SPECIES DISCRIMINATION IN A HETEROGENEOUS MEDITERRANEAN ENVIRONMENT USING FIELD AND AIRBORNE SPECTROSCOPIC DATA

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Mediterranean ecosystems are characterized by a species-rich and heterogeneous vegetation. This complicates mapping of these species with remote sensing, as 1) pixels rarely represent a single species, and 2) it is hardly possible, if at all, to identify homogenous pixels that can serve as end-members for spectral unmixing.

In this study we tested whether the use of heterogeneous end-member definition in spectral unmixing would produce better results in an object-based classification compared to a pixel-based classification.

In September and October 2011 we had an eight-week field campaign in the Peyne catchment in southern France. We visited 223 field sites and made an inventory of the vegetation composition of the canopy within 5x5m2 plots. 9 species dominated the canopy, while 19 species were found in total. Besides we collected field spectra of all tree and shrub species with an ASD Fieldspec. All plots lied within the extent of an airborne HyMap image with 126 spectral channels and a pixel size of 5 by 5m. The HyMap image was segmented into objects with an average size of 0.25ha, while compactness had a 10% contribution to reduce the chances of geometrical mismatch of field plot and image object. This size is chosen such that vegetation composition can be considered homogenous.

We follow two approaches to classify the image objects. The first uses the collected field spectra to create a spectral library of heterogeneous vegetation; for each combination of two species different spectra were created with increments of 25%. So, for two species A and B, five spectra were created: 100%A 0%B, 75%A 25%B, 50%A 50%B, 25%A, 75%B, 0%A 100%B. With this heterogeneous library, the image will be classified and the field plots will be used to validate the results.

The second approach uses the field plots both for training and for validation. The endmembers are derived from the representative objects for specific vegetation compositions. The spectral unmixing yields percentages for the different heterogeneous endmembers from which object composition will be derived.

The validation procedure is equal in both approaches, although the number of used plots obviously differs. From the spectral unmixing the composition of an object is described in proportions of different endmembers. The endmembers themselves are composed of different species in different ratios, so the proportions multiplied by the different ratios provide the species composition of the objects. This novel approach yields vegetation composition maps at a regional scale based on airborne spectroscopic images.

Preliminary results after our recent field campaign (finished two weeks ago) show that with the homogenous endmembers dominant species are overestimated and some nondominant species are not recognized at all. At the conference we will show the classification results of the heterogeneous endmembers. We expect that the combined spectra of dominant and non-dominant species will result in maps where the nondominant species are represented as well.