Remote Sensing for Vadose Zone Hydrology

Ground-based, air-borne, and space-borne remote-sensing techniques have evolved over the past several decades and provided many new techniques for estimating various land surface attributes at multiple scales related to mass and energy dynamics. The vadose zone, encompassing land surface, root zone, and the deeper soil profile down to the groundwater table, is a complex domain, particularly related to various hydrologic and biological processes across different scales. In this zone, spatial distributions and temporal dynamics of soil moisture and evapotranspiration (ET), including their interdependence, are critical to climate feedback, hydrology, and plant canopy health. Their temporal and spatial variability across catchments affect surface and subsurface runoff, modulates evaporation and transpiration, determines the extent of groundwater recharge and contaminant transport, and initiates or sustains feedback between the land surface and the atmosphere. With the recent development and deployment of various remote-sensing platforms working with different techniques such as optical, microwave, gravitational, infrared, and other sensors, improved temporal and spatial measurement or estimates of soil moisture, evapotranspiration, soil hydraulic parameters, soil salinity, and vegetation attributes are possible.

The August 2013 issue of Vadose Zone Journal contains a special section, “Remote Sensing for Vadose Zone Hydrology,” consisting of 14 contributions on fundamental and applied studies using different remote-sensing platforms, including satellite retrieval algorithm development, data assimilation techniques, scaling issues, ground validation, and field applications in the context of vadose zone hydrology. The foci of these papers range across root zone soil moisture retrieval and variability, evapotranspiration dynamics and distribution, agricultural water management,


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