

Retrieval of Land Surface Parameters Using Passive Microwave Measurements at 6 to 18 GHz

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An approach is evaluated for retrieval of land parameters (soil moisture, vegetation water content, and surface temperature) using satellite microwave radiometer data in the 6 to 18 GHz frequency range. The approach is applicable to data that will be acquired by the Advanced Microwave Scanning Radiometer (AMSR), planned for launch on the ADEOS-II and EOS PM-1 satellite in 1999 and 2000, respectively. The retrieval method is based on a radiative transfer model for land-surface and atmospheric emission, with model coefficients that can be tuned over specific calibration regions and applied globally. The method uses an iterative, least squares algorithm, based on six channels of radiometric data. Simulations using this algorithm indicate that, for an assumed sensor noise of 0.3 K in all channels, soil moisture and vegetation water content retrieval accuracies 0.06 g cm^{-3} and 0.15 kg m^{-2} , respectively, should be achievable in the region of vegetation water content less than 1.5 kg m^{-2} . A surface temperature accuracy of 2 C should be achievable regardless of vegetation cover. These accuracies are for retrievals averaged over the sensor footprint, and exclude conditions of precipitation, open water, snow cover, frozen ground, or high topographic relief within the footprint. The algorithm has been tested using data from the Nimbus-7 Scanning Multichannel Microwave radiometer (SMMR) for the years 1982-85, over the African Sahel, and the retrieval results compared to output from an operational numerical weather prediction model. The retrieval algorithm is shown to discriminate well between soil moisture, vegetation, and temperature variations, and to provide estimates within the expected accuracies.

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