Satellite Data Processing

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ITCOOcean Training Program
on
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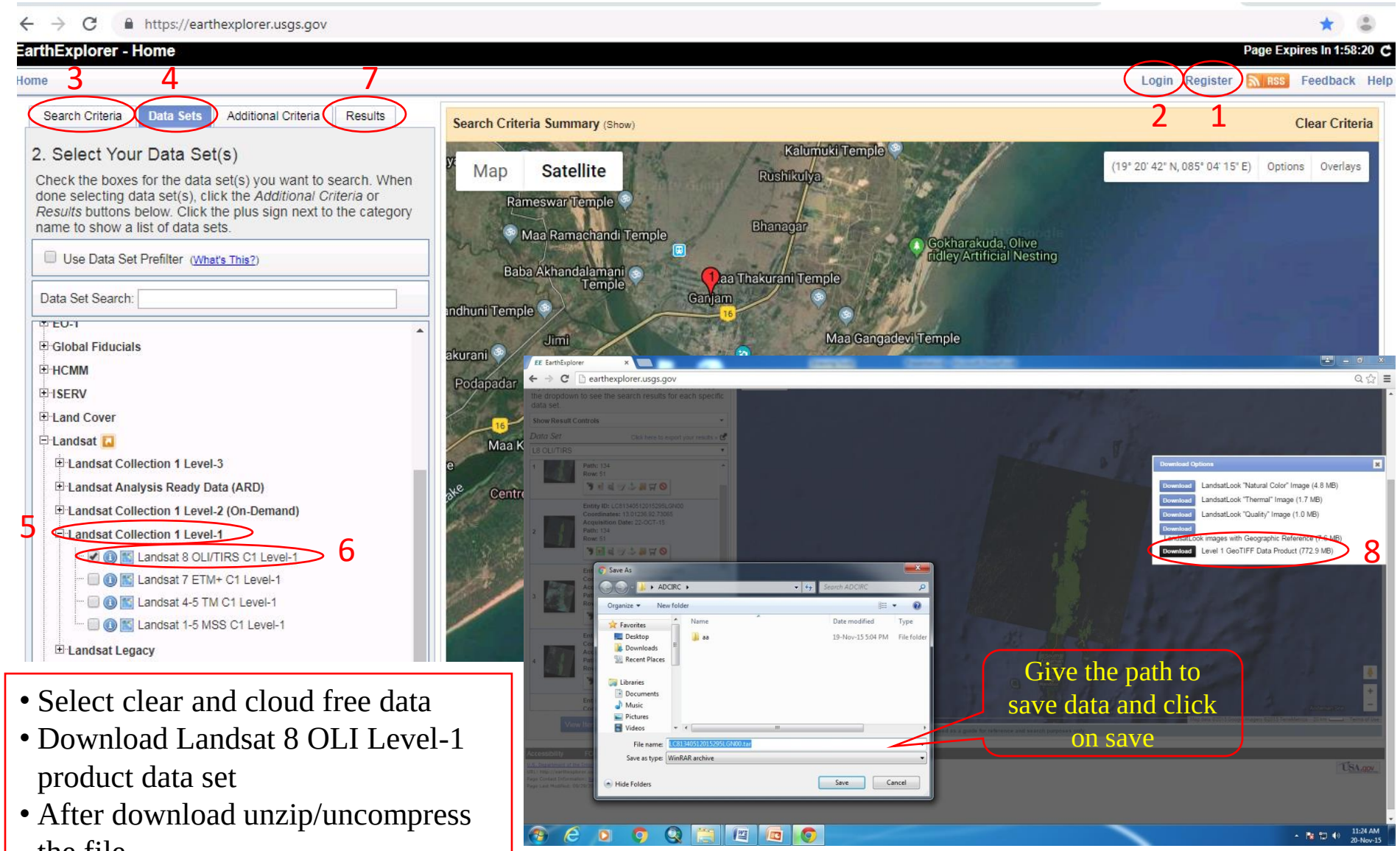
Outline

- Satellite image downloading
- Raster data opening in QGIS
- Data conversion DN to Reflectance
- Raster Band Composition
- Change the band combination
- Adding data to the band set
- Data Clipping
- NDVI
- Create the training input file
- Training sample extraction
- Image classification
    a) Unsupervised Image Classification
    b) Supervised Image Classification

Satellite image Download (Landsat data)

➢ Go to http://earthexplorer.usgs.gov/ and create new user account ⟶ Login

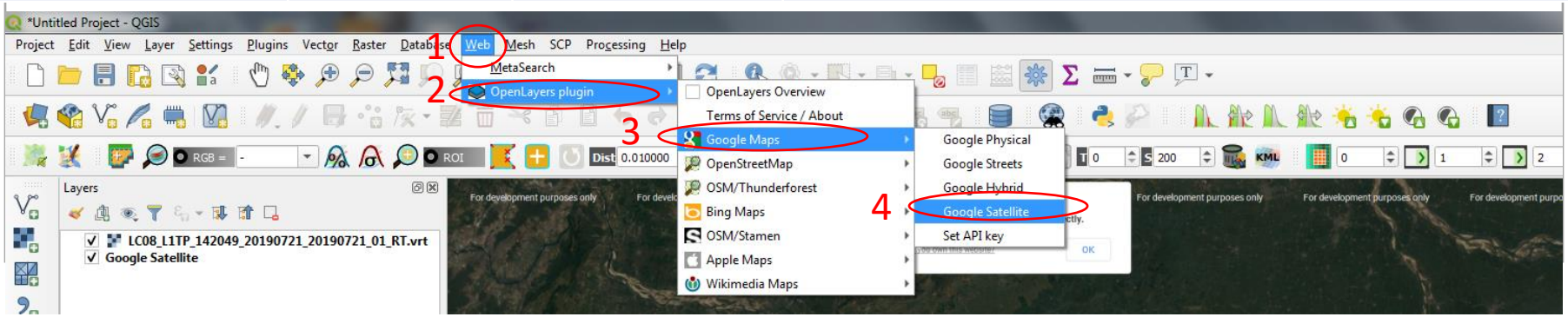


- Select clear and cloud free data
- Download Landsat 8 OLI Level-1 product data set
- After download unzip/uncompress the file

Landsat 9 OLI bands

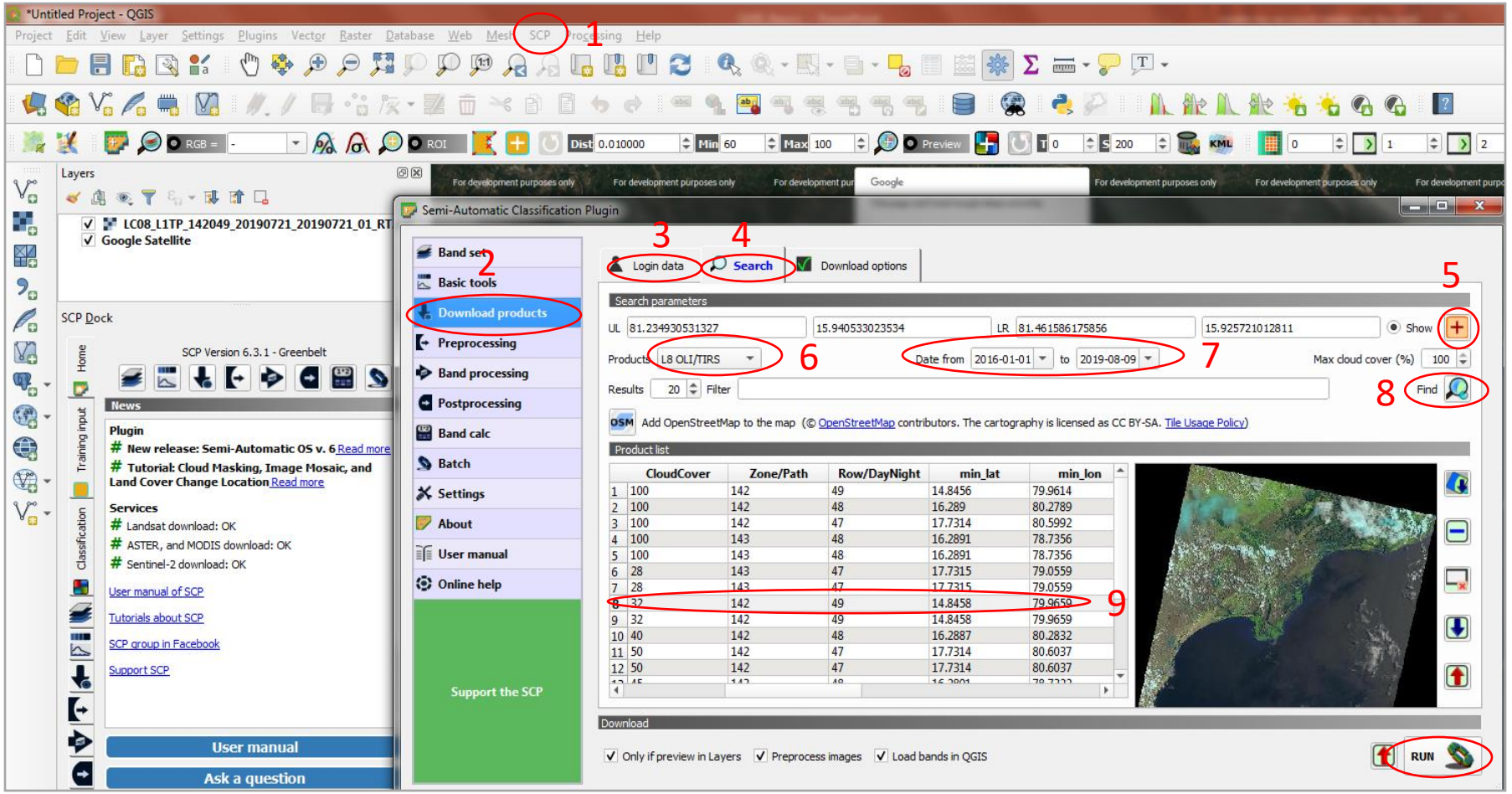
Band	Wavelength	Spatial Resolution	Useful for mapping
Band 1 - coastal aerosol	0.43-0.45	30	Coastal and aerosol studies
Band 2 - blue	0.45-0.51	30	Bathymetric mapping, distinguishing soil from vegetation and deciduous from coniferous vegetation
Band 3 - green	0.53-0.59	30	Emphasizes peak vegetation, which is useful for assessing plant vigor
Band 4 - red	0.64-0.67	30	Discriminates vegetation slopes
Band 5 - Near Infrared (NIR)	0.85-0.88	30	Emphasizes biomass content and shorelines
Band 6 - Short-wave Infrared (SWIR) 1	1.57-1.65	30	Discriminates moisture content of soil and vegetation; penetrates thin clouds
Band 7 - Short-wave Infrared (SWIR) 2	2.11-2.29	30	Improved moisture content of soil and vegetation; penetrates thin clouds
Band 8 - Panchromatic	0.50-0.68	15	Sharper image definition
Band 9 - Cirrus	1.36-1.38	30	Improved detection of cirrus cloud contamination
Band 10 - TIRS 1	10.60-11.19	100	Thermal mapping and estimated soil moisture
Band 11 - TIRS 2	11.50-12.51	100	Improved thermal mapping and estimated soil moisture

Loading Google earth to QGIS:

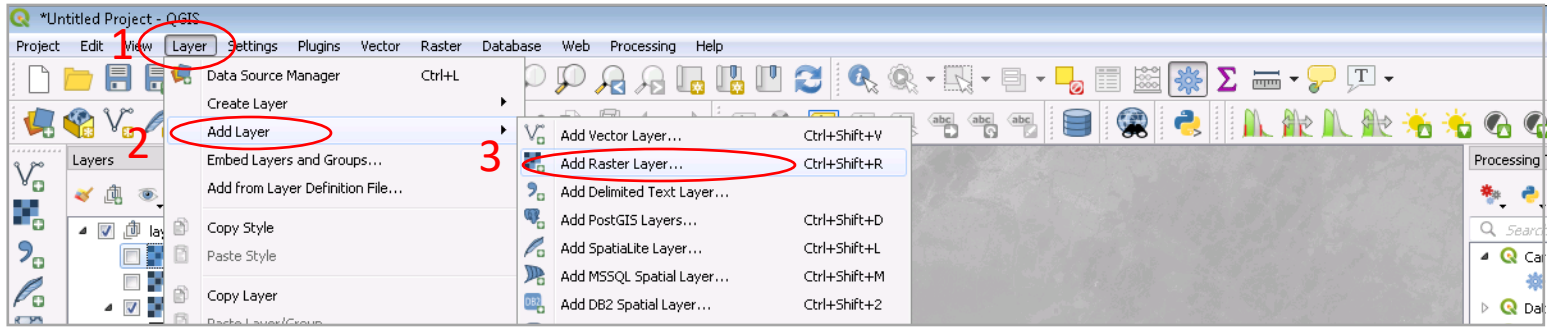


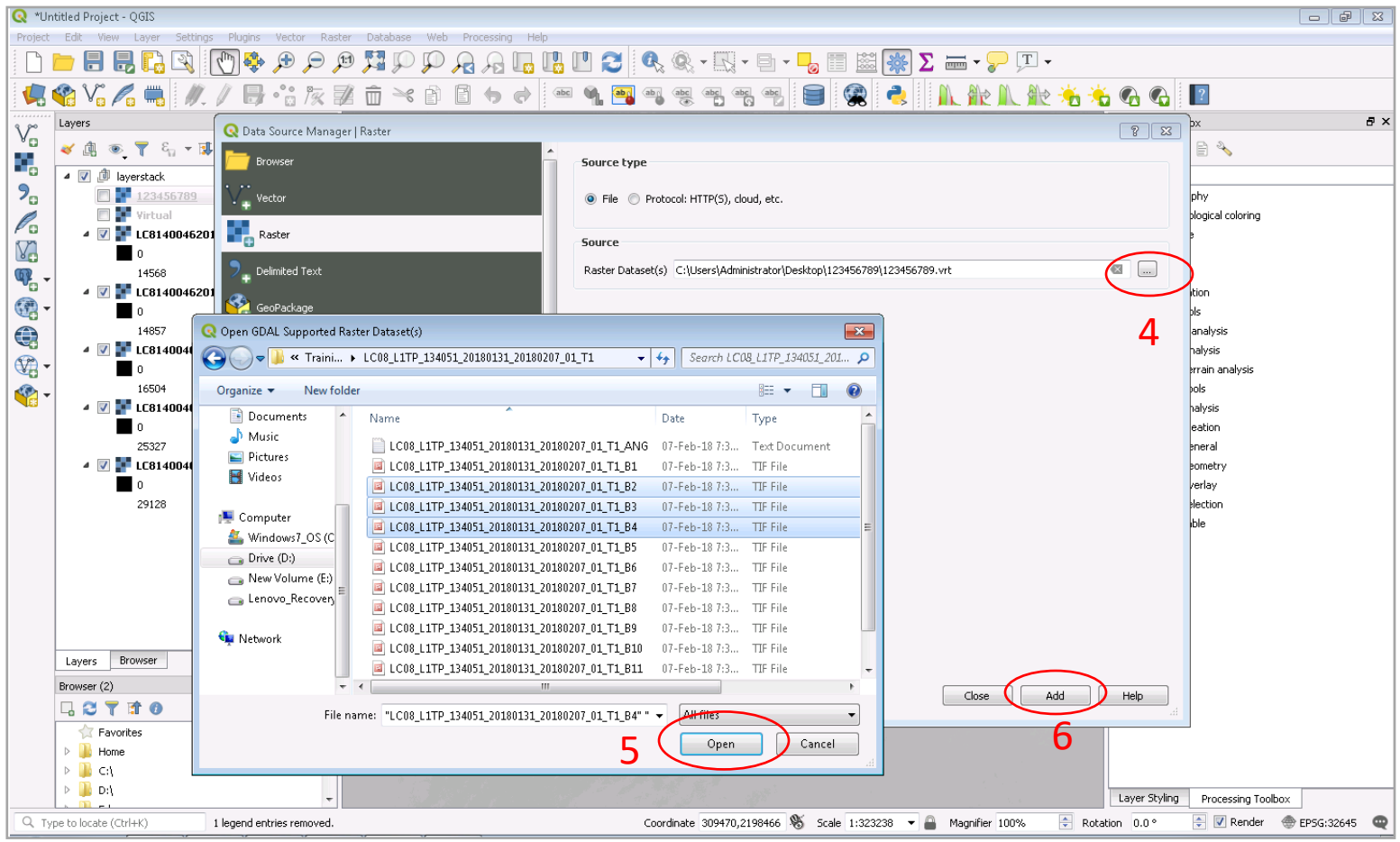
Raster data downloading in QGIS:

- Now open Semi Automatic Classification → Download Products
- Click on login data enter login ID and Password (Need login in https://ers.cr.usgs.gov/login/)
- Click on search clock on + symbol → now go to QGIS window left click for UL, right click for UR
- Now coordinates will appear in UL and UR → Products select L8 OLI/TRS → Select Date
- Click on find image list will come select image → Click on run give path to save data

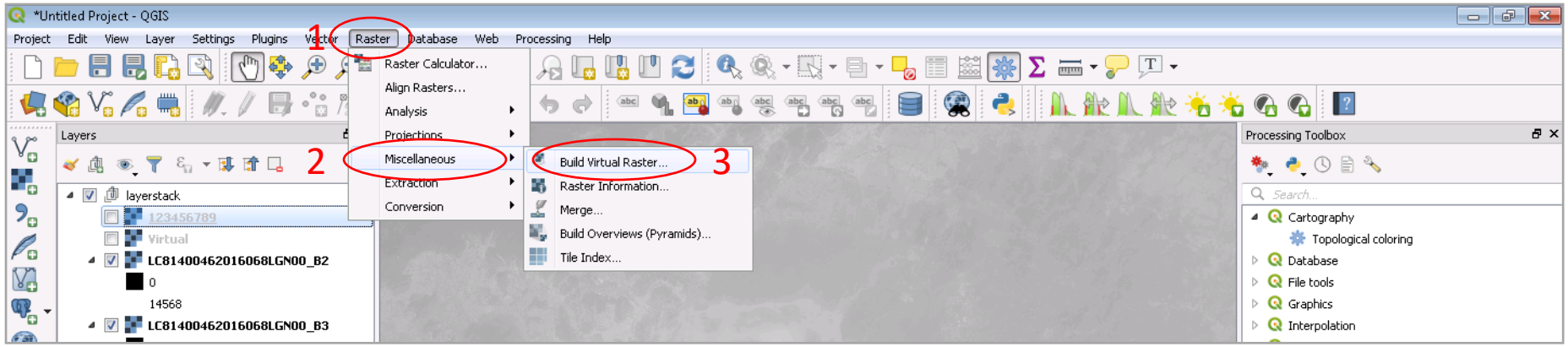


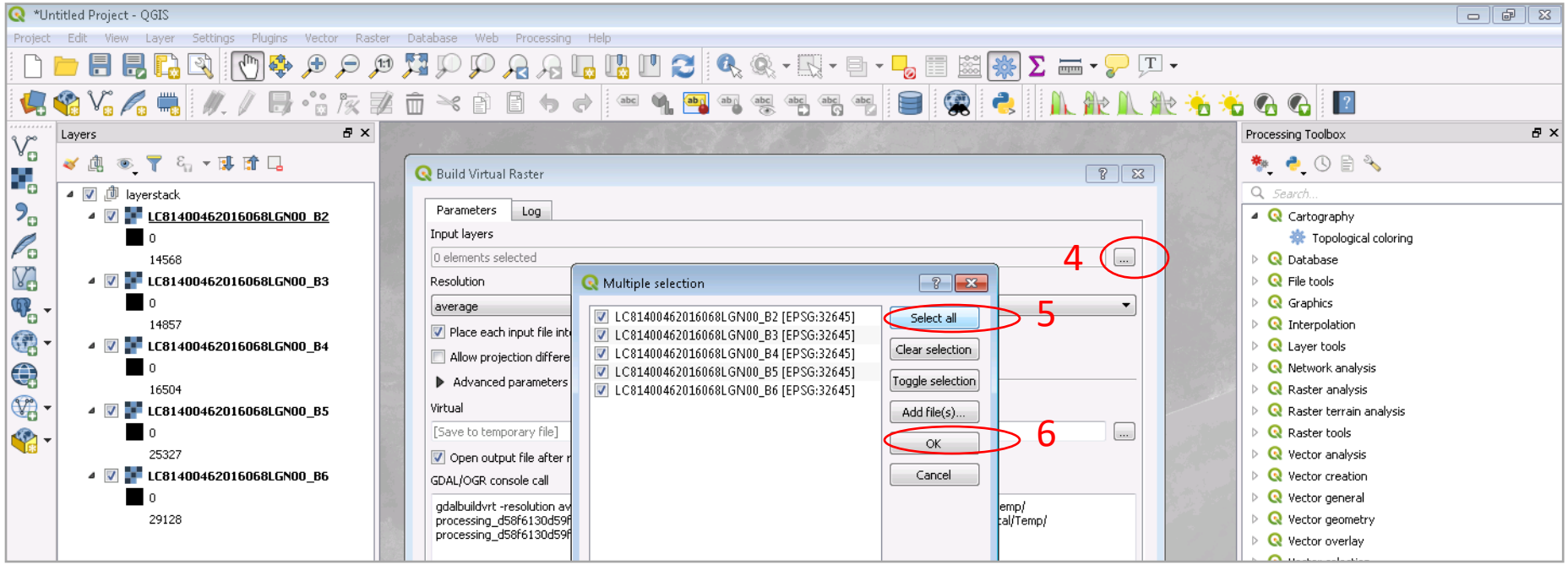
Raster data opening in QGIS:



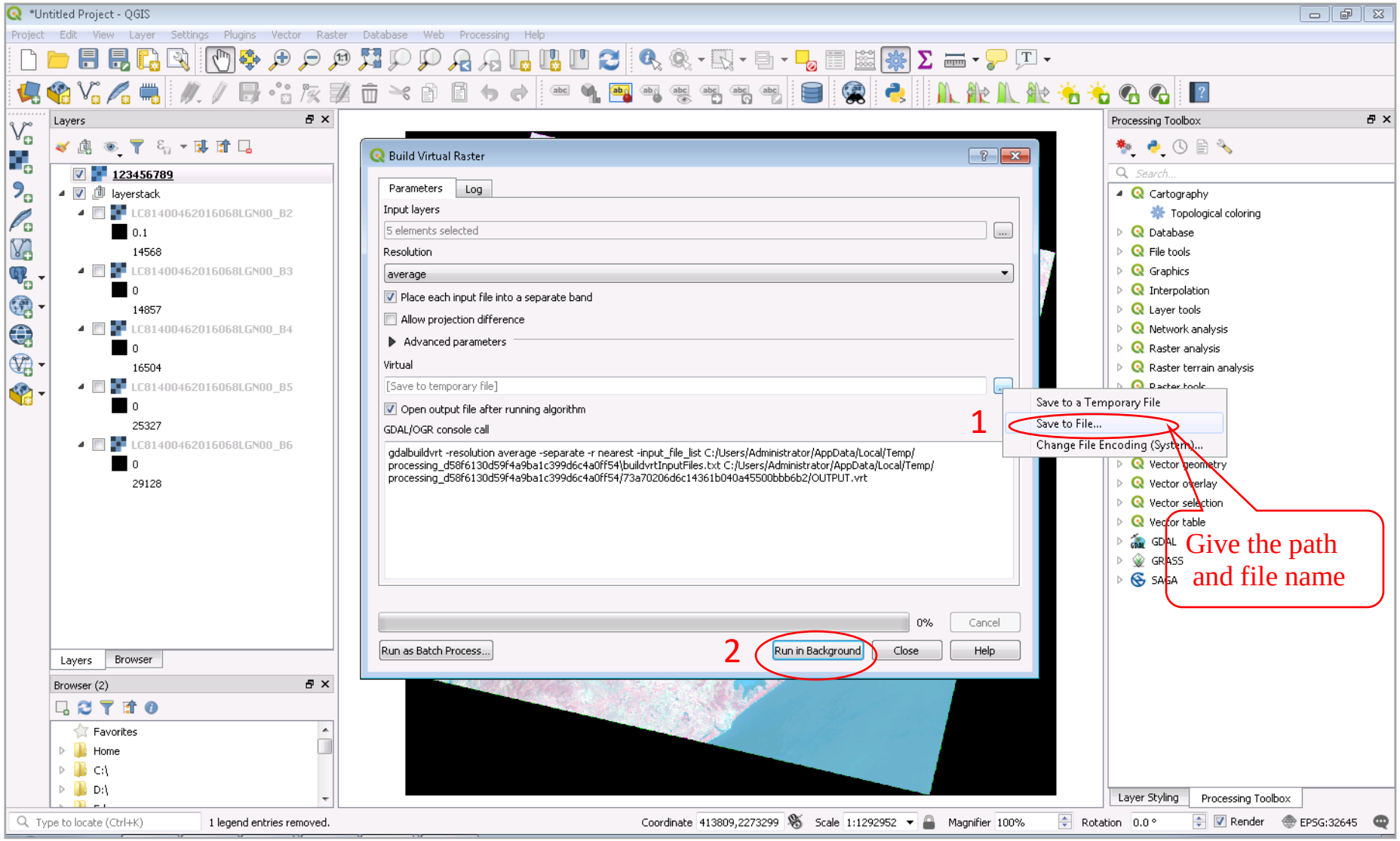


Raster Band Composition:





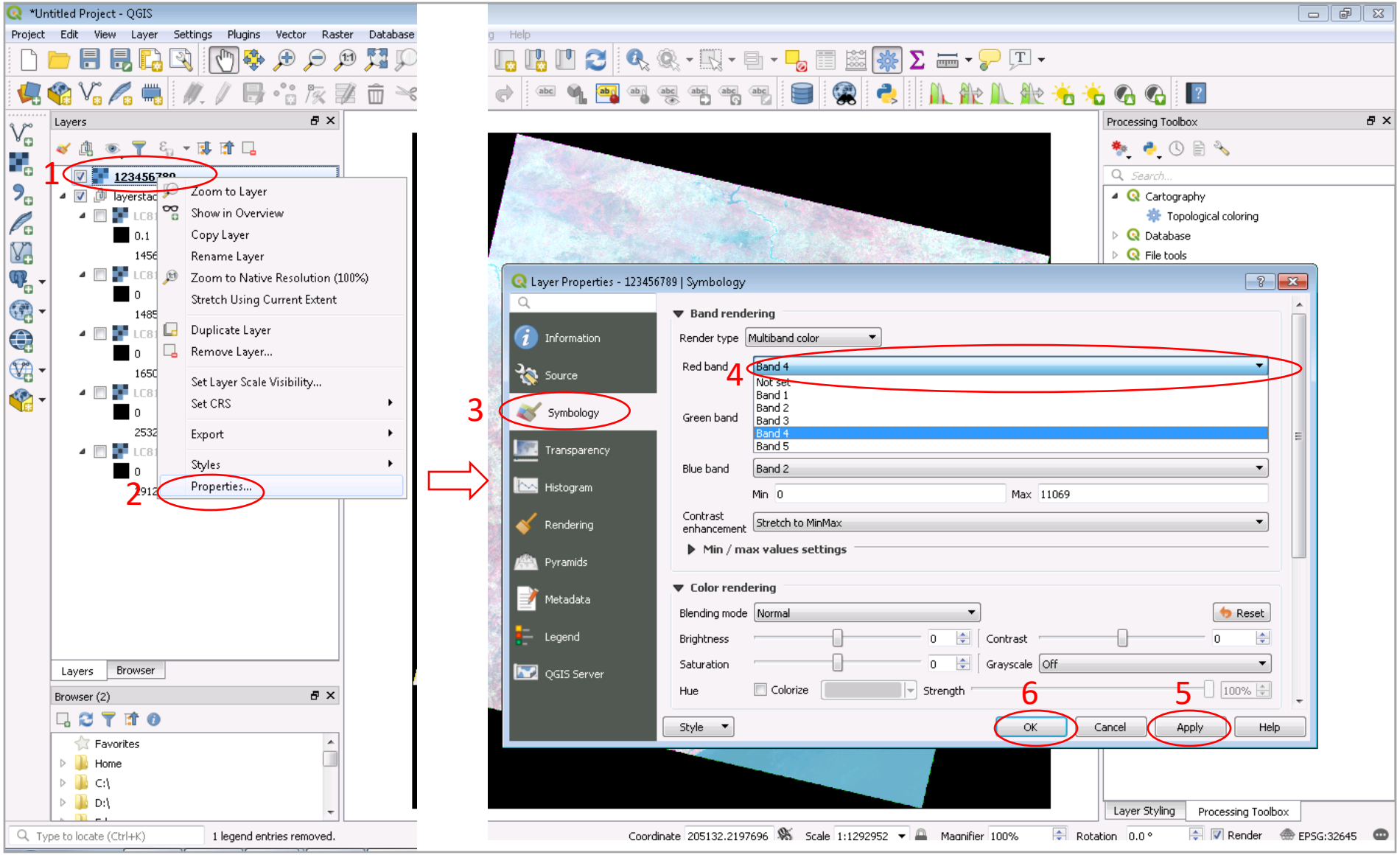
Contin…….



➢Open the FCC image

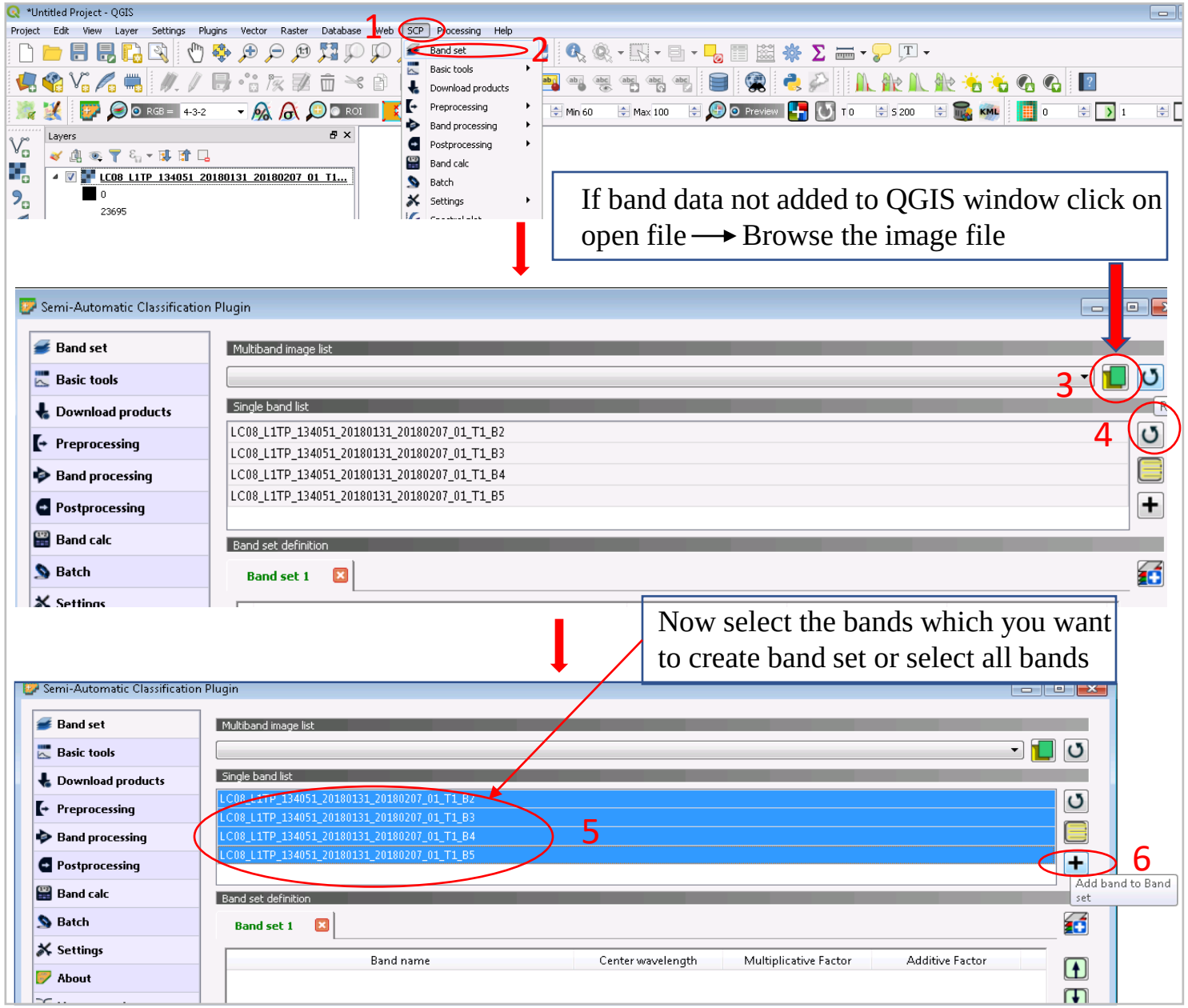
Change the band combination

➢Select the FCC image ⟶ right click ⟶ properties

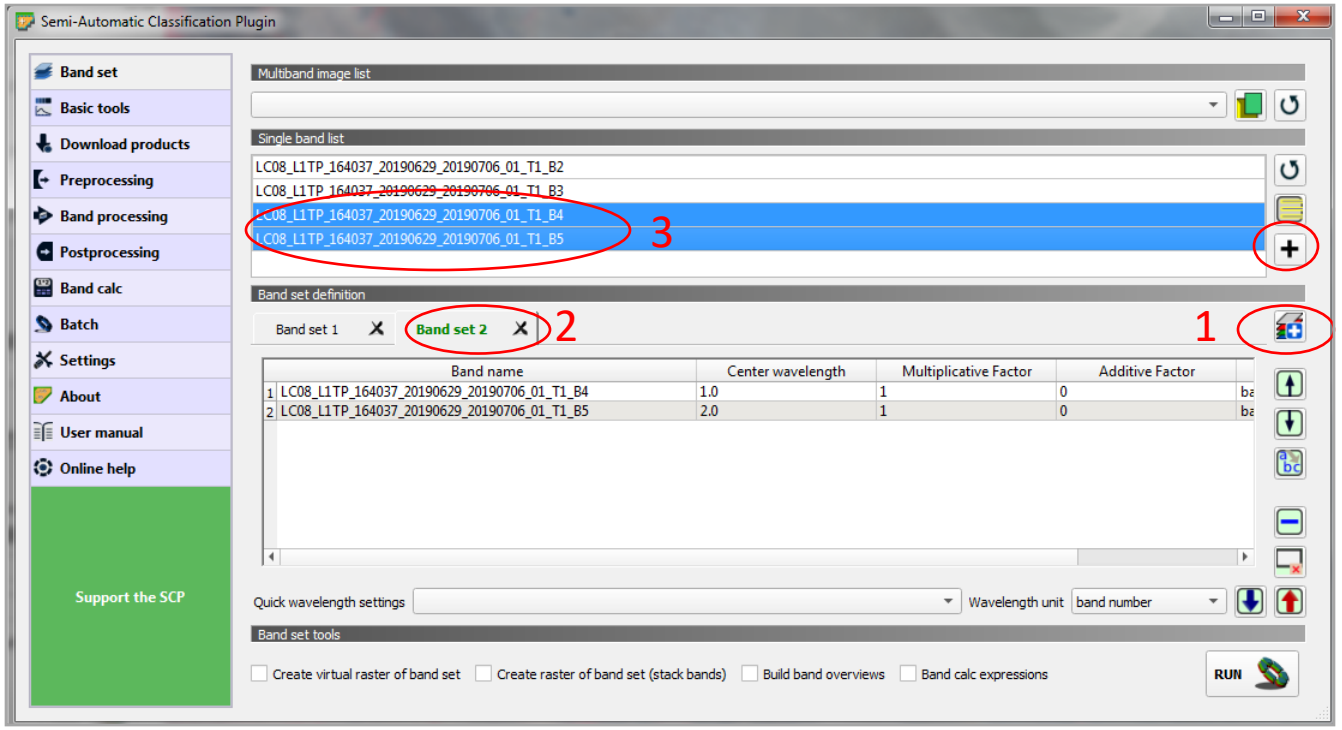


Adding data to band set:

➢Go to SCP click on band set ⟶ SCP plugin window opens.



- More band set creation



- After band creation if you want to remove any band from band set

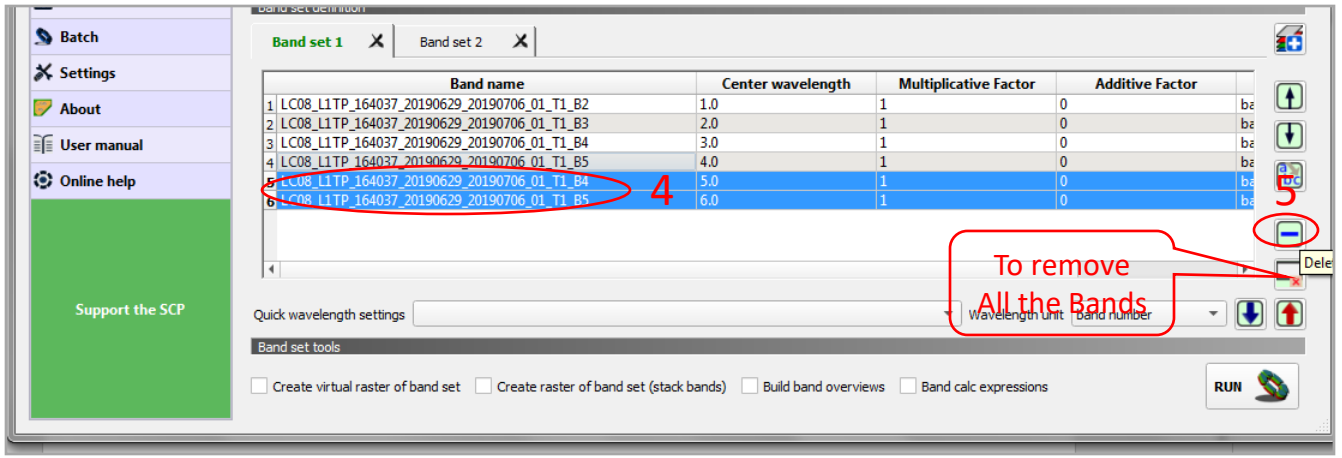
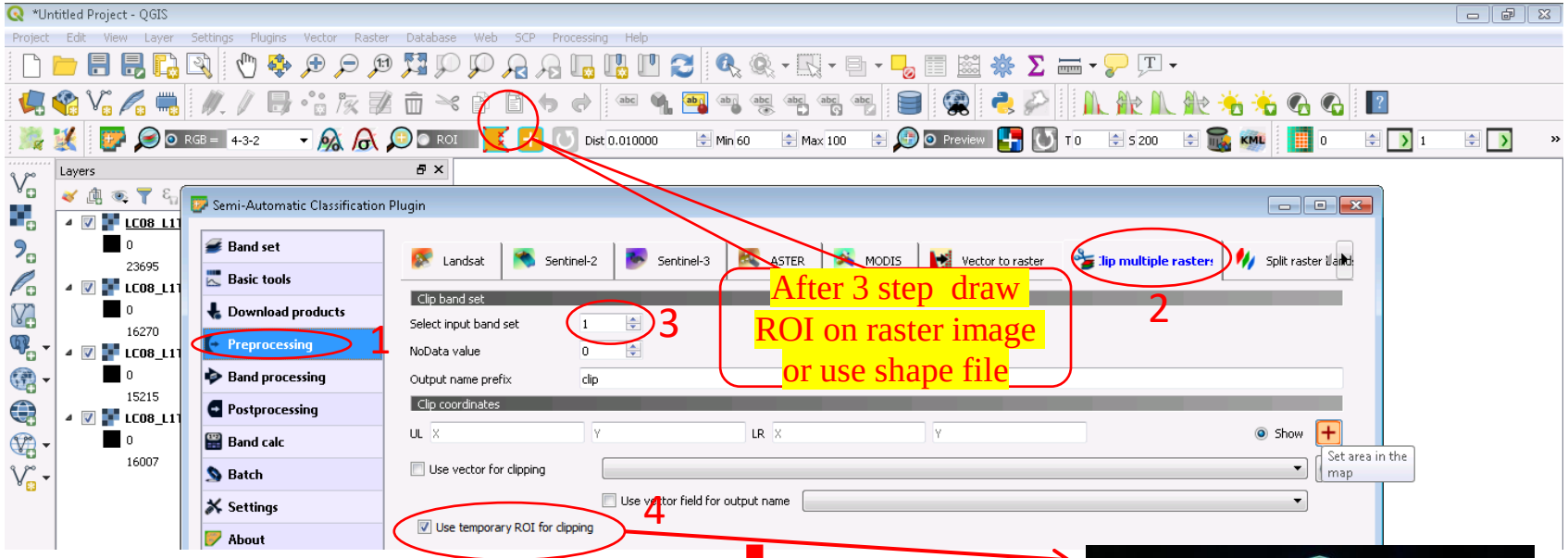
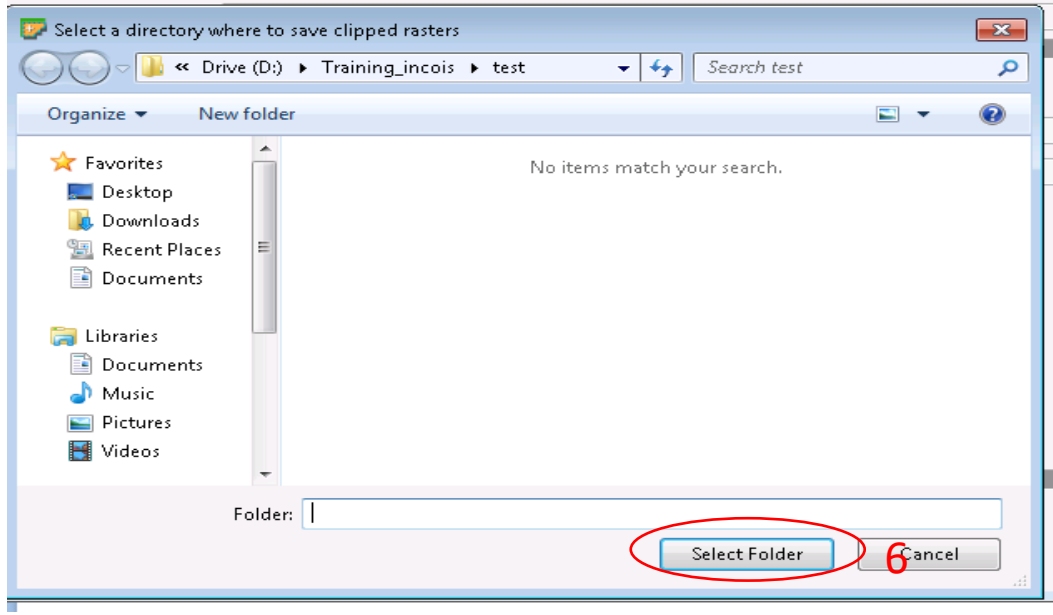


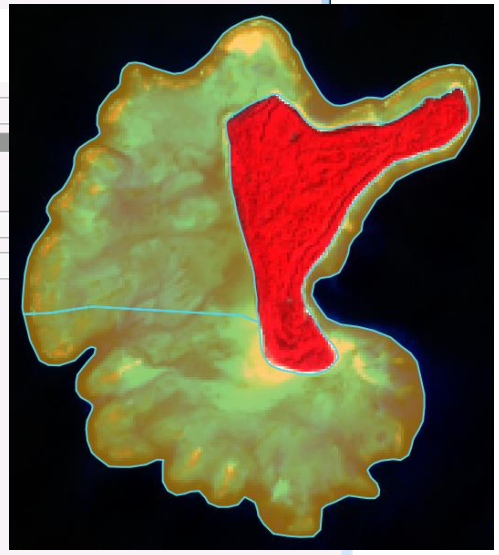
Image Clipping

➢Go to SCP ⟶ processing ⟶ Landsat ⟶ Clip multiple rasters



➢After 3 step draw ROI on raster image





DN to Reflectance Conversion

Conversion to TOA Reflectance

Reflective band DN's can be converted to TOA reflectance using the rescaling coefficients in the MTL file:
$\rho\lambda' = M\rho Qcal + A\rho$
where:

$\rho\lambda'$ = TOA planetary reflectance, without correction for solar angle.
Note that $\rho\lambda'$ does not contain a correction for the sun angle.

$M\rho$=Band-specific multiplicative rescaling factor from the metadata (REFLECTANCE_MULT_BAND_x, where x is the band number)

$A\rho$ =Band-specific additive rescaling factor from the metadata (REFLECTANCE_ADD_BAND_x, where x is the band number)

Qcal = Quantized and calibrated standard product pixel values (DN)

https://yceo.yale.edu/how-convert-landsat-dns-top-atmosphere-toa-reflectance
https://www.usgs.gov/landsat-missions/using-usgs-landsat-level-1-data-product

Go to SCP → create band set

Go to SCP → Bandcalc → write formula → run → output folder name.

LC08_L1TP_140047_20140404_20200911_02_T1_MTL - Notepad

File Edit Format View Help


```
    "RADIANCE_ADD_BAND_9": "-11.94527",
    "RADIANCE_ADD_BAND_10": "0.10000",
    "RADIANCE_ADD_BAND_11": "0.10000",
    "REFLECTANCE_MULT_BAND_1": "2.0000E-05",
    "REFLECTANCE_MULT_BAND_2": "2.0000E-05",
    "REFLECTANCE_MULT_BAND_3": "2.0000E-05",
    "REFLECTANCE_MULT_BAND_4": "2.0000E-05",
    "REFLECTANCE_MULT_BAND_5": "2.0000E-05",
    "REFLECTANCE_MULT_BAND_6": "2.0000E-05",
    "REFLECTANCE_MULT_BAND_7": "2.0000E-05",
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    "REFLECTANCE_MULT_BAND_9": "2.0000E-05",
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    "REFLECTANCE_ADD_BAND_5": "-0.100000",
    "REFLECTANCE_ADD_BAND_6": "-0.100000",
    "REFLECTANCE_ADD_BAND_7": "-0.100000",
    "REFLECTANCE_ADD_BAND_8": "-0.100000",
    "REFLECTANCE_ADD_BAND_9": "-0.100000"
  },
  "LEVEL1_THERMAL_CONSTANTS": {
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    "K2_CONSTANT_BAND_10": "1321.0789",
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    "K2_CONSTANT_BAND_11": "1201.1442"
  }
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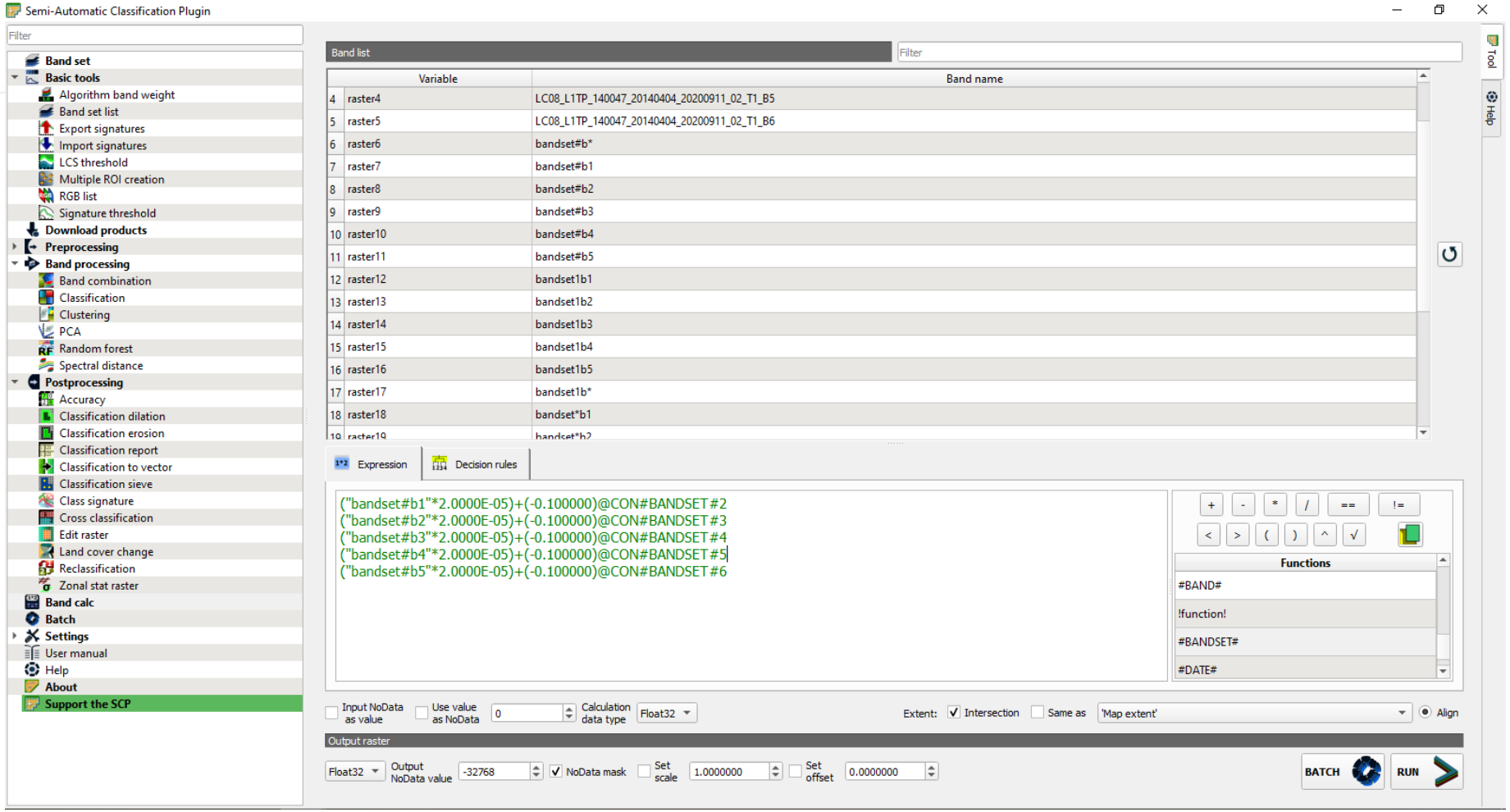
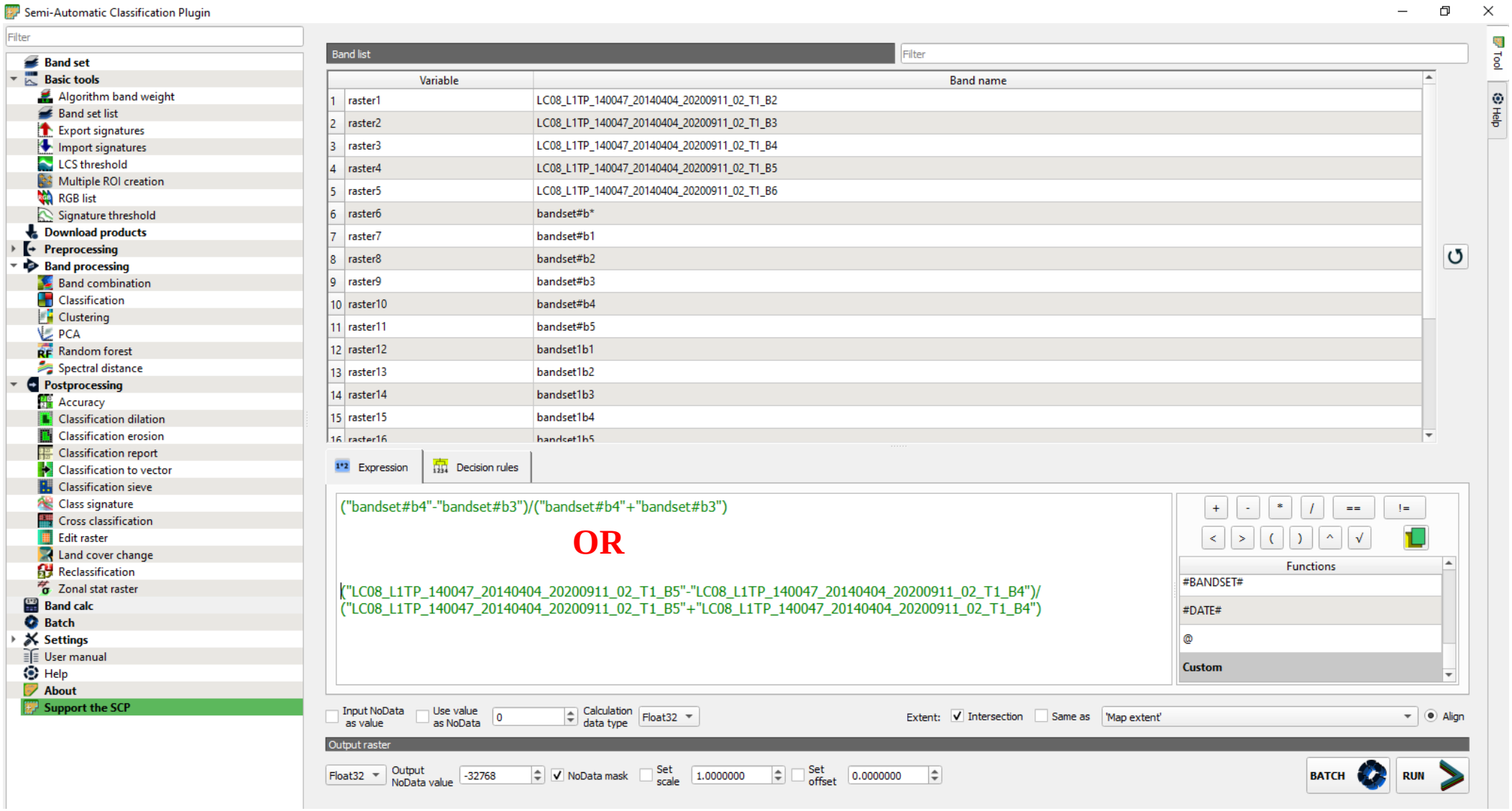


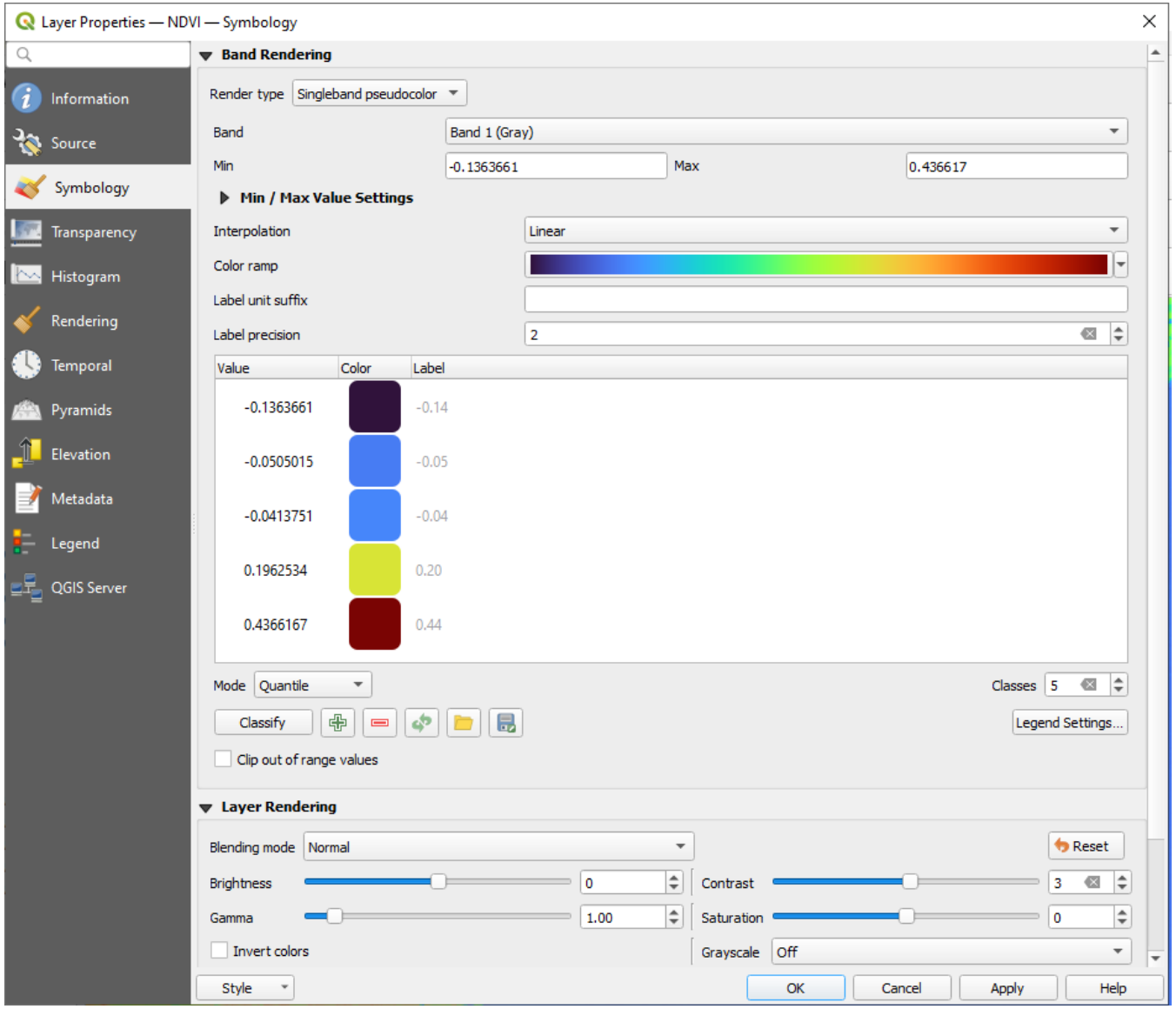
NDVI calculation

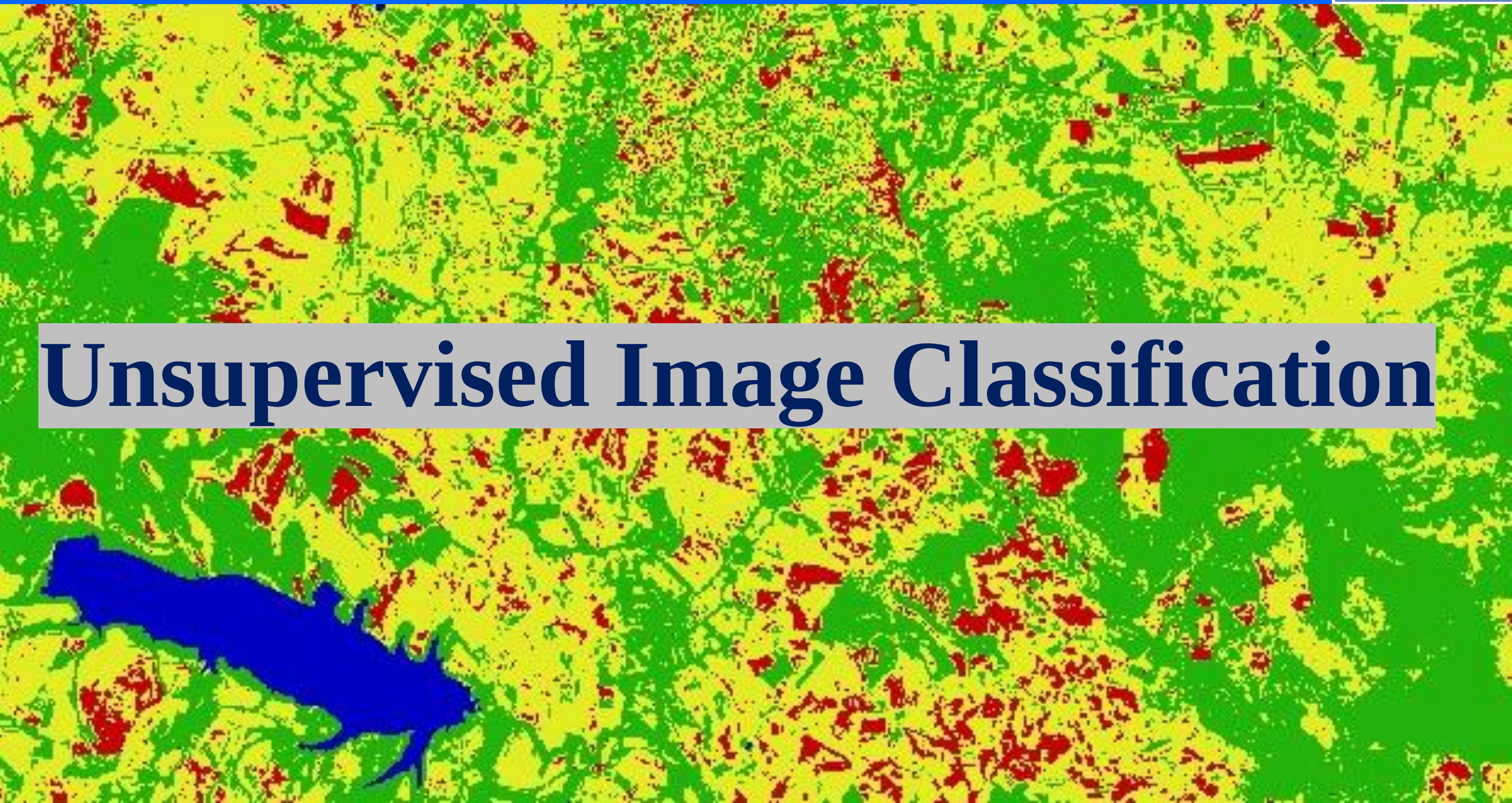
Go to SCP → Bandcalc → write formula → run → output folder name.



Change Symbology and number of classes

Go to Layer →select the layer and right-click→ Layer properties → Symbology Rendering type: Singleband Pseudocolour→ Colour ramp: select colour → mode: Queantile → Classes: ex:5 →Apply → ok





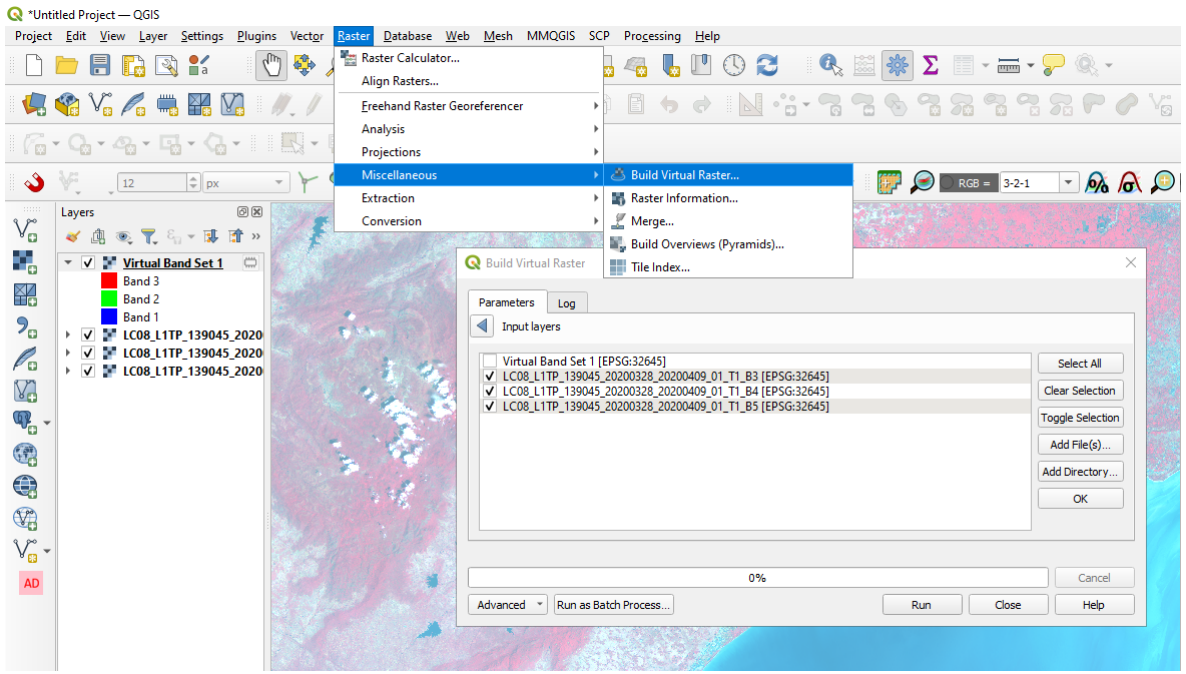
Unsupervised Image Classification

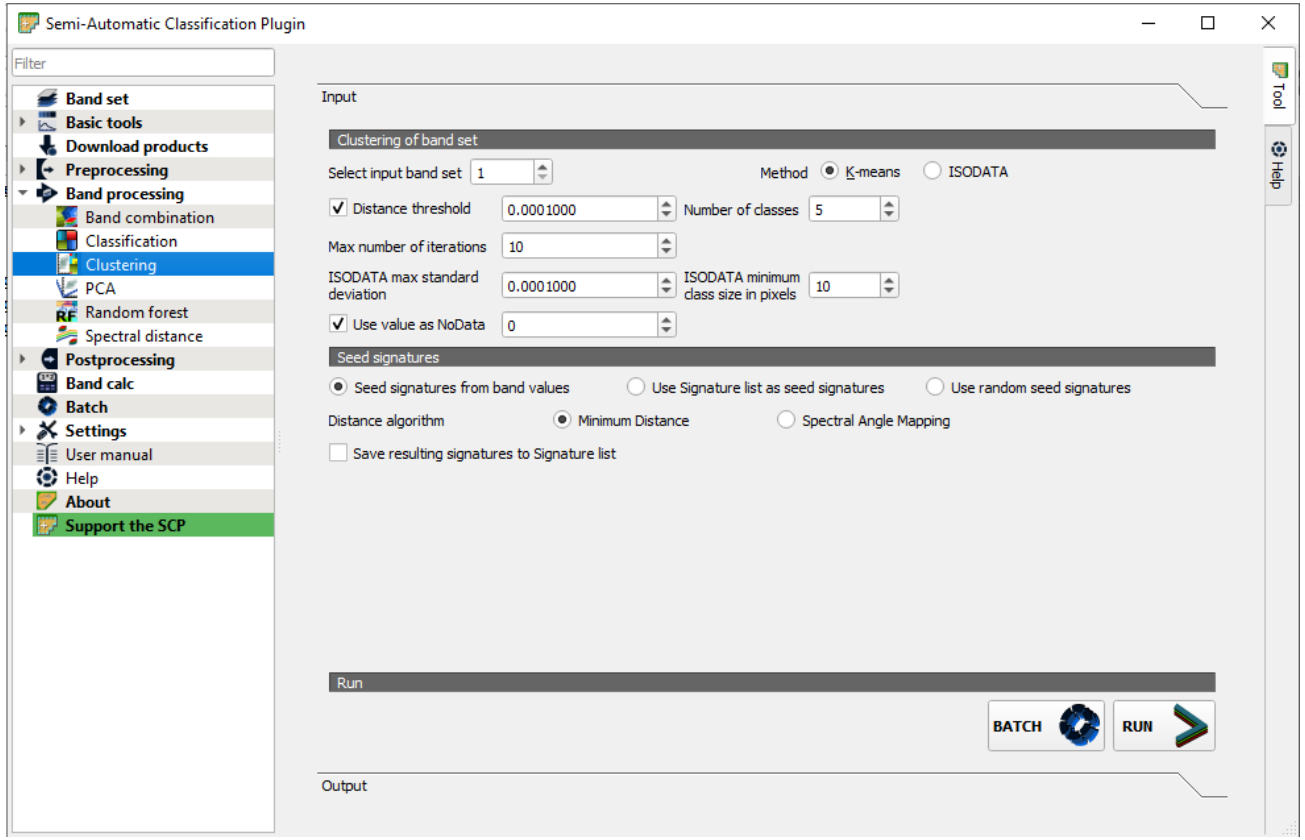
Unsupervised image cassification

- Open Raster Image in QGIS
- Go to raster→ Miscellaneous → Build Virtual Rater → select bands → run
- Go to SCP→ Band set → Select Multi band image → select our image → select band click on + to make Bandset.
- Go to Band processing → Clustering → select input band set: select out band set → Method: K-mean →

Number of classes: as our requirement ex: 5 → check use values as No data: 0 → run → give output path and file name.

- Using MapSwipe Tool (plugin) swipe the classified image check with the original data(Go to plugin →MapSwipe tool.

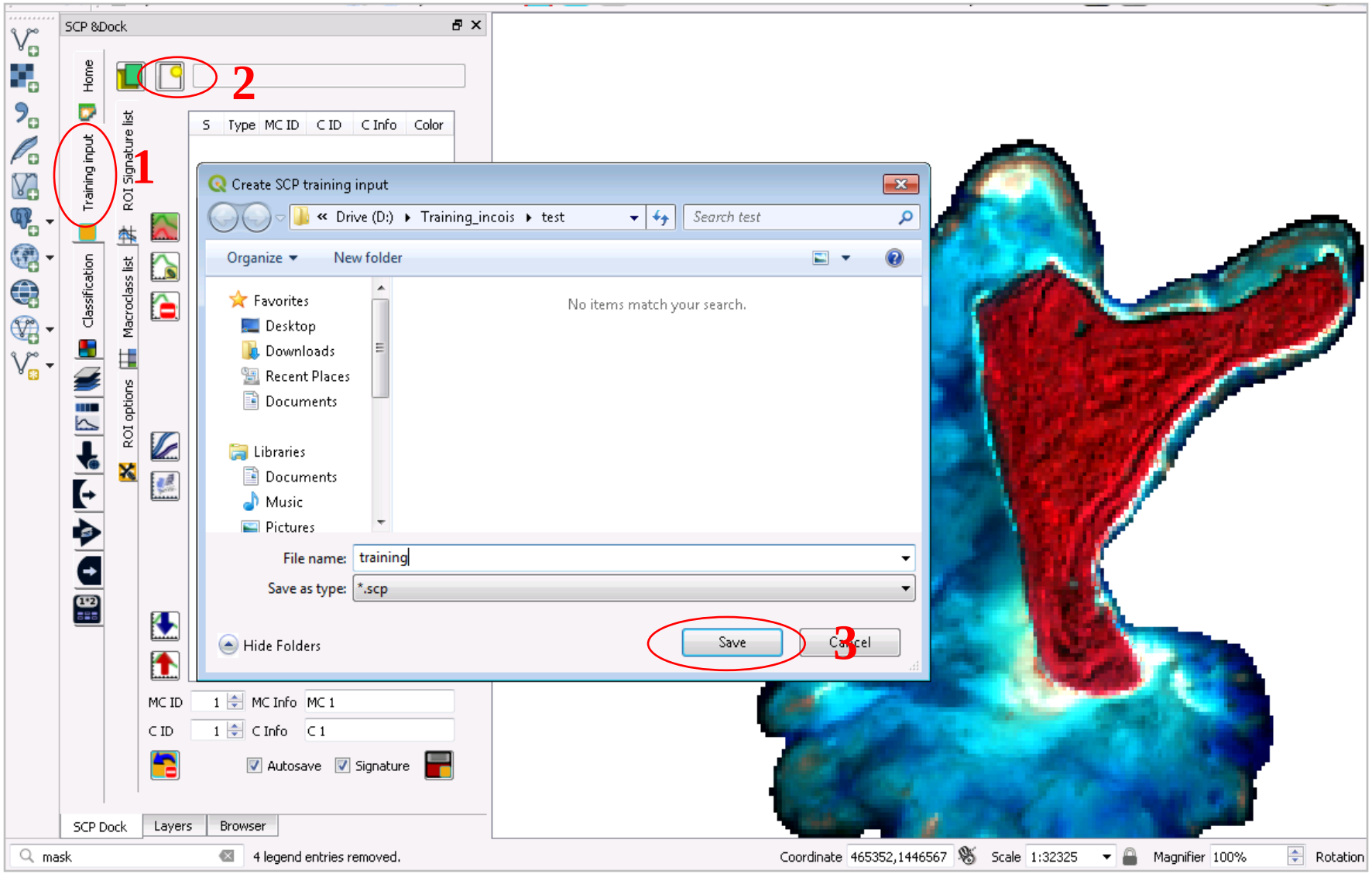




Supervised Image Classification

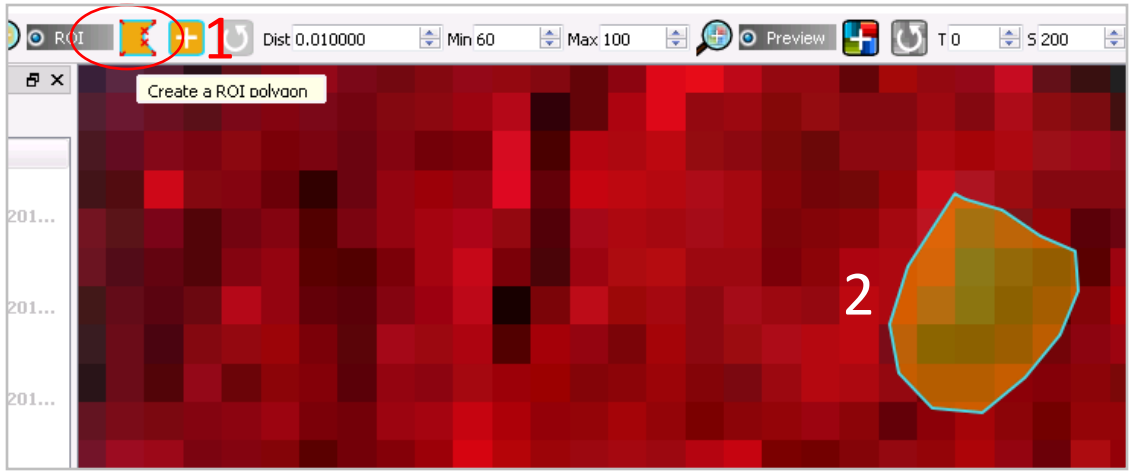
Create the training input file

Go to SCP Dock → Training input → Create SCP training input



Training sample extraction

➢Now go to the create ROI polygon and draw a polygon



➢Now click on save temporary ROI to training input
➢Collect all training classes
➢Based on class you have to changing MC Id and C ID

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

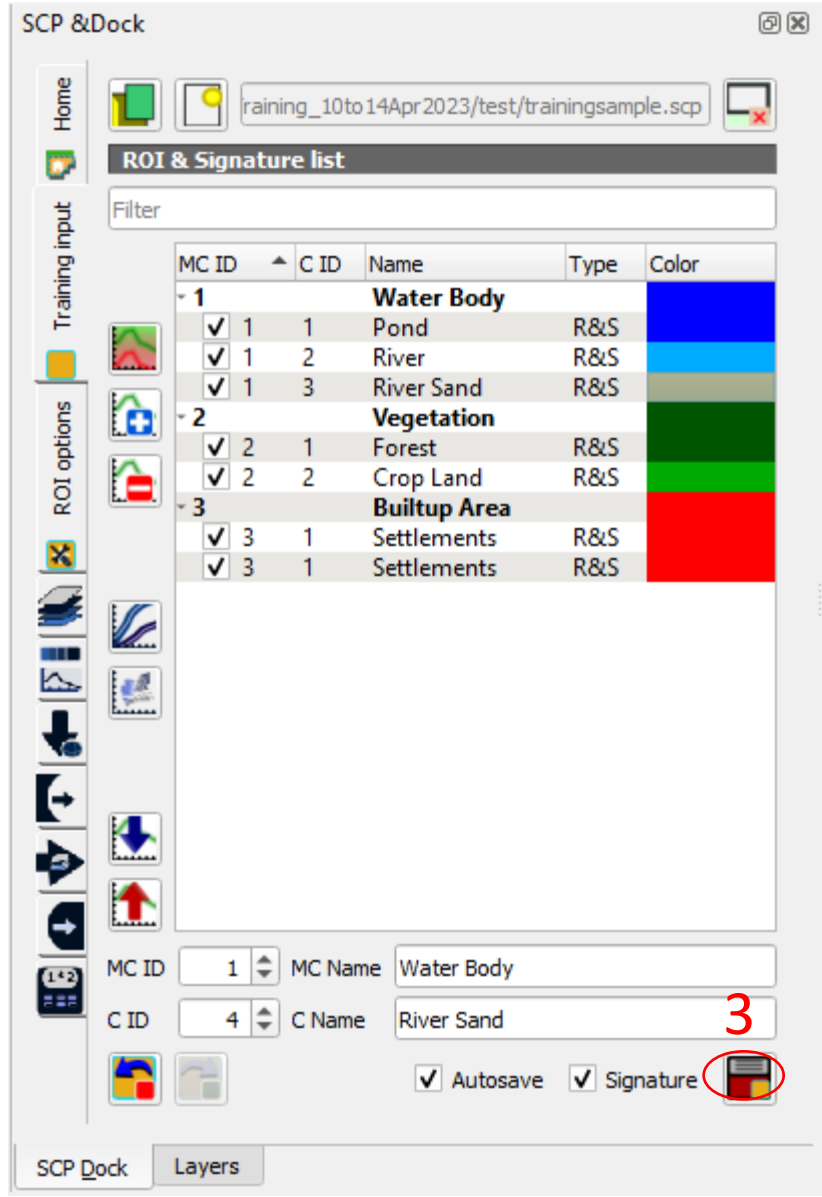
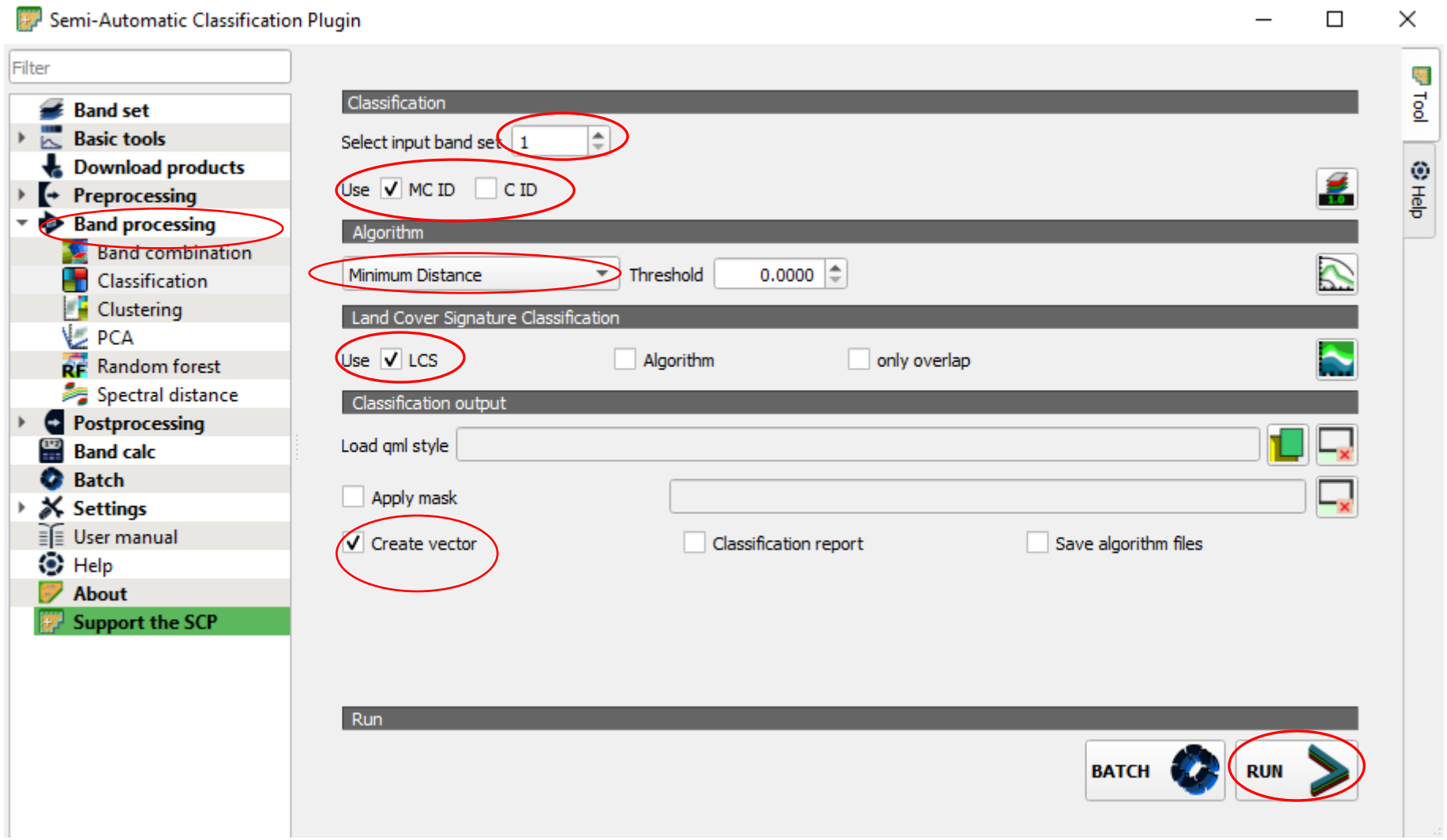


Image classification



- Go to SCP → Band Processing → Classification
- Use Micro ID or class ID
- Select algorithm → Landcover signature classification
- Click on run → give the path to save the classified image.


Thank you