



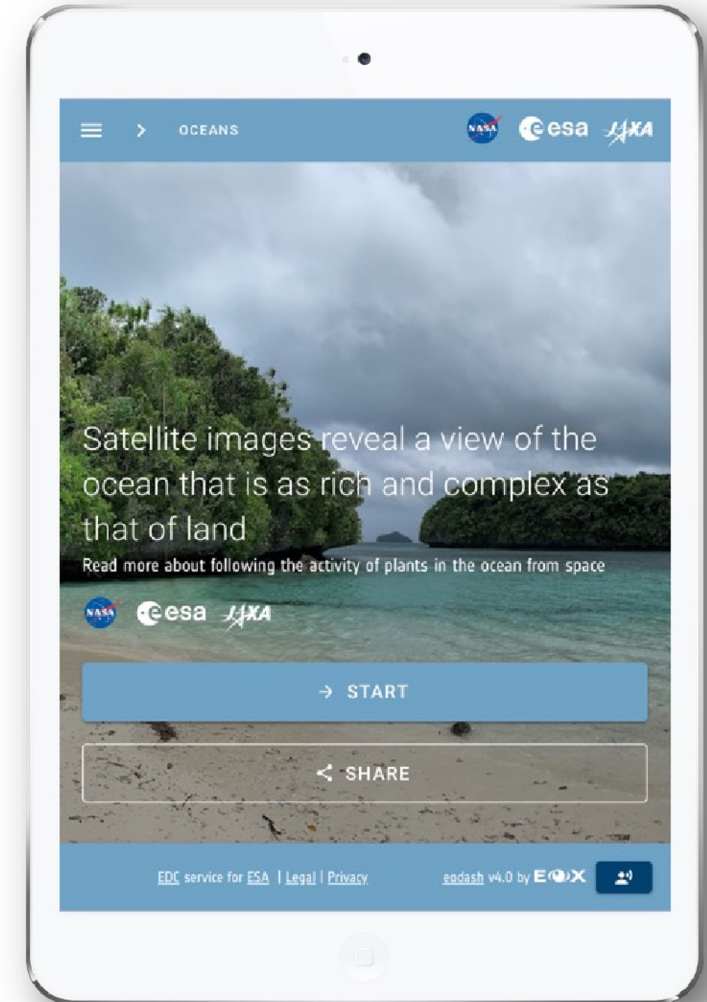
NASA-ESA-JAXA EO Dashboard

A. Anghelea, ESA
M. Maskey, NASA
S. Sobue, N. Sugita, JAXA

Project overview



- Objectives and timeline
- Contributing activities
- Main Features & Demo
- Vision and roadmap



Objectives & Timeline



First Release June 2020

- OBJECTIVE 1. Demonstrate joint capabilities of NASA-ESA-JAXA to observe COVID-19 environmental and economic impacts from space
- OBJECTIVE 2. Communicate indicators to the general public and decision makers
- OBJECTIVE 3. Engage the wider public via competitions, e.g. EO Dashboard Hackathon, SpaceApps



KEY ACHIEVEMENTS

Rapid release

3 months

<https://eodashboard.org>
released in June 2020

EO Indicators

12 EO missions

Tri-agency science teams developed indicators using EO data from 12 ESA, NASA, JAXA missions

Global Users

146 countries

Accessed from all regions and continents

Communication

251 citations

Cited on 251 websites and joint participation to CEOS, AGU, SpaceApps, etc.

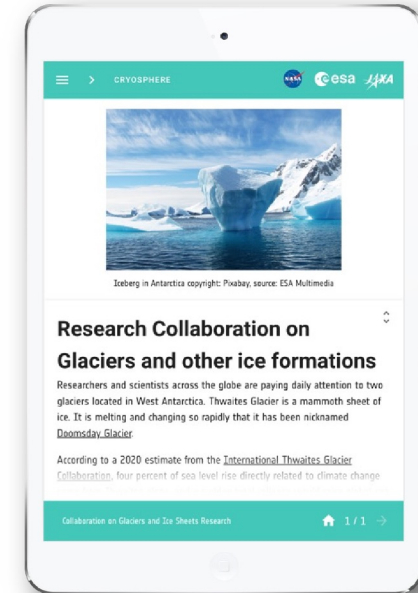


Objectives & Timeline



Second major release 2022

- OBJECTIVE 1. Communicate tri-agency scientific findings with societal relevance through storytelling for 7 thematic domains: atmosphere, oceans, biomass, cryosphere, agriculture, economy, covid-19, using open data
- OBJECTIVE 2. Strengthen the links with relevant communities including data science and related training and education, and enhance participation and awareness on EO for societal impact
- OBJECTIVE 3. Promote Open Science Practices



KEY ACHIEVEMENTS

New Content

25 EO Missions

Expanded EO indicators covering 7 new domains

Storytelling

15 Stories

Jointly developed stories to communicate tri-agency scientific findings

Training & Education

3 Workshops

Jointly delivered hands-on workshops and trainings at major events: LPS, IGARSS, FOSS4G, etc.

Open Science

Open-Source

Jointly developed open-source code, notebooks and tools to exploit tri-agency data

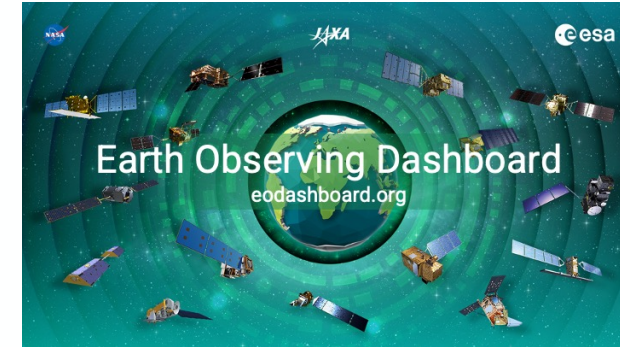


Objectives & Timeline



Ongoing work 2023-2024

- OBJECTIVE 1. Strengthen interoperability across ESA, NASA and other agencies' infrastructures
- OBJECTIVE 2. Expand scientific findings supported by joint EO data and communicate via storytelling with advanced visualization
- OBJECTIVE 3. Promote Open Science best practices and engage with the community



KEY ACHIEVEMENTS

Interoperability

ESA-NASA-OGC

Open Science

Persistent

Demonstrator

Storytelling

4 new Stories

Released 4 new stories on Cryosphere. Biomass and Inland Water stories are in development

Training & Education

3 Workshops

IGARSS Sessions on Open Science, FOSS4G and IGARSS Workshops, BiDS 2023, EGU, GEO ODOK, etc.

Promote Cooperation

IAF Award "Space for Climate Protection"



Contributing Activities



- EO Dashboard is supported by the three agencies via several activities
- Each agency contributes with:
 - EO Data and EO Science
 - In-kind expertise (scientific analyses, communication)
 - Infrastructure and technology: NASA's VEDA, ESA's Euro Data Cube, Jaxa's Earth Graphy
- Through the **Open Science Persistent Demonstrator** ESA and NASA will sponsor pilots to further open-source development by the community to enhance EO Dashboard visualisation and information exchange (among other activities) → **see presentation on Wednesday by OGC to learn how to participate**



Network of Resources



Earth-graphy

All about JAXA's Earth Observations



NASA's VEDA: Visualization, Exploration, and Data Analysis



Why?

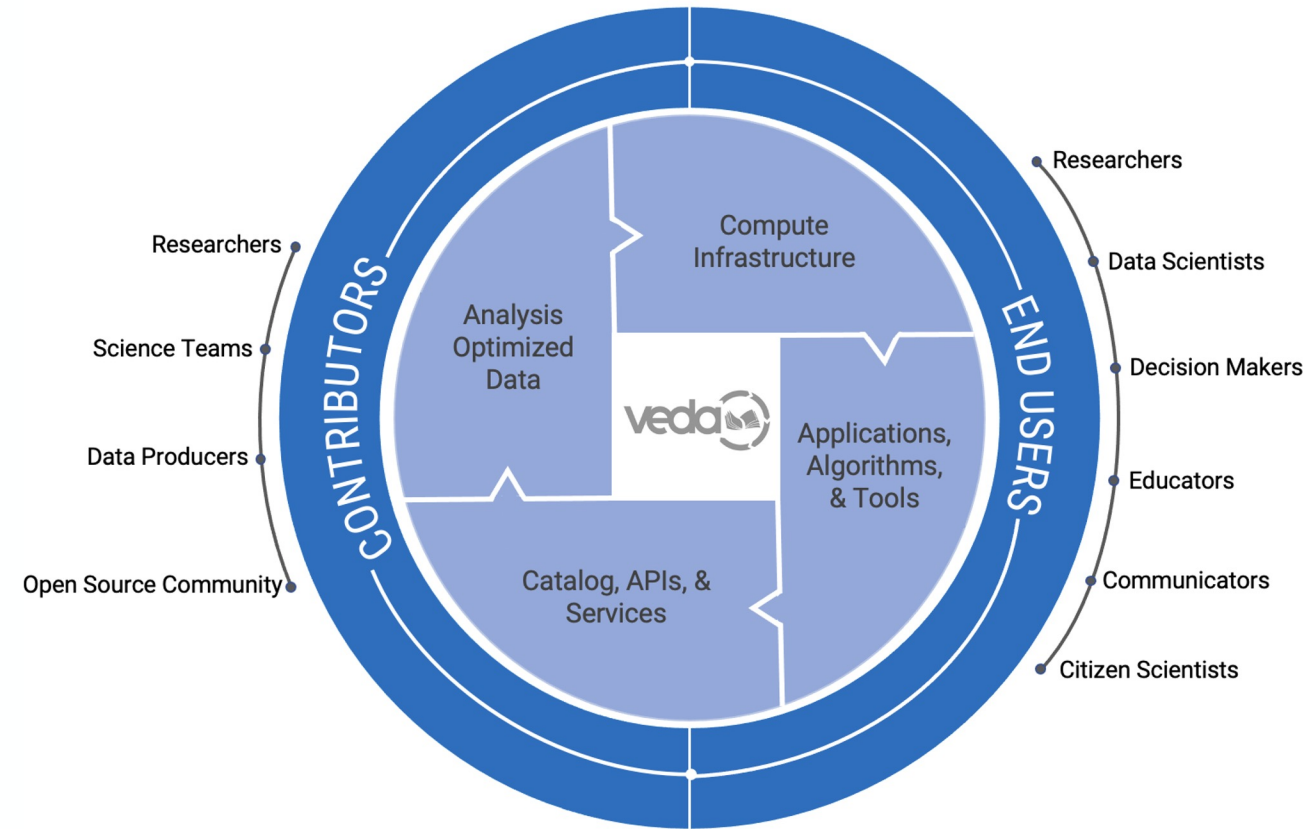
Interdisciplinary science depends on large amount of Earth science data and computational resources

Working with these datasets is non-trivial

Big data science requires advanced distributed computing knowledge

What?

VEDA is an open platform that brings key Earth science datasets next to **open source tools** for data processing, analysis, visualization, and exploration in a managed and **more accessible** computing environment



Explore

Analyze

Publish

Communicate

The screenshot shows the NASA EarthData VEDA Dashboard interface. At the top, the 'Explore' step is highlighted in a dark blue arrow. The dashboard header includes the NASA logo, 'EARTHDATA VEDA Dashboard BETA', and navigation links for 'Welcome', 'Discoveries', 'Datasets', 'Feedback', and 'About'. The main content area features a globe with a 'No2' data layer selected, showing a color scale from blue (Less) to red (More). A sidebar on the left lists 'Datasets' for 'Nitrogen Dioxide', including 'No2' and 'No2 (Diff)'. Below the globe, a 'Datasets' section provides a grid of data product thumbnails with titles such as 'Facebook Population Density', 'Harmonized Landsat Sentinel-2 (Selected Events)', 'Nighttime Lights supporting Environmental Justice', 'Blue tarp detections', 'Household and Disability Score', 'Housing Type and Transportation Score', 'Minority Status and Language Score', 'Overall Social Vulnerability', and 'Socioeconomic indicators'. Each thumbnail includes a brief description of the data product.

Finding relevant data products

Exploring data to identify interesting features



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Explore

Analyze

Publish

Communicate

```

(9): fig, ax = plt.subplots(1,2, figsize=(11,5))
# visualize burn area values for all fires
ax[0].hist(gdf['farea'].values, bins=300)
ax[0].set_xlim(0,200)
ax[0].set_yscale('log')
ax[0].set_xlabel('Fire Area (km2)')
ax[0].set_ylabel('Count')

# plot only sample of fires because
# all of them will take a while to render
conus.plot(ax=ax[1], edgecolor="black", color="none")
gdf.sample(10000).plot(ax=ax[1], edgecolor="red", color="red")
ax[1].set_xlabel('Longitude')
ax[1].set_ylabel('Latitude')
fig.show()

(10): # isolate large fires >= 5km2
large_fires = gdf[gdf['farea']>=5]
print('n of large fires:', len(large_fires))
# n of large fires: 1744

(11): # optional interactive visualization
# timestamps must be dropped because they don't play
# well with the interactive map
large_fires.drop(['StartTime', 'EndTime'], axis=1).explore(column='fid', style_kws={'fill': False},
# tiles='Stamen Terrain', cmap='jet')

(12): base_path = 's3://veda-data-store-staging'

fire_ids = set()
file_paths = []

fl_str = 'FL'
nfp_str = 'NFP'

for obj in veda.objects.filter(Prefix='EIS/other/feds-output/2022/Largefire'):
    file_path = os.path.join(base_path, obj.key)

    if fl_str in file_path or nfp_str in file_path:
        #pass
        continue

    file_name = file_path.split('/')[-1]
    fire_id = file_name.split('.')[0]

    fire_ids.add(fire_id)
    file_paths.append(file_path)

fire_ids = list(fire_ids) # convert to list for indexing

```

Developing advanced data products and analysis

Carrying out calculations "in place" without the need to download data

Dynamically allocating resources for computationally demanding processing



Explore

Analyze

Publish

Communicate

The screenshot shows the NASA Earthdata Biomass Earthdata Dashboard. The main map displays a color-coded map of boreal forest biomass. A 'Point value' popup is visible, showing the following data: ICESat-2 Boreal Biomass 2020: 9.1799, ICESat-2 Boreal Biomass SE: 2.5947, Max NDVI: 0.3964, and TSRI: 0.9250. The 'PRODUCTS' sidebar on the right contains a detailed description of the ICESat-2 data, stating it is a photon counting lidar instrument that launched in 2018 and is collecting global 3D structure measurements of Earth's terrain and vegetation. Below the text is a photo of a river valley with the credit 'Photo credit: Paul Montesano'.

Conveniently delivering data through existing interfaces

Providing automatic access to interactive visualization capabilities

Allowing users to analyze your products within the environment



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→ THE EUROPEAN SPACE AGENCY

Explore

Analyze

Publish

Communicate

The screenshot shows the NASA VEDA Dashboard interface. At the top, there is a navigation bar with the NASA logo, 'EARTHDATA VEDA Dashboard BETA', and a dropdown menu for 'AREA: Environmental...'. Below this is a secondary navigation bar with 'SECTION: Welcome Discoveries Datasets Feedback About'. The main content area features a large header image with the title 'Connecting Disaster Recovery with Environmental Justice' and a subtitle 'Featuring Hurricane María and Hurricane Ida'. Below the header, there are two text blocks. The first block is titled 'Connecting Disaster Recovery with Environmental Justice: Hurricane María' and describes the impact of Hurricane María on Puerto Rico in 2017. The second block is titled 'Connecting Disaster Recovery with Environmental Justice: Hurricane Ida' and describes the impact of Hurricane Ida on New Orleans in 2021. The text in both blocks discusses the challenges faced by disadvantaged communities and the role of NASA's data in understanding and responding to natural disasters.

User friendly data-driven storytelling

Enrich science and applications narratives with interactive exploration

VEDA supports the NASA-ESA-JAXA EO Dashboard



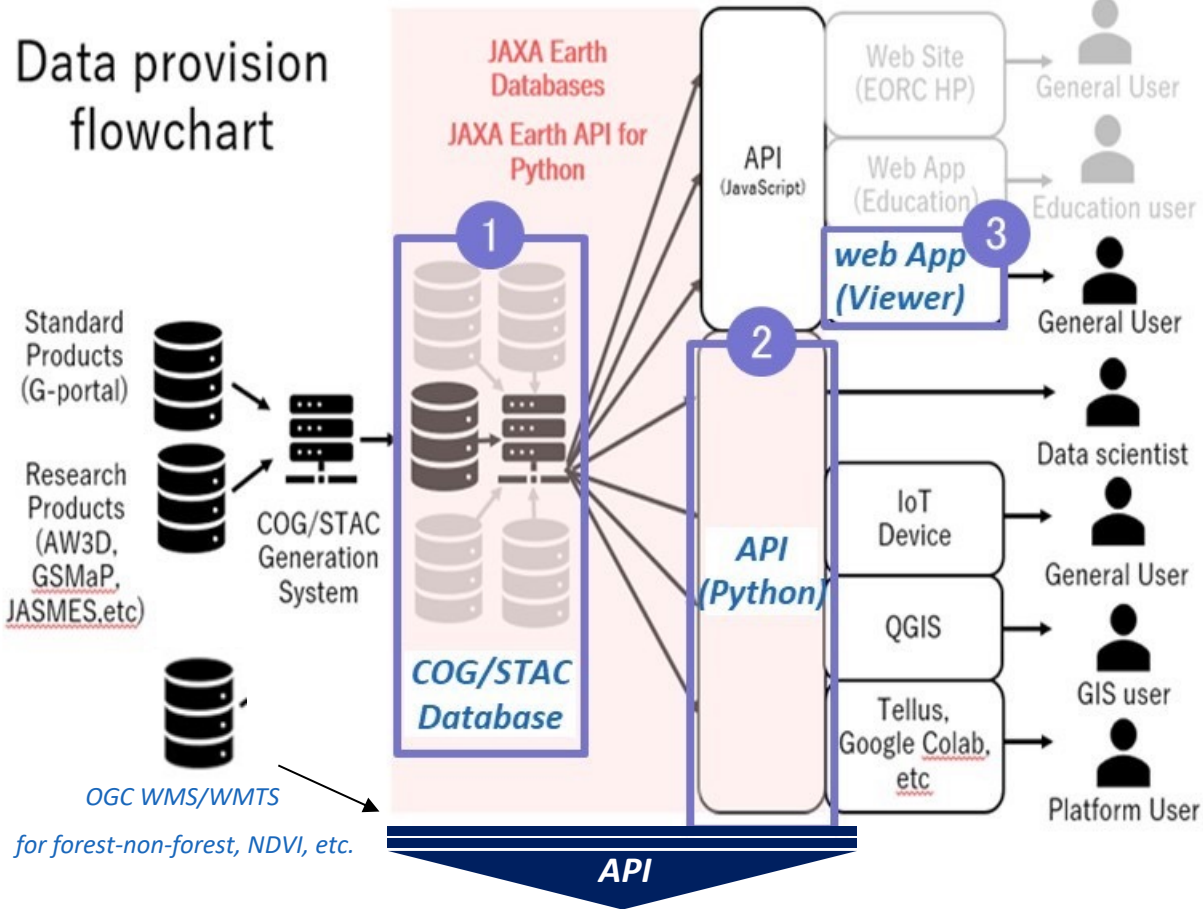
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JAXA's "Earth-graphy" interconnected with EO Dashboard through API and WMS/WMTS

To provide easy access of JAXA's earth observation data and information

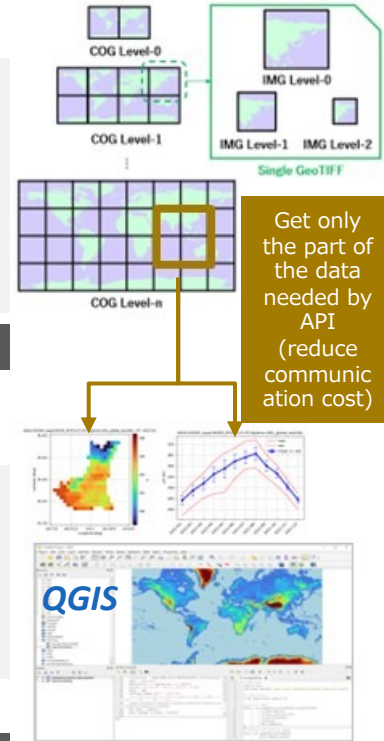
Data provision flowchart



1 JAXA Earth Database

: contains 74 types of JAXA's EO satellites data with **Cloud Optimized GeoTIFF(COG)** format and metadata by **SpatioTemporal Asset Catalogs(STAC)** format named "**CEOS Analysis Ready Data for Land(CARD4L)**"

<https://data.earth.jaxa.jp/en/datasets/>



2 JAXA Earth API (for Python)

: acquires EO data from database directly
: performs remote sensing processes, statistical processing and imaging
: has an IF function with QGIS

... JavaScript API is under development

<https://data.earth.jaxa.jp/en/>

3 JAXA Earth Data Explore

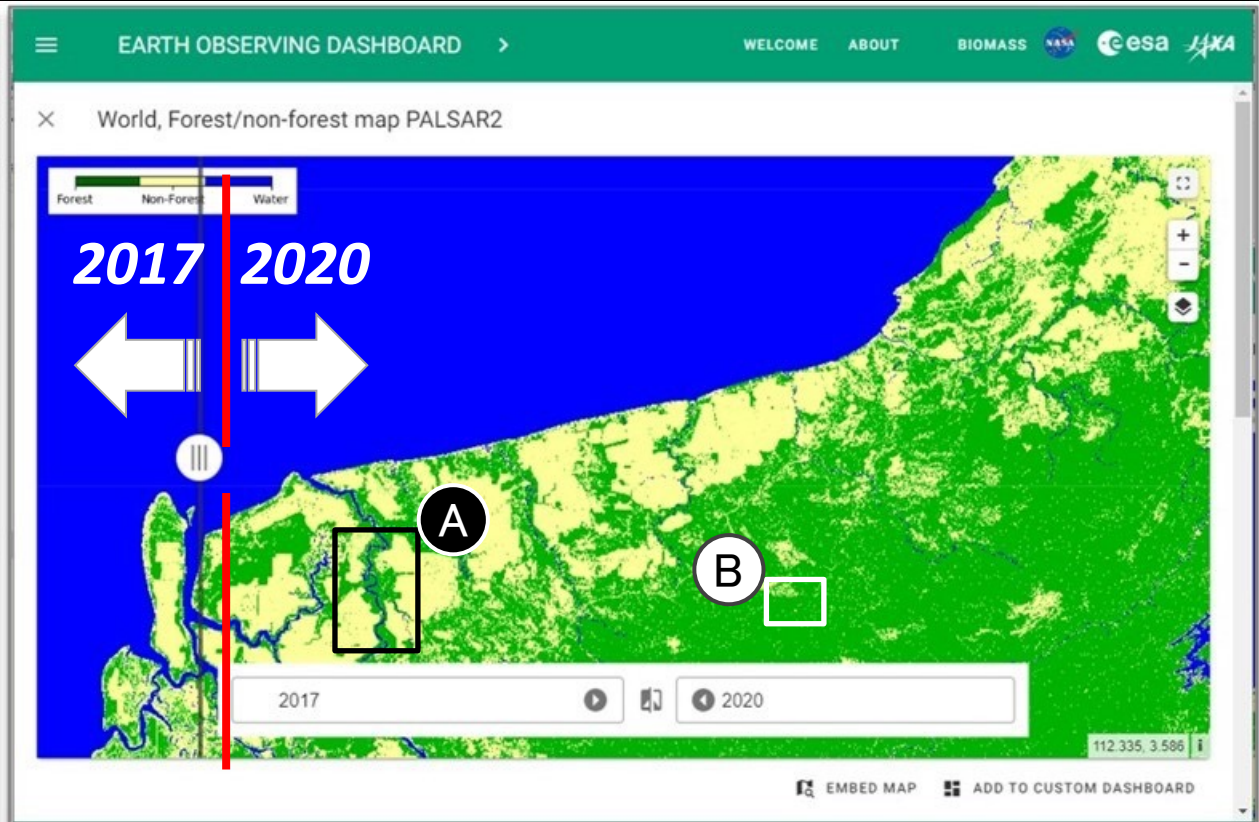
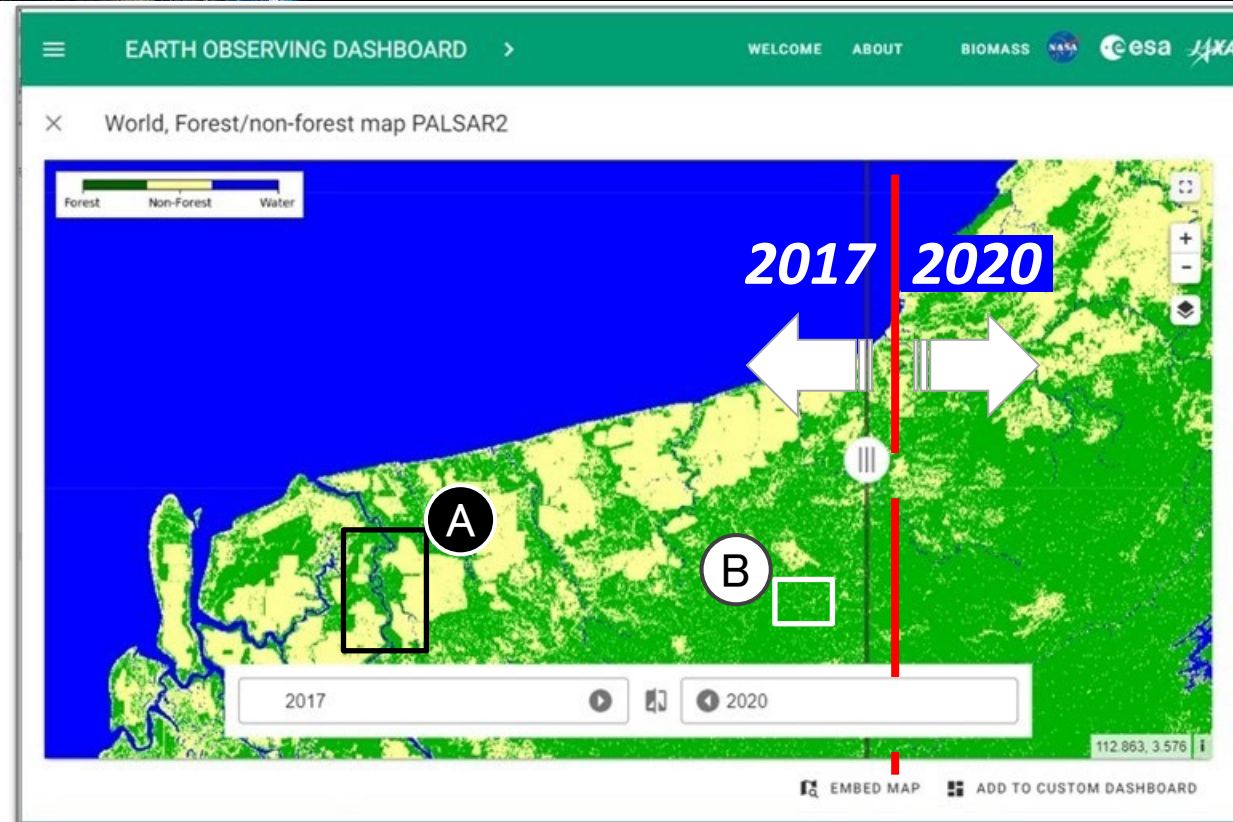
: a web application that allows to check various satellite data stored in COG/STAC database

<https://data.earth.jaxa.jp/app/explorer/>

Visualization

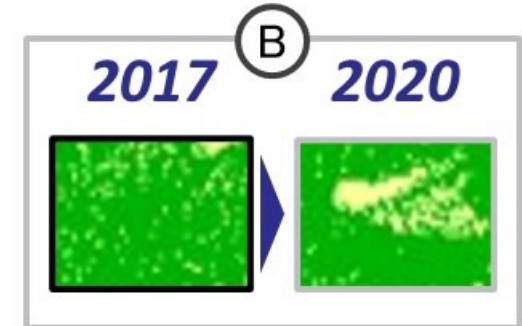
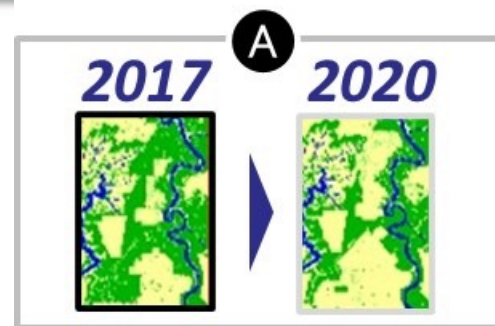


Global PALSAR-2 FNF using OGC WMS/WMTS through EO dashboard or QGIS



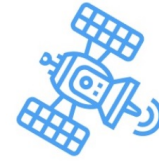
Comparison of Forest/Non-Forest area between 2017 and 2020

Identify the extent of deformation



EURO DATA CUBE

Euro Data Cube Services



Data Access

Conveniently access global archives of analysis-ready Earth Observation data from all the major providers in one place



Processing Capabilities

Manage your own computation and storage environment. Take advantage of data cube technology or batch processing capabilities for resource-intensive use cases



Collaborate & Sell

Share your data and algorithm with the community and customers on the EDC Marketplace

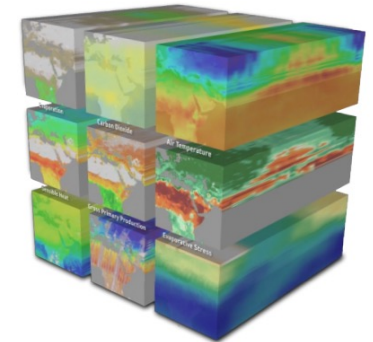
Earth Observation Information Factory

- **one-stop-shop for EO** - you can find all important EO and derived data products at one place
- **analyse** an event or phenomena from different perspectives
- provision of multiple data sources
- **compare** and **correlate** several variables at the same time
- **customize** your data pipeline
- try it out for **free**
- kick-start your **Earth Observation Application!**

Euro Data Cube in a nutshell is a combination of several services:

Global Archives of Analysis Ready Data

- Open satellite missions - Sentinel, Landsat, MODIS, etc.
- Commercial VHR datasets - PlanetScope, Pléiades, SPOT, etc.
- Earth System Data Cube
- ESA and Copernicus Climate Change Initiative
- User contributed content
- Data fusion in order to combine various datasets



<https://eurodatacube.com>

- NoR Portfolio <https://nor-discover.cloudeco.group/>
- ESA Sponsorship:
 - Any user can apply for ESA Sponsoring of cloud resources for research, pre-commercial, development and demonstration activities that do not generate revenue
- 3 steps:
 - Browse the NoR Discovery Portal and select provider
 - Use the Wizzard to calculate the price
 - Fill in the ESA sponsoring and send to nor-sponsorship-requests@esa.int
- The NoR will provide successful applicants with a voucher for the selected services, allowing free-at-point-of-use consumption for research
- **Get in touch if you are interested to become a provider of services on the NoR**

Network of Resources

← → ↺ map.nor-discover.org

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↑ NoR

Welcome to the NoR map!

Apply filters to search projects funded by ESA NoR.
Click the NoR icons to get more detailed information.

Filter

by Country

Select Country v

by Categories

<input type="checkbox"/> Agriculture	<input type="checkbox"/> Coastal	<input type="checkbox"/> Forestry
<input type="checkbox"/> Geohazard	<input type="checkbox"/> Glacier	<input type="checkbox"/> Hydrology
<input type="checkbox"/> Ocean	<input type="checkbox"/> Polar	<input type="checkbox"/> Urban
<input type="checkbox"/> Miscellaneous		

by Date of sponsorship approval

from to
dd/mm/yyyy

Found 321 Projects*

*Please be aware that information is updated on a regular basis. Not all projects are implemented in the library yet.

If you miss information on your project, please contact us through the homepage.

If you want to contribute, please visit our homepage for further instructions.

An ESA initiative

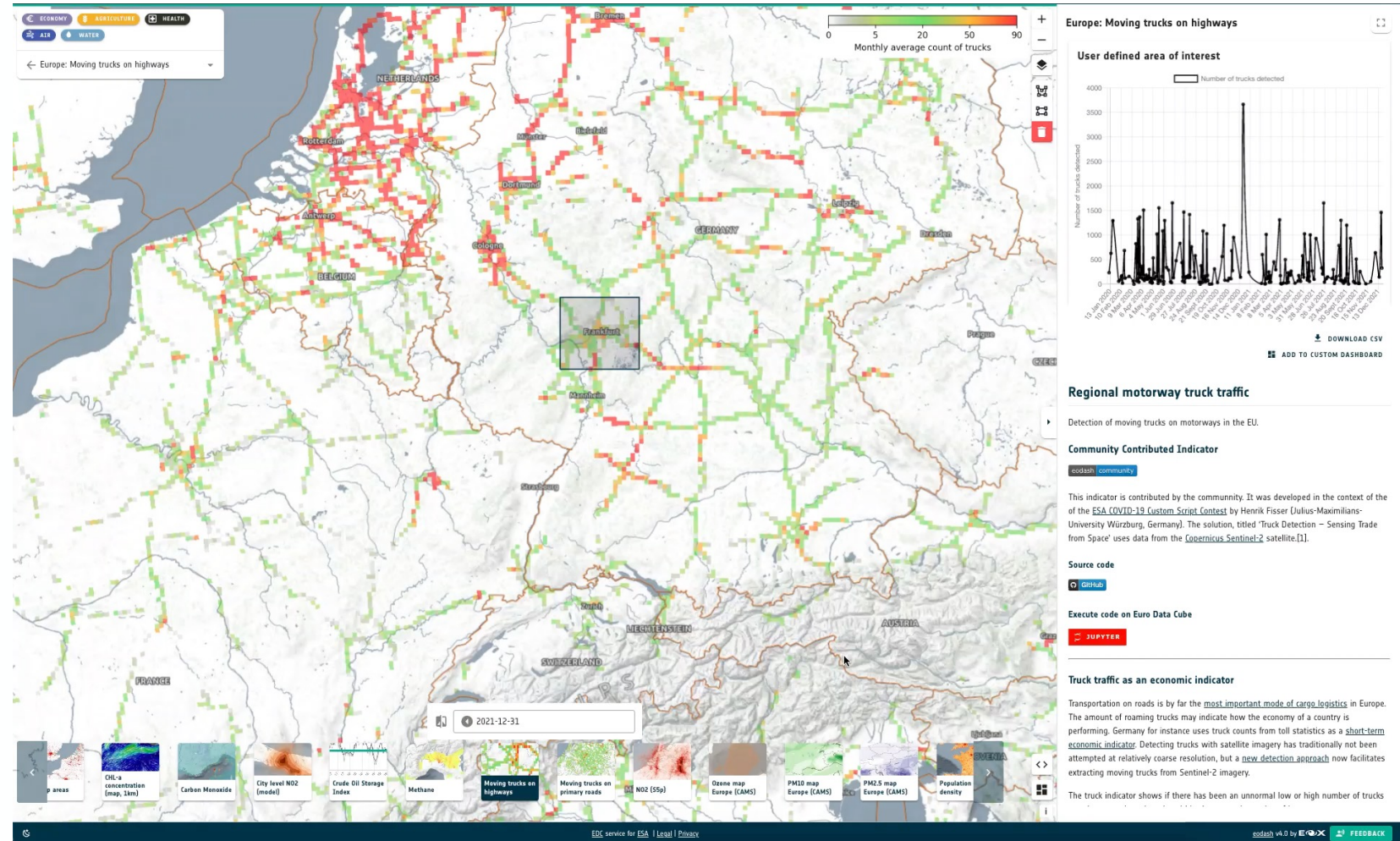


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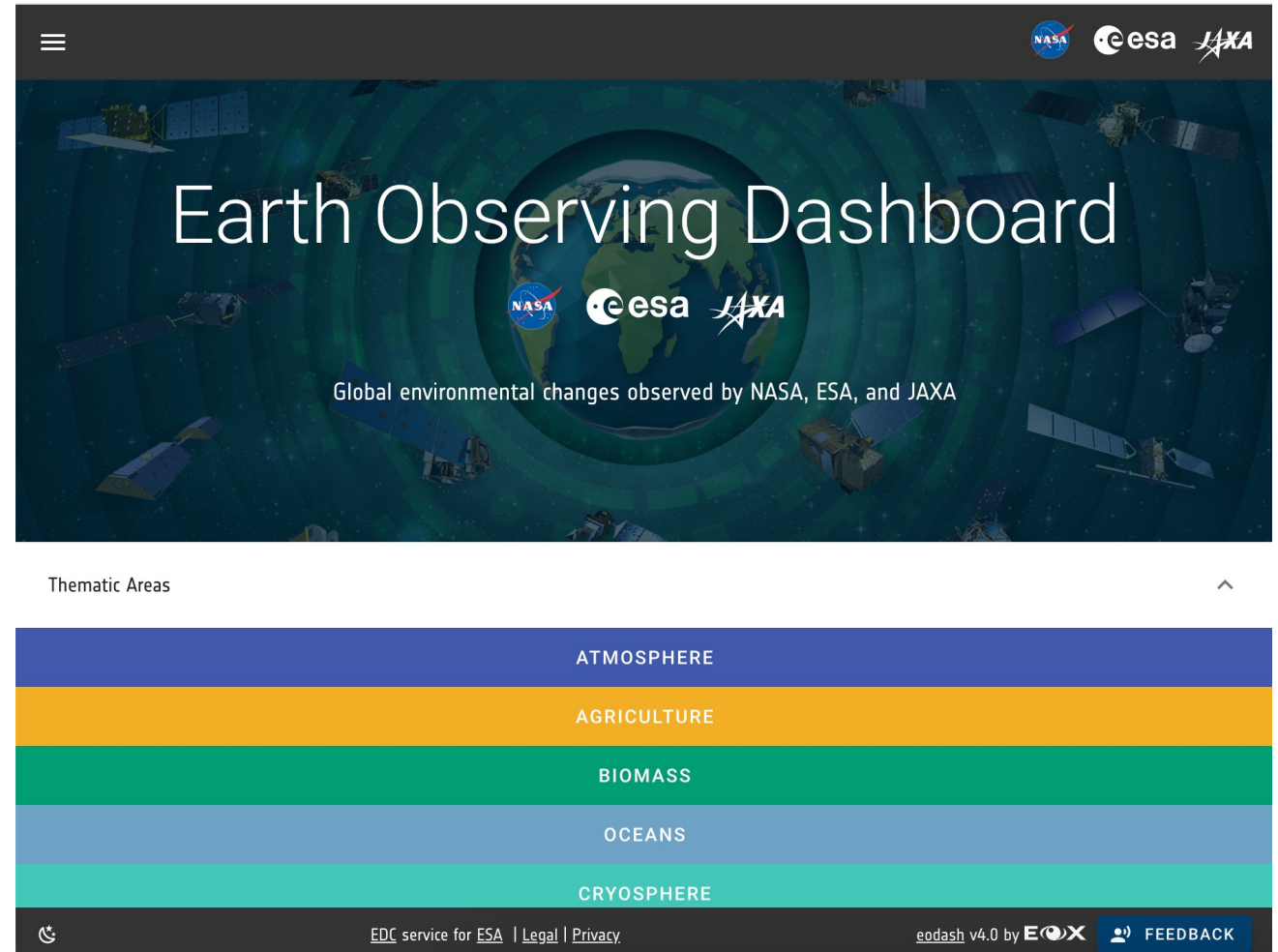
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Foster Open Data Science

- Development of open access resources for data scientists to work with the EO data they discover in EO Dashboard
- Improve discoverability (STAC)
- EODASH-VEDA interoperability (e.g., common data format and API)
- EODASH contributors guide & resources (end 2023)



- Storytelling
- EXPLORE DATASETS
- Custom Dashboard



Produced by

NASA-ESA-JAXA
EO Dashboard Team

<https://eodashboard.org>