Arctic sea ice continues decline as temperatures rise

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New satellite records monitored by a national team of collaborators show a four-year pattern of extremely low summer sea-ice coverage in the Arctic that continued in September 2005, which may be the result of warming temperatures and earlier spring melting.

Since 2002, the satellite data have revealed unusually early springtime melting in areas north of Siberia and Alaska. In 2005, the trend expanded to include the entire Arctic ice pack, said Ted Scambos of CU-Boulder's National Snow and Ice Data Center, which led the study that also involved NASA and the University of Washington.

The research group used the satellite record -- dating back to 1978 -- to determine that the 2005 spring and summer melting began about 17 days earlier than usual, a new record. Average air temperatures across most of the Arctic Ocean from January to August 2005 were between 3.6 degrees F and 5.4 degrees F warmer than average compared to the last 50 years, said the team.

The conditions were followed by the lowest sea-ice extent yet seen in the satellite data, a five-day mean average of 2.06 million square miles on Sept. 19. The team reported the extent was lower than the mean average September sea-ice extent from 1978 to 2001 by about 20 percent, or 500,000 square miles, an area about twice the size of Texas.

"Since the 1990s, The melting and retreat trends are accelerating," said Scambos. "And the one common thread is that Arctic temperatures over

the ice, ocean and surrounding land have increased in recent decades."

The study was spearheaded by CU-Boulder's NSIDC and involved NASA's Goddard Space Flight Center in Greenbelt, Md., NASA's Jet Propulsion Laboratory in Pasadena and the University of Washington in Seattle. NSIDC is part of the Cooperative Institute for Research in Environmental Sciences, or CIRES, a joint program of CU-Boulder and the National Oceanic and Atmospheric Administration.

The winter of 2004-2005 exhibited the smallest recovery of Arctic sea ice of any previous winter in the 23-year satellite record, the group reported. With the exception of May 2005, every month since November 2004 has exhibited the lowest monthly average of sea-ice extent since satellite record-keeping began in the region.

Although sea-ice records prior to 1978 are comparatively sparse, they imply the recent decline exceeds previous sea-ice lows, said Julienne Stroeve of CU-Boulder's NSIDC. "Considering the record-low amounts of sea-ice this year leading up to the month of September, 2005 could surpass 2002 as the lowest amount of sea-ice cover in more than a century," she said.

Arctic sea ice typically reaches a minimum in September at the end of the summer melt season. The trend of Arctic sea ice decline documented by satellites is now about 8.4 percent per decade since the 1970s, the group reported.

Scientists believe the Arctic Oscillation, a major atmospheric circulation pattern that can push sea ice out of the Arctic, may have contributed to the sea-ice reduction in the mid-1990s by making it more vulnerable to summertime melt, said CU-Boulder's Mark Serreze of NSIDC. While the pattern has become less of an influence on the region since the late 1990s, the sea ice has continued to decline.

"Something has fundamentally changed here, and the best answer is warming," Serreze said.

The decline is likely to affect future temperatures in the Arctic, since ice acts as a cooling mechanism to reflect most of the sun's radiation back into space, Scambos said. As sea ice melts, larger areas of darker ocean decrease the amount of solar energy reflected away from Earth.

"Feedbacks in the system are starting to take hold," Scambos said. "The consecutive record-low extents make it pretty certain a long-term decline is underway."

Arctic sea ice consists of both annual ice and multi-year ice. The multi-year ice has been declining at almost 10 percent per decade, said Florence Fetterer of CU-Boulder's NSIDC. While a recovery of multi-year ice would require sustained cooling in the Arctic, especially during the summer months, climate models predict continued Arctic warming, she said.

Source: University of Colorado at Boulder