

Infrared Sounding Observation of Soil Moisture and Relationship with Skin Temperature

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We have developed a simple, yet effective scheme to derive volumetric soil moisture (VSM) using infrared (IR) land surface emissivity retrieved from satellite measured IR spectral radiance. This novel scheme is applied to a 10-year period of global IR emissivity data retrieved from MetOp-A Infrared Atmospheric Sounding Interferometer (IASI) measurements. The VSM calculated from these IR emissivity data (denoted as IR-VSM) is compared with that routinely retrieved from satellite microwave (MW) multi-sensor measurements (denoted as MW-VSM). Monthly-mean spatially-gridded climatology datasets are then generated to demonstrate VSM spatial variation as well as its seasonal-cycle and inter-annual variability. Positive agreement is shown to exist between IR- and MW-VSM. The relationship between soil moisture and surface skin temperature, as well as the skin temperature diurnal difference (denoted as dTs), were examined globally using the land surface skin temperature (denoted as Ts) retrieved from the same measurements of IASI. We are able to draw the conclusion that both skin temperature and skin temperature diurnal differences follow an inverse relationship with soil moisture.

Keywords: Remote sensing, Infrared, retrieval, soil moisture, skin temperature