



Earth Observation for Ukraine (EO4UA)

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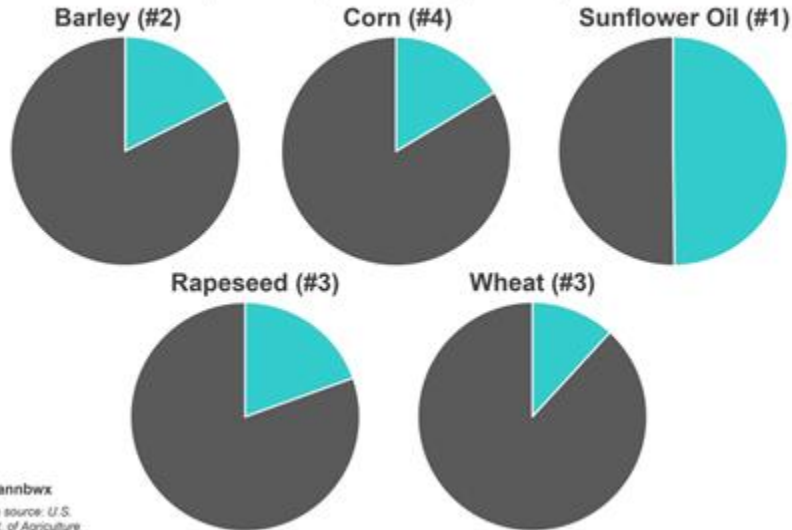
-
1. Introduction to CloudFerro and the EO4UA initiative by Jędrzej Bojanowski
 2. Technical details on EO4UA data and services by Jan Musiał
 3. Analysis of current status of agriculture in Ukraine by prof. Nataliia Kussul
 4. QA & Discussion

Ukraine is a granary of global importance

EO4UA

Ukraine's Projected Share of World Exports 2021/22

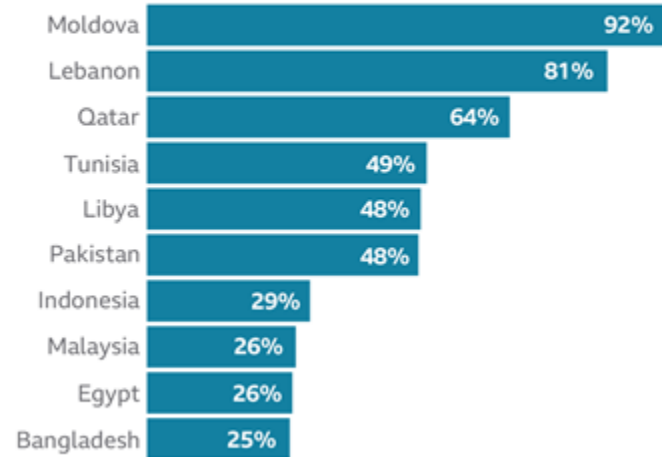
(Shown in teal; product ranking in parentheses)



@kannbwax
Data source: U.S.
Dept. of Agriculture

Ukraine plays crucial role in the global food supply

% of wheat imports sourced from Ukraine



Source: UN Food and Agriculture Organization, data for 2020

BBC

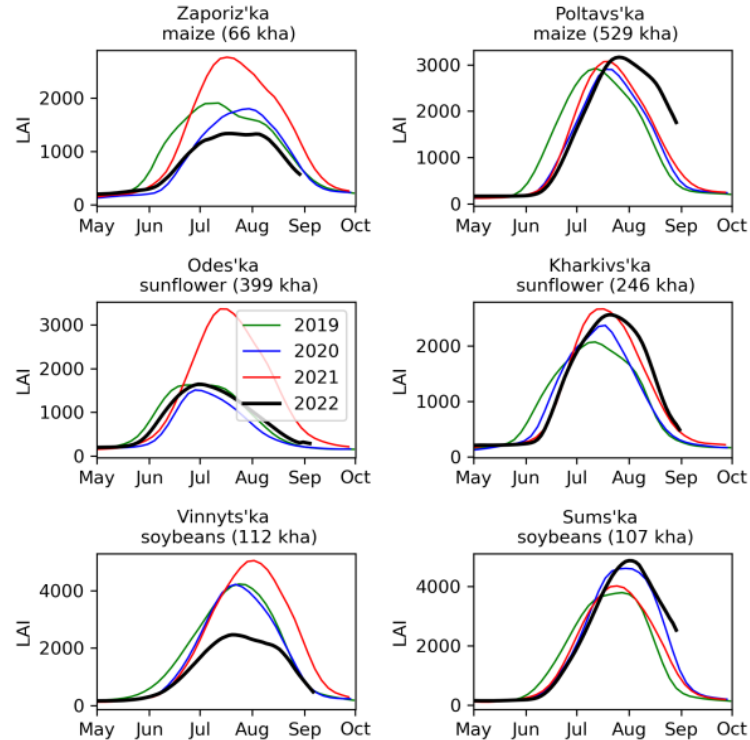


Figure 2. Leaf Area Index (LAI) profiles for maize, sunflower and soybean in selected oblasts. Trends are extracted for parcels identified for given crop type and compared to previous years.

The EO4UA is a bottom-up initiative that aims at:

- provisioning EO data and cloud services to our Ukrainian partners to allow them for continuing their research work
- supporting Ukrainian and international authorities in assessing environmental losses by provisioning processing capabilities combined with a large repository of satellite data and higher-level products generated by us and other EO4UA members
- processing, storing and sharing analysis ready data (e.g. Sentinels' imagery, boundaries of agricultural fields, etc.) which are indispensable for environmental analyses.
- storing and sharing products and analyses generated by EO4UA partners to facilitate consecutive studies.



Who we are and why we are the ideal initiator of EO4UA?



CREODIAS commissioned by ESA and European Commission – a public cloud computing platform enabling immediate and free access to >28PB online EO satellite data, together with user tools and resources for its processing;



WEkEO contracted by **EUMETSAT** – second DIAS built by CloudFerro, where we deliver cloud computing and storage services; platform provides meteorological satellite data, provided by the key EU entities: EUMETSAT, ECMWF, Mercator Ocean



EO Cloud for **ESA** – Earth Observation Innovation Platform Testbed

Climate Data Store

CDS ordered by **ECMWF** – hybrid cloud computing providing access to climate data, analyzes and forecasts in time and space scales, built and operated by CloudFerro



CODE-DE commissioned by **DLR** – a national EO platform providing easy and free access to EO data for Germany and efficient processing environment; users can benefit from a synergy with the CREODIAS platform that ensures efficient use of resources as well as an autonomy for key national processes

EO4UA members

EO4UA

Academia



Companies



Data platforms



EO data available within the EO4UA



Products available on the CREODIAS platform:

- Sentinel-1,-2,-3,-5, Landsat and other Copernicus products available via CREODIAS Finder and Browser

CREODIAS finder <https://finder.creodias.eu>

EO4UA

REST
query



finder.creodias.eu

CREODIAS powered by CloudFerro

Help Log In Register Cart (0)

SEARCH CRITERIA

Ukraine

Product identifier or path

observed 2022-05-01 2022-05-31

published YYYY-MM-DD YYYY-MM-DD

position latitude longitude

cloud cover 0-100 %

order products using: processor

show: all products

collections: <https://finder.creodias.eu/resto/api/collections/Sentinel2/>

Polygon Selection Upload Polygon

Point Selection Clear All

Search

search results

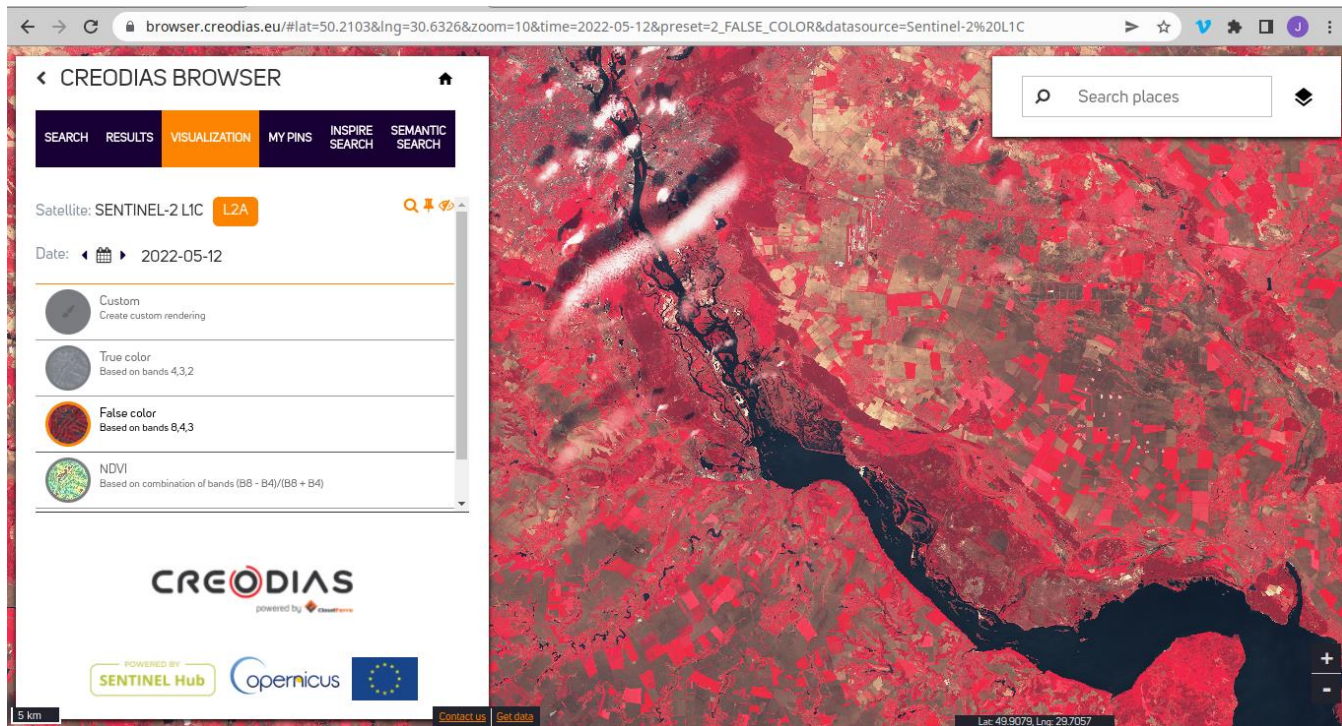
Title	Observation date	Publication date	Cloud %	File size
S2A_MSILIC_20220520T090601_N0400_R050_T35TPM_20220520T11124.S...	2022-05-20 09:06:01.024	2022-05-20 14:53:38.295432	68%	483ME
S2A_MSILIC_20220520T090601_N0400_R050_T36UUB_20220520T11124.S...	2022-05-20 09:06:01.024	2022-05-20 14:54:18.908814	88%	494ME
S2A_MSIL2A_20220520T090601_N0400_R050_T35UQT_20220520T135214...	2022-05-20 09:06:01.024	2022-05-20 15:31:53.576602	98%	854ME
S2A_MSILIC_20220520T090601_N0400_R050_T35UQR_20220520T11124.S...	2022-05-20 09:06:01.024	2022-05-20 14:49:08.181441	36%	532ME
S2A_MSIL2A_20220520T090601_N0400_R050_T35UNR_20220520T135214...	2022-05-20 09:06:01.024	2022-05-20 15:42:01.822149	53%	1017ME
S2A_MSIL2A_20220520T090601_N0400_R050_T36UUB_20220520T135214...	2022-05-20 09:06:01.024	2022-05-20 15:52:17.437589	98%	646ME
S2A_MSILIC_20220520T090601_N0400_R050_T35UPQ_20220520T11124.S...	2022-05-20 09:06:01.024	2022-05-20 14:56:23.414995	33%	752MB
S2A_MSILIC_20220520T090601_N0400_R050_T35UNT_20220520T11124.S...	2022-05-20 09:06:01.024	2022-05-20 14:49:02.185986	55%	607ME
S2A_MSIL2A_20220520T090601_N0400_R050_T35UNQ_20220520T135214...	2022-05-20 09:06:01.024	2022-05-20 15:48:03.98384	70%	987ME

showing 10 out of ca. 1990 total result(s)

copy all as paths copy all as uris add all to cart remove all from cart

CREODIAS browser <https://browser.creodias.eu>

EO4UA



EO data available within the EO4UA



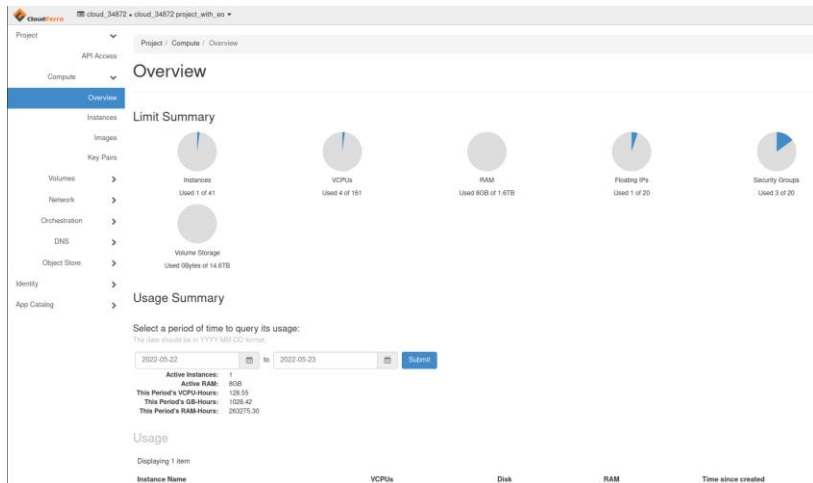
Products available on the CREODIAS platform:

- Sentinel-1,-2,-3,-5, Landsat and other Copernicus products available via CREODIAS Finder and Browser

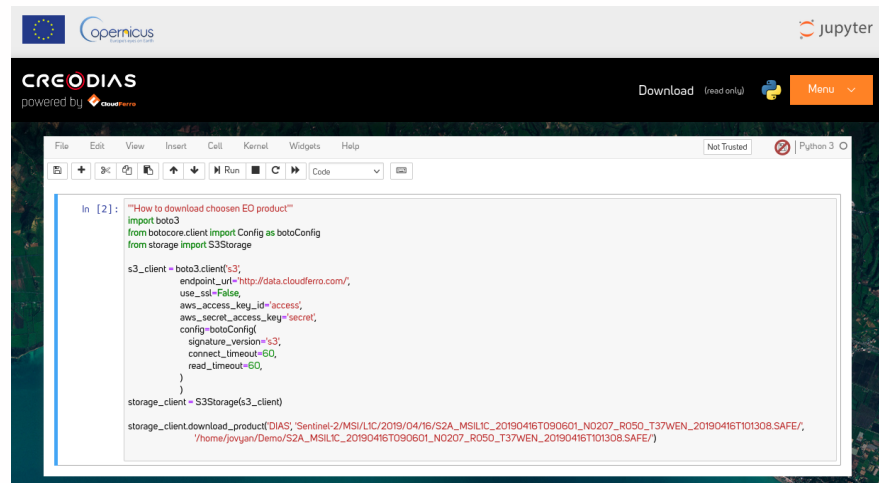
Products available within federated EO4UA repository:

- Sentinel-1 CARD-BS gamma0 backscatter (CloudFerro)
- Sentinel-1 coherence 12 days (Vista, JRC)
- Sentinel-2 MAJA Level-2A reflectance (CODE-DE) <- to be processed further
- Sentinel-2 WASP Level-3A mosaic (CloudFerro) <- to be generated
- In-situ data from JECAM network for Ukraine (Kyiv Polytechnic Institute)
- Crop Type Classification in Kyiv Region in 2021 (Kyiv Polytechnic Institute)
- Forest fires in Kyiv Region in March 2022 (Institute of Geodesy and Cartography)
- Agricultural field boundaries in years 2016-2022 from Sentinel-2 (Sentinel Hub)

Horizon platform to manage VMs



Jupyter Notebook



```
In [2]: "How to download chosen EO product"
import boto3
from boto3.client import Config as botoConfig
from storage import S3Storage

s3_client = boto3.client('s3',
    endpoint_url='http://data.cloudferro.com/',
    use_ssl=False,
    aws_access_key_id='access',
    aws_secret_access_key='secret',
    config=botoConfig(
        signature_version='s3',
        connect_timeout=60,
        read_timeout=60,
    )
)

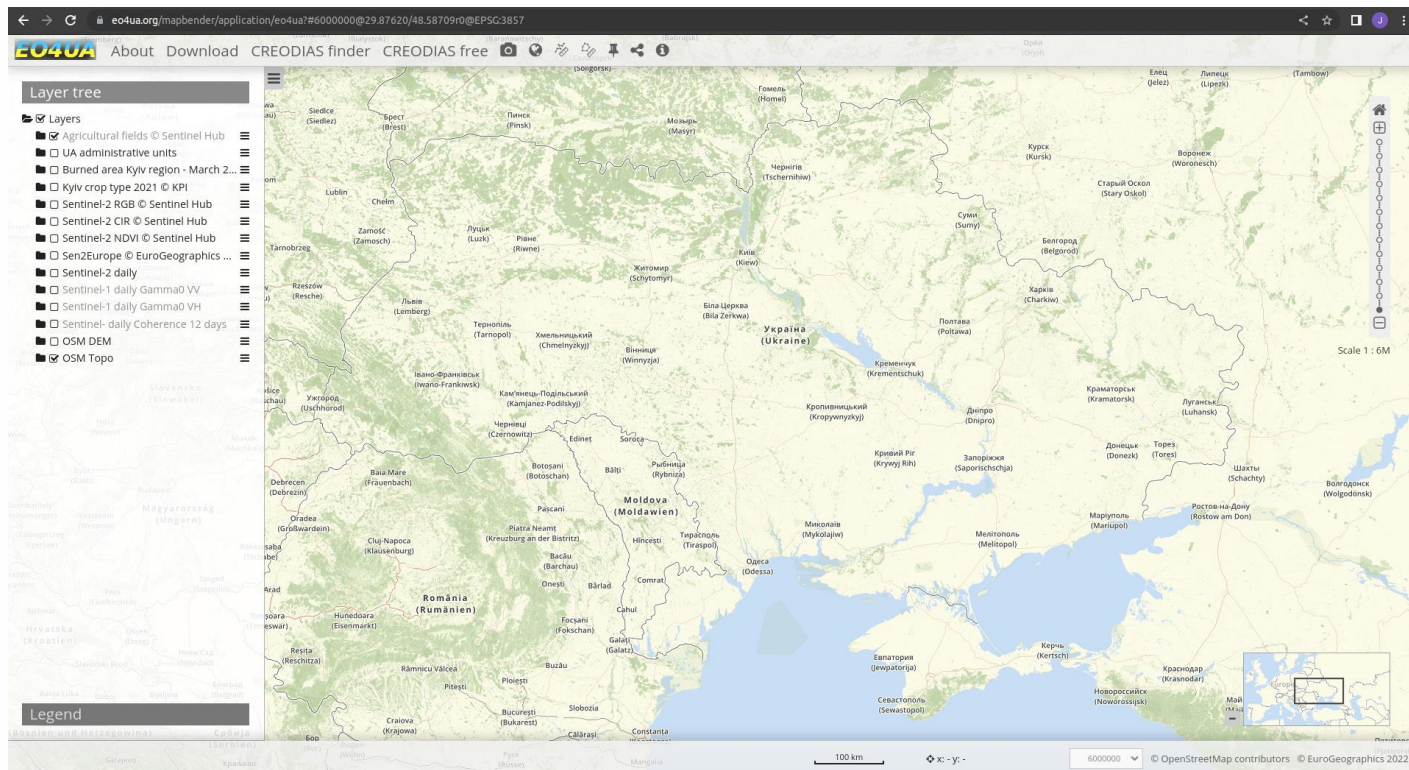
storage_client = S3Storage(s3_client)

storage_client.download_product('DIAS', 'Sentinel-2/MSI/LC/2019/04/16/S2A_MSILC_20190416T090601_N0207_R050_T37WEN_20190416T101308.SAFE',
    '/home/ferro/Demo/S2A_MSILC_20190416T090601_N0207_R050_T37WEN_20190416T101308.SAFE')
```

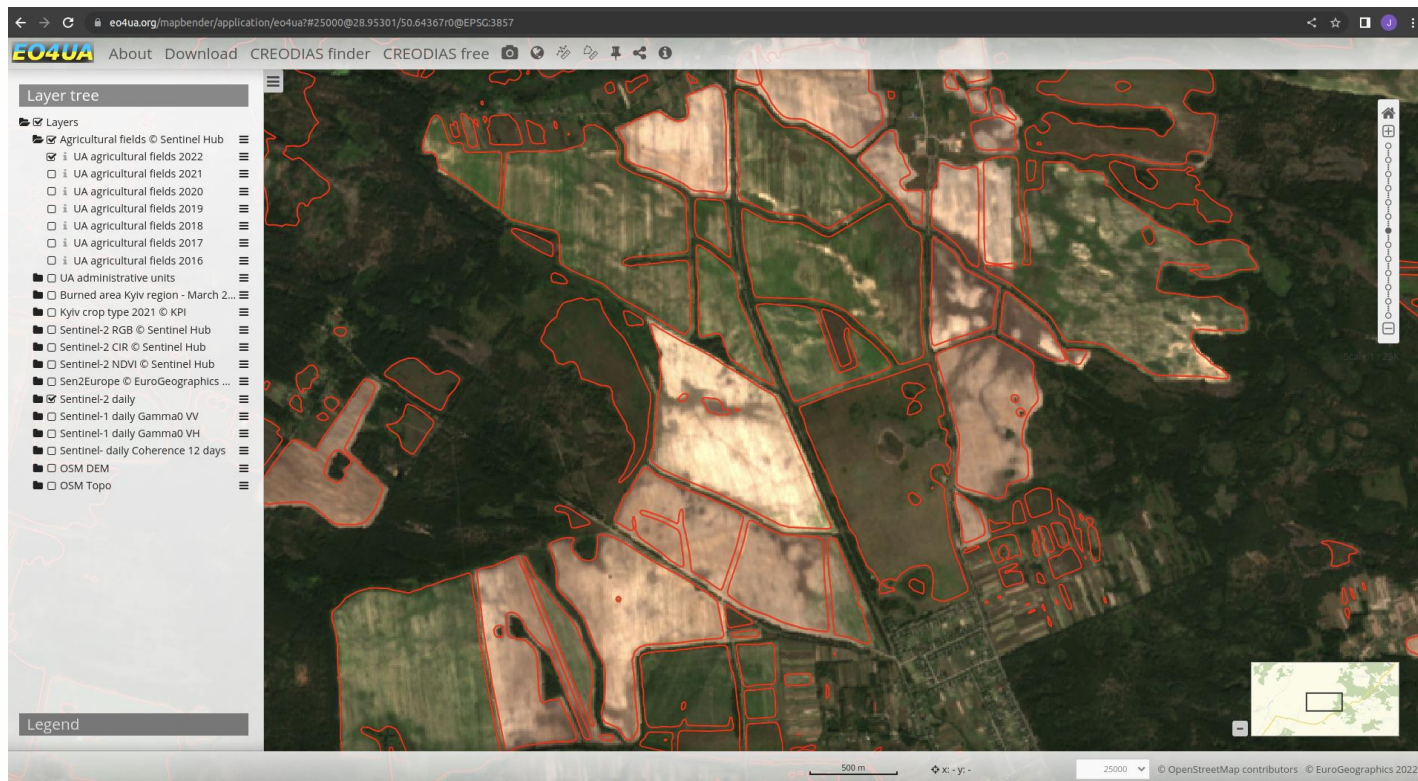
There is a possibility to test CREODIAS platform for free within 150 EUR limit. Tutorials/Webinars, on how to use CREODIAS cloud are available on YouTube.

EO4UA geoportal www.eo4ua.org

EO4UA

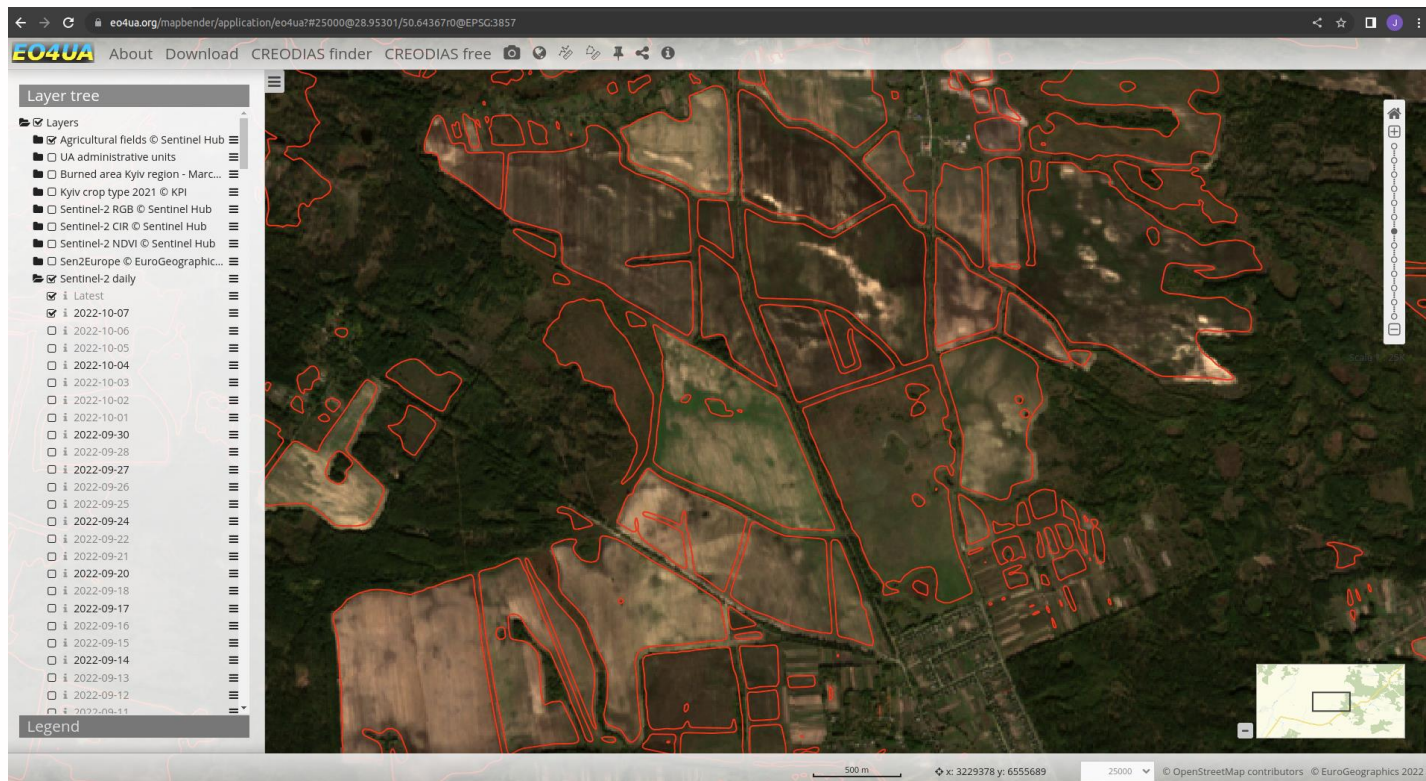


Agricultural fields from Sentinel-2



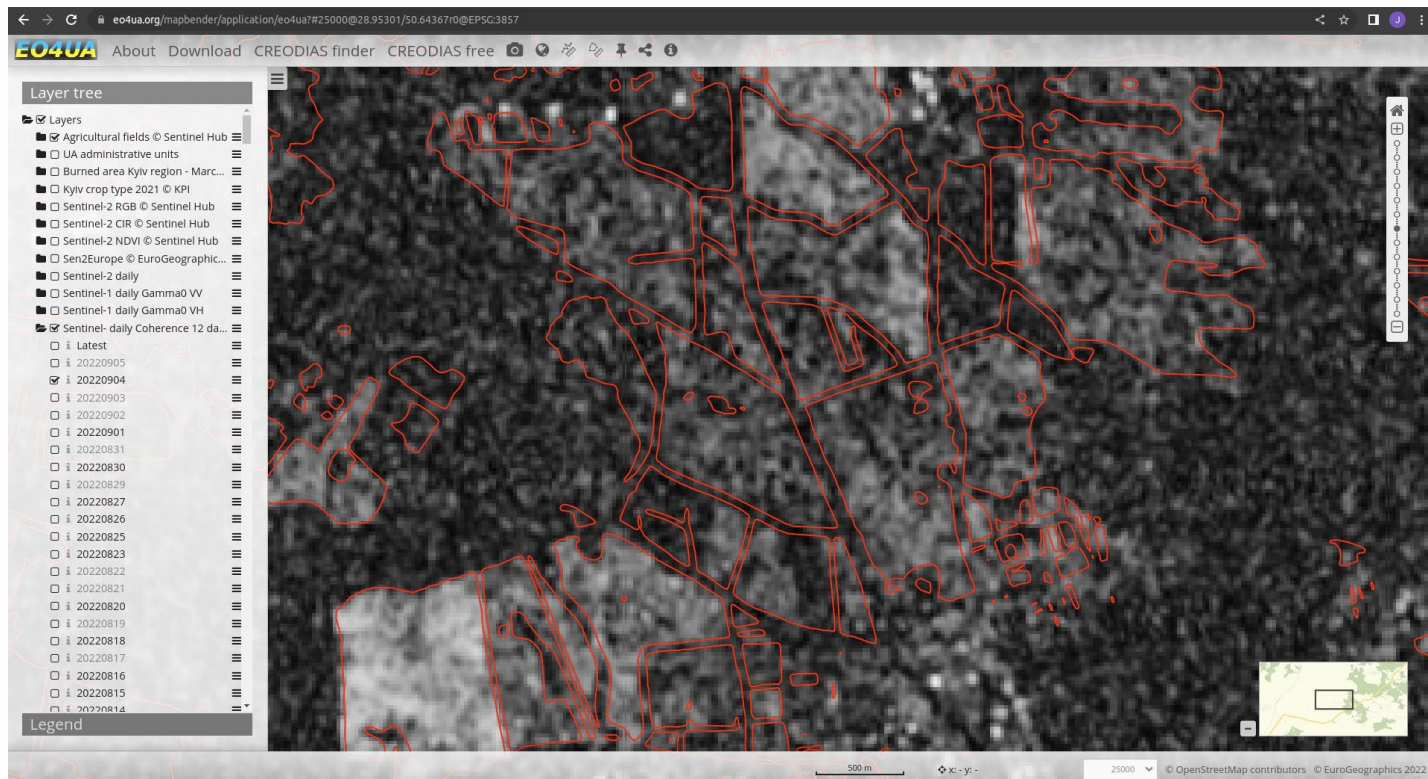
Daily! Sentinel-2 reflectance

EO4UA



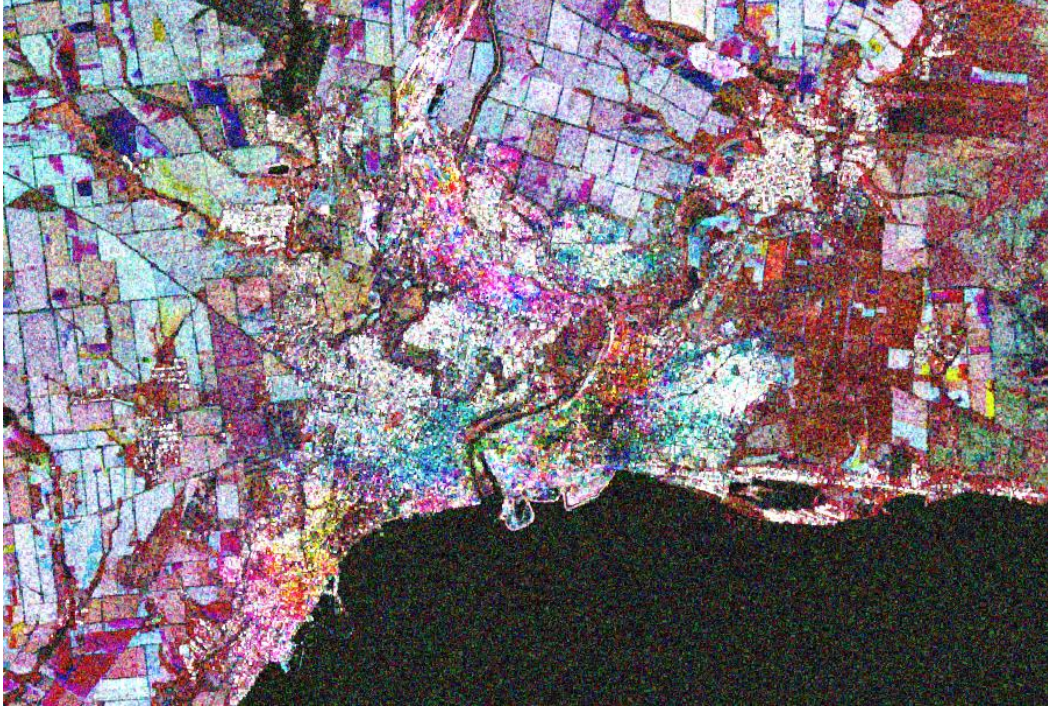
Daily Sentinel-1 backscatter & 12-days coherence

EO4UA



Analysis of war damage in Mariupol

EO4UA



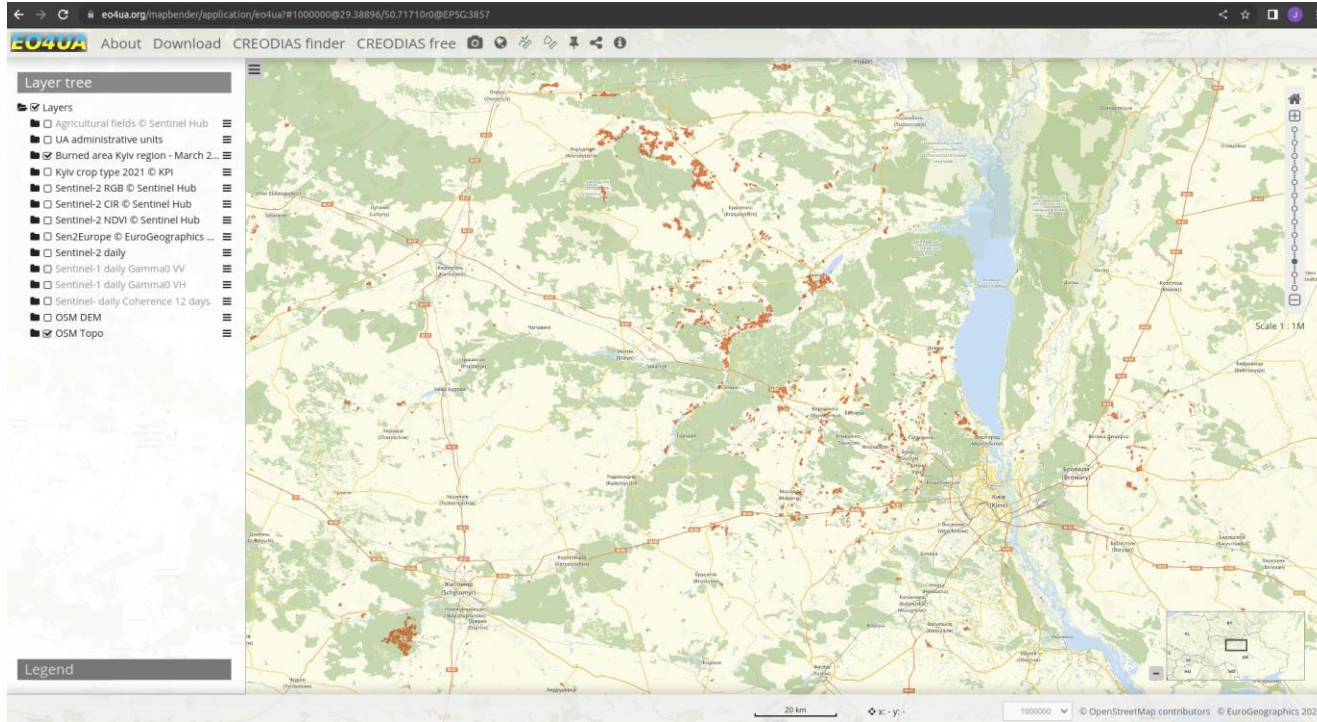
12-days S1A coherence composite highlighting Mariupol destruction

March 16 - March 28, March 28 - April 9 and April 9 - April 21



Forest fires near Kyiv – March 2022

EO4UA



<https://inconada.eu>

How to access data? 1-st method

EO4UA

The screenshot displays the EO4UA web application in a browser window. The address bar shows the URL: `eo4ua.org/mapbender/application/eo4ua?6000000@29.87620/48.58769r0@EPSG:3857`. The browser's navigation bar includes links for "About", "Download", "CREODIAS finder", and "CREODIAS free".

On the left side of the application, there is a "Layer tree" panel. It lists various data layers with checkboxes. The "OSM DEM" layer is selected. Other visible layers include "Agricultural fields © Sentinel Hub", "UA administrative units", "Burned area Kyiv region - March 2...", "Kyiv crop type 2021 © KPI", "Sentinel-2 RGB © Sentinel Hub", "Sentinel-2 CIR © Sentinel Hub", "Sentinel-2 NDVI © Sentinel Hub", "Sen2Europe © EuroGeographics...", "Sentinel-2 daily", "Sentinel-1 daily Gamma0 VV", "Sentinel-1 daily Gamma0 VH", "Sentinel-1 DEM Coherence 12 days", "OSM DEM", and "OSM Topo".

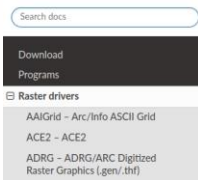
The main area of the application is a map of Ukraine and surrounding regions (Romania, Moldova, Belarus). The map is overlaid with a grid and shows various geographical features. A scale bar at the bottom right indicates a scale of 1:6M. The map is credited to "OpenStreetMap contributors" and "EuroGeographics 2022".

In the foreground, a file save dialog is open. The title bar says "Enter name of file to save to...". The "Name" field contains "EO4UA.zip". The dialog shows a file explorer view with a list of files and folders. The "Temp" folder is selected. The "Save" button is highlighted.

Entire EO4UA repository is zipped? How is it possible? **EO4UA**

Zippped EO4UA repository... ... contains VRT text files

VRT headers points to...



GDAL documentation • Raster drivers • VRT - GDAL Virtual Format

Previous

VRT - GDAL Virtual Format

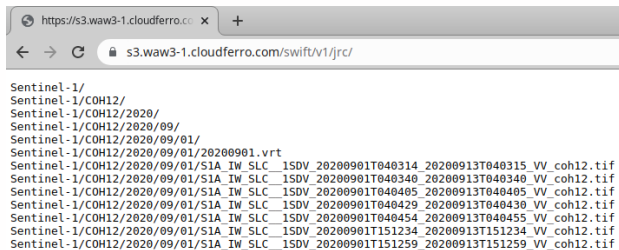
Driver short name

VRT

✓ Driver built-in by default

This driver is built-in by default

... COG files in S3 CREODIAS storage



Cloud optimized formats suitable for streaming

COG for rasters



Search docs

Download
Programs

☐ Raster drivers

- AAIGrid - Arc/Info ASCII Grid
- ACE2 - ACE2
- ADRG - ADRG/ARC Digitized Raster Graphics (.gen/.thf)
- AIG - Arc/Info Binary Grid

GDAL documentation » Raster drivers » COG – Cloud Optimized GeoTIFF generator

⏪ Previous

COG – Cloud Optimized GeoTIFF generator

New in version 3.1.

Driver short name
COG

✓ Driver built-in by default

This driver is built-in by default

FlatGeobuf for vectors



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☐ Vector drivers

- AmigoCloud

GDAL documentation » Vector drivers » FlatGeobuf

⏪ Previous

FlatGeobuf

New in version 3.1.

Driver short name
FlatGeobuf

Important!! Cloud optimized formats requires GDAL ≥ 3.1
Make sure your QGIS has a recent GDAL version.

How to access data? 2-nd method

EO4UA repository can be directly mounted in file explorer using
Samba share = Windows network folder

On Unix systems type: `smb://data.eo4ua.org/eo4ua`

On old Windows systems type: `\\data.eo4ua.org\eo4ua`

Login: anonymous
password: none

Important!! On new Windows 10 and 11 Samba client is disabled by default!



EO4UA next steps

1. Supporting **Ukrainian** and international institutions/entities by centralizing more and more datasets for Ukraine and by offering cloud computing resources.
2. Adding meteo data for Ukraine for environmental (e.g. crop yields) modeling.
3. Involving new EO4UA members.
4. Seeking for long-term financing.
5. Development of WMS/WFS services based on Kubernetes to allow for scalability.
6. Creation of custom cloud computing environment dedicated to EO4UA based on Linux, STACK, Open Data Cube, OpenEO.

A hand wearing a blue nitrile glove is shown making a peace sign (V-sign) with the index and middle fingers extended. The hand is positioned on the left side of the frame. The background is a blurred image of the Ukrainian national flag, featuring horizontal stripes of blue and yellow. The text "EO4UA join us!" is overlaid on the right side of the image in a bold, yellow, sans-serif font.

EO4UA join us!