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New study blames human beings for half of Arctic ice melt

Richard Mauer | Anchorage Daily News

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ANCHORAGE — About half the recent record loss of Arctic sea ice can be blamed on global warming caused by human activity, according to a new study by scientists from the nation's leading climate research center.

The peer-reviewed study, funded by the National Science Foundation is the first to attribute a specific proportion of the ice melt to greenhouse gases and particulates from pollution.

The study used supercomputers and one of the world's most sophisticated climate models to reach its conclusions, said lead author Jennifer Kay, a staff scientist at the National Center for Atmospheric Research in Boulder, Colo. The paper was published last week in the scientific journal *Geophysical Research Letters*.

Kay said her study was an attempt to learn how much Arctic Ocean melting can be attributed to "natural variability" - complex changes wrought by nonhuman forces - and how much has been caused by greenhouse gases such as carbon dioxide and by atmospheric particulates.

In doing so, she was also able to look ahead to future annual and decade-long fluctuations. She and the other authors said conditions will become more volatile from year to year. That means there will be years and perhaps decades when the ice pack expands. But the trend is in the other direction.

"There's no doubt about it - sea ice is going away," she said. "What we found was that about half of that trend is related to the increasing greenhouse gases." The other half of the sea-ice loss, as observed over the late 20th century, was "just related to variability in the system."

The study comes at an important time as public policy and climate change intersect in Alaska and elsewhere in the North. The reduction of the ice pack is already opening Arctic waters to transportation, development and military activities. The NCAR study says that the melting of the ice pack is no short-term fluke but an actual change in climate.

The study could also come into play in the current legal and political fight over the federal government's listing of polar bears as a threatened species. The U.S. Fish and Wildlife Service listed polar bears on the assumption the loss of sea ice - an essential part of their habitat - would soon have dramatic effects on their survival.

The state and others sued, claiming in part that the earlier modeling that predicted sea-ice loss was flawed and that the listing would needlessly hinder development.

On the other side, environmentalists wanted more restrictions than the federal government proposed, including reductions in Lower 48 greenhouse gas emissions to forestall the death of the ice pack.

In the study, the authors said earlier research determined that greenhouse gases were responsible for some loss of sea ice, but no one had been able to firmly establish how big a part they played.

Kay said the climate model she chose, Community Climate System Model version 4, had been developed by teams of scientists over several decades. She ran 4,000 years' worth of data through the model, a period when volcanoes, solar variations and other factors were known or believed to have forced climate changes.

The scientists placed extra focus on the years since 1979, when satellite images became available to determine the extent of sea-ice depletion.

The model accurately "predicted" what actually occurred historically, validating the method, she said.

But more to the point, by replaying the climate forces of the 20th century over and over through the model, the scientists were able to show that variability can account for only half the loss of ice, she said.

That means that if humans were still only hunters and gatherers, sea ice might have retreated anyway over the past 30 years.

But what made the loss of ice a record? Kay said it was centuries of carbon emissions and other human-caused changes to the atmosphere. Those pollutants prevent solar heat from radiating back into space, creating the "greenhouse effect."

Had variability instead trended in the opposite direction over the past 30 years - toward growing the ice pack - the model showed that the addition of greenhouse gasses would have prevented the ice pack from thickening. The variability would have masked the greenhouse effect for a period of time - the ice wouldn't have shrunk, but it also wouldn't have grown, she said.

As for the future, with the climate warming and the Arctic ice thinning still further, you can throw away the term "natural variability," she said. "Where heavy sea ice once tended to dampen climate variability, that natural climate is gone. With the ice pack reduced, she said, year-to-year and decade-to-decade volatility increases.

"Our work really demonstrates that the variability in the climate model simulations is not entirely natural by the end of the 20th century," she said. "That's why we call it in the paper, 'internal variability.' We're in a warmer state now, so we have different variability than we did before when it was just natural variability."