Methane Leaks from U.S. Energy Production Are Dominated by Unprocessed Gas Associated With Petroleum Exploration

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Scientific Achievement

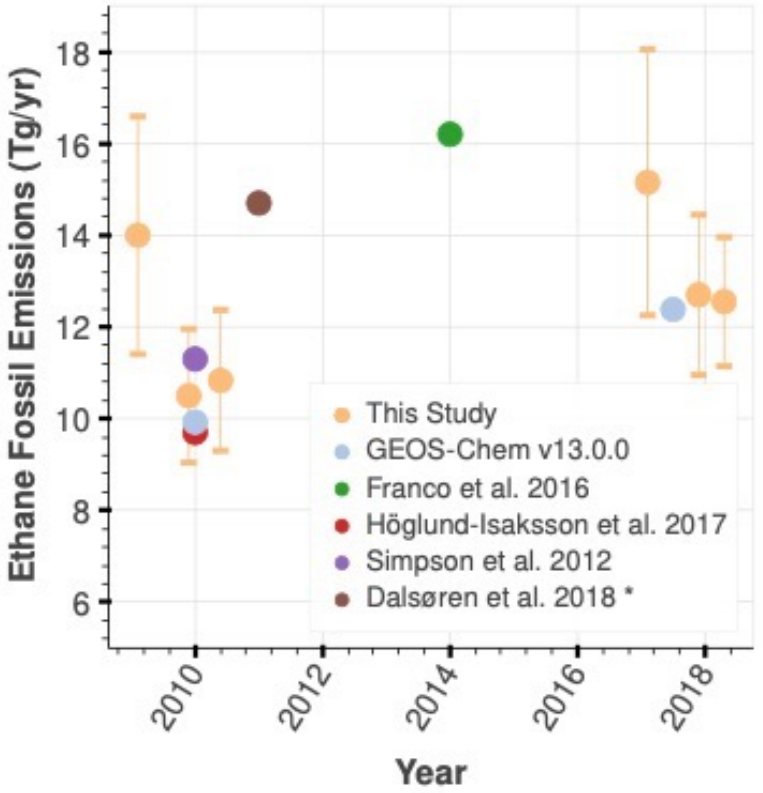
- We find that fossil methane leaks are dominated by unprocessed gas associated with petroleum production.

Significance and Impact

- Constraining the origin and magnitude of emissions from fossil production is key towards mitigating climate impact.

Technical Details

- We utilize global in situ observations, global chemical transport model GEOS-Chem, and developed a novel Bayesian hierarchical model



We developed a Bayesian hierarchical model to estimate ethane and propane fossil emissions. Our estimates compare well to other studies and show a decadal increase in both gases. We use ethane and propane as tracers to diagnose the origin of methane leaks.

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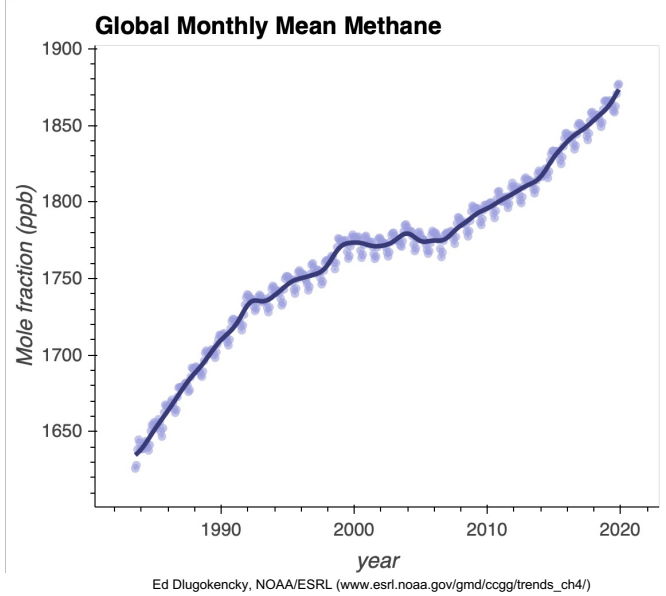
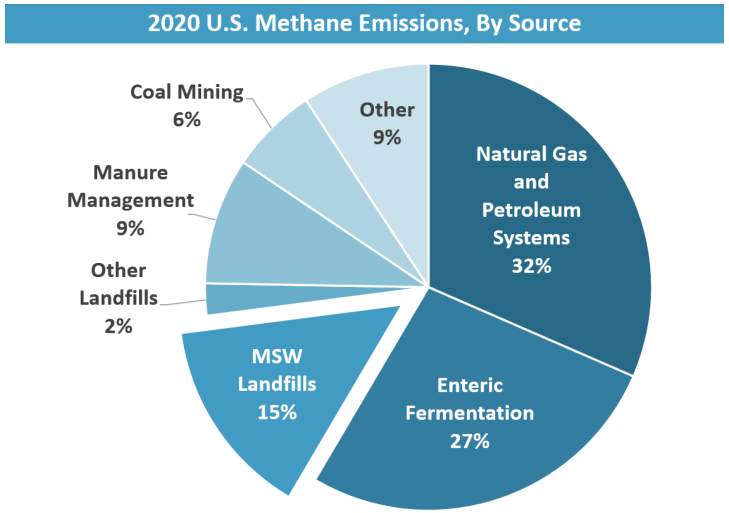
Why: Methane is a potent greenhouse gas. Diagnosing and quantifying methane emissions is key towards reducing climate impact.



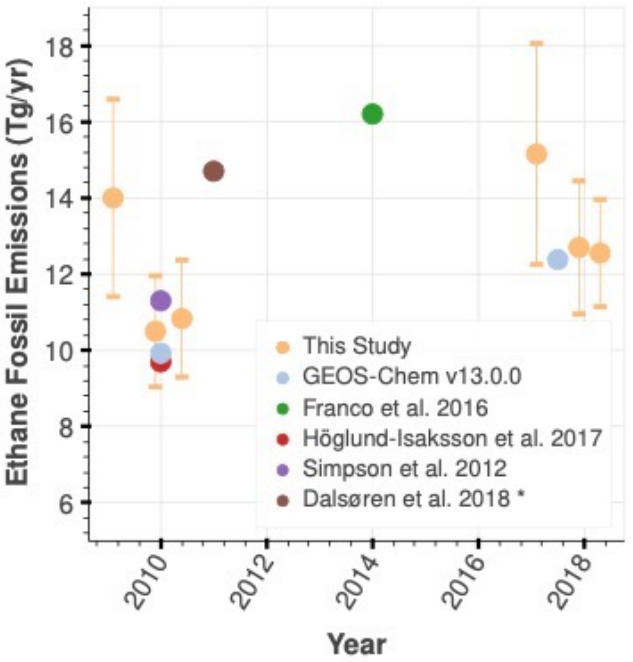
Ed Dlugokencky, NOAA/ESRL (www.esrl.noaa.gov/gmd/ccgg/trends_ch4/)

Issue: Natural gas & petroleum systems are estimated to be the highest human source of methane in the U.S. Yet, the origin and magnitude of emissions from oil & gas processes remains highly uncertain.

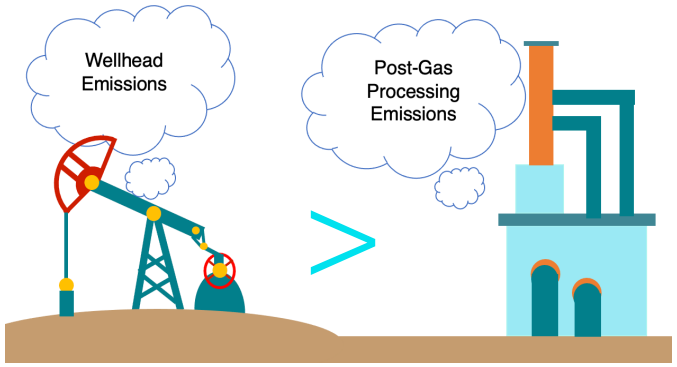


Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020*. U.S. EPA. 2022.

Approach: We developed a novel Bayesian statistical model to estimate emissions of methane fossil tracers (ethane and propane) to help diagnose the origin of methane leaks from the oil & gas sector.



Findings: Our tracer emissions agree well with other studies. Our analysis provides evidence that methane leaks originate from unprocessed gas, and that leaks are dominated by heavy petroleum-producing regions.



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