

EGU21-12359, updated on 12 Jun 2021

<https://doi.org/10.5194/egusphere-egu21-12359>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Mapping vegetation variables in Google Earth Engine using Gaussian Process Regression models.

Matías Salinero Delgado¹, Luca Pipia², Eatidal Amin¹, Santiago Belda¹, and Jochem Verrelst¹

¹Universitat de València, Image Processing Laboratory, Paterna (Valencia), Spain

²Institut Cartogràfic i Geològic de Catalunya (ICGC), Parc de Montjuïc, 08038, Barcelona, Spain

The aim of ESA's forthcoming FLuorescence EXplorer (FLEX) is to achieve a global monitoring of the vegetation's chlorophyll fluorescence by means of an imaging spectrometer, FLORIS. For the retrieval of the fluorescence signal measured from space, other vegetation variables need to be retrieved simultaneously, such as (1) Leaf Area Index (LAI), (2) Leaf Chlorophyll content (Cab), and (3) Fractional Vegetation cover (FCover), among others. The ongoing SENTIFLEX ERC project has already demonstrated the feasibility to operationally infer these variables by hybrid retrieval approaches, which combine the generalization capabilities offered by radiative transfer models (RTMs) and computational efficiency of machine learning methods. Reflectance spectra corresponding to a large variety of canopy realizations served as input to train a Gaussian Process Regression (GPR) algorithm for each targeted variable. Following this approach, sets of GPR retrieval models have been trained for Sentinel-2 and -3 reflectance images.

In that direction, we started to explore the potential of Google Earth Engine (GEE) to facilitate regional to global mapping. GEE is a platform with multi-petabyte satellite imagery catalog and geospatial datasets with planetary-scale analysis capabilities, which is freely available for scientific purposes. Among the different EO archives, it is possible to access the whole collection of Sentinel-2 ground reflectance data. In this work, we present the results of an efficient implementation of the GPR-based vegetation models developed for Sentinel-2 in the framework of SENSAGRI H2020 project in GEE. By taking advantage of GEE cloud-computing power, we are able to avoid the typical bottleneck of downloading and process large amounts of data locally and generate results of GPR-based retrieval models developed for Sentinel-2 in a fast and efficient way, covering large areas in matter of seconds. As a first step in that direction we present here an open web-based GEE application able to generate LAI Green and LAI Brown maps from Sentinel-2-imagery at 20m in a tile-wise manner all over the world, and time series of selected pixels during user-defined time interval.

To illustrate this functionalities and have better understanding of the phenology, we targeted a region in Castilla y León (Spain) from where we will present results for 2018 classified per crop type. This land cover classification was generated by the ITACYL (Instituto Tecnológico Agrario de Castilla y León) during SENSAGRI.

Future development will tackle the possibility to extend our analysis capability to additional

variables, such as FCover and Cab, maintaining the computational efficiency as the main driver to ensure that the GEE application continues to be an agile and easy tool for spatiotemporal Earth observation studies.