

living planet symposium

BONN
23–27 May
2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE



Rapid Action on Covid-19 and EO

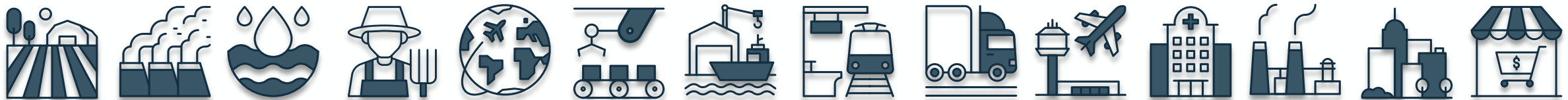
Anca Angheloa, ESA

24/05/2022

Objectives

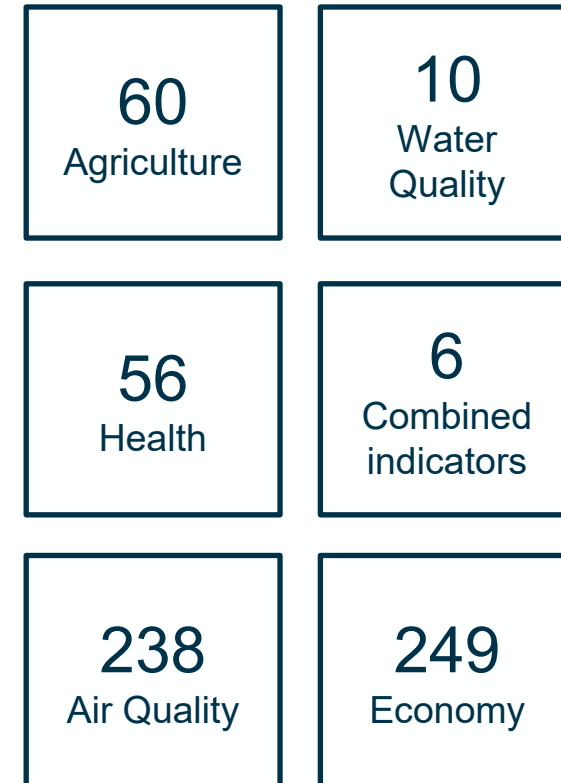
<https://race.esa.int>

- Join initiative of ESA EOP and EC DG-DEFIS
- Provide public EO info on the state of European society and economy, with 4 focus areas:
 - **climate, environment, economy and agriculture**
- Using European EO: Copernicus Sentinels and Third Party Missions
- Leveraging on European companies capabilities and using AI powered latest **platforms technology**



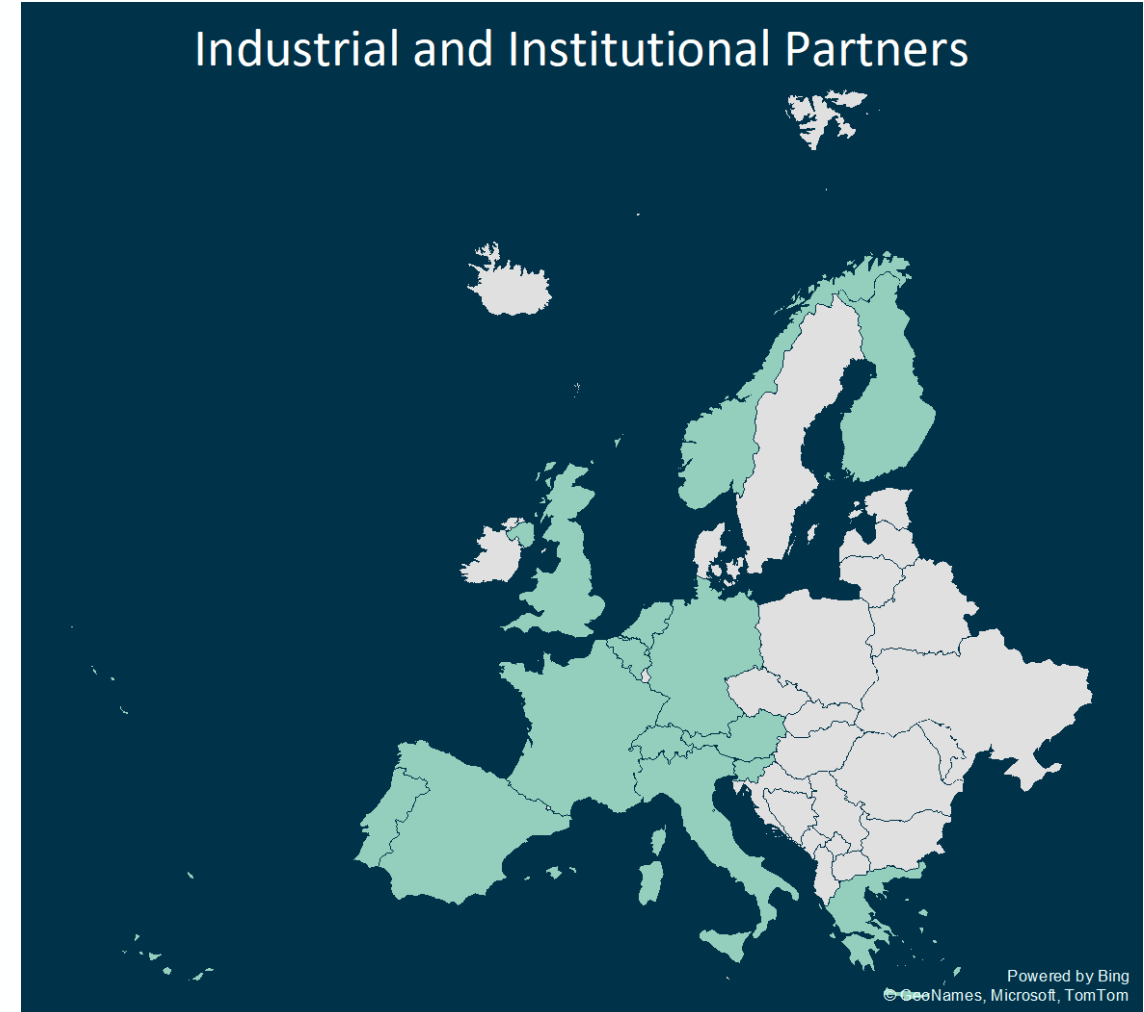
Timeline and Status

- Launched in May 2020 with a suite of core products
- Products by ESA, European Industry, Copernicus Services
- Continuously updated throughout 2021 and 2022
- Expanded with new data and tools
- Open for community contributions
- Used in training and education in EO



Main Achievements (1/3) – Collaboration

- 40 industrial and institutional contributors
- Copernicus Services – CAMS, CMEMS, C3S
- Participation of the scientific community



Main Achievements (2/3) – Open Science



- Open EO Data and information (e.g., Copernicus)
- Open Source Library
- Open resources for Training and Education

LPS 2022

- Open Science Agora (Thu 08:30)
- Demo @OEF (Thu 14:00)

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Hands-on tutorial – IGARSS 2022

The screenshot shows the GitHub repository for 'eodash'. The main content area displays the README.md file, which includes a welcome message, a DOI (10.5281/zenodo.6547059), and information about the software's purpose and contributors. The right sidebar shows the latest release (v3.0, 8 days ago), a list of contributors (16 total), and a language usage chart showing Vue (48.3%), JavaScript (39.4%), Python (9.6%), CSS (1.6%), HTML (0.6%), SCSS (0.3%), and Other (0.2%).

The screenshot displays the RACE Dashboard & EO Brochure interface. It features a map of Europe with circular indicators showing data points for various countries. A sidebar on the left lists available countries including Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, and Finland. The main content area includes a video player with a play button and a section titled 'COVID-19 Impact seen by Satellite' with a sub-section 'Changes in commercial fluxes'. The interface also includes navigation elements like 'Watch on YouTube' and 'FEEDBACK'.



<https://github.com/eurodatacube/eodash>

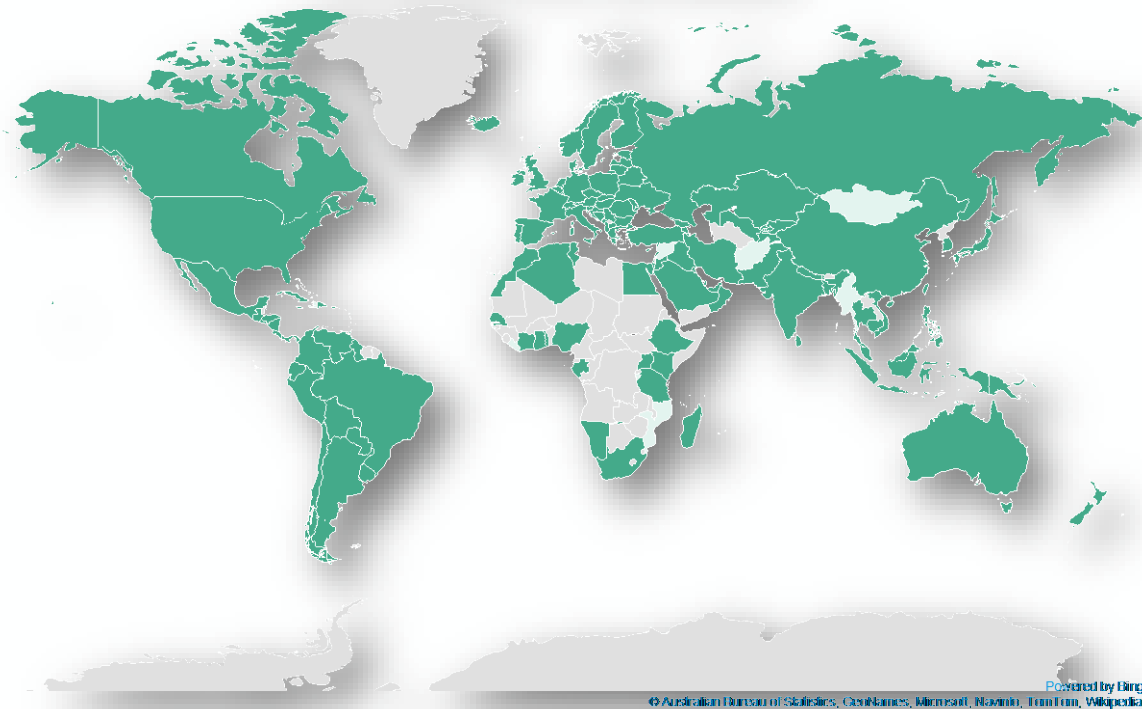


Main Achievements (3/3) – Innovation

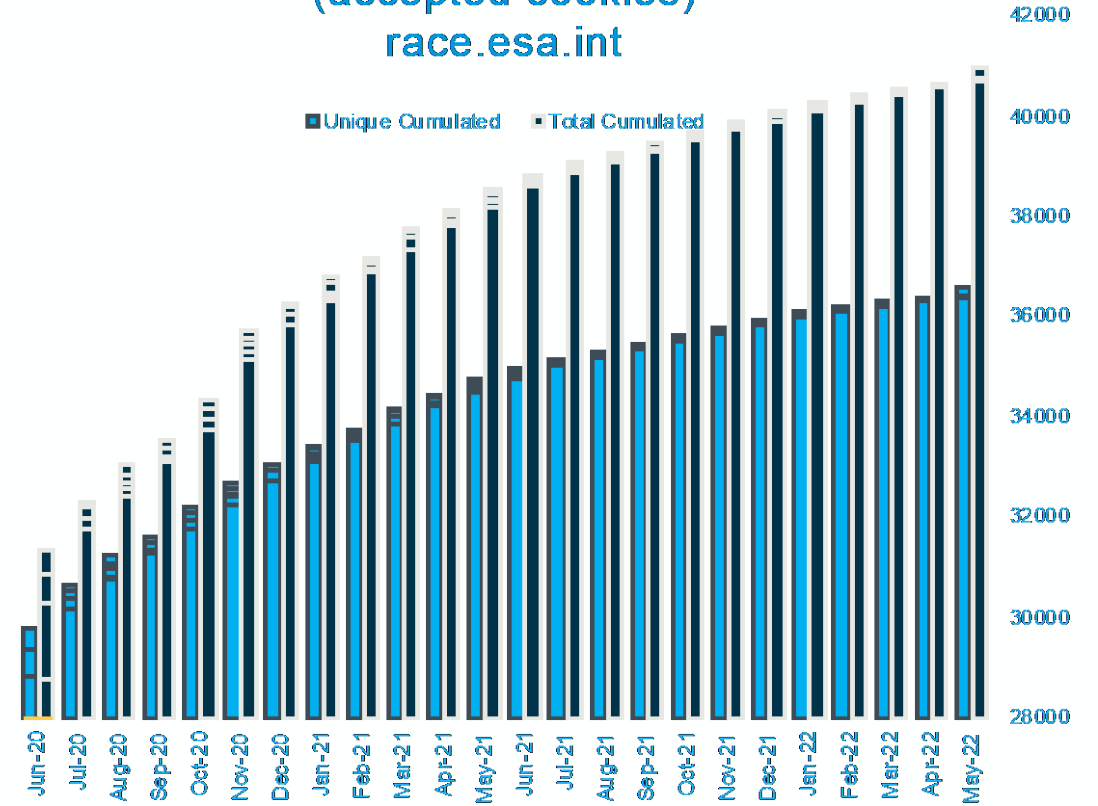


- Framework for Rapid Innovation
- Flexibility for Exploratory R&D
- Agile Development with Design Thinking
- Open for public contributions

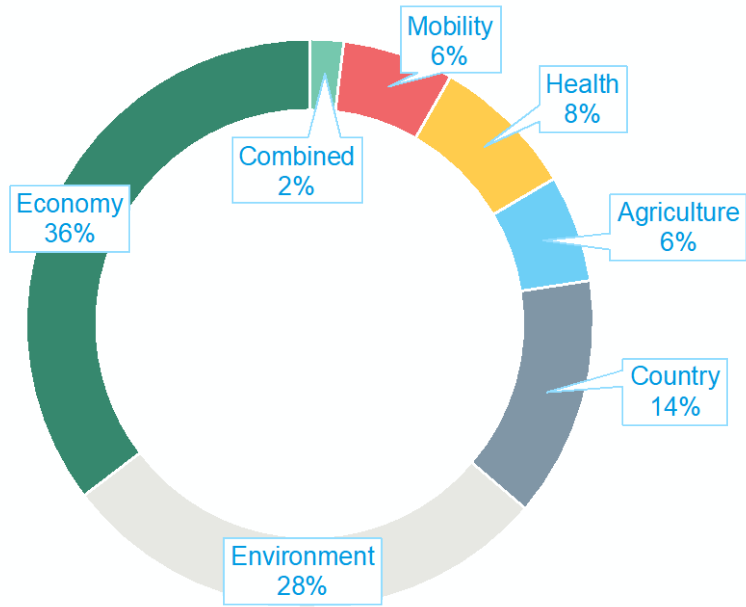
116.460 visits from 130 countries



Total Cumulated number of visits (accepted cookies) race.esa.int

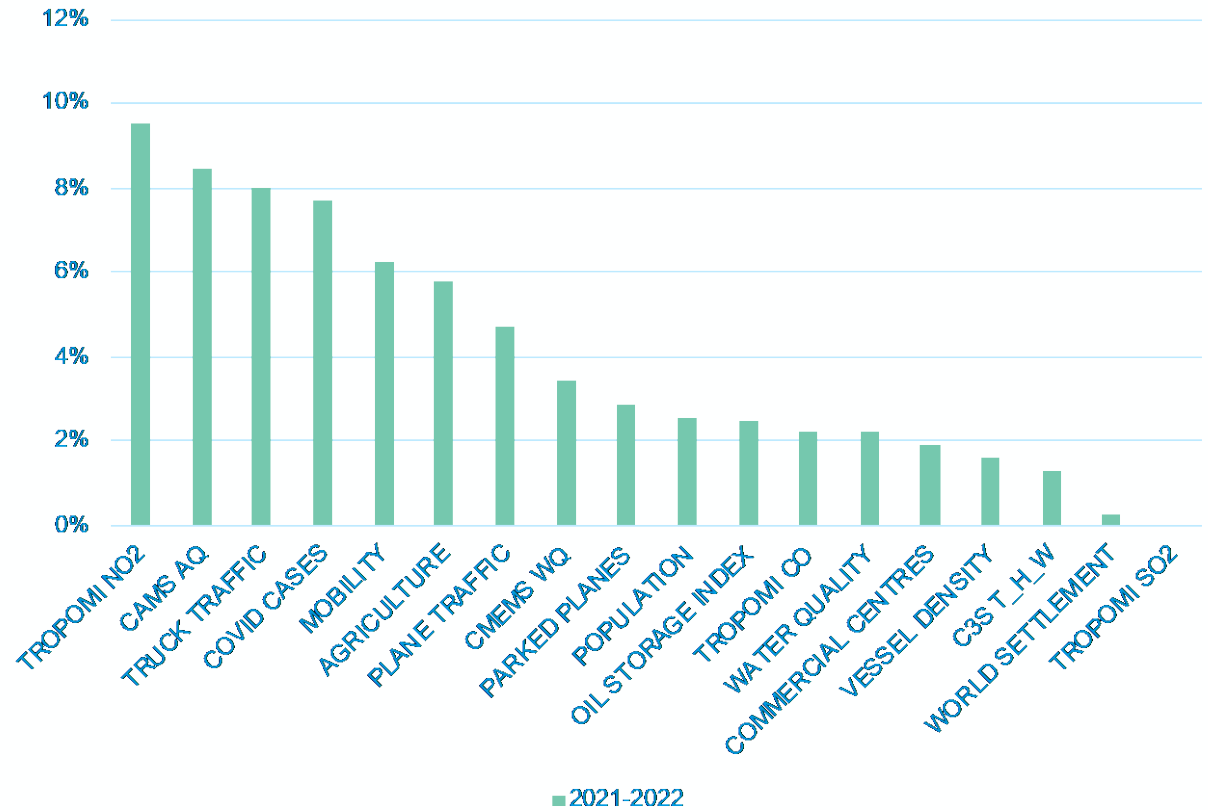


Applied search filters



■ Combined ■ Mobility ■ Health ■ Agriculture ■ Country ■ Environment ■ Economy

Top Indicators



■ 2021-2022

Data Sources

Copernicus Sentinel-1

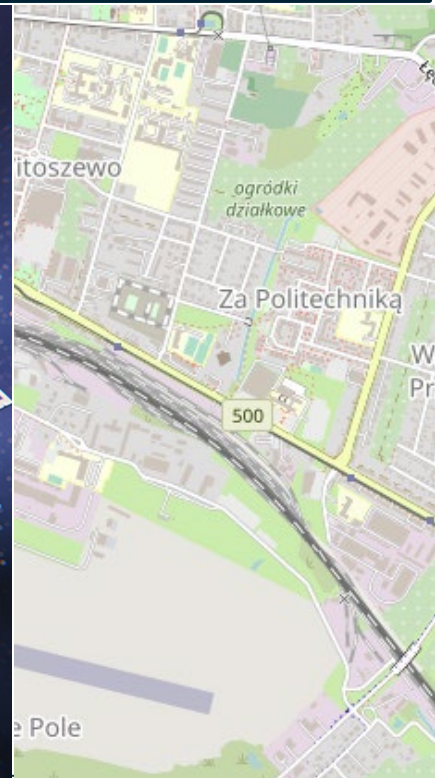
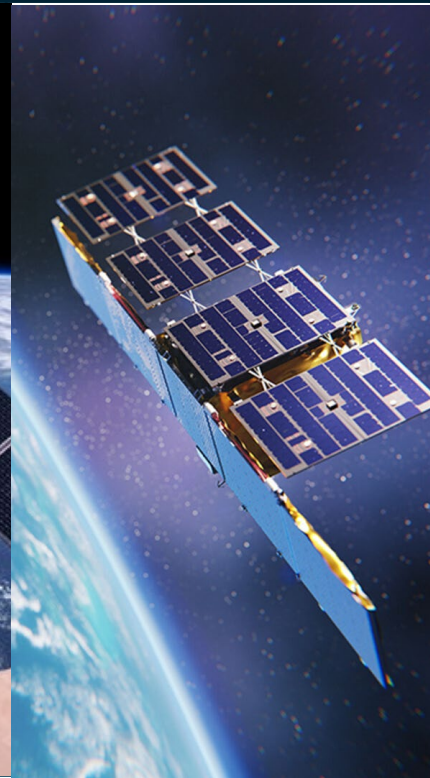
Copernicus Sentinel-2

Copernicus Sentinel-3

Copernicus Sentinel-5p

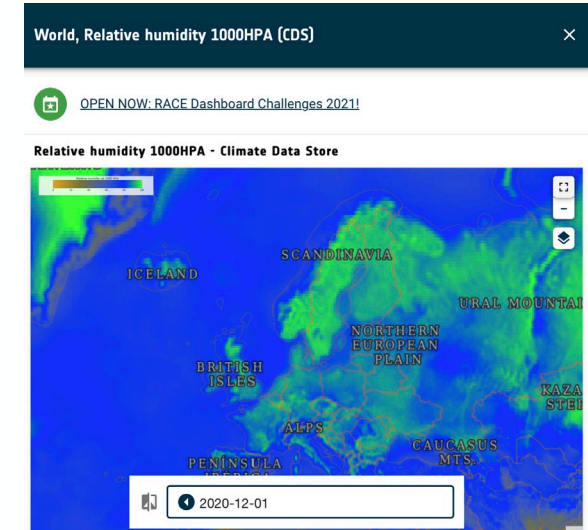
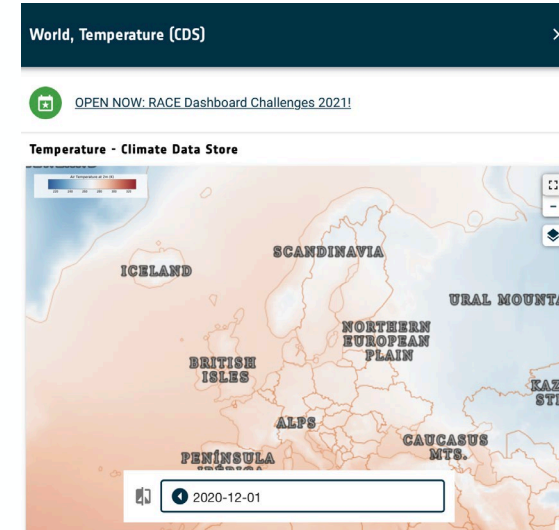
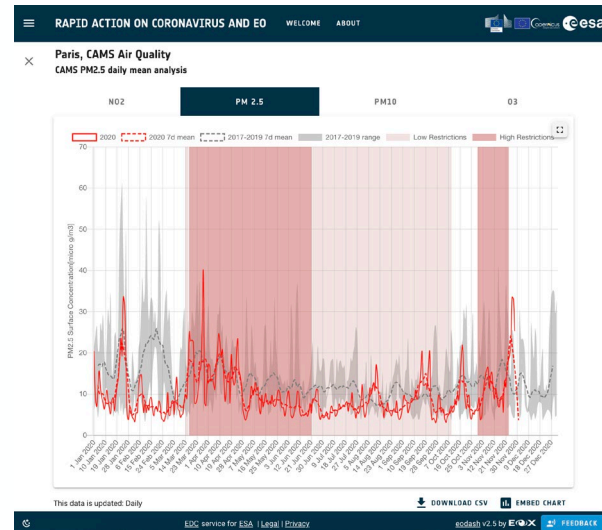
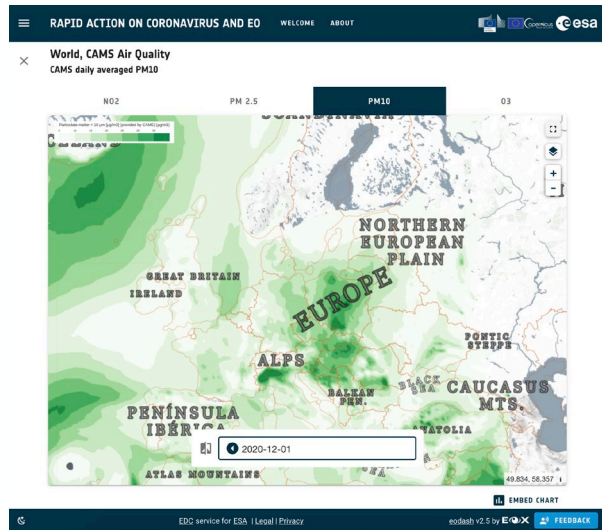
Third Party Mission Data

Non-EO Data: AIS, Mobile, Mobility, OSM, Our World in Data, Oxford, etc.



Copernicus Services Data (1/2)

- CAMS - NO2, PM2.5, PM10, O3
 - 50 European Cities
 - Time Series and Maps
- C3S – Temperature, Humidity, Wind

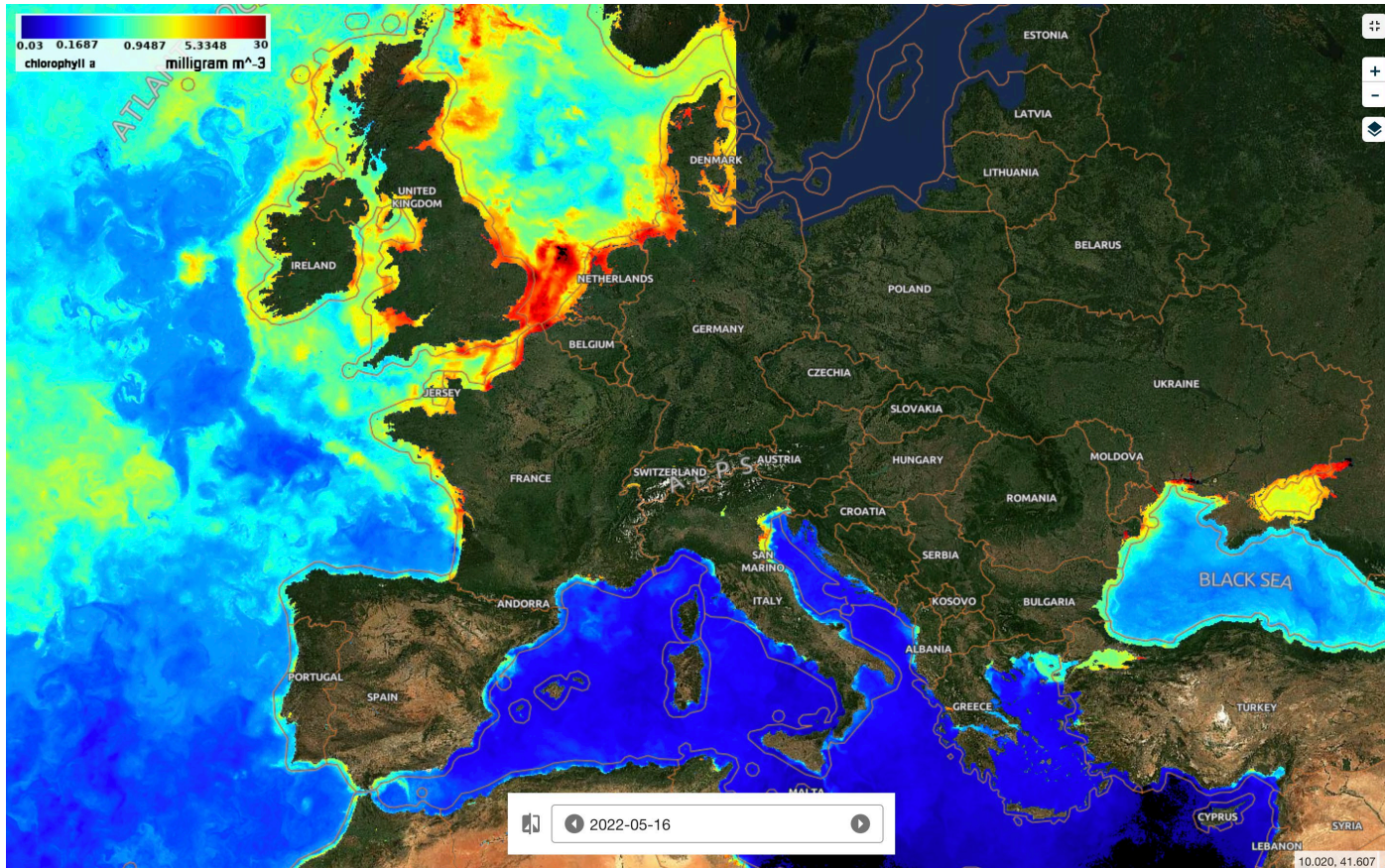


<https://atmosphere.copernicus.eu/>

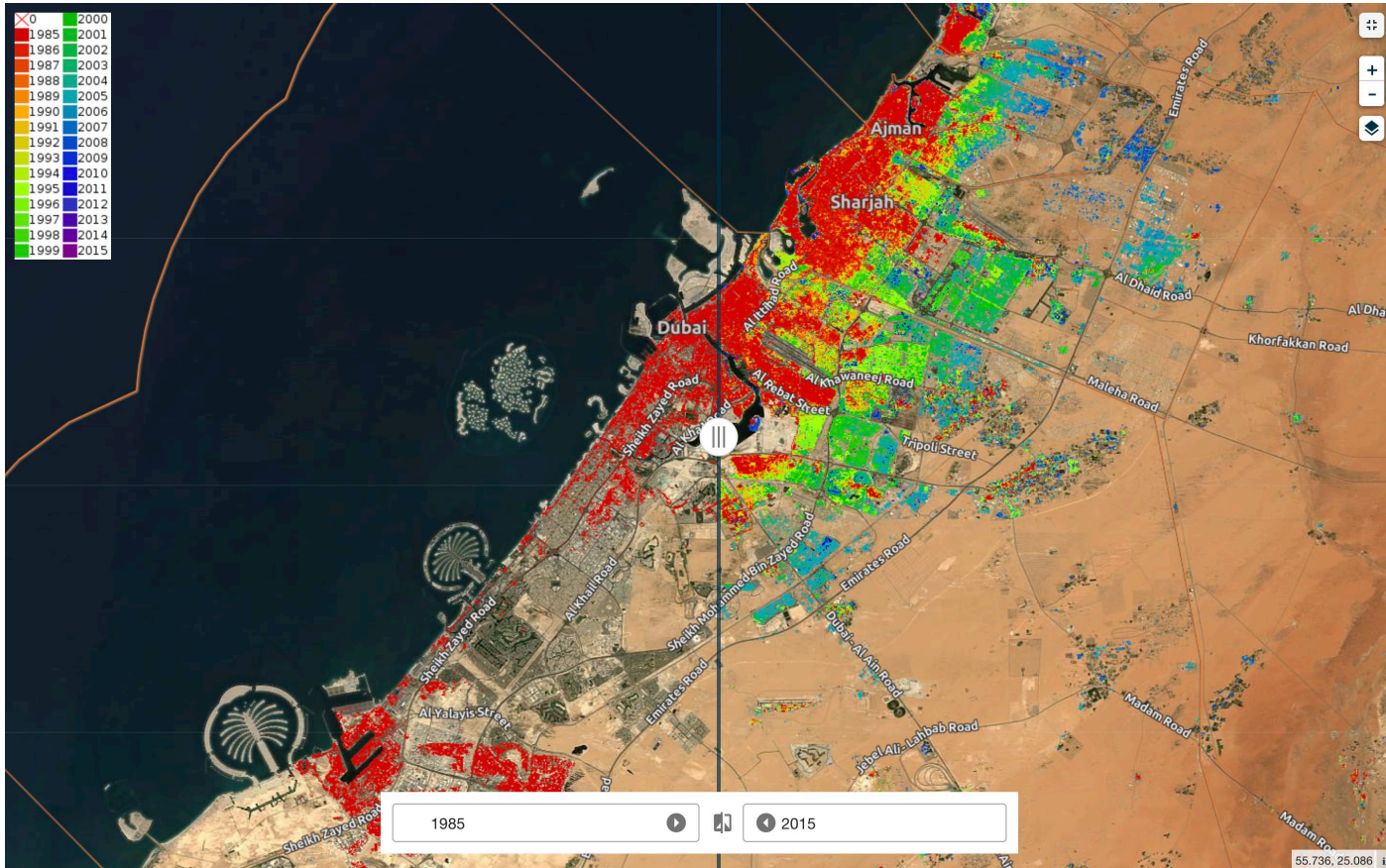
<https://climate.copernicus.eu/climate-information-support-covid-19-research>

Copernicus Services Data (2/2)

- **CMEMS daily interpolated gap-free Level-4 chlorophyll concentration**
 - **Mediterranean, Black Sea, Atlantic**



Source:
<https://marine.copernicus.eu/>



- DATA EXPLORATION
 - Versatile visualisation options
 - 2D maps / 3D globe views (used in the NASA-ESA-JAXA EO Dashboard)
 - Custom charts for indicators
 - Map annotations with vector data overlays
 - Multiple map layers
 - Map comparisons at different times
 - Tabular data download
 - Analytics on User defined AOIs

Demo Thursday: Collaborative Storytelling with EO Dashboard, 14:00

Open Earth Forum Area



Measuring Thickness of sea ice in the polar oceans

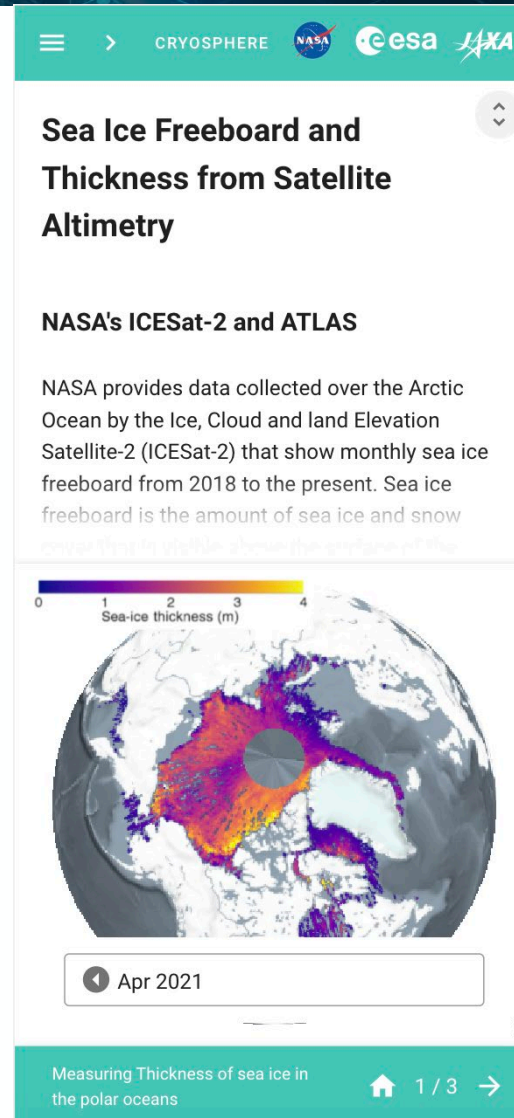
Read more about monitoring Sea Ice Freeboard & Thickness from Satellite Altimetry.

NASA ESA JAXA

→ START

SHARE

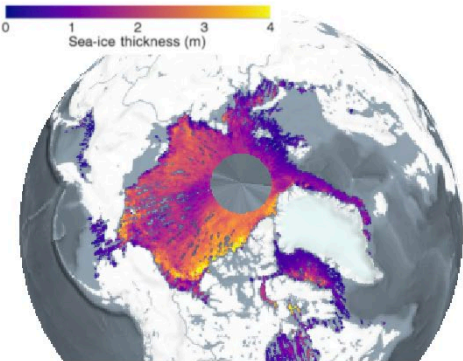
EDC service for ESA | Legal | Privacy eodash v3.0 by EOX



Sea Ice Freeboard and Thickness from Satellite Altimetry

NASA's ICESat-2 and ATLAS

NASA provides data collected over the Arctic Ocean by the Ice, Cloud and land Elevation Satellite-2 (ICESat-2) that show monthly sea ice freeboard from 2018 to the present. Sea ice freeboard is the amount of sea ice and snow cover that is visible above the surface of the



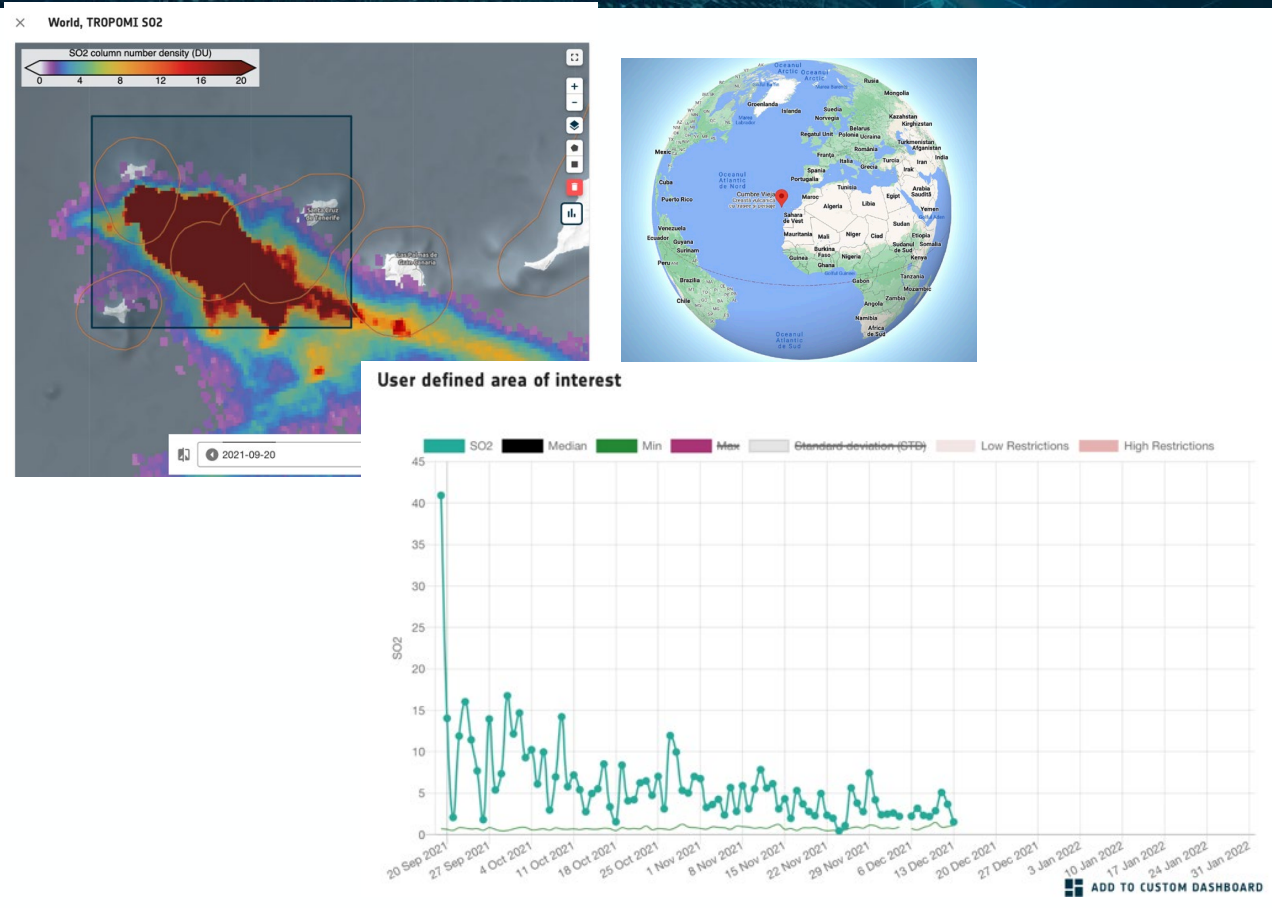
Sea-ice thickness (m)

Apr 2021

Measuring Thickness of sea ice in the polar oceans 1 / 3 →

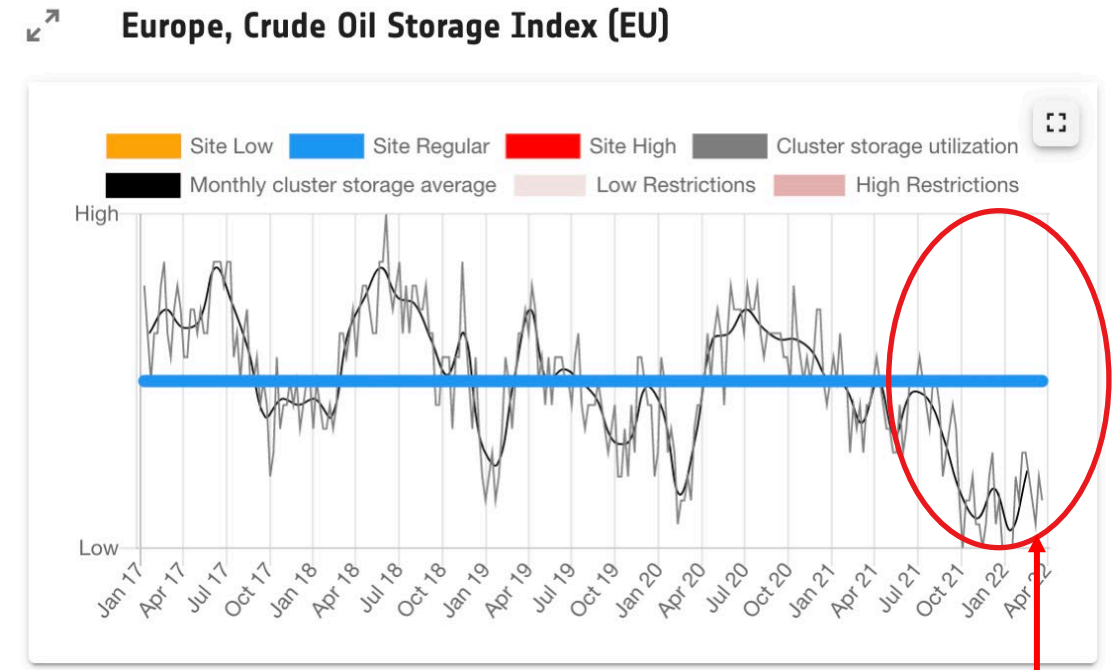
- COLLABORATIVE STORYTELLING
 - Custom-dashboard
 - Add selected indicators to custom view
 - Customise layout
 - Customise text and images
 - Combine with external sources
 - Embed external elements
 - Support for markdown
 - Real-time collaboration on editing
 - Deploy as story (available on NASA-ESA-JAXA EO Dashboard)

Example Insights – Analytics



Volcanic SO2 observed by Sentinel 5p TROPOMI

- Variation of SO2 emissions during the eruption of the Cumbre Vieja eruption in October 2021

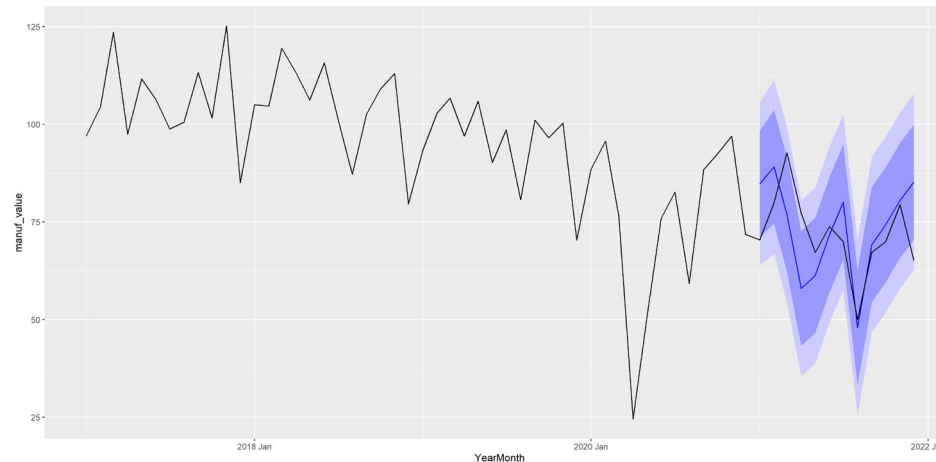
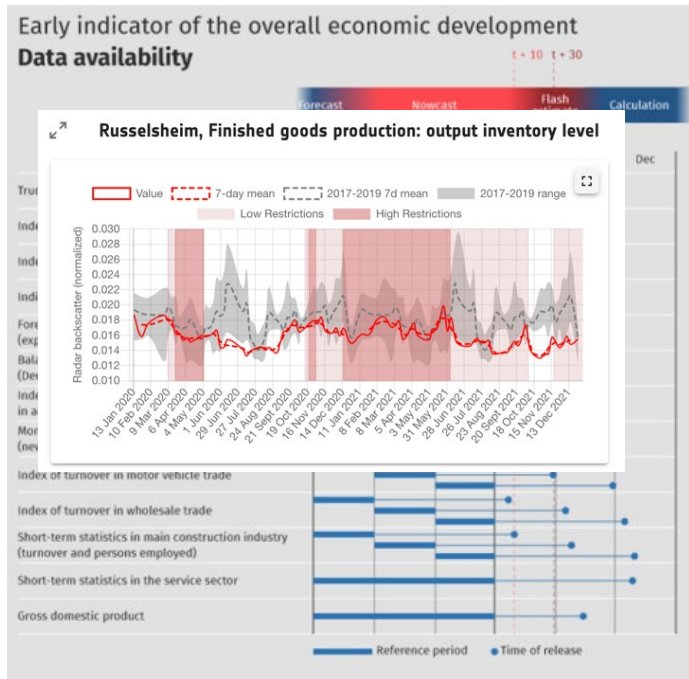


Crude Oil Storage Index – provided by OILX

- Based on Sentinel-1, Sentinel-2, AIS and other data
- Captures the shortage of crude oil availability in Q1 2022

Example Insights – EO for GDP nowcasting

- **Accelerate early GDP estimation – Analysis by DESTATIS**
- **Question:** What satellite data can be used to calculate products that support early GDP estimates?
- **Approach:** Comparison of satellite-derived measures from RACE with the DESTATIS Production index car manufacturing



Forecasting:
Used RACE indicator and historical data of the production index to forecast data for 2021 (blue), and compare with actual values

Results :

- 2017-2020 period $\rightarrow r = 0.60$
- 2017 – 2021 period $\rightarrow r = 0.8$

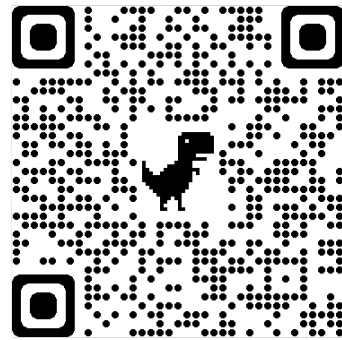
Change rate detection analysis:

- 2018-2021 period $\rightarrow r = 0.65$

- RACE created context for innovation and demonstrated:
 - New ways of collaboration and engagement, e.g. with **Copernicus Services** on use of new technologies, **coordination** among 40+ contributors (scientists, industry, Copernicus Services, EC, ESA)
 - New ways to define EO application with **community** contributed ideas
 - Reliability and maturity of European **technology, having maximised reuse and efficiently managed components integration**
 - Effectiveness of product development **methodology (Agile)**
 - **Open Science** – transparent, reproducible, accessible, inclusive

Next steps – building on this experience and model, enhancing Open Science, collaboration and consolidating a framework for innovation

<https://race.esa.int>



Thank you!