Strong methane point sources contribute a disproportionate fraction of total emissions across multiple basins in the U.S.

Science Question

- How much to large methane point sources ("super-emitters") make up regional budgets
- What timescales do these emissions persist?
- From what emission sectors do these sources originate?

Analysis

- Deploy AVIRIS-NG and GAO airborne imaging spectrometers to detect and quantify CH4 point sources at high spatial resolution (3-5m) with multiple revisit.
- TROPOMI column XCH4 concentrations and HRRR-STILT transport model to estimate basin-wide CH4 fluxes.

Results

- Across 5 basins in the U.S., we find that point sources in the oil&gas, coal, waste, and manure sectors make up a sizable contribution of the total flux (average 40%).
- In the oil&gas sector, gathering pipelines made up 23% of emissions point sources across campaigns and were the second largest source of methane emissions after production.
- Both short- and long-lived sources contribute significant fractions to total emissions. An observing strategy with long intervals between revisits would not be able to distinguish between these modes and potentially miss a sizeable contribution from short-lived emissions.

Significance

- This study represents a culmination of multiple CMS and NASA funded projects to prototype a "tiered" observing system where multiple observations and jointly analyzed and fused to understand and prioritize areas for CH4 mitigation
- Significant CH4 reductions can be realized by targeting a small population of emitters, assuming there is sufficient sampling capacity of an observing system.
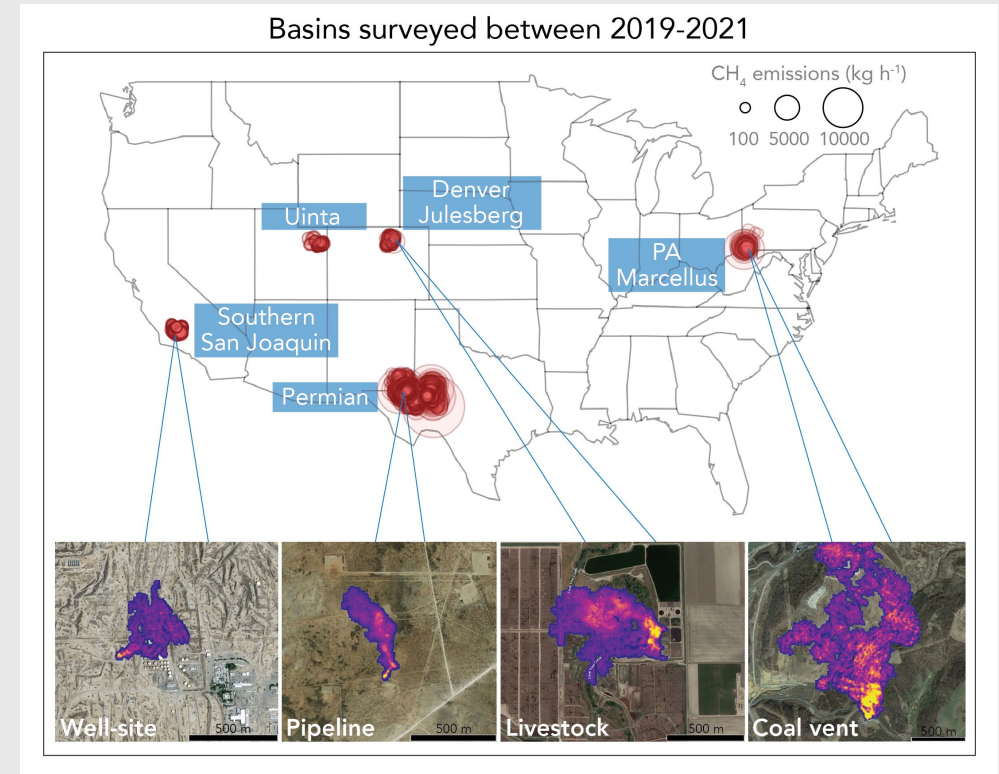
Acknowledgements

Figure 1. Major basins surveyed between 2019-2021 with either the GAO or AVIRIS-NG airborne imaging spectrometers. Bottom panels show representative CH4 point source plumes from various emission sources, including a well-site, pipeline, manure management/livestock, and a coal vent.