Welcome to the 2nd Sea Ice Extent

Summer is always a busy time in the Arctic! See what’s happening at NOAA in this edition of the Sea Ice Extent with weather (image of the strongest Arctic cyclone of the season, so far—left); sea ice extent minimum predictions (including NOAA participants); NSIDC’s update on new baseline & description of sea ice products; preliminary results from AOOS’s survey on sea ice data stakeholders and the services they use; NOAA’s Alaska RISA Sea Ice Atlas update ...and more!

Did You Know?

Until July 2013, NSIDC used the 22-year period 1979 to 2000 when comparing current sea ice extent to past conditions. When NSIDC first began to monitor and analyze sea ice extent, a longer period was not available. Since the satellite record is now extended, NSIDC moved to the more standard 30-year reference period*, from 1981 to 2010. Data prior to July 2013 have been processed to this new baseline. The monthly median representation of ice extent is in a different location now (pink line, right). This is most noticeable where the Odden, a tongue of ice off Greenland that would form quickly and persist for a few weeks in the winter, is no longer apparent for the winter months.

*A 30-year period typically defines a climatology and is the standard used by the World Meteorological Organization and NOAA. 30 years is considered long enough to average out most variability from year to year, but short enough so that longer-term climate trends are not obscured.
Arctic Sea Ice News and Analysis uses the Sea Ice Index as its standard long-term record of sea ice extent, but another product, Multisensor Analyzed Sea Ice Extent or MASIE, also provides a record of daily Arctic sea ice extent. The Sea Ice Index was showing extent at 3.97 x 10^6 sq km on 25 August 2012 while MASIE recorded almost a million more sq km of ice, 4.91 x 10^6 sq km on the same day.

**Why the difference, and which product is correct?**

The Sea Ice Index is based on the output of an algorithm that uses satellite passive microwave data to get sea ice concentration. Passive microwave algorithms cannot discern the presence of sea ice at low concentrations or when the ice surface is wet, as under present melting conditions. These algorithms potentially indicate regions with still significant ice hazards to navigation as open or ice-free water. MASIE is based on the National Ice Center IMS product. The IMS is produced by analysts using OLS (1km resolution), AVHRR (up to 2.9km resolution) and MODIS (250m resolution) visual and infrared imagery at a much higher spatial resolution than passive microwave (12.5 to 75 km). These can better identify the presence of smaller ice parcels under low concentration conditions. NIC analyses can also be augmented with synthetic aperture radar data having an even higher spatial resolution of 100 meters or less and the ability to sense the surface through cloud cover as well.

The oval figure below shows the 16 August 2012 sea ice extent images from the Sea Ice Index (left) and MASIE (right). The time series below the images has extent for both products from 25 July through 29 August. The NIC analyzed sea ice extent, represented by MASIE, includes an extensive low concentration marginal ice zone, a significant part of which is missed by the Sea Ice Index.

To illustrate this, we layered NIC’s 16 August daily marginal ice zone (MIZ) product over MASIE (square figure, below) using the kml format available for both products. The yellow line is a conservative outer limit of ice at anything over trace concentrations, while the red line marks the boundary between ice at less than and greater than 80% concentration on 16 August. Comparing this to the Sea Ice Index extent, it is evident that the passive microwave-derived product is missing vast areas with ice at low concentrations. On the other hand, MASIE may appear to indicate such areas as a “solid” expanse of ice. The MASIE ice extent mask may also lead to an erroneous interpretation of actual surface conditions. Still, such visualization makes sense for an operational product. As a general rule, any region with greater than 40% concentration in each 4 km MASIE cell is mapped as ice. The green pushpin icon in the image is the approximate location of the USCG Healy on 15 and 16 August, when the photographs shown to the right were taken from the icebreaker. Clearly, ice is present in regions where the passive microwave-derived Sea Ice Index indicates no ice.

A great deal of manual and therefore subjective interpretation along with varying data sources and methods go in to each day’s IMS extent product. In contrast, the Sea Ice Index has been consistently produced for the entire record length. Thus, the latter is the correct product to use if one is interested in the response of ice to climate forcing. On the other hand, to follow where any ice may be present on a given day, MASIE and its underpinning NIC analysis is preferred.

**Moral of the story?** Know your sea ice products before drawing conclusions based on them. Contact Florence Fetterer, NSIDC User Services, or the NIC if you have questions about these or other products. —F. Fetterer, NOAA Liaison, National Snow & Ice Data Center P. Clemente-Colón, Chief Scientist, U.S. National Ice Center
BOEM & NOAA are working on a plan to improve sea ice forecasting on the weather to seasonal time scales.

NOAA, NSF, & NASA have partnered to test & deploy unmanned aircraft systems (UAS) to observe Arctic conditions north of Alaska during August as part of MIZOPEX.

ONR & NOAA are teaming up to deploy dropsondes in October 2013 north of Alaska to assess the state of the Arctic atmosphere during the critical freeze-up period.

The Sea Ice Outlook is in full-swing for 2013 (see July report below).

Arctic Sea Ice Outlook, 2013: How low will it go?

NOAA contributors to the Sea Ice Outlook include Bob Grumbine, Xingren Wu, and Wanqiu Wang from NCEP and Rym Msadek, Gabriel Vecchi and Mike Winton from GFDL.

Arctic sea ice extent as of 13 August 2013 —from NSIDC; nsidc.org/arcticseaice news.
Sea Ice Atlas for Alaska waters

The Alaska Center for Climate Assessment and Policy (ACCAP), AOOS, the NWS Anchorage Office, NSIDC, and NOAA are working together to produce a historic digital sea ice atlas —due out by late 2013. The atlas consists of digitally-stored sea ice concentration data on a grid covering all Alaska coastal waters to a distance of ~500 km (300 mi) from shore, with a spatial resolution of 25 km. The time resolution is monthly for the period 1850s-1950s, and weekly for the period from the early 1950s to 2010 with the allowance of subsequent updates.

For more information on ACCAP and the sea ice atlas: http://accap.uaf.edu/

Sea Ice Products Survey by AOOS

AOOS circulated a survey on sea ice data products to people who access online sources for sea ice information. The information collected will be used to help guide development of future sea ice resources, including the sea ice atlas described above. Here is a peak at some preliminary results:

- 113 participants took the survey.
- A roughly equal number of government, commercial, and university entities made up 75% of the respondents, followed by about 15% military and 6% NGO.
- The most popular use for the sea ice information was planning. Research or forecasting came next. A smaller number of respondents mentioned navigation.
- The National Ice Center (NIC) was reported as the most used source of information, followed by the NWS Ice Desk. 85% of survey takers had accessed the NIC at least once in the past year.
- Example uses of the information included planning and supporting US Navy operations in the Arctic, research cruise preparation, assessing the rate of ice development, tracking marginal ice, and assisting with forecast model input and validation.

A complete survey summary will be posted on the AOOS website later this summer (www.aoos.org).
If you have questions, please email Darcy at duqan@aoos.org.

NOAA is a key member of Interagency Arctic Research Policy Committee

In their 5-year plan, IARPC has identified improving Sea Ice Forecasting as a priority task

IARPC Sea Ice Implementation Team —NOAA Members

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Send your ‘Extent’ comments/ideas to Janet Intrieri