Table 1. Carbon stock (kg C m^{-2}) in soil and regolith (soil + weathered bedrock).

Site	Regolith			Soil		
Elevation (m)	Minimum (kg C m^{-2})	Median (kg C m^{-2})	Maximum (kg C m^{-2})	Minimum (kg C m^{-2})	Median (kg C m^{-2})	Maximum (kg C m^{-2})
400	4.04±0.67	4.14±0.66	4.40±0.70	3.98±0.62	4.07±0.60	4.32±0.63
1100	10.90±3.51	11.60±3.74	13.11±4.21	8.70±3.20	9.21±3.39	10.27±3.72
2000	29.32±16.32	32.07±17.68	33.37±18.10	23.47±15.50	25.47±16.73	25.82±16.90
All sites	13.62±13.05	14.67±14.30	15.75±14.71	11.12±11.18	11.89±12.16	12.51±12.22

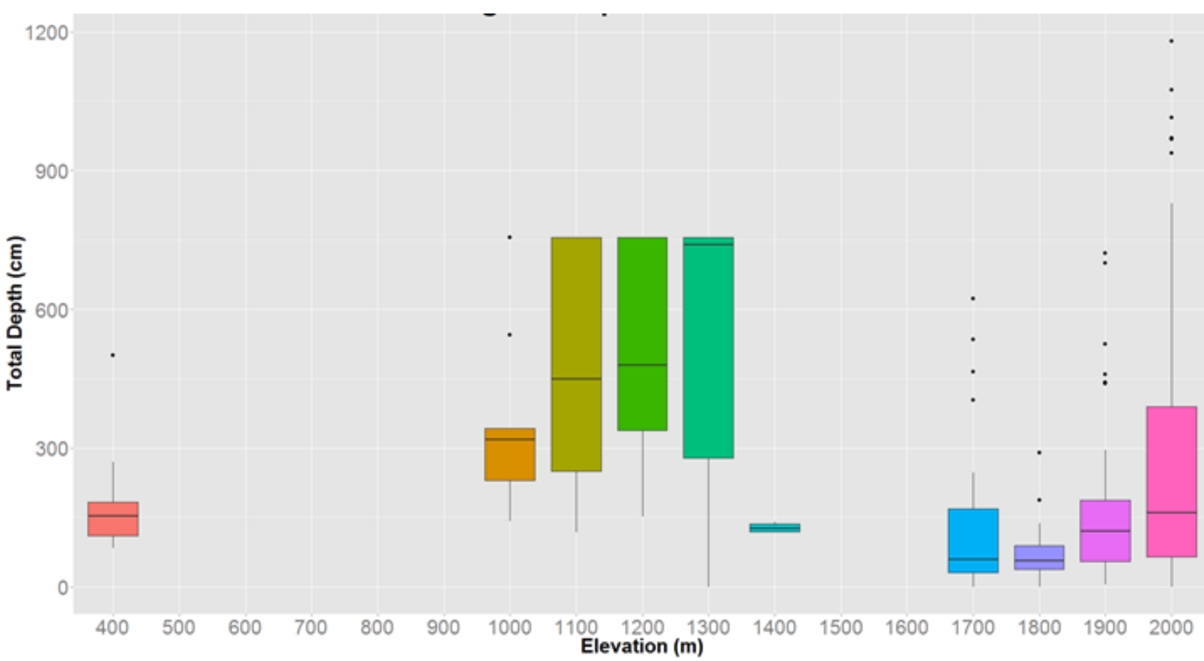

Figure. 1. Regolith thickness across the Sierran elevation gradient. Glaciated terrain above 3000 m was not included in this analysis.

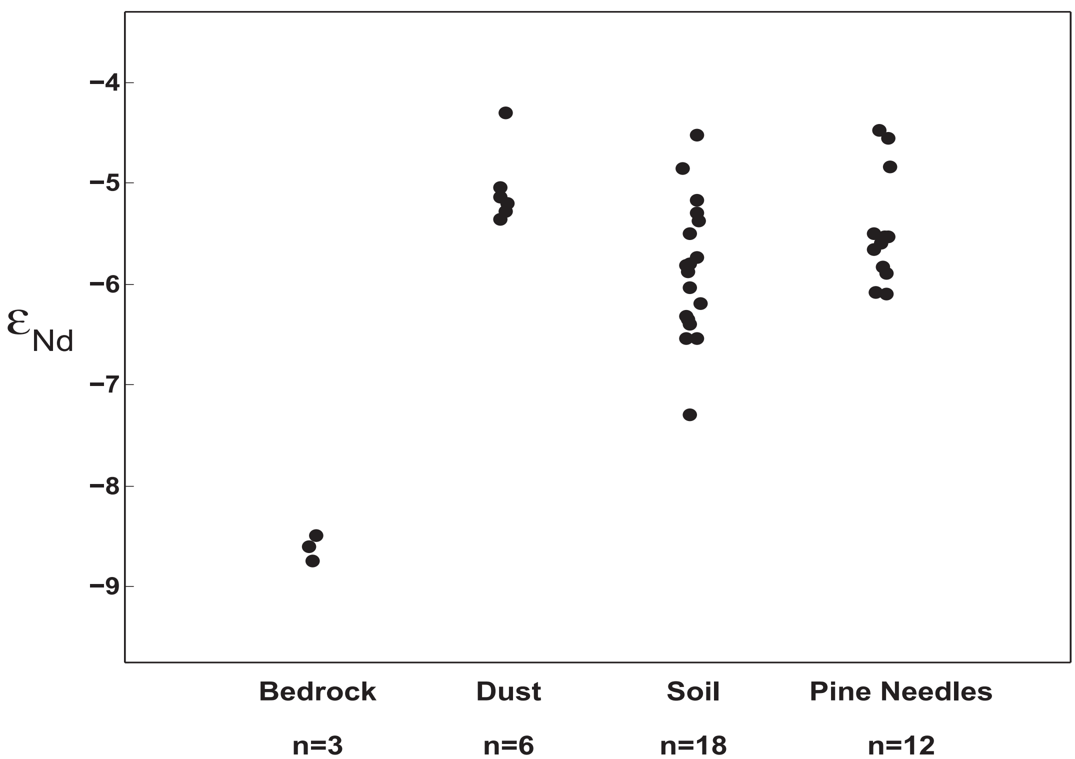

Figure 2: εNd values of bedrock, dust, soil, and pine needle samples from the Bald Mountain Granite. Individual data points are displayed with horizontal jitter for clarity. These results indicate that dust accounts for between 70 and 80 percent of the Nd in soils and pine needles, assuming that dust and bedrock are the two sources of the element in each case.

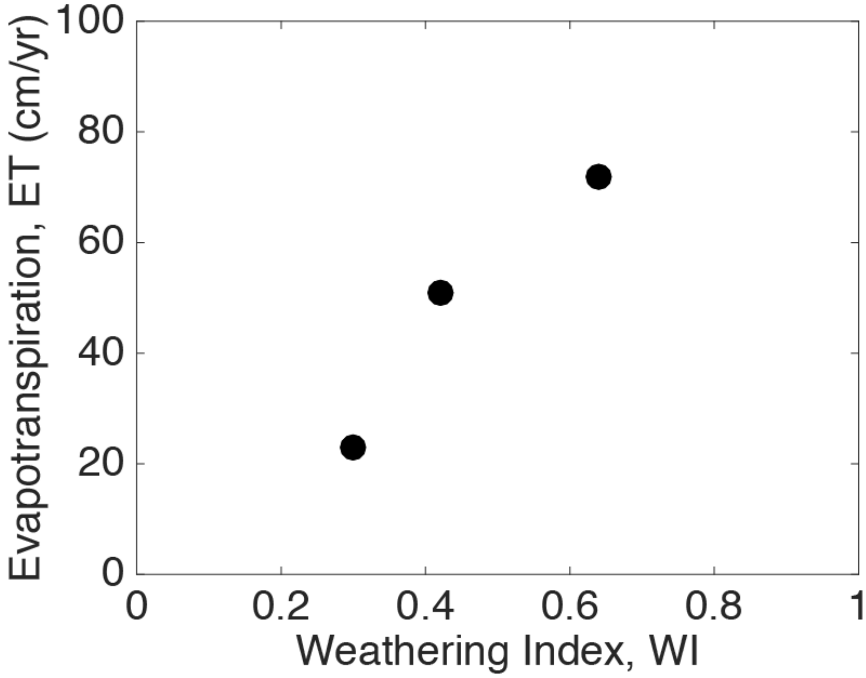

Figure. 3. Weathering index (WI) is averaged over the 3.6 ha area of each geophysical survey and is calculated as the normalized difference between the theoretical maximum and measured shear-wave velocity at each point on the landscape. (Note: this means that low values of WI imply little water storage capacity and high values of WI imply large water storage capacity.) Evapotranspiration (ET), a measure of ecosystem productivity, is inferred from remotely sensed NDVI using regression relationship of Goulden and Bales (2014).

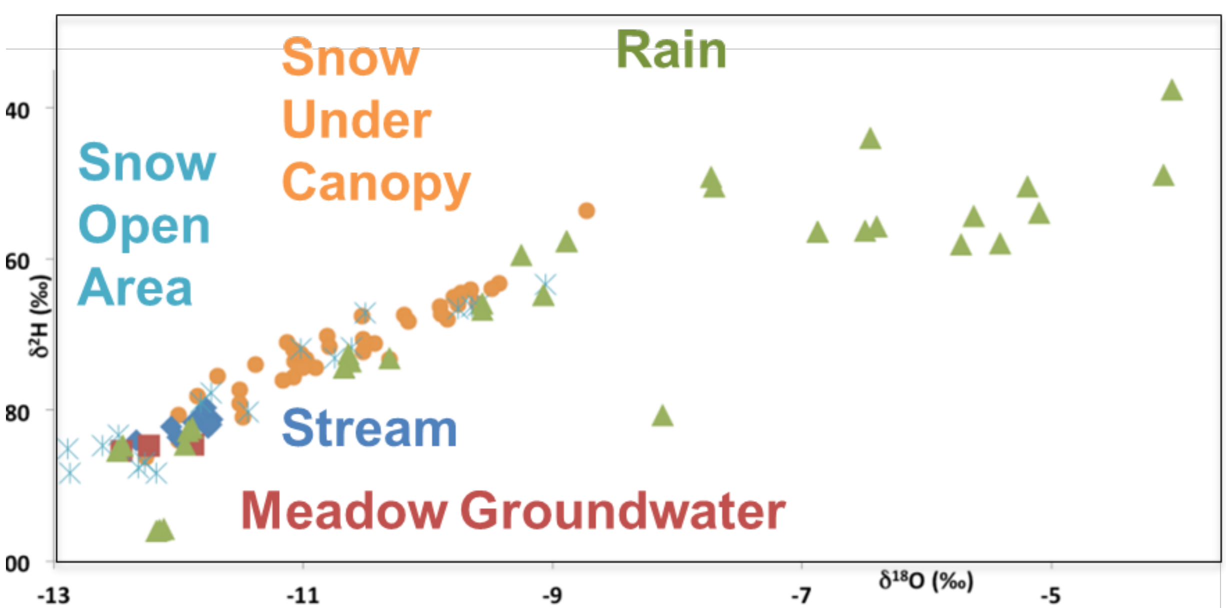

Figure 4. The changing isotopic signature of hydrological compartments – snow, rain, groundwater, stream – over the year.

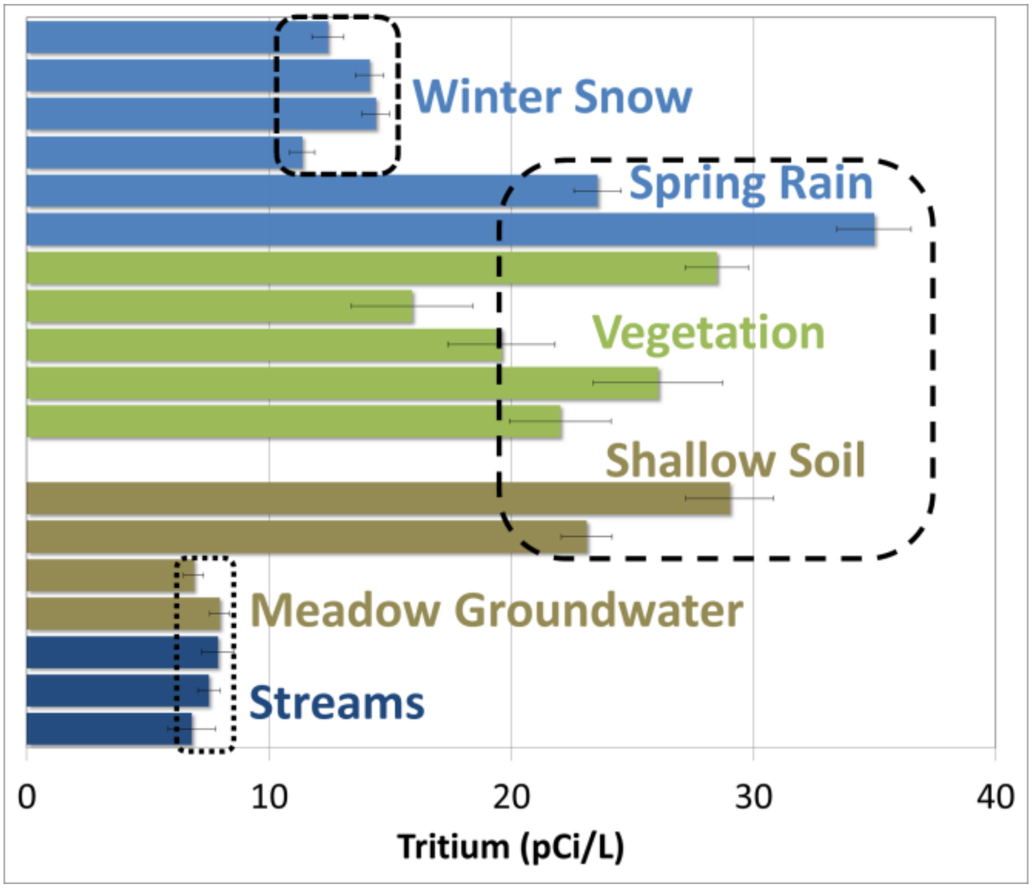

Figure 5. Tritium activities in snow, rain, vegetation, shallow soil, groundwater and streams show disconnect between snow, spring rain, vegetation and shallow soil and meadow groundwater and streams.

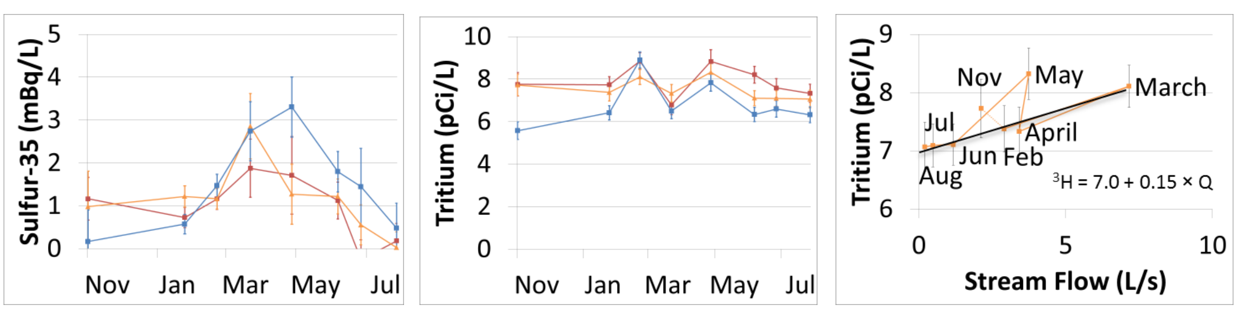

Figure 6. Monthly variation of residence time tracers sulfur-35 (left, $t_{½}$ = 87 days) and tritium (middle, $t_{½}$ = 12.3 years) in P301 (red), P300 (orange) and Big Creek (blue), and correlation between tritium and stream flow (P300).

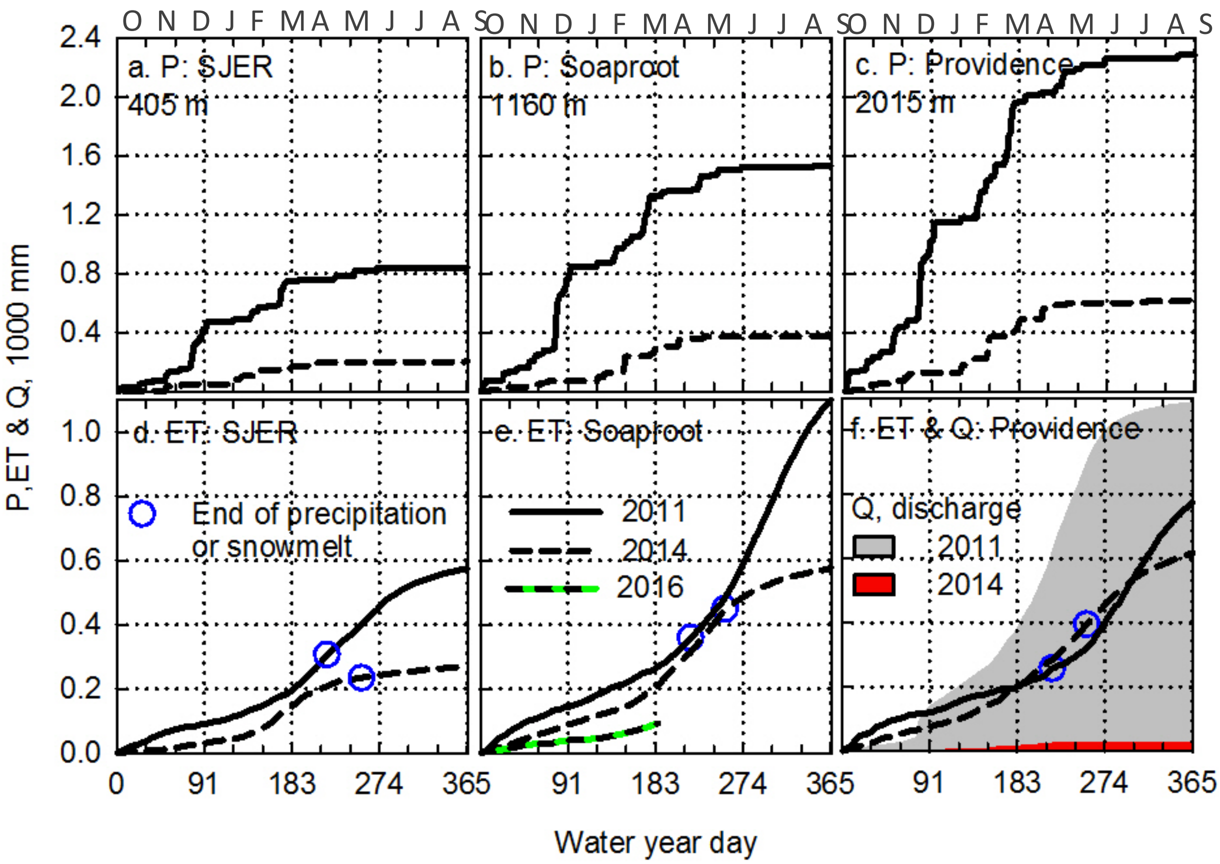

Figure 7. Cumulative daily precipitation (a-c) and ET (d-f) measured by eddy correlation for 2011 and 2014, for San Joaquin (Oak Savannah) and two forested sites, Soaproot and Providence. Discharge for one catchment at Providence also shown on panel (f). Vertical lines on ET graphs indicate last day of precipitation and snowmelt for 2011 and 2014, marking the day after which all ET and streamflow came from storage that was not replenished until the next rain (right after end of water year). ET for Soaproot in first half of 2016 shown is black/green dashed line. Months indicated at top. Manuscript in preparation..

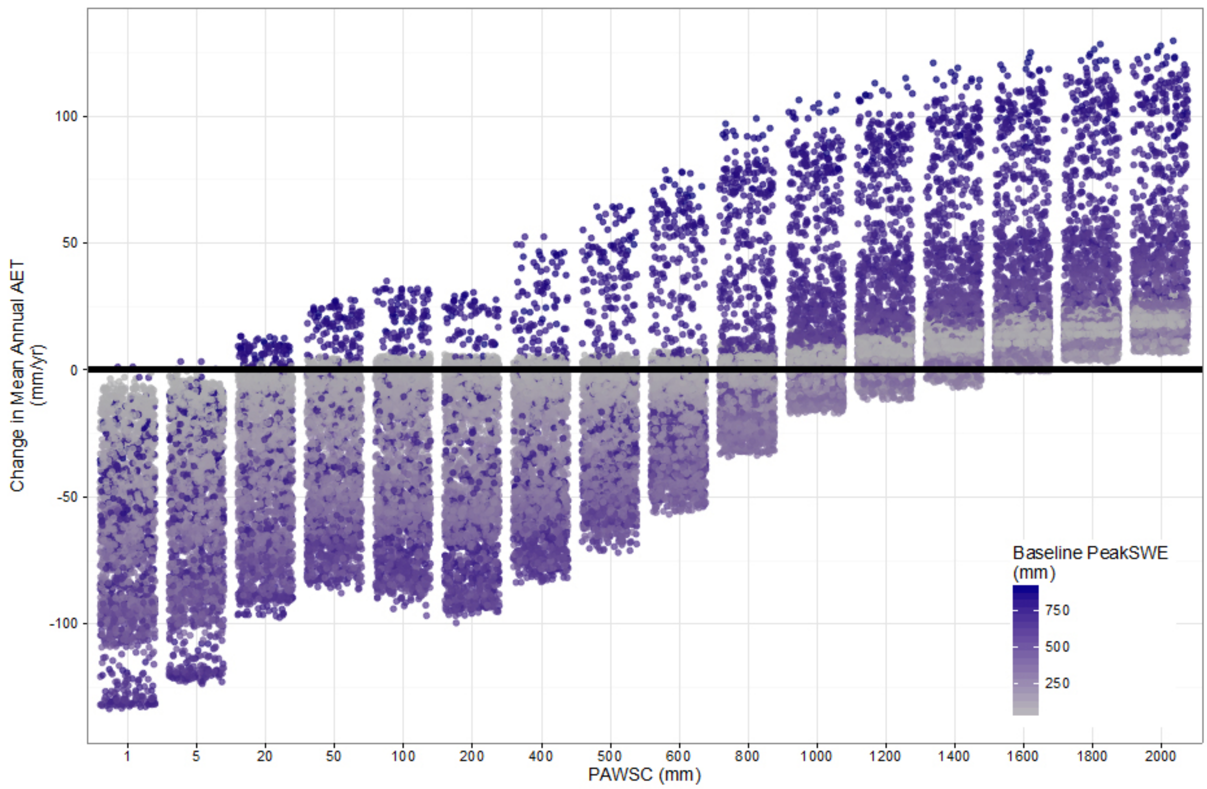

Figure 8. Estimates of changes in actual ET (AET) with 2°C warming for more than 2000 locations along elevational transects in the Sierra Nevada, based on RHESSys modeling. Each point is a change for a given site, with the color shading indicating the mean annual peak snowpack. Abcissa is plant available water storage capacity (Tague et al., in review).

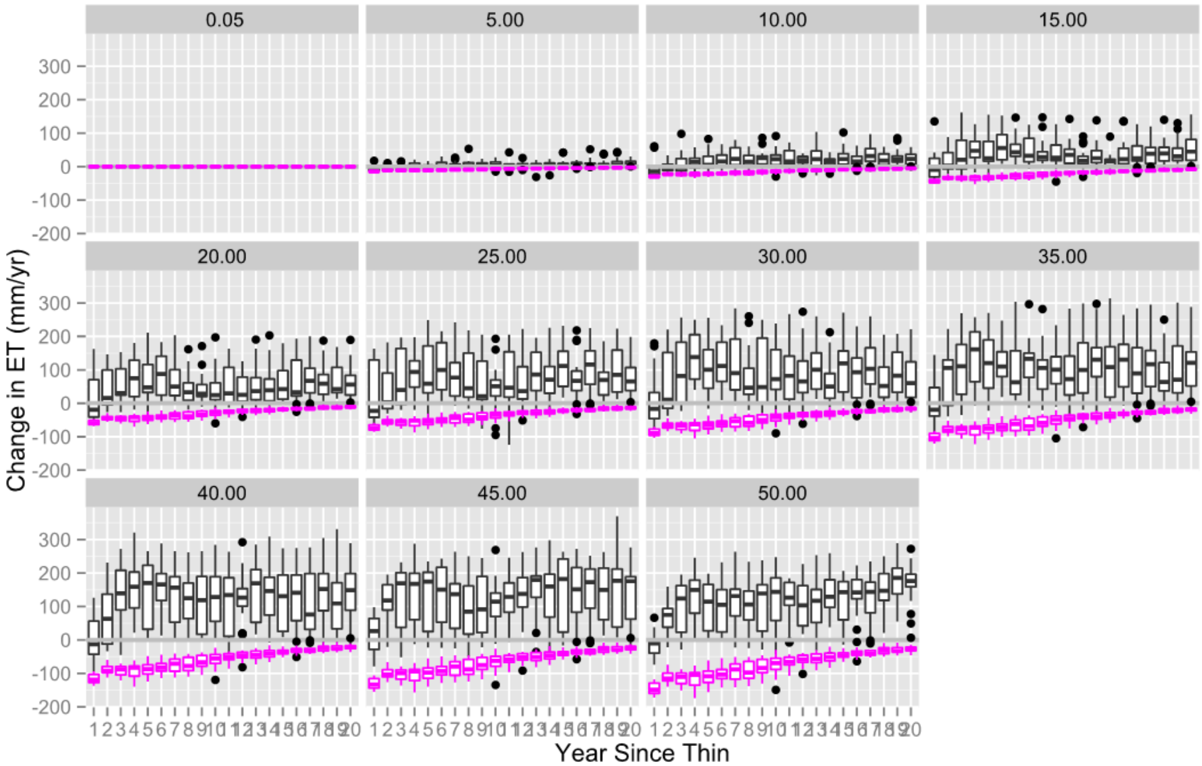

Figure 9. Estimated post-thinning recovery trajectories, shown as change in ET, relative to undisturbed baseline. Boxes depict the impact of inter-annual climate variation. Black boxes show recovery if we assume that neighboring trees share water. Pink symbols show results assuming tree roots are isolated. Panels show increasing levels of biomass removal during thinning (Tague and Moritz, in review).

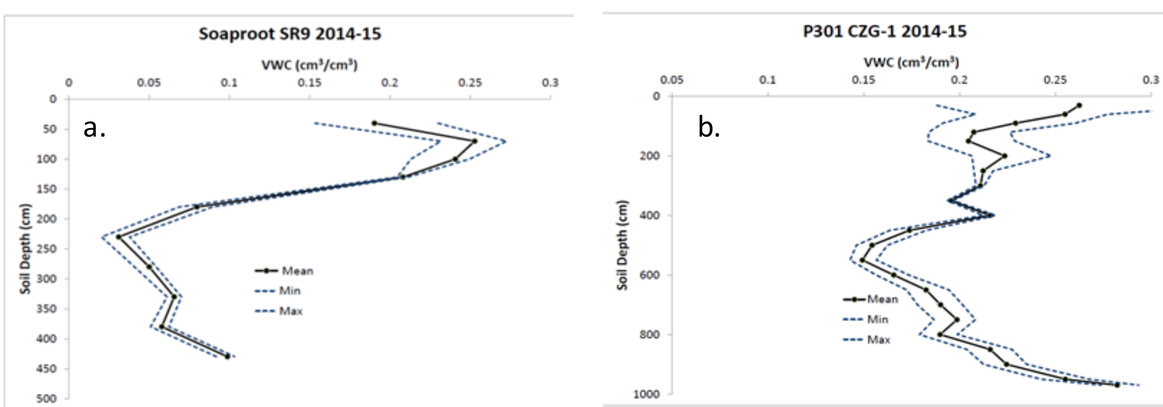

Figure 10. Regolith water content at a) 1100 m and b) 2000 m elevation.