Identification, Quantification and Validation of Methane Emissions at Facility Level

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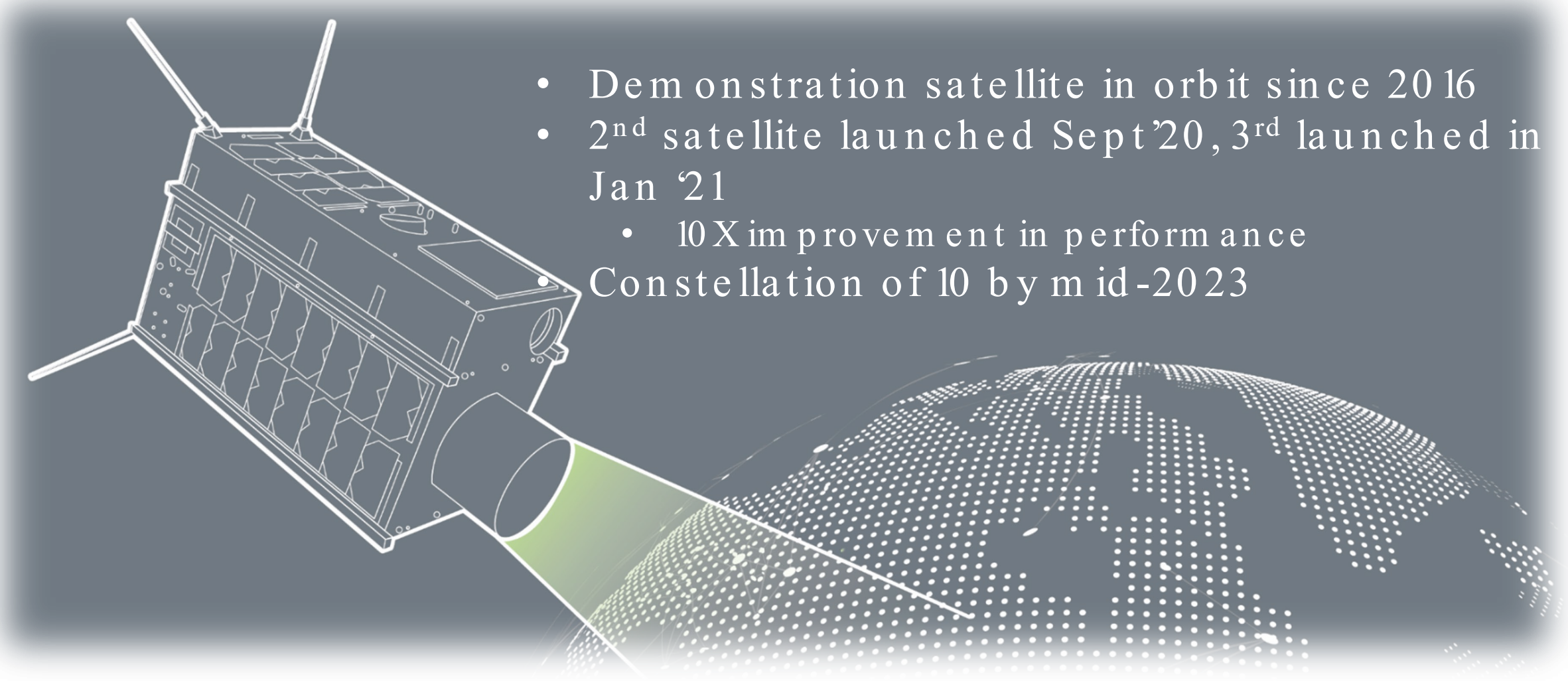
GHGSAT: PIONEERED METHANE MEASUREMENTS AT FACILITIES FROM SPACE



- Demonstration satellite in orbit since 2016
- 2nd satellite launched Sept'20, 3rd launched in Jan '21
  - 10X improvement in performance

Constellation of 10 by mid-2023

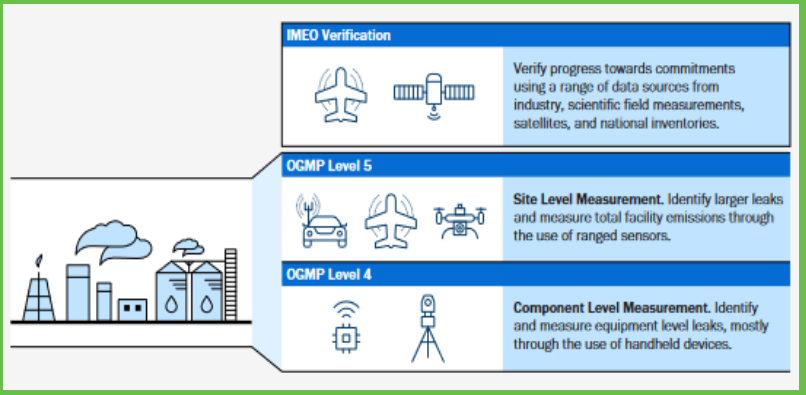
IDENTIFICATION: ACTIVE PLUME DETECTION

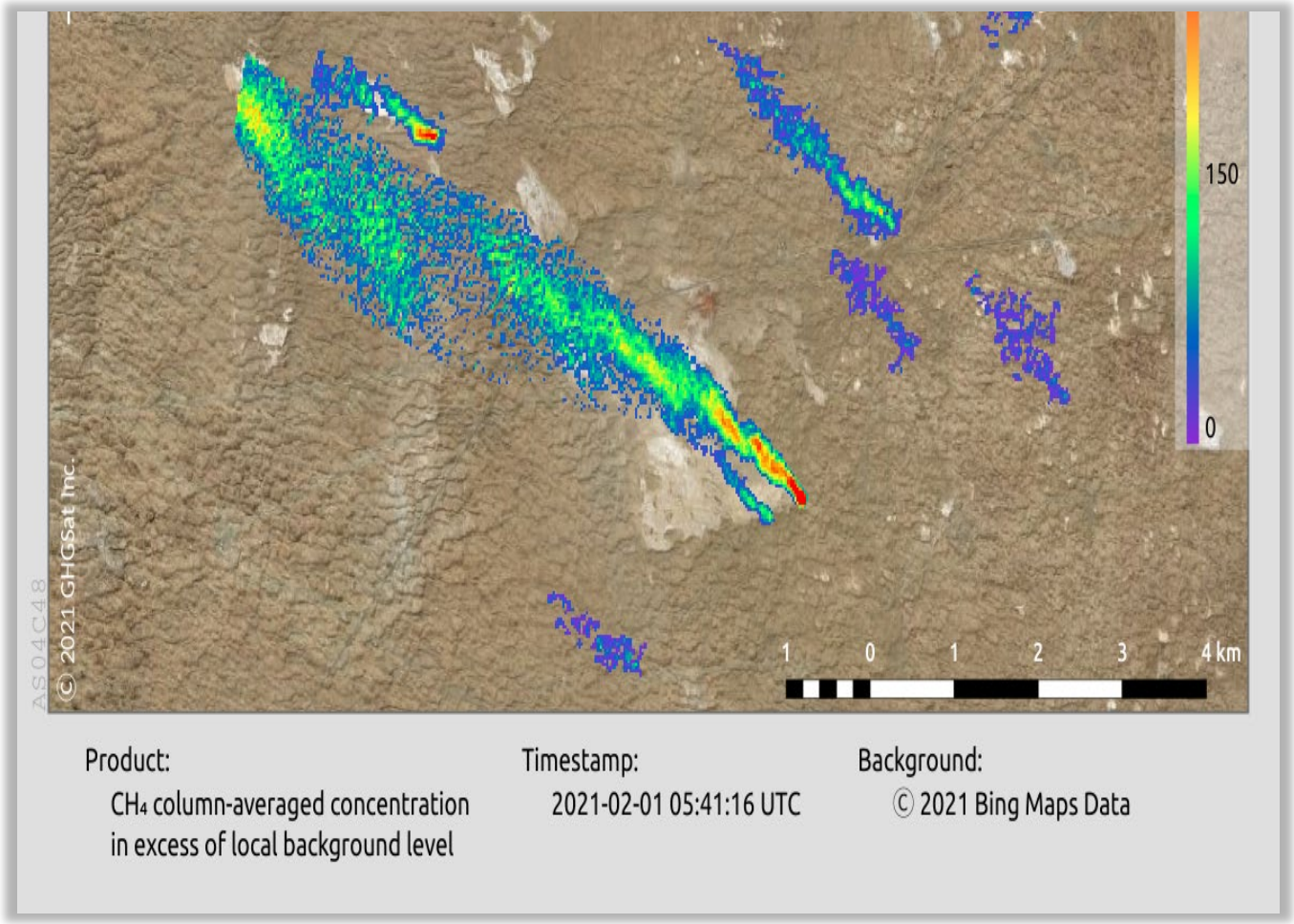
OIL & GAS

From **Q2** to **Q3** in 2021

+47%

The number of emissions detected **increased by 47%**.

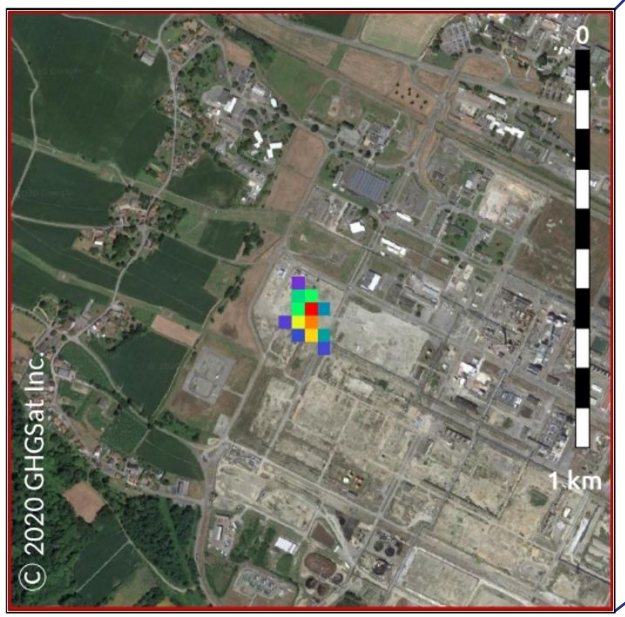


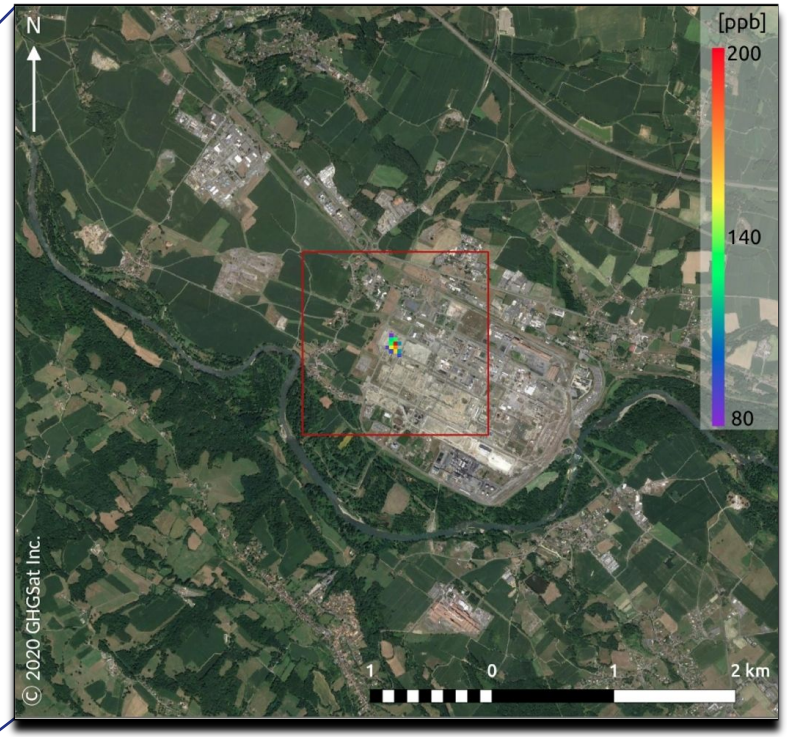


- 8 methane plumes on the same satellite pass
- Mix of unlit flares and leaking pipeline valves
- Only 2 of the 8 plumes may have been visible with public satellites

QUANTIFICATION: CONTROLLED RELEASE USE CASE

"In developing the technical solutions of tomorrow to monitor methane emissions, Total uses its TADI facility to validate emerging technologies on the market, notably those selected by OGCI Climate Investments."





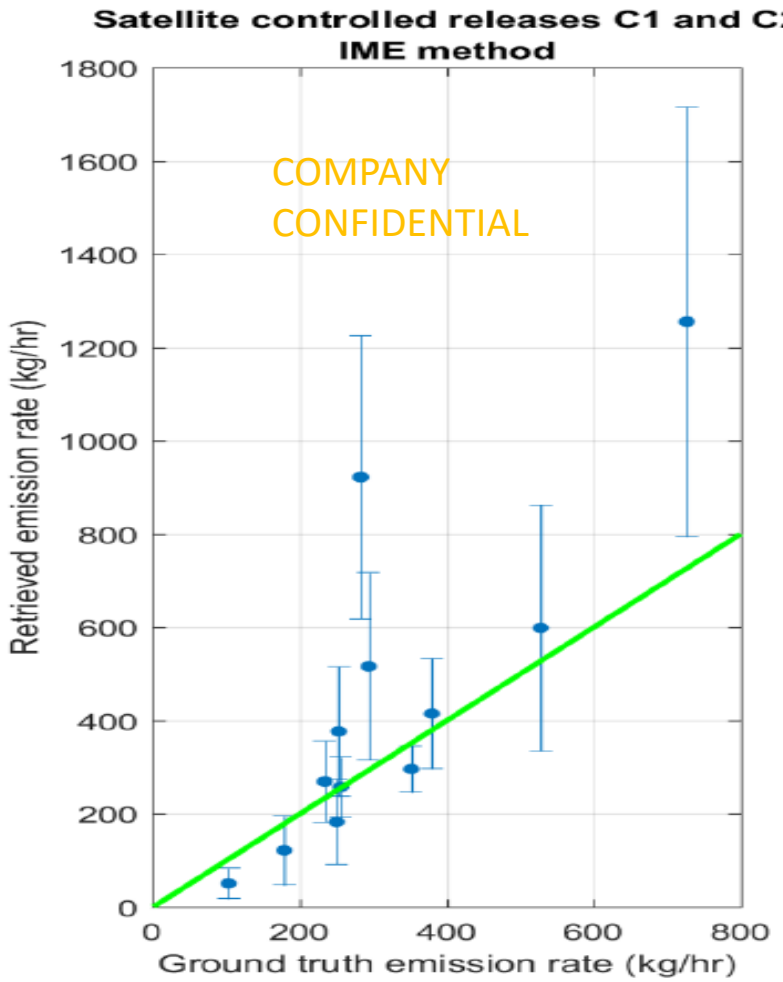
Blind controlled release in partnership with Total, Oct, 2020 – France

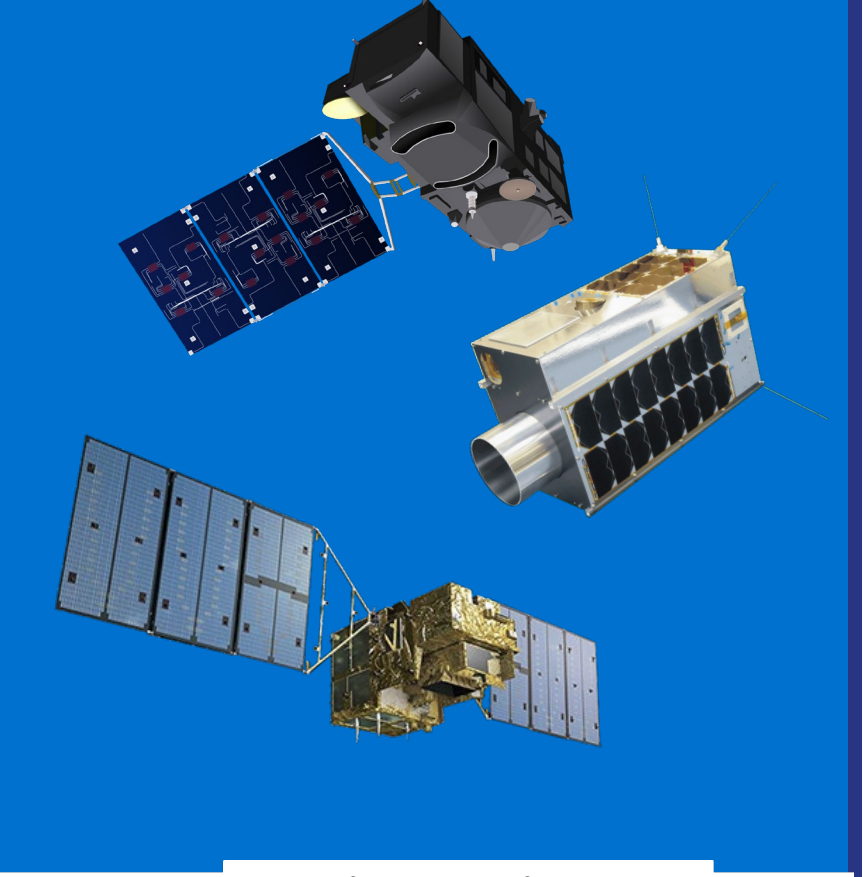
GHGSat had no knowledge of release rate or position

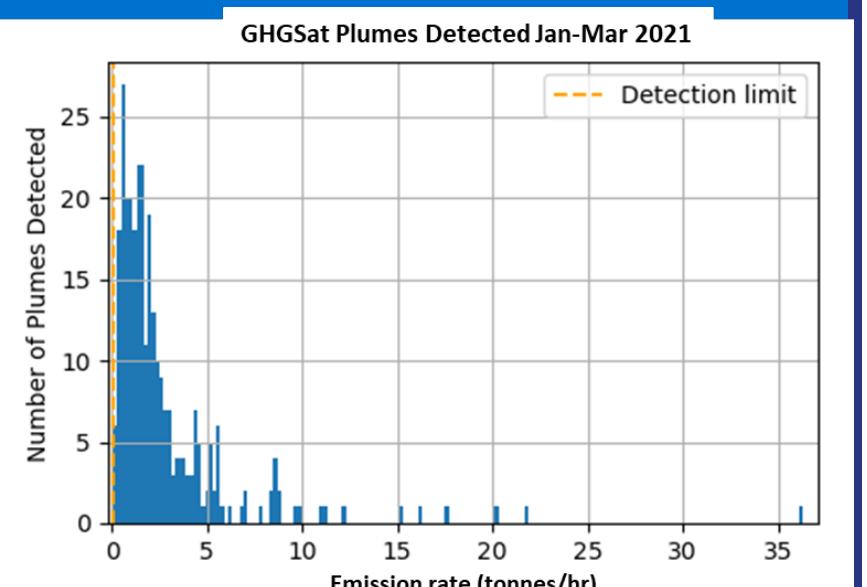
- Our retrieval: 250 ± 140 kg/hr
- Ground truth: 234 kg/hr
- Wind 1.6 m/s

QUANTIFICATION: SATELLITE CONTROLLED RELEASES

- GHGSat has performed various controlled releases
- Controlled releases focus on characterising performance for identification, quantification and validation of emissions recorded
- Variety of conditions (morphology, terrain, weather).
- Derived estimates in agreement with the released rate
- Key limitation on estimates derived - High winds







VALIDATION: CO-OPERATION ONE SIZE *DOES NOT* FIT ALL

GERG
THE EUROPEAN GAS RESEARCH GROUP

- Satellites to monitor methane have different – and complementary – capabilities

- The need dictates the type of satellite – or the combination of satellite systems
  - *Understanding of regional and global distribution of methane* → S5P/TROPOMI
  - *Visibility of world's largest methane emitters*
  - *Survey of specific regions* → S2, L8, S5P
  - *Comparison of performance with peers or other industries* → GHGSat
  - *Monitoring of operational assets to support LDAR and reporting* → GHGSat

Co-operation is KEY in detecting both small and large emissions.

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