NASA-ESA-JAXA EO Dashboard Collaboration

October 2023
Presentation to principals
NASA, ESA, JAXA

Objectives

✓ 2020

Leverage strong cooperation and collaboration among ESA-NASA-JAXA to demonstrate environmental impact of COVID-19

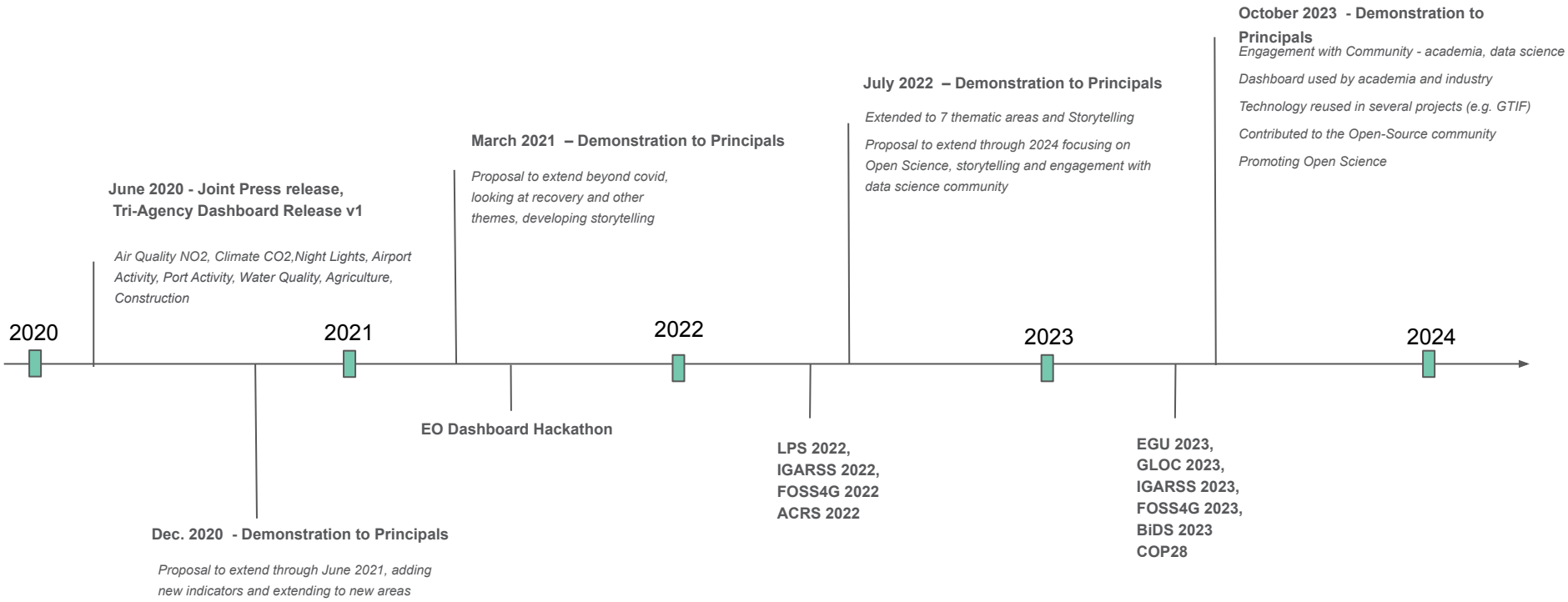
✓ 2021

Leverage the successful collaboration to build upon COVID-19 indicators to address broader environmental change

✓ 2022

Continue to leverage the collaboration to evolve dashboard as a global open-source community engagement platform

Timeline


2020
2021
2022
2023
2024
June 2020 - Joint Press release, Tri-Agency Dashboard Release v1
Air Quality NO2, Climate CO2,Night Lights, Airport Activity, Port Activity, Water Quality, Agriculture, Construction
Dec. 2020 - Demonstration to Principals
Proposal to extend through June 2021, adding new indicators and extending to new areas
March 2021 – Demonstration to Principals
Proposal to extend beyond covid, looking at recovery and other themes, developing storytelling
EO Dashboard Hackathon
July 2022 – Demonstration to Principals
Extended to 7 thematic areas and Storytelling
Proposal to extend through 2024 focusing on Open Science, storytelling and engagement with data science community
LPS 2022, IGARSS 2022, FOSS4G 2022 ACRS 2022
EGU 2023, GLOC 2023, IGARSS 2023, FOSS4G 2023, BiDS 2023 COP28
October 2023 - Demonstration to Principals
Engagement with Community - academia, data science
Dashboard used by academia and industry
Technology reused in several projects (e.g. GTIF)
Contributed to the Open-Source community
Promoting Open Science

Dashboard evolution

Facilitator of Community Involvement

- Open Principle: Open Data, Information, Insights and Findings: collaboratively developed by the 3 agencies
- Infrastructure: Provision and visualization of data and computational resources for easy access
- Innovation & Partnership: Research and implementation, Analysis, Exploration and discovery
- Community engagement: Education, Training, Cultivation of vibrant open science community (i.e. citizen and applied science)

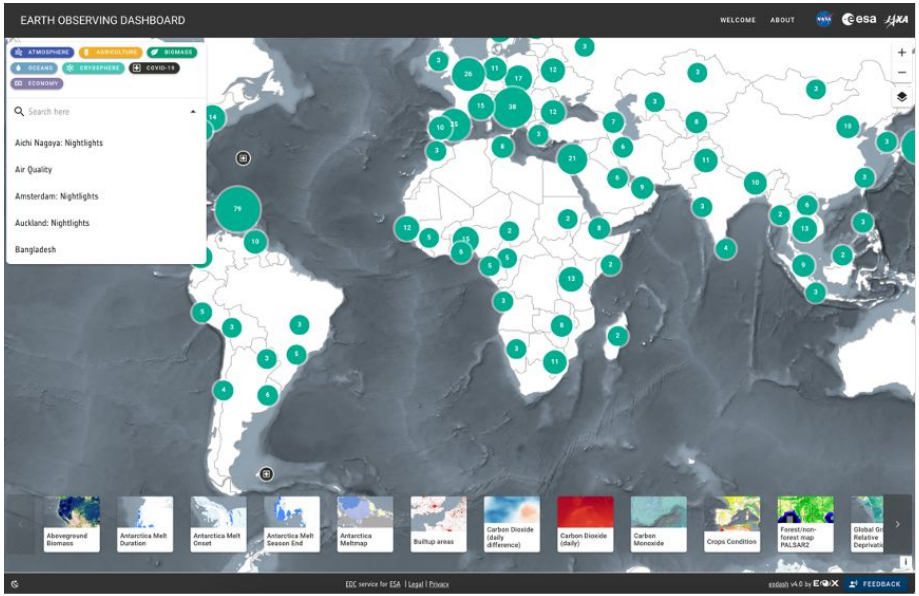
EO Mission Data in EO Dashboard

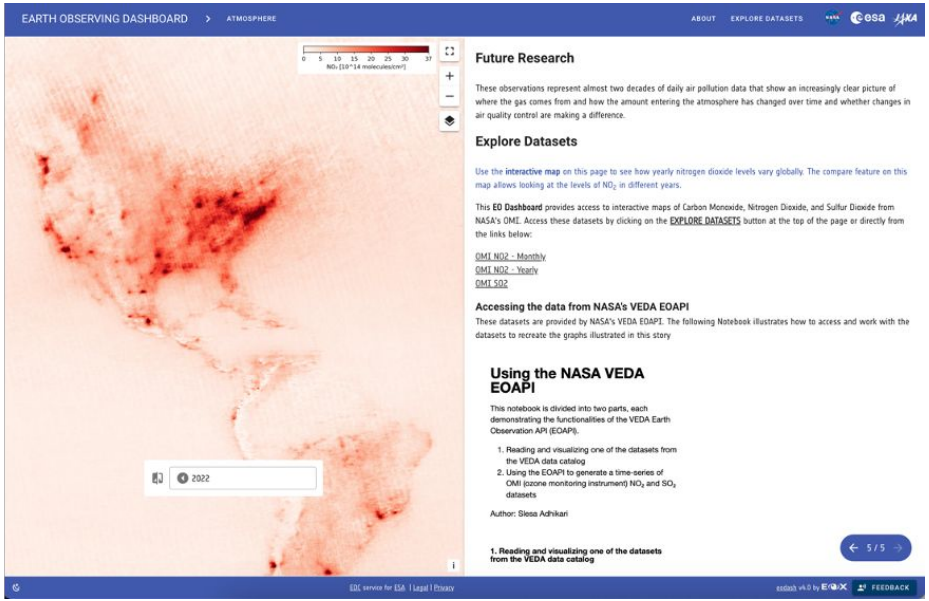
850+ OPEN ACCESS DATASETS

	NASA	ESA	JAXA	Nr. AOIs (Local datasets)	Global Datasets
Atmosphere	OMI, OCO-2, OMPS, AIRS, IASI, CrIS, MOPITT	Sentinel-5p TROPOMI	GOSAT/GOSAT-2	58	CO2 daily, CO2 daily difference, CO, SO2, CH4, NO2 daily, NO2 monthly, NO2 yearly
Biomass and Land	MAAP	Sentinel-1, CCI biomass	GCOM-C, ALOS-2	3	NDVI, Forest-non-forest map, above ground biomass
Oceans and Water	MODIS, VIIRS,	Sentinel-2, Sentinel-3, CCI Lakes	GCOM-C	64	Lakes water quality, true colour, lake turbidity, ocean primary productivity
Economy	SkySat, PlanetScope, VIIRS, Landsat-8	Sentinel-1, Sentinel-2	ALOS-2	350	Built Up areas, global gridded relative deprivation indices (several), population densities
Agriculture	GPM, Landsat-8, SMAP, MODIS, SGLI,	Sentinel-1, Sentinel-2, Sentinel-5p, SMOS	GPM, GCOM-C, GCOM-W ALOS-2	46	Crop area and crop conditions, NDVI, Agromet information (Precipitation, Precipitation anomaly, soil moisture, soil moisture anomaly, LST, LST anomaly)
Cryosphere	IceSat-2, MODIS	Cryosat-2, Envisat ASAR, Sentinel-1, Sentinel-2	GCOM-W	13	Antarctica melt duration, onset and season end, Antarctica melt maps, Arctic Sea Ice concentration, Antarctic Sea Ice concentration, Sea Ice thickness, West Antarctica glaciers

Features 1. Tri-agency Data Discovery

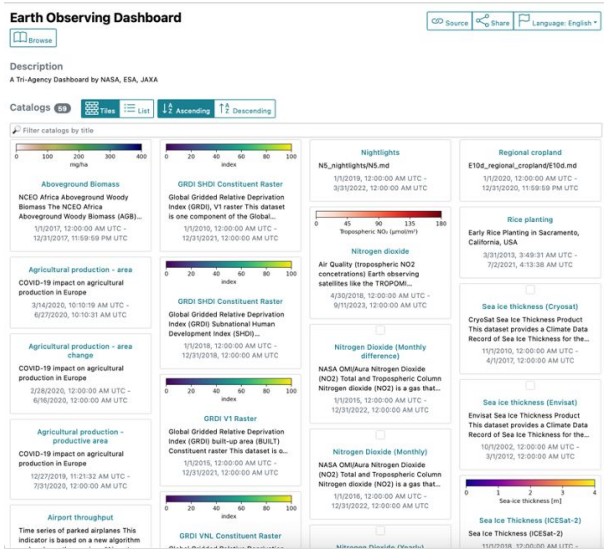
- Search by theme, location, indicator
- Discover data in stories

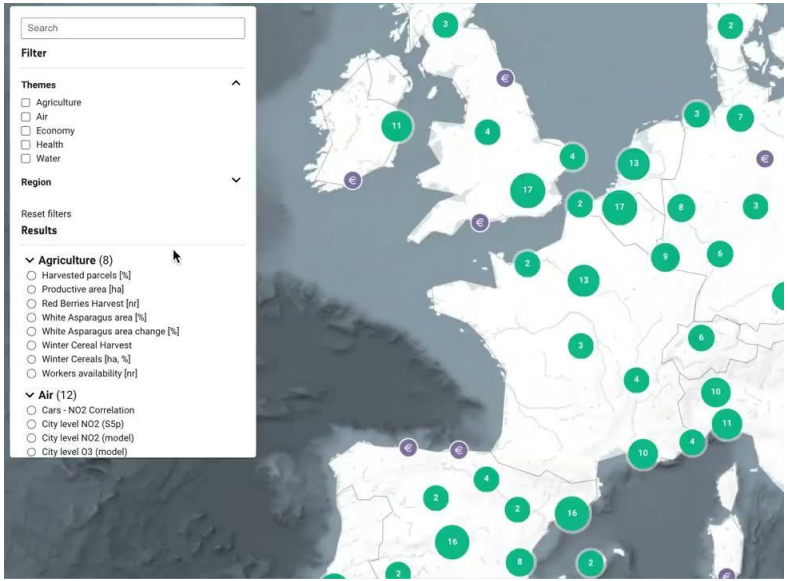




Upcoming: Enhanced Data Discovery

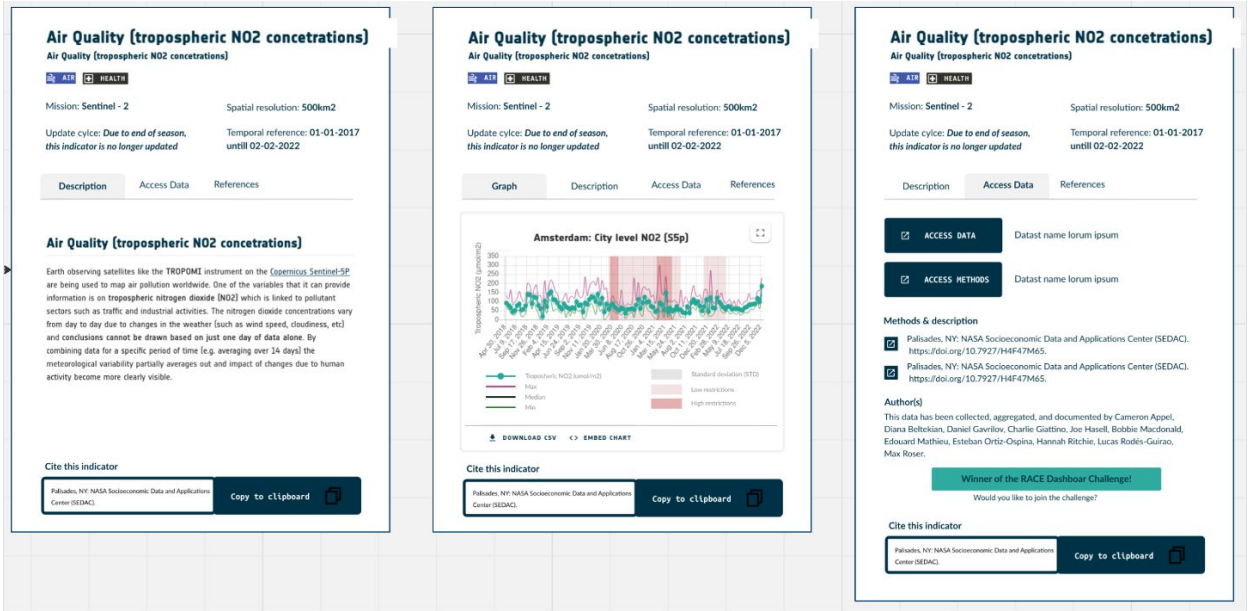
- Standard-based Catalogue – all data with harmonized metadata (e.g. STAC extension)
- Filter and search by any data attribute present in the catalog:
- EO Mission, Theme, Location, Data provider, Key word, etc……





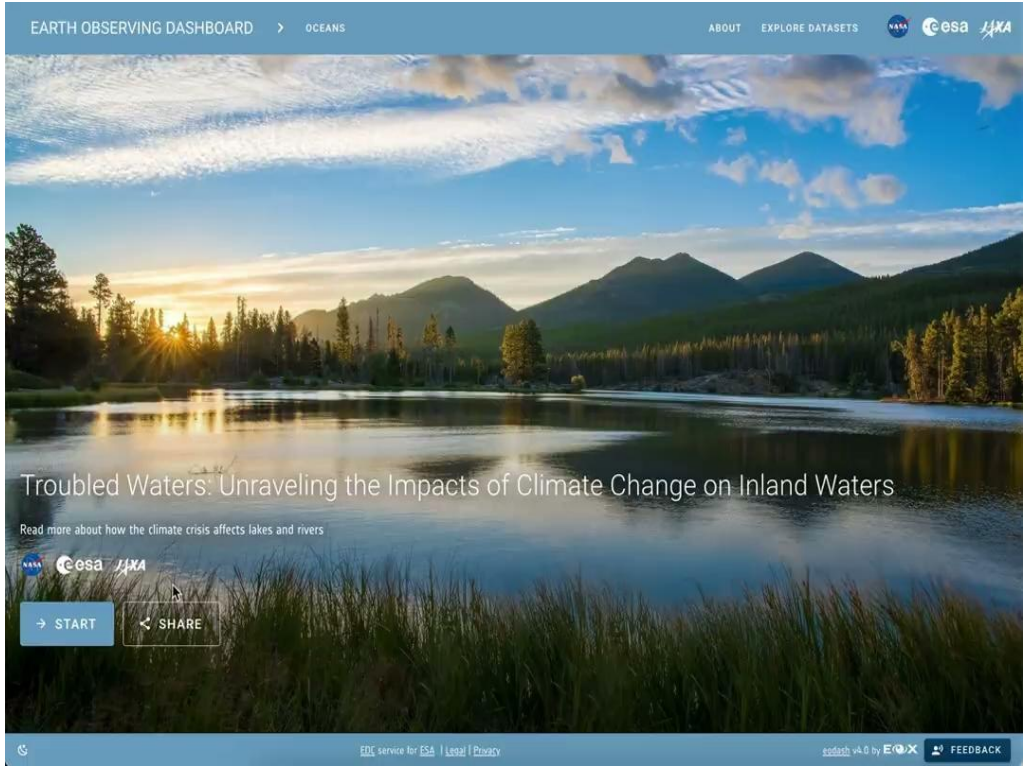
Upcoming: Enhanced Data Discovery

- A new Data Panel with all the relevant dataset information, including access to DATA, visualization of DATA and COMPUTATION.

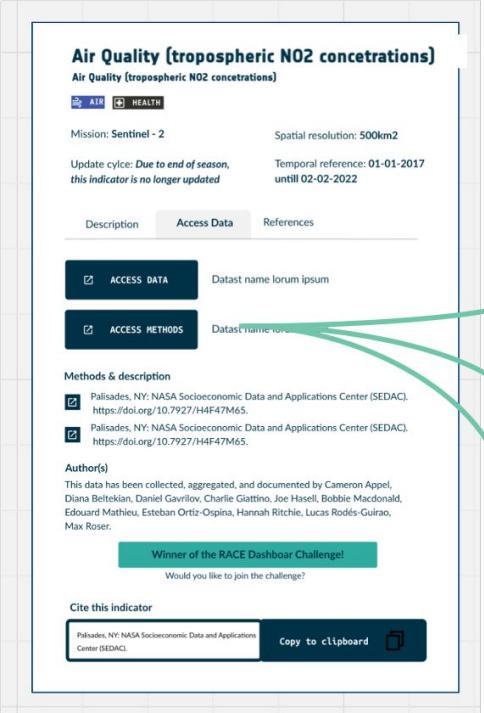


Features 2. Access to computation

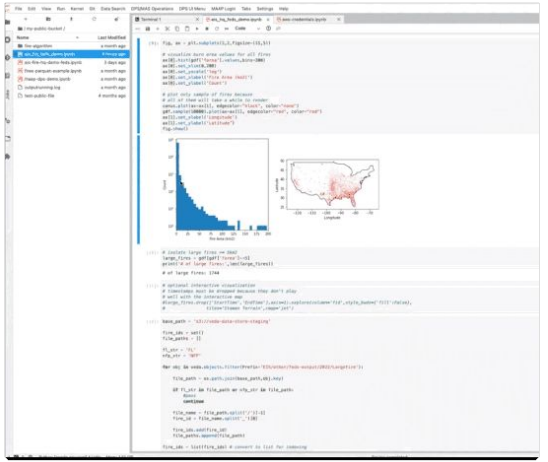
Example Jupyter Notebooks are embedded in the Stories to guide the user how to access and work with the data from ESA, NASA, JAXA



Upcoming - Enhanced Access to Computation



- Datasets to have associated “processes” hosted by ESA, NASA or JAXA systems
- Processes are part of dataset’s “metadata”, are accessible from data panel
- User is able to “run the process” on the respective ESA, NASA or JAXA system to reproduce or work with the dataset

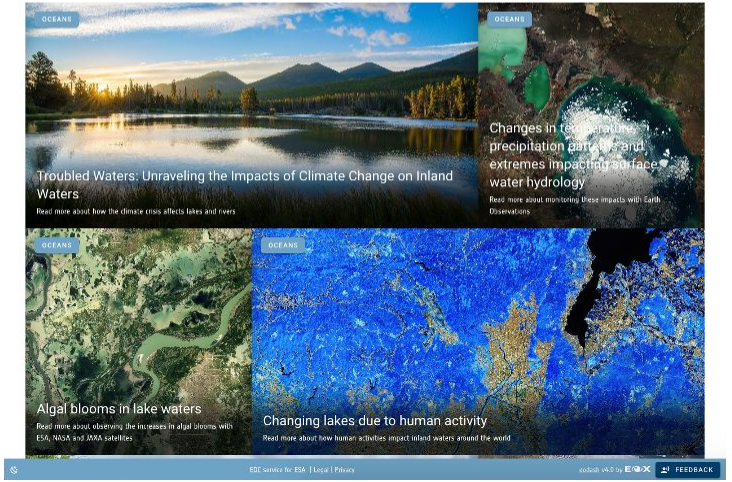


Features 3. Storytelling

Current process:

- Research and findings by ESA, NASA, JAXA scientists with academia
- Coordinate and discuss among POC and science leads with communication members to list up the content of storytelling
- Illustrated using EO datasets and indicators for storytelling agreed by coordination team (POCs, science leads, communication members)
- Communicated via interactive stories developed by communication teams
- Review by ESA, NASA, JAXA scientists

Stories

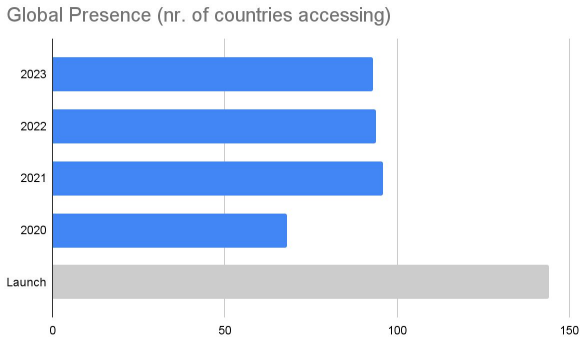


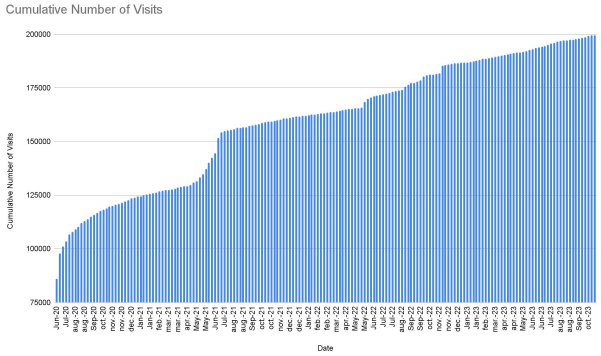
Innovation: discovery, analysis, communication

Community-contributed storytelling

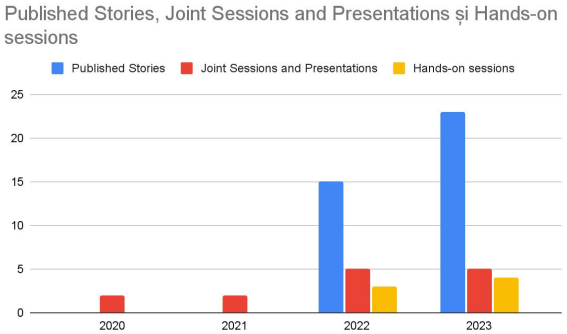
Promote storytelling more efficiently, rapidly and innovatively using three agencies EO data with science community based in Europe, US and Japan

Outreach KPIs





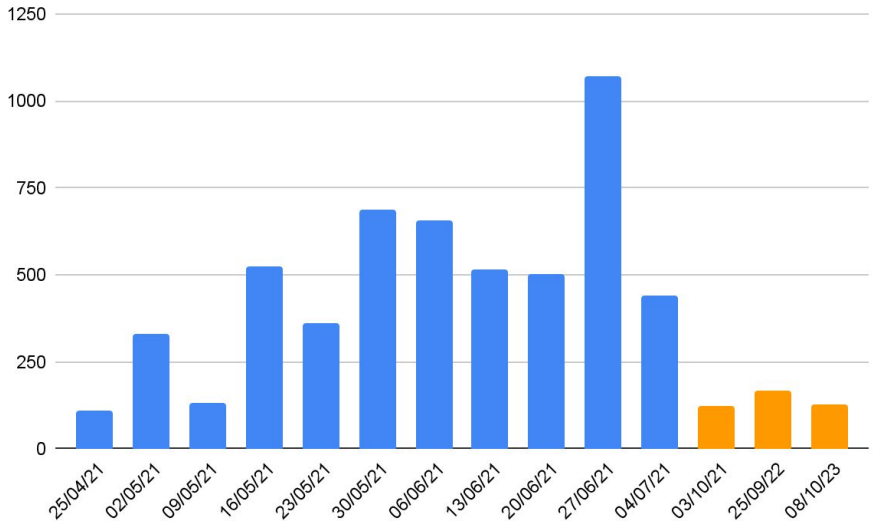
~200.000
TOTAL VISITS



Takeaway:

- Projected larger reach in 2023 vs 2022,
- Sustained access rate globally

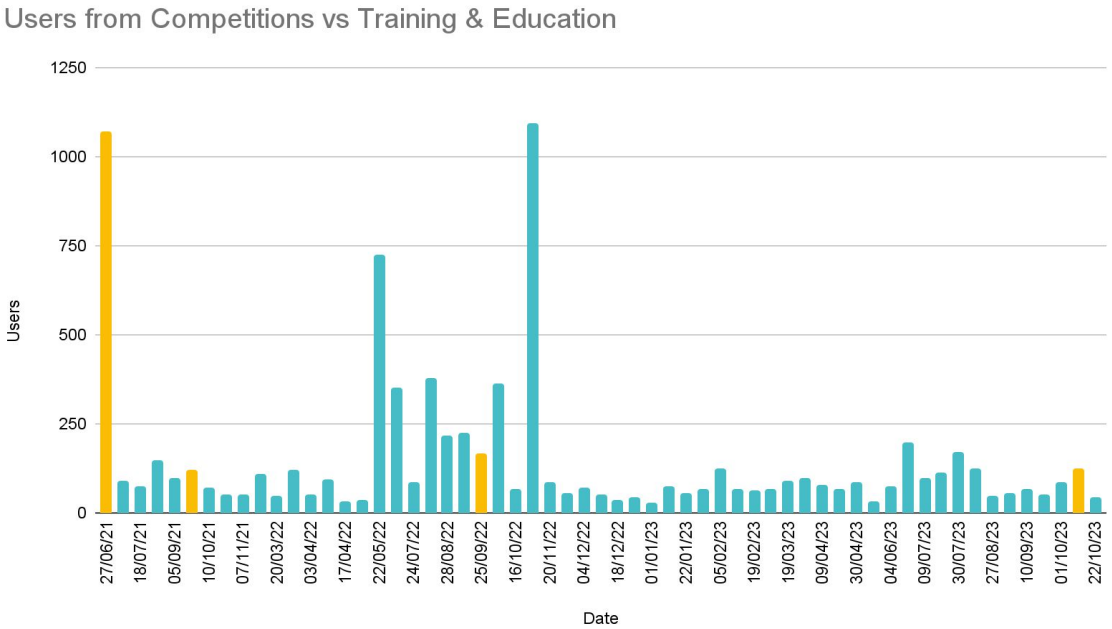
Users during competitions

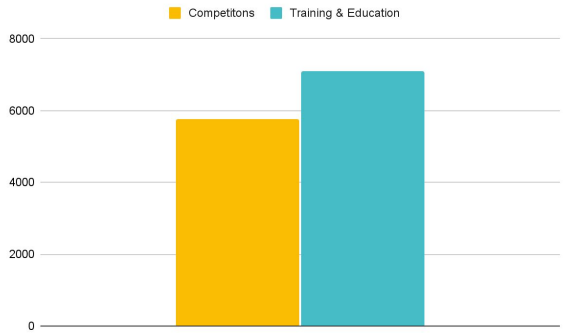


Takeaway:

- Competitions typically generate a spike in use of the dashboard
- Dedicated competitions e.g. “EO Dashboard Hackathon” generated significantly more users than generic competitions e.g. “SpaceApps”

Academic and Industry training use





Academia & industry training

Takeaway:

- Universities and Consultancy Companies use EO Dashboard to train students and young researchers on a continuous basis
- Use from training can be as large or larger than spikes during competitions (1000 users / week)
- Overall, constant use from academia and industry generates more users than competitions (7.000 vs 5.000 users)

Academic and Industry training use

Examples of academic and industry users:

Lewis University

codio

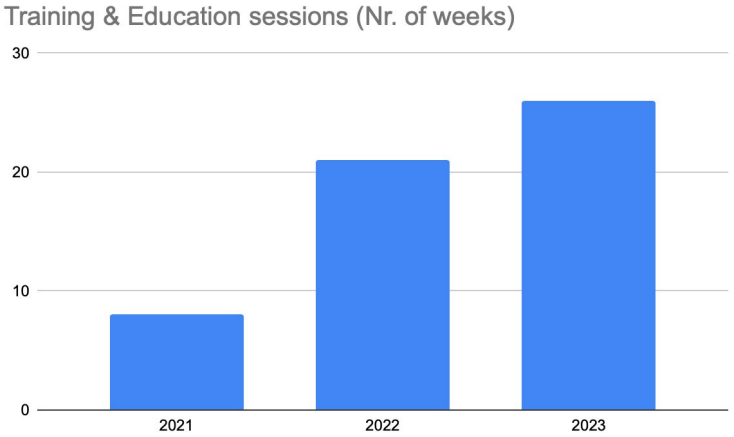
UNIVERSITY OF WATERLOO

Mahidol University
Faculty of Information and Communication Technology

University of Wisconsin-Madison

LOS ANGELES UNIFIED
READY FOR THE WORLD

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

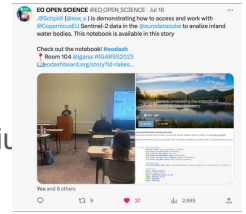


Takeaway:

- Yearly increase of use by academia and industry for training (*independent use, not organised by ESA, NASA, JAXA)
- Topics: Data Science, Data Visualisation, Earth Observation
- How it is used:
  - in Jupyter environments
  - for class assignments

2023 Tutorials and Workshops by JAXA - NASA - ESA

- Presented in 2023:
  - EGU (European Geosciences Union)
  - FOSS4G (Free Open-Source Software for Geospatial)
  - IGARSS (Int. Geoscience and Remote Sensing Symposiu



- Upcoming in 2023:
  - ACRS (Asian Conference on Remote Sensing)
  - BiDS (Big Data from Space)
  - COP28 (UN Climate Change Conference)

Takeaway:

- Tri-agency workshops and tutorials organised in Europe, US, Asia
- Engaging with various communities: remote sensing, geoscience, big data, EO, climate change, open-source
- Showcasing:
  - the tri-agency data, indicators and stories
  - technologies contributed by the 3 agencies (NASA VEDA, ESA EDC & NoR, JAXA Earth-graphy)

Contributions and links to other projects and initiatives

- EO Dashboard software and technology is 100% reused for the Austrian demonstrator of the Green Transition Information Factory (https://gtif.esa.int)
- The EO Dashboard data catalogue is based on community standards (STAC) and has contributed back to the evolution of the standard
- Web-components developed for EO Dashboard indicator visualisation are being explored by other projects (due to being framework agnostic)
- EO DASHBOARD benefits from the development of the underlying platforms and services (VEDA, EDC, JAXA Earth-graphy etc.) and demonstrates interoperability across them
    - enhancements to EO Dashboard will come from the Open Science Persistent Demonstrator activity co-funded by ESA, NASA (and open to any other participant)

Continued collaboration goals and approach

July 2024 (Current collaboration)

- Organise workshops with academic and industrial participants at ESA (Science Hub), NASA and JAXA, to generate new content directly by users, to populate the dashboard.
- Educate in EO data science and open science - IGARSS 2024
- Leverage existing projects and developments at each agency, maximising synergies and reuse of resources
- Promote multi-mission data exploitation and use of ESA-NASA-JAXA computation platforms and services

Beyond July 2024

- Develop tools for user-contributed data, code and stories
- Engage with users via Workshops and Hackathons:
    - Workshops at ESA's Science Hub, NASA, JAXA with academia and industry
    - Hackathon/Training/Demonstrations at Living Planet Symposium 2025
- Expand interoperability and contributions to open-source

Discussions

- Extending the thematic domains
  - new themes could be added to the Dashboard, e.g. extreme events

- Opening up the collaboration to other participants
  - Call for participation to onboard other agencies (e.g. ISRO with full or junior partnership / obligation)

draft user journey