SMAP Radiometer Twice-Daily rSIR-Enhanced EASE-Grid 2.0 Brightness Temperatures, Version 2

USER GUIDE

How to Cite These Data

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

Brodzik, M. J., D. G. Long, and M. A. Hardman. 2021. *SMAP Radiometer Twice-Daily rSIR-Enhanced EASE-Grid 2.0 Brightness Temperatures, Version 2*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/YAMX52BXFL10 [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0738

National Snow and Ice Data Center

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1 DATA DESCRIPTION

This data set contains twice-daily, enhanced-resolution brightness temperature data produced by image reconstruction of the standard SMAP product, SMAP L1B Radiometer Half-Orbit Time-Ordered Brightness Temperatures. Data are available on the Northern Hemisphere, Southern Hemisphere, Temperate, and Mid-Latitude (subset of Global) EASE-Grid 2.0 projections and on the 03 km, 3.125 km, 09 km, 25 km, and 36 km resolution grids. This data set applies the radiometer version of the Scatterometter Image Reconstruction (rSIR) technique to SMAP measurements. This same rSIR technique was used to derive brightness temperatures from the SMMR, AMSR-E, and SSM/I-SSMIS sensors for the MEaSUREs Calibrated Enhanced-Resolution Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR data set NSIDC-0630.

1.1 Parameters

The main parameter for this data set is Brightness Temperature (Tb), measured in kelvins (K).

The range of values for channel F, the 4th Stokes parameter, is -50 to 50 K. The range for Tb for channels H and V is 50 to 350 K

Data files are produced for all dates. If no input data are available for a given data, data variables are stored as empty arrays.

Table 1 provides details regarding the parameters.

Table 1. Parameters

Parameter	Description	Units
crs	Coordinate reference system; EASE-Grid 2.0	For details, see Geolocation section of this document
Incidence_angle	Average incidence angle of the measurements used to derive T_b	degrees (°) measured clockwise from local North
TB	Brightness Temperature (T_b). See File Naming Conventions table for details.	kelvin (K)
TB_num_samples	Number of measurements used to derive T_b	count
TB_std_dev	Standard deviation of the measurements used to derive T_b	kelvin (K)
TB_time	Average time of the measurements used to derive T_b	Minutes since 00:00:00 on the day of measurement
time	ANSI date	Days since 1972-01-01 00:00:00
x	projection_x_coordinate	meters
y	projection_y_coordinate	meters

1.2 File Information

1.2.1 Format

Data are provided in NetCDF (.nc) format using Climate and Forecast 1.6 and Attribute Conventions for Dataset Discovery 1.3 metadata conventions.

Extensible Markup Language (.xml) files with associated metadata are also provided.

1.2.2 File Contents

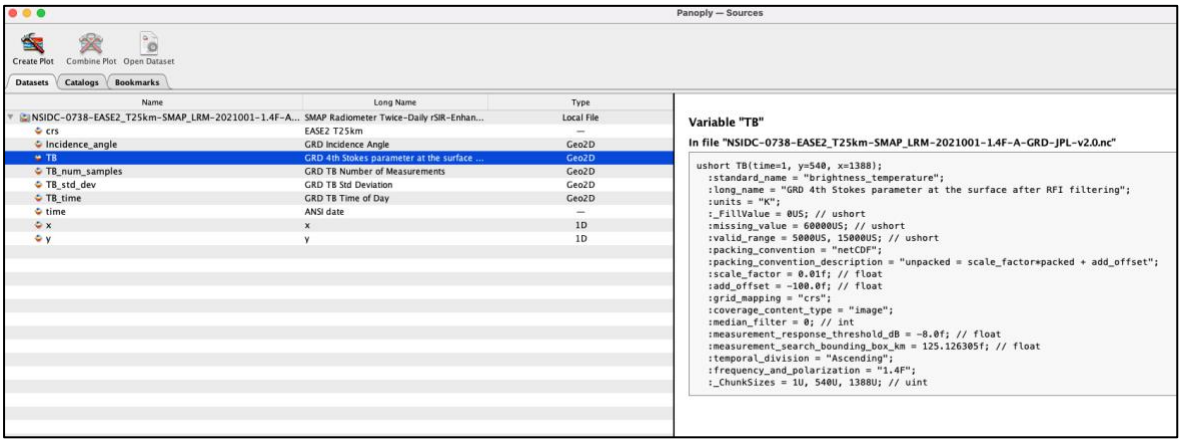

Figure 1. Sample of NetCDF file as seen in Panoply. On the left are listed the parameters, explained above in section 1.1. On the right, detailed metadata for each parameter.

1.2.3 Naming Convention

Data files are named according to the following convention and as described in Table 2.

Sample File Name:

`NSIDC-0738-EASE2_N3.125km-SMAP_LRM-2021001-1.4F-E-SIR-JPL-v2.0.nc`

File Name Components

`NSIDC-0738-EASE2_[G][###km]-[SMAP_LRM]-yyyyddd-[1.4channel]-[pass]-[algorithm]-JPL-v##.nc`

Table 2. File Naming Convention

Variable	Description
NSIDC-0738	NSIDC unique data set identifier
EASE2	Indicates the data are projected in EASE-Grid 2.0

Variable	Description
G	Grid: N = Northern S = Southern T = Temperate & Tropical M = Mid-latitudes
###km	Resolution of the data, values range from 3 km to 36 km.
SMAP_LRM	Indicates the data are derived from the SMAP L-band radiometer
yyyyddd	Date in year-day-of-year format
1.4channel	Channel (frequency + polarization), possible polarizations include: V = vertical H = horizontal F = 4th Stoke's parameter
pass	The direction or local-time-of-day of the satellite pass: A = Ascending (T or M grids only) D = Descending (T or M grids only) M = Morning (N or S grids only) E = Evening (N or S grids only)
algorithm	Specifies the algorithm use for the image reconstruction: GRD = drop-in-the-bucket SIR = radiometer version of Scatterometer Image Reconstruction
JPL	Indicates the input data producer was the NASA Jet Propulsion Laboratory
v#.#	Data set version number

1.3 Spatial Information

1.3.1 Coverage

The spatial coverage for the entire data set is global. However, spatial coverage varies between data files. Data are available on the Northern Hemisphere, Southern Hemisphere, Mid-Latitude, and Temperate & Tropical EASE-Grid 2.0 projections.

1.3.2 Resolution

Spatial resolution varies by data file. Data using the T grid are available at resolutions of 3.125 km. and 25 km. Data using the M grid are available at resolutions of 3 km, 9 km, and 36 km. Data using the N and S grids are available at all resolutions. See the Algorithm Theoretical Basis Document (Brodzik et al., 2021) for details.

1.3.3 Geolocation

Table 3 provides geolocation information for this data set.

Table 3. Geolocation Details

Projected coordinate system	EASE-Grid 2.0 Global (Temperate & Tropical and Mid-latitude)	EASE-Grid 2.0 Northern Hemisphere	EASE-Grid 2.0 Southern Hemisphere
Longitude of true origin	0	0	0
Latitude of true origin	30	90	-90
Scale factor at longitude of true origin	N/A	N/A	N/A
Datum	WGS 1984	WGS 1984	WGS 1984
Ellipsoid/spheroid	WGS 1984	WGS 1984	WGS 1984
Units	Meter	Meter	Meter
False easting	0	0	0
False northing	0	0	0
EPSG Projected CRS code	6933	6931	6932
PROJ4 string	+proj=cea +lon_0=0 +lat_ts=30 +x_0=0 +y_0=0 +ellps=WGS84 +towgs84=0,0,0,0,0,0,0 +units=m +no_defs	+proj=laea +lat_0=90 +lon_0=0 +x_0=0 +y_0=0 +ellps=WGS84 +towgs84=0,0,0,0,0,0,0 +units=m +no_defs	+proj=laea +lat_0=-90 +lon_0=0 +x_0=0 +y_0=0 +ellps=WGS84 +towgs84=0,0,0,0,0,0,0 +units=m +no_defs
Reference	http://epsg.io/6933	http://epsg.io/6931	http://epsg.io/6932

1.4 Temporal Information

1.4.1 Coverage

31 March 2015 to 01 January 2022

While these dates suggest a continuous sequence of data, users should note that some empty data files exist where input data were not available. For files with no available inputs, file level metadata will show a zero for "number_of_input_files". For a comprehensive list of missing or bad data, please see the SMAP Master List of Bad and Missing Data.

1.4.2 Resolution

Data resolution is twice – daily.

2 DATA ACQUISITION AND PROCESSING

2.1 Background

This data set applies the radiometer version of the Scatterometer Image Reconstruction (rSIR) technique to a new passive microwave sensor, the NASA SMAP radiometer. This technique was originally developed and applied to the SMMR, AMSR-E, and SSM/I-SSMIS sensors; it has now been used to produce enhanced-resolution images from the SMAP radiometer. This data set is provided in the same format, with all the same high-quality metadata, as the *MEaSUREs Calibrated Enhanced-Resolution Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR (NSIDC-0630)* data set.

2.2 Acquisition

The input for this data set is the *SMAP L1B Radiometer Half-Orbit Time-Ordered Brightness Temperatures, Version 5 (SPL1BTB)* data set, minor version R17000. Using the quality flag on the input data set, only the highest quality SPL1BTB measurements are used for image reconstruction.

Due to differences in the input data sets, users should not mix data from Version 1 with data from Version 2. Version 1 of NSIDC-0738 is derived from Version 4 of SPL1BTB , whereas Version 2 of NSIDC-0738 uses version 5 of SPL1BTB as input data. See (link to SMAP data versions page) for more details on how the input product has changed.

2.3 Processing

This data set follows the same processing steps as the MEaSUREs (NSIDC-0630) data set. For details, see Long et al. (2019), the Algorithm Theoretical Basis Document for this data set (Brodzik et al., 2020), and the NSIDC-0630 User Guide and ATBD (Brodzik and Long, 2016).

2.4 Quality, Errors, and Limitations

For a more detailed description of this data set, including estimates of resolution enhancement using numerical simulation, see Long et al., (2019). The effective resolution enhancement will change within a selected image as a function of orbital overlap, channel and polarization. An additional study that uses actual SMAP images to quantify resolution enhancement has found that

the effective resolution enhancement of SMAP rSIR images at high latitude locations is 30-60% finer than conventionally processed gridded data (Long et al., 2021).

Data from the V4 and V5 of SPL1BTB inputs differ significantly. Users should not mix data from current with past versions of this data set. Specifically, do not mix data from version 1 of NSIDC-0738 with data from version 2 NSIDC-0738.

2.5 Instrumentation

2.5.1 Description

For a detailed description of the SMAP instrument, visit the SMAP Instrument page at the Jet Propulsion Laboratory (JPL) SMAP website.

3 VERSION HISTORY

The following table outlines version history.

Table 5. Version History Summary

Version	Release Date	Description of Changes
1.0	August 2019	Initial Release
2.0	August 2021	This version includes the following updates: Complete reprocessing with revised swath inputs Uses latest SPL1BTB v5 inputs Updated DAAC archive to 30 Apr 2021 Commenced near real-time processing No orbital drift: no change in ltod thresholds Fixed bug in GRD time arrays that resulted in all time array data being set to earliest time stamp in the array

4 RELATED DATA SETS

MEaSUREs Calibrated Enhanced-Resolution Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR (NSIDC-0630)

SMAP L1B Radiometer Half-Orbit Time-Ordered Brightness Temperatures, Version 5 (SPL1BTB)

SMAP Data at NSIDC | Overview

5 RELATED WEBSITES

SMAP at NASA JPL

6 CONTACTS AND ACKNOWLEDGMENTS

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7 REFERENCES

Brodzik, M. J. and D. G. Long. 2016. Calibrated Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR (CETB) Algorithm Theoretical Basis Document. MEaSUREs Project White Paper. NSIDC. Boulder, CO. Available at: https://nsidc.org/sites/nsidc.org/files/technical-references/MEaSUREs_CETB_ATBD_v1.0.pdf

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8 DOCUMENT INFORMATION

8.1 Publication Date

18 August 2021

8.2 Date Last Updated

April 2022