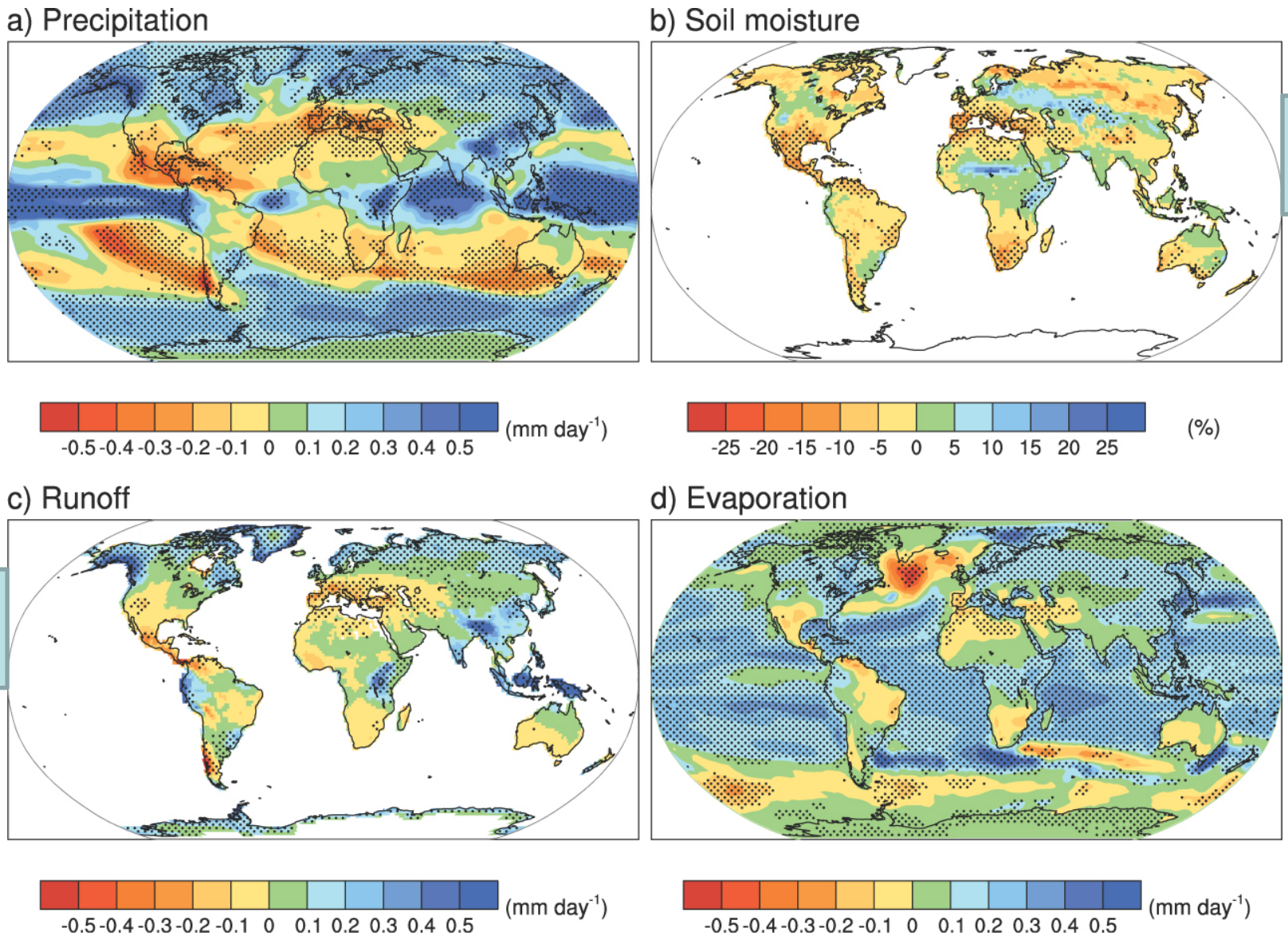
IPCC Multi-model Projections for A1B,2100

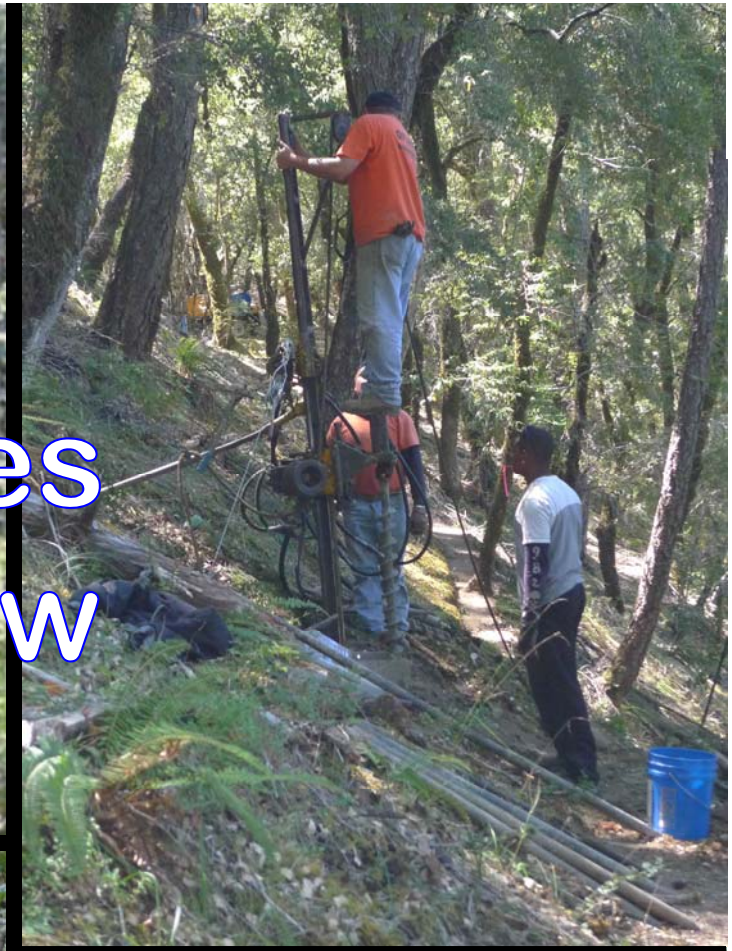
stippling: 80% of models agree in sign of change

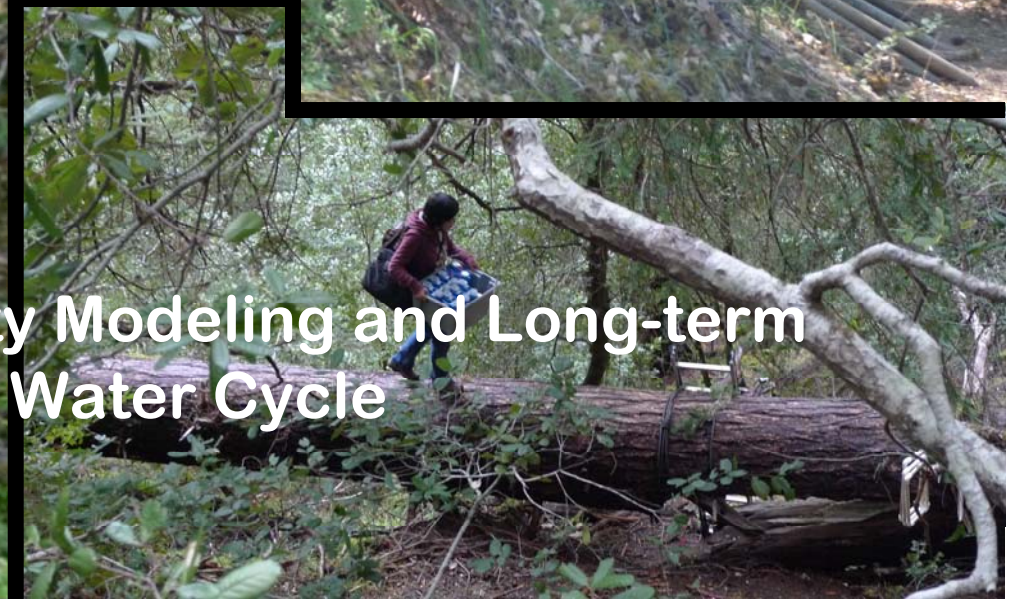


IPCC AR4 WG1

Root-Rock Interactions:

Fast Flow Processes and Reservoir below Soil Layer



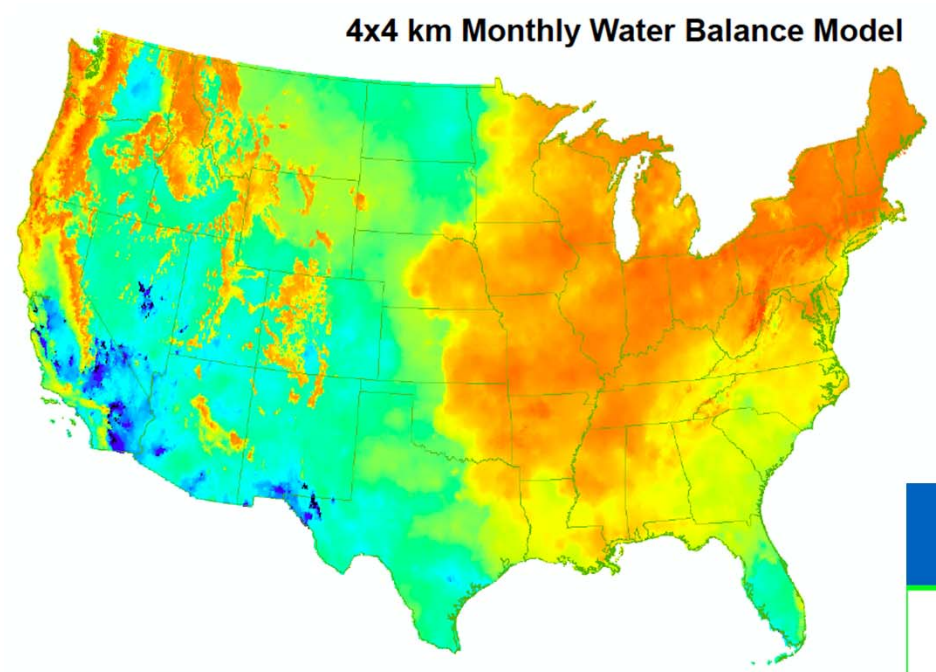


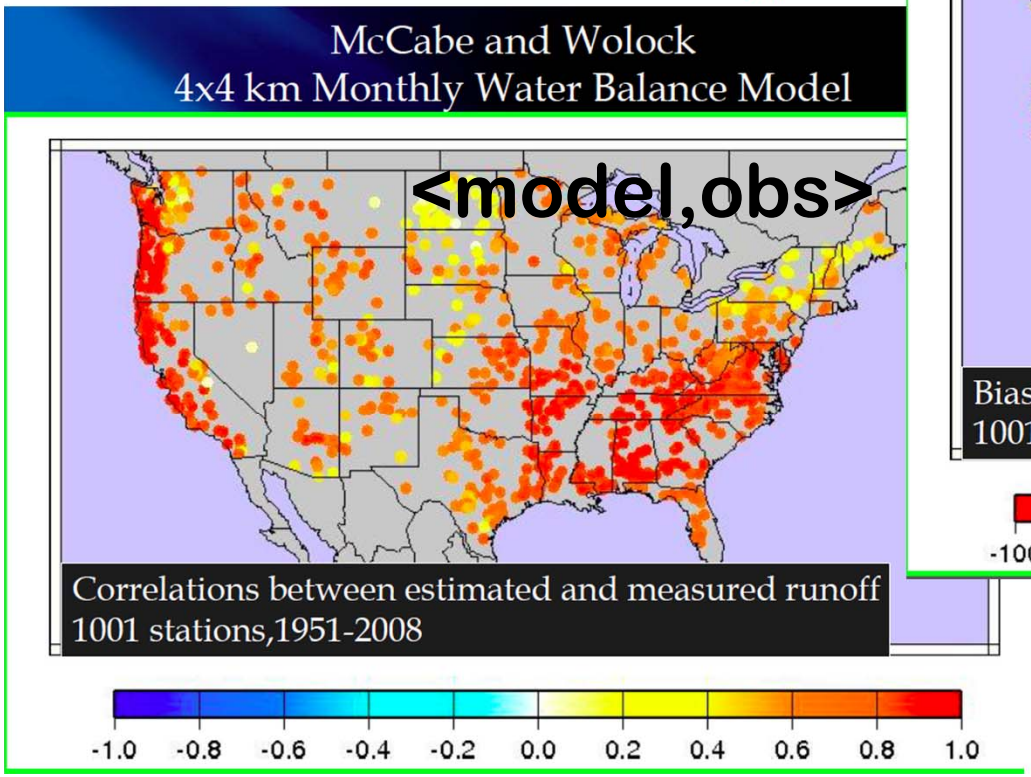
Inez Fung

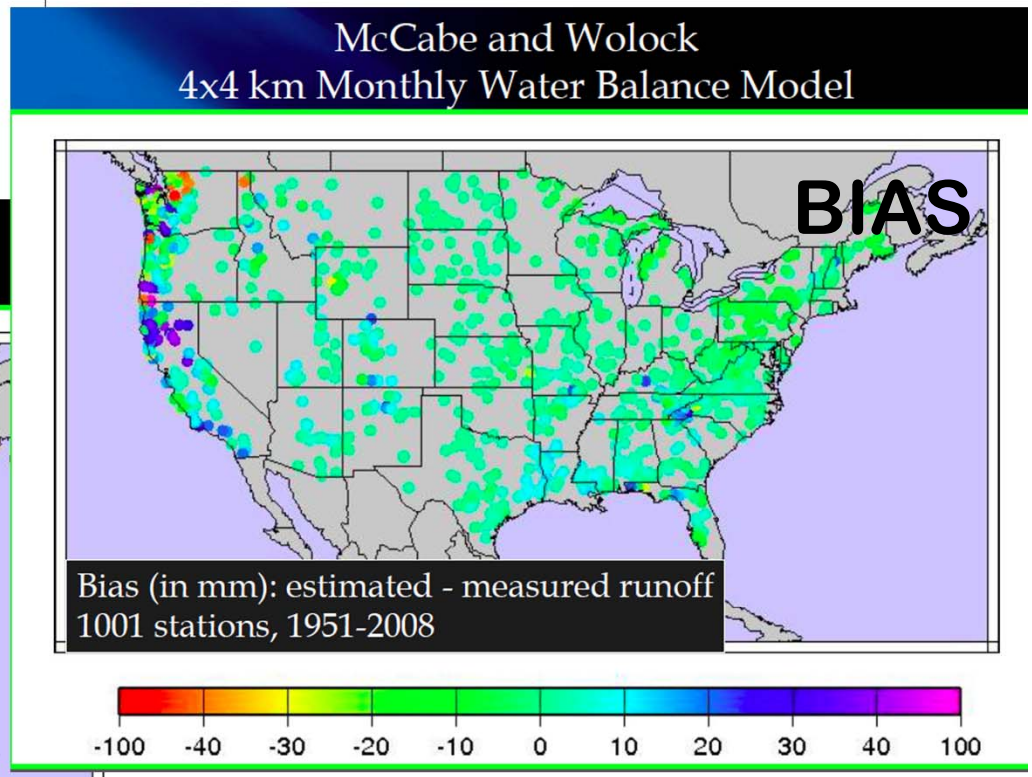
DOE Workshop on Community Modeling and Long-term Predictions of the Integrated Water Cycle
Washington DC

Sept 24 2012

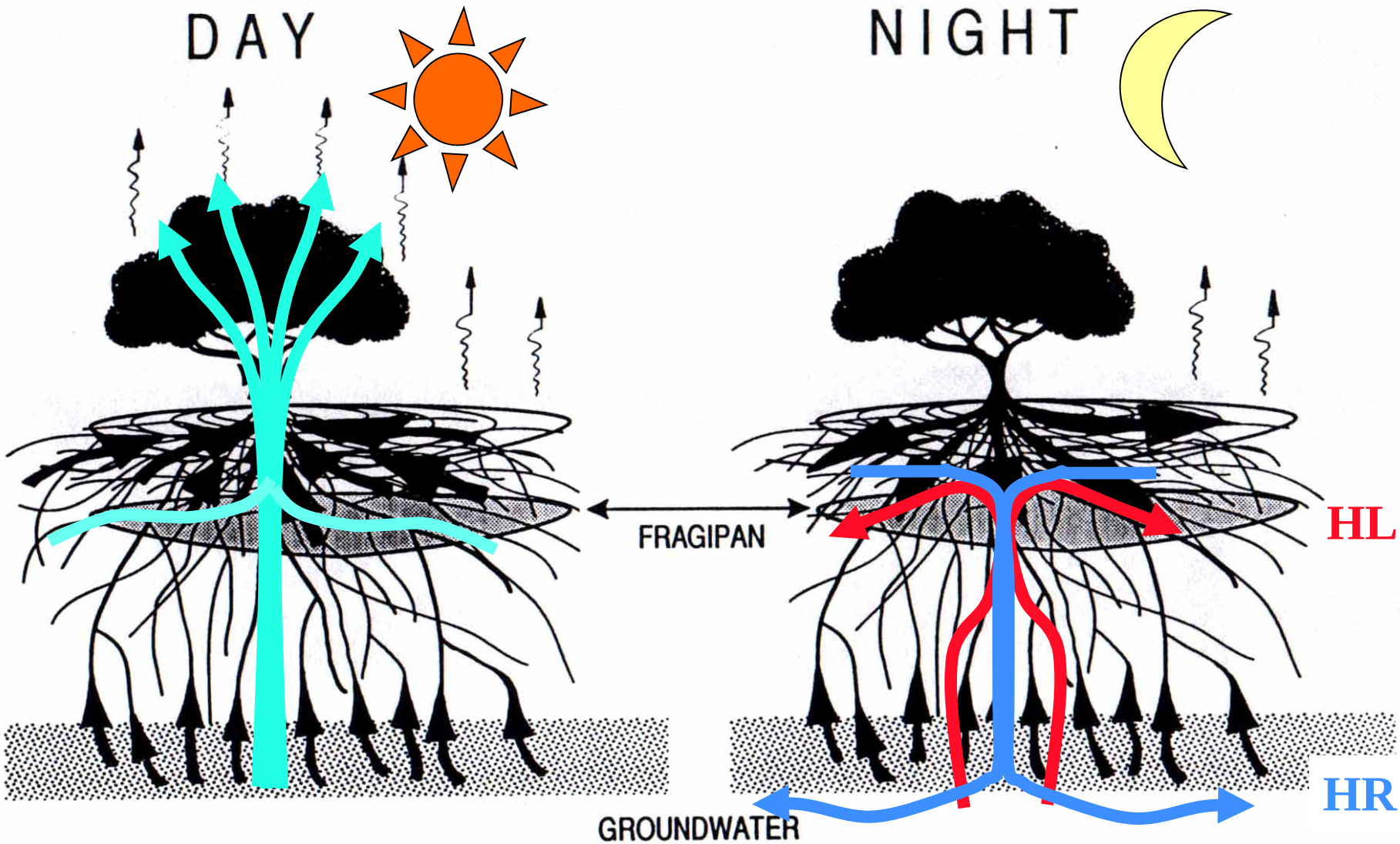
USGS EPA Monthly Water Balance Model





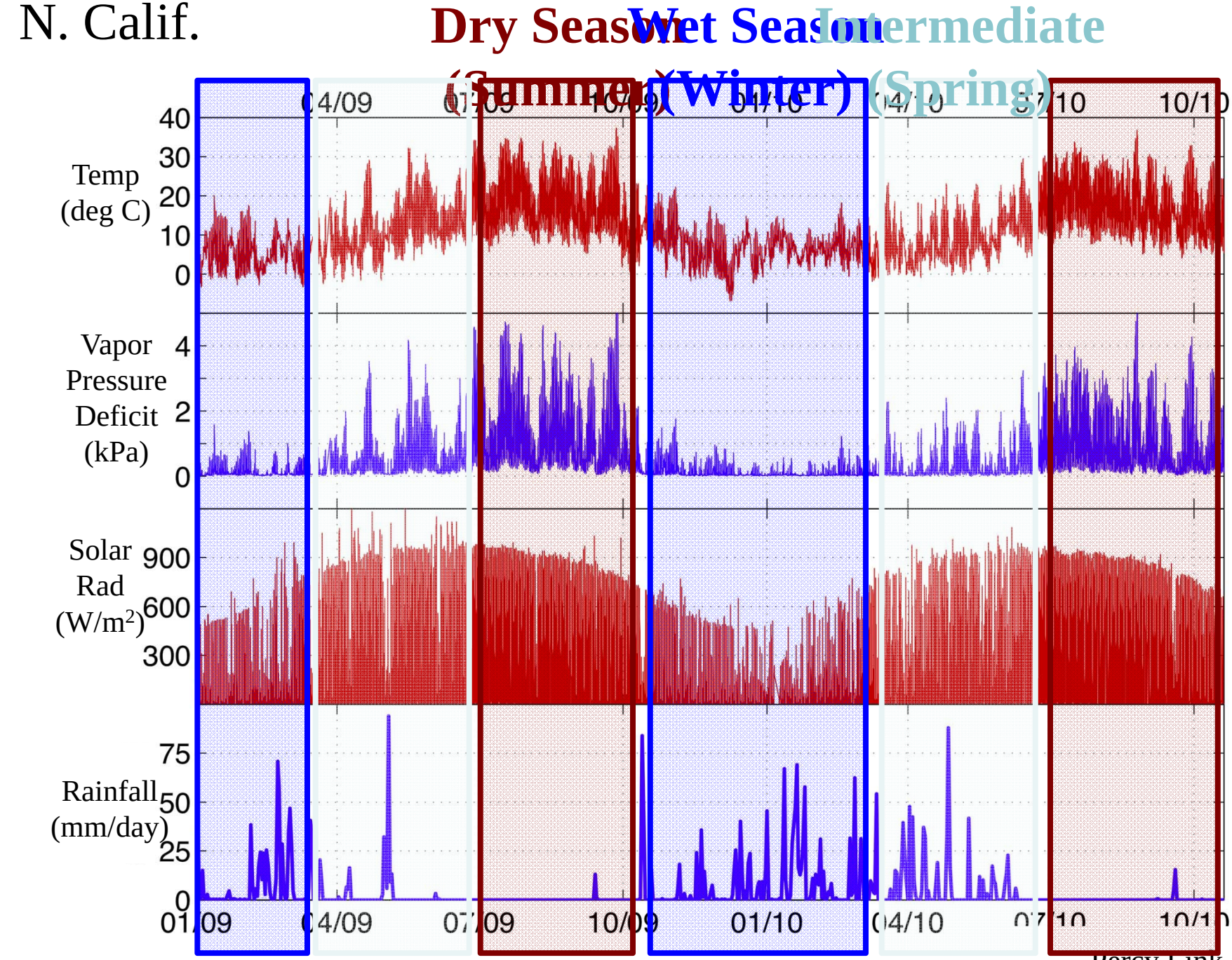


"Hydraulic Lift (HL) or Redistribution (HR)"



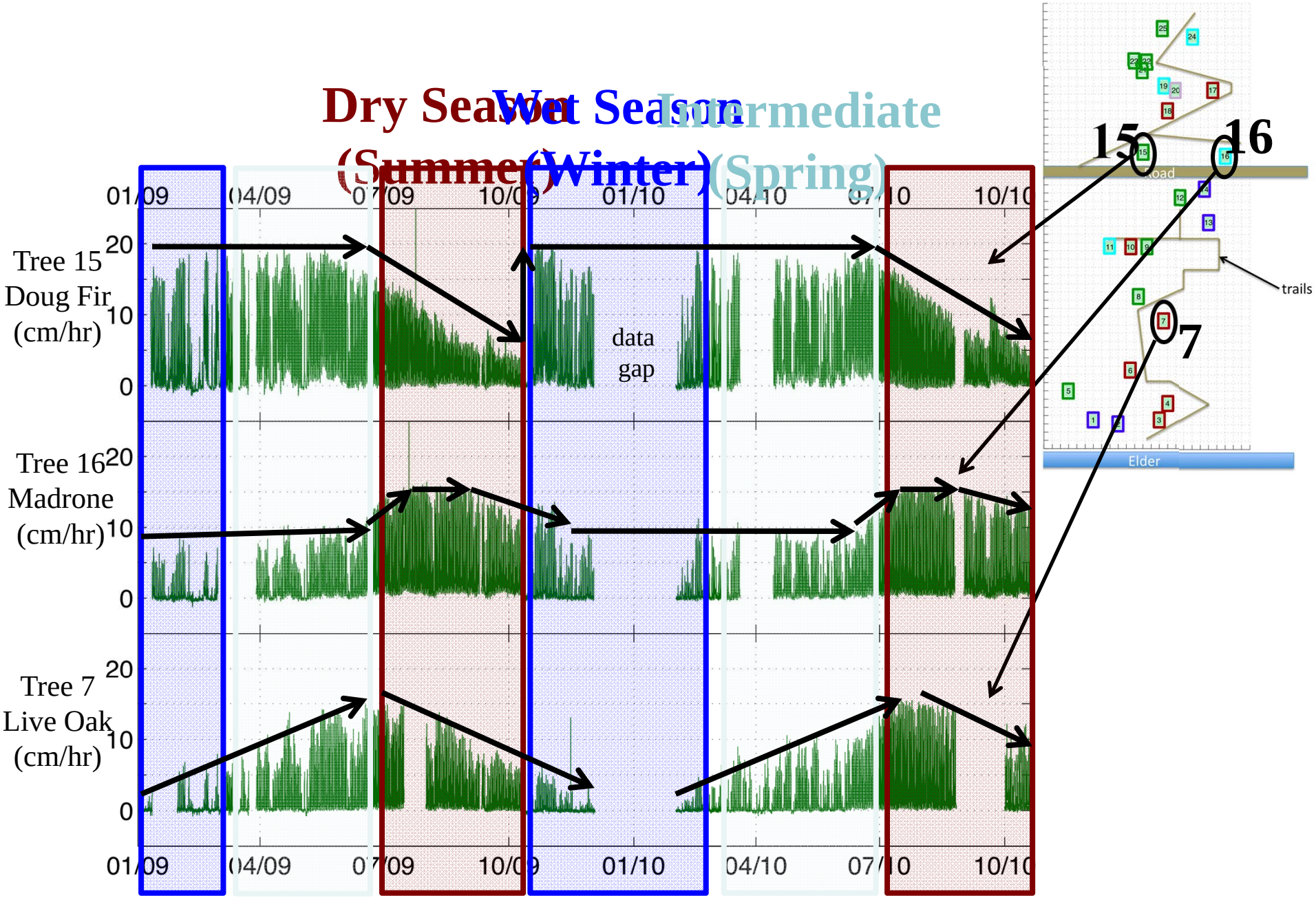
Lee et al. PNAS 2005 – Hydraulic redistribution in CCSM

N. Calif.

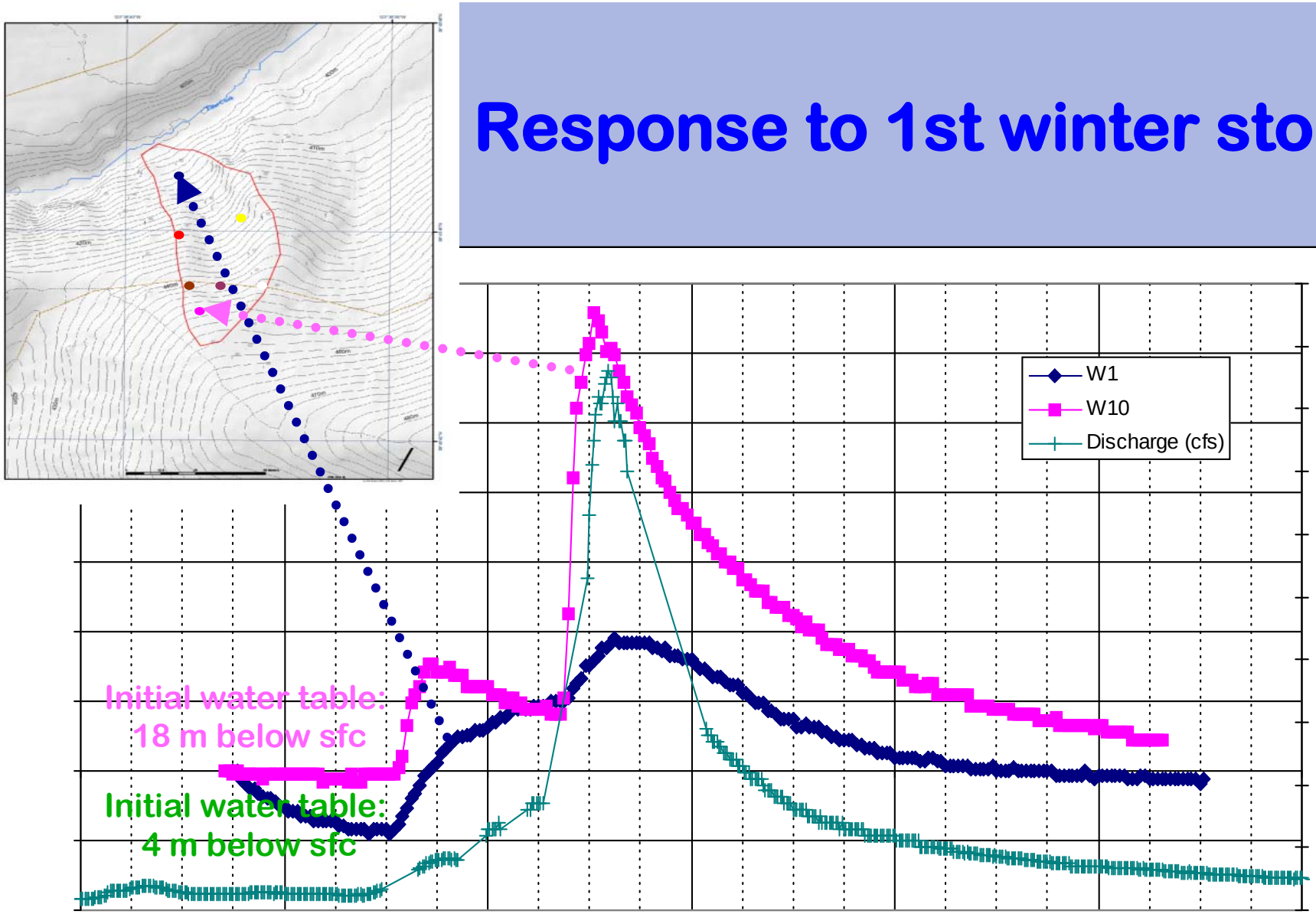


temperature, with 7am–7pm mean (red) and 7pm–7am mean (blue);

Percy Link


Dry Season
(Summer)
Wet Season
(Winter)
Intermediate
(Spring)
Tree 15
Doug Fir
(cm/hr)
Tree 16
Madrone
(cm/hr)
Tree 7
Live Oak
(cm/hr)
data
gap
01/09
04/09
07/09
10/09
01/10
04/10
07/10
10/10
20
10
0
15
16
7
trails
Elder

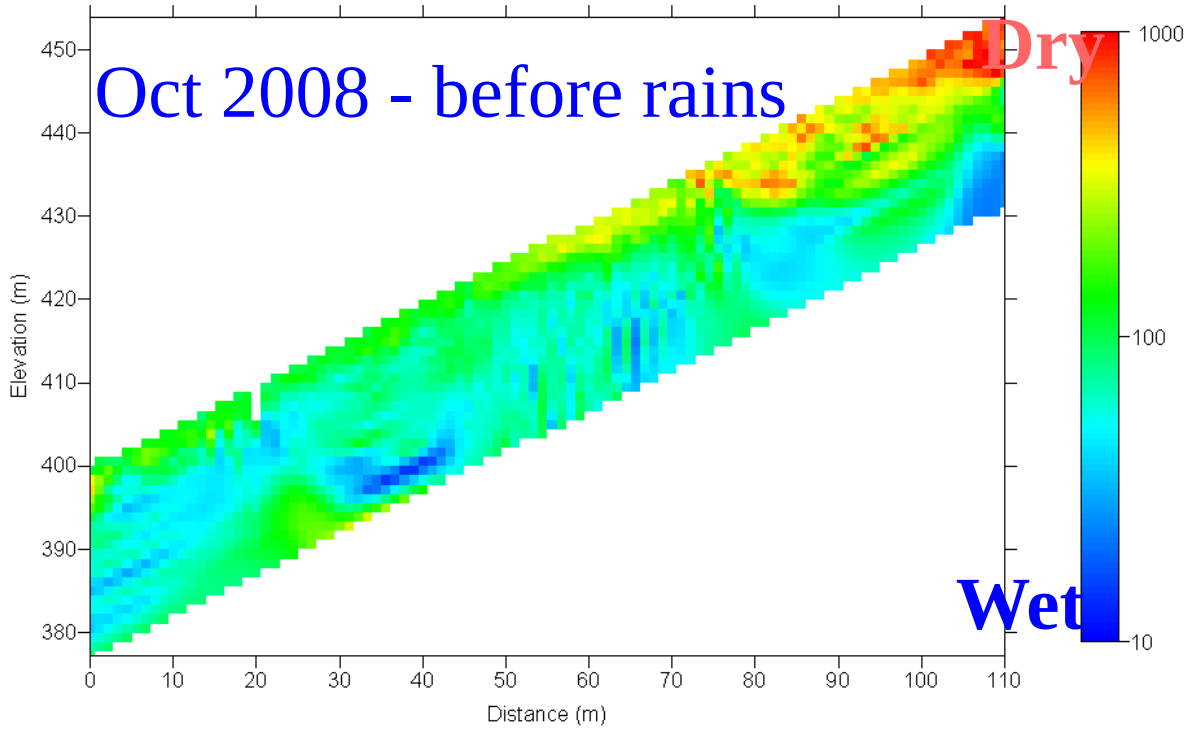
Response to 1st winter storm

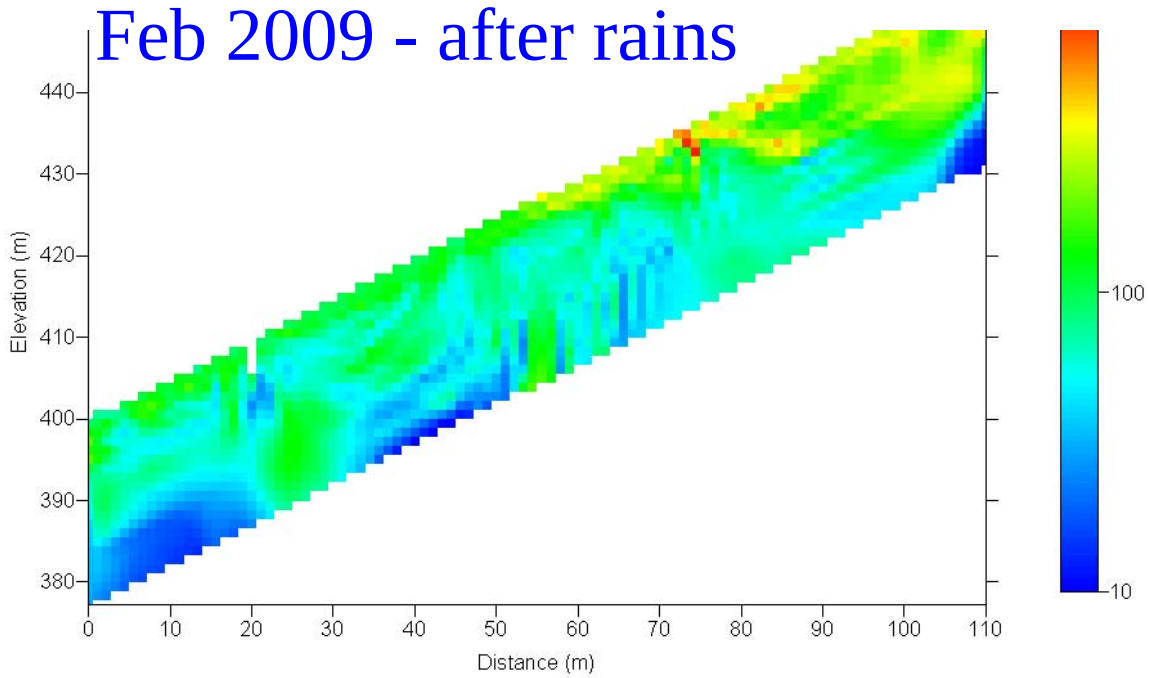


Rapid flow through fractures !

Salve (LBL)
Dietrich (EPS)

Soil/Rock Moisture

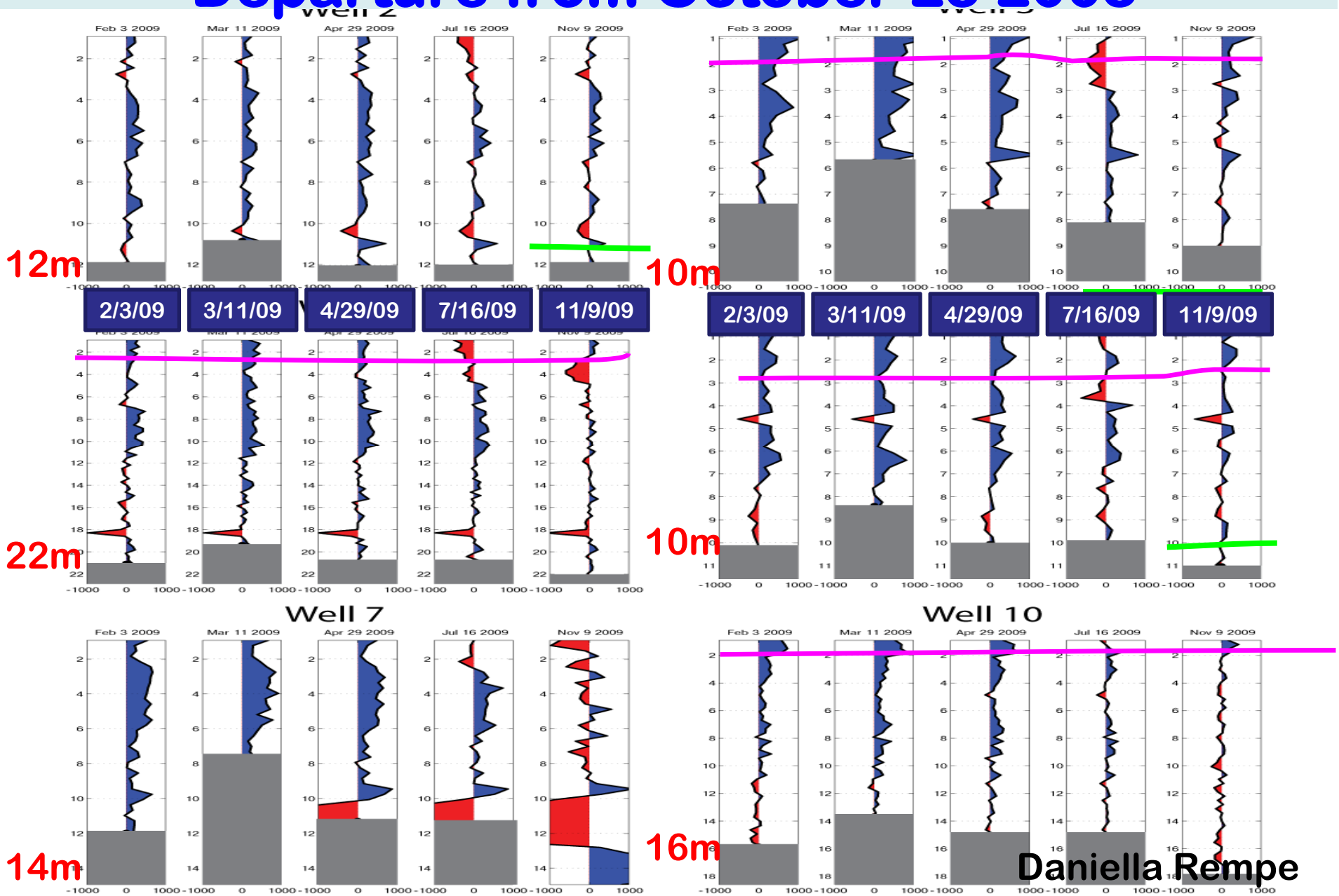




Electrical Res. Tomography: Moisture in rock fractures

Dietrich (EPS)
Salve (LBL) et al.

Neutron Probe Measurements: Departure from October 28 2008



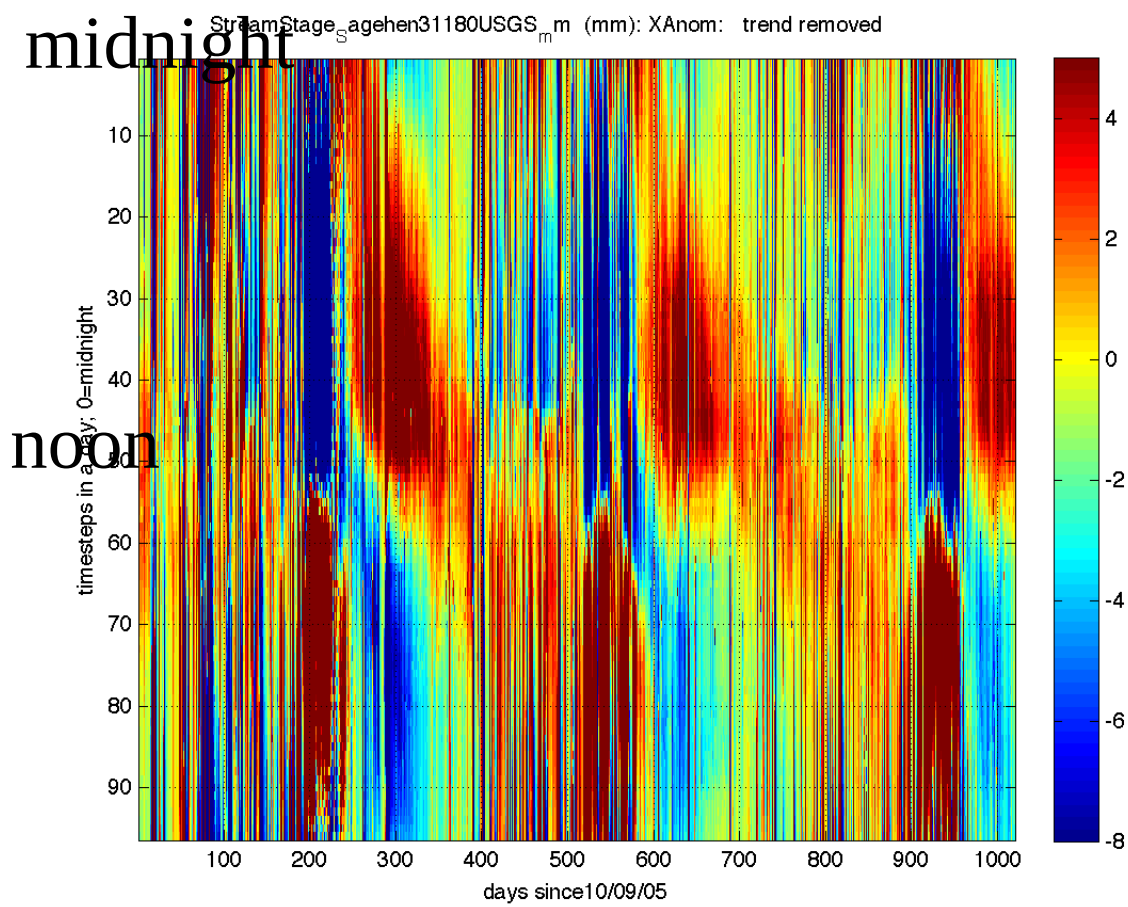
Daniella Rempe

Fast Processes… Rock Moisture

- 1/3 of US gets winter precipitation
- Rapid flow through fractured rock
- Moisture(z) not monotonic
- Significant reservoir in fractured rock: 30% of moisture between surface and water table
- Some evergreen species withdraw water from "rock moisture" to sustain dry season photosynthesis

→Resilience of vegetation in droughts

→Timing and magnitude of runoff

Some hope

- Forest inventory data → trees tell us about subsurface root-moisture interactions
- High frequency stream flow → integrated response of watershed