Hands on practices on products and applications.

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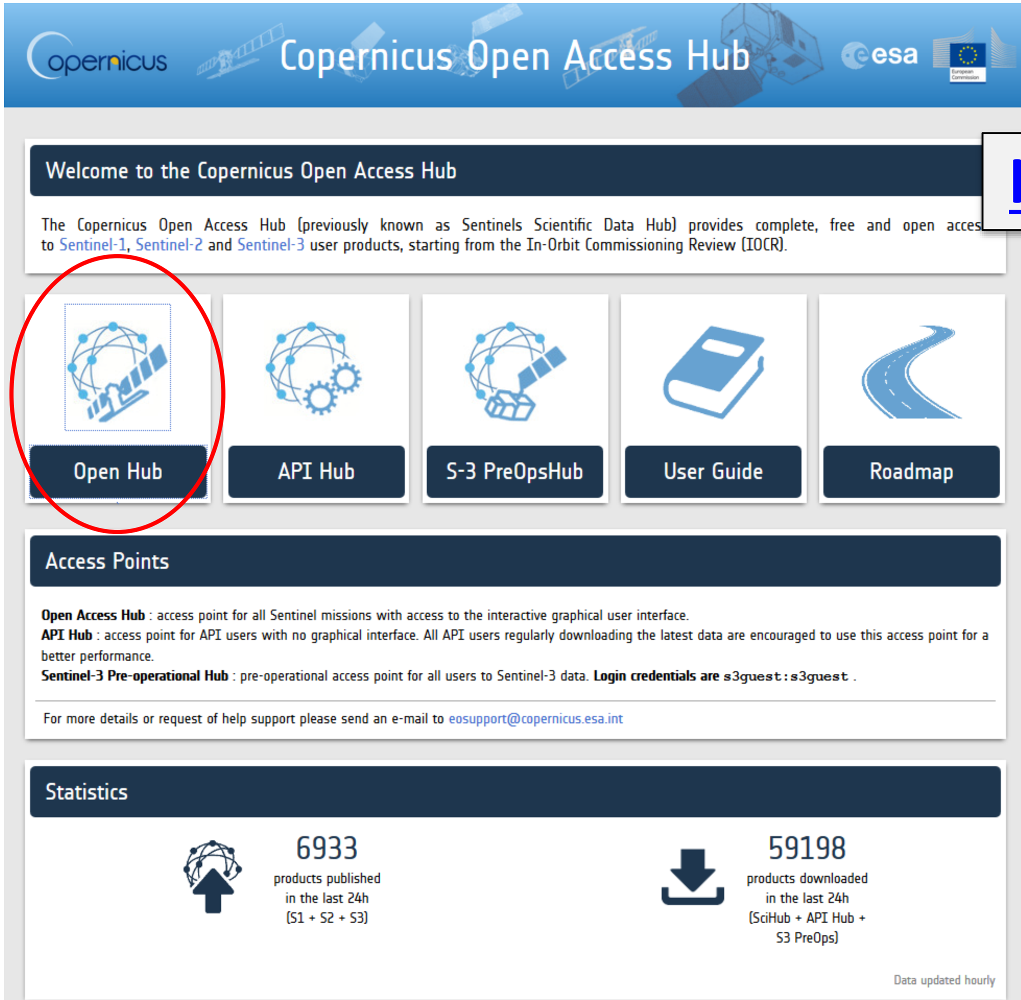
Presentation overview

- Download Sentinel-1 and Sentinel-2 data
- SNAP download
- Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)
- Sen2Cor download
- Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (Sen2Cor, SNAP)

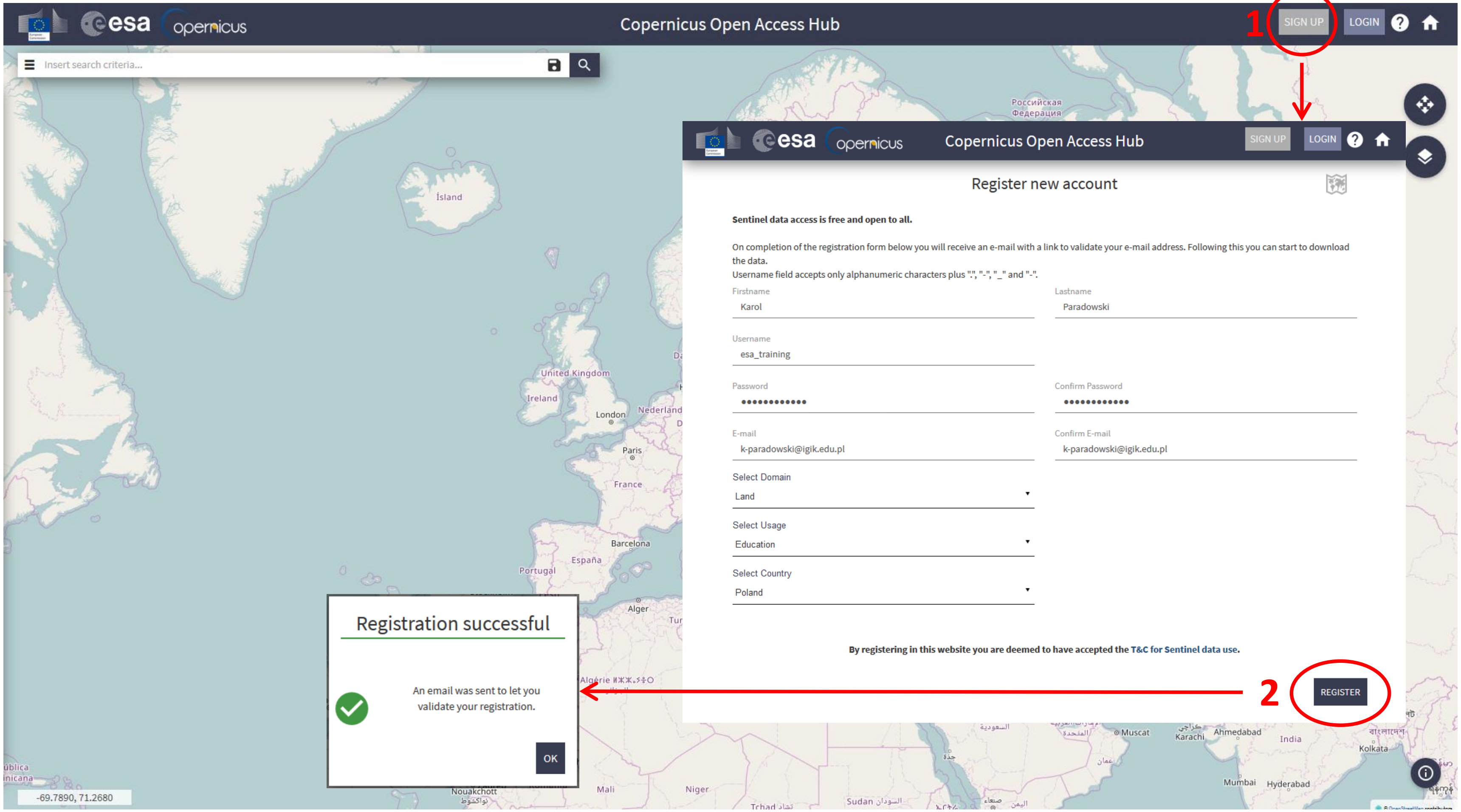
Download Sentinel-1 and Sentinel-2 data



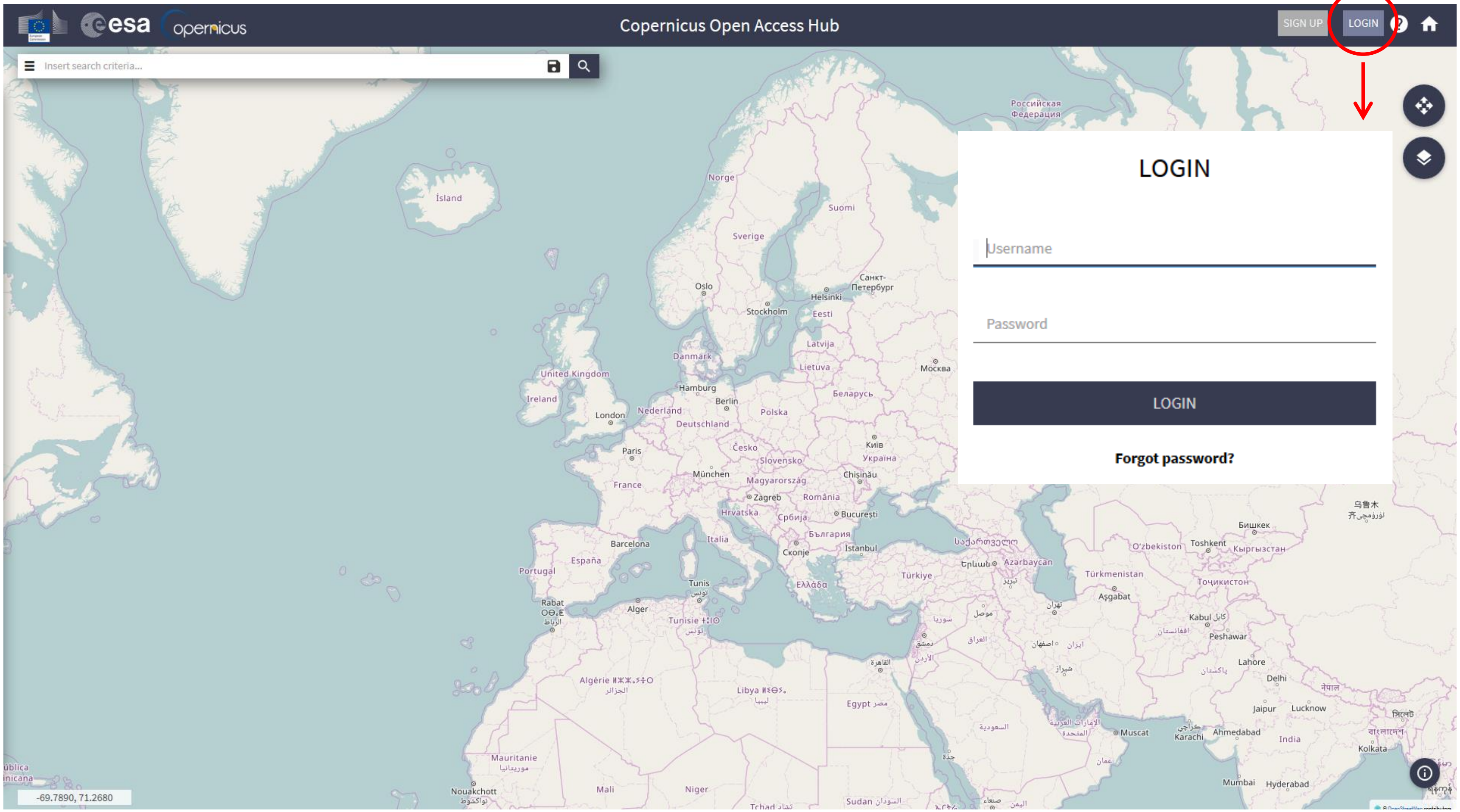
https://scihub.copernicus.eu/

Open Hub

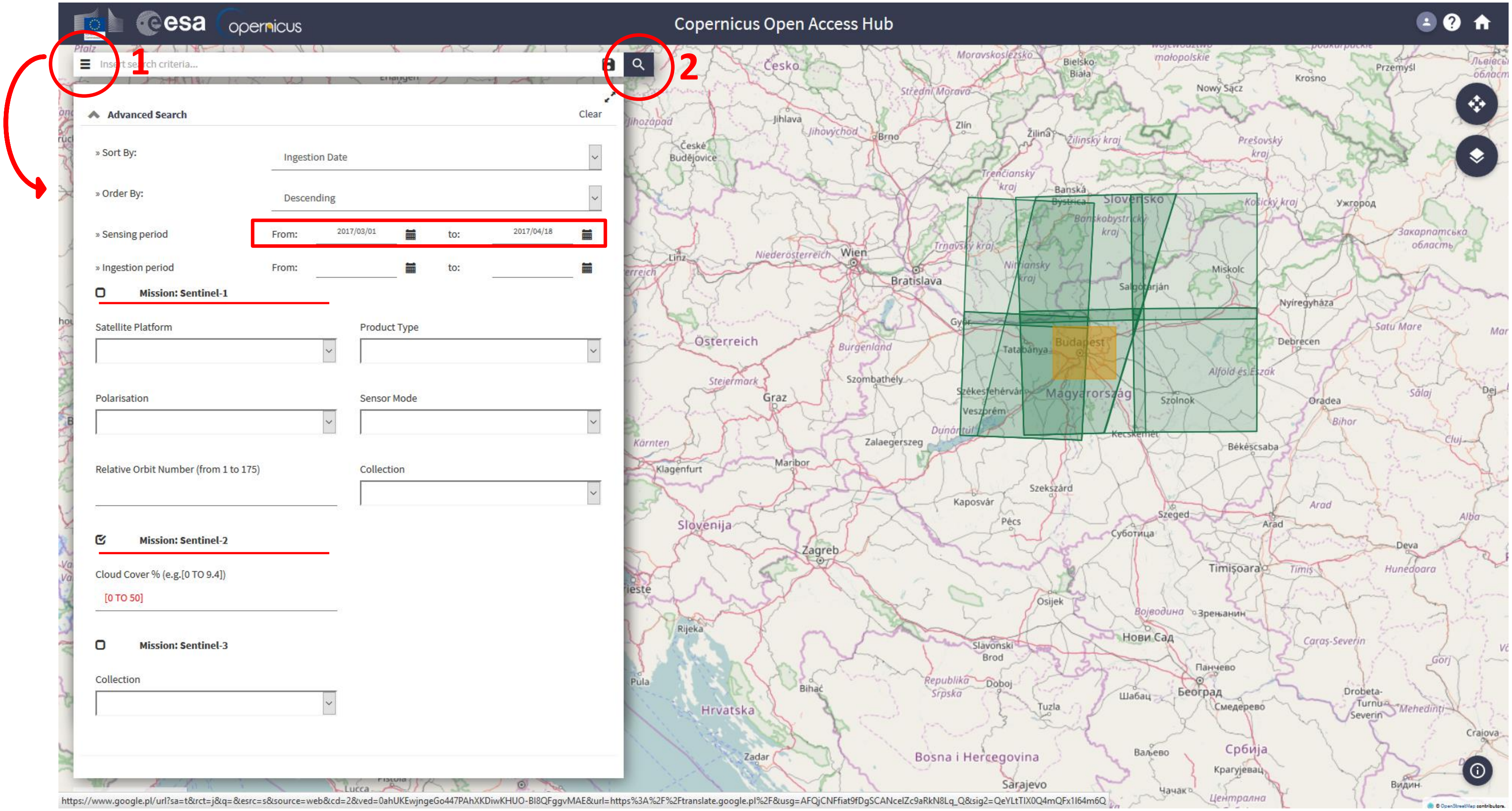
Download Sentinel-1 and Sentinel-2 data



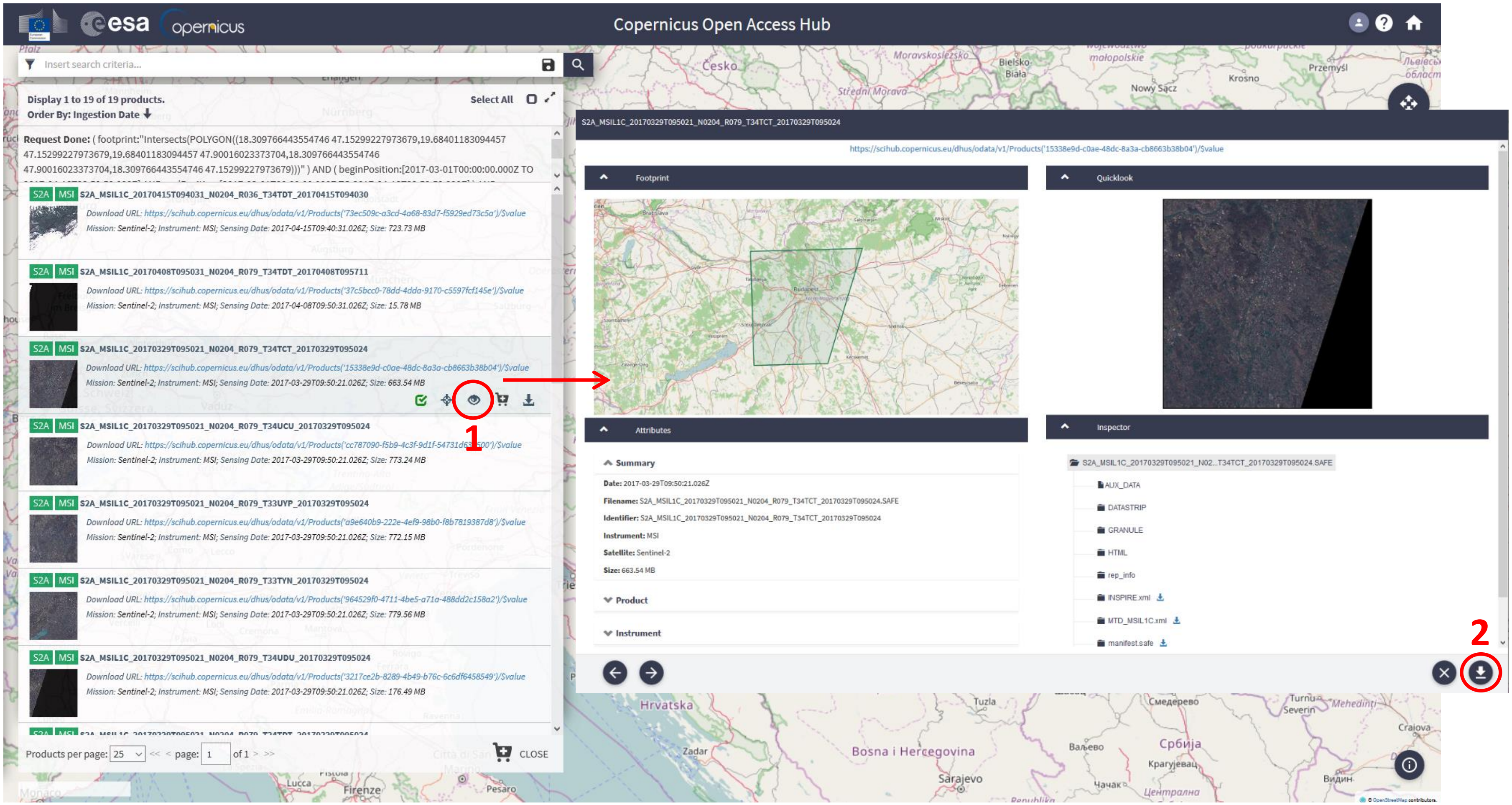
Download Sentinel-1 and Sentinel-2 data



Download Sentinel-1 and Sentinel-2 data



Download Sentinel-1 and Sentinel-2 data



SNAP: Sentinel Application Platform


step
science toolbox exploitation platform
esa

ESA STEP TOOLBOXES DOWNLOAD GALLERY DOCUMENTATION COMMUNITY THIRD PARTY PLUGINS

SNAP
Sentinel 1 Toolbox
Sentinel 2 Toolbox
Sentinel-3 Toolbox
SMOS Toolbox
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Community
Useful Links

SNAP SURVEY

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Download

Here you can download the latest installers for SNAP and the Sentinel Toolboxes.

Data provision is available to all users via the Sentinel Data Hub.

Current Version

The current version is **5.0.0** (05.12.2016 **14:40**).

For detailed information about changes made for this release please have a look at the release notes of the different projects: SNAP, S1TBX, S2TBX, S3TBX, SMOS Box, PROBA-V Toolbox

We offer three different installers for your convenience. Choose the one from the following table which suits your needs. During the installation process each toolbox can be excluded from the installation. Toolboxes which are not initially installed via the installer can be later downloaded and installed using the plugin manager. Please note that SNAP and the individual Sentinel Toolboxes also support numerous sensors other than Sentinel.

	Windows 64-Bit	Windows 32-Bit	Mac OS X	Unix 64-bit
Sentinel Toolboxes	These installers contain the **Sentinel-1**, **Sentinel-2**, **Sentinel-3** Toolboxes			
	Download	Download	Download	Download
SMOS Toolbox	These installer contains only the **SMOS Toolbox**. Download also the Format Conversion Tool (Earth Explorer to NetCDF) and the user manual.			
	Download	Download	Download	Download
All Toolboxes	These installers contain the **Sentinel-1**, **Sentinel-2**, **Sentinel-3** Toolboxes, **SMOS** and **PROBA-V** Toolbox			
	Download	Download	Download	Download

If you later decide to install an additional toolbox to your installation you can follow this step-by-step guide.

2017

ESA POLinSAR 2017 Workshop

2016

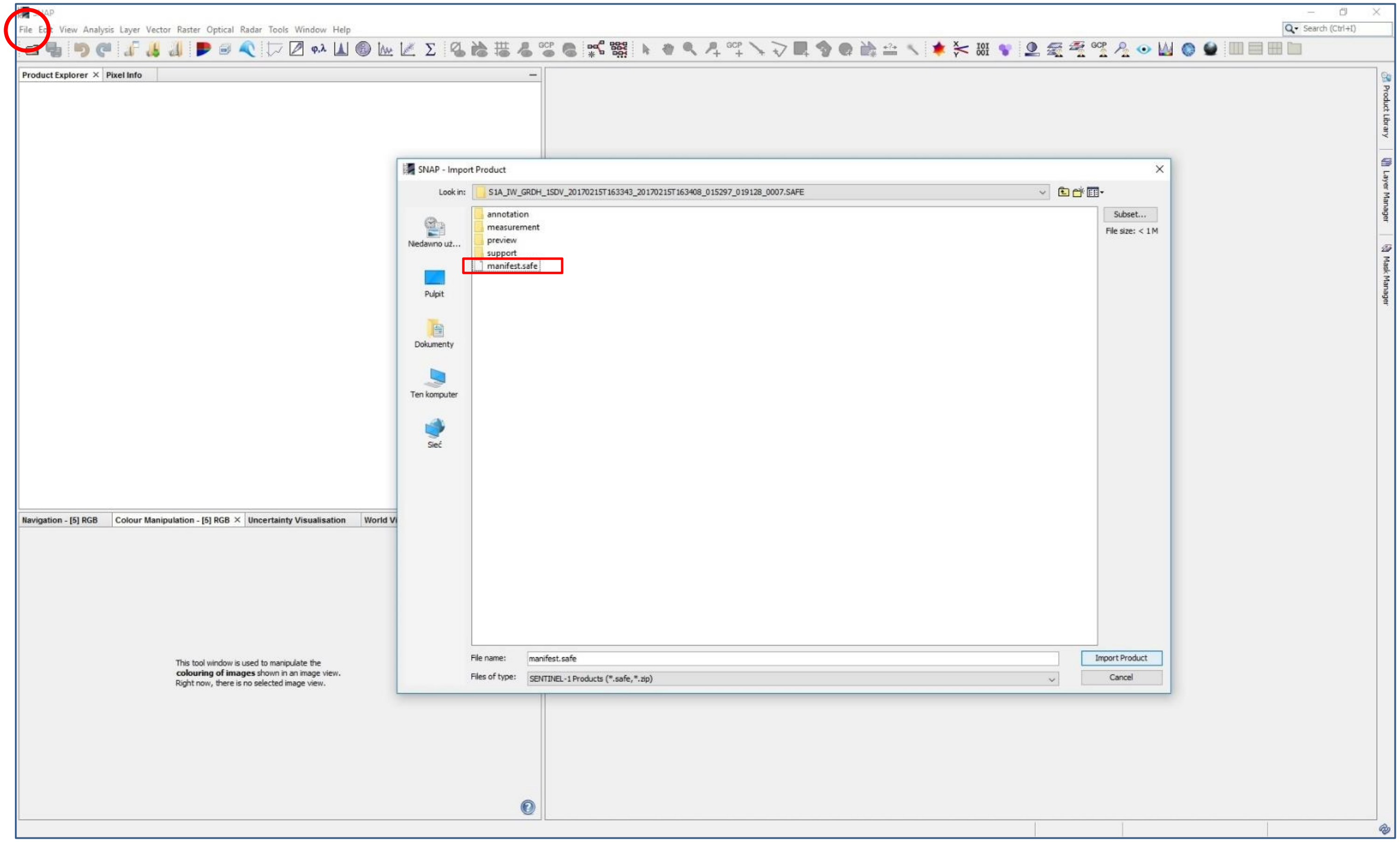
Colour and Light in the Ocean from Earth Observation

Earth Observation Open Science 2016 Conference

ESA EO summer school on "Earth System Monitoring & Modelling"

http://step.esa.int/main/download/

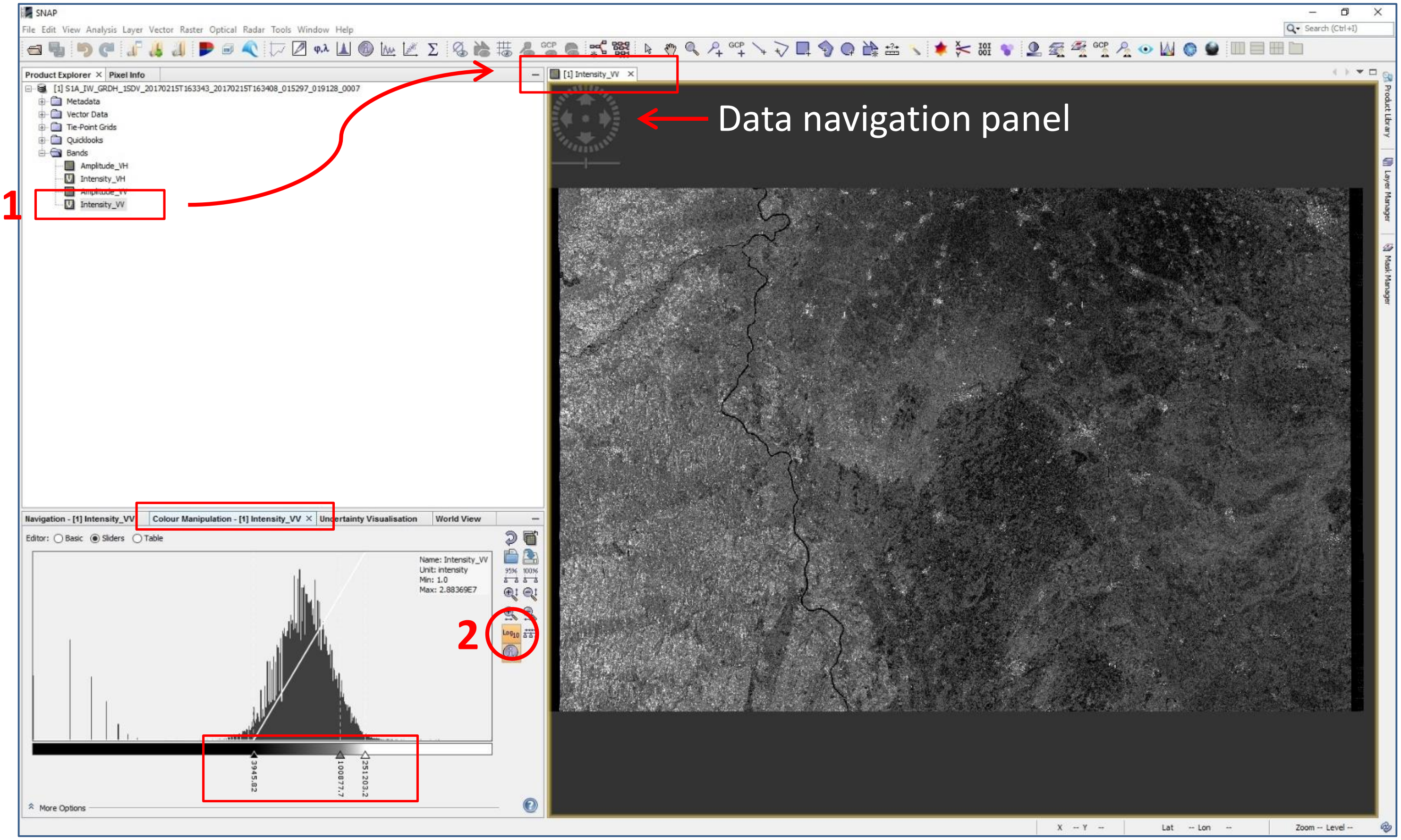
Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)



-> File
-> Import
-> SAR Sensors
-> SENTINEL-1

Navigate to first of three Sentinel-1 data folder, select „manifest.safe" and confirm with „Import Product" button.

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)



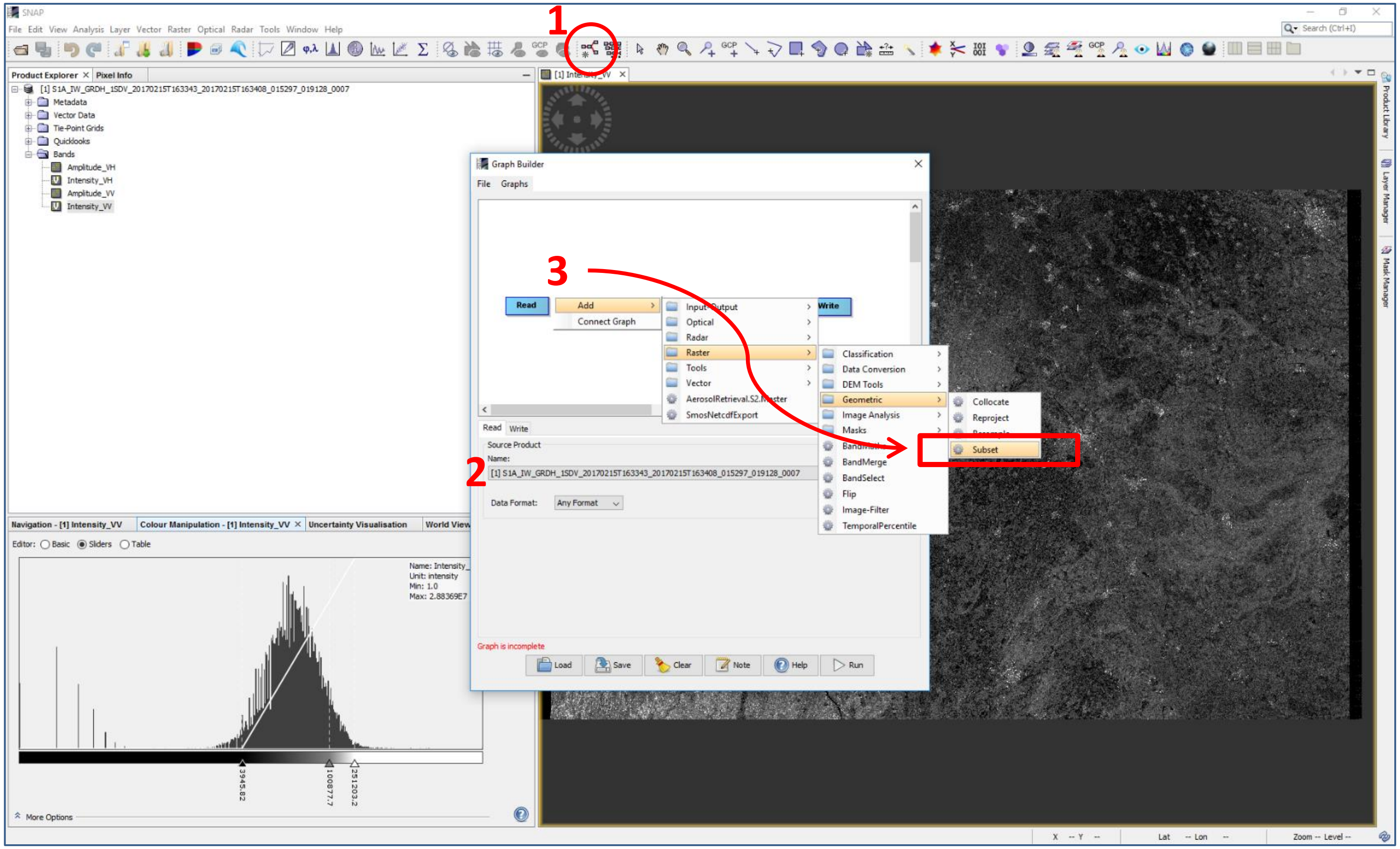
1

In „Product Exporer" panel navigate to „Bands" and double-click on „Intensity_VV" to visulize the data with VV polarization.

2

In „Colour Manipulation" panel click on „Switch to logarithmic display" and use black, grey and white sliders to stretch image histogram.

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)



1
Click on „Graph Builder” icon to open empty graph.

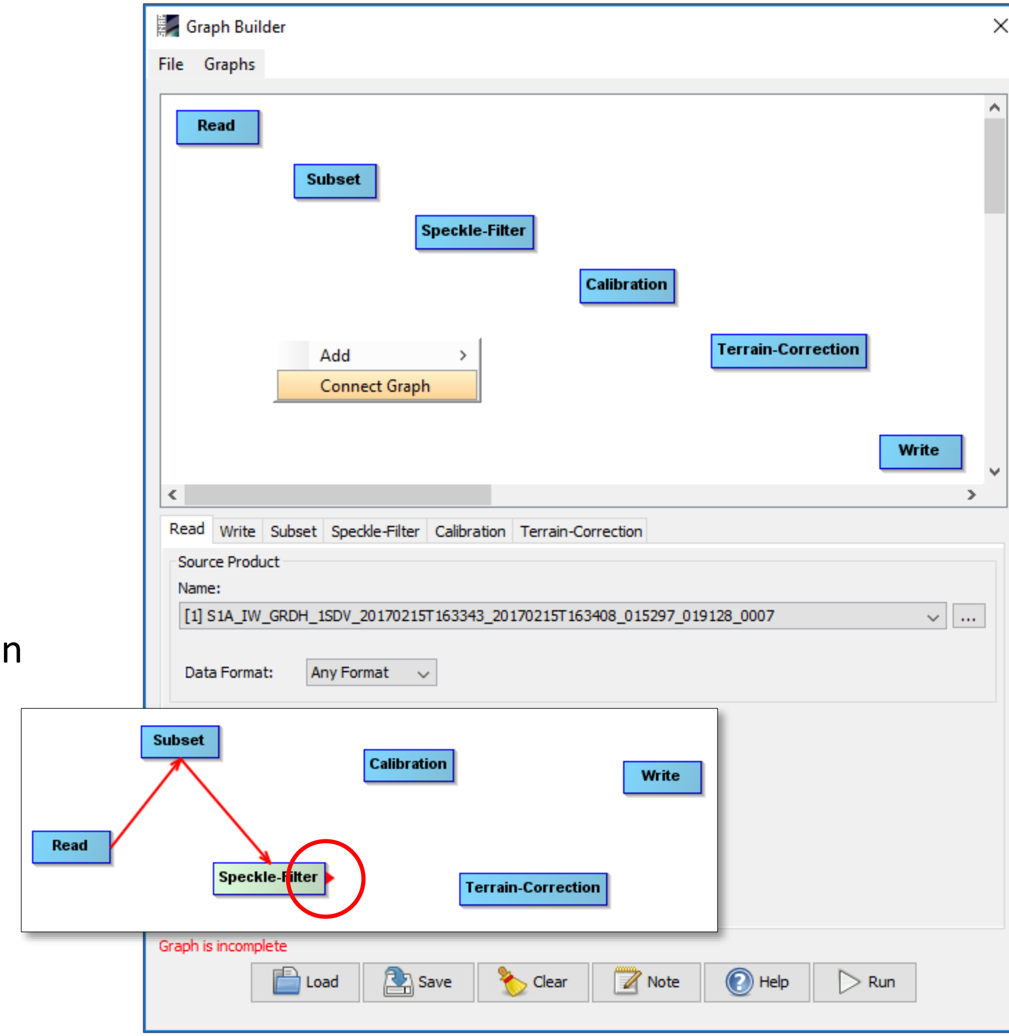
2
Select Sentinel-1 image from drop-down list of open layers.

3
Right-click on the empty canvas and navigate to „**Subset**” tool (Add -> Raster -> Geometric -> **Subset**). A new TAB appears below the canvas.

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

In the same way as „Subset” tool add „Speckle-Filter”, „Calibration” and „Terrain-Correction” tools to the canvas.

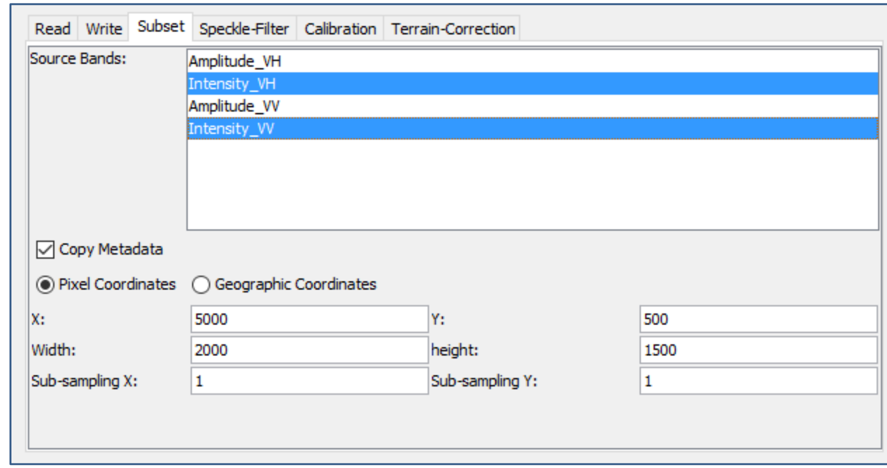
- **Speckle-Filter**
  - Add -> Radar -> Speckle Filtering -> **Speckle-Filter**
- **Calibration**
  - Add -> Radar -> Radiometric -> **Calibration**
- **Terrain-Correction**
  - Add -> Radar -> Geometric -> Terrain Correction -> **Terrain-Correction**



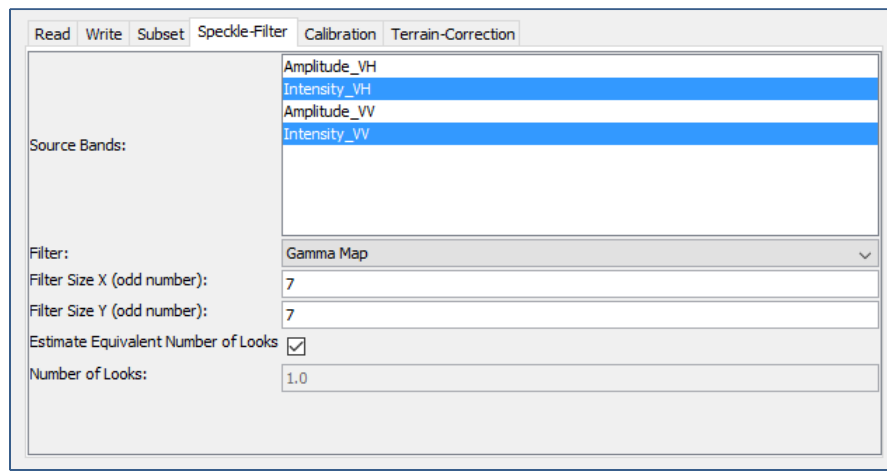
Right-click on the canvas and click „Connect Graph” or connect tools manually by dragging arrows - starting from the right border of each element

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

Open „Subset" tab and define in pixel coordinates upper left corner (X, Y) and size (Width, height) of the desired subset. If „Source Bands:" window is empty simple switch between different tabs to refresh the view. Select two Intensity layers only (with Ctrl button).

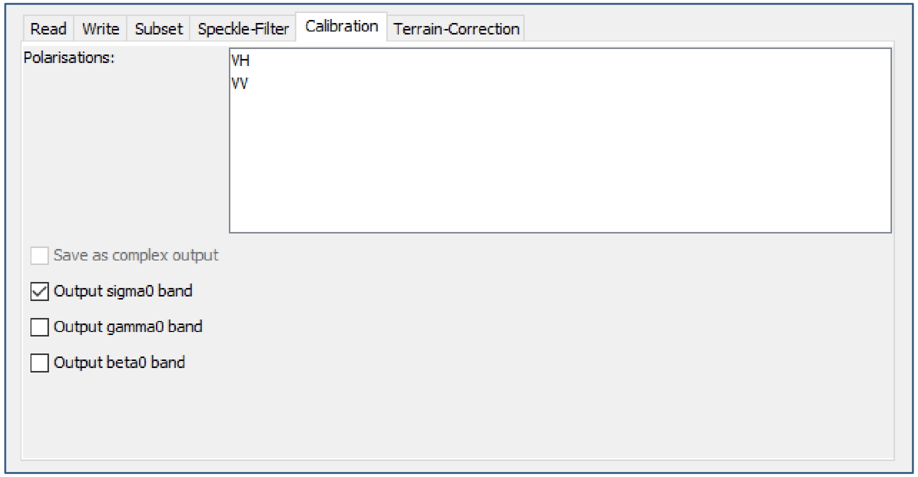


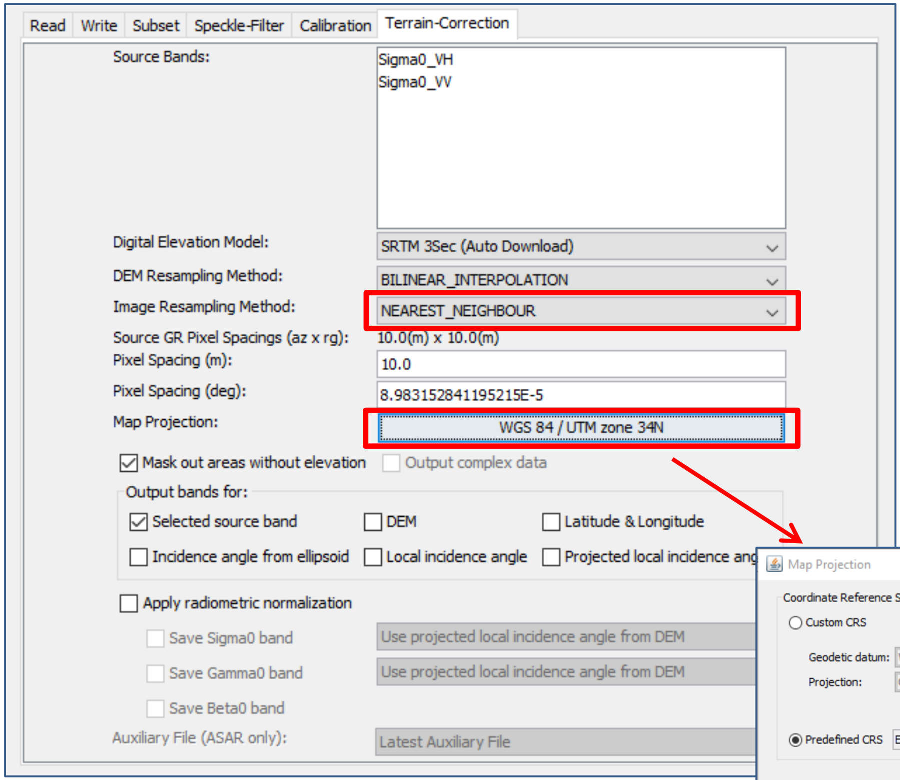
Open „Speckle-Filter" tab and define Filter (e.g. Gamma Map) and Filter Size X and Y (e.g. 7). Select two Intensity layers only (with Ctrl).

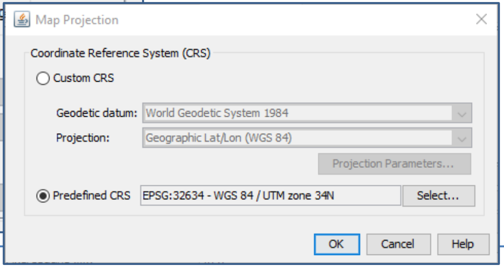


Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

Leave „Calibration” tab options without changing anything.





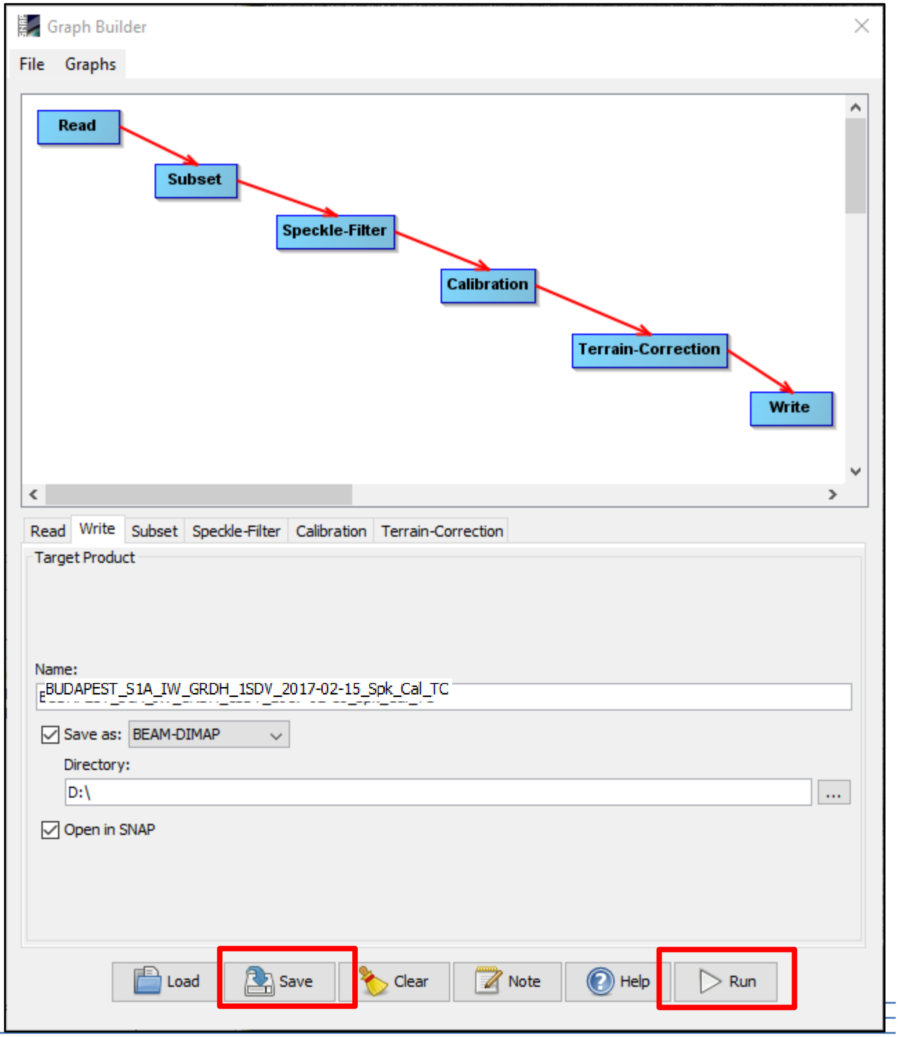


In „Terrain-Correction” tab change “Image Resampling Method” to „NEAREST_NEIGHBOUR” and “Map Projection” to desired projection.

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

Open „Write” tab and define processed file name (you can leave it default), file format (BEAM-DIMAP as default), and saving location.

Click on „Save” button to save created Graph and hit „Run” to execute workflow. The processed image will appear in „Product Explorer” window.



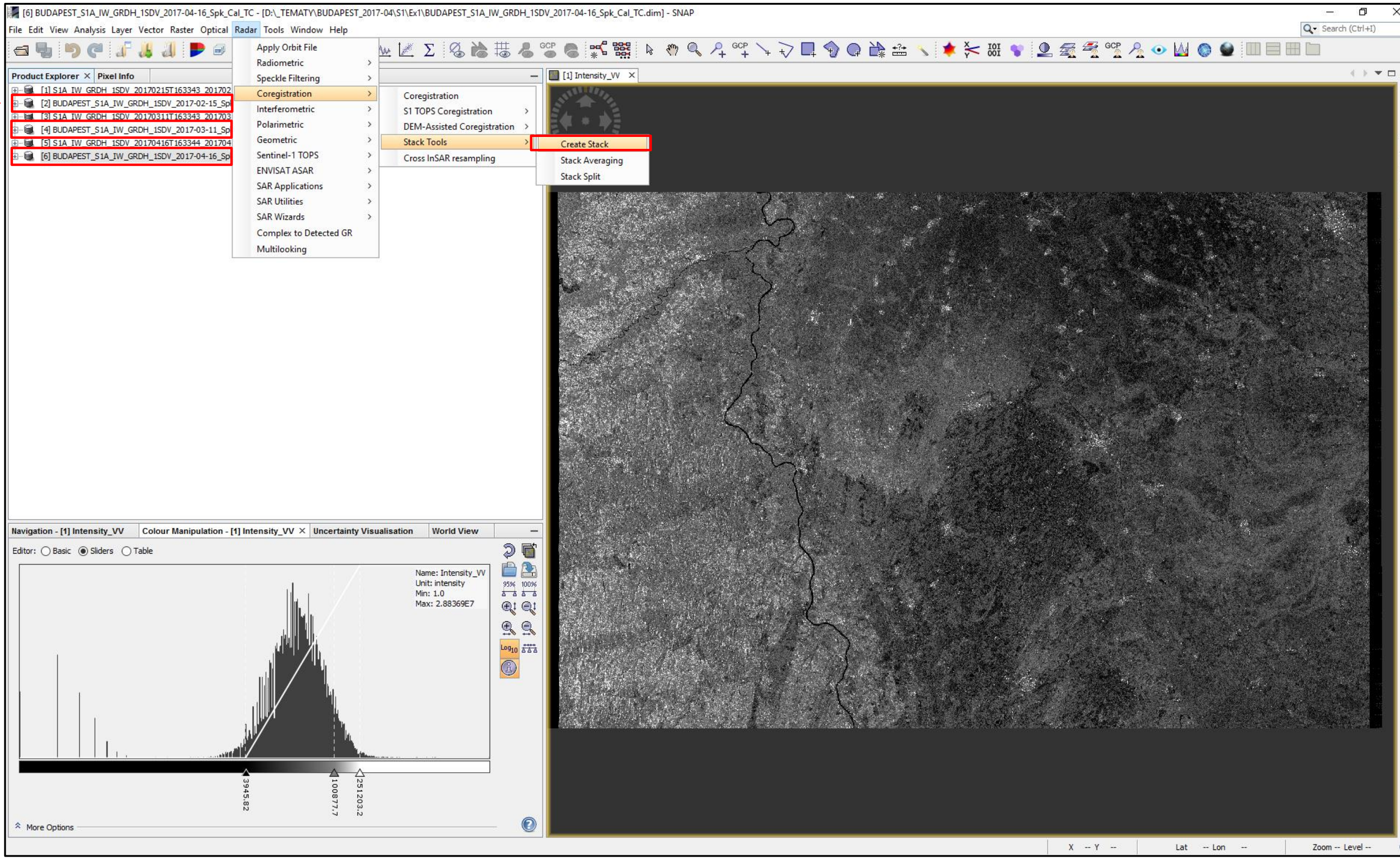
Repeat the procedure to generate preprocessed subsets for two other data sets from different acquisition dates:

- import Sentinel-1 data into SNAP
- use „Graph Builder” to load and execute previously saved workflow.

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

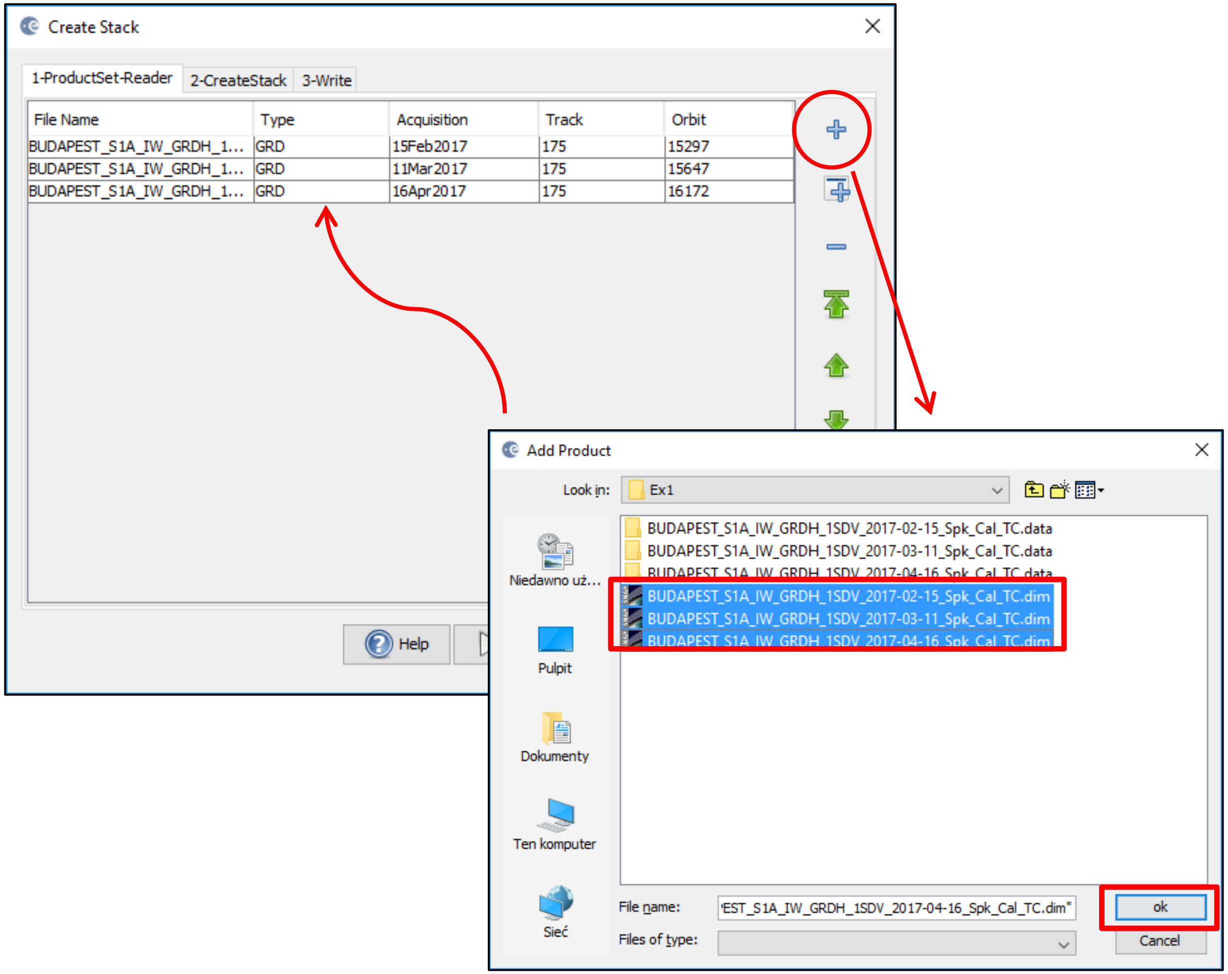
Generated Sentinel-1 subsets for three different acquisition dates.

Navigate to:
-> Radar
-> Coregistration
-> Stack Tools
-> **Create Stack**
to open stack creation tool.

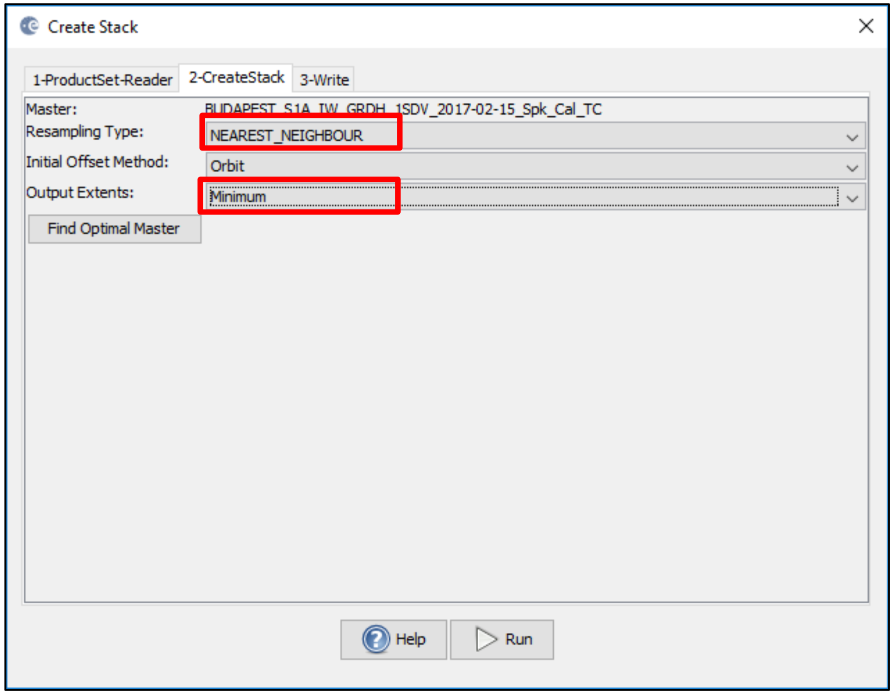


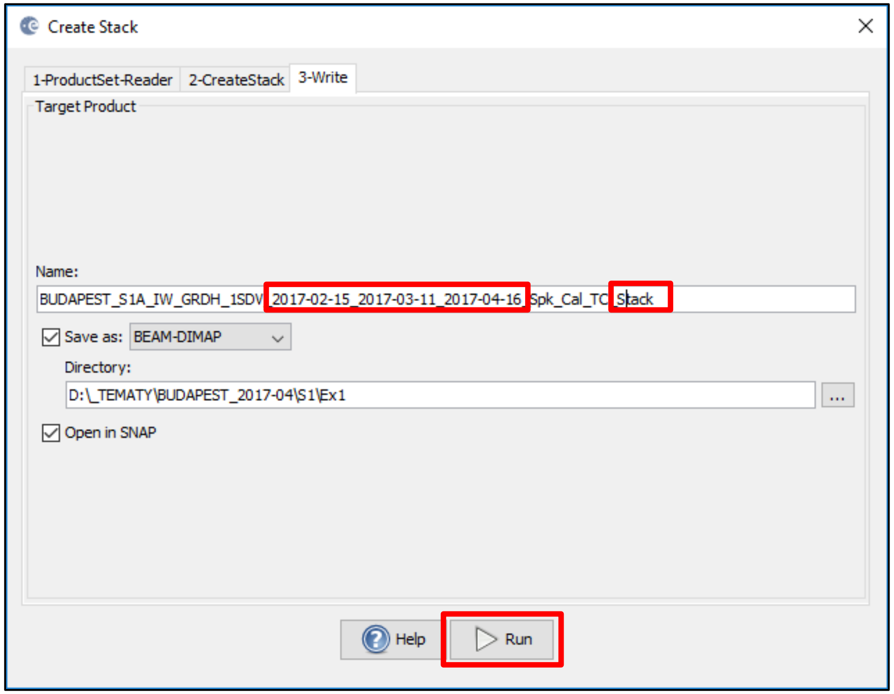
Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

In „1-ProductSet-Reader" tab use plus symbol to open „Add Product" dialog. Navigate to and select three Sentinel-1 subsets (with Ctrl button). Press „ok" button to add files to the list.



Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)





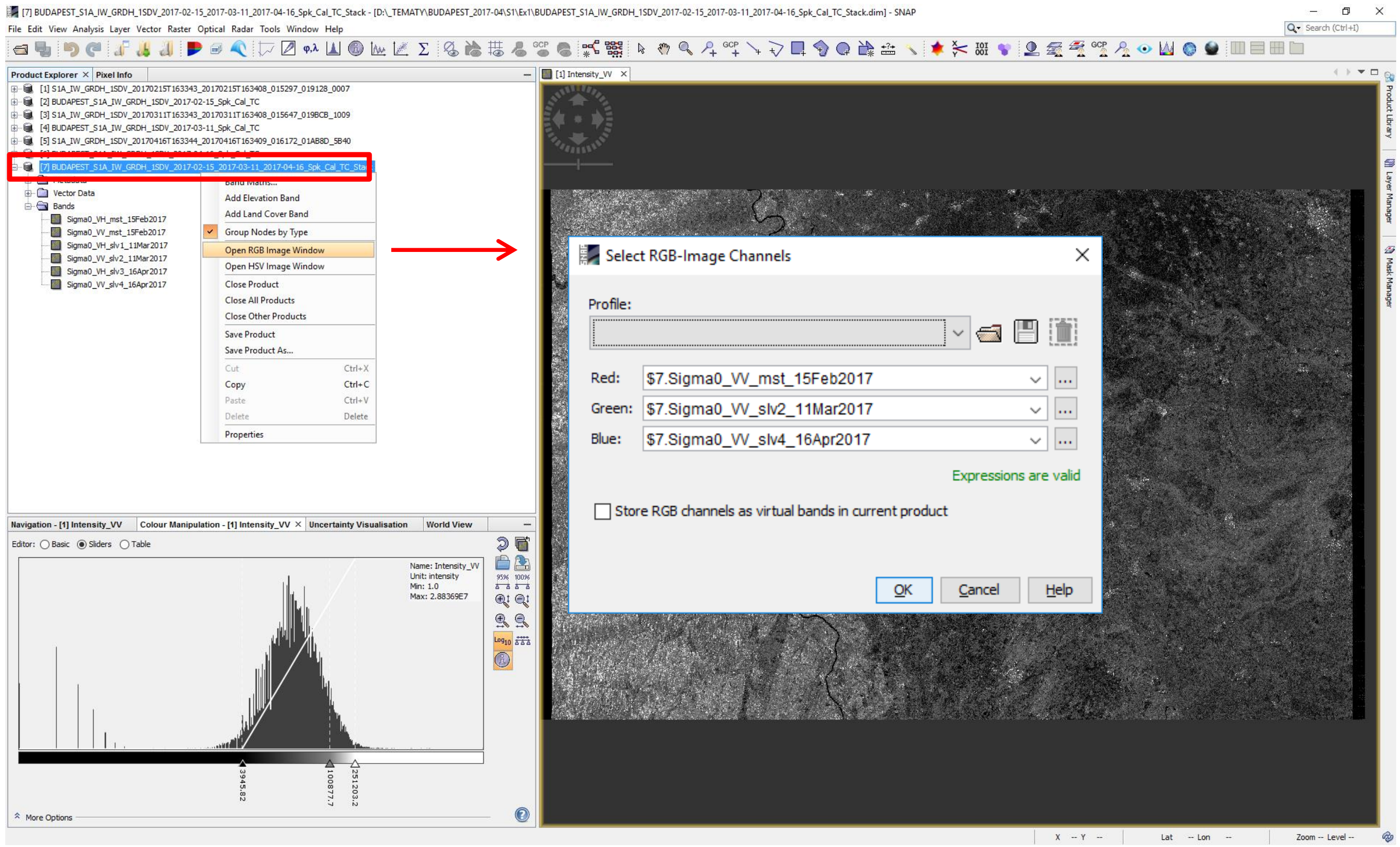
In „2-CreateStack" tab change „Resampling Type:" to „NEAREST_NEIGHBOUR" and „Output Extents:" to „Minimum".

Go to „3-Write" tab and modify (or leave default values) product name and output directory. Execute tool by pressing „Run" button.

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

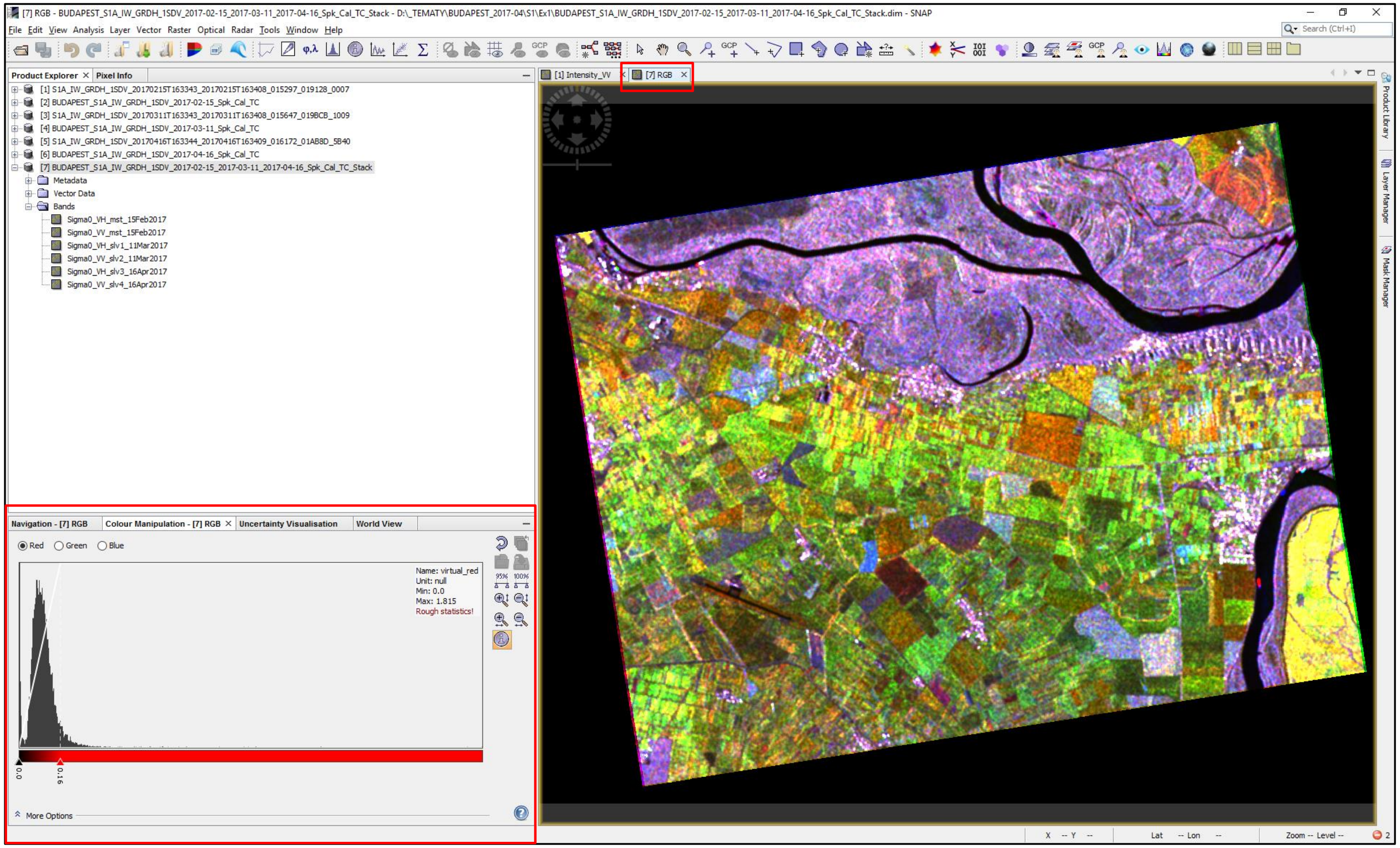
Right-click on the newly created stack and select „Open RGB Image Window”.

From drop-down list select VV bands (three different dates) for red, green and blue and press „OK” to create RGB composition.



Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

A new "Image Window" will appear with RGB composition.



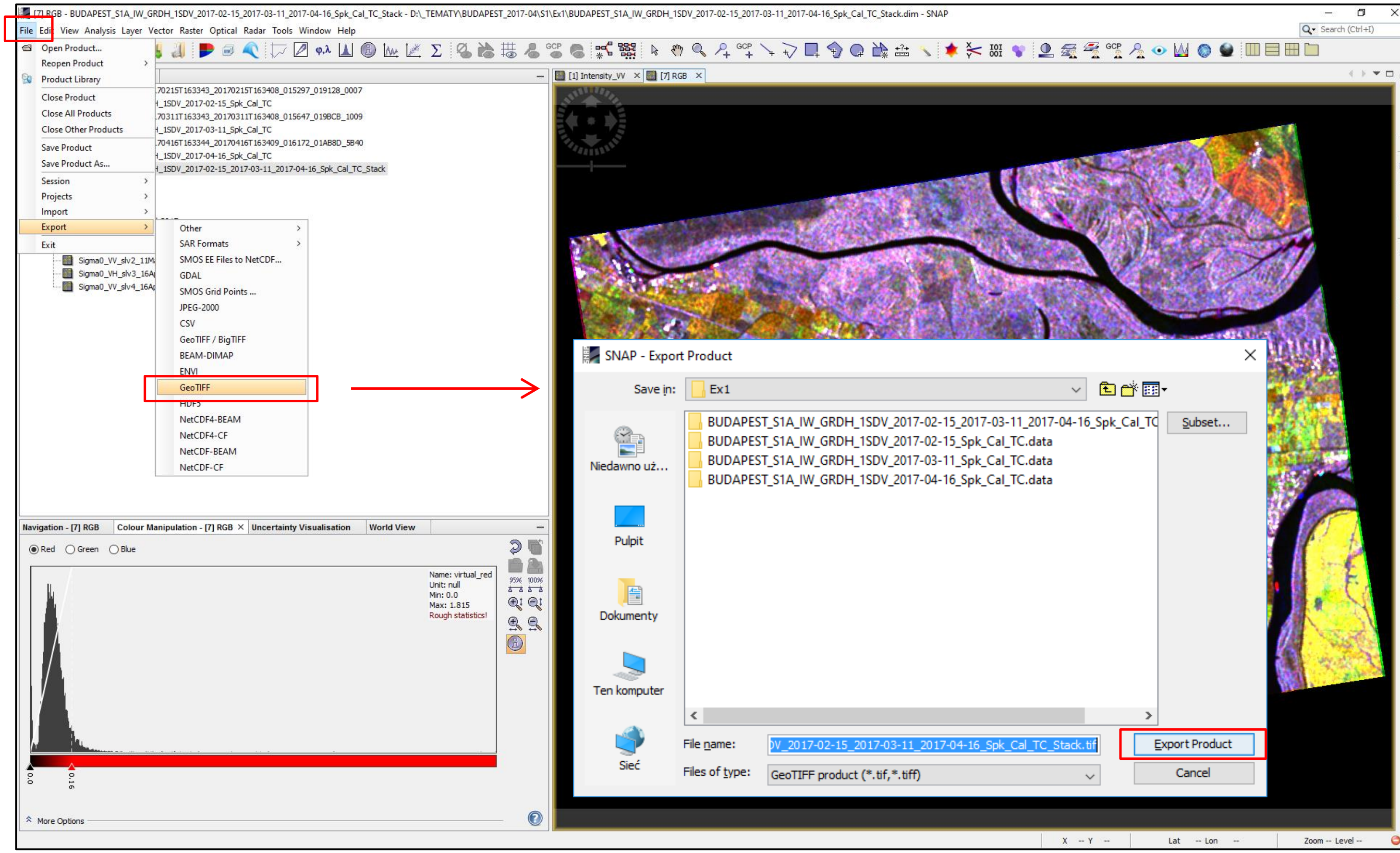
If needed, adjust histogram stretching for each layer (red, green, blue)

Exercise 1 – Sentinel-1 preprocessing and data fusion (SNAP)

Make sure that the stacked image is selected in „Product Explorer” window.

Navigate to:
-> File
-> Export
-> **GeoTIFF**
to open „**SNAP – Export Product**” tool.

Specify file name and location and press „Export Product” button.



Sen2Cor: Sentinel-2 Level 2A Atmospheric Correction Processor

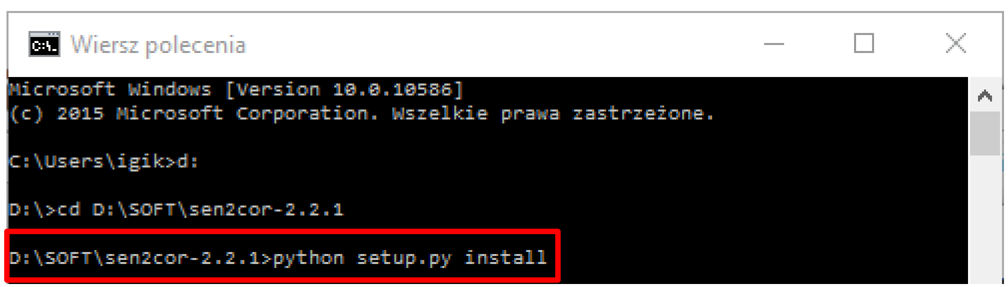
http://step.esa.int/main/third-party-plugins-2/sen2cor/

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (**sen2cor**, SNAP)

Sentinel-2 MSI – Level-2A Prototype Processor Installation and User Manual

CHAPTER 3 – CONFIGURATION AND INSTALLATION (page 31)

- Setting up the Runtime Environment (**Anaconda** Upgrade/Installation)
  - http://continuum.io/downloads
- **Sen2Cor** Installation
  - In the command line utility navigate to the sen2cor-2.3.1 folder, type "python setup.py install" and follow the instructions. The setup will install the Sen2Cor application and all its dependencies under the Anaconda python distribution.



Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (**sen2cor**, SNAP)

- Sen2Cor installation script will use internet connection to download all needed packages.
- User will be asked to press „y” and „Enter” to finish the configuration of environment settings and confirm location of sen2cor home directory (which will store e.g. sen2cor configuration file).

Wiersz polecenia

```
SEN2COR 2.2.1 setup script:
This will finish the configuration of the environment settings.

OK to continue? [y/n]: y

Please input a path for the sen2cor home directory:
default is: C:\Users\igik\documents\sen2cor
Is this OK? [y/n]: y
copying C:\Anaconda2\Lib\site-packages\sen2cor-2.2.1-py2.7.egg/sen2cor\cfg\L2A_G
IPP.xml -> C:\Users\igik\documents\sen2cor\cfg
Setting environment for sen2cor ...
Setting environment variable GDAL_DATA:
SUCCESS: Specified value was saved.
Setting environment variable SEN2COR_HOME:
SUCCESS: Specified value was saved.
Setting environment variable SEN2COR_BIN:
SUCCESS: Specified value was saved.
Congratulations, you are done!
- you can call the processor from everywhere via: "L2A_Process"
- you will find the default configuration called "L2A_GIPP.xml" under:
C:\Users\igik\documents\sen2cor\cfg

Installation sucessfully performed.

D:\SOFT\sen2cor-2.2.1>
```

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (**sen2cor**, SNAP)

- Use „L2A_PROCESS --help” command to display help screen with possible options.

Wiersz polecenia

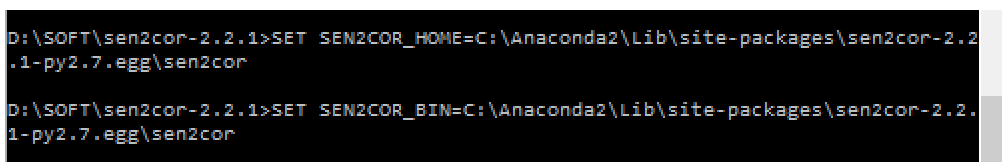
```
D:\>l2a_process --help
usage: L2A_Process [-h] [--resolution {10,20,60}] [--sc_only] [--cr_only]
                   [--refresh] [--GIP_L2A GIP_L2A] [--GIP_L2A_SC GIP_L2A_SC]
                   [--GIP_L2A_AC GIP_L2A_AC]
                   directory

Sentinel-2 Level 2A Processor (Sen2Cor). Version: 2.3.1, created: 2017.02.03,
supporting Level-1C product version: 14.

positional arguments:
  directory             Directory where the Level-1C input files are located

optional arguments:
  -h, --help            show this help message and exit
  --resolution {10,20,60}
                        Target resolution, can be 10, 20 or 60m. If omitted,
                        all resolutions will be processed
  --sc_only             Performs only the scene classification at 60 or 20m
                        resolution
  --cr_only             Performs only the creation of the L2A product tree, no
                        processing
  --refresh             Performs a refresh of the persistent configuration
                        before start
  --GIP_L2A GIP_L2A     Select the user GIPP
  --GIP_L2A_SC GIP_L2A_SC
                        Select the scene classification GIPP
  --GIP_L2A_AC GIP_L2A_AC
                        Select the atmospheric correction GIPP

D:\>
```

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (**sen2cor**, SNAP)

In case of environment variables error (on Windows OS) use following commands to set them correctly:

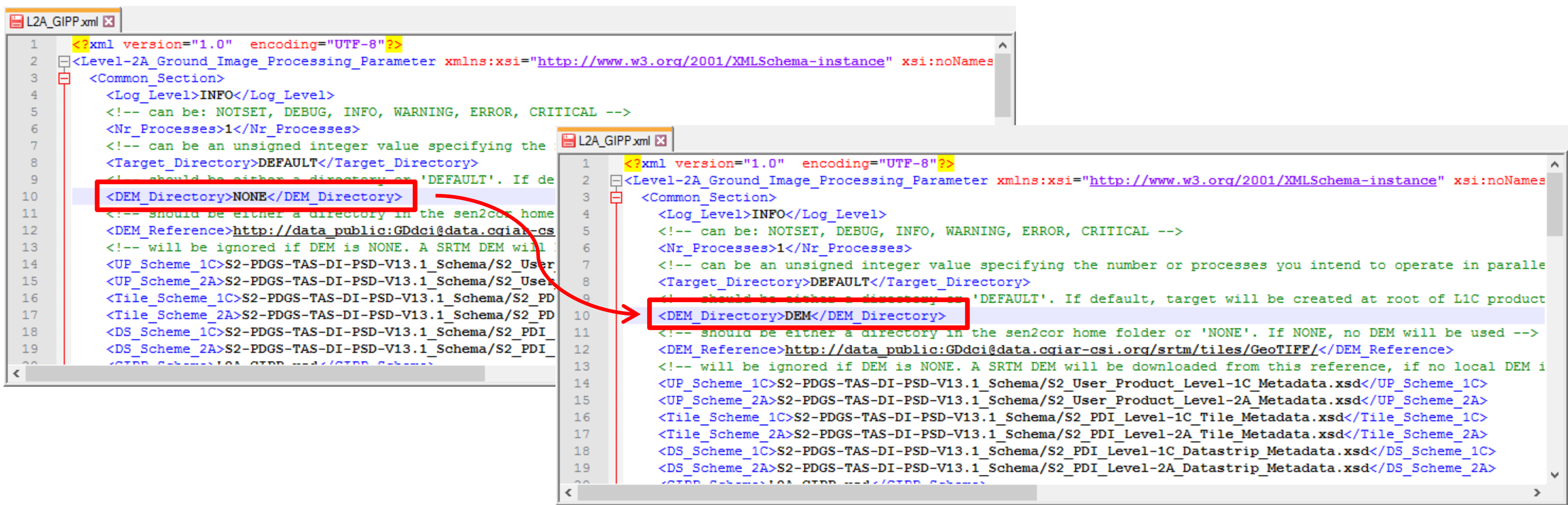
- SET SEN2COR_HOME=C:\Anaconda2\Lib\site-packages\sen2cor-2.3.1-py2.7.egg\sen2cor
- SET SEN2COR_BIN=C:\Anaconda2\Lib\site-packages\sen2cor-2.3.1-py2.7.egg\sen2cor

If needed adjust both paths to point to the sen2cor folder within Anaconda installation folder.


```
D:\SOFT\sen2cor-2.2.1>SET SEN2COR_HOME=C:\Anaconda2\Lib\site-packages\sen2cor-2.2
.1-py2.7.egg\sen2cor

D:\SOFT\sen2cor-2.2.1>SET SEN2COR_BIN=C:\Anaconda2\Lib\site-packages\sen2cor-2.2.
1-py2.7.egg\sen2cor
```

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (**sen2cor**, SNAP)

- To include DEM data in data correction go to the sen2cor home folder (usually in user's Documents folder, e.g. „C:\Users\<user-name>\Documents\sen2cor") and in the „cfg" folder open L2A_GIPP.xml file with appropriate editor (like Notepad++).
- In the line with „DEM_Directory" tags change „NONE" to any other name (e.g. „DEM").



Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (**sen2cor**, SNAP)

To start data processing use the following command:

L2A_PROCESS <unzipped image data folder path> <optional parameters>

e.g.

„L2A_PROCESS D:\S2A_MSIL1C_20170329T095021_N0204_R079_T33TYN_20170329T095024.SAFE

--resolution 10”

```
C:\WINDOWS\system32\cmd.exe
D:\>l2a_process S2A_MSIL1C_20170329T095021_N0204_R079_T33TYN_20170329T095024.SAFE --resolution 10
```

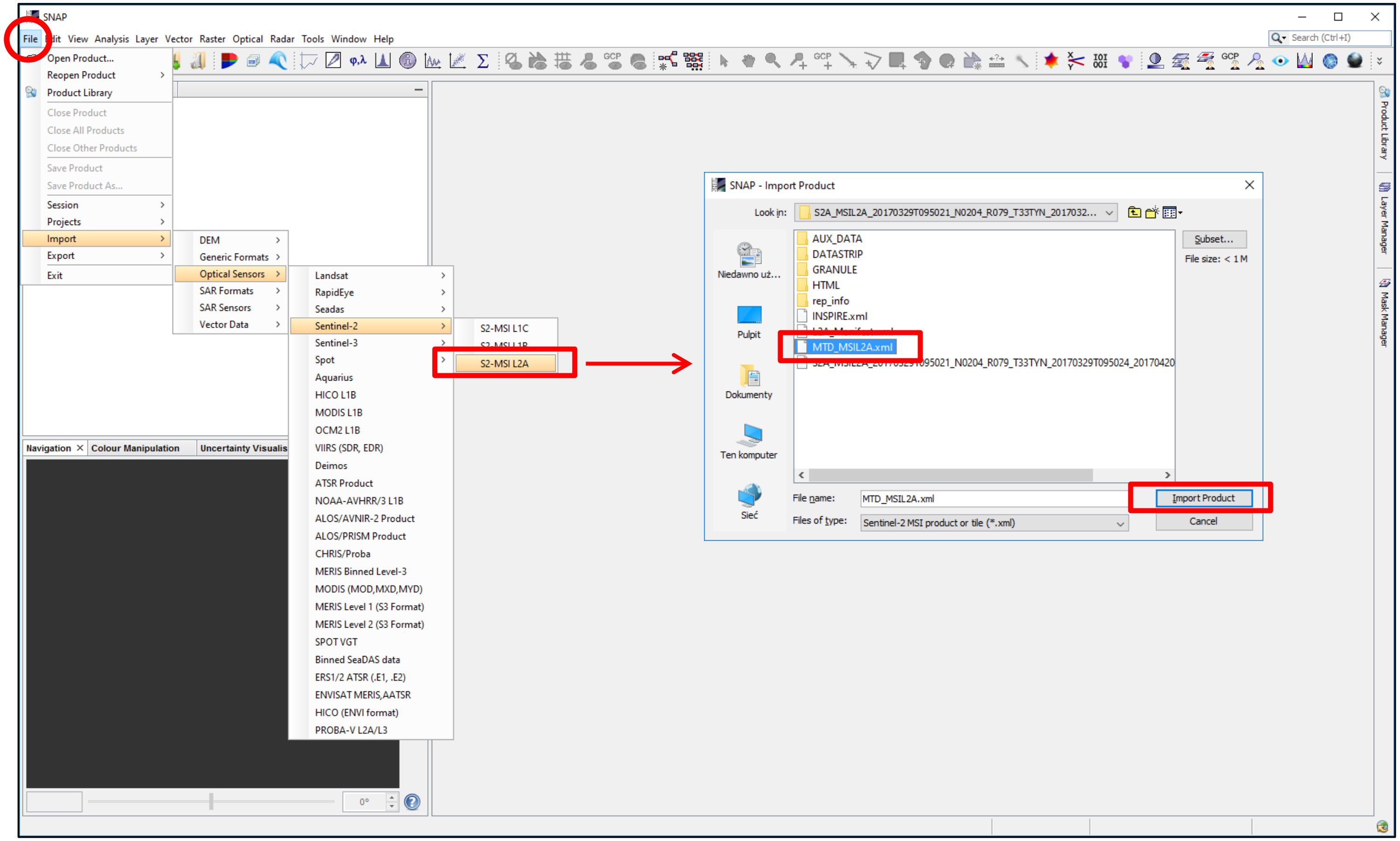
INPUT FOLDER:

S2A_MSI**L1C**_20170329T095021_N0204_R079_T33TYN_20170329T095024.SAFE

OUTPUT FOLDER:

S2A_MSI**L2A**_20170329T095021_N0204_R079_T33TYN_20170329T095024.SAFE

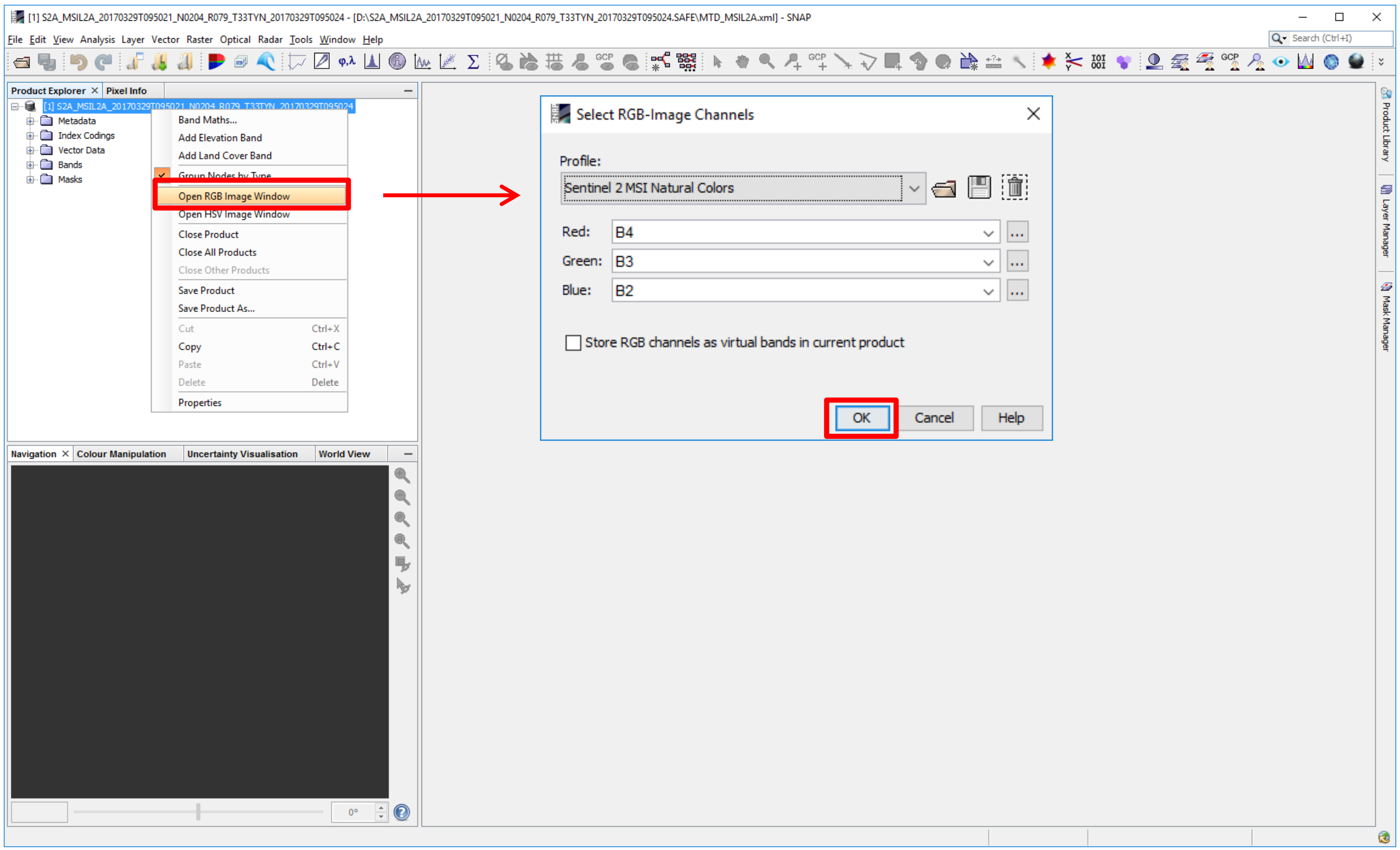
Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



In **SNAP** navigate to:
-> File
-> Import
-> Optical Sensors
-> Sentinel-2
-> **S2-MSI-L2A**

Navigate to processed Sentinel-2 main data folder, select „MTD_MSIL2A.xml" file and use „Import Product".

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)

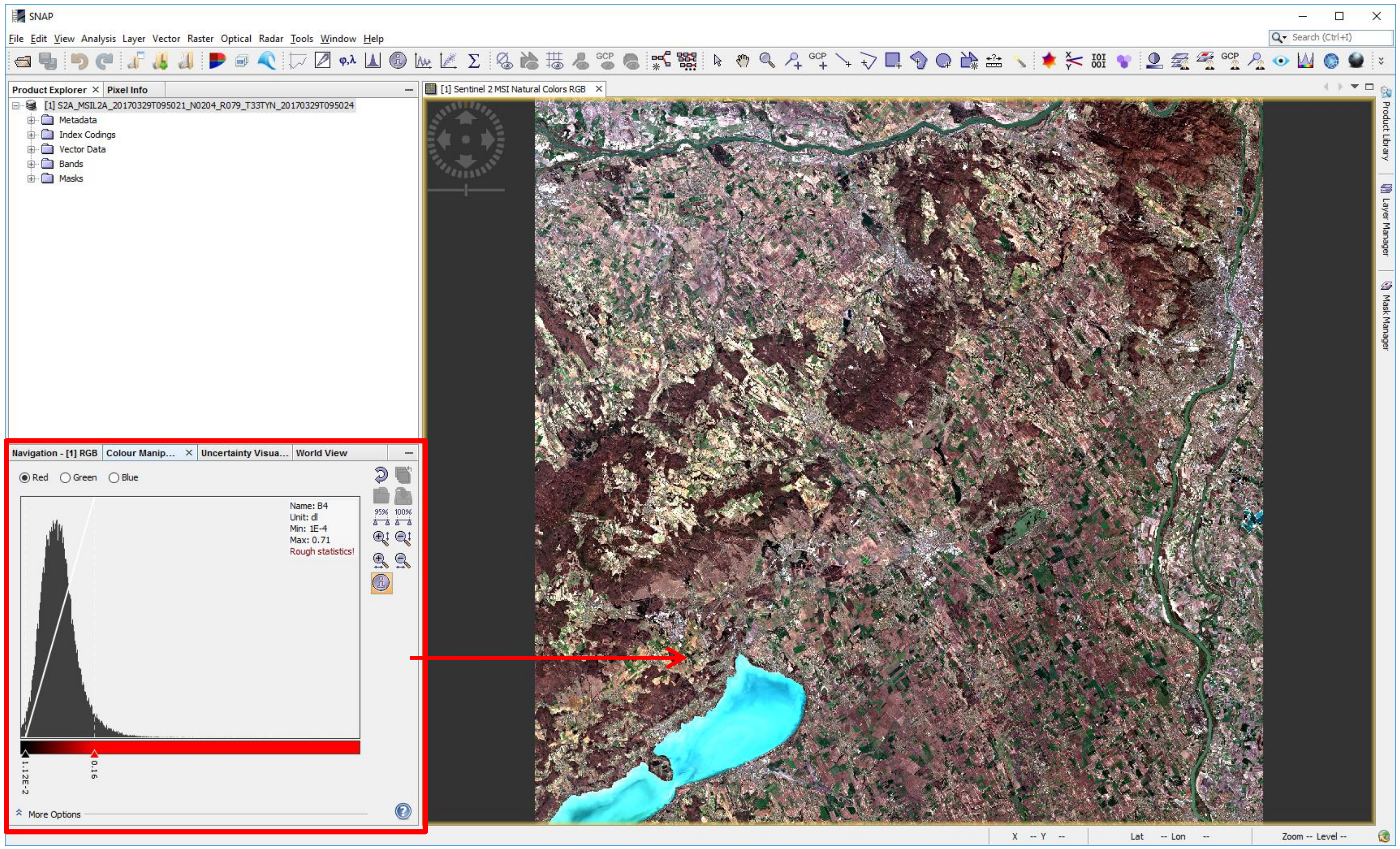


In „Product Explorer” window right-click on the newly added data and select „Open RGB Image Window” tool.

In „Select RGB-Image Channels” window select „B4” band as red, „B3” as Green and „B2” as Blue to create „Natural Colors” composition. Confirm with „OK”.

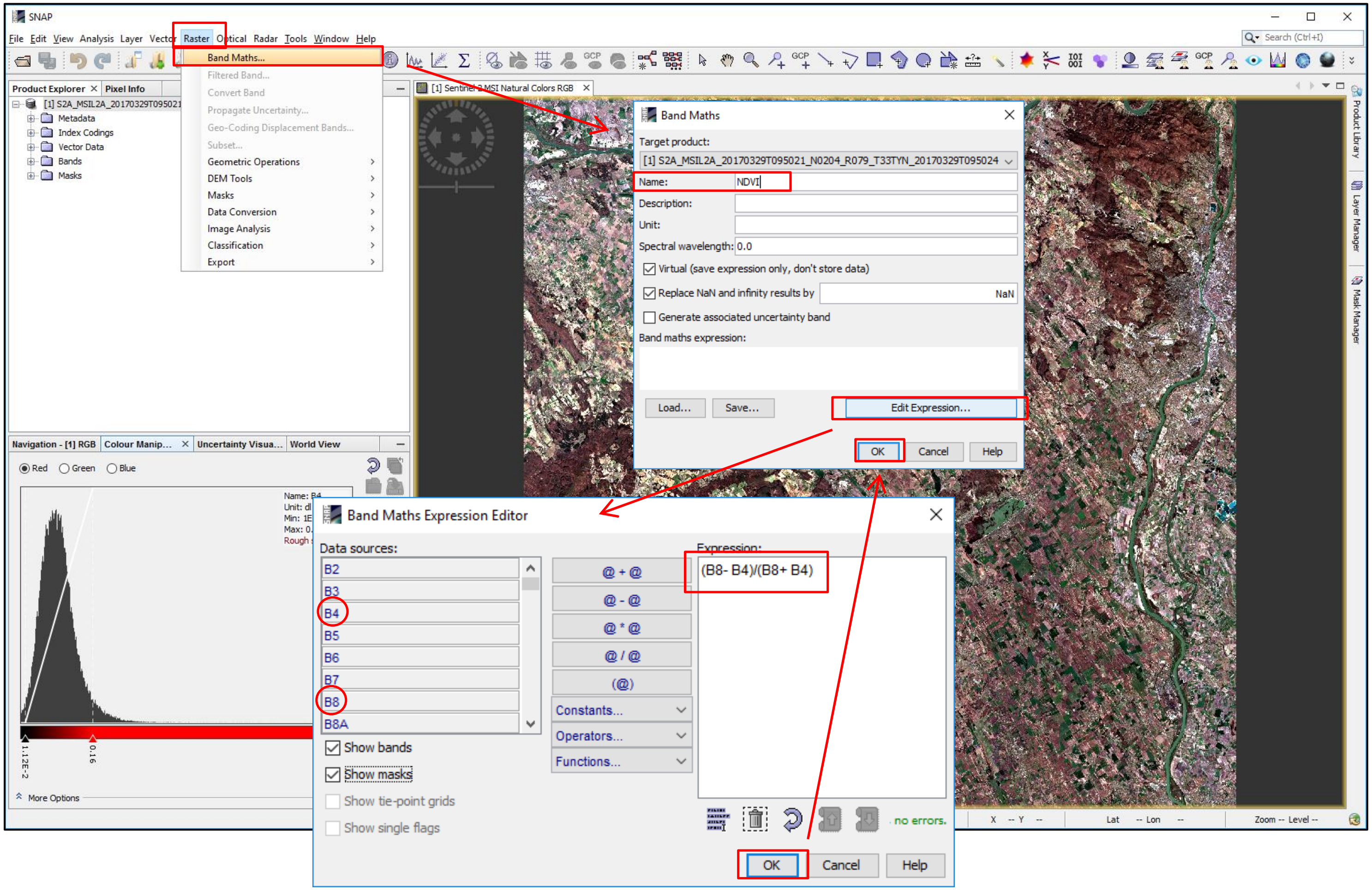
A new „Image Window” will appear.

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



If needed, manipulate with sliders for Red, Green and Blue bands in the „Colour Manipulation” panel to strech the histogram.

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



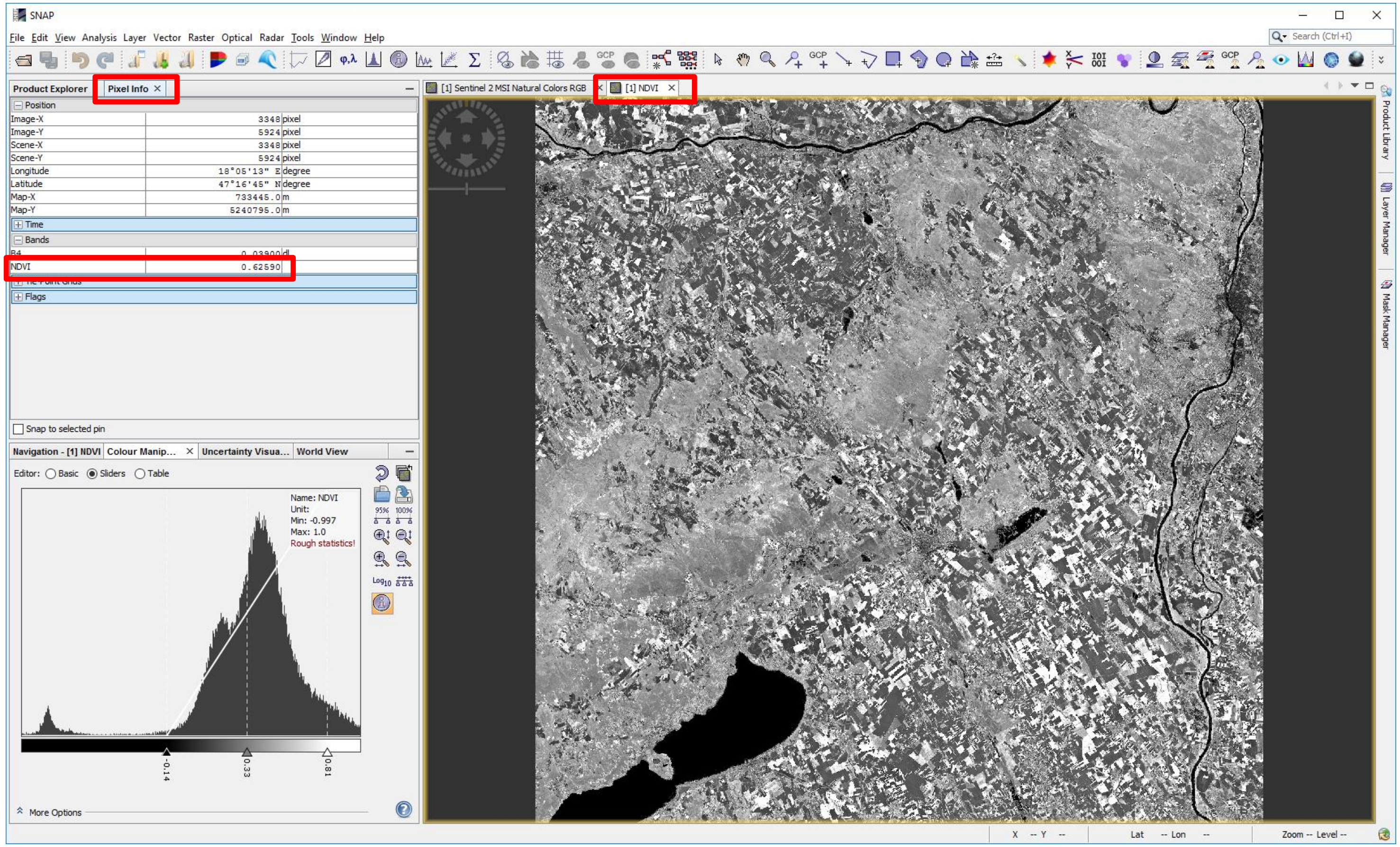
From menu „Raster” select „Band Maths...”.

In „Band Maths” dialog define name (e.g. „**NDVI**”) and select „Edit Expression...” button.

In „Band Maths Expression Editor” define expression as: „**(B8 – B4)/(B8 + B4)**” and press „OK”.

Confirm with „OK” in „Band Maths” window.

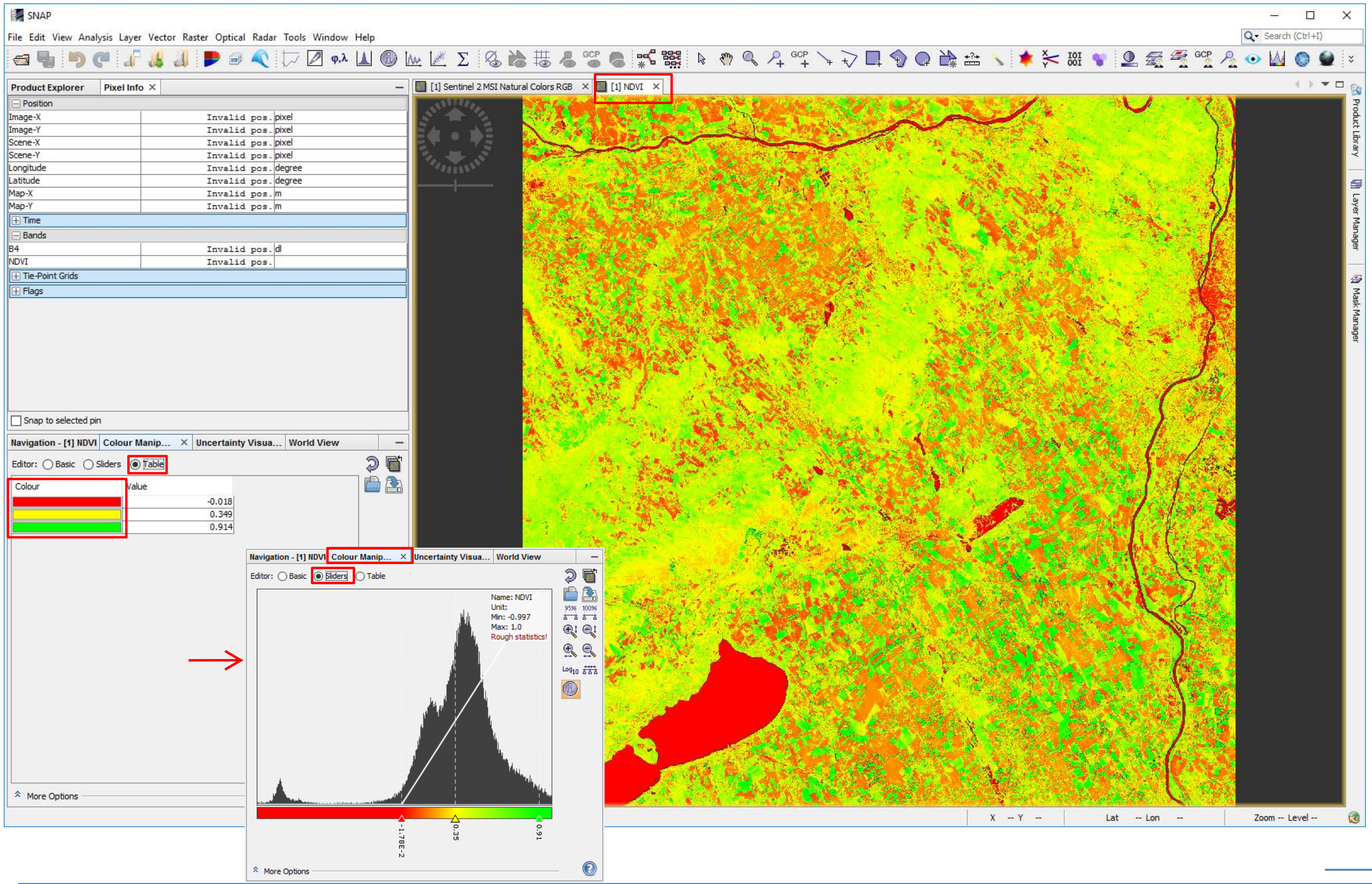
Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



A new „Image Window” with calculated NDVI in grey scale will appear.

Switch to „Pixel Info” tab to inspect NDVI values updated from the current cursor position.

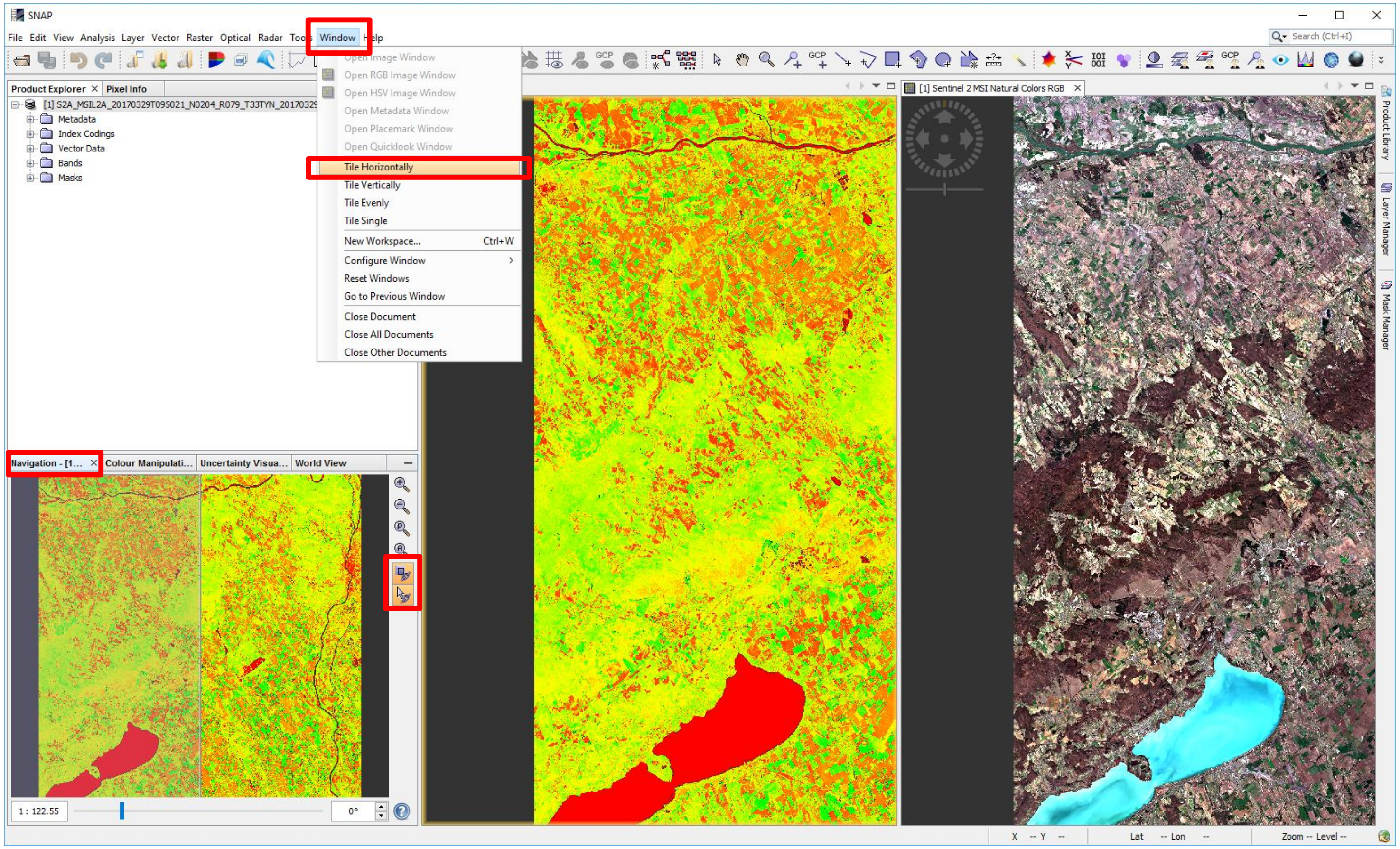
Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



In “Colour Manipulation” panel switch to “Table” view and set red, yellow and green colors in “Colour” column.

Go to “Sliders” view and adjust histogram to improve clarity of the data.

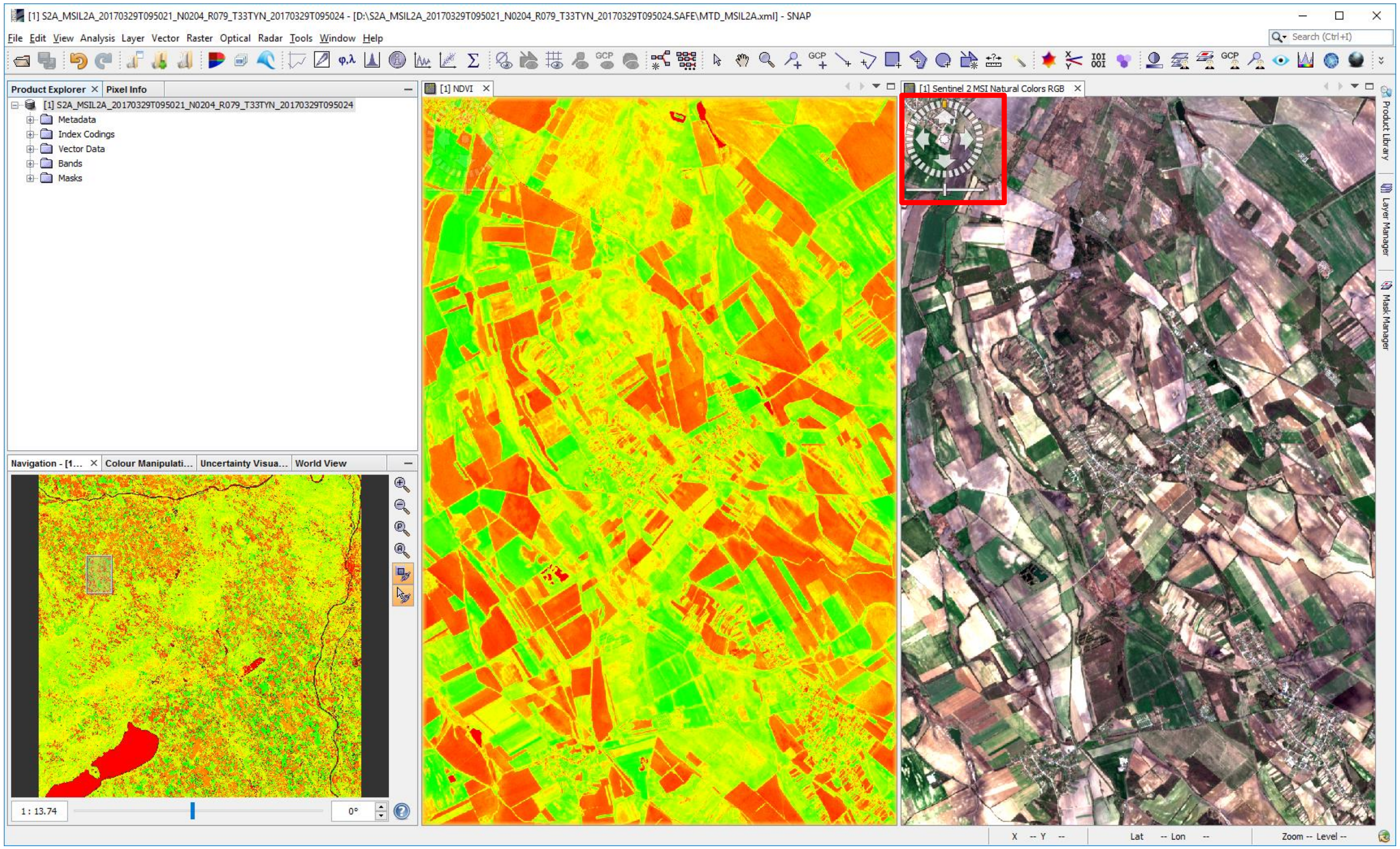
Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



In menu "Window" select "Tile Horizontally".

In "Navigation" tab make sure that both synchronize views and cursor positions buttons are selected.

Exercise 2 – Sentinel-2 atmospheric correction and NDVI index (sen2cor, **SNAP**)



Use on-screen navigation buttons to inspect the data.

Thank you for your attention.

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