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8 Raster Processing

a) Data Acquisition, Cloud Handling & Mosaicing basics



INES Ruhengeri
Institute of Applied Sciences



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

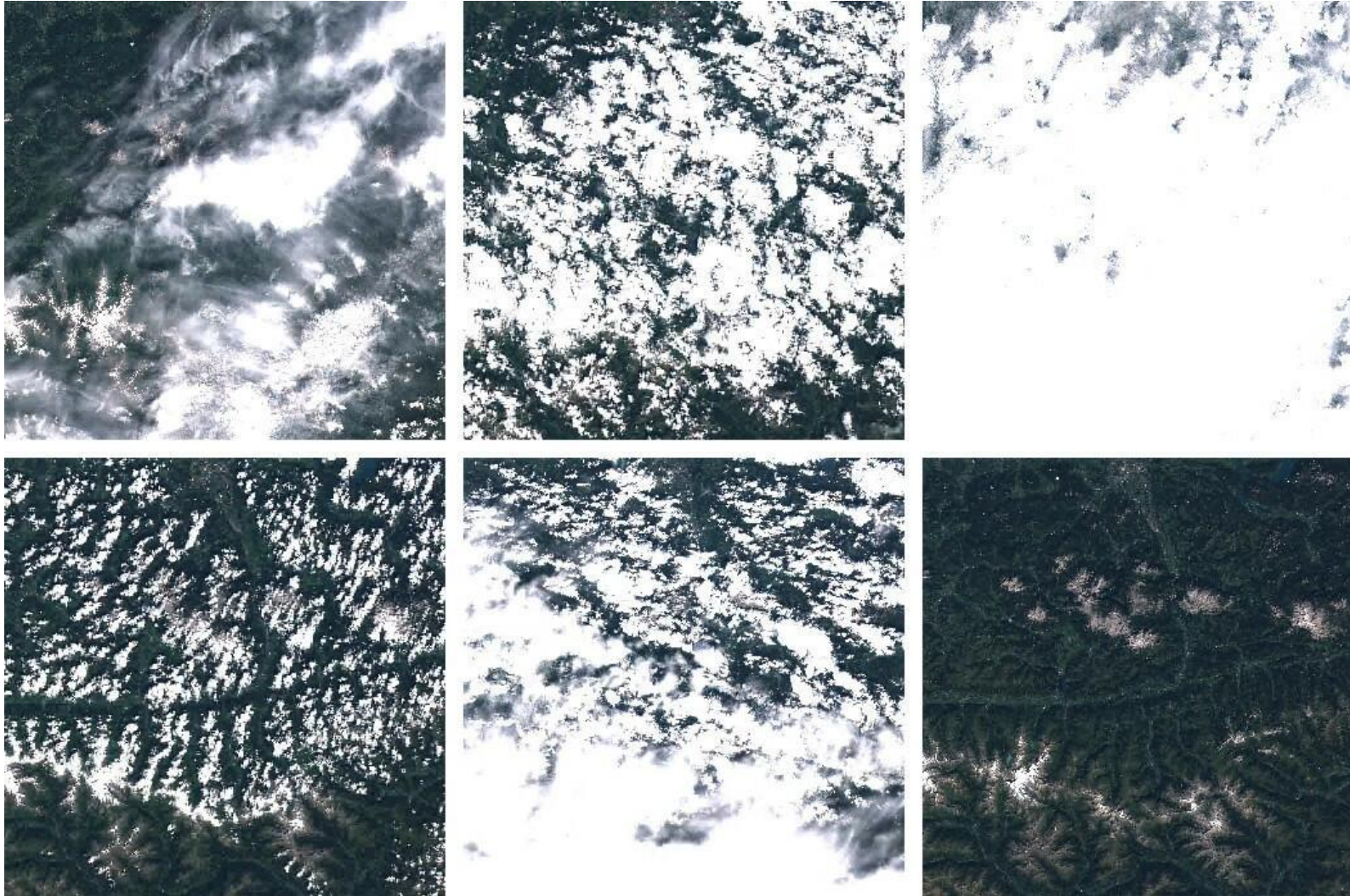


Order of Preprocessing steps

- **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

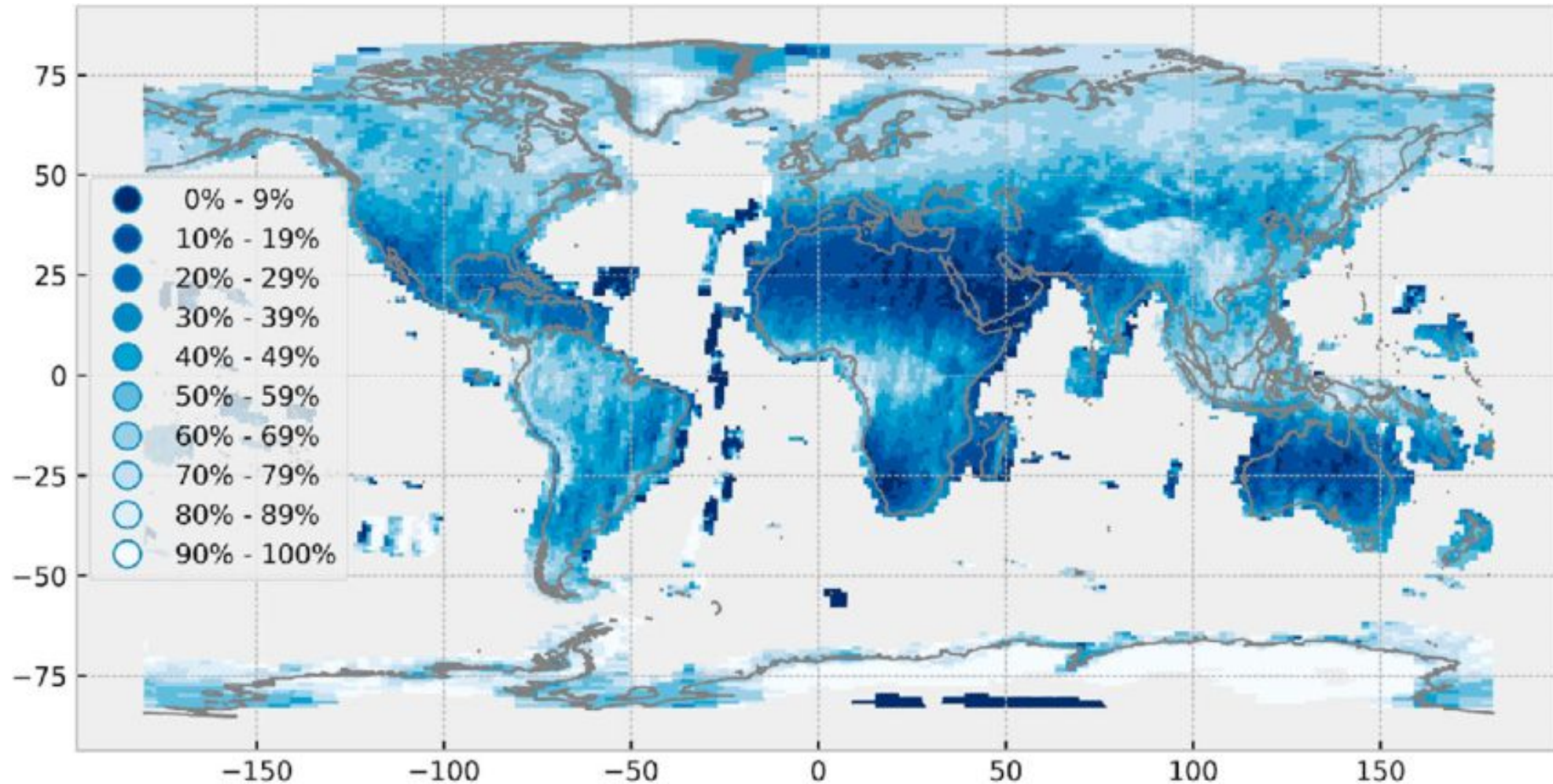


(Ungar 2017).



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?

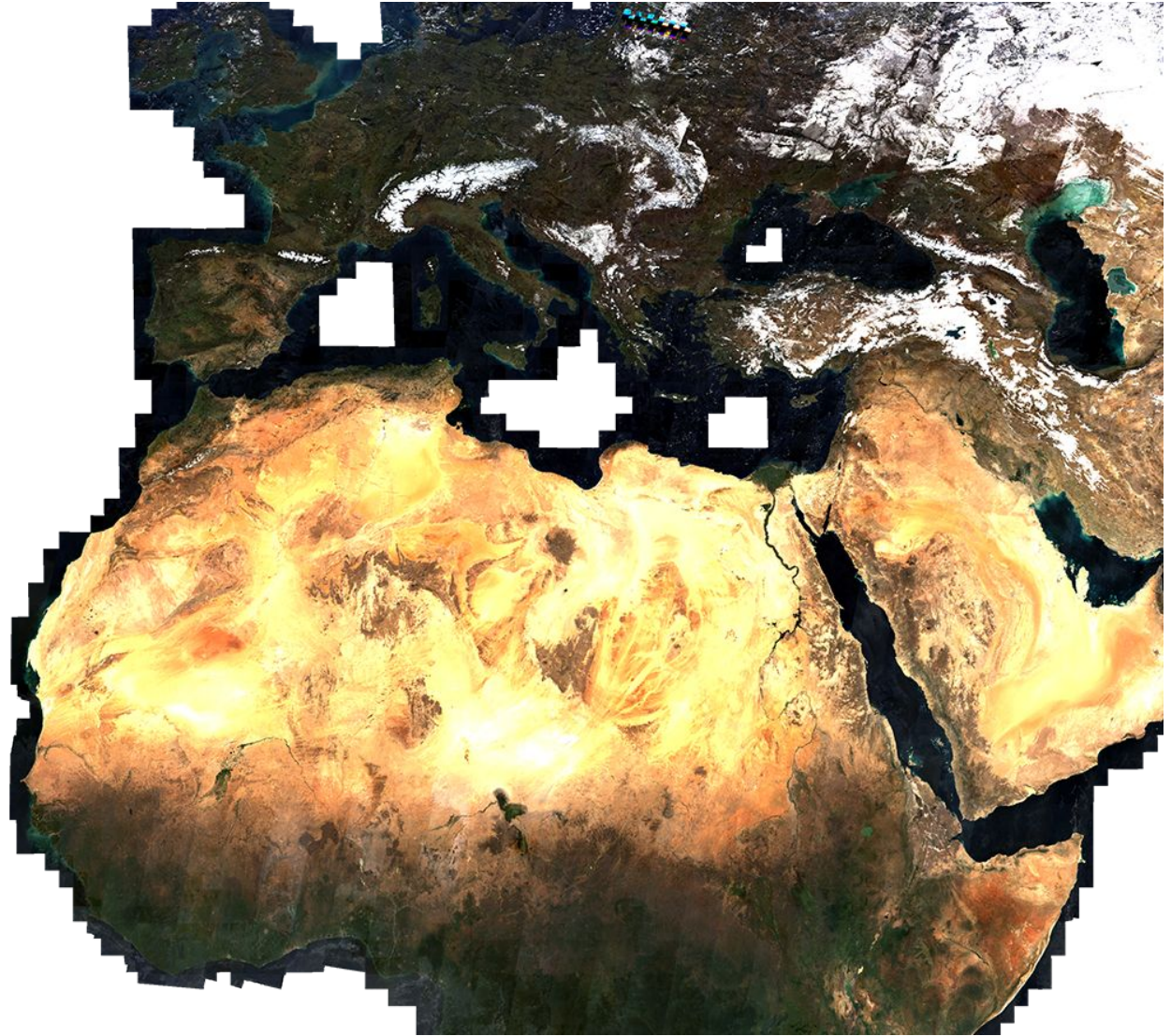
- Sentinel-2 and other satellite imagery come in separate tiles
- Large study areas require multiple images to cover the entire region
- Merging helps remove gaps and ensures spatial continuity

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:

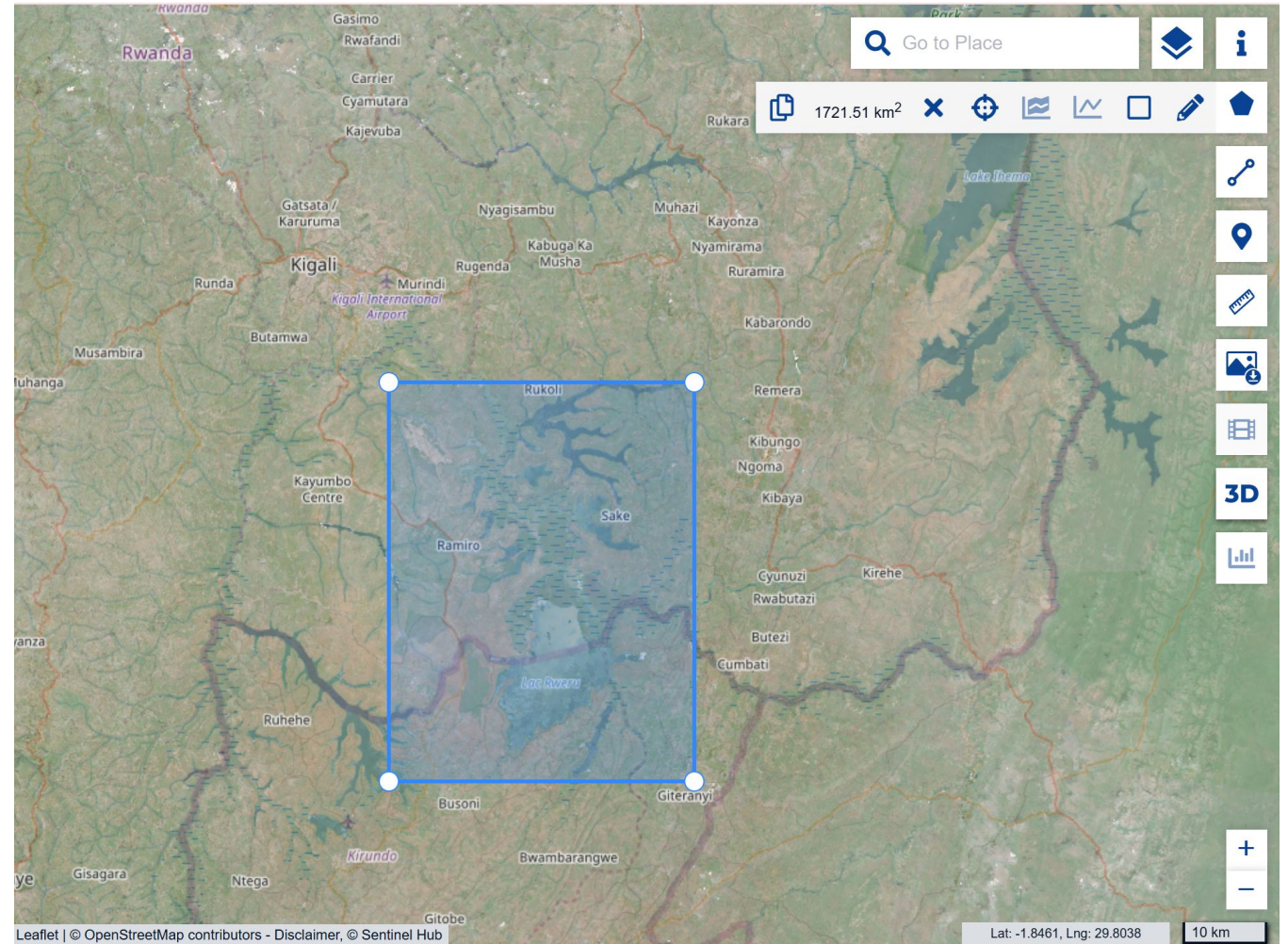
1. Visit the Sentinel Browser
2. Define **Area of Interest (AOI)** using a bounding box or shapefile
3. Choose **Sentinel-2 L2A** for atmospherically corrected data
4. Filter by **date range** and **cloud cover**
5. Download in **GeoTIFF format** for QGIS compatibility

Recap: Accessing Sentinel-2 Data



Select the Area of Interest (AOI)

In this case, I choose wetlands in Ruanda



Recap: Accessing Sentinel-2 Data



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

DATE: TIME RANGE

1

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

[Go to search](#)

Showing 2 results

S2C_MSIL2A_20250225T080941_N0511_R078_T36MTC_20250225T113814.SAFE

Mission: SENTINEL-2 **Instrument:** MSI **Size:** 631MB

Sensing time: 2025-02-25T08:09:41.025000Z

[Visualise](#)

SENTINEL-2 MSI S2MSI2A

S2C_MSIL2A_20250225T080941_N0511_R078_T35MRT_20250225T113814.SAFE

Mission: SENTINEL-2 **Instrument:** MSI **Size:** 1135MB

Sensing time: 2025-02-25T08:09:41.025000Z

[Visualise](#)

SENTINEL-2 MSI S2MSI2A

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v1.14.8
 Leaflet | © OpenStreetMap contributors - Disclaimer, © Sentinel Hub

Recap: Accessing Sentinel-2 Data

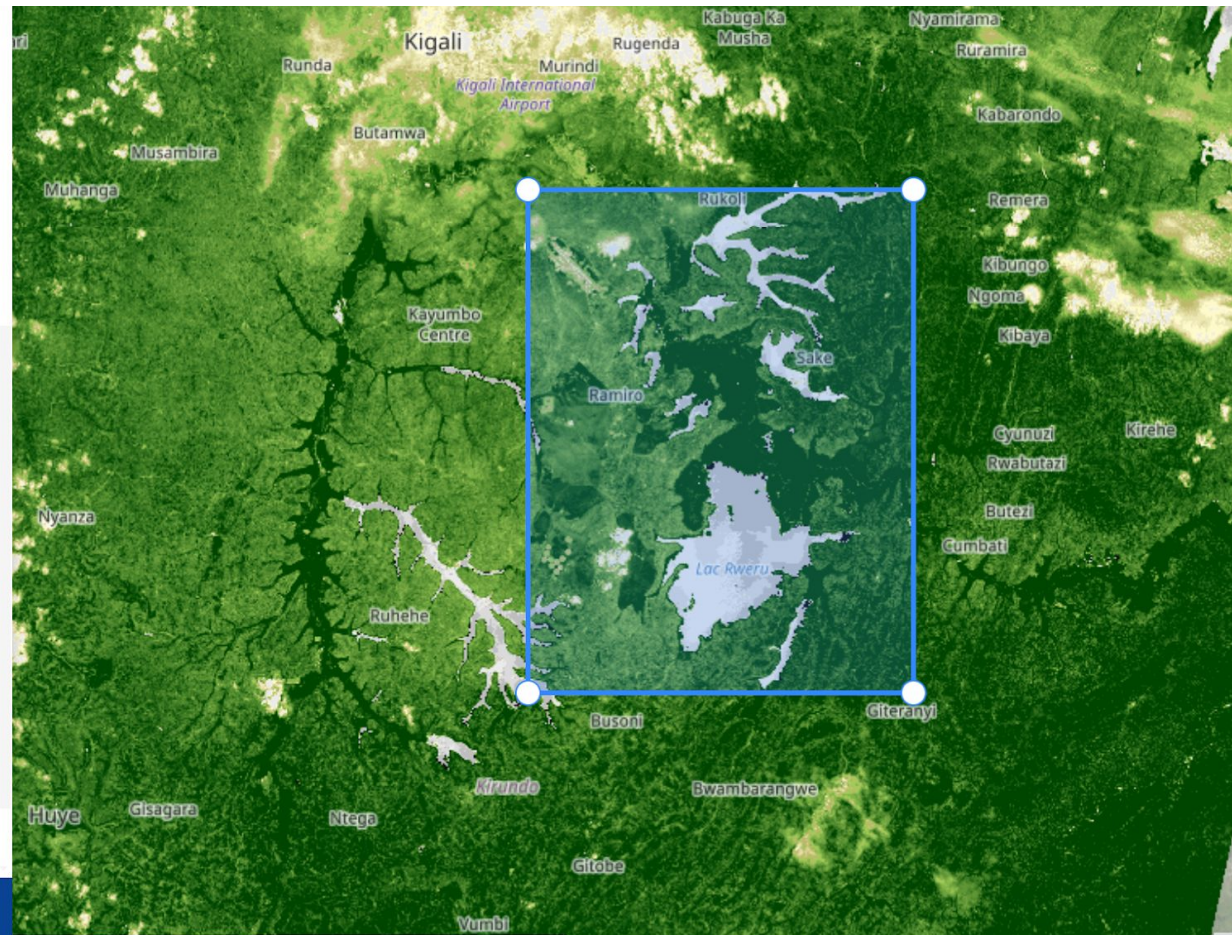
In the Layers Tab you can either choose the RGB Image or finalised Analysis products such as the NDVI

LAYERS:

- True color**
Based on bands B4, B3, B2
- False color**
Based on bands B8, B4, B3
- Highlight Optimized Natural Color**
Enhanced natural color visualisation
- NDVI**
Based on a combination of bands (B8 - B4...) [+ Add to](#) [</>](#) [v](#)
- False color (urban)**
Based on bands B12, B11, B4
- Moisture index**
Based on a combination of bands (B8A - B11)/(B8A + B11)
- SWIR**
Based on bands B12, B8A, B4
- NDWI**
Based on a combination of bands (B3 - B8)/(B3 + B8)
- NDSI**
Based on a combination of bands (B3 - B11)/(B3 + B11)
- Scene classification map**
Classification of Sentinel-2 data as result of ESA's Scene classification algorithm.

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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!

Dr. Insa Otte, Hanna Schulten
 (on behalf of the EOCap4Africa Team)
 and colleagues

insa.otte@uni-wuerzburg.de



INES Ruhengeri
 Institute of Applied Sciences

