Relationships between Single Scattering Albedo under Different Frequencies and Polarizations Based on Simulated Datasets

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Since vegetation effects on microwave signals are of great importance in both soil moisture and vegetation status retrieving, the description of vegetation parameters, i.e. leaf area index, biomass and vegetation water content, and soil moisture, based on passive microwave radiative models, have been significantly developed in recent years. The single scattering albedo, defined as the ratio of the scattering coefficient and the extinction coefficient of vegetation, is a key parameter of most of these models. However, in some models, the single scattering albedo always takes an empirical value from field experiments or literatures, which make it arbitrary and limited since it has no clear physical foundation.

As we all know, the single scattering albedo, changing with the bulk, shape and size of vegetation, as well as the frequency and polarization of the microwave signal, involves a mass of information about the vegetation status. In this paper, the algorithms to retrieve the scattering and extinction effects of vegetation on microwave signals based on radiative transfer model will be introduced and the relationships between the single scattering albedo under different frequencies and polarizations will be examined.

In considering vegetation effects on microwave signals, we will first simulate some typical single scatterers, such as disc and needle (presenting leaves), short cylinder (presenting branches), vertical long cylinder (presenting trunks). Then the typical scatterers would be put together to present some typical vegetation structure types. They include:

1. The randomly, vertically, horizontally orientated discs, needles, and short cylinders (leaves and branches) for short vegetations;
2. The above randomly, vertically, and horizontally orientated discs, needles, and short cylinders (leaves and branches) with a long vertical cylinder (trunks) for forest type vegetations.

After the above simulations, the single scattering albedo about the typical vegetaiton could be obtained. Through our analyses, we find that vegetation scattering property and structure have a great impact on the quantitative descriptions of the relationships between the vegetation part of the microwave properties at the different frequencies and polarizations. This is because the different vegetation structures can result in the significant differences in its scattering properties. Thus, by applying the regressive models on the simulated datasets,

the relationships between single scattering albedo under different frequencies and polarizations could be obtained.

We will demonstrate the algorithms of retrieving single scattering albedo and the relationships between them in details.

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