earth Observing System (HDF-EOS5) format. Ancillary files are also available that contain a quality assessment summary, a list of input data granules, and granule-specific metadata.

1.2.2 File Contents

The root directory of the HDF-EOS5 data files contains two main groups: /HDFEOS/ and /HDFEOS INFORMATION/.

T_bs are stored as 32-bit integer data fields in /HDFEOS/, within the following North and South Pole subgroups:

…/GRIDS/NpPolarGrid06km/Data Fields/
…/GRIDS/SpPolarGrid06km/Data Fields/

The T_b data fields utilize the following naming convention:

Example
SI_06km_NH_89H_ASC

Naming Convention
SI_06km_[HEM]_[FPOL]_[ORBIT]

The following table describes the variables in the data field naming convention:

[1]Advanced Microwave Scanning Radiometer (AMSR) for EOS

Table 1. Data Field Variable Names and Descriptions

Variable Name	Description
SI_06km	Sea ice, 6 km resolution
HEM	NH (N. Hemisphere) or SH (S. Hemisphere)
FPOL	Frequency and polarization: 89H = 89.0 GHz, hor. 89V = 89.0 GHz, vert.
ORBIT	ASC (ascending) DSC (descending) DAY (daily average)

T_bs values are scaled by a factor of 10 (or have a "scale factor" = 0.1) when written to the data fields. To recover T_bs in kelvins, multiply the stored value by 0.1. E.g., a stored value of 2673 = 267.3 K. Missing data are denoted by a value of 0.

The /NpPolarGrid06km/ and /SpPolarGrid06km/ subgroups also contain latitude and longitude arrays, named "lat" and "lon", respectively, plus the NetCDF dimension scales[2] "XDim" and "YDim".

The /HDFEOS INFORMATION/ group contains the HDF-EOS global attributes "CoreMetadata.0" and "StructMetadata.0".

1.2.3 File Naming Convention

Files in this data set utilize the following naming convention:

Example

AMSR_U2_L3_SeaIce6km_B04_20120702.he5

AMSR_UE_L3_SeaIce6km_B04_20020601.he5

Naming Convention

AMSR_U[S]_L3_SeaIce6km_[X][##]_[yyyymmdd].[ext]

The following tables describes the variables in the file naming convention:

[2] For more information about NetCDF dimension scales, see NetCDF-4 Dimensions and HDF5 Dimension Scales.

Table 2. Variable Values for the File Name

Variable	Description
AMSR_U	AMSR Unified
S	Sensor code: E = AMSR-E; 2 = AMSR2
L3	Data processing level (L3 = Level 3)
SeaIce6km	6 km sea ice product
X	Product Maturity Code (See Table 3)
##	File version number
yyyymmdd	Year (yyyy), month (mm), and day (dd) of data acquisition. E.g., 20120702 = 2 July, 2012.
ext	File extension: .he5 = HDF-EOS5 .qa = quality assessment summary .ph = list of input granules .xml = granule metadata

Table 3. Product Maturity Code Variable Values

Variables	Description
B	Beta: Developing algorithm with updates anticipated.
T	Transitional: Period after Beta when algorithm matures and stabilizes, but product is not quite ready for validation.
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

North Polar Grid

N: 89.24° S: 30.98° E: 180.0° W: -180.0°

South Polar Grid

N: -39.23° S: -89.24° E: 180.0° W: -180.0°

The above coverages are depicted in Figure 1 and Figure 2 :

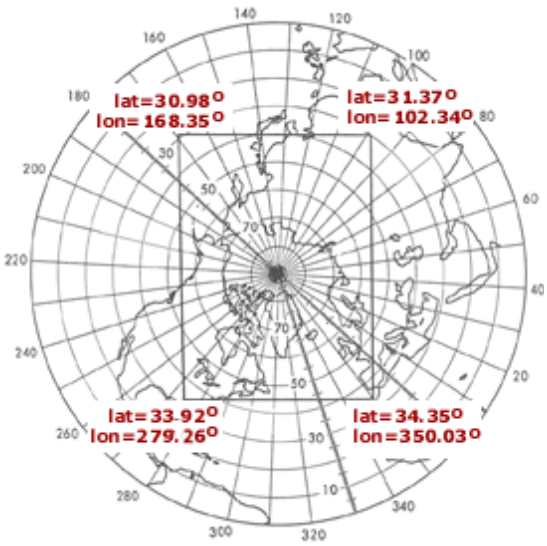

Figure 1. North Polar Grid

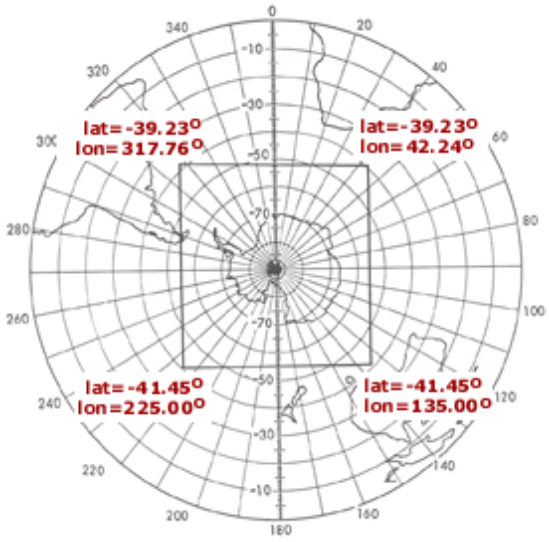

Figure 2. South Polar Grid

ⓘ 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

These data are gridded at a nominal resolution of 6.25 km x 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 4. Geolocation Details

Projected coordinate system	NSIDC Sea Ice Polar Stereographic North	NSIDC Sea Ice Polar Stereographic South
Geographic coordinate system	Unspecified datum based upon the Hughes 1980 ellipsoid	Unspecified datum based upon the Hughes 1980 ellipsoid
Longitude of true origin	-45	0
Latitude of true origin	70	-70

Projected coordinate system	NSIDC Sea Ice Polar Stereographic North	NSIDC Sea Ice Polar Stereographic South
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	https://epsg.org/crs_3411/NSIDC-Sea-Ice-Polar-Stereographic-North.html	https://epsg.org/crs_3412/NSIDC-Sea-Ice-Polar-Stereographic-South.html

Table 5. Grid Details

Hemisphere	**Northern**	**Southern**
Grid cell size (km)	6.25 × 6.25	6.25 × 6.25
Grid size (rows × columns)	1792 × 1216	1328 × 1264
Geolocated lower left point in grid (km)	(-3850, -5350)	(-3950, -3950)
Nominal gridded resolution	6.25 km	6.25 km
Grid rotation	0	0
ulxmap: x-axis coord, center of upper left pixel (XLLCORNER) (km)	-3,846.875	-3,946.875
ulymap: y-axis coord, center of upper left pixel (YLLCORNER) (km)	5,846.875	4,346.875

For additional details about this projection, see "A Guide to NSIDC's Polar Stereographic Projection."

1.4 Temporal Information

ⓘ This AMSR-E/AMSR2 unified product was originally released with AMSR2 data only (2 July 2012 to present). In May 2022, the data provider began processing and delivering the AMSR-E portion of the data set to NSIDC. We will be making these files available as we receive them.

1.4.1 Coverage

1 June 2002 to 4 October 2011

2 July 2012[3] to the present

1.4.2 Resolution

Daily

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

This product is derived from AMSR-E and AMSR2 Level-1R (L1R) T_b swath observations produced by the Japan Aerospace Exploration Agency (JAXA). The L1R data are resampled using the Backus-Gilbert method to remap observations from the two sensors—which utilize different main reflector and antenna configurations—into T_b observations with consistent footprint sizes at each frequency. The resampling theory and implementation are detailed in "Descriptions of GCOM-W1 AMSR2 Level 1R and Level 2 Algorithms".

2.2 Processing

After any out-of-bounds values are screened out from the L1R swath data, AMSR-E and AMSR2 89 GHz observations are mapped to the 6.25 km polar stereographic grid by first converting the geodetic latitude and longitude at the center of each observation footprint into AMSR-E or AMSR2 grid coordinates. These grid coordinates are then used to assign T_b observations to cells in the 6.25 km polar stereographic grid. Observations that fall outside the polar grids are ignored.

Average T_b values are then computed for all observations within each 6.25 km grid cell during a 24-hour period (midnight to midnight, GMT). If no observations fall within a cell during a 24-hour

[3] Data are not available from 04 October 2011 – 02 July 2012, between the end of the AMSR-E mission and the beginning of AMSR2.

period, the value is reported as missing ("0"). Separate averages are computed for ascending and descending orbits, which are then used to compute the daily average T_b value.

As such, the daily average is not the average of all T_b observations, but the average of the ascending and descending averages. As shown by the following equation, this approach can bias the daily average (DAY) toward ascending (ASC) or descending (DSC) observations, if the ASC or DSC averages on a given day are computed from different numbers of observations (i.e., different values of *n* and *m*):

$$DAY = \frac{\frac{ASC_1 + ASC_2 + \ldots ASC_n}{n} + \frac{DSC_1 + DSC_2 + \ldots DSC_m}{m}}{2}$$

2.3 Quality, Errors, and Limitations

The input AMSR-E and AMSR2 L1R data are subject to operational QA by JAXA before they are delivered to the AMSR SIPS. In addition, AMSR-U output data are subject to similar QA tests that determine, e.g., whether files are correctly named, contain all expected elements, are in the expected format, etc. AMSR-U data also go through the QA protocols described in the following sections.

2.3.1 Automated QA

Each HDF-EOS5 data file contains core metadata with QA metadata flags. These flags are set by the operational processing code run by the AMSR Science Investigator-led Processing System (SIPS) prior to data delivery (this metadata is also available as a separate XML file). Data files that pass these automated QA screens are forwarded to NSIDC. If a file fails QA, the issue is resolved and the file is reprocessed. Operational QA is only reviewed closely after the fact, in conjunction with questions that arise post-processing.

2.3.2 Science QA

As part of the SIPS processing code, science QA checks maximum and minimum values and the percentage of missing and out-of-bounds data for each variable. In addition, the Science Computing Facility, co-located with the SIPS, reviews the operational QA files and conducts the following post-processing QA analyses:

- Comparisons with historical data
- Detection of geolocation errors
- Verification of calibration data
- Identification of trends in calibration data

- Detection of anomalously large scatter

2.3.3 Accuracy and Precision

See AMSR Unified | ATBDs and General Resources for details about the algorithms and data used to confirm the accuracy and precision of unified AMSR-E and AMSR2 observations.

3 INSTRUMENTATION

AMSR-E was a modified version of the AMSR instrument on JAXA's Advanced Earth Observing Satellite-II (ADEOS-II). It was developed at JAXA in cooperation with U.S. and Japanese scientists for the NASA Aqua satellite mission. For more information about AMSR-E, see AMSR-E Instrument Description.

AMSR2 was launched on May 18, 2012 on board JAXA's GCOM-W1 satellite. Additional information about the AMSR2 instrument is available on the GCOM-W1 | AMSR2 Channel Specification and Products page.

4 SOFTWARE AND TOOLS

4.1 Geolocation

NetCDF formatted arrays of latitudes and longitudes at the centers of 6.25 km north and south polar stereographic grid cells are available in the Polar Stereographic Ancillary Grid Information, Version 1 data set.

4.2 Land Masks

NSIDC also provides masks and overlays that can be used, for example, to conceal unwanted Northern and Southern Hemisphere land regions or contaminated coastal ocean pixels incorrectly assigned sea ice concentrations. To determine which masks are available for this data set, see "Does NSIDC have tools to extract and geolocate polar stereographic data?."

5 VERSION HISTORY

See AMSR Unified Version History for a summary of changes since the start of mission.

6 RELATED DATA SETS

A near real-time (NRT) version of this data set is available from NASA's Land, Atmosphere Near real-time Capability for Earth Observing Systems (LANCE).

7 CONTACTS AND ACKNOWLEDGMENTS

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8 REFERENCES

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9 DOCUMENT INFORMATION

9.1 Publication Date

July 2018

9.2 Date Last Updated

February 2025