U.S. National Ice Center Arctic and Antarctic Sea Ice Charts Become a Research Data Set

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Introduction

Ice analysts at the USNIC have access to a wealth of high-resolution satellite imagery as well as data from other sources. Using these, analysts draw weekly charts of ice concentration and stage of development.

Charts are more detailed and usually more accurate than are satellite-data-derived ice concentration fields.

We reformat the charts and condense the information they contain to make them easier to use for research purposes such as

- Validating algorithms being developed for satellite data
- Assessing the changing makeup of sea ice types in a region
- Checking the results of sea ice forecast models

Method

USNIC analysts at GIS workstations draw polygons around and assign attributes to areas of ice having roughly the same composition of ice types and concentrations. Charts are saved in SIGRID-3, a WMO standard for encoding ice concentration, form, and stage of development.

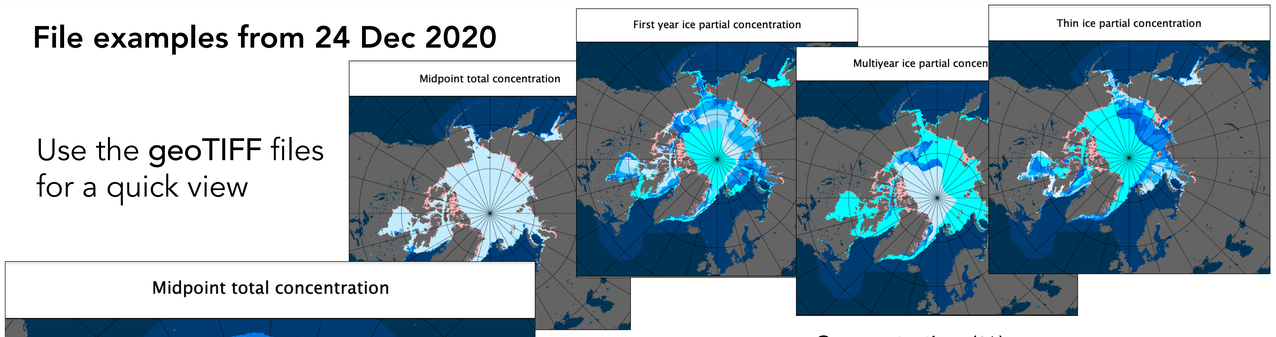
NSIDC converts these into shapefiles with

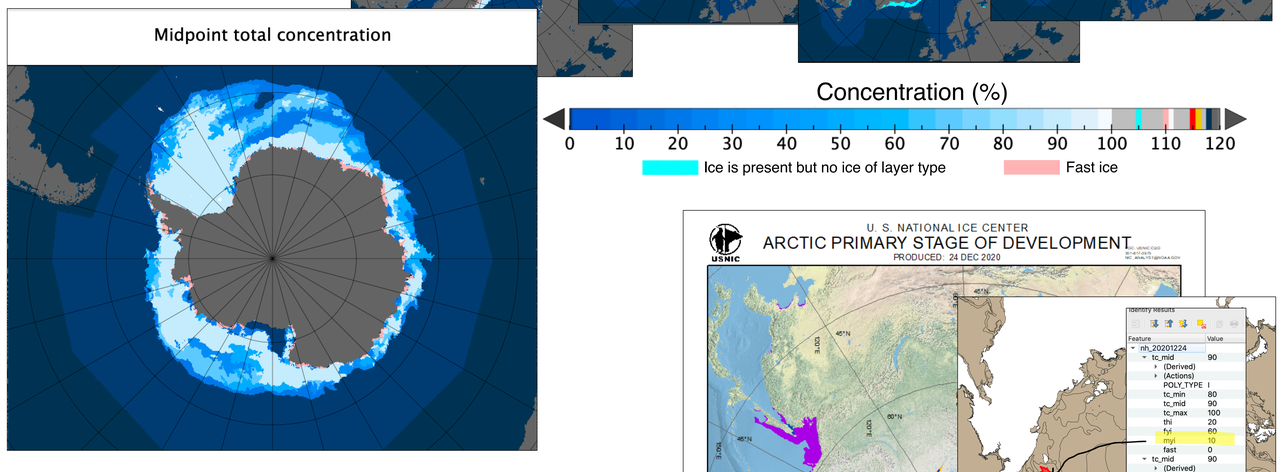
- *minimum, mid-range, and maximum values for total ice concentration* of all types of ice
- the *concentration of multiyear, first-year, and thin ice types*, where those categories are composed of the stages of development shown in the table in the right panel
- *Extent of fast ice*

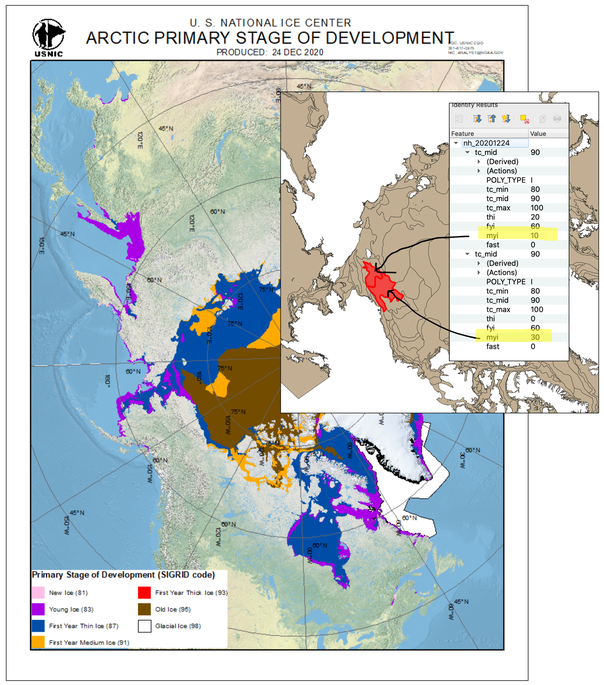
Each week's shapefile is reprojected and written out as shape, and 10 km-grid netCDF and geoTIFF files.

File examples from 24 Dec 2020

Use the **geoTIFF** files for a quick view





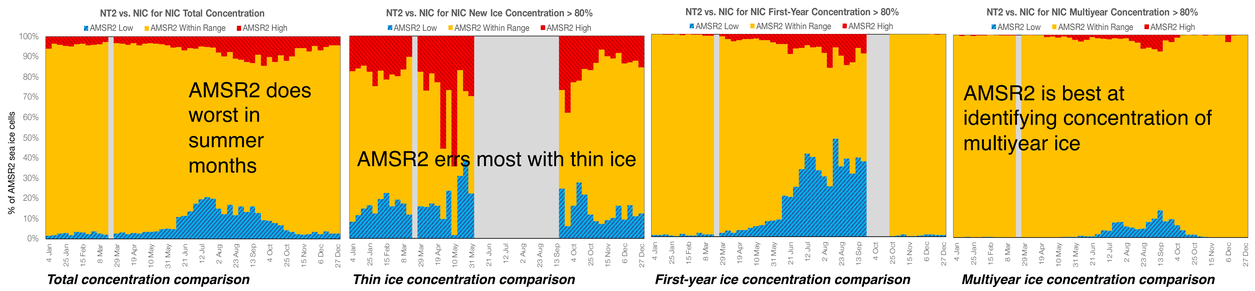


Use the **shapefiles** to drill down for detailed information. The USNIC product at right shows where old ice is present in any amount (brown). The shapefile illustrates the rich underlying detail of the analyst-drawn polygons, and shows polygons that have some multiyear ice so are brown in the USNIC product, but have higher concentrations of first-year ice.

Use the **netCDF** files for analysis.

For example, below, the USNIC data have been used to check AMSR2-derived sea ice concentrations over a year of observations. The length of the yellow bars varies with the number of grid cells for which the data sources agree.

From Meier, Fetterer and Stewart, AMS 15th Conference on Polar Meteorology and Oceanography in Boulder, CO, 20-24 May 2019.



Total concentration comparison *Thin ice concentration comparison* *First-year ice concentration comparison* *Multiyear ice concentration comparison*

Method (con't)

Ice type in this product	Stage of development in SIGRID-3
Multiyear ice	Old ice 2nd year ice Multi-year ice
First-year ice	First year ice (FYI) Thin FYI Thin FYI _ stage1 Thin FYI _ stage2 Medium FYI Thick FYI
Thin ice	New ice Nilas, ice rind Young ice Gray ice Gray-white ice
Fast ice	Ice form

Results

A data set covering 2003 through the most recent chart day, with weekly frequency through most of the series. 5- and 10-year climatologies are included.

Data sources and methods used by analysts have changed over the years. These inconsistences sometimes result in apparent changes in ice concentration. A Users Guide documents known changes so that they can be taken into account by researchers.

Conclusions

USNIC charts have information about sea ice composition not available elsewhere.

Condensed, reformatted and extensively documented, the charts are easy to use for research purposes.

Acknowledgments

We thank the analysts at USNIC. Their work makes this data product possible

Further information

To get *U.S. National Ice Center Arctic and Antarctic Sea Ice Concentration and Climatologies in Gridded Format*, search on "NSIDC G10033".