



# LUMOS Remote sensing image processing algorithms for land use and land cover monitoring systems

**Programme**  
STEREO III

**Contract**  
SR/01/349

**Start - End**  
16 October 2017 - 15 October 2020

**Project type**  
Transversal support

<https://eo.belspo.be/LUMOS>



## Context and objectives

An assessment of the STEREO program revealed that too often algorithms developed under the umbrella of STEREO projects, although published in A1 publications, are not or only very occasionally disseminated/used by other researchers within and outside the STEREO network.

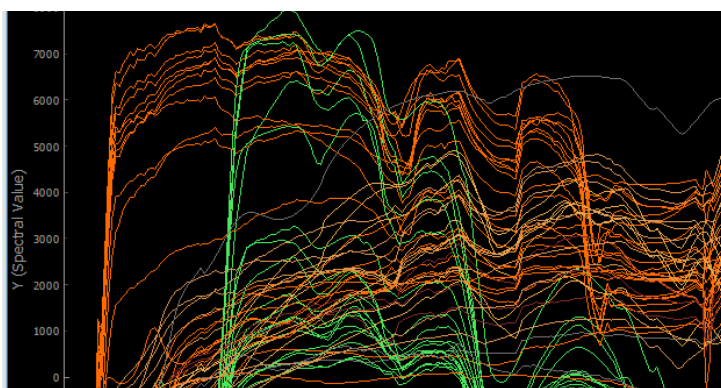
We wanted to realize a set of plugins for QGIS, based on BELSPO research, that appealed to a diverse user group (from student to expert) and to offer those tools alongside a user manual and exercises, all in a simple, standardized way.

## Project outcome

### Scientific results

The following tools have been developed:

- Tree Density Tool: Calculate the tree density of a given region, by moving a sliding window over a brightness image and detecting local maxima. <https://treedensitycalculator.readthedocs.io>
- Neural Network MLP Classifier: Supervised classification method for multi-band passive optical remote sensing data, based on the MLP (multi-layer perception) neural network classifier by scikit-learn. <https://mlp-image-classifier.readthedocs.io>
- Spectral Library Tool: Build, visualize and optimize spectral libraries. <https://spectral-libraries.readthedocs.io>
- MESMA: Multiple Endmember Spectral Mixture Analysis (MESMA), visualisation of results and other MESMA-related post-processing. <https://mesma.readthedocs.io>
- EOF-based Time Series Reconstructor: Image reconstructing algorithm based on EOFs (empirical orthogonal functions), designed specifically for oceanography. <https://eof-reconstructor.readthedocs.io>
- FORCE4Q: Visualize FORCE Level-2 outputs or Landsat/Sentinel2 Level-2A products in QGIS. It specifically makes use of FORCE's Higher Level Processing System for generating image composites and time series from multi-temporal Level 2 bottom of atmosphere surface reflectance imagery. <https://force4q.readthedocs.io>



2	impervious	paved	parking_lot
3	impervious	paved	road
4	impervious	paved	airport_runway
5	pervious	GV	shrub
6	pervious	GV	shrub
7	pervious	GV	shrub
8	pervious	NPV	bark
9	pervious	NPV	bark
10	pervious	NPV	bark

- Bit Flag Renderer: Visualisation of individual bit flags in the Quality Assurance (QA) band of common EO data like Landsat, MODIS or FORCE L2). <https://bit-flag-renderer.readthedocs.io>
- EO Time Series Viewer: Interactive visualization and labelling of time series data that is composed of different spatial, spectral and temporal domains. <https://eo-time-series-viewer.readthedocs.io>
- Build your own QGIS plugin: Support for translating an algorithm to a QGIS plugin with documentation. <https://create-qgis-plugin.readthedocs.io>

## Societal (including environmental) relevance

See as objective.

## Products and services

See as scientific results.

## Potential users

We try to create tools that are both directed to novice users, by trying to minimize user input, but at the same time reaching experts and developers, with more advanced functions and a well-documented API.



### Project leader(s)

*SOMERS Ben* | VITO - Remote Sensing - Teledetectie en aardobservatieprocessen  
ben.somers@kuleuven.be

### Belgian partner(s)

*CRABBÉ Ann* | KULeuven - Division Forest, Nature and Landscape  
ann.crabbe@kuleuven.be

### Website

<https://eo.belspo.be/en/stereo-toolbox>



### Belgian Science Policy Office (BELSPO)

WTC III - Boulevard Simon Bolivar 30 b. 7 Simon Bolivarlaan • B-1000 Brussels  
Tel. +32 (0)2 238 34 11 • www: eo.belspo.be • Email: stereo@belspo.be