H11I-1396 Investigating Field-Scale Soil Moisture at Upland Watershed and Ephemeral Lake Sites Using Stationary and Roving Cosmic Ray Neutron Sensing.

Monday, 11 December 2023

08:30 - 12:50

Poster Hall A-C - South (Exhibition Level, South, MC)

Abstract

In water-limited environments, such as the southwestern United States, soil moisture plays a crucial role in atmospheric, hydrologic, and ecologic processes. Precipitation events serve as the primary source of water to these environments and are a key catalyst governing soil moisture variability and the hydrologic connectivity across the land surface. To gain a deeper understanding of these processes in the Chihuahuan Desert, it is critical to identify the roles of soil moisture in controlling upland infiltration, runoff generation, and the inundation of valley bottoms and ephemeral lakes. Since soil moisture is dependent on soil profile characteristics, vegetation, and atmospheric variables, field-scale methods are needed to quantify soil moisture connectivity between upstream and downstream areas. In comparison to *in-situ* sensors, the Cosmic Ray Neutron Sensing (CRNS) method has been shown as a reliable method for capturing soil moisture dynamics in areas of several hectares as well as for performing transect measurements across landscapes. In this study, we compare two instrumented CRNS sites within the closed (endorheic) Jornada Basin: an upland watershed on a piedmont slope and an ephemeral lake or playa in a valley bottom. In conjunction, we deploy two roving CRNS units at the ephemeral lake during short field campaigns during the summer monsoon season to quantify soil moisture variations across an ecotone between the playa grassland and its surrounding shrubland areas. These efforts also help describe the sub-field scale variability present within a single CRNS sensor footprint. We investigate the differential soil moisture dynamics of these two environments prior to, during, and after

precipitation events that have a variable impact on runoff generation and lateral hydrological connectivity across the landscape. This is accomplished by quantifying the timing of the soil moisture response and its residence time in each system and relating these features to measurements of evapotranspiration, deep percolation, and water levels. A deeper understanding of soil moisture dynamics within these contrasting settings is expected to support remote sensing and numerical modeling estimates in arid endorheic basins.

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