A Soil Moisture Reflectance Model in Visible and Near IR Bands

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Reflectance variation of bare soil with different moisture contents was described by a one-dimensional model of soil-water mixture employing the two-stream approximation of the radiative transfer equation. The concept of bulk absorption and scattering coefficients of electromagnetic radiation in the surface layers of moist soil was introduced for derivation of the Kubelka-Munk equations, which had been applied to various reflectance problems. The diffuse reflectivity of moist soil in visible and near-infrared bands could be explicitly expressed in terms of a moisture variable as well as optical characteristics parameters, or vice versa. A method was developed to determine these characteristic parameters from a set of soil reflectivity and moisture data. Hence, surface soil moisture contents could be measured by observing the soil spectral reflectivity. The relationships drawn from the model were supported by the data of bare soil samples in laboratories. The model demonstrated the potential of remote sensing for estimation of soil moisture from readily available remotely-sensed data.