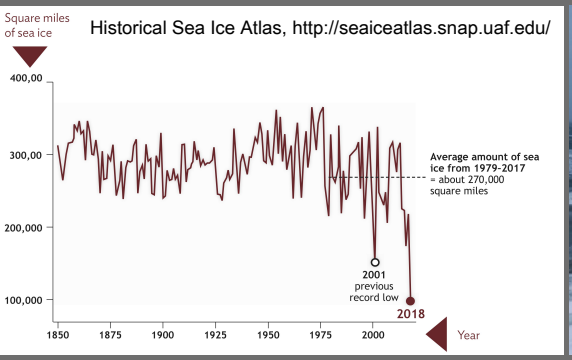
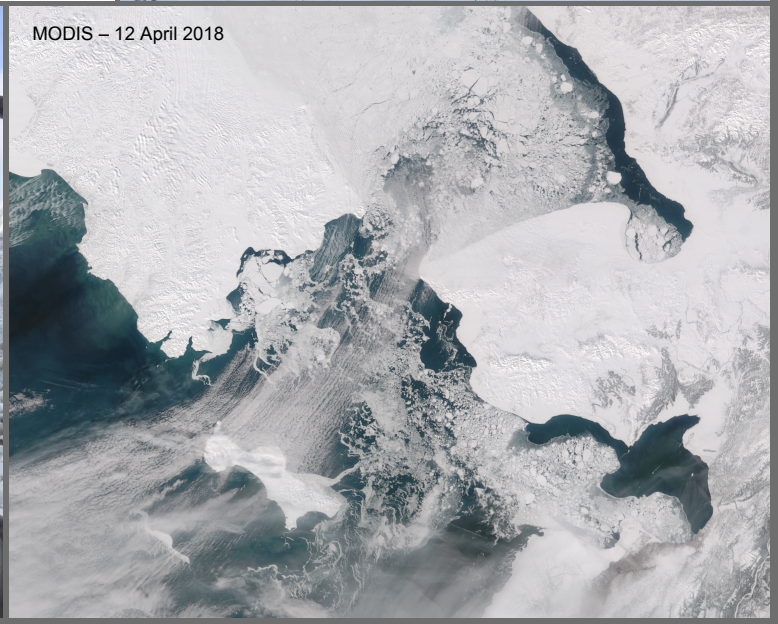
Bering & Chukchi Sea ice in winter of 2017/18





Hajo Eicken, Heather McFarland, John Walsh, Olivia Lee

International Arctic Research Center, University of Alaska Fairbanks, AK

Rick Thoman

NOAA/National Weather Service, Fairbanks, AK

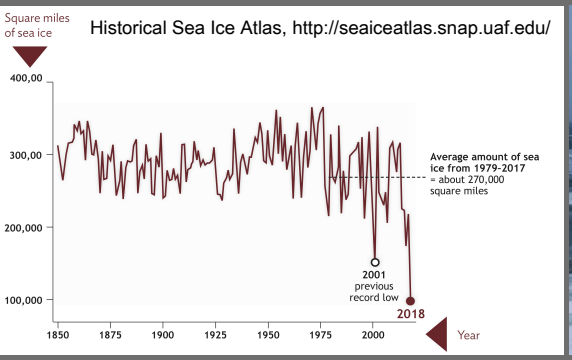
Matt Druckenmiller

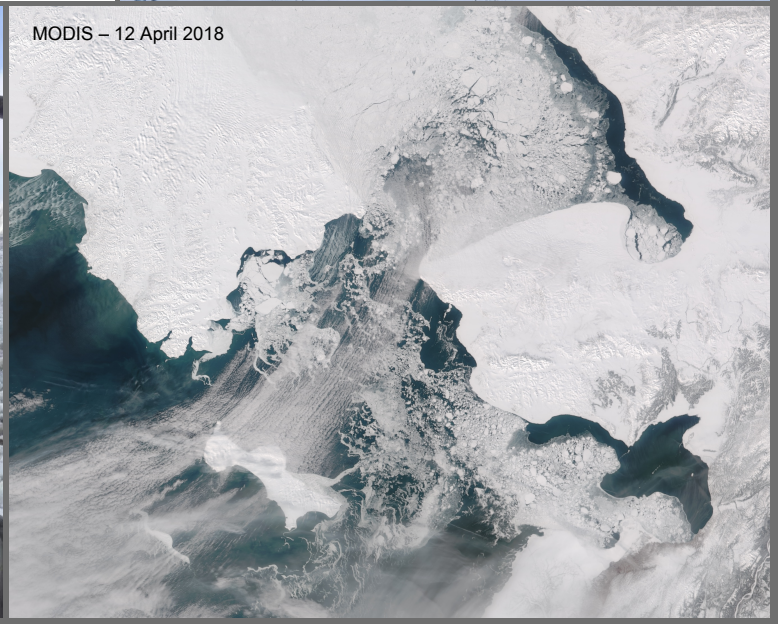
National Snow and Ice Data Center, Boulder, CO

Zack Labe

University of California Irvine, CA

Bering & Chukchi Sea ice in winter of 2017/18





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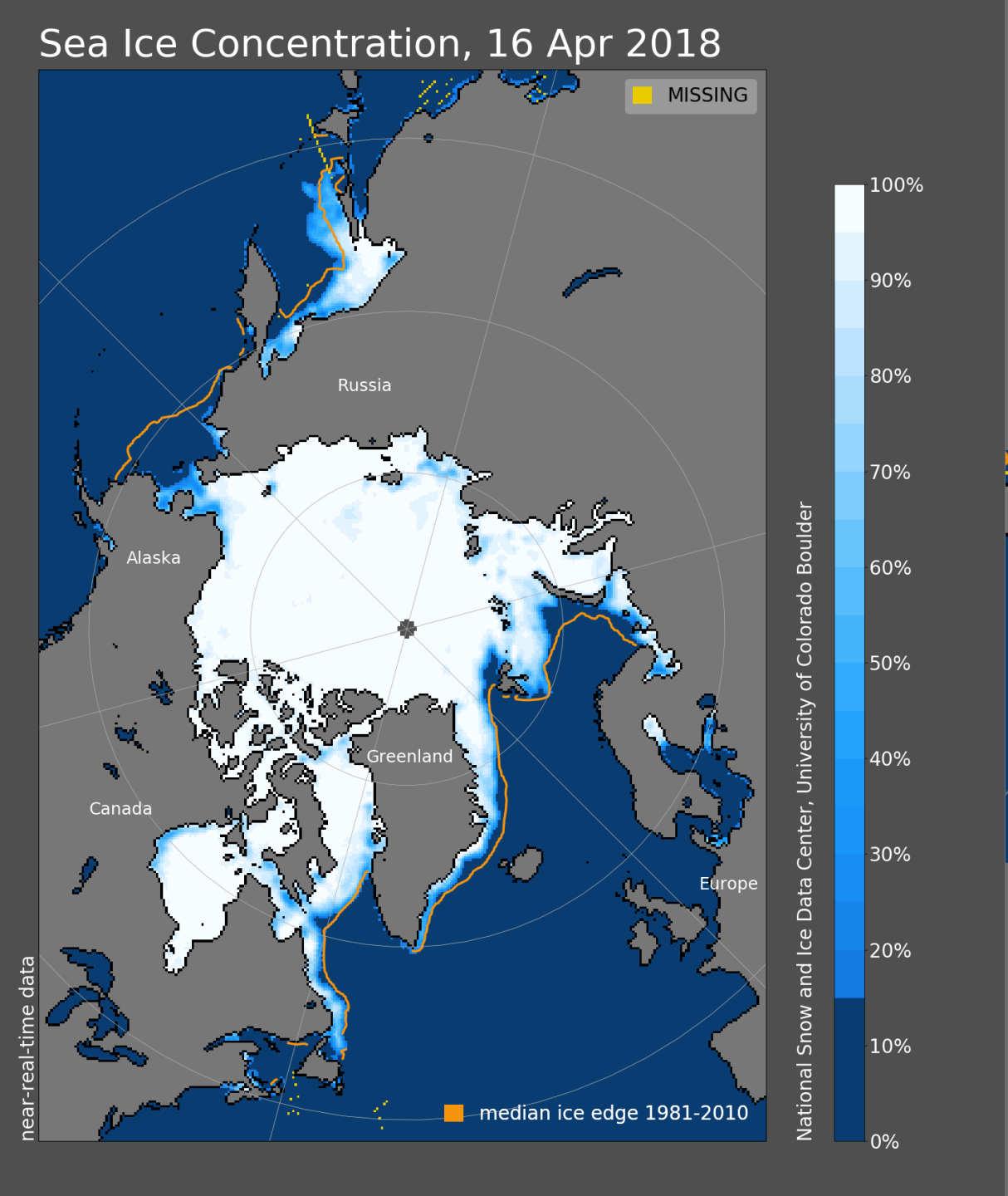
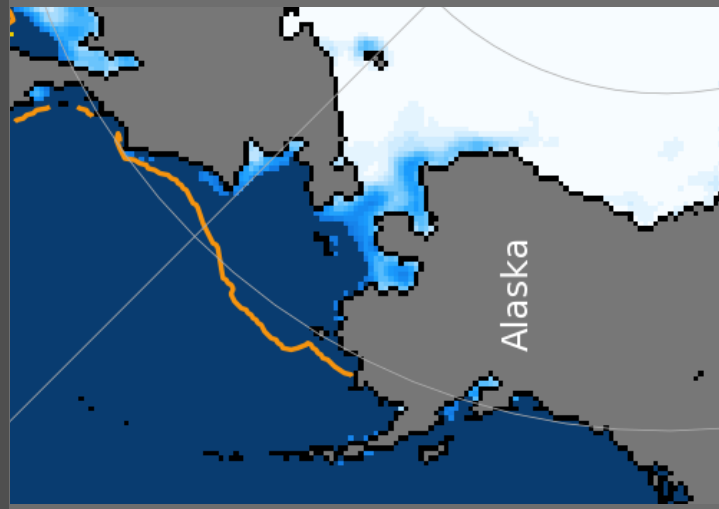
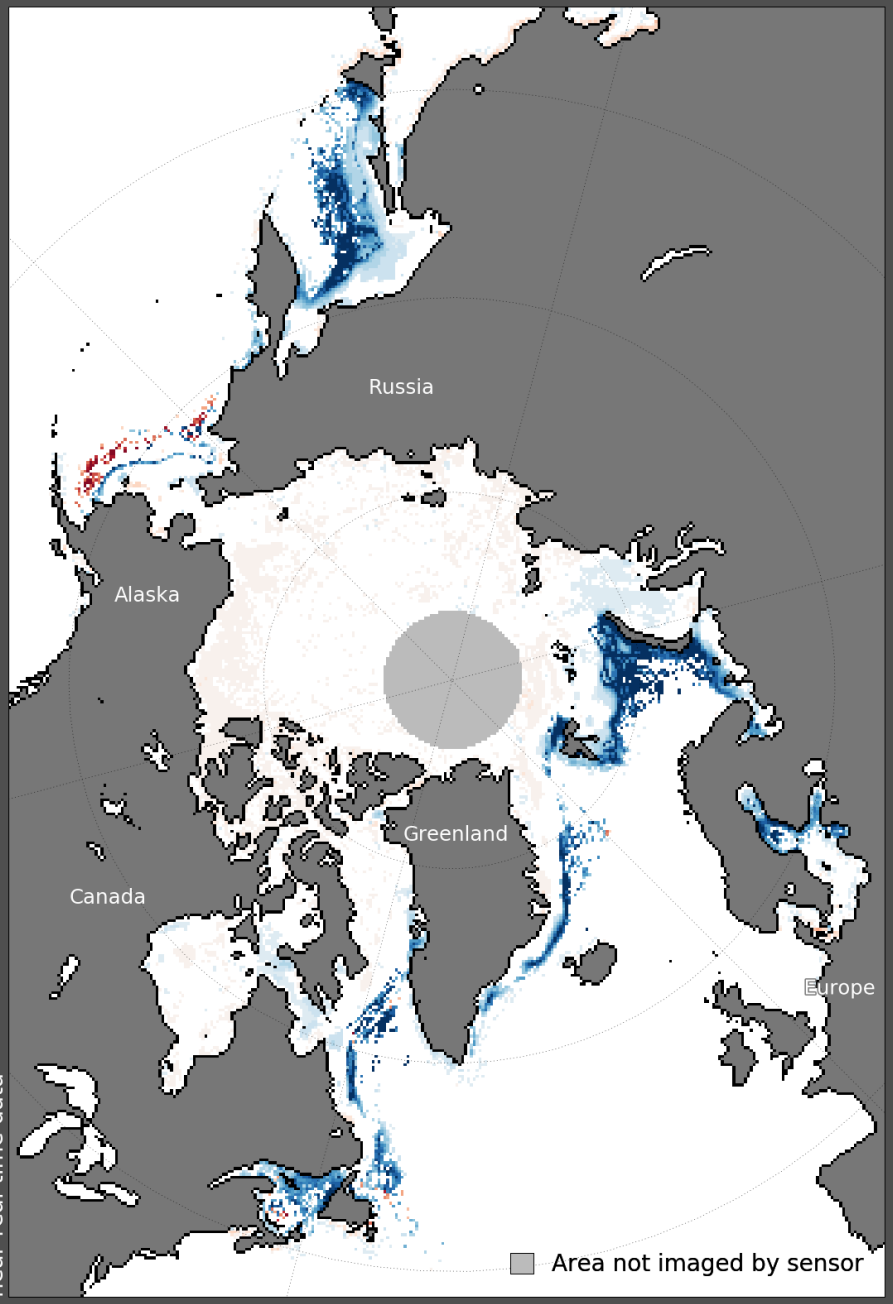
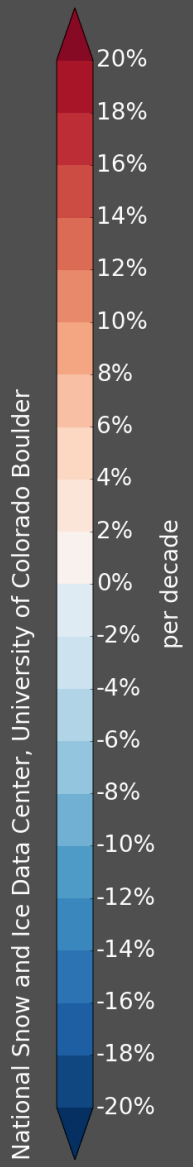


- Arctic sea ice cover yesterday
- Much less ice than normal in the Bering Sea

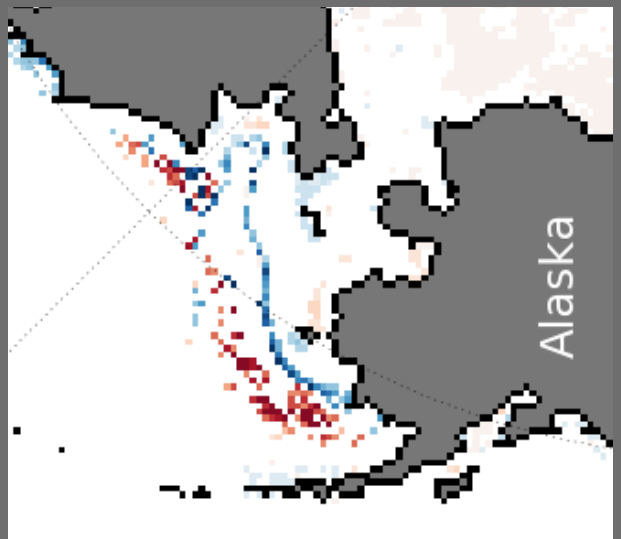


Sea Ice Concentration Trends, Mar 2018

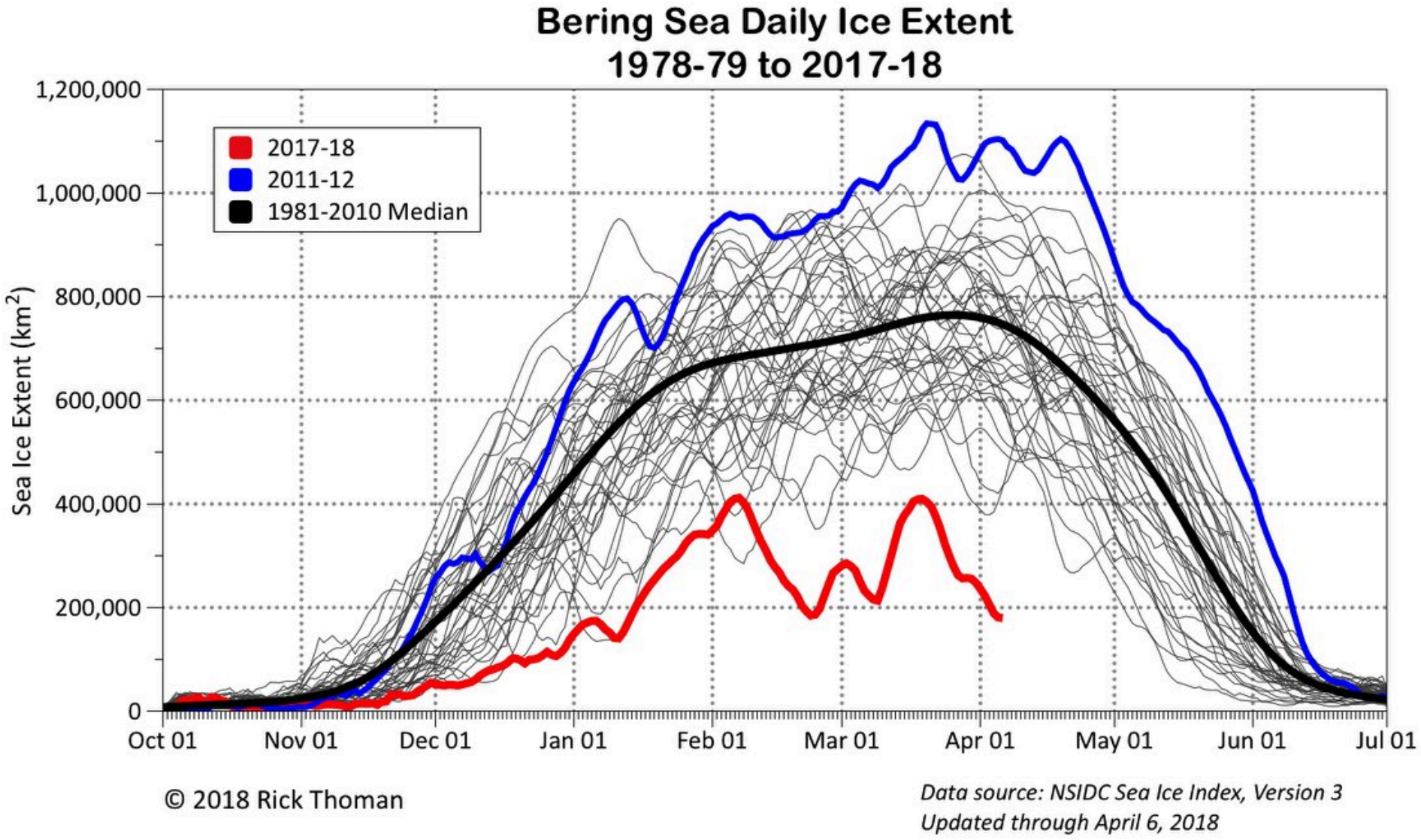


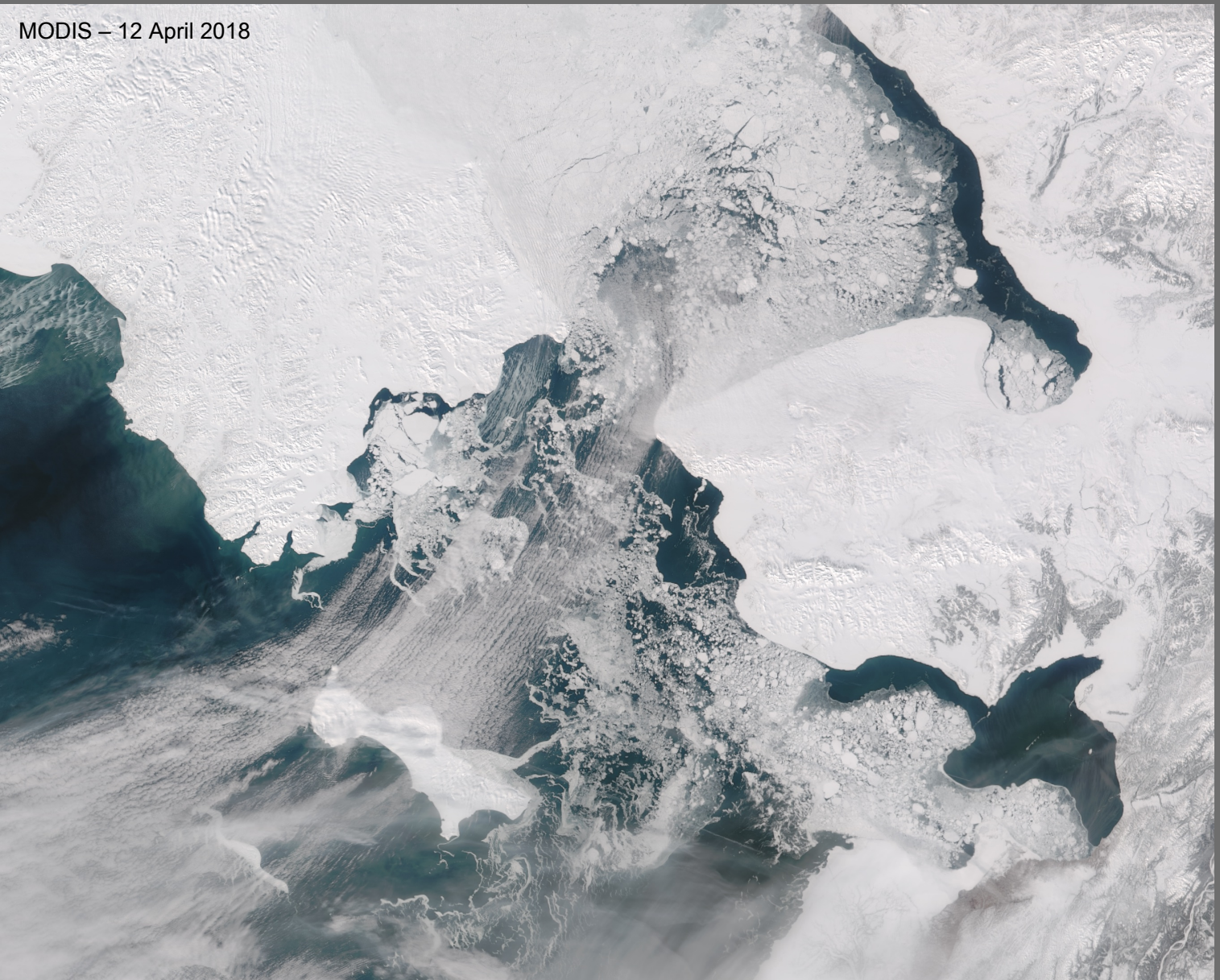


- In past four decades less winter ice in many parts of the Arctic
- Bering Sea is more complicated
- More ice than normal in 1990s to early 2000s
- Much less ice in the past few years



Ice conditions compared to recent years



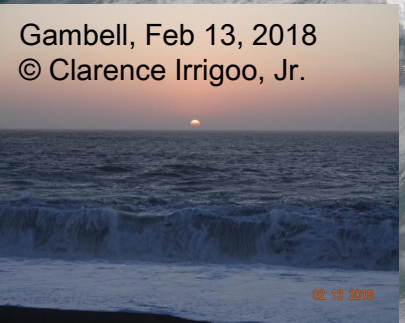

MODIS – 12 April 2018

MODIS – 12 April 2018

Little to no ice grounding on shoal off Wales

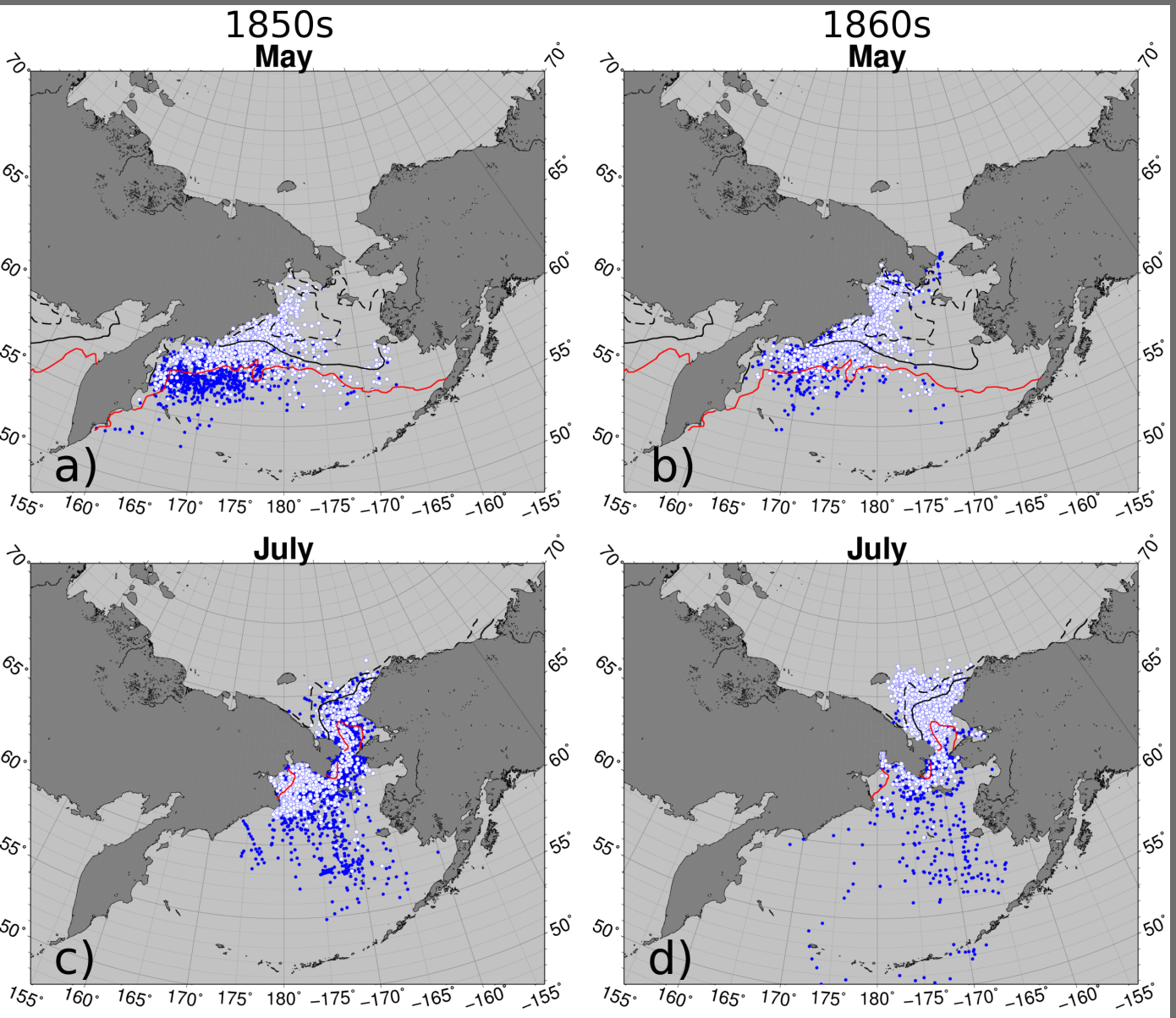
Little to no ice in Gulf of Anadyr & off St. Lawrence Island

Little to no landfast ice along coast from Wales to Cape Espenberg



Gambell, Feb 13, 2018
© Clarence Irrigoo, Jr.

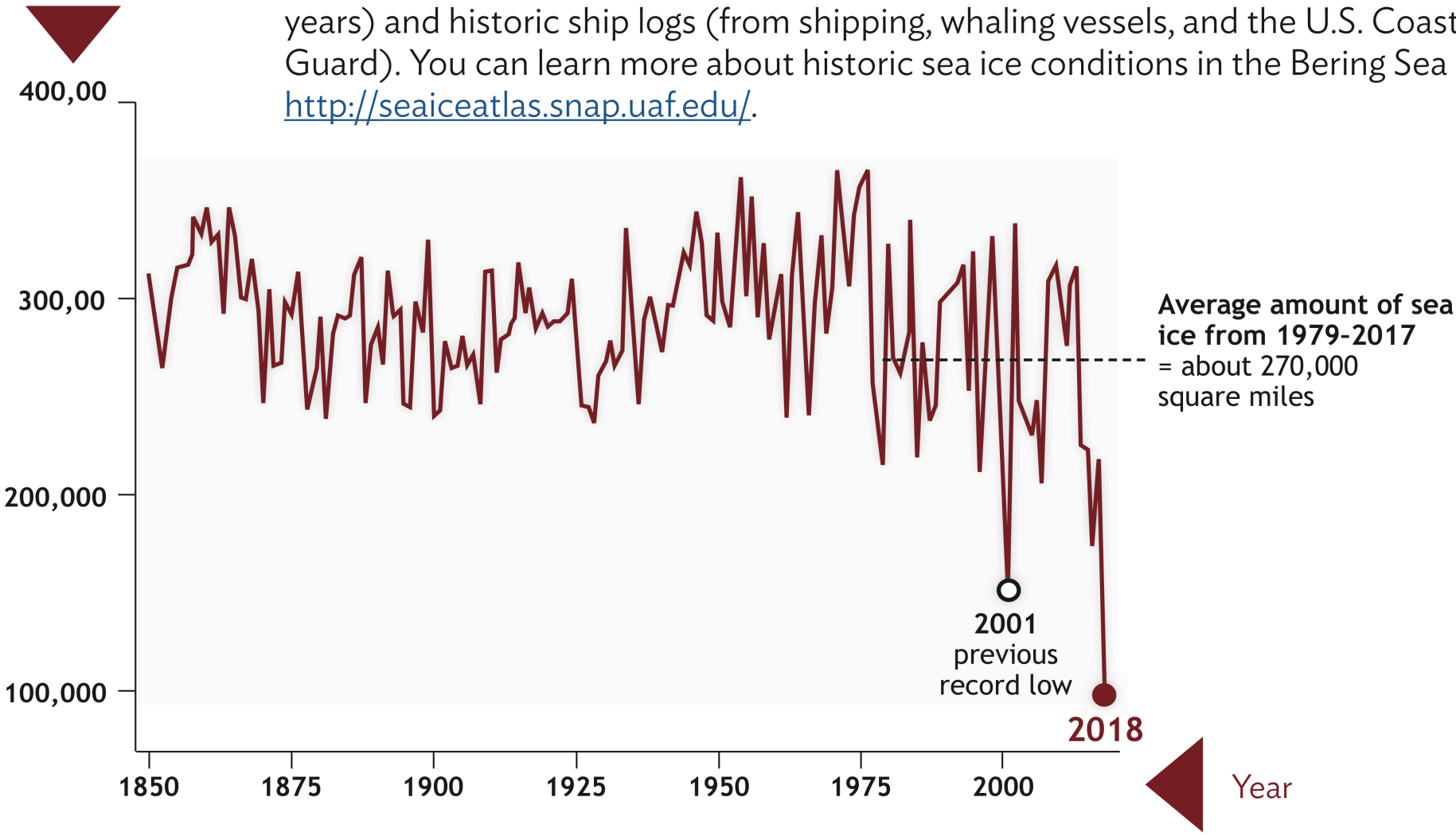
Historical perspective from ship logs



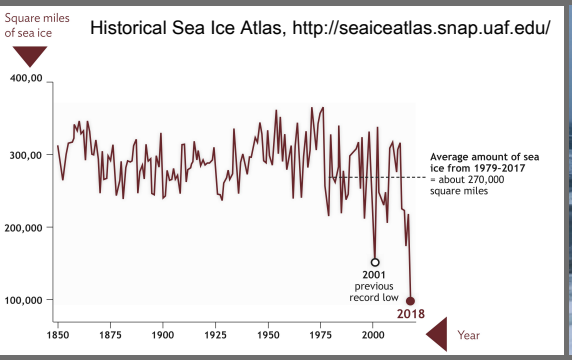
- Whaling ships kept detailed record of ice conditions back to 1850s
- Data has been analyzed and compiled with other observations into UAF Historical Sea Ice Atlas

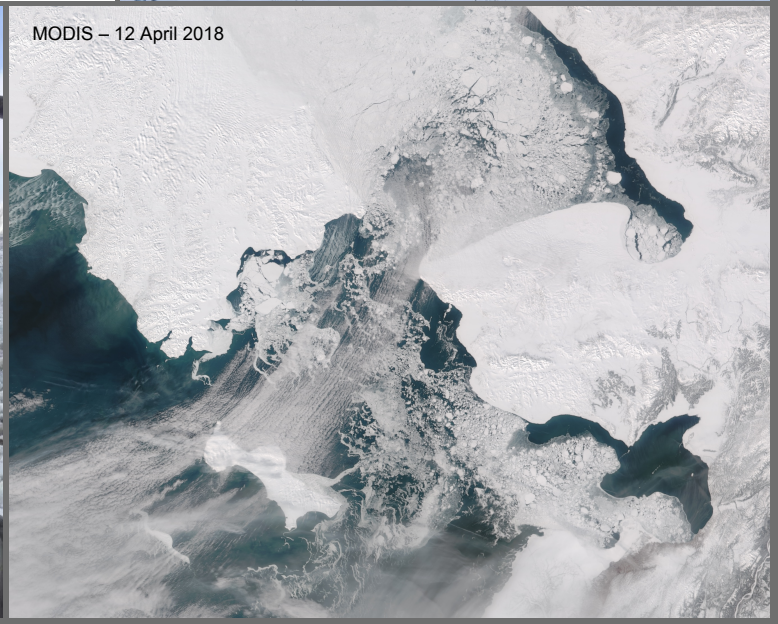
Long-term history of sea ice in the region

The graph below compares the amount of sea ice this February to the past 168 years based on information gathered from recent satellites (over the last 40 years) and historic ship logs (from shipping, whaling vessels, and the U.S. Coast Guard). You can learn more about historic sea ice conditions in the Bering Sea at http://seaiceatlas.snap.uaf.edu/.



Bering & Chukchi Sea ice in winter of 2017/18





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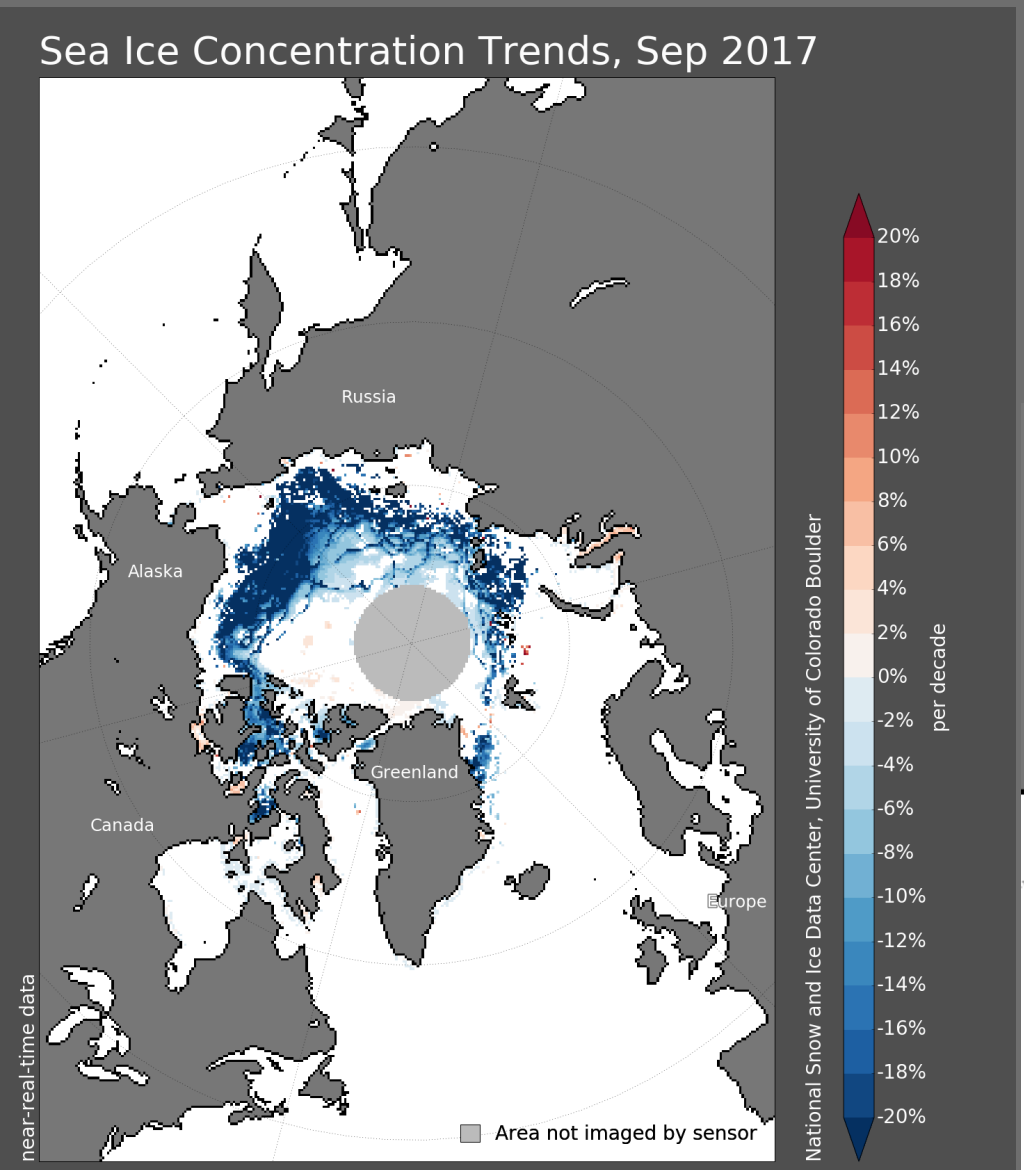
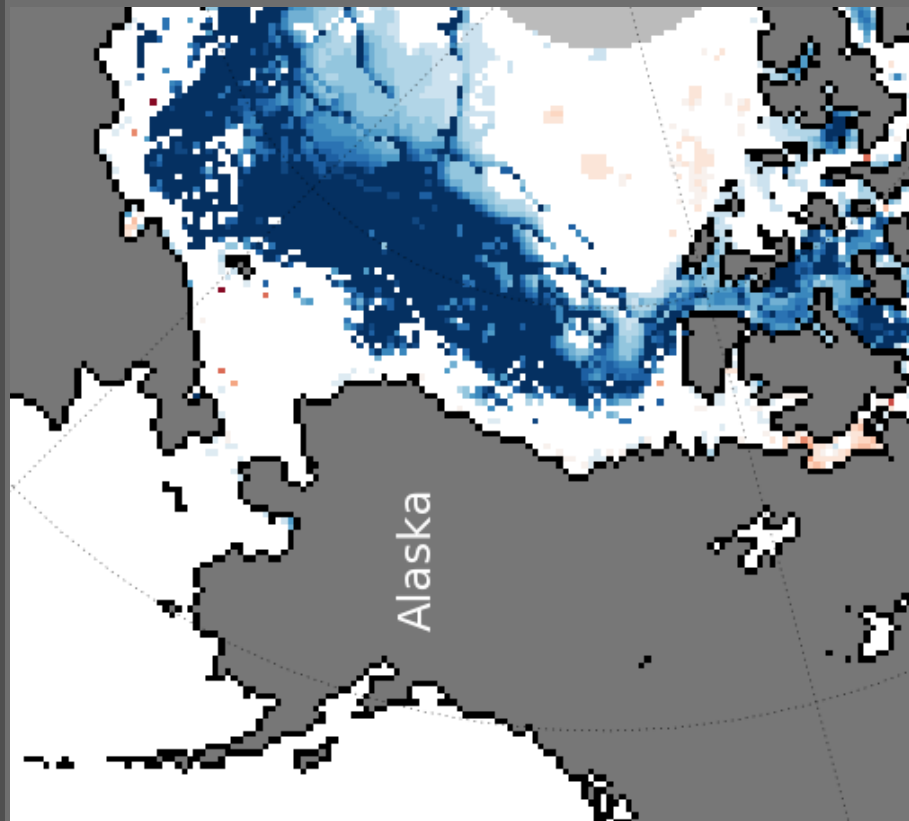
Possible causes: Reduced Arctic ice



- More open water & thinner ice north of Alaska



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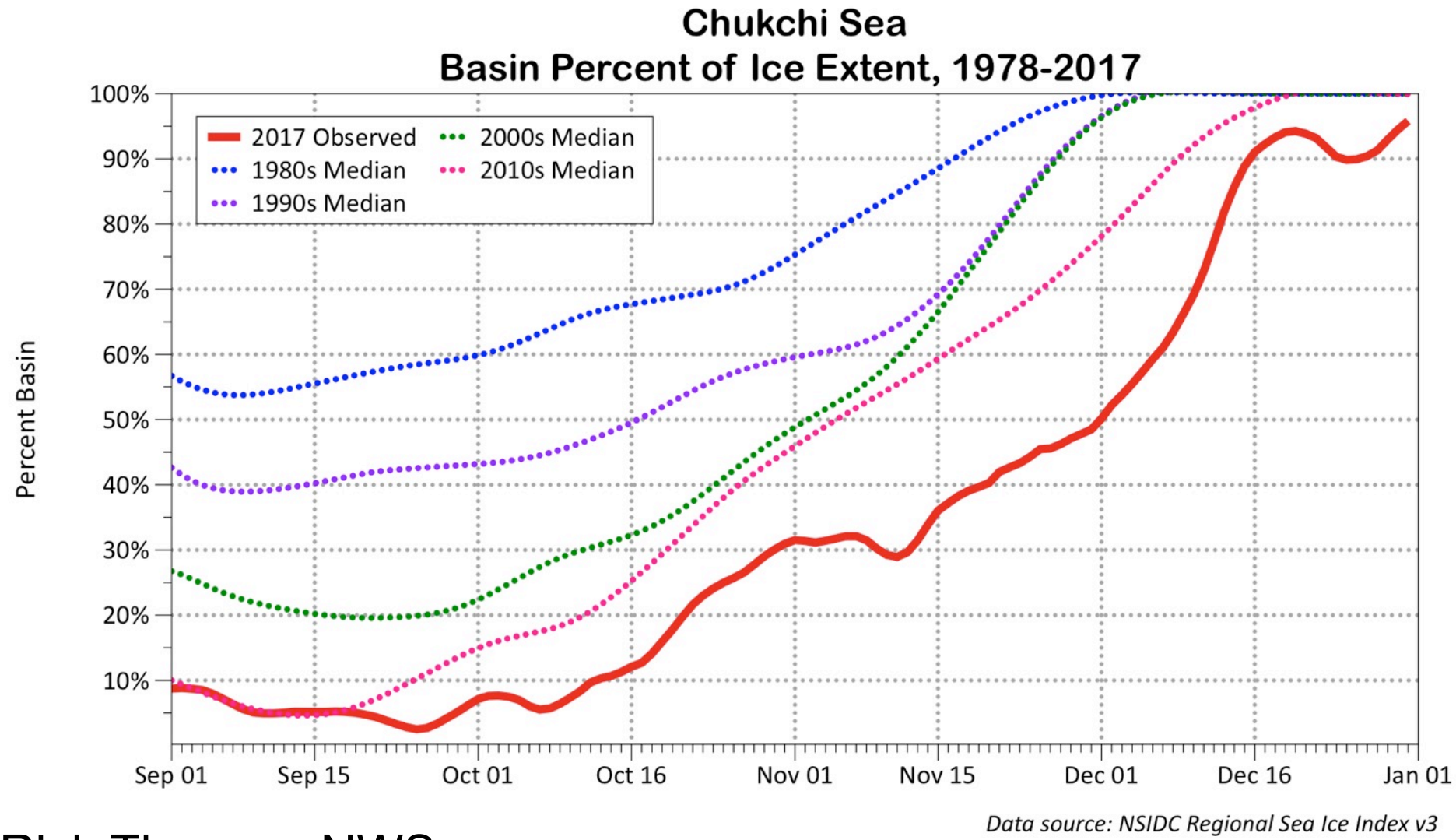
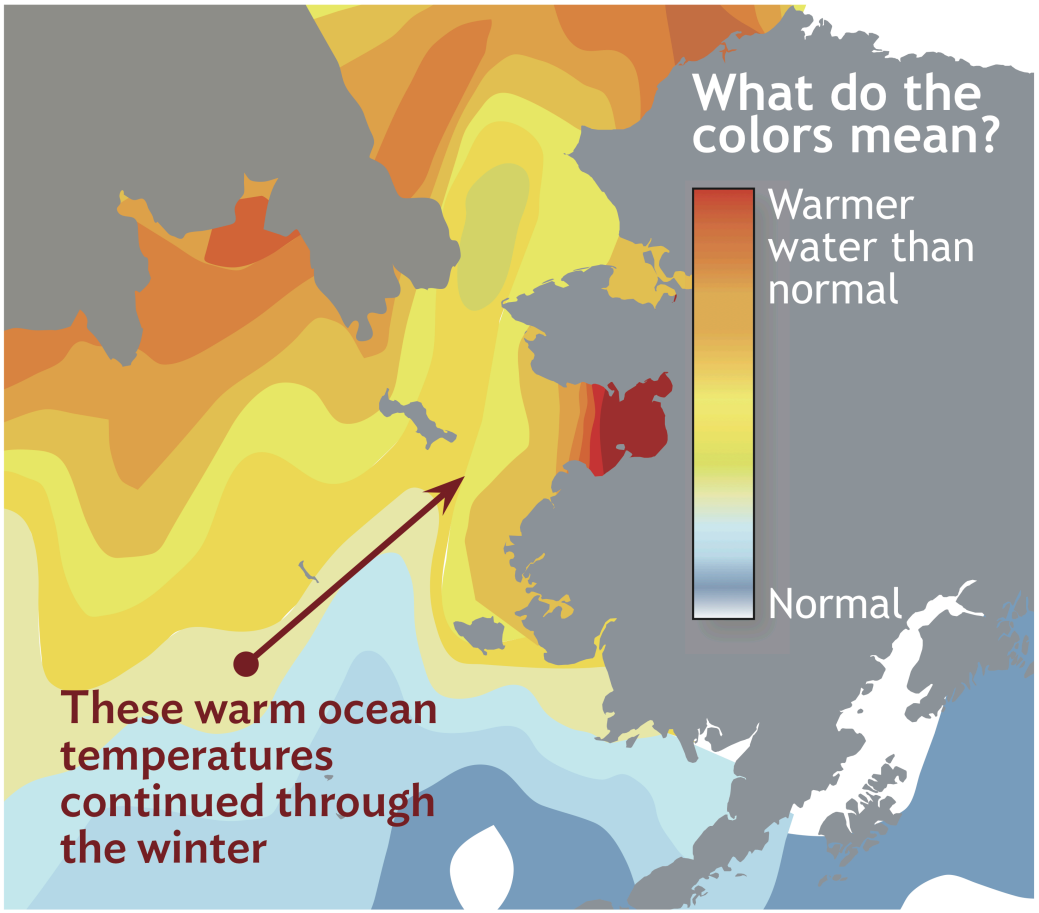


Rick Thoman, NWS

Possible causes: Warmer waters

Warmer sea water than normal

This map shows how much warmer than usual the surface sea water was during summer and fall 2017. Red and orange colors mean above normal temperatures.

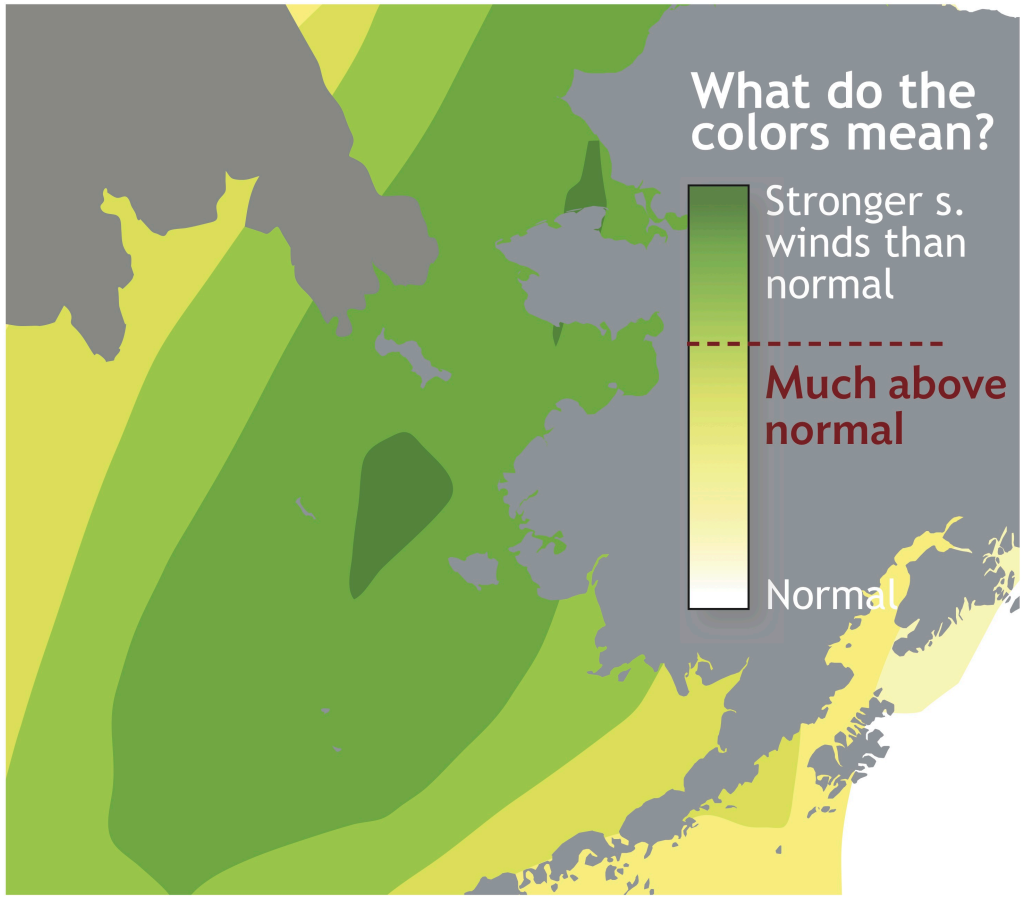


- Bering & Chukchi Seas have been warming
- Warmer waters brought from the South & through heating in the region

Possible causes: South winds

More south wind than normal

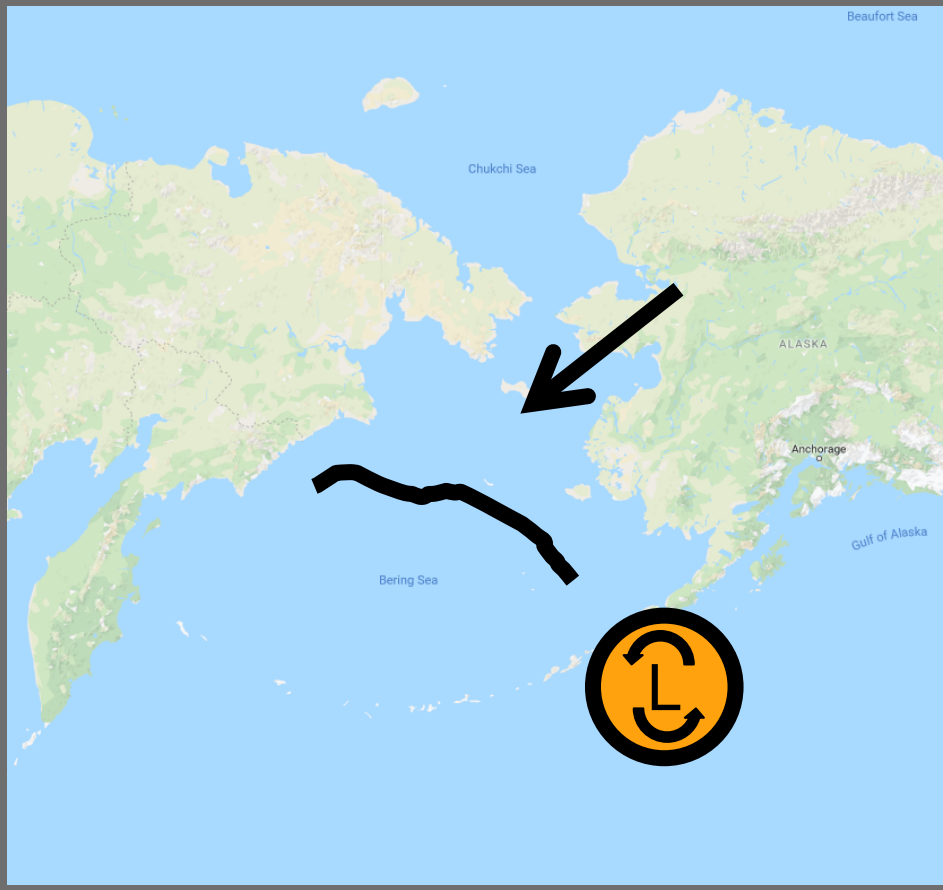
This map shows where south winds were stronger than usual from December 2017 to February 2018. Green colors mean stronger south winds than normal.



- Stronger south winds
  - push ice to the North
  - Bring warmer air from the South
- Position of Aleutian Low important

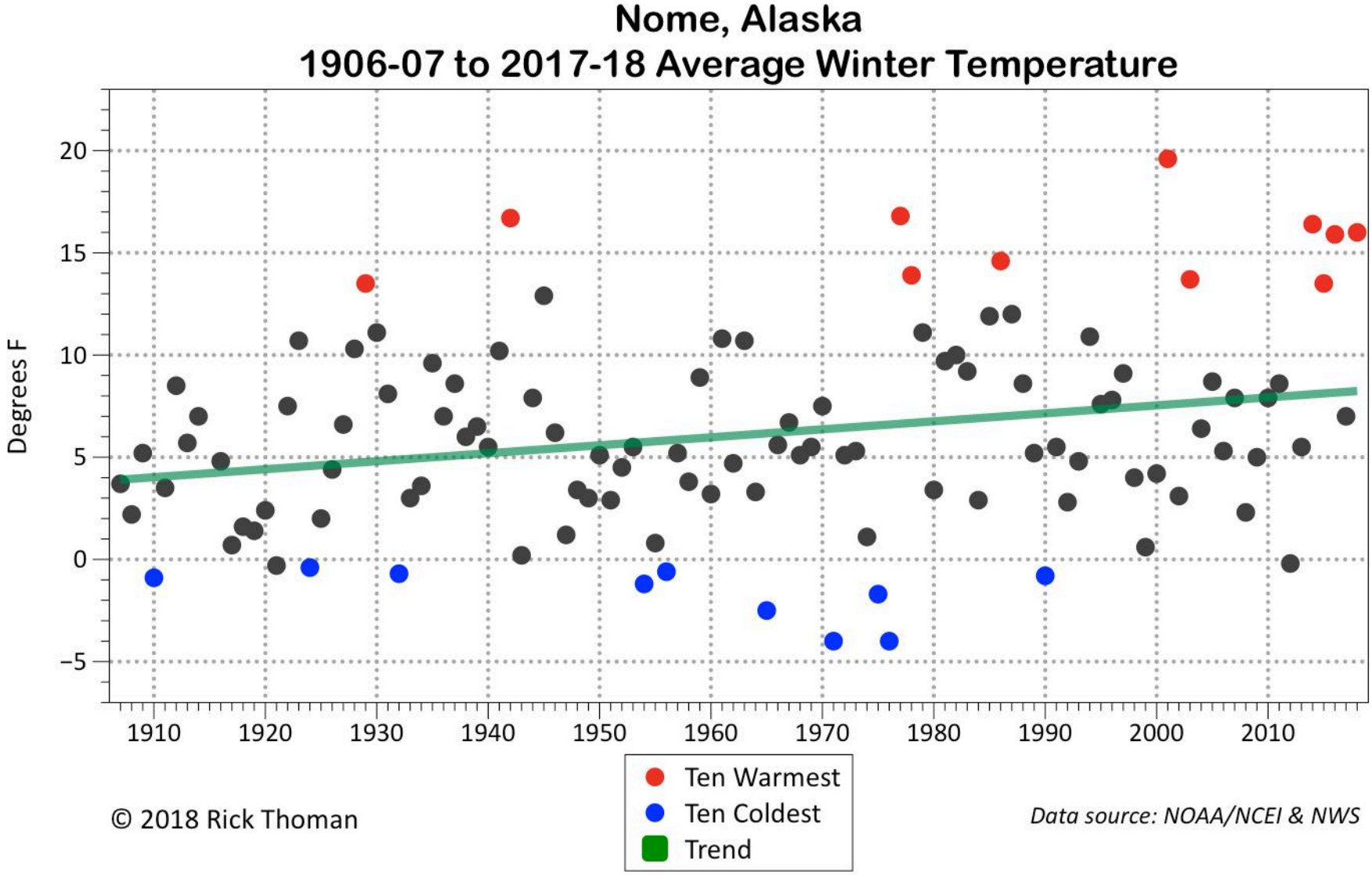
Position of Aleutian Low pressure system: Helps or hinders ice growth in Bering Sea

- Aleutian Low further to West: Warmer air & winds from south keep ice extent low

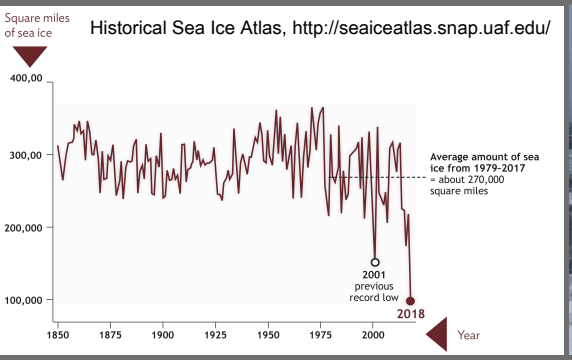


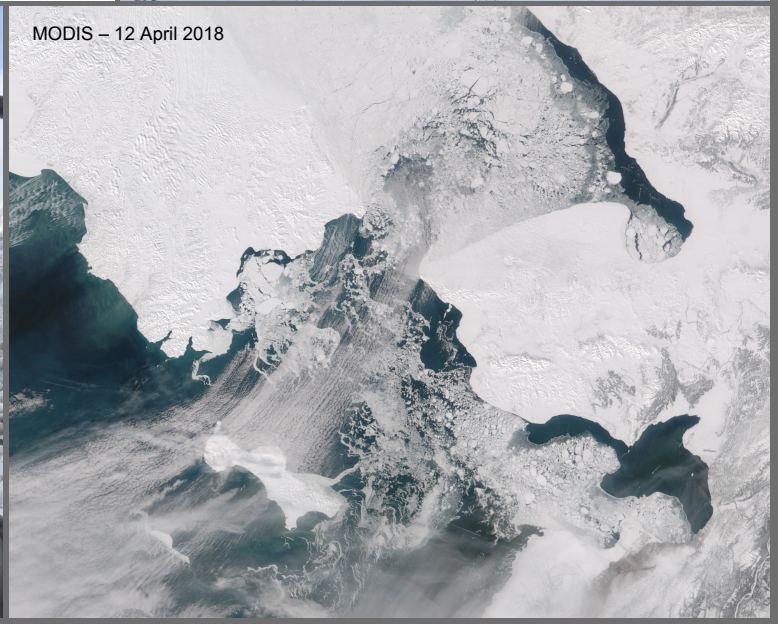
- Aleutian Low further to East: Colder air & winds from North keep ice extent high

Outcomes: Warmer temperatures in the region



Bering & Chukchi Sea ice in winter of 2017/18





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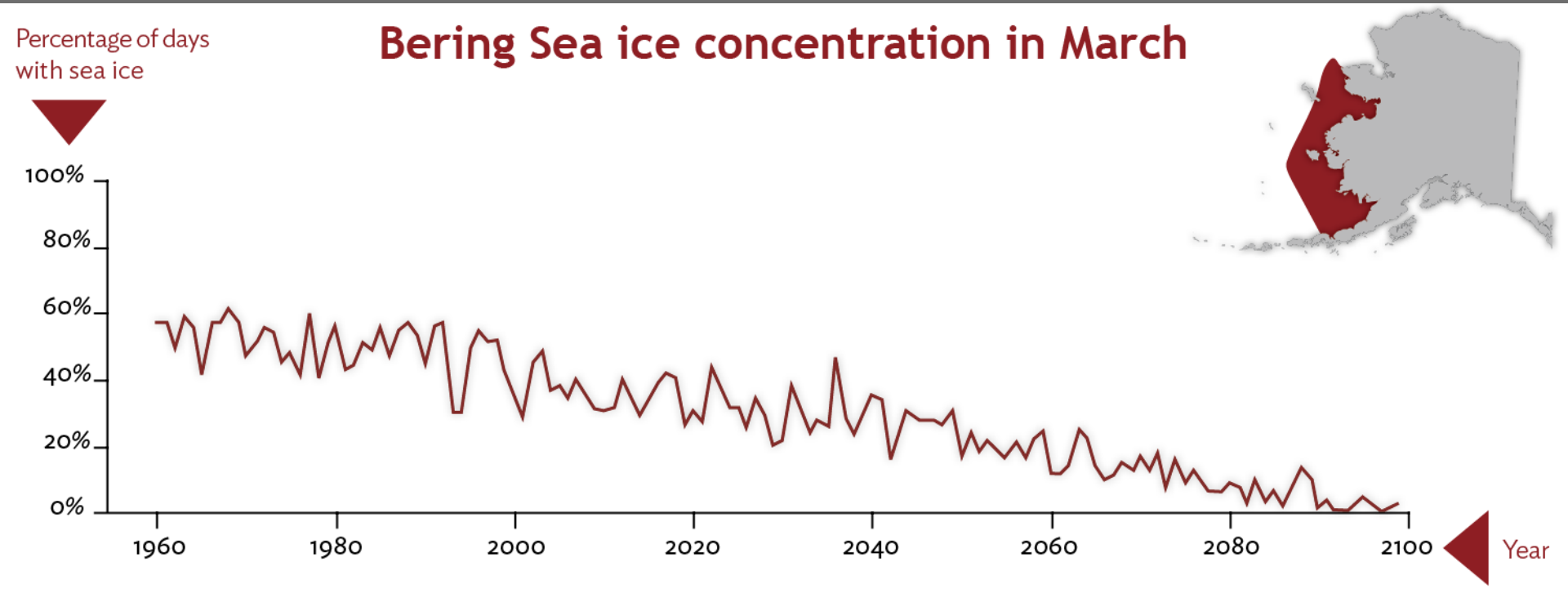
What will future sea ice in the coastal Bering Sea look like?



- Climate models show continuing decline & continued variability of winter coastal Bering Sea ice
- Any lessons from today's observations?
- What about other parts of Arctic Alaska?

Key sea-ice cycle stages/variables

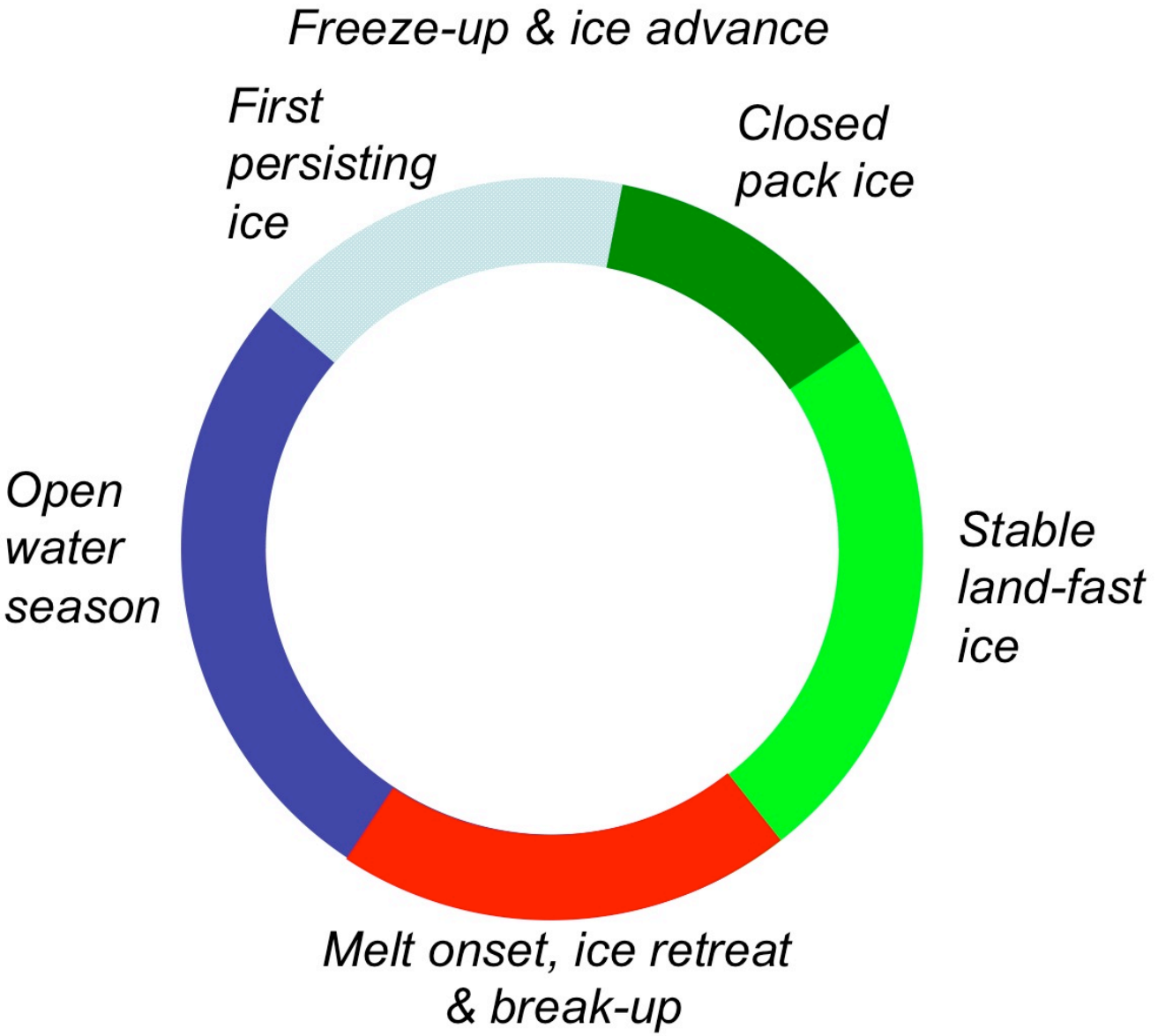
“Freeze-up start”

“Freeze-up end”

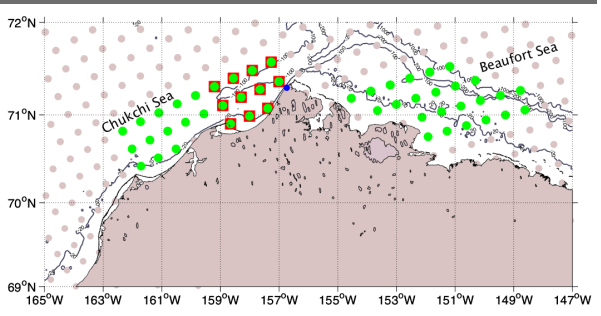
Shifts towards later freeze-up & reduced ice stability in northern Alaska

Billy Adams, Utqiaġvik, 9 January 2018:
"There is good ice till about 700 yards out then this young stuff that got left behind. So we will wait till it gets harder and thicker maybe in 1 week or so, then get back on and rebuild trails."

Key sea-ice cycle stages/variables



- Trend towards shorter ice season in coastal Chukchi & Beaufort Seas
- By mid-century only “transition season ice”?



Johnson & Eicken, Elementa, 2016

Sep 21
Sep 06
Aug 22
Aug 07
Jul 23
Jul 08
Jun 23
Jun 08
May 24
May 09
Apr 24
Apr 09
Mar 25
Mar 10
Feb 23
Feb 08
Jan 24
Jan 09
Dec 25
Dec 10
Nov 25
Nov 10
Oct 26
Oct 11
Sep 26
Sep 11

Break-up

std 30.2

Transition season ice regime

std 19

Freeze-up

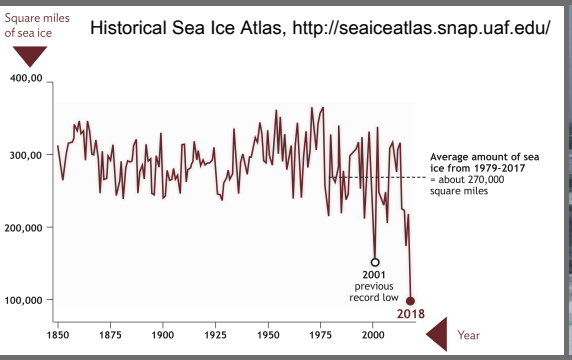
80 85 90 95 00 05 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 00 05 10 15 20

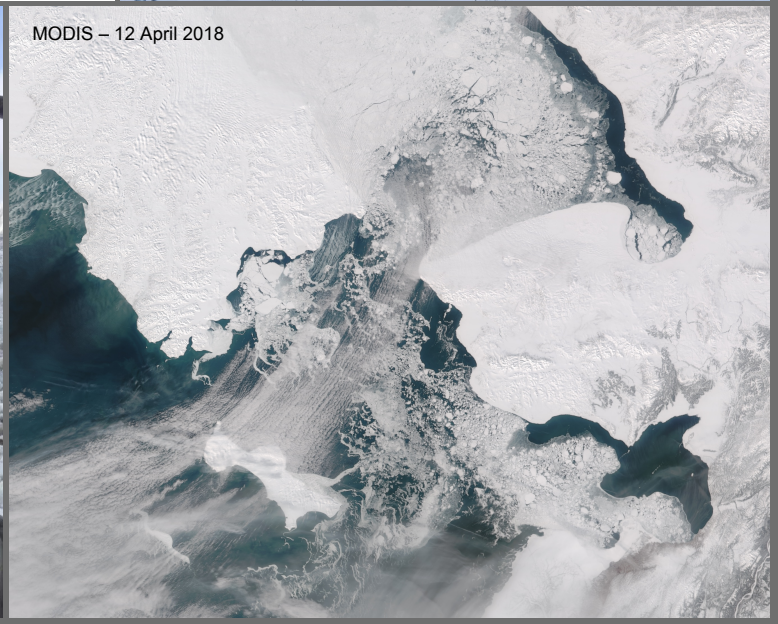
Year

Summary

- Winter 2017/18 had the lowest winter ice cover in the Bering Sea since more than a century and a half.
- A warmer ocean, stormier conditions with more winds from the South, and delayed freeze-up in the Chukchi Sea all contributed.
- This year was extreme, but it is part of a long-term trend of reduced winter/spring ice cover.
- There will continue to be a lot of variations from year to year.

Bering & Chukchi Sea ice in winter of 2017/18





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Survey questions

- Was sea ice at your community this winter the lowest that you have ever observed (if you typically get sea ice in winter)?
- Did this winter's ice conditions (sea ice, river ice, lake ice) present challenges in your community, for example by making travel over ice more hazardous?

Broader questions

- What have ice conditions been like at your community this year compared to the recent past? In particular, did you see any difference in the date of freeze-up, the date of formation and extent of land fast ice, and the type of ice near your community?
- Have there been impacts on subsistence activities, travel or safety from any differences in this year's ice conditions?
- Has the weather been similar to recent years this winter? Did you notice any difference in storm patterns, amount and type of precipitation (snow, rain), or air temperatures?
- Have there been any other unusual weather, ocean, or ice conditions or wildlife sightings and behavior at your community?