

REMOTE SENSING OF SPECIES COMPOSITION WITH MULTI-ANGLE AND HYPERSPECTRAL DATA

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Abstract:

Recent empirical studies have shown that multi-angle hyperspectral data are useful for predicting canopy height, forest cover density, fractional area distributions, stand basal area, tree height, biomass, vegetation health and tree species composition, but the physical reason for this correlation was not understood. We found that the canopy spectrally invariant parameters – the recollision and escape probabilities – explain the physics behind the observed correlations. The recollision probability (probability that a photon scattered from a phytoelement will interact within the canopy again) is a measure of the multi-level hierarchical structure in a vegetated pixel and can be obtained from hyperspectral data. The escape probability (probability that a scattered photon will escape the vegetation in a given direction) is sensitive to canopy geometrical properties such as aspect ratio (crown diameter to crown height) and can be derived from multi-angle spectral data. The escape and recollision probabilities have the potential to separate forest types based on crown shape and the number of hierarchical levels within the landscape. This poster introduces the concept of the canopy spectral invariants and demonstrates how this approach can be used to monitor forest structural parameters, tree species distribution and vegetation health with multi-angle and hyperspectral data. The canopy spectral invariants offer a simple and accurate parameterization for the shortwave radiation block in many global models of climate, hydrology, biogeochemistry, and ecology. Parameterization of the shortwave (spectral) radiation budget of vegetation canopies and its monitoring from space measurements will also be discussed in the poster.

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