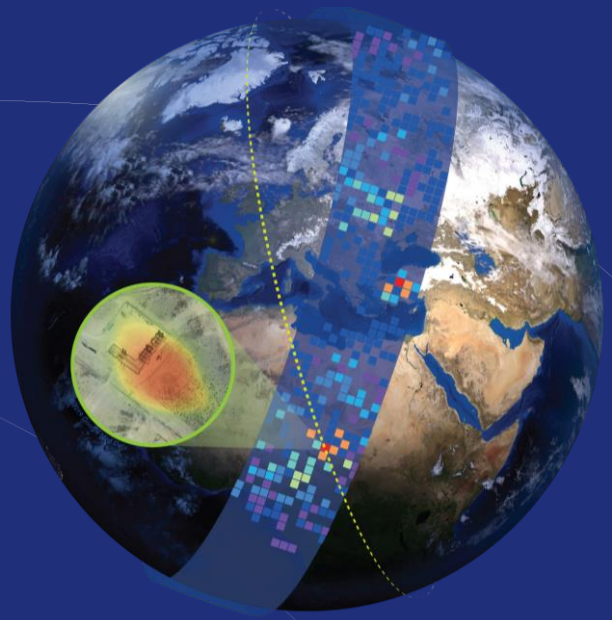


METHANE MONDAYS

AIRCRAFT & SATELLITES

Ángel E. Esparza, PhD, P.E., CESCO
Technical Sales Engineer | U.S. and LATAM

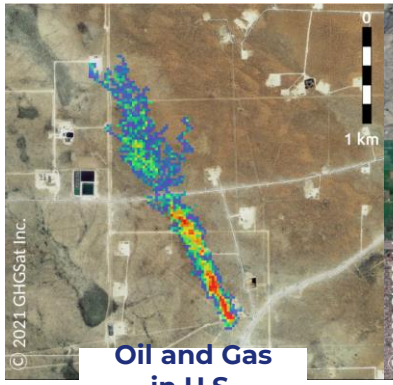
Brody Wight
Sales Director | Energy, Landfills, and Mines

February 21, 2022

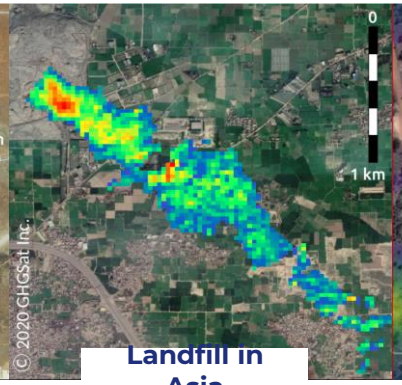
GHGSAT

75 | UNECE

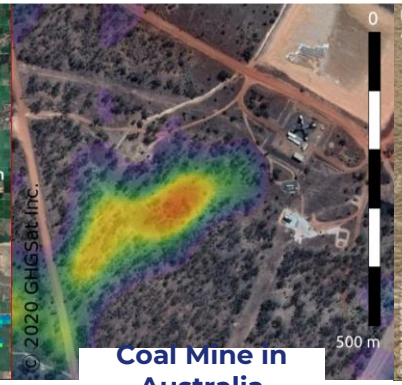
GLOBAL METHANE EMISSIONS MONITORING



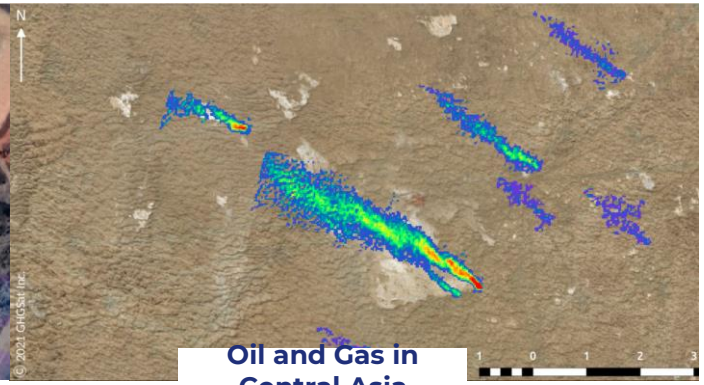
Oil and Gas in U.S.



Landfill in Asia



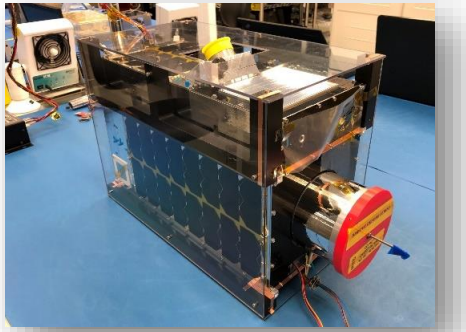
Coal Mine in Australia



Oil and Gas in Central Asia

Aircraft Variant (AV)

- AV1 ➔2019
- AV2 ➔ 2021
- AV3 ➔ 2022
- AV4-5 ➔ 2023



Satellites

- D ➔2016
- C1 ➔ 2020
- C2 ➔ 2021
- C3-C5 ➔ 2022
- C6-C10 ➔ 2023
- C11 (CO_2) ➔ 2023

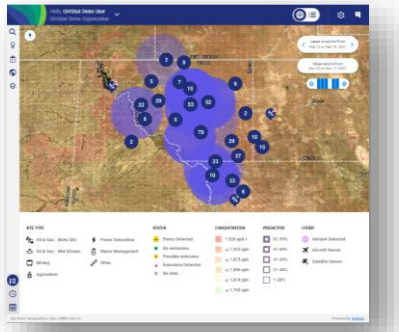
GHGSAT'S WORKFLOW

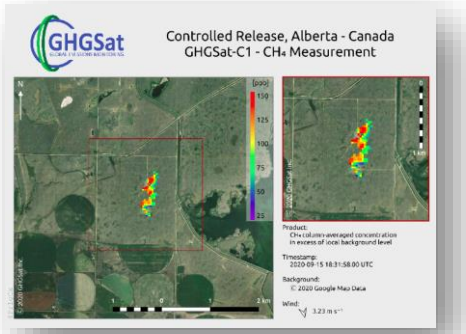
Predictive Analytics → Monitor & Measure → Reporting → Generate Insights

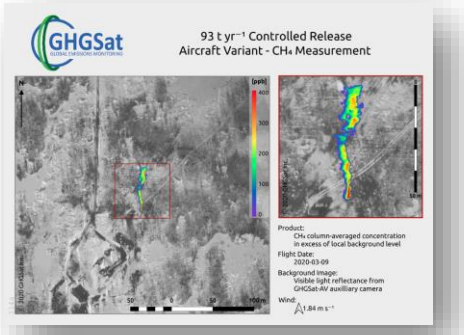
Data Input → Basin Scale Analytics → Satellite → Aircraft Variant → Emission Alerts → Regular Reports SPECTRA

Global Maps
GHG Intensity
Scopes 2 and 3 emissions
Carbon footprints, etc.

- Locations
- Weather
- Flaring
- Emissions
- 3rd Party Satellites
- Insights



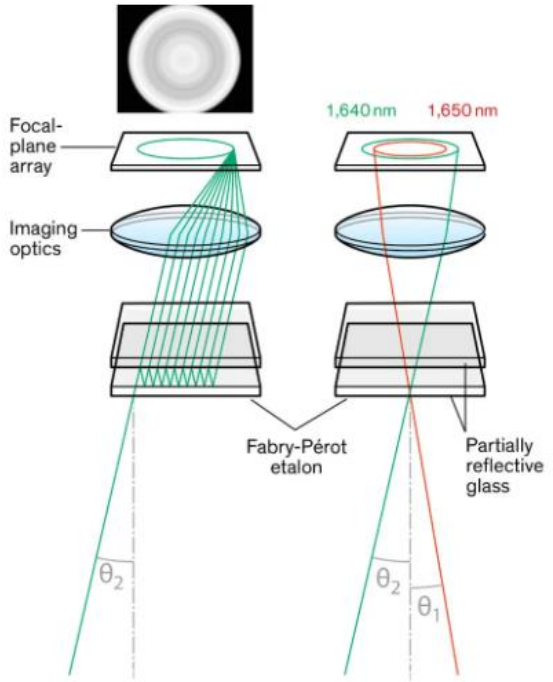


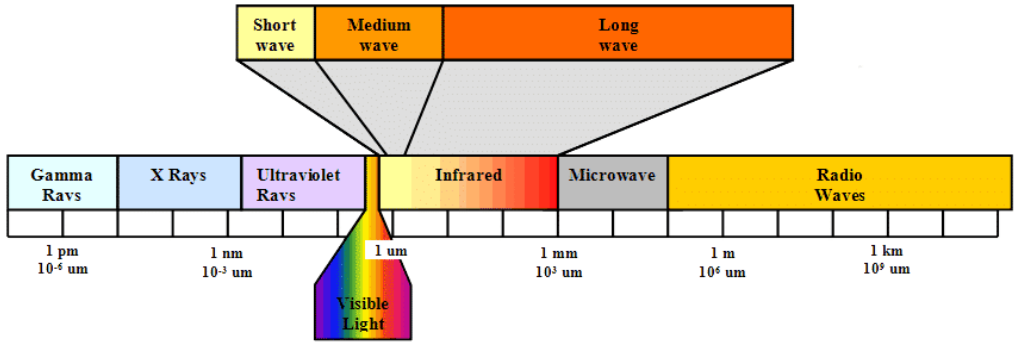


INSTRUMENT

Spectroscopy

- Wide-Angle, Fixed-cavity Fabry-Pérot (WAF-P)
- Shortwave infrared (SWIR)
  - 1600-1700 nm for methane





HOW AV WORKS

Aircraft Monitoring

FEATURES

Flight Altitude
Up to 3,000 m
(10,000 ft above ground level (AGL))

Across-track Swath Width
~750 m swath width
(at 10 000 ft AGL)

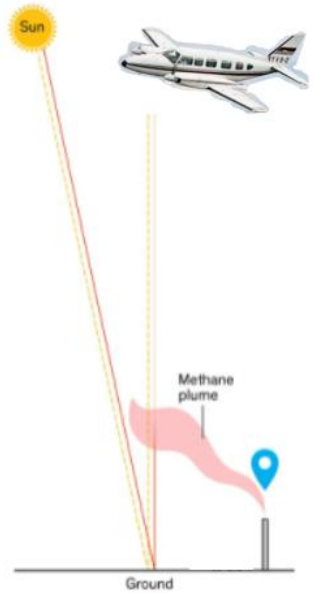
Ground Speed
120 knots

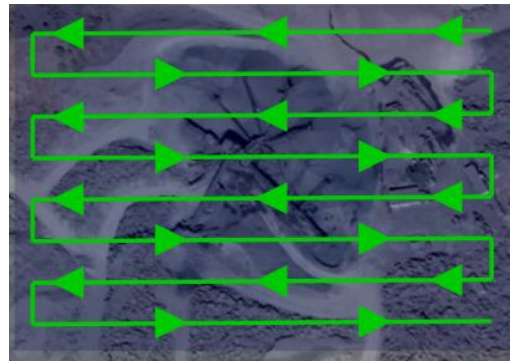
Spatial Resolution (GSD)
Under 1m (<3 ft)
Altitude dependent

Area Surveys
385 km² / day
(150 miles² / day)
(at 10 000 ft AGL)

Linear Survey
Up to 500 miles / day
(800 km / day)

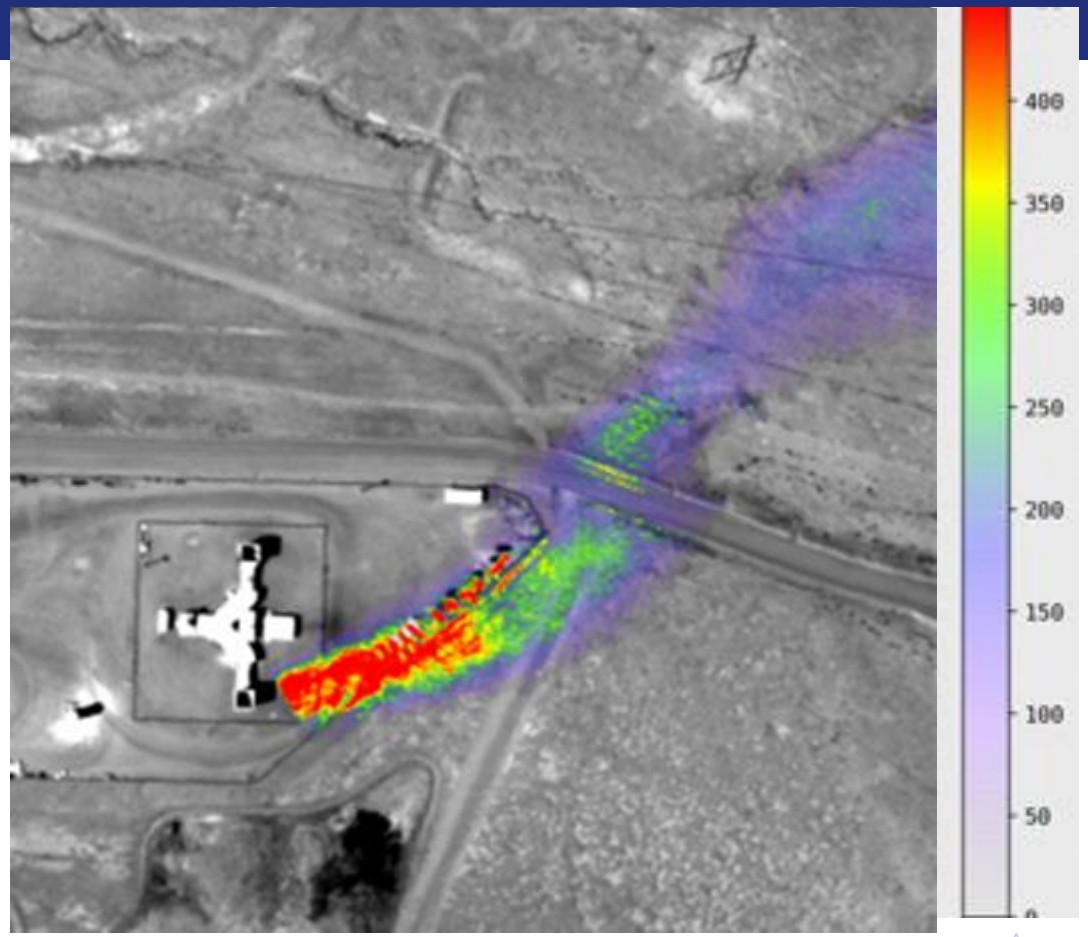
Detection Threshold
Between 10and 35 kg/hr, depending on wind and acquisition parameters





EXAMPLES OF GHGSAT AIRCRAFT MEASUREMENTS

GHGSat-AV – Underground Coal Mine



United States – San Juan Coal Mine Vent

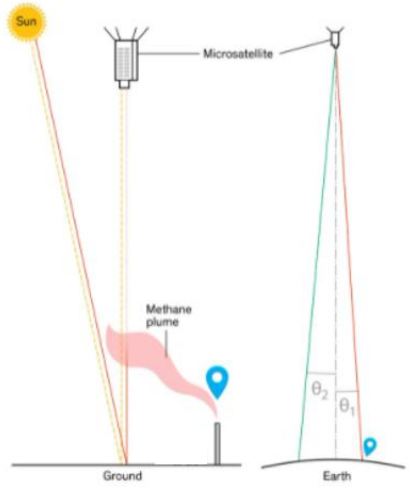
2021

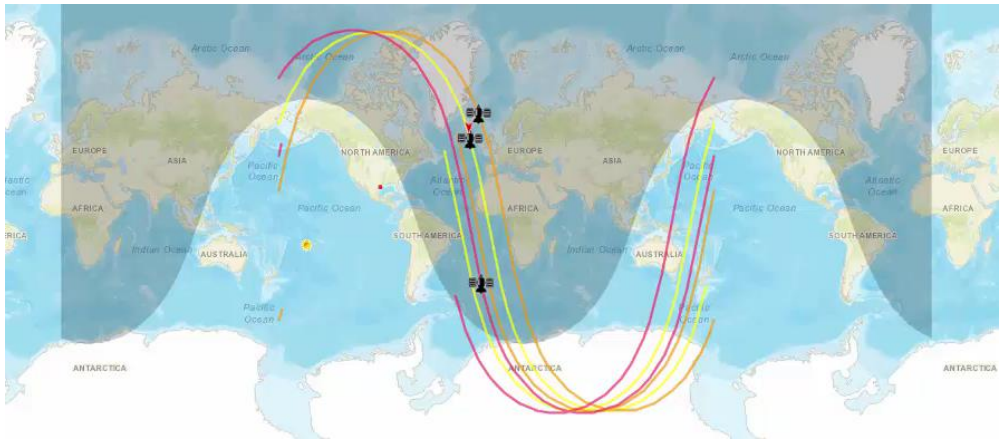
Point Source: 300 kg/hr

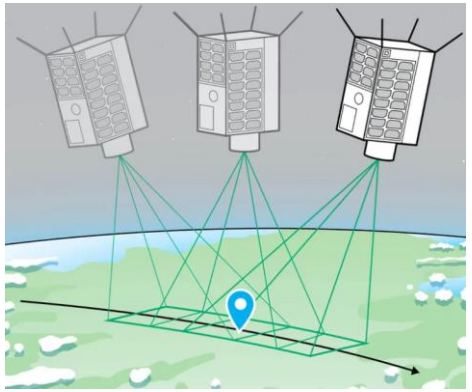
HOW SATELLITES WORKS

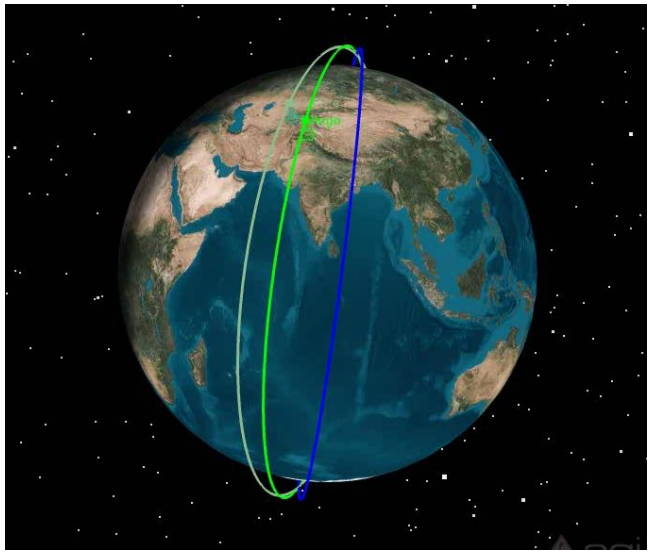
Onshore Monitoring

- 200 images
  - 200,000 pixels/image
- ~7.6 km/sec (~4.7 mi /sec)
- Orbit: Sun-synchronous Polar
  - Resolution: ~25 m
  - FOV: ~12 km x 12 km
  - Altitude: ~500 km
  - Orbits/day: 15



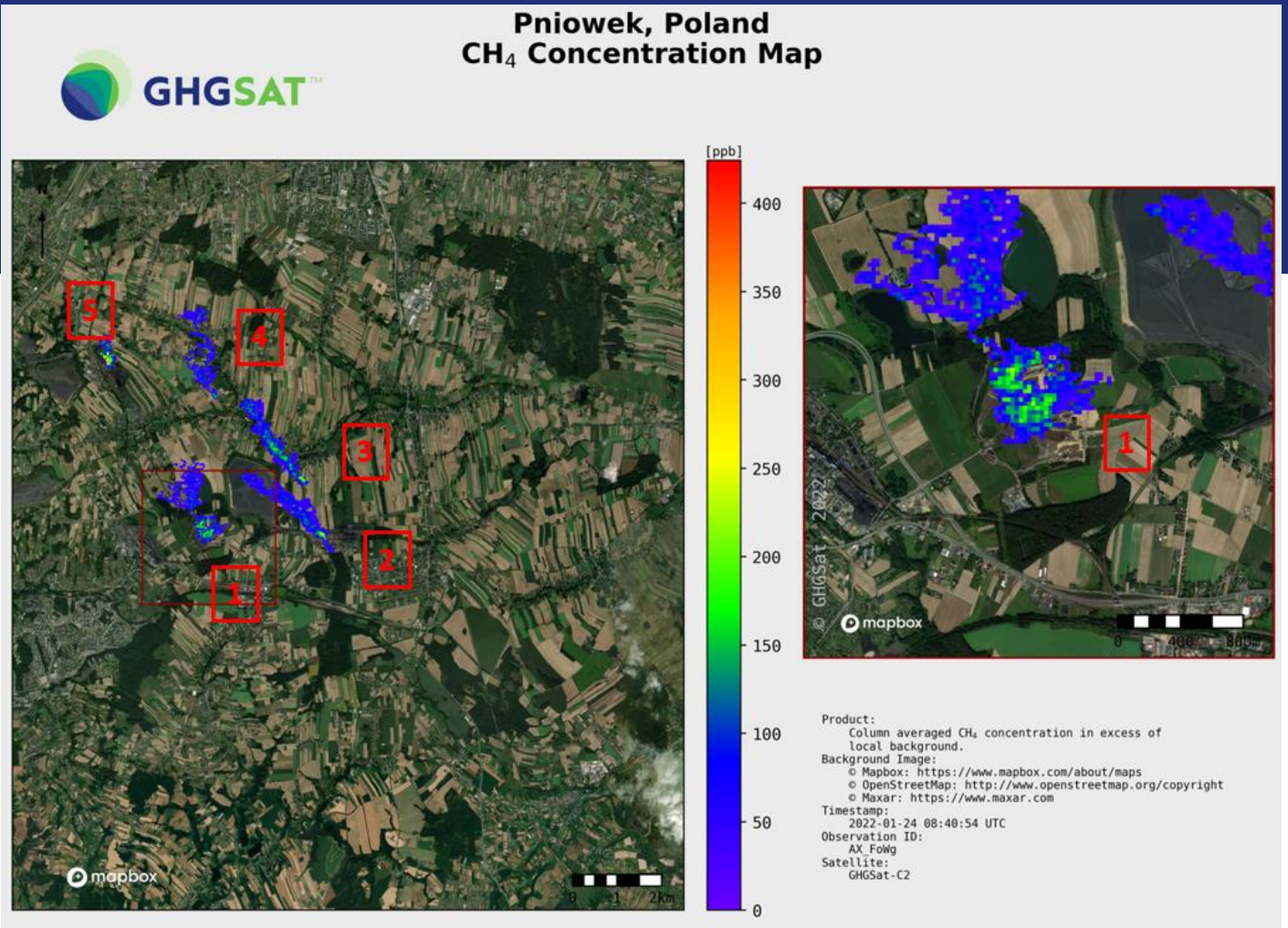






EXAMPLES OF GHGSAT SATELLITE MEASUREMENTS

GHGSat-CX – Underground Coal Mine

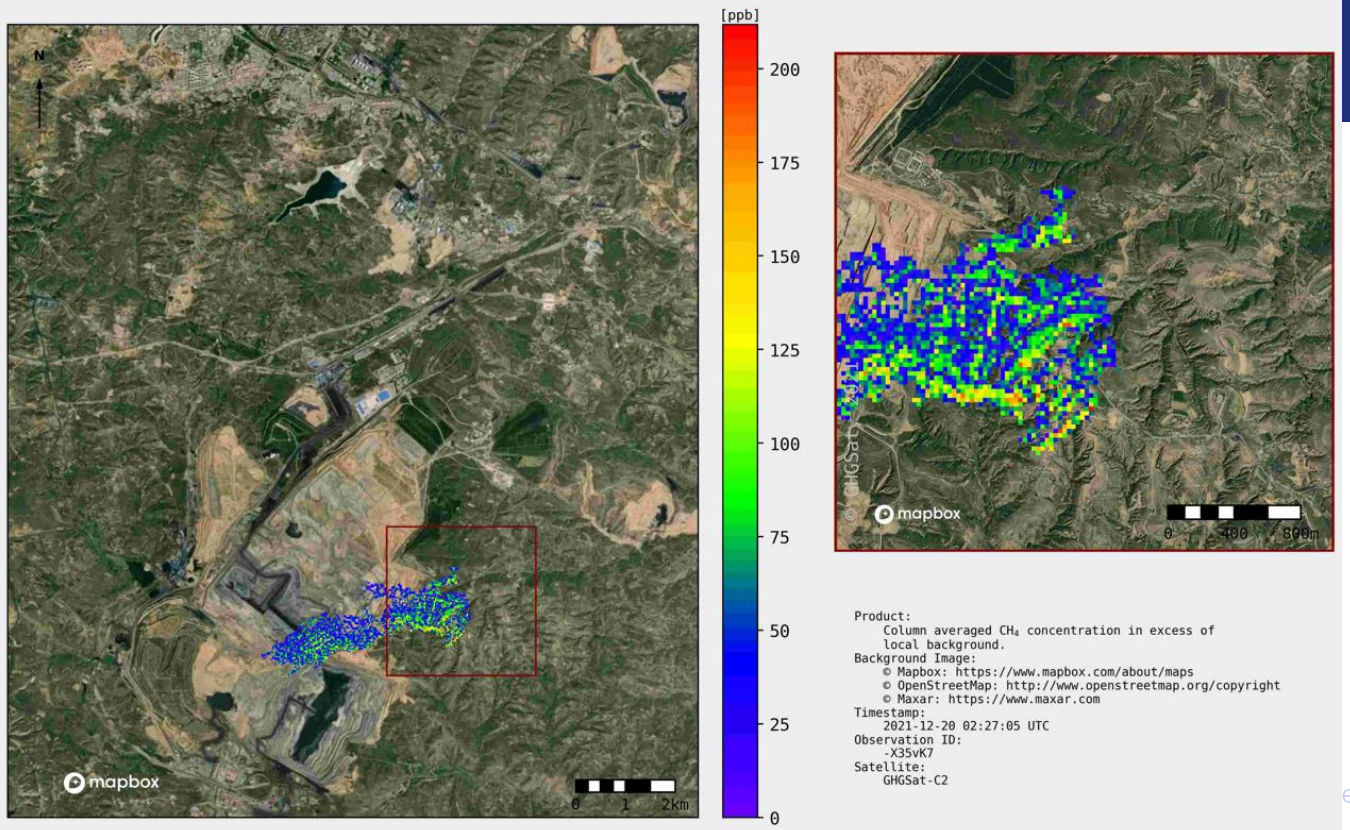


January 2022

1) 1, 265 kg/hr
2) 1, 815 kg/hr
3) 1,216 kg/hr
4) 898 kg/hr
5) 635 kg/hr

EXAMPLES OF GHGSAT SATELLITE MEASUREMENTS

GHGSat-CX – Open Pit Mine



China

December 2021

Point source 1: 2,384 kg/h ± 47%

A TIERED SYSTEM-OF SYSTEMS

Analytics + Satellites + Aircraft + Targeted Facility Surveys

Analytics

AI with data from GHGSat and third-party satellites to predict areas at higher risk of emissions

GHGSat

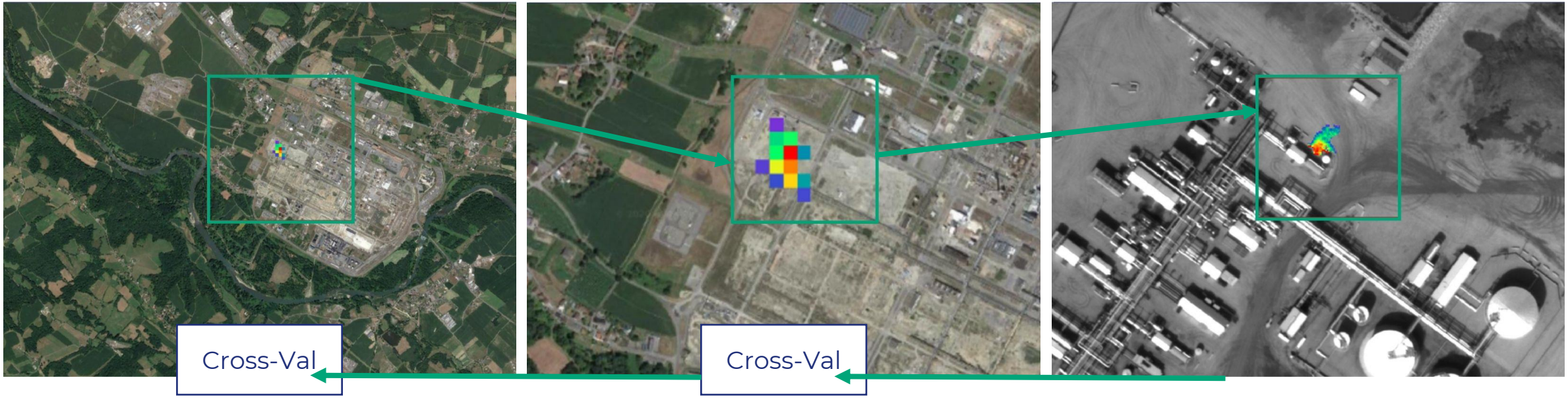
TIP & CUE

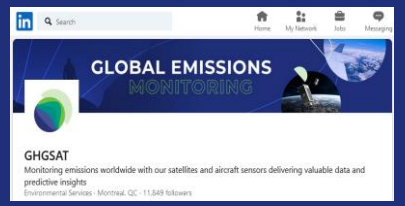
<30 m pixels, monthly coverage with satellites

Aircraft - UAV Sensors

TIP & CUE

<1 m pixels, bi-annual coverage with fleets of sensors in key areas





THANK YOU

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