



MEaSURES Greenland Ice Mapping Project (GIMP) Land Ice and Ocean Classification Mask, Version 1

USER GUIDE

How to Cite These Data

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

Howat, I. 2017. *MEaSURES Greenland Ice Mapping Project (GIMP) Land Ice and Ocean Classification Mask, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/B8X58MQBFUPA> [Date Accessed].

We also request that you acknowledge the author(s) of this data set by referencing the following peer-reviewed publication:

Howat, I., A. Negrete, and B. Smith. 2014. The Greenland Ice Mapping Project (GIMP) land classification and surface elevation data sets. *The Cryosphere*, 8. 1509-1518. <https://doi.org/10.5194/tc-8-1509-2014>

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

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/NSIDC-0714>



National Snow and Ice Data Center

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1 DATA DESCRIPTION

This data set provides complete land ice and ocean classification masks for the Greenland ice sheet for the years 2000, 2015, and 2020, posted at 15 m, 30 m, and 90 m. The masks are derived from imagery acquired by RADARSAT-1¹, the Enhanced Thematic Mapper Plus (ETM+) on Landsat 7², and the Operational Land Imager (OLI) on Landsat 8².

1.1 Parameters

Data consist of classifications for land ice/ocean (1), depending on the map, versus all other terrain (0). A grounded ice mask is provided for the year 2000 only. This file indicates values of “1” or “NoData.”

1.2 File Information

1.2.1 Format

GeoTIFF (.tif)

1.2.2 Naming Convention

Masks at 15 m and 30 m resolution are provided as a set of 36, 249.3 km × 450 km tiles. As described below and shown in Figure 1, 15 m and 30 m mask file names include a column and row tile designation, starting from (0,0) in the lower left corner of the study area to (5,5) in the upper right. The 90 m resolution masks comprise a single, ice sheet-wide file for the given year.

GeoTIFF files utilize the following naming convention:

Examples

GimpIceMask_15m_2000_tile0_0_v1.2.tif

GimpOceanMask_15m_2000_tile0_0_v1.2.tif

GimpIceMask_90m_2000_v1.2.tif

GimpOceanMask_90m_2000_v1.2.tif

Naming Convention

Gimp[type]Mask_[res]m_[year]_tile[col_row]_[v.v].tif

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

¹ Distributed by the Canadian Space Agency (CSA)

² Distributed by the United States Geological Survey (USGS)

Table 1. File Name Variables and Descriptions

Variable	Description
Gimp	Greenland Ice Mapping Project
type	Mask type: Ice, Ocean, or GroundedIce (2000 only)
res	Spatial resolution in meters: 15, 30, or 90
year	Year
col_row	Column and row tile ID, from "0_0" in the lower left corner to "5_5" in the upper right (see Figure 1). This variable is only present in 15 m and 30 m file names.
v.v	Major and minor version number. v1.2 = Version 1.2
.tif	File name extension for GeoTIFF-formatted file

The grounded ice mask for the year 2000 is named "GimpGroundedIceMask_90m_2000_v.1.2".

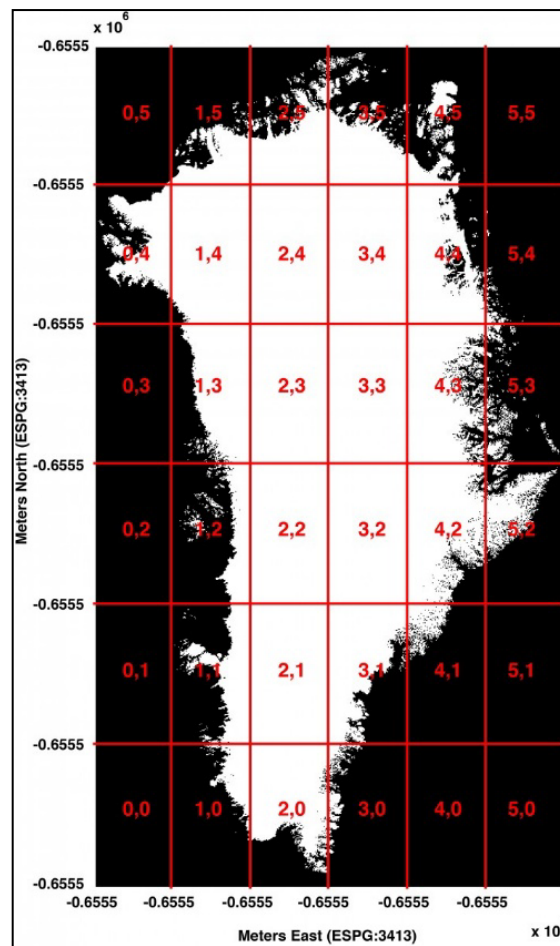


Figure 1. Tile Designations and Boundaries

1.3 Spatial Information

1.3.1 Coverage

North: 82° N

South: 58° N

East: 7° E

West: 90° W

1.3.2 Resolution

15 m, 30 m, 90 m

1.3.3 Geolocation

Data are provided in the “WGS 84 / NSIDC Sea Ice Polar Stereographic North” projection ([EPSG:3413](#)).

i The GeoTIFFs for 2015 and 2020 include file metadata that details the coordinate reference system. This information is not included in the GeoTIFFs for the year 2000.

In addition, the header for the grounded ice mask erroneously specifies the latitude of true scale as “7” instead of “70.” This error can be corrected by reprojecting the file using the following GDAL command:

```
gdalwarp -s_srs EPSG:3413 -t_srs EPSG:3413 GimpGroundedIceMask_90m_2000_v1.2.tif output.tif
```

1.4 Temporal Information

1.4.1 Coverage

1 July 1999 – 30 September 2002

15 January 2013 – 30 September 2015

1 July 2020 – 1 October 2020

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

The masks are constructed from imagery at the highest possible spatial resolution and from within as narrow a time window as possible. For the 2000 masks, orthorectified 15 m Landsat 7 ETM+ imagery, from the [MEaSURES Greenland Ice Mapping Project \(GIMP\) 2000 Image Mosaic](#),

[Version 1](#) data set, was selected from July and August—as close to 1 August as possible—from (in preferential order) the years 2000, 1999, 2001, and 2002. Up-sampled 20 m RADARSAT-1 SAR imagery acquired between October and December 2000³ was used north of Landsat’s maximum extent (Howat et al., 2014, Joughin et al., 2010).

The 2015 masks were similarly derived from imagery acquired by the Landsat 8⁴ OLI between 1 July and 30 September 2015 and RADARSAT-1 between 15 January and 26 March 2013 (see [MEaSURES Greenland Ice Sheet Mosaics from SAR Data, Version 1](#)).

The 2020 masks were derived from Landsat 8 OLI imagery acquired between 1 July and 1 October 2020.

2.2 Processing

Mask files were created by manually digitizing panchromatic and/or pan-sharpened multispectral images. In areas of abundant debris and snow cover, ice margins were identified by breaks in surface slope, emerging melt water streams, color differences, and the presence of small meltwater ponds.

Similarly, glaciers were differentiated from perennial snowfields based on visible crevassing, surface moraines, and the existence of a visible glacier toe. Snowfields without these features were not classified as ice. Coastlines in the ocean masks were digitized using the same approach, with the null value from the ice and ocean masks used as ice-free terrain. For additional information, see Howat, et al., 2014.

2.3 Quality, Errors, and Limitations

2.3.1 Error Estimates

Uncertainties in classifications arise from three main sources:

- Image pixel resolution
- Image geo-registration
- Erroneous or non-selection of pixels (i.e., mapping error)

The contributions and magnitudes of these error sources are discussed in detail in Howat et al., 2014.

³ Produced by the Applied Physics Laboratory, University of Washington.

⁴ Scene LC08_L1TP, acquired from the Land Processes Distributed Active Archive Center. See [“What is the naming convention for Landsat Collections Level-1 scenes?”](#) for details.

3 VERSION HISTORY

Table 2. Version History Summary

Version	Release Date	Description of Changes
1.2	March 2026	Ice and ocean masks added for the year 2020.
1.2	May 2021	Ice and ocean masks added for the year 2015. In addition, all file names were updated to include the year.
1.1	April 2017	In the initial release, the location of the upper left pixel was incorrectly specified as the distance in meters from the North Pole to the center of the upper left pixel. For V1.1, this location was corrected to the distance from the North Pole to the upper left corner of the upper left pixel, thus shifting the data grid by one-half pixel. The data values were unaffected by this change.
1	February 2017	Initial release

4 RELATED WEBSITES

- [Alaska Satellite Facility](#)
- [Canadian Space Agency](#)
- [Landsat Data Access | USGS](#)

5 REFERENCES

Howat, I. M., A. Negrete, and B. E. Smith. 2014. The Greenland Ice Mapping Project (GIMP) land classification and surface elevation datasets. *The Cryosphere*, 8(4): 1509-1518.

<https://doi.org/10.5194/tc-8-1509-2014>

Joughin, I., B. E. Smith, I. M. Howat, T. Scambos, and T. Moon. 2010. Greenland flow variability from ice-sheet-wide velocity mapping. *Journal of Glaciology*, 56: 415–430.

<https://doi.org/10.3189/002214310792447734>

6 DOCUMENT INFORMATION

6.1 Publication Date

February 2017

6.2 Date Last Updated

March 2026