

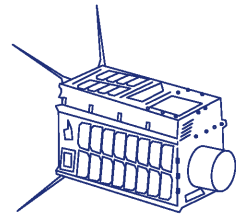
GHGSAT: SATELLITE METHANE MONITORING

In Orbit Today

GHGSat pioneered the technology that delivers high-resolution data on greenhouse gas emissions from space.

2016
CLAIRE
Technology demonstrator proving GHG can be detected and measured accurately from space.

2020
IRIS
First commercial satellite delivering 10 x better performance.



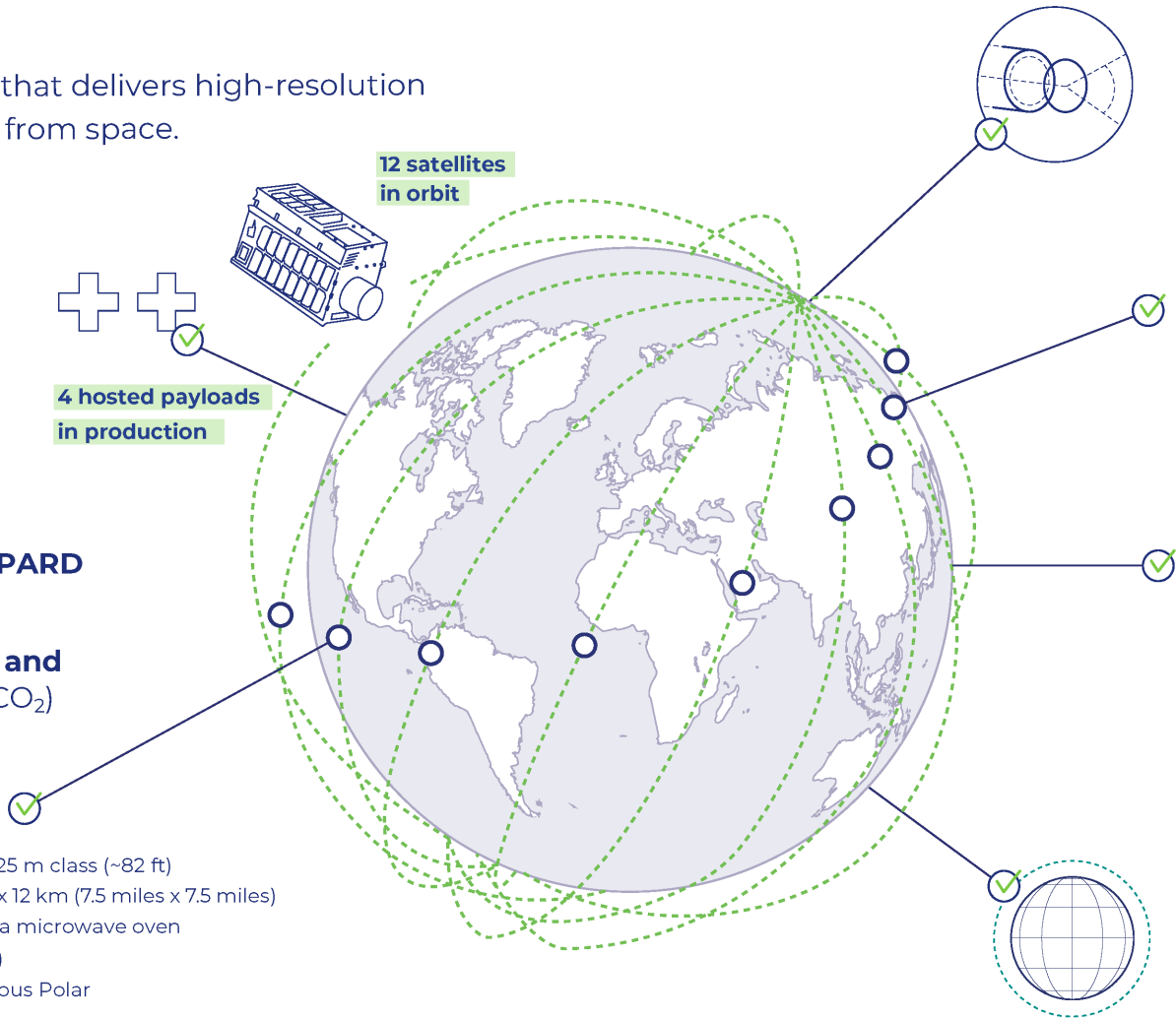
2021
HUGO

2022
LUCA, PENNY and DIAKO

2023
MEY-LIN, GASPARD and OCÉANE
ELLIOT, JUBA and VANGUARD (CO₂)

Coverage

Spatial resolution: ~25 m class (~82 ft)
Field of view: 12 km x 12 km (7.5 miles x 7.5 miles)
Size: Comparable to a microwave oven
Weight: 15 kg (33 lbs)
Orbit: Sun-Synchronous Polar



Instruments

GHGSat commercial satellites are designed and dedicated for methane and carbon dioxide observations. Each satellite is equipped with a wide-angle imaging spectrometer for measuring the vertical column density of greenhouse gases.

Capability

With proprietary patented sensor technology, GHGSat satellites are capable of measuring methane emissions from onshore and offshore platforms, attributing those large or small emissions directly to individual facilities, down to 100 kg/hr, worldwide.

Emission Intelligence for Markets

Oil & Gas	Coal Mining	Waste Management
Environmental Services	Agriculture	Financial Services

Governments and Regulators

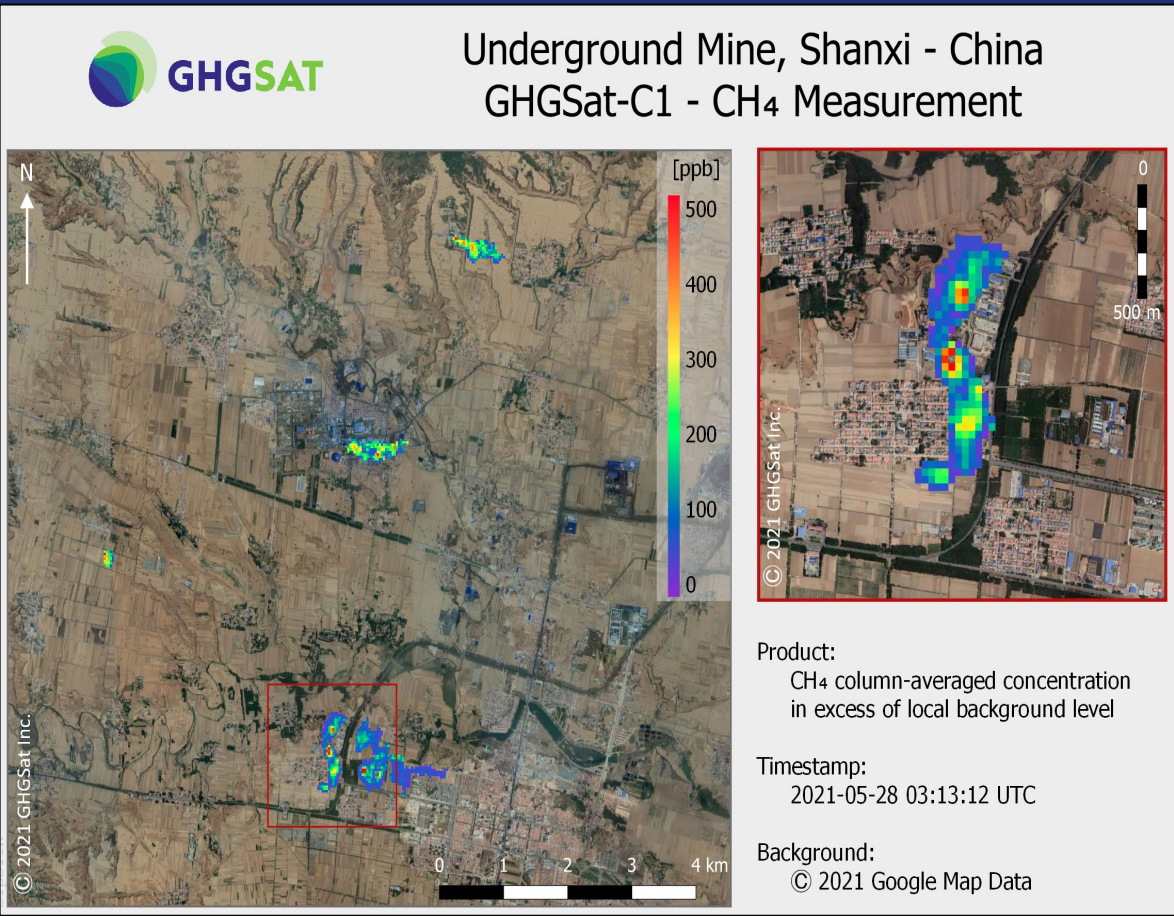
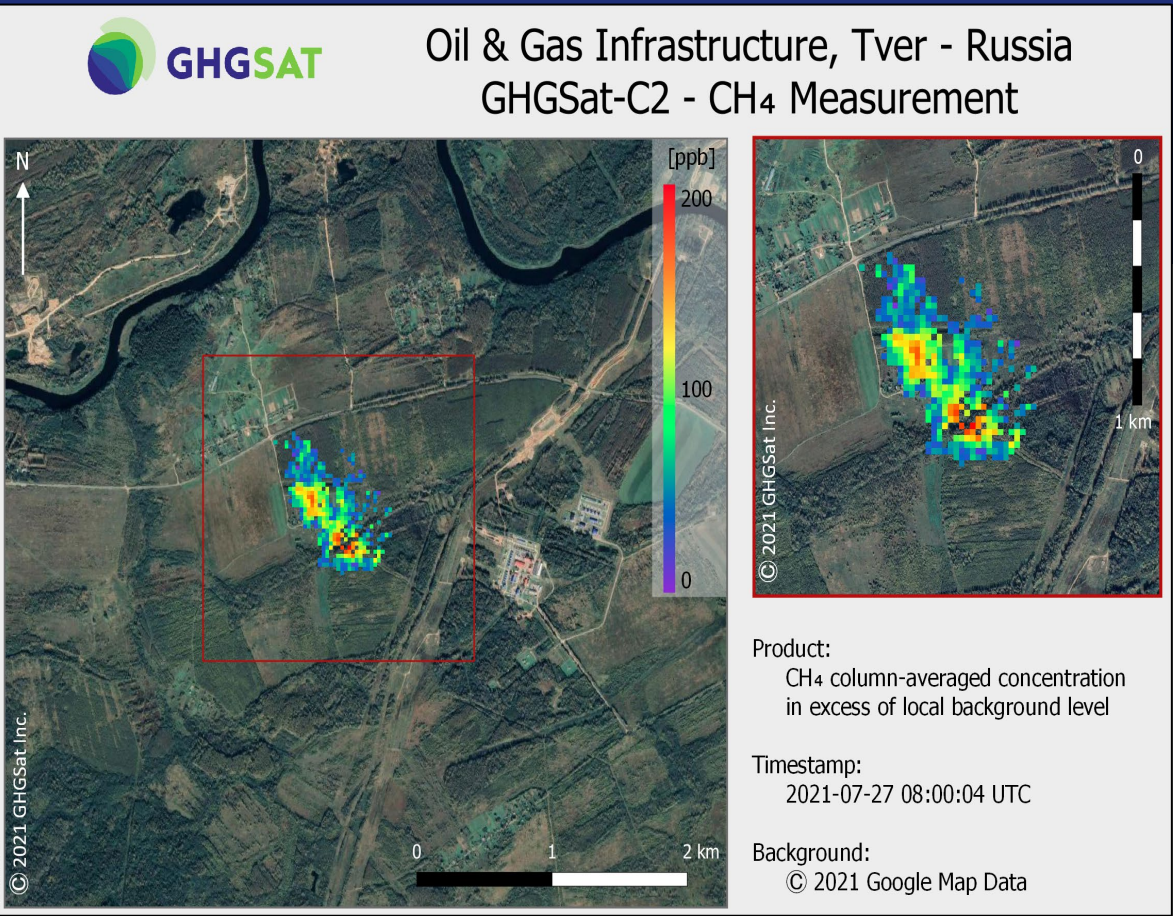
Our Commitment

Bringing global transparency to greenhouse gas emissions, GHGSat is accelerating the decarbonization of our planet.



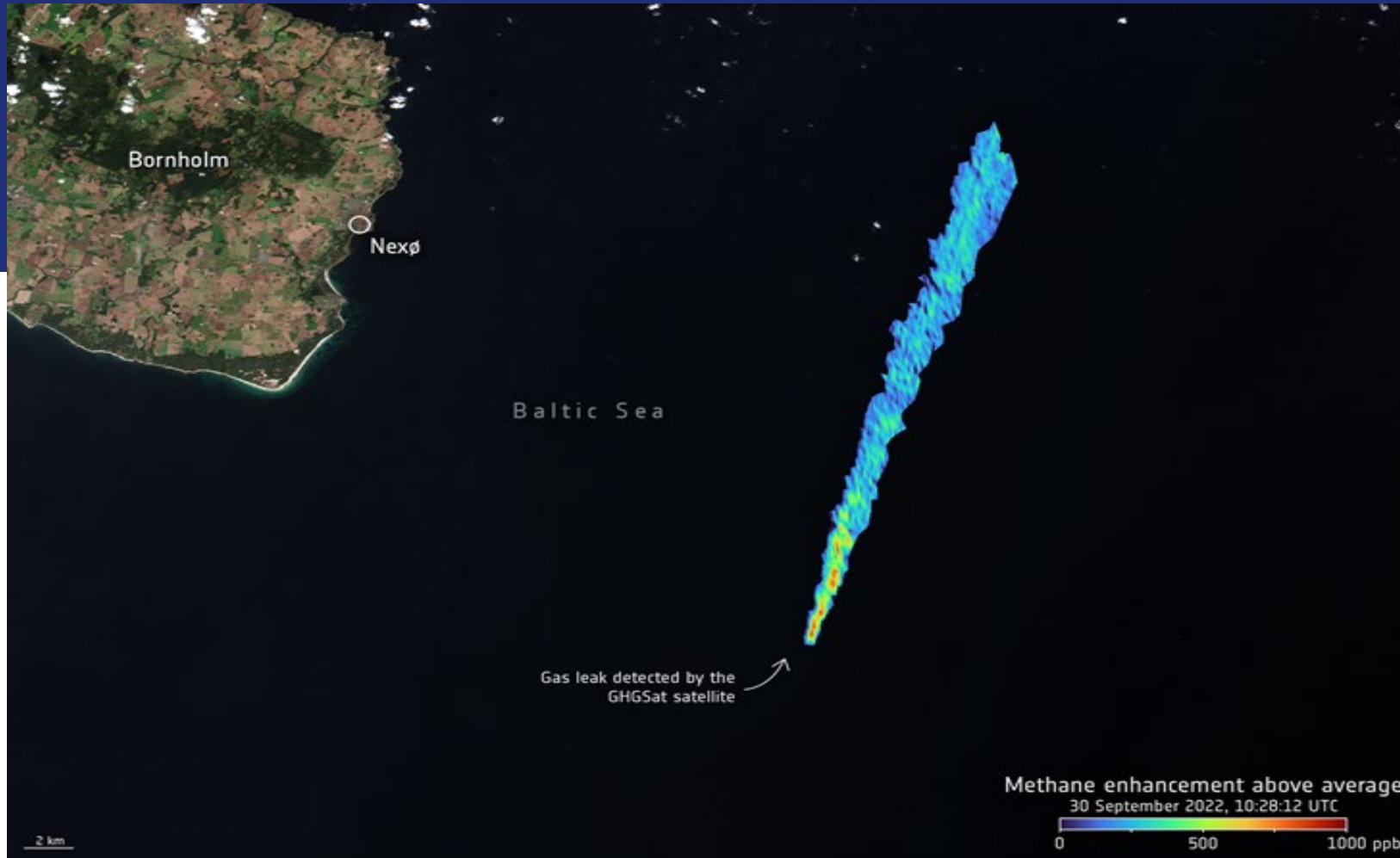
EXAMPLES OF GHGSAT SATELLITE OBSERVATIONS

Industrial facilities in Russia and China



OFFSHORE MONITORING

Nord Stream pipeline leak



Giant Methane Leak From Nord Stream Pipeline Detected From Space

ENVIRONMENT 10 October 2022 By NANCY ATKINSON, UNIVERSE TODAY

Gas leak detected by GHGSat satellite. (GHGSat/ESA)

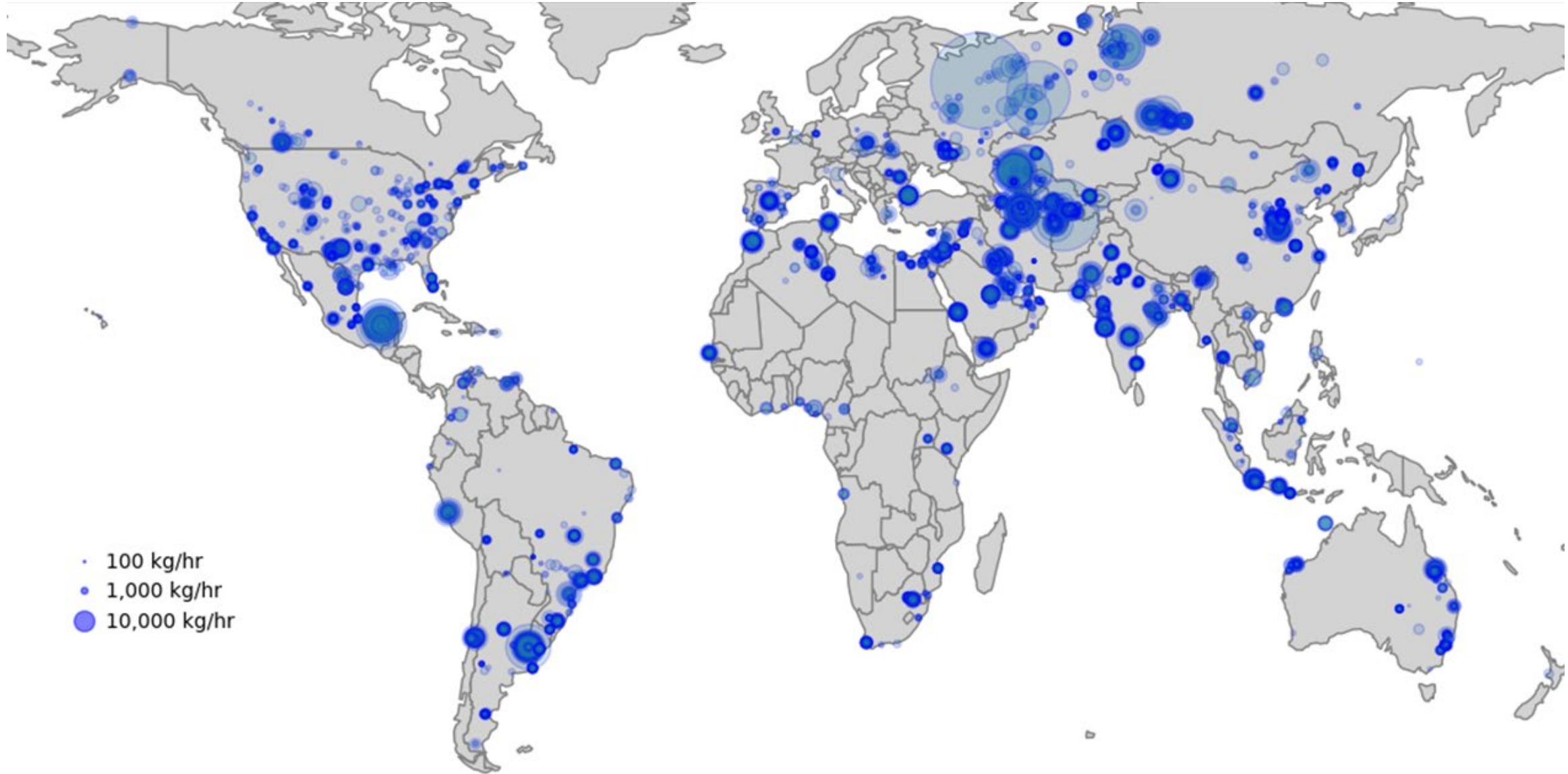
On 26 September 2022, [leaks were discovered](#) in the underwater Nord Stream 1 and 2 gas pipelines, located near Denmark and Sweden. Both pipelines are owned by Russia and were built to transport natural gas from Russia to Germany through the Baltic Sea.

Officials have said the leaks were caused by deliberate action, not accidents, and were likely intentional sabotage. While accusations have abounded, the motives behind the damage are not yet known.

Seismic disturbances in the Baltic Sea were detected, and officials said that while neither pipeline was transporting gas at the time of the blasts, they still contained pressurized methane, which is the main component of natural gas.

The methane has now spewed out, producing a wide stream of bubbles on the sea surface which are visible from various satellites in Earth orbit.

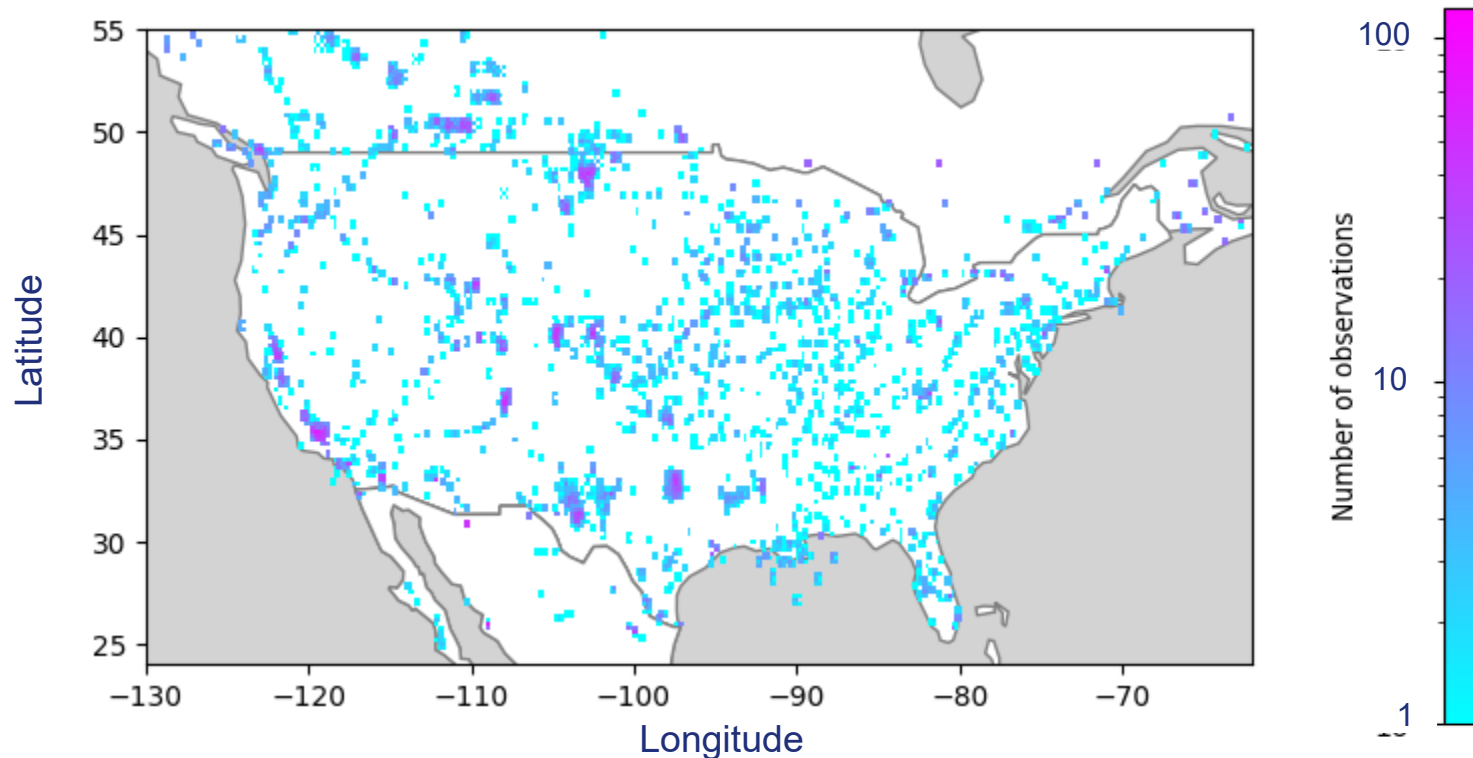
GHGSAT SATELLITES DETECTED OVER 14,000 METHANE EMISSIONS IN 2023





GHGSAT U.S. OBSERVATION TOTALS: 2023

- U.S. Successful Satellite Observations: **5097**
 - A “successful observation” is defined as one that is sufficiently free of clouds to make a validated measurement, regardless of whether emissions are detected (within the satellite 12 x 12 km field of view) or not.
 - Note: Count does not include observations in Canada and Mexico shown in graphic below.
- U.S. Successful Satellite Observations with Emissions: **1047**
- Total Plume Count: **1643**
 - This is the total number of methane emissions (also referred to as “plumes”) detected in the U.S. during this period across all sectors: oil & gas, waste management, agricultural, mining, and chemical.
 - The total plume count can be larger than the count of observations with emissions, as there can be multiple plumes detected in one successful observation.





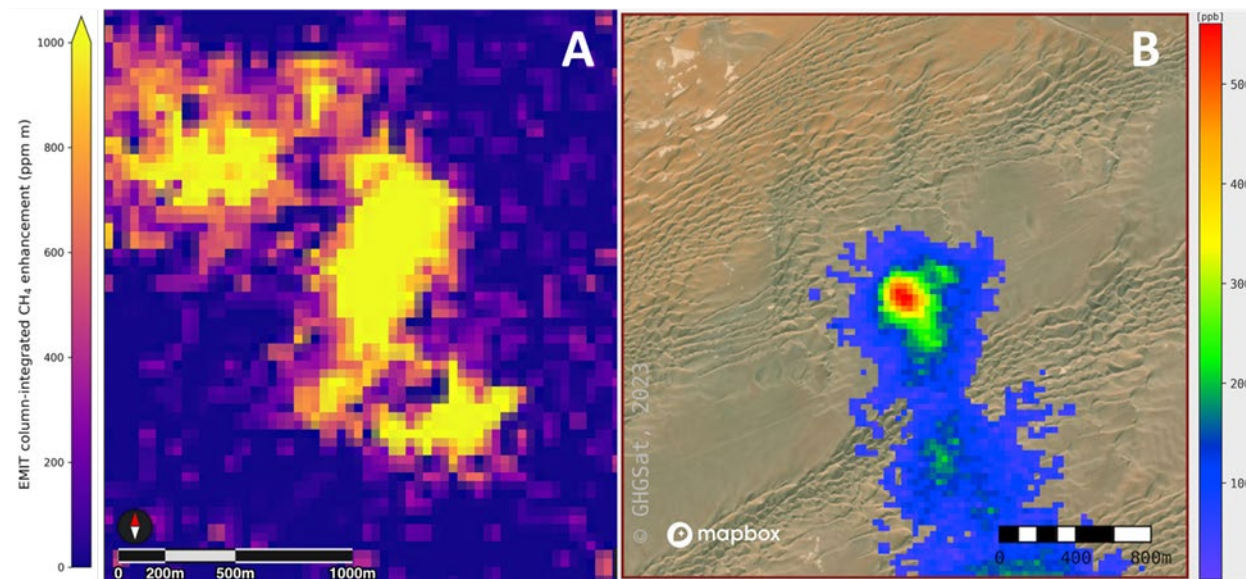
COMPLIMENTARY TO NASA MISSIONS

Example: Coordinated observations between GHGSat and NASA EMIT

- Commercial and Govt systems are **COMPLEMENTARY**, not mutually exclusive
 - Greater coverage together; More revisit opportunities
 - Ability to cross-validate
- Satellites part of a tiered system of methane monitoring (incl. aerial, in-situ)
- Potential for collaboration with US Greenhouse Gas Center

100 coordinated observations were planned with the NASA EMIT team as part of GHGSat's scientific evaluation under the NASA Commercial Satellite Data Acquisition (CSDA) program

Example on the right is a site in Yemen (A = EMIT, B = GHGSat, 1 hour apart)

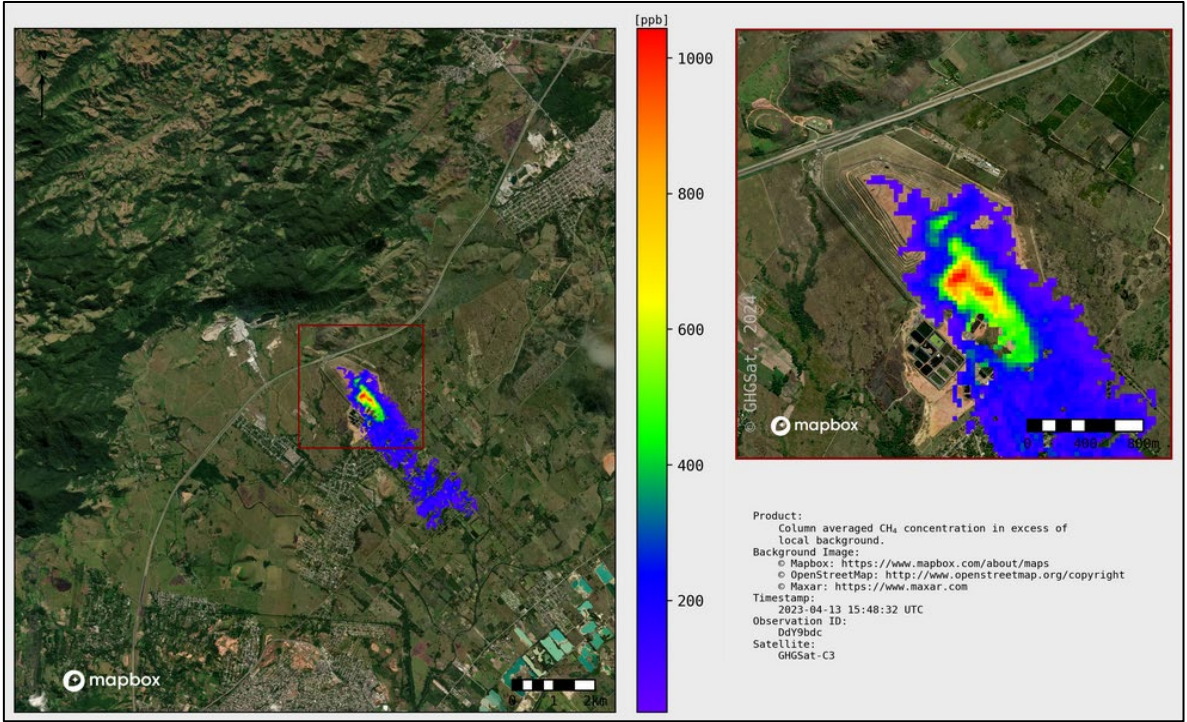




NASA EVALUATION OF GHGSAT DATA

NASA Commercial Satellite Data Acquisition (CSDA) Program

- GHGSat’s methane data is now available through the NASA Earthdata portal for U.S. Government funded researchers
- Evaluation criteria for CSDA assessment:
 - ✓ Utility of the data for advancing Earth system science research (primary criteria)
 - ✓ Quality of the data
 - ✓ Quality of user support services
- GHGSat data is also available through the ESA Third Party Missions (TPM) program and the U.K. Satellite Applications Catapult



PI	Institution	Project Description
Clayton Elder	NASA JPL	Evaluating GHGSat methane datasets with respect to EMIT methane plume data
Ben Poulter	NASA Goddard	Evaluating GHGSat for monitoring natural ecosystem methane fluxes
Max Krause	EPA	Evaluating uncertainty of remote sensing landfill methane emission assessments
Dauida Streett	NOAA	Evaluating GHGSat data offshore in the Gulf of Mexico
John Worden	NASA JPL	Evaluating GHGSat plume data for updating CH ₄ emission inventories and trends
Nicolay Balashov	NASA Goddard	Evaluation of GHGSat point source quantification in an urban environment
Danielle Wood	MIT	Assessing accuracy of greenhouse gas emission inventories in a multi-municipality metropolitan area