EOCap4Africa

8   Raster Processing

a) Data Acquisition, Cloud Handling & Mosaicing basics

Learning objectives

Learn which preprocessing steps matter in a remote sensing study

Understand the theoretical basics of cloud masking and mosaicing

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. **Mosaicing** – 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

- **Mosaicing 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!
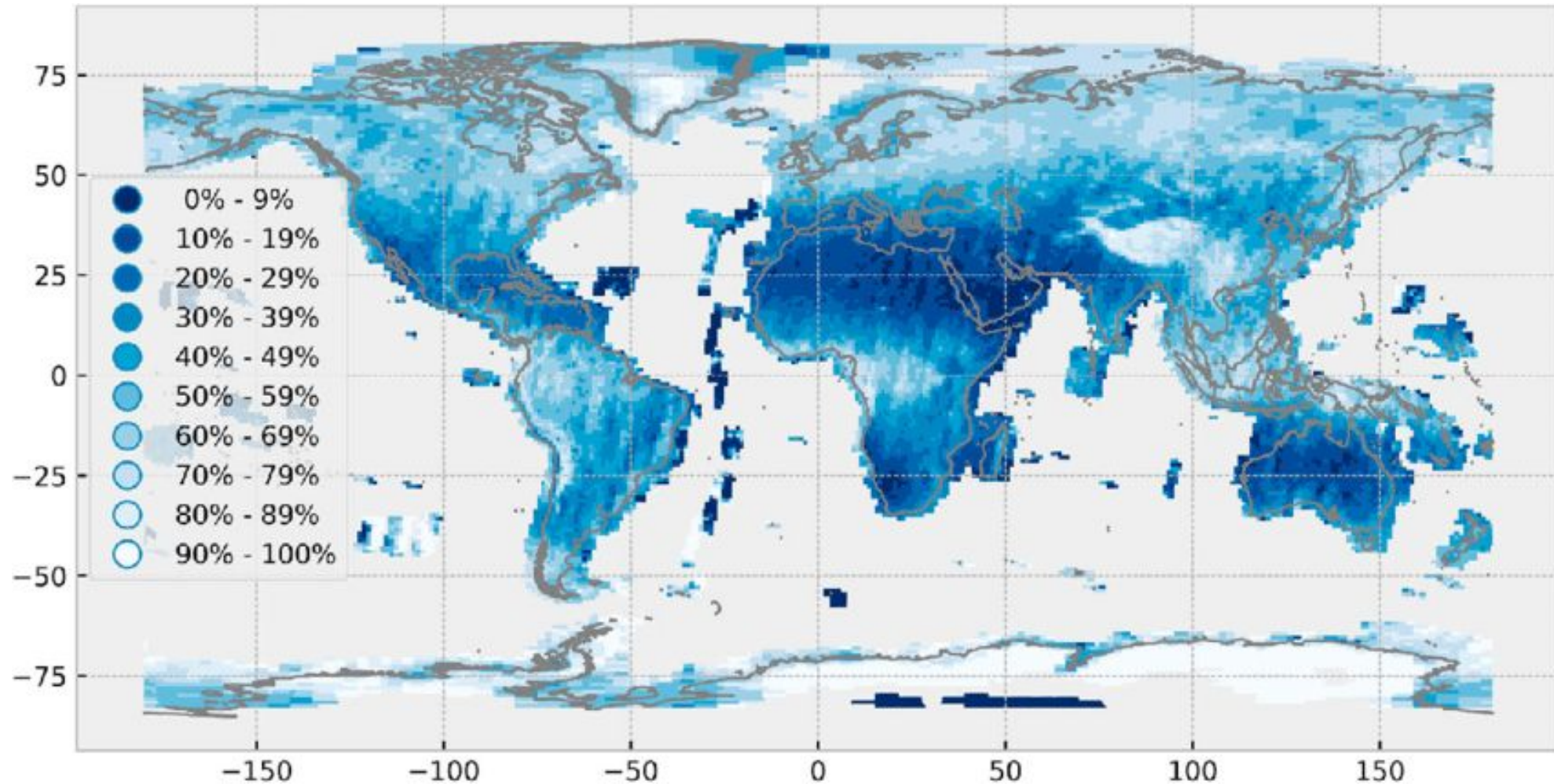
Cloud coverage on Sentinel-2 Data
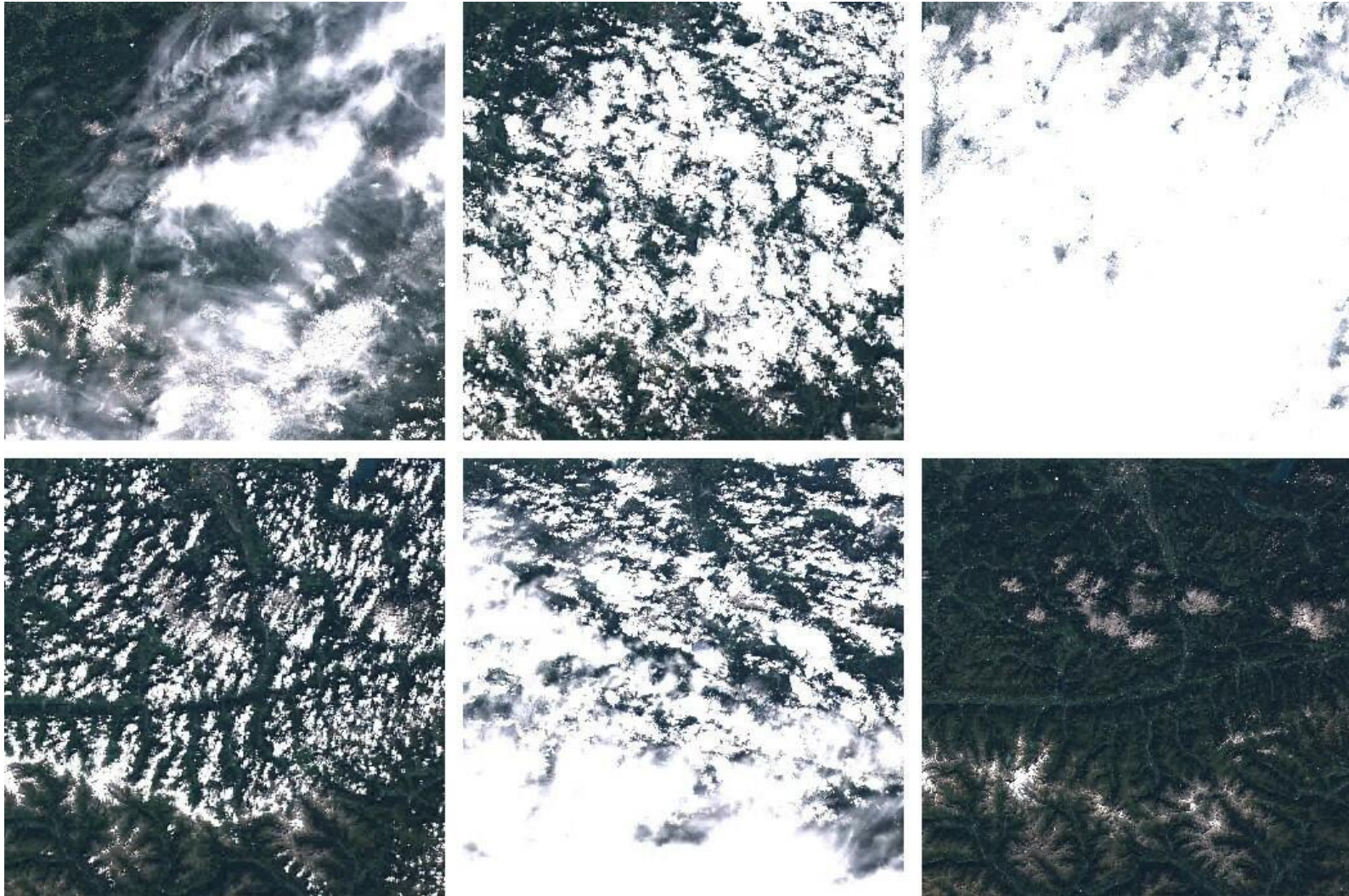
(Ungar 2017)

Cloud coverage on Sentinel-2 Data

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

(Sudmanns et al. 2019)

What is mosaicing?

Mosaicing 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
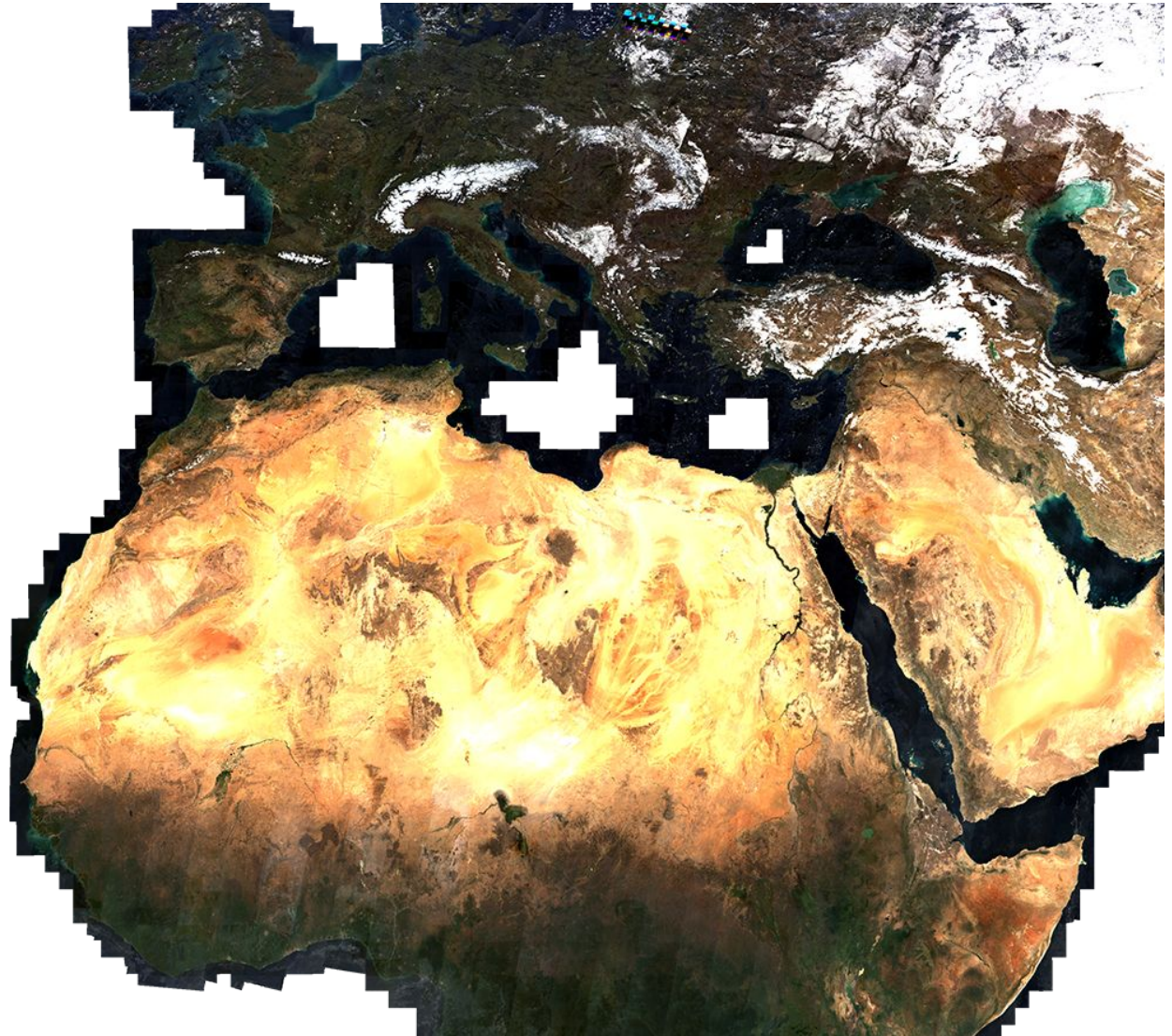
(Sentinel Hub n.d.)

Recap: Accessing Sentinel-2 data

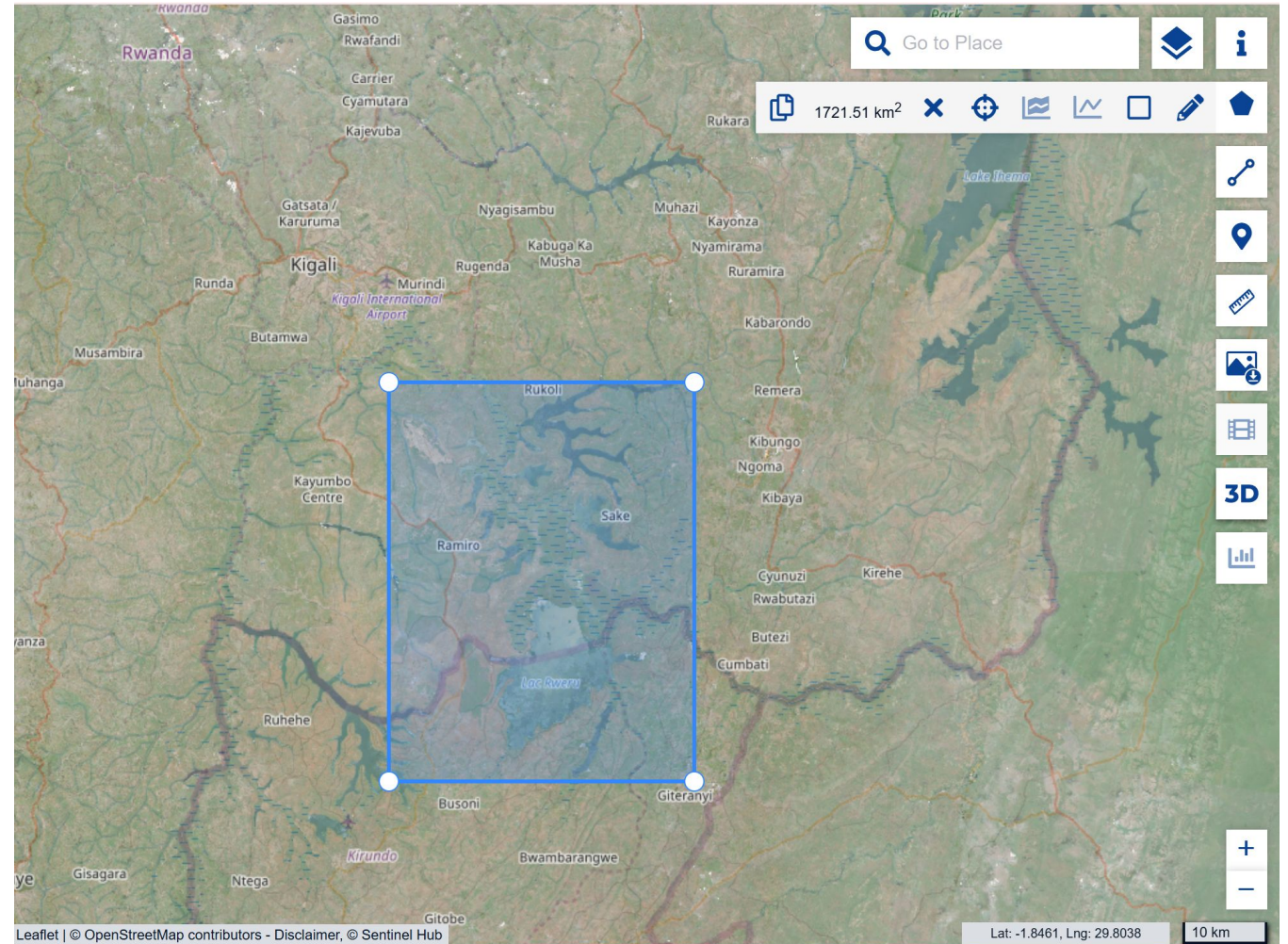https://browser.dataspace.copernicus.eu

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

DATE: TIME RANGE

From:

< 2025-01-01 > hh 00 : mm 00

Until:

< 2025-02-26 > hh 23 : mm 59

Max. cloud coverage: 30%

Mosaicking order: Layer default

Find products within selected time range

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 is essential for optical satellite imagery

Mosaicing 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

Ungar, J. (2017, March 6). Sentinel-2 cloudless. *EOX.* Retrieved from https://eox.at/2017/03/sentinel-2-cloudless/

Sentinel Hub. (n.d.). *True color mosaic – Sentinel-2 120m Mosaic.* Retrieved from https://custom-scripts.sentinel-hub.com/custom-scripts/sentinel2-120m-mosaic/true-color/

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Thank you for your attention!

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