

## Poster #21-59

### Quantifying Dynamic Water Storage in Weathered Bedrock from the Pore to Landscape Scale

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BER Program: SBR

Project: University Award

Many uplands regions are characterized by shallow soils underlain by weathered and fractured bedrock. The extent to which water is dynamically stored in the weathered bedrock region as “rock moisture” has not been systematically explored, yet its misrepresentation in hydrologic and Earth System models may have significant consequences for predicting transpiration fluxes as well as the chemical composition of groundwater and streamflow. Limited case studies have identified that deeply rooted trees can use water stored in weathered bedrock to subsidize soil moisture, particularly in times of water stress, however, further characterization of the moisture dynamics of the weathered bedrock region are needed to quantify ecosystem sensitivity to environmental change. Here, we seek to develop a predictive, geomorphic framework for quantifying landscape-scale rock moisture storage by directly evaluating differences in weathering profile evolution and dynamic water storage across four sites. Using a combination of near-surface geophysics and drilling, we map the weathered bedrock region and quantify the moisture dynamics within it at three sites associated with the Eel River Critical Zone Observatory, and the East River SFA. In the first six months of the study we have initiated the measurement of catchment-scale erosion rate via cosmogenic radionuclide analysis to evaluate how the pace of landscape evolution impacts weathering profile development. Seismic refraction datasets have now been collected across all four sites and reveal differences in the depth and extent of weathering. To directly quantify dynamic rock moisture storage, we are measuring core-scale petrophysical and hydraulic properties of weathered and unweathered bedrock and conducting successive downhole logging in boreholes, where core and boreholes are available. By the end of 2018, core and borehole logging data will be completed at all four sites. Results of successive logging from two of the sites reveals significant differences in the magnitude and spatial distribution of water storage dynamics that should correspond to the hillslope scale seismic profiles. Additionally, field-scale nuclear magnetic resonance (NMR) logging indicates that dynamic water storage may occur in both the rock matrix and fractures. Laboratory analyses of core samples are underway to further investigate how water storage is distributed at the pore scale. By characterizing the pore- to hillslope-scale distribution of water storage in weathered bedrock at four sites and placing the dynamic storage in the context of landscape and weathering profile evolution, we seek to develop a predictive framework for modeling water storage in weathered bedrock and its impact on the hydrologic cycle.