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Modeling the impact of the spatial surface heterogeneity on soil moisture products

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Promising techniques for soil moisture retrieving will be a dual-polarized radiometer with multiangular viewing configuration at L-band and mean ground resolution of about 40 km. The dataset obtained with this instrument could be used in hydrological models if the dissaggregation into high-resolution product was provided. However, a poor spatial resolution can lead to the significant errors in the retrieval of mean soil moisture. Two key contributors to error are the vegetation cover and heterogeneity of soil moisture distribution. Recent efforts have been dedicated toward the estimating these errors. For this, relationship between land and water-covered surfaces was supposed to be known from auxiliary data at fine scale. However, due to the temporal dependence the auxiliary data cannot provide entire information about the land state.

A model is considered here provides the soil moisture estimates at 40 km scale taking into account for a more realistic specification of land surface heterogeneity and spatial vegetation patterns. In addition to the auxiliary data, the data obtained with land surface scheme at fine scale have been inserted into the radiative transfer model. Two variants of the coupling models are developed: a simple variant of radiative transfer theory usually used to simulate the brightness temperature and more complex radiative transfer model accounting the impact of the vegetation layer. To test the method, mean values of soil moisture are composed from AVHRR data for several date observations. In the case of heavy vegetation, spatial distribution of soil moisture within pixel doesn't have sufficient impact on brightness temperature if the simple radiative transfer equations are applied. More complex model partially decreases the effect of vegetation cover and the influence of land surface heterogeneity becomes more pronounced. This approach can be served as a means to postprocess the soil moisture data obtained from future microwave satellite sensor such as SMOS.