MethaneSAT: revolutionizing measurement of methane emissions worldwide

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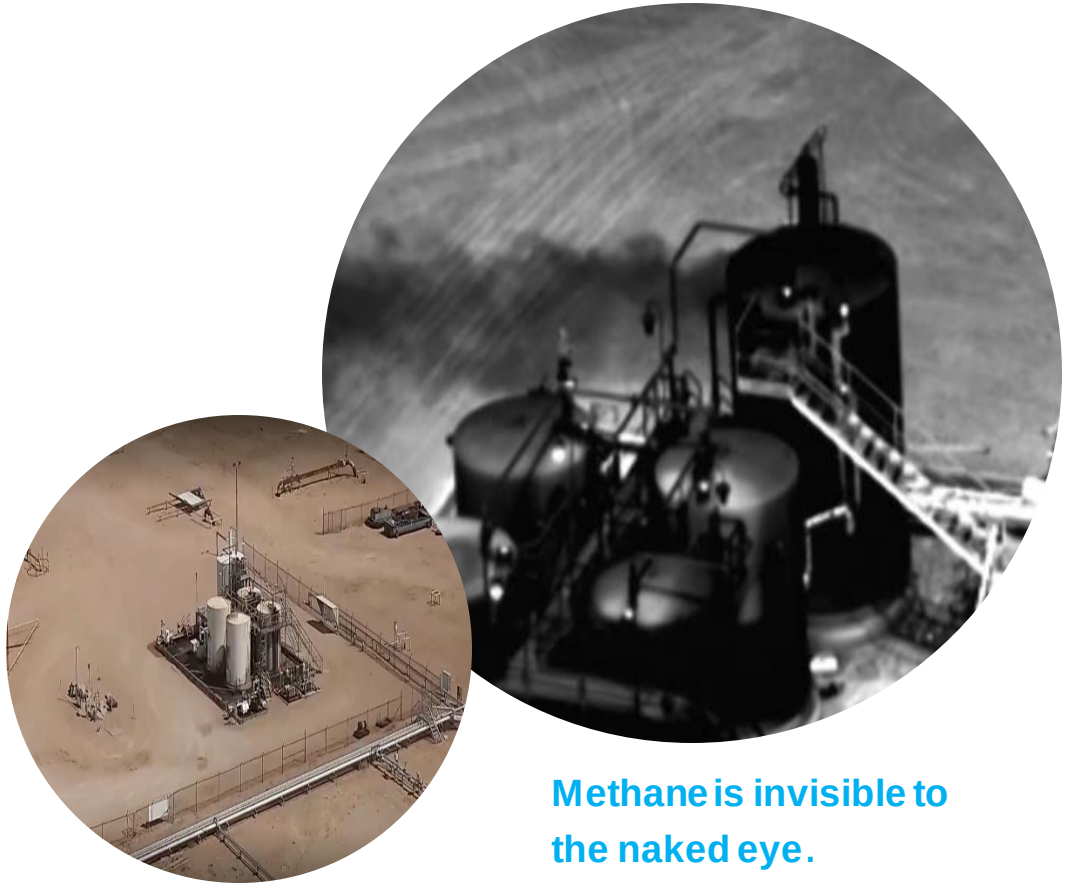
Methane is causing **25% of man-made global warming.**

Oil & gas is the largest industrial source of U.S. methane emissions.

Methane is the primary constituent of natural gas: emissions are a public health, climate and waste problem.

Methane from O&G production sources is emitted with **VOCs, a building block of ozone pollution**.



Methane is invisible to the naked eye.

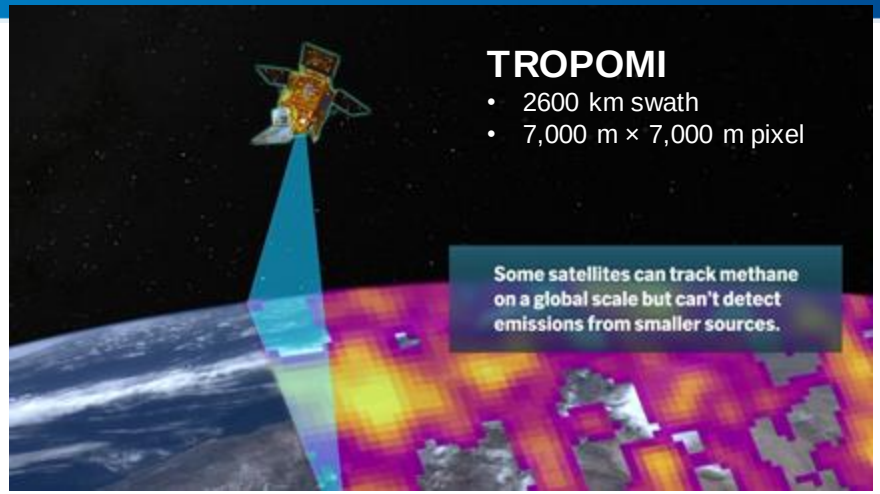
An ecosystem of methane-detecting satellites is emerging, each with distinct capabilities and purpose.

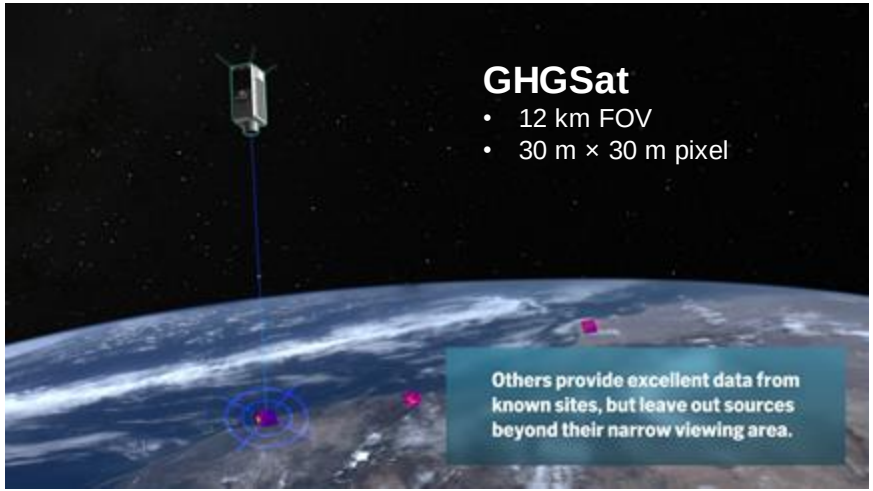
They're giving companies, regulators, investors, and the public a new level of transparency and insight for tackling an urgent climate challenge.

MethaneSAT & other satellites

GLOBAL MAPPING	AREA MAPPING	LOCAL MAPPING
Global & large-scale regions Large point sources	Area sources Point sources Sector-wide quantification	Point sources Facility level attribution
TROPOMI SCIAMACHY GOSAT GOSAT-GW CO2M	MethaneSAT	GHGSat PRISMA EnMAP Carbon Mapper ZY1

MethaneSAT was designed to fill a gap in understanding the magnitude of methane emissions at a regional scale





MethaneSAT will be the most advanced methane-tracking satellite in space

Goal | To quantify methane emission rates, from multiple sectors, including at least 80% of global oil and gas production regions

Access | All data freely available online through methanesat.org

Purpose | Provide radical transparency through freely accessible methane data on a global scale

Launch | March 2024; planned lifetime of 5 years

Partners

BLUE CANYON TECHNOLOGIES

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Ball Aerospace & Technologies Corp.

ROCKET LAB

HARVARD UNIVERSITY

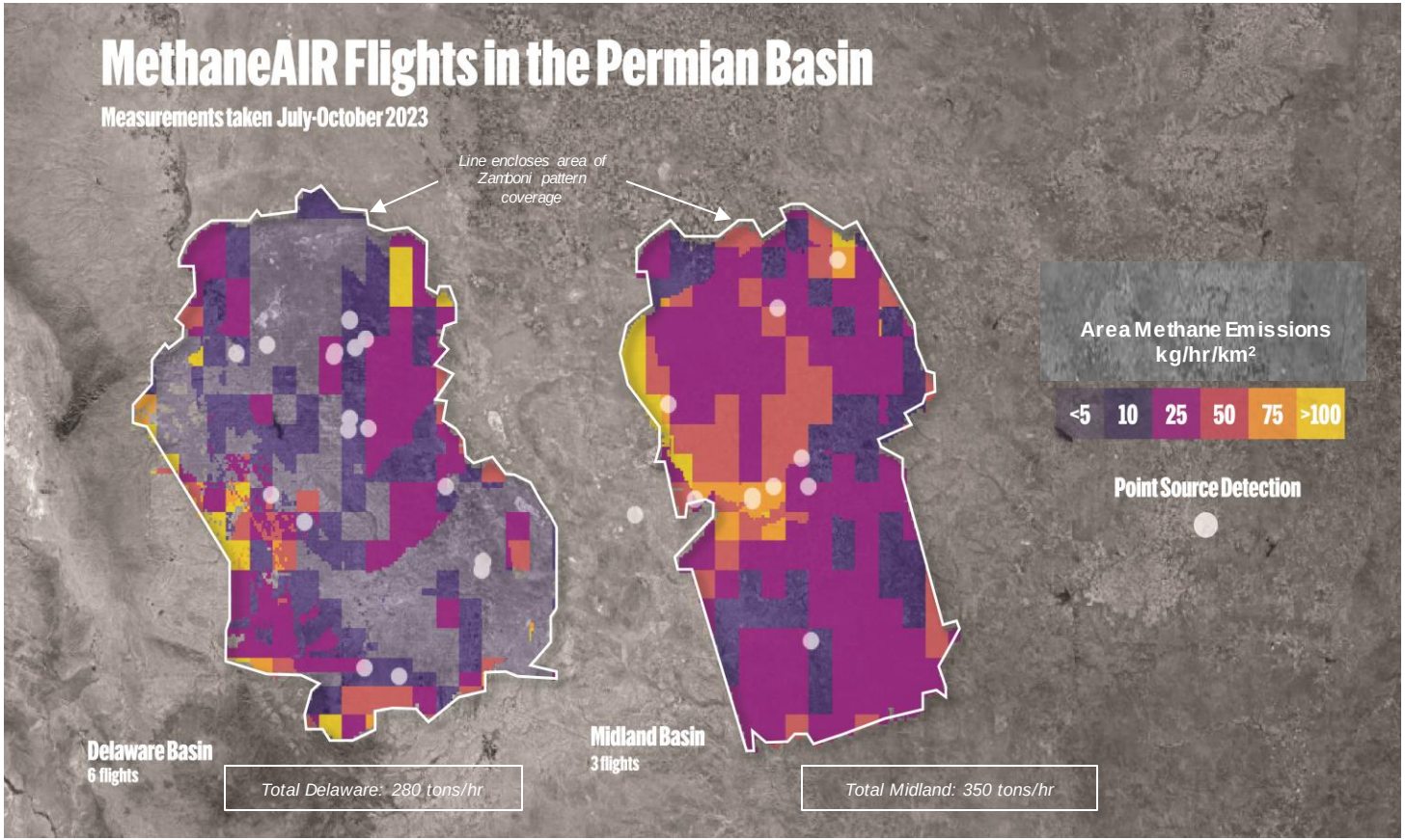
CENTER FOR ASTROPHYSICS
HARVARD & SMITHSONIAN

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

Remote sensing can help address **two distinct data needs**

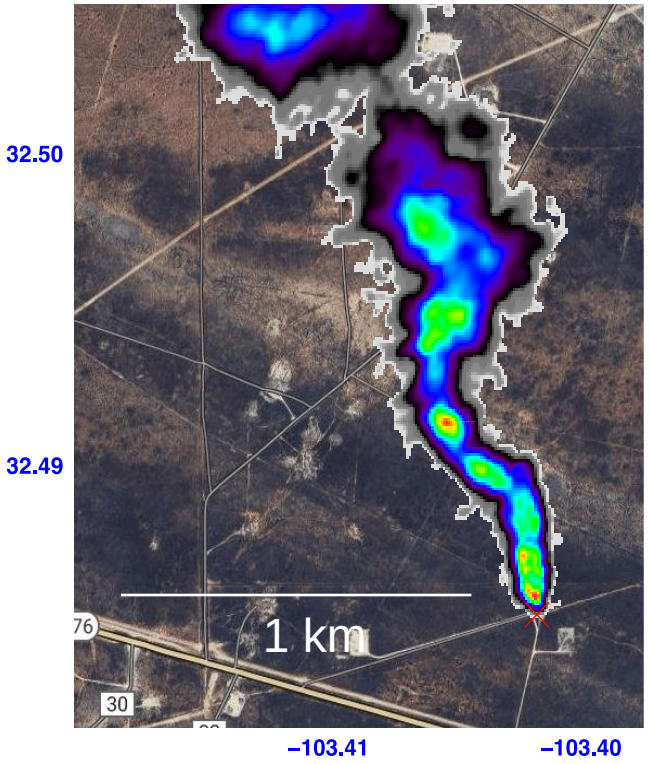
#1: Track emissions:

Where they occur, how **large** they are, and how they **change** over time at the national and basin scale

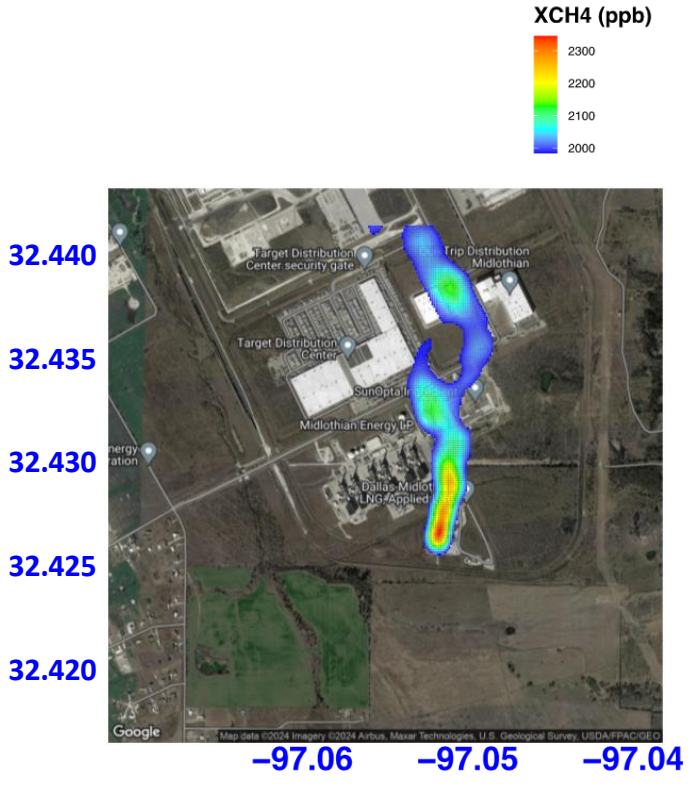


Remote sensing can help address **two distinct data needs**

#2. Provide data on large emissions from a **specific source** to help companies and regulators find and fix leaks



Permian MX024 15000 kg/hr



Midlothian (TX) Energy 4730 kg/hr

MethaneSAT's unique capabilities mean it will see **all emissions** and produce **accurate, policy relevant data**

Geographic scale

- 200km^2 target in 30 seconds
- 95 minutes orbit time, 3-4 day revisit rate

High precision

- 130m x 400m resolution
- 3 parts per billion

Compare emissions across basins

Enable empirically based Methane Supply Index

Track O&G commitments (e.g. OGDC)

Solve challenges of comparing top down & bottom up

Why are total regional emissions important for fighting climate change?

Recent evidence from multiple scientific assessments indicate that smaller diffuse emission sources account for a significant component of total regional emissions, if not for the vast majority.

High-emitting point sources or super emitters **alone** do not enable effective mitigation of emissions across the O&G supply chain.

Quantitative data on total emissions and how those emissions are **spatially distributed** across wide areas are critically needed.

MethaneSAT is unique in **quantifying total regional emissions and producing spatially-resolved emissions data across O&G regions,** compared to point source detection satellites (e.g. GHGSAT, CarbonMapper) that only produce data on high-emitting point sources at the facility level.


MethaneSAT will cover 80% of the world's O&G regions in 150 targets. Each target will be 200 km x 200 km
These sites are located in 48 production basins around the globe.
Not real data, for demo purposes only.

The satellite

Imaging spectrometer that operates in target mode and collects methane data globally

The data platform

Free web-based global methane emissions data platform that processes and visualizes the satellite data

MethaneAIR, an aerial precursor to MethaneSAT, is measuring majority of onshore O&G production regions in North America

- **The goal:** Quantify methane emission rates of 80% of onshore O&G production regions in North America.
- **The timeline**: Flights started in 2023.
- **The plane:**
  - Retired from a private operator, the modified Lear 35 is the first aircraft tasked to measure methane full-time. It is operated by iO Aerospace.
  - The plane carries the same spectrometer technology as MethaneSAT, but is flying at 40,000 ft, above most commercial traffic.
  - It carries two pilots & a technician, with flights lasting ~5 hours.

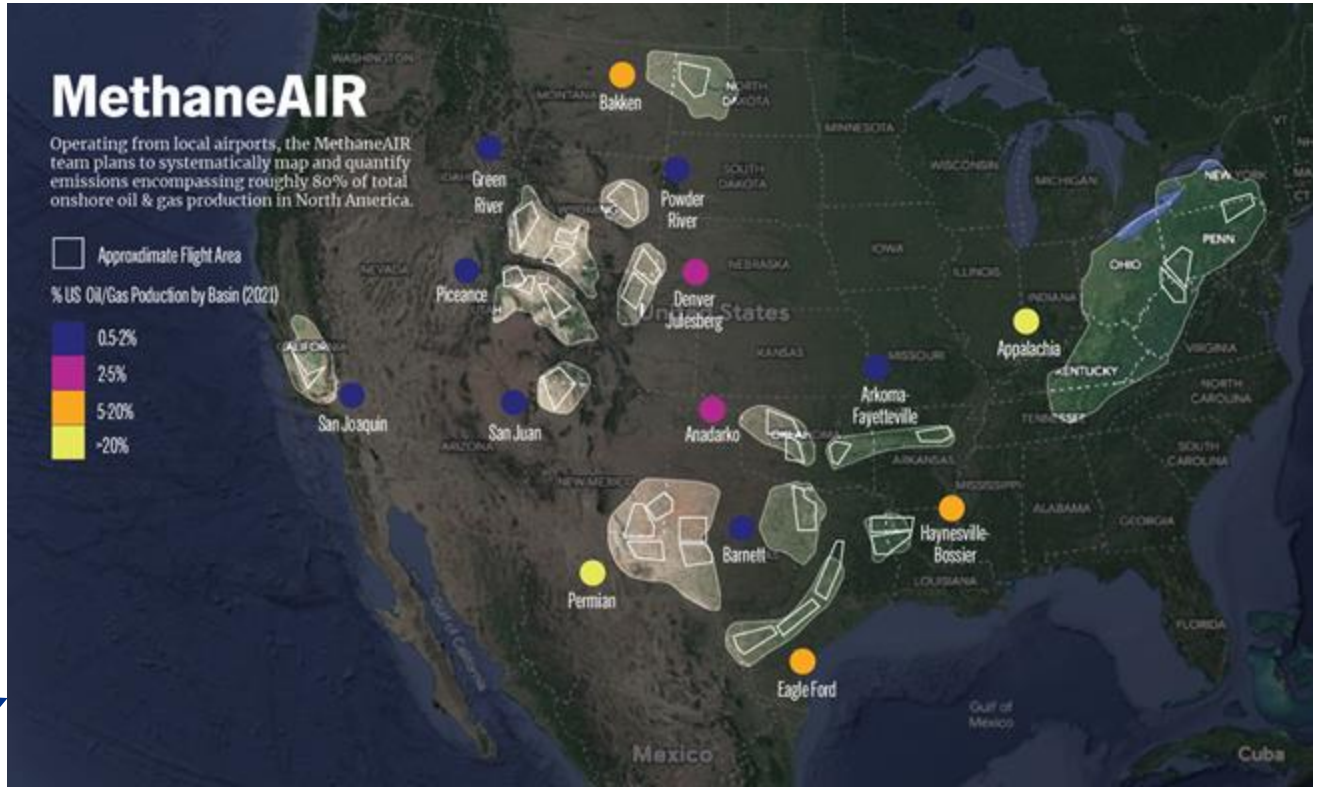
We will be sharing this data publicly later this year.

MethaneAIR has already gathered data from over 80% of US O&G production

MethaneAIR has flown over:

- Eagle Ford
- Haynesville
- Bakken
- Anadarko
- Arkoma Fayetteville
- Denver
- Arkoma Woodford-Caney
- Barnett
- Uinta
- Permian
- Appalachia
- *…with more to come*

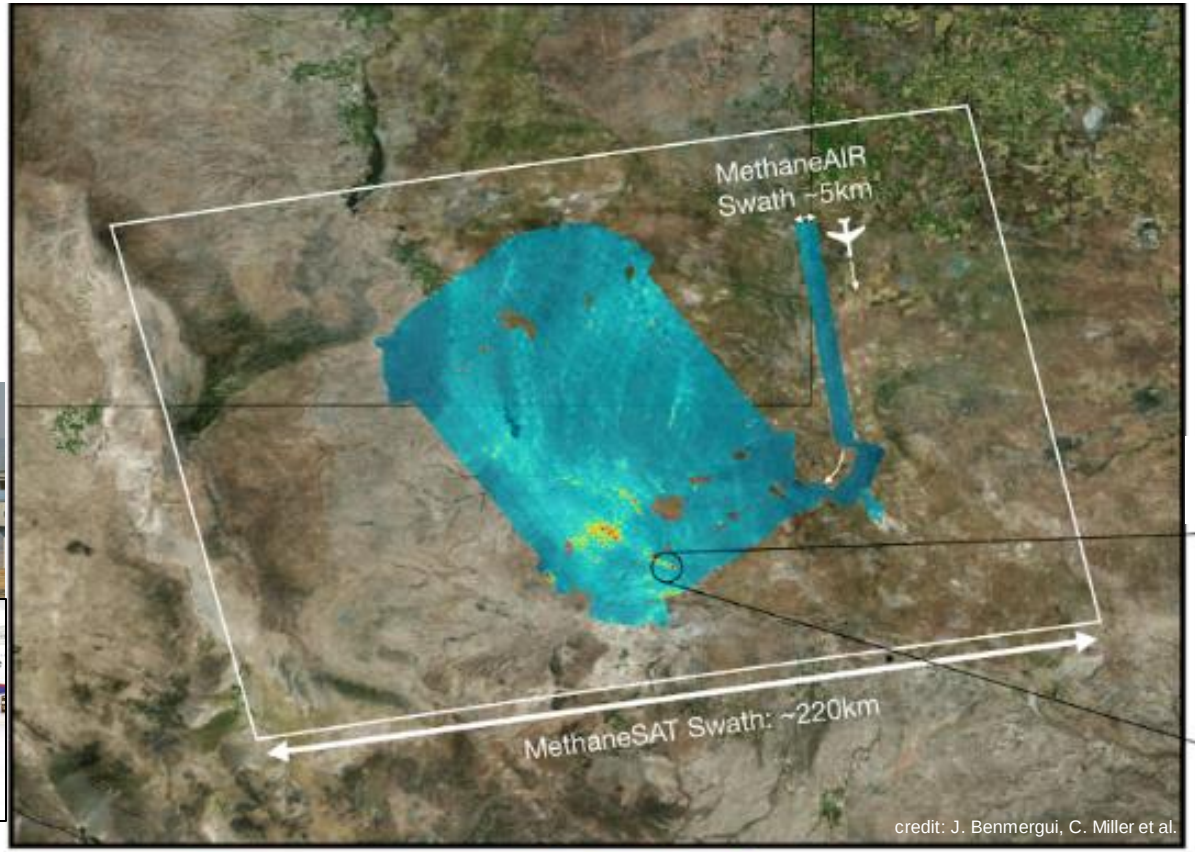
All the basins in the US that MethaneAIR will be covering

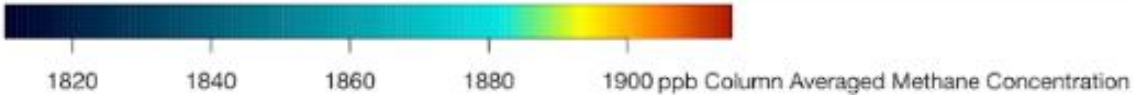


MethaneAIR: airborne precursor to MethaneSAT

Preliminary results.
- Confidential -

MethaneAIR flight RF06 over the Permian Basin, in Texas/New Mexico, world's largest oil field.

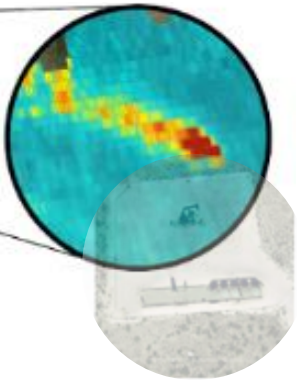




MethaneAIR flew the region in 2 hours.

MethaneSAT will scan it in 30 seconds.

Methane plumes are clearly visible



The MethaneSAT Opportunity

Operators

- Integrate this data with other emissions monitoring
- Prioritize where to deploy leak detection and repair efforts
- Monitor facilities that are remote, unmanned, or operated by joint venture partners

Finance

- Manage risk associated with excess methane emissions
- Identify opportunities associated with better methane performance
- Conduct company benchmarking
- Hold companies accountable during engagements

Regulators

- Identify regional emissions, problematic infrastructure, and estimation errors to inform regulatory requirements
- Compare data to operator reports
- Improve on existing datasets
- Track progress against emission reduction goals