AMSR-E/Aqua Daily EASE-Grid Daily Global & Quarter-Degree Gridded Brightness Temperatures, Version 1

USER GUIDE

How to Cite These Data

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

Knowles, K., M. Savoie, R. Armstrong, and M. J. Brodzik. 2006. *AMSR-E/Aqua Daily EASE-Grid 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/XIMNXRTQVMOX. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0301

National Snow and Ice Data Center

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1 DATA DESCRIPTION

This document pertains to two data sets: AMSR-E/Aqua Daily EASE-Grid Brightness Temperatures (NSIDC-0301) and AMSR-E/Aqua Daily Global Quarter-Degree Gridded Brightness Temperatures (NISDC-0302).

The AMSR-E/Aqua Daily EASE-Grid Brightness Temperatures consist of gridded data in one of three projections (all with 25 km resolution): The Northern Hemisphere EASE-Grid, Southern Hemisphere EASE-Grid, and full global EASE-Grid. The AMSR-E/Aqua Daily Global Quarter-Degree Gridded Brightness Temperatures are gridded to one global cylindrical, equidistant latitude-longitude projection at 0.25° (quarter-degree) resolution.

These data are gridded from swath format using an Inverse Distance Squared (ID2) interpolation. The source data are Level-2A swath brightness temperatures from the AMSR-E/Aqua L2A Global Swath Spatially-Resampled Brightness Temperatures (AE_L2A) data set.

1.1 Parameters

These interpolated brightness temperature data have a scale factor of 0.1. Multiply data values by 0.1 to obtain brightness temperatures in kelvins (K). The valid range of brightness temperature is approximately 65 to 320 K. The value 0 indicates missing data.

1.1.1 Sample Images

The following sample images show AMSR-E 36 GHz, horizontally-polarized brightness temperatures from descending passes for December 31, 2005, gridded to the three different EASE-Grids.

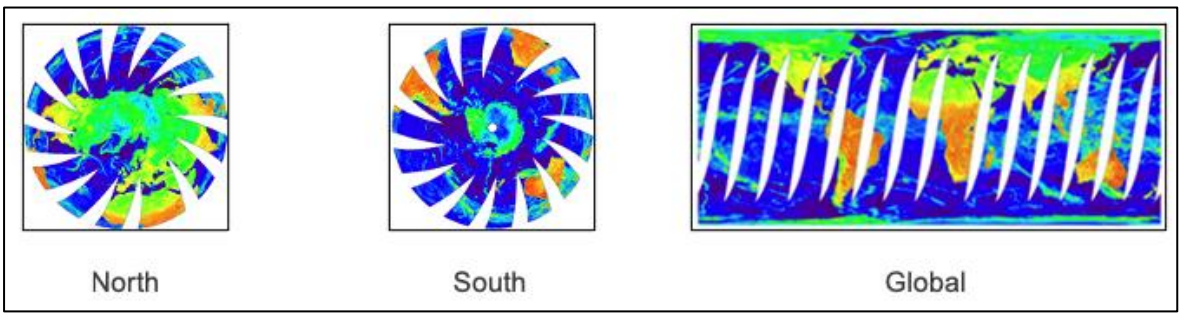

Figure 1. Sample Images of AMSR-E 36 GHz data.

1.2 File Information

1.2.1 Format

Files contain flat binary (unformatted) grid arrays, one grid per file. Files are compressed for delivery.

There are 24 brightness temperature data files per day for a given projection: separate data files for each of the 12 channels and the two pass directions per channel. Data are 2-byte unsigned integers, little-endian byte-order, representing temperatures in tenths of kelvins. Data values range from 650 to 3200, with the value 0 indicating missing data.

There are two, time files per day for a given projection: ascending and descending passes. Data are 2 byte signed integers, little-endian byte-order, indicating time of data acquisition as minutes since midnight (0:00 UTC) of the date of the enclosing file. The values in the time files range from 0 to 1440, with the value -32768 indicating missing data.

Geolocation files containing latitude and longitude coordinates are also available. Please see the Software and Tools section for more information.

1.2.2 File Size and Volume

File size varies by projection, as shown in Table 1. The sizes shown are approximations for uncompressed files; files are distributed with approximately 60% compression.

Table 1. File Size

Projection	File Size
EASE-Grid, north and south	1 MB
EASE-Grid, global	1.5 MB
Quarter-degree	2 MB

The total data set volume per day includes 24 brightness temperature data files (12 channels, two pass directions per channel) and two, time files (two pass directions), for each projection.

The volumes shown in Table 2. Total Data Set Volume Per Day are approximations for uncompressed files; files are distributed with approximately 60% compression.

Table 2. Total Data Set Volume Per Day

Projection	Volume Per Day
EASE-Grid, north	27 MB

Projection	Volume Per Day
EASE-Grid, south	27 MB
EASE-Grid, global	42 MB
Quarter-degree	54 MB

1.2.3 Directory Structure

Data files are organized on the HTTPS site according to projection type, instrument (AMSR-E), specific grid, and year of data. The directory structure on the HTTPS site is illustrated in Figure 2 . In this illustration, the year directories are representative placeholders; on the HTTPS site, there are multiple such directories, each named for a 4-digit year, such as 2002 or 2006.

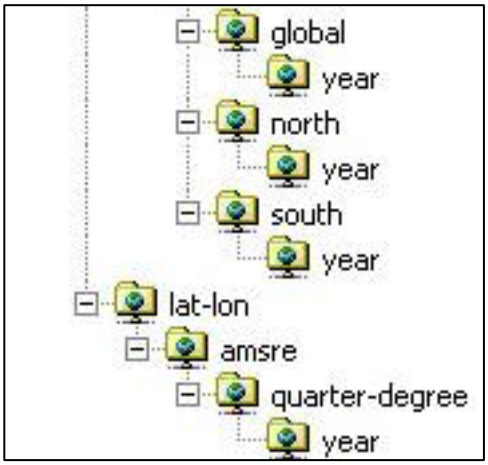

Figure 2. HTTPSDirectory Structure

1.2.4 Naming Convention

Files are compressed (zipped) for delivery, with a .gz extension added to the file names described below.

1.2.4.1 EASE-Grid Files

The EASE-Grid brightness temperature data files are named according to the following convention and as described in Table 3:

```
ID2r3-AMSRE-SL2005135D.v01.89V

ID2rx-AMSRE-aayyyydddp.vnn.ccc
```

Where:

Table 3. EASE-Grid Brightness Temperature Data Files' Naming Convention

Variable	Description
ID2	Inverse Distance Squared
rx	Resolution number of swath input data (r1, r3)
AMSRE	Identifies this a file containing AMSR-E data
aa	Area of coverage (NL = north, SL = south, ML = global)
yyyy	Four-digit year
ddd	Three-digit day of year
p	Pass direction (A = ascending, D = descending)
vnn	Data version number (for example, v01, v02)
ccc	AMSR-E channel indicator: numeric frequency (06, 10, 18, 23, 36, or 89) followed by polarization (H or V)

The EASE-Grid time files follow the same naming convention, except they end in the extension.TIM.

ID2r3-AMSRE-SL2005135D.v01.TIM.

1.2.4.2 Quarter Degree Files

The quarter degree brightness temperature data files are named according to the following convention and as described in Table 4.

```
ID2r1-AMSRE-D.252005135D.v01.89V
```

```
ID2r1-AMSRE-D.25yyyydddp.vnn.ccc
```

Where:

Table 4. Description of Quarter Degree Brightness Temperature File Name Variables

Variable	Description
ID2	Inverse Distance Squared
r1	Resolution 1 swath input data
AMSRE	Identifies this an AMSR-E file
D.25	Identifies this as a quarter degree file
yyyy	Four-digit year
ddd	Three-digit day of year
p	Pass direction (A = ascending, D = descending)
vnn	Gridded data version number (for example, v01, v02, v03)

Variable	Description
ccc	AMSR-E channel indicator: numeric frequency (06, 10, 18, 23, 36, or 89) followed by polarization (H or V)

Time files follow the same naming convention, except they end with the extension .TIM.

`ID2r1-AMSRE-D.252005135D.v01.TIM.`

1.2.4.3 Version Numbers

The version number in the file names (vnn) indicates the version of the gridded brightness temperature data set, as described in Table 5. This version number also reflects the level of AMSR-E/Aqua L2A Global Swath Spatially-Resampled Brightness Temperatures (AE_L2A) source data used.

Table 5. Version Number Description

Version	Description
v01	All version v01 gridded brightness temperature data were produced from *beta-level* AMSR-E source data (AE_L2A version Bxx). Users of v01 gridded data should replace them with v03 gridded data as they become available, because the source data were upgraded from beta-level to validated for v03.
v02	Version v02 gridded brightness temperature data were produced from *validation-level* AMSR-E source data (AE_L2A version Vxx). Users of v02 gridded data should replace them with v03 gridded data as they become available, because v03 data address the known edge-contamination problem in the source data.
v03	Version v03 gridded brightness temperature data are produced from *validation-level* AMSR-E source data (AE_L2A version Vxx). In addition, v03 data exclude the first 14 samples of each scan from the AE_L2A source data due to an issue with possible contamination at that edge of the scan.

Users should always work with the latest (highest version number) gridded brightness temperature data available for a given date.

When a new version becomes available, any previously-released data (lower version numbers) will be reprocessed to the latest version (highest version number). The new data are staged to the HTTPS site as they become available, replacing the earlier version data for the same date. For example, as v03 north and south azimuthal EASE-Grid data become available on the HTTPS site, they replace the previously available v01 or v02 data for the same date. (Note: The global

cylindrical EASE-Grid and global quarter-degree gridded brightness temperature data were initially released as version v03.)

Please see AMSR-E Data Versions for more information about the AE_L2A source data versions.

1.2.4.4 Resolution Number

The rx resolution number in the file name indicates the resolution number (resolution 1 or resolution 3) of the brightness temperatures extracted from the AE_L2A source data. See the Processing Steps section for more information about this resolution number.

1.3 Spatial Information

1.3.1 Coverage

Southernmost Latitude: 90.0° S

Northernmost Latitude: 90.0° N

Westernmost Longitude: 180.0° W

Easternmost Longitude: 180.0° E

1.3.2 Geolocation

1.3.2.1 EASE-Grid

These data are provided in three projections with different areas of coverage: Northern Hemisphere, Southern Hemisphere, and global. The north and south grids are 721 by 721 and the global grid is 1383 by 586. The global grid does not cover the extreme polar regions. The EASE-Grid resolution is 25 km.

Please see the EASE-Grid website for the EASE-Grid description, including the exact grid extent (in section EASE-Grid Family of Grid Definitions) for each projection. The descriptions for NL (north), SL (south) and ML (global) grids apply to this data set.

1.3.2.2 Quarter-Degree Grid

Quarter-degree data provide full global coverage, with a 0.25° latitude and longitude resolution. These data are in one global cylindrical, equidistant latitude-longitude projection. The quarter-degree data are gridded with 1440 rows and 720 columns.

1.4 Temporal Information

1.4.1 Coverage

Data are available from 19 June 2002 to 27 September 2011. See the Version Numbers section for information about versions and reprocessed data.

NSIDC provides daily data files for days that are incomplete; but in some cases, there is no data at all for a particular day. Table 6 lists missing data files for data that have been processed.

Note: NSIDC has recently noticed corrupt files in the AE_L2A input source data which has increased the number of missing files in this data set. We want to make sure we provide the most accurate products possible. When data are missing due to this file corruption problem, we will backfill missing dates when the corruption issue has been resolved. Please refer to Table 6 for a list of known missing dates for processed data.

Table 6. Missing Data Files for Processed Data

Year	Missing Dates (mm/dd)
2011	01/26[1]
2010	02/03 - 02/04
2009	None
2008	None
2007	11/28
2006	11/18
2005	11/17
2004	11/19
2003	10/30 - 11/05
2002	07/30 - 08/07, 09/13 - 09/19
[1] Missing dates are current through the end of the most recent quarterly processing.	

2 DATA ACQUISITION AND PROCESSING

2.1 Processing

2.1.1 Derivation Techniques and Algorithms

Since its launch in 2002, the AE_L2A AMSR-E Level-2A source data has been made available as a beta-level data set (in seven successive versions). Beginning in 2006, some AE_L2A source data

were made available as validation-level data, with the entire data set expected to be reprocessed as "validated" on a rolling basis in the future.

In order to simplify the many versions used as input to the gridded data, and to provide gridded data to users as quickly as possible, NSIDC is issuing these AMSR-E gridded data sets using simplified data set version numbers. Any gridded v01 data will have been produced from beta-level AE_L2A data, while gridded v02 data will have been produced from validation-level AE_L2A data. Gridded v01 data will be replaced by gridded v02 data when AE_L2A data that are designated "validated" become available in the future. We encourage users to register in order to receive e-mail notification about future product changes, including updated versions.

2.1.2 Processing Steps

The AMSR-E Level-2A swath brightness temperature source data (AE_L2A) are converted to gridded brightness temperature data as described in the steps below.

1. For the global EASE-Grid and quarter-degree latitude-longitude grid, extract resolution 1 brightness temperatures from the AE_L2A file. Resolution 1 data include Level-2A 6.9, 10.7, 18.7, 23.8, 36.5, and 89.0 GHz brightness temperatures, all resampled to the 75x43 km (6.9 GHz) antenna pattern.
2. For the north and south EASE-Grids, extract resolution 3 brightness temperatures from the AE_L2A file. Resolution 3 data include the following.
    - Level-2A 23.8, 36.5 and 89.0 GHz brightness temperatures, resampled to the 27x16 km (18.7 and 23.8 GHz) antenna pattern
    - Level-2A 10.7 GHz brightness temperatures, resampled to the 51x29 km (10.7 GHz) antenna pattern
    - Level-2A 6.9 GHz brightness temperatures, resampled to the 75x43 km (6.9 GHz) antenna pattern
    - Level-1B 18.7 GHz brightness temperatures, not resampled
3. Extract the times and locations of the extracted brightness temperatures.
4. Segregate the data into 24-hour periods, midnight to midnight UTC.
5. For each grid, separate the data into ascending and descending pass directions (this is done relative to the sensor footprint, not the satellite).
6. Eliminate samples with temperatures less than 65 K and greater than 320 K.
7. Eliminate the first 14 samples of each scan.
8. For a given grid cell, select the orbit with local time nearest to the local equator crossing time for the satellite. Record this time in the time file.
9. For each channel, calculate the brightness temperature value for the grid cell as a weighted average of a 2x2 kernel of nearest-neighbor input samples from the selected orbit within 17.5 km of the cell center. Weights are equal to the inverse of the distance (cell center to sample center) squared. Cells with total weights less than the threshold value (1.0) are set to the missing data value (0).
10. Save and compress the gridded brightness temperatures and time data.

2.2 Quality, Errors, and Limitations

Extensive quality control procedures are followed in the production of the AE_L2A source data. See the Quality Assessment section of the AE_L2A documentation for more information. The gridding procedure assumes that source data brightness temperatures are legitimate, and performs no filtering of input data based on quality flags.

2.2.1 Error Sources

See the error sources section of the AMSR-E/Aqua L2A Global Swath Spatially-Resampled Brightness Temperatures documentation for more information about known problems with the data.

3 SOFTWARE AND TOOLS

Geolocation files are available at the top level of the data directory in the gzipped TAR file "0.25degree_geolocation.tar.gz". The TAR file includes a map projection parameters file (.mpp), a grid parameter definitions file (.gpd), and binary latitude and longitude files. Latitudes and longitudes are reported in decimal degrees, scaled by 100,000, with a precision of one one-hundred-thousandth of a degree (one meter). The TAR file also contains a README.txt file that describes the geolocation file naming convention and provides additional details about the 0.25° global grid.

If you use the IDL tools distributed with either DMSP SSM/I Pathfinder Daily EASE-Grid Brightness Temperatures or Nimbus-7 SMMR Pathfinder Daily EASE-Grid Brightness Temperatures, you may use those same tools with these data sets.

4 RELATED DATA SETS

DMSP SSM/I Pathfinder Daily EASE-Grid Brightness Temperatures

Nimbus-7 SMMR Pathfinder Daily EASE-Grid Brightness Temperatures

For more information on the NSIDC EASE-Grid, geolocation tools, and other related products available in EASE-Grid, please see EASE-Grid.

5 CONTACTS AND ACKNOWLEDGMENTS

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6 REFERENCES

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Knowles, Kenneth W. 1993. Points, Pixels, Grids, and Cells -- A Mapping and Gridding Primer. Unpublished report to the National Snow and Ice Data Center, Boulder, Colorado USA.

Knowles, Kenneth W. Intercomparison of Resampling Methods for SMMR Pathfinder in EASE-Grid Format. Unpublished report to the National Snow and Ice Data Center, Boulder, Colorado USA.

Table 7 list related documents available on NSIDC's Web site.

Table 7. Related Documents on NSIDC's Web Site

Document	Description	URL
Instrument Description: Advanced Microwave Scanning Radiometer (AMSR-E)	AMSR-E description	https://nsidc.org/data/amsre/technical-references
EASE-Grid	EASE-Grid details	https://nsidc.org/data/ease
AMSR-E/Aqua L2A Global Swath Spatially-Resampled Brightness Temperatures	Documentation for source swath data	https://nsidc.org/data/ae_l2a
AMSR-E Data Versions	Information about source swath data versions	https://nsidc.org/data/amsre/data_versions/index.html

7 DOCUMENT INFORMATION

7.1 Publication Date

December 2006

7.2 Date Last Updated

13 April 2021