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AN OVERVIEW OF VEGETATION CANOPY MODELING FOR SIGNATURE CORRECTION AND ANALYSES

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Modeling of the interaction of solar radiation with vegetation canopies offers a tool for sensor design, signature extension, and relating intrinsic scene parameters to composite scene response. Theoretical approaches include both the deterministic solution of a system of simultaneous differential equations and Monte Carlo Modeling which treats the canopy as consisting of layered statistical ensembles of foliage elements against a soil background. In this paper the authors discuss several applications of canopy modeling to the general problem of understanding and correcting signature variations.

Discussion will emphasize a Monte Carlo model that was originally developed to investigate the bidirectional reflectance character of natural grasslands. Subsequently, as part of the Large Area Crop Inventory Experiment, the model was used to analyze wheat reflectance dependence on both diurnal and crop development variation. LANDSAT response was simulated by interfacing the canopy reflectance model with an atmospheric radiation transfer model. The combined model predictions were used to develop correction coefficients for sun angle effects in wheat and to investigate signal variations induced by soil brightness. Research into the feasibility of utilizing model-derived data to infer intrinsic scene variables through divergence classification was also conducted. The model is currently being modified for forest canopies to study scene mixture and sun angle effects in this context.