2012 Arctic Report Card

Data visualizations and graphics from the NOAA climate.gov team

http://www.climatewatch.noaa.gov/article/2012/2012-arctic-report-card

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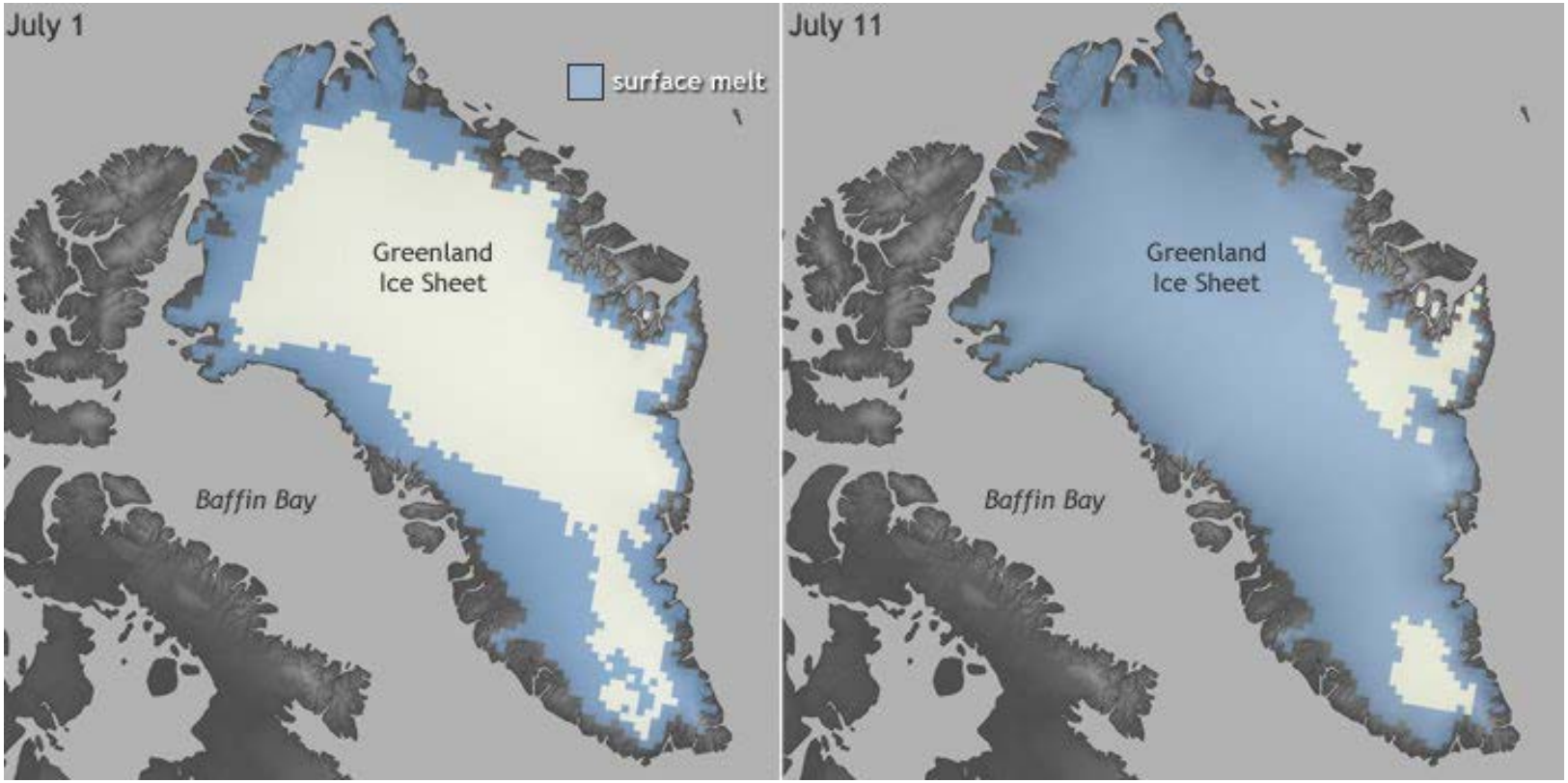
http://www.arctic.noaa.gov/reportcard

Widespread melting on Greenland

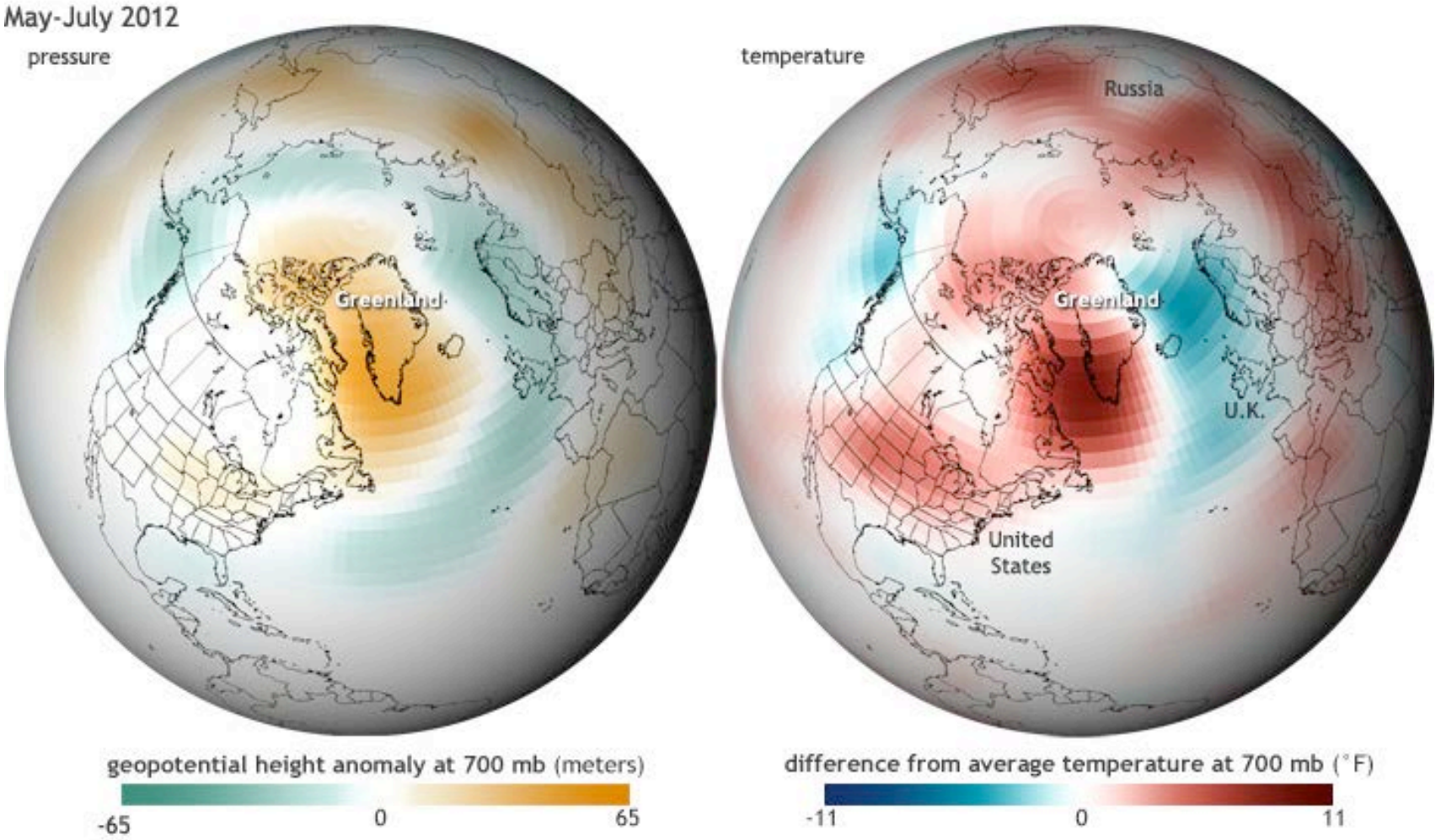


Surface melt in early & mid-July, 2012.

A rare, nearly ice-sheet-wide melt was recorded by satellites for the first time in 2012. The melt season was the longest it has been since satellite observations began in 1979.

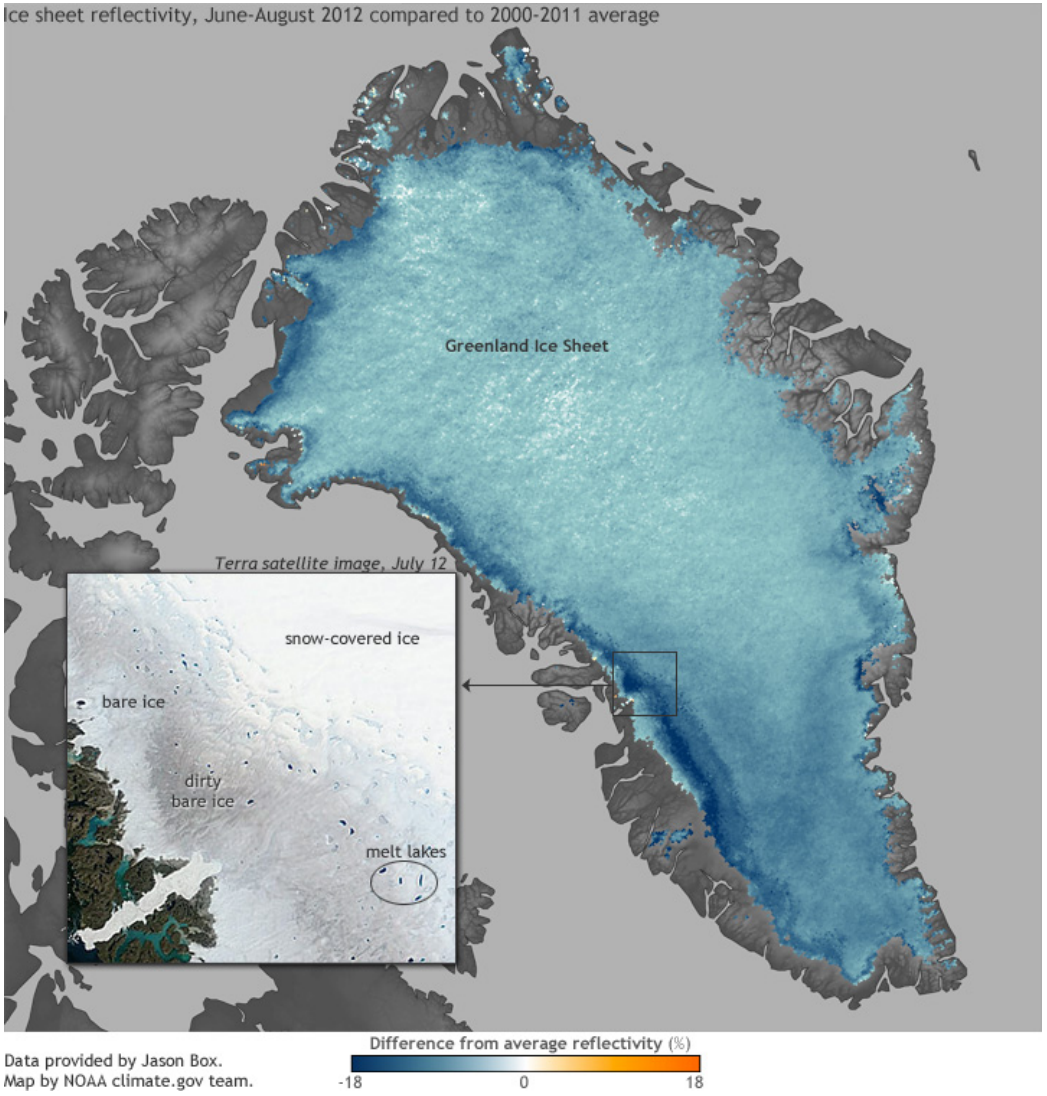
Melting ice contributes to sea level rise through direct, mass loss, and melt water can lubricate the underside of glaciers and accelerate glacier flow, further contributing to sea level rise. Surface melt changes the shape of ice and snow crystals, making them less reflective.

Summer weighed heavily on Greenland



The unusual melting event followed several months during which high pressure systems repeatedly parked over Greenland. High pressure generally leads to calm winds and sunny skies, both of which boost temperatures during the all-day sunshine of mid-summer at high latitudes.

Greenland Ice Sheet Getting Darker



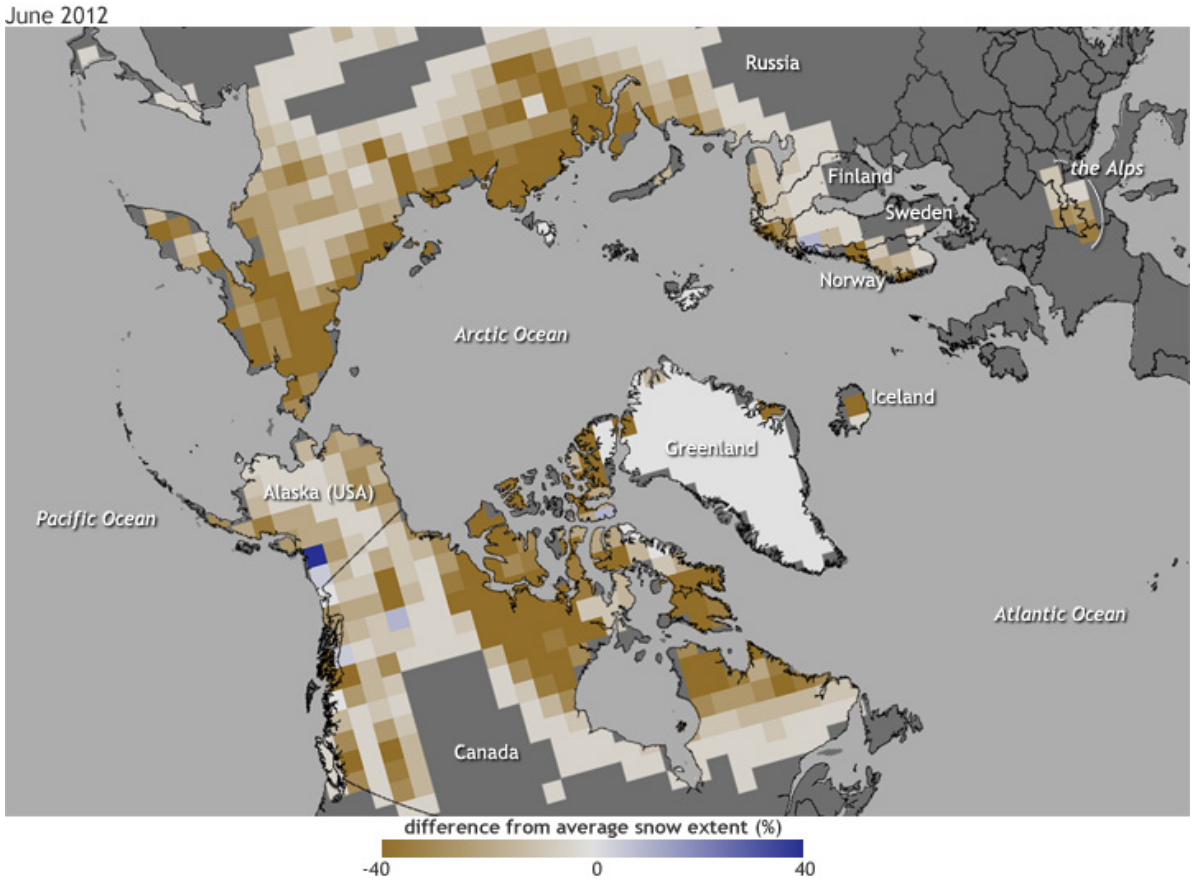
Percent sunlight reflected by Greenland Ice Sheet from June-August 2012, compared to 2001-2010.

The percent of sunlight reflected by the Greenland Ice Sheet in summer 2012 was the lowest it has been in more than a decade of observations.

The inset image from the SW coast shows the type of changes that cause darkening. Snow loss from the margins exposes bare ice, which contains soot, dust, and other dark particles.

The darkening of the ice sheet caused by warming is a self-reinforcing process. Darker ice reflects less sunlight, which accelerates warming and melting.

New record low June snow cover



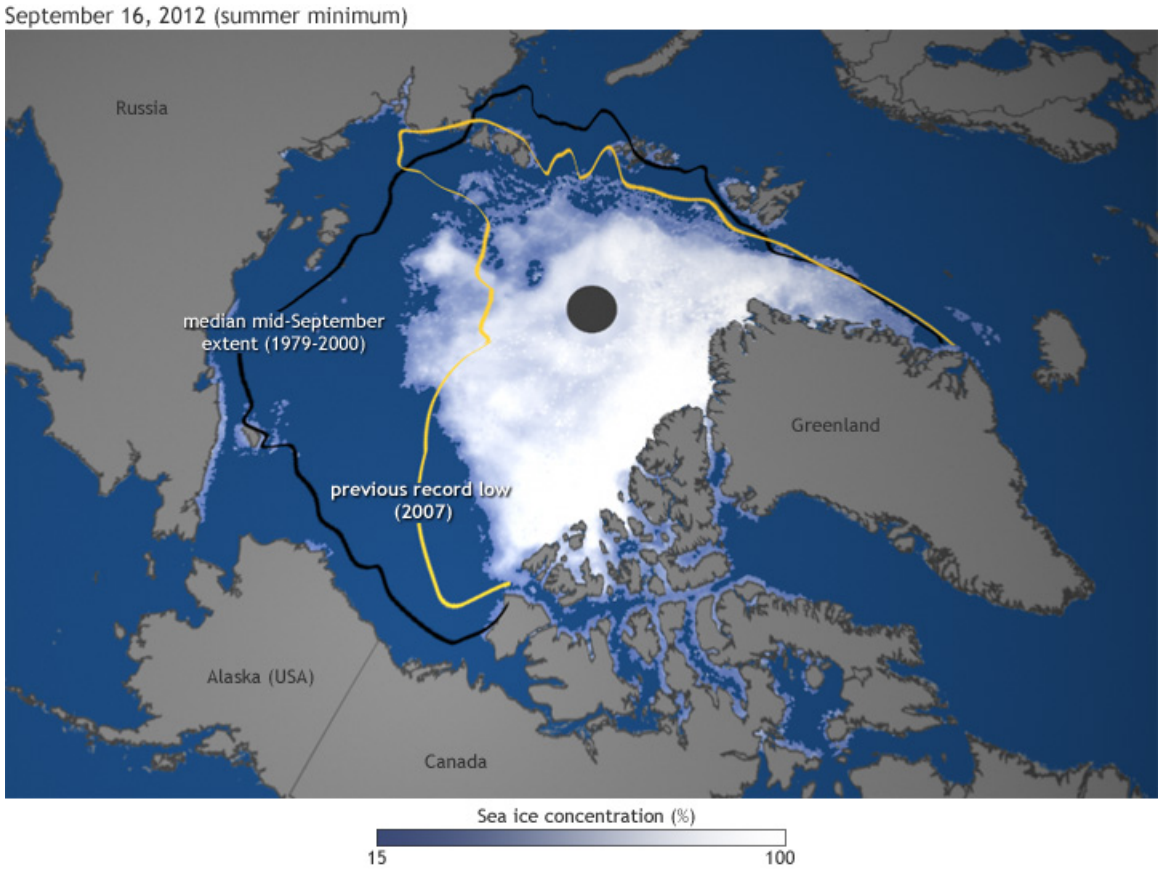
Difference from average snow cover extent in the Northern Hemisphere in June 2012 compared to 1971-2000.

Snow cover extent in both Eurasia and North America hit new record lows in June. It is the third time in five years that N. America has set a new record low, and the fifth year in a row that Eurasia has.

The rate of snow cover loss over Northern Hemisphere land areas in June between 1979 and 2012 is -17.6% per decade—a faster decline than sea ice loss.

Loss of spring snow cover affects the length of the growing season, the timing and dynamics of spring river runoff, permafrost thawing, and wildlife populations.

Arctic sea ice extent at summer minimum set new record low



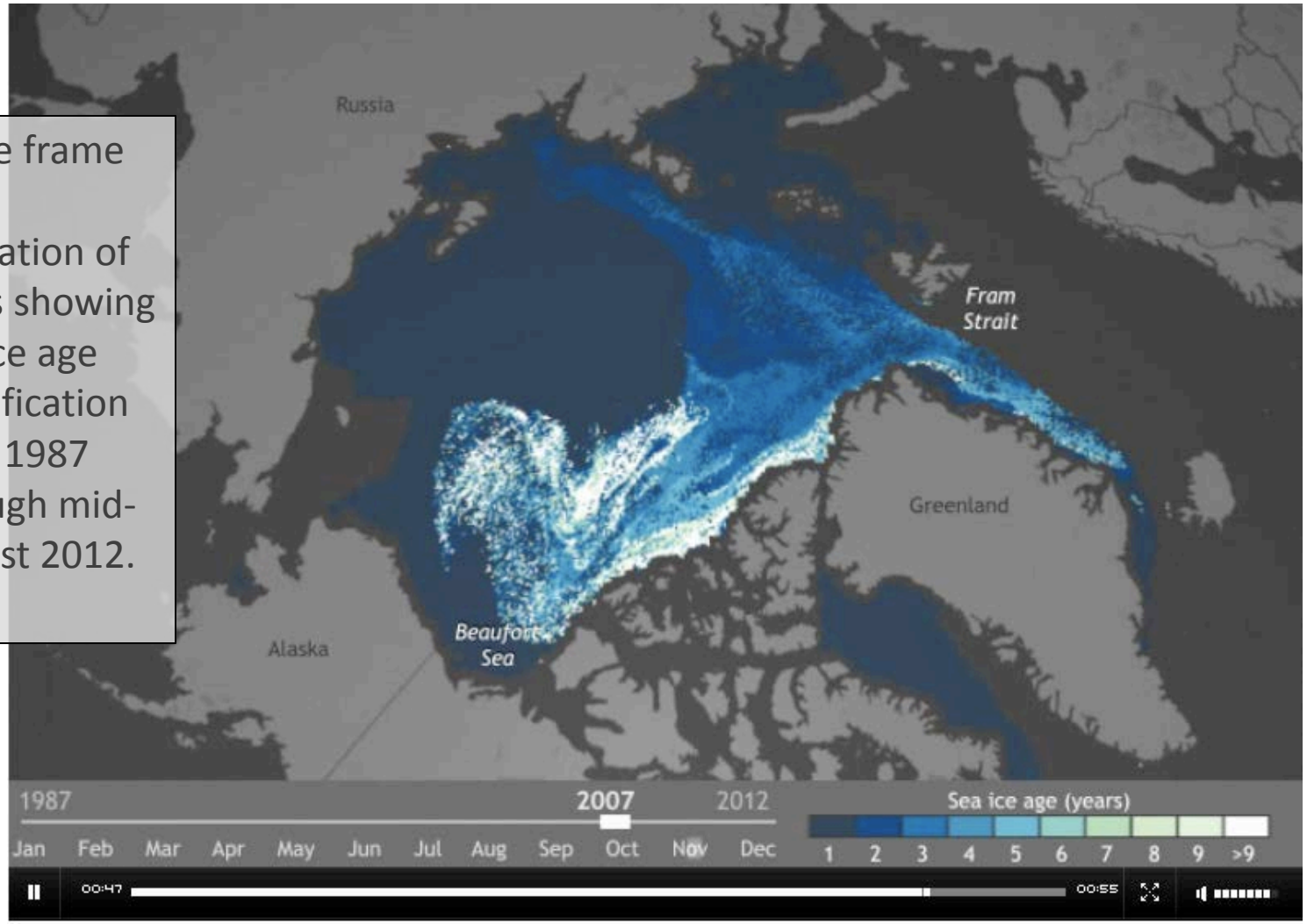
Sea ice extent on September 16, 2012.

Arctic sea ice reached its smallest extent of the year on September 16. At 1.3 million square miles (3.41 million sq. km), it was a new record low: **18% smaller** than the previous record low, and **49% below** the long term average (1979-2000).

The last six years have the six smallest minimum extents since satellite observations began in 1979. As the ice pack shrinks, the ocean absorbs more sunlight, and warming accelerates, causing more ice loss. Wind patterns, clouds, ocean currents, and ecosystems are being transformed.

Arctic Sea Ice Getting Thinner, Younger

Single frame from animation of maps showing sea ice age classification from 1987 through mid-August 2012.



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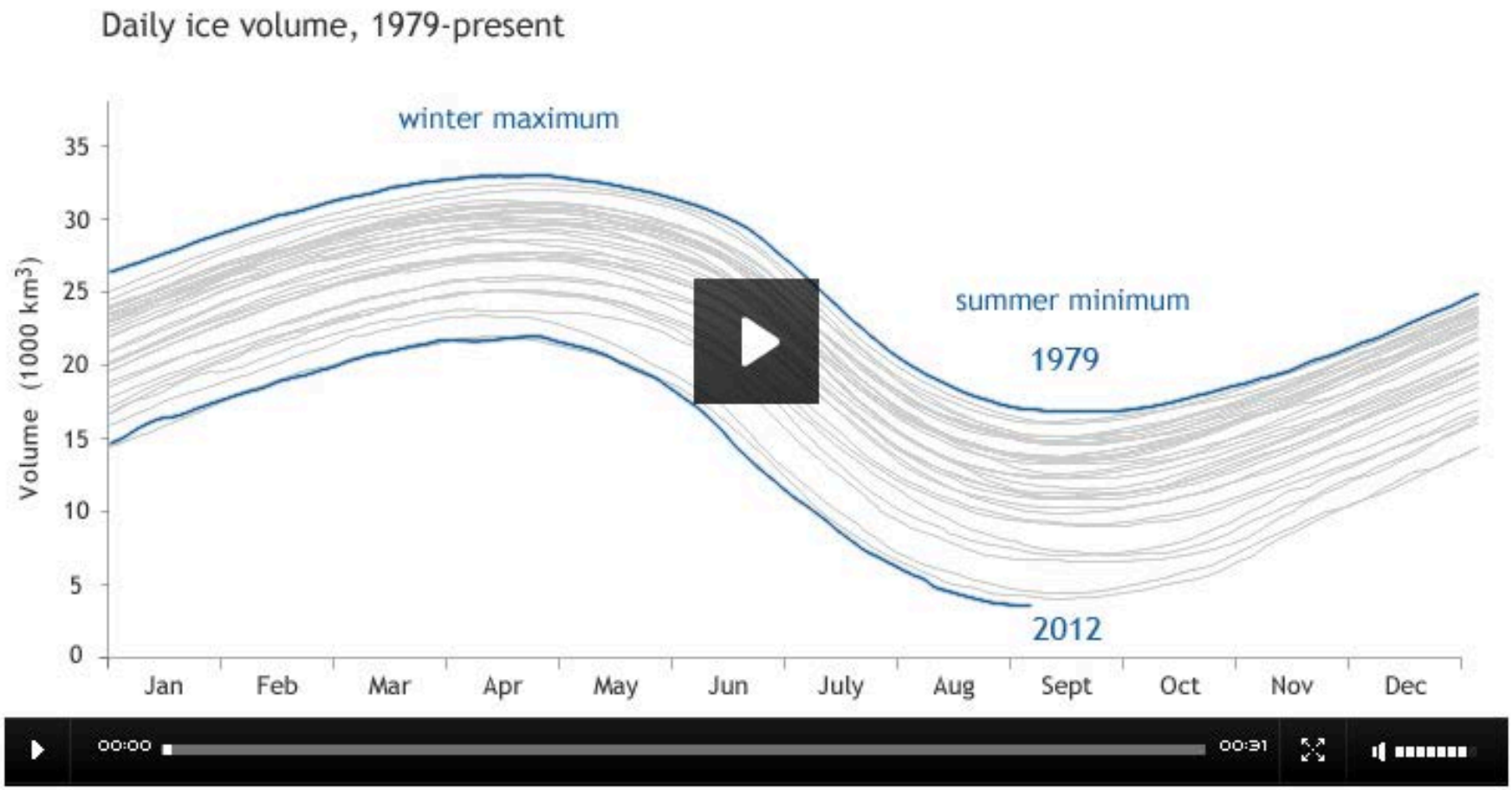
Arctic Sea Ice Getting Thinner, Younger



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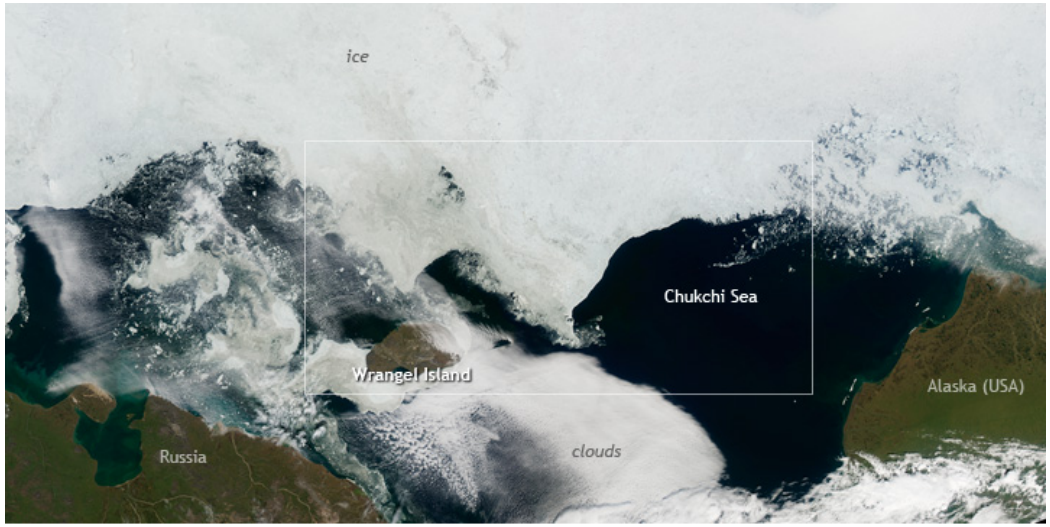
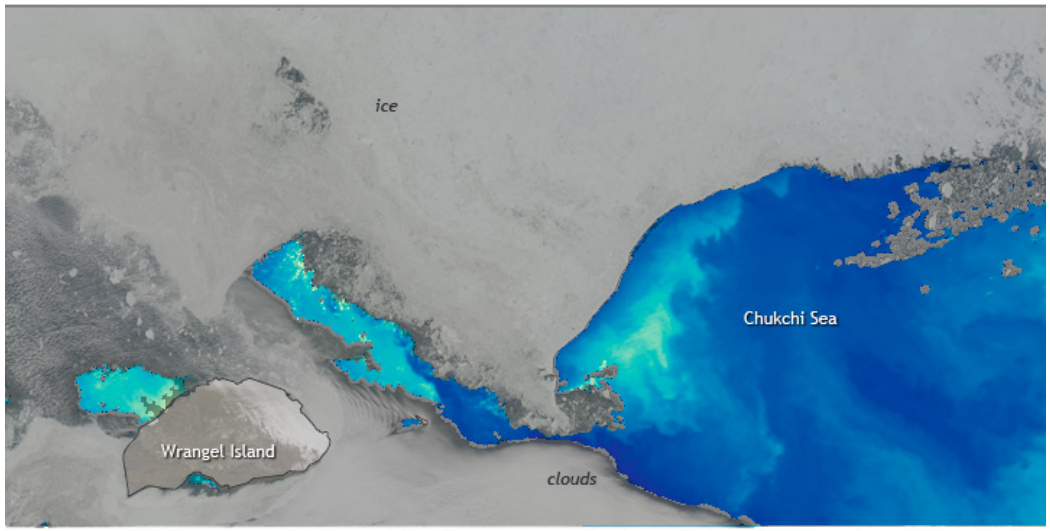
Massive under-ice blooms of phytoplankton observed in Chukchi Sea



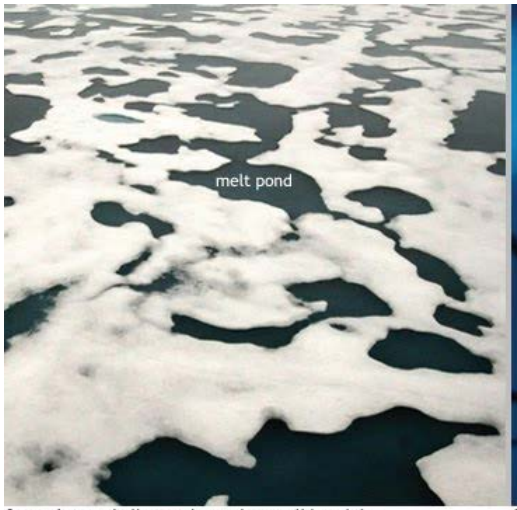


All around the Arctic, the sea ice edge is a hot spot for phytoplankton productivity each spring and summer.

The top satellite image is like a digital photo, and the bottom image shows chlorophyll concentrations (a sign that plant-like phytoplankton are present) in the surface waters of the Chukchi Sea on July 11, 2011.

High productivity at the ice edge is not unusual, but scientists at sea when this image was captured discovered **a massive bloom** reaching up to 100 kilometers ***under*** the ice.

Melt ponds on ice surface act as skylights



from above: shallow melt ponds on solid pack ice

from below: underwater "skylights" created by melt ponds

water color & clarity without bloom

water color & clarity during massive under-ice bloom

These photos were captured in July 2011 in the Chukchi Sea in the same vicinity of the previous satellite image.

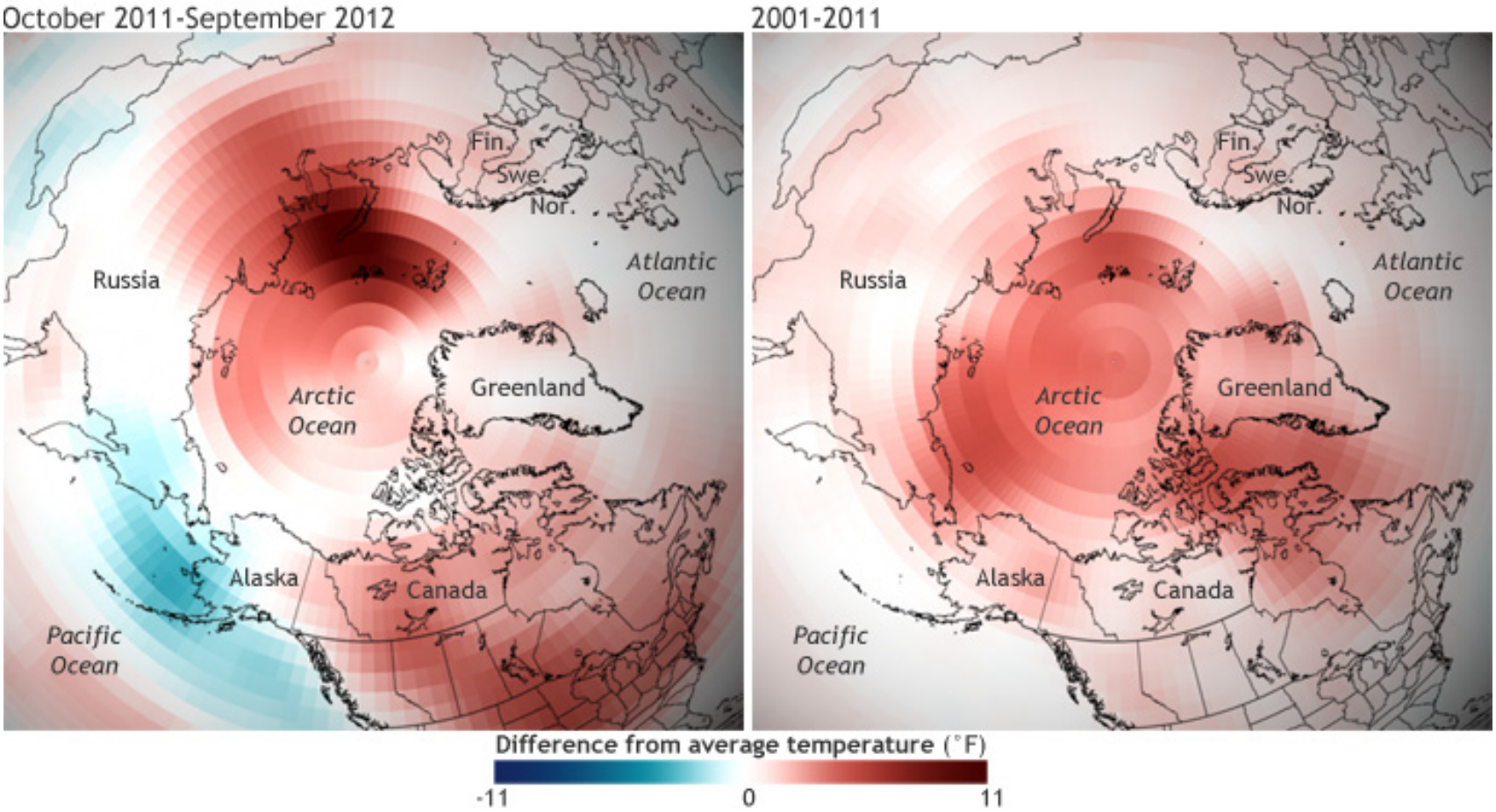
The top pair is like a set of negatives, showing how the melt ponds allow filtered light through the sea ice.

The bottom pair shows the water under the ice when a bloom is not present versus during the July 2011 bloom in the Chukchi Sea.

These under-ice blooms may increase estimates for Arctic phytoplankton productivity by tenfold.

Photos by Karen Frey.

Global warming is amplified in Arctic



From year to year, Arctic temperature patterns are strongly influenced by natural climate variability, with both cold and warm pockets.

Over the span of a decade, though, Arctic amplification of global warming is evident: no part of the Arctic was cooler than the long-term average.