Use of MODIS derived broadband albedo in the RAMS

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Abstract (371 words)

Land surface albedo controls the amount of short wave absorbed at the Earths surface and thus is an important modulator of the surface energy budget, boundary layer process and cloud formation. Currently, the majority of mesoscale models use prescribed values of broadband albedo for each type of surface land use. Depending upon the grid spacing, the grid cell may be a composite of areas of differing land use. Some mesoscale models assume one type of land use for a fraction of land within each grid cell, while others allow for specification of multiple types of land use per grid cell.

An area averaged albedo, computed using the specified albedo values for each land use category within a grid cell, is used for calculations of radiative transfer through the atmospheric column. The radiative transfer calculations yields the downwelling shortwave fluxes at the surface which is then used to determine the surface energy budget for each land use type. Albedo for each land use type is required for the surface energy budget computations. Over vegetated areas, the albedo of both the vegetation canopy and the exposed bare soil are needed.

This study examines the feasibility of using the 1 km resolution broadband albedo derived from Moderate Resolution Imaging Spectroradiometer (MODIS) data in the Regional Atmospheric Modeling System (RAMS). The RAMS uses a sophisticated Land Ecosystem Atmosphere Feedback (LEAF-2) model to represent land surface processes which allows for specification of multiple types of land use at individual grid points. It is relatively straightforward to use MODIS derived broadband albedo for specifying an area averaged value for atmospheric column radiative transfer calculations in RAMS. However, the use of MODIS derived broadband albedo in surface energy budget computations is more complex. Over vegetated areas, LEAF-2 model requires specification of bare soil and vegetation canopy albedo while the MODIS derived broadband value is a composite of these values. The present study examines the application of a spectral unmixing technique to MODIS derived broadband albedo for specifying canopy and bare soil albedo values in LEAF-2. Details of implementing the spectral unmixing technique, including utilization of other datasets and error estimates, will be discussed. The impact of using the MODIS derived broadband albedo in RAMS will also be discussed.