

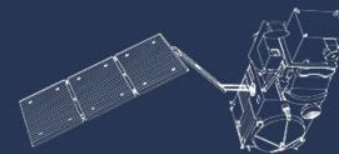
ESA - otvorený prístup k satelitným dátam a ich analýzy



sentinel-1



sentinel-2



sentinel-3

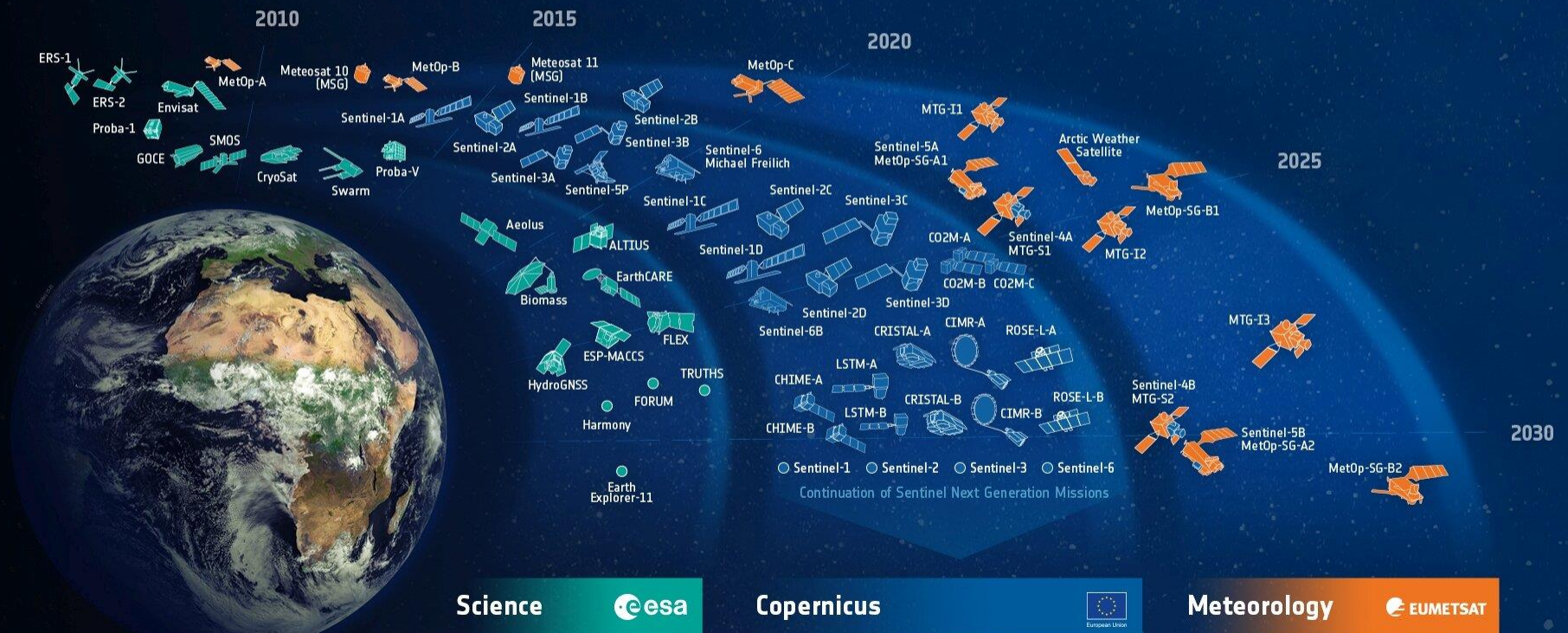
Content

- ESA space activities in earth observation
- Copernicus programme
- Open access to ESA data Sentinel - 1,2,3
- Data Space Copernicus and basic analyses
- Open access to Third-Party Mission TPM

ESA missions – past, current and future



ESA-DEVELOPED EARTH OBSERVATION MISSIONS



Science



Copernicus



Meteorology



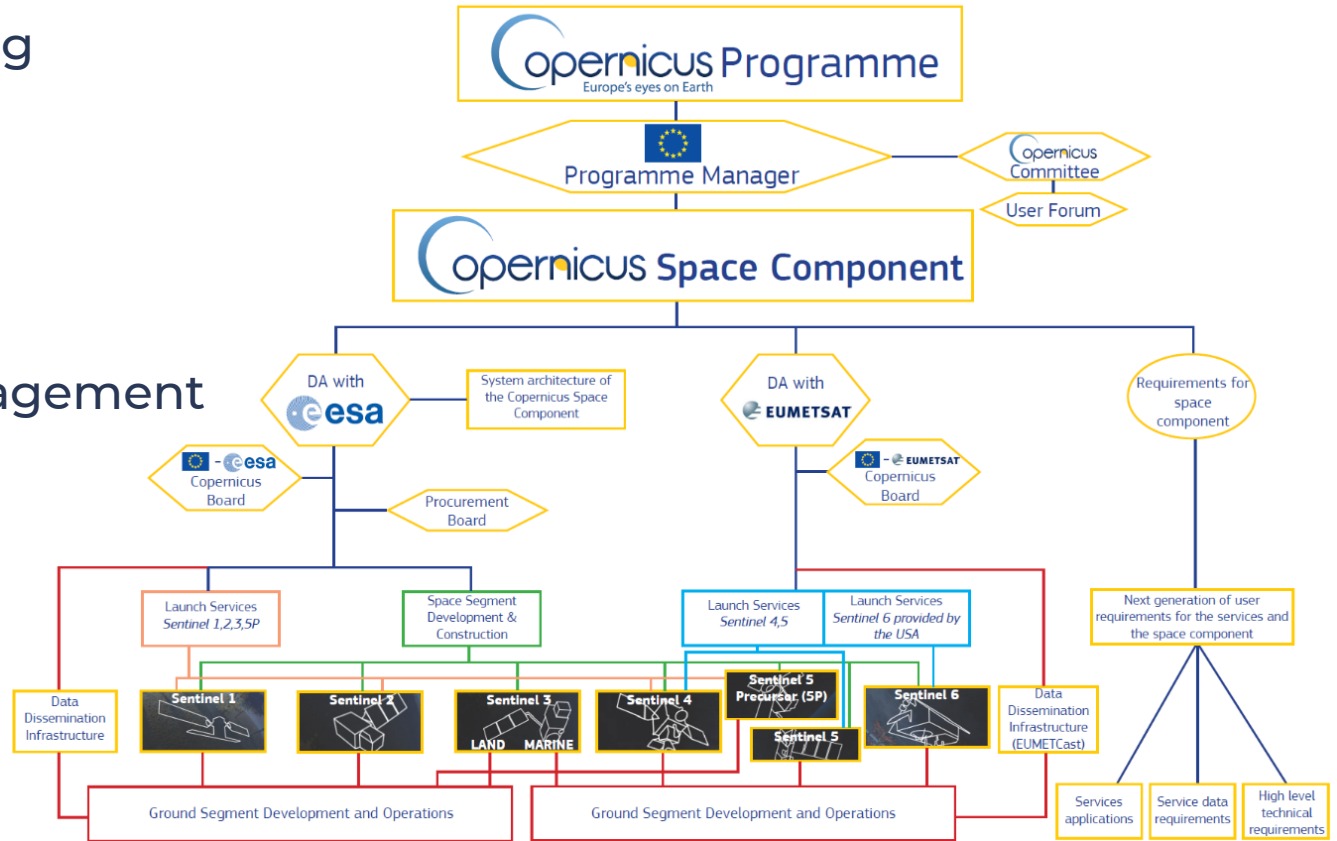
Source: https://www.esa.int/ESA_Multimedia/Images/2019/05/ESA-developed_Earth_observation_missions

ESA activities

Copernicus programme

- Atmosphere monitoring
- Marine monitoring
- Land monitoring
- Climate change
- Security
- Emergency management

Earth Observation



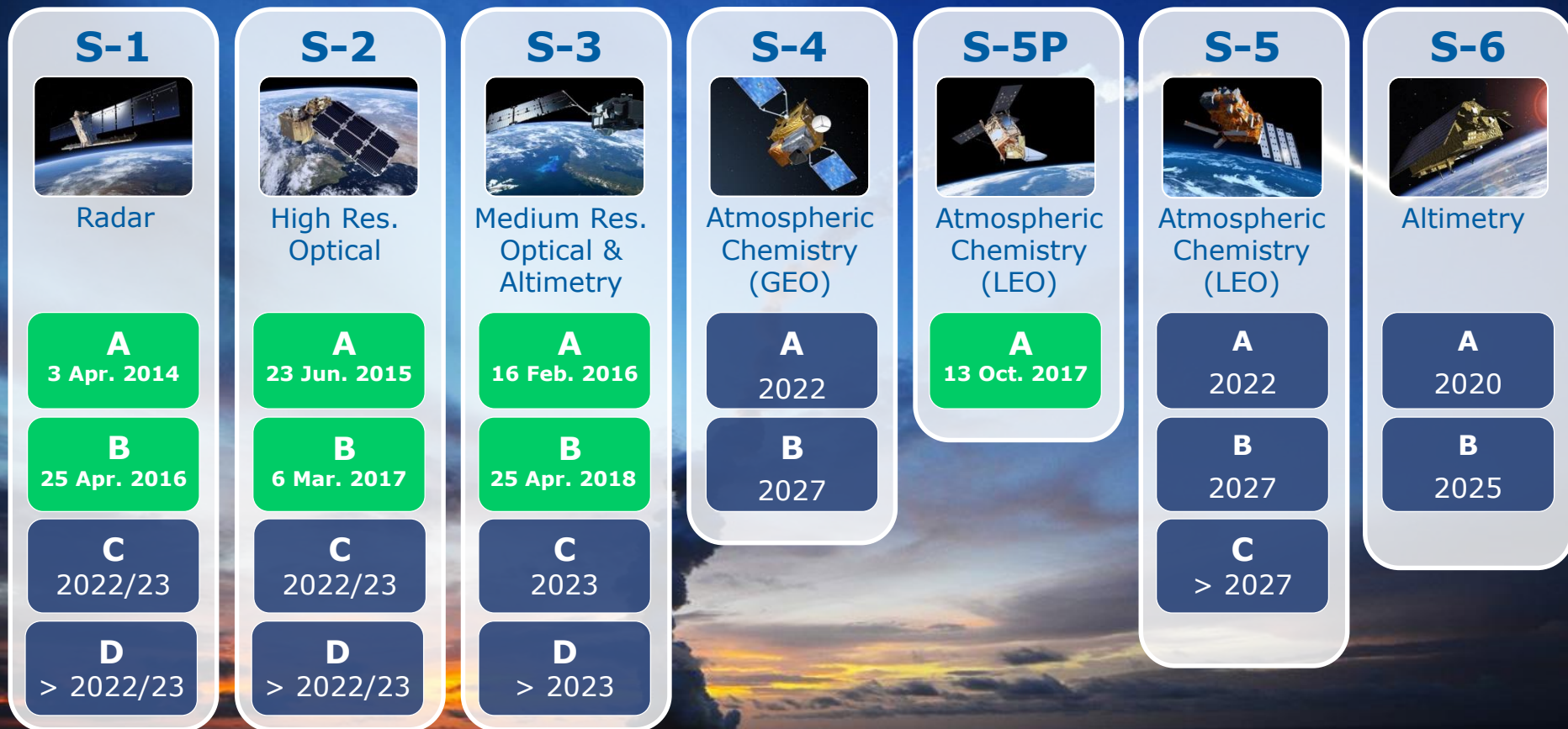
Source: www.copernicus.eu/en/about-copernicus/copernicus-detail



ESA missions - current

Sentinel status

Source: ©ESA



ESA missions - current

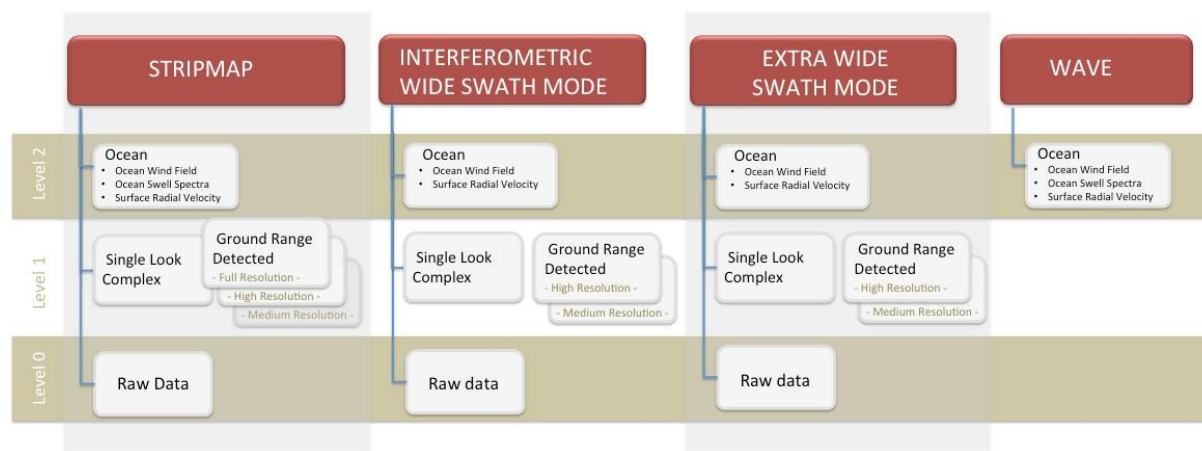
Sentinel – 1 A,B



Source: ©ESA/P. Carril

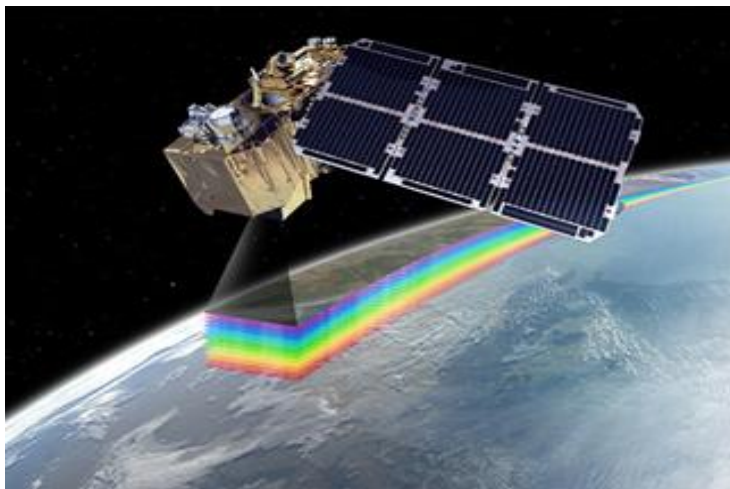
- Radar mission in C – band with synthetic aperture SAR
- Monitoring of oceans, seas, land and emergency management

Sentinel - 1	
Orbita	Blízko polárna
Výška letu	693 km
Inklinácia	98,18°
Periódka obehu	98,6 min
Cyklus	5 dní
Hmotnosť	2.300 kg
Štart misie	S1-A 3.4.2014 S1-B 25.4.2016
Trvanie misie	aktívna



Source: ©ESA

ESA missions - current



Source: ©ESA

Sentinel – 2 A,B

- Multispectral satellite
- Monitoring of oceans, seas, land and emergency management – vegetation, water and forest management, agriculture and emergency management

Sentinel 2	Vlnová dĺžka (mm)	Priestorové rozlíšenie (m)
Band 1 - Coastal aerosol	443	60
Band 2 - Blue	492	10
Band 3 - Green	560	10
Band 4 - Red	665	10
Band 5 - Vegetation red edge	704	20
Band 6 - Vegetation red edge	740	20
Band 7 - Vegetation red edge	783	20
Band 8 - NIR	833	10
Band 8A - Vegetation red edge	865	20
Band 9 - Water vapour	945	60
Band 10 - SWIR - Cirrus	1373	60
Band 11 - SWIR	1614	20
Band 12 - SWIR	2202	20

Sentinel - 2	
Orbita	Helio- synchronna, blízko polárna
Výška letu	786 km
Inklinácia	98,62°
Periódá obehu	100 min
Cyklus	5 dní
Hmotnosť	1.140 kg
Štart misie	S2-A 23.6.2015 S2-B 7.3.2017
Trvanie misie	aktívna

ESA Open-access to data

Earth online

<https://earth.esa.int/eogateway>

→ THE EUROPEAN SPACE AGENCY esa

earth online ● MISSIONS ● **DATA** ● NEWS ● EVENTS ● TOOLS | SEE ALL

Find something on Earth Online

DATA

Discover and download the Earth observation data you need from the broad catalogue of missions the European Space Agency operate and support.

- Aeolus**
Discover what data products are offered for ESA's Aeolus mission....
- CryoSat**
Discover what data products are offered for ESA's CryoSat mission....
- SMOS**
Discover what data products are offered for ESA's SMOS mission....
- Swarm**
Discover what data products are offered for ESA's Swarm mission....
- All other collections**
See all of the available data collections and products for ESA and Third Party Missions....

ESA Open-access to data

Data Space

- <https://dataspace.copernicus.eu/>

The screenshot shows the homepage of the Copernicus Data Space Ecosystem. At the top right, there is a navigation menu with links for News, Events, Gallery, Videos, and About. Below this, there are three main navigation categories: EXPLORE DATA, ANALYSE DATA, and ECOSYSTEM, each with a dropdown arrow. To the right of these categories are two buttons: SUPPORT and LOGIN. The LOGIN button is highlighted with a red circle. On the left side, there are logos for the Programme of the European Union, Copernicus, and ESA. The main heading reads "Explore the Copernicus Data Space Ecosystem". Below the heading, there is a welcome message and a "REGISTER" button with an external link icon. On the right side, there is a large, stylized graphic of a satellite or data point cloud with concentric circles around it.

ESA Open-access to data

Data Space portal

<https://dataspace.copernicus.eu>

The screenshot shows the top navigation bar with the European Union flag, 'PROGRAMME OF THE EUROPEAN UNION', 'Copernicus', and 'esa' logos. On the right, there are 'SUPPORT' and 'HOME' buttons. Below the navigation, the text reads 'Home > Sign in to your account'. A welcome message follows: 'Welcome to the Copernicus Data Space Ecosystem! Login to your personal dashboard to easily access a wide variety of Earth observation resources. Don't have an account yet? Register now to easily create a new account in just a few minutes.'

The screenshot shows the 'Create a personal account' page. It includes the same top navigation bar as the login page. The main heading is 'Create a personal account'. Below it, a sub-heading says 'Complete the form below to create a new account. After submission you will receive a verification mail to confirm your subscription and login to your personal account.'

This is a close-up of the login form. It has two input fields: 'Email' and 'Password'. Below the password field, there is a red circle around the 'LOGIN' button. A red line also points to the 'Forgot Password?' link above the button.

Register and create an account for free in 60 seconds

- ✓ Access a variety of Earth observation data
- ✓ Manage your personal settings
- ✓ Follow your credits and orders

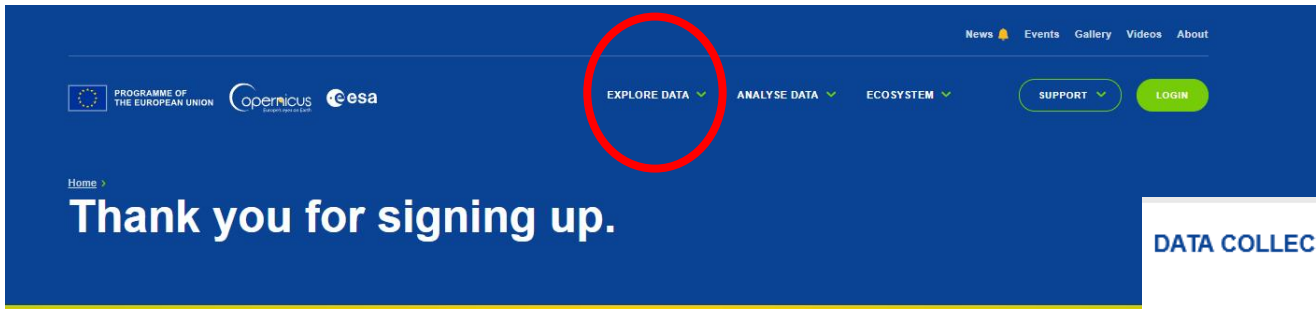
REGISTER

The screenshot shows the 'Register form' with the following fields and options:

- First name *
- Last name *
- Email *
- Password *
- Confirm password *
- Country *
- Type of user (you and/or your organisation is ?) *
- Thematic activity
- Purpose of use
- Accept [Terms and conditions](#)
- Join our mailing list to be informed about future news.
- Give permission to contact you for the purpose of possible user surveys.
- [Back to Login](#)
- REGISTER

ESA Open-access to data

Data Space



You will receive a verification email in your mailbox.

Discover our services

Explore data

Access a wide range of Earth observation data from the Copernicus Sentinel missions and more. The Copernicus Data Space Ecosystem provides tools for easy discovery, visualization and download which will be continuously upgraded.

[DISCOVER THE DATA](#)

Analyse

The service provides a powerful data analytics environment. Access a set of high-quality data processing tools to extract information valuable to conduct public, private or commercial activities. The Copernicus Data Space Ecosystem is set to be the next level of user data processing and distribution infrastructure.

[ACCESS THE TOOLS](#)

Ecosystem

The Copernicus Data Space Ecosystem is the next step in the evolution of Earth observation data. The Ecosystem aims to gather tools and resources to unlock the full potential of this data. This allows to build a thriving, open and expanding Ecosystem to increase the impact of Earth Observation data for a sustainable society.

[FIND OUT MORE](#)

DATA COLLECTIONS:

- Sentinel-2
- Sentinel-1
- Sentinel-2**
- Sentinel-3
- Sentinel-5P
- DEM
- Sentinel-2 Mosaics

DATE: 2023-11-29

Max. cloud coverage: 30%

Su	Mo	Tu	We	Th	Fr	Sa
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2

LAYERS:

- True color
- False color
- Highlight Optimized Natural Color
- NDVI
- False color (urban)
- Moisture index

ESA Open-access to data

Optical image

Open Access Browser

EN Login

VISUALIZE SEARCH

DATE: 2023-10-03 30%

Show latest date Find products for current view

Max. cloud coverage: 30%

October 2023

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

Default

DATA COLLECTIONS:

Sentinel-2

- Sentinel-2 L1C
- Sentinel-2 L2A

LAYERS:

- True color (Based on bands B4, B3, B2)
- False color (Based on bands B8, B4, B3)
- Highlight Optimized Natural Color (Enhanced natural color visualization)
- NDVI (Based on a combination of bands (B8 - B4)/(B8 + B4))
- False color (urban) (Based on bands B12, B11, B4)
- Moisture index (Based on a combination of bands (B8A - B11)/(B8A + B11))

Show effects and advanced options Hide layer Share

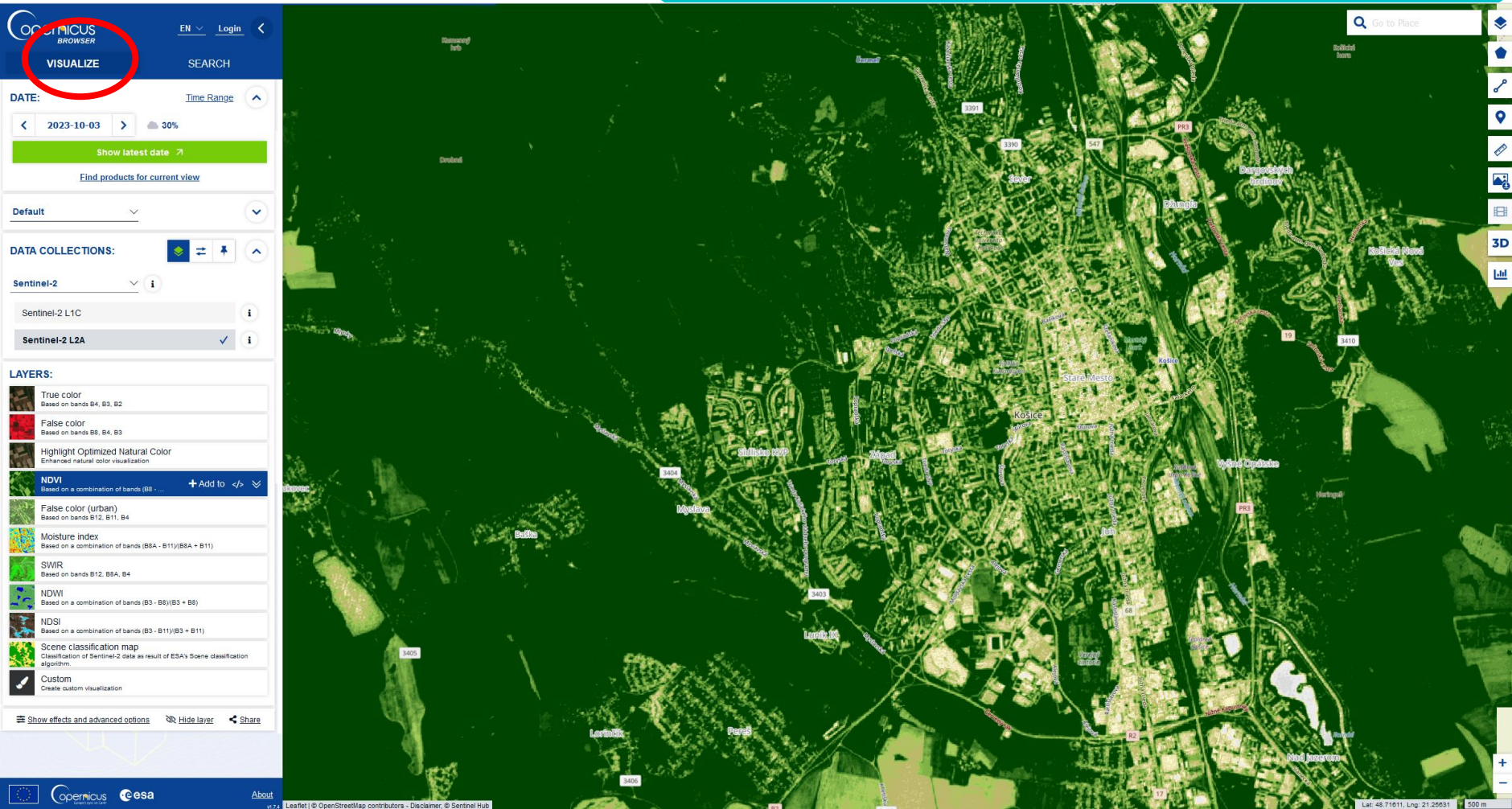
ESA Open-access to data

False colours

The image shows a screenshot of the Copernicus Sentinel-2 data visualization interface. The interface is split into a control panel on the left and a map area on the right. The control panel includes a search bar, a date range selector set to '2023-10-03', and a 'VISUALIZE' button circled in red. Below this, there are options for 'DATA COLLECTIONS' (Sentinel-2) and 'LAYERS'. The 'LAYERS' list includes 'True color', 'False color' (selected), 'Highlight Optimized Natural Color', 'NDVI', 'False color (urban)', 'Moisture index', 'SWIR', 'NDWI', 'NDSI', 'Scene classification map', and 'Custom'. The map area displays a false color visualization of a rural landscape, with a large red area representing vegetation. The interface also features a 'Go to Place' search bar and various map navigation tools on the right side.

ESA Open-access to data

Vegetation NDVI



ESA Open-access to data

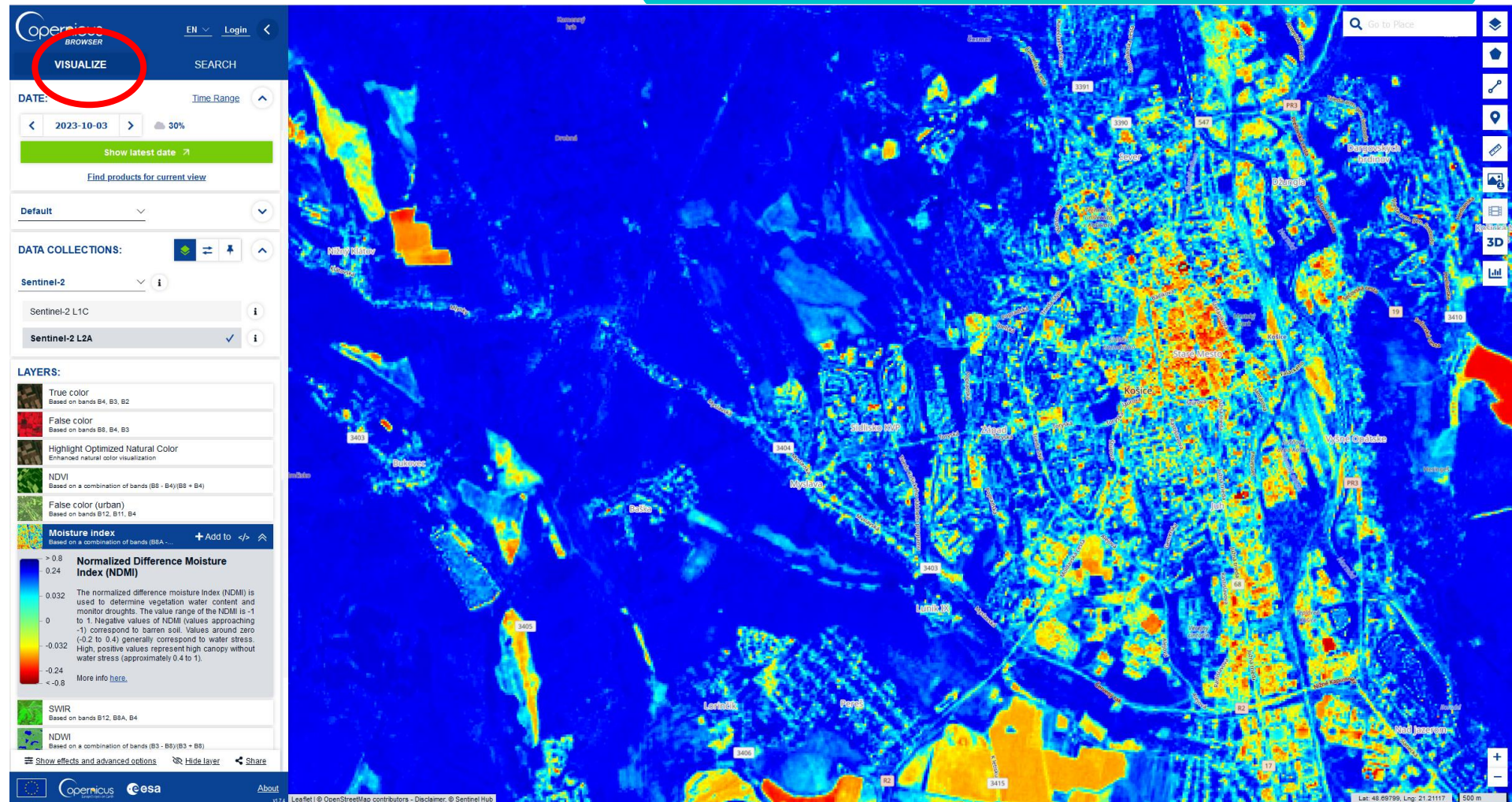
Water NDWI

The screenshot displays the Copernicus Browser interface for visualizing Water NDWI data. The interface is divided into several sections:

- Top Bar:** Includes the Copernicus logo, language selection (EN), login, and search options. The "VISUALIZE" button is highlighted with a red circle.
- DATE:** Shows the current date as 2023-10-03 and a 30% zoom level. A "Show latest date" button and a "Find products for current view" link are present.
- DATA COLLECTIONS:** Lists available data collections, including Sentinel-2 L1C and Sentinel-2 L2A (which is selected).
- LAYERS:** A list of visualization options such as True color, False color, Highlight Optimized Natural Color, NDVI, False color (urban), Moisture index, SWIR, NDWI (selected), NDSI, and Scene classification map.
- Map Area:** A satellite image of a rural landscape with NDWI overlays in blue, indicating water bodies. The map includes a search bar, a "Go to Place" button, and various navigation controls.
- Bottom Bar:** Contains logos for Copernicus and ESA, along with "About" and "Share" options. The status bar at the very bottom shows the Leaflet map source and coordinates: Lat: 48.6366, Long: 21.6624, 2km scale.

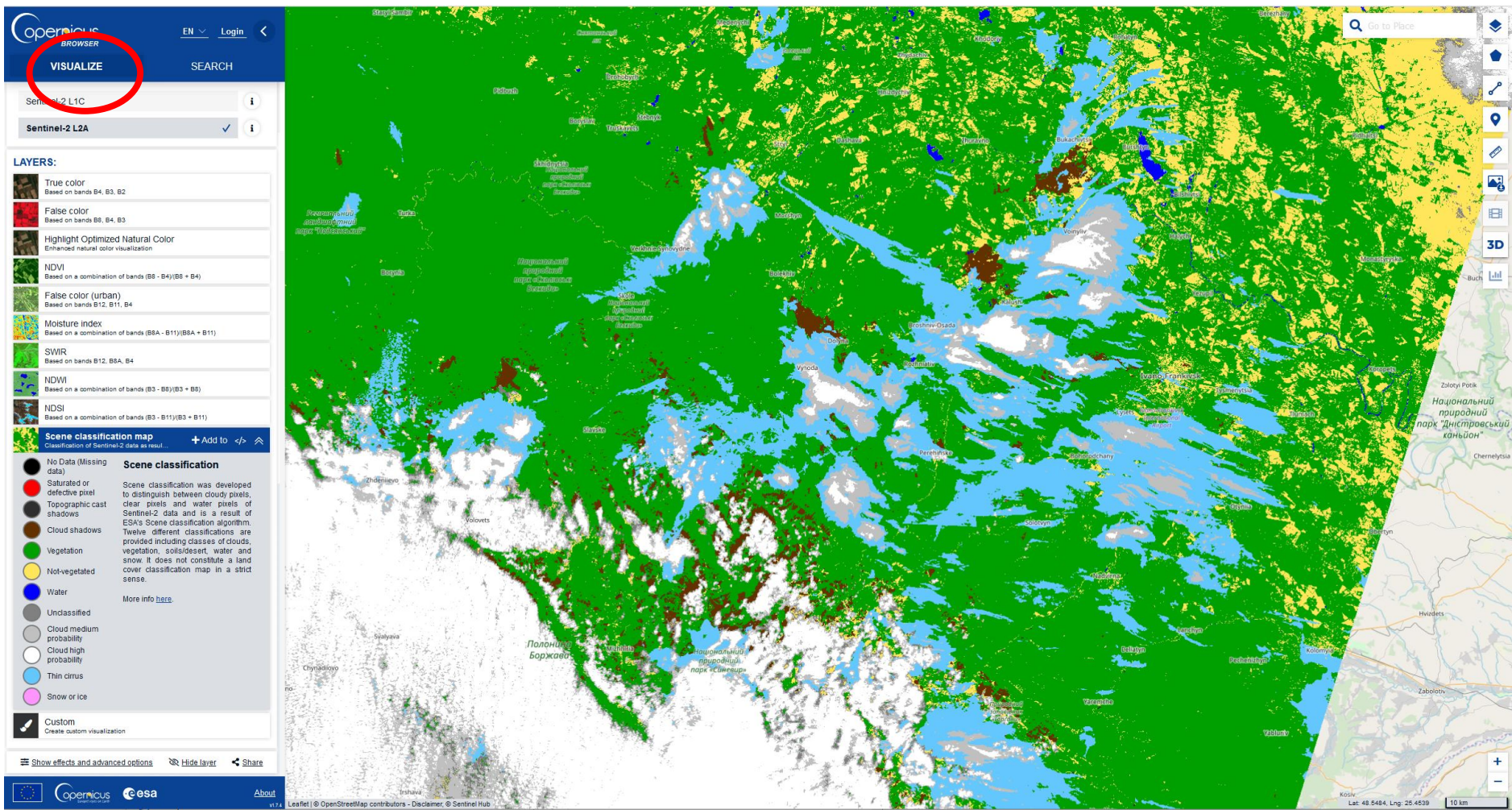
ESA Open-access to data

Soil moisture



ESA Open-access to data

Classified data



ESA Open-access to data

Satellite image search

The screenshot displays the OpenPicus Browser interface. On the left, the 'SEARCH CRITERIA' section includes a 'Product name' field. Below it, the 'DATA SOURCES' section lists 'SENTINEL-1', 'SENTINEL-2' (checked), 'MSI' (checked), 'L1C', and 'L2A'. A 'TIME RANGE' section shows 'from: 2023-10-29' and 'until: 2023-11-29'. A 'SEARCH' button is at the bottom of the sidebar. The main area shows a satellite map of Košice, Slovakia, with various geographical features and roads. The interface includes a search bar at the top right and a sidebar with navigation tools.

ESA Open-access to data

Satellite image search

The screenshot displays the Openicus Browser interface for satellite image search. The top left corner shows the 'Openicus BROWSER' logo and a 'VISUALIZE' button. A search bar is located at the top center, with 'EN' and 'Login' buttons highlighted by red circles. Below the search bar, a list of search results is shown, each with details such as 'Mission: SENTINEL-2', 'Instrument: MSI', and 'Size'. The fourth result is highlighted with a red circle around its 'Visualize' button. To the right of the list is a map view showing the search area over Eastern Europe, with several blue rectangular overlays indicating the search regions. The map includes a search bar at the top right and various navigation controls on the right side.

Result ID	Mission	Instrument	Size	Sensing time
S2B_MSIL1C_20231125T094229_N0509_R036_T34UDU_20231125T102950_SAFE	SENTINEL-2	MSI	800MB	2023-11-25T09:42:29.024Z
S2B_MSIL2A_20231125T094229_N0509_R036_T34UDU_20231125T11940_SAFE	SENTINEL-2	MSI	1138MB	2023-11-25T09:42:29.024Z
S2B_MSIL2A_20231122T093219_N0509_R136_T34UDU_20231122T11801_SAFE	SENTINEL-2	MSI	244MB	2023-11-22T09:32:19.024Z
S2B_MSIL2A_20231122T093219_N0509_R136_T34UEU_20231122T11801_SAFE	SENTINEL-2	MSI	1140MB	2023-11-22T09:32:19.024Z
S2B_MSIL1C_20231122T093219_N0509_R136_T34UDU_20231122T102233_SAFE	SENTINEL-2	MSI	792MB	2023-11-22T09:32:19.024Z
S2B_MSIL1C_20231122T093219_N0509_R136_T34UFU_20231122T102233_SAFE	SENTINEL-2	MSI	807MB	2023-11-22T09:32:19.024Z
S2B_MSIL1C_20231122T093219_N0509_R136_T34UDU_20231122T102233_SAFE	SENTINEL-2	MSI	166MB	2023-11-22T09:32:19.024Z
S2A_MSIL2A_20231107T093201_N0509_R136_T34UEA_20231107T140003_SAFE	SENTINEL-2	MSI	867MB	2023-11-07T09:32:01.024Z
S2A_MSIL1C_20231107T093201_N0509_R136_T34UFA_20231107T113034_SAFE	SENTINEL-2	MSI	808MB	2023-11-07T09:32:01.024Z
S2A_MSIL2A_20231107T093201_N0509_R136_T34UFA_20231107T140003_SAFE	SENTINEL-2	MSI	1154MB	2023-11-07T09:32:01.024Z

ESA Open-access to data

Satellite image search

PRODUCT INFO

ATTRIBUTES

PREVIEW

FOOTPRINT

Download data files

Product id: [https://zipper.dataspace.copernicus.eu/odata/v1/Products\(a8ae3297-10ec-4cb8-8483-277ba410c132\)/\\$value](https://zipper.dataspace.copernicus.eu/odata/v1/Products(a8ae3297-10ec-4cb8-8483-277ba410c132)/$value)

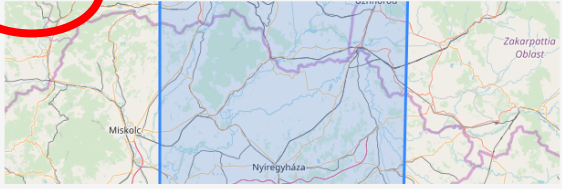
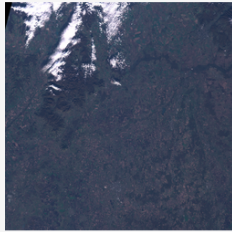
Workspace **Download**

Summary	
Name:	S2B_MSIL1C_20231122T093219_N0509_R136_T34UEU_20231122T102233.SAFE
Size:	792MB
Sensing time:	2023-11-22T09:32:19.024Z
Platform short name:	SENTINEL-2
Instrument short name:	MSI

Product	
Absolute orbit number:	35054
Acquisition mode:	INS-NOBS
Beginning date time:	2023-11-22T09:32:19.024Z
Cloud cover:	1.996036168096
datastripld:	S2B_OPER_MSIL1C_DS_2BPS_20231122T102233_S20231122T093215_N05.09
Ending date time:	2023-11-22T09:32:19.024Z
Modification date:	2023-11-22T12:39:05.640Z
Origin date:	2023-11-22T11:47:53.397Z
Processed by:	ESA
Processing date:	2023-11-22T10:22:33+00:00
Processing level:	S2MSI1C
Processor version:	05.09
Product group id:	GS2B_20231122T093219_035054_N05.09
Product type:	S2MSI1C
Publication date:	2023-11-22T12:36:42.942Z
Relative orbit number:	136
S3Path:	/eodata/Sentinel-2/MSI/L1C/2023/11/22/S2B_MSIL1C_20231122T093219_N0509_R136_T34UEU_20231122T102233.SAFE
Tile id:	34UEU

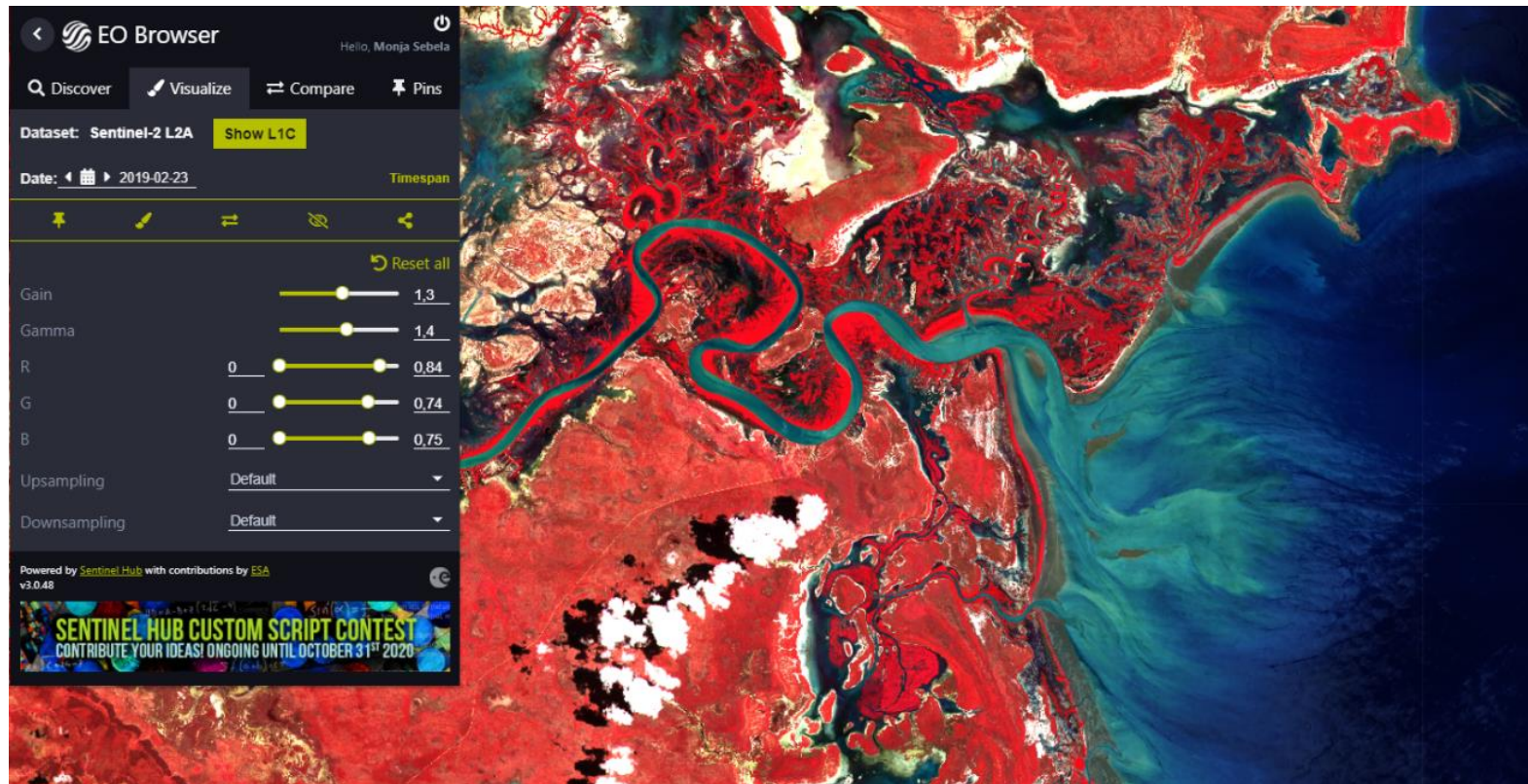
Instrument	
Instrument short name:	MSI

Platform	
Platform short name:	SENTINEL-2
Satellite platform:	B



Open-access to data Sentinel - 1,2,3

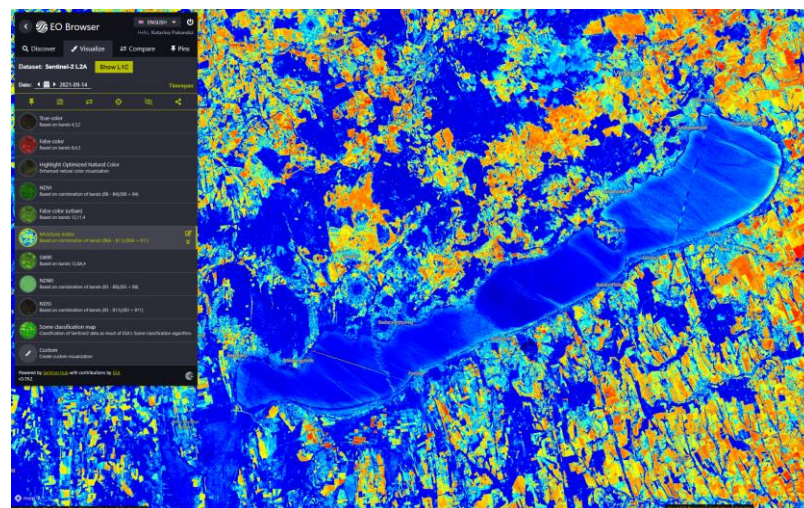
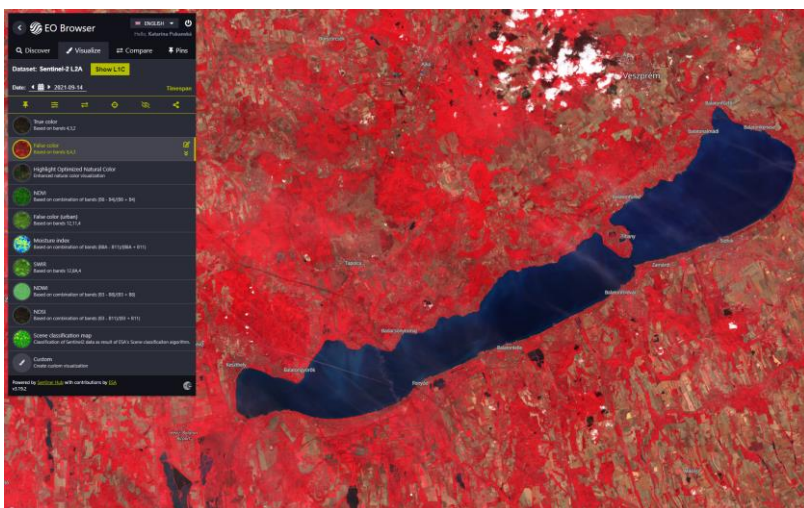
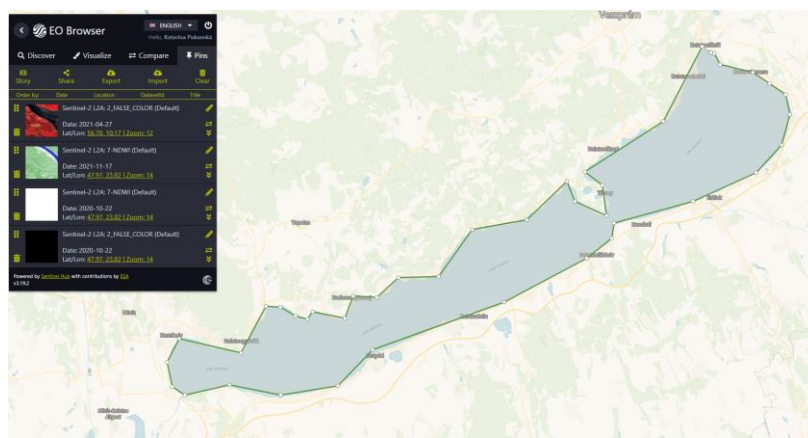
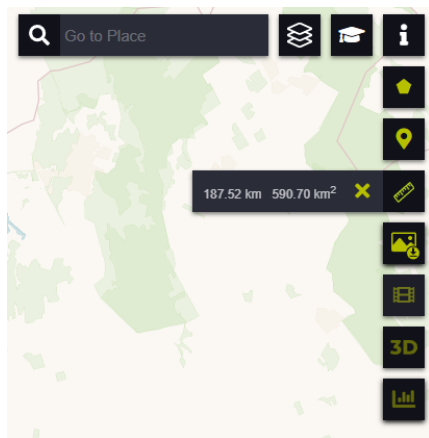
EO Browser



<https://apps.sentinel-hub.com/eo-browser>

Open-access to data Sentinel - 1,2,3

EO Browser



Open-access to data Sentinel - 1,2,3

EO Browser

Timelapse

📅 2021-08-14 - 📅 2021-09-14

filter by months

Select 1 image per:

orbit day week month year

Sentinel-2 L2A: NDWI

🔍 Search

➕ Add layers from pins

Visualisations

Min. tile coverage: 0%

Max. cloud coverage: 100%

Borders

Select All

2021-08-15 Sentinel-2 L2A NDWI
Coverage: 100%
Cloud cover: 21%

⏸ Speed: 1 fps Transition: None 1 / 7 ⚙️ [Download](#) [Share](#)

Archive data ESA & TPM

ESA & Third party missions

The screenshot displays the 'eo cat' web application interface. At the top, there is a navigation bar with links for Home, Settings, User Guide, Contact Us, and About. Below this, a search and filter panel is visible on the left, including a 'Keywords' section with a 'Reset all keywords' button and several dropdown menus for 'Envisat', 'Any Instrument', 'Any Instrument Type', and 'Any Earth Topic'. A search bar for 'Filter on dataset names...' is also present. The main area is a satellite map of Europe and the Mediterranean region, with a coordinate display in the top right corner showing '01°09'44" 31°15'30"'. A list of datasets is shown on the left side of the map, with several items checked, including 'Envisat ASAR AP Co- and Cross-polar L0 [ASA_A_ 125948]', 'Envisat ASAR IM Precision L1 [ASA_IMP_1P] 874716', and 'Envisat ASAR IM Single Look Complex L1 [ASA_I_ 874712]'. At the bottom, a timeline navigation bar shows years from 2008 to 2013, with specific months and days selected for each year. Below the timeline, there are search results for each year, all showing 'No search done'.

Archive data ESA & TPM

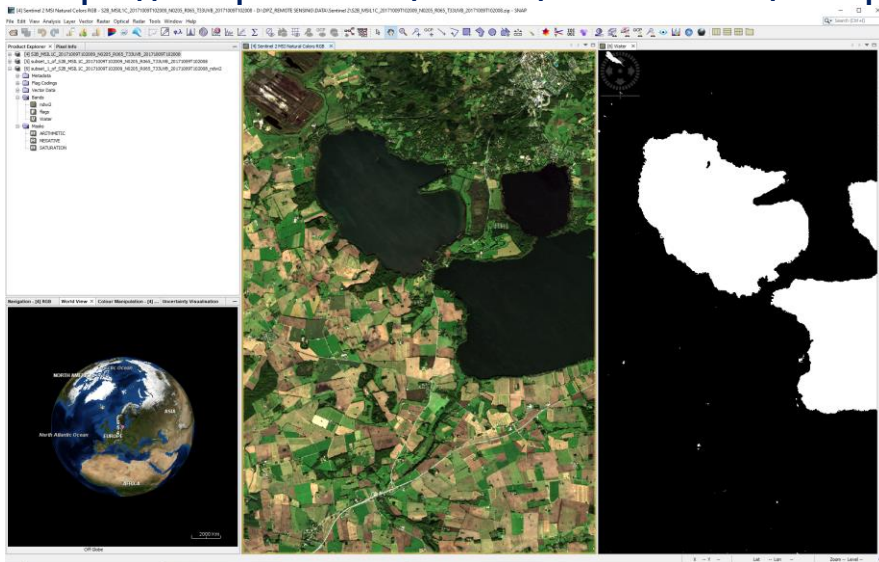
Third Party Missions

- Okamžitý prístup cez MyEarthNet, <https://earth.esa.int/web/guest/pi-community/myearthnet>
- Podaním návrhu, ktorý je hodnotený počas 6-8 týždňov a ak ja akceptovaný, žiadateľovi sa prideli kvóta produktov pre projekt. Podanie návrhu je možné realizovať na tomto linku: <https://earth.esa.int/webiguest/pi-community/>.
- Oznámenie o príležitosti (Announcement of Opportunity (AO)) – ESA vydá oznámenie pre konkrétne misie, resp. výskumné témy na oznámenú špecifickú príležitosť. Link: <https://earth.esa.int/webiguest/pi-community/apply-for-data/ao-s>

ESA SNAP

SeNtinel Applications Platform

<https://step.esa.int/main/download/snap-download>



	Windows 64-Bit	Windows 32-Bit	Mac OS X	Unix 64-bit
Sentinel Toolboxes	These installers contain the Sentinel-1, Sentinel-2, Sentinel-3 Toolboxes, download size is close to 900MB.			
	Main Download Mirror Download	Main Download Mirror Download	Main Download Mirror Download	Main Download Mirror Download
SMOS Toolbox	These installers contain only the SMOS Toolbox, download size is close to 500MB. Download also the Format Conversion Tool (Earth Explorer to NetCDF) and the user manual .			
	Main Download Mirror Download	Main Download Mirror Download	Main Download Mirror Download	Main Download Mirror Download
All Toolboxes	These installers contain the Sentinel-1, Sentinel-2, Sentinel-3 Toolboxes, SMOS and PROBA-V Toolbox, download size is close to 1GB.			
	Main Download Mirror Download	Main Download Mirror Download	Main Download Mirror Download	Main Download Mirror Download

Earth observation with ESA missions

<https://eo-esa.fberg.tuke.sk/>



[Domov](#) [O Projekte](#) [Prednášky](#) [Cvičenia](#) [Učebnica](#) [O Predmete](#) [Štúdium geodézie](#)

Dialkový prieskum Zeme misiami ESA

je univerzitný predmet vytvorený v spolupráci s Európskou vesmírnou agentúrou ESA v rámci 5. projektovej výzvy programu PECS (Plan for European Cooperating States)

Prednášky

Semestrálne prednášky o misiách ESA, spracovaní satelitných snímok a ich využití v oblasti geovied

Cvičenia

Praktické cvičenia zo spracovania satelitných dát v programovom prostredí SNAP

O predmete

Všetky praktické informácie o predmete a podmienkach jeho absolvovania

ČO ROBÍME

Vzdelávame nových užívateľov širokého spektra produktov ESA v oblasti dialkového prieskumu Zeme



Earth observation with ESA missions

<https://eo-esa.fberg.tuke.sk/>

Prednášky **Návody na cvičenia**

PREDNÁŠKA Č.1
ESA a jej vesmírne aktivity
• open access k dátam zo satelitných misií Sentinel Hub

PREDNÁŠKA Č.2
Elektromagnetické žiarenie

PREDNÁŠKA Č.3
Optický diaľkový prieskum Zeme
• Snímka
• Odrazivosť
• Sensory

CVIČENIE Č.1
Otvorený prístup k dátam z portálu Copernicus Open Access Hub

CVIČENIE Č.2
Detekcia vodných plôch použitím satelitov ESA

CVIČENIE Č.3
Detekcia aktívnych požiarov použitím družice Sentinel - 3

EARTH OBSERVATION WITH ESA MISSIONS
KATARÍNA PUKANSKÁ
KAROL BARTOŠ
ĽUBOMÍR KSENAK

DOWNLOAD

References

Books

European Space Technology master plan 2017

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