

Satellite data show 'highest emissions ever measured' from U.S. oil and gas operations

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The Permian Basin is the largest oil field on the planet. Tens of thousands of wells dot the 86,000 square landscape that spans West Texas and Southeastern New Mexico. Credit: Environmental Defense Fund, Nick Simonite

Findings published today in the journal *Science Advances* show that oil and gas operations in America's sprawling Permian Basin are releasing methane at twice the average rate found in previous studies of 11 other major U.S. oil and gas regions. The new study was authored by scientists from Environmental Defense Fund, Harvard University, Georgia Tech

and the SRON Netherlands Institute for Space Research.

"These are the highest emissions ever measured from a major U.S. oil and gas basin. There's so much [methane](#) escaping from Permian oil and gas operations that it nearly triples the 20-year climate impact of burning the gas they're producing," said co-author Dr. Steven Hamburg, chief scientist at EDF. "These findings demonstrate the rapidly growing ability of satellite technology to track emissions like these and to provide the data needed by both companies and regulators to know where emissions reductions are needed."

Based on 11 months of satellite data encompassing 200,000 individual readings taken across the 160,000 square-kilometer basin by the European Space Agency's [TROPOMI instrument](#) from May 2018 to March 2019, Permian oil and gas operations are losing methane at a rate equal to 3.7% of their gas production. The wasted methane—which is the main component in natural gas—is enough to supply 2 million U.S. households.

Methane is a potent greenhouse gas, anthropogenic emissions of which cause over a quarter of today's warming. Reducing methane from oil and gas operations is the fastest, most cost-effective way to slow the rate of warming, even as the necessary transition to [a net-zero carbon economy](#) continues.

Findings highlight crucial new applications

Satellites offer an important new methane measurement tool that can cover large areas faster and more frequently than conventional methods. They can also provide data on gas producing regions around the world that are impossible to reach by aircraft or from the ground.

"Advances in satellite technology and data analytics are making it

possible to generate regular and robust information on methane emissions from oil and gas operations even from the most remote corners of the world," said Mark Brownstein, EDF senior vice president for Energy. "It's our goal to use this new data to help companies and countries find, measure, and reduce methane emissions further and faster, and enable the public to both track and compare progress."

Launched in 2017, the TROPOMI instrument used in the study offers more precise measurements, higher resolution and better coverage than its forerunners. It is part of an emerging ecosystem of methane-tracking satellites with a growing range of capabilities, including one with even higher precision currently being developed by EDF subsidiary MethaneSAT LLC for launch in 2022. MethaneSAT will track oil and gas methane around the globe on a near-weekly basis, identifying and measuring smaller emission events and more widely dispersed sources not discernable with current technology.

Permian emissions challenge

The Permian Basin has emerged as one of the world's most prolific oil-producing regions in recent years, producing 3.5 million barrels of crude and 11 billion cubic feet of natural gas per day (about 30% and 10% of the respective U.S. totals in 2018).

Today's new peer-reviewed findings validate a set of ground-based and airborne measurements released two weeks ago by EDF's [PermianMAP](#) initiative, which found methane escaping from oil and gas operations in the most productive part of the basin at a rate of 3.5%. That project is currently collecting a year's worth of methane data across a 10,000 square-kilometer study area within the basin via fixed-wing aircraft, helicopters, towers, and ground-based mobile sensors.

High leakage rates in the Permian imply the opportunity to greatly

reduce methane emissions in this sprawling oil and gas producing region, through better infrastructure design and development, more effective operations and better regulation at both the state and federal levels.

The TROPOMI study uses the latest technology and methods available to analyze and present data, a process that currently takes a great deal of time and effort. But researchers are quickly learning how to automate and accelerate these complex calculations. The MethaneSAT project, for example, is expected to deliver data based on weekly measurements in near-real time.

"Early TROPOMI images showed that the Permian was one of the largest methane hotspots in the U.S. But the satellite was new, and data analysis hadn't even started. Quantifying emissions and deriving a leak rate for a huge area was a big, hands-on effort, even with the best tools," said EDF's Dr. Ritesh Gautam, one of the study's lead researchers.

"Studies like this are expanding those boundaries. MethaneSAT and missions that follow will be more capable, delivering more data much faster, in ways that are more actionable by stakeholders."

More information: Yuzhong Zhang et al. Quantifying methane emissions from the largest oil-producing basin in the United States from space, *Science Advances* (2020). [DOI: 10.1126/sciadv.aaz5120](https://doi.org/10.1126/sciadv.aaz5120)

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