

Polarization Signatures of Microwave Emission from Dry Snow

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Abstract:

Snow covers are important objects of remote sensing since they play a key role in various hydrological, climatological, and meteorological processes. The most important characteristics of snow covers are the snow cover extent and the snow water equivalent or snow depth. Several experimental activities carried out using ground-based and satellite systems have been shown the capability of passive microwave sensors to monitor seasonal variations in snow cover. Recent research have revealed a potential of microwave passive polarization measurements for snow water equivalent (snow depth) estimations. Particularly, it was found that in the centimeter and millimeter wavelength band there is a relation between the microwave polarization index and the snow water equivalent.

In the paper presented, the semi-empirical model for microwave emission from dry snow is proposed to calculate the microwave emissivity at different polarizations and polarization indices. The experimental case study of microwave emission from a snow layer at vertical and horizontal polarizations was conducted at 6.9 and 18.7 GHz to examine the relation between the snow layer reflectivity and the snow layer depth. It was found that both the reflectivity and the polarization difference increase with the increase in the depth of snow layer. These results are in agreement with results of seasonal ground-based measurements carried out at natural conditions. The proposed model allows the explanation of the dependences established.