

Science Question

- The waste sector is a major contributor to methane emissions, but uncertainties remain about the contribution of point sources to waste sector emissions and the underlying processes leading to point source emissions at landfills.
- Airborne imaging spectrometers provide facility-scale methane emissions data at high spatial resolution, allowing attribution of observed plumes to specific infrastructure and processes.
- What are the major activities and infrastructure leading to point source methane emissions at US landfills?

Analysis

- We use remote sensing observations collected in 2023 using Arizona State University's Global Airborne Observatory to detect and quantify point source methane emissions at US landfills.
- We combine plume imagery, high spatial resolution visible imagery, and meteorological information (e.g., wind direction) to attribute observed plumes to specific sources at the landfill, including the area of the landfill where waste is being added, called the work face, and gas infrastructure.

Results/Significance

- We observed 17% of open landfills in the US (217 landfills) and saw about half of these with point source emissions (115 landfills).
- We found that work face emissions were detected more often (52 landfills) than gas-control infrastructure emissions (12 landfills).
- The largest emitting sites in all observed regions were landfills with work face emissions, especially those sending landfill gas to renewable natural gas facilities, and these landfills showed the most disagreement with reported emissions in the Greenhouse Gas Reporting Program.

Acknowledgements

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Figure 1: Example image of a detected methane emission from the work face of a Texas landfill. The white arrow indicates an area of the landfill that is impacted by work face activities.

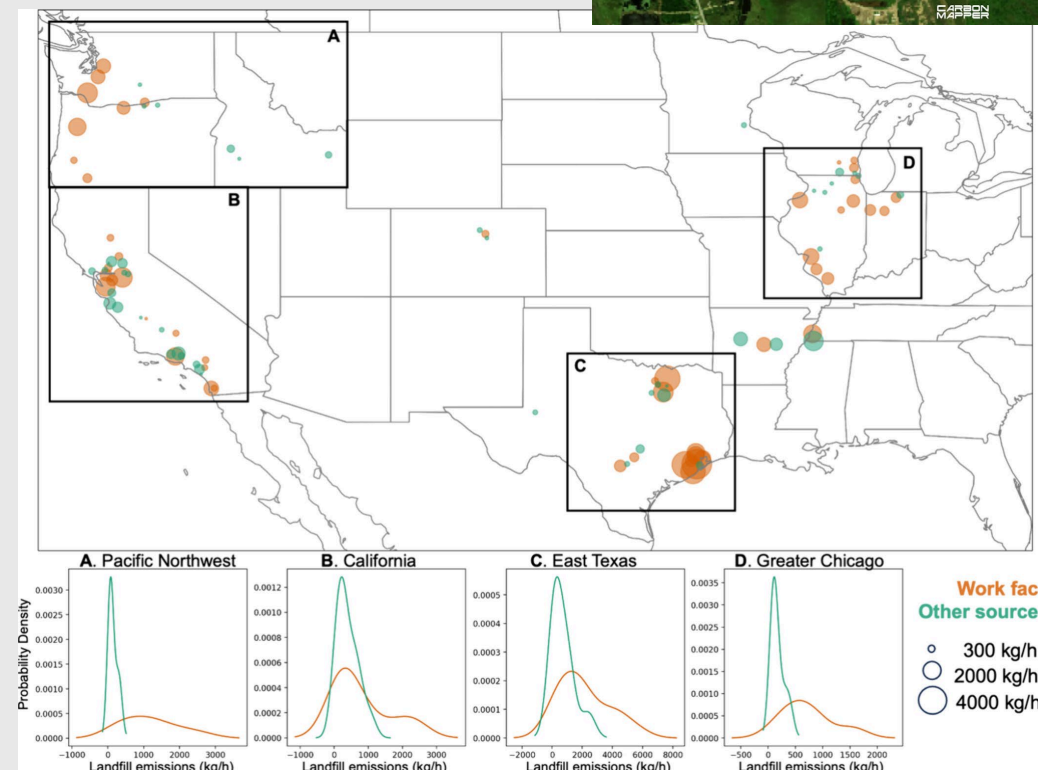
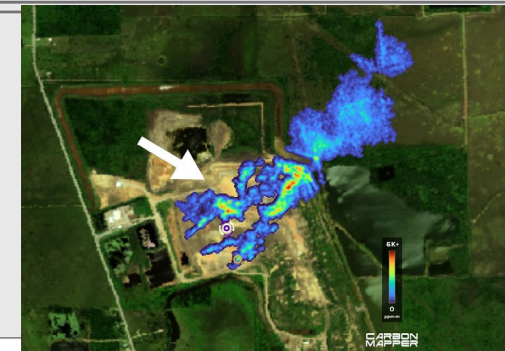


Figure 2. Average quantified methane emission rates for landfills with and without evidence of work face emissions. Inset plots show the kernel density estimates separated by source type.