Feb 2nd, 9:30 AM - 3:30 PM

Research poster: From lab to basin scale: A Look at changes in evaporative and transpirative processes in arid and semi-arid shallow groundwater systems

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**Background and Motivation**

- Soil water evaporation and plant transpiration, collectively known as evapotranspiration (ET), are important to both the surface energy balance and hydrologic cycle, particularly in arid and semi-arid regions.
- With the potential for decreased precipitation from climate change (Barnett and Pierce, 2007) and increased demand for water resources, understanding forces that drive ET and water balance components is required.
- Southern Nevada Water Authority (SNWA) is studying the feasibility of pumping groundwater from valleys in central Nevada to meet the needs of its citizens.
- Decreasing groundwater levels within the Great Basin alluvial and carbonate aquifer systems could change the amount of water distributed between the phreatic and vadose zones.
- Linking moisture content, water potential, and thermal gradients to the ET rates could provide an important connection between above- and below-ground processes, improving the prediction of long-term water resources.

**Objectives**

- Use an innovative technology to look at water and thermal balances by measuring the temperature responses using PVC wrapped with fiber optic (FO) cable and distributed temperature sensing (DTS) in borings at two test sites:
  1. Valley basins in Spring and Snake Valleys, NV, and
  2. Lysimeter facility in Boulder City, NV;
- Determine changes in the amount of sensible and latent heat released or absorbed from shallow groundwater sources;
- Measure vertical soil moisture and potential gradients to determine the direction and rate of soil water movement; and
- Pending approval of an instrument fellowship (Decagon Devices), determine if recharge to the basin-fill aquifer occurs within the valley floor.

**FO DTS Instrumentation**

- FO DTS wrapped pole and thermistors will measure temperature in upper phreatic, capillary, and vadose zones with spatial resolution of 1 m and temperature resolution up to 0.01 C.
- TDRs and HDUs will measure water content and water potential as a function of depth (already installed in Spring Valley, NV).
- Pending approval of instrumentation fellowship (Decagon), one Drain Gauge, three STE Soil Moisture, EC, Temp Sensors and three MPS-1 Dielectric Water Potential Sensors will be installed at each site to determine whether recharge occurs through the valley floors.
- Groundwater levels monitored with pressure transducer, linking groundwater fluctuations to changes in temperature (using the DTS pole), and ET processes (using Eddy Covariance [EC] towers and Heat Flux Plates).
- Data collected from instrument array would support corrected water and energy budget calculations that will in turn provide important information for hydrologic modeling.

**References**


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