Detection of Methane Emissions from Natural Gas Power Plants in the United States.

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Introduction

- Methane (CH_4) is a greenhouse gas that has the highest impact on climate change after carbon dioxide(Barré, 2021).
- At least 25% of today's global warming is caused by methane.
- Understanding the sources of methane can help find

Image: Joost de Gouw

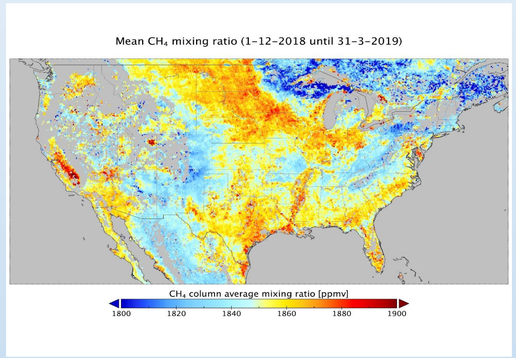
- This study investigated if natural gas power plants are sources of methane. This work inspects natural gas power plants sources of methane in order to better understand impacts on climate change.

Method

- We used a data set of methane anomalies calculated by Barre, where observed methane is higher than the expected methane.
- **For data analysis:** Igor Pro was used to calculated the nearest methane anomaly for each power plant.
- **Natural Gas Power Plant:** Visualized natural gas plants, coal plants, and oil plants as histograms to capture associated methane anomalies due to plant leaks.
- To study the significance, we have also studied the distance from random locations to the nearest methane anomaly

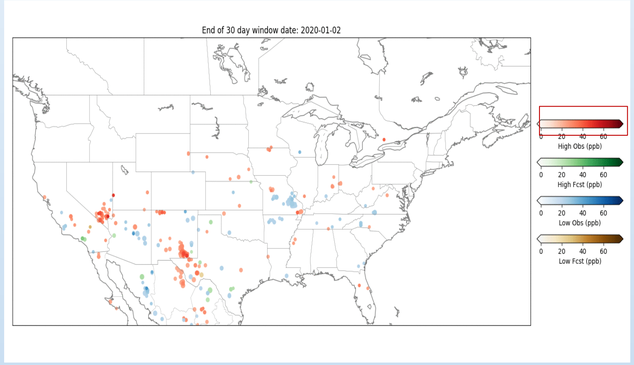
Data Collection Method

- Methane has been measured from space since 2017 by the space-based TROPOMI instrument.
- Using this data set, Barre et al have determined methane anomalies, where the measured methane is greater than the expected methane



Average methane columns over the contiguous U.S. between 1 December 2018 and 31 March 2019 are shown

De Gouw, Joost A., et al. "Daily Satellite Observations of Methane from Oil and Gas Production Regions in the United States." *Scientific Reports*, vol. 10, no. 1, 2020, doi:10.1038/s41598-020-57678-4.

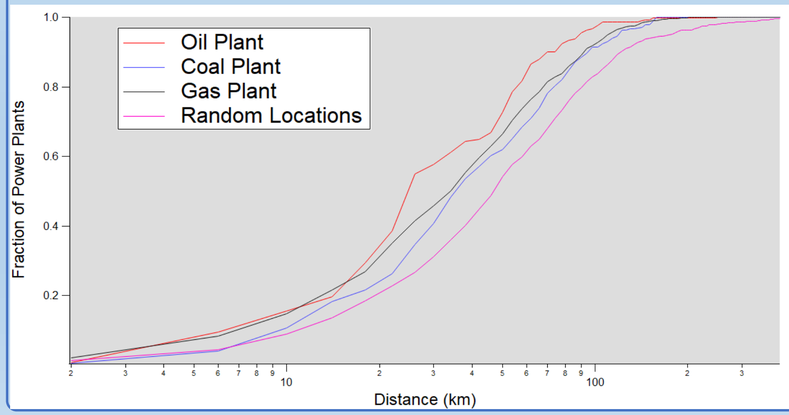


Anomalies/definition of category 1 anomalies shown in Red

Barre, Jerome, et al. "Systematic Detection of Local CH4 Anomalies by Combining Satellite Measurements with High-Resolution Forecasts." *Atmospheric Chemistry and Physics*, Copernicus GmbH, 1 Apr. 2021, acp.copernicus.org/articles/21/5117/2021/.

Results

Distance between power plants and the nearest methane anomaly



- 14.8% of natural gas plants are within 10 km from a methane anomaly, and essentially co-located due to the resolution of the anomaly data set.
- However, 8.8% of random locations are also co-located with methane anomalies, so the evidence that power plants release methane is only weak

The cumulative histograms show the integrated fraction of power plants (on the y-axis) as a function of the distance to the nearest anomaly (on the x-axis).

Conclusion

- The data indicated that the power plants are not a frequent source of methane.
- There is some suggestions that power plants release some methane; on average they are closer to methane anomalies than a random location.
- Further research is needed to determine the association of methane anomalies with other potential and known sources, as this information is vital to combat global warming.

References

- Barre, Jerome, et al. "Systematic Detection of Local CH4 Anomalies by Combining Satellite Measurements with High-Resolution Forecasts." *Atmospheric Chemistry and Physics*, Copernicus GmbH, 1 Apr. 2021, acp.copernicus.org/articles/21/5117/2021/.
- De Gouw, Joost A., et al. "Daily Satellite Observations of Methane from Oil and Gas Production Regions in the United States." *Scientific Reports*, vol. 10, no. 1, 2020, doi:10.1038/s41598-020-57678-4.
- *EPA*, Environmental Protection Agency, www.epa.gov/gmi/importance-methane.

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