RANGELAND ECOLOGICAL SITE CLASSIFICATION FROM HYPERION AND LANDSAT IMAGERY USING MIXTURE TUNED MATCHED FILTERING AND NEURAL NETWORKS

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ABSTRACT:

The heterogeneity of soil and vegetation patterns in rangelands generates complex spectra that hinder the identification of surface features using remote sensing. Hyperspectral imagery, using narrow, continuous spectral measurement facilitates the discrimination of materials that visually appear very similar and allows estimating their abundance within each pixel. However, the application of hyperspectral Hyperion data to land cover classification at landscape scale is somewhat limited by the sensor's narrow swath (7.7 km). In this research, we propose the synergistic use of Hyperion and Landsat imageries in a three-step procedure to discriminate and map ecological sites in Patagonian rangelands, southern Argentina. Firstly, endmembers are selected from the Hyperion image using the Pixel Purity Index and the Endmember Average RMSE. Secondly, Mixture Tuned Matched Filtering and Logistic Regression analyses are used for processing the Hyperion data and generate ecological site probability images in the area covered by hyperspectral imagery. Finally, Neural Networks are applied to model the relationships between the spectral response patterns of the Landsat TM and the probability images from Hyperion over the entire study area (800 Km2). Goodness of fit was measured using the Hosmer-Lemeshow test showed good agreement between the matched filter scores and the spatial distribution of each ecological site. The presence of gravels and tertiary calcareous outcrops gives distinctive absorption spectrums that may be useful in discriminating the ecological sites. The results obtained suggest that hyperspectral data have potential for mapping the distribution of ecological sites in rangelands and that their synergistic use with Landsat imagery allows extrapolating local information to landscape scale.

TOPIC: Multi-spectral and hyperspectral remote sensing
ALTERNATIVE TOPIC: Land cover classification