EEMDL
Energy Emissions Modeling and Data Lab

2024 Responsible Gas Symposium
Poster Session

COLORADO SCHOOL OF MINES

Title: Estimating methane emission durations using continuous monitoring systems

ABSTRACT

Updates to the EPA's Greenhouse Gas Reporting Program Subpart W will come into effect in January 2025, which include a requirement to report all "maintenance or abnormal emission events" greater than 100 kg/hr. Estimating the duration of these emissions is critical for accurate reporting, as the total emitted mass of methane is highly influenced by the length of the emissions. Infrequent sampling campaigns can roughly bound emission duration, but the fidelity of the duration estimates are limited by the sampling frequency. Continuous monitoring systems (CMS), on the other hand, measure methane concentrations in near-real time and hence provide a promising avenue for more robust, measurement-informed emission duration estimates. Here we present a method for creating duration estimates using CMS data. Our proposed method uses a gradient-based spike detection algorithm to cluster enhancements in the concentration time series into events and quantifies uncertainty by assessing the information content of the underlying concentration data as a function of wind direction.

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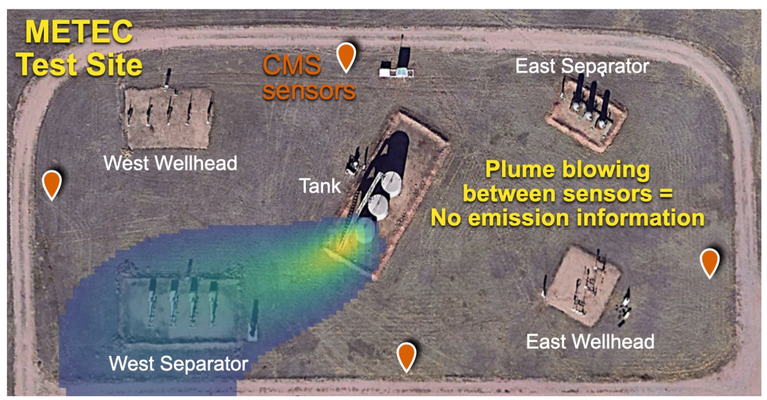
1. Motivation

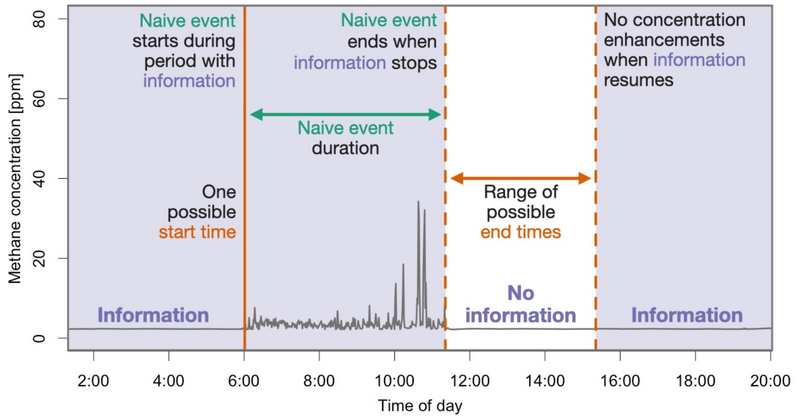
- Updates to the EPA's GHGRP Subpart W come into effect in January 2025, including a requirement to report all "maintenance or abnormal emission events'' > 100 kg/hr.
- Estimating the duration of these events is critical, as the total emitted mass of methane is highly influenced by the length of the emission.
- Infrequent sampling campaigns can roughly bound duration, but the fidelity of the duration estimate is limited by the sampling frequency.

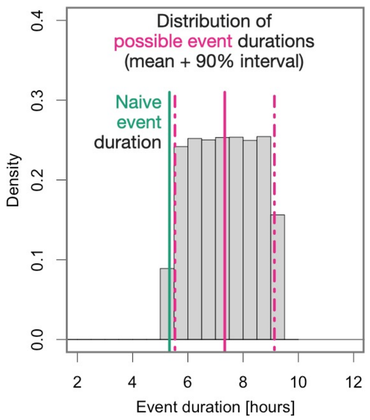
2. Background



- Continuous monitoring systems (CMS) measure methane concentrations in near real time and can complement snapshot measurements.
- However, gaps in information can make it appear that emissions stop early.

3. Methods





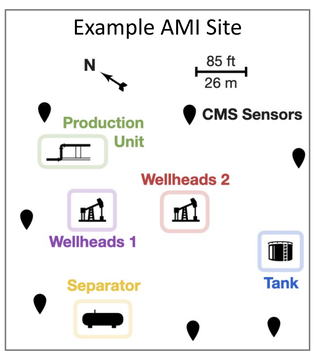
- Use atmospheric dispersion model to identify periods of information and no information.
- Account for gaps in information when calculating emission start and end times.
- Compute probability of combining events that are separated by period of no information.

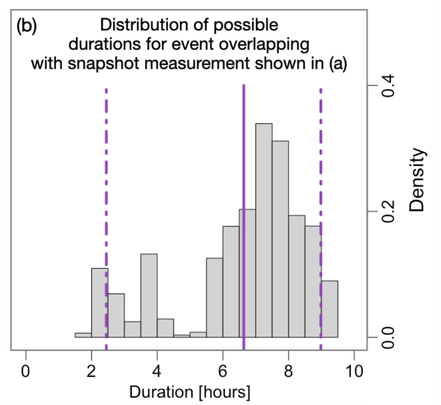
5. Conclusions

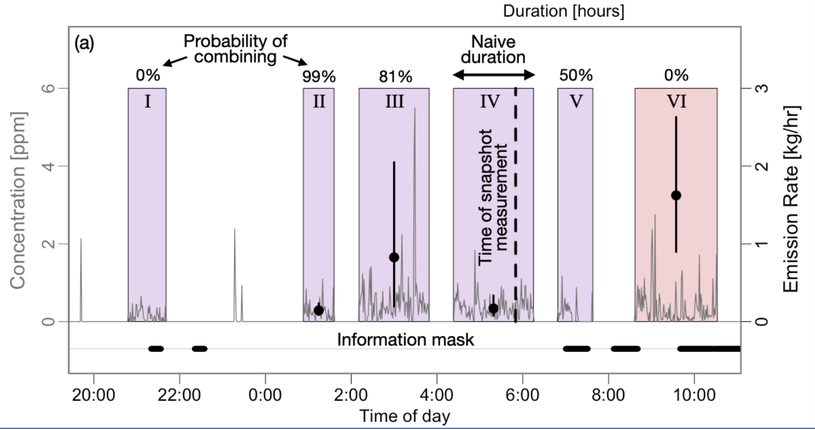
1. CMS measure concentrations continuously but do not always provide emission information.
2. CMS can bound the duration of emissions detected by snapshot measurement technologies.

4. Results

- We apply this method to CMS data collected as a part of the Appalachian Methane Initiative (AMI).
- One example snapshot measurement shown below. "Naïve" duration from CMS is under two hours. Duration estimates from proposed method range from 2-10 hours.
- Frequency estimates for example site range from 120 [118, 123] to 475 [461, 492] emission events per year, depending on the emission source.







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