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sen2r is an R package which allows simplifying and automating searching, download and preprocessing time series of Sentinel-2 optical data over user-selected areas of interest.

Usage is facilitated by → **The sen2r GUI**, while several **R** functions are available to easily build customised processing scripts focused on Sentinel-2 data download and processing.

The possibility to launch the processing with a set of saved parameters allows users to easily build scripts devoted to automatically update an archive of Sentinel-2 products in near real-time.

- ✓ **Interactively:** open the **sen2r** GUI by launching the function

- ✓ **Non interactively:** launch the processing with the command

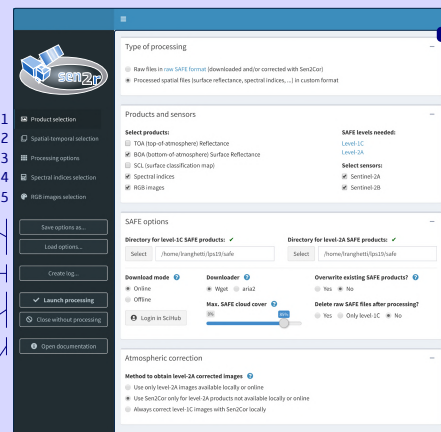
```
sen2r("/tmp/saved_param.json")
```


providing the path of a saved parameter file, or using the arguments of the function `sen2r()`

See the function reference at <http://sen2r.ranghetti.info/reference/sen2r>

A graphical user interface based on **R** Shiny can be used to easily set the processing parameters.

- ✓ Set the parameters (see the five screenshots)
- ✓ Import / export parameters from/in a JSON text file
- Send output messages to a log file instead than standard output.
- ✓ Close the GUI (launching / not launching the processing)
- ✓ Open the online documentation at <http://sen2cranohetti.info>



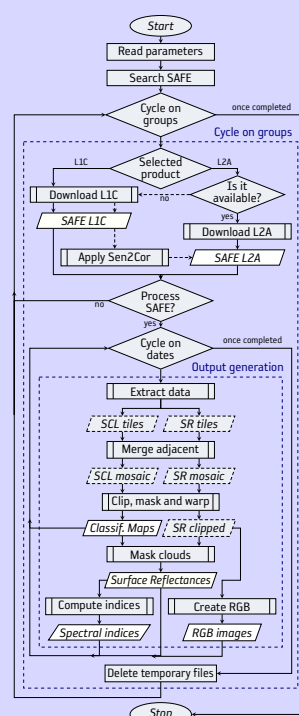
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- | | |
|----------------------------------|--|
| <code>s2_list()</code> | Retrieve a list of available Sentinel-2 products |
| <code>s2_download()</code> | Download them |
| <code>sen2cor()</code> | Correct level-1c products locally with Sen2Cor |
| <code>s2_rgb()</code> | Create RGB images from reflectances |
| <code>s2_calcindices()</code> | Compute spectral indices from reflectances |
| <code>safe_getMetadata()</code> | Get information from SAFE filenames or from existing archive |
| <code>sen2r_getElements()</code> | Get metadata from image filenames produced by sen2r |
| <code>s2_tiles()</code> | Return Sentinel-2 tiles footprints as a R object |
| <code>s2_dop()</code> | Return the Dates Of Passage of Sentinel-2 satellites over orbits |

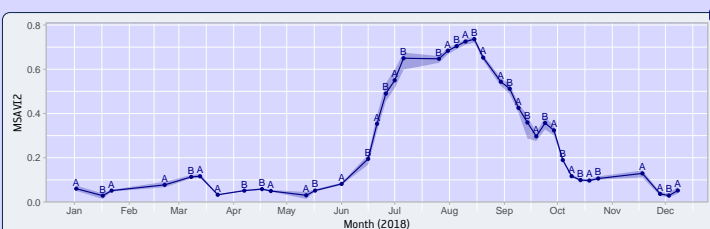
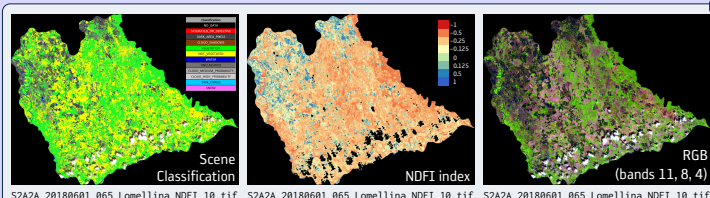
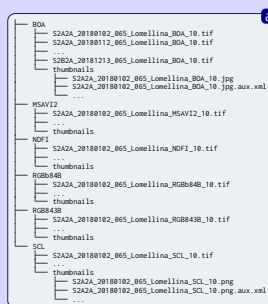
- 1 Search and download Sentinel-2 products matching requisites (time window, area of interest, required products);

- 2 if required, apply Sen2Cor to generate level-2A (atmospherically corrected reflectances) Sentinel-2 archives from level-1C (top-of-atmosphere reflectances);
- 3 apply geometric transformations (merge adjacent tiles, clip to the area of interest, reproject, resize, ...);
- 4 apply a cloud mask based on categories of the Scene Classification Map;
- 5 generate RGB images (true-colour or false-colour);
- 6 compute spectral indices;
- 7 export required output products in a commonly used raster format.



- a) Processed data are saved in a standardised tree, where:
 - each subfolder corresponds to a product;
 - output files use a short naming convention containing:
 - the sensor (Sentinel-2A or 2B) and the level (1C or 2A),
 - the sensing date,
 - the Sentinel-2 orbit,
 - the name of the Area of Interest,
 - the product name,
 - the original Sentinel-2 resolution (in metres).

- (b) Example of 3 output products computed from the same Sentinel-2 image.
- (c) Example of a time series computed for an output product (MSAVI₂ index) on the extent of a single rice field (10 ha). Solid line and ribbon represent respectively the average value and first and third quartiles, while letters indicates the sensors which acquired each image (2A or 2B).



sen2r documentation:
<http://sen2r.ranghetti.info>

installation and dependencies:
<http://sen2r.ranghetti.info/articles/installation>

source code: <https://github.com/ranghetti/sen2r>

report bugs or suggest improvements:
<https://github.com/ranghetti/sen2r/issues>

sen2r docker container:
<https://hub.docker.com/r/ranghetti/sen2r>

sen2ris developed by Luigi Ranghetti and Lorenzo Busetto (IREA-CNR), and it is released under the GNU General Public License version 3 (GPL-3).

The functionalities to search and download Sentinel-2 data are based on the Python tool `Sentinel1-download` by Olivier Hagolle.

To cite this library, please use the following entry:

Ranghetti L. and Busetto L. (2019). *sen2r: an R toolbox to find, download and preprocess Sentinel-2 data*. R package version 1.0.2. DOI: 10.5281/zenodo.1240384. URL: <http://sen2r.ranghetti.info>

