Near-Real-Time AMSR2 EASE-Grid Daily Global Ice Concentration and Snow Extent, Version 1

USER GUIDE

How to Cite These Data

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

Stewart, J. S., Meier, W. N., Wilcox, H., & Scott, D. J. (2025). *Near-Real-Time AMSR2 EASE-Grid Daily Global Ice Concentration and Snow Extent, Version 1* [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/H1NBW96MSEGY. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NISE_A2

National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Summary

The Near-real-time Ice and Snow Extent (NISE) Advanced Microwave Scanning Radiometer 2 (AMSR2) data set (NISE_A2) provides daily, global maps of sea ice concentrations and snow extent. The data provides a best estimate of current ice and snow conditions based on information and algorithms available at the time the data are acquired. Near-real-time products are not intended for operational use in assessing sea ice conditions for navigation.

1.2 Parameters

The main parameters for this data set are snow extent (the presence or absence of snow) and sea ice concentration (measured as a percentage).

1.3 File Information

1.3.1 Format

Data are provided in HDF-EOS2 format. HDF-EOS2 (Hierarchical Data Format - Earth Observing System) is a self-describing file format based on HDF4 that was developed specifically for distributing and archiving data collected by NASA EOS satellites. For more information, visit the HDF-EOS Tools and Information Center.

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

1.3.2 File Contents

Daily data are provided in a single HDF-EOS2 file containing two data fields, extent and age, for both the Northern and Southern Hemispheres (Table 1). Extent and age values are stored as binary arrays of unsigned 1-byte (8-bit) data ranging in value from 0 to 255.

Table 1. HDF-EOS2 File Parameters

Data Field	Description	Possible Values
Extent	The snow coverage and sea ice concentration of all pixels in the study areas; coastal pixels are also identified	0: Snow-free land 1-100: Sea ice concentration (%) 101: Permanent ice coverage (Greenland, Antarctica) 102: Not used 103: Pixel has snow 104-251: Not used 252: Coastal pixel (unable to reliably apply microwave algorithms) 253: Pixel suspected of having ice 254: Off-Earth grid points 255: Ocean
Age	The age of the input data relative to the data file; the difference between the day of acquisition for the input data and the day of production for the HDF-EOS2 file	0-254: age (in days) before the date of the data file 255: fill value for off-Earth grid points and undetermined data pixels

1.3.3 Naming Convention

Files are named according to the following conventions and as described in Table 2.

`NISE_AMSR2_yyyymmdd.HDFEOS`

`NISE_AMSR2_yyyymmdd.HDFEOS.xml`

Table 2. Description of File Name Variables

Variable	Description
`NISE`	Near-real-time Ice and Snow Extent
`AMSR2`	Advanced Microwave Scanning Radiometer 2: sensor
yyyy	4-digit year
`mm`	2-digit month of year
dd	2-digit day of month
`.HDFEOS`	The data files are in HDF-EOS2 format and .xml for granule metadata in Extensible Markup Language

Example File Names:

NISE_AMSR2_20240714.HDFEOS

NISE_AMSR2_20240714.HDFEOS.xml

1.4 Spatial Information

1.4.1 Coverage

Spatial coverage is global except for a gap near each pole. The application of monthly-varying masks limits the mapped extent of snow and sea ice in both hemispheres (see the Data Acquisition and Processing section of this document for more details). Spatial coverage is shown in Figure 1 and 2.

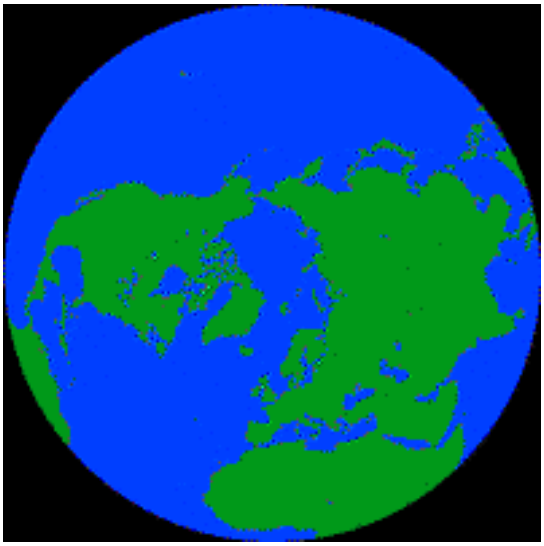

Figure 1. Northern Hemisphere

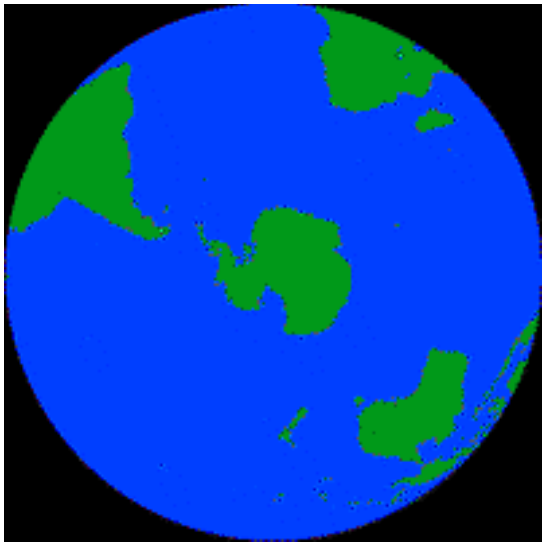

Figure 2. Southern Hemisphere

1.4.2 Resolution

The polar EASE grids (EASE-Grid) have a nominal resolution of 25 km.

1.4.3 Geolocation

Sea ice concentration and snow extent maps are provided in the 25 km Northern Hemisphere and Southern Hemisphere Equal-Area Scalable Earth Grids (EASE-Grid North and EASE-Grid South). Table 3 and Table 4 below provide more details.

Table 3. Geolocation Details

Geographic coordinate system	Unspecified datum based upon the International 1924 Authalic Sphere	Unspecified datum based upon the International 1924 Authalic Sphere
Projected coordinate system	NSIDC EASE-Grid North	NSIDC EASE-Grid South
Longitude of true origin	0	0
Latitude of true origin	90	-90
Scale factor at longitude of true origin	N/A	N/A
Datum	Not specified based on the International 1924 Authalic Sphere	Not specified based on the International 1924 Authalic Sphere
Ellipsoid/spheroid	International 1924 Authalic Sphere	International 1924 Authalic Sphere
Units	meter	meter
False easting	0	0
False northing	0	0
EPSG code	3408	3409
PROJ4 string	+proj=laea +lat_0=90 +lon_0=0 +x_0=0 +y_0=0 +a=6371228 +b=6371228 +units=m +no_defs	+proj=laea +lat_0=-90 +lon_0=0 +x_0=0 +y_0=0 +a=6371228 +b=6371228 +units=m +no_defs
Reference	http://epsg.io/3408	http://epsg.io/3409

Table 4. Grid Details

Projection Coordinate System	NSIDC EASE-Grid North	NSIDC EASE-Grid South
Grid cell size (x, y pixel dimensions)	25,067.53 m x 25,067.53 m	25,067.53 m x 25,067.53 m
Number of rows	721	721
Number of columns	721	721
Geolocated lower left point in grid	N/A, off the Earth	N/A, off the Earth
Nominal gridded resolution	25 km	25 km
Grid rotation	none	none
ulxmap – x-axis map coordinate of the center of the upper-left pixel (XLLCORNER for ASCII data)	-9036842.76	-9036842.76
ulymap – y-axis map coordinate of the center of the upper-left pixel (YLLCORNER for ASCII data)	9036842.76	9036842.76

1.5 Temporal Information

1.5.1 Coverage

Data coverage begins on 01 January 2024 and is ongoing.

1.5.2 Resolution

Data are available at a daily resolution.

For each 24-hour period, NISE_A2 is updated using the most recent input data for a given grid cell. The frequency of input updates varies as a function of latitude. Grid cells representing latitudes above 55° N or below 55° S, for which multiple satellite passes are available each day, are usually updated every 24 hours. Due to the orbital geometry of the GCOM-W1 satellites and the swath width of the AMSR2 sensor, the time interval between successive observations at low-latitude locations (20° S to 20° N) can be up to five days, similar to SSM/I and SSMIS sensors on DMSP platforms (Hollinger et al. 1987). Given the absence of sea ice and very limited snow extent at these low latitudes, the infrequent updates were deemed acceptable.

Occasionally, input data are unavailable or unobtainable. When this happens, the age values at any location may be older than five days. An age grid indicates the number of days since each grid cell was last updated.

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition and Instrumentation

The NISE_A2 product uses Level 1R passive microwave brightness temperature (Tb) data from the Advanced Microwave Scanning Radiometer 2 (AMSR2) sensor onboard the JAXA GCOM-W satellite. Refer to the GCOM-W1 Instruments and GCOM-W/AMSR2 L1R Brightness Temperature for more information on the instruments, sensors, and input data.

2.2 Processing

The process to derive snow extent from passive microwave satellite data is undergoing revision and improvement at NSIDC as time and resources permit. Algorithms may be updated if improved versions become available, where changes are intended to improve the snow and ice mapping capabilities of NSIDC. Sea ice concentrations are taken from AMSR2 Daily Polar Gridded Sea Ice Concentrations and re-projected to NISE_A2's 25km EASE-grid. The sea ice concentrations are

calculated using the NASA Team Sea Ice algorithm as described in Cavalieri et al. (1992) and Descriptions of and Differences between the NASA Team and Bootstrap Algorithm FAQ.

Snow extent calculations use GCOM-W/AMSR2 L1R Brightness Temperatures from the Japan Aerospace Exploration Agency (JAXA). Tbs from the morning passes are gridded using the methodology of the previous NISEv5 product. Snow extent is mapped using a snow water equivalent (SWE) algorithm developed for Scanning Multichannel Microwave Radiometer (SMMR) data, as described in Chang, Foster, and Hall (1987), and modified for use with SSM/I and SSMIS data, as described in Armstrong and Brodzik (2001 and 2002). SWE estimates below a threshold of about 7.5mm (the exact value varies by sensor) are set to zero to indicate no snow. In the NISE_A2 product, land grid cells are either encoded as “no snow” (if the SWE is less than the threshold), or “has snow” (if the threshold is met). NISE_A2 calibrated the SWE algorithm coefficients for consistency between F17 and AMSR2 snow extent fields.

A land/ocean/ice mask is used to determine which algorithm (sea ice concentration or snow extent) is used for each pixel. Additional climatology masks are used to identify spurious data, primarily due to weather affecting passive microwave data collection. Currently, the sea ice climatology mask is a monthly ocean mask derived from historical SMMR (1979 - 1987) and SSM/I (1987 - 2003) data. The snow extent climatology for the Northern Hemisphere is a monthly mask derived from the Northern Hemisphere EASE-Grid Weekly Snow Cover and Sea Ice Extent (October 1966 - May 2005) data. The snow extent climatology for the Southern Hemisphere is a monthly land mask derived from SSM/I period (1987 - 2003) data.

2.3 Quality, Errors, and Limitations

2.3.1 Differences between NISE_A2, NISEv5 (F18), and NISEv4 (F17)

To ensure timeliness of releasing the NISE_A2 product, the NSIDC DAAC performed high level qualitative comparisons between the sample NISE_A2 and NISEv5 (F18) and NISEv4 (F17). Our initial assessment is that there is good spatial agreement between NISE_A2 and NISEv4/NISEv5 sea ice concentration and snow extent fields. The NISE_A2 product usually has complete global coverage with only two days’ data, rather than the up to five days needed for SSMIS. The snow extent field be slightly more extensive in the NISE_A2 product than in the SSMIS NISE; this may be improved in future versions with additional calibration of the snow-water-equivalent calculations.

Figures 3 and 4 show the sea ice and snow extent in the Northern and Southern Hemispheres across the NISE versions.

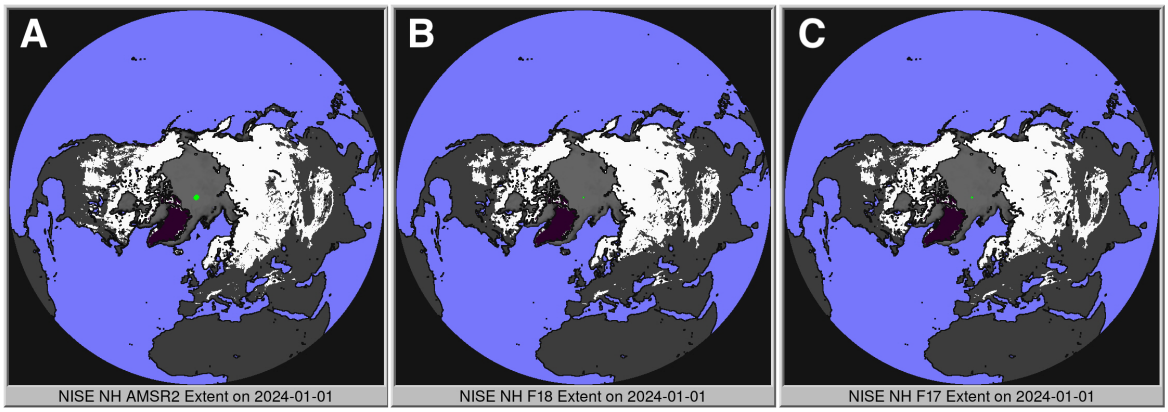

Figure 3. NISE_A2 (A), NISEv5 (F18 / B), and NISEv4 (F17 / C) snow and sea ice extent on 2024-01-01 in the Northern Hemisphere.

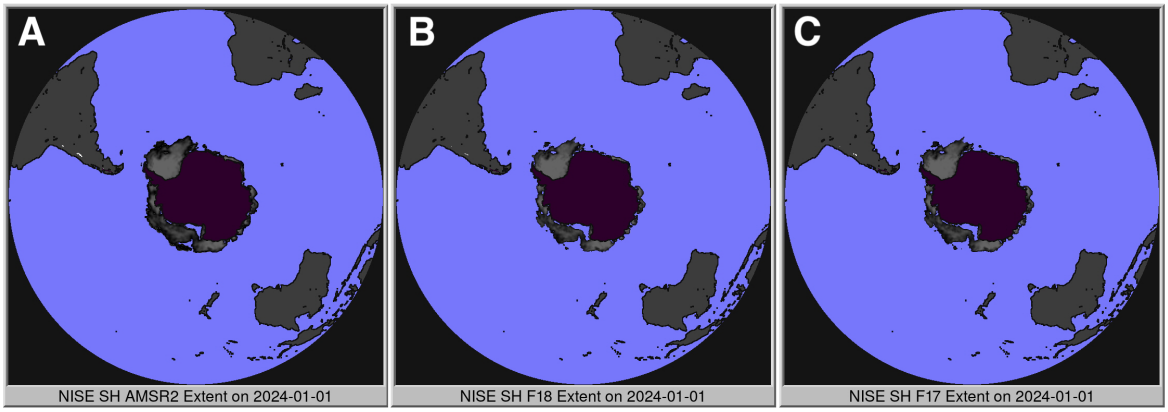

Figure 4. NISE_A2 (A), NISEv5 (F18 / B), and NISEv4 (F17 / C) snow and sea ice extent on 2024-01-01 in the Southern Hemisphere.

The NSIDC DAAC's initial assessment is that there is good spatial agreement between NISE_A2 and NISEv4/NISEv5 sea ice concentration and snow extent fields. The snow extent field may extend further in the AMSR2 product than in the SSMIS NISE; this may be improved in future versions with additional calibration of the snow-water-equivalent calculations.

2.3.2 Error Sources and Limitations

Physical conditions affecting the accuracy of the sea ice concentration algorithm include atmospheric water content, ocean roughening and spray, presence of thin ice, and formation of melt ponds on the sea ice. Errors become greatest during mid- to late-summer, resulting primarily from melt ponds on the ice surface, and also from atmospheric- and weather-related effects over open ocean. To minimize the error over open ocean, a filter is applied to detect these atmospheric effects. False ice concentration estimates may also occur along coastlines due to mixed pixels. Mixed pixels contain signals from both land and water in unknown proportions. For the NISE_A2

product, such errors are minimized by designating these pixels as coastal pixels (see Table 1 for more details).

The presence of dense coniferous and deciduous forests presents problems for mapping snow extent because the vegetation canopy obscures snow on the ground. The best conditions for accurate snow extent mapping are in areas of little or no vegetation, such as prairies and tundra. In all areas, the snow extent mapping algorithm only identifies a grid cell as snow-covered when it has a computed snow depth greater than 2.5 cm.

3 VERSION HISTORY

Table 5. Description of Version Changes

Version	Implementation date (yyyy-mm-dd)	Description
V1	2025-07-31	Initial operational release: product was published to maintain continuity with the end of support for the SSM/I-SSMIS NISEv5 product.

4 RELATED DATA SETS

AMSR2 Daily Polar Gridded Sea Ice Concentrations

AMSR2 Daily Polar Gridded Brightness Temperatures

Near-Real-Time SSM/I-SSMIS EASE-Grid Daily Global Ice Concentration and Snow Extent

5 ACKNOWLEDGMENTS

NASA provided funding to produce this data set through the NSIDC Distributed Active Archive Center (DAAC).

6 REFERENCES

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Japan Aerospace Exploration Agency. 2012. *GCOM-W/AMSR2 L1R Brightness Temperature*. https://doi.org/10.57746/EO.01gs73ant4d0y20r133tz5bz7p

7 DOCUMENT INFORMATION

7.1 Publication Date

July 2025

7.2 Date Last Updated

September 2025