MEaSUREs Annual Greenland Outlet Glacier Terminus Positions from SAR Mosaics, Version 1

USER GUIDE

How to Cite These Data

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

Joughin, I., T. Moon, J. Joughin, and T. Black. 2015, 2017. *MEaSUREs Annual Greenland Outlet Glacier Terminus Positions from SAR Mosaics, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/DC0MLBOCL3EL. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0642

National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Parameters

Geometric ice front positions.

1.1.1 Parameter Description

Shapefiles of ice front locations for outlet glaciers in Greenland for 2000–01, 2005–06, 2006–07, 2007–08, 2008–09, 2012–13, 2014-15, 2015-16, and 2016-17 winter seasons. Beginning with the 2014-15 season, three new fields are included in the data. See Table 1 for a description of all data fields.

Table 1. Primary Data Attributes

Data Field	Description	Values
GlacierID	Numerical ID assigned to each glacier (used consistently across all data sets)	0 - 238
QualFlag (included beginning with 2014 data)	Quality flag indicator for digitized ice fronts of lower certainty or drawing from multiple image sources	0 – no flag 1 – digitized terminus position is estimated or uncertain (see Section 2.4) 2 - uncertain digitized terminus position was improved or verified using Landsat imagery
ImgSource (included beginning with 2014 data)	Satellite source of image used to digitize terminus position	Sentinel1 Landsat
DateRange (pre-2014 data)	Date range for images from full Greenland mosaic used to create digitized ice fronts	DDMMMYYYY - DDMMMYYYY
DATE (change to new format begins with 2014 data)	Date of image used to digitize terminus position	YYYYMMDD

Data Field	Description	Values
GrnlndcNam (updated* beginning with 2014 data and in GlacierIDv01.1.shp)	Greenlandic glacier name	*Values are standardized to match "New Greenlandic" attribute in database of Greenland glacier names (Bjørk et al., 2015)
Official_n (included beginning with 2014 data and in GlacierIDv01.1.shp)	Officially recognized glacier name	Values are standardized to match "Official_n" attribute in database of Greenland glacier names (Bjørk et al., 2015)
GlacName (pre-2014 data)	Glacier Name	Glacier name (usually European glacier name)
AltName (included beginning with 2014 data and in GlacierIDv01.1.shp)	Alternative glacier name	Includes foreign name or Old Greenlandic name (Bjørk et al., 2015), or other recognized names)

1.1.2 Sample Data Record

Figure 1 illustrates ice front positions for three Greenland glaciers during six winters.

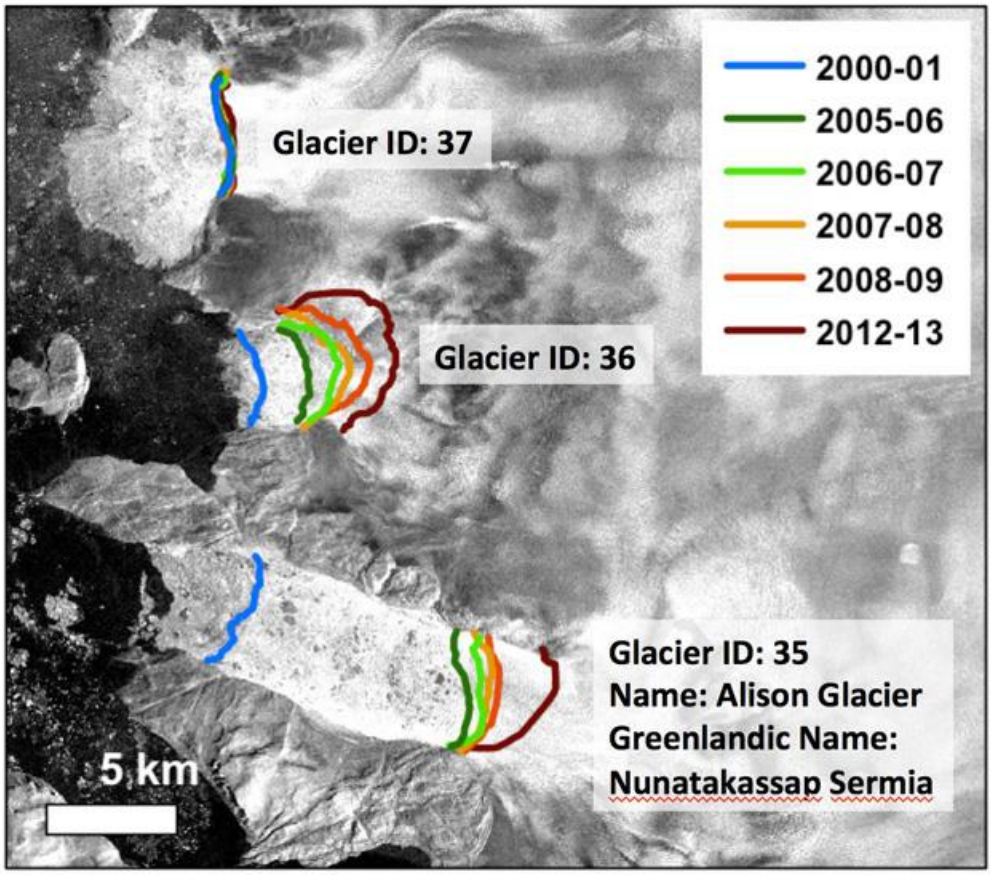

Figure 1. Sample Data Visualization

1.2 File Information

1.2.1 Format

ESRI ArcGIS Shapefile

.shp – main file that stores the feature geometry
.shx – index file that stores the index of the feature geometry
.dbf – dBASE table that stores the attribute information of features
.sbn and .sbx – files that store the spatial index of the features
.prj – file that stores the coordinate system information
.cpg – optional file to specify the code page for identifying the character set to be used

There is also a metadata file (.xml) for each shapefile.

1.2.2 Directory Structure

Data are available on the HTTPS site in `https://n5eil01u.ecs.nsidc.org/MEASURES/NSIDC-0642.001/.`

Within this directory are the following folders:

Table 2. Top-Level Directory Structure

Folder Name	Description
2000.09.30	Winter 2000–2001 glacier terminus position data and glacier IDs
2005.12.24	Winter 2005–2006 glacier terminus position data
2006.12.30	Winter 2006–2007 glacier terminus position data
2007.11.22	Winter 2007–2008 glacier terminus position data
2009.01.04	Winter 2008–2009 glacier terminus position data
2013.01.15	Winter 2012–2013 glacier terminus position data
2015.01.21	Winter 2014–2015 glacier terminus position data
2016.02.02	Winter 2015–2016 glacier terminus position data
2017.02.01	Winter 2016–2017 glacier terminus position data

The 2000.09.30 folder contains 18 files: 9 files for the glacier identifiers and 9 for the terminus position data. All other folders contain 9 files each for the terminus position data.

1.2.3 Naming Convention

This section explains the shapefile file naming convention for this data set.

Example File Names:

termini_0809_v01.2.cpg
termini_0809_v01.2.dbf
termini_0809_v01.2.prj
termini_0809_v01.2.sbn
termini_0809_v01.2.sbx
termini_0809_v01.2.shp
termini_0809_v01.2.shx
termini_0809_v01.2.xml

Convention:

termini_XXYY_v01.2.ext
GlacierIDs.ext

Table 3. Naming Convention for Shapfiles

String	Description
termini	Glacier terminus position file
GlacierIDs	GlacierID denotes a reference file with glacier points and consistent glacier identification number.
XXYY	Winter season. For example, 0809 is the winter of 2008–2009.
vxx.x	Current version number

String	Description
EXT	File extension. The shapefile (.shp) format includes: .cpg (character set code), .dbf (attributes), .prj (projection information), .sbn and .sbx (spatial index), .shx (feature geometry index), and .xml (metadata).

1.2.4 File Size

Character set code (`.cpg`), spatial index (`.sbx`), and projection (`.prj`) files average 1 KB.
Spatial index files (`.sbn`) range from 2 KB to 3 KB.
Feature geometry index files (`.shx`) average approximately 2 KB.
Database files (`.dbf`) range from 25 to 68 KB.
Shapefiles (`.shp`) range from 6 KB to 100 KB.
Metadata files (`.xml`) average approximately 7 KB.

1.2.5 Volume

The complete data volume is approximately 1153 KB.

1.3 Spatial Information

1.3.1 Coverage

Southernmost Latitude: 60° N
Northernmost Latitude: 83° N
Westernmost Longitude: 75° W
Easternmost Longitude: 14° W

1.3.2 Resolution

The nominal uncertainty in digitized position is 50 m but could be larger in regions where there is poor contrast at the terminus (e.g., melange). Nominal ground resolution for the source SAR mosaics and Landsat ranges between 15 m to 50 m.

1.3.3 Projection and Grid Description

GeoTIFFs are provided in a WGS 84 polar stereographic grid with a standard latitude of 70° N and rotation angle of -45° (sometimes specified as a longitude of 45° W). With this convention, the y-axis extends south from the North Pole along the 45° W meridian (EPSG:3413).

1.4 Temporal Information

1.4.1 Coverage

Data are available for the following winters.

- 2000–2001
- 2005–2006
- 2006–2007
- 2007–2008
- 2008–2009
- 2012–2013
- 2014-2015
- 2015-2016
- 2016-2017

Table 4 lists the exact date ranges for each winter.

Table 4. Date Ranges for Images

Data Year	Date Range
2000/01	30 Sept 2000 – 23 Jan 2001
2005/06	24 Dec 2005 – 04 Apr 2006
2006/07	30 Dec 2006 – 04 Feb 2007
2007/08	22 Nov 2007 – 30 Mar 2008
2008/09	10 Jan 2009 – 05 Feb 2009
2012/13	15 Jan 2013 – 26 Mar 2013
2014/15	21 Jan 2015 – 31 Mar 2015
2015/16	02 Feb 2016 – 02 Apr 2016
2016/17	01 Feb 2017 – 06 Apr 2017

1.4.2 Resolution

One set of ice front positions per year.

2 DATA ACQUISITION AND PROCESSING

2.1 Background

From 2000 through 2013, the terminus positions were created using 20 m resolution SAR Mosaics of Greenland. As of 2014, the positions were created using the SAR imagery from the Copernicus Sentinel-1 satellite and Landsat 8 panchromatic imagery.

2.2 Acquisition

See MEaSUREs Greenland Ice Sheet Mosaics from SAR Data and MEaSUREs Greenland Image Mosaics from Sentinel-1A and -1B, Version 2 for information on the base maps used to create this data set.

2.3 Derivation Techniques and Algorithms

Terminus positions were digitized using mosaics created from RADARSAT satellite data through 2013, and as of 2014, they were created from Sentinel-1 and Landsat 8 satellite data. Positions were digitized for Greenland Ice Sheet outlet glaciers with terminus widths of roughly 1.5 km or greater. All glaciers that appear in each year's mosaic were digitized with few exceptions. For users of the data set, image quality varies and should be considered on a per-glacier basis. In cases where the terminus was highly fractured, the terminus position does not include fully detached (fractured) areas. For some glaciers, this determination is not clearly objective.

Number of glaciers in full data set: 238

Not all glaciers appear in each year due to limits in the satellite coverage; however, as of the 2014/15 winter season, all glaciers are included.

Table 5. Number of glaciers digitized per year

Data Year	Number of glaciers digitized
2000/01	205
2005/06	203
2006/07	200
2007/08	208
2008/09	201
2012/13	206
2014/15	238
2015/16	238
2016/17	238

2.4 Quality, Errors, and Limitations

Errors in digitized terminus location may occur due to:

- image distortion due to local topography
- difficulty distinguishing intact glacier ice from adjacent glacier or sea ice

- highly fractured terminus area
- resolution limits
- manual digitization error

The digitization line is meant to cover roughly the full width of the active glacier terminus and the line ends do not necessarily indicate a junction between ice and rock or any other defined measure of a glacier edge. Therefore, this data set should not be used as a measure of glacier width.

2.5 Instrumentation

2.5.1 Description

For information about the SAR systems used to construct the mosaics from which this data set is derived, see the Alaska Satellite Facility's SAR Basics web page, the Japan Aerospace Exploration Agency (JAXA) About ALOS - PALSAR site, and the European Space Agency's Copernicus Sentinel-1 site. Information on the Landsat-8 OLI sensor is available on the USGS web site.

3 SOFTWARE AND TOOLS

These data can be readily accessed using GIS software such as ArcGIS and QGIS.

4 VERSION HISTORY

Version 1.2 was released in October 2017. Refer to Table 6 for this data set's version history:

Table 6. Version History

Version	Description
V1.2 (October 2017)	Added glaciers to two winters: 2006/2007 – glaciers 90 and 91 2008/2009 – glaciers 1-9, 90, and 91
V1.1 (August 2017)	Minor changes include: • Added data for winters of 2014/2015, 2015/16, 2016/17 • Added new parameter attributes for the new data • Added 29 new glaciers • Provided a new GlacierID file with added glaciers and updated attributes
V1 (September 2015)	Initial release

5 RELATED DATA SETS

Digital SAR Mosaic and Elevation Map of the Greenland Ice Sheet
RAMP AMM-1 SAR Image Mosaic of Antarctica
MEaSUREs Greenland Ice Sheet Mosaics from SAR Data
MEaSUREs Greenland Ice Sheet Velocity Map from InSAR Data
MEaSUREs Greenland Ice Velocity: Selected Glacier Site Velocity Maps from InSAR
MEaSUREs InSAR-Based Antarctica Ice Velocity Map
MEaSUREs InSAR-Based Ice Velocity Maps of Central Antarctica: 1997 and 2009
MEaSUREs InSAR-Based Ice Velocity of the Amundsen Sea Embayment, Antarctica

6 RELATED WEBSITES

MEaSUREs Data | Overview
Alaska Satellite Facility
Canadian Space Agency
Japan Aerospace Exploration Agency

7 CONTACTS AND ACKNOWLEDGMENTS

Investigator(s) Name and Title

Ian Joughin
University of Washington
Applied Physics Laboratory
1013 NE 40th Street
Box 355640
Seattle, WA 98105

Twila Moon
National Snow and Ice Data Center
CIRES, 449 UCB
University of Colorado
Boulder, CO 80309-0449 USA

Jonah Joughin
Jonahjoughin@gmail.com

Taryn Black
teblack@uw.edu

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Space Agency, distributed through the Alaska Satellite Facility, and processed by Joughin, I., T. Moon, J. Joughin, and T. Black.

8 REFERENCES

Bjørk, A. A., L. M. Kruse, and P. B. Michaelsen. 2015. Brief communication: Getting Greenland's glaciers right – a new data set of all official Greenlandic glacier names. *The Cryosphere* 9(6): 2215-2218. doi: https://doi.org/10.5194/tc-9-2215-2015.

9 DOCUMENT INFORMATION

9.1 Publication Date

29 September 2015

9.2 Date Last Updated

29 December 2020