

## **Application of a hybrid classifier to discriminate Mediterranean crops and forests. Different problems and solutions.**

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Identifying Mediterranean forest covers and crops with a detailed nomenclature and high accuracy is still an important challenge for remote sensing researchers because of the spatial fragmentation of these covers. On the other hand, the medium temporal resolution and pixel size of Landsat images allow analysing the evolution of vegetation phenology with relative low cost. A fundamental issue to attain such objective is the classification method.

Traditionally, classification methods have been divided into two broad categories: supervised and unsupervised. The most commonly applied supervised classification method, the maximum likelihood procedure, is not very effective when covers are not normally distributed as in our case. Conversely, the standard procedure of unsupervised classification is based on the assumption that each spectral class corresponds to one and only one thematic category and vice-versa, but this does not always work because there are different possible patterns of correspondence.

For these reasons, we used a hybrid classifier that involves an unsupervised classification with a large number of spectral classes to be found (several hundreds), which are later assigned to categories through training areas by means of spatial correspondence between them.

This classification strategy has been applied to two cover types and study areas. The first one is located on the coastal North-East of Catalonia (Spain) with predominance of agricultural land where crops are cultivated in different parcel sizes and high intra-annual phenology evolution (sharp boundaries); the second one is located in the inner North of Catalonia with predominance of forest land with an important continuous gradient (fuzzy boundaries).

Due to the mentioned differences, the hybrid classifier was applied to different images from 2003. For crops classification 63 remote sensing bands were used and, to reduce data correlation, a principal component analysis (PCA) was applied. With the unsupervised classification 70 clusters were obtained from the first twenty PC (86.56% of the variance). For forest classification 28 remote sensing bands were used plus five climatic variables and the terrain slope, obtaining 257 clusters from the unsupervised classification.

Results show a high thematic accuracy (more than 85%) in both cases with a detailed legend (9 and 15 categories respectively). In the crop map all pixels were classified, despite of boundary pixels. For forest covers, 25% of total pixels remained not classified due to the high spatial heterogeneity. In this case a more exhaustive analysis was applied between clusters not assigned and new training areas. The hybrid

classifier has given highly accurate results, solving the habitual problems of supervised and unsupervised classifications and being very quick and easy to use.