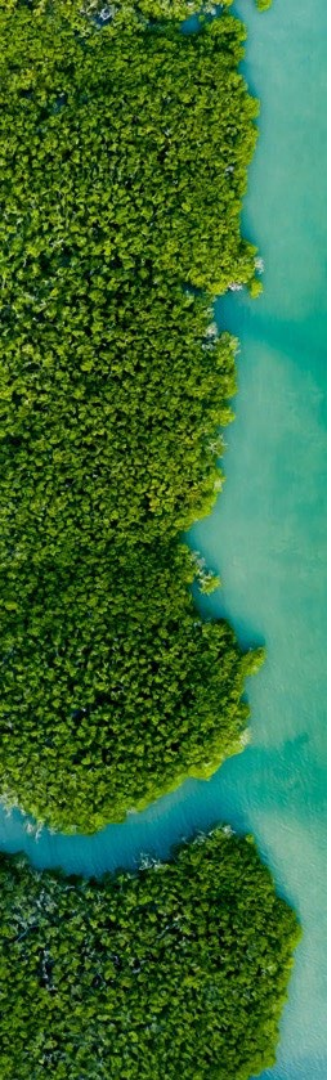


Satellites to detect methane emissions

Environmental Defense Fund

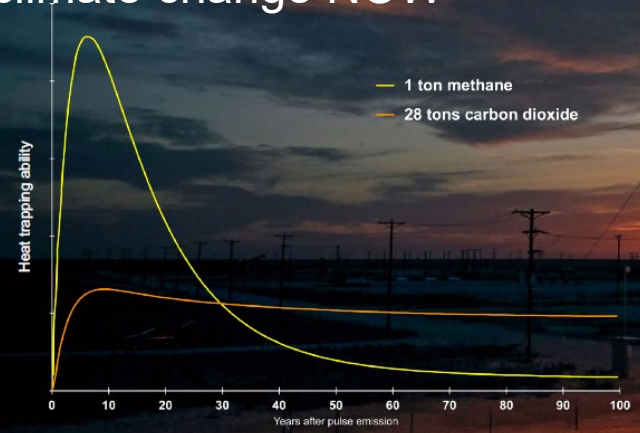
Alba Lorente – alorente@edf.org

Environmental Defense Fund

Reductions of methane – fast and *cheap* way to slow global warming

Methane has more than 80 times the warming power of CO_2 over the first 20 years after release

It's the fastest way to slow climate change NOW



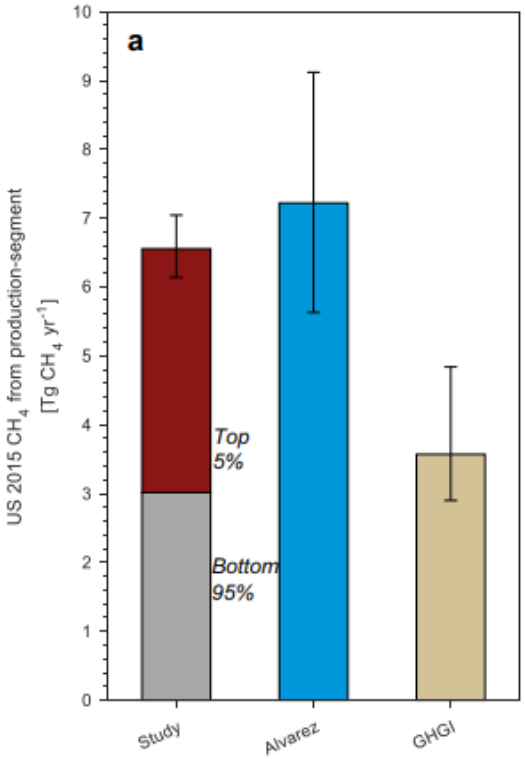
75% of fugitive methane emissions from oil and gas could be reduced using presently available technologies, and much of that at no net cost

(Global methane Tracker 2023, IEA)

Need for empirical data – underestimation in bottom-up inventories

Zavala-Araiza et al. (2015)

"Measured oil and gas methane emissions **are 90% larger** than estimates based on the US Environmental Protection Agency's Greenhouse Gas Inventory "



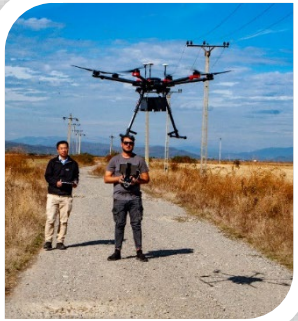
Alvarez et al. (2019)

"Estimated emissions are **60% higher** than the US Environmental Protection Agency inventory estimate, likely because existing inventory methods miss emissions released during abnormal operating conditions."

Rutherford et al. (2021)

"Both our bottom-up component-level inventory results and the Alvarez site-level results are **approximately 2x** those of the GHGI estimate."

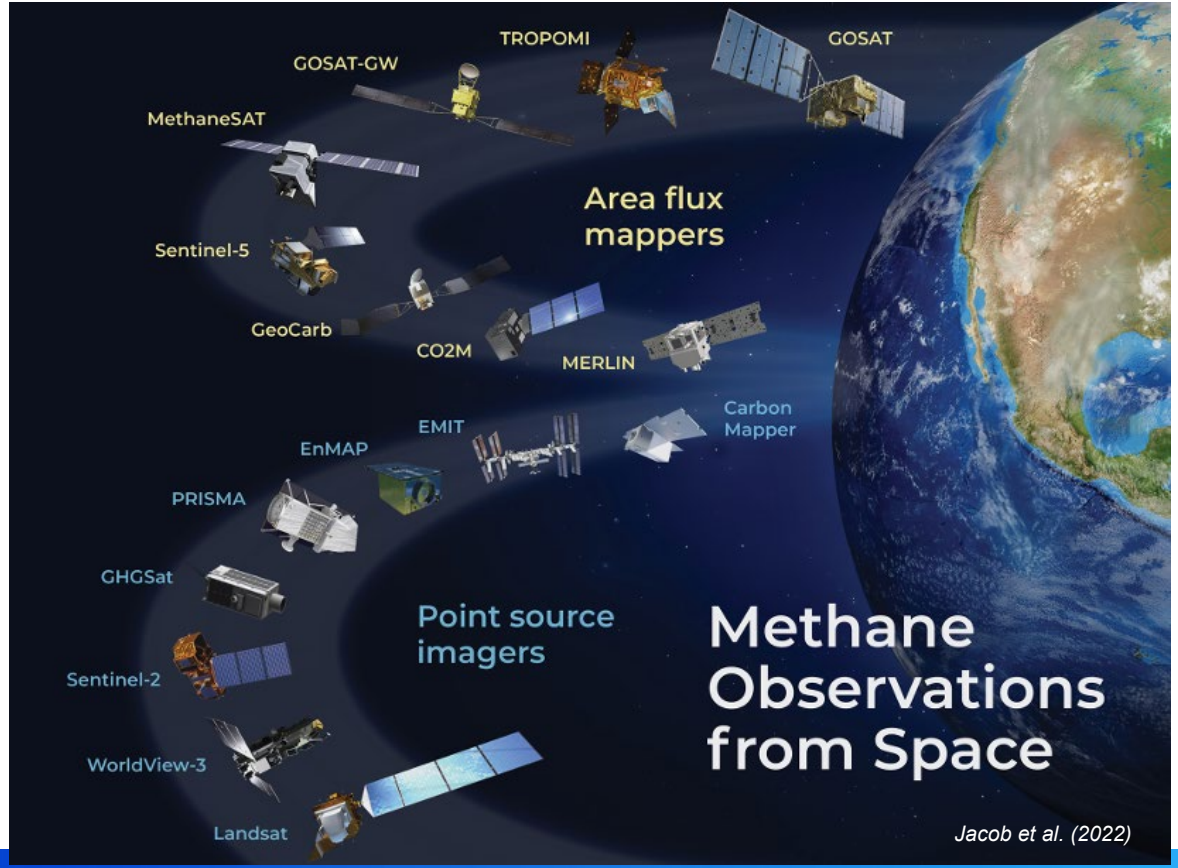
SPATIAL SCALE



Goal:

Detection, quantification, or both?

Current satellite constelation



Current satellite constelation

Jacob et al. (2022)

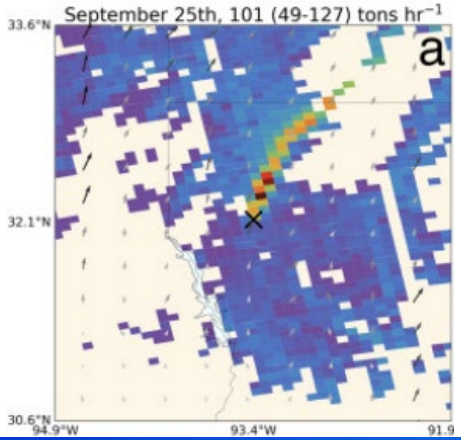
Global mapping
Global & large-scale regions Large point sources
TROPOMI GOSAT

Wide swath – 2600 km
5.5 x 7 km^2 pixel size

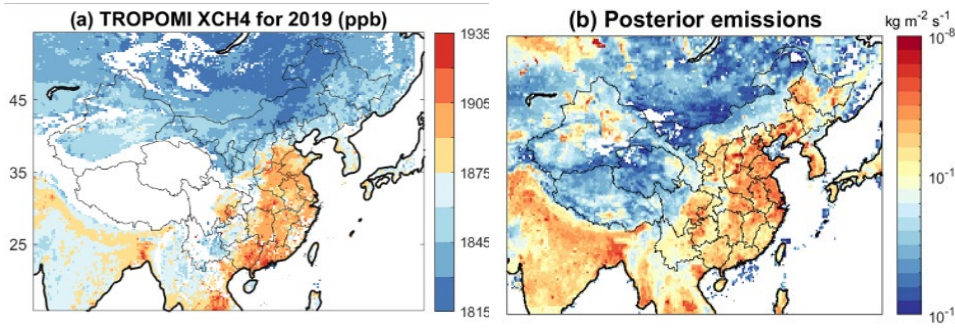
Current satellite constelation

Global mapping
Global & large-scale regions Large point sources
TROPOMI GOSAT

Jacob et al. (2022)

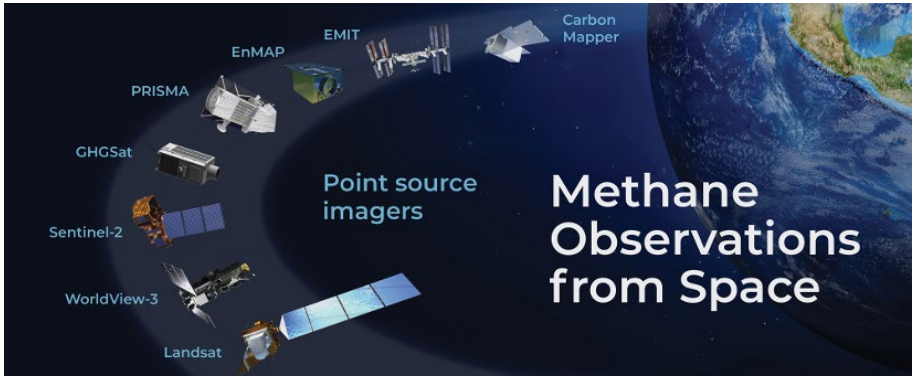


Maasakkers et al. (2022)

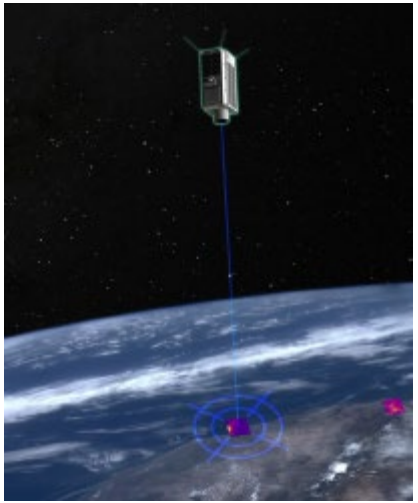


Chen et al. (2022)

Current satellite constelation



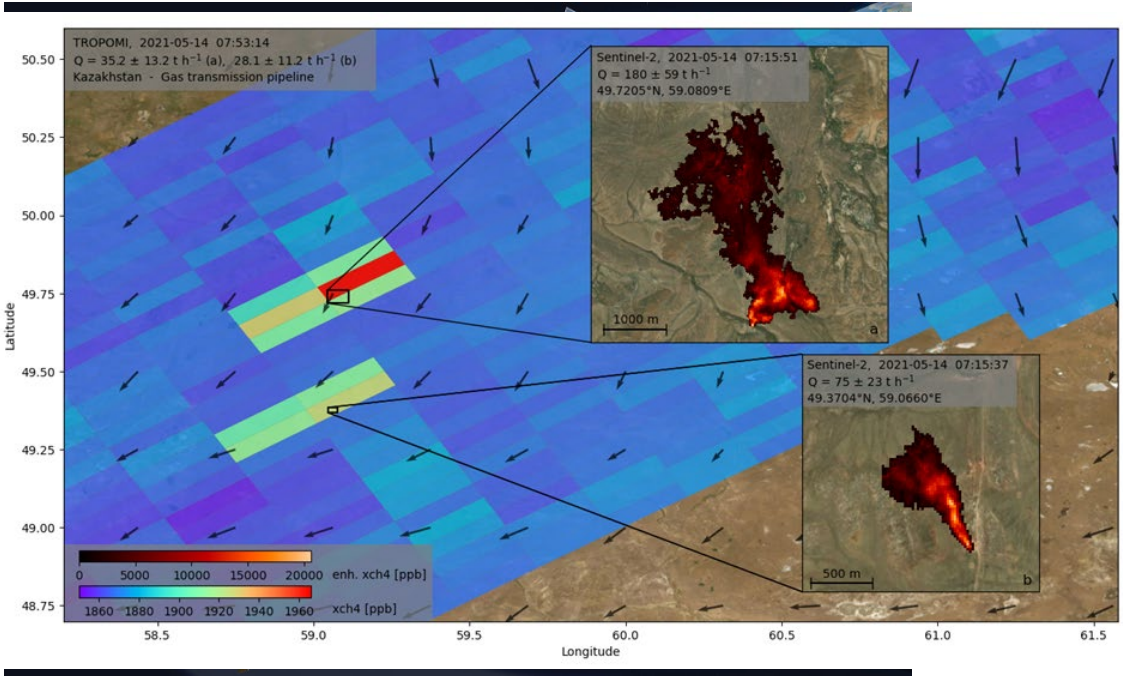
Jacob et al. (2022)



12 km FOV
30 x 30 m pixel

Local mapping
Point sources Facility-level attribution
GHGSat PRISMA Sentinel-2

Current satellite constelation



Schuit et al. (2023)

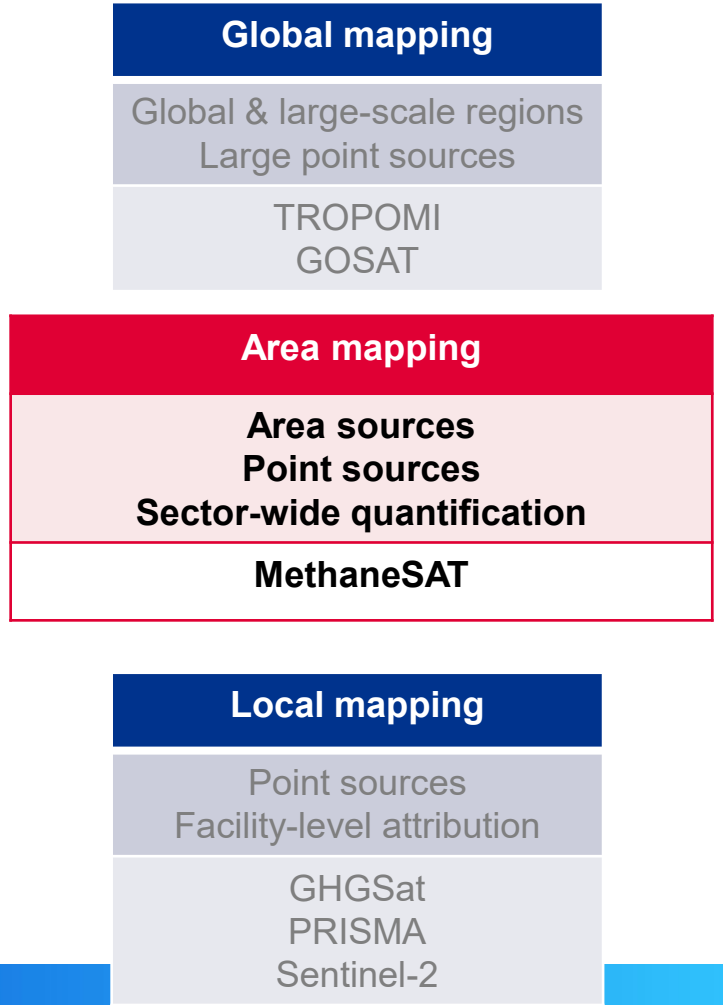
Global mapping
Global & large-scale regions Large point sources
TROPOMI GOSAT

Local mapping
Point sources Facility-level attribution
GHGSat PRISMA Sentinel-2

MethaneSAT

Operational mission lead by the Environmental Defense Fund

Designed to fill a gap in understanding the magnitude of methane emissions at a regional scale

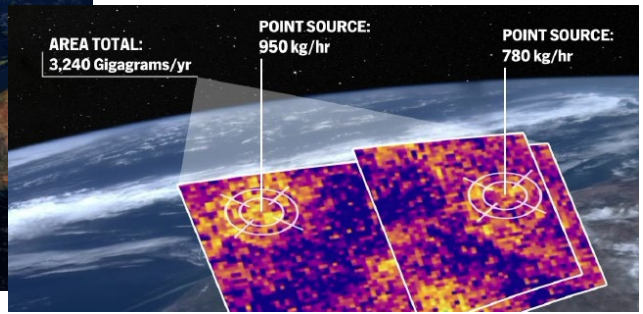


MethaneSAT

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

Targets of 200x200 km^2

Revisit targets every 3-4 days



MethaneSAT

- Quantify and track total regional emissions from individual O&G basins and subbasins, providing sector-wide emission quantification
- Quantify and track area source emissions, to reveal how much methane is emitting at 1km² scale & how emissions vary across the landscape
- Quantify and trace high-emitting point sources back to latitude and longitude

**prototype for presentation purposes only*

Credit: Fiona Liao, Susan Kasper et al.

What sets MethaneSAT apart?

The satellite

Wide view path and geographical scale

- ✓ 200 km view path
- ✓ Revisit targets every 3-4 days
- ✓ 200 x 200 km targets

High resolution and precision

- ✓ Native pixel resolution of 200m x 400m
- ✓ Concentration measurement sensitivity t detect down to 3 parts pe billion

MethaneSAT webportal

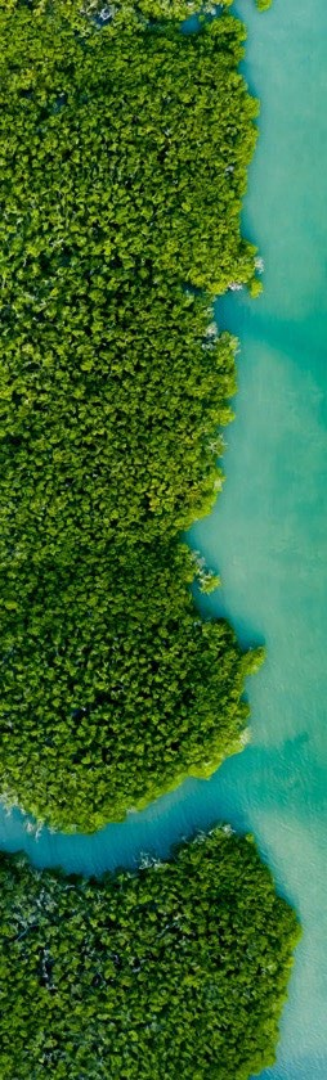
Automation of emission estimates

- ✓ Provides **emission rates**, revealing how fast methane is escaping.
- ✓ Automated calculations that currently can take scientists weeks to months, providing users with data in a few days

Actionable data & transparency

- ✓ Visualized online
- ✓ Overlaid with oil and gas assets
- ✓ Free to access for mitigation purposes

Credit: Fiona Liao, Susan Kasper



Conclusions

- Methane emission reductions can slow global warming now, and reductions can be achieved with available technology at no net cost
- Better and more transparent empirical data are needed
- Satellites have increased our understanding of the level and nature of methane emissions
  - Current satellites:
    Emissions from global and large-scale regions
    Point sources
- MethaneSAT:
  - Quantify and track total regional emissions, area source emissions and high-emitting point sources
  - Actionable data and transparency

Thank you!

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Environmental Defense Fund