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8 Raster Processing

a) Data Acquisition, Cloud Handling & Mosaicking basics

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Learning Objectives

Learn which preprocessing steps matter in a remote sensing study

Understand the theoretical basics of cloud masking and mosaicking

Practice how to acquire Sentinel-2 data via Sentinel Hub

Why do we preprocess Raster Data?

Clouds and shadows obscure surface features

Processing raw data improves accuracy for analysis

Combining multiple images provides better coverage

Sentinel-2 tiles do not always align perfectly

Common Preprocessing steps in GIS

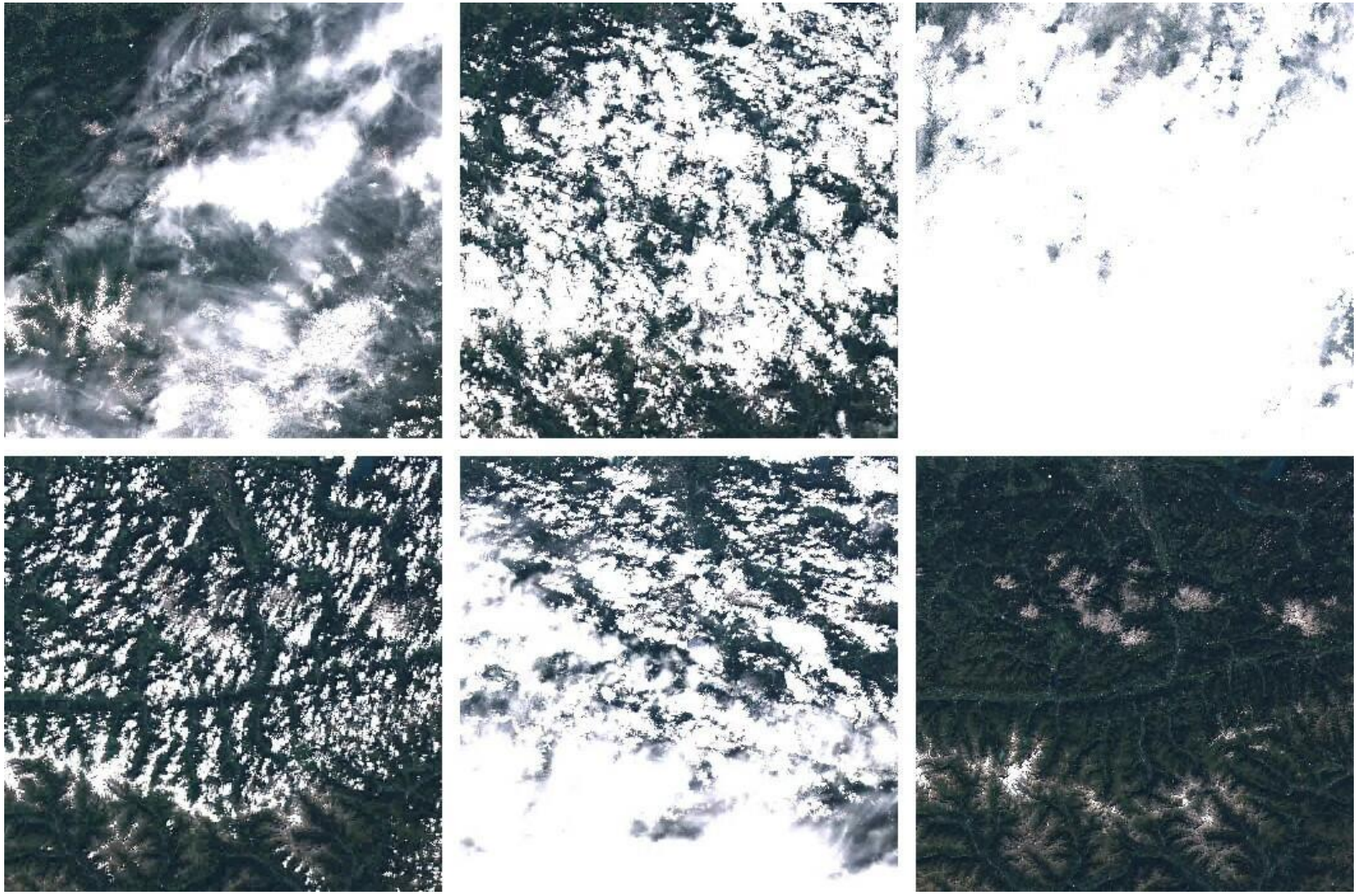
1. **Cloud Masking** – Remove unwanted cloud pixels
2. **Mosaicking** – Merge multiple Sentinel-2 tiles
3. **Clipping** – Focus on an Area of Interest
4. **Resampling** – Adjust pixel resolution
5. **Reprojection** – Align coordinate systems for consistency

Order of Preprocessing steps

- **Cloud Masking first** prevents contaminated pixels from affecting the mosaic
- **Mosaicking before clipping** ensures a continuous dataset before selecting an AOI
- **Reprojection after clipping** reduces unnecessary transformations on large datasets
- **Resampling last** ensures final compatibility with the analysis requirements

QGIS offers great tools for all of these steps!

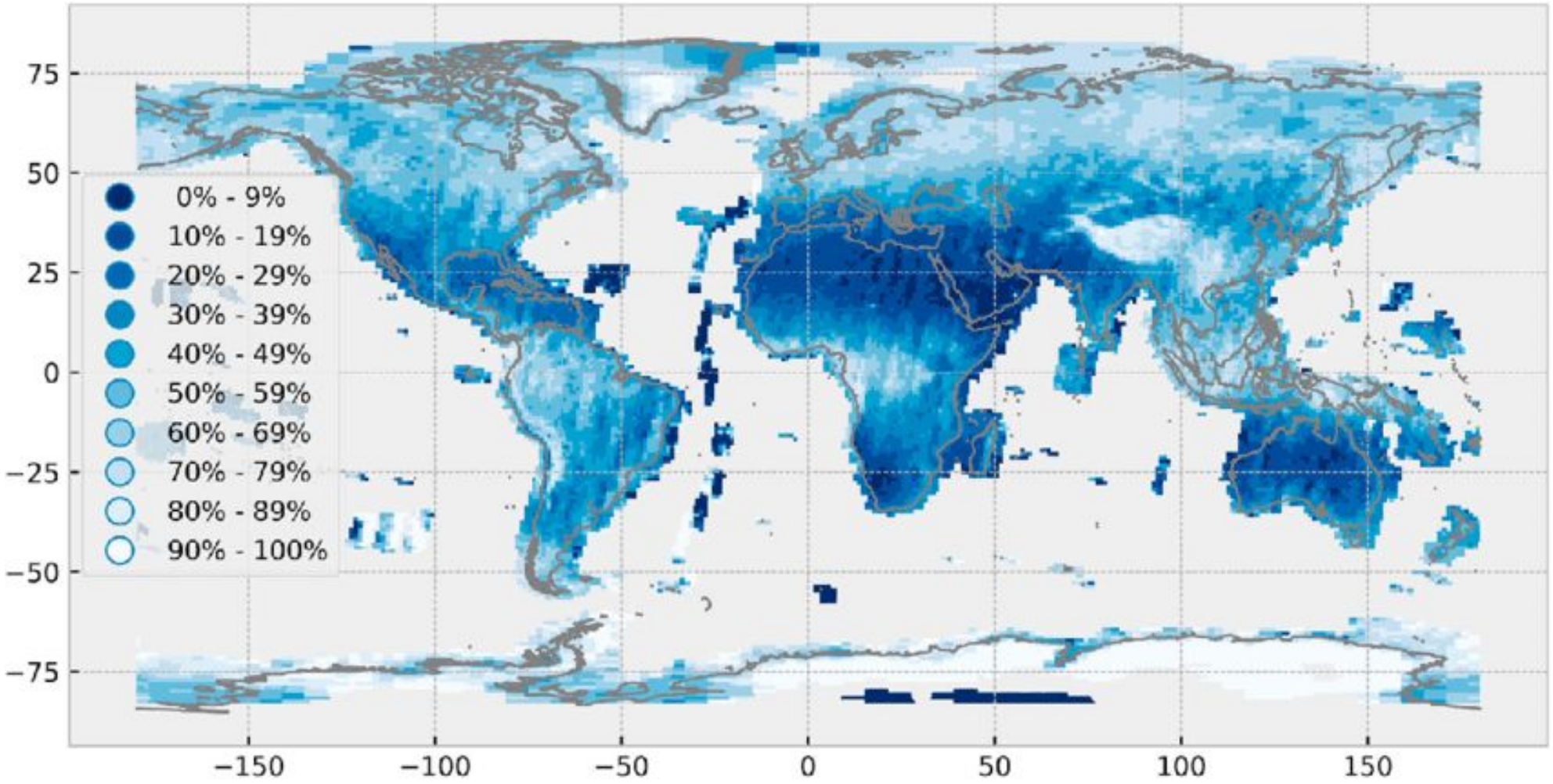
Cloud Coverage on Sentinel-2 Data



(Ungar 2017).

Cloud Coverage on Sentinel-2 Data

Global spatial distribution of the average cloud cover of Sentinel-2



(Sudmanns et al. 2019).

What is Mosaicking?

Mosaicking is the process of merging multiple raster tiles into a seamless image

Why is it needed?

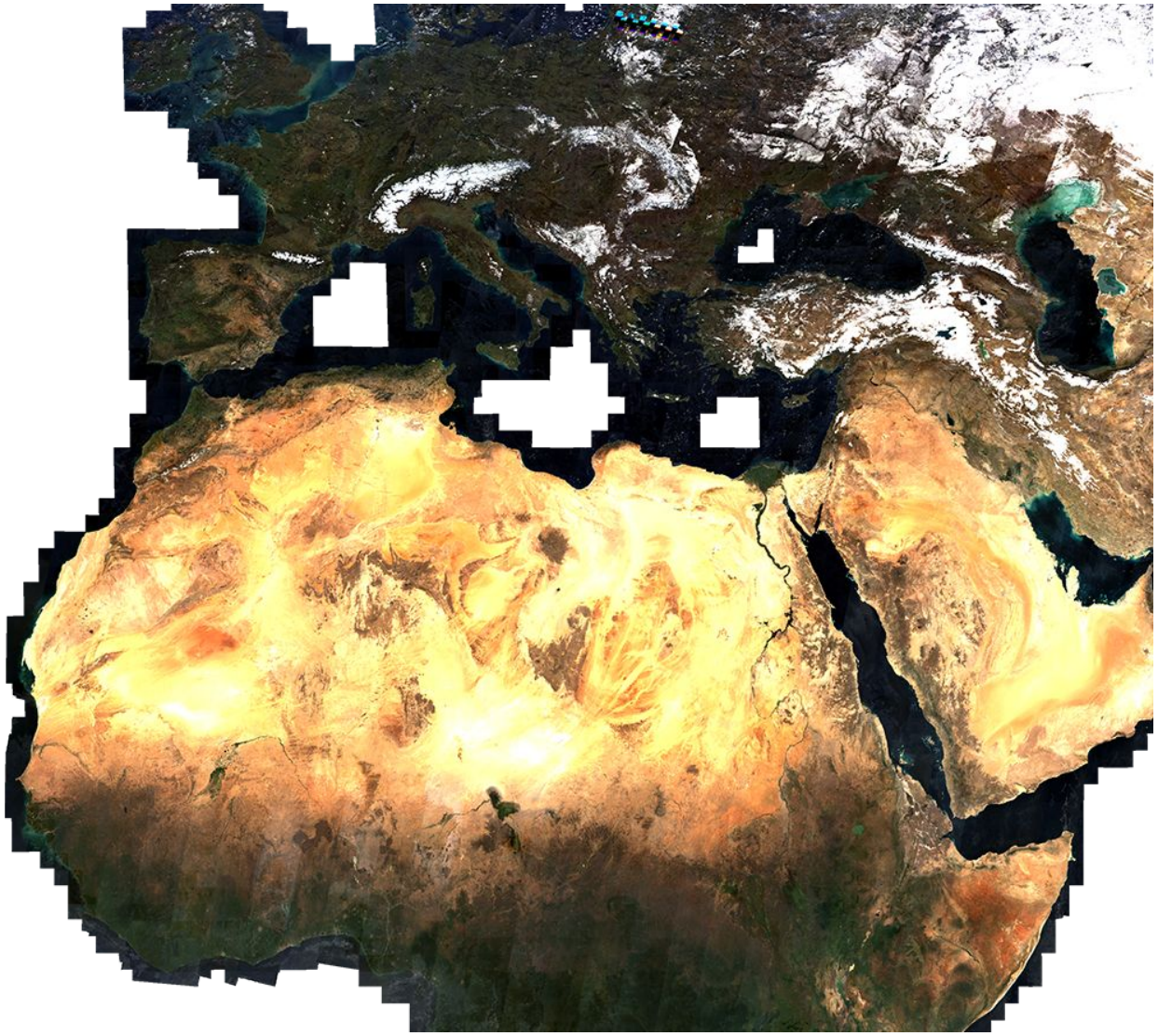
- Sentinel-2 and other satellite imagery come in separate tiles
- Large study areas require multiple images to cover the entire region
- Merging helps remove gaps and ensures spatial continuity

How does it work?

- Overlapping areas are blended using pixel values
- NoData values are handled to avoid gaps
- The output is a single, continuous raster dataset

Sentinel-2 Mosaic

Showing southern Europe and northern Africa



(Sentinel Hub n.d.).

Recap: Accessing Sentinel-2 Data

https://browser.dataspace.copernicus.eu

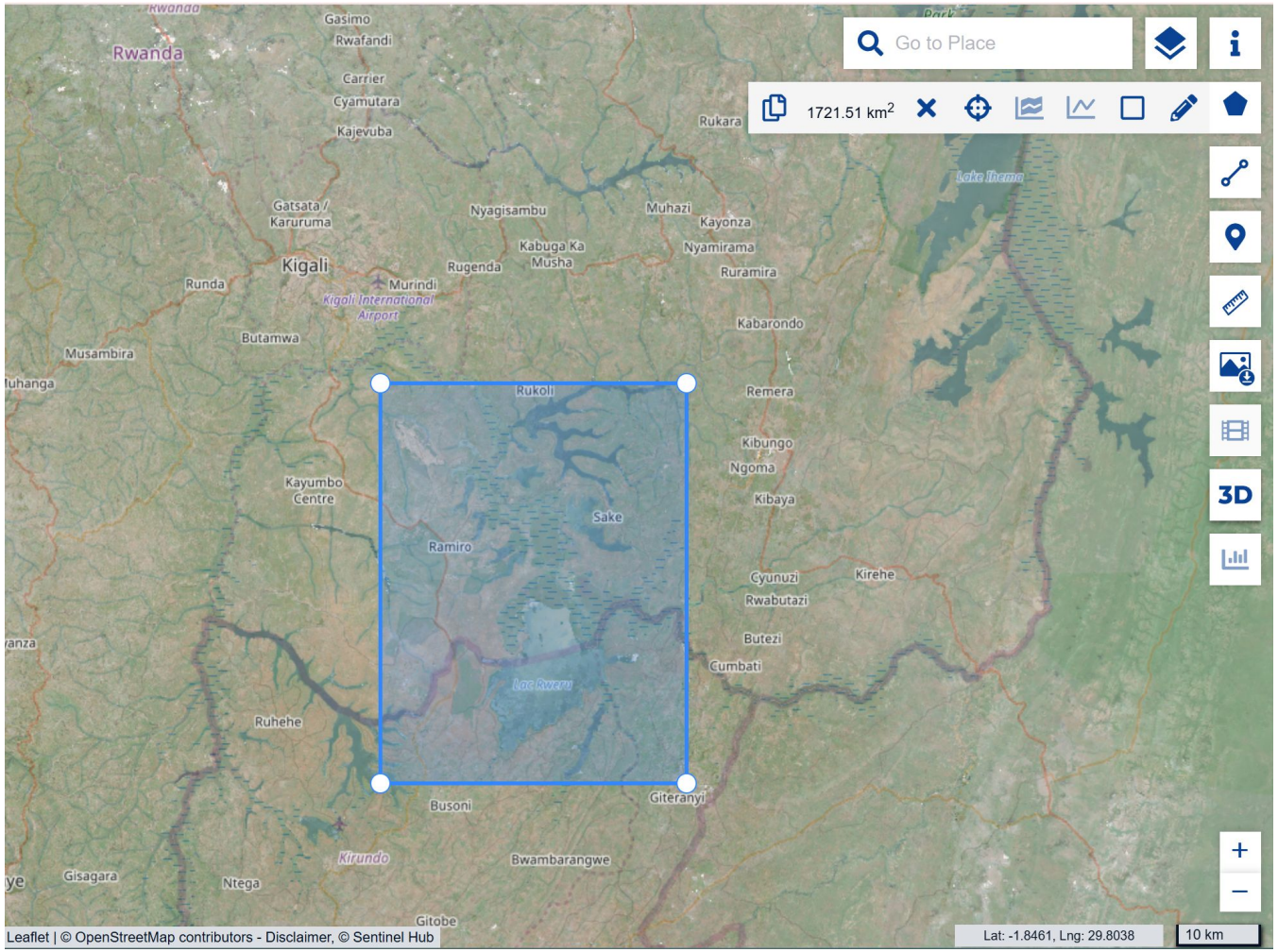
General Workflow:

1. Visit the Sentinel Browser
2. Define **Area of Interest (AOI)** using a bounding box or shapefile
3. Choose **Sentinel-2 L2A** for atmospherically corrected data
4. Filter by **date range** and **cloud cover**
5. Download in **GeoTIFF format** for QGIS compatibility

Recap: Accessing Sentinel-2 Data

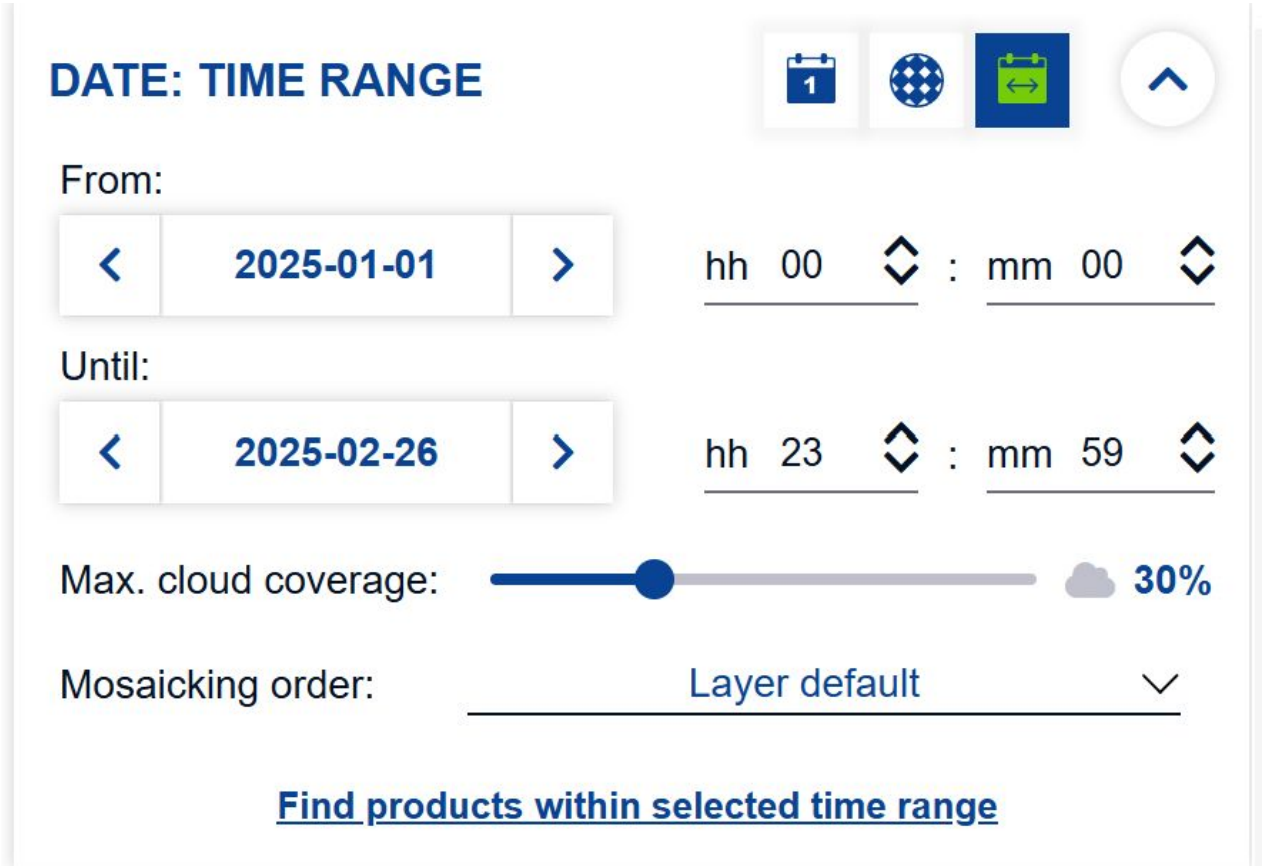
Select the Area of Interest (AOI)

In this case, I choose wetlands in Rwanda



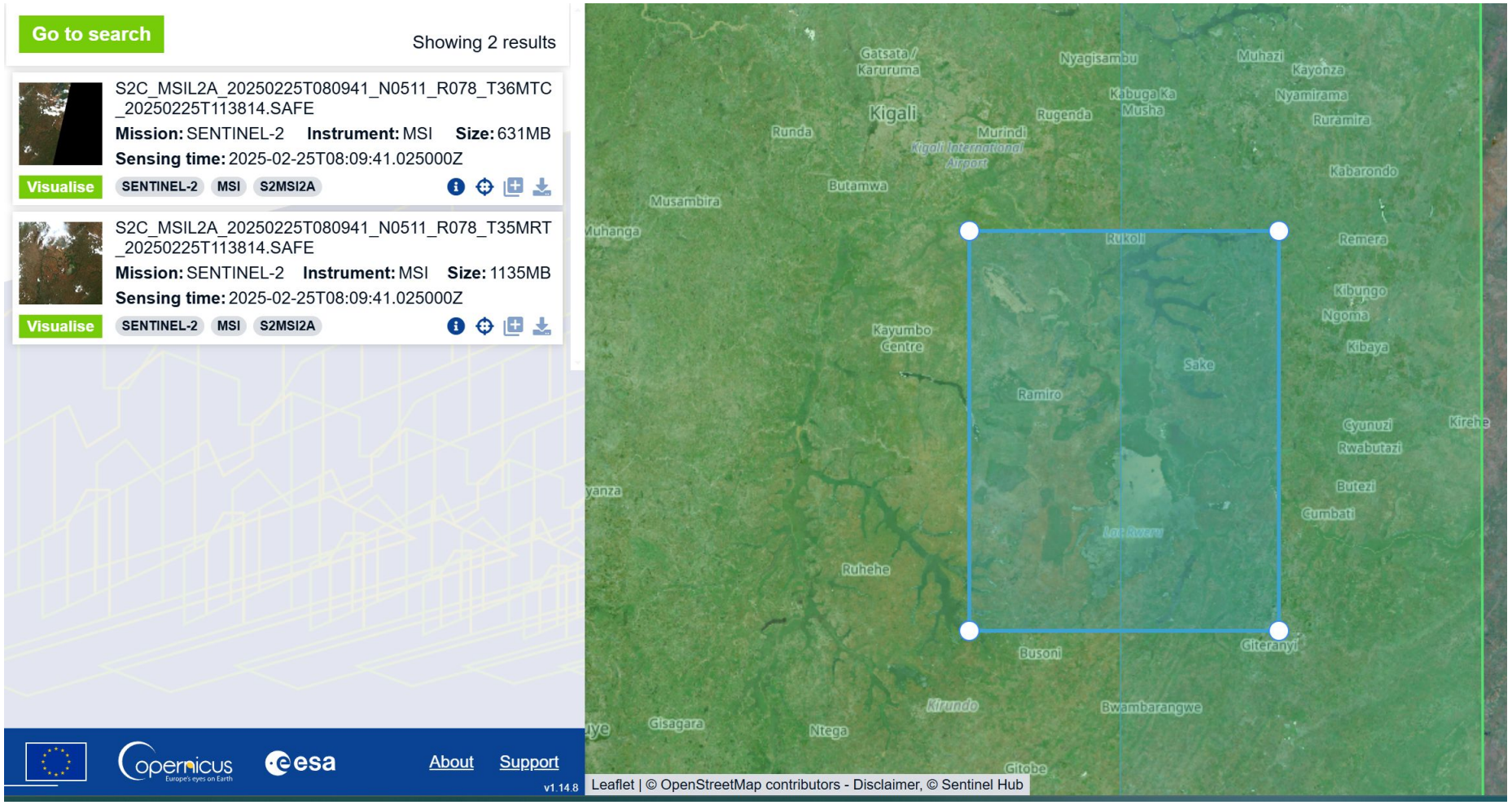
Recap: Accessing Sentinel-2 Data

Select date of image acquisition, cloud cover and mosacking order suitable to your study



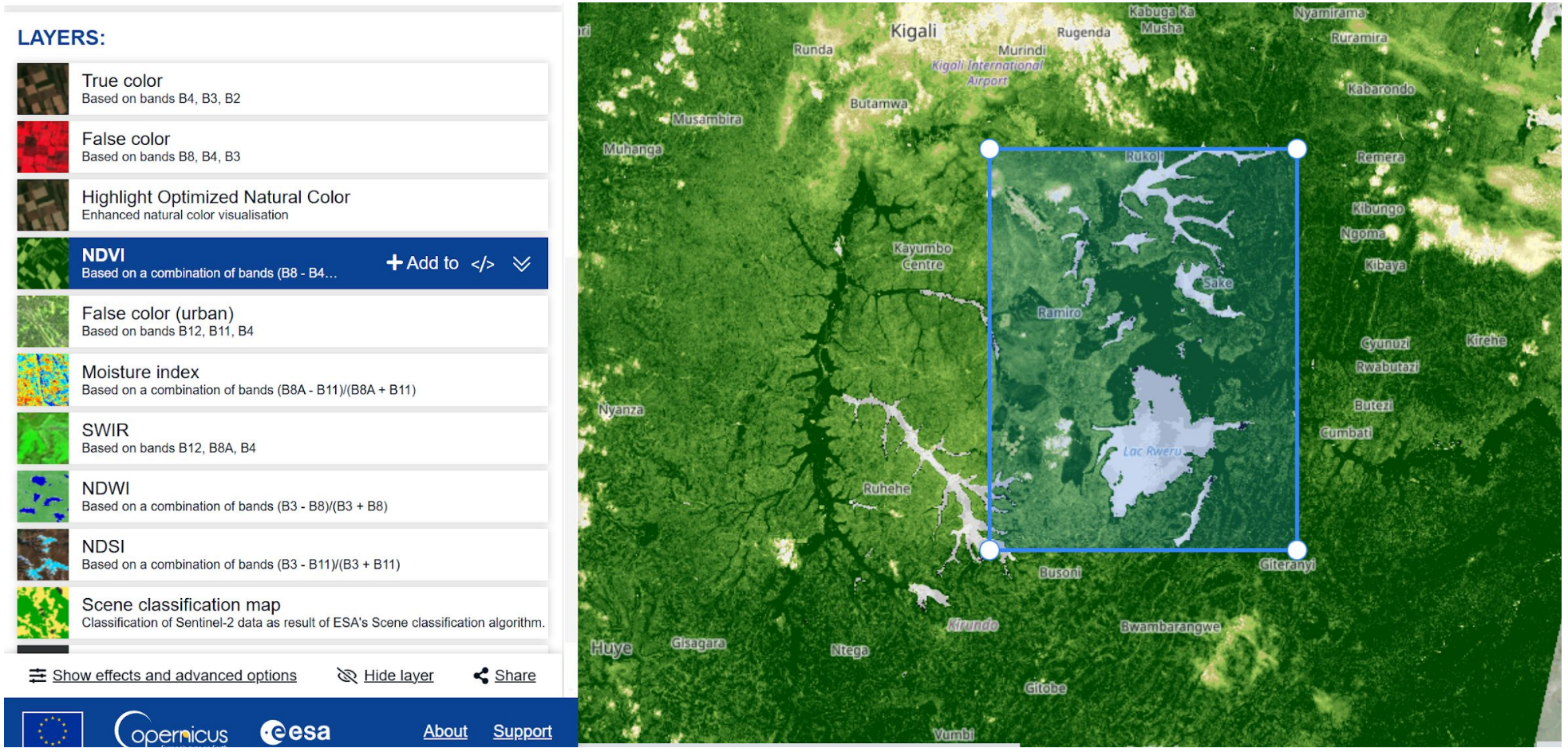
Recap: Accessing Sentinel-2 Data

Compare results and choose the image that best covers your AOI



Recap: Accessing Sentinel-2 Data

In the layers tab you can either choose the RGB image or finalised analysis products such as the NDVI



Recap: Accessing Sentinel-2 Data

Finally, if you are logged in to your account, you can download the scene.

Download a Sentinel-2 scene of your liking by following the steps outlined before.

Think of a study in which this scene might be useful.

Summary & Key Takeaways

Sentinel-2 data is easily accessible via **Copernicus Browser**

Cloud cover removal is essential for optical satellite imagery

Mosaicking combines multiple tiles for seamless analysis

QGIS provides user-friendly tools for raster preprocessing

Sources

Sudmanns, M., Tiede, D., Augustin, H., & Lang, S. (2019). Assessing global Sentinel-2 coverage dynamics and data availability for operational Earth observation (EO) applications using the EO-Compass. *International Journal of Digital Earth, 13(7),* 1-17. https://doi.org/10.1080/17538947.2019.1572799

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Thank you for your attention!

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