Vadose Zone Journal

Special Section: Connecting In Situ and Remotely Sensed Soil Water Content Measurements

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Available soil water content sensing technologies (e.g., electro-magnetic sensors (time-domain reflectometry, and capacitance sensors), neutron probes, COsmic-ray Soil Moisture Observing System (COSMOS), ground penetrating radar, and active and passive microwave remote sensing) have different footprints, ranging from a few centimeters to several kilometers. They also have various reading frequencies and abilities to monitor different depths of the vadose zone, where the in situ and near surface sensors have advantages over the remotely sensed types. Most of these sensors are becoming standard tools needed for different hydrological, ecological, agricultural, and environmental studies, where multiple soil water content data types are needed. For instance, it's common for agricultural operations to use surface-based sensors to determine soil hydraulic and physical properties (e.g., porosity, water holding capacity, and hydraulic conductivity), in situ sensors for irrigation scheduling, and/or remote sensors for water stress monitoring. Thus, understanding the relationships between these different technologies is crucial for several uses, such as drought monitoring, flood prediction, weather forecasting, irrigation requirements, groundwater recharge, water cycle analysis, crop yield prediction, solute transport, and pollutant monitoring. These diverse needs for soil water content integrate data from different soil water content sensing technologies raise serious scientific questions. What are the advantages and disadvantages of using data from different sensors with different accuracy, precision, and footprints? What type of improvements should water managers and hydrologists undertake to facilitate data exchanges across data platforms and applications? What are the new applications that use soil water content data? What are the best sensor combinations required for different data uses and needs?

Many of the above-mentioned issues, and others, were addressed by the participants of the Joint Meeting of the Third In-Situ and Remote Soil Sensing Technology Conference, the multistate Micro-Irrigation Technical Committee Annual Meeting, and the ASA Sensor-Based Water Management Community held by the Prairie View A&M University College of Agriculture and Human Sciences in Houston, Texas, March 13–14, 2014. This special section of Vadose Zone Journal includes contributions presented at this meeting, and we also seek and will accept contributions from those who did not attend or present. The focus of the contributions of this special section is on the applied uses of in situ and remote soil water sensing technologies. The manuscripts of the special section will cover five major research areas.

- Plant water use and related topics area. We anticipate manuscripts covering moisture stress in giant sequoia groves, visualization of water and salt dynamics throughout the soil profile in active plant water root zone, monitoring of stem water content of native and invasive trees, calculation of spectral crop coefficient parameter for crop water use estimation, and temporal behavior of soil water content spatial variation scale.

- Large-scale performance of soil water content sensing networks used for drought monitoring, climate reference network, advanced use of different remote sensing products; and validation of a land surface model.

- Soil water and solute monitoring; examples include remediation of salinized agricultural soils and on the dual measurement of soil water and bulk electric conductivity.

- The use of in situ soil water content sensors for determining soil physical and hydraulic properties.

- New soil water content sensors and remote sensors missions, calibration–validation and improvement of existing sensors, and assessing impacts of organic matter content of in-situ sensor performance.

Manuscript submission (http://mc.manuscriptcentral.com/vzj) deadline: March 31, 2015.