A Comparison Study of Extreme Precipitation from SixRegional Climate Models via Spatial Hierarchical Modeling Part 2

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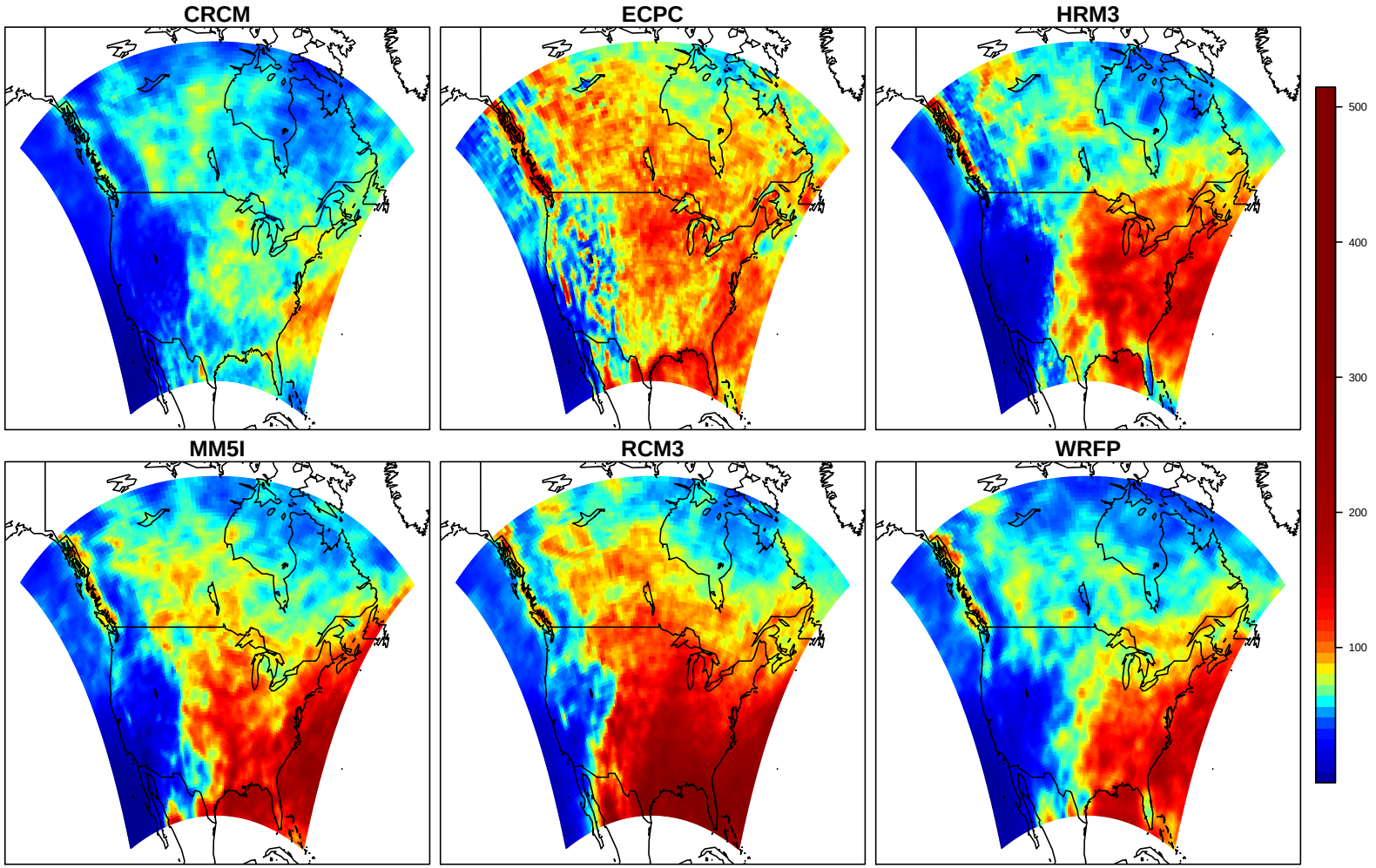
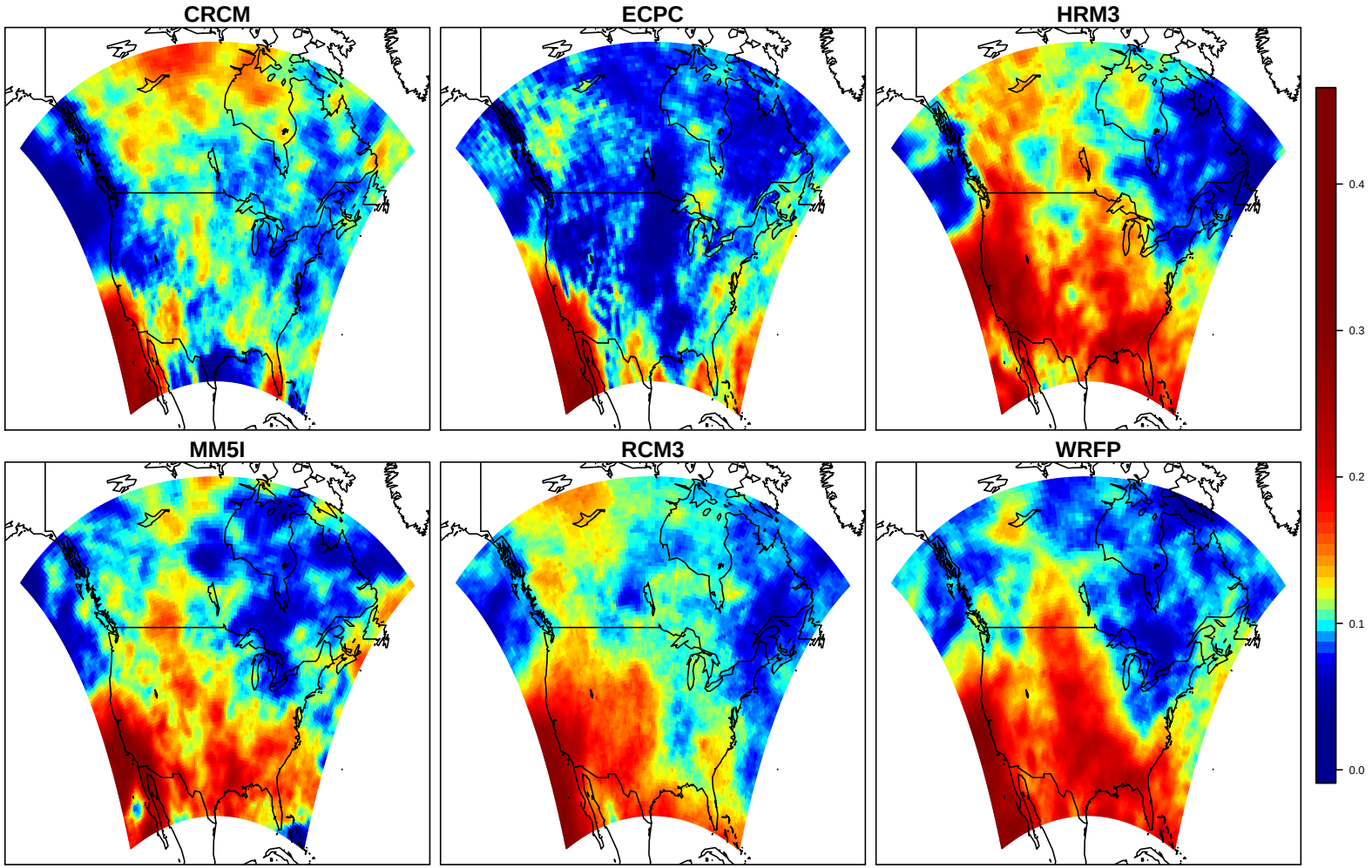
Comparison of Summer 100-year Return Levels

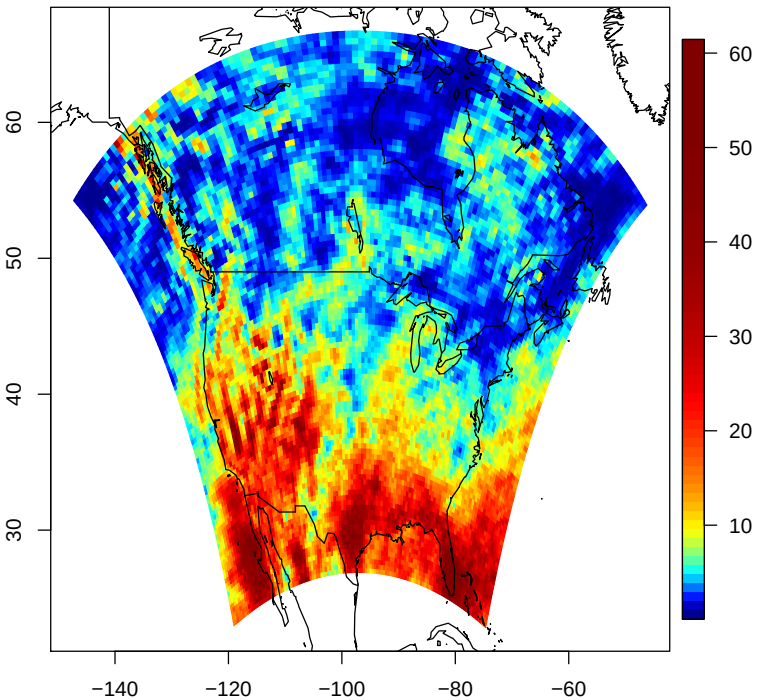


Examining ξ (Summer)

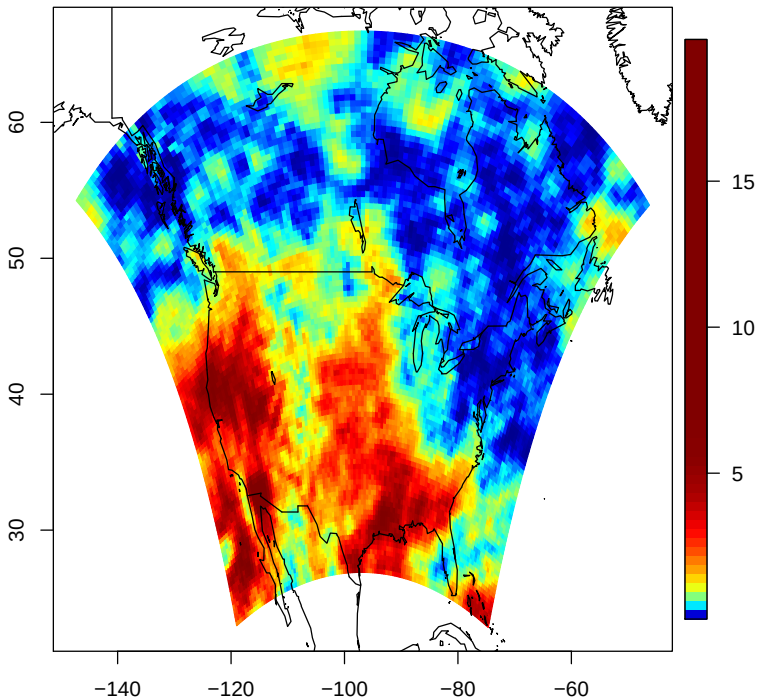


Significance (Summer)

100-year Return Level



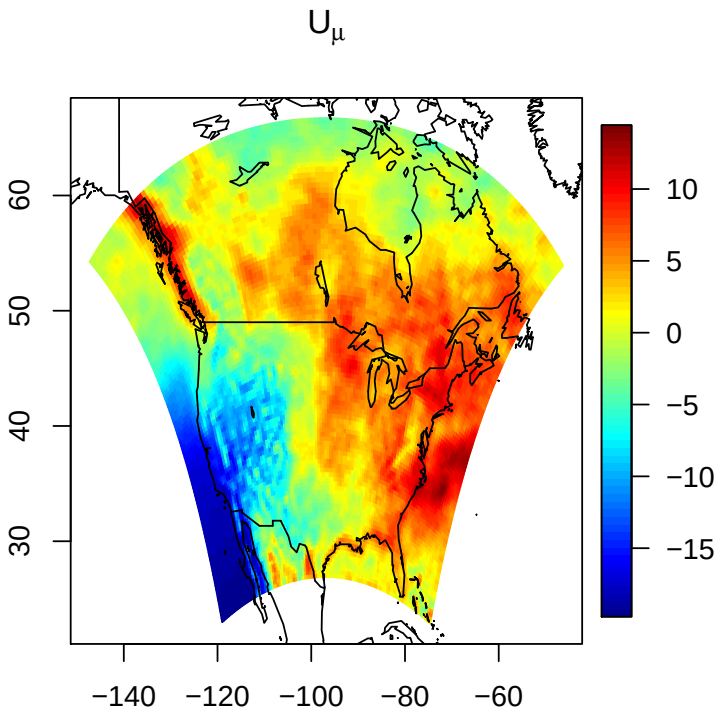
ξ

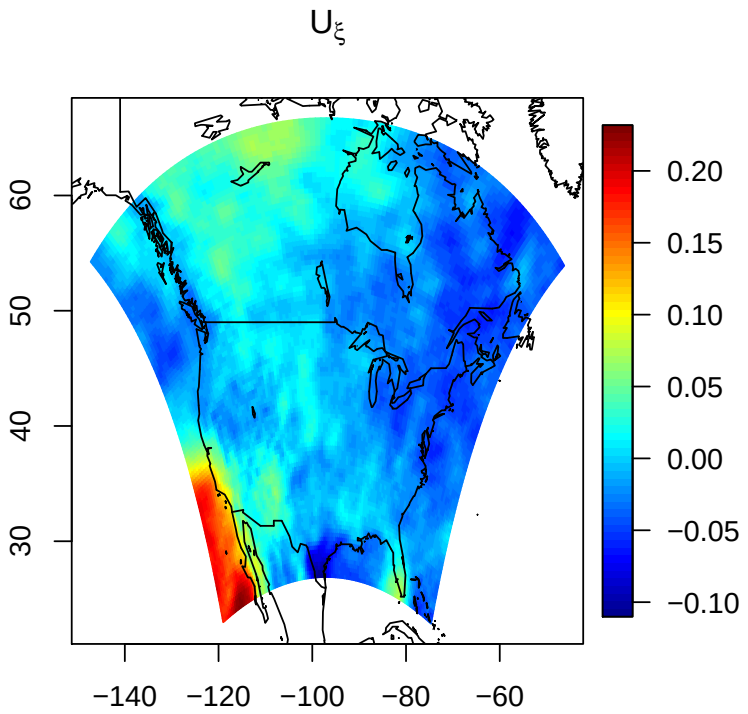


F-test for equality of means, significance level: 2.22

Is the spatial hierarchical model necessary?

CRCM, Summer

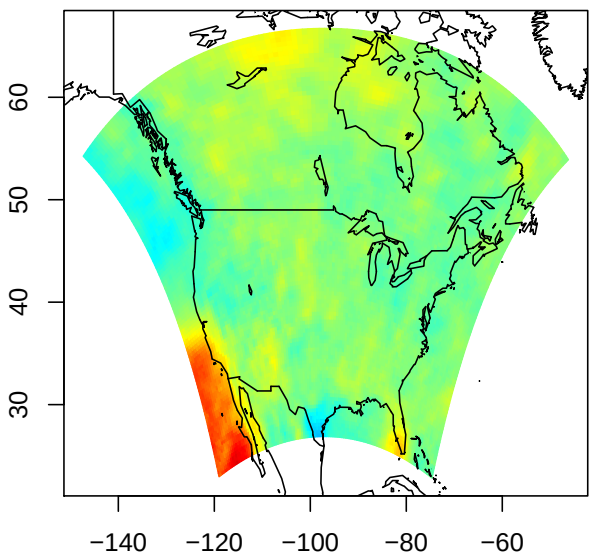




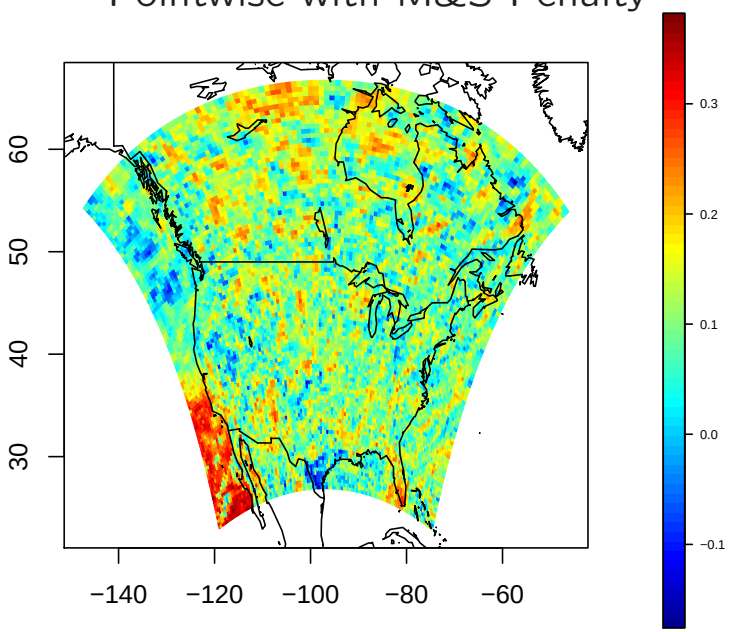
What is the benefit of the spatial hierarchical model?

Estimates for ξ, CRCM Model, Summer

Spatial Hierarchical Model



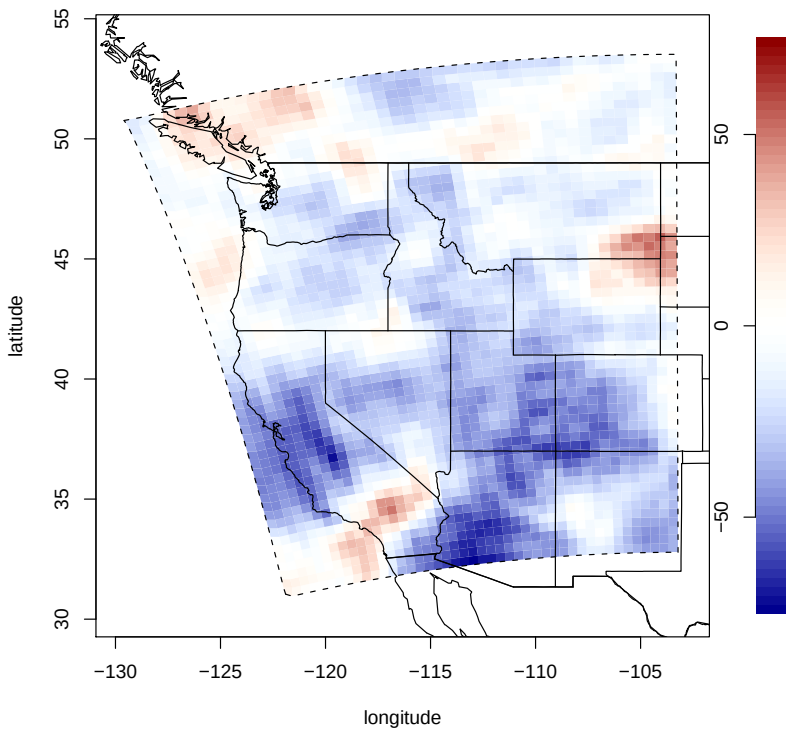
Pointwise with M&S Penalty



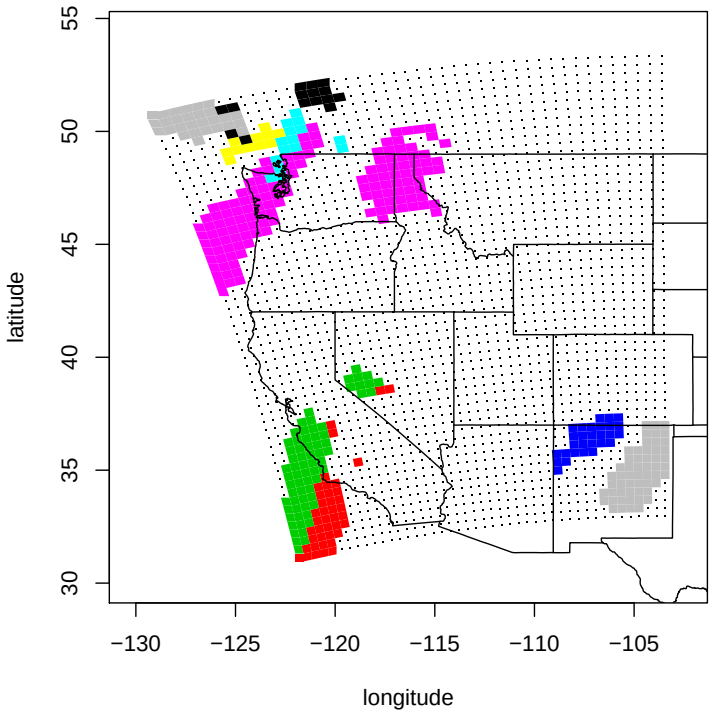
Can this be done for threshold exceedance data?

Yes, Cooley and Sain (2010) built a similar model for exceedances. Compared extreme precip from a control run to those of a future run.

Percent change in 100-year return level



What about conditional independence assumption?



Map shows the spatial extent of several storms in the summer of year 1 of the control run.

What about conditional independence assumption?

Can one model the spatial dependence in the *data* as well as the spatial climatological effects captured by the latent process?

Block maximum data:
1. Max-stable process, (Ribatet, Cooley, Davison, 2011)
2. Gaussian copula, (Sang and Gelfand, 2010)

Threshold exceedances:
???

Comparison to Ground Station (Summer)

Summer Estimates for Fort Collins, CO

95% credible intervals

	ξ	100-yr RL
Weather Station[1]	(0.097, 0.144)	(9.01, 12.12)
CRCM	(0.040, 0.158)	(3.91, 5.63)
ECPC	(0.029, 0.145)	(6.70, 10.18)
HRM3	(0.080, 0.199)	(5.22, 8.40)
MM5I	(0.102, 0.224)	(6.76, 10.61)
RCM3	(0.100, 0.207)	(10.19, 15.52)
WRFP	(0.130, 0.240)	(3.54, 5.66)

[1] Weather station estimates from Cooley et al. (2007).

Model Evaluation...and What About Impacts?

Model Evaluation: How does one 'score' tail behavior? I think straight comparisons to observations are probably silly.

But models did seem to produce tail parameter estimates, $\hat{\xi}$, similar to observations. RCM's are producing heavy tails.

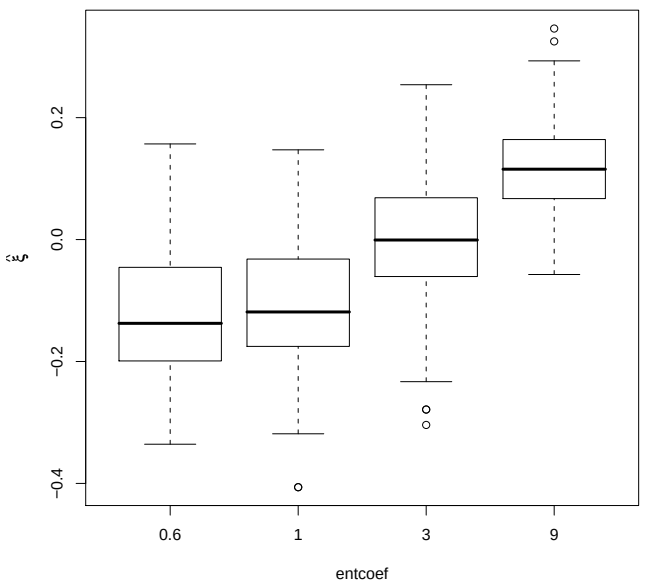
Impacts: I have avoided talking about impacts. Could pose interesting questions now that we have Phase II NARCCAP runs.

- further *statistical* downscaling needed
- need to also describe data dependence (storm effects)

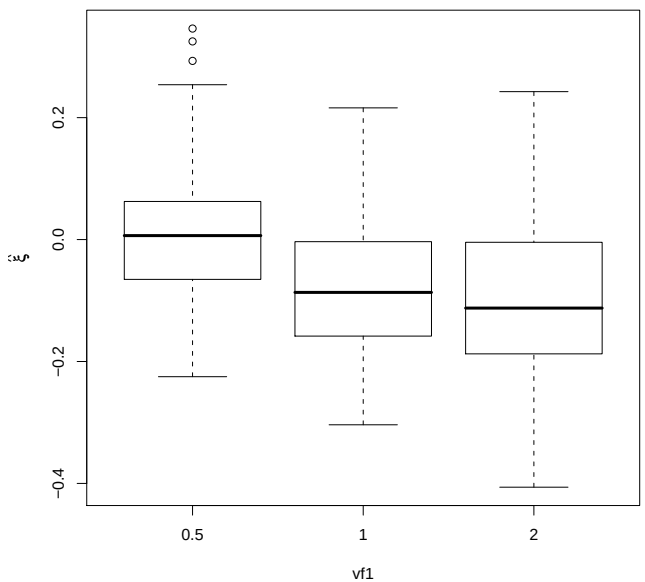
Different Study: Which parameters affect ξ?

Fowler et al. (2010) investigated 34 model parameters in the ClimatePrediction.net to see which affected the estimated value of ξ.

Entrainment Coefficient



Ice Fall Speed



UQ Program Working Groups

Rare events one of the five primary themes of UQ Program

- 'rare events' means different things to different communities-methods workshop to examine several perspectives
- are there new areas where EVA is appropriate/useful?
- climate/weather extremes: large scale indicators, conditional modeling, downscaling, model evaluation, extreme phenomena that aren't nicely described by theory (e.g., heat waves), multivariate analyses
- extremes theoretical/methodological development: dependence (temporal, spatial, multiple component), asymptotic dependence and independence and models

References

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