

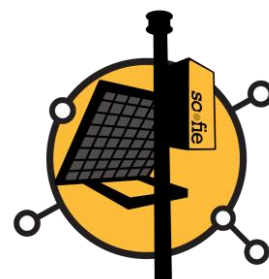


Continuous monitoring

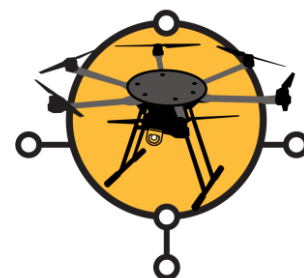
Emissions monitoring solutions



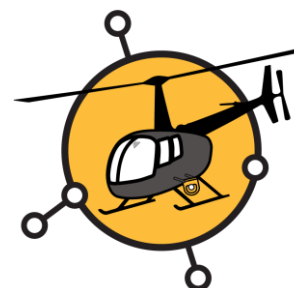
OGI camera



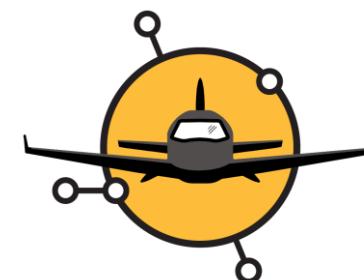
Continuous
monitors



Drone survey



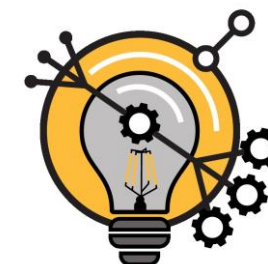
Helicopter
flyover



Aerial
measurements



Analytics



Research and
development

Proposed rule risks significant emissions reductions benefits

The rule's approach to action levels and detection limits for continuous monitoring systems discourages their use.

Because:

1. Large numbers of sites emit at levels above the action level
2. Current technologies do not meet these limits (yet do achieve emissions reduction goals)
3. Unnecessarily low monitoring sensitivity leads to nuisance alerts



*You don't need a microscope
to see a beachball*

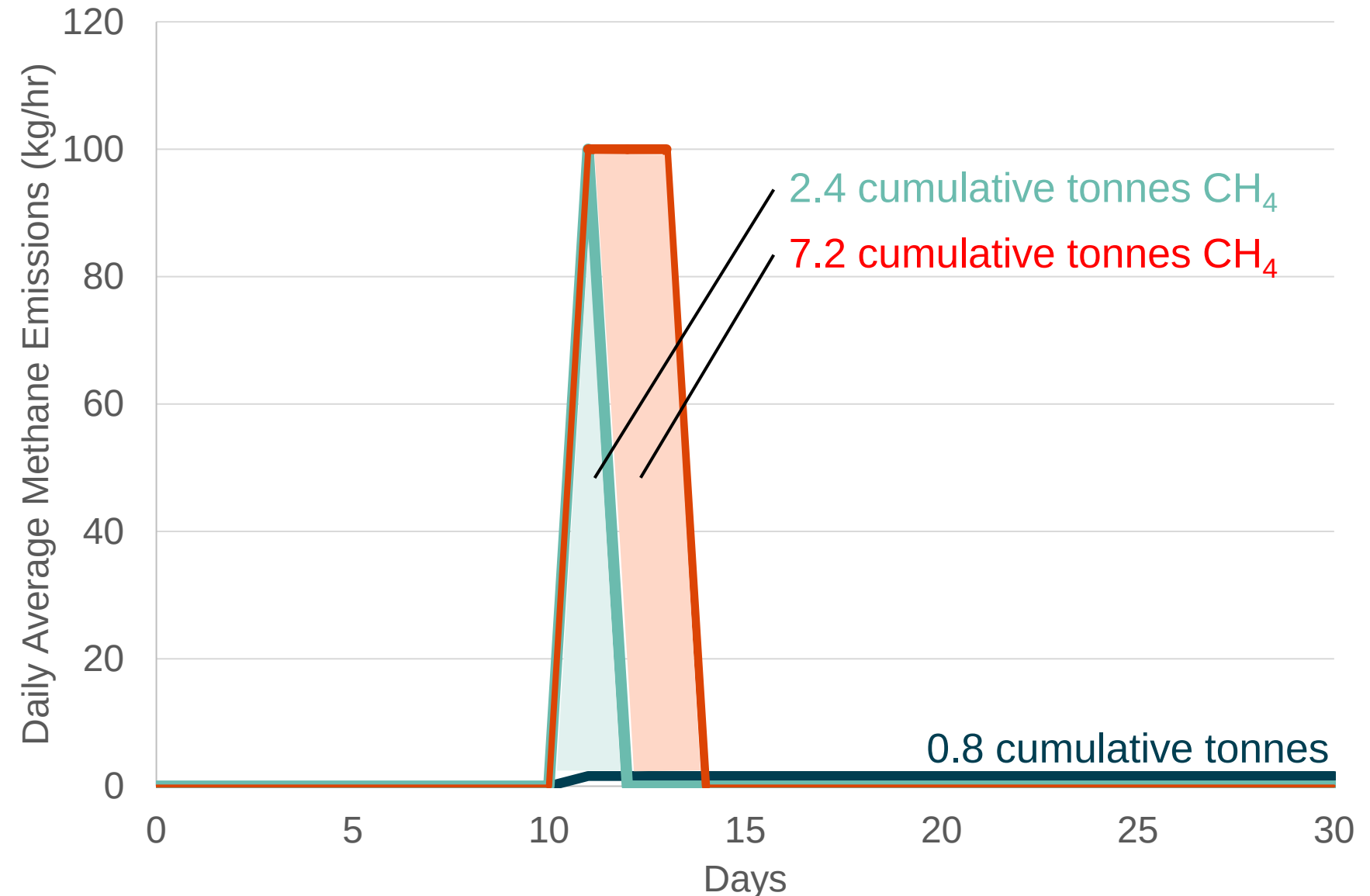
Continuous monitors enable large emission reductions

- Large emission sources tend to be unpredictable
- Total emissions reduction depend strongly on speed to detection

Large Emission Source Detected Quickly by CMS

Large Emission Source Detected by AVO

Small Emission Source - Undetected



Continuous monitors are good at leak detection

Super emitters matter substantially - most methane emissions come from a small number of sites with large emission rates

Barnett Shale

60% emissions from 5% of sites, **>4.6 kg CH₄/hr**
(Rella et al.)

Marcellus

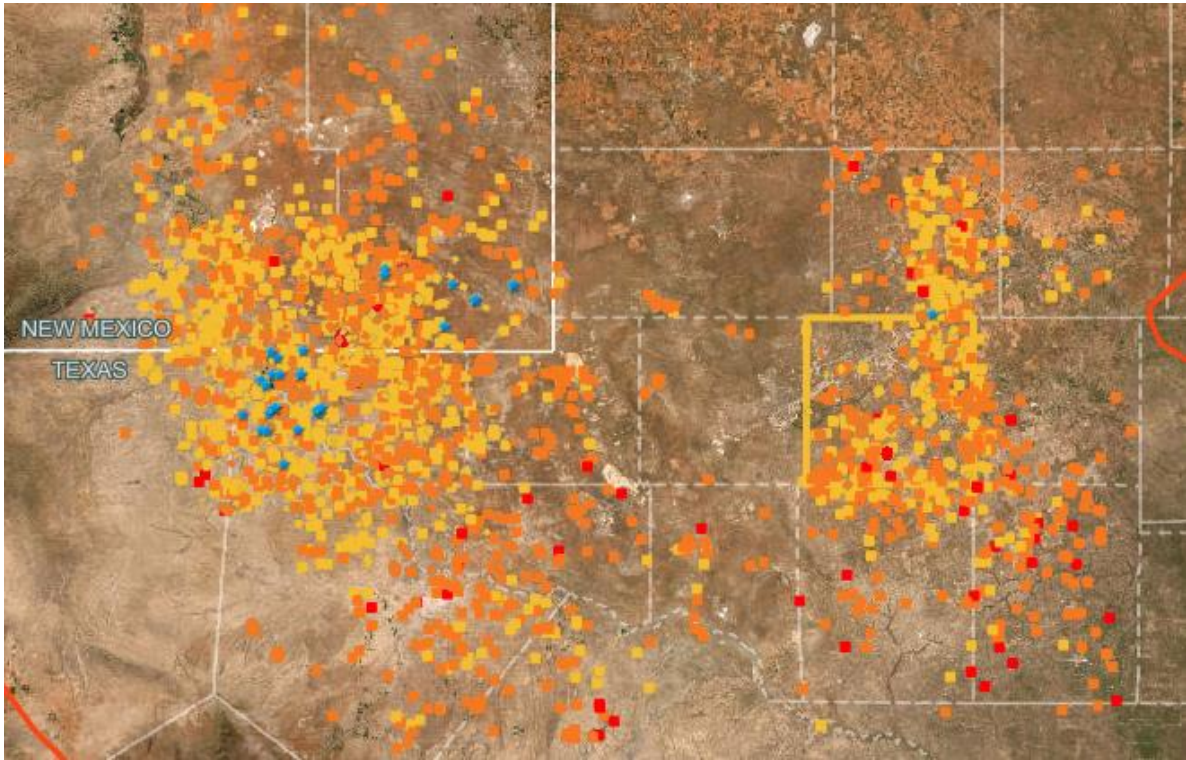
Similar observations for both conventional and unconventional emissions
(Omara et al.)

Permian

36% of AVIRIS-NG and GAO detected plumes greater than **500 kg CH₄/hr**

Permian Map

Super emitters made up the majority of observed emissions.



Permian methane analysis project. Yellow are leaks 2-100 kg/hr, orange 100-1000 kg/hr, red >1000 kg/hr
<https://www.permianmap.org/>

Each specification must account for the situation

	Specification	Emission characteristics	Sensor/system characteristics
A	Time to detection	Average duration of target emission sources	Number (and location) of sensors
B	Minimum detectable emission enhancement (increase above background)	Emission rate of target emission	Sensor sensitivity
C	Avoid nuisance alarms	Background and routine emissions	System analytics, sensor sensitivity
D	Avoid false negatives	Target emission source release characteristics	Number and location of sensors

Site-specific characteristics are bigger factors than detection limits for detection efficiency — variables include:

- Meteorological conditions
- Duration of the event
- Emission rate of event
- Number of Sensors deployed
- Configuration of site
- Sensor locations
- Background and routine emissions
- Minimum detection emission enhancement
- Release source characteristics
- System analytics
- Detection limit of sensors



“*...the continuous monitoring networks examined in this work could detect an infinite duration emission event between 48-551 minutes, on average.*”

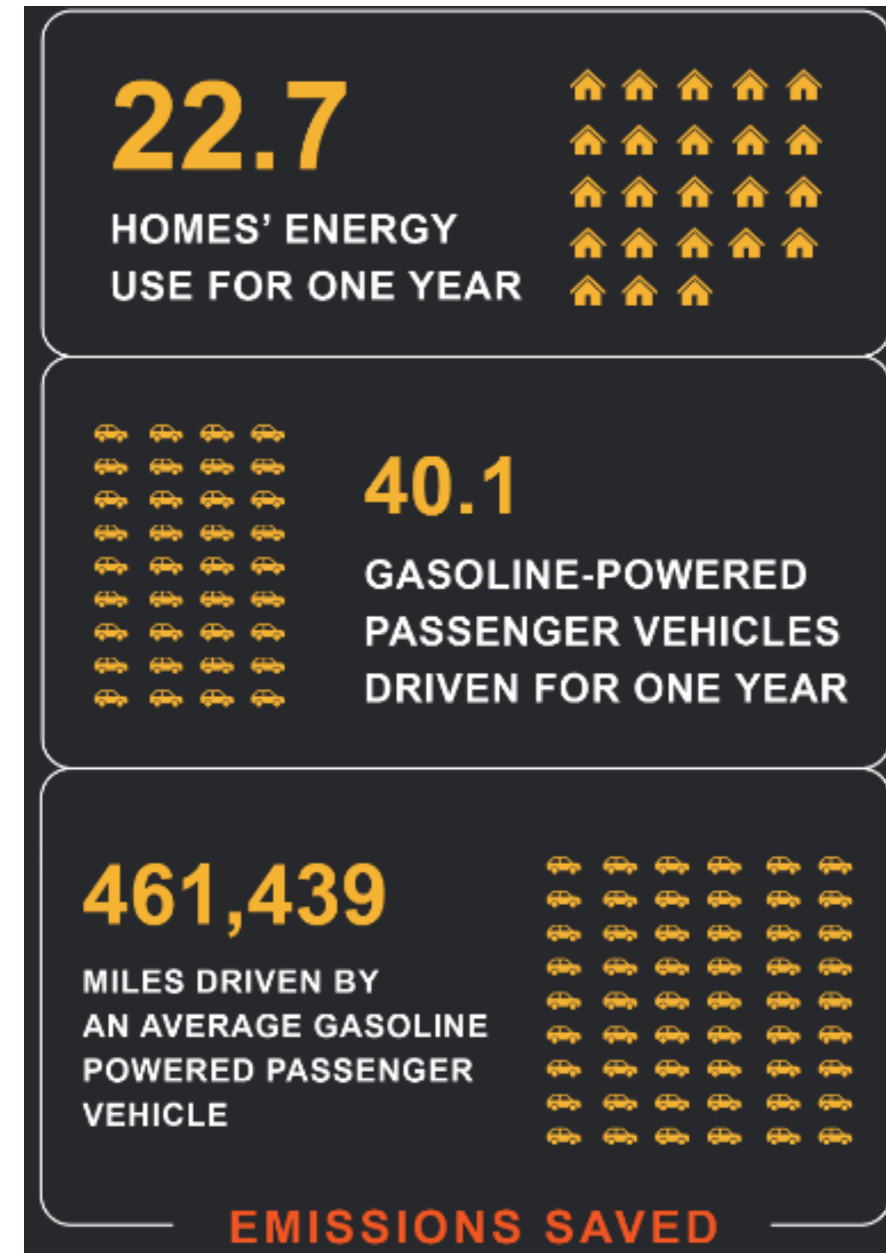
Qining Chen, Colette Schissel, Yosuke Kimura, Gary McGaughey, Elena McDonald-Buller, and David T. Allen
Environmental Science & Technology **2023** 57 (4), 1788-1796

Continuous monitors see when something goes really wrong

Recent examples from SOOFIE

- Site glass break
 - Large CH₄ leak and an oil spill.
 - **Leak stopped within 90 minutes**
- Water line break
 - Large CH₄ leak at 3 different areas along water line
 - **Leak stopped within 80 minutes**

These saves represent huge amounts of emissions reductions; our goal!



1

Revise action-level to be site-specific and determined by a baseline with no prescriptive thresholds to derive suitable action levels for rolling averages.

2

Revise action-level to avoid nuisance alerts which will be onerous for small-to-medium businesses to fulfill root cause analysis requirements.



Thank you for your time