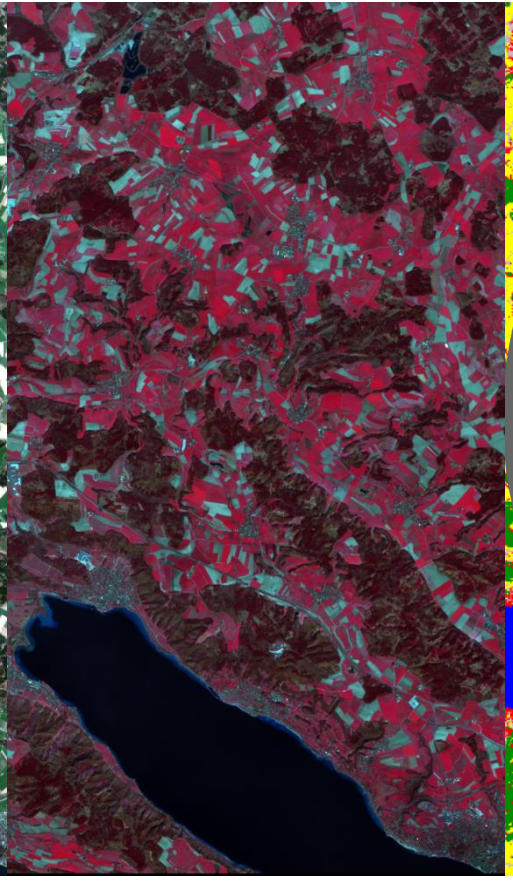
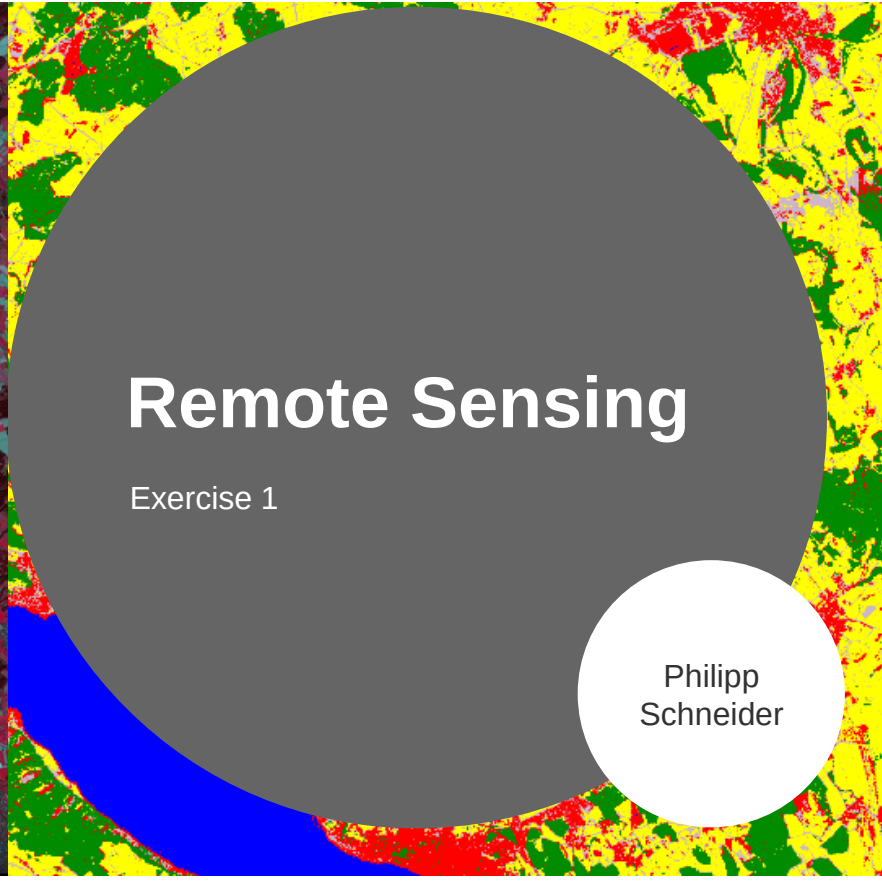
Universität Stuttgart





Remote Sensing

Exercise 1

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Remote Sensing – Exercise 1

organizational

German course

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Remote Sensing – Exercise 1

agenda

- Organizational
- Goals of this exercise
- Potential exam questions (!)
- Demo: Exercise 1

Remote Sensing – Exercise 1

organizational

3 Dates

- Dates of the meetings will be told in the lecture or in ILLIAS
- Always in CIP Pool

- Homework
  - I will show you what to do during the meetings
  - You can write your reports in groups of up to 2
  - Passing the exercise is prerequisite for the exam

Remote Sensing – Exercise 1

Goals of this exercise

Exercise 1

- How to download optical image data from Sentinel-2 (an area of your choice)
- Learn how to import it to the ENVI software
- Export a geoTiff from ENVI

Exercise 2

- Interpret the different bands
- Do some useful analysis (Vegetation and agricultural monitoring)

Exercise 3

- Classification (supervised and unsupervised)

Remote Sensing – Exercise 1

Goals of this exercise

Part 1

- Before we start the demo part we'll have a look on some potential exam questions

Part 2

- I will show you how to solve the homework

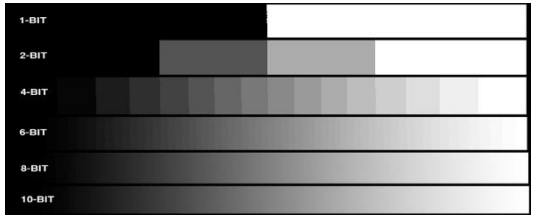
Remote Sensing – Exercise 1

Questions

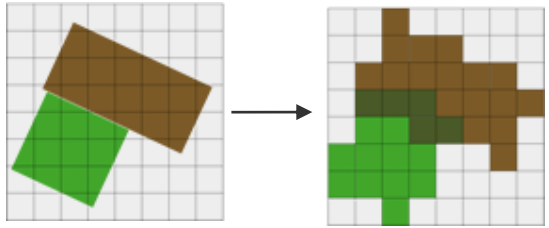
Q: What is the difference between geometric, spectral and radiometric resolution?

A:

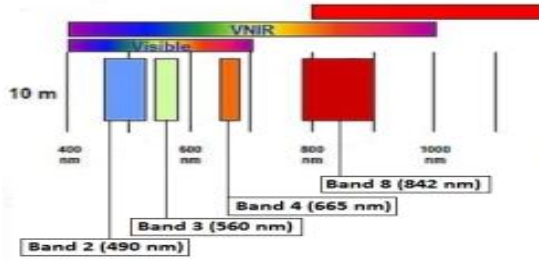
The radiometric resolution stands for the ability of a digital sensor to distinguish between **grey-scale values** while acquiring an image.



The ability of a remote sensing sensor to detect **details** is referred to as **spatial resolution**.



The higher the number of **bands** of a remote sensing sensor, the higher the **spectral resolution** of a satellite.

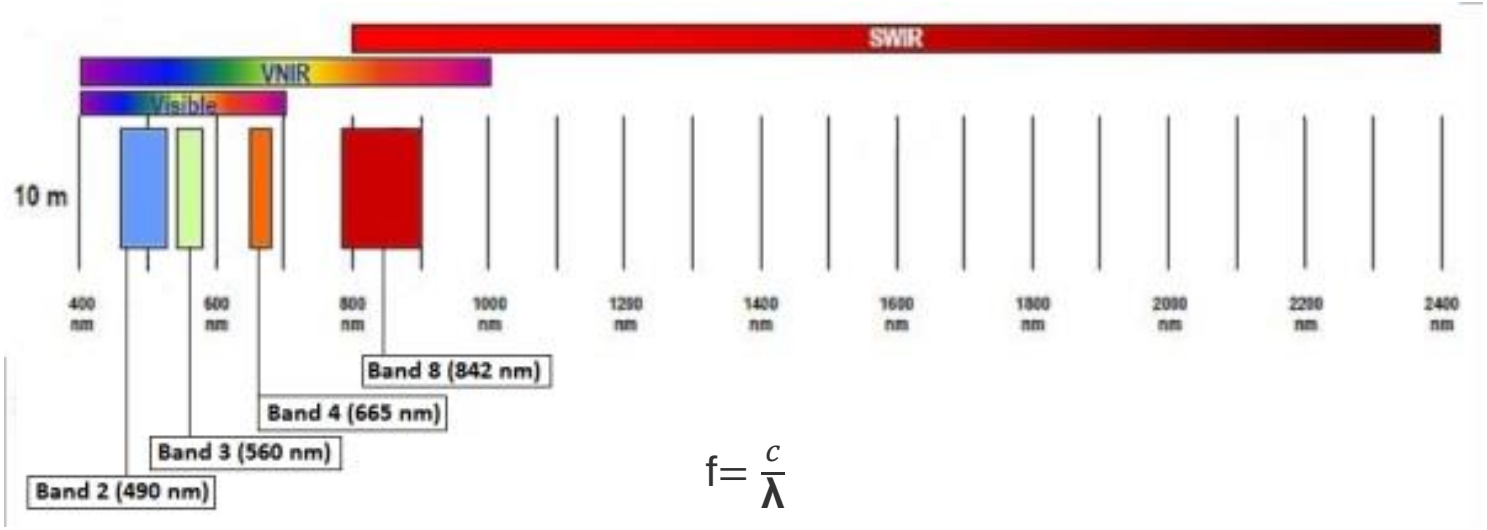


more

Remote Sensing – Exercise 1

Questions

Q: What is the wavelength/frequency of visible and near infrared light?



$$f = \frac{c}{\lambda}$$

Remote Sensing – Exercise 1

Questions

Q: What is a false color image?

A: An **arbitrary assignment** of the **bands** of a multispectral image to the **RGB** channels of a displayed image.

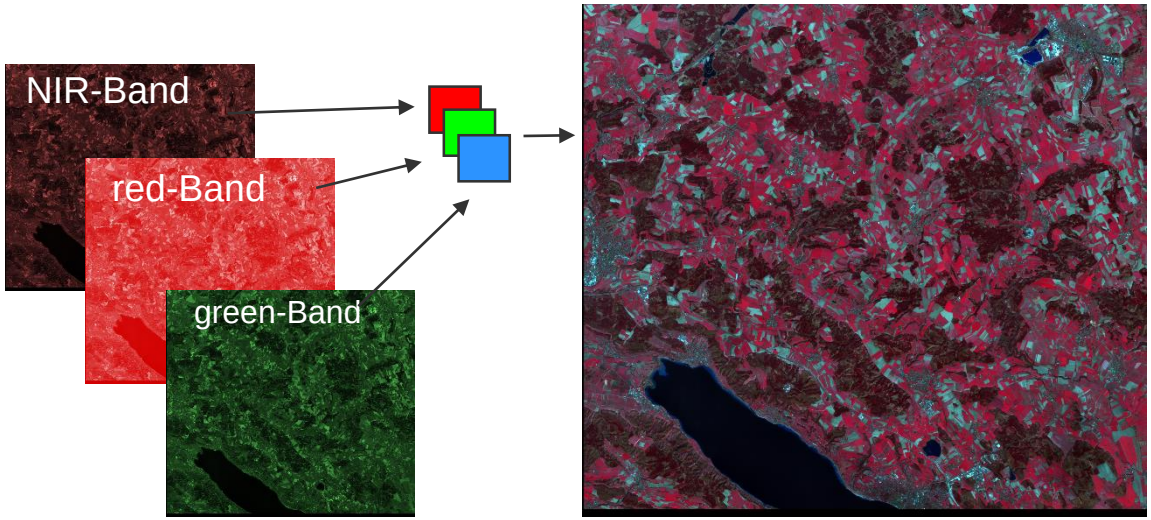
Very common false color composite is:

RED = NIR Band

GREEN = red Band

BLUE = green Band

This scheme allows vegetation to be detected readily in the image.

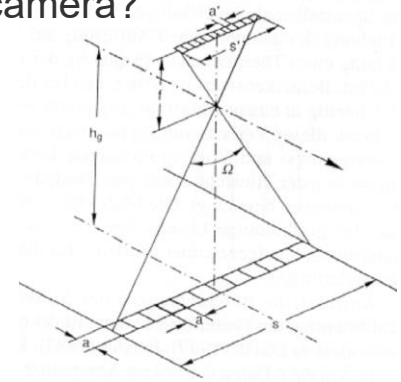


Remote Sensing – Exercise 1

Questions

Q: What is the difference between a push-broom camera and an “normal” camera?

- Advantages and disadvantages of both systems?

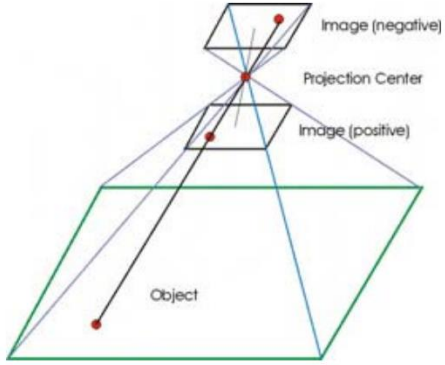


A:

Difference:

PB: multiple linear CCD arrays, each array samples one band.

NC: one CCD matrix with band filters on pixels



Advantages:

PB : “infinite” long images

NC: Easy to post-process.

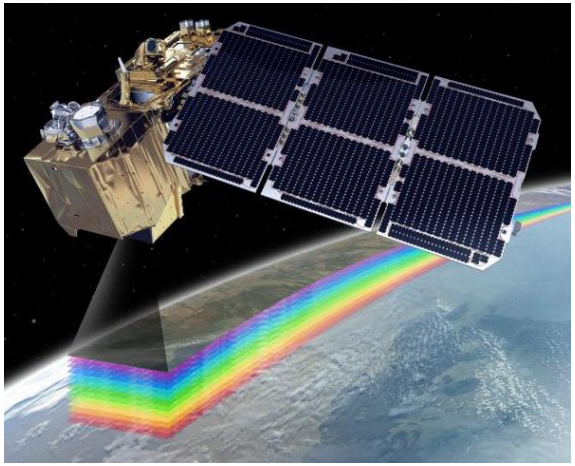
Disadvantages:

PB: temporal offset between bands, flightpath must be known

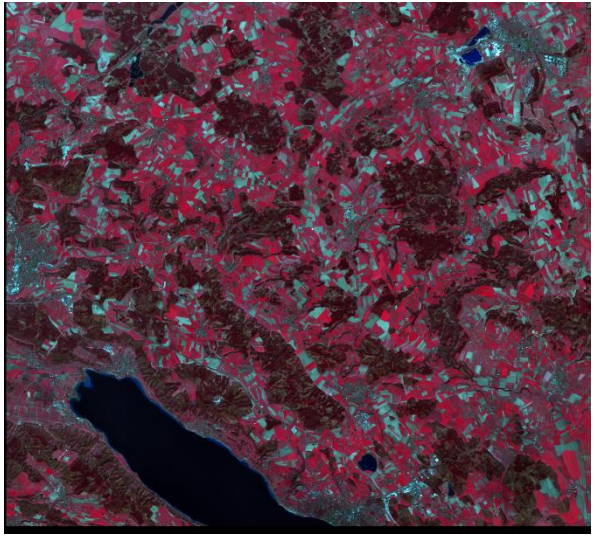
NC: Massive CCD required for good coverage with good GSD

Remote Sensing – Exercise 1

Goals of todays exercise



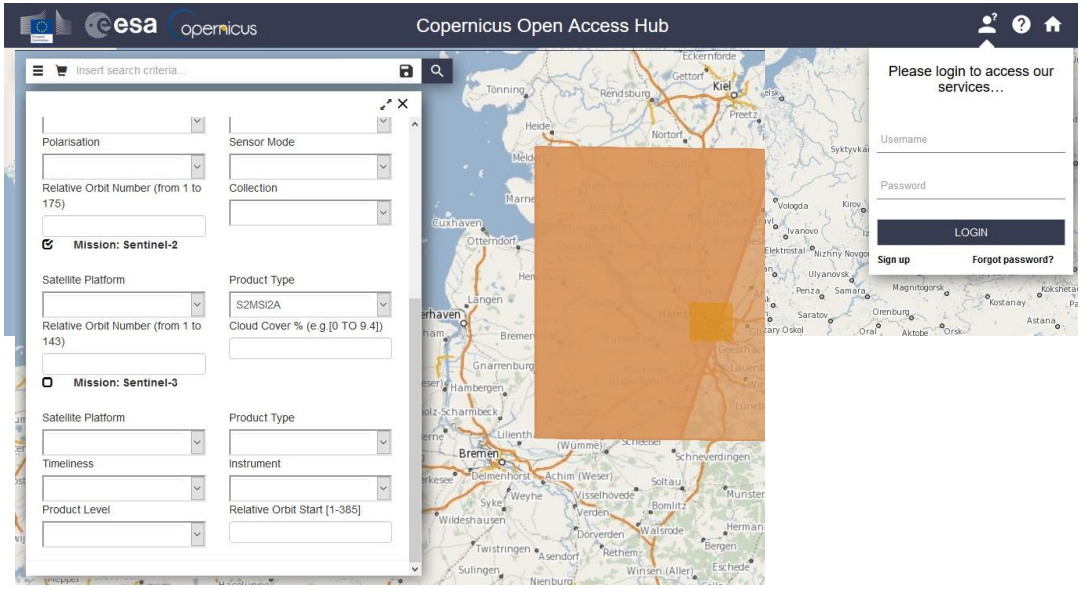
- Download Sentinel-2 data from https://scihub.copernicus.eu/
- Import the file to ENVI
- Crop an area of interest
- Create a false color image and a true color image



Remote Sensing – Exercise 1

Download Sentinel-2 data

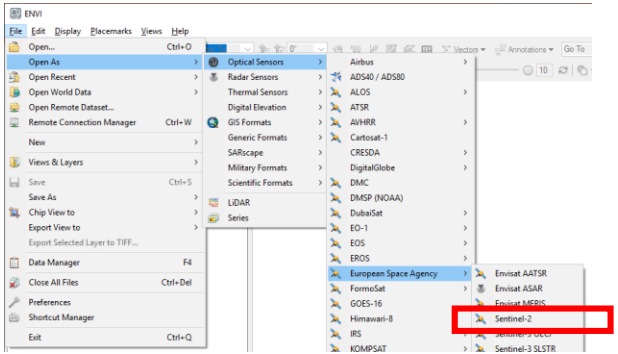
- Sign up for the Copernicus Open Access Hub
- Define a region
- In the filter menu:
  - Mission: Sentinel-2
  - Product Type: S2MSI2A
- Download a product (image) with low cloud coverage
- unzip



Remote Sensing – Exercise 1

Import the file to ENVI

- Import SENTINEL-2 Data into ENVI:
  - File -> open As … -> select the *MTD_MSIL2A.xml* file



Remote Sensing – Exercise 1

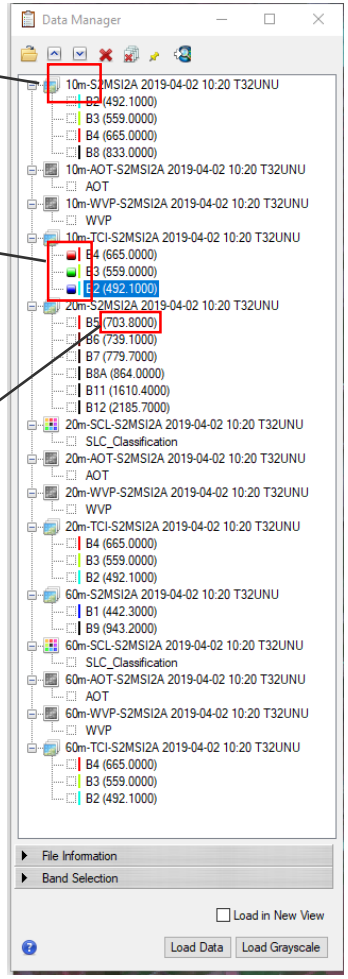
Select Bands to display in Data Manager

Spatial resolution

Selected RGB channels

"Load Data" to load them as RGB into Layer Manager

Wavelength



Data Manager (press F4) gives you an overview over the available data in memory

Useful acronyms in this context

- B1 -B12 spectral channels
- TCI True Color Image
- AOT Aerosol Optical Thickness
- WVP Water Vapor Precipitable
- SCL Scene Classification Layer

Remote Sensing – Exercise 1

ENVI overview

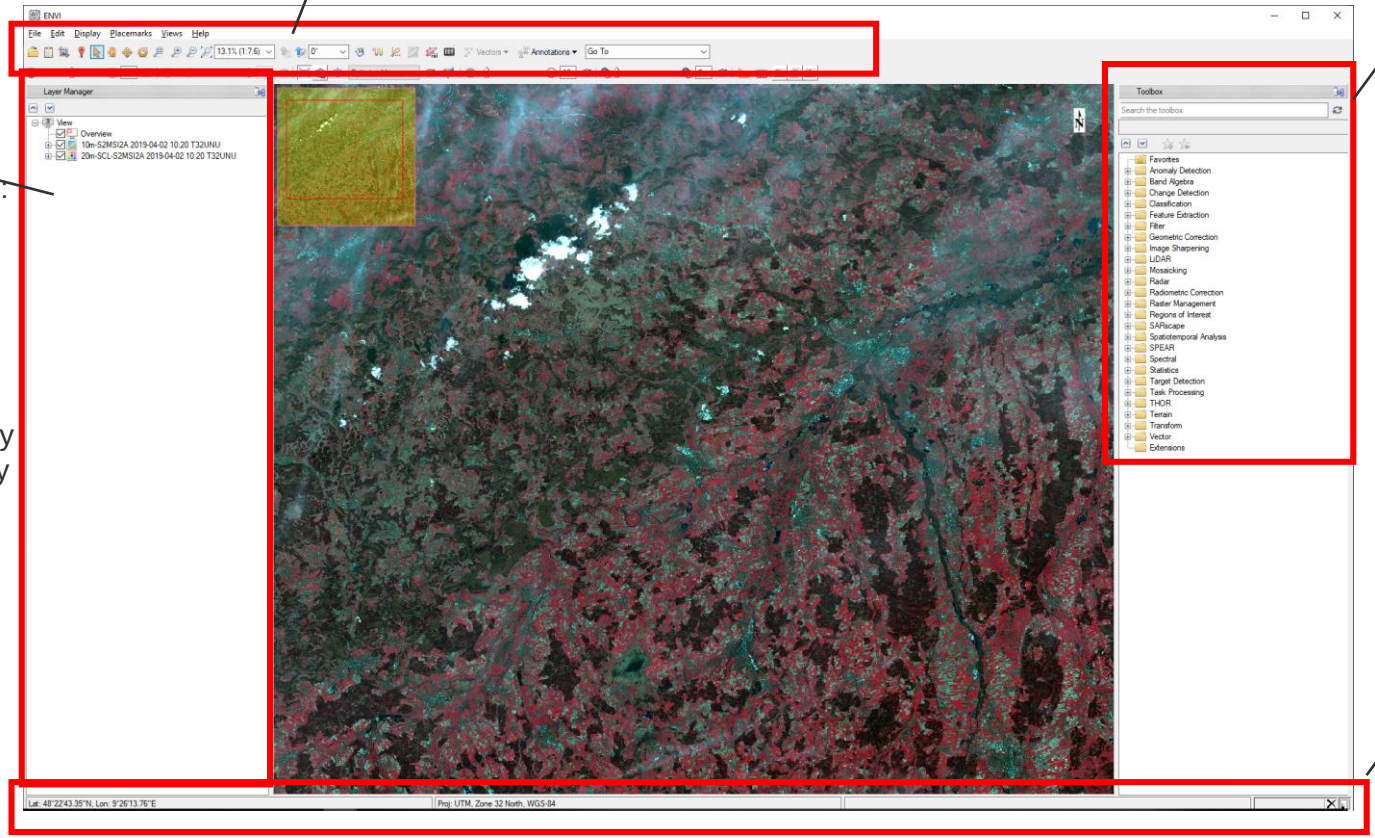
Topbar:
Basic tools to change appearance, add ROIs, add color bar

Toolbox:
Here you find all the tools to manipulate and analyze the image.

Layer manager:
All the visibly layers loaded from the Data Manager.

Layers are stacked, so they can be cover by other layers

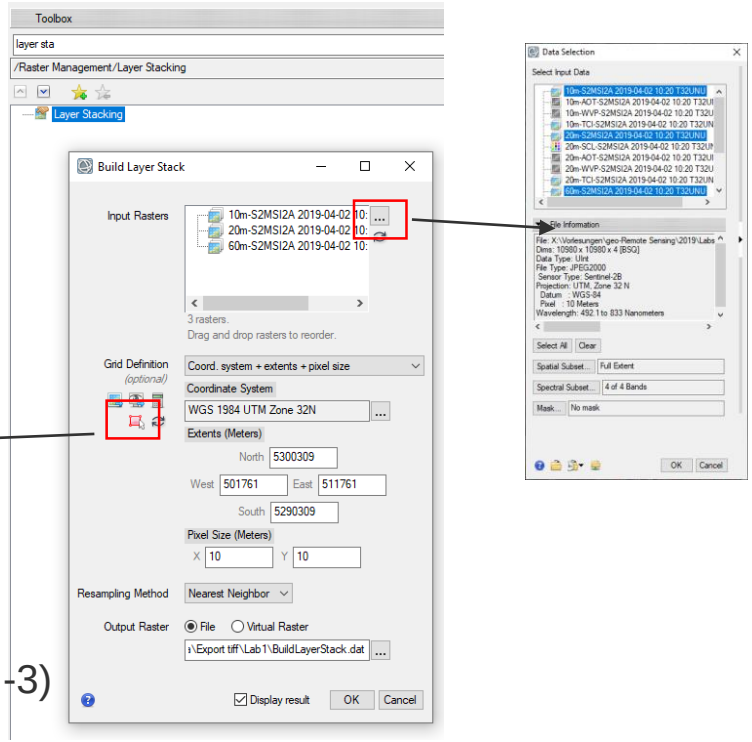
Status bar:
Information about the geolocation and the coordinate system



Remote Sensing – Exercise 1

Crop an area of interest

- Select the Layer Stacking Tool from Toolbox
- Select: All S2MSI2A Layers
- Choose a Region of Interest
- Make sure your ROI extents 10km x 10km
- Pixel Size 10m x10m (Choose Resampling method)
- Choose save path for file (You will need that for Exercise 2-3)
- Display Results



Remote Sensing – Exercise 1

Create and Save an false color image

In the Data Manager (F4)

- Select and Load for false color image:
  - RED -> 864nm
  - GREEN -> 665nm
  - BLUE -> 559nm
- Select and Load for true color image:
  - RED -> 665nm
  - GREEN -> 559nm
  - BLUE -> 492nm

  In the Layer Manager
  - Right click on the layer you want to export
  - Export to TIFF