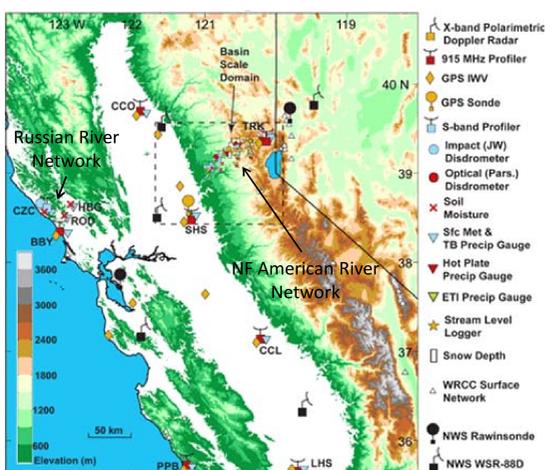


Robert Zamora F. Martin Ralph Timothy Schneider
NOAA/ESRL Physical Sciences Division
Edward Clark
NOAA/NWS Colorado Basin River Forecast Center

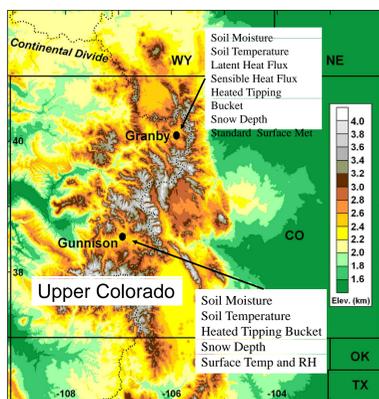
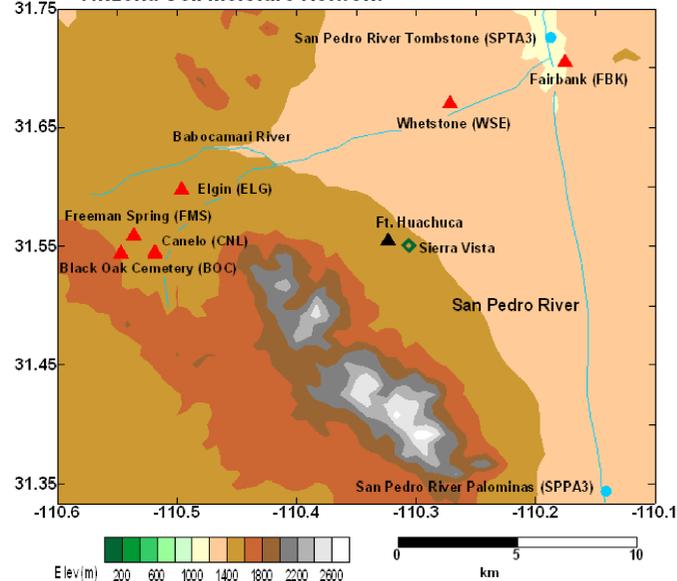
Goal: To develop the capacity to make observations that can be used to help understand the role that soil moisture plays in determining our weather and climate

The Soil Moisture Observing Networks

California



Arizona Soil Moisture Network

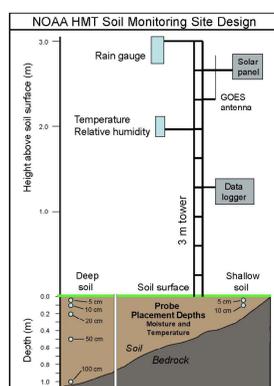


- Russian River: 3 stations
- NF American River: 10 stations
- Babocamari River: 6 stations
- Upper Colorado River: 2 stations

A Typical Soil Moisture Observing Station



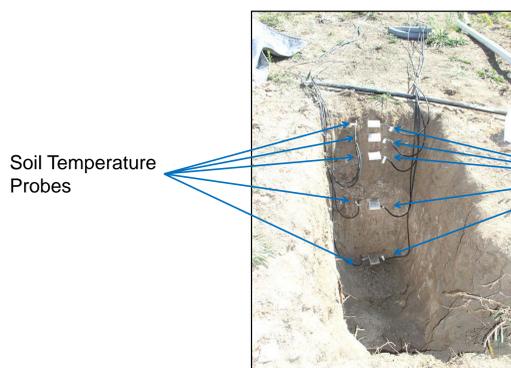
- Rain Gage
- Solar Panel
- GOES Antenna
- Surface Temperature and Relative Humidity
- Datalogger



Two minute averages of each variable are computed and transmitted hourly to Boulder.

Custom calibrations are derived for each station using gravimetric sampling.

The high temporal sampling rate used makes it possible to study the response of the soil on time scales ranging from sub-hourly to decades.

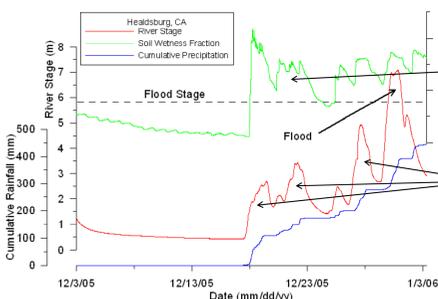


Soil Temperature Probes

Soil Moisture Reflectometers

Events Captured by the HMT Soil Moisture Observing Networks

Russian River Flood 31 December 2005 – 3 January 2006

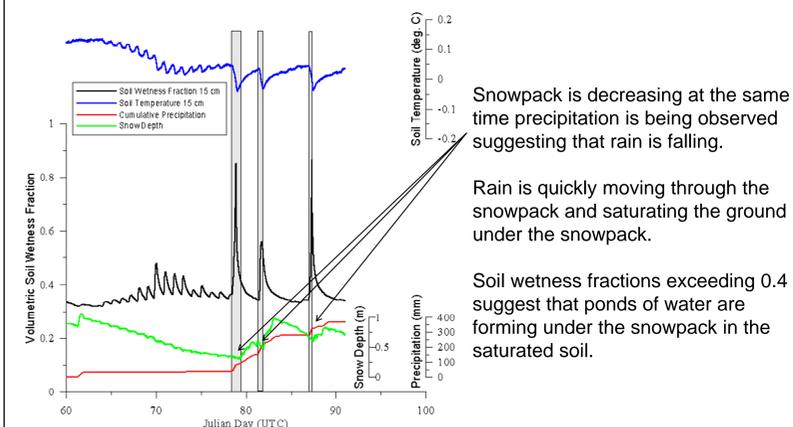


Precipitation associated with a series of winter storms falls on nearly saturated soil and brings the soil to above saturated conditions.

Once the soil is saturated the river responds very quickly to each storm event.

Flooding coincided with a storm that produced 110 mm of precipitation.

Rain on snow events NF American River March 2008

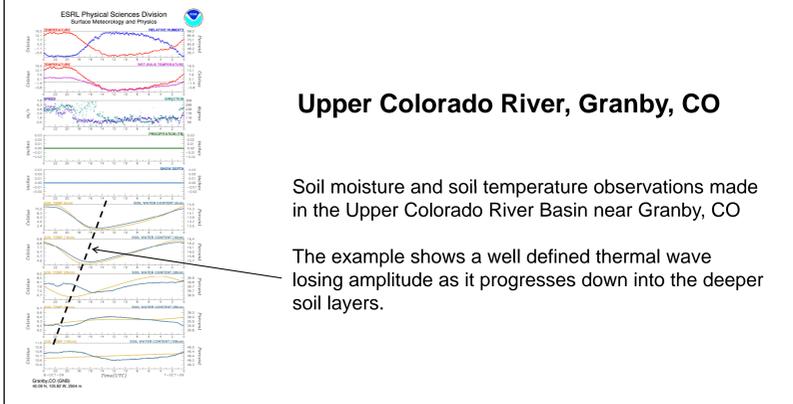


Snowpack is decreasing at the same time precipitation is being observed suggesting that rain is falling.

Rain is quickly moving through the snowpack and saturating the ground under the snowpack.

Soil wetness fractions exceeding 0.4 suggest that ponds of water are forming under the snowpack in the saturated soil.

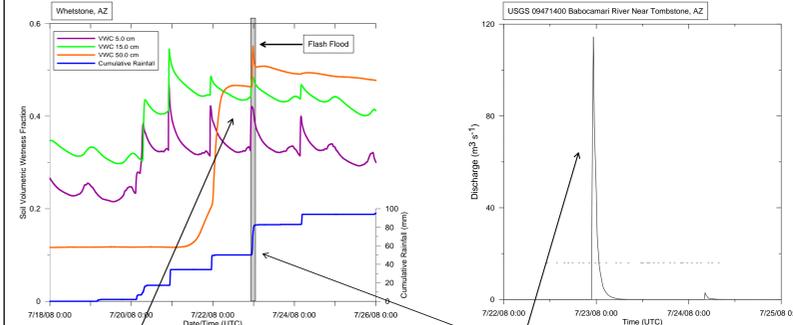
Upper Colorado River, Granby, CO



Soil moisture and soil temperature observations made in the Upper Colorado River Basin near Granby, CO

The example shows a well defined thermal wave losing amplitude as it progresses down into the deeper soil layers.

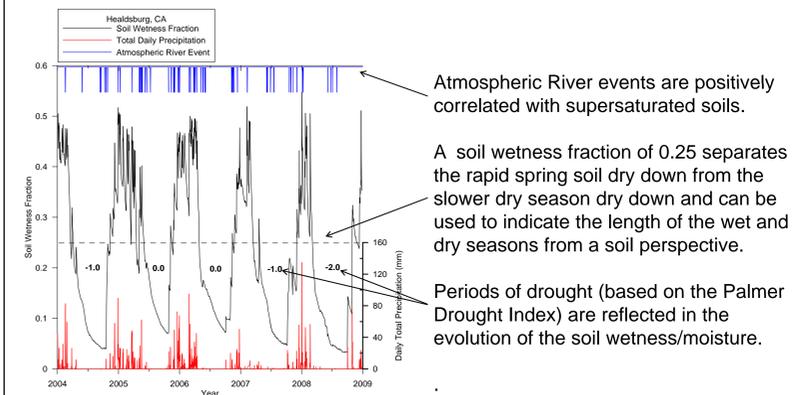
Babocamari River flood 23 July 2008



The monsoon rain event occurring on 00 UTC 22 July finally brought the soil column to saturation.

Flooding coincided with a storm that dropped 30 mm of precipitation on top of saturated soil at 00 UTC 23 July.

Five year soil moisture climatology for Healdsburg, CA



Atmospheric River events are positively correlated with supersaturated soils.

A soil wetness fraction of 0.25 separates the rapid spring soil dry down from the slower dry season dry down and can be used to indicate the length of the wet and dry seasons from a soil perspective.

Periods of drought (based on the Palmer Drought Index) are reflected in the evolution of the soil wetness/moisture.