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Study Says Undersea Release of Methane Is Under Way

By CORNELIA DEAN

Climate scientists have long warned that global warming could unlock vast stores of the greenhouse gas methane that are frozen into the Arctic permafrost, setting off potentially significantly increases in global warming.

Now researchers at the University of Alaska, Fairbanks, and elsewhere say this change is under way in a little-studied area under the sea, the East Siberian Arctic Shelf east of the Bering Strait.

Natalia Shakhova, a scientist at the university and a leader of the study, said it was too soon to say whether the findings suggest that a dangerous release of methane looms. In a telephone news conference, she said researchers are only beginning to track the movement of this methane into the atmosphere as the undersea permafrost that traps it degrades.

But climate experts familiar with the new research, reported in Friday's issue of the journal Science, said that even though it does not suggest imminent climate catastrophe, it is important because of methane's role as a greenhouse gas. Although carbon dioxide is a far more abundant and persistent in the atmosphere, ton for ton atmospheric methane traps at least 25 times as much heat.

Until recently, undersea permafrost has been little studied, but work so far shows it is already sending surprising amounts of methane into the atmosphere, Dr. Shakhova and other researchers are finding.

Last year, scientists from Britain and Germany reported that they had detected plumes of methane rising from the Arctic seabed in the West Spitbergen area, north of Scandinavia. At the time, they said they began their work hoping to gain data to predict future emissions and did not expect to find evidence that the process was already under way.

It is "indispensable" to keep track of methane in the region, Martin Heimann of the Max Planck Institute in Germany said in a commentary accompanying the Science report. So far, he said, methane contributions from Arctic permafrost have been "negligible," he wrote. "But will this persist into the future under sustained warming trends? We do not know."

In an e-mail message, Euan Nisbet of the University of London, an expert on atmospheric methane, said the situation "needs to be watched carefully."

Atmospheric concentrations of methane have more than doubled since pre-industrial times, Dr. Heimann wrote. Most of it comes from human activities including energy production cattle raising and the cultivation of rice. But about 40 percent is natural, including the decomposition of organic materials in wetlands and frozen wetlands like permafrost.

In a telephone news conference on Wednesday, Dr. Shakhova said that permafrost in the East Siberian Arctic Shelf, peatland that flooded as sea levels rose after the last ice age, is degrading in part because runoff from rivers that feed the Arctic Ocean is warmer than it has been in the past.

She estimated that annual methane emissions from the East Siberian Arctic Shelf now total about 7 teragrams. (A teragram is 1.1 million tons.) By some estimates, global methane emissions total about 500 teragrams per year.

Dr. Shakhova, who is also affiliated with the Russian Academy of Sciences, said that undersea methane ordinarily undergoes oxidation as it rises to the surface, where it is released as carbon dioxide. But because water over the shelf at most about 50 meters deep, she said, the gas bubbles to the surface there as methane.

As a result, she said, atmospheric levels of methane over the Arctic are 1.85 parts per million, almost three times as high as the global average of 0.6 or 0.7 parts per million. Concentrations over the shelf are 2 parts per million or higher.

But, "I am not the person to judge" whether the Arctic findings suggest that estimates of climate change in coming decades should be rewritten, she added.

"I would not go so far as to suggest any implications," she said. "We are at the very beginning of research."

Andrew C. Revkin contributed reporting.