

Sea Ice *Extent*

this issue

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NOAA currently produces sea ice & marine weather forecasts, participates in seasonal sea ice outlooks, & evaluates sea ice projections in IPCC climate models. NOAA obtains ice, ocean & atmosphere measurements for improved understanding & model formulations of the processes affecting sea ice, conducts & improves analysis of satellite & airborne data for sea ice parameters including extent, concentration, & thickness, & contributes to interagency-international Arctic ocean & ice observation networks.

Welcome to the *Sea Ice Extent* newsletter!

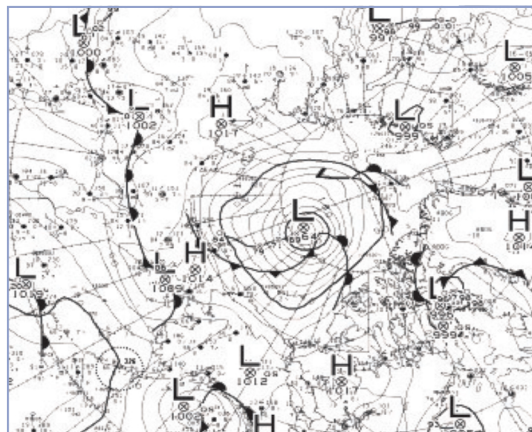
The Arctic is getting a lot of attention lately --each year awaits a potential new record low in sea ice extent and 2012 did not disappoint. NOAA conducts a wide variety of sea ice related research, forecasting, modeling, observation, and service activities and, although interest is high, resources for needed Arctic observations, model development, and forecast product improvements has stayed at a steady level. Improvements to our sea ice forecasting capability makes coordination across NOAA and with our other-agency, academia, and stakeholders partners more important than ever!

The good news is that this past year's record low sea ice extent was matched by a record-high in cross- and inter- agency efforts. A major intent of 'The Extent' is to communicate the NOAA Sea Ice Forecasting team's activities and partnerships this year and what's on board for next year to keep the conversation and collaborations going!



Image of the *Season*

A study published in [Geophysical Research Letters](#) looked at 19,625 Arctic storms concluding that in terms of size, duration and several other "key cyclone properties," the Great Arctic Cyclone was the most extreme summer storm, and the 13th most powerful storm --summer or winter-- since modern satellite observations began in 1979. From *Climate Central*



Surface weather analysis for August 6, 2012 (0600 Z) shows a strong cyclone over the central Arctic Ocean north of Alaska.
Credit: *Canadian Meteorological Centre*



NASA/MODIS satellite image mosaic shows a massive low pressure center spinning across the central Arctic Ocean on August 5, 2012. Canada and Alaska are located to the left, Europe and Russia to the right. Credit: *NASA*

NOAA's Sea Ice Forecasting Team

Weather Service

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Alaska Regional Team

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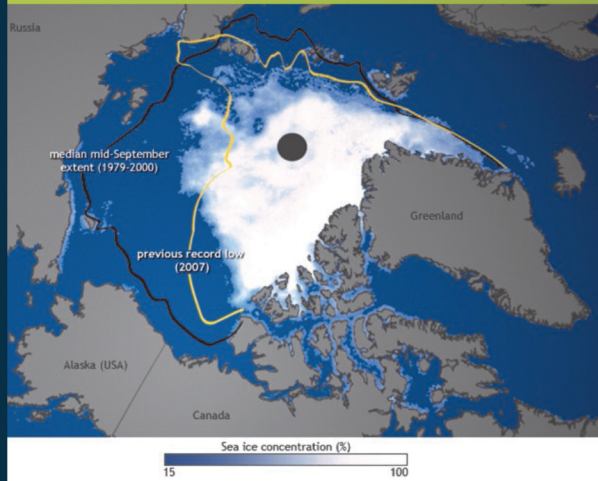
Want to join or send an invitation to someone you think might want to join?

Let us know!

NOAA Sea Ice @ a Glance

NESDIS satellite obs, analysis, validation, ice analysis for commerce & transportation **NIC** 2-7 day, bi-weekly sea ice condition charts for 22 regions; 30-day outlook every 15 days; seasonal outlook issued June 1 **Alaska Ice Program** see 'call-out' box below **NDBC** 2 weather buoy sites and 3 moored buoys in Bering **NCEP** Global Forecast System (GFS), North American Model (NAM), Climate Forecast System (CFS), and Real-Time Ocean Forecast System with sea ice models embedded & planned improvements for sea ice; guidance on accumulated drift of ice to 16 days with ensemble prediction; SSM/I daily global grids of sea ice cover for analysis & models; AMSR-2 added shortly; daily SST analysis **NGDC/NSIDC** Sea Ice Index, sea ice analysis archive **GLERL** regional, high-res coupled ecosystems models **GFDL** Earth System Models & prototype global decadal prediction system with sea ice model components **ESRL** FIM sea ice and snow cover forecast improvements, Arctic aerosol, chemistry, cloud & boundary layer research **CPO** liaisons to IARPC; IABP, Sea Ice Outlook **PMEL** South Bering Sea buoy network, NPEO obs, Arctic climate change detection system, Arctic report card **NOS** research & analysis of Arctic C&T under a changing climate

....and much more!



Arctic Sea Ice Extent, 2012: Record Seasonal Minimum

On **September 16, 2012**, Arctic sea ice reached its minimum extent for the year of 3.41 million square km (NSIDC)

The Arctic Report Card <http://www.arctic.noaa.gov/reportcard>

The Arctic region continued to break records in 2012—among them the loss of summer sea ice, spring snow cover, and melting of the Greenland ice sheet. This was true even though air temperatures in the Arctic were unremarkable relative to the last decade.

The Arctic Report Card has, since 2006, summarized the quickly changing conditions in the Arctic. A record-breaking 141 authors from 15 countries contributed to the peer-reviewed report.

- **Snow cover** A new record low snow extent for the Northern Hemisphere was set in June 2012, and a new record low was reached in May over Eurasia.
- **Sea ice** Minimum Arctic sea ice extent in September 2012 set a new all-time record low, as measured by satellite since 1979.
- **Greenland ice sheet** There was a rare, nearly ice sheet-wide melt event on

the Greenland ice sheet in July, covering about 97 % of the ice sheet on a single day.

- **Ocean** Sea surface temperatures in summer continue to be warmer than the long-term average at the growing ice-free margins, while upper ocean temperature and salinity show significant interannual variability with no clear trends.
- **Weather** Most of the notable weather activity in fall and winter occurred in the sub-Arctic due to a strong positive North Atlantic Oscillation, expressed as the atmospheric pressure difference between weather stations in the Azores and Iceland. There were three extreme weather events including an unusual cold spell in late January to early February 2012 across Eurasia, and two record storms characterized by very low central pressures and strong winds near western Alaska in November 2011 and north of Alaska in August 2012.

Did You Know? NWS' Alaska Region 'Ice Desk' issues 3-day sea ice condition & outlooks (MWF), twice weekly SST analysis (T/Th), & 5-day sea ice forecasts & advisories (MWF). NWS AK Region analyzes model outputs and satellite/weather/ocean observations to provide sea ice analyses, forecasts, mapping information & liaison service to all of Alaska stakeholders like emergency managers, hunters, fishermen, boat operators, energy & shipping industries & navigation safety partners with 24/7/365 availability for ice incidents (*as sometimes seen on 'The Deadliest Catch'!*)

Sea Ice Partnerships Round-Up!



When BOEM-Alaska realized that Shell would likely invoke the clause in their permit to ask for an extended drilling period, BOEM looked to NWS sea ice & weather expertise to support their decisions. This partnership supports BOEM's adaptive management strategy.



NOAA, NSF, & NASA are partnering to test & deploy low, medium, and high altitude unmanned aircraft systems (UAS) to observe Arctic conditions in the atmosphere, ocean, MIZ, weather systems, ...

NOAA worked with Canadian Ice Services to provide ice input for the CMC Regional Ice Prediction System (RIPS)



Established link between NWS and DOD/ACE for download of Ice Mass Balance Buoy data to NCEP forecast model



NWS trained 165 Shell contract employees in basic sea ice observation and 25 employees more in-depth training for aerial sea ice observers. These observers provided over 3,100 observations from 14 vessels. NWS also received data from four Shell weather buoys via NDBC.



Operation IceBridge



Conducted Sea Ice Outlook and produced Sea Ice for Walrus Outlook in Spring 2012



Calibration and validation of IceBridge airborne measurements over sea ice; sea ice and wave modeling studies

NOAA's Alaskan Partners Extraordinaire

NOAA's Alaska Regional Team is at the forefront of regional user needs & requests, other agency regional activities, & facilitation of climate service product development & regional roll-out strategy. The Regional Team facilitates cross-NOAA & interagency connections & opportunities.

The **NOAA Alaska RISA** (ACCAP, Alaska Center for Climate Assessment & Policy) establishes dialog & builds better understanding with partners & stakeholders; builds relationships among regional users; articulates regional needs; assists in defining regional requirements, connects advocates to NOAA programs from planning through execution.

The Alaska Ocean Observing System

increases access to existing ocean & coastal data in useful ways to meet the needs of stakeholders in the Alaska region.



NOAA Sea Ice Partners

U.S. Navy

Coast Guard

NASA

BOEM

NSF

National Snow & Ice Data Center

Alaska Ocean Observing System

Int'l Arctic Buoy Program

Army Corps of Engineers

Cold Regions Research Lab (CRREL)

Shell, BP, Statoil, & ConocoPhillips

Environment Canada

University of Washington

University of Colorado

University of Alaska-Fairbanks

...and many more!

What's Up in 2013?



MIZOPEX 2013

The Marginal Ice Zone Ocean and Ice Observations and Processes Experiment will use UAS to study the ice, ocean, and atmosphere off the north slope of Alaska (NOAA/NASA/University of Alaska/University of Colorado)

<http://ccar.colorado.edu/mizopex/>

	WEATHER	SEASONAL	DECADAL
OBS	<ul style="list-style-type: none"> Train & expand Volunteer Observing Ship & coastal community participation for sea ice obs# (NWS/AR) Integrate new NPP products into NIC ops* (NESDIS/STAR) Deploy ice-measuring buoys w/IABP* (CPO) 	<ul style="list-style-type: none"> IceBridge 2013 sea ice flights+ (w/NASA) Ice Mass Balance buoys deployed*+ (w/CRREL) UAS obs during MIZOPEX+ (see box at left) 	<ul style="list-style-type: none"> IceSat-2 Science Team mission planning & cal/val flight surveys*+ (w/NASA)
MODELS	<ul style="list-style-type: none"> dynamic-thermodynamic sea ice model going public in experimental mode* FIM coupled model development* (ESRL) 	<ul style="list-style-type: none"> CFSv3 development* (EMC+CPC) 	<ul style="list-style-type: none"> Global system model development* (GFDL)
SERVICES	<ul style="list-style-type: none"> Freezing spray product* (NWS) Ocean wave forecast for Bering & portions of Beaufort, Chukchi Seas* (NWS) Engage stakeholders to determine sea ice needs*+# (w/NSF, NASA, BOEM) 	<ul style="list-style-type: none"> Sea Ice & Walrus Outlooks*+ (w/NSF) Improved ice edge maps*# (w/AOOS) 	<ul style="list-style-type: none"> IPCC AR5* (GFDL) Sea Ice Atlas# (w/AOOS) Digitize historical sea ice data sets* (w/AOOS, ACCAP, NSIDC)
X-CUT	Participate in IARPC-led interagency implementation team on sea ice forecasting*+ Participate in ongoing NOP implementations#		

*NOAA Arctic Vision & Strategy Goal #NOP Goal +IARPC Goal

*NOAA has 5-year Arctic strategy to address stakeholder needs for Sea Ice Services

- Improve daily to weekly sea ice models and forecasts
- Develop new seasonal prediction services
- Produce multi-decadal sea ice projections
- Conduct retrospective and prospective studies of the linkages between changes in Arctic sea ice and hemispheric weather and climate

for

- Accurate, quantitative, daily forecasts to decadal predictions of sea ice to support safe Arctic operations and ecosystem stewardship
- Better understanding of linkages between changes in Arctic climate and hemispheric weather

#NOAA is the lead agency for the National Ocean Policy (NOP)

1 of the 9 NOP objectives is focused on the Arctic region with Observing & Forecasting Sea Ice as a primary goal

+NOAA is a key member of the Interagency Arctic Research Policy Committee (IARPC)

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

NOAA in Alaska



<http://www.facebook.com/pages/NOAA-in-Alaska/196714957391>

Weather Scale Forecasts

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Decadal Scale Forecasts

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