



CLEAN AIR  
TASK FORCE

# Application of remote sensing in coal mine methane monitoring

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# Clean Air Task Force

- Non-profit organization founded in 1995.
- Headquartered in Boston (USA), with global staff and presence.
- Focusing on methane emissions for more than 20 years.

# New technologies are changing methane mitigation landscape

- An increasing number of methane measurement techniques is available: hyperspectral cameras, LiDARs, in-situ sensors.
- These are being deployed on the ground, trucks, drones, airplanes, and satellites.
- These are driven by the strong interest in methane monitoring and key enabling technologies like low-cost access to space, miniaturized electronics, and AI.
- Remote sensing instruments are game-changers, providing global reach, visibility, and quantification for an otherwise invisible problem.



ABB / METEC

planet.

CARBON  
MAPPER

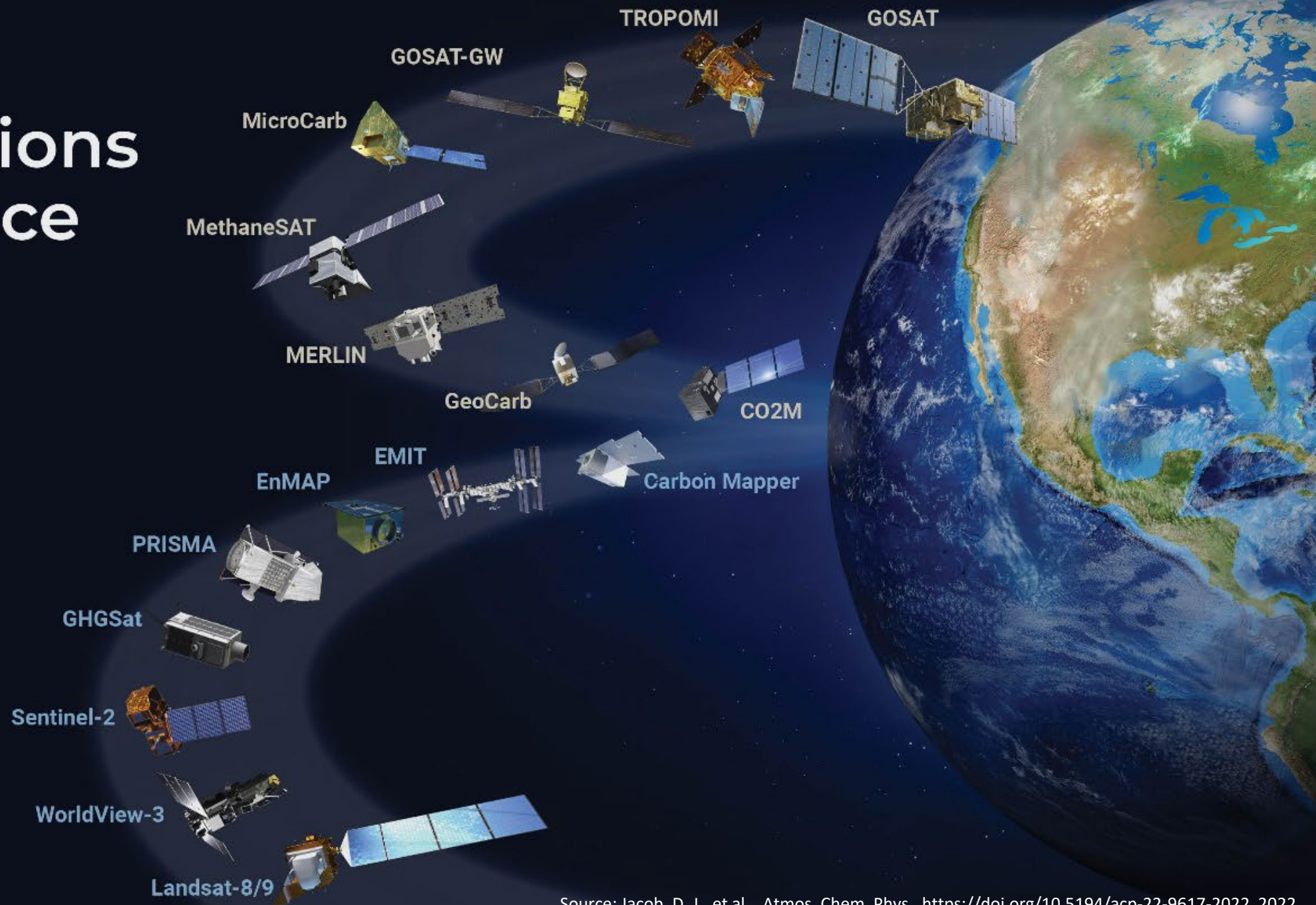


Planet Labs, Inc./Carbon Mapper

# Methane Observations from Space

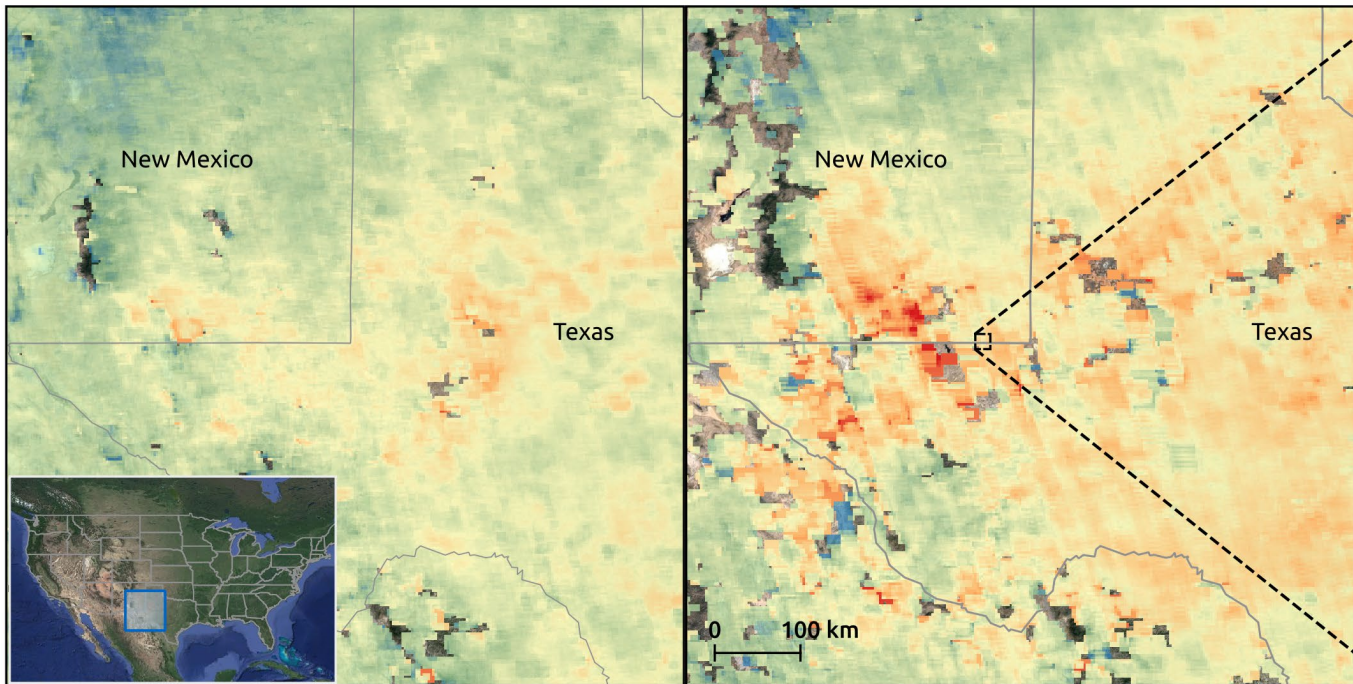
Area flux mappers

Point source imagers



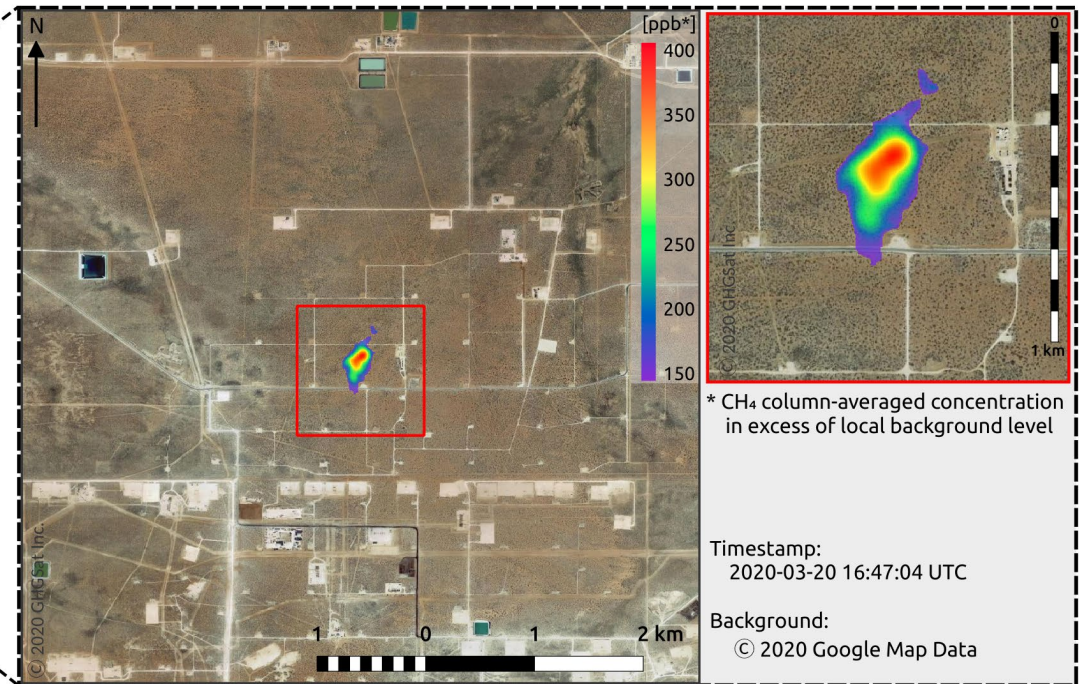
# — Each instrument is optimized for different task

Monthly averages derived from TROPOMI  
March - April 2019      March - April 2020



1800 1920  
ppbv

GHGSat-D Satellite Observation  
March 20<sup>th</sup>, 2020



\* CH<sub>4</sub> column-averaged concentration in excess of local background level

Timestamp:  
2020-03-20 16:47:04 UTC

Background:  
© 2020 Google Map Data

# — High-resolution plume detection (GHGSat)

## Satellite CH<sub>4</sub> Measurement

Mining - Poland



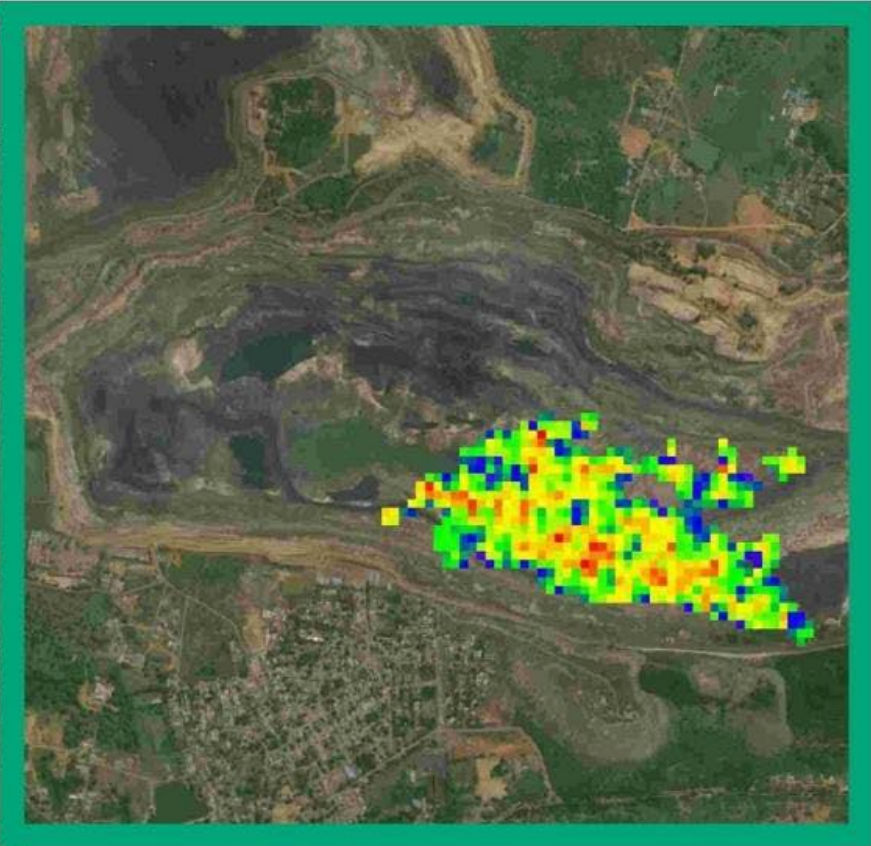
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© Maxar: <https://www.maxar.com>

BACKGROUND ©2023 MAPBOX  
Date: 2023-02-09  
Time: 12:31:22 UTC

Source: <https://spectra.ghgsat.com/>

— High-resolution plume detection (GHGSat) cont.

**Satellite CH<sub>4</sub> Measurement**  
Mining - India

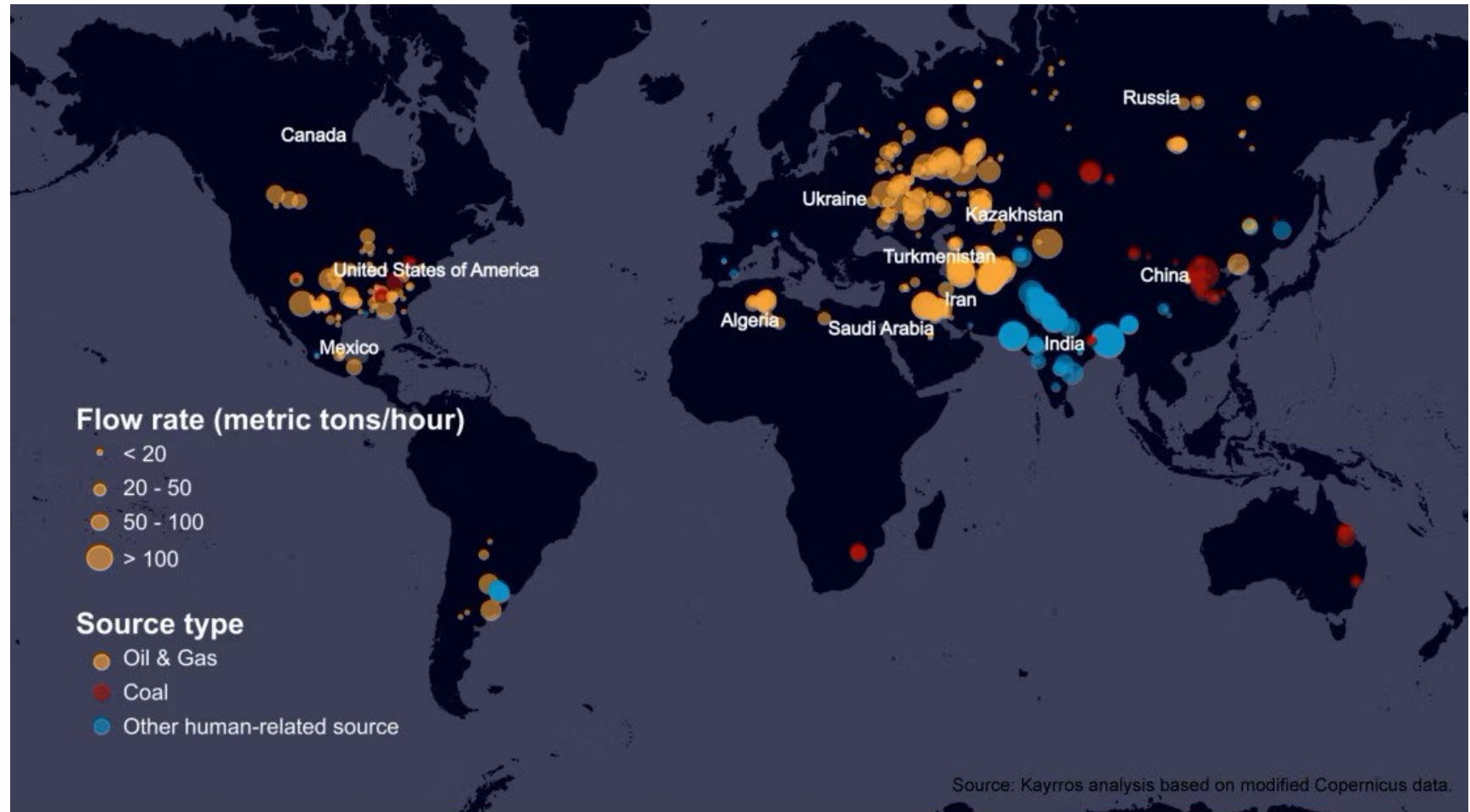
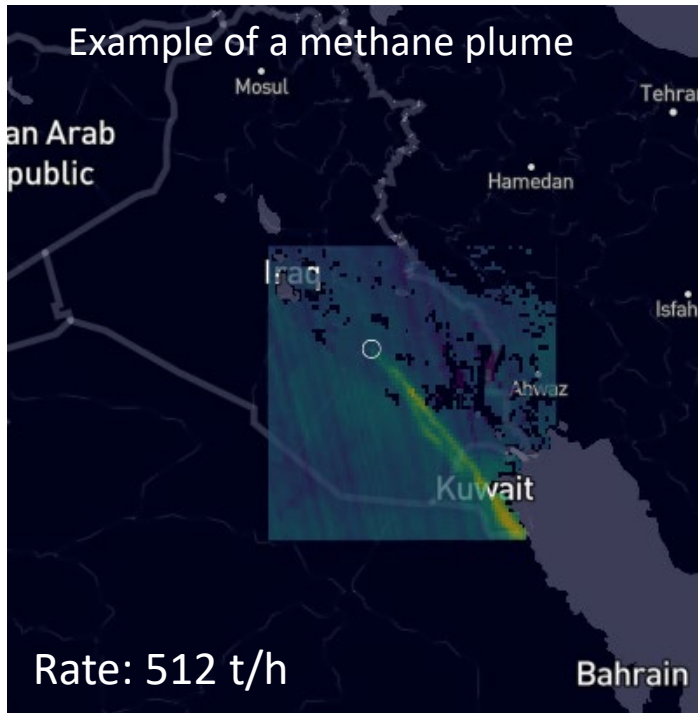


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BACKGROUND ©2023 MAPBOX  
Date: 2023-01-06  
Time: 03:40:29 UTC

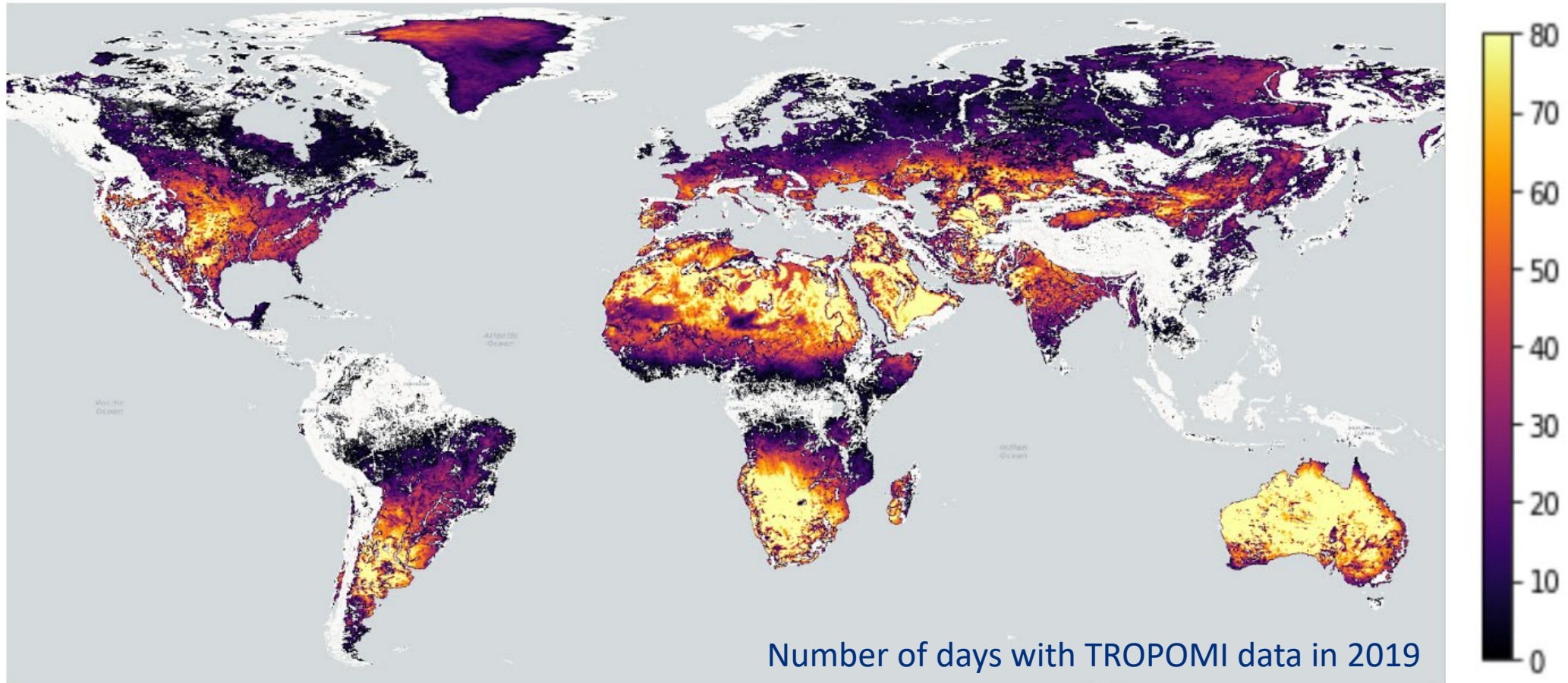
Source: <https://spectra.ghgsat.com/>

# — Detection of ultra-emitters with area flux mappers

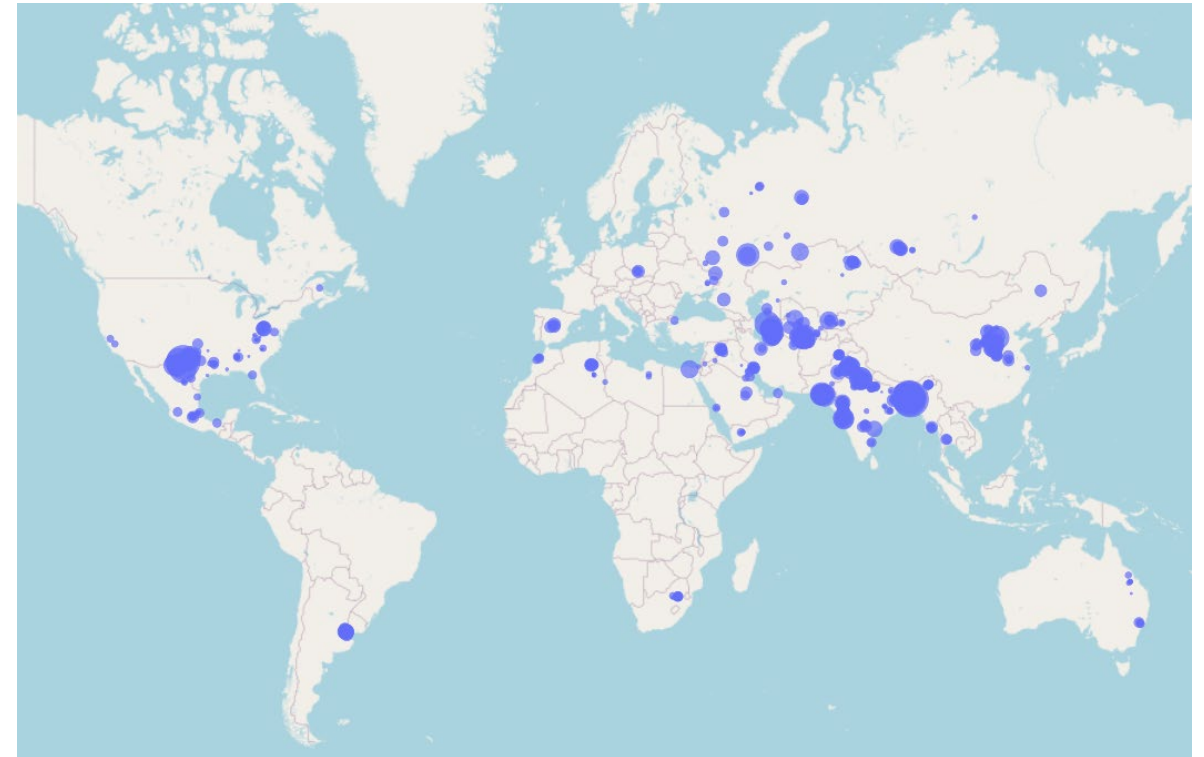




— Each satellites has its own blind spots



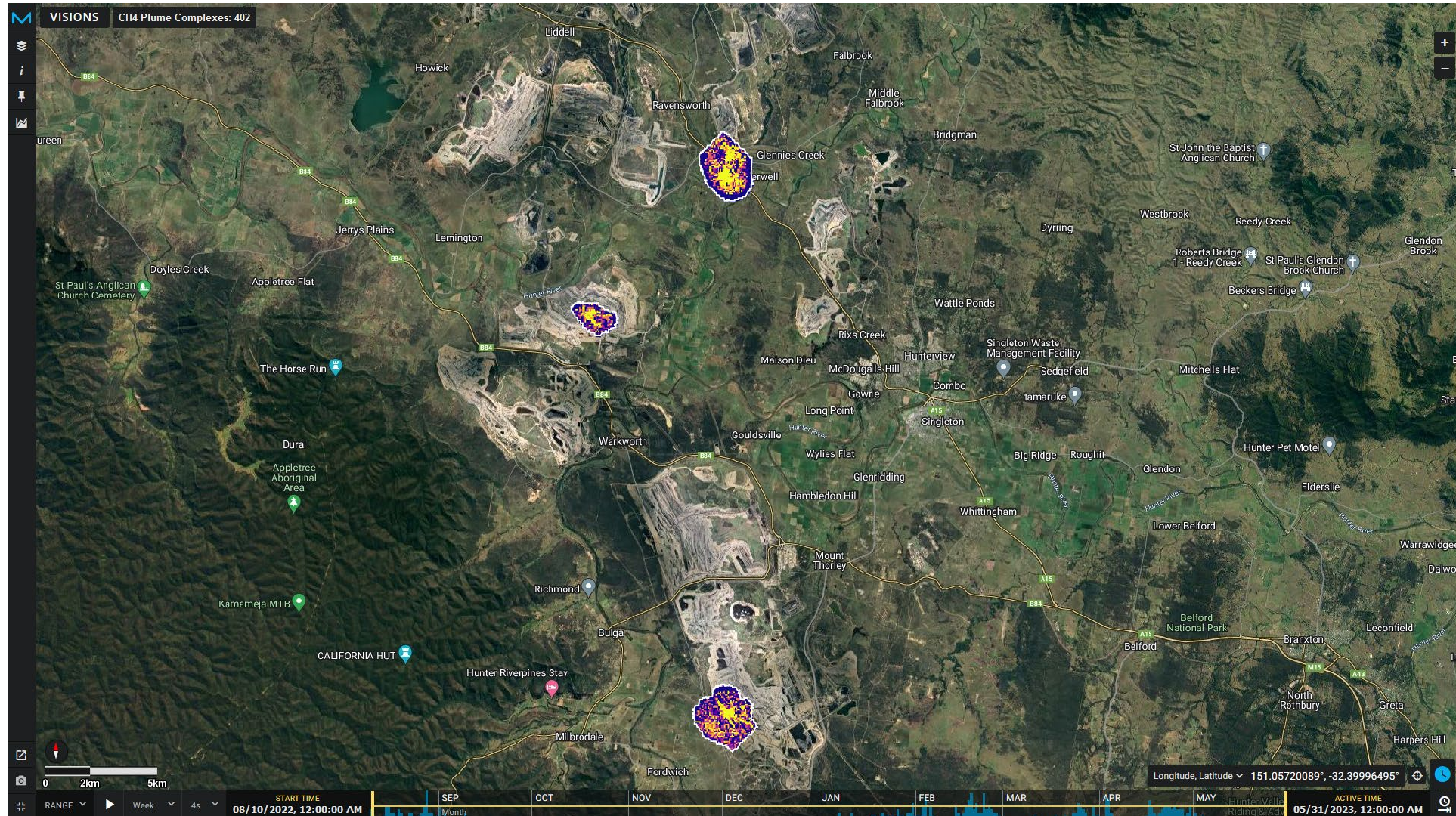
— The number of available / open datasets will increase rapidly



High-resolution onshore methane plumes (NASA / EMIT instrument)  
<https://earth.jpl.nasa.gov/emit/data/data-portal/Greenhouse-Gases/>

Onshore ultra-emitters during 2023 (SRON / TROPOMI)  
<https://earth.sron.nl/methane-emissions/>

# — Examples of plume detections in Australia (NASA/EMIT)



# Flaring detection

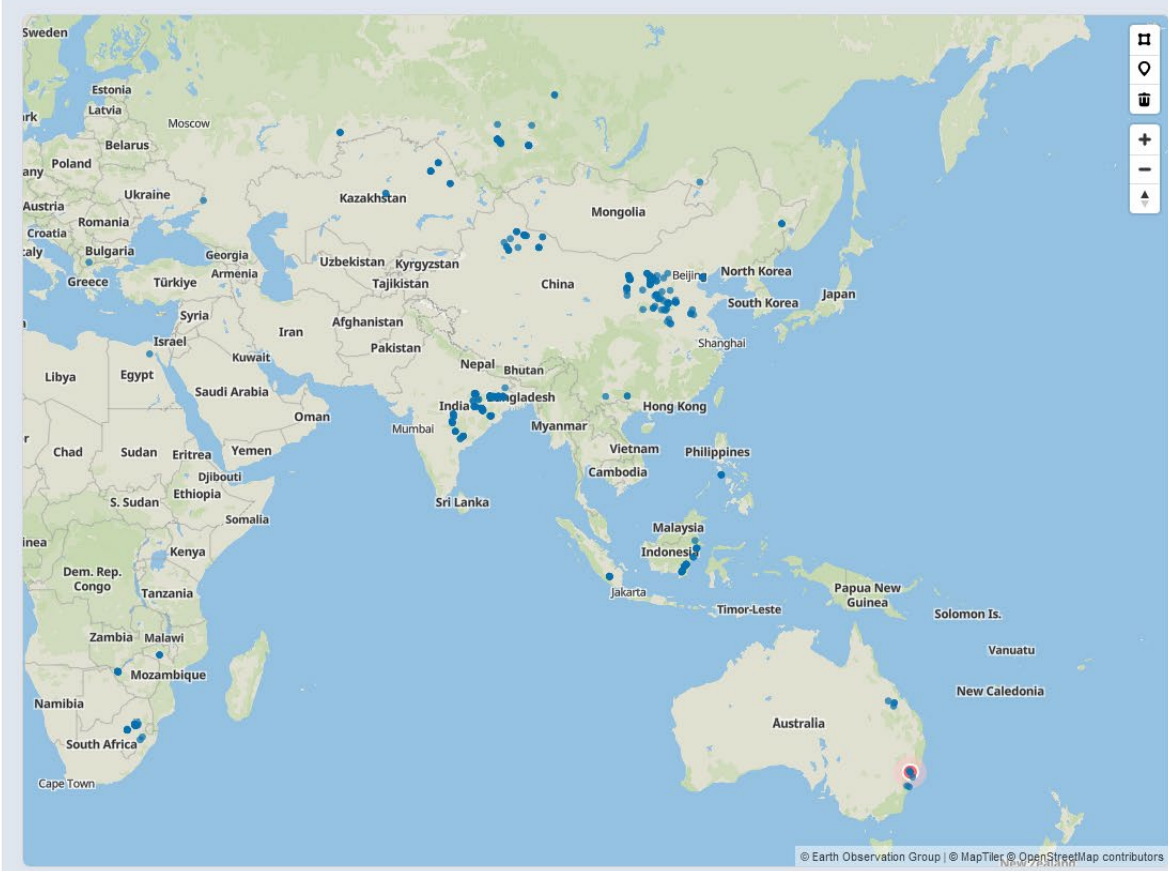
- Combustion sources are easy to detect during night.
- Flares have a very high temperature ( $\sim 1100^{\circ}\text{C}$ ) and can be distinguished from other combustion sources.
- Currently virtually all flaring data come from a single instrument (VIIRS)



# — Coal mine flaring observations

- Dashboard
- Backgrounds
- Map Layers
- EOG Dashboard  
nighttime observations
- Citation
- Documentation

1.0.0



### Details for IR Emitter #354

Area: 2 m<sup>2</sup>      Detection frequency: 30.30%

Location: -32.449561, 151.104820      Open With...

Open Temporal Profile      IR Emitter Feedback



# Satellites as part of an observing ecosystem

- Satellites offer **unprecedented transparency** of methane emissions worldwide.
- Need to combine techniques into a **unified observing system**, fit for the infrastructure it needs to observe.
- Need to integrate observations with **operator knowledge** to interpret observations and derive trustworthy annual emissions estimates.
- Satellites offer a **unique opportunity** to demonstrate mitigation progress and **highlight champions** in methane reduction efforts.





Follow our work:

<https://www.catf.us/methane/>

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