EuroSDR
European Spatial Data Research

Remote sensing and change detection with Sentinel time series data

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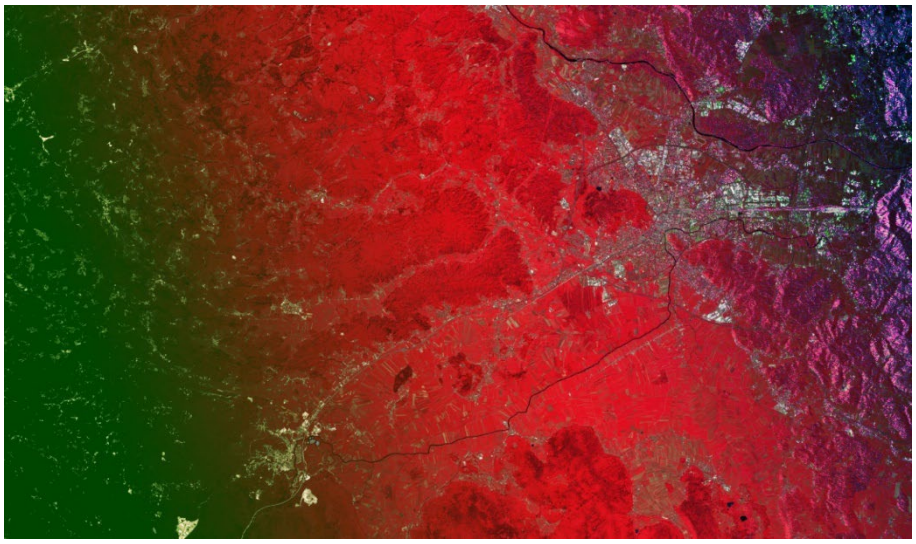
Target audience: Staff of national mapping agencies, researchers, academics, students, private companies

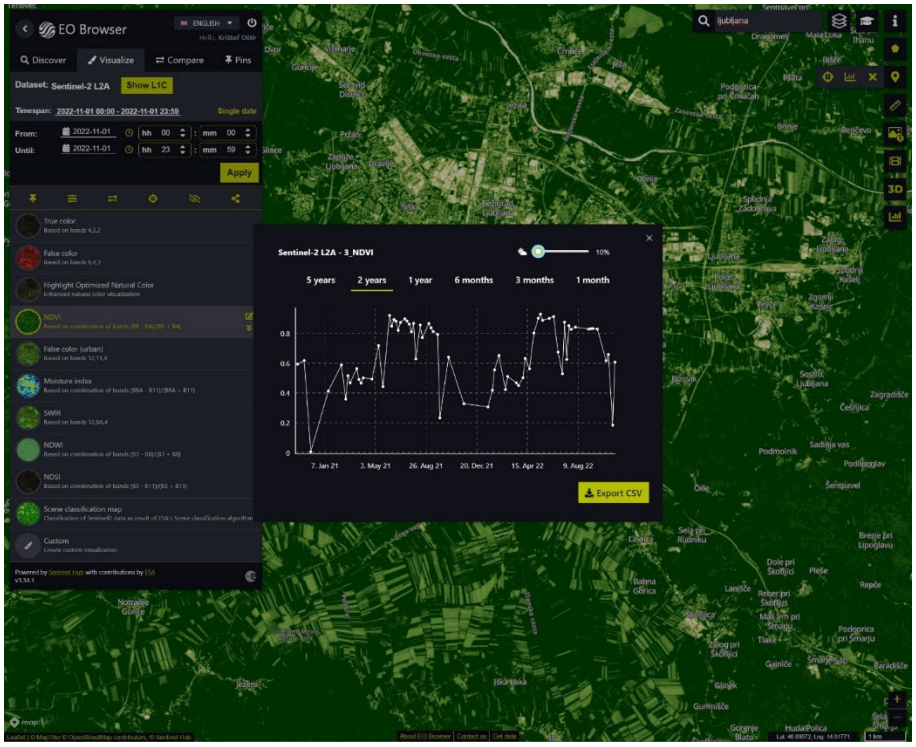
Prerequisites: Familiarity with satellite imagery and Earth observation

Course objectives: The course will introduce the latest developments and solutions for satellite imagery processing, with a particular focus on high resolution radar (Sentinel-1) and optical (Sentinel-2) data, from data access to time series processing using Jupyter Notebooks and the Sentinel Hub Statistical API. The course will include theoretical lectures and practical examples.

Topics covered: Sentinel (Copernicus) data, Sentinel Hub, time series analysis, machine learning

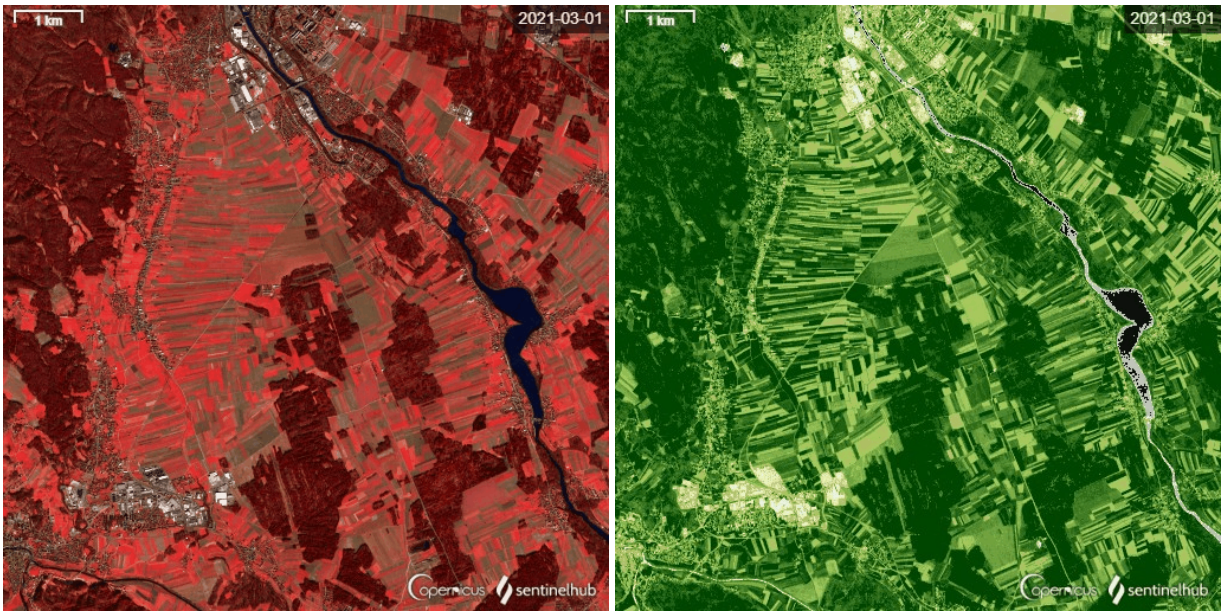


Module 1: Earth Observation and Copernicus
The first module focuses on Earth observation and its applications, with an emphasis on the Copernicus and Sentinel satellites. The basics of remote sensing are refreshed, followed by an introduction to the processing of optical and radar data and the use of time series.



Module 2: Sentinel Hub and EO Browser

The aim of this module is to prepare data for time series processing. We start with Copernicus Open Access Hub and demonstrate how to retrieve and process the data in SNAP. In the second step, Sentinel Hub is used to retrieve and download time series data with Jupyter Notebooks.

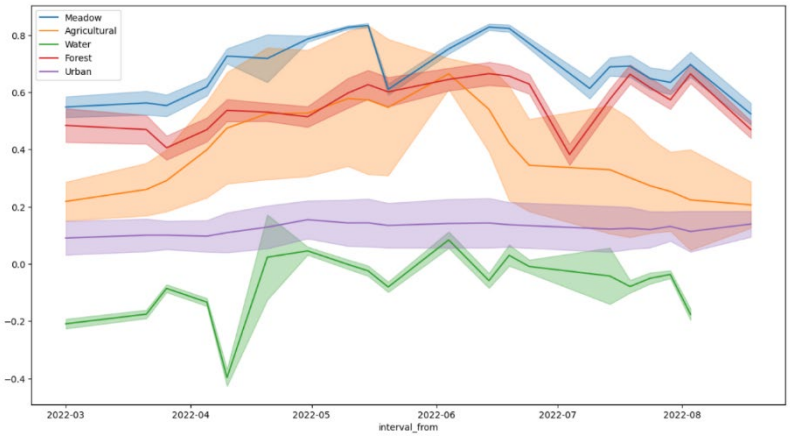


Module 3: Time Series Analysis

The final step focuses on processing satellite time series using the Sentinel Hub Statistical API. Participants will learn how to prepare time series data for selected areas (polygons), save them as data frames (tables), perform simple classification and change analysis using machine learning. Theoretical aspects will be supported by own exercises (own domain, area).

```
In [30]: fig, ax = plt.subplots(figsize=(15,8))
         #filtered = data[data.indices_CLP_mean<0.2]
         filtered = data[data.masks_CLM_mean<0.4]

         for idx, _type in enumerate(filtered.type.unique()):
             series = filtered[filtered.type==_type]
             series.plot(ax=ax, x='interval_from', y='indices_NDVI_mean', color=f'C{id
             ax.fill_between(series.interval_from.values, series.indices_NDVI_mean-ser
```



Access to Sentinel Hub will be provided for all participants.