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Leaking Siberian ice raises a tricky climate issue

AP Associated Press

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By ARTHUR MAX, Associated Press – Mon Nov 22, 12:00 am ET

CHERSKY, Russia – The Russian scientist shuffles across the frozen lake, scuffing aside ankle-deep snow until he finds a cluster of bubbles trapped under the ice. With a cigarette lighter in one hand and a knife in the other, he lances the ice like a blister. Methane whooshes out and bursts into a thin blue flame.

Gas locked inside Siberia's frozen soil and under its lakes has been seeping out since the end of the last ice age 10,000 years ago. But in the past few decades, as the Earth has warmed, the icy ground has begun thawing more rapidly, accelerating the release of methane — a greenhouse gas 23 times more powerful than carbon dioxide — at a perilous rate.

Some scientists believe the thawing of permafrost could become the epicenter of climate change. They say 1.5 trillion tons of carbon, locked inside icebound earth since the age of mammoths, is a climate time bomb waiting to explode if released into the atmosphere.

"Here, total carbon storage is like all the rain forests of our planet put together," says the scientist, Sergey Zimov — "here" being the endless sweep of snow and ice stretching toward Siberia's gray horizon, as seen from Zimov's research facility nearly 350 kilometers (220 miles) above the Arctic Circle.

Climate change moves back to center-stage on Nov. 29 when governments meet in Cancun, Mexico, to try again to thrash out a



AP – In this Oct. 23, 2010 photo, Russian scientist Sergey Zimov walks on a Siberian lake near the town of ...

Slideshow: Climate Change Issues

course of counteractions. But U.N. officials hold out no hope the two weeks of talks will lead to a legally binding accord governing carbon emissions, seen is the key to averting what is feared might be a dramatic change in climate this century.

Most climate scientists, with a few dissenters, say human activities — the stuff of daily life like driving cars, producing electricity or raising cattle — is overloading the atmosphere with carbon dioxide, methane and other gases that trap heat, causing a warming effect.

But global warming is amplified in the polar regions. What feels like a modest temperature rise is enough to induce Greenland glaciers to retreat, Arctic sea ice to thin and contract in summer, and permafrost to thaw faster, both on land and under the seabed.

Yet awareness of methane leaks from permafrost is so new that it was not even mentioned in the seminal 2007 report by the Intergovernmental Panel on Climate Change, which warned of rising sea levels inundating coastal cities, dramatic shifts in rainfall disrupting agriculture and drinking water, the spread of diseases and the extinction of species.

"In my view, methane is a serious sleeper out there that can pull us over the hump," said Robert Corell, an eminent U.S. climate change researcher and Arctic specialist. Corell, speaking by telephone from a conference in Miami, said he and other U.S. scientists are pushing Washington to deploy satellites to gather more information on methane leaks.

The lack of data over a long period of time casts uncertainty over the extent of the threat. An article last August in the journal Science quoted several experts as saying it's too early to predict whether Arctic methane will be the tipping point.

"Arctic Armageddon Needs More Science, Less Hype," was its headline.

Studies indicate that cold-country dynamics on climate change are complex. The Arctic Monitoring and Assessment Program, a scientific body set up by the eight Arctic rim countries, says overall the Arctic is

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absorbing more carbon dioxide than it releases.

"Methane is a different story," said its 2009 report. The Arctic is responsible for up to 9 percent of global methane emissions. Other methane sources include landfills, livestock and fossil fuel production.

Katey Walter Anthony, of the University of Alaska Fairbanks, has been measuring methane seeps in Arctic lakes in Alaska, Canada and Russia, starting here around Chersky 10 years ago.

She was stunned to see how much methane was leaking from holes in the sediment at the bottom of one of the first lakes she visited. "On some days it looked like the lake was boiling," she said. Returning each year, she noticed this and other lakes doubling in size as warm water ate into the frozen banks.

"The edges of the lake look like someone eating a cookie. The permafrost gets digested in the guts of the lake and burps out as methane," she said in an interview in Amsterdam, the Netherlands, en route to a field trip in Greenland and Scandinavia.

More than 50 billion tons could be unleashed from Siberian lakes alone, more than 10 times the amount now in the atmosphere, she said.

But the rate of defrosting is hard to assess with the data at hand.

"If permafrost were to thaw suddenly, in a flash, it would put a tremendous amount of carbon in the atmosphere. We would feel temperatures warming across the globe. And that would be a big deal," she said. But it may not happen so quickly. "Depending on how slow permafrost thaws, its effect on temperature across the globe will be different," she said.

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Permafrost is defined as ground that has stayed below freezing for more than two consecutive summers. In fact, most of Siberia and the rest of the Arctic, covering one-fifth of the Earth's land surface, have been frozen for millennia.

During the summer, the ground can defrost to a depth of several feet, turning to sludge and sometimes blossoming into vast fields of grass and wildflowers. Below that thin layer, however, the ground remains frozen, sometimes encased in ice dozens or even hundreds of meters (yards) thick.

As the Earth warms, the summer thaw bites a bit deeper, awakening ice-age microbes that attack organic matter — vegetation and animal remains — buried where oxygen cannot reach, producing methane that gurgles to the surface and into the air.

The newly released methane adds to the greenhouse effect, trapping yet more heat which deepens the next thaw, in a spiraling cycle of increasing warmth.

Curbing man-made methane emissions could slow this process, said Walter Anthony.

"We have an incentive to reduce our fossil fuel emissions. By doing so, we can reduce the warming that's occurring in the Arctic and potentially put some brakes on permafrost thaw," she said.

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The U.S. National Oceanic and Atmospheric Administration, in its 2010 Arctic Report Card issued last month, said the average temperature of the permafrost has been rising for decades, but noted "a significant acceleration" in the last five years at many spots on the Arctic coast.

One of those spots would be Chersky, an isolated town on the bank of the Kolyma River at the mouth of the East Siberia Sea.

The ground in this remote corner of the world, 6,600 kilometers (4,000 miles) east of Moscow, has warmed about 2 degrees Celsius (3.6 Fahrenheit) in the last five years, to about -5 C (23 F?) today, says Zimov, director of the internationally funded Northeast Science Station, which is about three kilometers (2 miles) from town.

The warming is causing the landscape to buckle under his feet.

"I live here more than 30 years. ... There are many (dirt) roads in our region which I used or built myself, but now I can't use anymore. Now they look like canyons," he says.

Buildings, too, collapse. The school in Chersky, a Soviet-era structure with a tall bronze statue of Karl Marx on its doorstep, was abandoned several years ago when the walls began to crack as the foundations gave way.

The northern Siberian soil, called yedoma, covers 1.8 million square kilometers (700,000 sq. miles) and is particularly unstable. Below the surface are vertical wedges of ice, as if 15-story-high icicles had been hammered into the soft ground, rich in decaying vegetation, over thousands of years.

As the air warms, the tops of the wedges melt and create depressions in the land. Water either forms a lake or runs off to lower ground, creating a series of steep hillocks and gullies. During summer, lakeside soil



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may erode and tumble into the water, settling on the bottom where bacteria eat it and cough up yet more methane.

The process takes a long time, but Zimov has done a simulation by bulldozing trees and scraping off moss and surface soil from 1 hectare (2.5 acres) of former larch forest, rendering it as if it had been leveled by fire.

Seven years later the previously flat terrain is carved up with crevices 10 to 15 feet (3 to 5 meters) deep, creating a snowy badlands.

Gazing across a white river to the apartment blocks on a distant hill, Zimov said, "In another 30 years all of Chersky will look like this."

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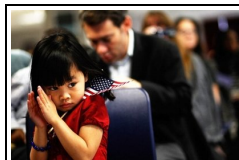
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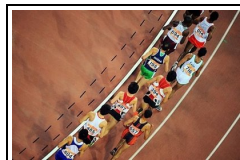


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Some common misconceptions, and the facts about each:

1. It's the sun - FALSE. The sun has, on average, been steady since 1960. Meanwhile, global temps rose about 0.5 degrees C.

2. Climate changes randomly - FALSE. It changes with changes in energy coming in and going out. Orbital variations -- amplified by CO2 -- cause and end ice ages by changing the amount of sun coming in and heat going out. We're cutting the heat going out by raising CO2 higher than it's been in at least 800,000 years [1], thus raising temps.

3. Scientists predicted an ice age in the 1970s - FALSE. Popular media hyped the idea of a coming ice age. Scientists did not.

4. Climate changed before so we're not changing it now - FALSE. Anything that changes the amount of energy coming in to earth or the amount going out also changes climate. Before civilization, all those changes were natural. In 150 years we've raised CO2 levels beyond anything seen in the last 800,000 years [1]. That CO2 traps energy in the atmosphere, raising temps.

5. It's really warm at my house, so climate change is bunk - FALSE. Climate is about the entire earth surface's energy content, not about the energy content of a particular city. The earth can get warmer while your city gets colder.

6. Volcanoes emit far more CO2 than we do - FALSE. Volcanoes emit about 1% of the CO2 that we do.

7. CO2 is necessary for life, not harmful. - MISLEADING. A substance can be both in different ways. For example, you need water to survive, but can also drown in it.

8. We can't predict weather 7 days out, so we can't predict climate. - FALSE. Weather is short term, climate is a long-term average. You can't predict whether tossing a fair coin once will give heads or tails, but can definitely predict that tossing it 10000 times will give about 5000 heads and 5000 tails.

9. But CLIMATEGATE!!!! - FALSE. All scientists involved were fully exonerated in multiple investigations. The real question is who hacked the scientists' computers (a crime) and then lied about their research (defamation) -- and why?

Get the facts at Skeptical Science (easy to understand), Real Climate (with details direct from climate scientists), and Science of Doom (for those interested in atmospheric physics).

Also, the ambitious among you might want to tackle the book "Atmospheric Science" by Wallace & Hobbs.

[1] Updated from previous figures of 400k and 650k to account for the EPICA ice core, as analyzed by Luthi et al (2008). Thanks for motivating me to search for newer data....

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BushLizard2U 3 minutes ago | [Report Abuse](#)

1 1

Guess what Sheeple the earth has been coming OUT of an Iceage for the past 10,000 years and it continues to do so. Dinosaurs walked around the "polar regions" in a sub-tropical enviroment. So in fact ... the earth has been MUCH warmer in ancient times. These heating/cooling cycles were going on WAY before semi-evolved simians showed up and figured they were running the planet. This planetary process of heating will march on until the polar ice has all melted and the equatorial regions are turned to overheated deserts. Eventually the climatic system will reverse itself and the planet will head back into a cycle of Iceages again. So sit back and enjoy your tiny little personal life cycle while you can Howling like Baboons about planetary climate cycles will not change a thing. Please try to evolve to a point where you actually understand these processes.

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Craig L 7 minutes ago | [Report Abuse](#)

1 0

We'll just adpat and grow bananas in alaska.

[▶ Reply](#)



Guitardo 8 minutes ago | [Report Abuse](#)

1 0

News Flash: We're all going to die someday! In the meantime, let's try something new and remember to show a little love and understanding to each other while we have the opportunity. Let's party like it's 2012!

[▶ Replies \(1\)](#)



Quickres 8 minutes ago | [Report Abuse](#)

3 0

All this methane seems like a perfect solution to avoiding additional deep sea drilling. If it is simply bubbling up to the surface, you would think it would be much more economical to capture than drilling in a mile of water for a slim chance at finding oil/gas and then having to ship it in tankers back to the mainland.

They currently are able to capture methane at landfills with a series of hollow pipes placed into the ground, you would think doing this at a huge siberian lake would be like easy money.

[▶ Replies \(1\)](#)



OHitler 10 minutes ago | [Report Abuse](#)

2 2

over 6 billion sheeple let methane out of their butts every day.

[▶ Replies \(1\)](#)



Steve 11 minutes ago | [Report Abuse](#)

1 3

Big deal. This race needs to go extinct, and let the Earth heal.

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Sheila 13 minutes ago | [Report Abuse](#)

3 0

Sounds like a decent source for fuel if steps are taken to capture the pockets.

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Lundy 16 minutes ago | [Report Abuse](#)

0 1

first free the mind...the rest will then fall into place.

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Jimbo 17 minutes ago | [Report Abuse](#)

1 4

So if Methane is way worse than CO2, why don't they just burn it off?

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