

## 2013 wintertime Arctic sea ice maximum fifth lowest on record (w/ Video)

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(Phys.org) —Last September, at the end of the northern hemisphere summer, the Arctic Ocean's icy cover shrank to its lowest extent on record, continuing a long-term trend and diminishing to about half the size of the average summertime extent from 1979 to 2000.

During the cold and dark of Arctic [winter](#), [sea ice](#) refreezes and achieves its maximum extent, usually in late February or early March. According to a NASA analysis, this year the annual maximum extent was reached on Feb. 28 and it was the fifth lowest sea ice winter extent in the past 35 years.

The new maximum —5.82 million square miles (15.09 million square kilometers)— is in line with a continuing trend in declining winter [Arctic sea ice](#) extent: nine of the ten smallest recorded maximums have occurred during the last decade. The 2013 winter extent is 144,402 square miles (374,000 square kilometers) below the average annual maximum extent for the [last three decades](#).

"The [Arctic region](#) is in darkness during winter and the predominant type of radiation is long-wave or infrared, which is associated with [greenhouse warming](#)," said Joey Comiso, senior scientist at NASA Goddard Space Flight Center, Greenbelt, Md., and a principal investigator of NASA's Cryospheric Sciences Program. "A decline in the sea ice cover in winter is thus a manifestation of the effect of the increasing [greenhouse gases](#) on sea ice."

[Satellite data](#) retrieved since the late 1970s show that [sea ice extent](#), which includes all areas of the [Arctic Ocean](#) where ice covers at least 15 percent of the ocean surface, is diminishing. This decline is occurring at a much faster pace in the summer than in the winter; in fact, some models predict that the Arctic Ocean could be ice-free in the summer in just a few decades.

The behavior of the winter sea ice maximum is not necessarily predictive of the following melt season. The record shows there are times when an unusually large maximum is followed by an unusually low minimum, and vice versa.

"You would think the two should be related, because if you have extensive maximum, that means you had an unusually cold winter and that the ice would have grown thicker than normal. And you would expect thicker ice to be more difficult to melt in the summer," Comiso said. "But it isn't as simple as that. You can have a lot of other forces that affect the ice cover in the summer, like the strong storm we got in August last year, which split a huge segment of ice that then got transported south to warmer waters, where it melted."

The NASA Goddard sea ice record is one of several analyses, along with those produced by the National Snow and Ice Data Center (NSIDC) in Boulder, Colo. The two institutions use slightly different methods in their sea ice tally, but overall, their trends show close agreement. NSIDC announced that Arctic sea ice reached its winter maximum on Mar. 15, at an extent of 5.84 million square miles (15.13 million square kilometers) – a difference of less than half a percent compared to the NASA maximum extent.

Another measurement that allows researchers to analyze the evolution of the sea ice maximum is sea ice "area." The measurement of area, as opposed to extent, discards regions of open water among ice floes and

only tallies the parts of the Arctic Ocean that are completely covered by ice. The winter maximum area for 2013 was 5.53 million square miles (14.3 million square kilometers), also the fifth lowest since 1979.

While the extent of winter sea ice has trended downward at a less drastic rate than summer sea ice, the fraction of the sea ice cover that has survived at least two melt seasons remains much smaller than at the beginning of the satellite era. This older, thicker "multi-year ice" – which buttresses the ice cap against more severe melting in the summer – grew slightly this past winter and now covers 1.03 million square miles (2.67 million square kilometers), or about 39,000 square miles more than last winter. But its extent is still less than half of what it was in the early 1980s.

"I think the multi-year ice cover will continue to decline in the upcoming years," Comiso said. "There's a little bit of oscillation, so there still might be a small gain in some years, but it continues to go down and before you know it we'll lose the multi-year ice altogether."

This winter, the negative phase of the Arctic Oscillation kept temperatures warmer than average in the northernmost latitudes. A series of storms in February and early March opened large cracks in the ice covering the Beaufort Sea along the northern coasts of Alaska and Canada, in an area of thin seasonal ice. The large cracks quickly froze over, but these new layers of thin ice might melt again now that the sun has re-appeared in the Arctic, which could split the ice pack into smaller ice floes.

"If you put a large chunk of ice in a glass of water, it is going to melt slowly, but if you break up the ice into small pieces, it will melt faster," said Nathan Kurtz, a sea ice scientist at NASA Goddard. "If the ice pack breaks up like that and the melt season begins with smaller-sized floes, that could impact melt."

In the upcoming weeks, Kurtz will analyze data collected over the Beaufort Sea by NASA's Operation IceBridge, an airborne mission that is currently surveying Arctic sea ice and the Greenland ice sheet, to see if the sea ice in the cracked area was abnormally thin.

The sea ice maximum extent analysis produced at NASA Goddard is compiled from passive microwave data from NASA's Nimbus-7 satellite and the U.S. Department of Defense's Defense Meteorological Satellite Program. The record, which began in November 1978, shows an overall downward trend of 2.1 percent per decade in the size of the maximum winter extent, a decline that accelerated after 2004.

Provided by NASA's Goddard Space Flight Center

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