

Forest reflectance modeling in the Arctic region: results from a case study in Finland

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Conference theme: Physical modeling in remote sensing

The Arctic region, defined often as the region north from the polar circle (66° 32' N), is characterized by strong variations in sun light conditions - low intensity insolation with a protracted photoperiod during the summers in contrast to the complete darkness of the winters. The forests growing in the southern part of the region are sparse and have a low productivity. In Fennoscandia, the site type and understory vegetation of these forests ranges from permafrost to infertile, dry lichen heaths and extensive wetlands formed as the result of slow accumulation of organic matter.

In our study, we analyze factors behind the spectral signature of forests growing in the Arctic region of Finland, and apply a physically-based forest reflectance model (PARAS) based on the recollision probability concept to provide a theoretical basis to the analysis. To obtain the empirical input to our study, we collected a ground truth data set on leaf area index (LAI) from approximately 300 forest stands at two study areas, Rovaniemi and Tähtelä, as a part of our VALERI network activities in 2004 and 2006. SPOT HRVIR1 images from summers 2004 and 2006, corresponding to the times of the field campaigns, were used in the analyses to examine the relationship of canopy leaf area index and reflectances for different understory types (lichen heaths, dwarf shrub heaths and wetlands). Results from the study clearly indicate the influence of the various understory types and also provide valuable information on the performance of the reflectance parameterization model.