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ESA TRAINING COURSE ON RADAR AND OPTICAL REMOTE SENSING

Practical Part

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Practical Part – S2/L8 data processing

- Exercise 1 : Browse a S2/L8 product
- Exercise 2 : Band Maths
- Exercise 3 : Vector Data
- Exercise 4 : Resampling/ Subset of an image/Band select
- Exercise 5 : Unsupervised-/Supervised Classification

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Practical SNAP– Exercise 1 – Browse a S2/L8 product

- Import a Sentinel 2/Landsat8 product
- Display band properties
- Display a band contents in image view
- Display an RGB composite
  - Natural color (Red Green Blue)
  - False color infrared composition (NIR Red Green)
- Open another band combinations
- Open the color manipulation tab
- Open the “Sliders” or “Table” mode and modify the ramp
- Tile window
- Use the navigation view to spatially link both window
- Discover the Pixel Info View
- Mosaicing Sentinel-2 scenes

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Practical SNAP – Exercise 2 – Band Maths

- Create a new band by applying Band Maths
- Create a NDVI band
  - Near Infrared:B8/Red:B4
  - Open the color manipulation tab
  - Choose a color ramp to display NDVI
  - Open the “Sliders” or “Table” mode and modify the ramp
  - Find a suitable threshold to delineate vegetation areas
  - Find a suitable threshold to delineate water areas
  - Apply thresholds with band properties

- Create a Water index mask (NDWI)
  - Green : B3/ NIR : B8
- Create the Normalized Burned Ratio Index (NBRI) for PRE- and Post Fire images
  - NIR: B8/SWIR: B12
  - Working with the Mask Manager: highlight the Burned Area

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Practical SNAP – Exercise 3 – Vector Data

- Add a new Vector data container
  - Click on “Vector Data” in the product explorer
  - Click on “Vector>New vector data container”
  - Draw a line/Polygon
- Delineate an area of interest
  - Choose between rectangle/ellipse/polygon
- Use the Layer Manager to display the vector or hide it
- Use the Mask Manager to combine it with vegetation or water mask
- Visualize the geometry WKT

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Practical SNAP – Exercise 4 – Resampling/ Subset of an image/ Band select

- Import a Sentinel-2 scene
- Open the Resampling tool: *Raster/Geometric operations/ Resampling*
  - Define the size of the resampled product: either from reference band, by target width and height or by pixel resolution
- Open the Subset tool: *Raster/Subset:*
  - Spatial subset: select an area
  - Band subset: select the required bands
- Open the Band select tool: *Raster/ Data Conversation/ Band select*
  - Select the bands you want to store

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Practical SNAP/QGIS– Exercise 5 – Unsupervised-/Supervised Classification

- Import a Sentinel-2/ Landsat-8 scene
- Create a Spatial/Band Subset

Unsupervised Classifiers

- Perform the EM Cluster Analysis
  - Choose the Number of Clusters, Iterations, Source Bands
  - Create a ROI-Mask
- Perform the K-means Cluster Analysis
  - Choose the Number of Clusters, Iterations, Source Bands
  - Create a ROI-Mask

Supervised Classifiers

- Open the Minimum Distance Classifier
  - Add an image
  - Train on raster
  - Create training samples
  - Train on vector

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- **Classification with QGIS– Supervised Classification**
  - Open Quantum GIS Desktop (2.18.9)
  - Install the *Semi-Automatic Classification Plugin*
  - From the menu *All*, select the *Semi-Automatic Classification* Plugin and click the button *Install plugin*;

  - The SCP should be automatically activated; however, be sure that the Semi-Automatic Classification Plugin is checked in the menu Installed(the restart of QGIS could be necessary to complete the SCPinstallation);

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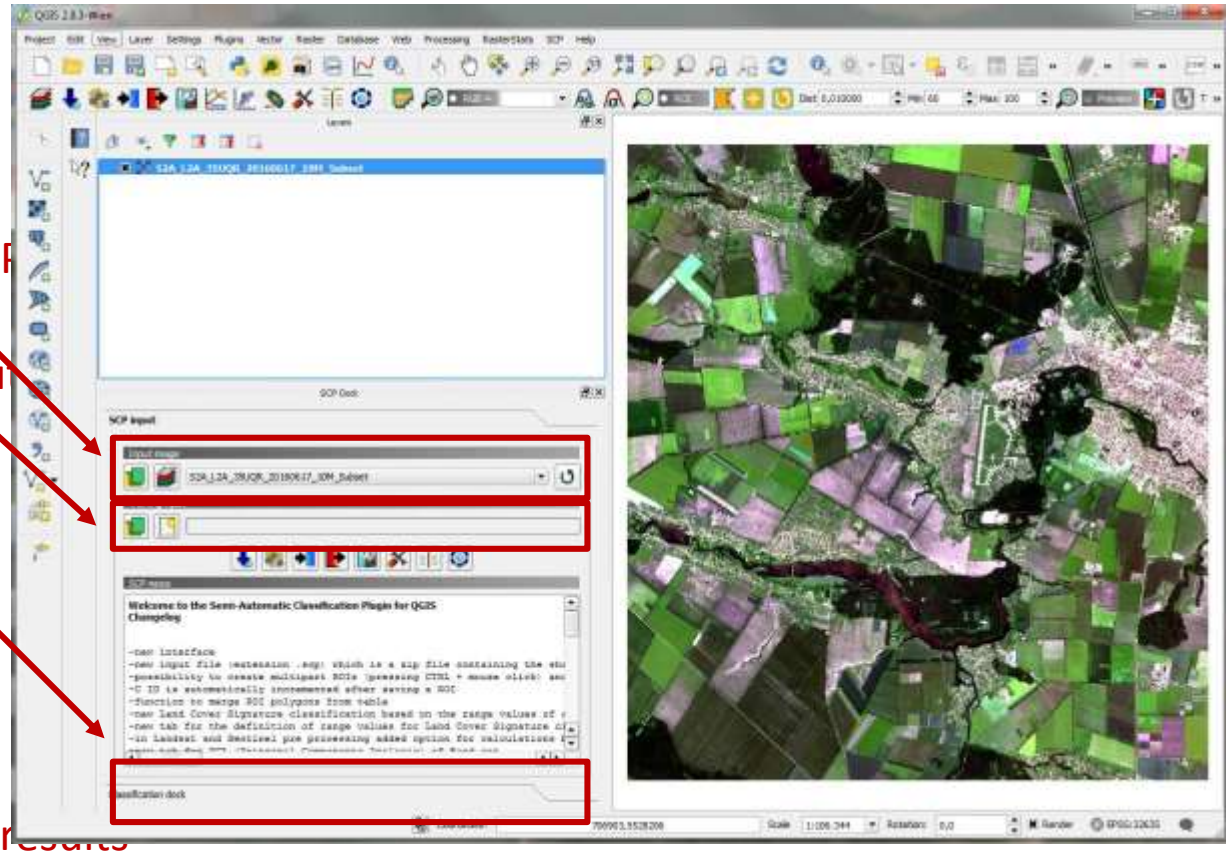
Practical QGIS

*A semi-automatic classification (more appropriately named **supervised classification**) is an image processing methods that allows for the identification of land type according to their spectral signatures. There are several kinds of classification algorithms, but the general purpose is to produce a thematic map of the land cover. SCP allows an interactive approach of the concept.*



1. Load the input raster in SCP

2. Create a new Training Input

will contain the ROIs

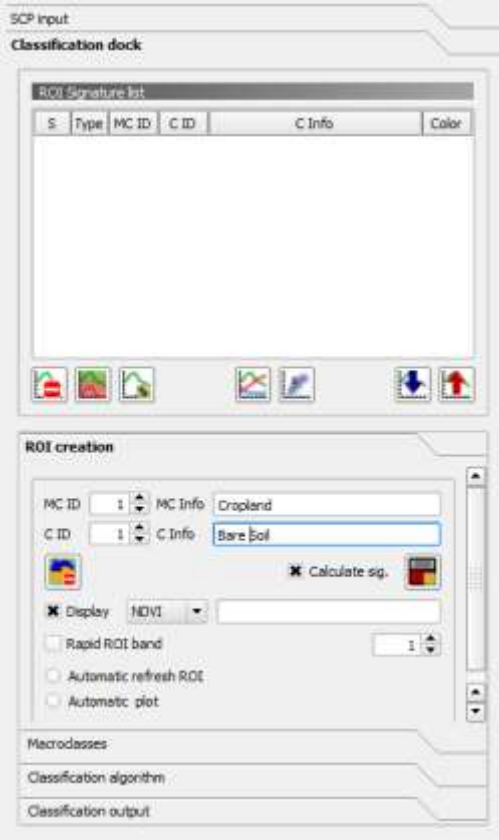
3. Create your Training Areas

4 .Perfom the classification

5. Enhance the classification results

3. Create Training Areas (ROIs)

- In order to **create manually a ROI** inside the dark area, click the button in the Working toolbar (you can ignore a message about wavelength unit not provided). Left click on the map to define the ROI vertices and right click to define the last vertex closing the polygon. You create a orange semi-transparent polygon, which is a temporary polygon
- Region growing algorithm can be also used to delineate your polygon.
- It is required to define the **Classes and Macroclasses** for each polygon. Macroclassescan be defined in the Macroclasses tab.
- You can save each Training shapefile : Click the button Save ROI



Create multiple polygon encompassing the diversity of landcover classes: ***Water bodies, bare soils, Crops, Build-up areas, Forests, grasslands***

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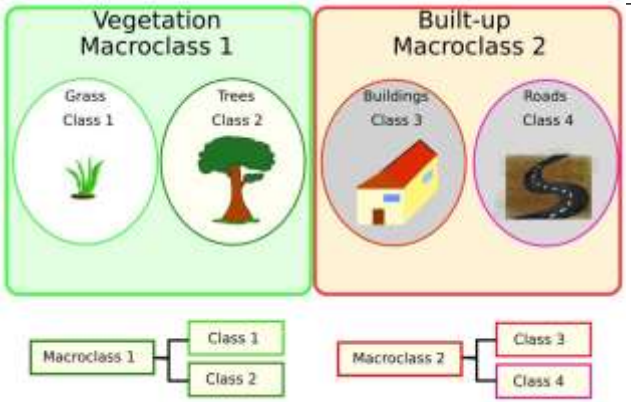
SCP allows for the definition of MacroclassID (i.e. MC ID) and Class ID (i.e. C ID), which are the identification codes of land cover classes.
A Macroclass is a group of ROIs having different Class ID, which is useful when one needs to classify materials that have different spectral signatures in the same land cover class.

Example of Macroclasses

Macroclass name	Macroclass ID	Class name	Class ID
Vegetation	1	Grass	1
Vegetation	1	Trees	2
Built-up	2	Buildings	3
Built-up	2	Roads	4



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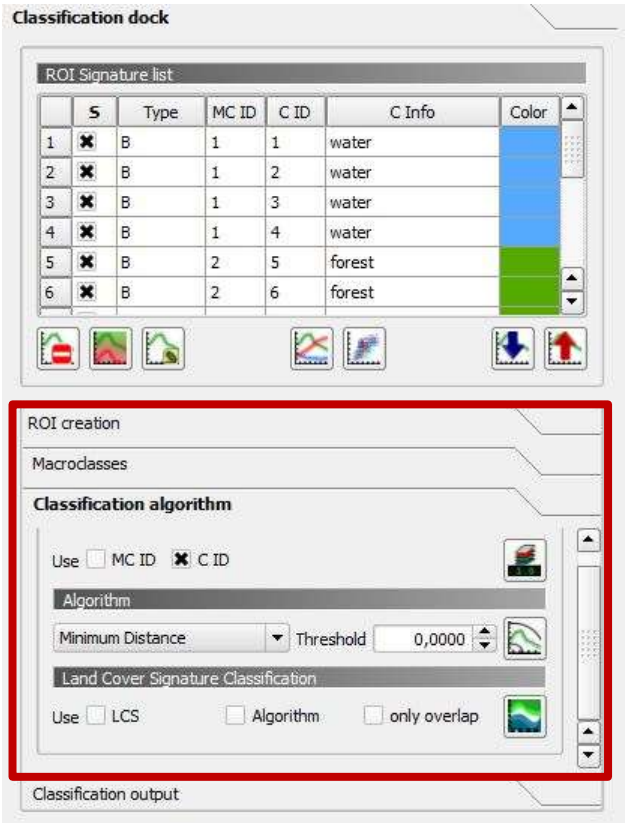
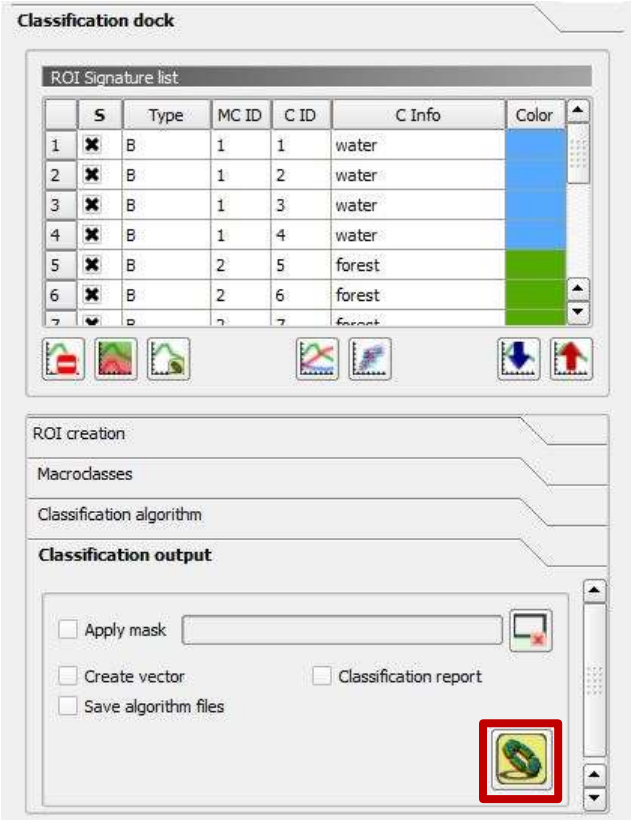
4.Perform a classification





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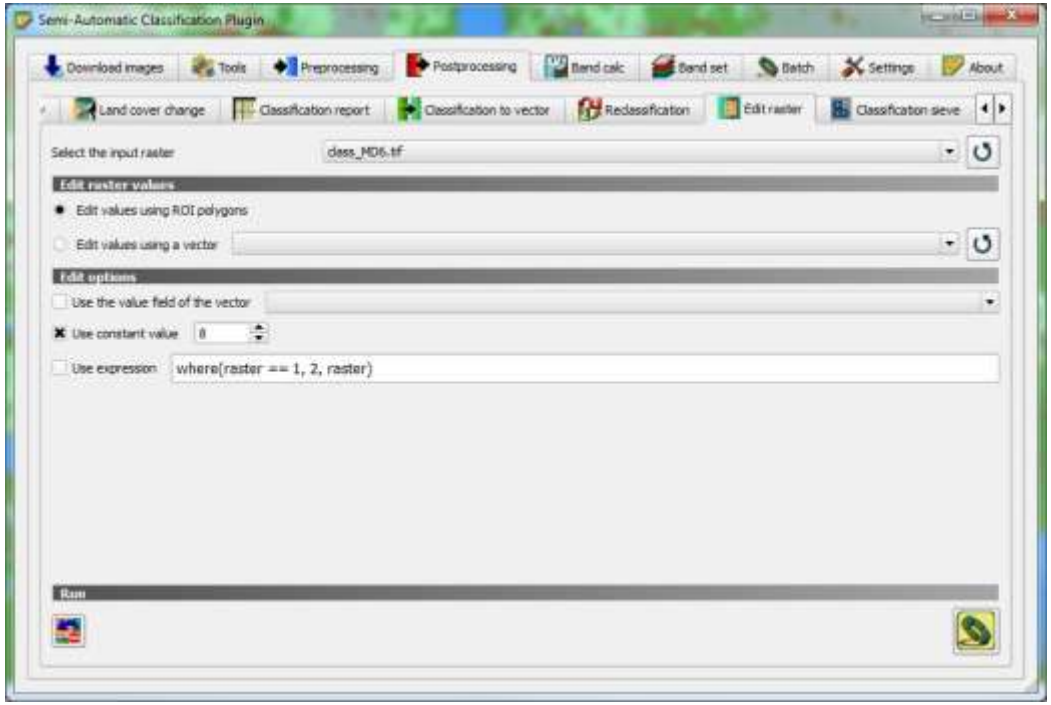
5. Enhance the classification results

- Click the *Raster Edit* icon

- Draw a ROI polygons over wrong classified areas

- Insert the class value



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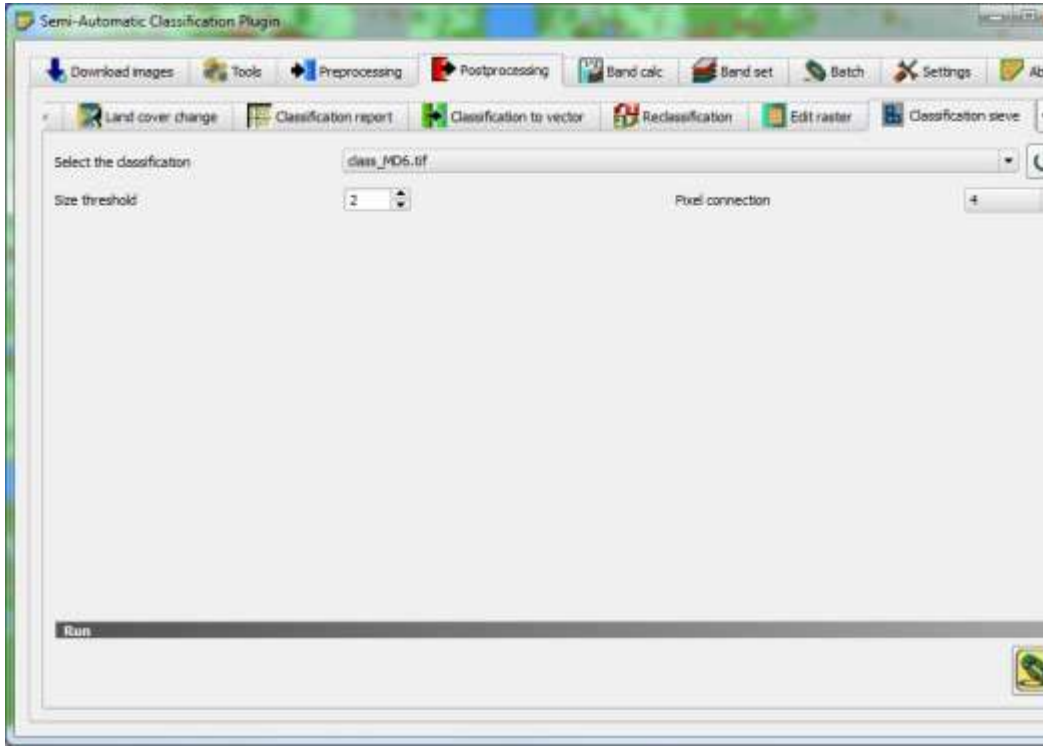
5. Enhance the classification results

- Remove automatically small wrong classified areas



- Size threshold : size of the patch to be replaced (in pixel unit); all patches smaller the the selected number of pixels will be replaced by the value of the largest neighbour patch;

- Pixel connection : select the type of pixel connection:
– 4: in a 3x3 window, diagonal pixels are not considered connected;
– 8: in a 3x3 window, diagonal pixels are considered connected;

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