



The role of satellites in methane emissions monitoring

Methane Monday webinar

June 20, 2022

Kayrros: leading geospatial analytics for energy and environment



CUSTOMER BASE

+80 customers

Including the world's leading financial institutions and energy companies

\$3 trillion

Aggregated market value of Kayrros customers



KEY METRICS

- Monitoring **200k+** energy assets
- Using **10+** constellations of satellites, source agnostic
- 5bn** position data points processed per day
- 100+** remote sensing & data fusion algorithms



REGIONAL FOOTPRINT



Paris



Houston



London



Singapore



New York



Bangalore



TEAM

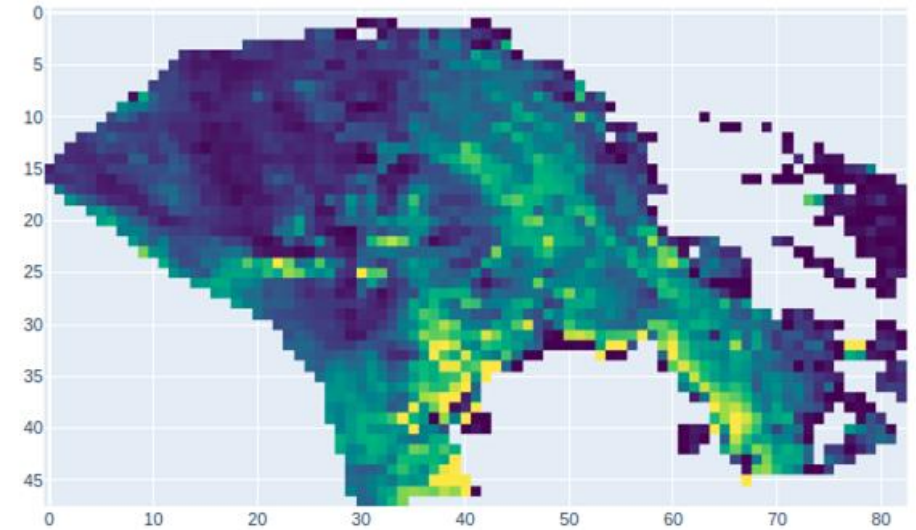
- Strong tech & science **team of 150**
- 80+ MSc and 15+ PhDs** from world-class universities & schools in artificial intelligence, physics, big data & energy
- 24** nationalities

There are two methods to measure methane emissions from space

Method 1

Basin Inversion

Quantify total emissions across an entire oil & gas or coal basin

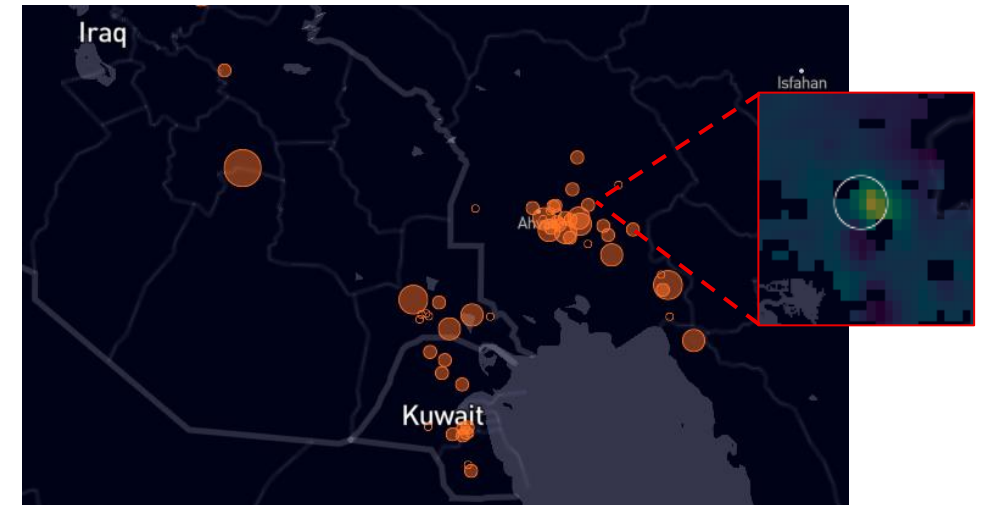


Methane concentrations in Iran-Iraq-Kuwait
2019-20 average

Method 2

Super-Emitters

Detect and quantify methane emissions from large sources



Methane hotspots in Iran-Iraq-Kuwait
January 2019 to date

Source: Kayrros analysis of Sentinel-5P data

The scientific basis of quantifying methane emissions from space is well established



GREENHOUSE GASES

Global assessment of oil and gas methane ultra-emitters

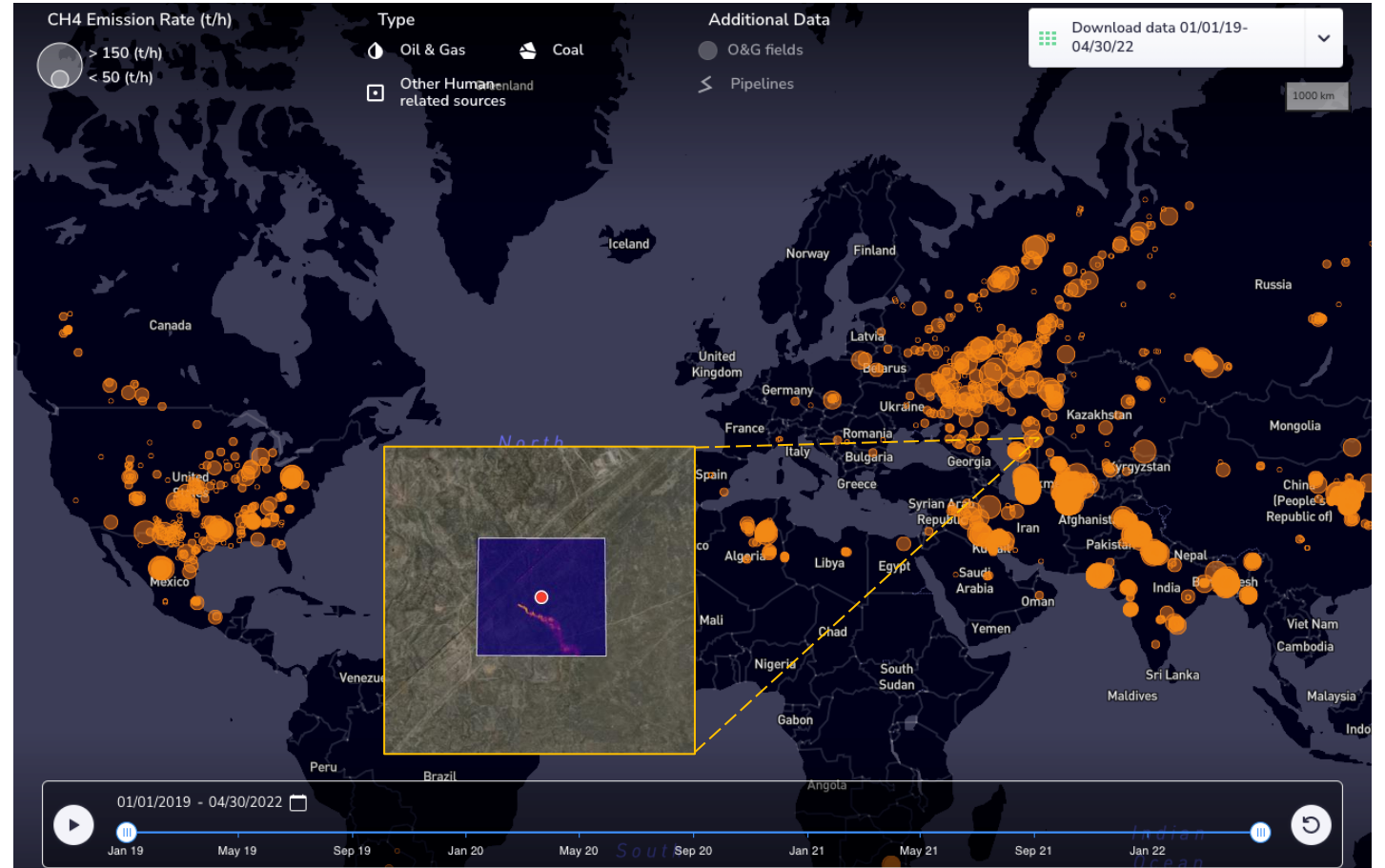
T. Lauvaux^{1*}, C. Giron², M. Mazzolini², A. d'Aspremont^{2,3}, R. Duren^{4,5}, D. Cusworth⁶, D. Shindell^{7,8,9}, P. Ciais^{1,10}

Key results

1. ultra-emitters that can be seen with Sentinel-5P account for approximately 10% of total emissions from the oil & gas sector
2. Eliminating these ultra-emitters is a priority given the relatively low cost of mitigation

Methane Watch
is operational and
ready for
immediate
deployment and
will be
contributed to
IMEO

Methane Watch platform



Methane super-emitters since January 2019, and example of vented emissions during pipeline maintenance in Kazakhstan

Bloomberg News uses Methane Watch to report on super-emitters and engage with oil & gas companies

B Bloomberg.com

Berkshire Hathaway Gas Pipeline Was Behind Massive ...

What on Earth? The Bloomberg Green newsletter is your guide to the latest in climate news, zero-emission tech and green finance.

1 week ago



Russia's Gas Pipelines May Save Europe This Winter But ...

Yet, because methane has far more planet-warming power than carbon ... French geoanalytics firm Kayrros SAS to pinpoint the plume from...

1 week ago



Canada Methane Plume Coincided With Work on Gas System

24, releasing natural gas — whose main component is methane — for 10 ... Kayrros SAS, a geoanalytics company, estimated an emissions rate of...

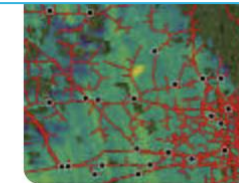
4 weeks ago



Wisconsin Launches Probe Into Methane Plume Spotted From ...

The state launched a probe after being contacted by Bloomberg News about a plume of methane detected in southwest Wisconsin by Kayrros SAS,...

1 month ago



Reported by

Bloomberg

with data from



Leaders in France, the EU and US use Kayrros data



“Thanks to Copernicus and with the company **Kayrros** and its partners we have been able to detect GHG emissions that other powers didn’t want to reveal.”

Emmanuel Macron



“The European Commission will propose legislation to ... make measuring, reporting and verification of methane emissions mandatory for companies.”

Kadri Simson – EU Energy Commissioner showing **Kayrros** map



“[We can measure the carbon footprint] of a large corporation or country.... The Washington Post had a terrific story with the methane pinpointed in Russia and the whole **[Kayrros]** map of methane.”

John Kerry – US Special Presidential Envoy for Climate

The International Energy Agency uses Kayrros data

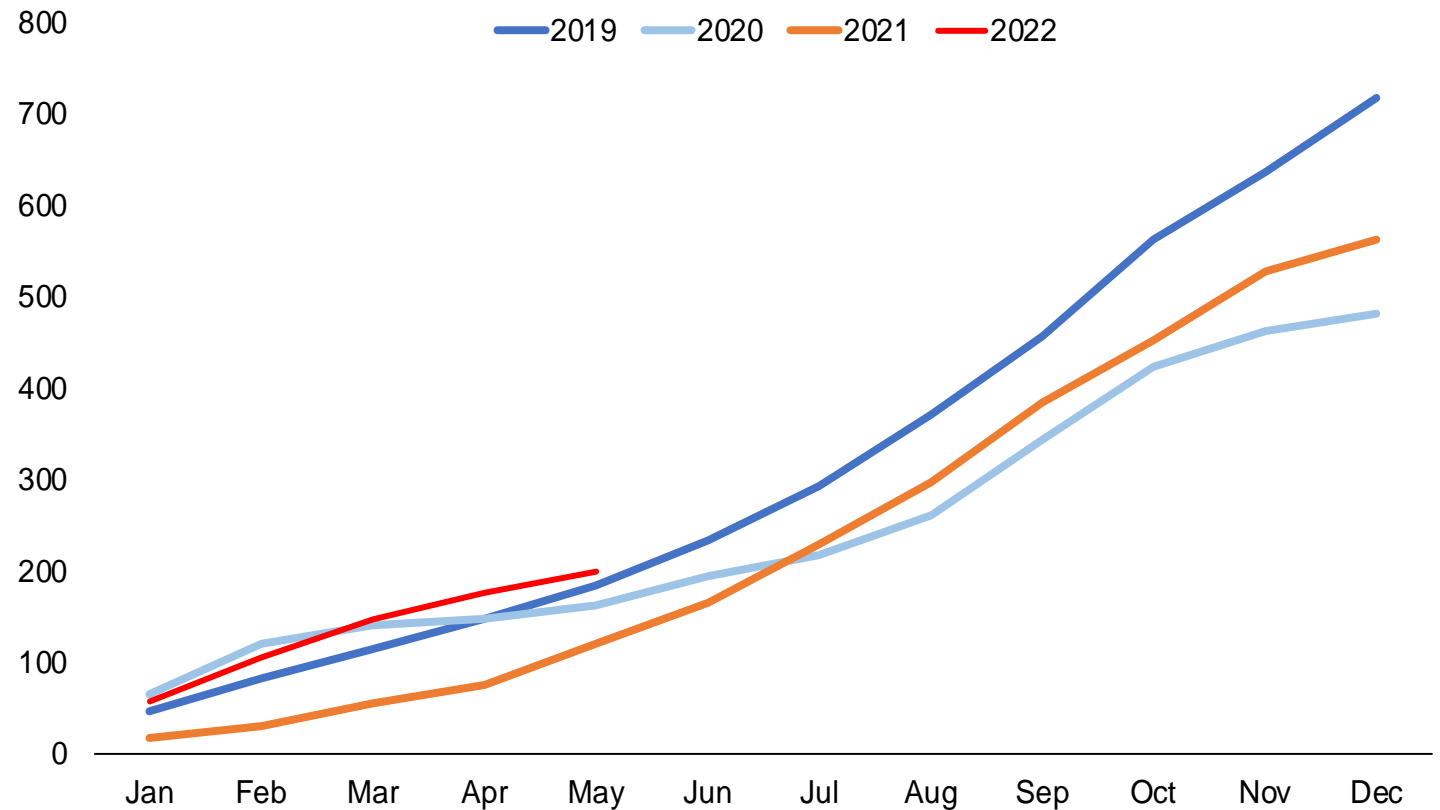


Role of Kayrros Methane Watch

1. Account for emissions from **super-emitters** in country-level inventories
2. Benchmark country estimates against **basin inversion models**.

The number of super-emitters detected in 2022 is above the previous peak

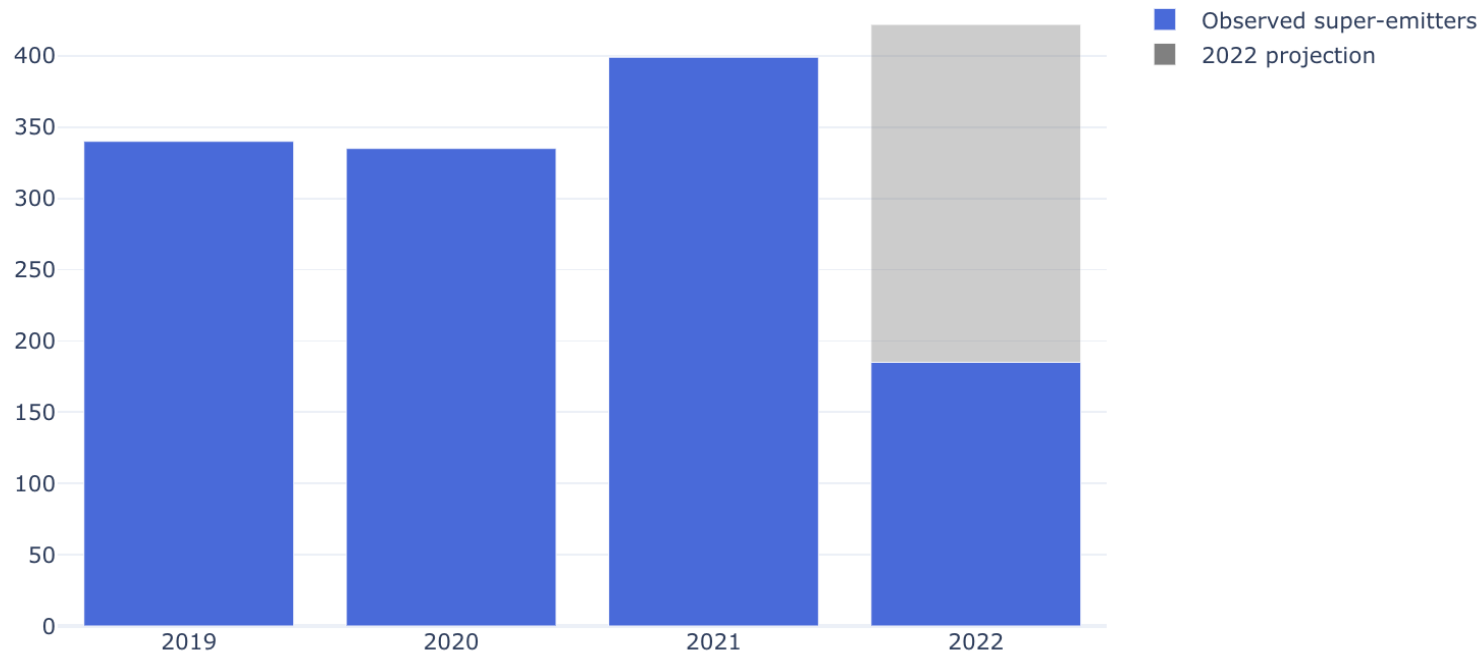
Cumulative number of super-emitters in the oil & gas sector detected using Sentinel-5P



Source: Kayrros Methane Watch

Super-emitters observations are on the rise since Covid in Global Methane Pledge participating countries

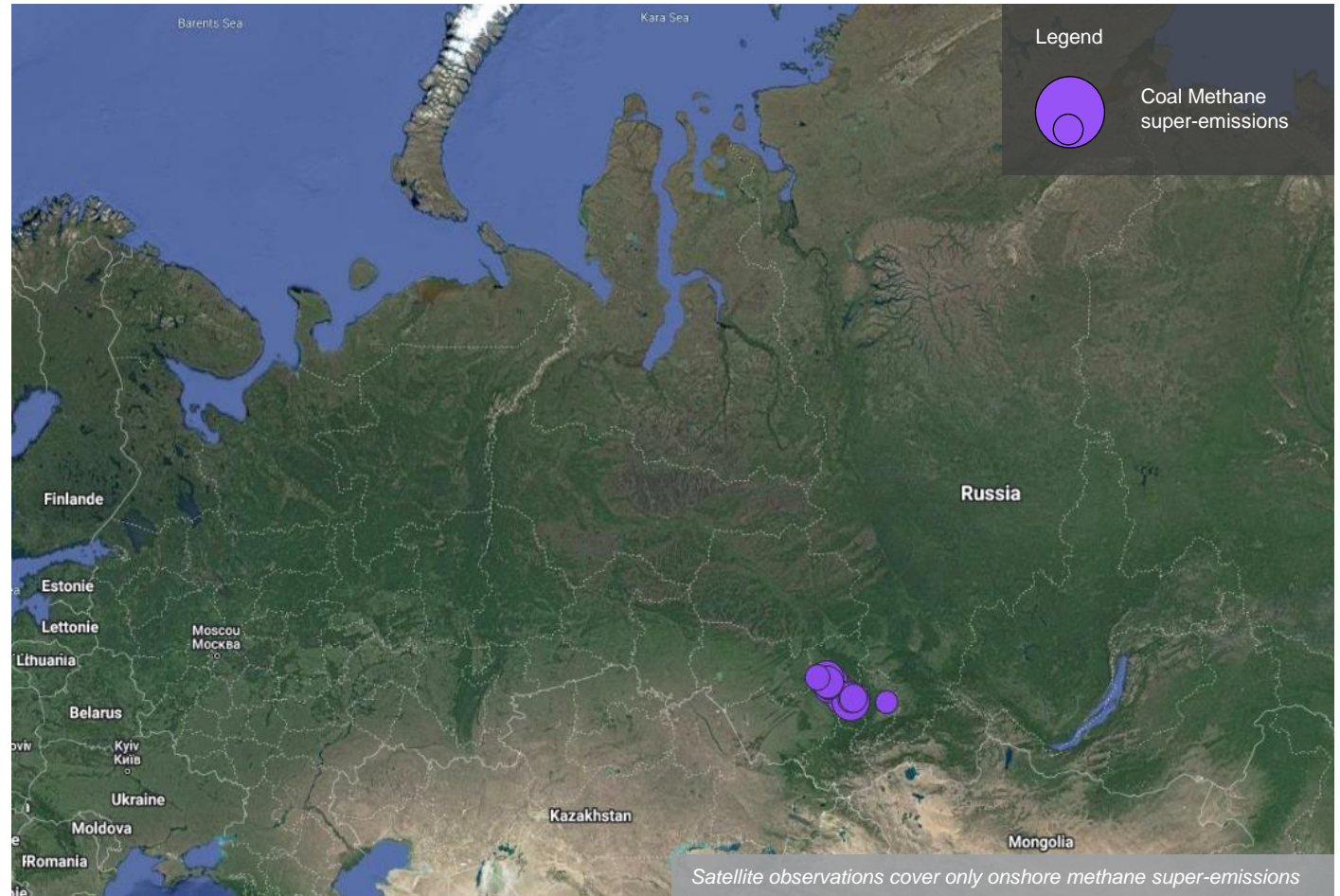
Number of observed methane super-emitters in Global Methane Pledge countries
(source: Kayrros Methane Watch)



- **+ 20%** super-emitters in 2021 vs 2020 in Global Methane Pledge countries
- **43%** of methane super-emitters detected since the Global Methane Pledge were observed in these countries
- Average emission rate : **64 tons of methane / hour**

Coal – Kayrros continuously detects super-emitters in Kuznetskiy basin, the largest coal production region in Russia

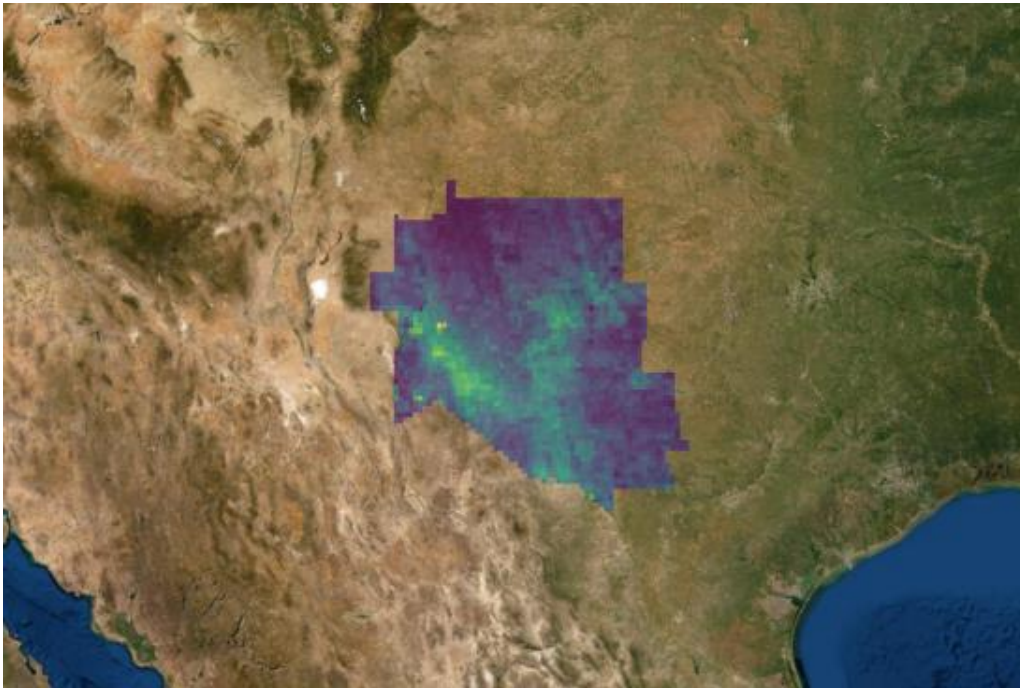
Raspadskya max emission rate: 153t/h on July 2019



- **45** methane super-emitters detected since Jan 2019
- Average emission rate : **62 tons of methane / hour**
- Maximum emission rate : **153 tons of methane / hour**

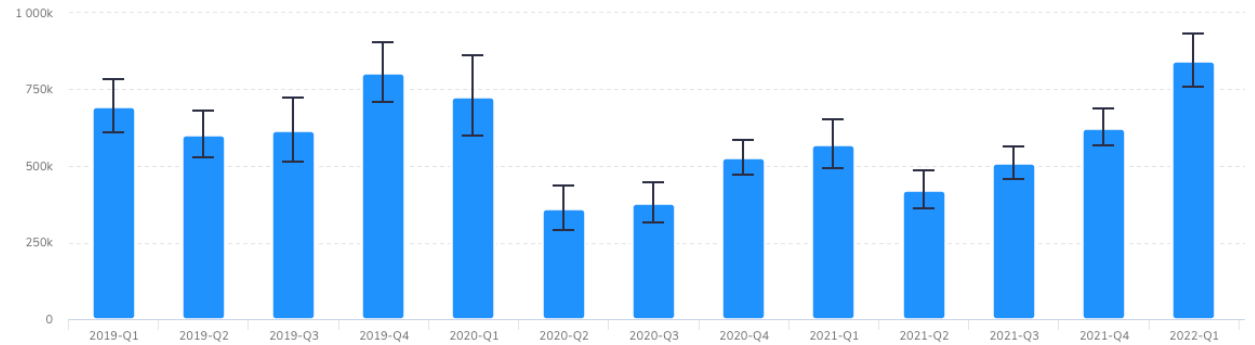
Methane emissions are **bouncing back post-Covid** in EU oil&gas import regions

Kayrros is able to estimate **total emissions in hydrocarbon production regions**, using Sentinel-5P, atmospheric and activity data



Aggregate 2022 methane emissions in the Permian

Kayrros' estimate of quarterly methane emissions from oil&gas in the Permian

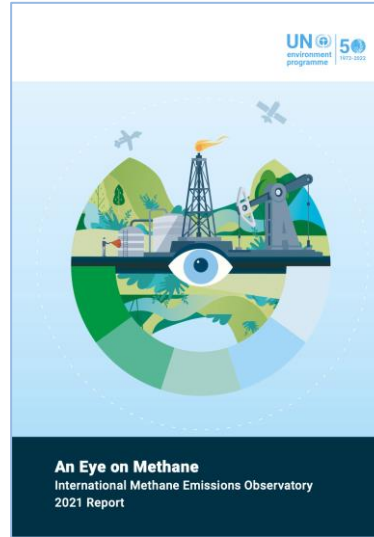


- Methane emissions in the Permian have reached their highest level since end of 2019 last quarter, following post-Covid oil&gas production recovery
- Increased demand from EU creates a risk of reaching record-level emissions in the region

Satellite monitoring is key to climate action on methane

Kayros will provide data to the International Methane Emissions Observatory

International Methane Emissions Observatory



Global Methane Pledge



Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on methane emissions reduction in the energy sector

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