SMAP Cal/Val – Sierra Nevada/San Joaquin Valley

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Site Description

• Type of site (one or more of these)
  - **CZO – SS** ~ 3 km² and about 300 soil moisture sensors
  - **American River (AR)** ~ 4,500 km² and about 200 soil moisture sensors
  - **Southern Foothill Research and Extension Center (SFREC)** ~ 33 ha and about 400 soil moisture sensors
  - **Paramount Farms (PF)** ~ 40 ha and about 50 soil moisture sensors
  - **Flux Tower Transect (FTT)**

• Measurements provided
  - Soil moisture and Temperature
    - DECAGON EC-TM and 5-TE
  - 10, 30, 60, and 90cm
  - Soil water potential
Providence Creek – main CZO instrument cluster

Elev 1700-2100 m

\[ T_{\text{ave}} = 8.9^\circ C \ (2000 \ m) \]

Annual precip: 1.0 m

130 dy snow

12 mo growing season – neither cold nor drought limited

White fir w/ sugar & other pines, incense cedar & patchy, dense shrubs

Over 400 sensors integrated for basin-scale, spatial measurements
Soil Moisture Monitoring Locations

American River

Sierra Foothill

Paramount Farms
Southern Sierra CZO

(NSF Critical Zone Observatory)

Elev., m

3000
2400
1800
1200
600

San Joaquin Experimental Range 400 m
Soaproot Saddle 1100 m
CZO P301 2000 m
Shorthair Creek 2700 m

Main CZO site

N-S transect of research catchments

E-W transect of flux towers

NEON to follow same E-W transect

MODIS image
CZO Soil Moisture Sensors

MPS-1
Matric Potential

ECH₂O-TM
Water Content, Temperature

5TE
Water Content, Temperature, Conductivity
Echo-TE Lab/Field Calibration

Graph 1: ECHO-TM sensors
- Measured Water Content vs Target Water Content
- Data points for different locations (e.g., Pit 1, Pit 2, Pit 3, GPR, UCSB-Son)

Graph 2: Volumetric Water Content vs ECHO-T wc
- Data points for different measurements and locations
Description of the Project Supporting the Site and Your Research Focus

• The proposal identifies three existing monitoring sites in the Sierra Nevada Mountains, that combined with existing and planned instrumentation provide the necessary data for understanding forest and oak woodland hydrology across a large range of elevations.
• In addition, we include an optional agricultural site near Bakersfield, CA.
• Data have been collected at these sites since 2008, and will continue for many years in the future;
• Research focus mostly on changing climate (precipitation/temperature/snow melt on functioning of natural and agriculture ecosystems (drought, water use))
Description of the Project Supporting the Site and Your Research Focus

• Southern Sierra Critical Zone Observatory (NSF), co-located with Kings River Experimental Watershed (USFS); co-location of NEON measurements planned

• Streamflow, meteorological data since 2004; soil & vegetation characterization, LIDAR coverage, snow & soil moisture since 2008, flux towers

• Additional sites under Sierra Nevada Adaptive Management Project (CA-DWR & USFS) – R. Bales

• Sites are integrated in **Sierra Nevada San Joaquin Hydrologic Observatory** that focuses on data and information that are relevant to hydrologic management and research in the 60,000 square kilometer – R. Bales
Issues

• Most of the sensors discussed here are existing
• Data are freely available
• More field calibration is needed
• We will deploy additional sensors to
  (1). Relate near-surface soil moisture to soil profile storage,
  (2) Upscale local soil moisture measurements to the watershed scale (using synoptic measurements)
• Consider to use selected sites at CZO as core validation site

• Goal: Integrate CZO with SMAP