RETRIEVAL OF VEGETATION BIOCHEMICALS USING A RADIATIVE TRANSFER MODEL AND HYPERSPECTRAL DATA

R. Darvishzadeh[*a] C. Atzberger[b] A. Skidmore[c] M. Schlerf[c]

[c] International Institute for Geo-information Science and Earth Observation (ITC), NRS, Hengelosestraat 99, P.O. Box 6, , 7500 AA , Enschede, Netherlands

[a] Shahid Beheshti University (SBU), Remote sensing & GIS, Tehran, Evin St., 1983963113, Tehran, Islamic Republic of Iran

[b] Joint Research Centre of the European Commission, MARS (Monitoring Agricultural Resources), TP 266, Via Enrico Fermi 1, , 21027 , Ispra (VA),, Italy

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ABSTRACT:

Accurate quantitative estimation of vegetation biochemical characteristics is necessary for a large variety of agricultural and ecological applications. The advent of hyperspectral remote sensing has offered possibilities for measuring specific vegetation variables that were difficult to measure using conventional multi-spectral sensors. In this study, the potential of biophysical modeling to predict leaf and canopy chlorophyll contents in a heterogeneous grassland is investigated. The well-known PROSAIL model was inverted with HyMap measurements by means of a look-up table (LUT). HyMap images along with simultaneous in situ measurements of chlorophyll content were acquired over a National Park in Italy. We tested the impact of using multiple solutions and spectral subsetting on parameter retrieval. To assess the performance of the model inversion, the RMSE and R2 between independent in situ measurements and estimated parameters were used. The results of the study demonstrated that inversion of the PROSAIL model yield higher accuracies for Canopy chlorophyll content, in comparison to Leaf chlorophyll content (R2=0.84, RMSE=0.24). Further a careful selection of spectral subset, which comprised the development of a new method to subset the spectral data, proved to contain sufficient information for a successful model inversion. Consequently, it increased the estimation accuracy of investigated parameters (R2=0.87, RMSE=0.22). Our results confirm the potential of model inversion for estimating vegetation biochemical parameters at leaf and canopy scale using hyperspectral measurements.

TOPIC: Multi-spectral and hyperspectral remote sensing
ALTERNATIVE TOPIC: Physical modeling and signatures