Data provided

The present dataset is published after the work of Paul Halas, Jérémie Mouginot, Basile de Fleurian and Petra Langebroek on the Southwest of the Greenland Ice Sheet, and served as a basis for the paper "Impact of seasonal fluctuations of ice velocity on decadal trends observed in Southwest Greenland", authored by the same list of authors.

The velocity products attached here were derived using the processing chain developed by Jérémie Mouginot and collaborators, following the steps described in Romain Millan's paper "Mapping Surface Flow Velocity of Glaciers at Regional Scale Using a Multiple Sensors Approach" (https://doi.org/10.3390/rs11212498).

In order to derive the velocity fields, we used all available imagery from Landsat 5, Landsat 7 and Landsat 8, from 1984 up to 2021, with less than 40% cloud coverage. Unfortunately, no data was collected for 1984, 1993, 1996, 1997 and 1998. From 2016, satellite imagery from Sentinel-2 is also used, improving the spatial coverage of our velocity maps.

In this archive, we provide:

- Complete dataset of all velocity fields derived from every image pair;
- Yearly median results run through all data for every single pixel;
- Yearly GeoTIFF spatial aggregate of all previously computed medians;
- The shapefile "cube_grid.shp" describing the grid used for our area.

Due to the number of files, the dataset is compressed under .zip archives, under one single archive for each Yearly median results and Yearly GeoTIFF. For the complete dataset of velocity fields, there is one archive per y coordinate (regrouping between 2 and 7 files depending on the latitude).

Complete dataset of all velocity fields

For manipulation purposes, our dataset is cut following a grid, where each inner area represents 37,5 km^2 (square of 250 x 250 pixels with 150 meters resolution, with 5 pixel overlap with neighboring cells). The grid can be found in the shapefile attached named cube_grid.shp.

Velocity products are shared under the netCDF format, following the Climate and Forecast metadata conventions (cfconventions.org). Every file, refered to "cube" hereafter, represents a cell of the grid, and every layer represents a velocity field extracted from a pair of images, as explained in "Data Reduction Using Statistical and Regression Approaches for Ice Velocity Derived by Landsat-8, Sentinel-1 and Sentinel-2" (https://doi.org/10.3390/rs12121935). An example name for a cube is "c_x02695_y11270.nc", indicating the xy coordinates on the grid. The closest East-neighbor to the previously mentioned cube will be "c_x02940_y11270.nc" (2695 + 245 = 2940 along x axis, 250 pixels to

the right, with 5 pixel overlap). In each file, the geographical coordinates are also available in the North Polar Stereographic projection (ESPG: 3414).

In the case where some cubes represented on the grid do not exist in the dataset here, it is possible that the cells are out of our region of interest at the time of the study, or that feature-tracking did not yield results for this specific area.

For each layer of a .nc file, several variables can be found:

- vx: ice velocity in m/yr in x direction
- vy: ice velocity in m/yr in y direction
- date1: date of acquisition of first image for the given layer (Modified Julian Date, example: 56042 = 2012-04-25)
- date2: date of acquisition of second image for the given layer (Modified Julian Date)
- error_vx: estimated error for ice velocity in x direction
- error_vy: estimated error for ice velocity in y direction
- sensor: satellite used for image acquisition

These products are outputs from the processing chain. While allowing the reader better control over post-processing, or selection on years / months / sensors, they are not cleaned from noise. While this might not be a problem for low altitudes, higher altitudes velocities will have to be filtered to avoid aberrant values.

Yearly median results

These netCDF files are lighter: they contain one unique layer, resulting from the per-pixel median of layers for a given year and a basic filtering excluding velocity fields that cover less than 500 pixels. These products are classified by year, and still follow the grid convention explained in the previous part. The name convention add the keyword "concat" and the year in each file name, for example: "c_x02940_y10780_concat_1999.nc".

Yearly GeoTIFF spatial aggregates

These products are yearly spatial aggregate of the yearly median results, and provided as .tif. They can be particularly useful for visualisation purposes and to check whether data is available in our dataset for a given region or year. It is also possible to directly use the .tif files for analysis, but only the velocity computed from vx and vy in the entire area is included in these raster files.

Acknowledgement and Financial support

This dataset was produced as part of the SWItchDyn project funded by the Research Council of Norway (NFR-287206) and the Bjerknes Centre for Climate Research strategic project RISES. Computing was performed on the resources provided by UNINETT Sigma2 – the National Infrastructure for High Performance Computing and Data Storage in Norway (NN9635K and NS9635K).