IS2SITMOGR4 & IS2SITDAT4

Notes to users and known issues

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Notes to users and known issues

This document contains notes, which are of use in the analysis of the sea ice thickness products, and issues that are known to the developers, which may be fixed in future releases of these products.

Contents

Note 1. Monthly gridded data product (IS2SITMOGR4)

(Updated on 03/02/22)
The ISTSITMOGR4 monthly gridded ICESat-2 winter Arctic sea ice thickness dataset is produced using ICESat-2 ATL10 along-track sea ice freeboards (https://nsidc.org/data/ATL10) and NESOSIM snow loading (https://github.com/akpetty/NESOSIM). The original processing methodology is described in Petty et al., (2020).

In the Version 1 data product release we used Release 004 (rel004) ATL10 freeboards and NESOSIM v1.1 output (https://doi.org/10.5281/zenodo.5164313). This was an update to the original results presented in Petty et al., (2020) which were hosted on the ICESat-2 sea ice website. In the Version 2 data product we used Release 005 (rel005) ATL10 freeboards and NESOSIM v1.1 output.

During the Version 1 data release we extended the data product to include September (2019 onwards), as complete NESOSIM/ATL10 data was available and summer melt (which is not captured in NESOSIM and complicates ATL10 returns) is expected to be minimal – i.e., we expect the ice has generally refrozen.

The impact of the updated ATL10 freeboards (rel002 to rel005) and NESOSIM snow loading (v1.0 to v1.1) on our winter Arctic sea ice thickness estimates has been summarized in a new publication that is currently under review (Petty et al., 2022). This paper includes a link to an online Jupyter Book which provides adaptable code to read in and analyze these data.

Browse images are available for each monthly IS2SITMOGR4 file, as shown in Figure 1.

Note that our current processing plan is to produce and release the complete set of winter Arctic sea ice thickness data in one go in the subsequent late spring/early summer of each year.

Note 2. Gridding issues

(Updated as of 03/02/22)
The monthly gridded thickness data (IS2SITMOGR4) is produced using a simple 'drop in the bucket' binning approach weighted by segment length, as in the monthly gridded ICESat-2 sea ice freeboard product (ATL20). Due to the profiling strategy of ICESat-2, this results in grid-cells that represent contrasting days of the given month. The '*mean_day_of_month*' variable (panel g in Figure 1) represents the mean day of the data contained within the given monthly grid-cell and should be considered when using these data, especially for more regional studies.

In the version 2 data release, we include new interpolated and smoothed variables of freeboard, snow depth and thickness as described in Petty et al., (2022). More sophisticated interpolation procedures are being explored for use in future releases along with increases in resolution (both temporal and spatial).

Note 3. Along-track data product (IS2SITDAT4)

We are releasing both the raw along-track thickness data (same segment resolution as ICESat-2 ATL10 freeboards) and a 10 km segment length-weighted mean along-track thickness product.

The raw product is targeted towards the advanced data user, while the 10 km mean product is drastically smaller in size and is targeted towards those that want a balance between along-track data and smaller file sizes.

Note 4. Sea ice type

(Added on 03/02/22)
In both datasets we include a sea ice classification estimate obtained from the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) Ocean and Sea Ice Satellite Application Facility (OSI SAF, www.osi-saf.org) (Breivik et al., 2012) to classify each segment as either first-year ice (FYI) or multiyear ice (MYI). Ice type information is needed in-part to derive the modified Warren snow depth estimates (see Section 2.2.2. in Petty et al., 2020), so our approach is to assume all ice is MYI unless the OSI SAF product explicitly characterizes a segment as FYI. Thus, in September when OSI SAF does not provide any ice type estimate due to added uncertainties in the end-of-summer retrievals, we assume all our derived thickness data are MYI.

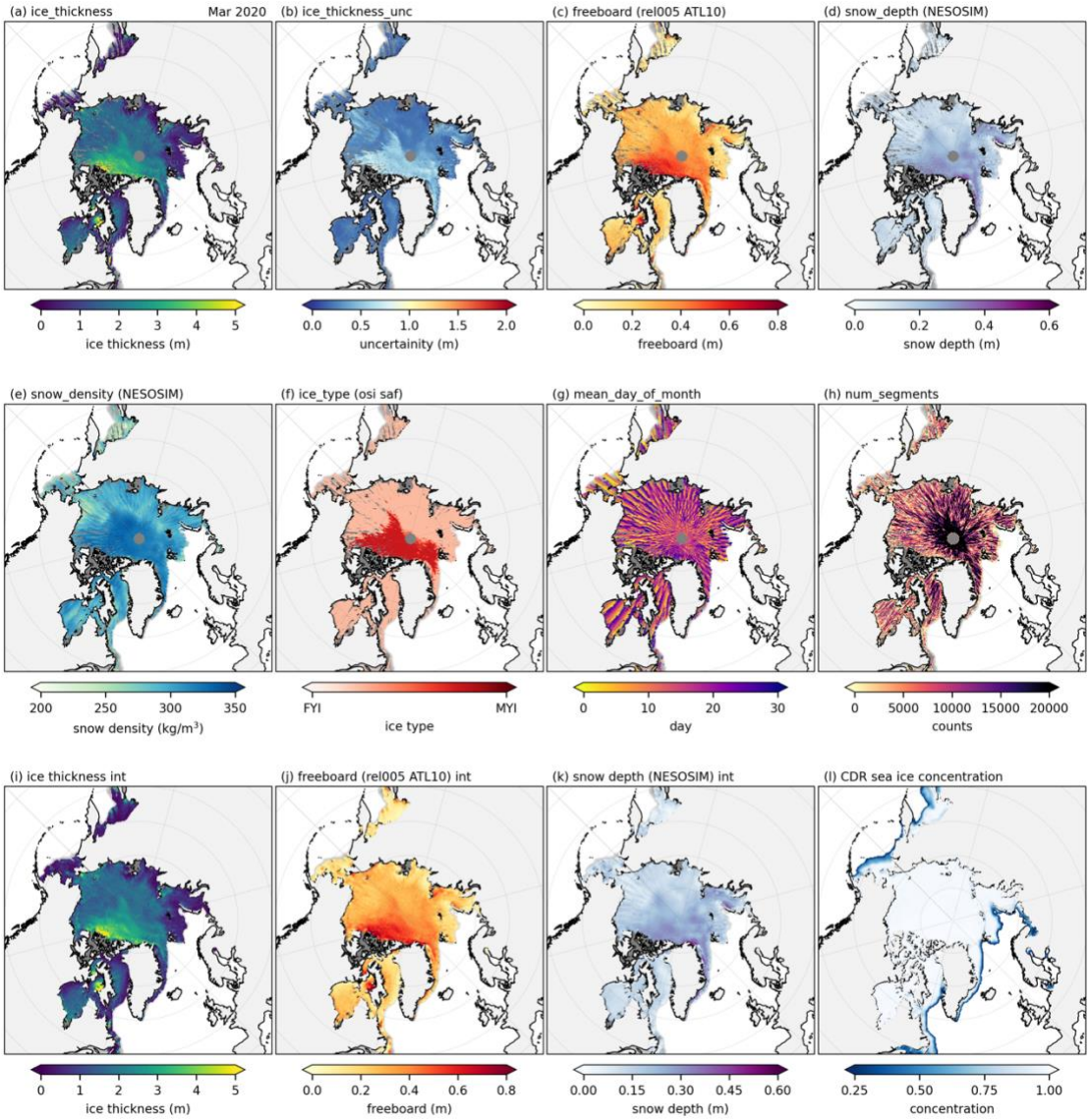

Figure 1: Example browse image for the March 2020 gridded sea ice thickness dataset (IS2SITMOGR4_01_202003_005_002.nc)

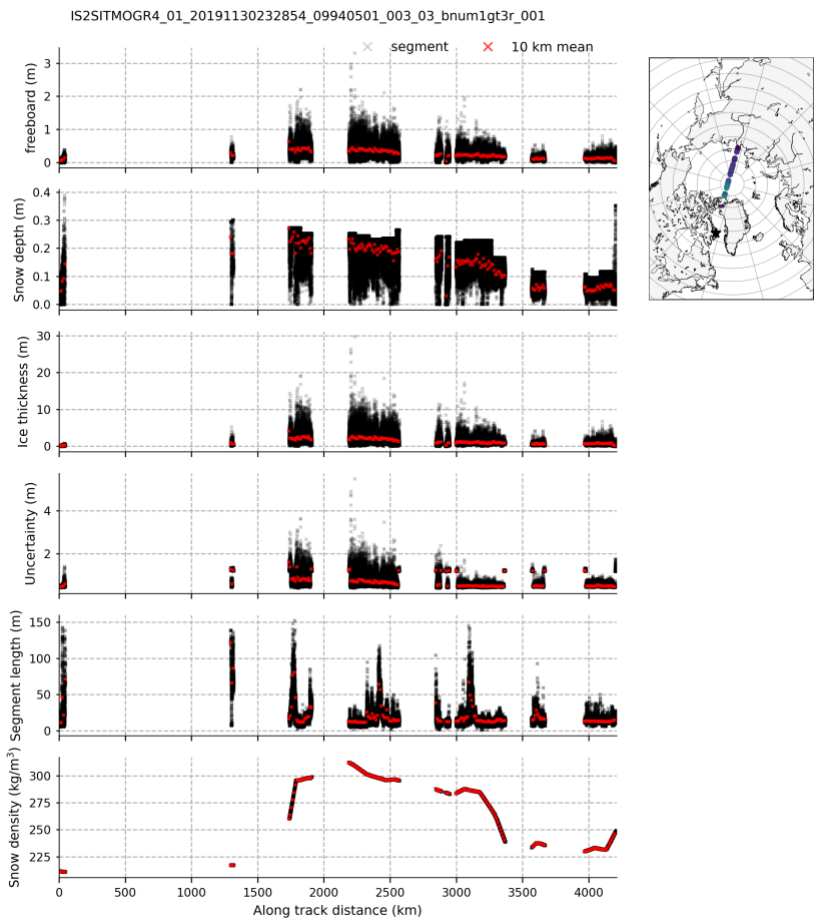

Figure 2: Example browse image for the along-track sea ice thickness product for November 30, 2019 (strong beam 1, gt3r). Raw data in black, 10 km segment length-weighted data in red. Star in the map indicates the start of the given granule.

References

Petty, A. A., N. T. Kurtz, R. Kwok, T. Markus, T. A. Neumann (2020), Winter Arctic sea ice thickness from ICESat-2 freeboards, *Journal of Geophysical Research: Oceans*, 125, e2019JC015764. doi:10.1029/2019JC015764

Petty A. A., N. Keeney, C. Cabaj, P. Kushner, M. Bagnardi (2022), Winter Arctic sea ice thickness from ICESat-2: upgrades to freeboard and snow loading estimates and an assessment of the first three winters of data collection, *The Cryosphere Discuss (preprint)*, doi: 10.5194/tc-2022-39.