# Mobile $CH_4$ measurement and inversion & an interactive visualization platform

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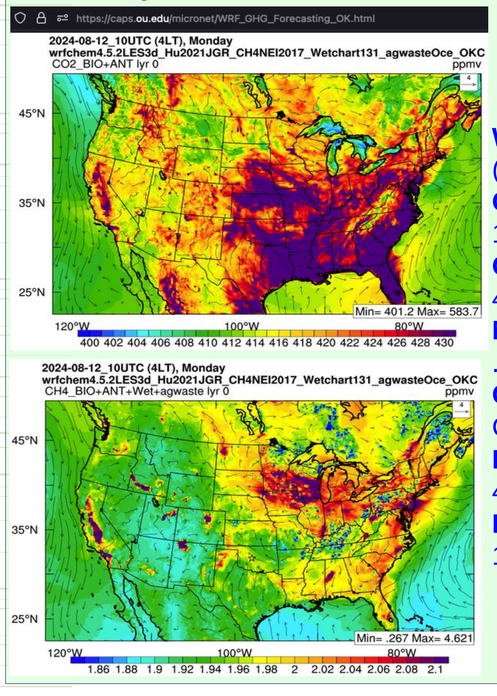
## Abstract

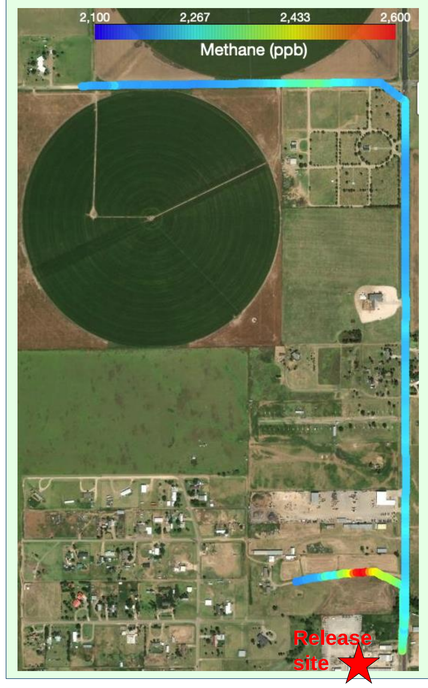
Methane ($CH_4$) is one of the most potent greenhouse gases (GHGs) responsible for global climate warming. However, accurate identification of $CH_4$ sources and their quantification for preventing/reducing $CH_4$ emissions are hampered by insufficient accuracy and spatiotemporal coverage of $CH_4$ measurements. In the past year, we have been conducting mobile $CH_4$ measurements using the highly-accurate LI-COR 7810 surveying different areas/regions, including Pampa, TX and Oklahoma, with the guidance of real-time $CH_4$ forecasting. Using the mass balance method, we estimated $CH_4$ emission rates from a cattle farm and wastewater treatment facility based on the mobile measurement. An interactive website visualizing measured $CH_4$ concentration is also developed, which help trace back the $CH_4$ plumes and thus help $CH_4$ inversion. Our study demonstrated that such mobile measurement plus the interactive visualization platform can be used to develop $CH_4$ emission inventories over a limited region, which we plan to explore in the near future.

## Mobile $CH_4$ measurement Guided by WRF-GHG real-time forecasting



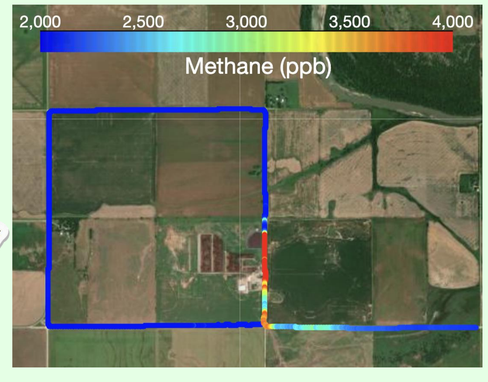

**WRF-GHG** (V4.5.2)
**$CO_2$ emission** 1km Vulcane3
**$CH_4$ emission** 4km NOAA FOG
**Meteo IC/BC** .25° GFS
**Chem IC/BC** CAMS
**Frequency** 4 times/day
**Resolution** 12km=>0.8km

## Measuring $CH_4$ in Pampa, Texas

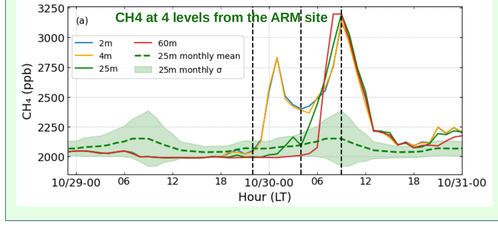



## Measuring $CH_4$ at the SGP ARM site

$CH_4$ Inversion
Mass Balance Method:
PBLH = 10m: 72.4 kg/hr
PBL H= 60m: *347.8 kg/hr*

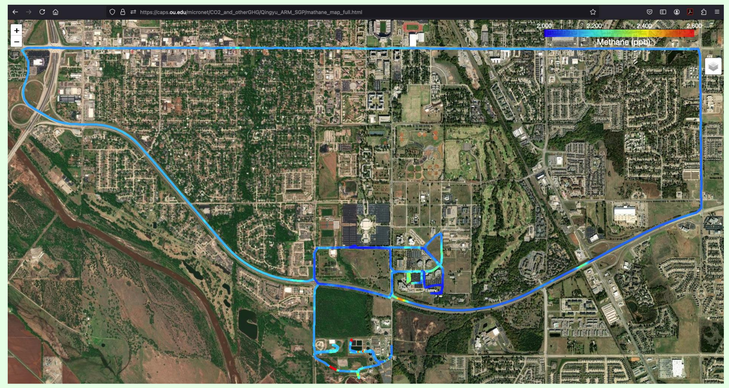




**The cattle farm likely caused the high $CH_4$ enhancement at the SGP ARM site 6 km away**

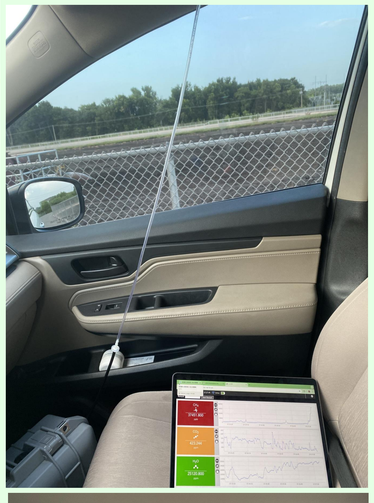




## Measuring $CH_4$ over Norman, Oklahoma




**$CH_4$ emission of 113 kg $hr^{-1}$ is estimated from the wastewater treatment facility of Norman using the mass balance method**




**CNG bus caused high $CH_4$ enhancement**

## Key points/Highlights

1. **We used mobile measurement of $CH_4$ and mass balance method to retrieve $CH_4$ emission at various locations.**
2. **Interactive websites are developed to visualize $CH_4$ concentrations over google map to aid developing inventories.**

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