Modeling optical properties of a tree-grass ecosystem using Radiative Transfer Models: A multi-model approach.

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ABSTRACT:

- FLIGHT (North, 1996) is a 3D Radiative Transfer Model (RTM) capable of accurately representing the structure of sparse canopies, such as savannas. Understory annual grasslands are a typical background in savannas, but FLIGHT always models the background as a soil spectrum. Furthermore, these grasslands often present stronger optical signals and dynamics than trees.
- To represent the understory grasslands, this study couples the 3D RTM FLIGHT representing tree canopy with the 1D RTM PROSAIL (Jacquemoud et al., 2011).
- NDVI-MODIS time series defined four phenological periods. These periods limited the ranges and relationships between model parameters used to generate look-up tables via Latin a hypercube sampling method.
- Field sampling collected site-specific parameters such as biophysical variables, tree cover structure, illumination and observation geometry.
- In order to validate the model output, several scenes simulated Compact Airborne Spectrographic Imagery (CASI) sensor bands
- The results show the feasibility of simulating the spectral response of a tree-grass ecosystem. They prove the suitability of the new coupled PROSAIL+FLIGHT model to represent tree-grass ecosystem reflectance factors and opens new opportunities to improve remote characterization of biophysical properties in this complex environment.

STUDY AREA

METHODOLOGY



RESULTS

PROSAIL & FLIGHT SEASONAL SIMULATED SPECTRA



FLIGHT



FLIGHT SCENE GENERATION

Airborne image (CASI)



FLIGHT scene



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CONCLUSIONS



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- PROSAIL represents accurately Mediterranean grassland reflectance factors in most of the cases. However, characterization of variables distributions according to each phenological period still need to be improved specially in the green-up phenological phase were dry stand material mix with new plants.

- PROSAIL+FLIGHT model coupling was successfully achieved to represent reflectance factors of a tree-grass ecosystem

- The model is capable of generating real scenes of this ecosystem, although the tree cover parametrization needs improvement from individual tree measurements.

Authors thank Speciab colleagues, Lara Vilar, Javier Martinez and Pilar Echavarría for contributing to the field work. The Spanish Ministry of Economy and Competitiveness in the framework of SynerTGE Project (CGL2015-G9095-R) and the COST Action OPTIMISE (ES1309) funded his work.