

# Sentinel2Analyzer

## Short Guide



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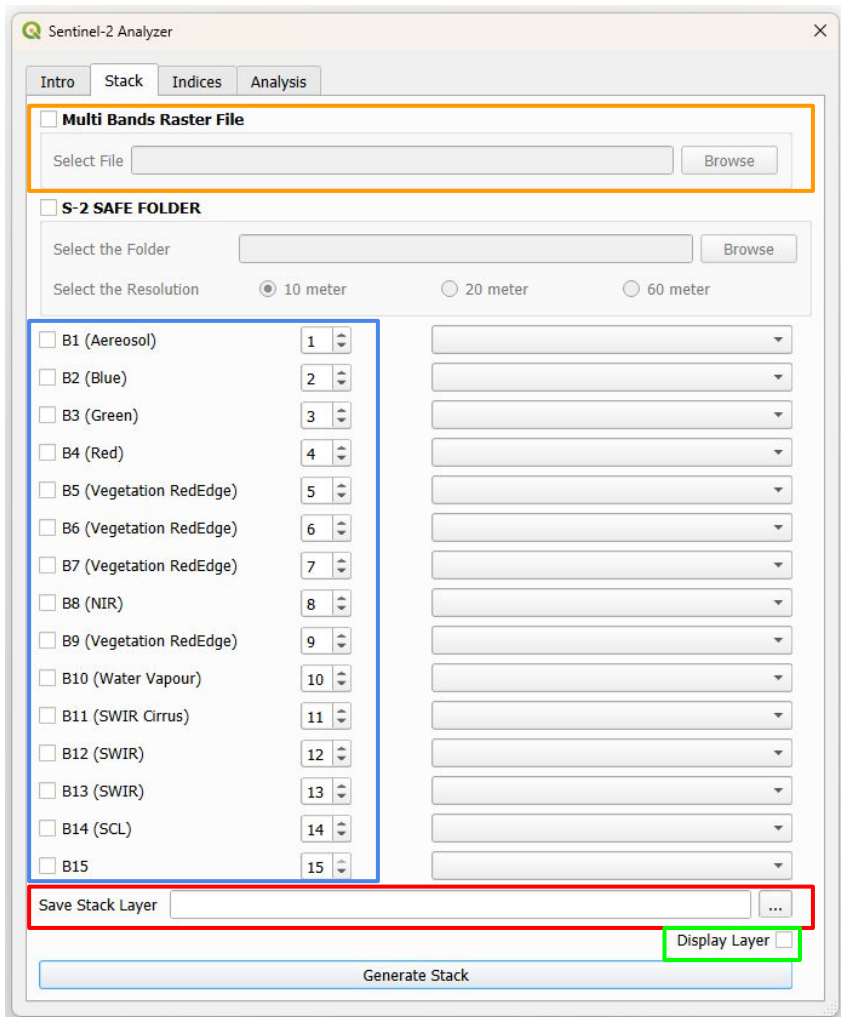
# Introduction



Sentinel-2 Analyzer is a QGIS plugin designed to help you efficiently explore and analyze Sentinel-2 satellite imagery.

It offers an intuitive, step-by-step workflow that guides users from raw data preparation to advanced analysis — all within the QGIS environment, without requiring any coding.

# STACK TAB

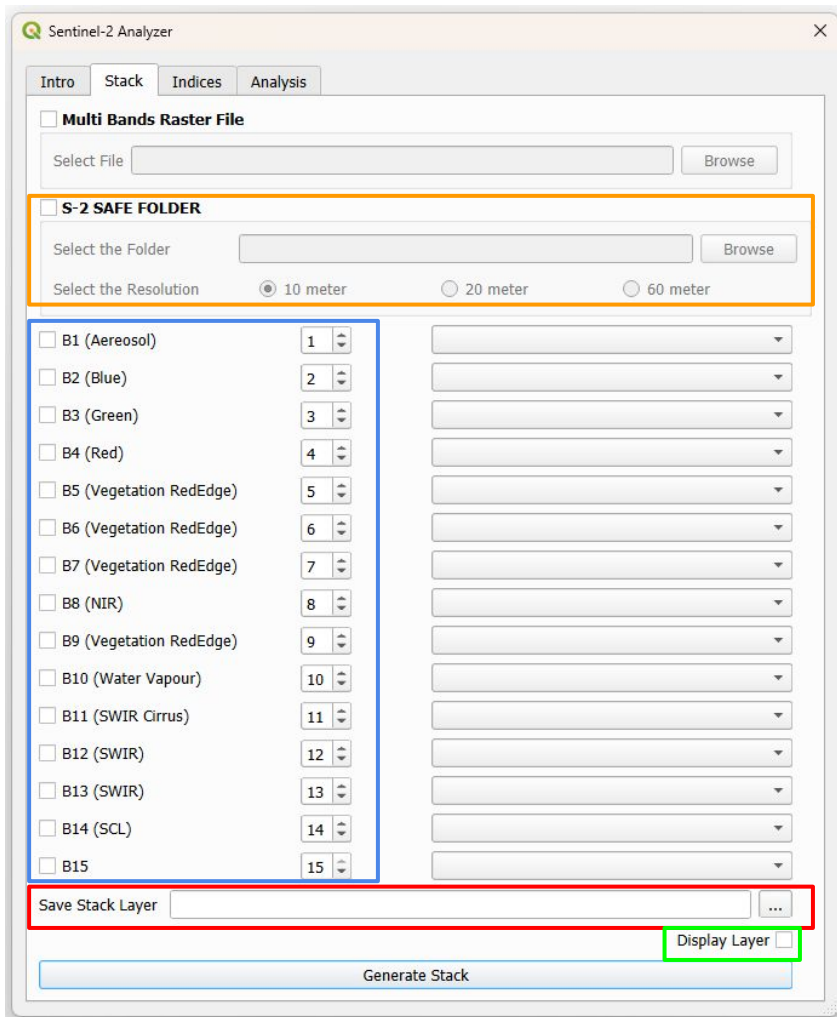


## STACK TAB 1/3

- supported format for raster .tif & .jp2
- User can generate a sub-stack from a multi bands raster file:
  - Insert the input raster path (orange box)
  - Specify the band to preserve in the new stack (blue box)
  - Specify the output path of the new stack \*\* (red box)
  - Automatically upload new raster in QGIS Layer Panel (green box)
  - Press “Generate Stack” button

\*\* It is necessary to specify which band to consider and the position of the band in the new file. Therefore the position of the desired band must be in a range from 1 to n (how many bands are selected) (1,2,3...,n)

User can save bands as he desires (R-G-B-NIR , B-G-R-NIR, ...)



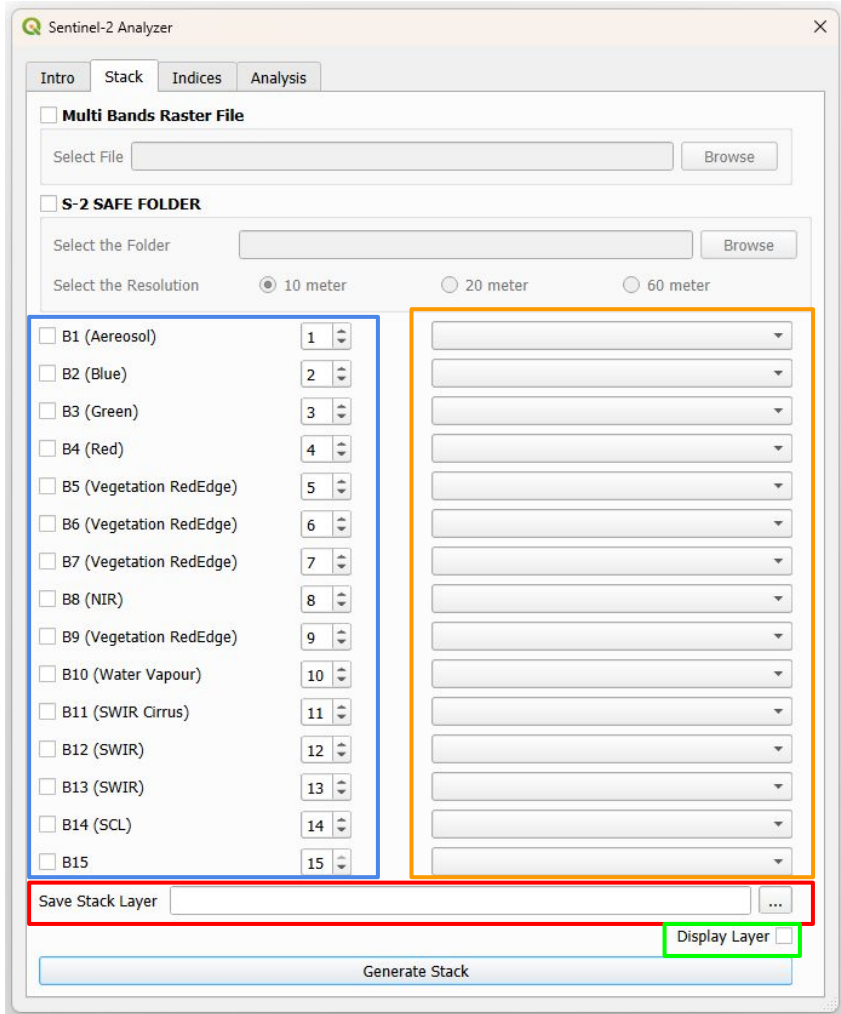
## STACK TAB 2/3

- supported format for raster .tif & .jp2
- User can generate a stack directly from SAFE folder downloaded from Copernicus EO Browser:
  - Insert the SAFE folder path (orange box)
  - Specify the desired resolution\* (orange box)
  - Specify the band to have in the stack \*\* (blue box)
  - Specify the output path of the stack (red box)
  - Automatically upload new raster in QGIS Layer Panel (green box)
  - Press “Generate Stack” button

\* Downsampling (from high to low resolution): mean of pixels  
 Upsampling (from low to high resolution): Nearest Neighbour

\*\* It is necessary to specify which band to consider and the position of the band in the new file. Therefore the position of the desired band must be in a range from 1 to n (how many bands are selected) (1,2,3...,n)

User can save bands as he desires (R-G-B-NIR , B-G-R-NIR, ...)



## STACK TAB 3/3

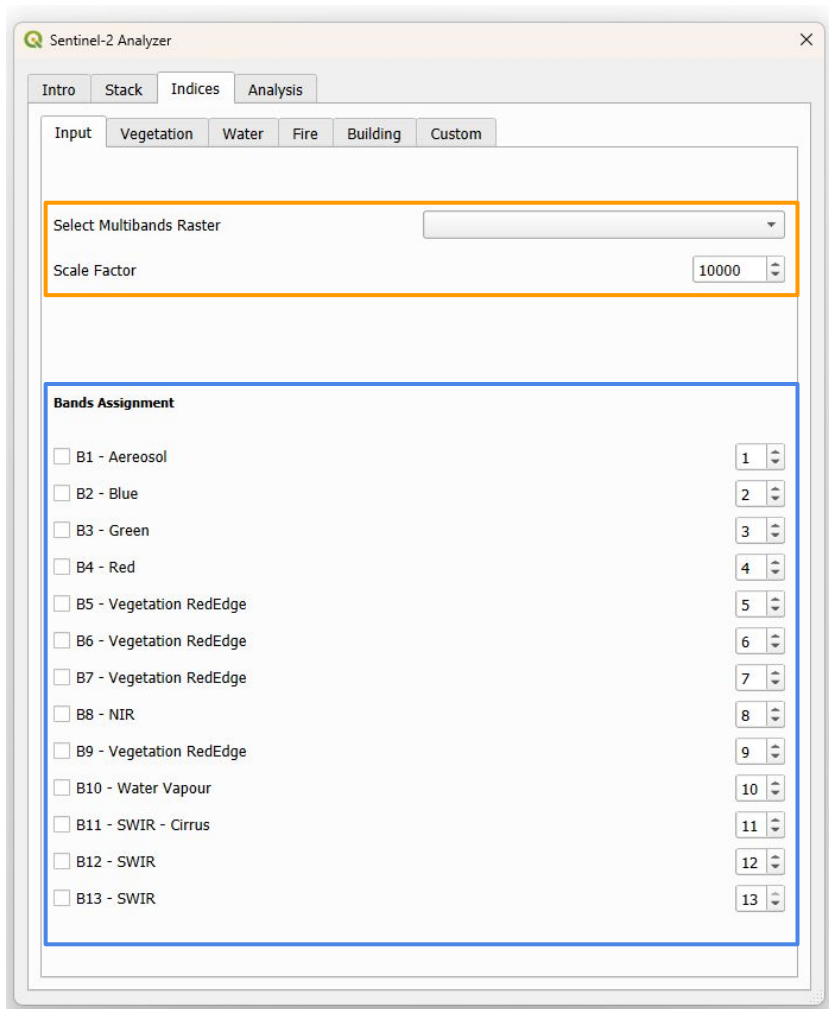
- supported format for raster .tif & .jp2
- User can generate a stack directly from single layer already upload in the QGIS Layer Panel:
  - Specify the layer according to the band\* (orange box)
  - Specify the band to have in the stack \*\* (blue box)
  - Specify the output path of the stack (red box)
  - Automatically upload new raster in QGIS Layer Panel (green box)
  - Press “Generate Stack” button

\* Layer must have the same resolution, crs, extension, ...

\*\* It is necessary to specify which band to consider and the position of the band in the new file. Therefore the position of the desired band must be in a range from 1 to n (how many bands are selected) (1,2,3...,n)

User can save bands as he desires (R-G-B-NIR , B-G-R-NIR, ...)

# INDICES TAB

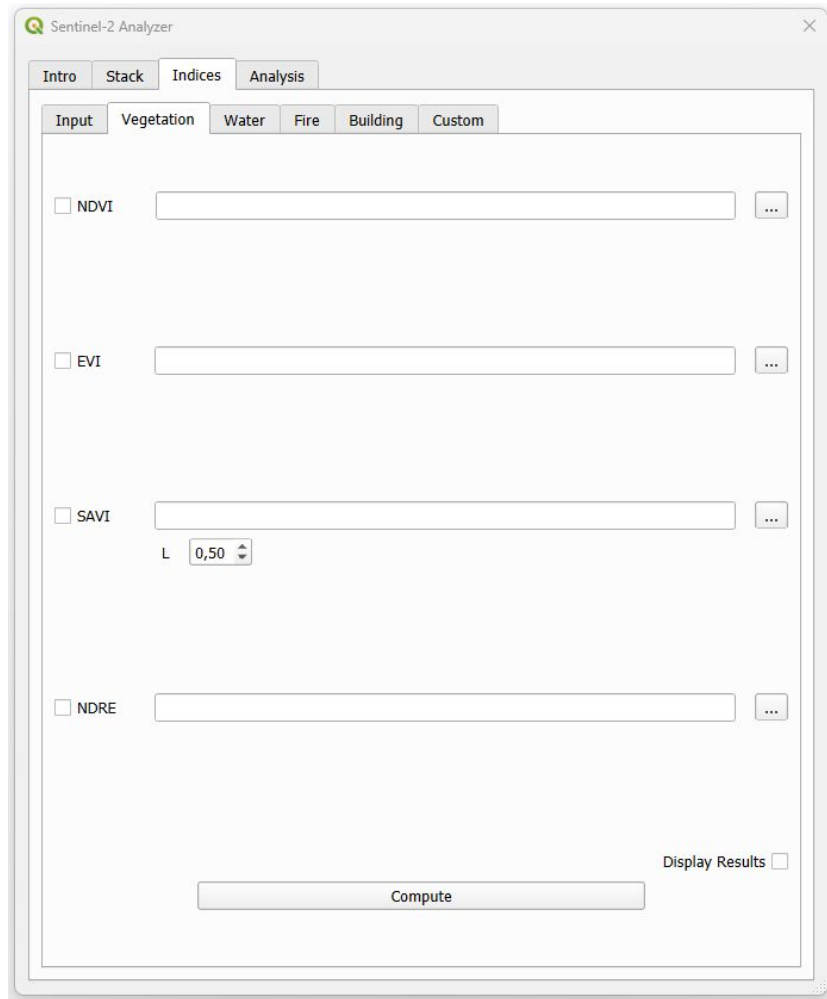


## INDICES TAB: *Input*

- supported format for raster .tif & .jp2
- User has to declare the structure of the raster file before computing indices:
  - Specify the layer, already upload in the QGIS Layer Panel, to consider (orange box)
  - Specify the Scale Factor\* (orange box)
  - Declare which bands are present in the considered layer and their position (blue box)

\* Default for S-2 L2A images is 10000

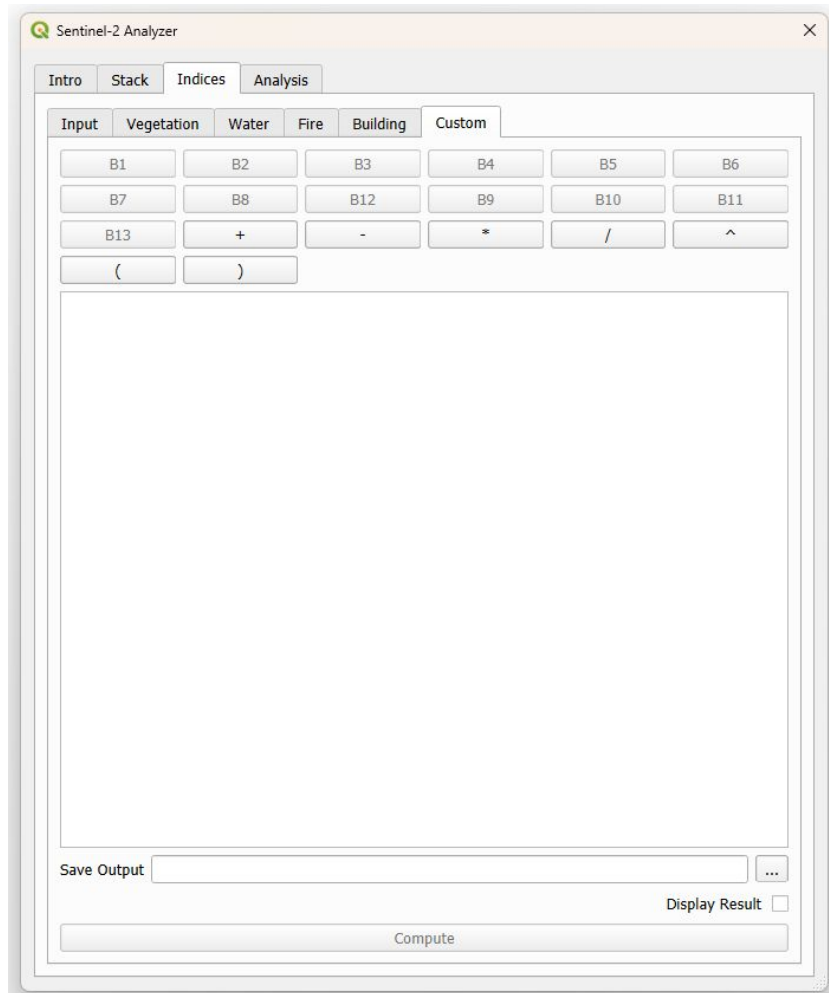




## INDICES TAB: *Vegetation/Water/Fire/Building*

- supported format for raster .tif & .jp2
- User can compute some vegetation/water/fire/building indices provided by default\*:
  - Specify which index wants to compute
  - Specify the output path of the raster
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Compute” button

\*It is mandatory to Declare the Input in the previous Tab: Indices-Input

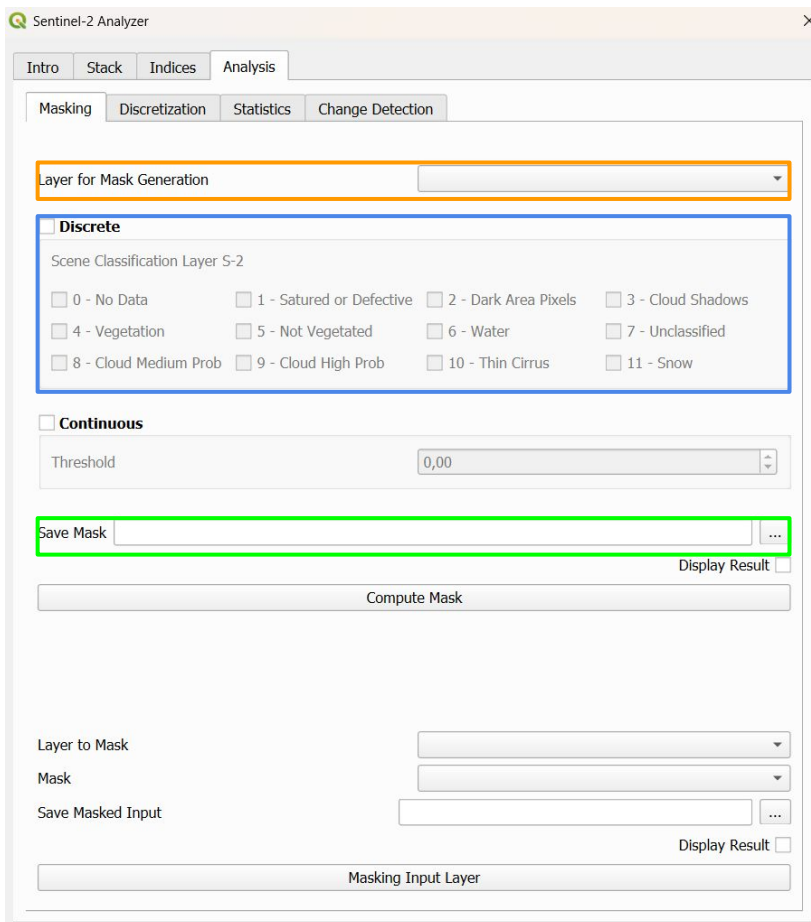


## INDICES TAB: *Custom*

- supported format for raster .tif & .jp2
- User can compute custom indices, or compute some operations on the bands\*:
  - Insert the operation in the window
  - Specify the output path
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Compute” button

\*It is mandatory to Declare the Input in the previous Tab: Indices-Input

# ANALYSIS TAB

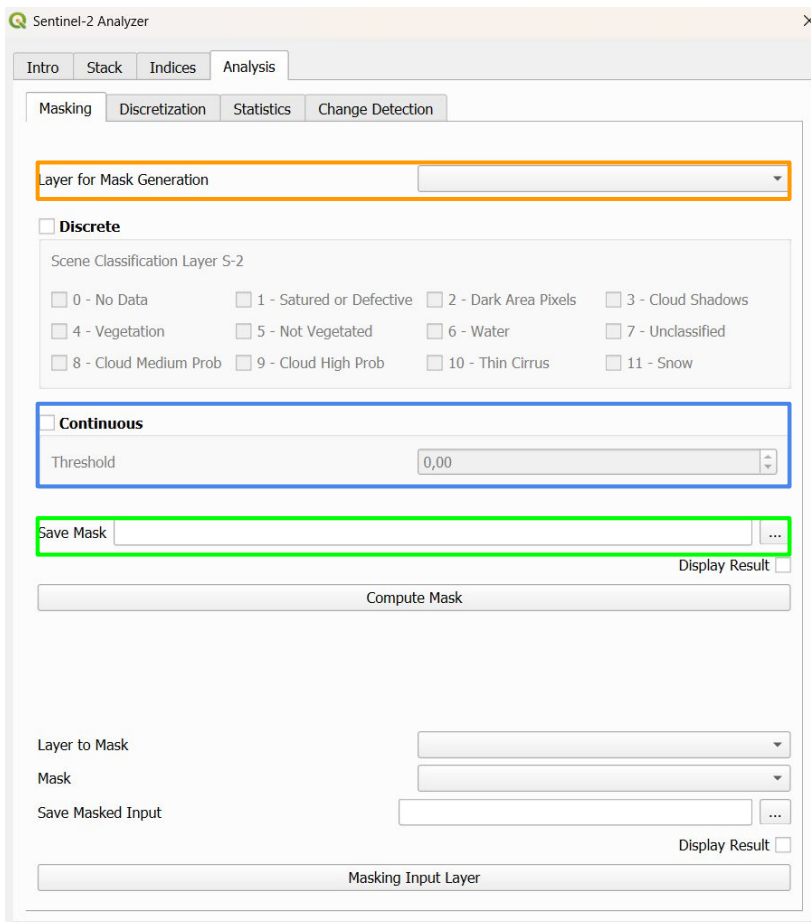


## INDICES ANALYSIS: *Masking* 1/3

- supported format for raster .tif & .jp2
- User can generate binary mask of a input layer\*:
  - Specify the layer, already upload in the QGIS Layer Panel, to consider (orange box)
  - Specify which discrete values want to mask\*\* (blue box)
  - Specify the output path (green box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Compute Mask” button

\*single band layer

\*\* discrete values proposed according to SCL product provided by Sentinel 2



## INDICES ANALYSIS: *Masking* 2/3

- supported format for raster .tif & .jp2
- User can generate binary mask of a input layer\*:
  - Specify the layer, already upload in the QGIS Layer Panel, to consider (orange box)
  - Specify the threshold value for continuous layer (blu box)
  - Specify the output path (green box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Compute Mask” button

\*single band layer

Sentinel-2 Analyzer

Intro Stack Indices Analysis

Masking Discretization Statistics Change Detection

Layer for Mask Generation

☐ Discrete

Scene Classification Layer S-2

☐ 0 - No Data ☐ 1 - Saturated or Defective ☐ 2 - Dark Area Pixels ☐ 3 - Cloud Shadows

☐ 4 - Vegetation ☐ 5 - Not Vegetated ☐ 6 - Water ☐ 7 - Unclassified

☐ 8 - Cloud Medium Prob ☐ 9 - Cloud High Prob ☐ 10 - Thin Cirrus ☐ 11 - Snow

☐ Continuous

Threshold 0,00

Save Mask

Display Result ☐

Compute Mask

Layer to Mask

Mask

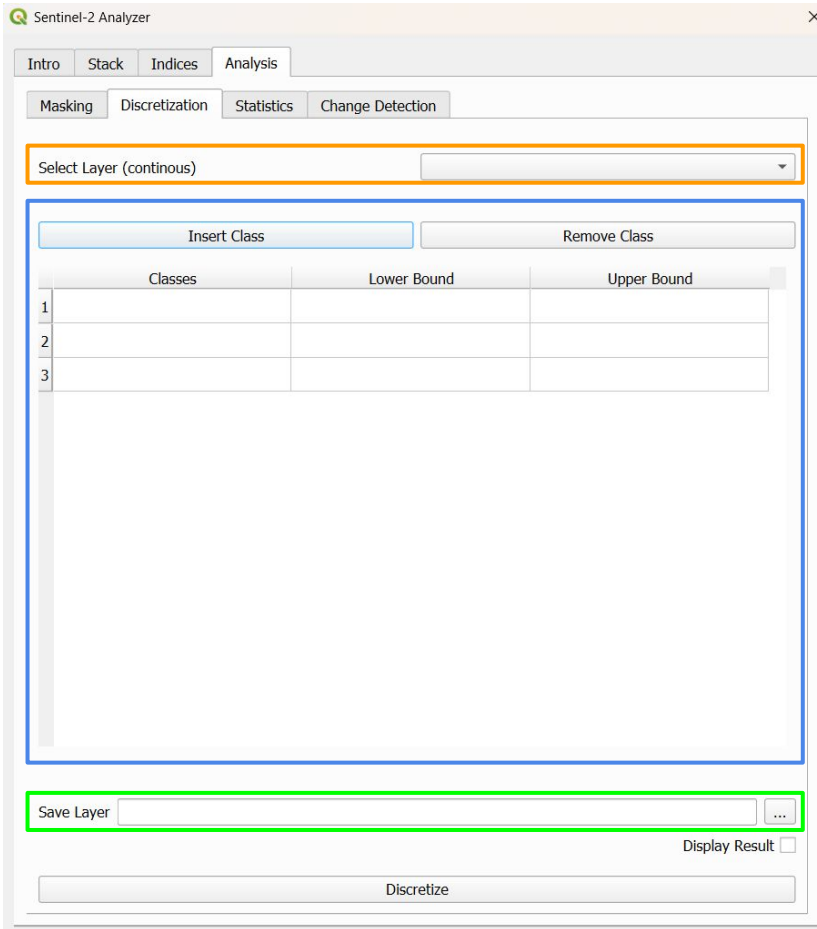
Save Masked Input

Display Result ☐

Masking Input Layer

## INDICES ANALYSIS: *Masking* 3/3

- supported format for raster .tif & .jp2
- User can apply binary mask to a input layer:
  - Specify the layer, already upload in the QGIS Layer Panel, to mask (orange box)
  - Specify the mask, already upload in the QGIS Layer Panel, to apply (blue box)
  - Specify the output path (green box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Masking Input Layer” button



## INDICES ANALYSIS: *Discretization*

- supported format for raster .tif & .jp2
- User can discretize continuous raster layer to generate discrete raster:
  - Specify the layer, already upload in the QGIS Layer Panel, to discretize (orange box)
  - Insert (delete) in the table desired classes\* and the corresponding range (lower and upper bound for each class) (blue box)
  - Specify the output path (green box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Discretize” button

\*classes must be integer values

Sentinel-2 Analyzer

Intro Stack Indices Analysis

Masking Discretization Statistics Change Detection

**Single Layer**

Select Layer

☐ Histogram

☐ Box Plot

☐ Descriptive Statistic (min, max, mean, variance, area)

Save Report ...

Report

**Layer Combination**

Select Layer (continuous)

Select Layer (discrete)

☐ Histogram per class

☐ Box Plot per class

☐ Descriptive Statistic per class (min, max, mean, variance, area)

Save Report ...

Report

## INDICES ANALYSIS: *Statistics 1/2*

- supported format for raster .tif & .jp2
- supported format for report .pdf
- User can generate a report related to a single input:
  - Specify the layer, already upload in the QGIS Layer Panel, on which generate a report (orange box)
  - Select which element to insert in the report (blue box)
  - Specify the report output path (green box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Report” button



Sentinel-2 Analyzer

Intro Stack Indices Analysis

Masking Discretization Statistics Change Detection

**Single Layer**

Select Layer

☐ Histogram

☐ Box Plot

☐ Descriptive Statistic (min, max, mean, variance, area)

Save Report  ...

Report

**Layer Combination**

Select Layer (continuous)

Select Layer (discrete)

☐ Histogram per class

☐ Box Plot per class

☐ Descriptive Statistic per class (min, max, mean, variance, area)

Save Report  ...

Report

## INDICES ANALYSIS: *Statistics 2/2*

- supported format for raster .tif & .jp2
- supported format for report .pdf
- User can generate a report combining to raster as input, one continuous and the other discrete:
  - Specify layers, already upload in the QGIS Layer Panel, on which generate a report (orange box)
  - Select which element to insert in the report (blue box)
  - Specify the report output path (green box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Report” button

Sentinel-2 Analyzer

Intro Stack Indices Analysis

Masking Discretization Statistics Change Detection

**Input Layer**

Select Layer (time 0)

Select Layer (time 1)

**Distance**

☐ Difference (t1-t0)

Save Difference Map  ...

☐ Euclidean Distance

Save Euclidean Distance Map  ...

☐ Hamming Distance with Report

Save Hamming Distance Map  ...

Save Report  ...

Display Result ☐

Compute Change Detection

## INDICES ANALYSIS:

### *Change Detection*

- supported format for raster .tif & .jp2
- supported format for report .pdf
- User can compute basic change detection analysis considering two input (time 0, time 1):
  - Specify layers, already upload in the QGIS Layer Panel, on which compute the analysis (orange box)
  - Select which distance to compute and specify the related output path (blue box)
  - Automatically upload new raster in QGIS Layer Panel
  - Press “Compute Change Detection” button

NB Hamming Distance can be compute only on binary single band raster as inputs

# INDICES

### Vegetation:

- $NDVI = (NIR - RED) / (NIR + RED)$
- $EVI = 2.5 * (NIR - RED) / (NIR + 6*RED - 7.5*BLUE + 1)$
- $SAVI = (NIR - RED) / (NIR + RED + L) * (1 + L)$
- $NDRE = (NIR - RED\_EDGE) / (NIR + RED\_EDGE)$

### Water:

- $NDWI = (GREEN - NIR) / (GREEN + NIR)$
- $MNDWI = (GREEN - SWIR2) / (GREEN - SWIR2)$
- $NDMI = (NIR - SWIR1) / (NIR + SWIR1)$

### Fire:

- NBR
- NBR2
- MIRBI

### Building:

- $NDBI = (SWIR2 - NIR) / (SWIR2 + NIR)$
- $NBI = (SWIR2 * RED) / NIR$
- $NBAI = [(SWIR2 - SWIR1) / GREEN] / [(SWIR2 + SWIR1) / GREEN]$
- $BAEI = (RED + 0.3) / (GREEN + SWIR1)$