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Fossil Fuels Are to Blame for Soaring Methane Levels, Study Shows

Emissions from human activity like the burning of fossil fuels may have been sharply underestimated. Credit...Gabriella Demczuk for The New York Times

By Hiroko Tabuchi Feb. 19, 2020Updated 2:03 p.m. ET

Oil and gas production may be responsible for a far larger share of the soaring levels of methane, a powerful greenhouse gas, in the earth's atmosphere than previously thought, new research has found.

The findings, published in the journal Nature, add urgency of efforts to rein in methane emissions from the fossil fuel industry, which routinely leaks or intentionally releases the gas into air.

"We've identified a gigantic discrepancy that shows the industry needs to, at the very least, improve their monitoring," said Benjamin Hmiel, a researcher at the University of Rochester and the study's lead author. "If these emissions are truly coming from oil, gas extraction, production use, the industry isn't even reporting or seeing that right now."

Atmospheric concentrations of methane have more than doubled from preindustrial times. A New York Times investigation into "super emitter" sites last year revealed vast quantities of

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methane being released from oil wells and other energy facilities instead of being captured.

The extent to which fossil fuel emissions, as opposed to natural sources, are responsible for the rising methane levels has long been a matter of scientific debate. Methane seeps from the ocean bed, for instance, and also spews from land formations called mud volcanoes.

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To shed light on the mystery, researchers at Rochester's Department of Earth and Environmental Studies examined ice cores from Greenland, as well as data from Antarctica stretching back to about 1750, before the industrial revolution.

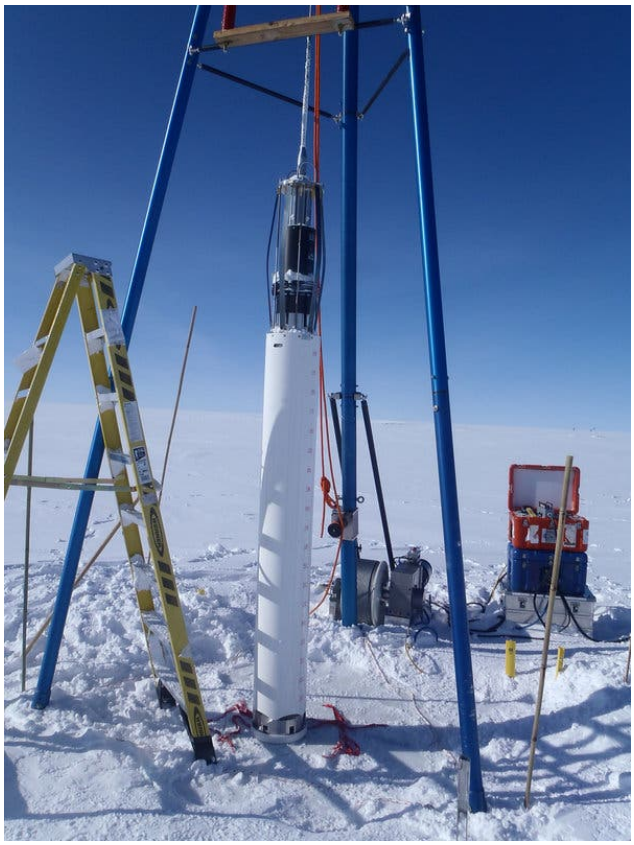
They found that methane emissions from natural phenomena were far smaller than estimates used to calculate global emissions. That means fossil-fuel emissions from human activity — namely the production and burning of fossil fuels — were underestimated by 25 to 40 percent, the researchers said.

The scientists were helped in their analysis by different isotopes found in methane emissions from natural sources, compared to emissions from the production of fossil fuels. Isotopes are versions of an element that have very slight differences, allowing the researchers to differentiate between them.

They used a melting chamber with a set of high-power burners to melt more than 2,000 pounds of ice cores to extract and examine air samples from the past. "It looked like a little rocket ship," said Vasilii Petrenko, a co-author of the Nature study and an associate professor at Rochester. "Think of a rocket engine, but except the flames pointing at the device."

Robert Howarth, an earth system scientist at Cornell University who was not involved with the research, called it "a very important study." He said it was consistent with recent research, like a study he published last year that estimated that North American gas production was responsible for about a third of the global increase in methane emissions over the past decade.

"Emissions from fossil sources are correspondingly larger than many have been estimating," Dr. Howarth said. "I find it very convincing."



A device used to extract ice cores, which were melted and studied by the researchers. Credit... Benjamin Hmiel

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Daniel J. Jacob, professor of atmospheric chemistry and environmental engineering at Harvard University, also described the findings as significant. Current estimates of methane from geological sources "were widely considered too high by atmospheric modelers such as myself," he wrote in an email.

But he took issue with the suggestion that emissions from fossil fuel production were larger than previously estimated. Fossil fuel emissions are "based on fuel production rates, number of facilities, and direct measurements if available. The natural geological source is irrelevant for these estimates," he said.

The disagreement reflects an overall discrepancy between what are called "bottom-up" measurements of emissions, those from individual oil and gas sites, as opposed to "top-down" calculations like the ones carried out by the Rochester researchers. "Bottom-up" measurements can be unreliable because of a lack of data from individual oil and gas sites. With "top-down" measurements, on the other hand, the exact source of emissions can be hard to pin down.

The findings come as oil and gas companies face increased pressure to rein in greenhouse gas emissions from their operations to address rising concerns about climate change.

Methane, the main component of natural gas, is of particular concern, because it can warm the planet more than 80 times as much as the same amount of carbon dioxide over a 20-year period. On top of fossil fuel production, livestock, landfills and other sources linked to human activity also emit methane.

Last week, the British oil giant BP set an ambitious climate change goal, saying it aimed to eliminate or offset by 2050 all planet-warming emissions from its oil and gas production, as well as emissions caused by the burning of the oil and gas it pumps from the ground. The company provided few details on how it would achieve that feat, however.

Adding to climate concerns, the Trump administration is moving forward with a plan that effectively eliminates requirements that oil companies install technology to detect and fix methane leaks from oil and gas facilities. By the Environmental Protection Agency's own calculations, the rollback would increase methane emissions by 370,000 tons through 2025, enough to power more than a million homes for a year.

Dr. Petrenko, one of the Rochester study's authors, said that the huge undertaking of studying giant ice cores meant the study relied on a small sampling of data. "These measurements are incredibly difficult. So getting more data to help confirm our results would be very valuable," he said. "That means there's quite a bit more research to be done."

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Hiroko Tabuchi is an investigative reporter on the climate desk. She was part of the Times team that received the 2013 Pulitzer for explanatory reporting. @HirokoTabuchi • Facebook