



EU Critical Energy & Transport Infrastructure Monitoring

Space 4 Critical Infrastructure: **Energy & Transport**

NEREUS

October 27, 2022

Credentials

+80 customers

Including governments, world leading financial institutions and large-scale operators

\$3 trillion

Aggregated market value of Kayrros customers

Resources

Using 10+ constellations of satellites

5 billion position data points processed per day

200.000+ assets monitored

100+ remote sensing and data fusion algorithms

6 Offices



Capacities

Hyperspectral sensors

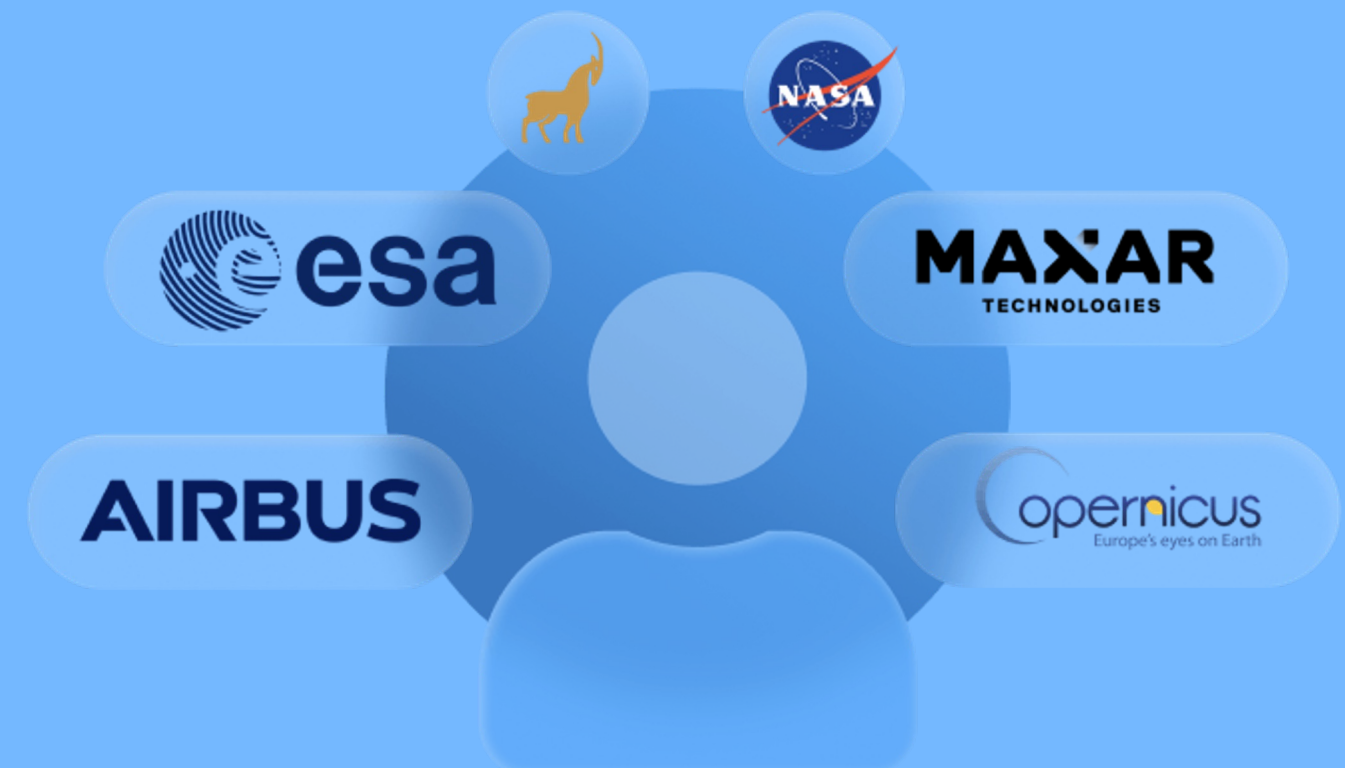
SAR & InSar radars

3D natural disaster mapping

Geolocation data

IoT & ground sensors

Partners



Deliverables

Climate impact

Methane emissions
Carbon emissions
Carbon offsets
Deforestation
Forest degradation
Etc.

Climate risk

Flood risk
Wildfire risk
Drought
Flood assessment
Wildfire assessment
Etc.

Energy mix

Solar farm monitor
Wind farm monitor
Hydrogen deployment
Oil consumption
Oil & Gas production
Crude oil inventories
Oil & gas Transportation
LNG watch
Etc.

EU Critical Energy & Transport Infrastructure Monitoring

4 case studies:

Railroads

LNG supply chain

Refining & crude oil inventories

Methane emissions



Wildfire Risk Monitoring

State-of-the-art of wildfire risk modeling

A 50m resolution risk model from ground truth measurements for accurate risk assessment.

The risk model includes more than 20 factors influencing wildfire behavior, including topographic features, vegetation, weather, climate conditions, the type of infrastructure present on the ground etc.

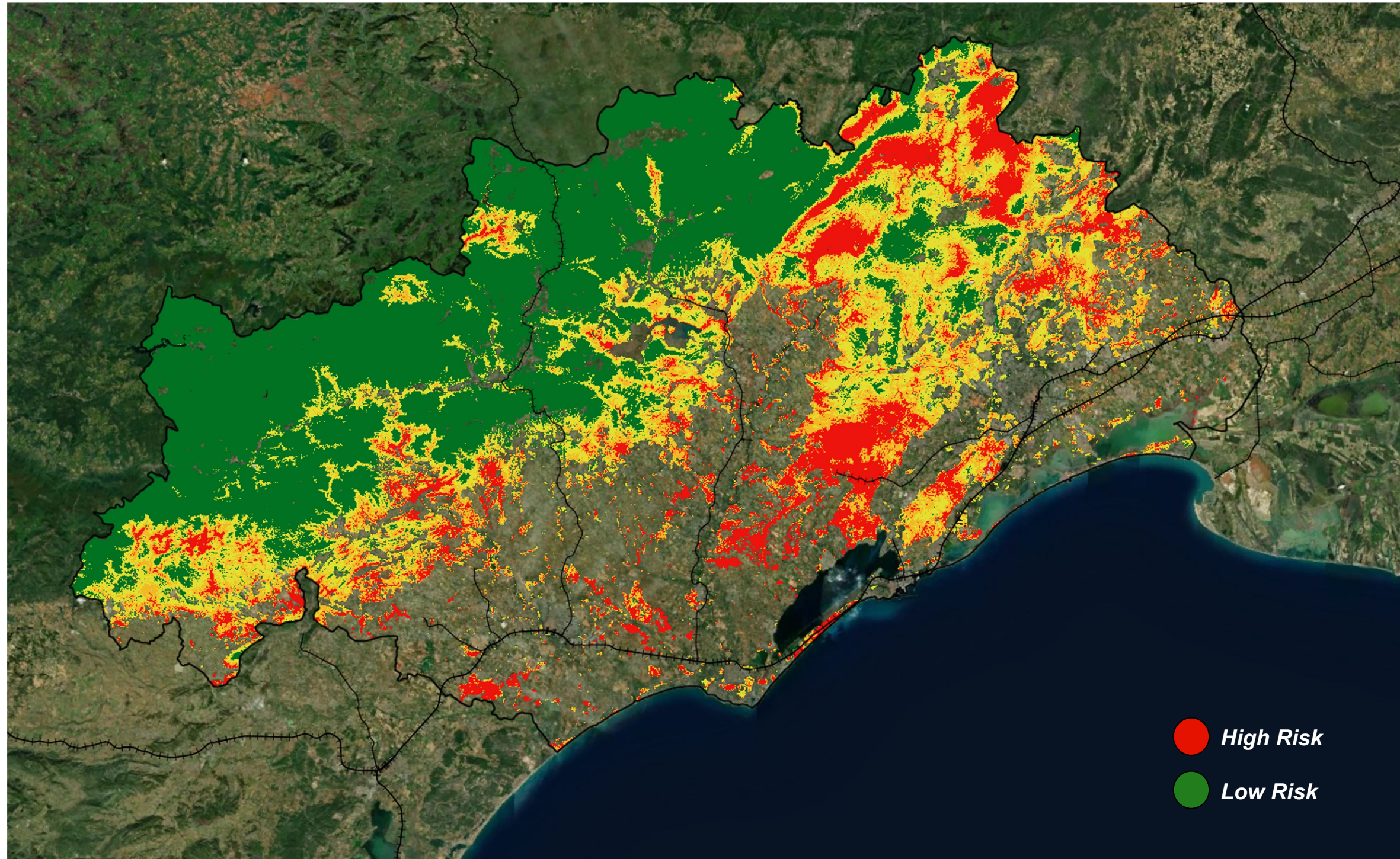




Railroad monitoring

Wildfire risk map to assess railway infrastructure exposure

2022 Wildfire Risk Map in the Herault Department, France (Kayros)



Before: predictive maintenance ahead of wildfire season

Risk assessment based on historical data & multiple parameters from satellite imagery

- ❑ Prepare and prioritize the vegetation control actions
- ❑ Identify the areas at risk and take preemptive measures

During: crisis management

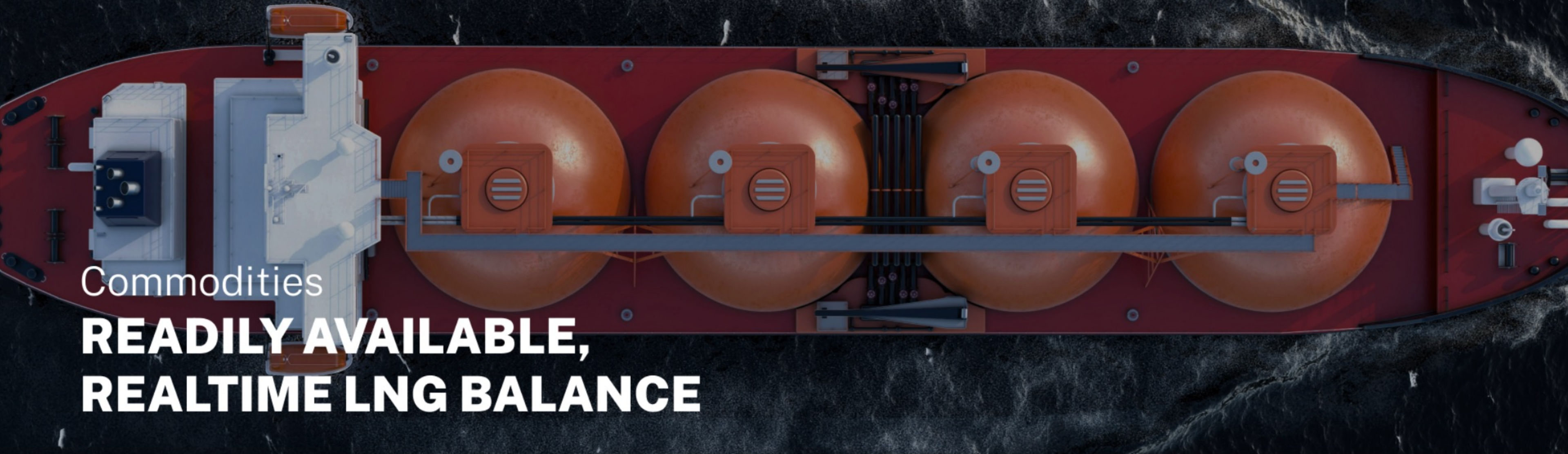
Daily active fires monitoring at local and national scale

- ❑ Near-real time alerting to help railway companies adapt the train traffic
- ❑ Fire propagation modelling for short-term forecast
- ❑ Centralized geographical information system for enhanced crisis management on the traffic

After: post-event analysis

Assessment of the damages caused during the year

- ❑ Mapping of the past fires and assessment of the damage severity on the infrastructure
- ❑ Decision support tool for retro-analysis and enhanced mitigation strategy



Commodities

READILY AVAILABLE, REALTIME LNG BALANCE



Timely

Track LNG flows & see LNG production shut-ins before the rest of the market



Predictive

Anticipate changes in LNG prices triggered by sudden shifts in available supply



Comprehensive

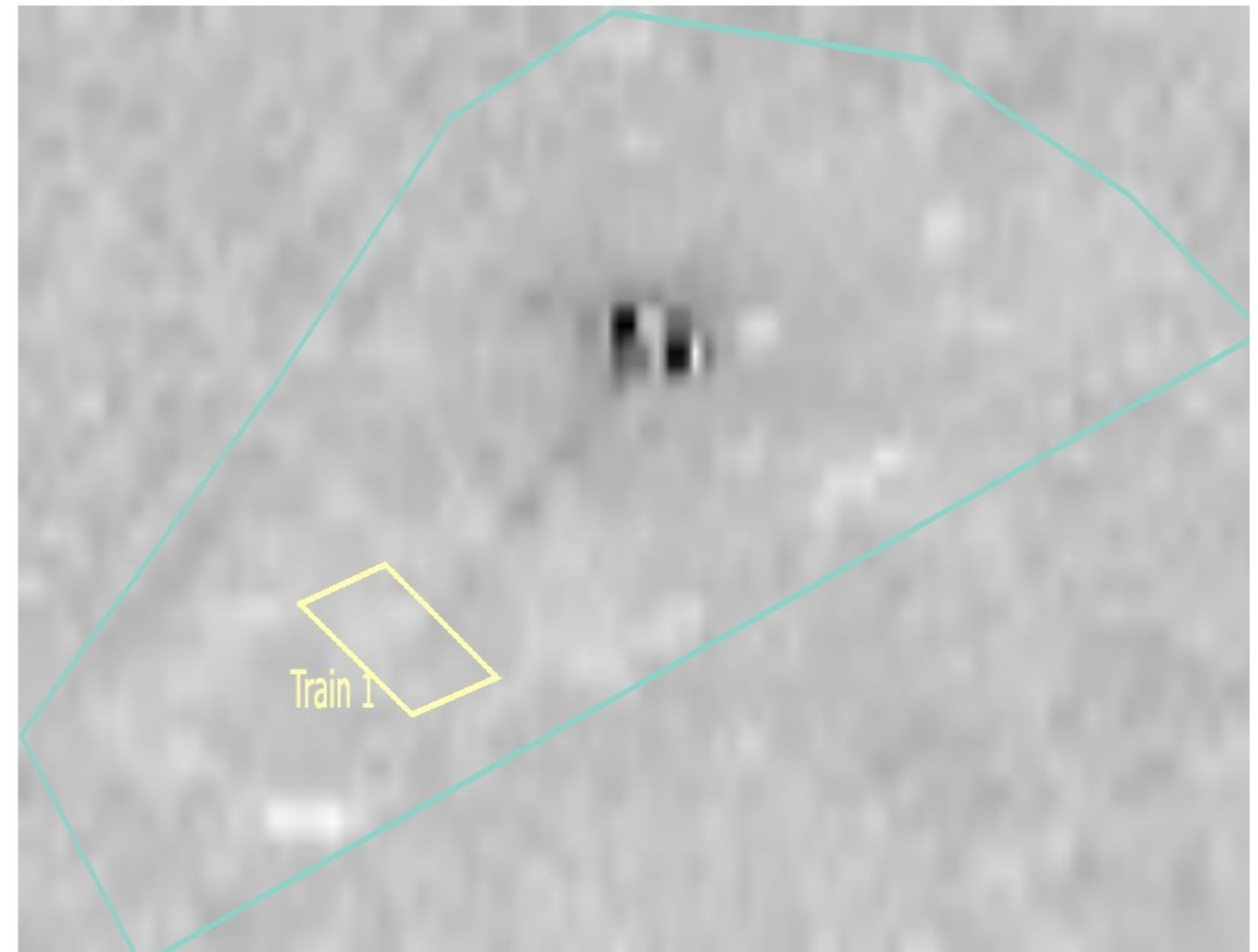
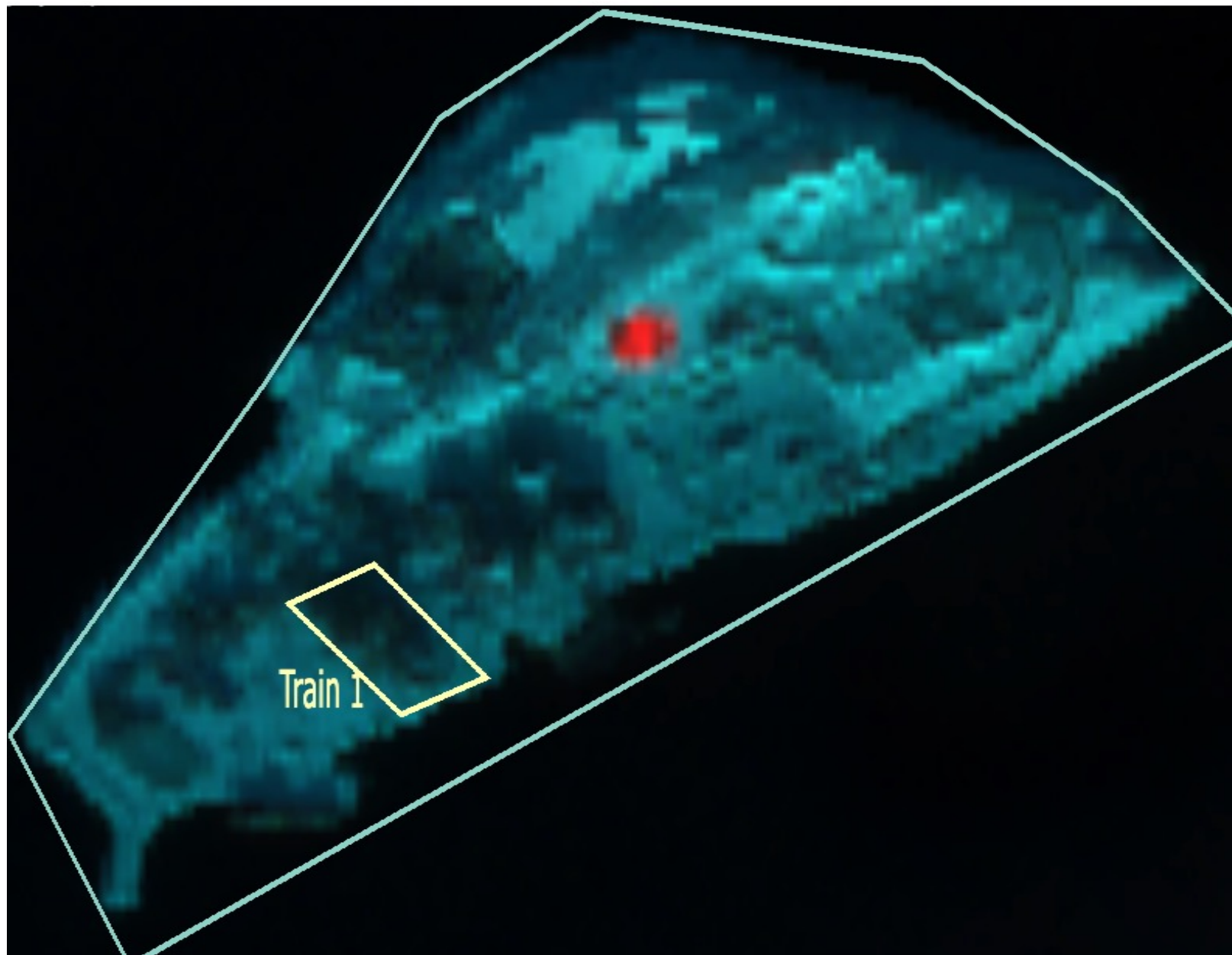
Combine LNG cargo tracking with the LNG Liquefaction Plant Monitor for a complete near-realtime view on worldwide LNG supply



LNG supply chain monitoring

Snøhvit natural gas liquefaction facility, Hammerfest, Norway

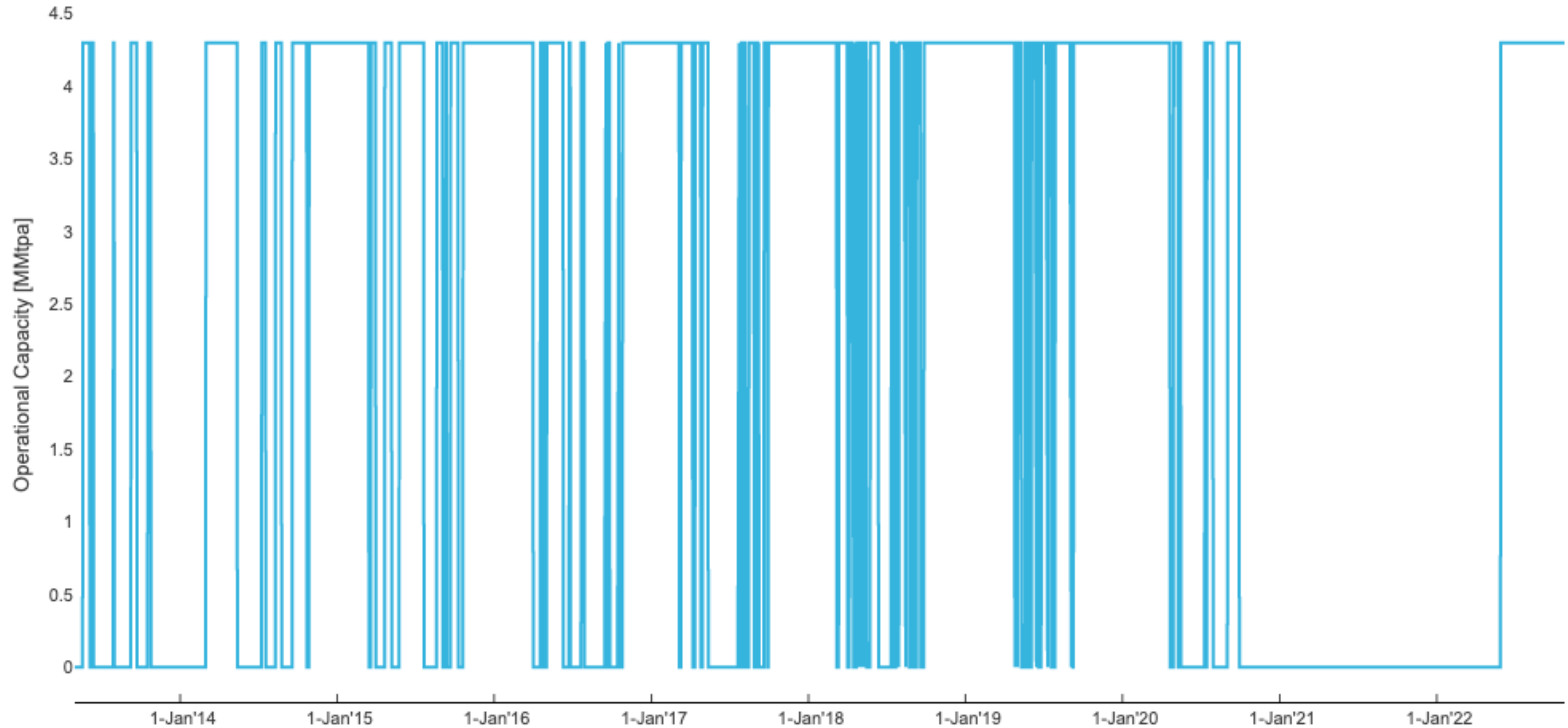
April 2022





LNG supply chain monitoring

Snøhvit natural gas liquefaction facility. Hammerfest, Norway





LNG supply chain monitoring

Global gas liquefaction capacity utilization

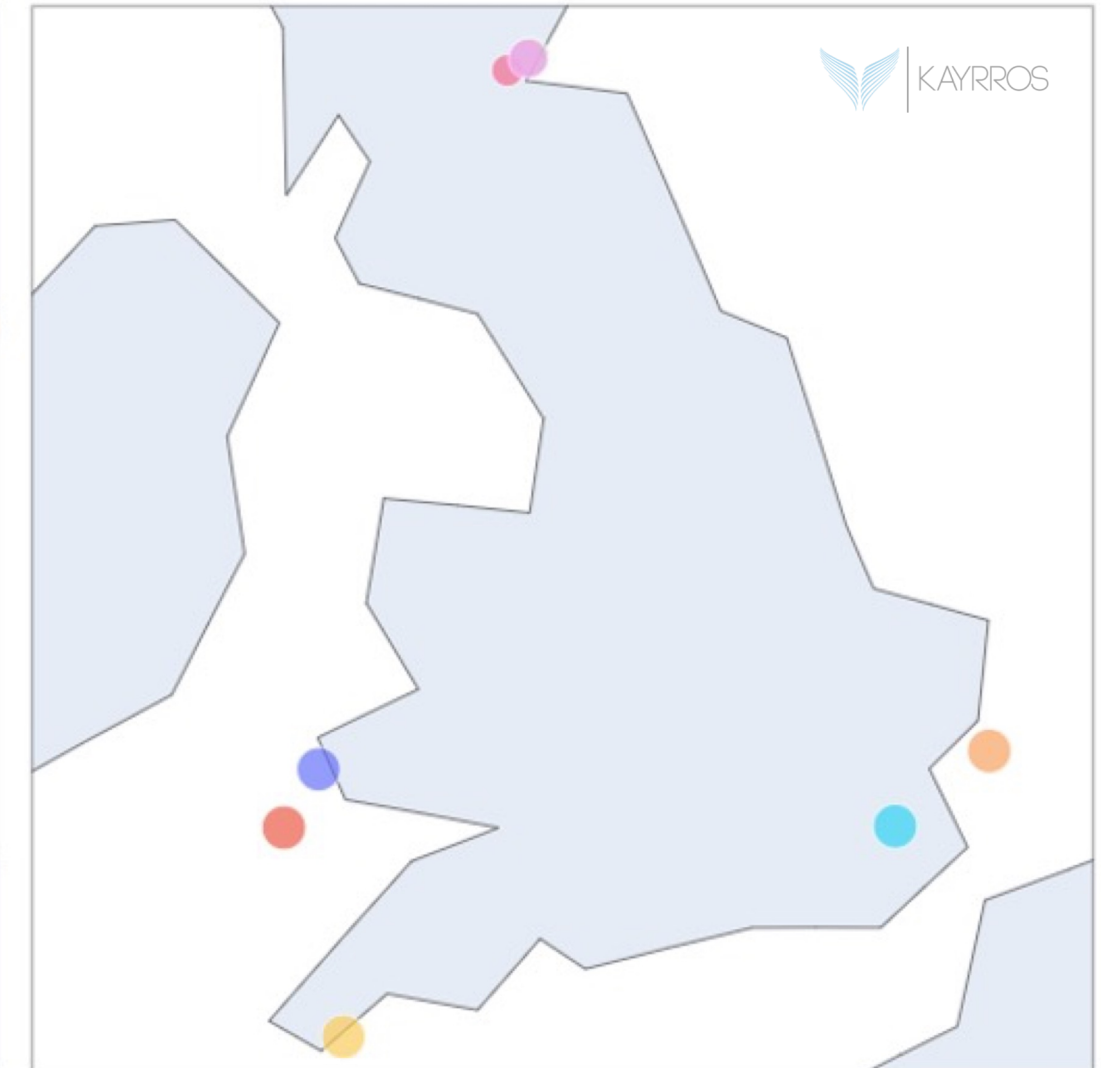
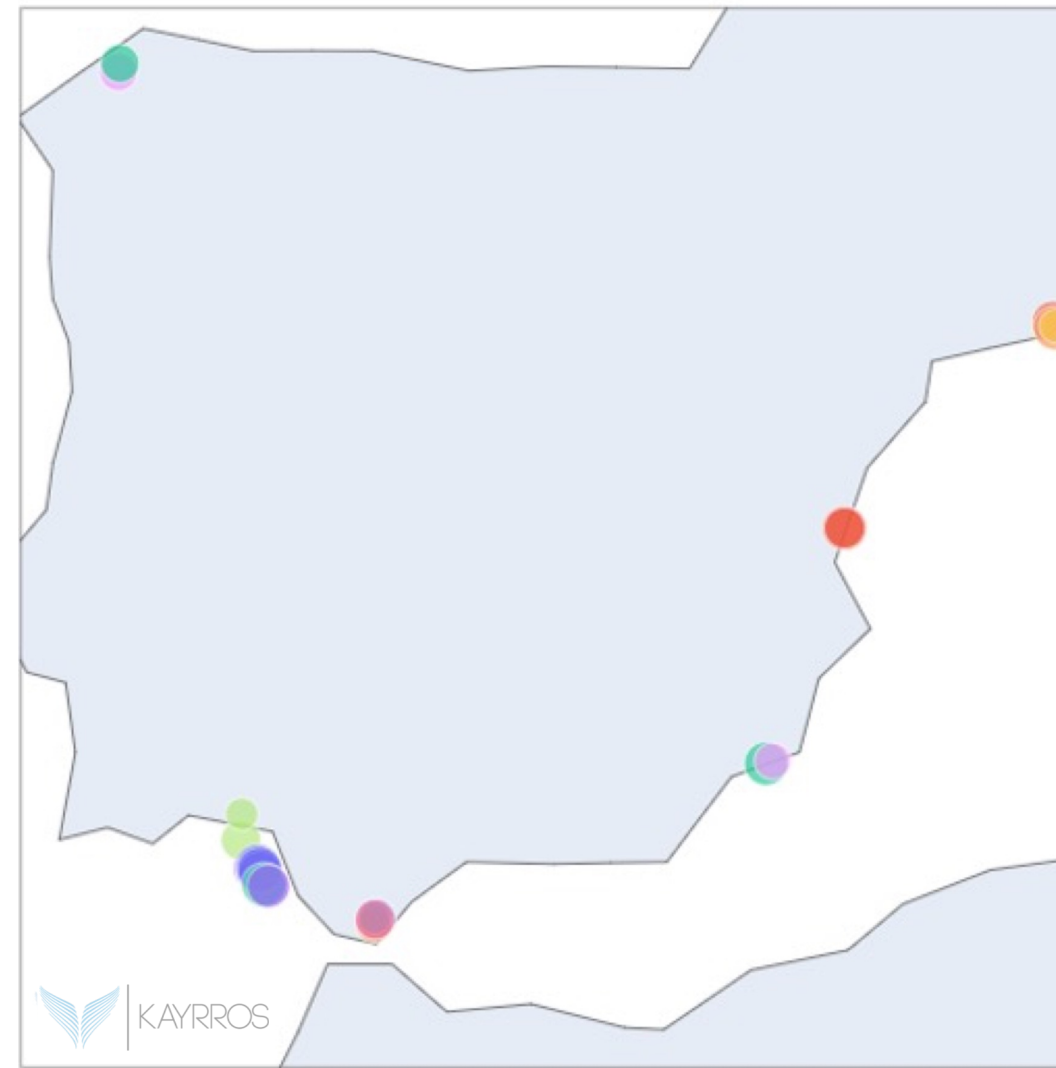
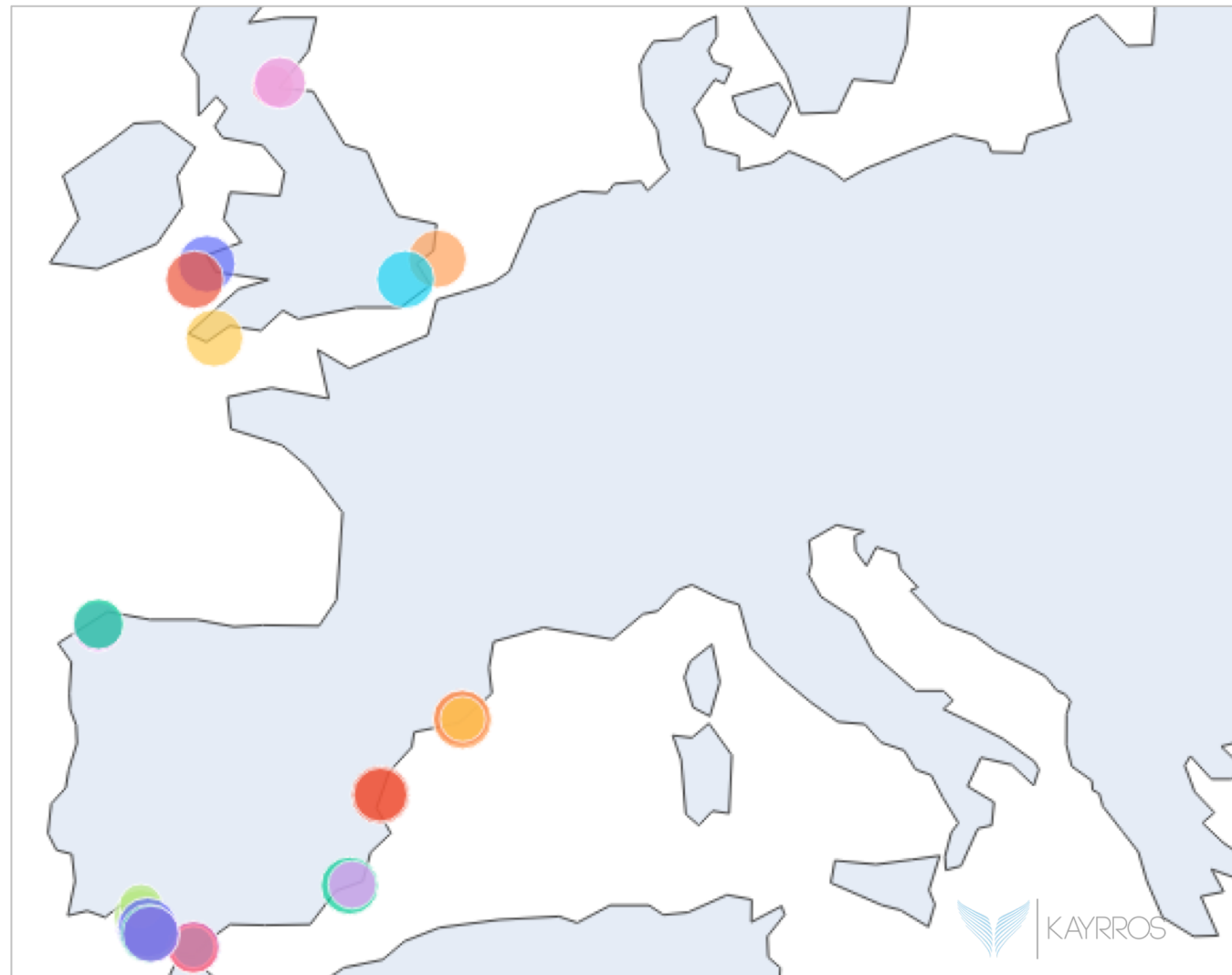




LNG

LNG ships waiting off the coast of UK and Spain

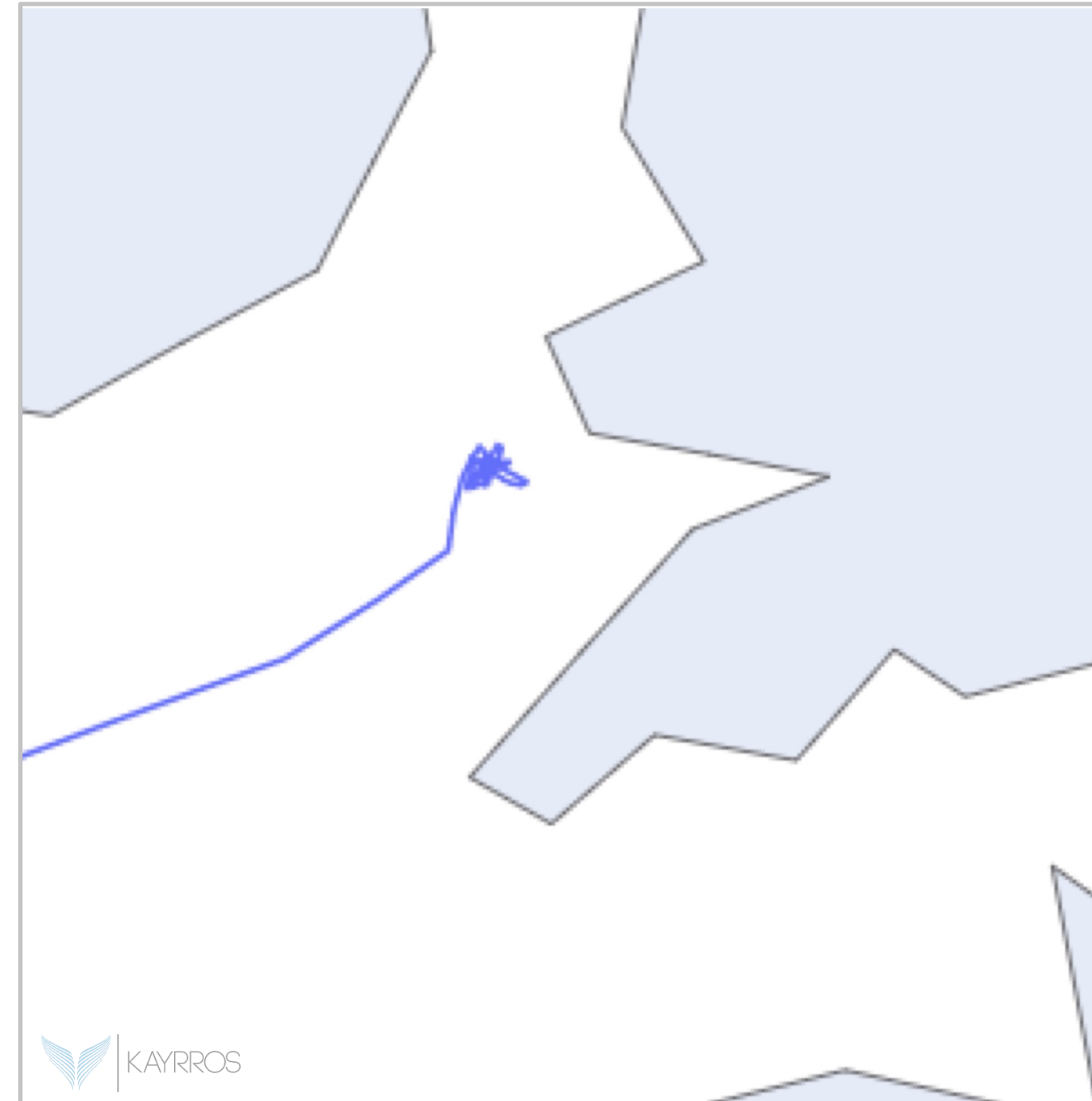
September-October 2022





LNG

LNG tanker leaving US harbor
and arriving off the coast of the UK





Commodities **CRUDE OIL INTELLIGENCE**

Satellite imagery delivers accurate, granular, near-realtime measurements on global crude oil inventories



Accurate

Use satellite-derived inventory measurements for accuracy in your crude oil balance models



Timely

Eliminate reliance on lagged reports to get ahead of market-moving public data releases



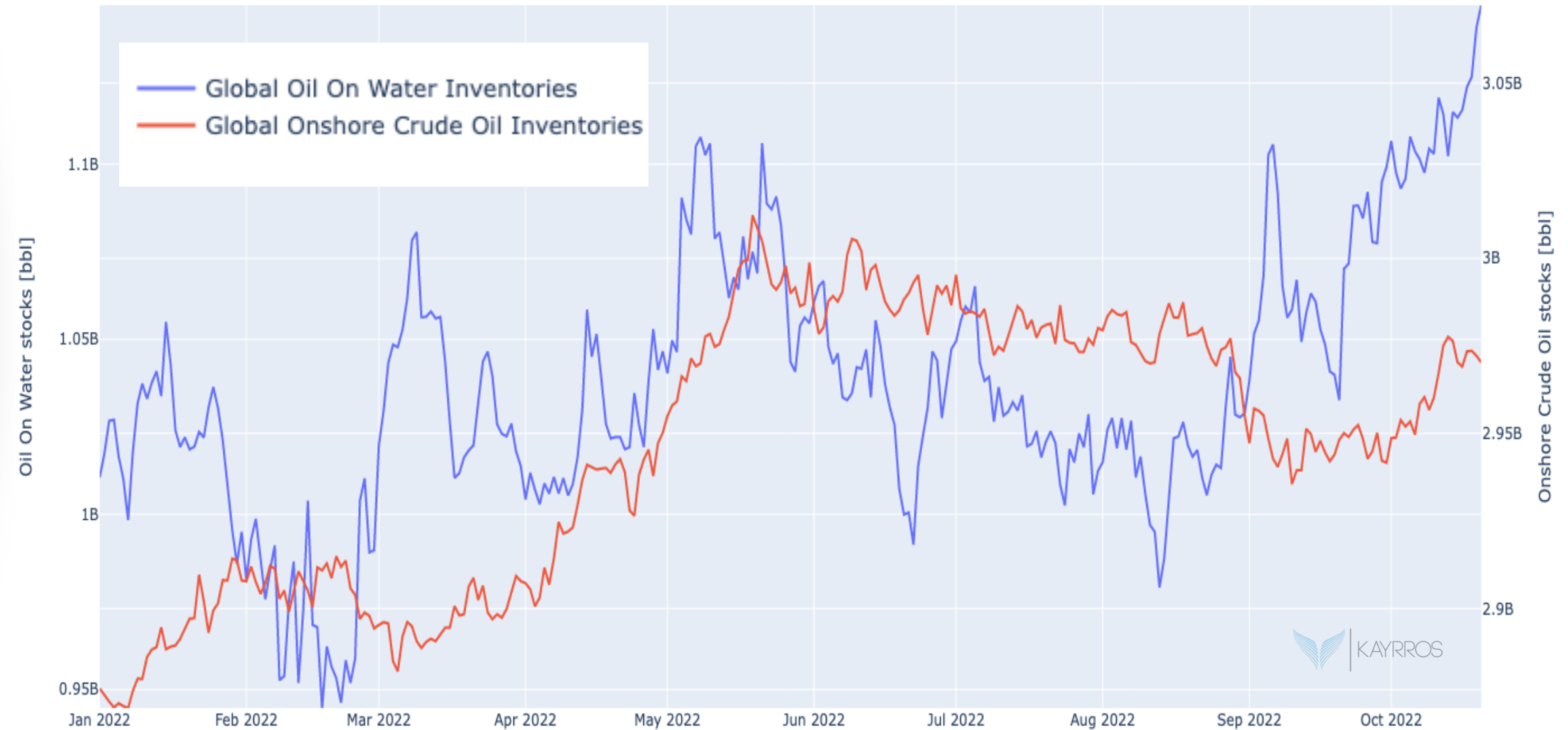
Analytical

Analyze market relationships between inventories and prices for more profitable trades



Crude oil inventories

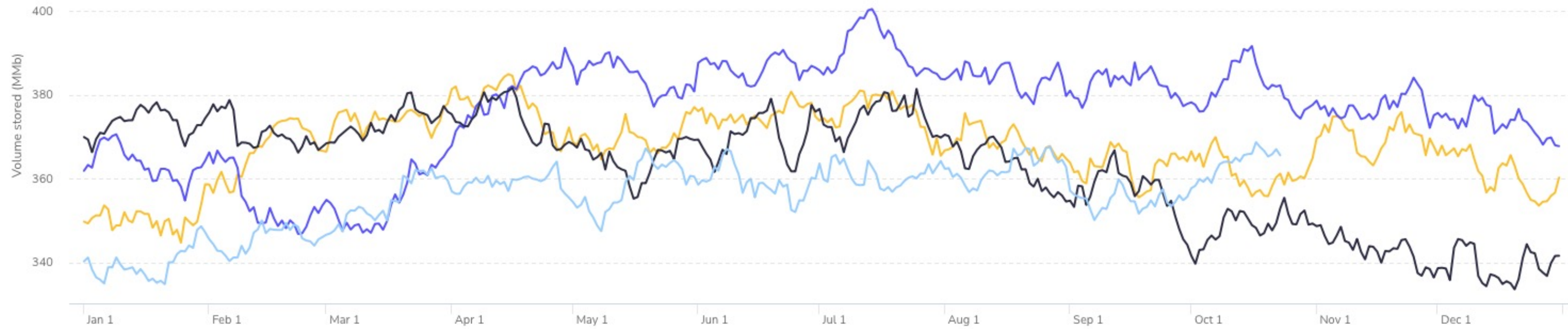
Global Crude Stocks: Above Ground Vs. On the Water (weekly)





Europe onshore crude oil inventories

Europe Onshore Crude Oil Inventories (daily)



Stocks Fill Percentage

Daily Weekly Monthly Quarterly ?

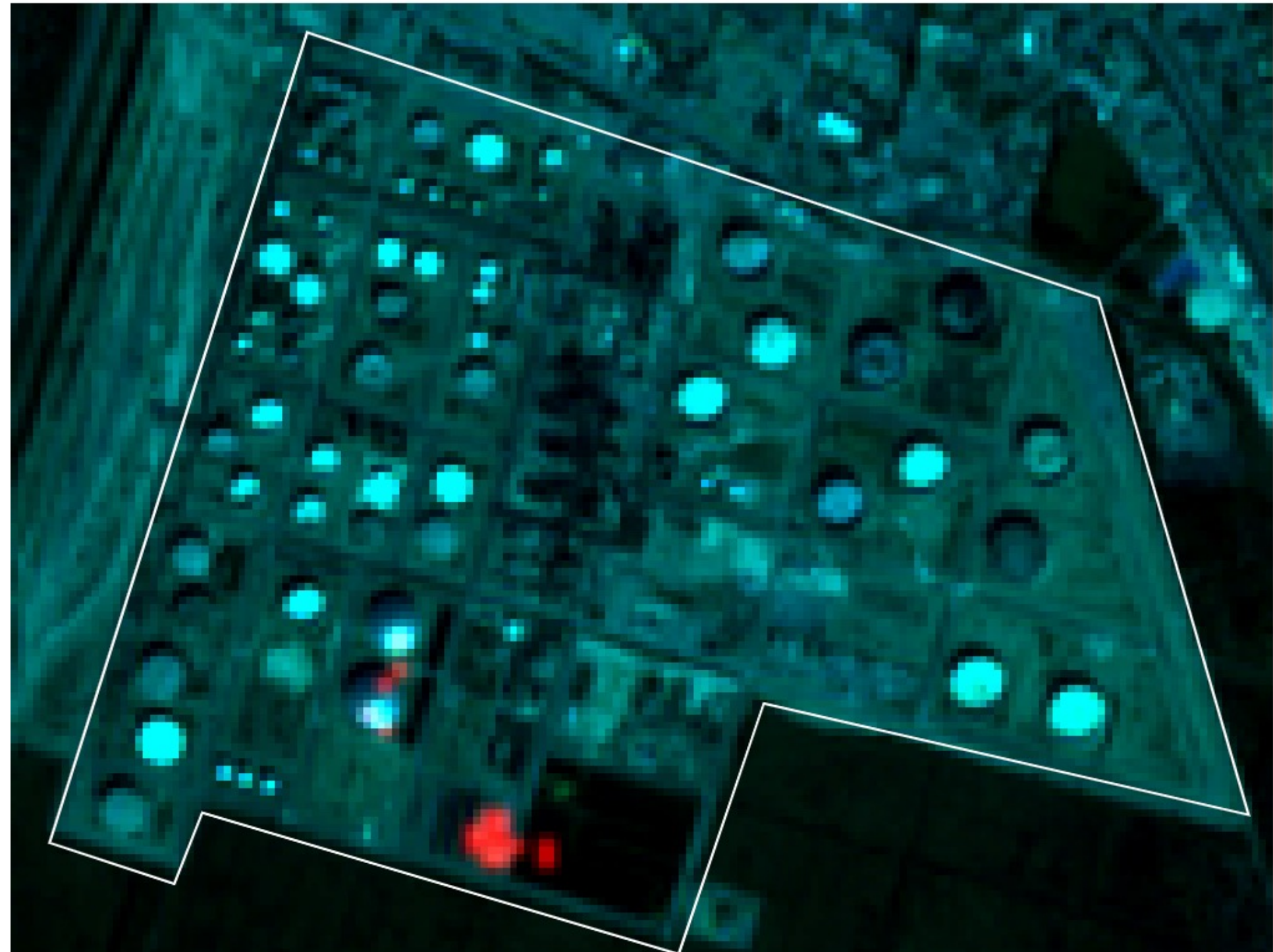
■ 2016 ■ 2017 ■ 2018 ■ 2019 ■ 2020 ■ 2021 ■ 2022



Refining

Labor action,
France

**Flaring at TotalEnergies Fos-sur-Mer refinery,
September 26, 2022**





Oil storage

CIM-CCMP Le Havre Terminal

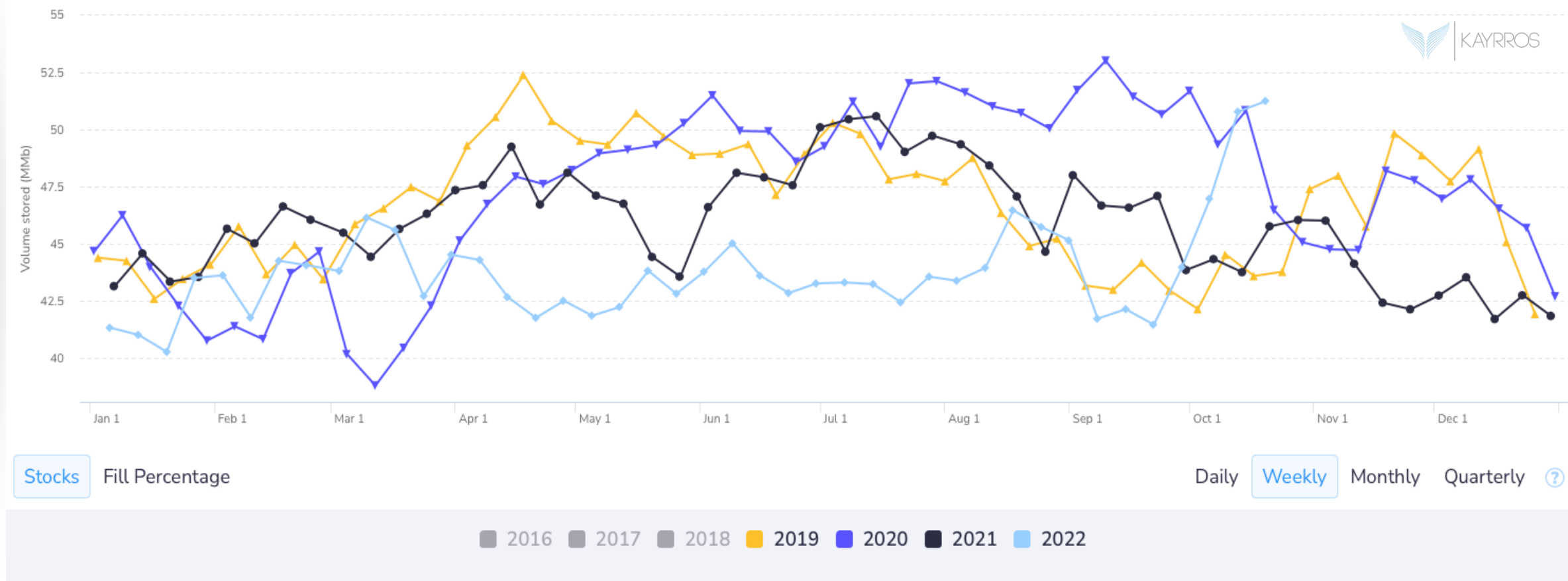


Capacity utilization nears 75% at 22 mb
Le Havre crude oil import terminal



France crude stocks

France Onshore Crude Oil Inventories





ESG

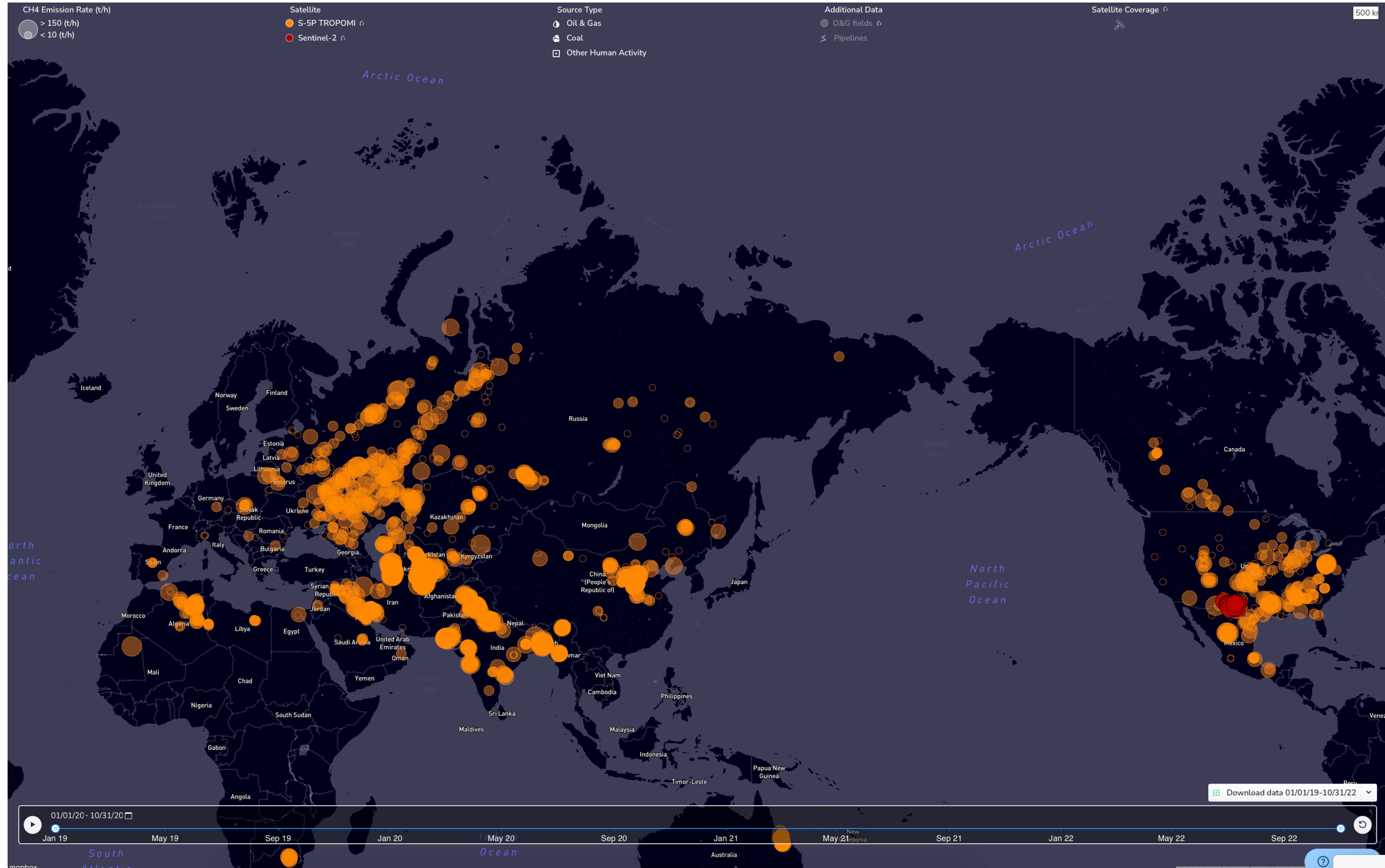
METHANE WATCH

Manage the reputational risk of super-emitters in oil & gas assets





Methane emissions





Paris

33 rue La Fayette
FR 75009

London

3 Waterhouse Square,
138 Holborn, London EC1N 2SW

New York

12 East 49th Street
NY 10017

Houston

708 Main Street Houston
TX 77002

Singapore

Level 2, 15 Beach Road
Singapore 189677

Bangalore

100 Feet Road Second
Block, KA 560034

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