EEMDL
Energy Emissions Modeling and Data Lab

2024 Responsible Gas Symposium
Poster Session

COLORADO SCHOOL OF MINES

Title: Using continuous monitoring systems for measurement-informed inventories on oil and gas production sites

ABSTRACT

As part of the Quantification, Monitoring, Reporting, and Verification (QMRV) research project, multiscale measurements were conducted at 39 oil and gas production sites. Measurement technologies included aerial snapshot platforms (drone and plane) and continuous monitoring systems (CMS), which measure methane concentrations in near-real time. Snapshot measurements can be higher or lower than conventional bottom-up inventories depending on the time of measurement, as emissions vary over time. Here we demonstrate how CMS can be used to: 1) reconcile bottom-up inventories and top-down snapshot measurements, and 2) create measurement-informed inventories that account for temporal variability.

See Daniels et al. (2023) for details!

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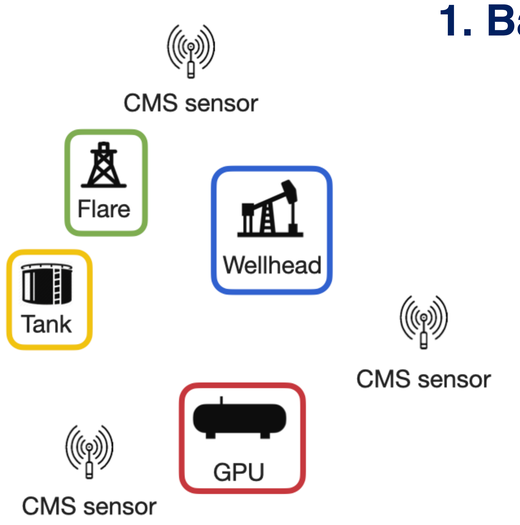
1. Background & Objectives



- Multiscale measurement campaign at oil and gas production sites included aerial snapshot measurements and continuous monitoring systems (CMS).
- **Goal:** Develop measurement-informed inventory (MII) on prototypical site (shown to left).
- **Challenge:** Large disagreement between bottom-up inventory and snapshot measurements. Can the snapshot measurements be used?
- **Solution:** Reconcile bottom-up inventory and snapshot measurements by creating a CMS-based MII.

2. Methodology

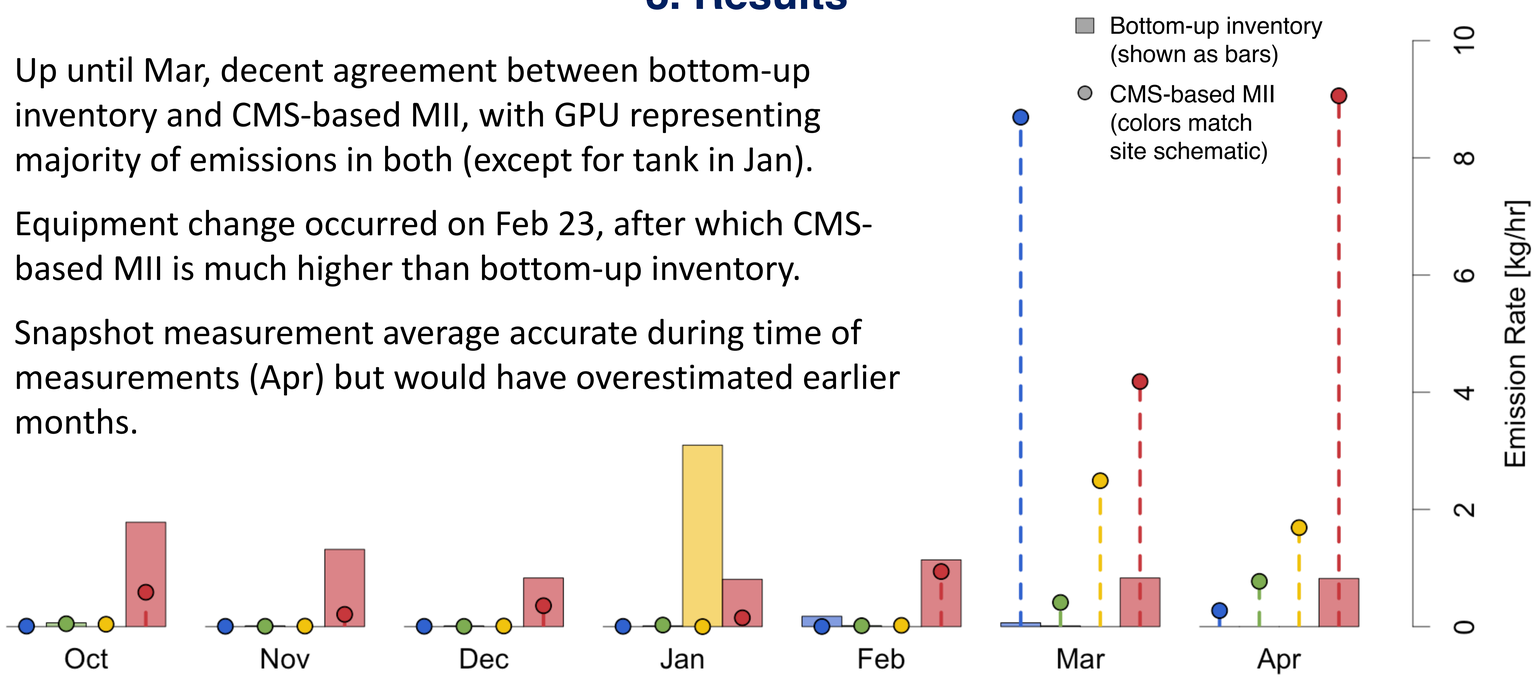
- Create snapshot measurement average by averaging 13 site-level measurements taken over 4 days in Apr.

Bottom-up inventory = 0.8 kg/hr	Snapshot measurement average = 12.5 kg/hr

- Create CMS-based MII by running Colorado School of Mines inversion framework on 7 months of CMS data.
- Framework performs event detection, localization, and quantification using minute-level concentration data. Average results at month-level to create CMS-based MII.

3. Results

- Up until Mar, decent agreement between bottom-up inventory and CMS-based MII, with GPU representing majority of emissions in both (except for tank in Jan).
- Equipment change occurred on Feb 23, after which CMS-based MII is much higher than bottom-up inventory.
- Snapshot measurement average accurate during time of measurements (Apr) but would have overestimated earlier months.



4. Conclusions & Next Steps

1. **Measurements are key!** Bottom-up inventory did not capture operational activity.
2. **Snapshot measurements can miss temporal variability.** Snapshot measurement average accurate during time of measurement, but potentially large errors if extrapolated to annual-level.

Next steps: Develop CMS-based MII on multiple sites within a basin. Can the basin-level distribution be used to say anything at the site-level?

References

William S. Daniels, et al. (2023). Toward multiscale measurement-informed methane inventories: reconciling bottom-up site-level inventories with top-down measurements using continuous monitoring systems. Environmental Science & Technology. DOI: 10.1021/acs.est.3c01121

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