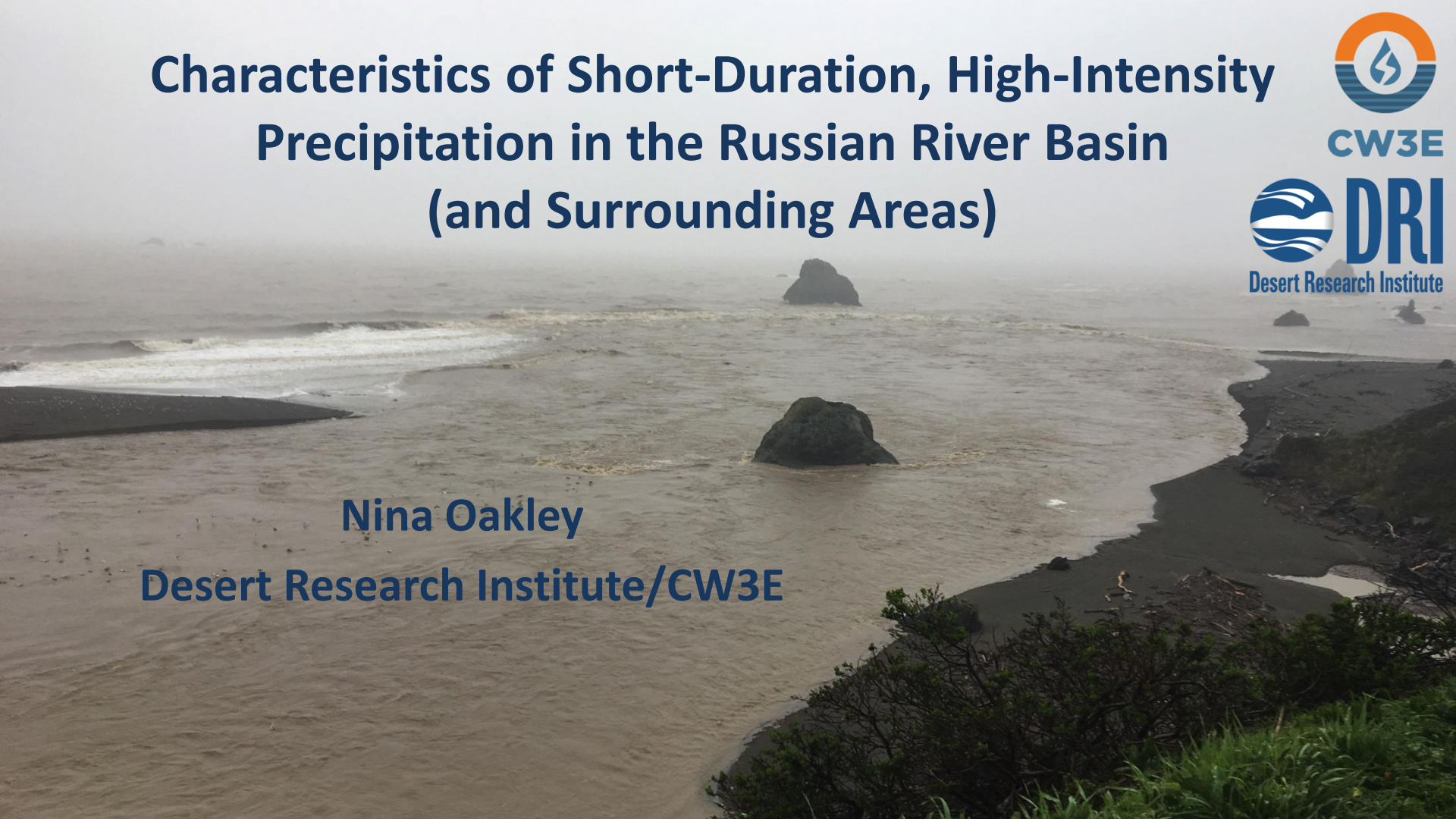
Characteristics of Short-Duration, High-Intensity Precipitation in the Russian River Basin (and Surrounding Areas)



Nina Oakley

Desert Research Institute/CW3E

What is high-intensity precipitation?

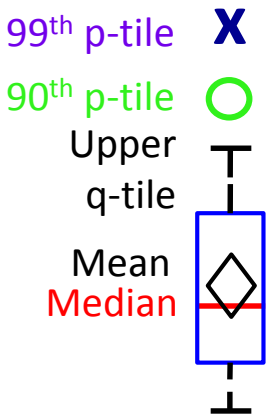
Flash flooding in Sonoma Co.
PC: SF Gate

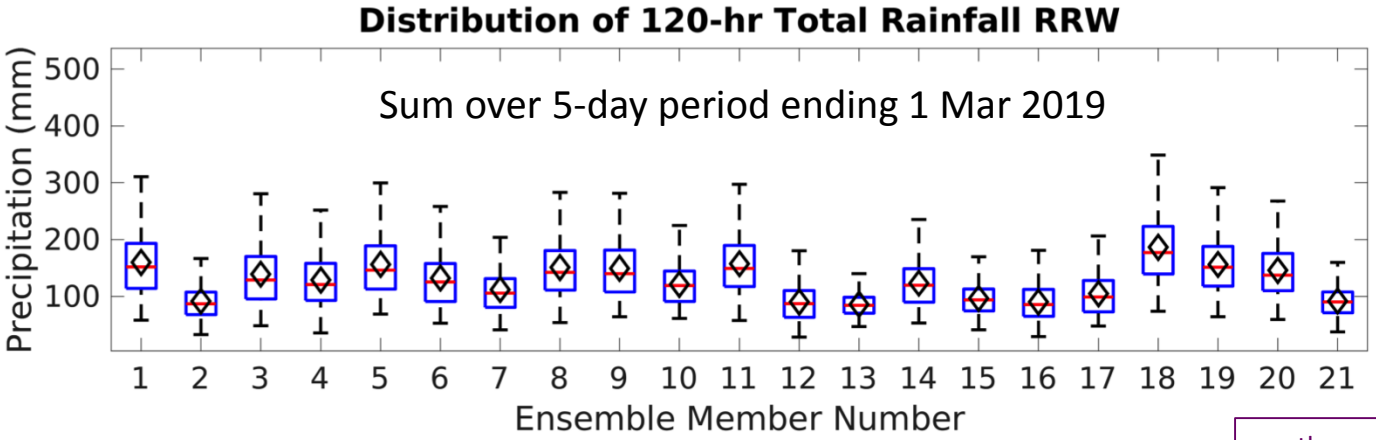
Engineered slope failure in Sonoma Co. after late Feb 2019 storm *PC: Press-Democrat*

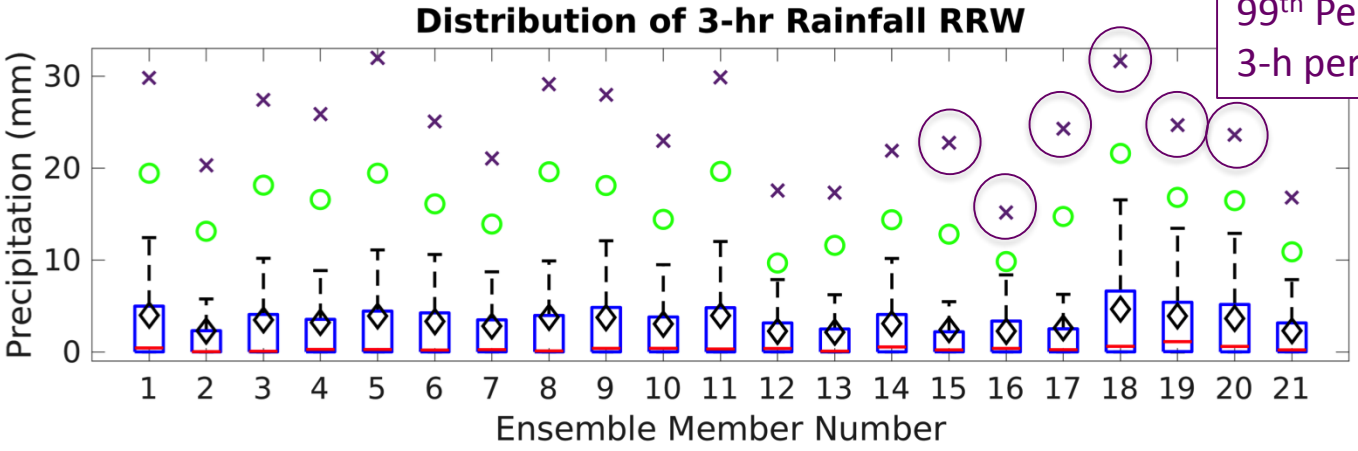
Mendocino Complex burn area

Anecdotally, **0.5 to 1 in h^{-1}** is of consequence

High-intensity precipitation likely impacts QPF





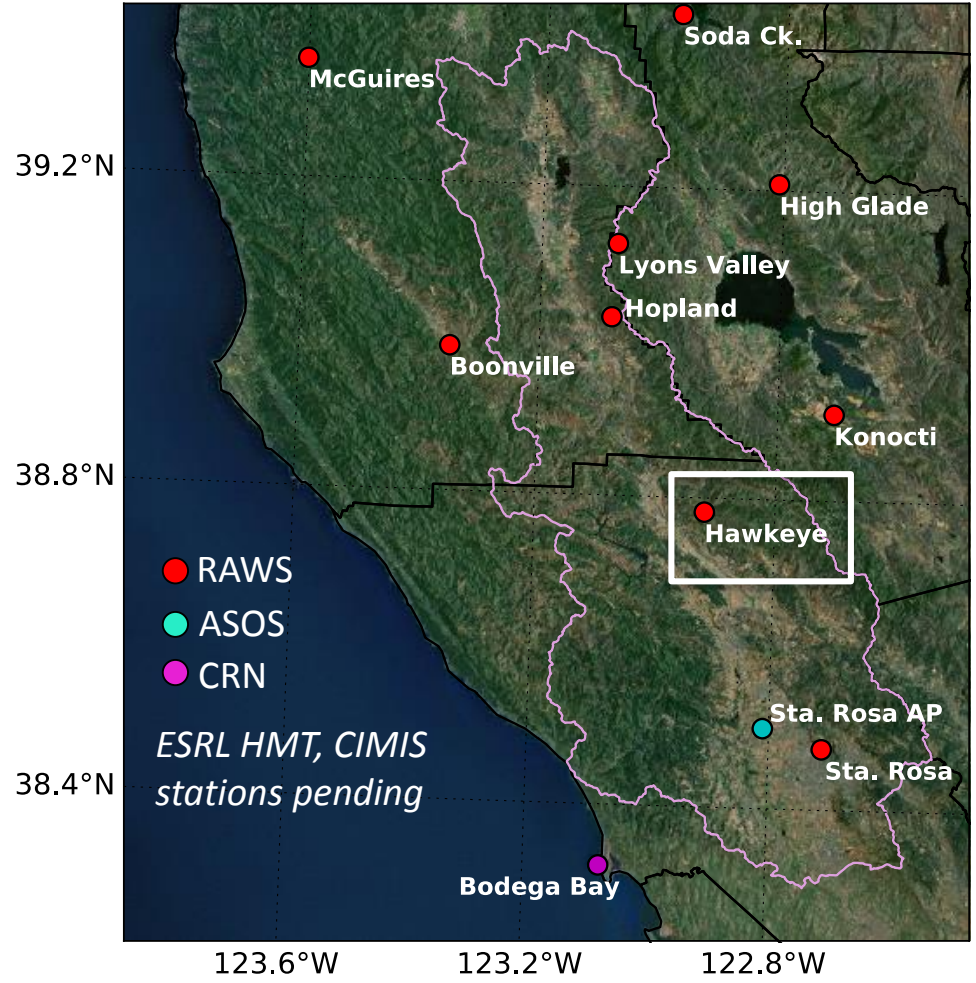


99th Percentile 3-h periods

The highest precipitation intensities are most variable across ensemble members

Figures courtesy Rachel Weihs (see her poster this afternoon)

A Precipitation Data Quest

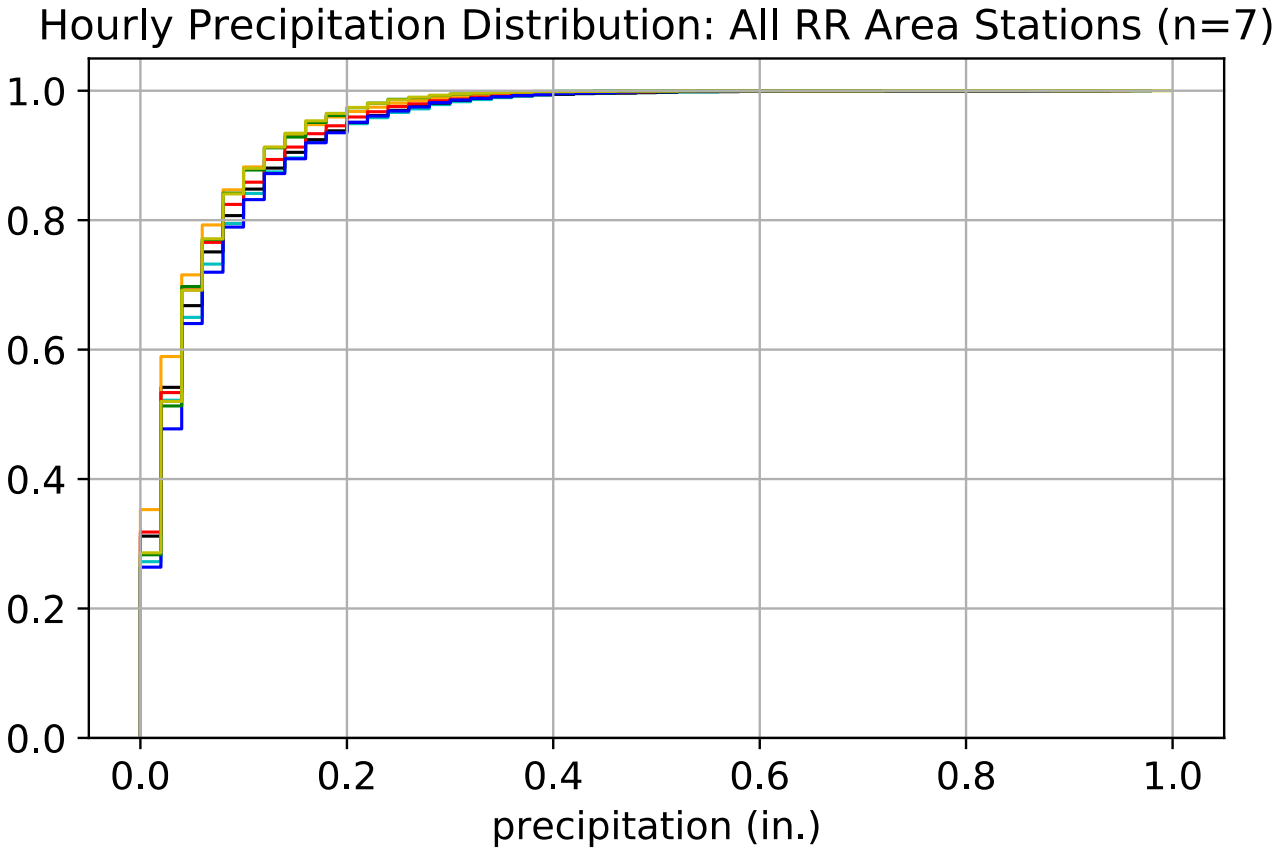


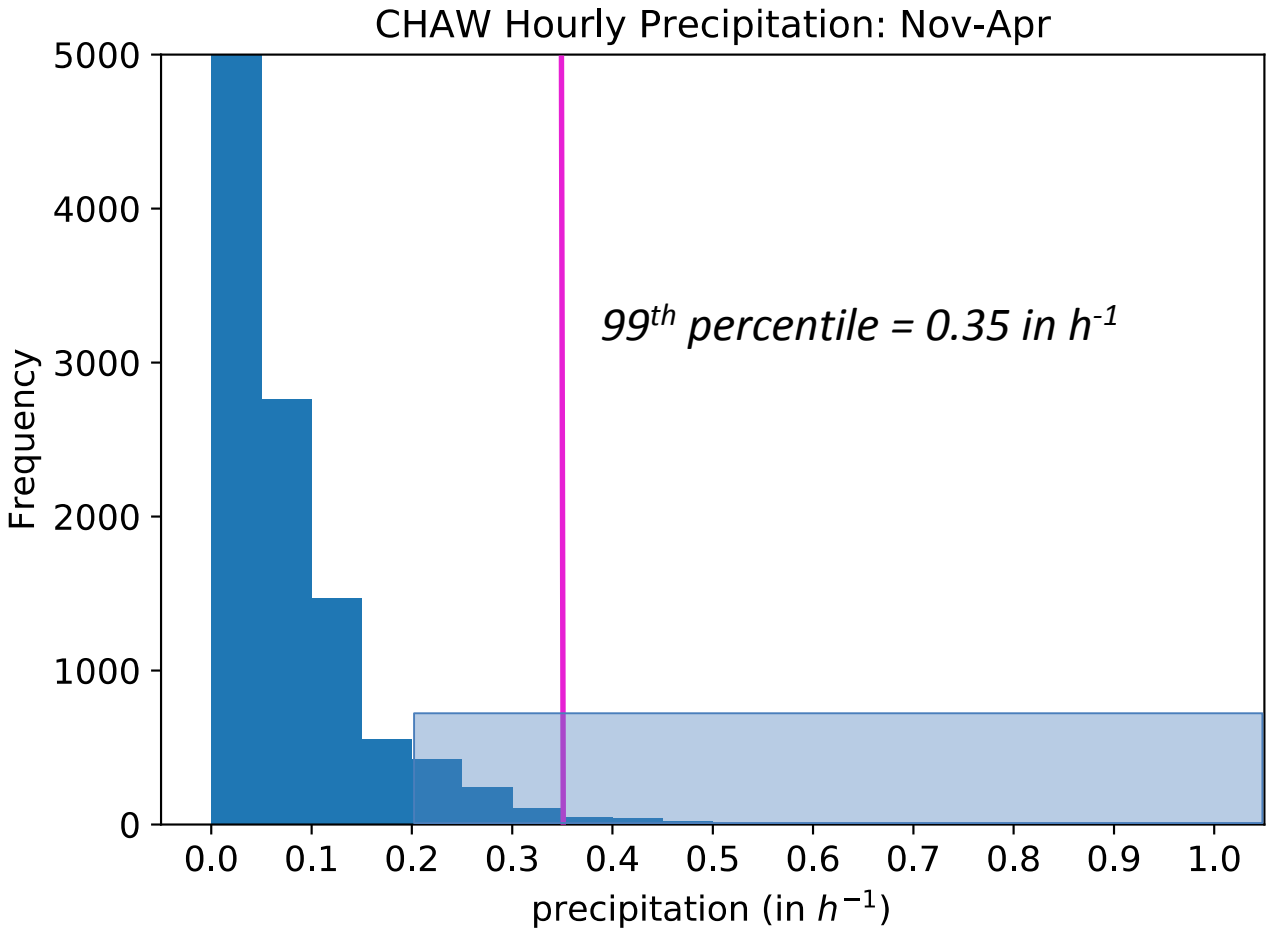
>15 years of hourly data >80% complete

Period of Record Hourly Distribution (Nov-Apr)

Finding: Similar distribution across stations in region.

More than 90% of observations < 0.2 in h^{-1}.





Period of Record Hourly Distribution

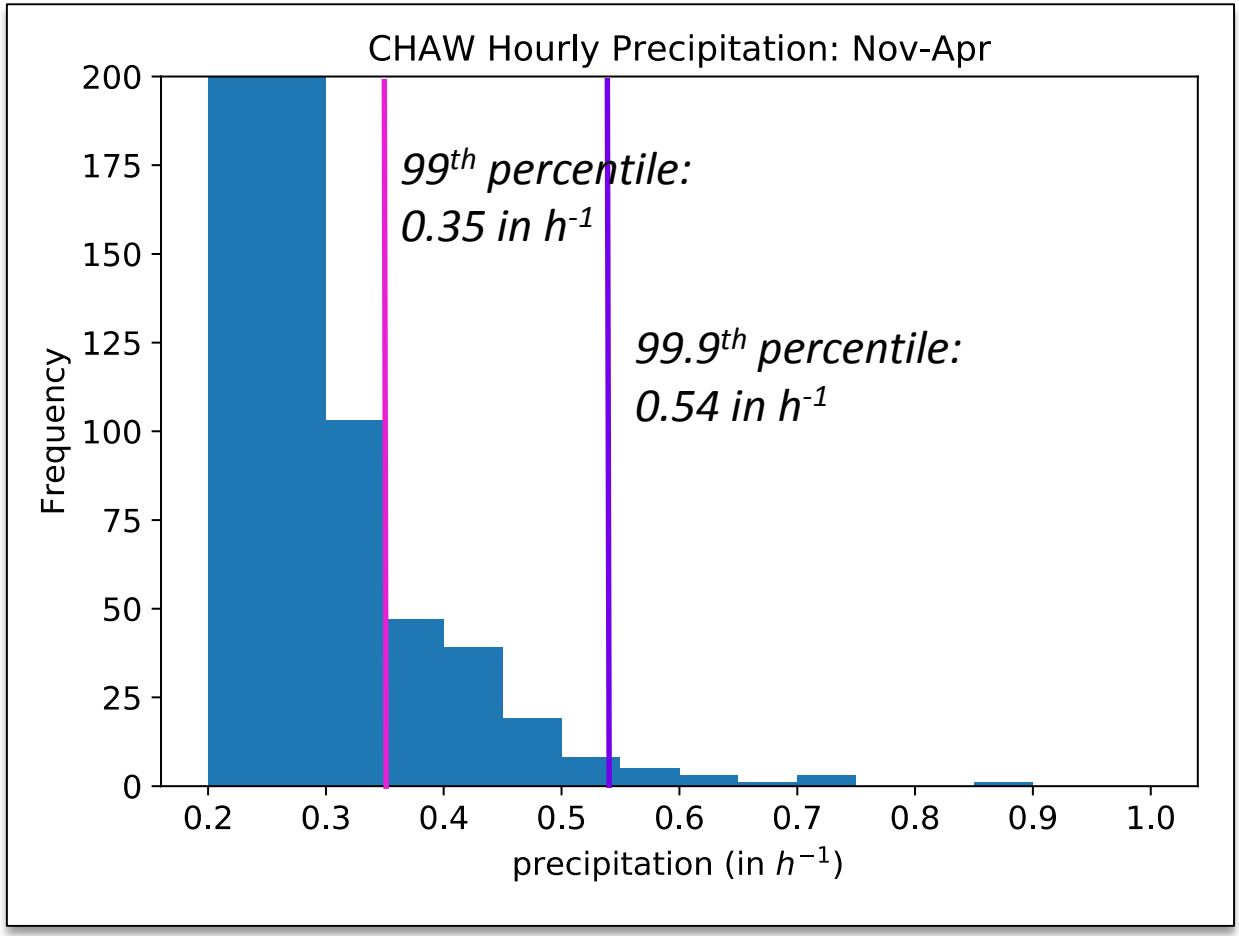
Hawkeye (CHAW) RAWS
Elev. 2000 ft., ~25 yrs. data

Period of Record Hourly Distribution

Hawkeye (CHAW) RAWS
Elev. 2000 ft., ~25 yrs data

Finding: The 0.5 in h^{-1} anecdotal threshold of interest is slightly less than 99.9th percentile.

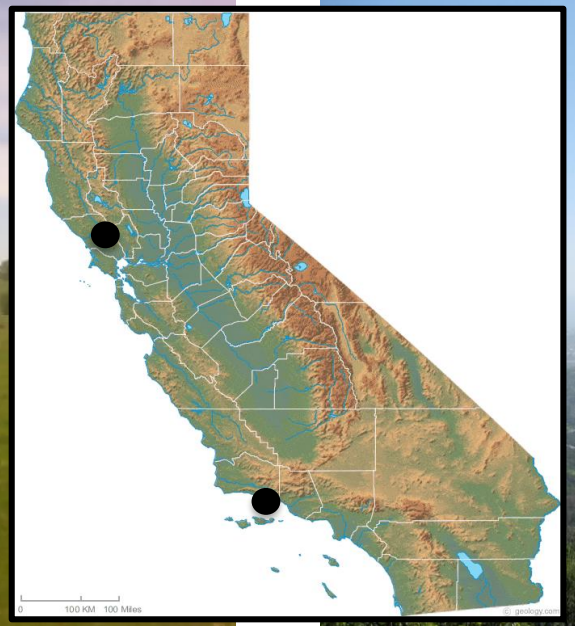
Note: previous work suggests that these extremes are generally associated with ARs.



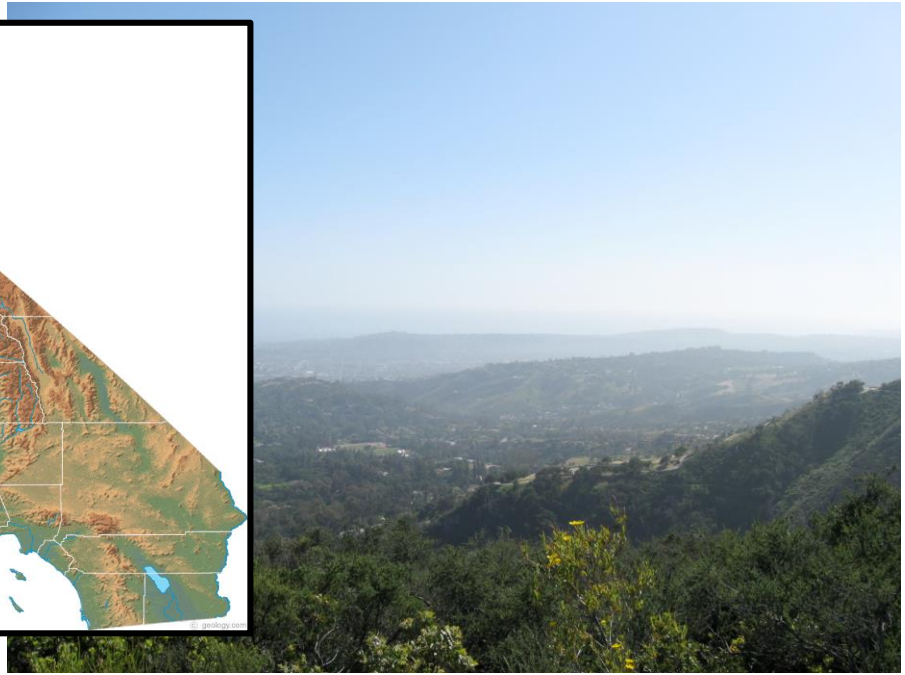
Comparison to Southern California (Nov-Apr)

Russian R. Watershed (Northern CA)

Looking West from Hawkeye RAWS
2000 ft



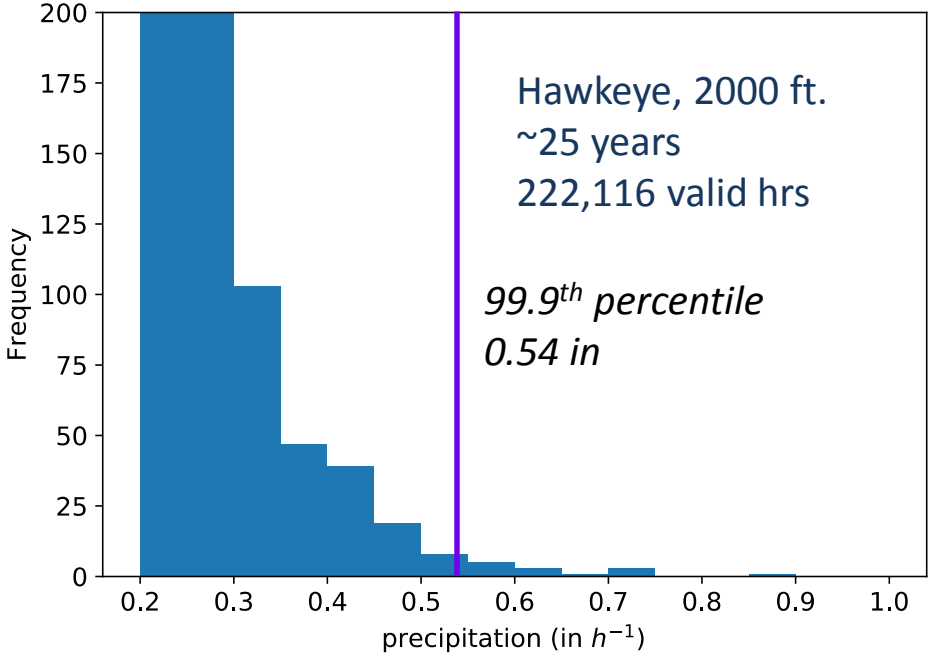
Transverse Ranges (Southern CA)



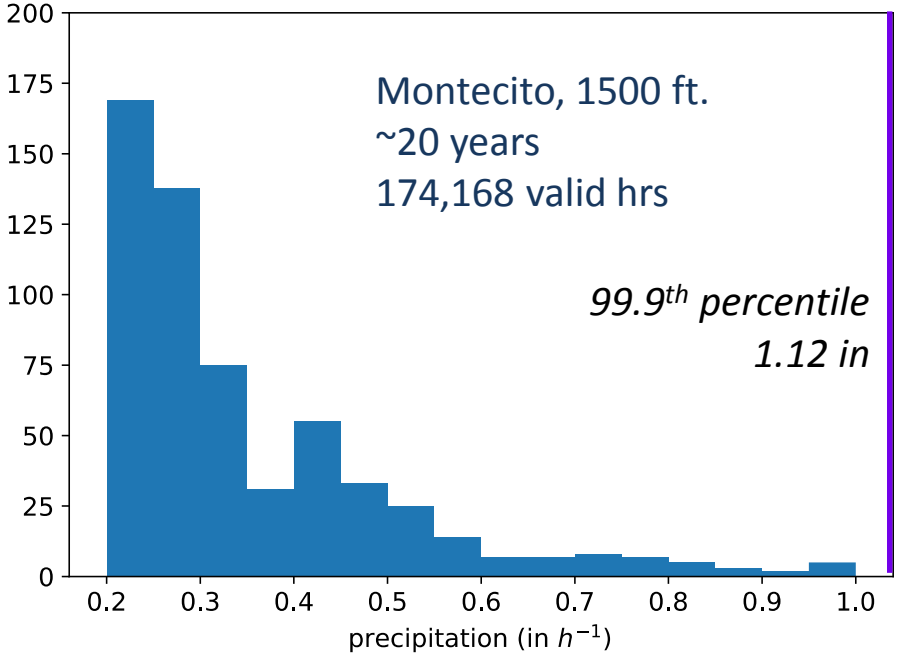
Looking West from Montecito RAWS
1500 ft

Comparison to Southern California (Nov-Apr)

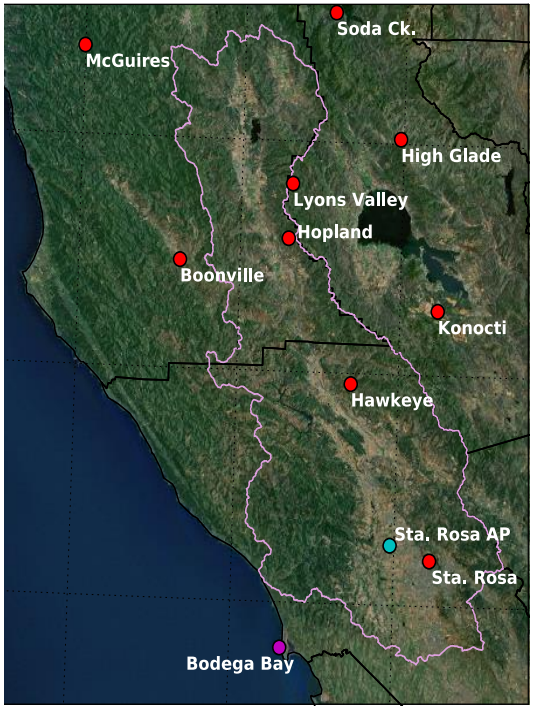
Russian R. Watershed (Northern CA)

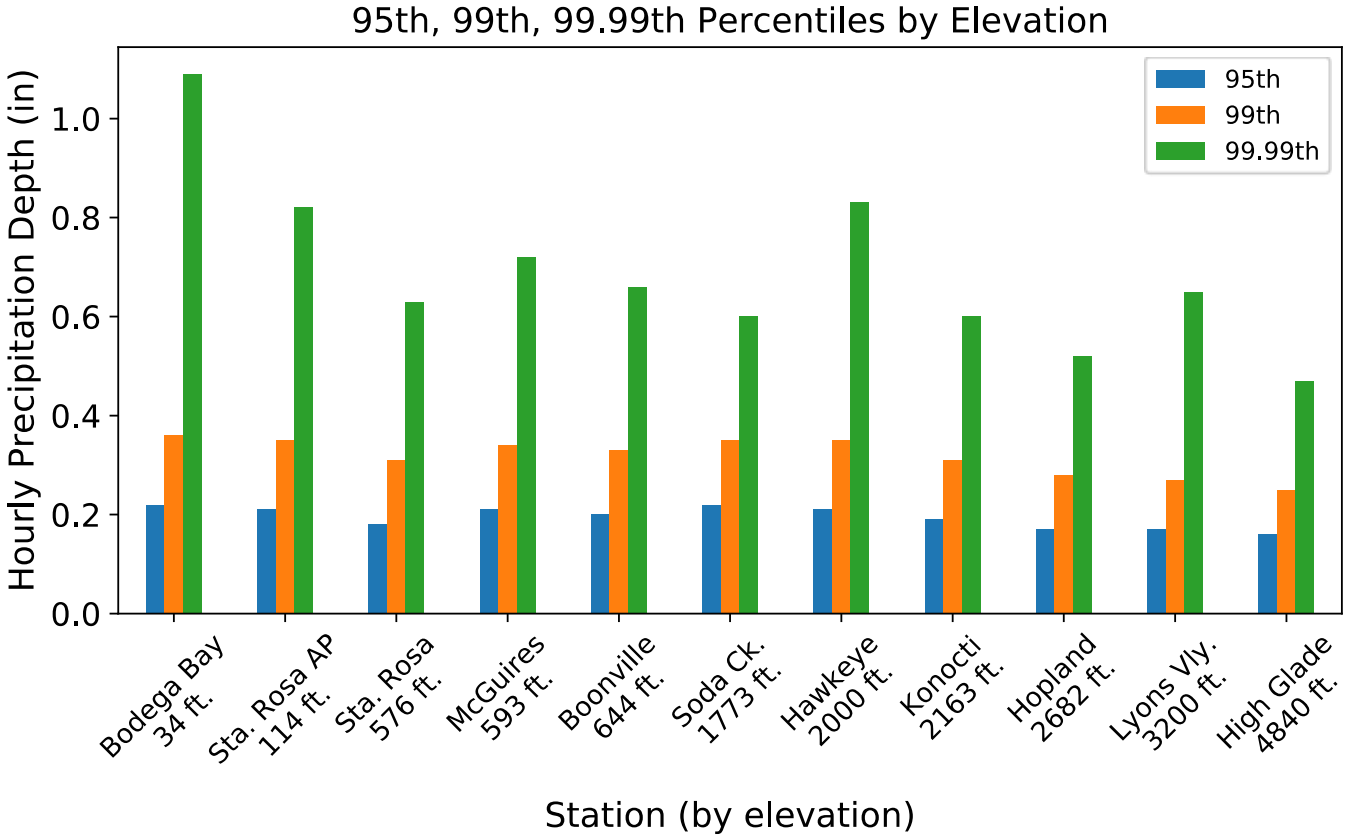


Transverse Ranges (Southern CA)



Finding: It rains more frequently at low intensity in RRB, but heavier tail/more extreme hourly intensities in S. CA. May affect likelihood of some hazards.

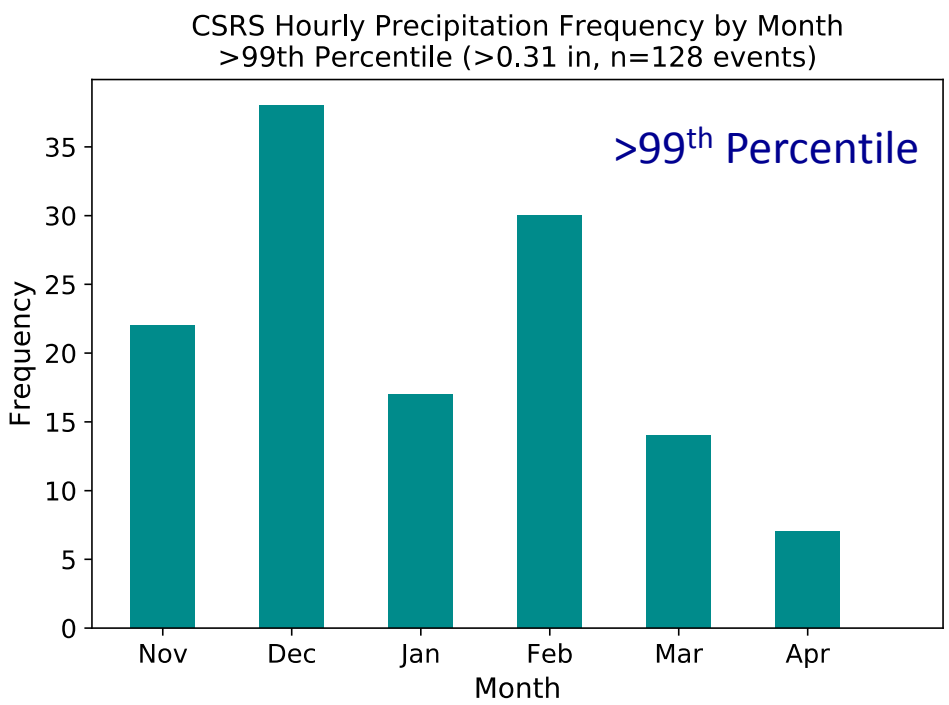


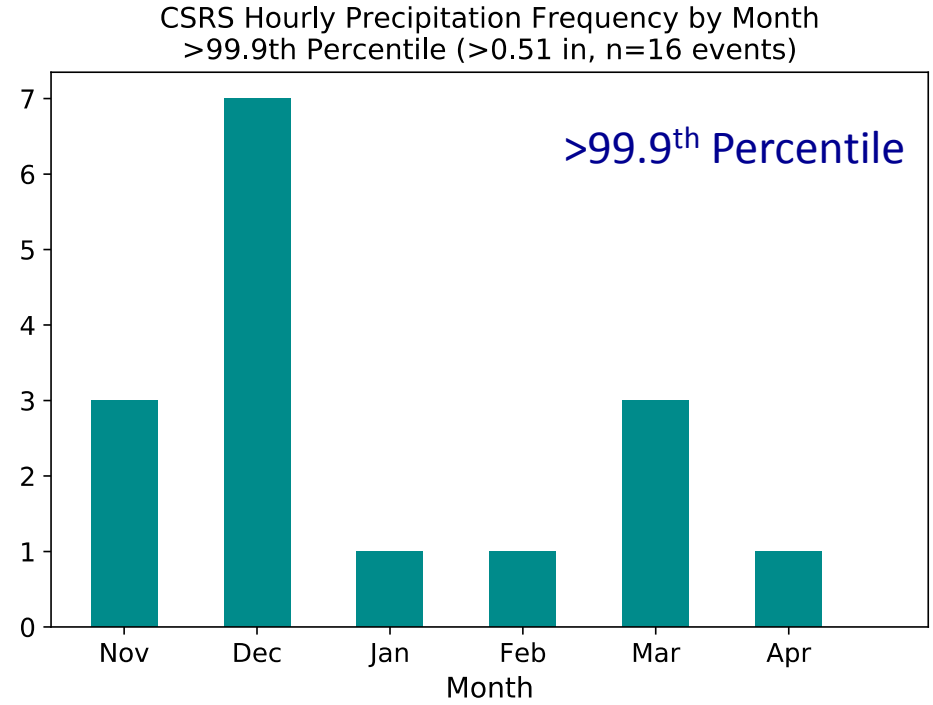


Finding: Little variance by elevation. Slightly lower values at higher elevations (which are also further inland).

Hourly extremes by month

Santa Rosa RAWS (576 ft.)





Finding: With few exceptions, >99th percentile events are most common in December. This is also the climatological wettest month of the year at most RRW locations.

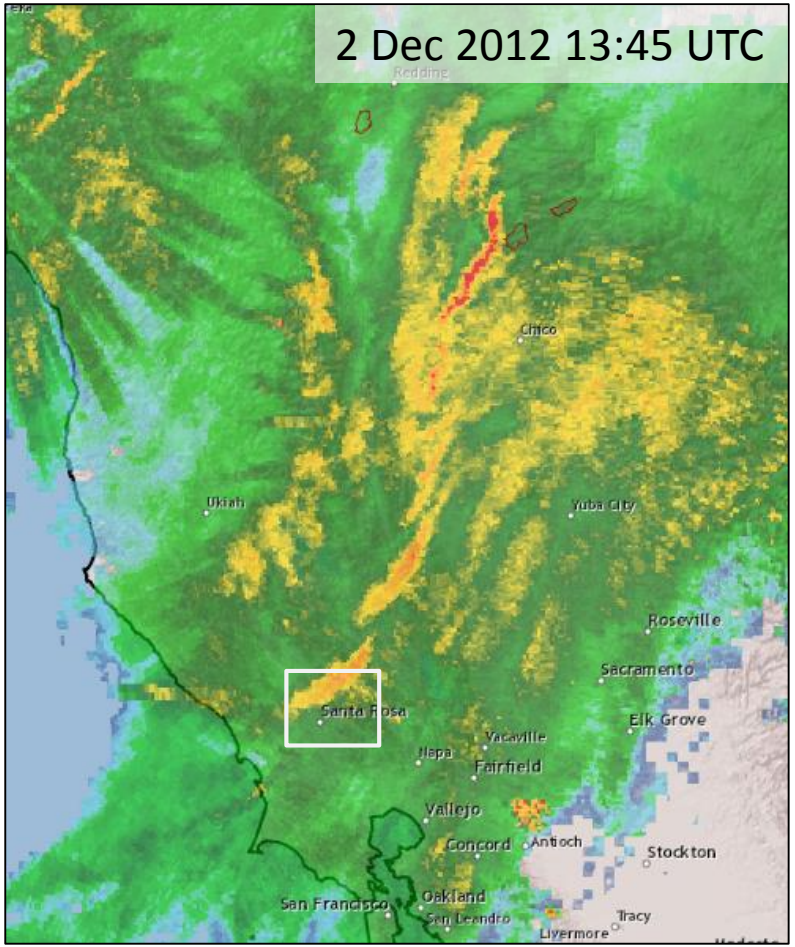
Conclusions

- Preliminary results on hourly precipitation characteristics
- Anecdotally, impactful precipitation is ~0.5 to 1 in h^{-1}
- May contribute to QPF uncertainty
- RRW distribution distinct from S. CA: More light precip days, fewer extremes
- Little variance in frequency of extremes by elevation
- Hourly extremes tend to occur in December (wettest month)

Flooded road near Guerneville, 27 Feb 2019

Next Steps: Atmospheric Characteristics and Modeling

- With *WRF-Reforecast* and other info, evaluate storm characteristics
- Spatial extent and evolution of features
- Compare WRF-reforecast hourly precipitation distribution to station observations
- Assess under what hourly characteristics do models over/underestimate event precipitation



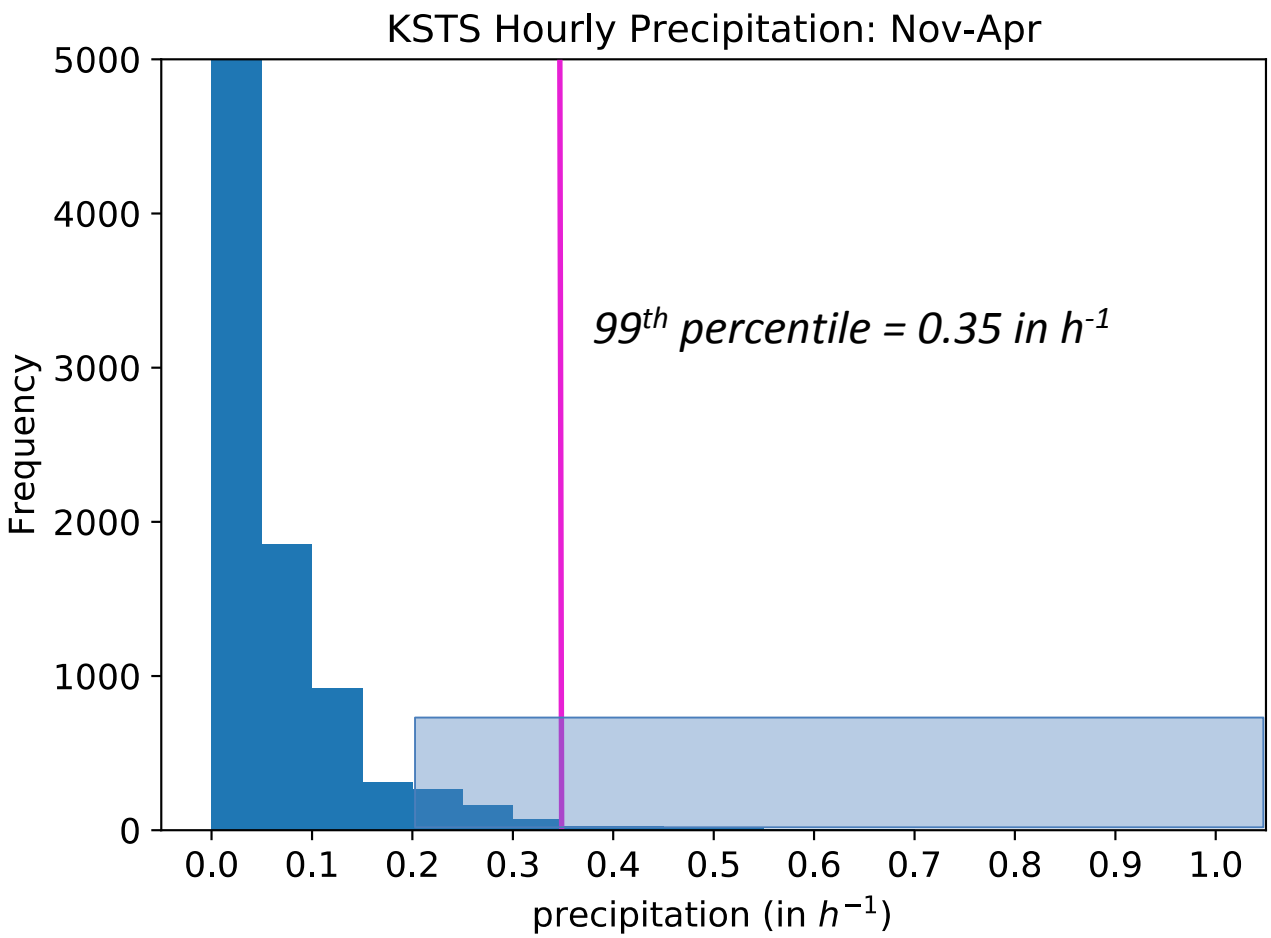
KSTS highest cool season hourly observation on record: 0.87 in h^{-1}

Extra Slides

Compared to Atlas 14

Station	Elev. (ft)	99.9 p-tile	# Years	60 min ARI ~0.5 in	# times >1y ARI in record cool (all)	60 min ARI ~1.0 in	# times >10y ARI in record cool (all)
KSTS	118	0.59	19	0.57, 1y.	12 (12)	0.99, 10y.	0 (0)
McGuires	593	0.5	29	0.48, 1y.	8 (13)	0.95, 10y.	0 (0)
Hawkeye	2000	0.54	25	0.53, 1y.	16 (18)	0.96, 10y.	1 (1)
Hopland	2682	0.39	17	0.47, 1y.	2 (3)	0.96, 25y.	0 (0) *25y

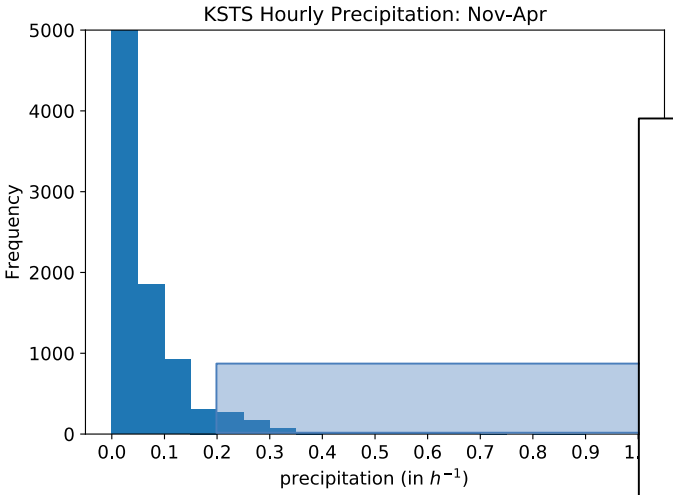
Finding: Events exceeding thresholds of interest occur less frequently than suggested by Atlas 14 ARIs. Caveat: Summer not well QCd, stations have some incomplete data.

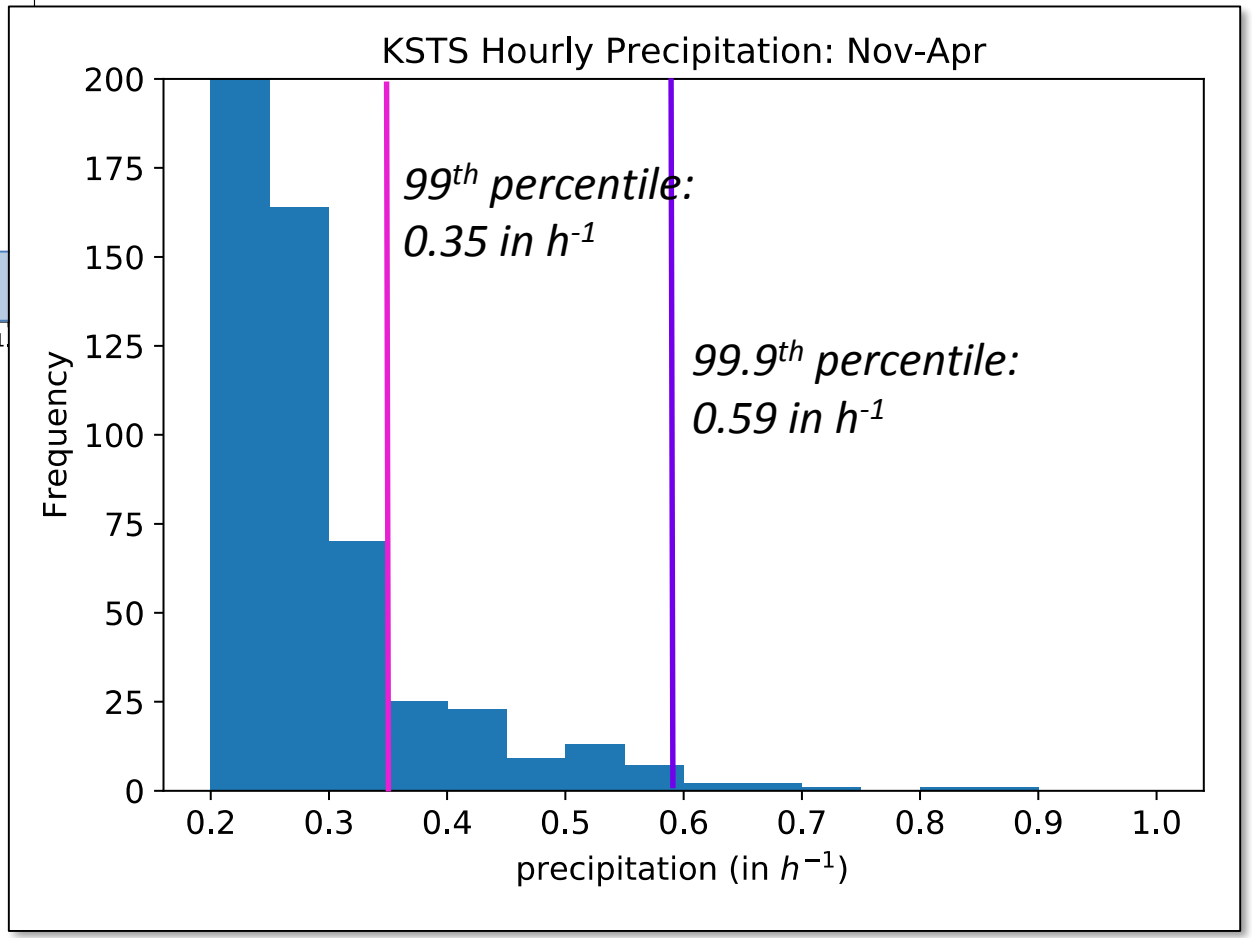


Period of Record Hourly Distribution

Santa Rosa AP (KSTS)
Elev. 114 ft., ~19 yrs. data

Period of Record Hourly Distribution



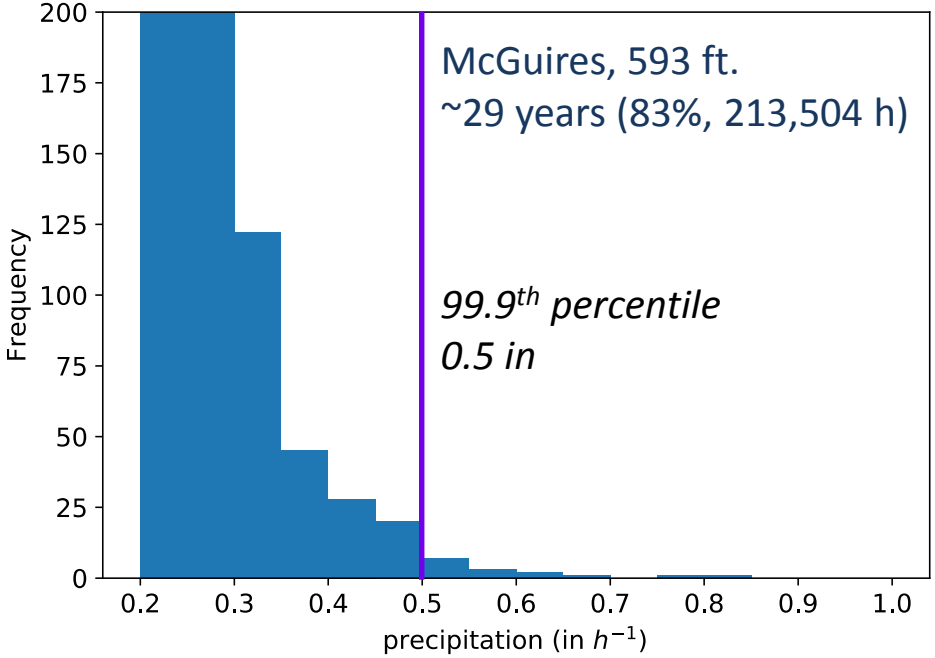


Santa Rosa AP
Elev. 114 ft., ~19 yrs data

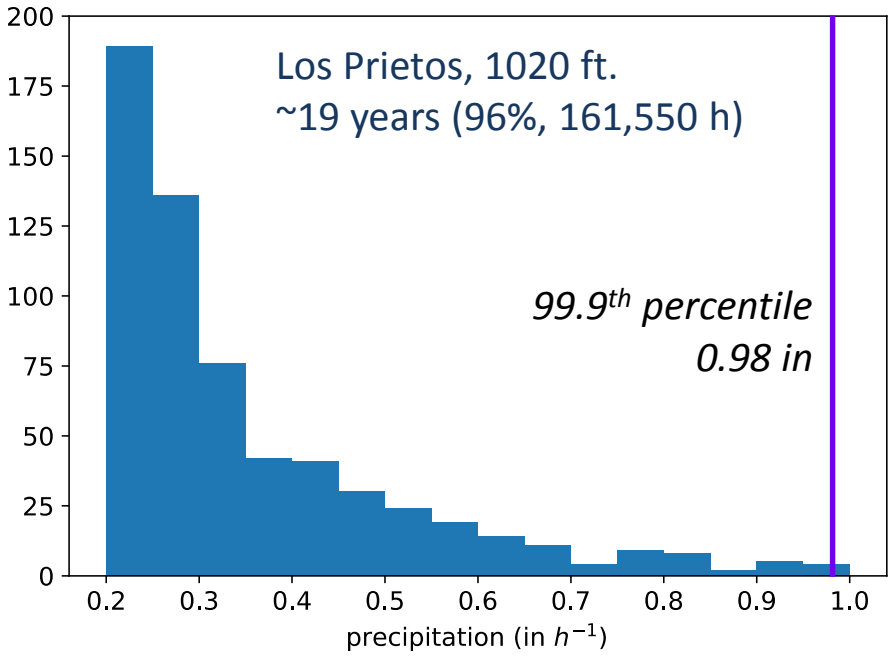
Our 0.5 in h^{-1} anecdotal threshold of interest is slightly less than 99.9th percentile.

Comparison to Southern California

Near Russian R. (Northern CA)

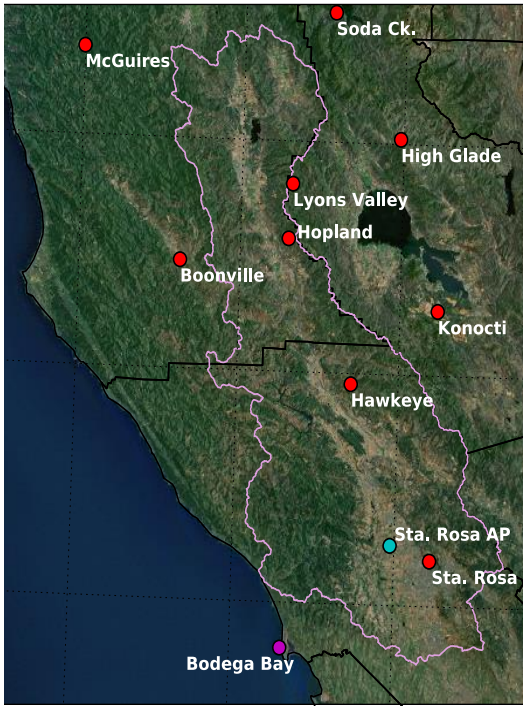


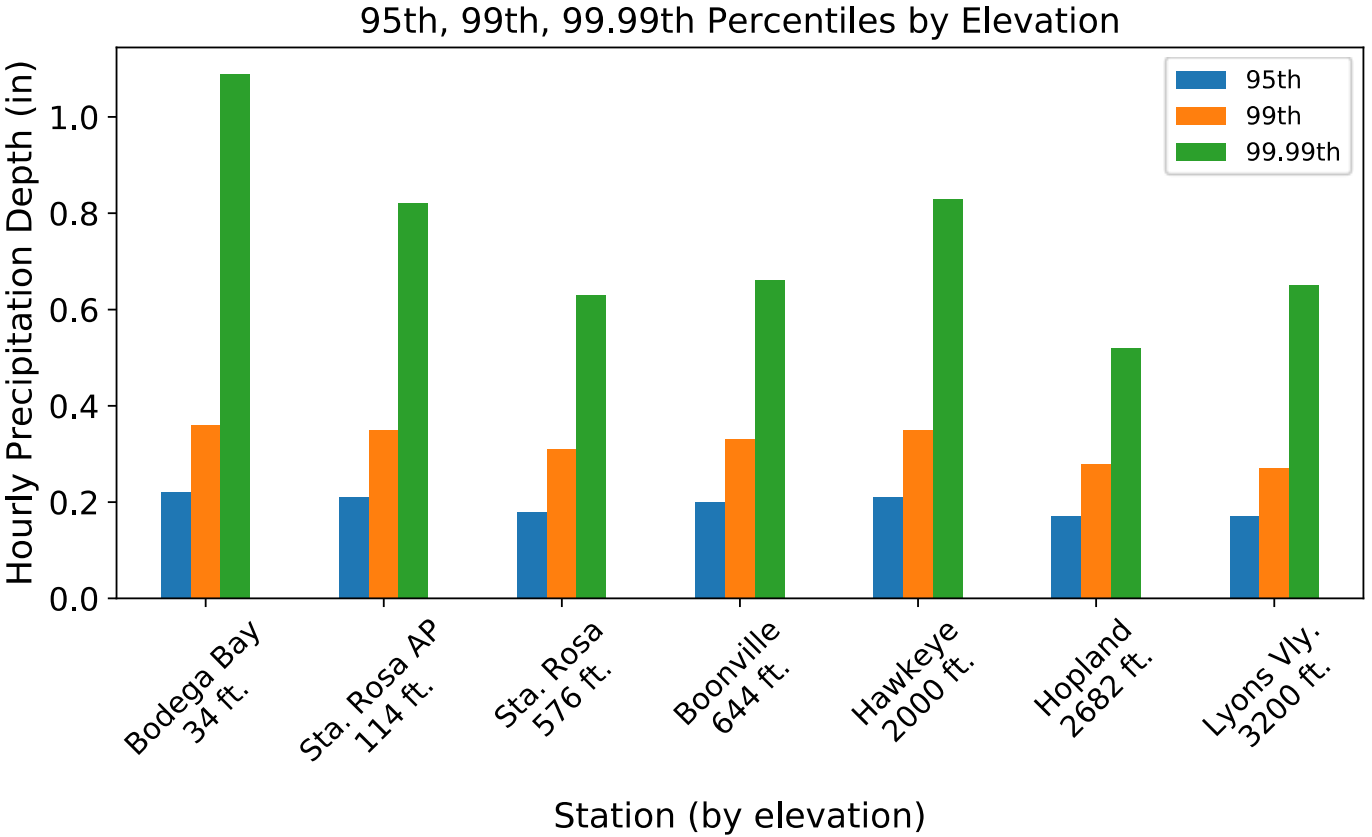
Transverse Ranges (Southern CA)



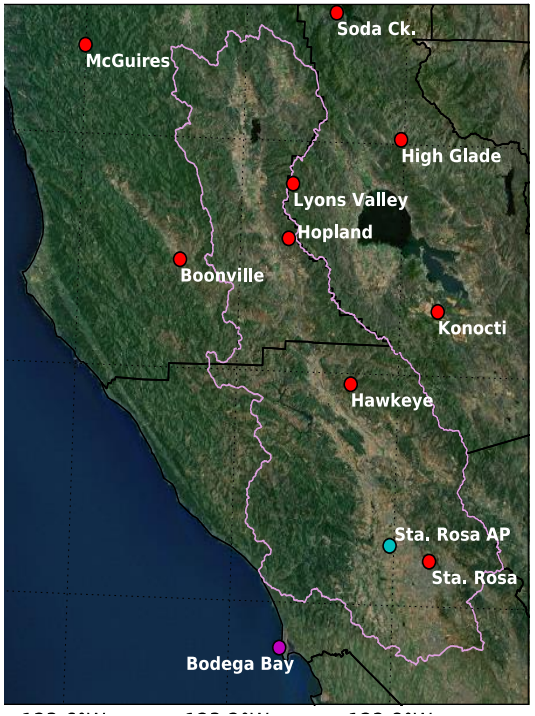
Conclusion: It rains more frequently at low intensity in RRB, but heavier tail/more extreme hourly intensities in S. CA.

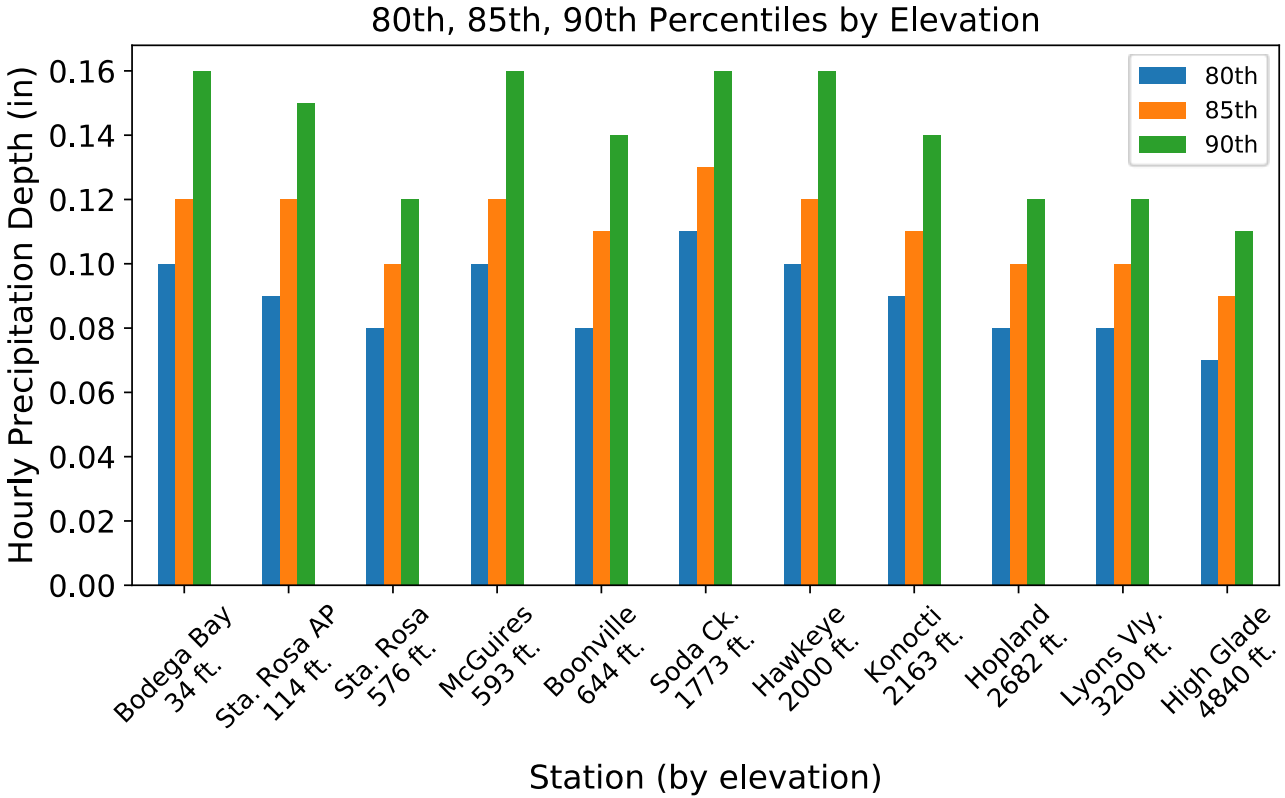
Basin/Coastal Stations





Conclusion: Little variance by elevation. Slightly lower values at higher elevations (which are also further inland).





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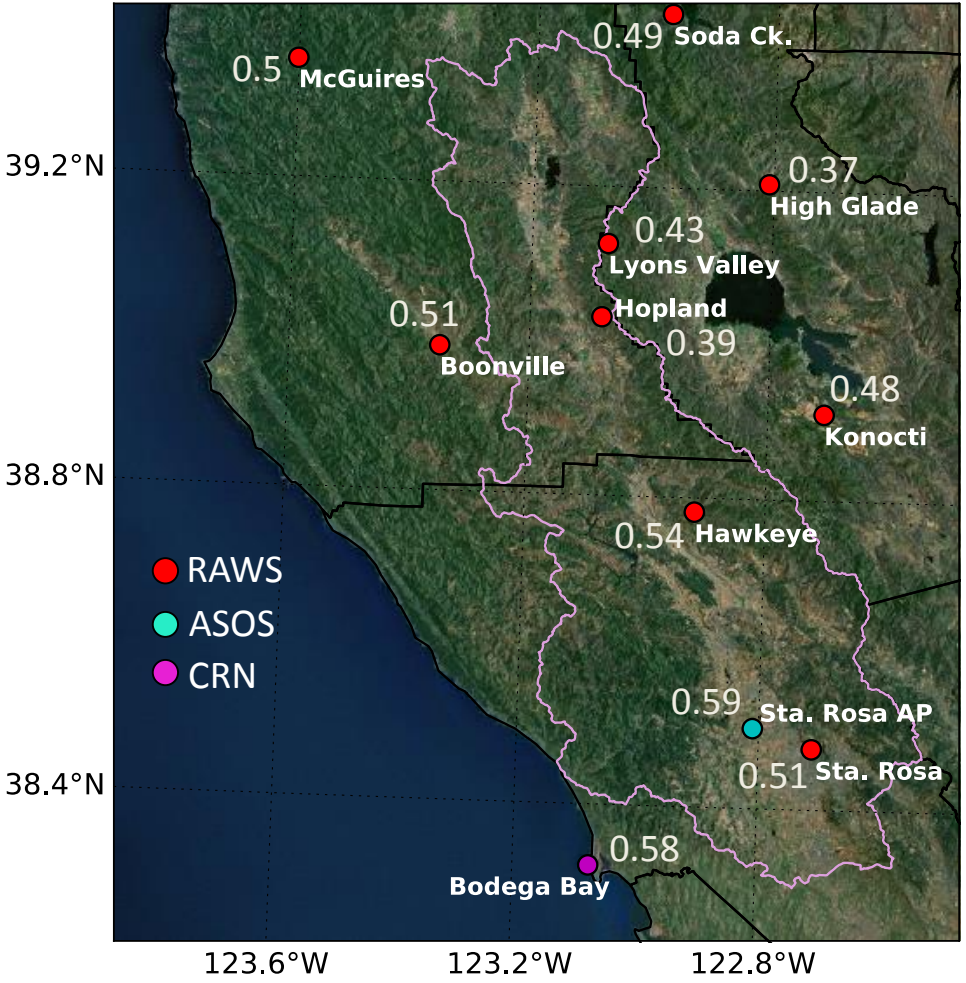

99.9th Percentile Spatially

Finding: Extreme percentile values slightly higher with proximity to ocean.