

Methane monitoring from space for O&G companies

ESA EO COMMERCIALIZATION
FORUM Paris – 30th Oct 23

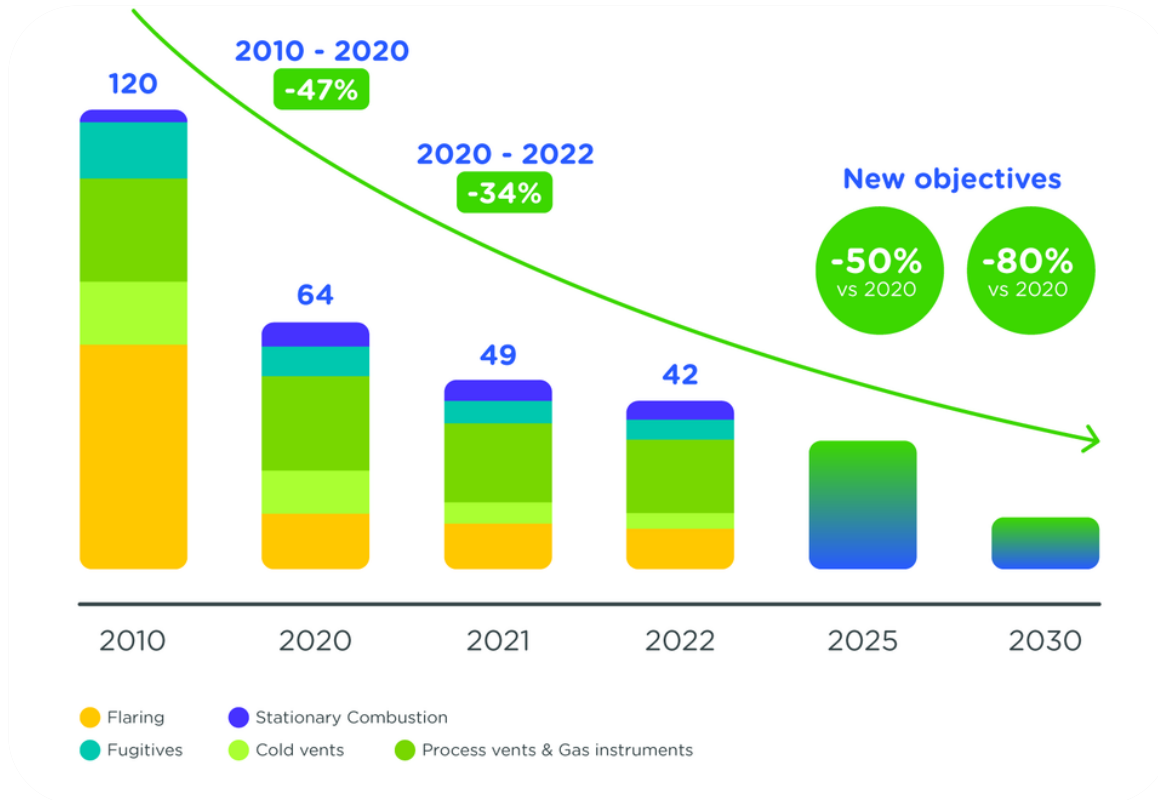
B. Blanco - TotalEnergies

C. Debart – GHGSat Europe



Methane Emissions at TotalEnergies

Methane emissions on operated facilities
kt CH₄



Our actions to move toward near-zero methane



Monitoring & Measuring



Annual leak detection & repair campaign



Reducing flaring & venting

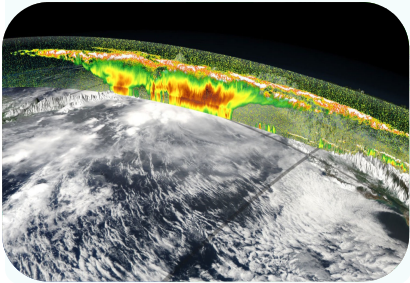
DEMETER objectives

Leverage use of Earth Observation imagery to accelerate TotalEnergies's businesses

Explore

Foundations

Hybrid
Physics/ML
(wind/climate)



New methods
demonstration

Develop

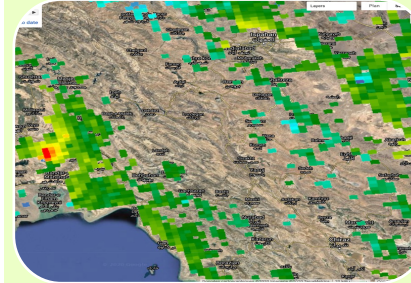
Environment

Vegetations
classification
Carbon sinks
Water



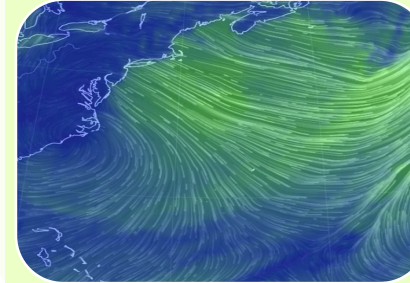
Greenhouse gases

CH₄ / CO₂
monitoring
Assimilation



Renewables

Solar, wind
prospection
Agrivoltaics
Hydrogen

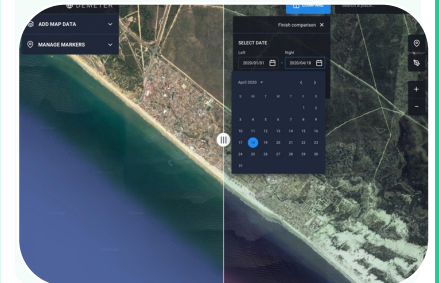


Develop solutions

Deploy

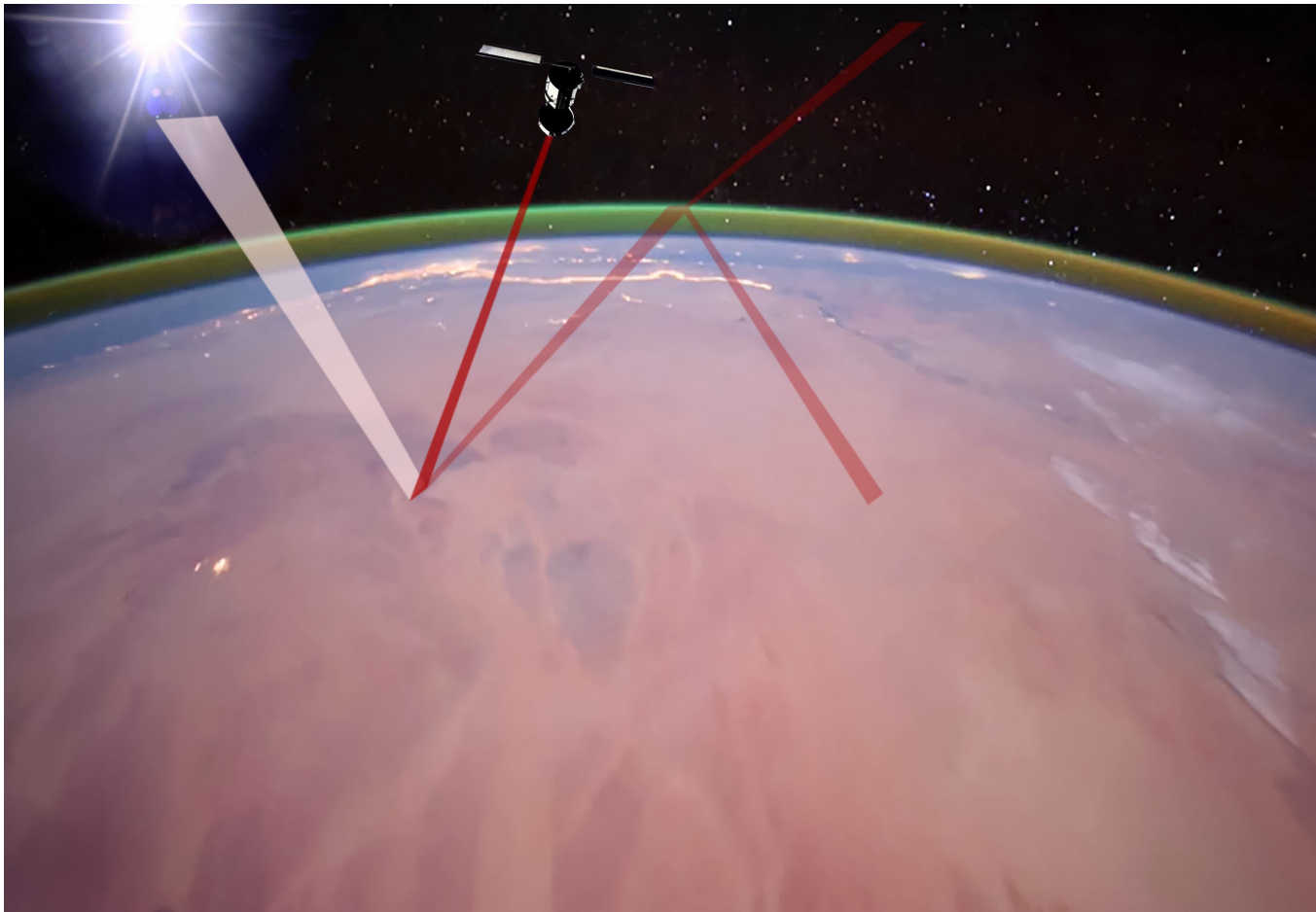
Workspace

Web interface
Use cases
delivery

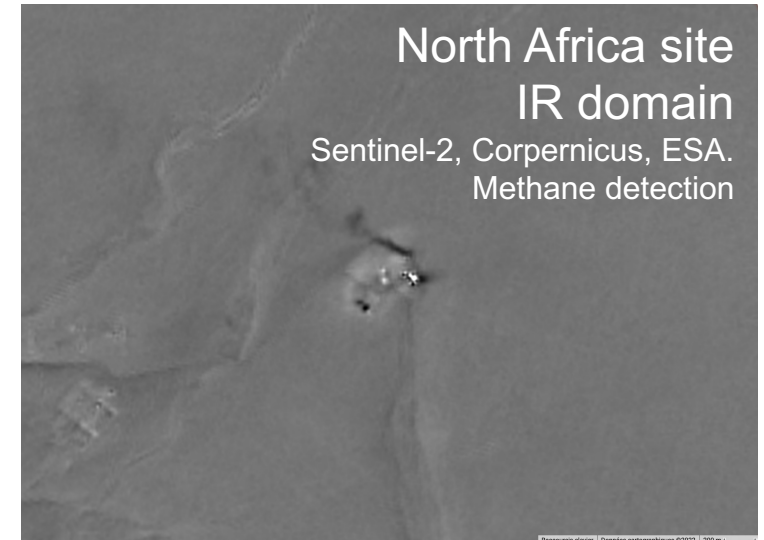


Make the tools
available to all.

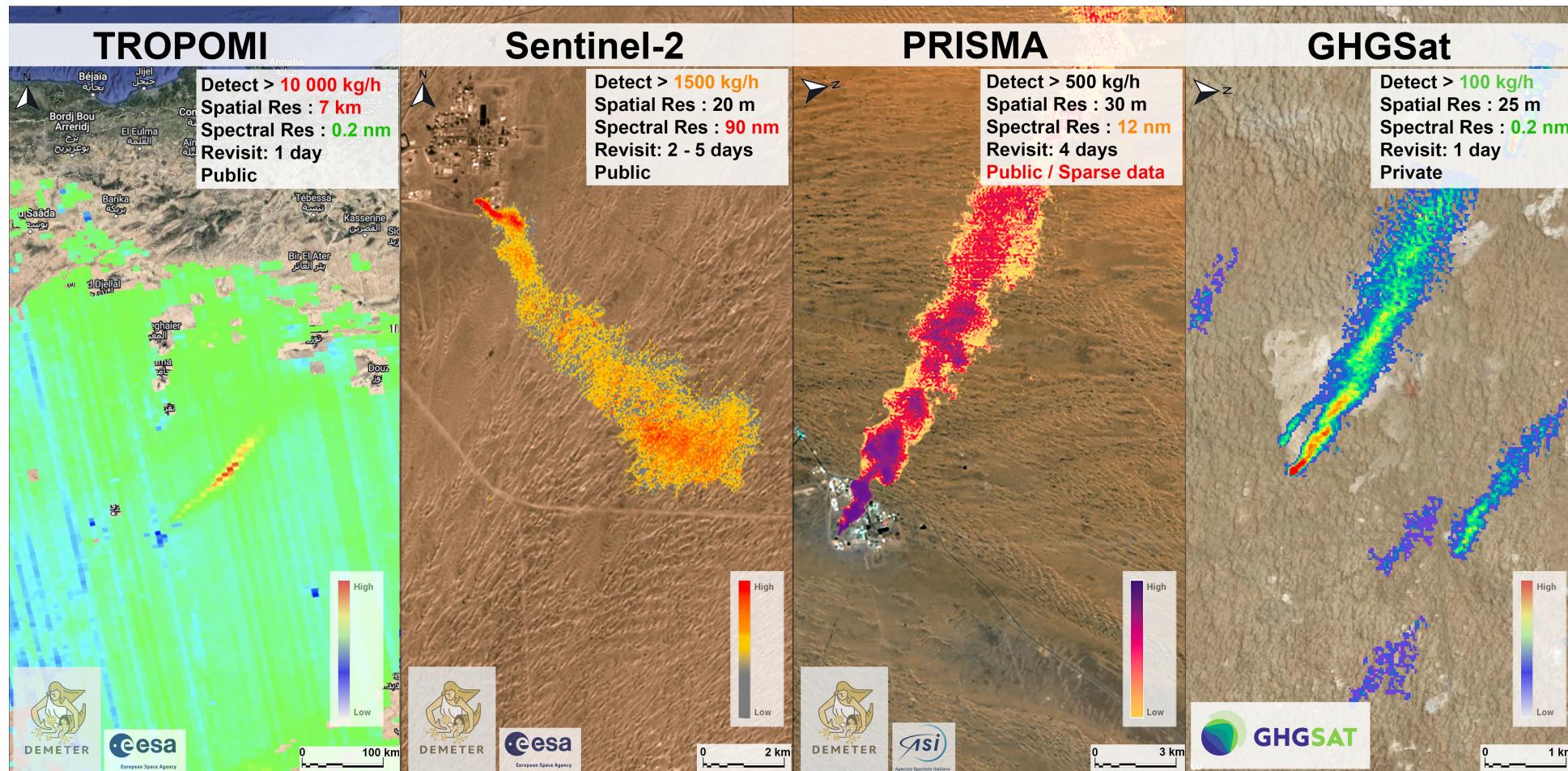
GHG Detection from space



Airglow from ISS, NASA, ESA. 2011



Remote Sensing, Methane and Image Processing



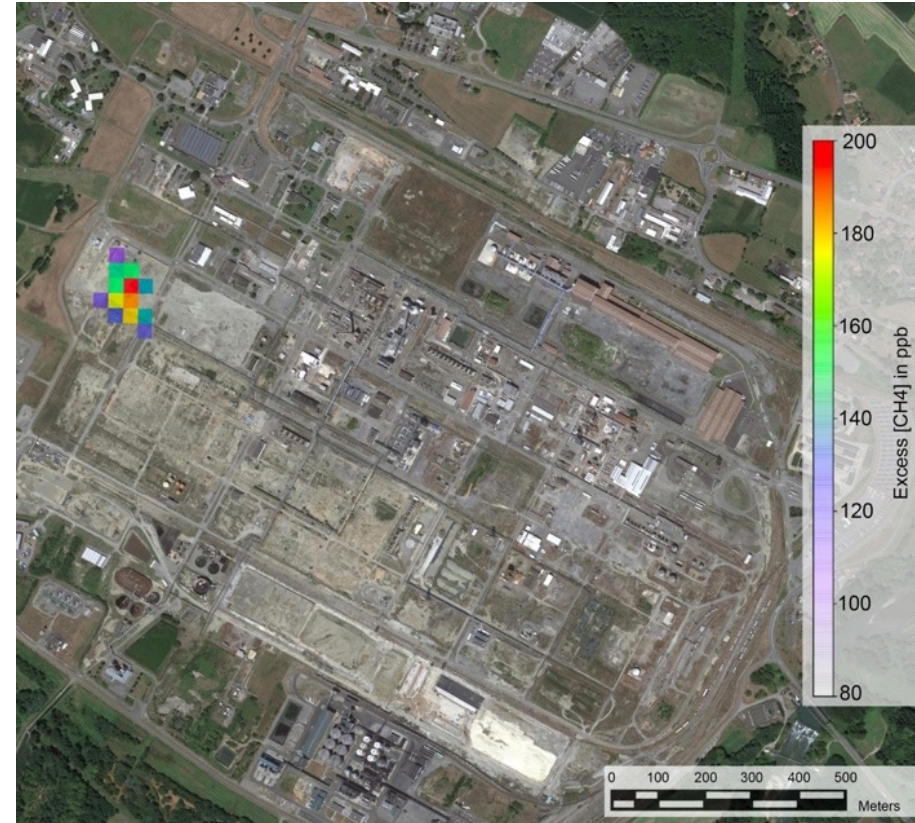
Sentinel-5P, Copernicus, ESA.

Sentinel-2, Copernicus, ESA.

Prisma, ASI.

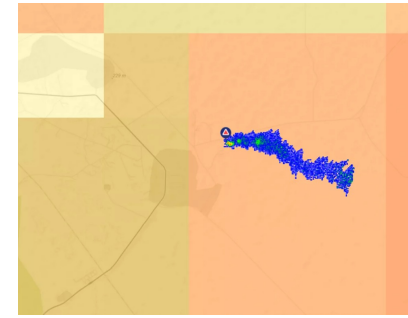
GHGSat Performance, blind test by TotalEnergies

- GHGSat was tested in 2020 over the TADI(TotalEnergies Anomaly Detection Initiative) platform in Lacq.
- A blind test over a controlled methane release of 234 kg/h. Part of test campaigns organized by TotalEnergies to benchmark methane detection and quantification technologies.
- GHGSat provided this detection that clearly identifies the source.
- They provided a quantification at 226 – 256 kg/hr. Which is an excellent performance.

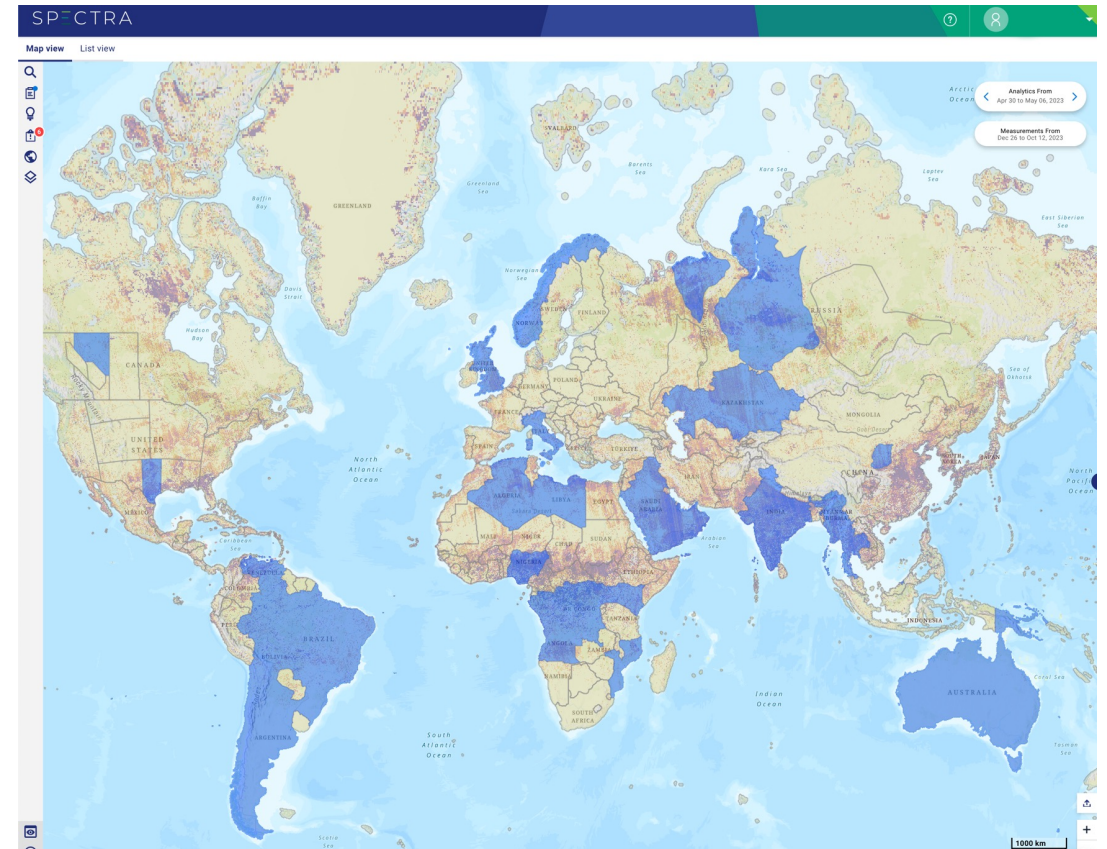


TotalEnergies site in Lacq, France

GHGSat Spectra



- GHGSat monitor public data over all TotalEnergies onshore assets since 2021
- Mostly use Copernicus program: Sentinel-2 and Sentinel-5P / TROPOMI
- No detections on operated assets.
- Some detections on non-operated assets. Each of them were meticulously studied and compared with reporting. Workshops were held with partners to understand the origin of the leaks.

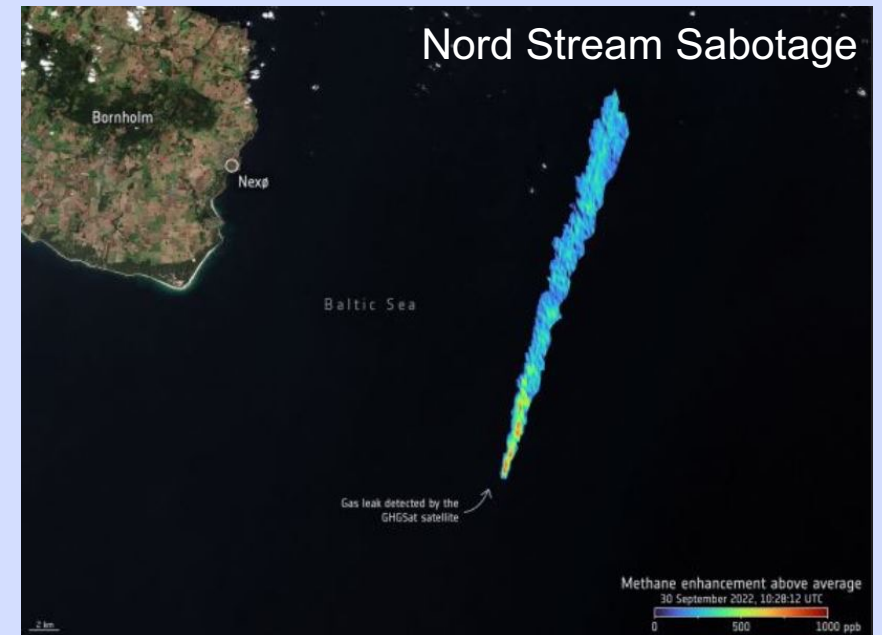
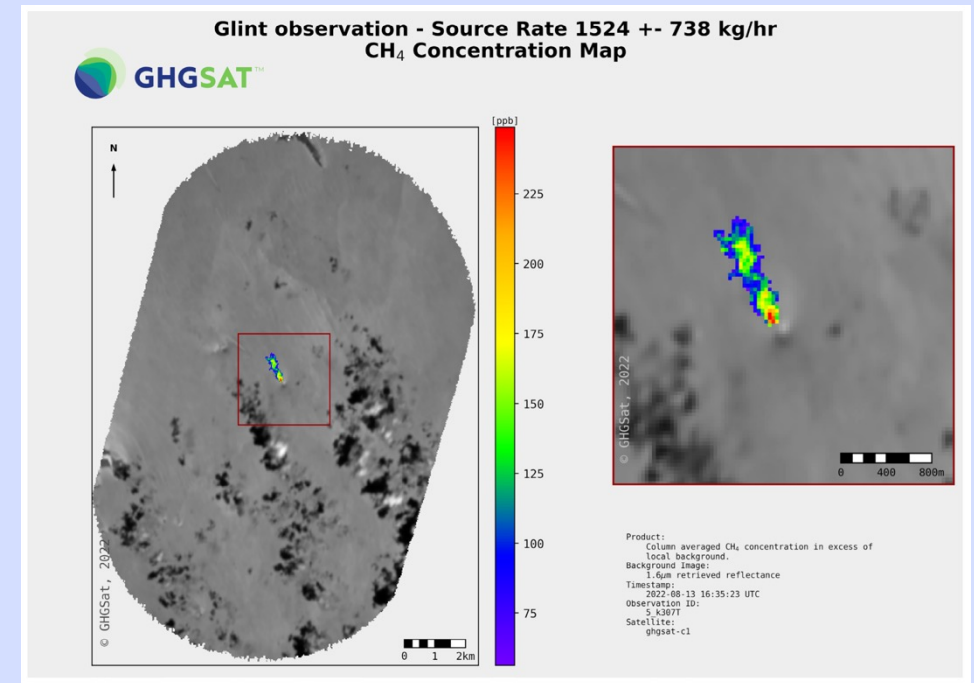


First Offshore Detections

- GHGSat Glint technology initiated by TotalEnergies
 - Measurement from the glint over ocean
 - « In the wild » detection close to New Orleans in August 2022
 - Nord Stream detection

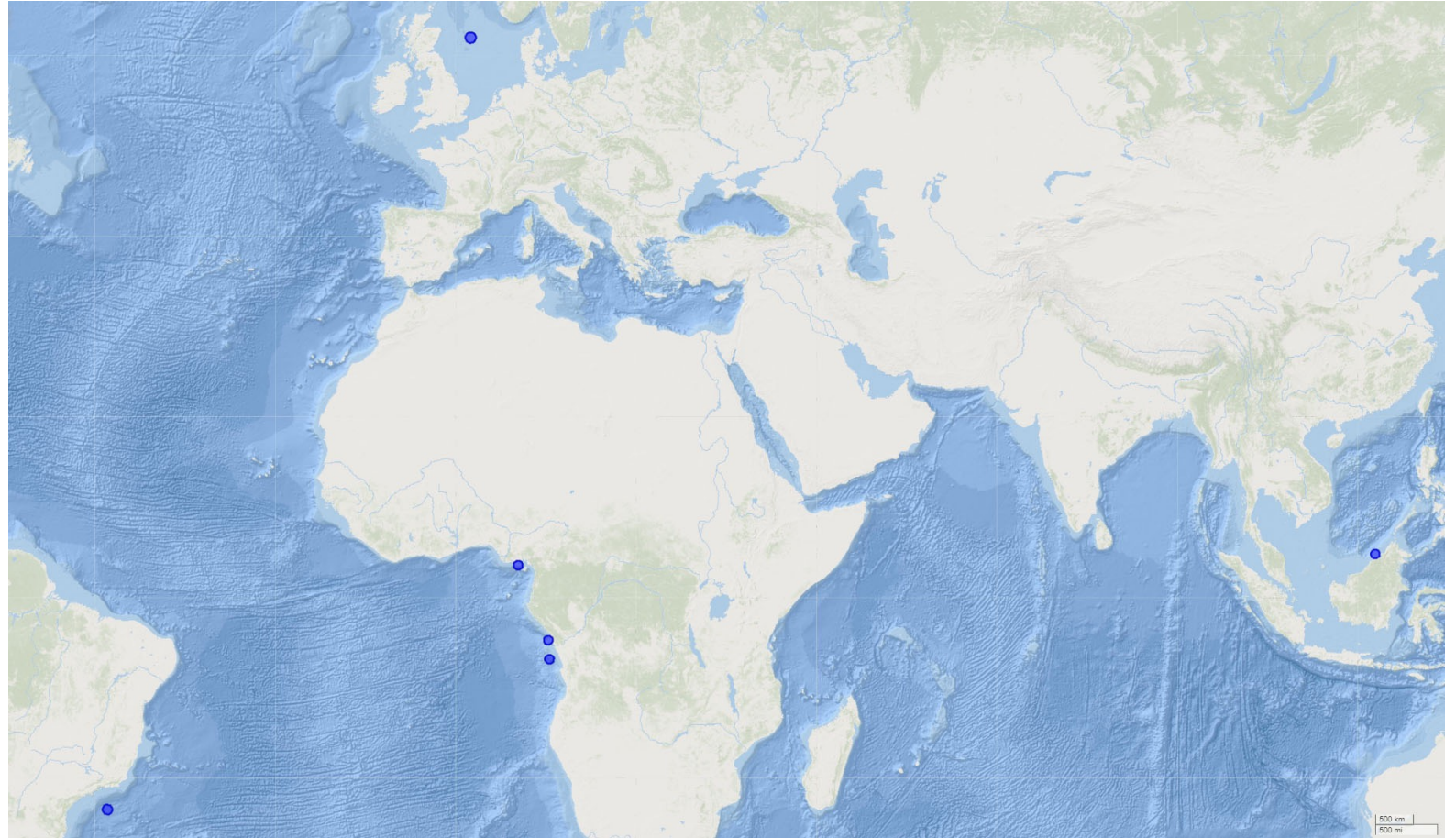


Earth with sunburst, NASA, 1996



Offshore Routine Monitoring

- 6 TotalEnergies assets are monitored since May 2023
 - Elgin, UK
 - Nkossa, Congo
 - OML100, Nigeria
 - B4, Brunei
 - LAPA, Brazil
 - Girassol, Angola
- 30 offshore clear observations. No detections.
- TotalEnergies organizes controlled releases to test the technology



TotalEnergies offshore sites monitored by GHGSat

Gaps between EO and services

- **More data = Better revisit = Better monitoring**
- **Methane retrievals of public data**
→ IMEO MARS UN Program
- **Data aggregation platform**
 - TotalEnergies developed an atmospheric model to make data fusion between technologies
 - Platform to aggregate all measurements:

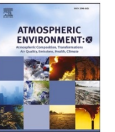
Ground sensors, drones, satellites, cameras... And compare with inventory.



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Atmospheric Environment: X

journal homepage: www.journals.elsevier.com/atmospheric-environment-x



Data assimilation method for quantifying controlled methane releases using a drone and ground-sensors

Zhuldyz Darynova^{a,*}, Benoit Blanco^a, Catherine Juery^b, Ludovic Donnat^b, Olivier Duclaux^b

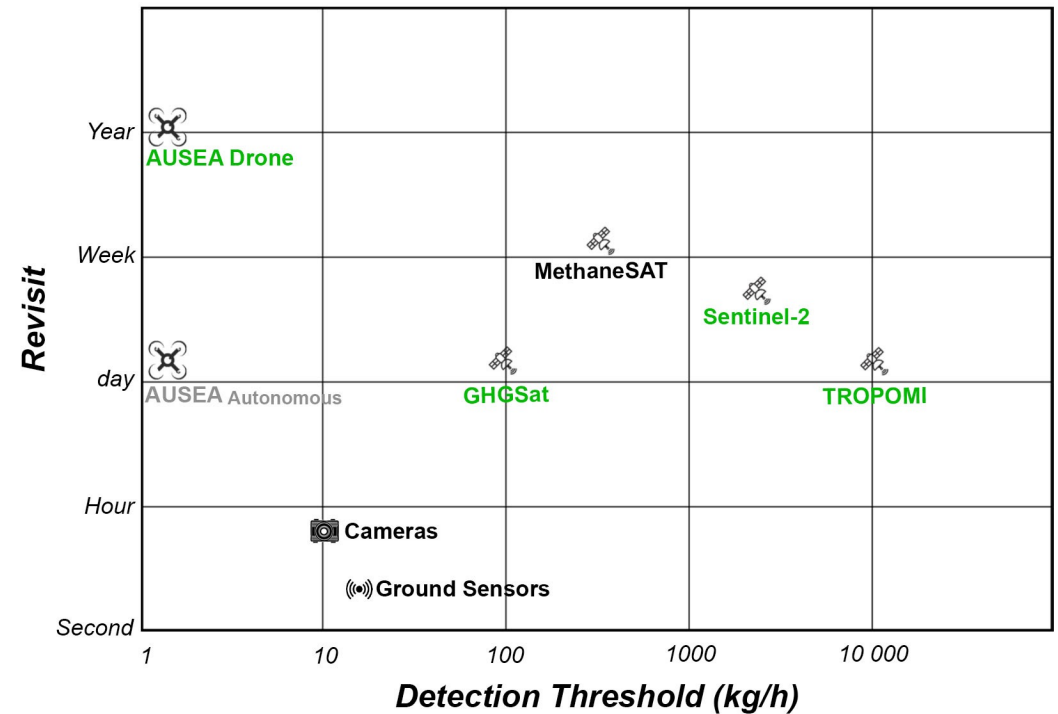
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Summary / Benefits for TotalEnergies of GHGSat and Copernicus

- GHGSat :
 - Routinely process Copernicus data
 - Best revisit / Best detection threshold
 - Available onshore & offshore
 - Crisis response < 24 hours
- Benefits for TotalEnergies :
 - Revisit and consistency of Copernicus program
 - Monitoring of assets, operated and non-operated
 - Third party / independent analysis of methane emissions

→ Satellites are today's best revisit and will be part of the monitoring ecosystem in the future.



THANKS

Contacts:

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Gauthier, T. Harvey

