

Icebergs, Ice Shelves, and Sea Ice

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Washington, DC



USCG



USN



NOAA



Overview

About the National Ice Center

Detecting and Tracking Antarctic Icebergs

Imagery and Examples

Questions for a Community Ice Sheet Model



NIC Mission & Scope

- Tri-agency organization
 - ~70 military and civilian personnel
 - Washington, D.C.
 - Pentagon Component
 - Excellence in sea ice analysis and forecasting - global leader

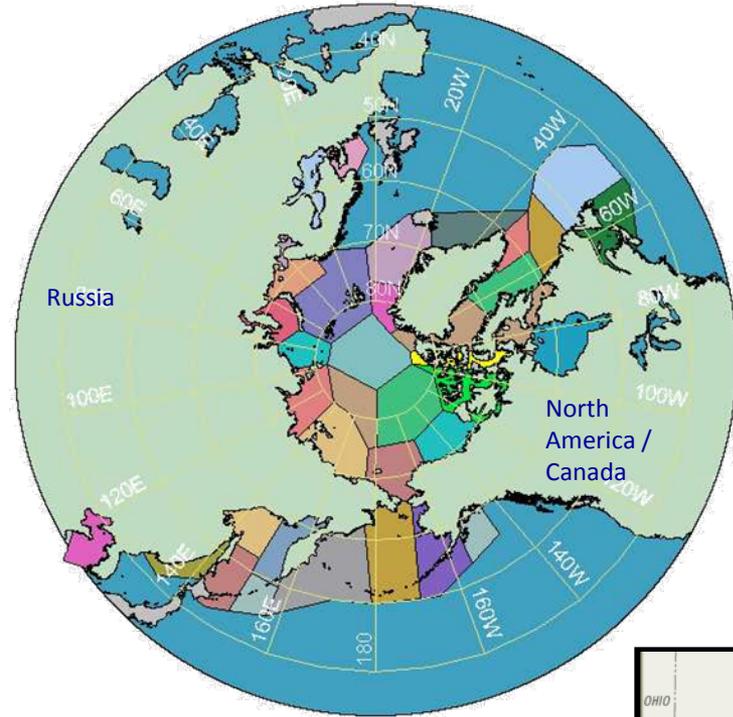


NIC's mission is to provide timely, accurate and relevant METOC/ICE products and services to meet the strategic, operational and tactical requirements of U.S. national interests across a global area of responsibility.



Area of Responsibility - 20.6M sq.mi.

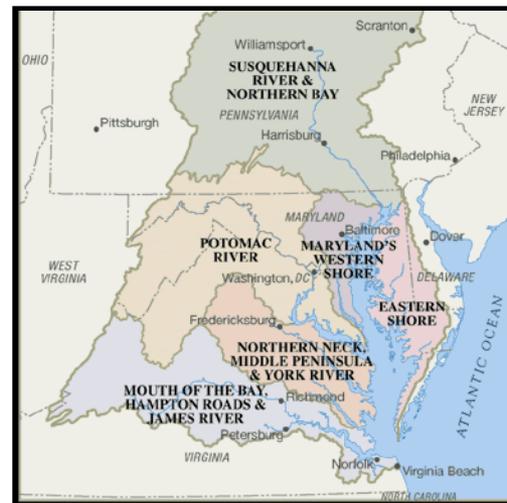
Arctic, Great Lakes, Antarctic



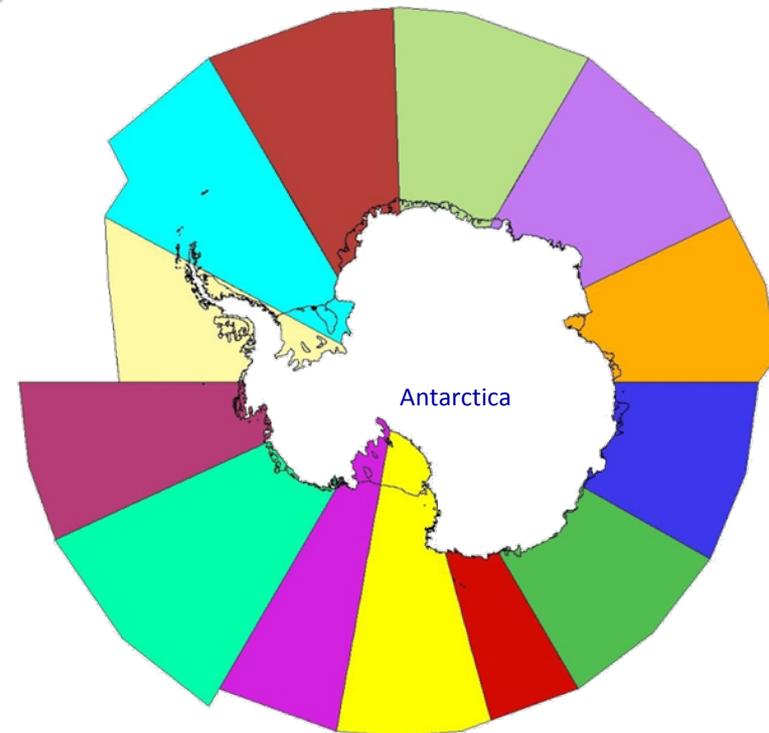
Arctic (including Sea Of Japan, Sea of Okhotsk, and Yellow Sea)



Great Lakes



Chesapeake / Delaware Bays



Antarctic



Mission & Scope

- International Partnerships
 - North American Ice Service (NAIS)
 - National/Naval Ice Center (NIC)
 - Canadian Ice Service (CIS)
 - International Ice Patrol (IIP)
 - International Arctic Buoy Programme (IABP) (9 participating countries)
 - International Ice Charting Working Group (IICWG)

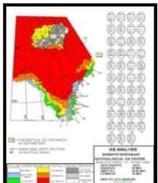


Integrated Excellence through External Partnerships

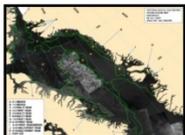


Operations

Products



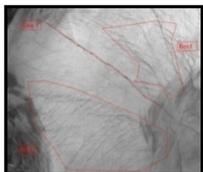
Hemispheric Ice Charts



Annotated Images



Special Arctic Oceanographic Synopsis (SPAROS)



Fractures, Leads and Polynyas (FLAP)



Public web page
230,318 hits in
2007



Average of 880
products per
month to over
140 customers



USN



ONI



NSF



MSC



NWS



Local Gov.



NOAA



USCG

Mission/Goal Supported

Battlespace Awareness

SA / ISR / I&W

Scientific Research

Maritime Shipping

Commercial Fisheries

Oceanographic and Atmospheric Models (NWP)

Safety of Life and Property At Sea

Safety of Navigation



Operations Customers

Federal Government Agencies



Federal / State Agencies

Research & Universities



International

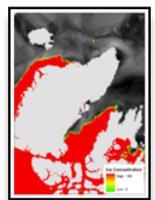
HUNTER Over 140 known customers & agencies



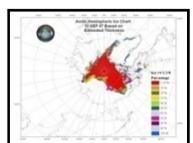
Science

Transitioning Science and Technology to Operations

Sensor Exploitation



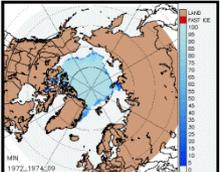
Product Development



New Technology



Scientific Expertise



NIC Science Team

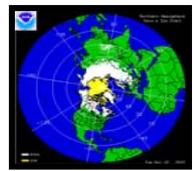
Chief Scientist – NOAA Civilian PhD
Dept Head - NAVY LT
DIVO - NOAA Corps Officer LTjg
TEAM Members – (2)PhD's, (2)MS's,
 (2)NAVY Enlisted, Research Partners



NIC OPERATIONS



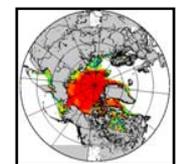
NWP



Research Community



Modeling Validation



Maintain a strategic vision for NIC operations, recommending appropriate operational and scientific investments and improved concepts for operational processes that support the long-range goals of the NIC, consistent with known customer requirements.



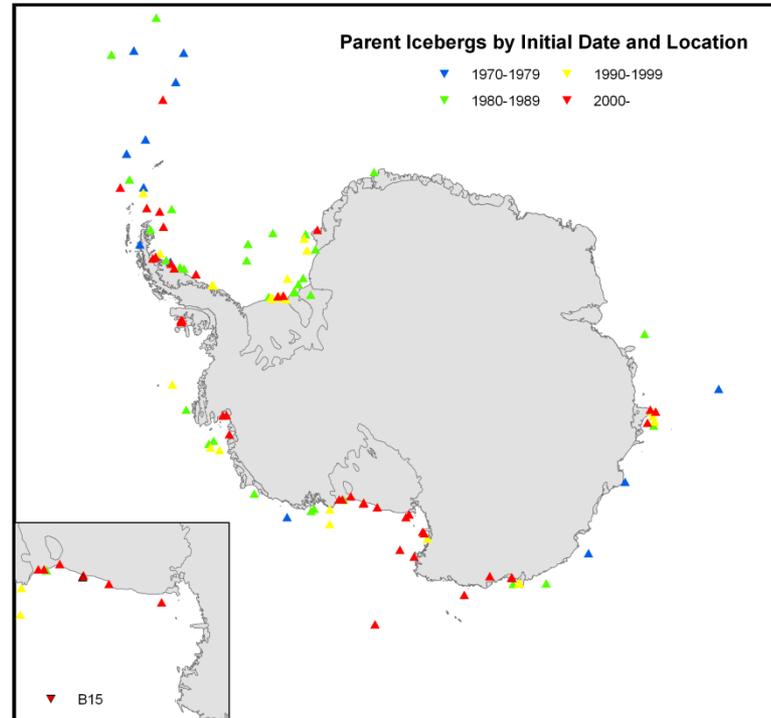
Iceberg Identification

<http://www.natice.noaa.gov/products/iceberg/>

Antarctic Icebergs are identified and named based on quadrant and sequential number:

A = 0-90W (Bellinghausen/Weddell Sea)
B = 90W-180 (Amundsen/Eastern Ross Sea)
C = 180-90E (Western Ross Sea/Wilkesland)
D = 90E-0 (Amery/Eastern Weddell Sea)

Icebergs must be at least 10 nautical miles along the long axis, and must be south of 60S. (Exceptions made for operational requirements.)

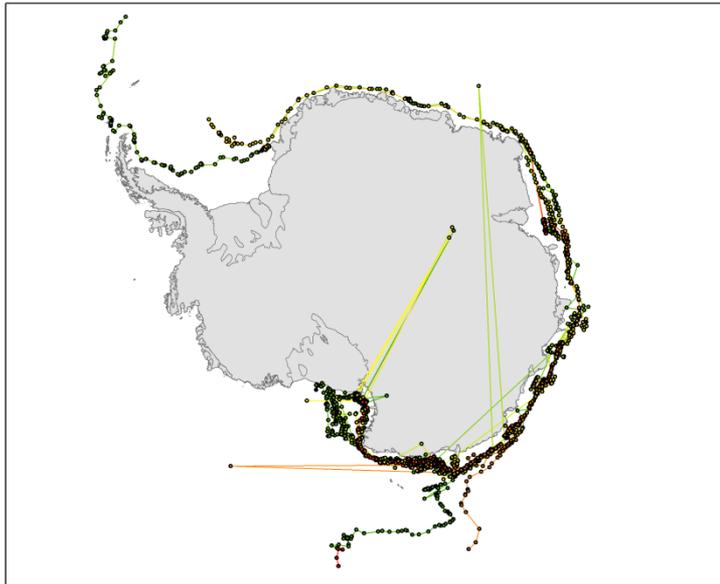


Improved remote sensing technologies have enhanced NIC's capability of identifying and monitoring icebergs.



Iceberg Tracking

<http://www.natice.noaa.gov/products/iceberg/>



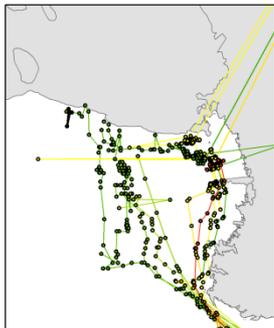
Once identified, NIC continues to track icebergs until :

- the iceberg drifts north of 60S and remains there more than 30 days
- the iceberg reduces in size below 10 nautical miles

If/when the parent iceberg breaks part, the new divisions are named based on the parent iceberg and given an alphabetical suffix:

- B15 becomes B15A, B15B, etc.
- B15 ceases to exist
- One iceberg can be parent to many

(Iceberg DB QC underway)



B15 Icebergs			
● B15	● B15F	● B15L	● B15R
● B15A	● B15G	● B15M	● B15S
● B15B	● B15H	● B15N	● B15T
● B15C	● B15I	● B15O	● B15U
● B15D	● B15J	● B15P	
● B15E	● B15K	● B15Q	



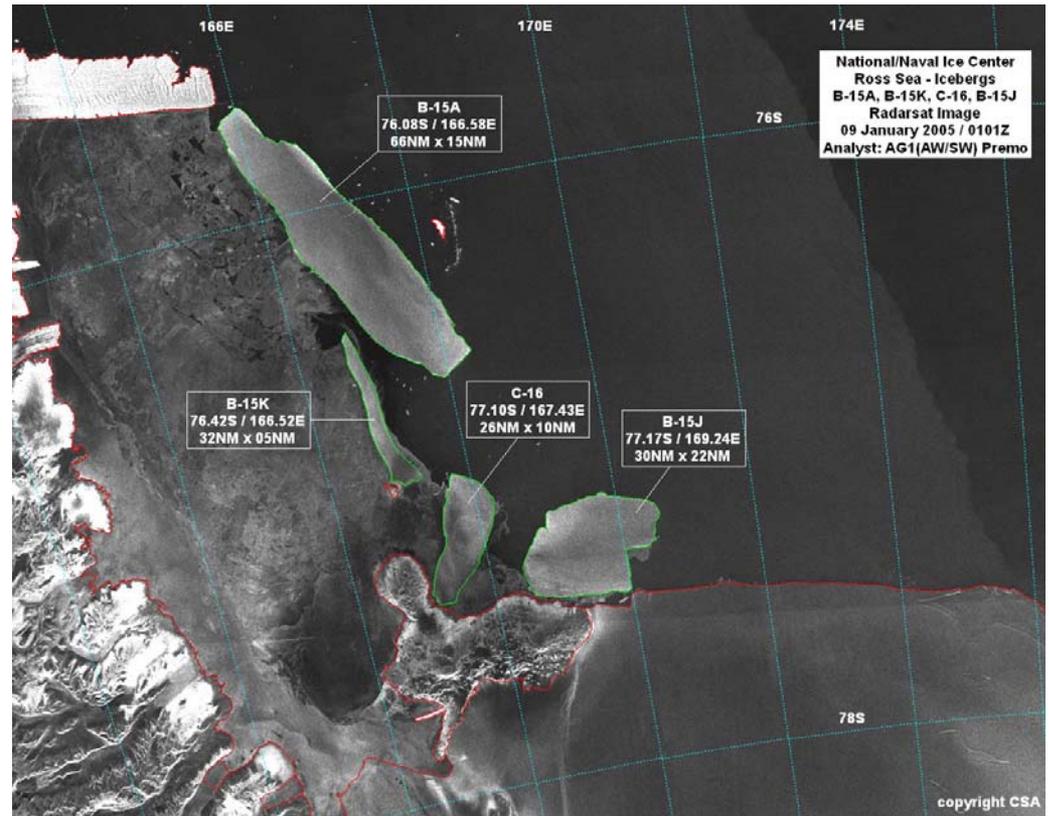
Icebergs and Sea Ice

An iceberg's presence can affect sea ice conditions.

In 2005, B15A grounded at the mouth of McMurdo Sound, blocking the export of sea ice.

The increased sea ice extended 80 nautical miles from McMurdo Station. Typical distance is 10 nautical miles.

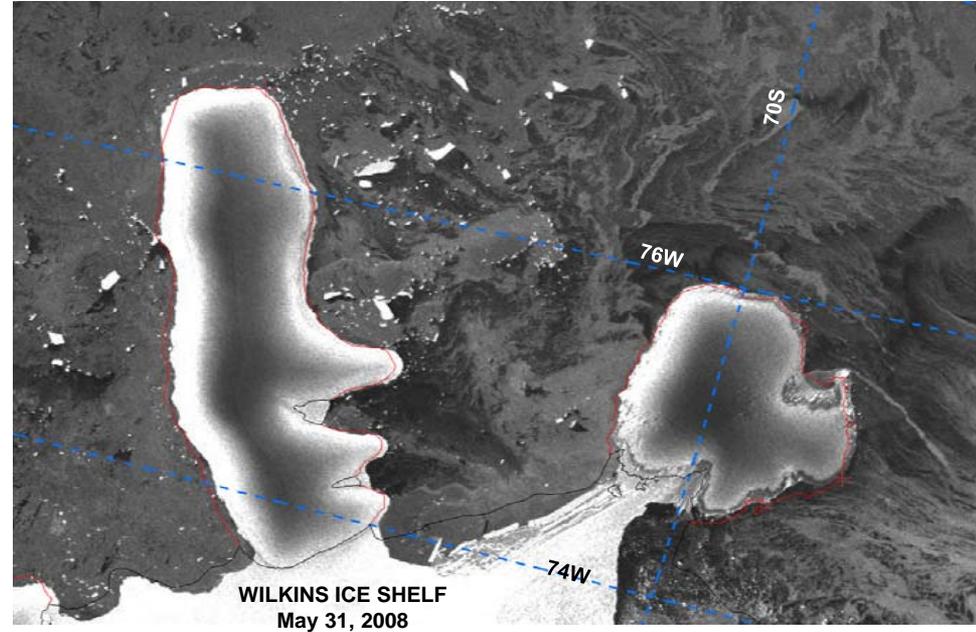
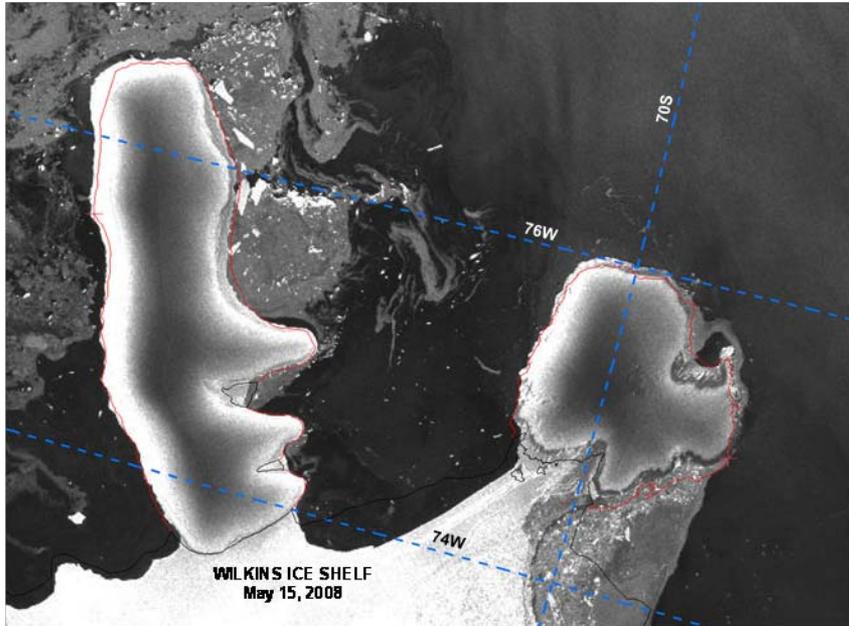
This required a second icebreaker to complete the annual resupply mission.



Thousands of Adelie and Emperor penguins also died as the increased distance between breeding colonies and food sources.



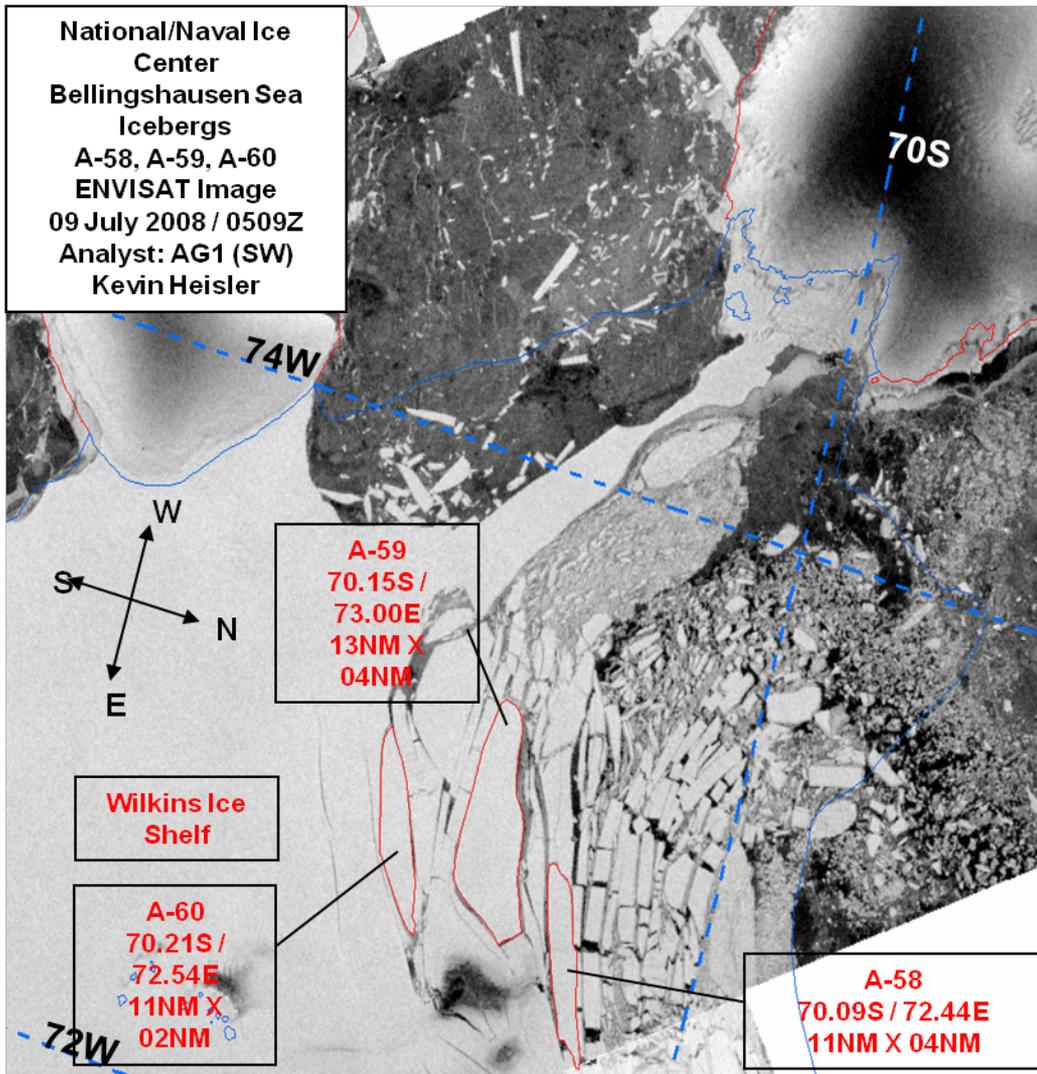
Collapsing Ice Shelves...



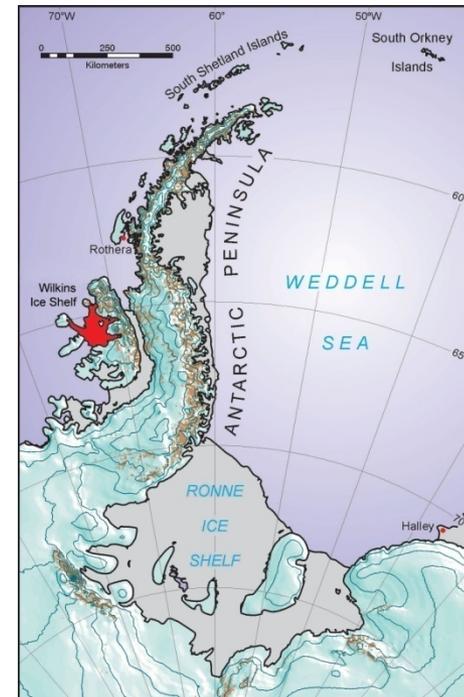
The Wilkins Ice Shelf began collapsing in March 2008. The previous ice shelf mask is indicated by a black line. These two images show the further reduction by a second break-off in late May...



... create icebergs and ocean...



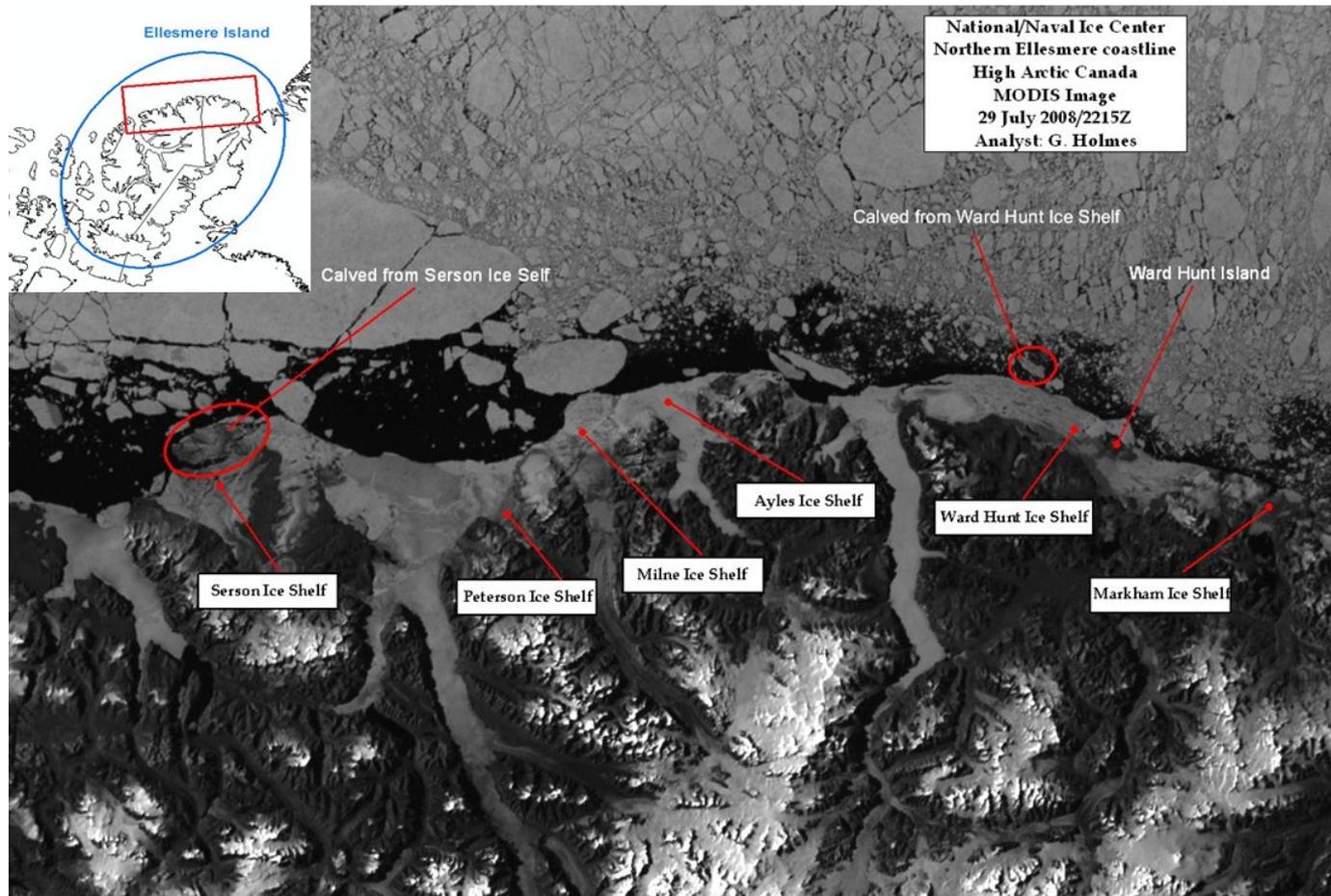
The shelf edge contour (now in blue) is no longer an accurate representation of the Wilkins Ice Shelf. *(but it is being updated)*



Map courtesy British Antarctic Survey



...in both hemispheres!



Meanwhile, Arctic ice shelves are also receding and calving icebergs into the Arctic Ocean.



Questions for a CISM

In a coupled environment (ice sheet + sea ice + ocean + atmosphere), how can the advance/retreat of ice shelves be handled?

- *increase/decrease of sea ice and ocean gridpoints*
- *change in lower boundary conditions for atmosphere*

How would icebergs be modelled?

- *too small for explicit treatment in a global model*
- *regional models, component, and standalone models*

Could a CISM-enabled model be used for medium range (30-90 day) forecasts?

- *NAIS operational interest*

What about the Arctic Ocean?