Arctic ice at low point compared to recent geologic history

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Leonid Polyak

Less ice covers the Arctic today than at any time in recent geologic history. That's the conclusion of an international group of researchers, who have compiled the first comprehensive history of Arctic ice.

For decades, scientists have strived to collect sediment cores from the difficult-to-access Arctic Ocean floor, to discover what the Arctic was like in the past. Their most recent goal: to bring a long-term perspective to the ice loss we see today.

Now, in an upcoming issue of *Quarternary Science Reviews*, a team led by Ohio State University has re-examined the data from past and ongoing studies -- nearly 300 in all -- and combined them to form a big-

picture view of the pole's climate history stretching back millions of years.

"The ice loss that we see today -- the ice loss that started in the early 20th Century and sped up during the last 30 years -- appears to be unmatched over at least the last few thousand years," said Leonid Polyak, a research scientist at Byrd Polar Research Center at Ohio State University. Polyak is lead author of the paper and a preceding report that he and his coauthors prepared for the U.S. Climate Change Science Program.

Satellites can provide detailed measures of how much ice is covering the pole right now, but sediment cores are like fossils of the ocean's history, he explained.

"Sediment cores are essentially a record of sediments that settled at the sea floor, layer by layer, and they record the conditions of the ocean system during the time they settled. When we look carefully at various chemical and biological components of the sediment, and how the sediment is distributed -- then, with certain skills and luck, we can reconstruct the conditions at the time the sediment was deposited."

For example, scientists can search for a biochemical marker that is tied to certain species of algae that live only in ice. If that marker is present in the sediment, then that location was likely covered in ice at the time. Scientists call such markers "proxies" for the thing they actually want to measure -- in this case, the geographic extent of the ice in the past.

While knowing the loss of surface area of the ice is important, Polyak says that this work can't yet reveal an even more important fact: how the total volume of ice -- thickness as well as surface area -- has changed over time.

"Underneath the surface, the ice can be thick or thin. The newest satellite techniques and field observations allow us to see that the volume of ice is shrinking much faster than its area today. The picture is very troubling. We are losing ice very fast," he said.

"Maybe sometime down the road we'll develop proxies for the ice thickness. Right now, just looking at ice extent is very difficult."

To review and combine the data from hundreds of studies, he and his cohorts had to combine information on many different proxies as well as modern observations. They searched for patterns in the proxy data that fit together like pieces of a puzzle.

Their conclusion: the current extent of Arctic ice is at its lowest point for at least the last few thousand years.

As scientists pull more sediment cores from the Arctic, Polyak and his collaborators want to understand more details of the past ice extent and to push this knowledge further back in time.

During the summer of 2011, they hope to draw cores from beneath the Chukchi Sea, just north of the Bering Strait between Alaska and Siberia. The currents emanating from the northern Pacific Ocean bring heat that may play an important role in melting the ice across the Arctic, so Polyak expects that the history of this location will prove very important. He hopes to drill cores that date back thousands of years at the Chukchi Sea margin, providing a detailed history of interaction between oceanic currents and ice.

"Later on in this cruise, when we venture into the more central Arctic Ocean, we will aim at harvesting cores that go back even farther," he said. "If we could go as far back as a million years, that would be perfect."

More information: *Quarternary Science Reviews* - www.elsevier.com/wps/find/jour … cription#description

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