



MEaSURES Calibrated Enhanced-Resolution Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR, Version 1

USER GUIDE

How to Cite These Data

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

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MEaSURES Calibrated Enhanced-Resolution Passive Microwave Daily EASE-Grid 2.0 Brightness

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

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/NSIDC-0630>



National Snow and Ice Data Center

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1 DATA DESCRIPTION

The Calibrated Enhanced Resolution Brightness Temperature (CETB) data set consists of gridded passive microwave brightness temperature data from the following instruments:

- Scanning Multichannel Microwave Radiometer (SMMR) on NIMBUS-7
- Special Sensor Microwave/Imager (SSM/I) on DMSP 5D-2/F8, F10, F11, F13, F14, DMSP 5D-3/F15
- Special Sensor Microwave Imager/Sounder (SSMIS) on DMSP 5D-3/F16, F17, F18, F19
- Advanced Microwave Scanning Radiometer - Earth Observing System (AMSR-E) on AQUA

The data are a new, multi-sensor Level 3 Earth Science Data Record (ESDR) with recently released improvements in cross-sensor calibration and quality checking, modern file formats, better quality control, improved projection grids, and local time-of-day (LTOD) processing. These data are gridded to the [EASE-Grid 2.0](#) definition and include enhanced-resolution imagery, as well as coarse-resolution, averaged imagery.

1.1 Parameters

The parameters for this data set are listed in Table 1.

Table 1. Parameters

Parameter	Description	Fill Value	Missing Value
TB	Brightness temperature	0.0	600.00
TB_time	Average time of the measurements used to derive TB	-32768	Not used
TB_std_dev	Standard deviation of the measurements used to derive TB	655.35	655.34 (only used when TB is set to missing value)
TB_num_samples	Number of measurements used to derive TB	0	Not used
Incidence_angle	Average incidence angle of the measurements used to derive TB	-0.01 (°)	Not used

1.2 File Information

1.2.1 Format

The data are in netCDF (.nc) format, using CF 1.6 (Climate and Forecast) and ACDD 1.3 (Attribute Conventions for Dataset Discovery) metadata conventions.

Individual CETB file sizes range from 0.08 MB to 102.6 MB. File sizes vary because CETB files employ internal compression. A full day of data ranges in size from 13.06 MB to 9.79 GB, with an average of 3.94 GB per day.

1.2.2 Directory Structure

Files are stored here: <https://n5eil01u.ecs.nsidc.org/MEASURES/NSIDC-0630.001/>. This directory organizes files by the date of the earliest data in them. All Temperate grids produce data from 00:00 to 23:59.99, so all data correspond exactly to the date of file. Northern and Southern grids produce data that may include data from up to 6 hours of the day before and possibly the day after. These files are placed in the directory that matches the beginning of the data in the file, not the date of the file itself.

Example: Input data for a file from day X starts a couple hours prior to midnight UTC day X. This file will be in the directory for day X-1, and there will be no file in directory for day X.

Note: this issue does not affect users who access the data through EarthData Search.

1.2.3 File Contents

Figure 1 contains example NetCDF data from 9 October 2013. All parameters listed in Table 1 are included, in addition to x (projected coordinate), y (projected coordinate), and time (days since 01 January 1970) variables.

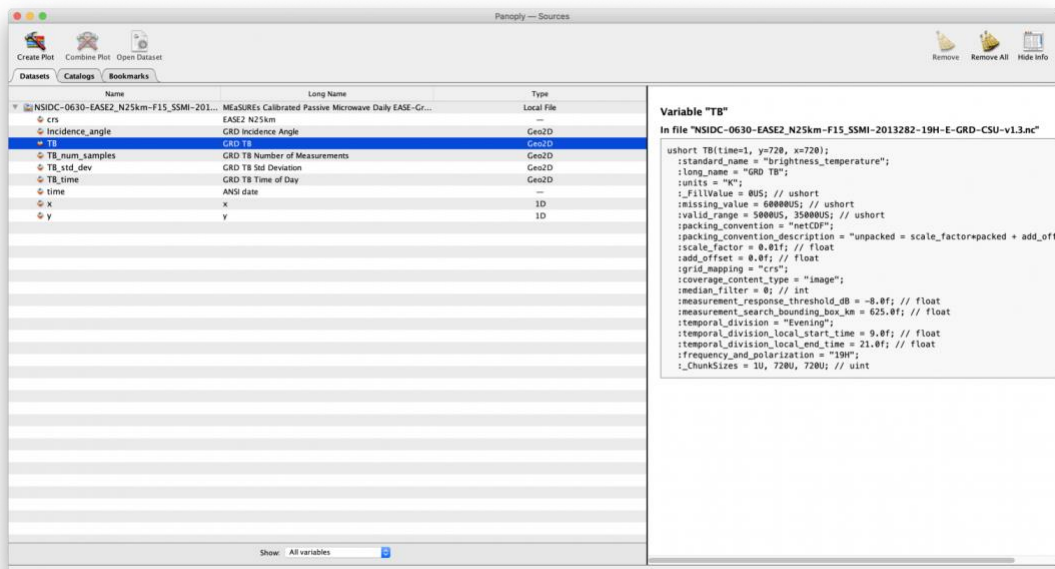


Figure 1. Sample NetCDF data from file NSIDC-0630-EASE2_N25km-F15_SSMI-2013282-19H-E-GRD-CSU-v1.3.nc. The data file contains the 19 GHz H-polarized measurements at the 25 km Northern Hemisphere resolution.

Figures 2-4 are examples of AMSR-E data from 27 September 2011. There is one image per grid (Southern, Temperate & Tropical, and Northern). The Northern and Southern images have a spatial resolution of 3.125 km, while the Temperate & Tropical image has a resolution of 6.25 km.

NSIDC-0630-EASE2_N3.125km-AQUA_AMSRE-2011270-36H-M-SIR-RSS-v1.3.nc

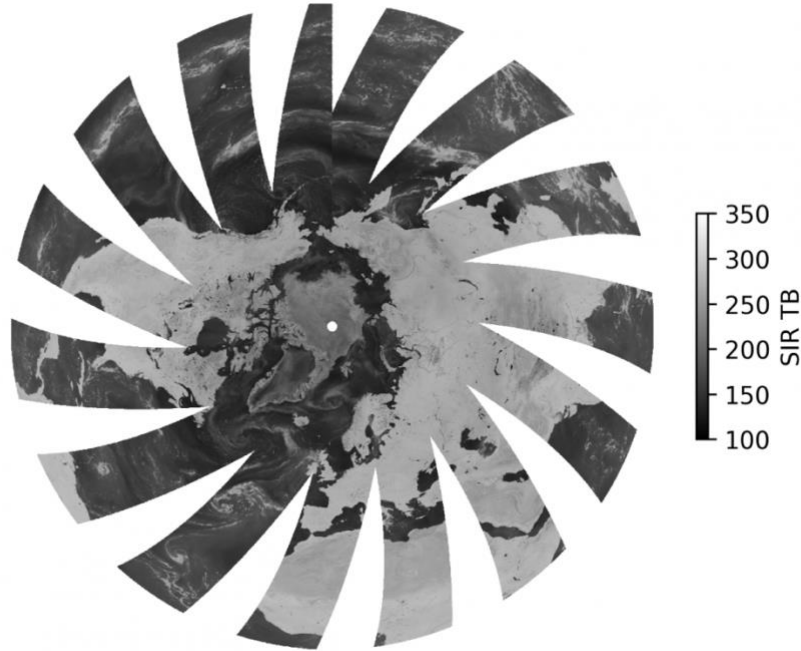


Figure 2. Northern Hemisphere sample image from file NSIDC-0630-EASE2_N3.125km-AQUA_AMSRE-2011270-36H-M-SIR-RSS-v1.3.nc. The image shows 36 GHz H-polarized TB (in Kelvin) at 3.125 km Enhanced Resolution; TB was derived using the rSIR method.

NSIDC-0630-EASE2_T6.25km-AQUA_AMSRE-2011270-18H-A-SIR-RSS-v1.3.nc



Figure 3. Temperate grid sample image from file NSIDC-0630-EASE2_T6.25km-AQUA_AMSRE-2011270-18H-A-SIR-RSS-v1.3.nc. The image shows 18 GHz H-polarized TB (in Kelvin) at 6.25 km Enhanced Resolution; TB was derived using the rSIR method.

NSIDC-0630-EASE2_S3.125km-AQUA_AMSRE-2011270-36H-M-SIR-RSS-v1.3.nc

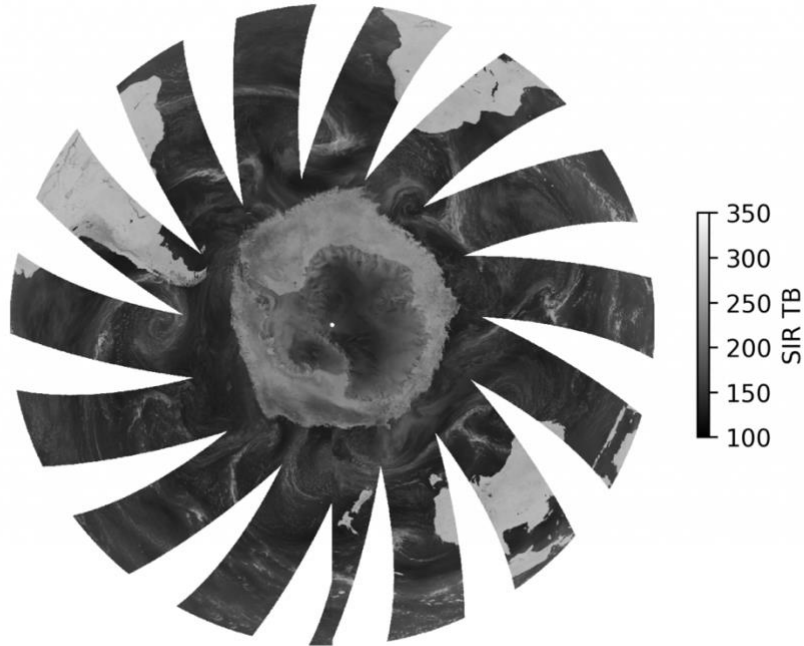


Figure 4. Southern Hemisphere sample image from file NSIDC-0630-EASE2_S3.125km-AQUA_AMSRE-2011270-36H-M-SIR-RSS-v1.3.nc. The image shows 36 GHz H-polarized TB (in Kelvin) at 3.125 km Enhanced Resolution; TB was derived using the rSIR method.

1.2.4 Naming Convention

Files are named according to the following convention and as described in Table 2:

NSIDC-0630-EASE2_GXXXXkm-platform_sensor-yyyyddd-channel-pass-algorithm-input-version.nc

Table 2. File Name Variables

Variable	Description	Values
NSIDC-0630	NSIDC unique data set identifier	NSIDC-0630
EASE2_	EASE2-Grid 2.0 projection	EASE2 Grid =
GXXXXkm	Grid and resolution of data in the file	Grid = Northern (N), Southern (S), or Temperate & Tropical (T) Resolution (in km) = ranges from 3.125 to 25 km
platform_sensor	Satellite platform id and sensor	NIMBUS7_SMMR F08_SSMI F10_SSMI F11_SSMI F13_SSMI F14_SSMI F15_SSMI AQUA_AMSR-E F16_SSMIS F17_SSMIS F18_SSMIS F19_SSMIS
yyyyddd	Reference day	4-digit year, 3-digit day of year
channel	Channel ID = 2-digit frequency and 1-letter polarization (horizontal (H) or vertical (V))	Differs by sensor, e.g. 37H
pass	The direction or LTOD of the satellite passes used	1-letter code: A = Ascending (T grids only) D = Descending (T grids only) M = Morning LTOD (N or S grids only) E = Evening LTOD (N or S grids only)
algorithm	Specifies the algorithm used for the image reconstruction	GRD = drop-in-the-bucket (25 km grids) SIR = radiometer version of Scatterometer Image Reconstruction (enhanced-resolution grids)
input	Input data producer	CSU = Colorado State University RSS = Remote Sensing Systems
version	Data set version number	vX.X for major/minor versions (e.g. v1.3)
nc	NetCDF data formatting suffix	.nc

Example file name: NSIDC-0630-EASE2_N3.125km-F08_SSMI-1987304-37H-M-SIR-RSS-v1.3.nc

1.3 Spatial Information

1.3.1 Coverage

Each data file contains one of three EASE-Grid 2.0 spatial coverages:

- Northern Hemisphere Lambert azimuthal equal-area
- Southern Hemisphere Lambert azimuthal equal-area
- Temperate & Tropical cylindrical equal-area projection (bounded by +/- 67° latitude).

1.3.2 Spatial Resolution

Each channel is processed at standard and enhanced resolutions. The standard grid resolution is 25 km, with enhanced-resolution grids defined in a nested fashion in powers of two: 12.5 km, 6.25 km, and 3.125 km (see Figure 5). All channels are gridded to 25 km, with higher resolutions dependent on channel frequency:

- Frequencies below 12 GHz are available at 25 km (standard) and 12.5 km (enhanced).
- Frequencies between 12 and 30 GHz are available at 25 km (standard) and 6.25 km (enhanced).
- Frequencies 30 GHz and above are available at 25 km (standard) and 3.125 km (enhanced).

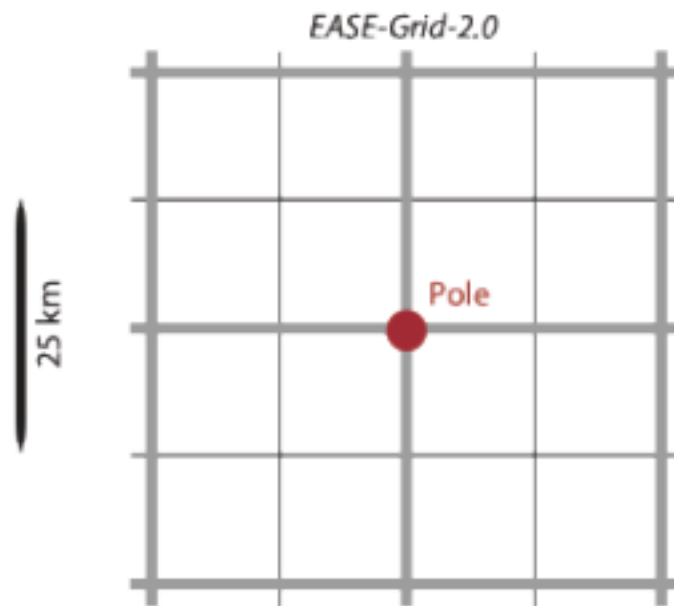


Figure 5. EASE-Grid 2.0 nesting relationship for 25 km and 12.5 km azimuthal grids at the pole. All CETB grids are nested analogously

1.3.3 Geolocation

The following tables provide information for geolocating this data set. The data are gridded to EASE-Grid 2.0 projections, at various coverages and spatial resolutions, as defined in Table 2. For more details on EASE-Grid 2.0, please refer to the [EASE Grids](#) web pages.

Table 3. CETB EASE-Grid 2.0 Projections and Grid

Name	Projection	Resolution (km)	Columns	Rows	Latitude Extent (degrees)	Longitude Extent (degrees)
EASE2_N25km	Northern Lambert Azimuthal	25	720	720	0 - 90	-180 - 180
EASE2_N12.5km	Northern Lambert Azimuthal	12.5	1440	1440	0 - 90	-180 - 180
EASE2_N6.25km	Northern Lambert Azimuthal	6.25	2880	2880	0 - 90	-180 - 180
EASE2_N3.125km	Northern Lambert Azimuthal	3.125	5760	5760	0 - 90	-180 - 180
EASE2_S25km	Southern Lambert Azimuthal	25	720	720	-90 - 0	-180 - 180
EASE2_S12.5km	Southern Lambert Azimuthal	12.5	1440	1440	-90 - 0	-180 - 180
EASE2_S6.25km	Southern Lambert Azimuthal	6.25	2880	2880	-90 - 0	-180 - 180
EASE2_S3.125km	Southern Lambert Azimuthal	3.125	5760	5760	-90 - 0	-180 - 180
EASE2_T25km	Cylindrical Equal-Area	25.02526	1388	540	+/-67.0575406	-180 - 180
EASE2_T12.5km	Cylindrical Equal-Area	12.51263	2776	1080	+/-67.0575406	-180 - 180
EASE2_T6.25km	Cylindrical Equal-Area	6.256315	5552	2160	+/-67.0575406	-180 - 180
EASE2_T3.125km	Cylindrical Equal-Area	3.128.15750	11104	4320	+/-67.0575406	-180 - 180

1.4 Temporal Information

1.4.1 Coverage

Temporal coverage varies by sensor. See Table 4 for the actual coverages.

Table 4. Temporal Coverage by Sensor

Sensor	Platform	Begin Coverage	End Coverage *
AMSR-E	AQUA	01 June 2002	04 October 2011
SSM/I	F08	07 September 1987	31 December 1991
	F10	08 December 1990	14 November 1997
	F11	03 December 1991	16 May 2000
	F13	03 May 1995	19 November 2009
	F14	07 May 1997	23 August 2008
	F15	23 February 2000	31 December 2019
SSMIS	F16	01 November 2005	31 December 2019
	F17	01 March 2008	31 December 2019
	F18	08 March 2010	31 December 2019
	F19	27 November 2014	09 February 2016
SMMR	Nimbus	25 October 1978	20 August 1987

*End coverage represents the end date for the majority of the granules.

1.4.2 Resolution

The grids are produced twice daily. Temperate grids are separated by ascending/descending passes, while the Northern and Southern grids are separated by local time of day (LTOD).

Table 4 shows the beginning and ending times for the LTOD morning/evening split in hours after UTC midnight on the day of processing. Note also that for all platforms except AMSR-E, the LTOD split times are the same for the Northern and Southern hemispheres. All of the Northern and Southern grids in the data set were processed with these times. These values are stored as part of the metadata in the CETB files as an attribute of the TB data.

Table 5. LTOD Times

Platform	Year	Morning start time	Morning end time	Evening start time	Evening end time
F08	All years	0.0	12.0	12.0	24.0
F10	1990-1993	2.0	14.0	14.0	26.0
F10	1994	3.0	15.0	15.0	27.0
F10	1995-1997	4.0	16.0	16.0	28.0
F11	All years	0.0	12.0	12.0	24.0
F13	All years	0.0	12.0	12.0	24.0
F14	1997-2001	3.0	15.0	15.0	27.0
F14	2002-2004	2.0	14.0	14.0	26.0
F14	2005-2008	0.0	12.0	12.0	24.0
F15	2000-2005	3.0	15.0	15.0	27.0
F15	2006-2007	2.0	14.0	14.0	26.0
F15	2008-2011	0.0	12.0	12.0	24.0
F15	2012	-2.0	10.0	10.0	22.0
F15	2013-2016	-3.0	09.0	9.0	21.0
F16	2005-2007	3.0	15.0	15.0	27.0
F16	2008-2009	2.0	14.0	14.0	26.0
F16	2010-2011	1.0	13.0	13.0	25.0
F16	2012-2013	0.0	12.0	12.0	24.0
F16	2014	-1.0	11.0	11.0	23.0
F16	2015-2017	-2.0	10.0	10.0	22.0
F17	All years	0.0	12.0	12.0	24.0
F18	All years	0.0	12.0	12.0	24.0
F19	All years	0.0	12.0	12.0	24.0

Platform	Year	Morning start time	Morning end time	Evening start time	Evening end time
SMMR	All years	6.0	18.0	18.0	30.0
AMSR-E	All years NH	5.0	17.0	17.0	29.0
AMSR-E	All years SH	8.0	20.0	20.0	32.0

2 DATA ACQUISITION AND PROCESSING

2.1 Background

The following sections describe CETB gridding algorithms. Please refer to Long and Brodzik (2016) for the theory of reconstruction techniques and complete details of the radiometer form of the Scatterometer Image Reconstruction (rSIR). The algorithm theoretical basis document (ATBD) for this data product (Brodzik and Long, 2018) also contains more details.

Coarse Resolution (GRD) Gridding Algorithms

The CETB standard resolution gridding procedure is a simple, “drop-in-the-bucket” average. The resulting data grids are designated GRD data arrays. For the “drop-in-the-bucket” gridding algorithm, the key information required is the location of the measurement. The center of each measurement geolocation is mapped to an output-projected grid cell. All measurements within the specified time period that fall within the bounds of a particular grid cell are averaged. This is the reported TB value for this pixel. Ancillary variables contain the number and standard deviation of included samples. The effective spatial resolution of the GRD product is defined by a combination of the pixel size and spatial extent of the 3dB antenna footprint size. Figure 6 provides a graphical representation of the standard resolution (25 km) of GRD measurements.

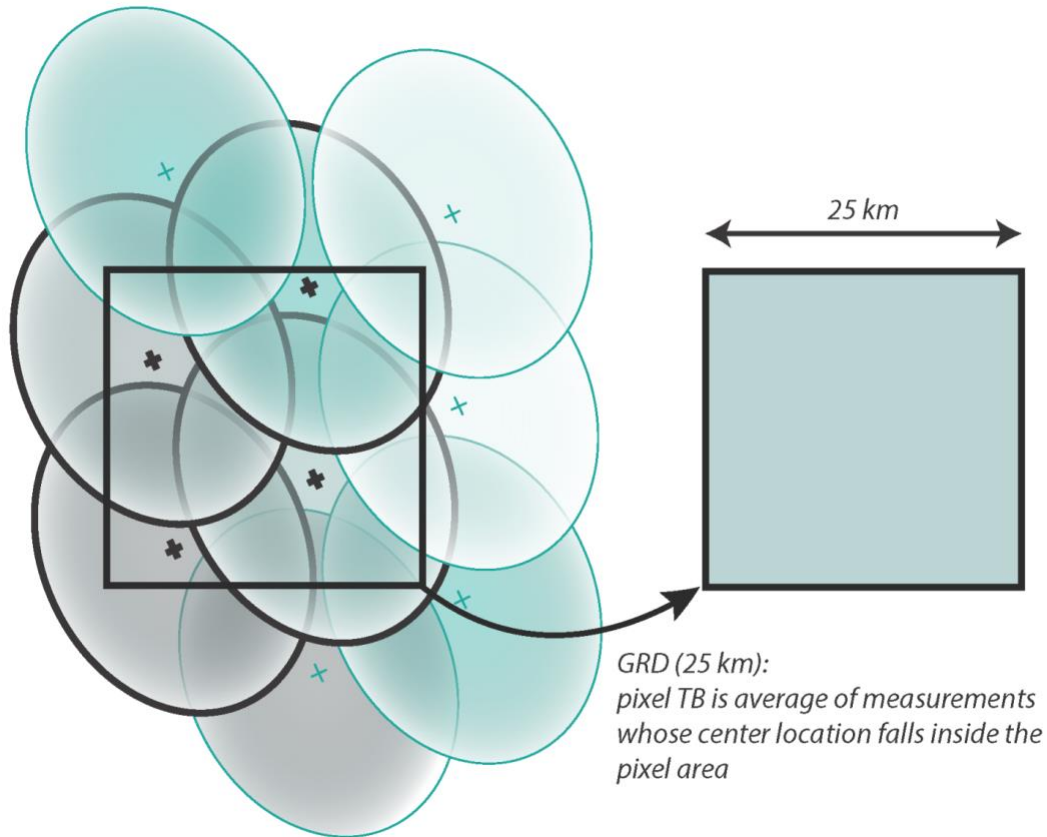


Figure 6. GRD 25 km Resolution

The radiometer version of the Scatterometer Image Reconstruction (rSIR) Algorithm

In addition the standard GRD resolution (25 km), all channels are also available at one nested, enhanced resolution (12.5 km, 6.25 km, or 3.125 km); see Table 6 for more details. Enhanced resolutions are generated using the radiometer version of the Scatterometer Image Reconstruction (rSIR) algorithm. The rSIR algorithm defines a group of pixels centered at each grid point. Each pixel is then weighted based on the Measurement Response Function (MRF) to estimate the TB at the enhanced resolution footprint. The MRF is determined by the antenna gain pattern (which is unique for each sensor and sensor channel, and may vary with scan angle), the scan geometry (notably the antenna scan angle), and the integration period. Figure 6 provides a graphical representation of the enhanced resolution of rSIR measurements. For a more details, see Long and Brodzik (2016) or Brodzik and Long (2018).

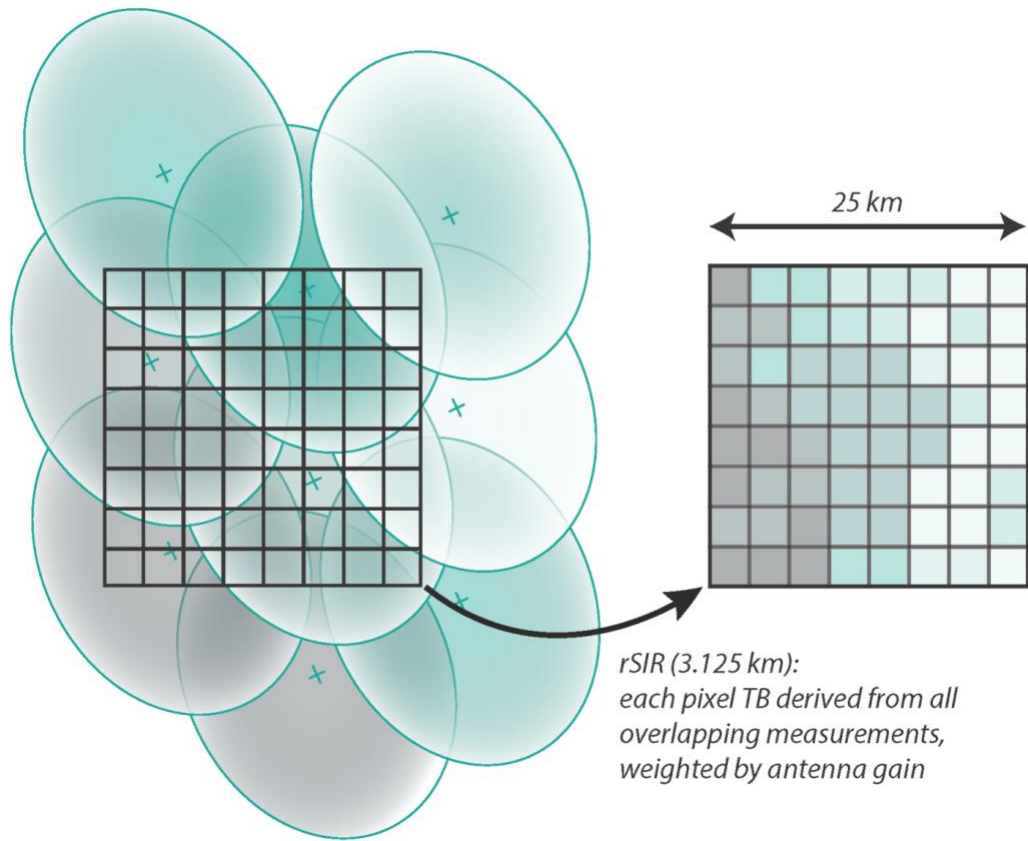


Figure 7. rSIR 3.125 km Resolution

Table 6. CETB Enhanced Resolution Grids

Sensor	Frequency (GHz)	Enhanced Resolution Grid (km)		
		12.5	6.25	3.125
SMMR	6	X		
SMMR	10	X		
SMMR	18		X	
SMMR	21		X	
SMMR	37			X
SSM/I	19		X	
SSM/I	22		X	
SSM/I	37			X
SSM/I	85			X
SSMIS	19		X	
SSMIS	22		X	
SSMIS	37			X
SSMIS	91			X
AMSR-E	6	X		
AMSR-E	10.7	X		
AMSR-E	18		X	
AMSR-E	23		X	
AMSR-E	36			X
AMSR-E	89			X

2.2 Acquisition

Table 7 lists all input data sets.

Table 7. Input Data Sources

Sensor	Temporal Coverage	Input Swath Data
SMMR	1978-1987	Nimbus-7 SMMR Pathfinder Brightness Temperatures, Version 1 (NSIDC-0036)
SSM/I-SSMIS	1987-2017	CSU FCDR (http://rain.atmos.colostate.edu/FCDR/)
AMSR-E	2002-2011	AMSR-E/Aqua L2A Global Swath Spatially-Resampled Brightness Temperatures, Version 3 (AE_L2A)

2.3 Processing

There are two general processing steps in generating the CETB product. These include data set pre-processing for spatial and temporal selection and gridding (both standard and enhanced resolutions).

2.3.1 Data set preprocessing

The first stage of processing includes ingesting the raw swath TB and performing initial data and temporal selections. Only the highest quality TB measurements are used to ensure the most reliable data set. Swath data are mapped to output grids by measurement geolocation and LTOD.

All of the CETB passive microwave sensors fly on near-polar, sun-synchronous satellites, which maintain an orbital plane with an orientation that is (approximately) fixed with respect to the sun. Thus, the satellite crosses the equator on its ascending (northbound) path at approximately the same LTOD. The resulting coverage pattern yields passes about 12 hours apart in LTOD at the equator. Most areas near the pole are covered multiple times per day. Analysis shows that the data from a single sensor fall into two LTOD ranges for polar measurements. The two periods are typically less than 4 hours long and spaced 8 or 12 hours apart. Significantly, due to the orbit repeat cycle, two succeeding days at any particular location may make measurements at different LTOD, and therefore, at different times during the diurnal cycle (Gunn, 2007), introducing undesired variability (noise) into a time series analysis.

The CETB azimuthal (Northern or Southern) grids are split into two images per day based on the LTOD approach of Gunn and Long (2008). This ensures that all measurements in any one image have consistent spatial/temporal relationships. The CETB adopts the LTOD division scheme for the Northern and Southern hemispheres. For the Temperate grids the data are divided into ascending and descending passes.

Each file includes gridded arrays of the following variables: TB, number of contributing measurements, as well as the average time, standard deviation, and average incidence angle of

contributing measurements used to derive the TB at each pixel. This enables investigators to explicitly account for the LTOD temporal variation of the measurements included in a particular pixel.

2.3.2 Gridding

CETB products are generated on standard resolution grids for all channels using a low-noise “drop-in-the-bucket” average (GRD algorithm), and enhanced-resolution grids using rSIR image reconstruction techniques (Long and Brodzik, 2016). For enhanced-resolution grids, the effective resolution depends on the number of measurements and the precise details of their overlap, orientation, and spatial locations; information about the antenna gain pattern, scan geometry, and integration period are required to compute the effective measurement response function (MRF). The MRF describes how much the emissions from a particular direction affect the observed TB value. For each sensor and channel, the MRF is modeled as a two-dimensional Gaussian using the 3-dB footprint size (Long and Brodzik, 2016). See Table 8 for the field-of-view values.

Table 8. Effective Field of View

Sensor	Frequency (GHz)	Semi-major (km)	Semi-minor (km)
SSMI	19 H, V	69	43
SSMI	22 V	60	40
SSMI	37 V	37	28
SSMI	37 H	37	29
SSMI	85 H, V	15	13
SSMIS	19 H, V	72	44
SSMIS	22 V	72	44
SSMIS	37 H, V	44	26
SSMIS	91 H, V	15	9
AMSR-E	6 H, V	75	43
AMSR-E	10.7 H, V	51	29
AMSR-E	18 H, V	27	16
AMSR-E	23 H, V	32	18
AMSR-E	36 H, V	14	8
AMSR-E	89 (H or V)	7	4
AMSR-E	89 (H or V)	6	4
SMMR	6.6 H, V	121	79
SMMR	10.7 H, V	74	49
SMMR	18 H, V	44	29
SMMR	21 H, V	38	24
SMMR	37 H, V	21	14

2.4 Quality, Errors, and Limitations

Earlier Versions

Version 1.3 renders all previous versions of this data set obsolete; users should update their files accordingly. The Version 1.3 release included a reprocessing of all data to implement the improvements described in the Appendix of this document.

Empty pixels in GRD images

In cases where no swath measurement center locations were mapped to the area of a gridded pixel, GRD images will occasionally have single pixels with no data. Normally, rSIR images do not suffer from this problem, because the rSIR gain threshold is set to a value that almost always ensures at least one component measurement that can be used to derive the pixel TB. However, beginning on 04 Nov 2004, the AMSR-E 89 GHz A-horn developed a permanent problem that

resulted in a loss of observations for the remaining life of AMSR-E. After this date, the rSIR 3.125 km 89 GHz data does occasionally have missing pixels (Beitsch et al., 2014).

Missing Dates

There are files to match every day of a sensor's temporal coverage. For dates with no data, data files exist with all variables set to "_FillValue."

Incomplete Image Reconstruction at Latitudinal Grid Boundaries

Not all possible input measurements were used in the image reconstruction at the high-latitude edges of the Temperate grids and at the equatorial edges of the Northern and Southern grids. Although the reconstructed TB at these locations are not erroneous, they are not as accurate as the reconstructed TB that make use of all input measurements.

The user is encouraged to exercise caution when analyzing data within approximately 20 km of these boundaries. To access the most accurate image reconstruction results, the user is advised to use the Northern or Southern grids to analyze mid- to high-latitude regions, and the Temperate grids to analyze regions near the equator. For example, when analyzing CETB 6.25 km rSIR Temperate images, switch to the Northern grid to analyze images within 3 pixels of the northern boundary. Analogously, when analyzing CETB 6.25 km rSIR Northern images, switch to the Temperate grid to analyze images within 3 pixels of the equator.

Note: the eastern and western boundaries of the Temperate grids (i.e., 180° E and 180° W) do not exhibit this problem, as all input measurements were included in the image reconstruction at these locations.

DMSP-F17 37V Channel

Beginning in April 2016, TB values from the DMSP-F17 37V channel may have all 0 K or NaN values. These TB could not be computed because the data were missing or flagged as too low quality in the input file.

Quality

For a comparison to other passive microwave data sets, please see the Algorithm Theoretical Basis Document (Brodzik and Long 2018).

2.5 Instrumentation

2.5.1 Description

For a detailed description of the instruments used to acquire the data, see the following NSIDC websites:

- [SMMR, SSM/I, and SSMIS Sensors Summary](#)
- [AMSR-E Instrument Description](#)

Table 10 provides a list of the channels for each instrument. All channels are gridded to 25 km, with higher resolutions depend on channel frequency:

- Frequencies below 12 GHz are available at 25 km (standard) and 12.5 km (enhanced).
- Frequencies between 12 and 30 GHz are available at 25 km (standard) and 6.25 km (enhanced).
- Frequencies 30 GHz and above are available at 25 km (standard) and 3.125 km (enhanced).

Table 10. CETB Product Sensors and Channels

Sensor	Channel Frequency (GHz) and Polarization
SMMR	6H, 6V, 10H, 10V, 18H, 18V, 21H, 21V, 37H, 37V
SSM/I	19H, 19V, 22V, 37H, 37V, 85H, 85V
SSMIS	19H, 19V, 22V, 37H, 37V, 91H, 91V
AMSR-E	6H, 6V, 10.7H, 10.7V, 18H, 18V, 23H, 23V, 36H, 36V, 89H, 89V

3 SOFTWARE AND TOOLS

For a list of resources for accessing NetCDF files, see the [NSIDC NetCDF Software Tools](#) website.

Geolocation files for this data set are in netCDF (.nc) format and are located

here: <ftp://sidacs.colorado.edu/pub/tools/easegrid2/>. File names indicate the grids for each file:

Northern (N), Southern (S), or Temperate & Tropical (T). For

example, EASE2_N12.5km.geolocation.v0.9.nc corresponds to the 12.5 km resolution grid in the Northern Hemisphere.

4 VERSION HISTORY

Table 11 lists the version history for this data set.

Table 11. Version History

Version	Date Published	Description of Changes
1.4	26 May 2020	Temporal update through 30 December 2019 for data derived from the SSM/I DMSP-F-15 sensor and the SSMIS DMSP-F16, -F17, and -F18 sensors. File-level metadata updated to acknowledge new funding sources and reflect changes to the data citation.
1.3	14 June 2018	See the Appendix – Corrections made to Version 1.3 for details
1.2	26 September 2017	For the AMSR-E-derived data, changes include: Adding missing input data for the first day of the month in the Northern Hemisphere and Southern Hemisphere projections Changing the size of the time dimension from 1 to "UNLIMITED" Adding files for dates with no data For SSMI-derived data, corrected the handling of QC flags to retain more data, eliminating only the flagged data in a given channel and taking care not to eliminate data in other channels Includes data derived from the following additional sensors: SSM/I on DMSP-F15 SSMIS on DMSP-F16 SSMIS on DMSP-F17 SSMIS on DMSP-F18 SSMIS on DMSP-F19 SMMR on Nimbus
1.1	03 May 2017	First public release. Includes data derived from the following additional sensors: SSM/I on DMSP-F08 SSM/I on DMSP-F10 SSM/I on DMSP-F11 SSM/I on DMSP-F13 SSM/I on DMSP-F14
1.0	December 2016	Internal release, only contained AMSR-E-derived data

5 RELATED DATA SETS

- [DMSP SSM/I-SSMIS Pathfinder Daily EASE-Grid Brightness Temperatures](#)
- [Near-Real-Time DMSP SSM/I-SSMIS Pathfinder Daily EASE-Grid Brightness Temperatures](#)
- [AMSR-E/Aqua Daily EASE-Grid Brightness Temperatures](#)
- [Nimbus-7 SMMR Pathfinder Daily EASE-Grid Brightness Temperatures](#)
- [Enhanced-Resolution SSM/I and AMSR-E Daily Polar Brightness Temperatures](#)

6 RELATED WEBSITES

- [NASA MEaSURES Research Project: EASE-Grid 2.0 TB ESDR](#)
- [Scatterometer Climate Record Pathfinder](#)

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8 REFERENCES

Beitsch, A., L. Kaleschke, and S. Kern. 2014. Investigating High-Resolution AMSR2 Sea Ice Concentrations during the February 2013 Fracture Event in the Beaufort Sea. Remote Sensing 6(5): 3841-3856. doi: <http://doi.org/10.3390/rs6053841>

Brodzik, M. J. and Long, D. G. 2018. Calibrated Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR (CETB) Algorithm Theoretical Basis Document [PDF file]. Retrieved from: https://nsidc.org/sites/nsidc.org/files/technical-references/MEaSURES_CETB_ATBD_v1.0.pdf

Gunn B. 2007. Temporal resolution enhancement for AMSR images. BYU Internal Report MERS 07-002. <http://www.mers.byu.edu/docs/reports/MERS0702.pdf>

Gunn B. A. and D. G. Long. 2008. Spatial resolution enhancement of AMSR TB images based on measurement local time of day. In IGARSS 2008-2008 IEEE International Geoscience and Remote Sensing Symposium, vol. 5, pp. V-33. IEEE. doi: <http://doi.org/10.1109/IGARSS.2008.4780020>

Long, D. G. and M. J. Brodzik. 2016. Optimum Image Formation for Spaceborne Microwave Radiometer Products. IEEE Transactions on Geoscience and Remote Sensing 54(5): 2763-2779. doi: <http://doi.org/10.1109/TGRS.2015.2505677>

9 DOCUMENT INFORMATION

9.1 Publication Date

5 March 2020

9.2 Date Last Updated

29 December 2020

APPENDIX A – DATA CORRECTION NOTES

Version 1.3 renders all previous versions of this data set obsolete; users should update their files accordingly. The Version 1.3 release included a reprocessing of all data to implement the improvements described below:

Correction #1. Some morning grids were incorrectly classified as Evening data and vice-versa. For example, Morning passes for day N were mislabeled as Evening passes for day N-1. All Morning/Evening classifications for the Northern and Southern grids are correct starting with Version 1.3.

Correction #2. Adjusted 85, 89, and 91 GHz channel gain thresholds. All the data from the affected channels were originally processed with a gain threshold of 8 dB resulting in an excess of missing pixels. The threshold was adjusted to 12 dB in Version 1.3 to minimize missing pixels.

Correction #3. Originally Temperate grid processing did not include the final orbit from the prior calendar day, which may have included data from current day at the end of the swath. At worse, this would have eliminated up to 34 minutes of data at the beginning of the day; in most cases, it was much less than that. Temperate grid processing now includes all data from the beginning of the intended calendar day.

Correction #4. All Northern and Southern grid data were correctly processed into LTOD Morning and Evening divisions using the values in Table A1, but were reported incorrectly in the metadata. The error occurred only for split times that were different from 0.0-12.0-12.0-24.0. Where the errors occur, they were for the start time in the morning grids and for the end time in the evening grids. In each case the incorrect value was set to 0.0. For example, if the LTOD split times were 0300 and 1500, then the morning start time was incorrectly reported as 0.0 and the end time was correctly reported as 15.0. Similarly, the evening start time was correctly reported as 15.0 and the evening end time was incorrectly reported as 0.0. The affected metadata fields are:

- TB:temporal_division_local_start_time for M (morning) files in the N or S projections
- TB:temporal_division_local_end_time for E (evening) files in the N or S projections

Beginning in Version 1.3, all LTOD for the Northern and Southern grid data are correctly reported in the metadata.

Table A - 1. LTOD Crossing Times.

Platform	Year	Morning start time	Morning end time	Evening start time	Evening end time
F08	All years	0.0	12.0	12.0	24.0
F10	1990-1993	2.0	14.0	14.0	26.0
F10	1994	3.0	15.0	15.0	27.0
F10	1995-1997	4.0	16.0	16.0	28.0
F11	All years	0.0	12.0	12.0	24.0
F13	All years	0.0	12.0	12.0	24.0
F14	1997-2001	3.0	15.0	15.0	27.0
F14	2002-2004	2.0	14.0	14.0	26.0
F14	2005-2008	0.0	12.0	12.0	24.0
F15	2000-2005	3.0	15.0	15.0	27.0
F15	2006-2007	2.0	14.0	14.0	26.0
F15	2008-2011	0.0	12.0	12.0	24.0
F15	2012	-2.0	10.0	10.0	22.0
F15	2013-2016	-3.0	09.0	9.0	21.0
F16	2005-2007	3.0	15.0	15.0	27.0
F16	2008-2009	2.0	14.0	14.0	26.0
F16	2010-2011	1.0	13.0	13.0	25.0
F16	2012-2013	0.0	12.0	12.0	24.0
F16	2014	-1.0	11.0	11.0	23.0
F16	2015-2017	-2.0	10.0	10.0	22.0
F17	All years	0.0	12.0	12.0	24.0
F18	All years	0.0	12.0	12.0	24.0
F19	All years	0.0	12.0	12.0	24.0

Platform	Year	Morning start time	Morning end time	Evening start time	Evening end time
SMMR	All years	6.0	18.0	18.0	30.0
AMSR-E	All years NH	-5.0	7.0	7.0	19.0
AMSR-E	All years SH	-4.0	8.0	8.0	20.0

Correction #5. At calendar year crossovers, data from the prior year (Dec 31) were not included in Jan 1 data, and data from the following year (Jan 1) were not included in Dec 31 data. Version 1.3 corrected this processing so that calendar year crossovers include data from Dec 31 and Jan 1, respectively.

Correction #6. Under rare, but not impossible conditions, occasional ascending scanlines were incorrectly classified as descending, and vice-versa. These incorrect classifications were fixed beginning with Version 1.3.

Correction #7. Prior to Version 1.3, static LTOD split times were used for the duration of the F16 record, but orbital drift required changing split times. LTOD split times became progressively more offset over the lifetime of the sensor, so that the static LTOD split times were eventually off by 5 hours, resulting in morning data being incorrectly classified as evening data and vice-versa. LTOD shifts due to orbital drift were corrected starting with Version 1.3.

Correction #8. Version 1.3 corrected the split times for the Northern grids, which were off by 2 hours. This correction only applied to AMSR-E-derived data.