

# Sentinel2Analyzer

## Short Guide



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# STACK TAB

Sentinel-2 Analyzer

Intro Stack Indices Analysis

☐ Multi Bands Raster File

Select File  Browse

☐ S-2 SAFE FOLDER

Select the Folder  Browse

Select the Resolution ☒ 10 meter ☐ 20 meter ☐ 60 meter

<input type="checkbox"/> B1 (Aereosol)	1	<input type="text"/>
<input type="checkbox"/> B2 (Blue)	2	<input type="text"/>
<input type="checkbox"/> B3 (Green)	3	<input type="text"/>
<input type="checkbox"/> B4 (Red)	4	<input type="text"/>
<input type="checkbox"/> B5 (Vegetation RedEdge)	5	<input type="text"/>
<input type="checkbox"/> B6 (Vegetation RedEdge)	6	<input type="text"/>
<input type="checkbox"/> B7 (Vegetation RedEdge)	7	<input type="text"/>
<input type="checkbox"/> B8 (NIR)	8	<input type="text"/>
<input type="checkbox"/> B9 (Vegetation RedEdge)	9	<input type="text"/>
<input type="checkbox"/> B10 (Water Vapour)	10	<input type="text"/>
<input type="checkbox"/> B11 (SWIR Cirrus)	11	<input type="text"/>
<input type="checkbox"/> B12 (SWIR)	12	<input type="text"/>
<input type="checkbox"/> B13 (SWIR)	13	<input type="text"/>
<input type="checkbox"/> B14 (SCL)	14	<input type="text"/>
<input type="checkbox"/> B15	15	<input type="text"/>

Save Stack Layer  ...

Display Layer ☐

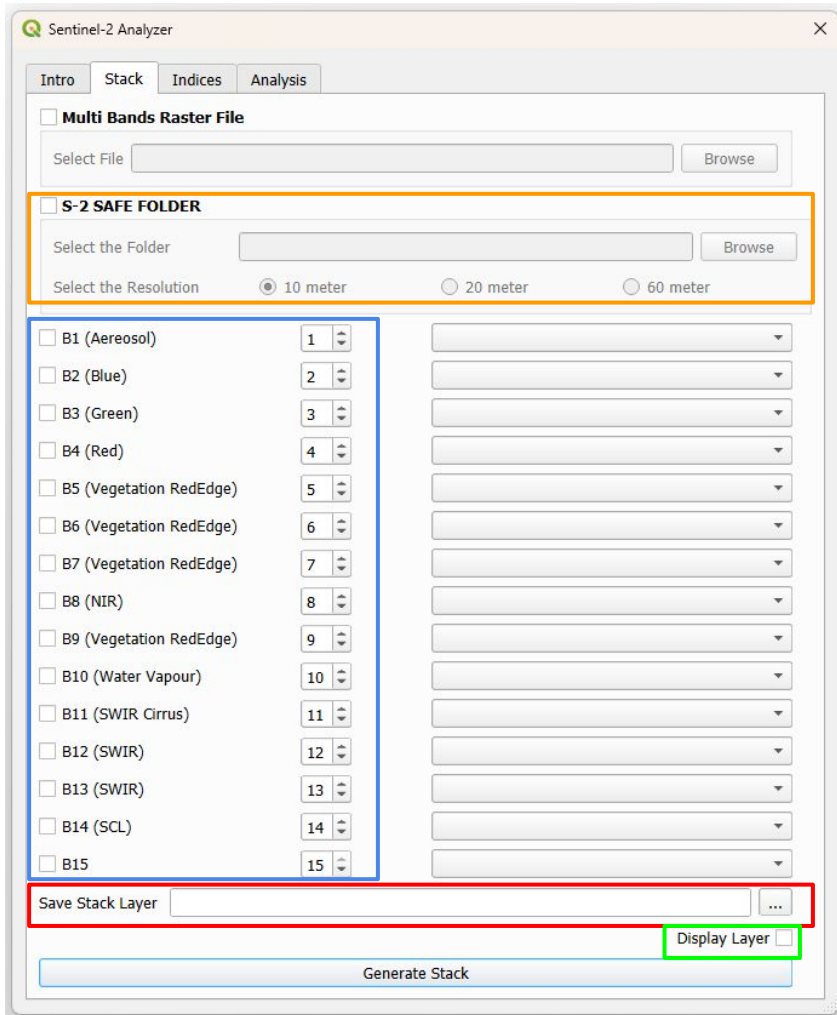
Generate Stack

## 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, ...)



Sentinel-2 Analyzer

Intro Stack Indices Analysis

☐ Multi Bands Raster File

Select File  Browse

☐ S-2 SAFE FOLDER

Select the Folder  Browse

Select the Resolution ☒ 10 meter ☐ 20 meter ☐ 60 meter

<input type="checkbox"/> B1 (Aerosol)	1	<input type="text"/>
<input type="checkbox"/> B2 (Blue)	2	<input type="text"/>
<input type="checkbox"/> B3 (Green)	3	<input type="text"/>
<input type="checkbox"/> B4 (Red)	4	<input type="text"/>
<input type="checkbox"/> B5 (Vegetation RedEdge)	5	<input type="text"/>
<input type="checkbox"/> B6 (Vegetation RedEdge)	6	<input type="text"/>
<input type="checkbox"/> B7 (Vegetation RedEdge)	7	<input type="text"/>
<input type="checkbox"/> B8 (NIR)	8	<input type="text"/>
<input type="checkbox"/> B9 (Vegetation RedEdge)	9	<input type="text"/>
<input type="checkbox"/> B10 (Water Vapour)	10	<input type="text"/>
<input type="checkbox"/> B11 (SWIR Cirrus)	11	<input type="text"/>
<input type="checkbox"/> B12 (SWIR)	12	<input type="text"/>
<input type="checkbox"/> B13 (SWIR)	13	<input type="text"/>
<input type="checkbox"/> B14 (SCL)	14	<input type="text"/>
<input type="checkbox"/> B15	15	<input type="text"/>

Save Stack Layer  ...

Display Layer ☐

Generate Stack

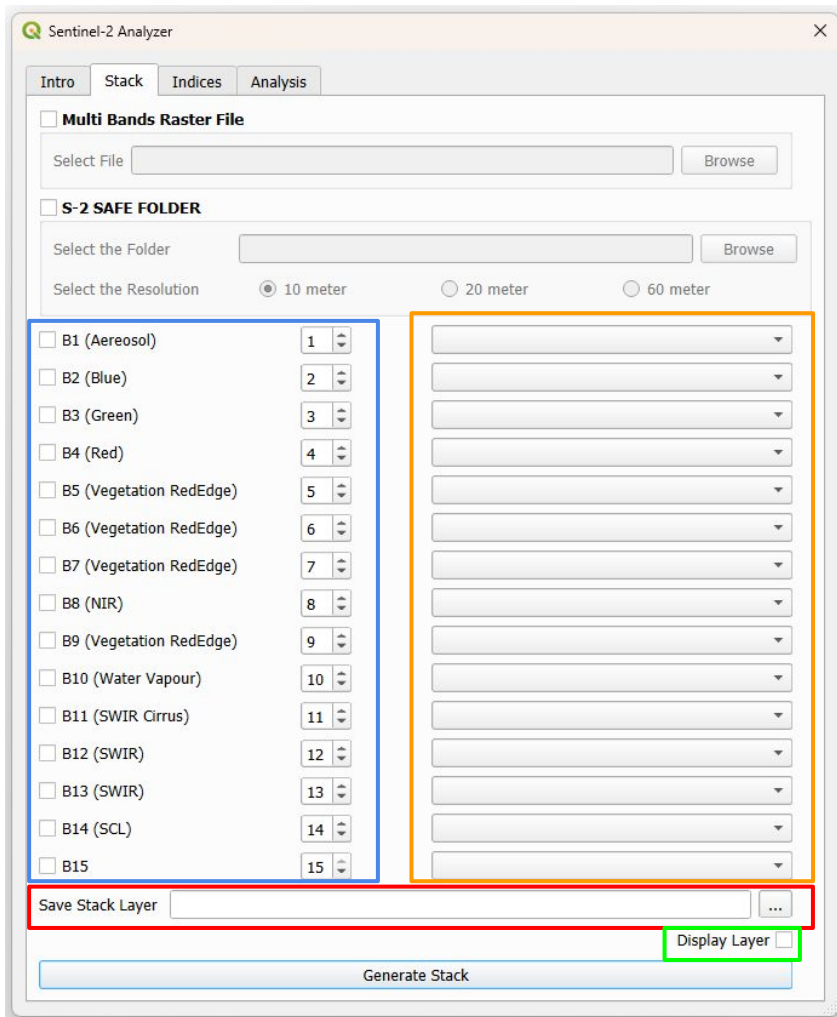
## STACK TAB 2/3

- 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, ...)



☐ **Multi Bands Raster File**  
 Select File

☐ **S-2 SAFE FOLDER**  
 Select the Folder

Select the Resolution ☒ 10 meter ☐ 20 meter ☐ 60 meter

<input type="checkbox"/> B1 (Aereosol)	1	<input type="text"/>
<input type="checkbox"/> B2 (Blue)	2	<input type="text"/>
<input type="checkbox"/> B3 (Green)	3	<input type="text"/>
<input type="checkbox"/> B4 (Red)	4	<input type="text"/>
<input type="checkbox"/> B5 (Vegetation RedEdge)	5	<input type="text"/>
<input type="checkbox"/> B6 (Vegetation RedEdge)	6	<input type="text"/>
<input type="checkbox"/> B7 (Vegetation RedEdge)	7	<input type="text"/>
<input type="checkbox"/> B8 (NIR)	8	<input type="text"/>
<input type="checkbox"/> B9 (Vegetation RedEdge)	9	<input type="text"/>
<input type="checkbox"/> B10 (Water Vapour)	10	<input type="text"/>
<input type="checkbox"/> B11 (SWIR Cirrus)	11	<input type="text"/>
<input type="checkbox"/> B12 (SWIR)	12	<input type="text"/>
<input type="checkbox"/> B13 (SWIR)	13	<input type="text"/>
<input type="checkbox"/> B14 (SCL)	14	<input type="text"/>
<input type="checkbox"/> B15	15	<input type="text"/>

Save Stack Layer

☐ Display Layer

## STACK TAB 3/3

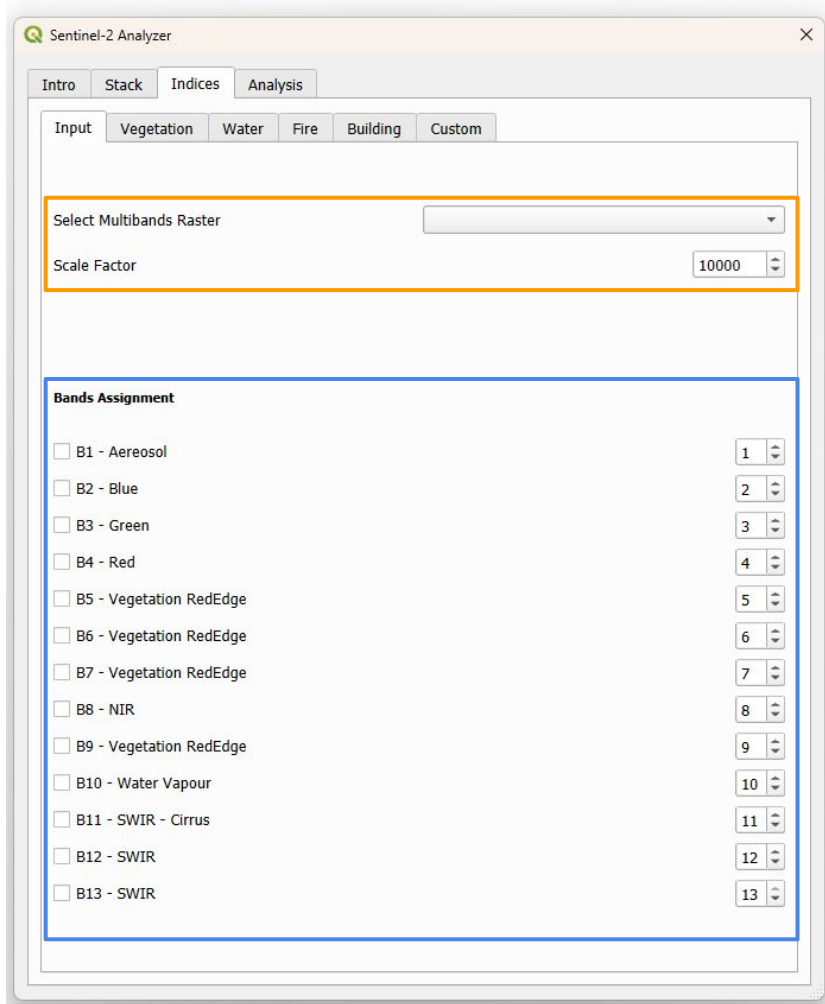
- supported format for raster .tif & .jp2
- User can generate a stack directly from single layer already upload in the QGIS Layer Panel:
  - Specify the layer according to the band\* (orange box)
  - Specify the band to have in the stack \*\* (blue box)
  - Specify the output path of the stack (red box)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

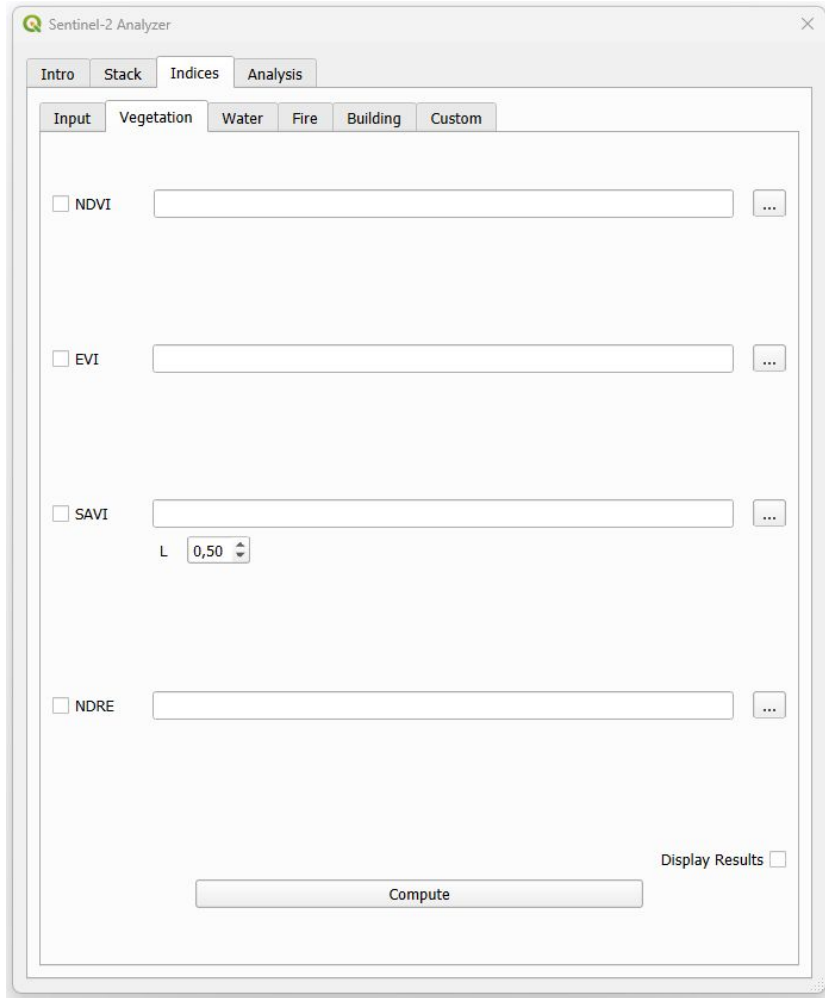
# INDICES TAB



## 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 Later 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

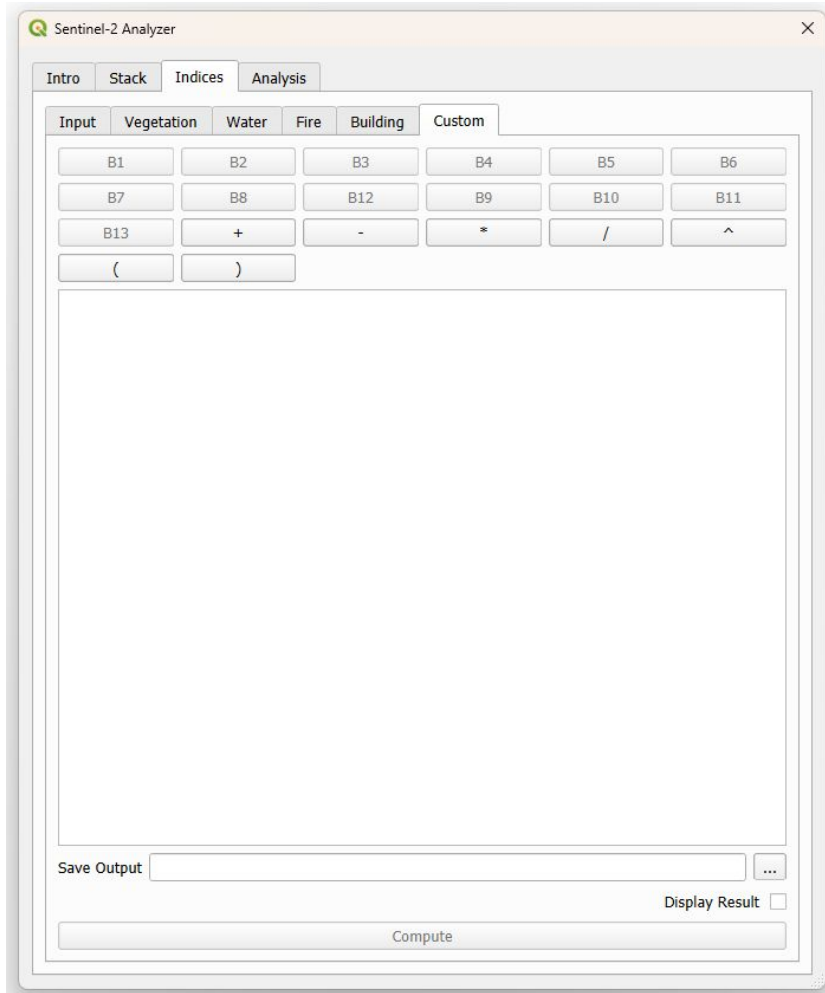


## INDICES TAB: *Vegetation/Water/Fire/Building*

- 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



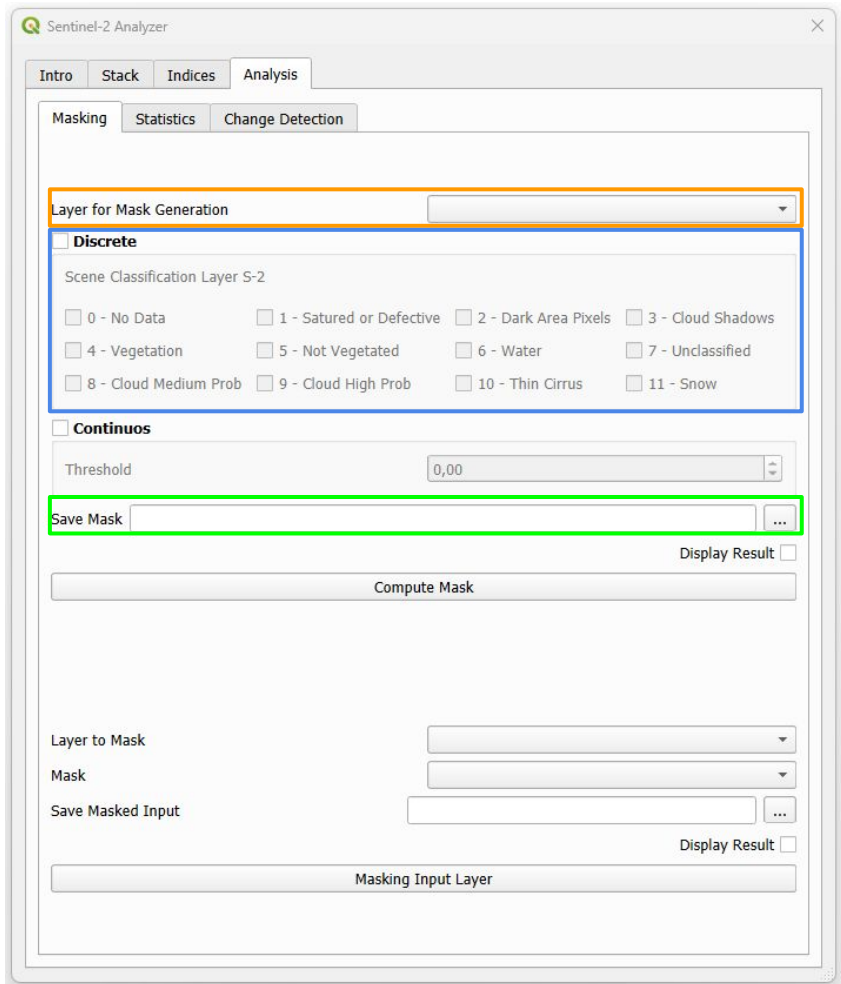


## INDICES TAB: *Custom*

- 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

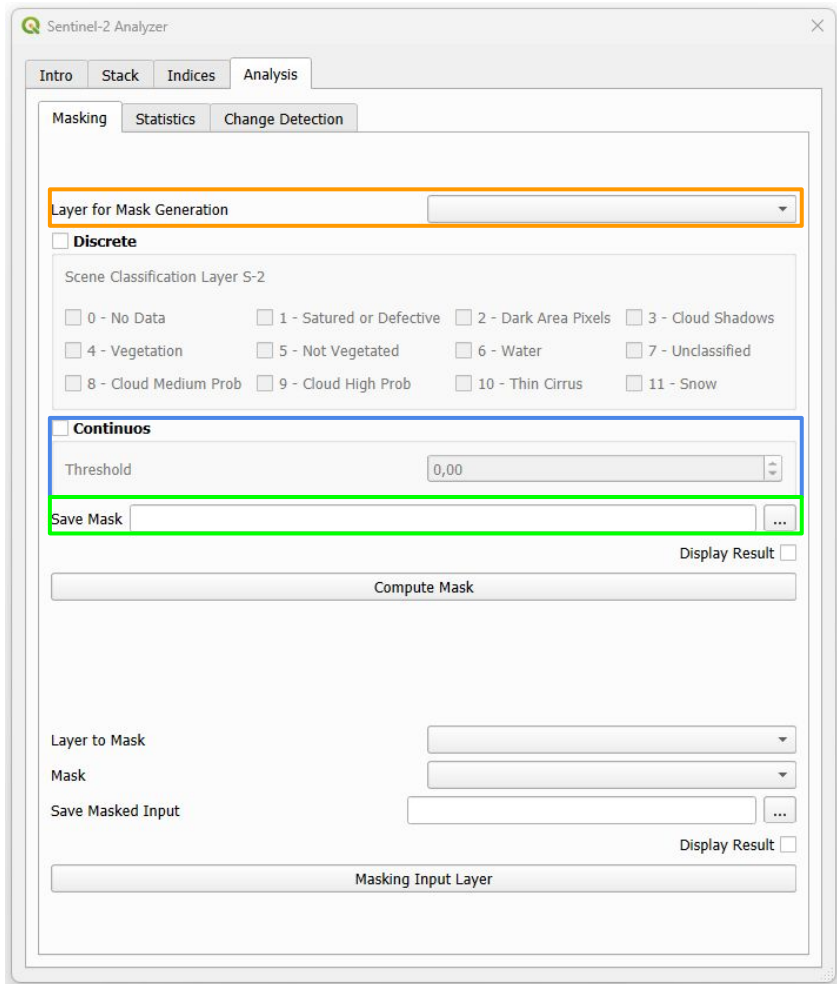


## INDICES ANALYSIS: *Masking 1/3*

- supported format for raster .tif & .jp2
- User can generate binary mask of a input layer\*:
  - Specify the layer, already upload in the QGIS Later Panel, to consider (orange box)
  - Specify which discrete values want to mask\*\*
  - 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

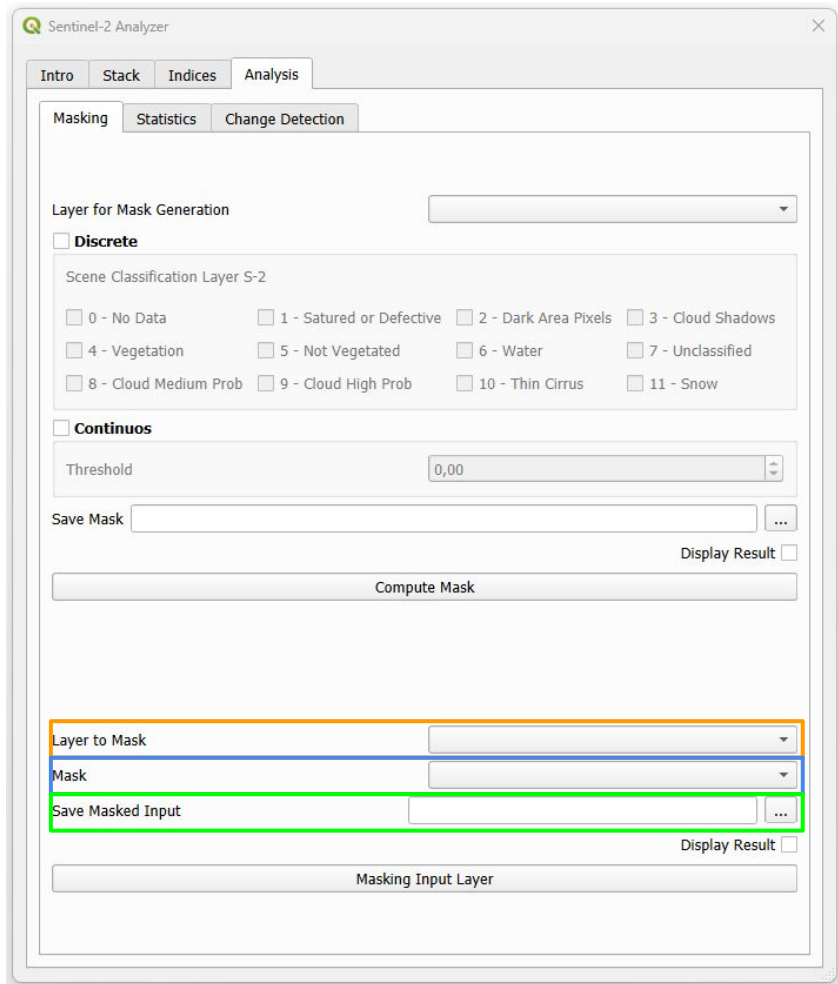


## INDICES ANALYSIS: *Masking 2/3*

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

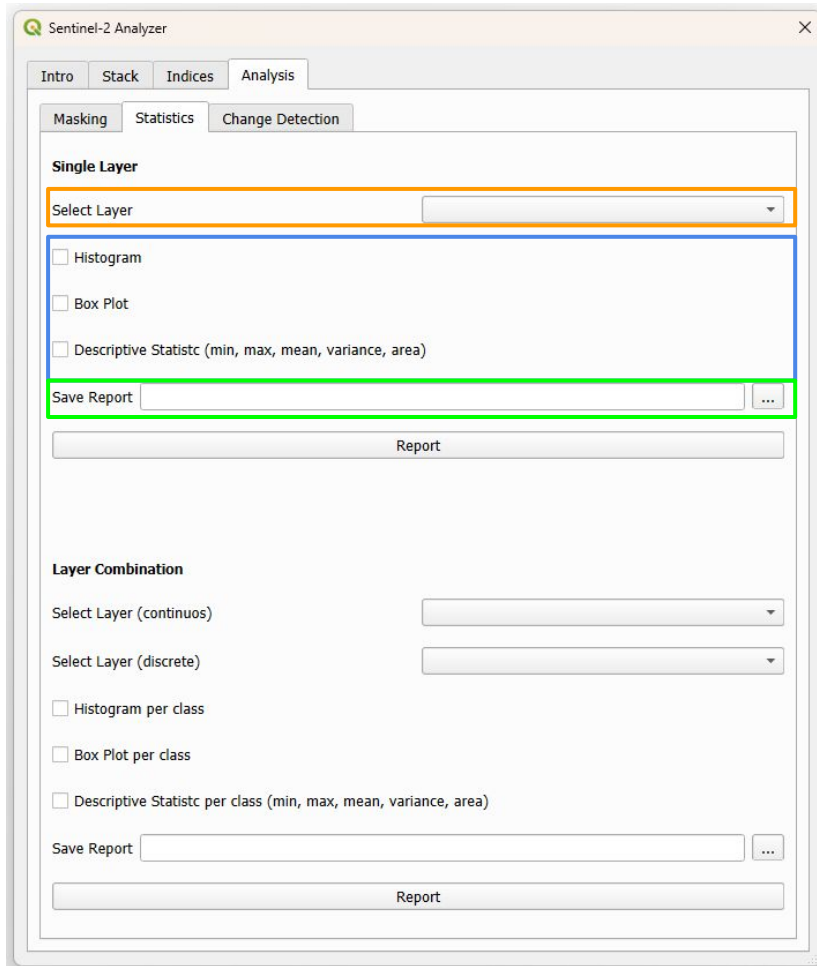
\*single band layer

## INDICES ANALYSIS: *Masking* 3/3



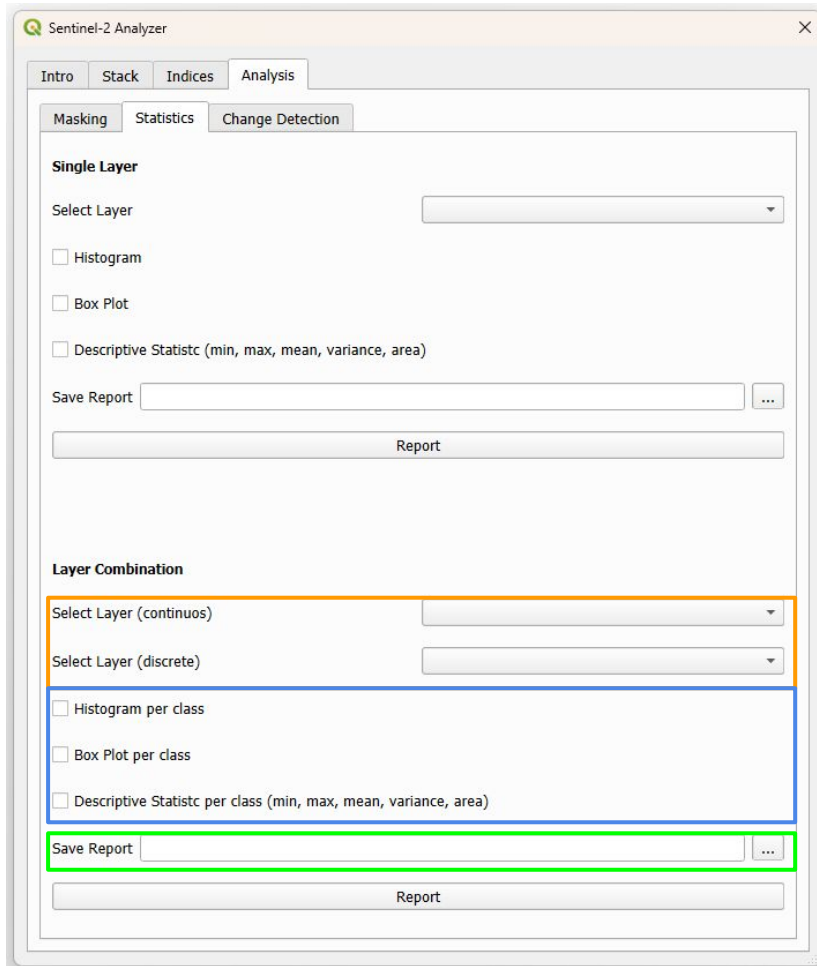
The screenshot shows the 'Masking' panel of the Sentinel-2 Analyzer. It has three tabs: 'Masking', 'Statistics', and 'Change Detection'. The 'Masking' tab is active. It contains a 'Layer for Mask Generation' dropdown menu. Below it, there are two sections: 'Discrete' and 'Continuous'. The 'Discrete' section is selected and shows a 'Scene Classification Layer S-2' with 11 categories: 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, and 11 - Snow. The 'Continuous' section is unselected and shows a 'Threshold' input field with the value '0,00'. Below these sections, there is a 'Save Mask' input field with a browse button (...). A 'Display Result' checkbox is next to it. A 'Compute Mask' button is at the bottom of this section. The bottom section of the panel has a 'Layer to Mask' dropdown (highlighted with an orange box), a 'Mask' dropdown (highlighted with a blue box), a 'Save Masked Input' input field with a browse button (...), and a 'Display Result' checkbox. A 'Masking Input Layer' button is at the bottom of this section.

- supported format for raster .tif & .jp2
- User can apply binary mask to a input layer:
  - Specify the layer, already upload in the QGIS Later Panel, to mask (orange box)
  - Specify the mask, already upload in the QGIS Later 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: *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



## 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 Statistics Change Detection

**Input Layer**

Select Layer (time 0)

Select Layer (time 1)

**Distance**

☐ Difference

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:

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