Non-linear mixing surface model of the remotely sensed images based on Monte-Carlo simulation

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Nonlinear mixing surface model of remotely sensed images is proposed based on Monte-Carlo simulation. The soil types of surface models for solar reflection wavelength region of multi-spectral radiometers have been proposed so far. Also non-linear mixing surface models taking into account atmospheric influence, in particular, Rayleigh and Mie scattering in the atmosphere have been proposed. There a few non-linear surface models which deal with multiple reflections in the surface materials, volume scattering in the targets. In particular, multiple reflections among trees, grasses, soils used to be taken into account. In this proposed paper(one of the solicited papers), a nonlinear mixing surface model for the solar reflection wavelength regions is proposed. The model utilizes Monte-Carlo simulation for representing the multiple reflections of the surfaces. The effective reflectance which is calculated with the ratio of the Top-of the Atmosphere: ToA radiance to the down welling radiance at the surface is proposed. Other than the flat surface, two slopes in the Instantaneous Field of View: IFoV are assumed as a mixed pixel. The effective reflectance derived from the proposed nonlinear model is then compared to that of linear model. The difference between both depends on the BRDF(Bi-Directional Reflectance Distribution Function) of the surface and slopes as well as optical depth of molecules and aerosols. The proposed non-linear model is also validated with the ASTER/VNIR onboard Terra satellite.

The proposed solicited paper will review the proposed linear and nonlinear mixing surface models first then the proposed nonlinear mixing surface model is described followed by the some characteristics of the nonlinear surface mixing models and experimental results from the Monte-Carlo simulations and comparative study with the real ASTER/VNIR imagery data.