SNAP GENERAL OVERVIEW

SUMMARY

- Introduction to Sentinel-1 and Sentinel-2 missions
- Sentinel-1 acquisition modes & data products
- Sentinel-2 data products
- How to access Sentinels data(+DEMO)
- Introduction to SNAP(+DEMO)

- Sentinel-1 Use Case (Flood detection)

SENTINEL-1

Key Features:

- C-band SAR instrument - All-weather, day-and-night
- Resolution depending on acquisition mode and data level
- 6 days revisit time at equator
- 2 launched on 3/4/2014 and 25/4/2016, 2 ordered

Applications:

- Maritime (Oil spill detection, etc..)
- Land (Crop Monitoring, etc..)
- Emergency (Flood monitoring, etc..)

SENTINEL-2

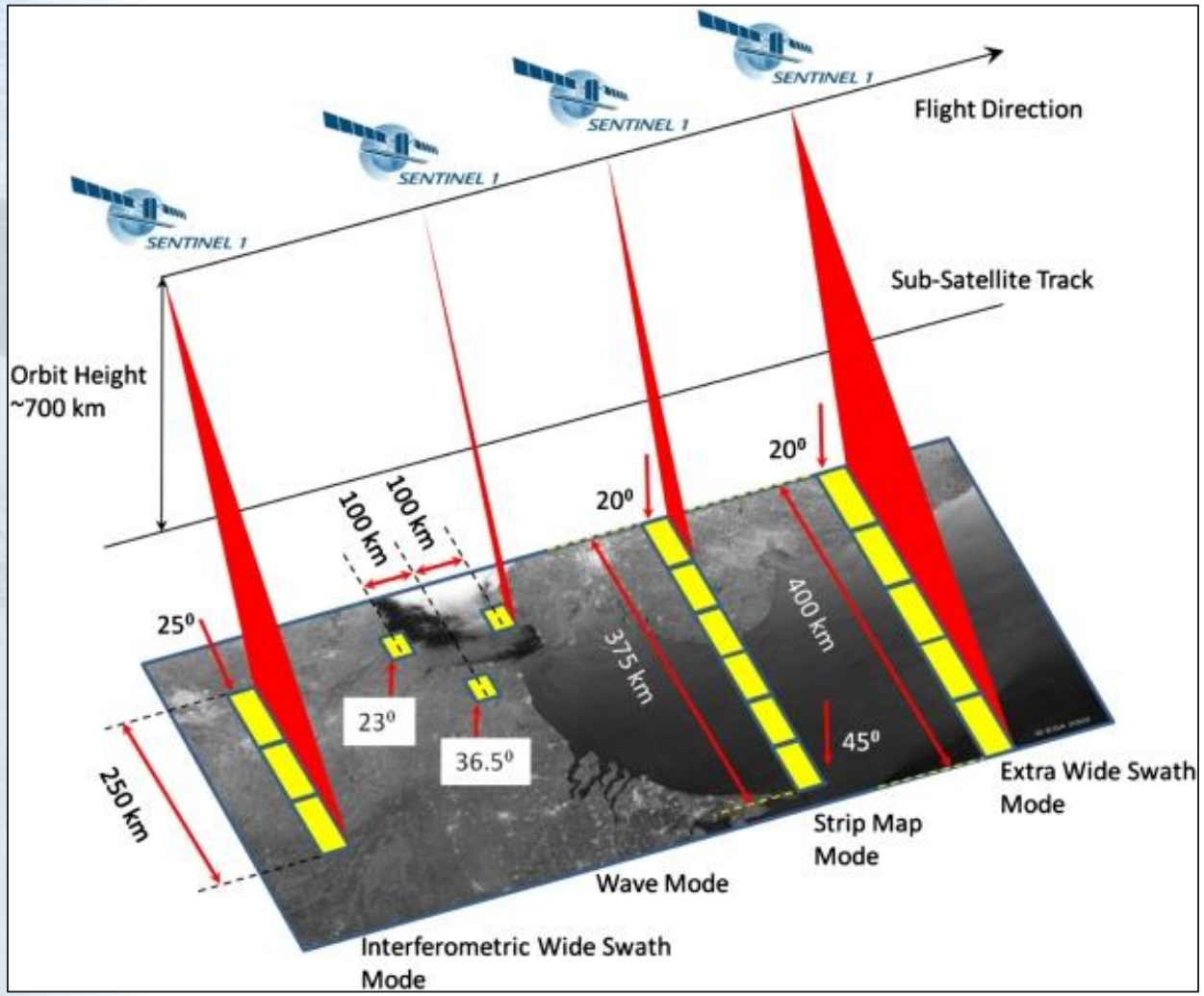
Key Features:

- Multispectral optical sensor (MSI)
- 10-60m resolution, 5 days revisit time
- 2 launched on 22/6/2015 and 7/03/20172, 2 ordered

Applications:

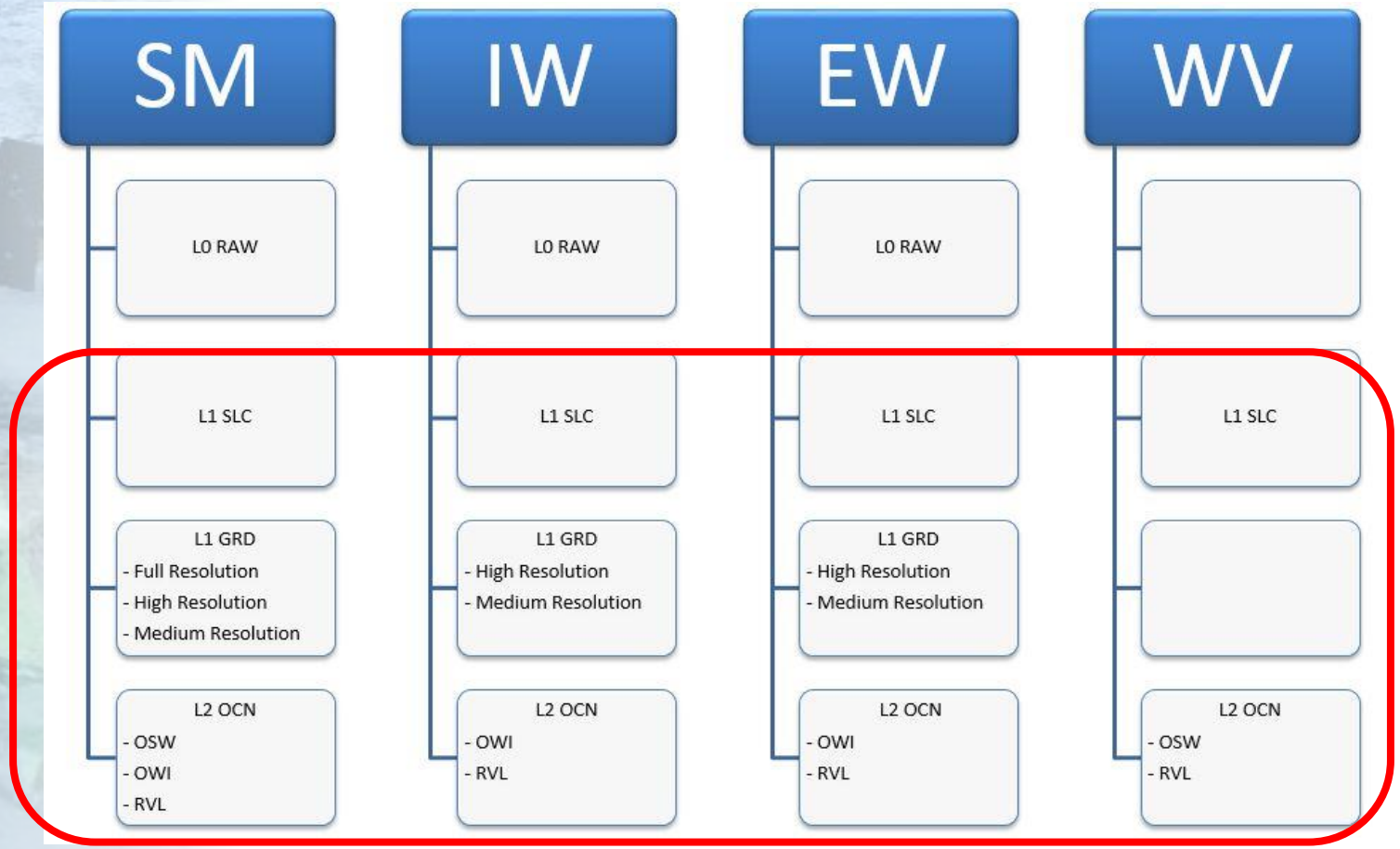
- Land monitoring(agriculture, coastal areas, etc..)
- Emergency management (wildfire, etc…)
- Security(maritime surveillance,etc..)

SENTINEL-1 ACQUISITION MODES



- Supported operations in single polarization (HH or VV) or dual polarization (HH+HV or VV+VH)
- The Wave Mode is the only one provided without dual polarization products
- Each acquisition mode has its own fields of application

SENTINEL-1 DATA PRODUCTS



- Level-1 and level-2 products at: https://scihub.copernicus.eu/
- Each level-1 product type needs some pre-processing step before being used for a specific application
- GRD (Ground Range Detected) has square spatial resolution
- SLC (Single Look Complex) has amplitude and phase informatio for each pixel of an image

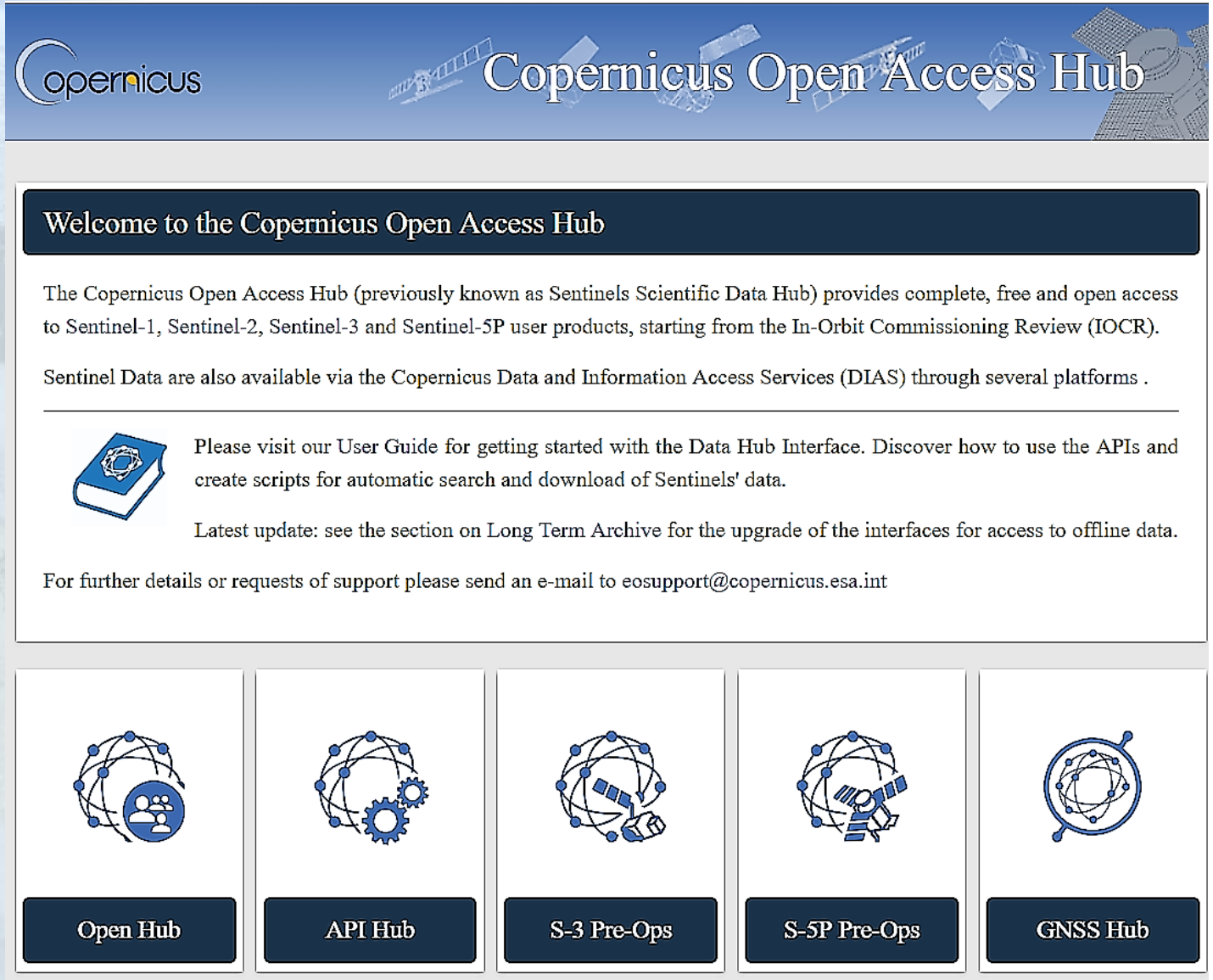
SENTINEL-2 DATA PRODUCTS

Name	High-level Description	Production & Distribution	Data Volume
Level-1C	Top-of-atmosphere reflectances in cartographic geometry	Systematic generation and on-line distribution	600 MB (each 100x100 km2)
Level-2A	Bottom-of-atmosphere reflectance in cartographic geometry	Systematic generation and on-line distribution and generation on user side (using Sentinel-2 Toolbox)	800 MB (each 100x100 km2)

- Level-1C products provide orthorectified (Top of Atmosphere) reflectances for 12 bands, covering the electromagnetic spectrum from VIS to SWIR wavelengths. They are available with global coverage at https://scihub.copernicus.eu/

- Level-2A products can be generated on user side with Sen2Cor tool, but from 26 March 2018 they are produced with Euro-Mediterranean coverage and available at https://scihub.copernicus.eu/.
  Worldwide coverage is under development

HOW TO ACCESS SENTINELS DATA



https://scihub.copernicus.eu/

SNAP (SeNtinel Application Platform)

- Sentinel-1 Toolbox
- Sentinel-2 Toolbox
- Sentinel-3 Toolbox
- SMOS Toolbox
- Proba-V Toolbox

INTRODUCTION TO SNAP/2

- Free common software platform for the ESA Sentinel Toolboxes
- It also provides operators for many other types of data: LandSat, MODIS, MERIS,RADARSAT-2, etc..
- SNAP is not a GIS software!!

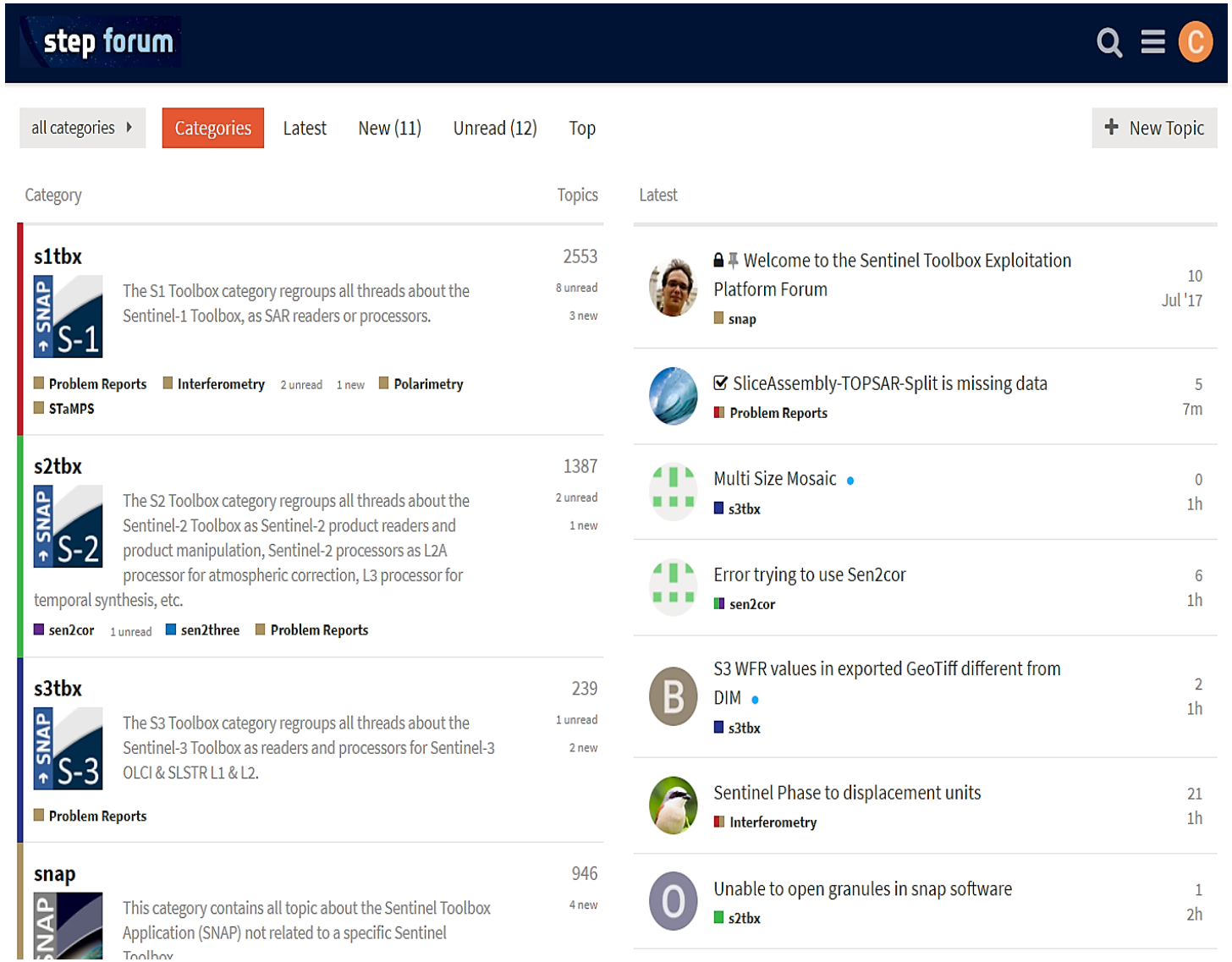
Using SNAP in your own programs:

- It is possible to use the SNAP Java API directly from Python, by installing the ***snappy*** Python module(provided with SNAP).

- The SNAP processors can be also invoked on Windows or Linux using the Command Line Interfaces of SNAP, especially the Graph Processing Tool (GPT), without running the desktop version of the software.

See the extra contents of this presentation for the links to online references about Python and CLI extensions of SNAP

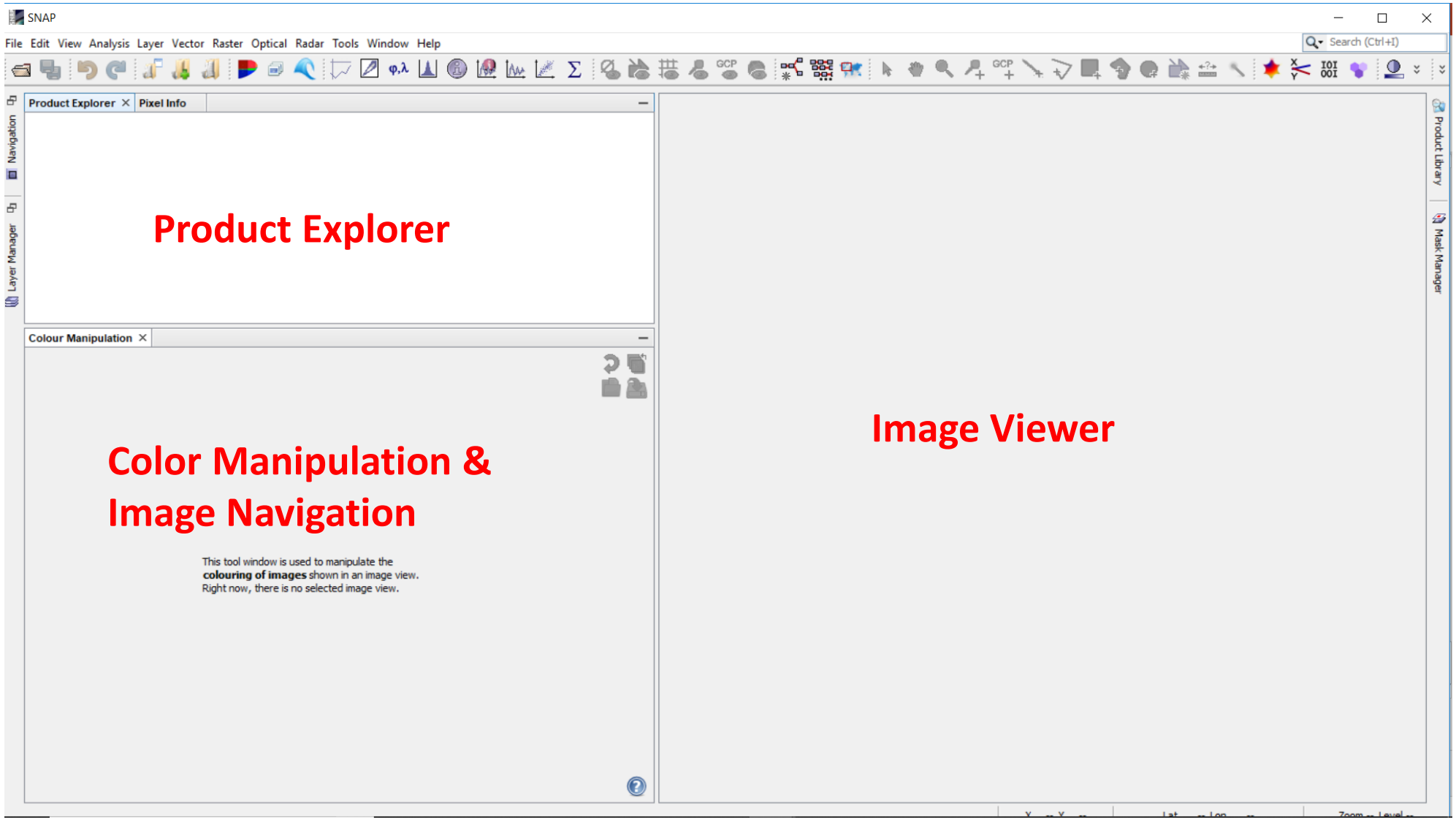
INTRODUCTION TO SNAP/4



- There is no official user manual for SNAP
- Very **active** and **helpful** **STEP** Forum: interaction with SNAP developers, advanced users and RS experts. See https://forum.step.esa.int/

INTRODUCTION TO SNAP/5

SNAP Overview



SNAP EXTRA contents: Sen2Cor

It generates the L2A product on user side (Atmospheric Correction)

Two possible installation modes:

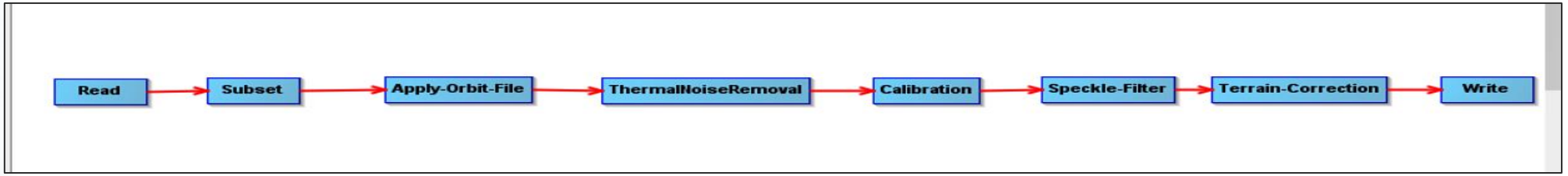
- Standalone installer for Windows/Linux/Mac (processing via Command Line Interpreter)
- Integration as a SNAP plugin (useful for SNAP processing chains)

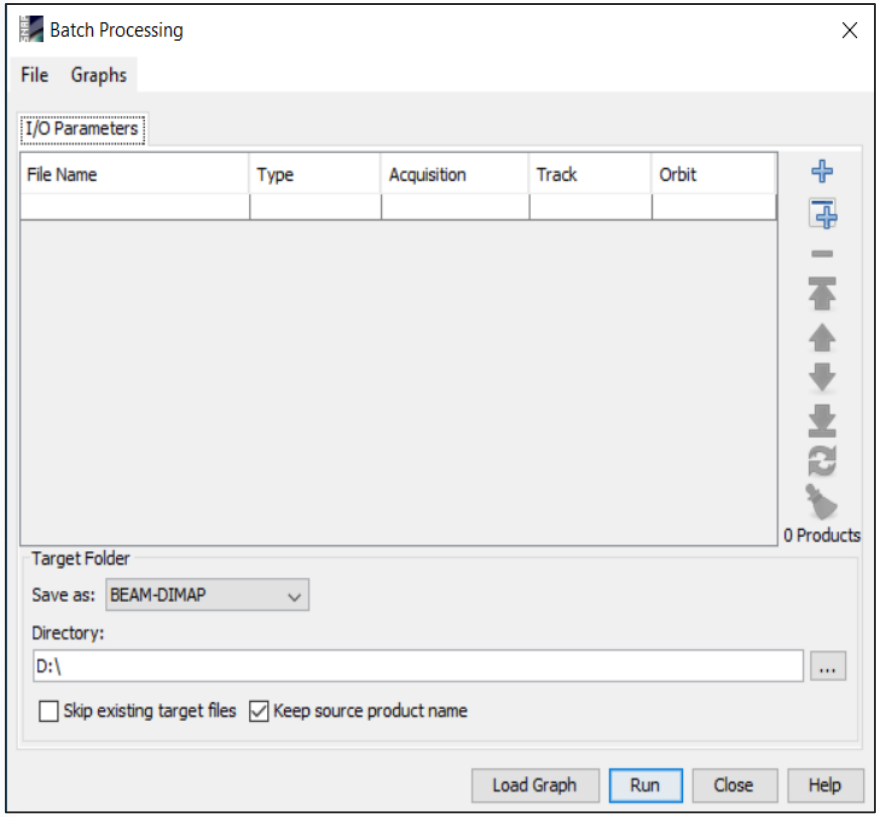
Three different product processing modes corresponding to three resolutions (10, 20,60 m)

How to run Sen2Cor via CLI (example for 60m resolution, calling the function from inside the user product directory):

```
L2A_Process
S2A_OPER_PRD_MSIL1C_PDMC_20150630T084936_R062_V20150627T103515_201506
27T1035 15.SAFE --resolution=60
```

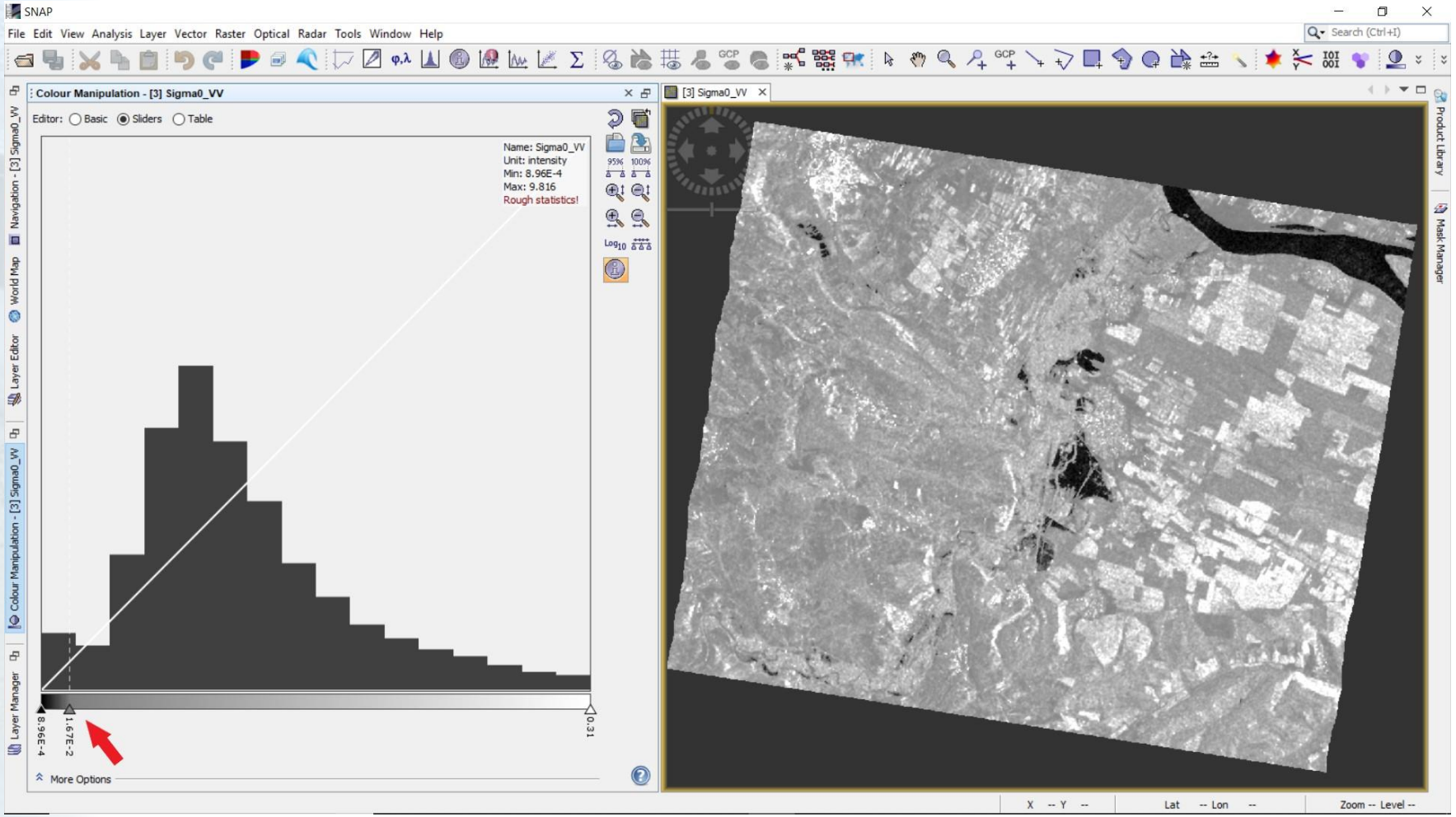
Step 1: Preprocessing chain & batch processing



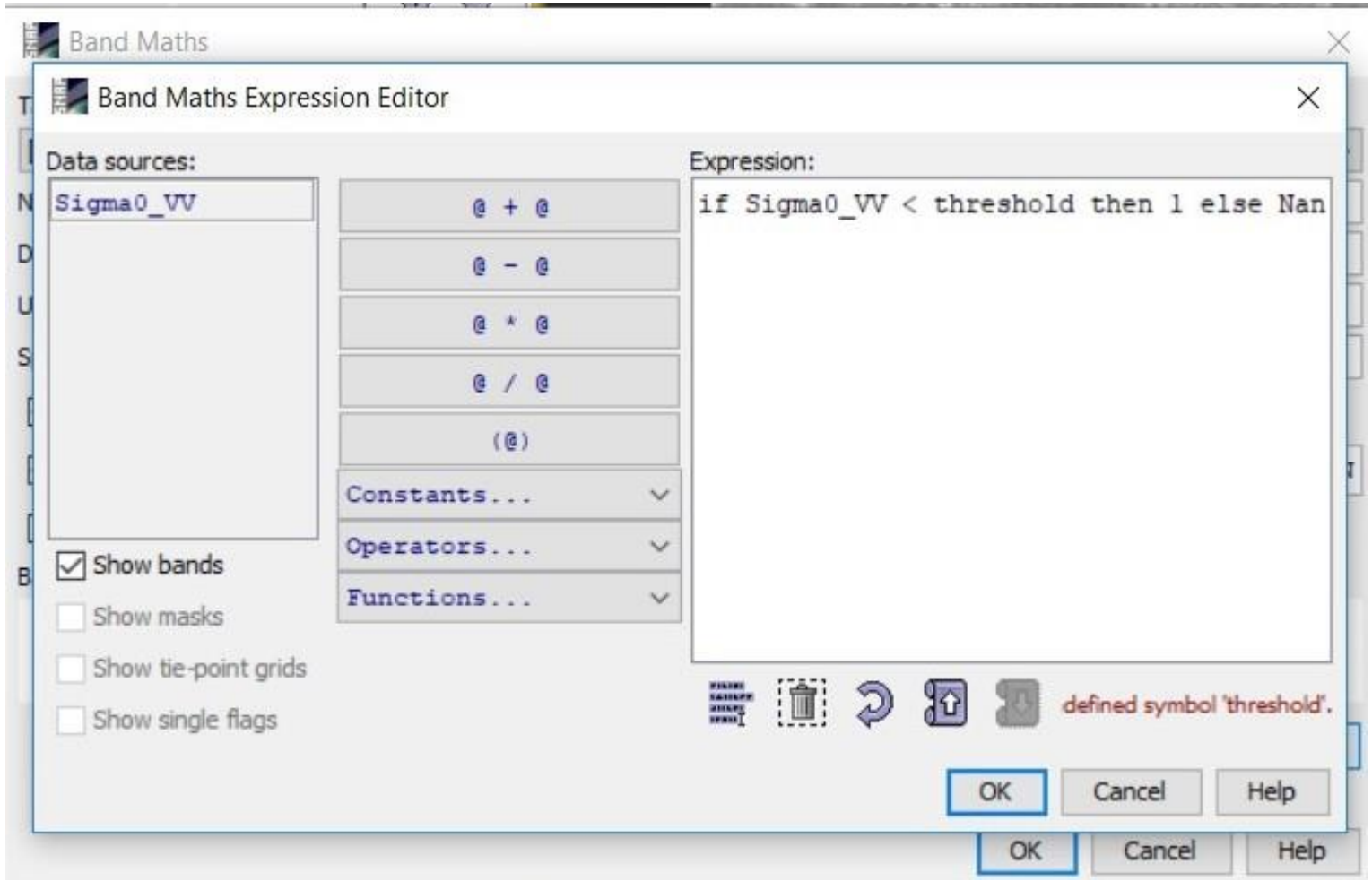


From the main menu : **Tools→ Batch Processing**

Step 2 : Histogram analysys and threshold selection

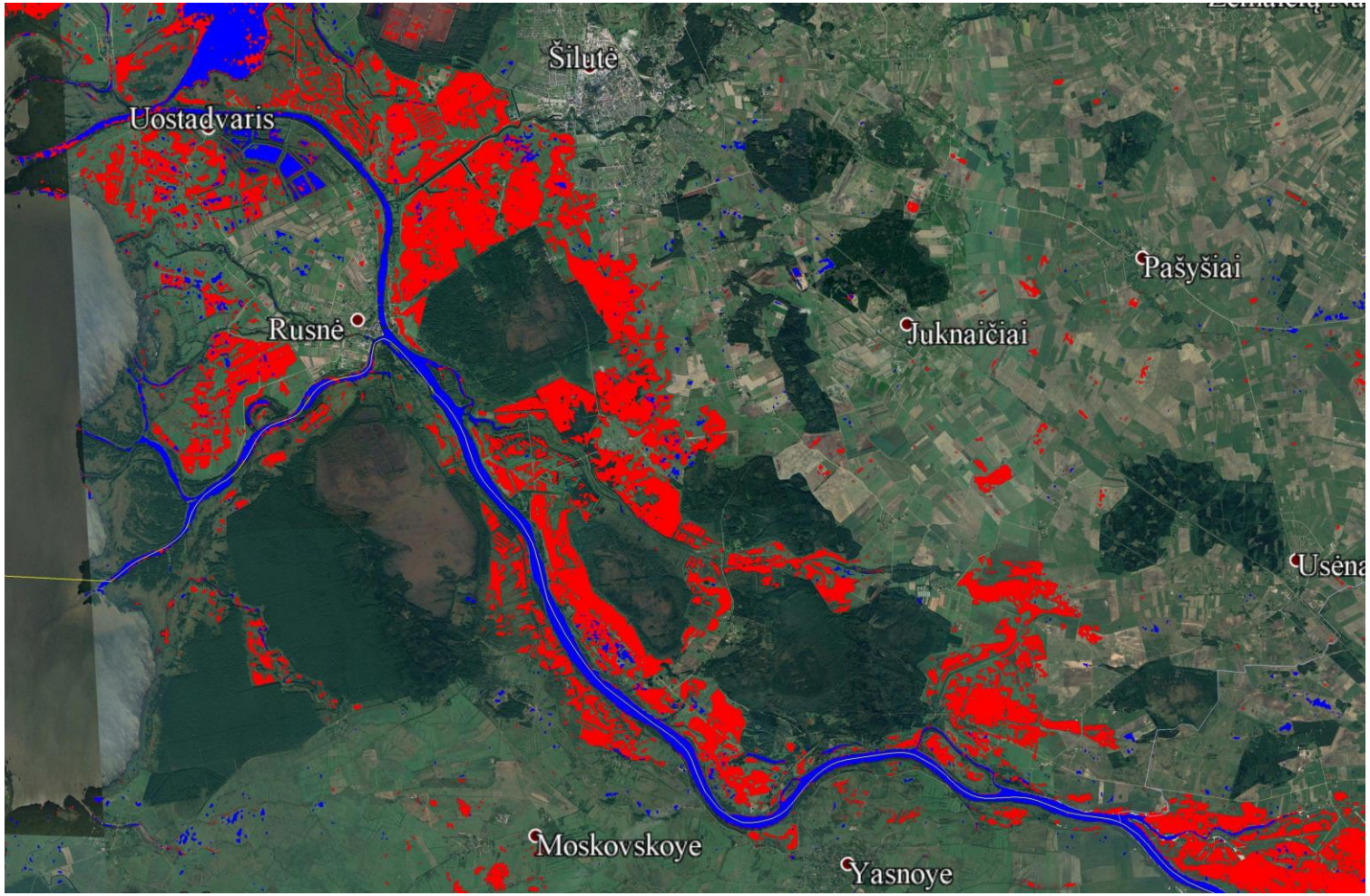


Step 3 : water mask creation (Raster→Band Maths)



SNAP EXTRA CONTENTS: Sentinel-1 use case

Step 4: exporting water masks to QGIS or Google Earth Pro and creation of a multitemporal map



INTRODUCTION TO SNAP: resources/1

External resources:

- ESA STEP tutorials:
  http://step.esa.int/main/doc/tutorials/

- EO College:
  https://eo-college.org

- ESA Earth Online:
  https://earth.esa.int/web/guest/pi-community/training

INTRODUCTION TO SNAP: resources/2

- **For Python integration and Bash Programming :**

https://senbox.atlassian.net/wiki/spaces/SNAP/pages/19300362/How+to+use+the+SNAP+API+from+Python

https://senbox.atlassian.net/wiki/spaces/SNAP/pages/70503475/Bulk+Processing+with+GPT

- **Sen2Cor installation & user manuals :**

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

INTRODUCTION TO SNAP: resources/3

- **Basic and advanced webinars covering a wide range of remote sensing applications and sensors (including Sentinel1 and Sentinel2), with training material included:**

  https://arset.gsfc.nasa.gov/webinars

- **SAR theory and Sentinel-1 training material (also other SAR sensors are present)**

  https://www.asf.alaska.edu/asf-tutorials/tutorial-overview/

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