MEaSUREs Greenland Ice Velocity: Selected Glacier Site Velocity Maps from InSAR, Version 2

USER GUIDE

How to Cite These Data

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

Joughin, I., I. Howat, B. Smith, and T. Scambos. 2020. *MEaSUREs Greenland Ice Velocity: Selected Glacier Site Velocity Maps from InSAR, Version 2*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/JQHJUOYCF2TE. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0481

National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Parameters

Ice velocity is reported in meters per year. The velocity magnitude is reported in the vv files. The vx and vy files contain the velocity components in the x- and y-directions, defined by the polar stereographic grid. These velocities are true values and not subject to the distance distortions present in a polar stereographic grid. In some areas, small gaps have been filled via interpolation. Interpolated values are identifiable as locations where velocity data are present but no error estimates exist. Radar-derived velocities are determined using a combination of conventional InSAR and speckle tracking techniques.

Error estimates are provided for all non-interpolated, radar-derived velocity vectors. These estimates include the statistical uncertainty associated with the phase and speckle tracking error. See Joughin (2002) for more detail on errors and how they are computed.

The missing data value for the velocity magnitude (vv) and error estimate (ex, ey) files is -1 and is set as the attribute in all files. The missing data value for the velocity component (vx, vy) files is -2e+9.

1.2 File Information

1.2.1 Format

For each grid and existing time period, the ice velocity magnitude (vv), its components (vx, vy), and the corresponding error estimates (ex, ey) are provided in Geographic Tagged Image File Format (GeoTIFF). A JPEG image of the velocity magnitude is provided for easy visualization. An ASCII formatted metadata file containing source satellite acquistion information is also included.

1.2.2 File Contents

Files are named according to the following convention:
TSX_[grid]_[startdate]_[enddate]_[hh-mm-ss]_[parameter]_[vXX.X].[ext]

Table 1 describes the existing options in the file naming convention. As an example, below are listed all the files for grid E61.10N for the 19-30 April 2014 period in version 2.0:

- TSX_E61.10N_19Apr14_30Apr14_09-16-09_vv_v02.0.tif
- TSX_E61.10N_19Apr14_30Apr14_09-16-09_vx_v02.0.tif
- TSX_E61.10N_19Apr14_30Apr14_09-16-09_vy_v02.0.tif
- TSX_E61.10N_19Apr14_30Apr14_09-16-09_ex_v02.0.tif

- TSX_E61.10N_19Apr14_30Apr14_09-16-09_ey_v02.0.tif
- TSX_E61.10N_19Apr14_30Apr14_09-16-09_v02.0.jpg
- TSX_E61.10N_19Apr14_30Apr14_09-16-09_v02.0.meta

Table 1. File Naming Convention

Variable	Description
TSX	Data Source TSX: denotes the twin satellites TerraSAR-X / TanDEM-X (TSX / TDX)
grid	The grid name describes: whether it is on the East (E), West (W), or South (S) coast latitude (for E and W) or longitude (for S) in decimal degrees
startdate	Date of first image (DDMMMYY)
enddate	Date of second image (DDMMMYY)
hh-mm-ss	Nominal time for pair
parameter	Velocity magnitude, velocity component, or error estimate vv: velocity magnitude vx: x component of velocity vy: y component of velocity ex: error of x component ey: error of y component
vXX.X	Version of the data set
.ext	File extensions: .tif = GeoTIFF formatted file .jpg = JPEG file; visualization of the velocity magnitude .meta = ASCII text file; contains the Central Julian date and nominal time (HH:MM:SS) for the pair, the date for each image, production date, sensor combinations, and geographical information

1.3 Spatial Information

1.3.1 Coverage

This data set contains velocity data for most of the outlet glaciers for the Greenland Ice Sheet. It is presented by study sites, with a total of 55 grids. The spatial coverage map in Figure 1 shows the locations of all grids on a map of Greenland.

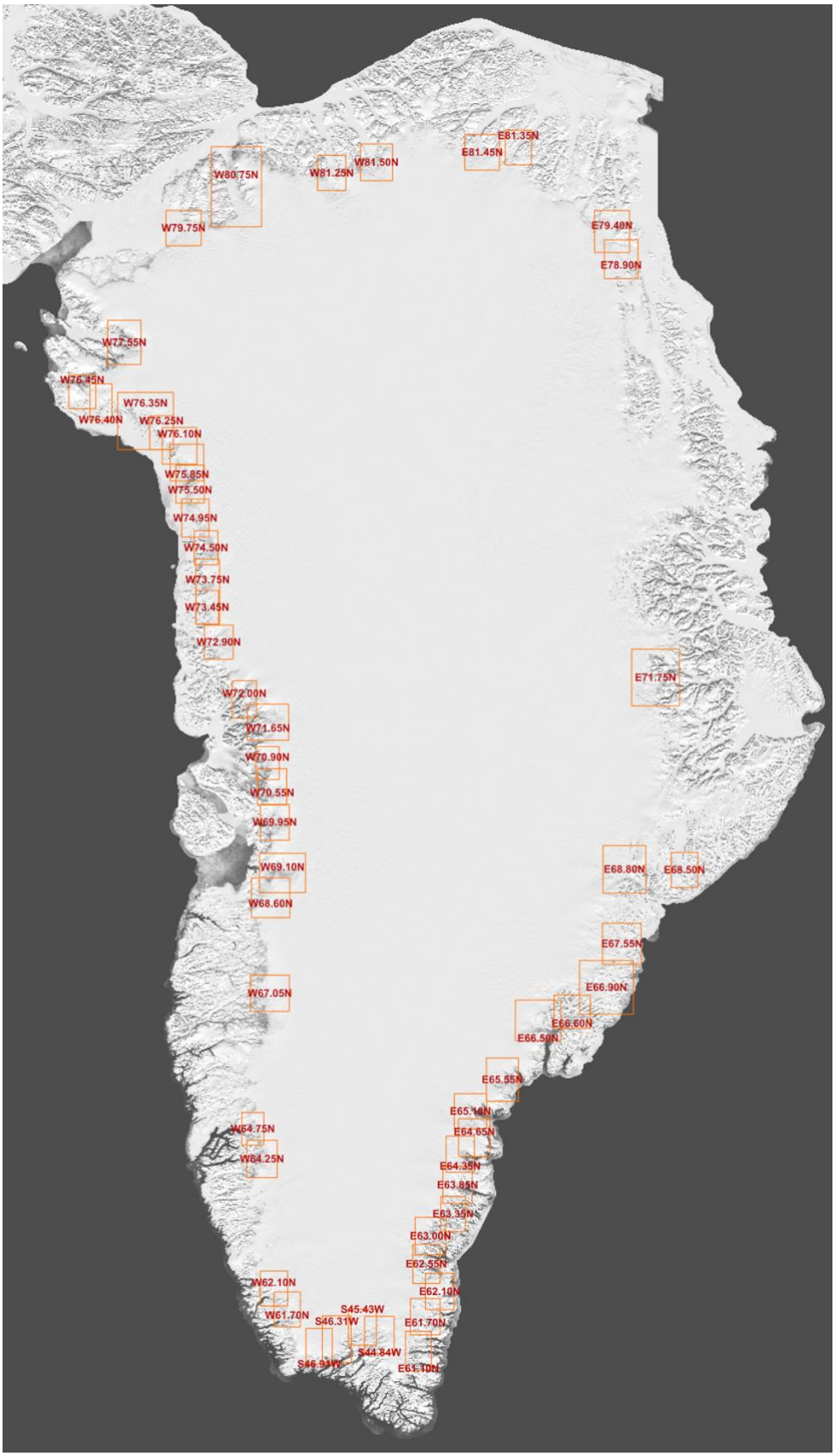

Figure 1. This map shows the locations of all the grids around Greenland.

1.3.2 Resolution

100 meters

1.3.3 Projection

Data are provided in subregions of a polar stereographic grid with a standard latitude of 70° N and a 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.

The origin specifies the polar stereographic coordinates for the center of the lower left pixel, i.e., the first sample in the file. This specification, using the middle of the reference pixel, differs from that used in some GeoTIFF and other formats where the reference coordinates are specified for the outer corner of the reference pixel.

1.4 Temporal Information

1.4.1 Coverage

12 June 2008 to present.
Data for 2008 were only obtained for three grids on a trial basis. Most grids have data starting in 2009.
This data set undergoes periodic updates as new data are collected and processed. Please check the Temporal Coverage table (available as an Excel spreadsheet under the Technical References tab) for a complete list of available dates by grid and by year.

1.4.2 Resolution

The temporal resolution varies between 11, 22, and 33 days on an 11-day repeat cycle.

2 DATA ACQUISITION AND PROCESSING

2.1 Theory of Measurements

The ice velocity maps in this data set were created using Synthetic Aperture Radar (SAR) data from the German Aerospace Center's (DLR) twin satellites TerraSAR-X / TanDEM-X (TSX/TDX). The methods include a combination of speckle tracking and conventional interferometry. See Joughin (2002) for more detail.

2.2 Sensor / Instrument Description

The twin satellites TerraSAR-X / TanDEM-X fly in close formation only a few hundred meters apart. For each time period in this data set, velocities were estimated from a pair of images. For any given pair, the images are obtained from either satellite and could have any of the possible sources: TSX/TSX,TSX/TDX, or TDX/TDX.

2.3 Error Sources

Error estimates are provided for all non-interpolated, radar-derived velocity components (vx, vy). They include the statistical uncertainty associated with the phase and speckle tracking error inherent in the SAR data. Formal errors agree reasonably well compared with errors determined from GPS data (Joughin, 2002). However, the true uncertainty is likely larger and these estimates should be used as an indication of relative quality rather than as absolute error.

3 SOFTWARE AND TOOLS

GeoTIFF files can be viewed with a variety of Geographical Information System (GIS) software packages, including QGIS and ArcGIS.

4 VERSION HISTORY

Version 2 was released in February 2020. Refer to Table 2 for the data set version history:

Table 2. Version History

Version	Description
V1 (May 2011)	Initial release
V1.1 (Feb. 2016)	GeoTIFF file format added; binary format discontinued; contains improved temporal sampling for the Jakobshavn Isbrae, Helheim, and Kangerdlugssuaq glaciers. The improved sampling addresses previous artifacts related to slope discontinuities at these glaciers' termini for the years 2009 – 2016
V1.2 (May 2017)	Renamed files to include the nominal time for pair; added 3 TSX subdirectories missing from their respective region directories; removed extraneous files from several TSX subdirectories; included .meta files for metadata
V2 (Feb. 2020)	1. Full reprocessing with accumulated minor updates. Output should be generally consistent with previous versions. 2. The tiffs are now cloud optimized and include scale-down by 2 and 4 pyramids. 3. Velocity magnitude is now included as a separate tiff to be consistent with other velocity products (so now there are vx, vy, and vv tiffs). 4. Correction of browse images (distortions, color bar placement, watermark, and color-scale consistency.) 5. Addition of consistent NoData values 6. Temporal coverage was extended.

5 RELATED DATA SETS

MEaSUREs Greenland Ice Sheet Velocity Map from InSAR Data

6 RELATED WEBSITES

- MEaSUREs at NSIDC | Overview
- NASA MEaSUREs Projects

7 CONTACTS AND ACKNOWLEDGMENTS

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8 REFERENCES

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9 DOCUMENT INFORMATION

9.1 Publication Date

16 January 2020

9.2 Date Last Updated

27 April 2020