Processing Sentinel 2 MSI in the JRC IMPACT tool v1.3b

Purpose: Unzipping, Layer stack and Archiving Landsat data

Input directory: *DATA/RAW_data*

Output directory: *DATA/CALIBRATED_data*

Output zip **backup** directory: *DATA/RAW_data/Processed* (could be deleted if not necessary)

By executing this module, Sentinel2_Level-1C zipped (.zip) archives placed in the **DATA/RAW_data** directory will be processed and converted into a single Geo Tiff, TOA-Reflectance file.

A Sentinel2 image is a compilation of granules of fixed length (approximately 25 km across track and 23 km along track) and area (100 km2 in UTM/WGS84 projection) available to user in SENTINEL-SAFE format (*https://sentinel.esa.int/web/sentinel/user-guides/sentinel-2-msi/data-formats*).

Is worth noting that granules

- might have different (UTM) projections
- are composed by 13 individual JP2 images having different resolutions (from 10mt to 60mt)

Before launching the processing is therefore necessary to set a common output projection and resolution by using the pop-up window as on figure below.
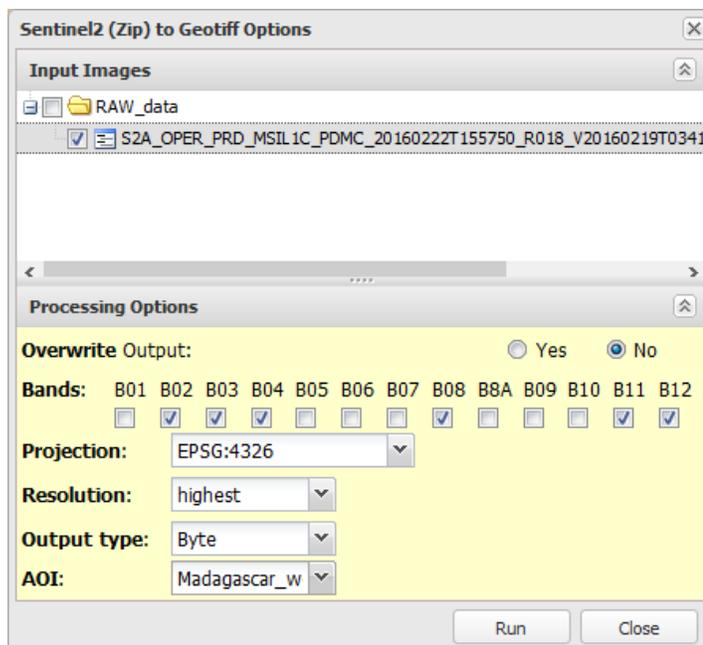
SENTINEL-2 data are acquired on 13 spectral bands in the VNIR and SWIR as follow:

- 10 m: 490 nm (B2), 560 nm (B3), 665 nm (B4), 842 nm (B8)
- 20 m: 705 nm (B5), 740 nm (B6), 783 nm (B7), 865 nm (B8a), 1610 nm (B11), 2190 nm (B12)
- 60 m: 443 nm (B1), 945 nm (B9) and 1375 nm (B10)

Currently is only possible to choose between Geographic LatLon projection (EPSG:4326) and UTM (most frequent among granules); user defined EPSG (such as Mercator, Alberts, …) will be available soon.

Be aware about possible geolocation inaccuracy and radiometry loss introduced by the warping and default NN resampling.

Default bands selection [B02, B03, B04, B08, B11,B12] corresponding to Landsat [B,G,R,NIR,SWIR1,SWIR2] results in a product close to TM / ETM+ / OLI and enable you to use the automatic classifier, evergreen forest normalization and spectral unmixing.

However, is image size and processing time is a concern, a light 3 bands image [B12,B08,B04] retains enough spectral information to successfully use the Index Builder (e.g. NDVI) and Image Segmentation while offering excellent contrast for visual interpretation.

Output resolution can be set as "highest" and "lowest" (among selected bands) or you can specify your choice with "user". Remember if using Lat Long the resolution is set in degrees (so 10m is approximately 0.0001 at equator).

While staking together bands of different resolution, nearest neighbour resampling is used (NO Pan-Sharpening)

Radiometric resolution of S2 MSI instrument is 12 bit, saved using Unsigned Integer 16 bit data type (UInt16) (https://sentinel.esa.int/web/sentinel/user-guides/sentinel-2-msi/resolutions/radiometric).

By selecting "Byte", output radiometric resolution will be converted into Byte (8 bit) by using a linear transformation

$$TOARef_{Byte} = (DN*0.0255)$$

Image DN values [0-4095] are converted to TOAReflectance [0,1] using the provided conversion factor (10000) and multiplied by 255 to obtain a byte TOAReflectance [0,255];

Additionally, by selecting a vector file as Area Of Interest (AOI) from the one available in **DATA/VECTOR_data**, only intersecting images and/or part of them are processed, reducing processing time and image size.

Once processed, zip file are automatically moved into ***DATA/RAW_data/*Processed** and GeoTiff file is available for navigation and further processing under the "Other" branch of the layer-tree panel.