

An Integrated System for Soil Moisture Retrieval with Satellite Remote Sensing

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Soil moisture is an important parameter for drought and flood monitoring, weather and climate prediction, and hydrology modeling. In the past decades, many efforts have been made for soil moisture estimation with space-borne sensors and in-situ measurements. These approaches measure soil moisture at different spatial scales, and each of them have certain advantages and limitations. Microwave remote sensing measurements can provide physical retrieval of soil moisture in low vegetation areas, but have poor spatial resolution. Optical/IR measurements can be used to retrieve soil moisture at high spatial resolution statistically, but limited to clear days. Network of ground stations measure soil moisture directly, but limited to spatially distributed points rather than regional scale. Fusion of soil moisture measurements from multiple space-borne sensors, and ground stations will improve accuracy, spatial and temporal resolutions. Based on our research on soil moisture retrieval with MODIS optical/IR measurements, we develop an integrated system for soil moisture retrieval by combining in-situ measurements and remote sensing measurements from multiple sensors. Our system include eight major components, which are remote sensing data processing, in-situ data processing, database management, model calibration, soil moisture mapping, validation, visual data analysis, and utility tools. Currently, we use AMSR-E and MODIS measurements in our system for soil moisture retrieval. The main functionalities of our system include collection and processing of AMSR-E and MODIS measurements, collection and processing of ground measurement and station information, spatial match-up of remote sensing measurements from multiple sensors, interactive model calibration with remote sensing and in-situ measurements, soil moisture mapping by combining microwave and optical/IR measurements, algorithm validation, and visual data analysis. The system provides an integrated platform for soil moisture algorithm research and applications. It also can be configured to run at automatic mode with user-customized options for operational use. With agent-based design, our system provides good connectivity. It can be easily and flexibly integrated into other operational systems. We are testing our system for soil moisture retrieval in eastern states of USA, and Shandong province, P. R. China.