

## **Nervous scientists wary of giant craters in Siberia**

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Svdnev Mornino Herald

Researchers say the mysterious craters could be linked to climate change as methane gas is released from the thawing permafrost, causing underground explosions.

In the middle of last summer came news of a bizarre occurrence no one could explain.

Seemingly out of nowhere, a massive crater appeared in one of the planet's most inhospitable lands. Early estimates said the crater, nestled in a land called "the ends of the Earth" where temperatures can sink far below zero, yawned nearly 30 metres in diameter.

The saga deepened. The Siberian crater wasn't alone. There were two more, ratcheting up the tension in a drama that hit its climax as a probable explanation surfaced. Climate change had thawed the permafrost, which had caused methane trapped inside the icy ground to explode. "Gas pressure increased until it was high enough to push away the overlying layers in a powerful injection, forming the crater," one German scientist said at the time.

Now, however, researchers fear there are more craters than anyone knew — and the repercussions could be huge. Russian scientists have now spotted a total of seven craters, five of which are in the Yamal Peninsula. Two of those holes have since turned into lakes. And one giant crater is rimmed by a ring of at least 20 mini-craters, [the Siberian Times reported](#). Dozens more Siberian craters are likely still out there, said Moscow scientist Vasily Bogoyavlensky of the Oil and Gas Research Institute, calling for an "urgent" investigation.

He fears that if temperatures continue to rise — and they were five degrees higher than average in 2012 and 2013 — more craters will emerge in an area awash in gas fields vital to the national economy.

"It is important not to scare people, but to understand that it is a very serious problem and we must research this," [he told](#) the Siberian Times. "We must research this phenomenon urgently, to prevent possible disasters."

One potential disaster relates to the explosions themselves. No one has been hurt in any of the blasts, but given the size of some of the craters, it's fair to say the methane bursts are huge. Researchers are nervous about even studying them. Who knows when a methane geyser will shoot off again?

"These objects need to be studied, but it is rather dangerous for the researchers," Bogoyavlensky [told](#) the Siberian Times.

"We know that there can occur a series of gas emissions over an extended period of time, but we do not know exactly when they might happen. ... It is very risky, because no one can guarantee there would not be new emissions."

Making matters worse, the gas is extremely flammable. One of the methane bursts has already caught fire. Nearby residents in a town called Antipayuta say they recently saw a bright flash in the distance. "Probably the gas ignited," Bogoyavlensky said. "This shows us that such [an] explosion could be rather dangerous and destructive. Years of experience has shown that gas emissions can cause serious damage to drilling rigs, oil and gas fields and offshore pipelines."

Of particular interest is the Siberian crater B2. Since its emergence, only 10 kilometres away from Bovanenkovo, a major Gazprom gas field, it has turned into a lake. But even now, photographs show, there are wisps of methane. The crater, covered by water, is still leaking gas. "This haze that you see on the surface show that gas seeps that go from the bottom of the lake to the surface," Bogoyavlensky [told the Siberian Times](#). "We call this process 'degassing'."

So, to recap: Siberia is warming. Permafrost thaws and spews methane, and blasts out a burst of highly flammable gas. Who could have guessed climate change would do all of that?

"No one knows what is happening in these craters at the moment," Bogoyavlensky said. "We plan a new expedition."

**-Washington Post**

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## Methane bubbles climate trouble





Methane bubbles can be trapped in ice during the autumn freeze

**Thawing Siberian bogs are releasing more of the greenhouse gas methane than previously believed, according to new scientific research.** Scientists from Russia and the US measured methane bubbling from a number of thawing lakes.

Writing in the journal *Nature*, they suggest the methane release is hastened by warmer temperatures, positively feeding back into global warming.

Methane's contribution to present-day global warming is second only to CO<sub>2</sub>.

The Intergovernmental Panel on Climate Change (IPCC) estimates that atmospheric concentrations are about two and a half times those seen in pre-industrial times.

“ **Methane flux from thaw lakes in our study region may be five times greater than previously estimated** ”

Katey Walker and colleagues

"Thaw lakes in north Siberia are known to emit methane, but the magnitude of these emissions remains uncertain," the scientists write.

"We show that methane flux from thaw lakes in our study region may be five times greater than previously estimated."

The lakes are produced in summers when land which is usually permanently frozen - permafrost - melts.

#### **Bubble traps**

The study depended on the systematic deployment of bubble traps on two lakes in the Cherskii region of Siberia, supplemented by ground-based and aerial observations of a further 95 lakes.

Katey Walker from the University of Alaska at Fairbanks and her colleagues calculate that across the region, thaw lakes emit 3.8 teragrams (Tg, million million grams) per year.

#### **ARCTIC PERMAFROST**



SOURCE: Arctic Council ACIA

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The contribution of these lakes is small compared to the IPCC estimate of total global methane production, 600 Tg per year.

More than half of this total comes from human activities, notably farming.

The importance of the Siberian release may lie in the relationship between warming and methane production.

If a high release rate of a greenhouse gas is being triggered by rising temperatures, that will in turn stimulate still higher temperatures - a positive feedback mechanism.

Extra context comes from the age of the emerging gas. Using radiocarbon techniques, the researchers showed that some of the escaping methane molecules had been formed more than 40,000 years ago.

The area of the planet covered by permafrost is projected to shrink as the surface warms.

Boreholes in permafrost in Svalbard, Norway, indicate that ground temperatures rose 0.4C over the past decade, four times faster than they did in the previous century.