GlobalResearch
Center for Research on Globalization

The Methane Monster Roars

By Dahr Jamail

Global Research, January 21, 2015
Truthout 13 January 2015

Theme: Environment

(Image: Icy waters, rising steam, gas jets via Shutterstock; Edited: JR/TO)

During a recent hike in Washington State's Olympic National Park, I marveled at the delicate geometry of frost-covered ferns. White crystalline structures seemed to grow from the green leaves, encasing them in a frozen frame of temporary beauty.

Progressing further up into the mountains, I stopped to lunch and sip hot coffee from a thermos while gazing across a river valley at a snow-covered mountainside, sizing up a frozen waterfall for a possible ice climb in the future. Yet I found myself beginning to wonder how many more winters ice would continue to form there.

The disparity of the beauty before me with my troubled thoughts about the planet has found no reconciliation. I had been collecting data and conducting interviews for articles about methane releases in the Arctic for weeks, and pondering the information through the holidays only led me into depression. Going out into the mountains helped, but also provoked grave concerns for our collective future.

To consider the possibility that humans have altered the atmosphere of the earth so drastically as to put our own lives in danger seems, at least emotionally, unfathomable. Given the scale of the planet, one would think, logically, it might not even be possible. Yet the majestic snow-covered peaks near where I live may no longer have glaciers (or even snow) within my lifetime, according to some of the scientists I've interviewed.

To see more stories like this, visit "Planet or Profit?"

Paul Beckwith, a climatology and meteorology professor at the University of Ottawa, Canada, is an engineer and physicist who researches abrupt climate change in both the present day and in the paleoclimatology records of the deep past.

"It is my view that our climate system is in early stages of abrupt climate change that, unchecked, will lead to a temperature rise of 5 to 6 degrees Celsius within a decade or two," Beckwith told me. "Obviously, such a large change in the climate system will have unprecedented effects on the health and well-being of every plant and animal on our planet."

A Very Different Planet

Vast amounts of methane lie frozen in the Arctic. It's not news that the Arctic sea ice is melting rapidly, and that it will likely be gone for short periods during the summers starting as early as next year. Losing that ice means releasing larger amounts of previously trapped methane into the atmosphere.

Additionally, lying along the Arctic's subsea continental margins and beneath Arctic permafrost are methane hydrates, often described as methane gas surrounded by ice. In March 2010, a report in Science indicated that these cumulatively contain the equivalent of 1,000 to 10,000 gigatons of carbon.

For perspective, humans have released approximately 1,475 gigatons in total carbon dioxide since the year 1850.

Beckwith warns that losing the Arctic sea ice will create a state that "will represent a very different planet, with a much higher global average temperature, in which snow and ice in the northern hemisphere becomes very rare or even vanishes year round."

In the simplest terms, here's what an ice-free Arctic would mean when it comes to heating the planet: Minus the reflective ice cover on Arctic waters, solar radiation would be absorbed, not reflected, by the Arctic Ocean. That would heat those waters, and hence the planet, further. This effect has the potential to change global weather patterns, vary the flow of winds and even someday possibly alter the position of the jet stream. Polar jet streams are fast-flowing rivers of wind positioned high in the earth's atmosphere that push cold and warm air masses around, playing a critical role in determining the weather of our planet.

"What happens in the Arctic does not stay in the Arctic," Beckwith explained. "The rapidly warming Arctic relative to the rest of the planet (five to eight times global average temperature rise) is decreasing the temperature gradient between the Arctic and the equator."

This decreased gradient is disrupting the jet stream, leading to further warming in the Arctic, forming a runaway feedback loop, which in turn is causing the release of more methane in the Arctic.

And on land, it's already happening as well. On Siberia's Yamal Peninsula, mysterious holes in the ground drew international attention before they became not-so-mysterious when Russian researchers found significant amounts of methane inside them. Now, that same area is making news again as researchers have found increasing amounts of methane emissions coming from thawing permafrost there.

"As the methane concentrations increase in the Arctic from the large warming rates there in both the atmosphere and ocean, the jet streams will be greatly disrupted even more than now," Beckwith said. "Physics dictates that this will continue to increase the frequency, severity and duration of extreme weather events like torrential rains leading to widespread flooding in some regions and droughts in other regions. Needless to say, this causes enormous economic losses and poses a severe and grave threat to our global food supply. Thus, the Arctic can be considered the Achilles heel in our climate system."

US Navy researchers have predicted periods of an ice-free Arctic ocean in the summer by 2016.

British scientist John Nissen, chairman of the Arctic Methane Emergency Group,suggests that if the summer sea ice loss passes "the point of no return" and "catastrophic Arctic methane feedbacks" kick in, we'll be in an "instant planetary emergency."

Why should we be so concerned about methane, when all of the talk around climate disruption seems to focus on carbon dioxide levels?

In the atmosphere, methane is a greenhouse gas that, on a relatively short-term time scale, is far more destructive than carbon dioxide. When it comes to heating the planet, methane is 23 times more potent than carbon dioxide, per molecule, on a 100-year timescale, and 105 times more potent on a 20-year timescale – and the Arctic permafrost, onshore and off, is packed with the stuff.

According to a study published in Nature Geoscience, twice as much methane as previously thought is being released from the East Siberian Arctic Shelf, a 2 million square kilometer area off the coast of northern Siberia. The recent study's researchers found that at least 17 teragrams (17 million tons) of methane are being released into the atmosphere each year, whereas a 2010 study had found only seven teragrams heading into the atmosphere.

To gain a better understanding of the implications of Arctic warming, I interviewed some of the scientists conducting the most cutting edge and current methane studies in the Arctic.

Dr. Leonid Yurganov is a senior research scientist at the University of Maryland Physics Department and the Joint Center for Earth Systems Technology, and his current research expertise is connected with remote sensing of tropospheric composition and Arctic methane levels. He is a co-author of an upcoming research paper that will show how recent Arctic warming has stimulated speculations about the release of methane from the seabed there and kicked off a new climatic positive feedback loop. Using remote sensing technology, his team has detected long-term increases of methane over large areas of the Arctic.

Yurganov warns of the consequences of a rapidly warming Arctic.

"The difference in temperatures between the poles and the equator drives our air currents from [the] west to [the] east," he told Truthout. "If this difference diminishes, the west to east transport becomes slower, and north-south currents become stronger. This results in frequent changes in weather in mid-latitudes."

While Yurganov isn't seeing "fast and immediate liberation of methane from hydrates" at this very moment, he warned of what would happen if and when it does occur.

"Increased methane would influence air temperature near the surface," he said. "This would accelerate the Arctic warming and change the climate everywhere in the world."

Yurganov does not foresee an immediate global collapse within a decade. In his view, the summer Arctic sea ice will continue to shrink in a more linear fashion, but the frequency of extreme weather events and rising sea levels will continue to accelerate. "People should accommodate to climate change and be prepared to a decline in life-level caused by it," he warned.

Yurganov sees population reduction via people not having as many babies as one answer to our predicament.

"Depopulation, that resolves all the problems," he said. "The earth with [a] lower global population, say, twice as low, would emit less carbon dioxide."

Another Russian scientist who has been studying methane releases in the Arctic, however,

had even more worrying news.

The Looming Specter of Abrupt Methane Release

Natalia Shakhova is a research associate professor of the University Alaska Fairbanks, International Arctic Research Center, where she focuses on the East Siberian Arctic Shelf (ESAS). Shakhova believes we should be concerned about her group's findings from the ESAS, specifically, because that area differs significantly from methane emissions happening elsewhere around the world.

The ESAS is the largest shelf in the world, encompassing more than 2 million square kilometers, or 8 percent of the world's continental shelf. Shakhova believes it holds an area-weighted contribution to the global hydrate inventory of "at least 10 to 15 percent."

"These emissions are prone to be non-gradual (massive, abrupt) for a variety of reasons," she told Truthout. "The main reason is that the nature of major processes associated with methane releases from subsea permafrost is non-gradual."

This means that methane releases from decaying frozen hydrates could result in emission rates that "could change in order of magnitude in a matter of minutes," and that there would be nothing "smooth, gradual or controlled" about it; we could be looking at non-linear releases of methane in amounts that are difficult to fathom.

She explained that the transition from the methane being frozen in the permafrost, either on land or in the shallow northern shores of the East Siberian Arctic, "is not gradual. When it comes to phase transition, it appears to be a relatively short, jump-like transformation from one state of the process to another state. The difference between the two states is like the difference between a closed valve and an open valve. This kind of a release is like the unsealing of an over-pressurized pipeline."

These immediate methane releases in the ESAS could be triggered at any moment by seismic or tectonic events, the subsiding of sediments caused by hydrate decay or sediment sliding due to permafrost degradation and thaw. The ESAS is particularly prone to these immediate shifts because it is three times shallower than the mean depth of the continental shelf of the world ocean.

"This means that probability of dissolved methane to escape from the water column to the atmosphere is from three to 10 times greater than anywhere in the world's oceans," Shakhova said. "In the ESAS, methane is predominantly transported as bubbles. Methane bubbles rise to the surface at a speed from 10 to 40 cm s-1; this means that it only takes minutes for methane to reach the water surface and escape to the atmosphere."

Including all factors, Shakhova estimates that the carbon pool of the ESAS is in orders of magnitude greater than 180 gigatons, and added that "its role will increase over time."

A study published in the prestigious journal Nature in July 2013 confirmed what Shakhova has been warning us about for years: that a 50-gigaton "burp" of methane from thawing Arctic permafrost beneath the East Siberian sea is "highly possible at anytime." That would be the equivalent of at least 1,000 gigatons of carbon dioxide. (Remember, for perspective, humans have released approximately 1,475 gigatons in total carbon dioxide since the year 1850.)

Even the relatively staid Intergovernmental Panel on Climate Change (IPCC) haswarned of such a scenario: “The possibility of abrupt climate change and/or abrupt changes in the earth system triggered by climate change, with potentially catastrophic consequences, cannot be ruled out. Positive feedback from warming may cause the release of carbon or methane from the terrestrial biosphere and oceans.”

In the last two centuries, the amount of methane in the atmosphere has increased from 0.7 parts per million to 1.7 parts per million. The introduction of methane in such quantities into the atmosphere may, some climate scientists fear, make increases in the global temperature of 4 to 6 degrees Celsius inevitable.

Yet some of the scientists I spoke with warned of even worse consequences.

Global Implications

Ira Leifer, an atmospheric and marine scientist at the University of California, Santa Barbara, and author of several Arctic methane studies, told Truthout that the scientific community has learned that methane emissions from the Arctic are already larger than previously thought, and said, “The warming trend in the Arctic is clear.”

The dangers of methane-related warning are staggering, according to Leifer.

“The amount of methane trapped in submerged permafrost is vast, and if even a small fraction reaches the atmosphere on the time scale of a few decades, it would lead to a dramatic increase in warming on a global scale,” he warned. “Furthermore, it could lead to a positive feedback where warming oceans release more methane which warms the Arctic more and leads to more methane release. Worse, the warming only slowly percolates to lower latitudes – and therefore it contributes to the enhanced Arctic warming.”

Just as Beckwith, Yurganov and Shakhova noted, Leifer warned that a warming Arctic has “global implications.”

Earth’s weather is controlled in three cells: the tropics, mid-latitude and polar. So a weakening of the difference in temperature between the pole-equator areas causes an expansion of the tropical cell, which drives desertification in some places and increased flooding in others. All the while, polar weather is expanding, as we’ve been seeing in the United States during recent winters.

While humans can adapt to these new fluctuations in the weather, agriculture and ecosystems cannot.

Like Shakhova, Leifer also expressed concern about the ESAS.

“The potential is there for hydrate emissions to increase with warming oceans due to increased dissociation,” he warned. He also confirmed that his recent studies of methane emissions in the Arctic even found the gas hundreds of miles from the coast. This means that the methane cannot be coming from land sources; Leifer has concluded that his recent studies “confirm a local marine source.”

Meaning, the subsea hydrates are already releasing their methane very far from shore. Beckwith notes that the increasing methane releases in the Arctic and the massive impact they will have on the planetary weather system mean “there will be continuing disruption

and fracturing of our weather and climate systems."

He went on to issue a stark warning. "Further acceleration of these processes is very likely to lead to an 'abrupt climate change' system reorganization from a cold, snowy, ice-covered Arctic Ocean to a 'blue Arctic Ocean' regime," he said. "The final state could have a global temperature average being 5 or 6 degrees Celsius warmer and the transition to this state could occur in one to two decades, as has occurred many times in the past as recorded in paleorecords."

The advent of the "blue Arctic Ocean" Beckwith warns us of is only a matter of time, and will most likely happen before 2020, considering that exponential decline in Arctic summer sea ice volume has already been determined by the Pan-Arctic Ice Ocean Modeling and Assimilation System data and models, which have been corroborated with recent CryoSat measurements, as well as modeling by the Naval Graduate School Regional Climate Models.

Beckwith believes the first of these "blue ocean" events will likely last a few weeks to one month the first time it happens, but then extend to several months just a few years later.

Meanwhile, the IPCC has not addressed Arctic methane releases as a runaway feedback loop, nor has the mainstream media across the political spectrum.

"Then, the greatly increased Arctic warming from albedo collapse would likely result in a year round 'Arctic blue ocean' within a decade or two, completing the regime shift to a much warmer climate," he said.

Thus, Beckwith, like Shakhova, warns of the 50-gigaton methane burst, and fears it is only a matter of time before it occurs.

I asked Leifer if he believed we have already triggered a rapid increase in global temperatures that could lead to the kind of abrupt climate shifts of which Beckwith warns.

"Recently, it has been announced that 2014 is the warmest year ever in the instrumental records," he said. "A large preponderance of the heat added to the climate system over the last decade or so has gone into heating the oceans and when this heat balance cycles back to the atmosphere we will see a very rapid rise in global average temperatures."

Another "Great Dying?"

The Permian mass extinction that occurred 250 million years ago was related to methane – in fact, the gas is thought to be the key to what caused the extinction of approximately 95 percent of all species on the planet.

Also known as "The Great Dying," it was triggered by a massive lava flow in an area of Siberia that led to an increase in global temperatures of 6 degrees Celsius. That, in turn, caused the melting of frozen methane deposits under the seas. Released into the atmosphere, it caused temperatures to skyrocket further. All of this occurred over a period of approximately 80,000 years.

We are already in the midst of what scientists consider the sixth mass extinction in planetary history, with between 150 and 200 species going extinct daily, a pace 1,000 times

greater than the “natural” or “background” extinction rate. This event may already be comparable to, or even exceed, both the speed and intensity of the Permian mass extinction. The difference: Ours is human caused. (Plus, it probably isn’t going to take 80,000 years; it has so far lasted just a few centuries, and is now gaining speed in a non-linear fashion.)

It is possible that, on top of the vast quantities of carbon dioxide from fossil fuels that continue to enter the atmosphere in record amounts yearly, an increased release of methane could signal the beginning of the sort of process that led to the Great Dying.

Some scientists fear that the situation is already so serious and so many self-reinforcing feedback loops are already in play that we are in the process of causing our own extinction. Worse yet, some are convinced that it could happen far more quickly than generally believed possible – in the course of just the next few decades – or, as Beckwith believes, possibly even sooner than that.

Back in Olympic National Park, when I was returning from my hike, I happened upon a small herd of elk. I watched them as they watched me, before they slowly began to retreat further into the forest. As I continued along, I wondered how they are responding to what is happening to the planet. Their habitat is shifting dramatically, as are their food and water sources. Approaching the trailhead, I marveled at green moss-covered trees – and contemplated how the magnificent natural landscape of Olympic National Park will respond as the climate is rapidly disrupted. The Olympic Mountains support the third largest glacier system in the 48 contiguous United States and are rapidly losing their glaciers. And with at least four already endangered species living within the park the impacts are already clear, and are guaranteed to worsen.

I went on to wonder how humanity will respond, but then checked myself with the fact that the Arctic methane feedback loops are most likely already well underway, only an international emergency immediate response to cease all global carbon emissions might slightly mitigate the crisis, and yet most world governments’ responses are laughable.

Naturally, what was left was to ask myself: How am I responding?

How are you?

Articles by: Dahr Jamail