Grassland mapping using SPOT5Take5 and Sentinel data in south Italy

In brief

AIM:
To investigate the benefits from using multi-temporal dataset of EO images to produce maps of grassland areas with a (semi) automatic procedure.

WHY:
The grassland areas are very important from the environmental point of view and their conservation is crucial to protect the biodiversity.

HOW:
A multi-sensor dataset is used in two ways: first the biophysical parameters derived from the dataset is used to create a potential grassland map. Then, from the analysis of the temporal behavior of the NDVI potentially cultivated (ploughed) areas are excluded for obtaining the final grassland mask.

What is a grassland?
According to the FAO definition, Grassland is a “land covered with grasses and other herbaceous species. Woody plants may be present, but if so, they do not cover more than 10% of the ground. There are many different types of grassland designated by ecozone, topography, climate, soil conditions, and so on. Derived grassland is maintained in that condition by regular burning; edaphic grassland arises on particular soil types, for example, those found in or around permanent or seasonal swamps”.

Grassland monitoring
Grasslands host a fraction of Europe’s biodiversity that is much larger than for other habitat types with similar or bigger spatial extent. However several studies prove that the changes in agricultural practices and land use pressures threaten grasslands which are disappearing at an alarming rate.

APPLIED METHODOLOGY

1. A set of biophysical parameters is derived from the multi sensors input EO images stack.
2. A supervised land cover classification is performed after the selection of a training dataset.
3. The result of the classification is a mask of the potential grassland areas.
4. In parallel, from the NDVI time series a common threshold is statistically derived in order to separate (permanently) vegetated from non-vegetated areas.
5. From the analysis of the temporal behavior of vegetated pixels three different classes are derived, as well as a ploughing indicator.
6. Combining the 3 and 5 the final grassland mask is derived.

References


Authors

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1. Planetek Italia s.r.l.
2. CNR-ISSIA

In the classification process (1 to 3) only the vegetated images are considered, in particular taking into account the seasonality of the grassland. This is done automatically considering the European bioclimatic zones.

Multi-sensors dataset
The procedure has been developed in order to be used with EO images acquired by different satellite sensors in order to have a dense temporal distribution of the images.

THE CASE STUDY

Test Site

Murgia is among the most important geological/crustal areas of Italy, mostly characterized by calcareous soils and with remarkable geological/phenomena. It is one of the largest dry grasslands areas of Europe.

A single image classification has been performed using a Spot5Take5 image acquired on 12th April 2015, to produce a grassland/no grassland map. By comparing this map with a reference data set an OA=74% has been obtained.

The methodology described above has been applied to the whole dataset composed by 10 Spot5Take5 images acquired from 13/04/2015 to 21/08/2015 and 7 Sentinel2 images acquired from 14/03/2015 to 21/03/2016. The final map has been obtained, showing an OA=91%.

The final map

The reference dataset (red on the left) and the two classifications on the right. The yellow map has been obtained using a single image classification while the blue one using the multi-temporal dataset.

Examples of false alarms reduction