

# NOTES

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Fall 2008

ISSUE NO. 65

<http://nsidc.org>

## NSIDC NEWS

### Arctic Sea Ice Down to Second-Lowest Extent; Likely Record-Low Volume

Arctic sea ice extent during the 2008 melt season dropped to the second-lowest level since satellite measurements began in 1979, reaching the lowest point in its annual cycle of melt and growth on 14 September 2008. Average sea ice extent over the month of September, a standard measure in the scientific study of Arctic sea ice, was 4.67 million square kilometers (1.80 million square miles). The record monthly low, set in 2007, was 4.28 million square kilometers (1.65 million square miles); the now-third-lowest monthly value, set in 2005, was 5.57 million square kilometers (2.15 million square miles).

The 2008 season strongly reinforces the thirty-year downward trend in Arctic sea ice extent. The September 2008 low was 34 percent below the long-term average from 1979 to 2000 and only 9 percent greater than the 2007 record. Because the 2008 low was so far below the September average, the negative trend in September extent has been pulled downward, from -10.7 percent per decade to -11.7 percent per decade.

NSIDC Senior Scientist Mark Serreze said, "When you look at the sharp decline that we've seen over the past thirty years, a 'recovery' from lowest to second lowest is no recovery at all. Both within and beyond the Arctic, the implications of the decline are enormous."

Conditions in spring, at the end of the growth season, played an important role in the outcome of this year's melt. In March 2008, thin first-year ice covered a record high 73 percent of the Arctic Basin. While this might seem like a recovery of the ice, the large extent masked an important aspect of sea ice health; thin ice is more prone to melting out during summer. So, the widespread thin ice of spring 2008 set the stage for extensive ice loss over the melt season.

Through the 2008 melt season, a race developed between melting of the thin ice and gradually waning sunlight. Summer ice losses allowed a great deal of solar energy to enter the ocean and heat up the water, melting even more ice from the bottom and sides. Oceans store heat longer than the atmosphere, contributing to melt long after sunlight has begun to wane. In August 2008, the Arctic Ocean lost more sea ice than any previous August in the satellite record.

NSIDC Research Scientist Walt Meier said, "Warm ocean waters helped contribute to ice losses this year, pushing the already thin ice pack over the edge. In fact, preliminary data indicates that 2008 probably represents the lowest volume of Arctic sea ice on record, partly because less multi-year ice is surviving now, and the remaining ice is so thin."

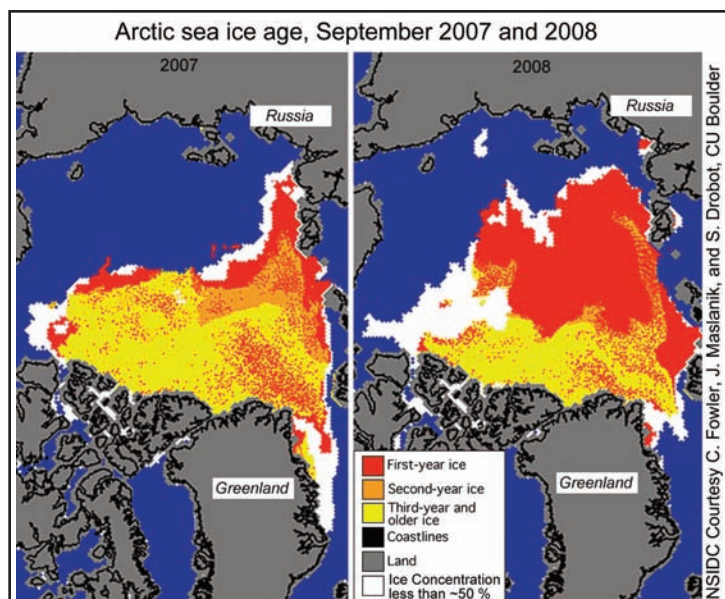
In the end, however, summer conditions worked together to save some first-year ice from melting and to cushion the thin pack from the effects

of sunlight and warm ocean waters. This summer's weather did not provide the "perfect storm" for ice loss seen in 2007: temperatures were lower than 2007, although still higher than average; cloudier skies protected the ice from some melt; a different wind pattern spread the ice pack out, leading to higher extent numbers. Simply put, the natural variability of short-term weather patterns provided enough of a brake to prevent a new record-low ice extent from occurring.

NSIDC Research Scientist Julienne Stroeve said, "I find it incredible that we came so close to beating the 2007 record—without the especially warm and clear conditions we saw last summer. I hate to think what 2008 might have looked like if weather patterns had set up in a more extreme way."

The melt season of 2008 reinforces the decline of Arctic sea ice documented over the past thirty years. NSIDC Lead Scientist Ted Scambos said, "The trend of decline in the Arctic continues, despite this year's slightly greater extent of sea ice. The Arctic is more vulnerable than ever."

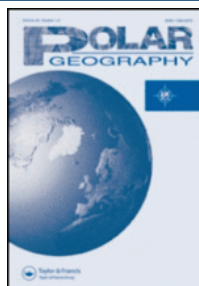
NSIDC will continue to post updates on Arctic sea ice conditions throughout the winter. To follow along, please see the Arctic Sea Ice News & Analysis Web site (<http://nsidc.org/arcticseaicenews/>).



A comparison of ice age in September 2007 (left) and September 2008 (right) shows the increase in thin first-year ice (red) and the decline in thick multi-year ice (orange and yellow). White indicates areas of ice concentration below ~50 percent, for which ice age cannot be determined. AVHRR, SMMR SSM/I, and IABP buoy data were used

## NSIDC Research Ranks Among Most-Cited in *Polar Geography*

Two papers by NSIDC scientists were selected for a special issue of the journal *Polar Geography*. The special issue, published in March-June 2008, included the five most cited papers published in the journal's 30-year history.



Tingjun Zhang's 1999 paper, "Statistics and characteristics of permafrost and ground-ice distribution in the Northern Hemisphere," described the conversion of the International Permafrost Association (IPA) circum-Arctic map of permafrost and ice conditions into a data set integrated with USGS elevation and land cover maps. Roger Barry was a co-author on the paper.

Ted Scambos was co-author on a 2000 paper entitled "On the recent calving of icebergs from the Ross Ice Shelf." The paper discussed the unusual calving of several large icebergs from the Ross Ice Shelf in 1999, and possible contributing factors. For more information, visit the *Polar Geography* Web site (<http://www.informaworld.com/smpp/title~content=g795054616~db=all>).

## Opening Gala for Silavut Exhibit

On 17 September 2008, the University of Colorado Museum of Natural History and NSIDC celebrated the grand opening of *Silavut: Inuit Voices in a Changing World*, with talks by the exhibit curators. NSIDC collaborated with the museum and Inuit elders from Clyde River, Nunavut, Canada, to produce the exhibit, which runs April 2008 through March 2009. Speaking at the opening gala were NSIDC scientist and lead curator Shari Gearheard and her Inuit research associates, elder and co-curator Ilkoo Angutikjuak and interpreter Geela Tigullaraq, all residents of Clyde River, Nunavut. Clyde River elders have been noting changes in the weather, sea ice, glaciers, wind patterns, and Arctic animals for many years, documenting their observations with the help of Dr. Gearheard through interviews and mapping activities. The community research blends science and oral history to create a more complete understanding of the changes occurring in the Arctic. During their talk, Dr. Gearheard and Mr. Angutikjuak stressed that Inuit elders have always noted changes in the environment, such as colder than average winters, or warmer than average summers, but that the observations they have made in the past decade are notable because such changes are happening more frequently or are more extreme than seen in the past. Mr. Angutikjuak was optimistic that Inuit and qallunaat (non-Inuit) can collaborate to solve the environmental problems people are witnessing around the globe.



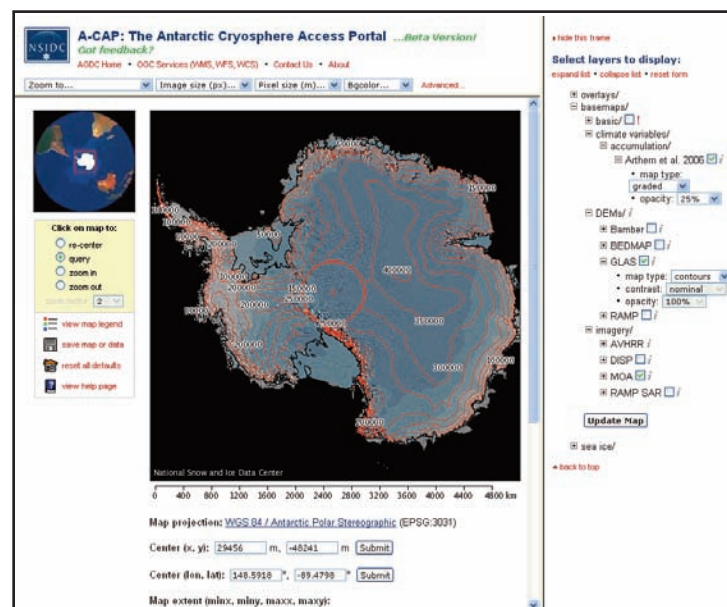
Shari Gearheard, Ilkoo Angutikjuak, and Geela Tigullaraq speak to the museum audience about changes in their community

## The Antarctic Cryosphere Access Portal (A-CAP)

A prototype of the Antarctic Cryosphere Access Portal (A-CAP site) has been released for public use. A-CAP is a geo-visualization and data download tool for AGDC data sets and other Antarctic-wide parameters, including glaciology, ice core data, snow accumulation, satellite imagery, digital elevation models (DEMs), sea ice concentration, and many other cryosphere-related scientific measurements. It was developed at NSIDC's NSF-OPP-funded Antarctic Glaciological Data Center (AGDC). A-CAP allows users to zoom in to a specific region, add overlays of coastlines, data flights, or traverses, annotate the maps with place names, and add a latitude-longitude grid or other geographic information.

In addition to providing an interactive Web interface, A-CAP also provides customizable map images and source data via specific Uniform Resource Locator strings (URLs) to a standard suite of Open Geospatial Consortium (OGC) services, such as Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service (WCS). The international specifications of these services provide an interoperable framework for sharing maps and geospatial data over the Internet. A-CAP products can be easily exchanged with other data centers worldwide and can be accessed remotely through OGC-compliant software applications such as ArcGIS, Google Earth, ENVI, and others.

A-CAP is built on MapServer, an open-source development environment for building spatially-enabled Internet applications. MapServer uses data sets that have been formatted as GeoTIFFs or Shapefiles to allow rapid sub-setting and Web presentation of large geospatial data files. The program requires no user-installed client software beyond a Web browser. A similar site for Greenland (G-CAP) is planned for next year. For more information see the A-CAP Web site (<http://nsidc.org/agdc/acap/>).



A-CAP Web interface with accumulation and elevation data sets shown superimposed on the MODIS Mosaic of Antarctica (MOA) image

## PRODUCTS & SERVICES

### Arctic Sea Ice Melt Pond Statistics and Maps, 1999, 2000, and 2001

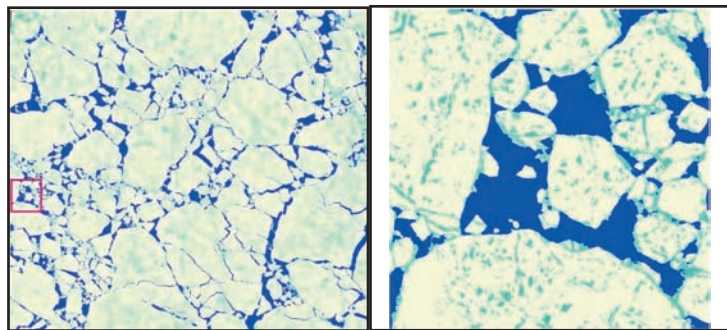


Scientists and melt ponds on summer Arctic Ocean sea ice

The NOAA program at NSIDC has recently released the *Arctic Sea Ice Melt Pond Statistics and Maps, 1999, 2000, and 2001* data set. This data set consists of tables of pond coverage and size statistics for 500 meter square cells within 10 kilometer square images along with the surface type maps from which the

pond statistics were derived. One-meter surface type maps with either two (water and ice) or three (pond, open water, and ice) classes were created using supervised maximum likelihood classification of high-resolution visible band imagery. Surface type maps from different sites and months can be quickly compared using the Browse Image Spreadsheet Tool (BIST) available on NSIDC's Web site. The satellite imagery was acquired over four Arctic Ocean sites (three in 1999) during the summers of 1999, 2000, and 2001. The sites were within the median extent of the perennial ice pack at that time, although since then (in the summer of 2007) the East Siberian site experienced its first open water summer since the satellite record began. For more information, see the product Web site (<http://nsidc.org/data/g02159.html>).

NSIDC's Florence Fetterer collaborated with the USGS Rocky Mountain Geographic Science Center (RMGSC) on the data set, and is working with RMGSC to make data and imagery from later years available as well.



On the left is a 10 km by 10 km GeoTIFF surface map of ponds, ice, and open water. On the right is an enlarged picture of the area in the red square.

### Ice Draft and Ice Velocity Data in the Beaufort Sea, 1990 to 2003

The NOAA program at NSIDC has recently released the *Ice Draft and Ice Velocity Data in the Beaufort Sea, 1990-2003* data set extending from April 1990 through September 2003. This data set provides measurements of ice draft and ice velocity over the continental shelf of the Eastern Beaufort Sea. Observations are made using two types of self-contained Upward Looking Sonar (ULS) moored near the sea floor: an Ice Profiling Sonar (IPS) to record the ice draft data and an Acoustic Doppler Current Profiler (ADCP) to obtain the ice velocity data. The data are provided in ASCII text format and are available via FTP. To access the data and further documentation, please see the product Web site (<http://nsidc.org/data/g02177.html>).

### AMSR-E/Aqua Daily L3 25 km Brightness Temperature & Sea Ice Concentration Polar Grids

As part of reprocessing to Version 2, sea ice temperature was removed from the *AMSR-E/Aqua Daily L3 25 km Brightness Temperature & Sea Ice Concentration Polar Grids* (AE\_SI25) algorithm due to inherent ambiguities between changes in the physical temperature of the ice and changes in the ice emissivity. The AE\_SI25 product name also changed to *AMSR-E/Aqua Daily L3 25 km Brightness Temperature & Sea Ice Concentration Polar Grids*.

### AMSR-E Sea Ice Concentrations in Google Earth

Sea ice concentrations from *AMSR-E/Aqua Daily L3 12.5 km Tb, Sea Ice Concentration, & Snow Depth Polar Grids* (AE\_SI12) have been created as .kml files for use in Earth browsers, such as Google Earth. These files include the latest 30-day, 60-day, and 90-day animations of the daily sea ice concentrations and sea ice extent in the Arctic. The animations are updated daily. To access the animations, see our virtual globes Web site ([http://nsidc.org/data/virtual\\_globes/index.html](http://nsidc.org/data/virtual_globes/index.html)).

### AMSR-E Level-2B & Level 3 Reprocessing

Reprocessing has been completed for all AMSR-E/Aqua Level-2B and Level 3 products. Data from 19 June 2002 (the start of the AMSR-E mission) to present are now Version 2, the validated or transitional version of the algorithm.

### AMSR-E Version 2 products in Data Pool

All AMSR-E Version 2 products are now available on our Data Pool see [http://www.nsidc.org/data/data\\_pool/index.html](http://www.nsidc.org/data/data_pool/index.html).

### Bootstrap Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I

The *Bootstrap Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I* have been updated. The daily and monthly data now span 26 October 1978 through 31 December 2007 for the northern and southern hemispheres. To access the data see the product Web site (<http://nsidc.org/data/nsidc-0079.html>).

### GLIMS Reaches Halfway Mark, Works Closer with WGMS

The Global Land Ice Measurements from Space (GLIMS) project at NSIDC is pleased to report that after recent database additions, the current total of glacier analyses in the database is nearly 83,000 – more than 50 percent of the total estimated number of glaciers on Earth.

GLIMS recently added the Fluctuations of Glaciers (FoG) metadata as a layer searchable in the map interface. The FoG series, prepared by the World Glacier Monitoring Service (WGMS), is a report on worldwide glacier changes published at 5-year intervals. NSIDC hosted Michael Zemp from the WGMS this summer, to help coordinate the merging of the GLIMS, World Glacier Inventory (WGI), and FoG databases. For more information on the FoG series and WGMS, please visit <http://www.wgms.ch/fog.html> and <http://www.wgms.ch/>. For more information on GLIMS, including access to the database, please see <http://nsidc.org/glims/> and the GLIMS project Web site (<http://glims.org>).

## PRODUCTS & SERVICES

### ICESat/GLAS Product News

ICESat/GLAS data reprocessing has begun. All laser periods will be reprocessed from Release-28 to Release-29. Until completion, a mix of the two releases will be available. ICESat/GLAS Release-29 data for the Laser 3I campaign (02 October 2007 to 05 November 2007) are now available for the following products: GLA01 to GLA09 and GLA12 to GLA15.

Release-29 is a significant release with extensive changes to the atmosphere processing, additions and corrections to the waveform and elevation processing, and incorporation of new tide models. Significant improvements have been made to the data product format documentation. This release will be accompanied with releases of the “Altimetry Data Products User Guide” and “Atmospheric Data Products User Guide.”

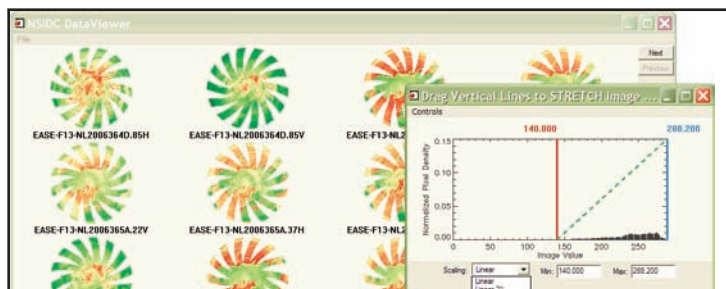
For more information about Release-29, see the ICESat/GLAS Data Releases Web page ([http://nsidc.org/data/icesat/data\\_releases.html](http://nsidc.org/data/icesat/data_releases.html)). For more information about ICESat/GLAS data, including ordering options, please see the ICESat/GLAS Web site (<http://nsidc.org/data/icesat/index.html>).

### NSIDC Data Analysis Tools

NSIDC scientific programmer, David Fanning, proprietor of the “Coyote’s Guide to IDL Programming” Web site, is currently creating interactive data analysis tools for Distributive Active Archive Center (DAAC) users. The first tool in this project, written as a prototype for other tools to come, is the DataViewer.

This tool allows the user to open any number of images obtained from the DAAC public archives. The images can be viewed in a user-configured grid, and the images can be paged forward and backward so that the entire set of images can be viewed quickly and easily. The output window is completely resizable, and tools are available for stretching the contrast for all the images as a group, or for each individual image. Each image can have its own color table manipulated and applied to it. Individual images can be zoomed for closer inspection, and there is an annotation feature that allows each image to be annotated and saved in a variety of file formats, including JPEG, TIFF, PNG, and PostScript. The DataViewer is written in the IDL language and can be run on the freely-available IDL Virtual Machine, for those users who do not own an IDL license. Source code is available from NSIDC.

David Fanning will be demonstrating the DataViewer program in the NSIDC booth at the Fall Meeting of the American Geophysical Union (AGU) meeting in San Francisco, 15 to 19 December 2008. Drop by our booth # 2125 to get a free DataViewer demo CD, and to discuss other data analysis tools you would like to have NSIDC develop. Plans are currently being made for timeseries analysis tools, plotting tools, and other image tools of interest to our users.



A sample image of the output configuration from NSIDC’s DataViewer

### New Google Earth Sea Ice Animations

NSIDC released two sets of Arctic sea ice animations to use in Google Earth. Each set contains 30, 60, and 90-day animations of sea ice concentration and extent that are updated daily. This allows users to follow changes in the sea ice coverage as they happen.

The first set of animations is based on data from the Special Sensor Microwave/Imager (SSM/I) on the Defense Meteorological Satellite Program (DMSP) F13 satellite. The second set is based on data from the Advanced Microwave Scanning Radiometer–Earth Observing System (AMSR-E) sensor on NASA’s Aqua satellite. The significant differences between the two data sets are that AMSR-E has twice the resolution as SSM/I (12.5 km versus 25 km) and AMSR-E has a wider swath which allows for better coverage near the pole.

The updates take place daily, allowing users to view the most recent images or animations. Users with limited memory or bandwidth may want to choose a shorter timeseries. To access the new animations, see our Virtual Globes Web page ([http://nsidc.org/data/virtual\\_globes/](http://nsidc.org/data/virtual_globes/)).



An AMSR-E daily sea ice image from 14 September 2008 displayed in Google Earth

### Library and Archives Updates

In an effort to create a stronger identity for the analog collections at NSIDC, we would like to announce the formation of the Roger G. Barry Office for Cryospheric Studies at NSIDC. Our new name will be useful when promoting the collections to researchers and students, and it will assist with our fundraising, outreach, and grant writing efforts. Short term goals include an open house event to formally announce the new name and the release of a new Web site. Long-term goals include the establishment of a “Friends” group. You may still contact the librarian and archivist at [library@nsidc.org](mailto:library@nsidc.org) with requests or questions.

**NOTICE:** The future distribution of our quarterly news letter *NSIDC Notes* will be as an online PDF file available on our Web site (<http://nsidc.org/pubs/notes/>). **This is our last printed issue.** If you would like to be notified by email when a new issue is available, send an email to [nsidc@nsidc.org](mailto:nsidc@nsidc.org). Current subscribers will receive this notification only if we have your email address on file. We will continue to publish *NSIDC Notes* online on a quarterly basis.

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## CONFERENCE NEWS

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### AGU Fall 2008

NSIDC will be attending the 2008 Fall Meeting of the American Geophysical Union (AGU). Data and services will be promoted and supported at the NSIDC booth #2052. In addition, a number of NSIDC scientists and data management staff will be presenting. Below is a list of presentations by NSIDC affiliates.

Lisa Ballagh, I-Pin Wang, Allaina Wallace

Title: Mapping Glacier Data and Photographs via GeoServer and Virtual Globes

Andrew P. Barrett, Mark C. Serreze

Title: Arctic atmospheric circulation and surface air temperature anomalies: are the rules changing?

Roger G. Barry, Ronald L. S. Weaver, Richard L. Armstrong

Title: NSIDC Contributions to Cryospheric Climate Data Records

Jane Beitler, Stephen Truex

Title: Playing with Satellite Data

Brendan Billingsley, Terry Haran

Title: Using GeoTIFFs for Data Sharing: Limitations and Solutions

M. J. Brodzik, Matthew H. Savoie, Richard L. Armstrong

Title: Global Snow Extent Climate Data Records and Trends Derived from Satellite Passive Microwave and Visible Data

Julia Collins, Florence Fetterer, James A. Moore

Title: Arctic Observing Network Data Management: Current Capabilities and Their Promise for the Future

Ruth Duerr, MuQun Yang, Maryam Gooyabadi, Chooghwon Lee

Title: Developing Archive Information Packages for Data Sets: Early Experiments with Digital Library Standards

Ruth Duerr

Title: Provenance: Promise and Practice

R. Duerr, M. Folk, M. Yang, C. Lynnes, P. Cao

Title: Towards Long-Term Archiving of NASA HDF-EOS and HDF Data - Data Maps and the Use of Mark-Up language

Mike Folk, Ruth Duerr

Title: Ensuring Long Term Access to Remotely Sensed HDF4 Data with Layout Maps

Doug Fowler, Siri Jodha Singh Khalsa, Ross Swick, Terry Haran,

Ted Scambos, Dave Korn

Title: Insights into GLAS waveforms using Google Earth

Kara Gergely, Terry Haran, Brendan Billingsley

Title: Virtual Globe Visualizations of Cryospheric Data at the National Snow and Ice Data Center

Terry M Haran, Ted A Scambos, Mark A Fahnestock, Bea M Csatho

Title: New Enhancements of an ERS1-2 + ICESat Digital Elevation Model of West Antarctica Using MODIS Imagery, Shapelets, and Kriging

Khalsa, Weaver, Duerr, Shaw

Title: Plugging into GEOSS - A Data Center Takes the Leap

Jonathan Kovarik

Title: Data Storage Systems at the National Snow and Ice Data Center: Evolution in Response to Change

Scott Lewis

Title: Geospatial Selection Using Mapx and JAZ JavaScript Libraries

Molly McAllister, Ruth Duerr, Siri Jodha Singh Khalsa, Terry Haran

Title: MODIS Interactive Subsetting Tool (MIST)

Walter N. Meier, Stephanie Renfrow, Mark Serreze

Title: Striking back: A case study in addressing a skeptic's public assertions about sea ice data

Walter N. Meier, Julienne Stroeve

Title: Enhanced Resolution Passive Microwave Sea Ice Motion Fields: Impacts on the 2008 Summer Melt Season and Long-Term Circulation Patterns

Walter N. Meier, Florence Fetterer, Ruth Duerr, Julienne Stroeve,

Steinar Eastwood, Lars-Anders Breivik, Leif Toudal Pedersen,

Rasmus Tonboe

Title: Progress and Ongoing Issues in the Development of a Passive Microwave Sea Ice Extent/Concentration Climate Data Record

Mark Parsons, Julia Collins

Title: Report From the Cryospheric Cyber infrastructure: Discovery, Access, and Delivery of Data for IPY (DADDI)

Mark Parsons

Title: Scientific Data as the Core Legacy of IPY

Stephanie Renfrow, Andy Mahoney, Walt Meier, Ted Scambos,

Mark Serreze, Julienne Stroeve

Title: Turning the tide: Serving science to a more-than-media audience

Donna J Scott, Walter N. Meier

Title: Expanding Research Capabilities With Sea Ice Climate Records for Analysis of Long-term Climate Change and Short-term Variability

M.C. Serreze

Title: Impacts of Declining Arctic Sea Ice: An International Challenge

M.C. Serreze, W. Meier, J. Stroeve, T. Scambos and S. Renfrow

Title: Arctic Sea Ice in 2008: Standing on the Threshold

Betsy Sheffield, Tingjun Zhang

Title: *All About Frozen Ground*, Online Resource for K-12 Students and Teachers

Stroeve, J.C., M. Serreze, A. Barrett

Title: Emerging Arctic Amplification as seen in the NCEP/NCAR Reanalysis

Ross Swick, Florence Fetterer, Siri-Jodha Singh Khalsa, Amanda Leon

Title: Near Real Time Animations of Earth Science Data in Virtual Globes

Ronald L. S. Weaver, Marilyn Kaminski

Title: The NSIDC DAAC's Role in Sustaining the IPY Data Legacy

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## TRIVIA

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**Last issue's question:** What is the difference between measurements of sea ice concentration and sea ice extent?

**ANSWER:** Concentration: a unitless term that describes the relative amount of area covered by ice, compared to some reference area and is generally specified as a percentage. Extent: defines a region as either "ice-covered" or "not ice-covered" for each data cell.

**Winner:** Ricardo Jana from the Instituto Antártico Chileno Plaza Gobernador

**This issue's question:** How long is the International Polar Year?

You can find the answer on our Web site (<http://nsidc.org>). E-mail your answers to NSIDC ([nsidc@nsidc.org](mailto:nsidc@nsidc.org)).

### Personnel

#### Arrivals:

Eliot Lee

Web Admin./Developer

Joni 'J.' Reeves

Business Manager

#### Departures:

Brad Hammerschmidt

User Services Representative

Lori Olcott

Data Operations Technician

Tinya Tran

Web site Developer

Daphne Urban

Data Operations Technician

#### Retirees:

Les Takamura

Buisness Manager

University of Colorado at Boulder  
National Snow and Ice Data Center  
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NSIDC Notes  
Fall 2008, Issue No. 65

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## CITING NSIDC DATA

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Please acknowledge NSIDC as the source when you obtain data from us. Refer to the data set documentation for suggested forms of acknowledgement and citation, or contact User Services for more information.

NSIDC also requests one reprint or the exact reference of any publication that was supported by data received from NSIDC. We also greatly appreciate reprints of any publication related to snow and ice research, for inclusion in the World Data Center Information Center collection.

If you have published data that you wish to archive and make available to the scientific community, please contact User Services to discuss the content, form, and size of the data set. A list of guidelines for submitting data in electronic format is available.

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## SUBSCRIPTION, SUBMISSION & CONTACT INFORMATION

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For information about any of the products or services offered by NSIDC, or to subscribe to NSIDC Notes, please contact User Services.

NSIDC welcomes the submission of short items from our readers that are of interest to the cryospheric community. Please use the following address to submit news items, publication notes, research notices, or brief articles for publication in NSIDC Notes.

View back issues on the NSIDC Web site  
(<http://nsidc.org/pubs/notes/>).

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