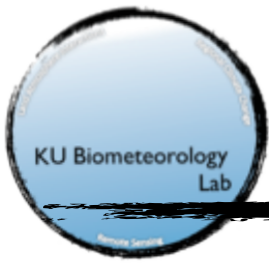


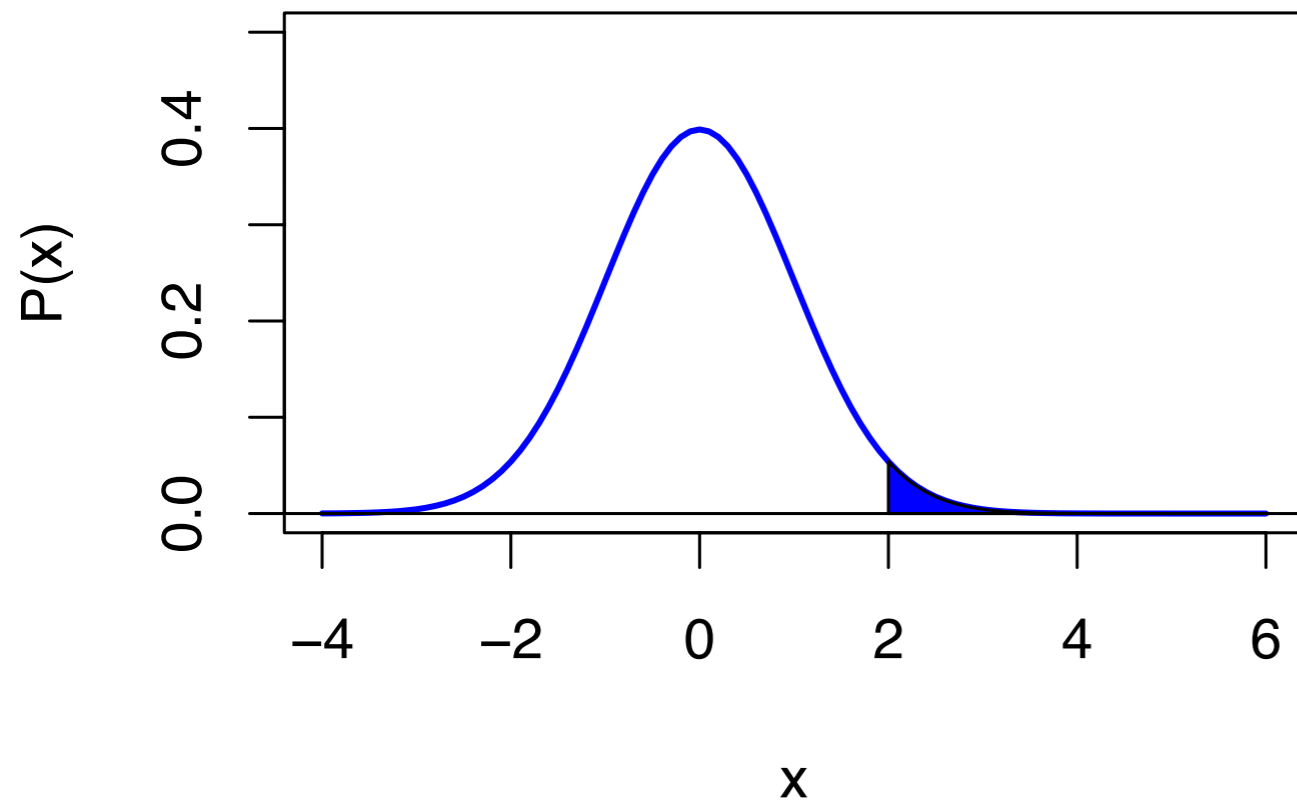
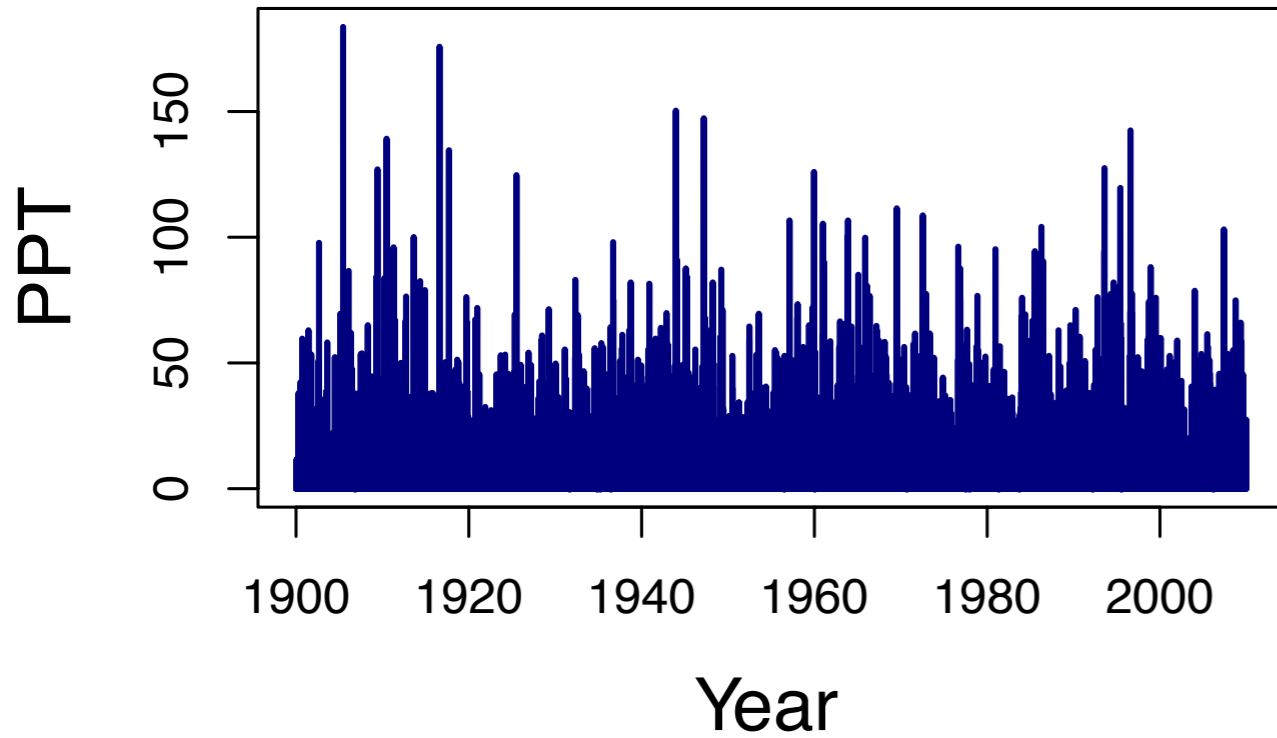
Assessing regional scale variability in North American extreme weather events

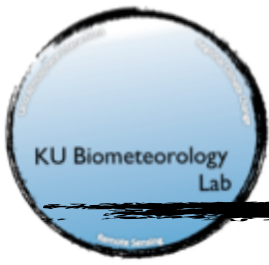
N. A. Brunsell, C. J. Wilson, and D. B. Mechem
Dept. of Geography, University of Kansas



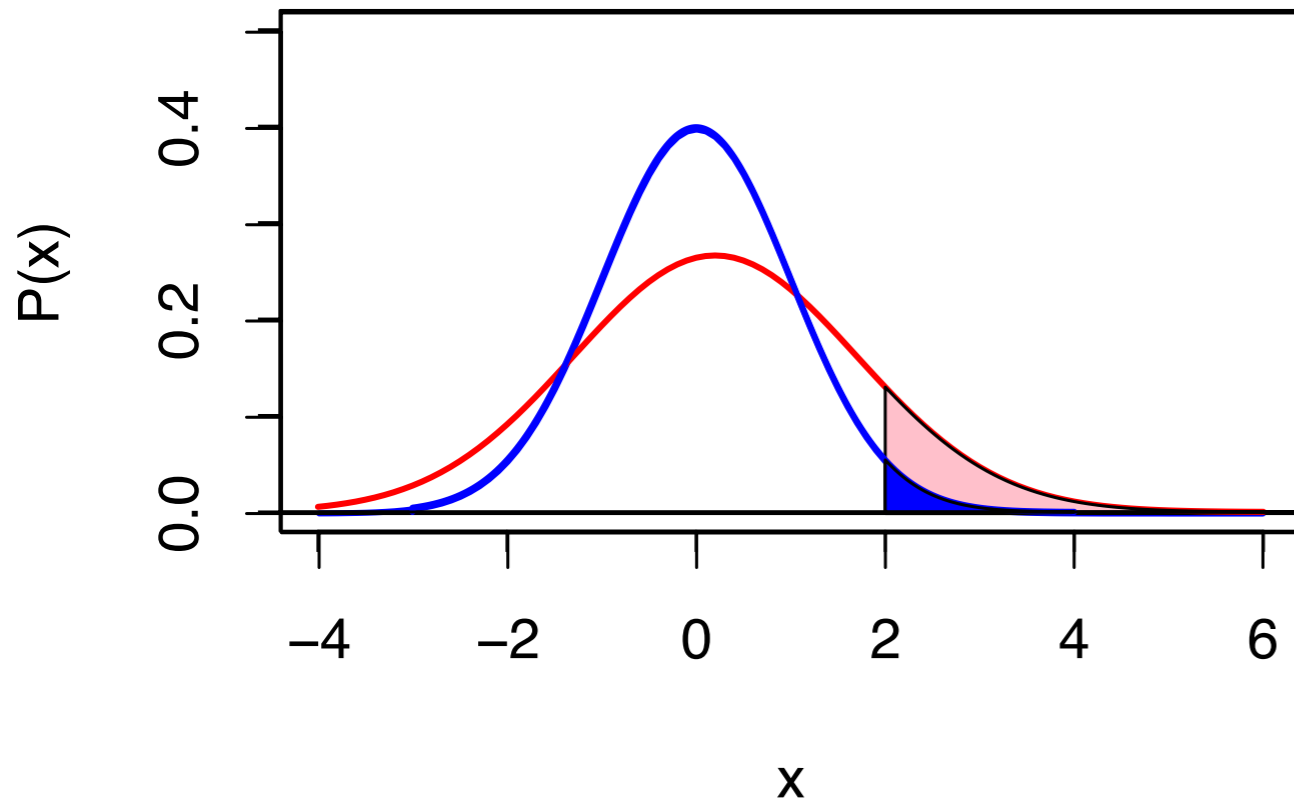
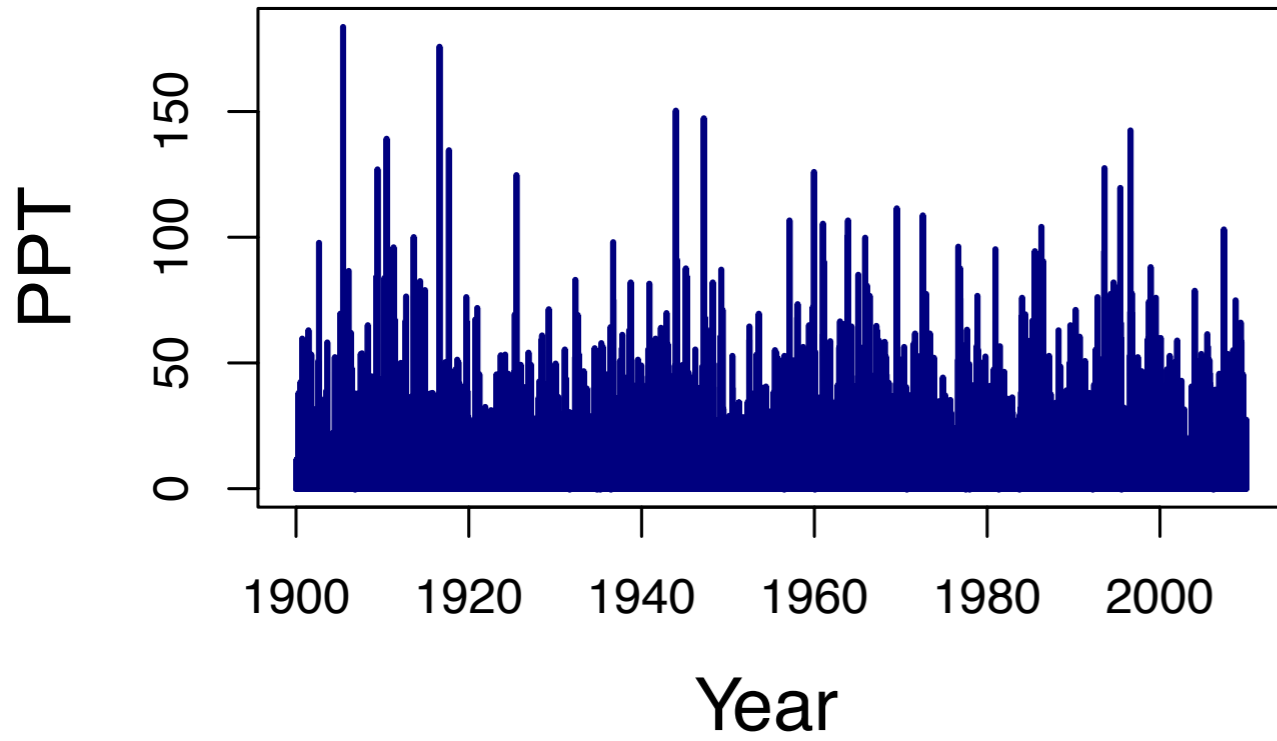


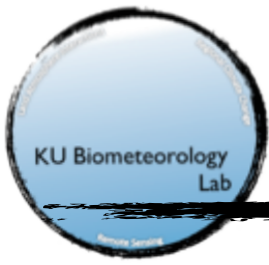
Extremes



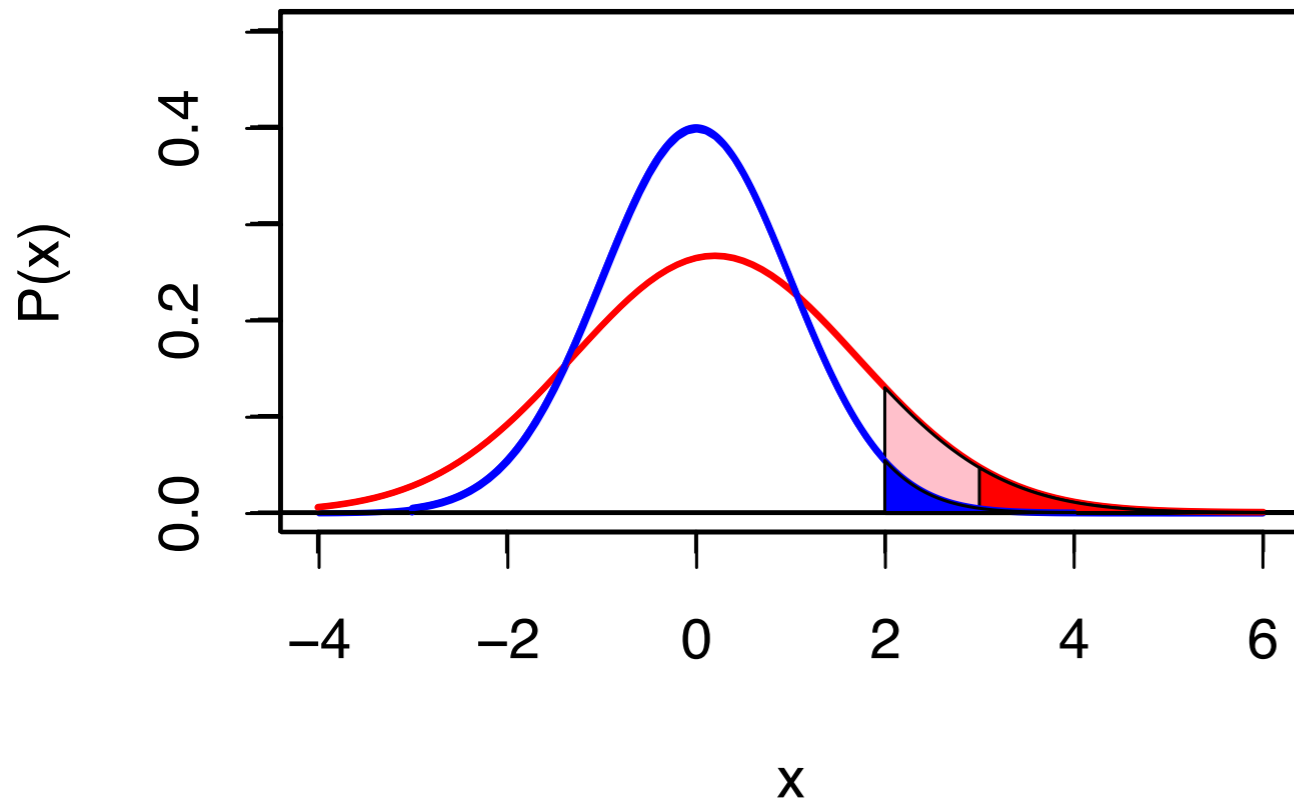
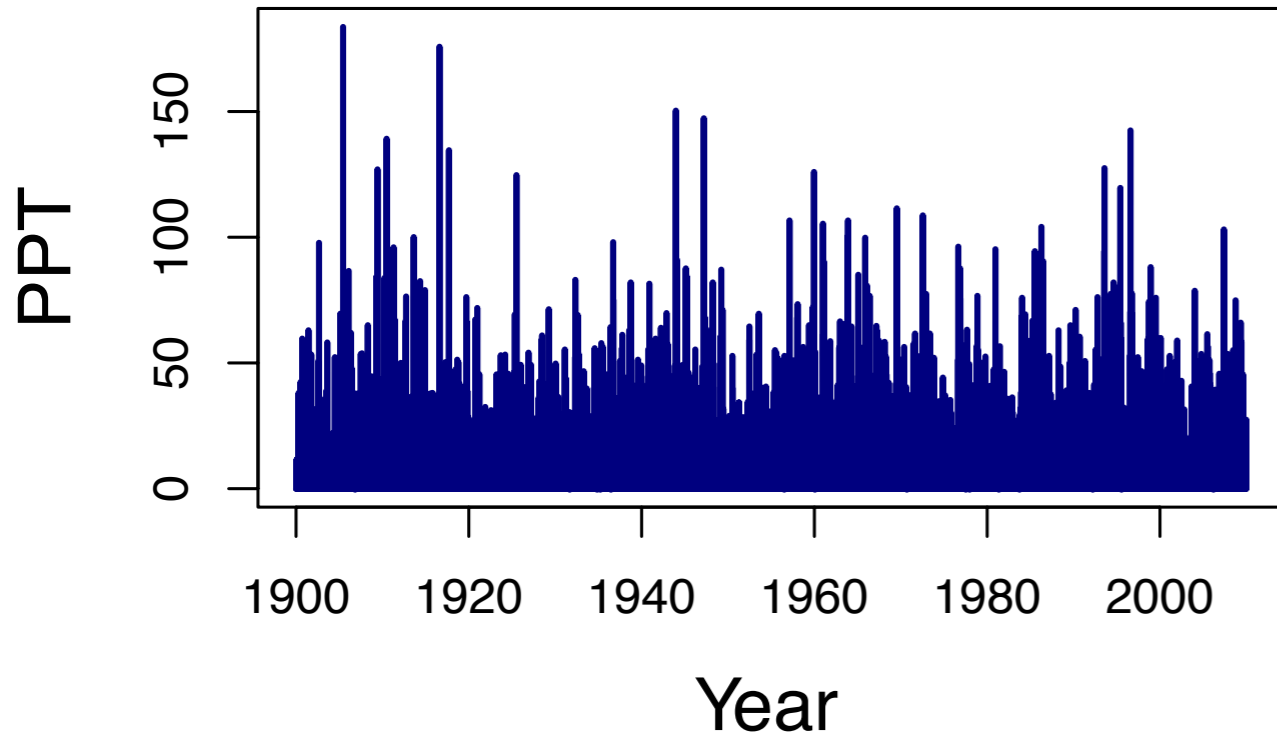


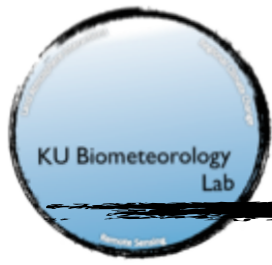
Extremes



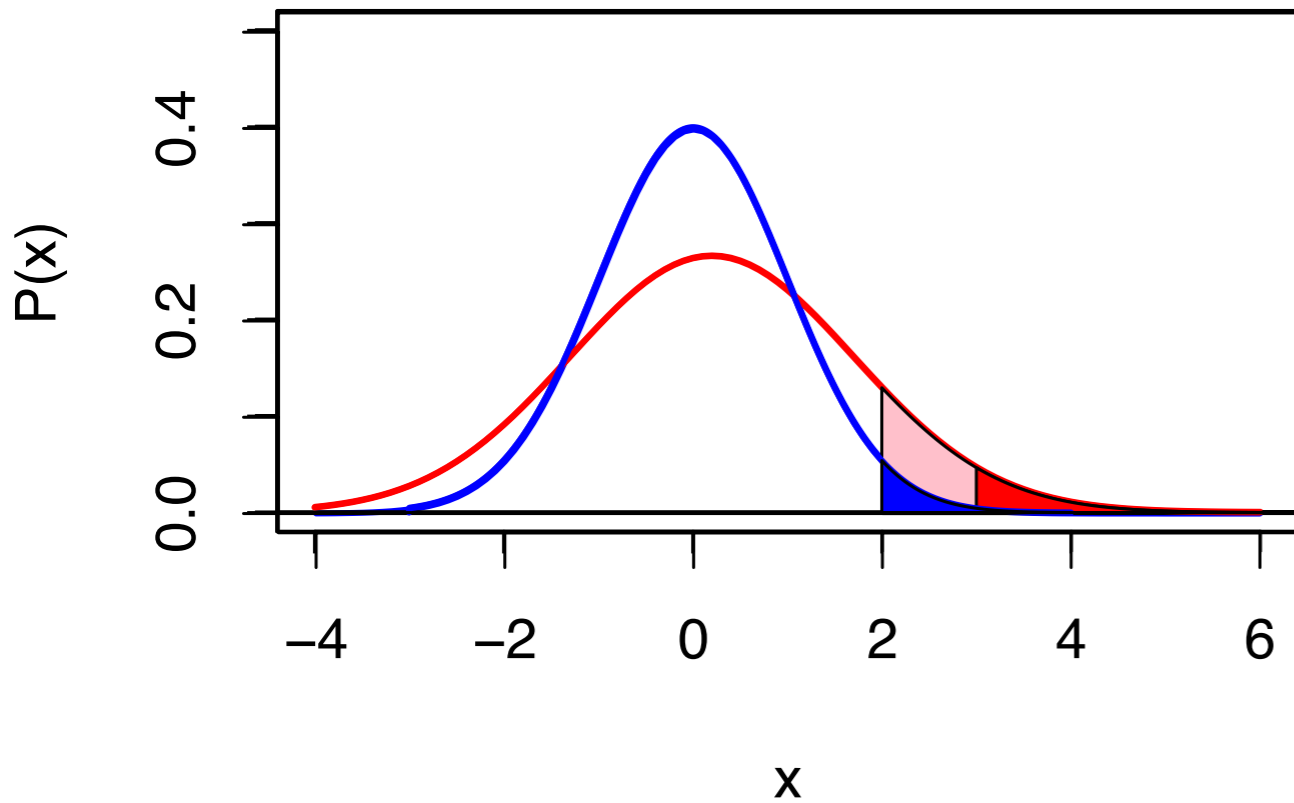
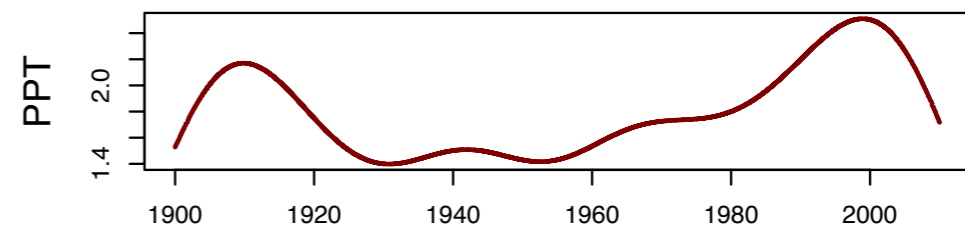
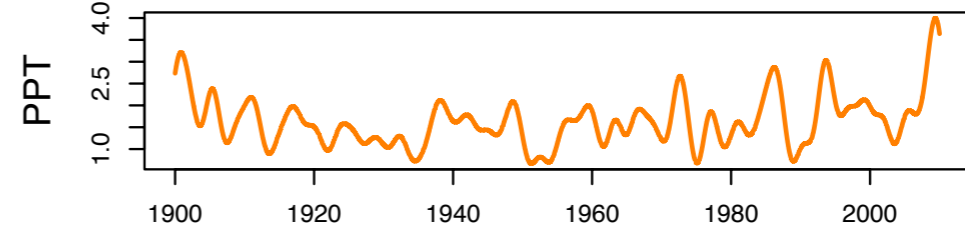
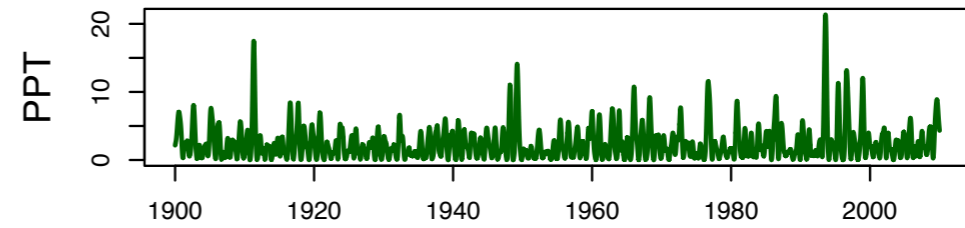
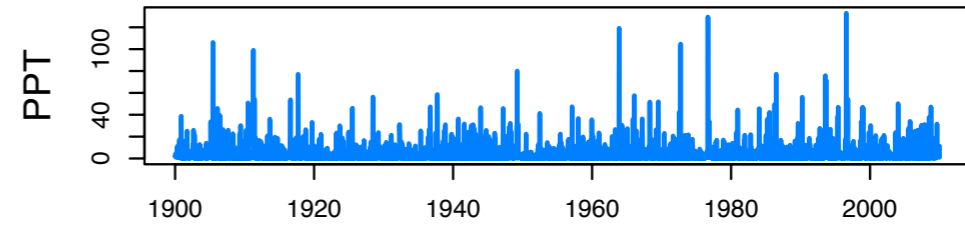
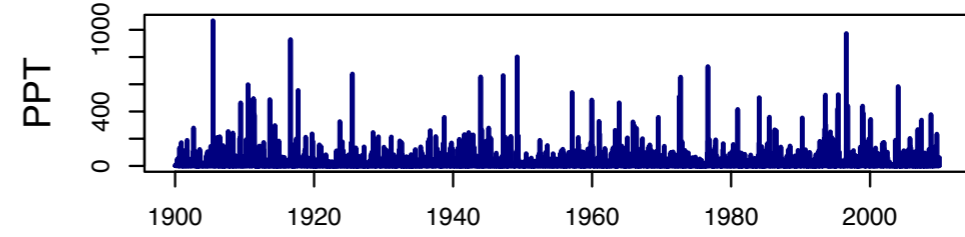
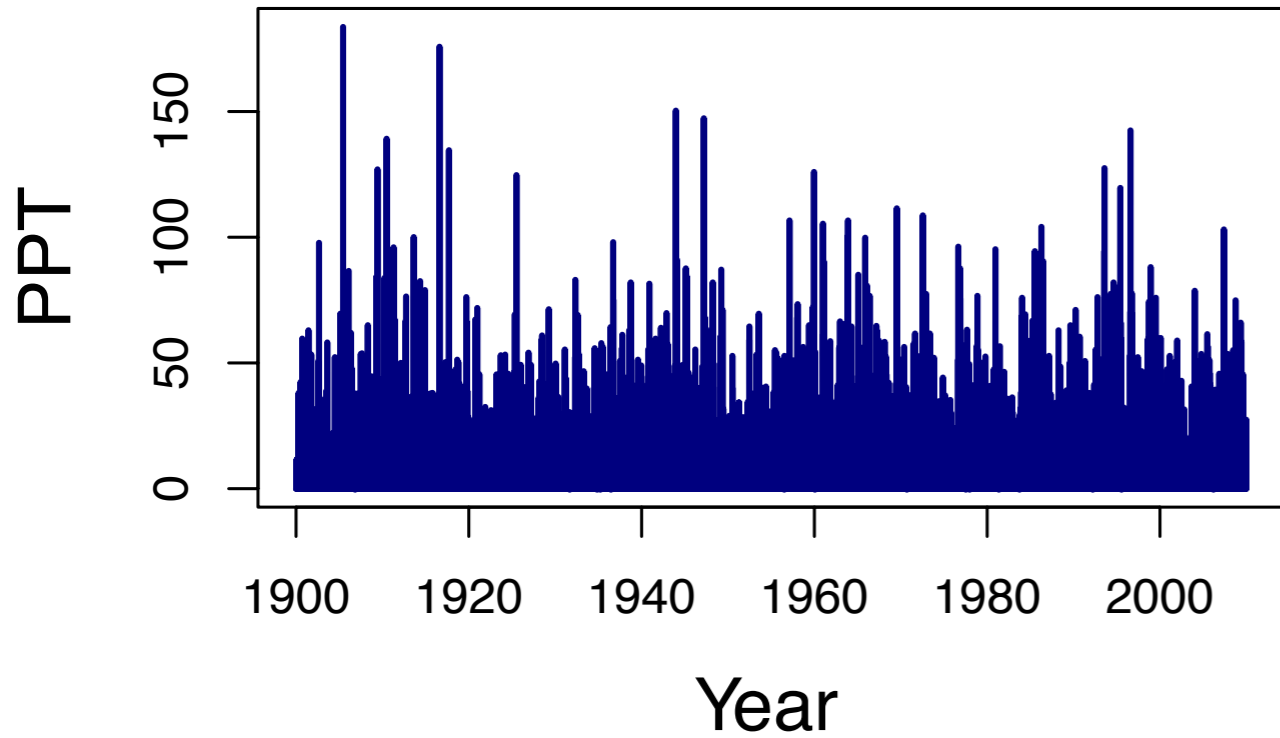


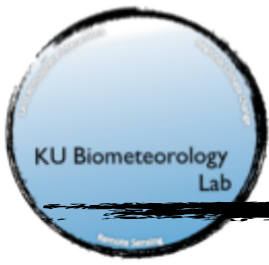
Extremes



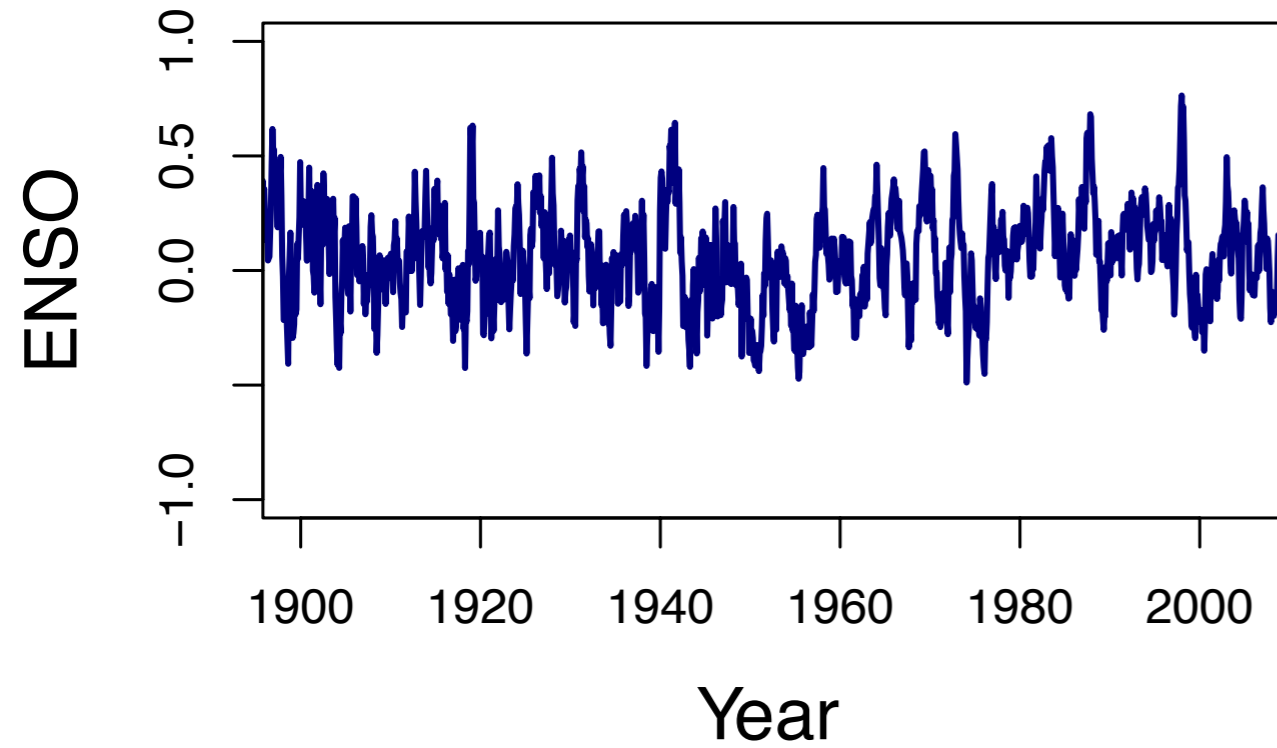
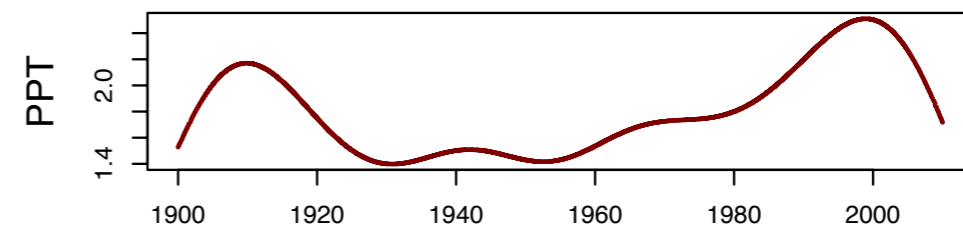
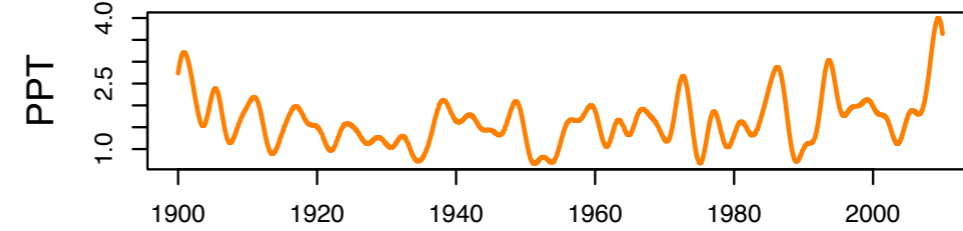
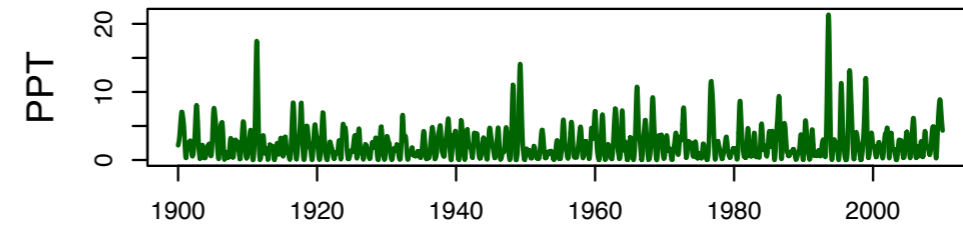
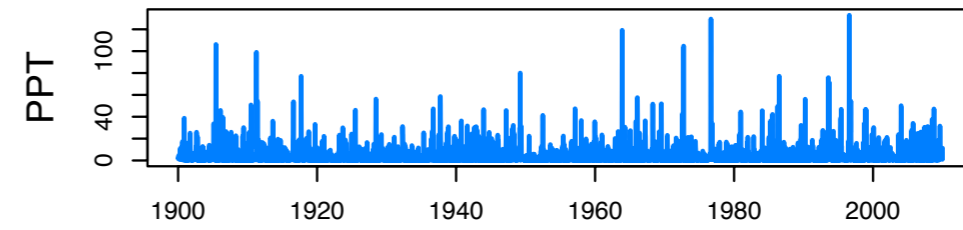
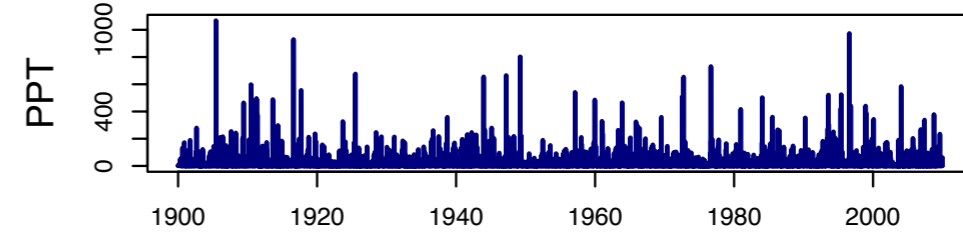
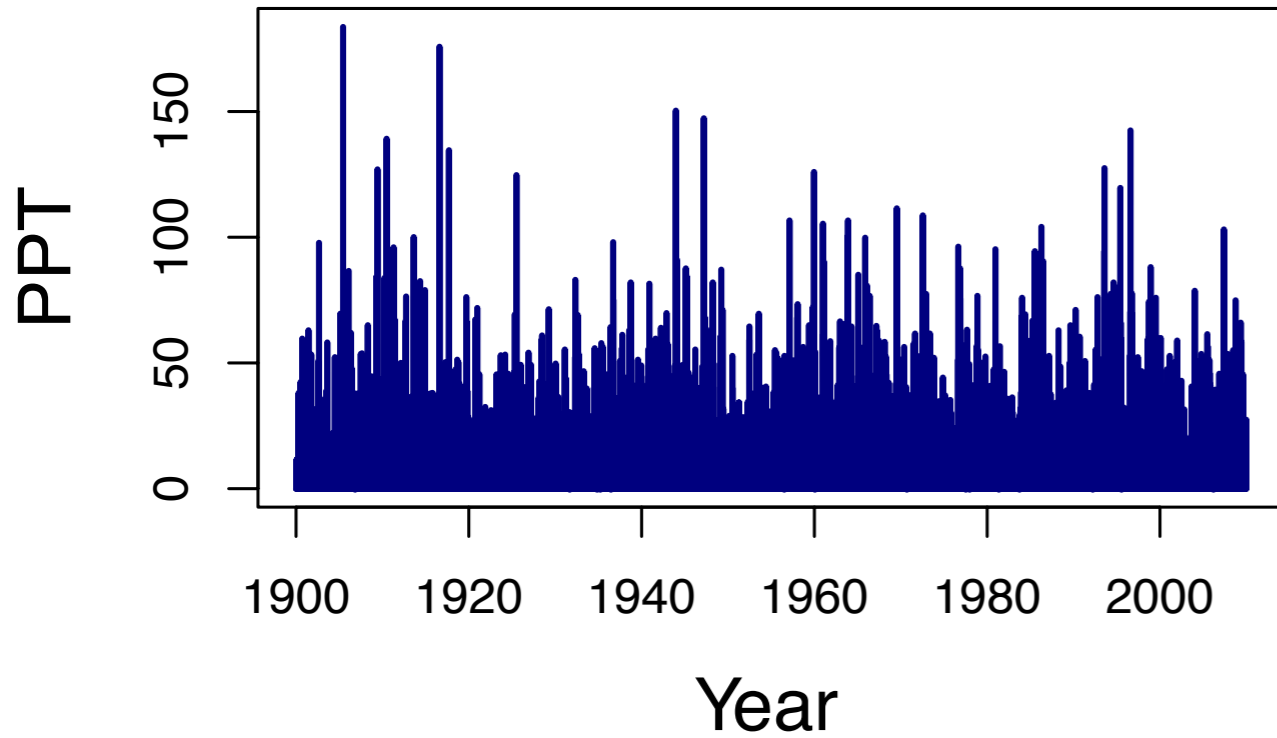


Extremes

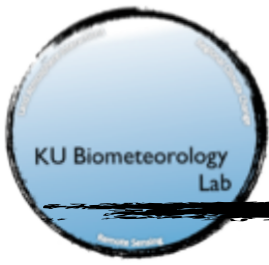




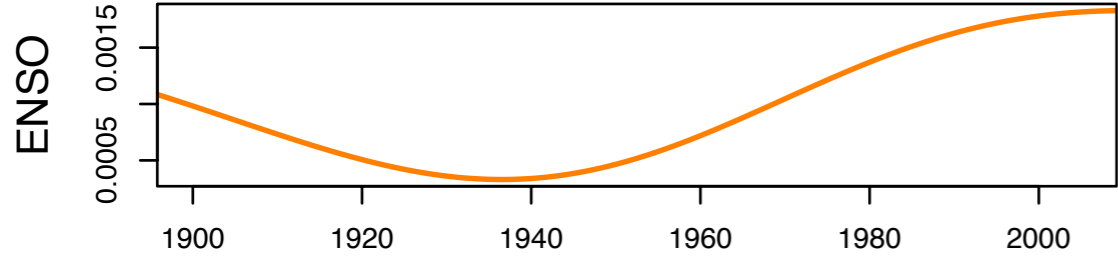
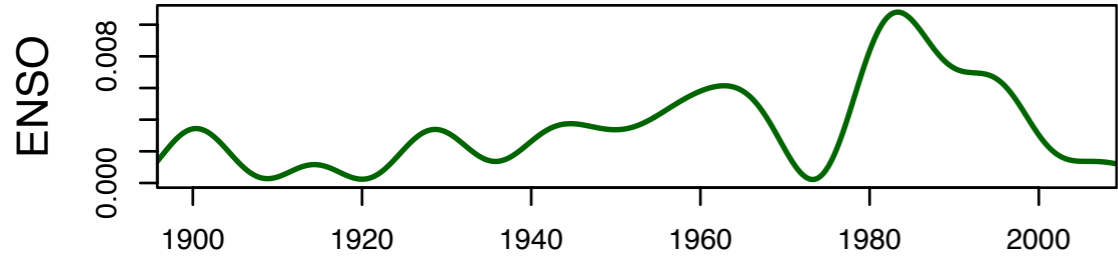
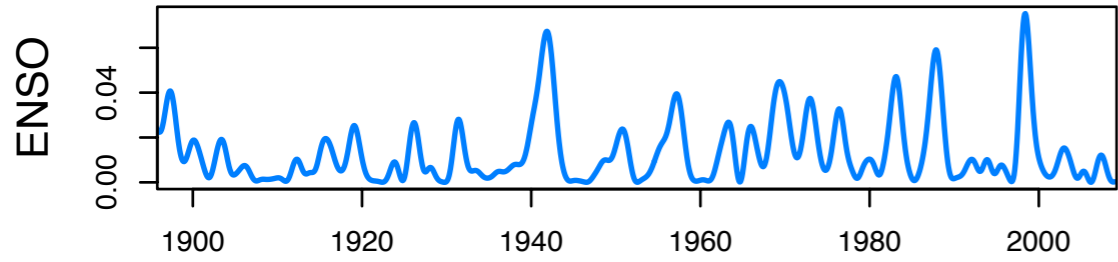
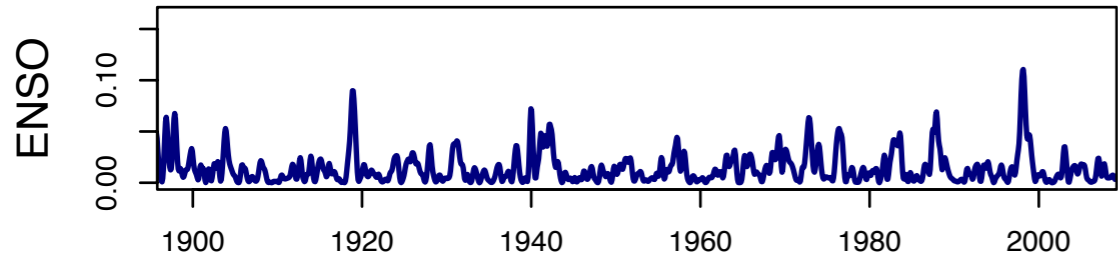
Extremes



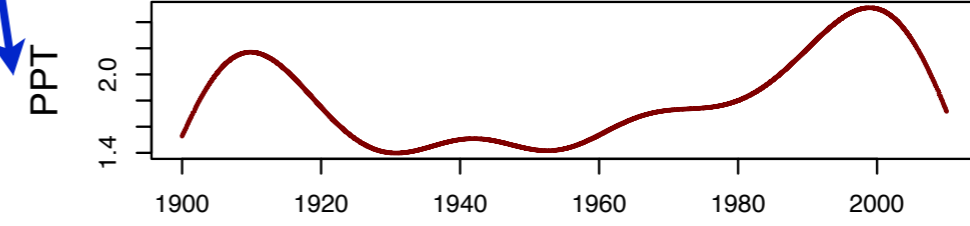
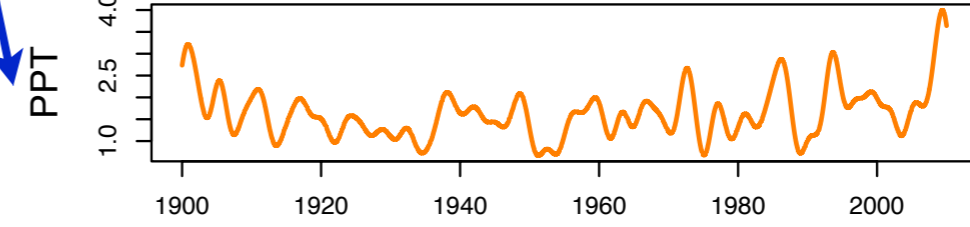
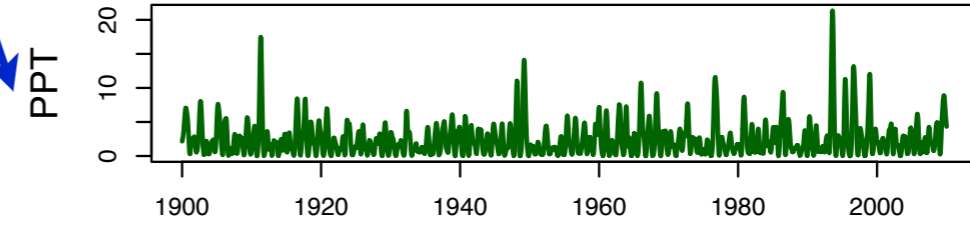
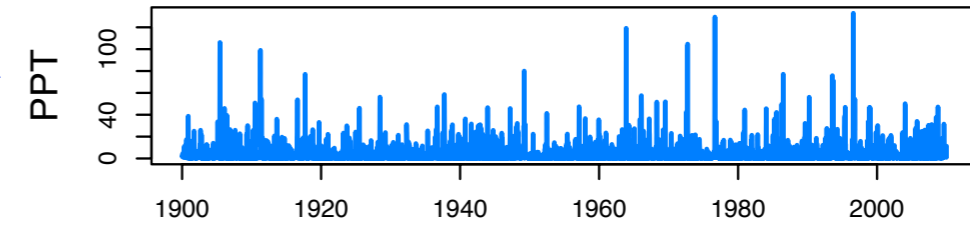
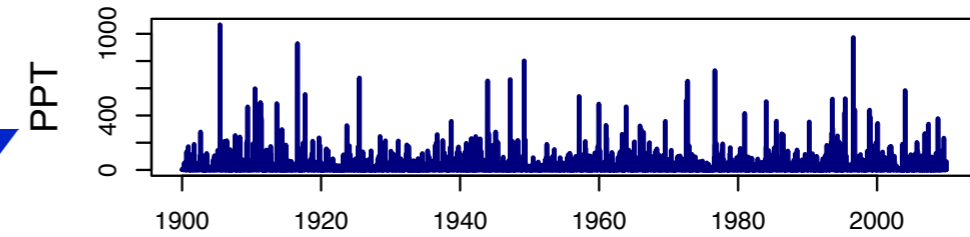
Year



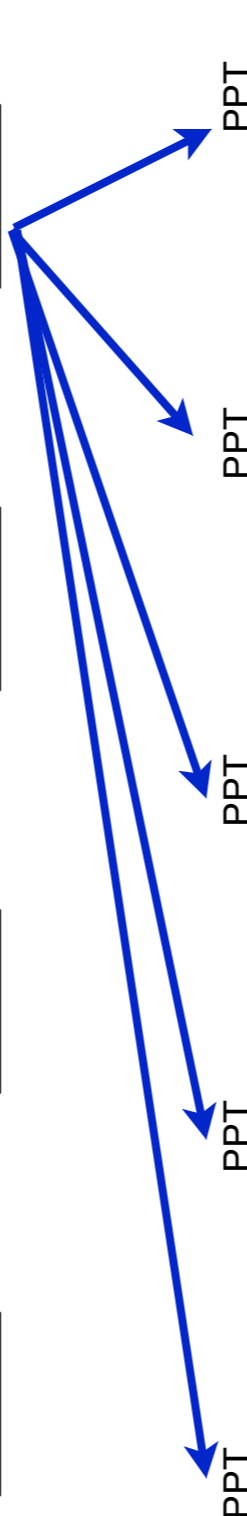
Extremes

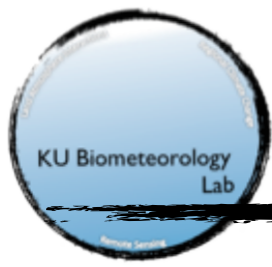


Year



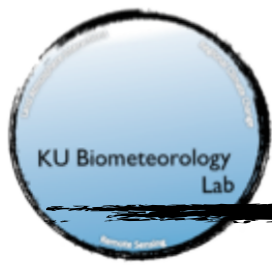
Year





Motivating Questions

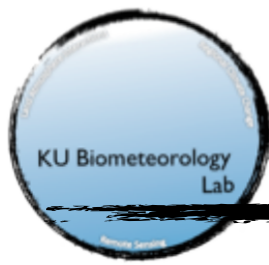
What temporal scales of the extreme value distributions are most sensitive to alteration by low-frequency climate forcings?



Motivating Questions

What temporal scales of the extreme value distributions are most sensitive to alteration by low-frequency climate forcings?

What is the nature of the spatial structure of variation in these timescales?

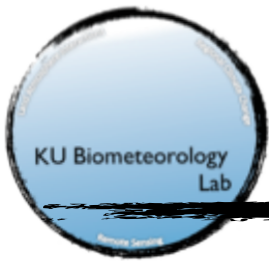


Motivating Questions

What temporal scales of the extreme value distributions are most sensitive to alteration by low-frequency climate forcings?

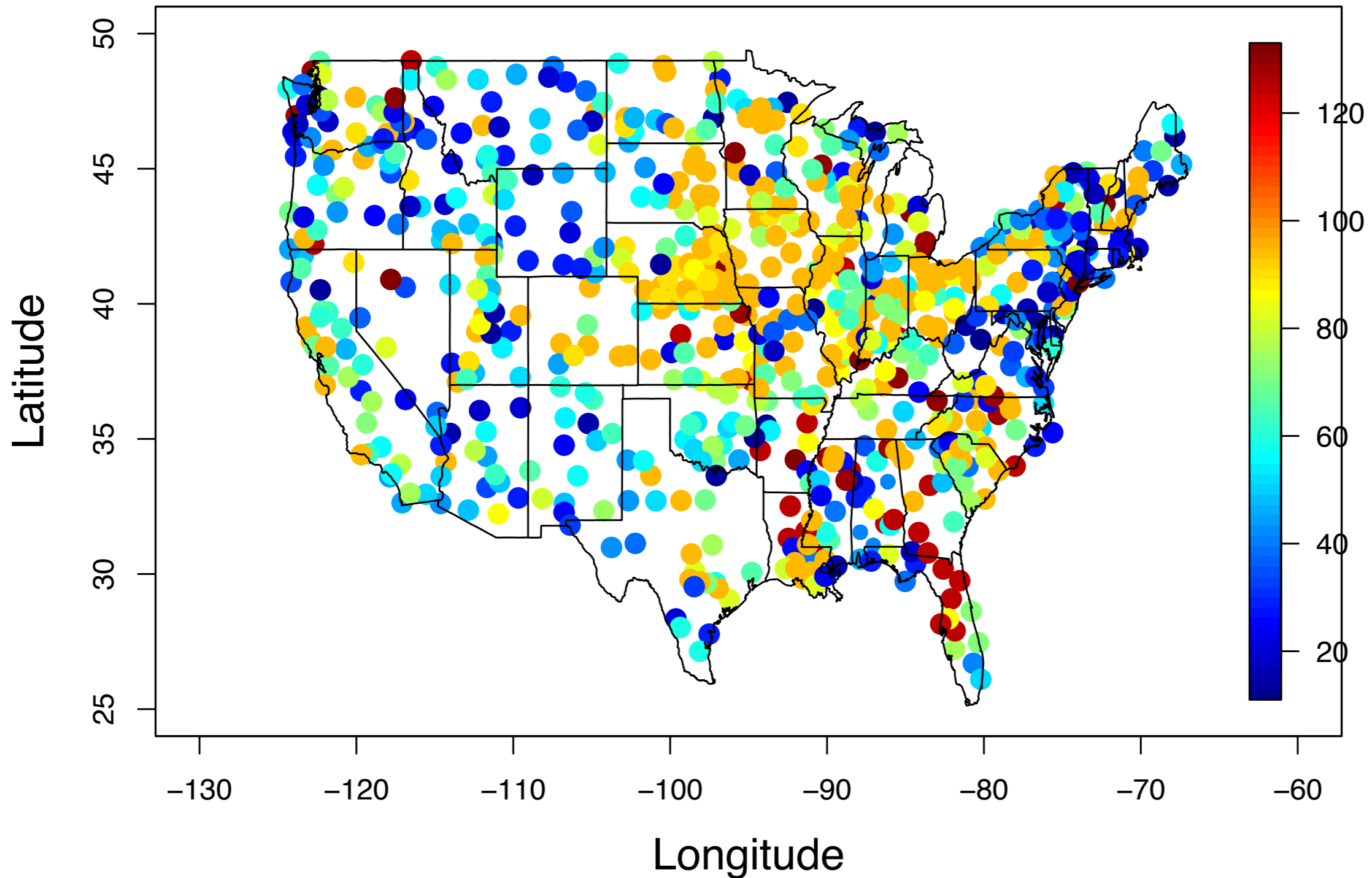
What is the nature of the spatial structure of variation in these timescales?

How is this projected to change under future climate scenarios?



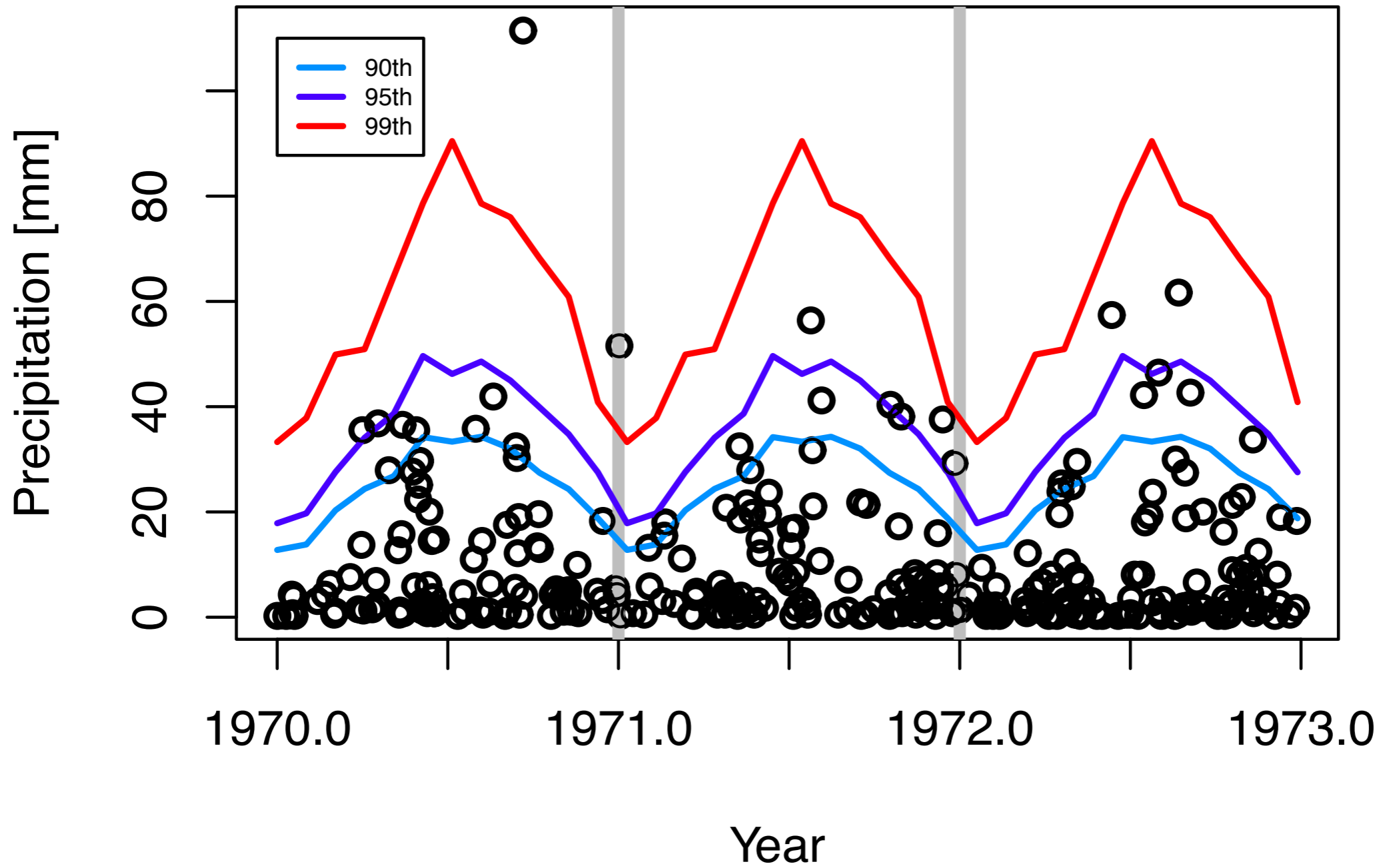
USHCN Observations

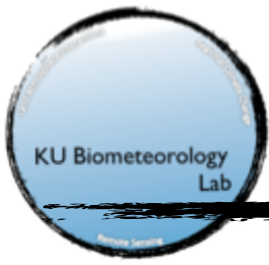
Station Length in Years



Precipitation

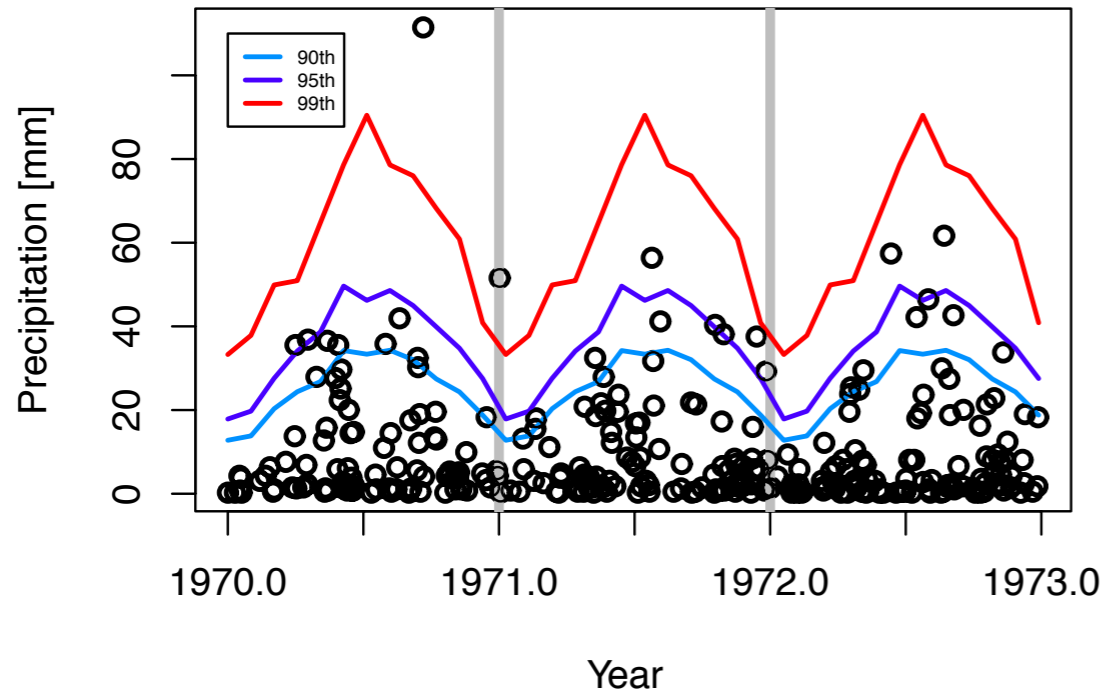
Lawrence, KS



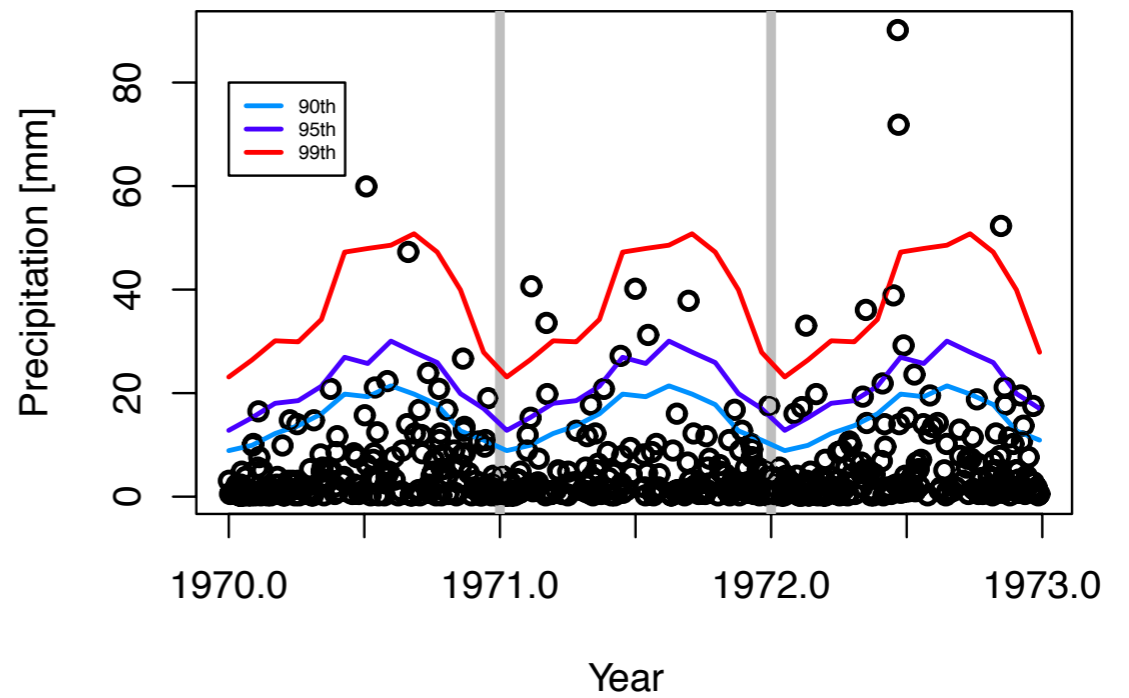


Precipitation

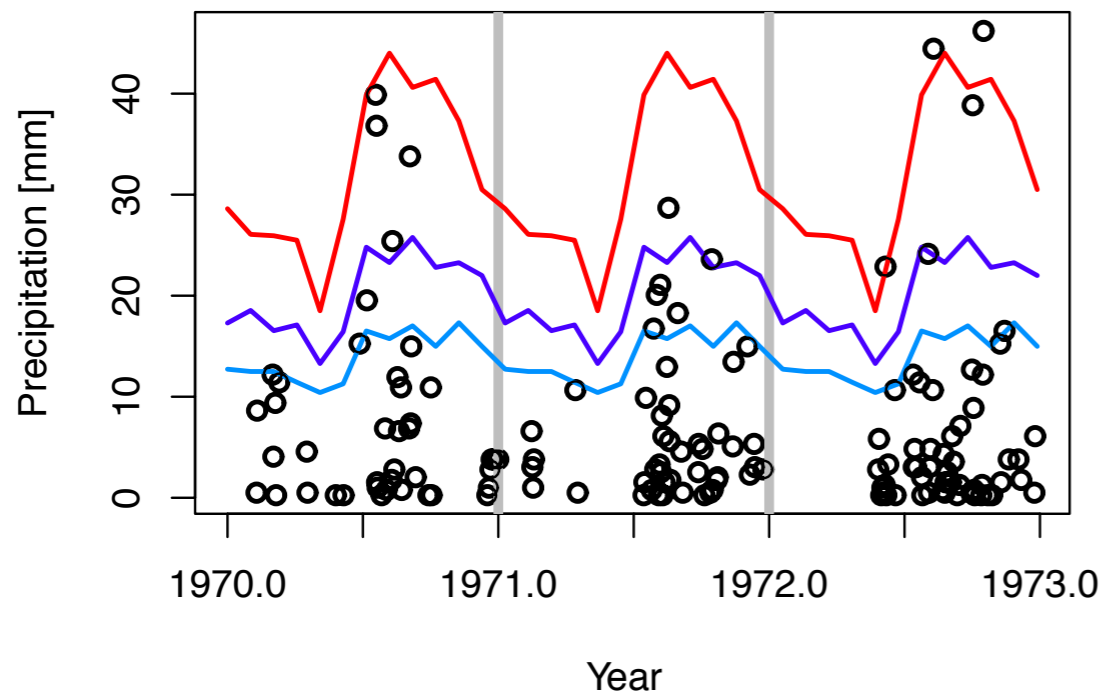
Lawrence,KS



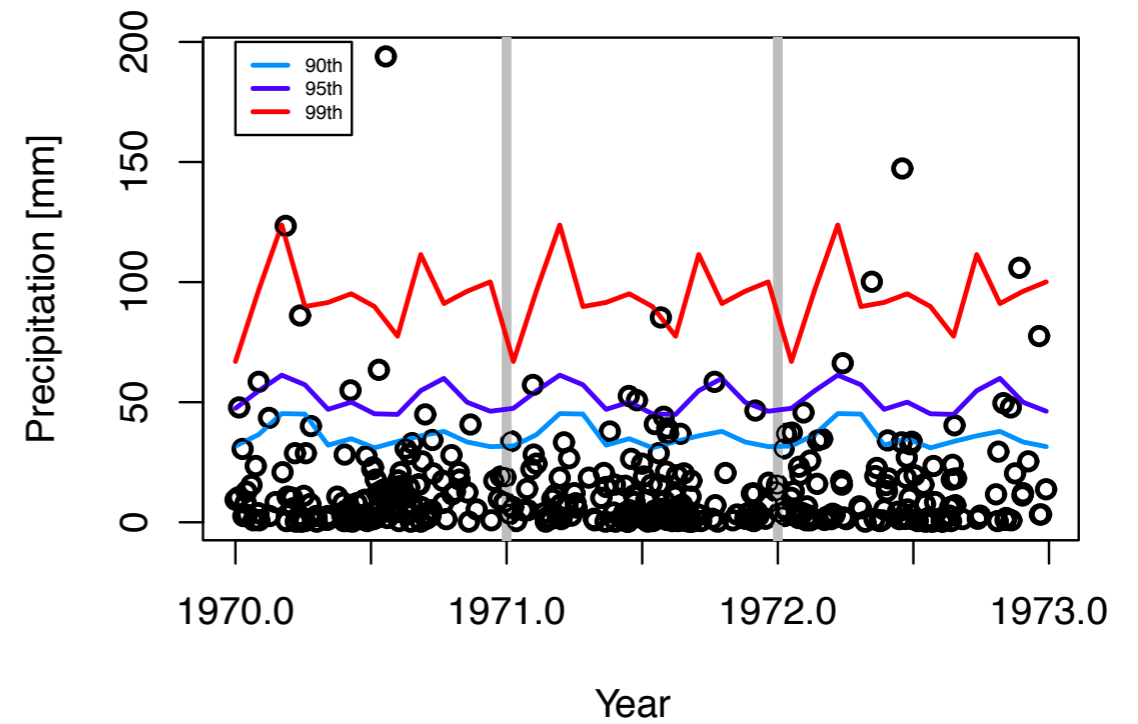
Ithaca,NY

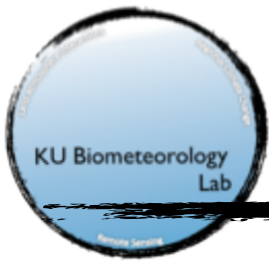


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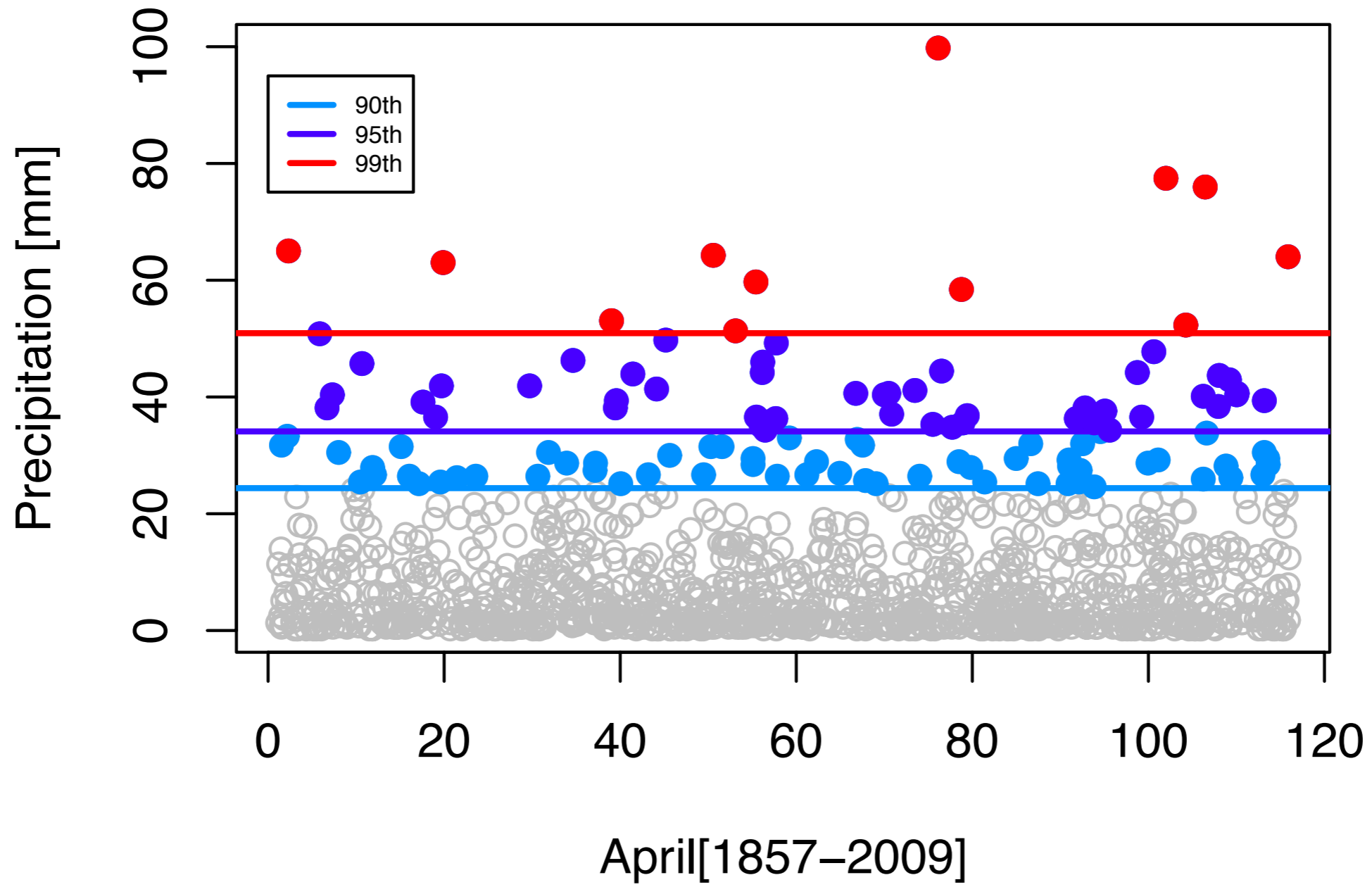
Tallahassee,FL

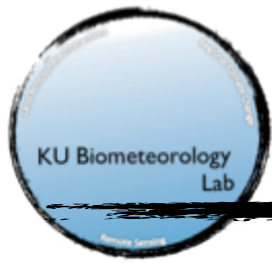




Extremes

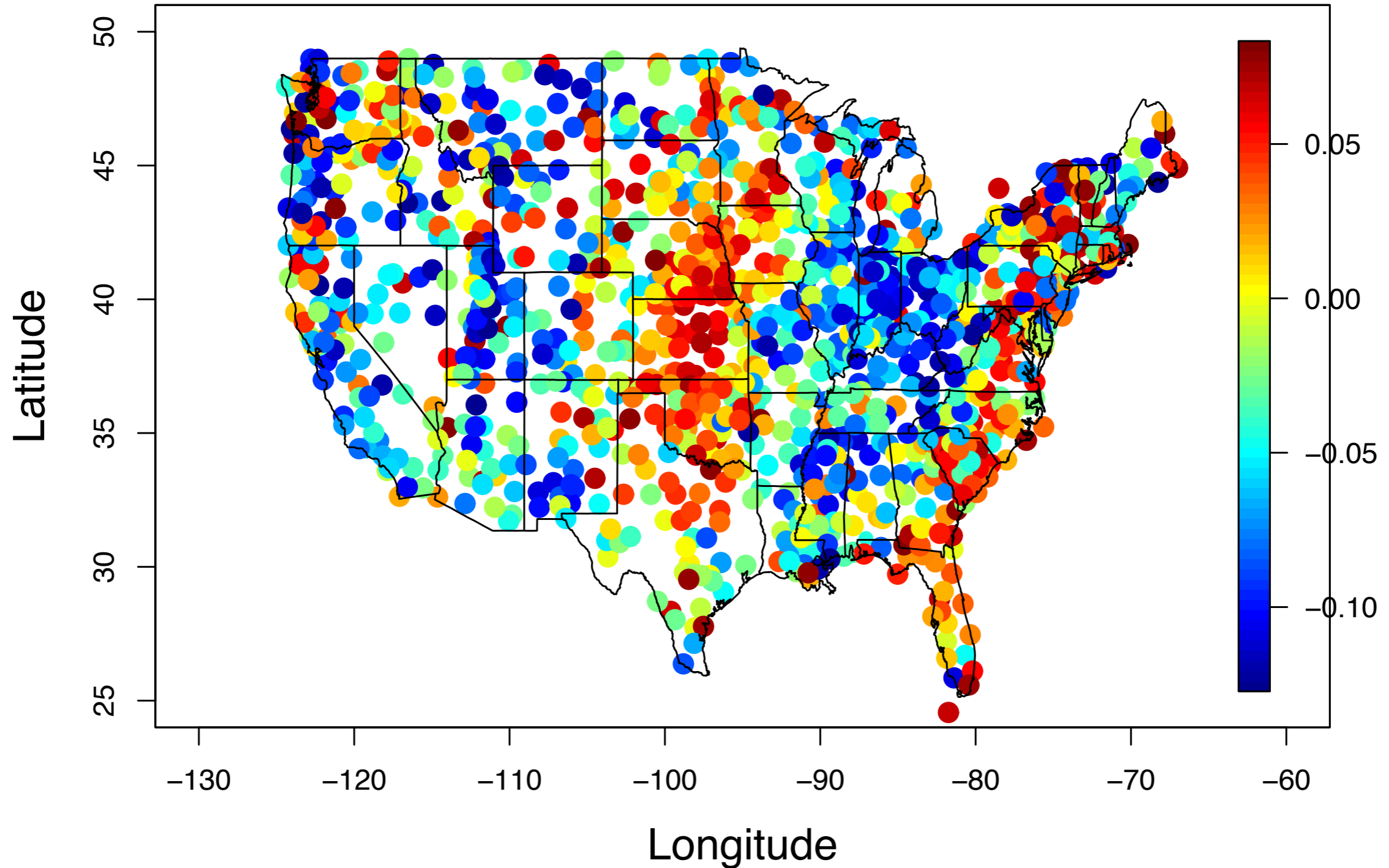
Lawrence, KS

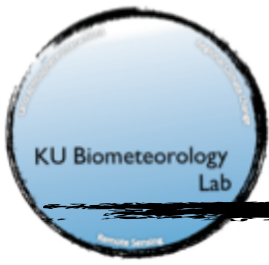




Trend in Extreme Precipitation

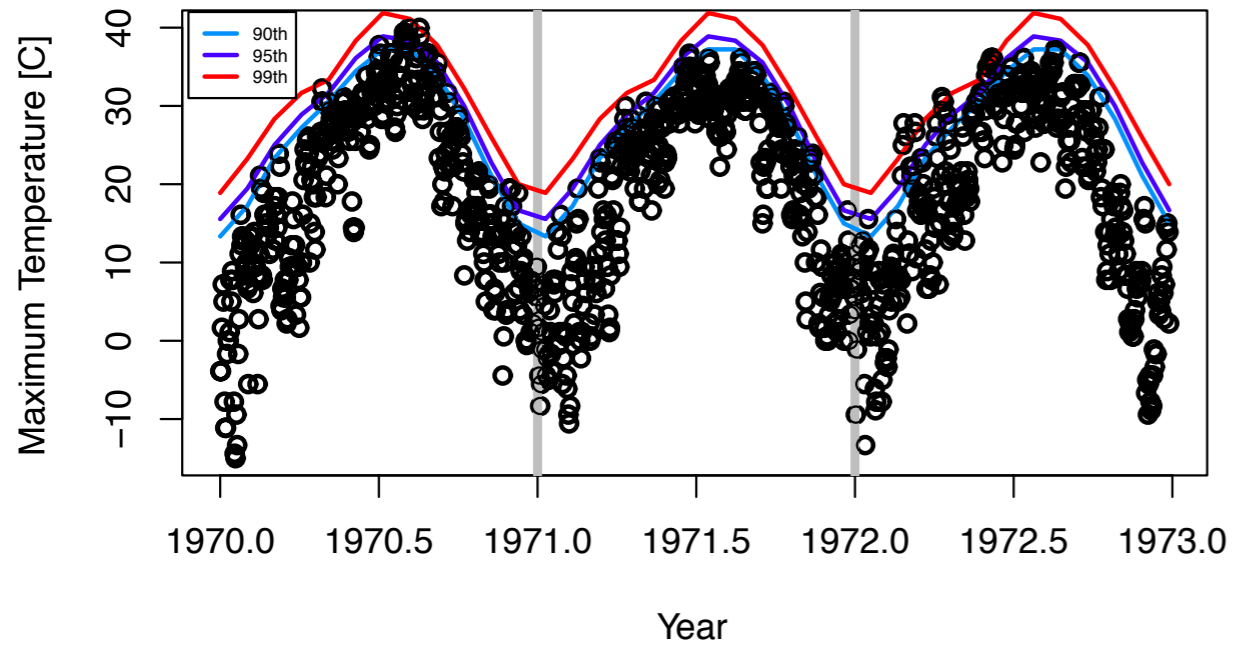
Slope on Number of PPT Extreme Events (mar:90)



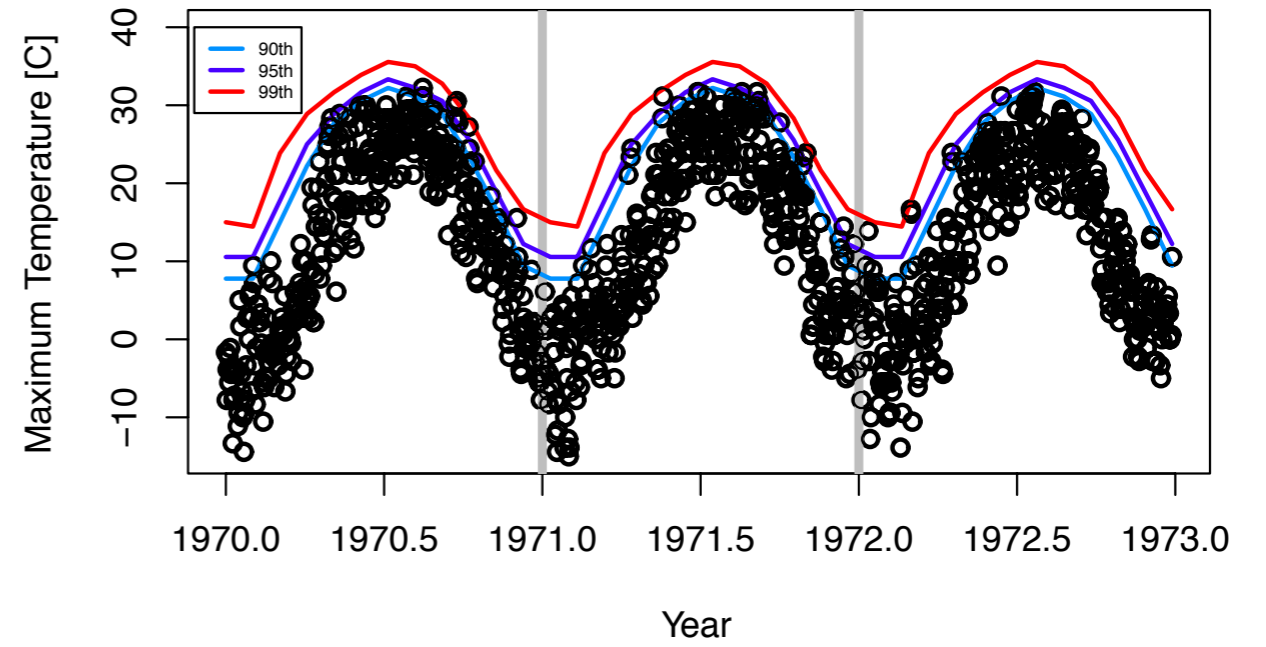


Maximum Temperature

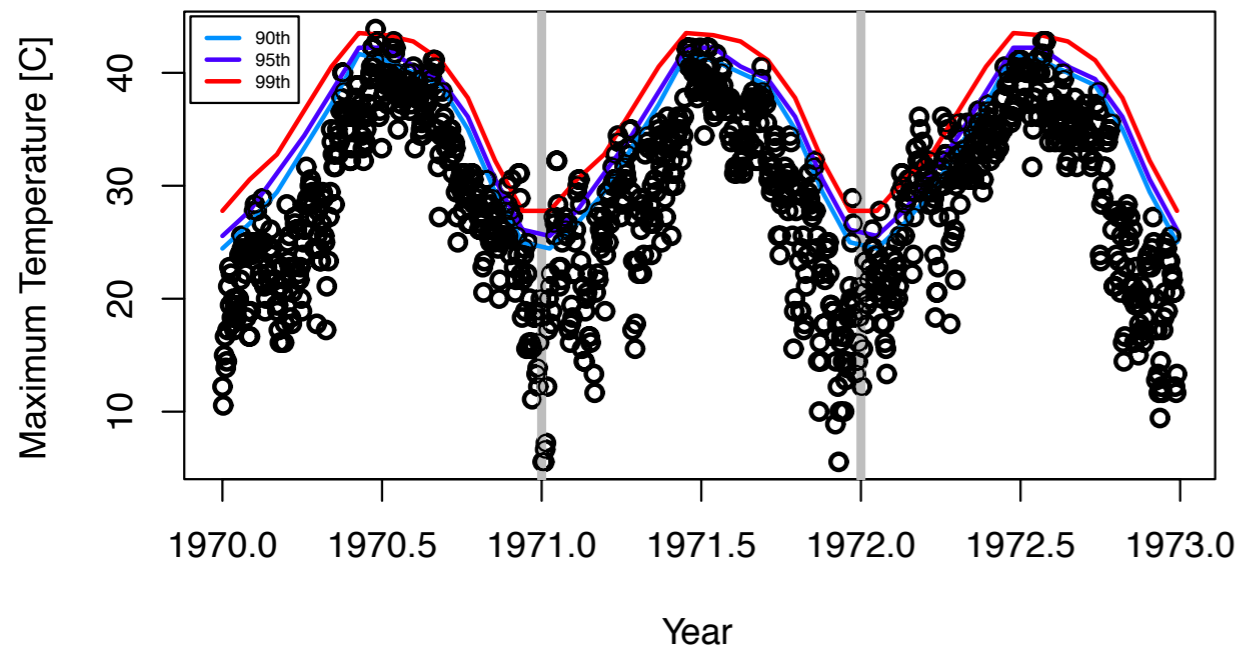
Lawrence,KS



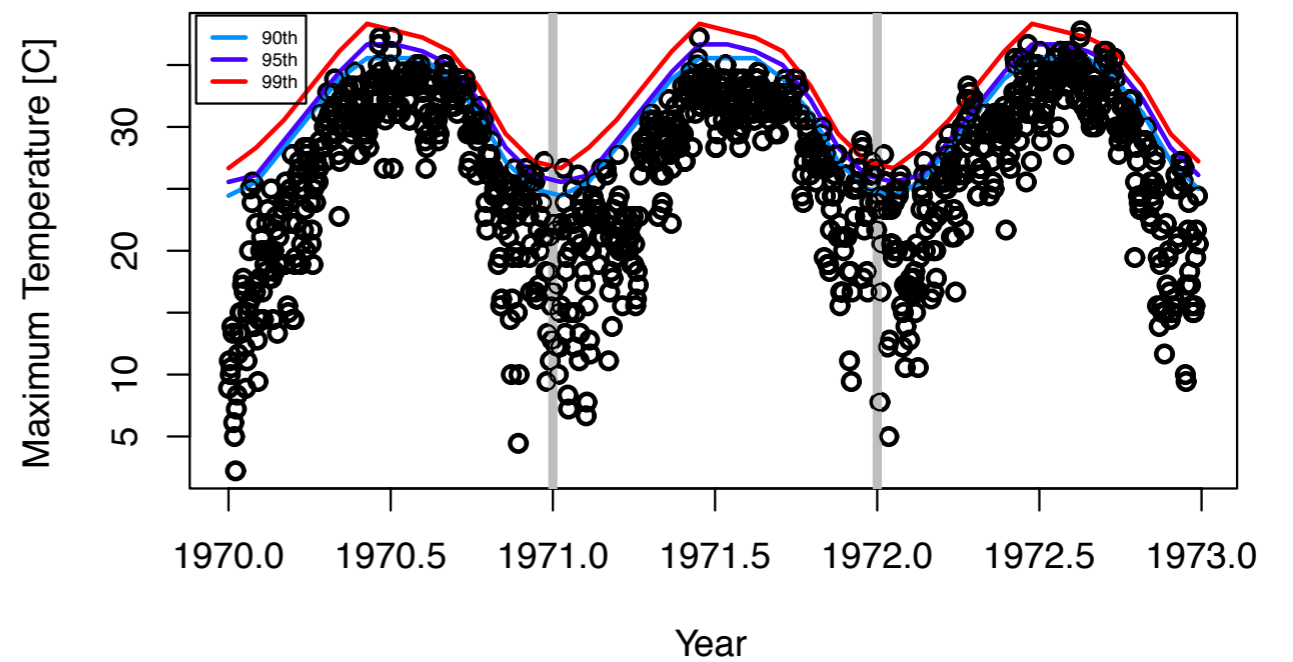
Ithaca, NY



Tucson,AZ

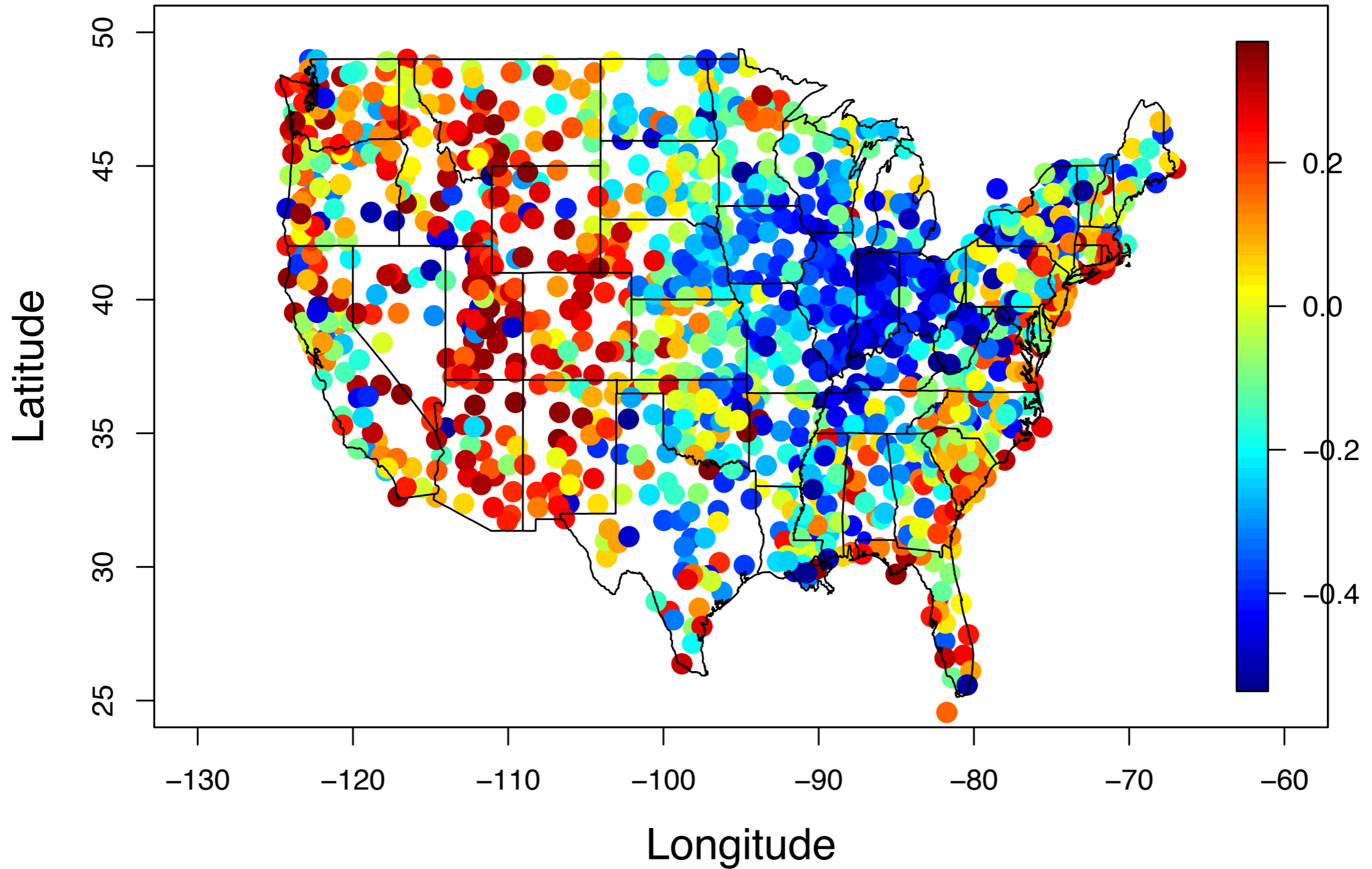


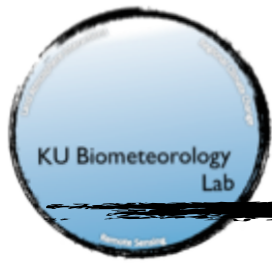
Tallahassee,FL



Temperature Trends

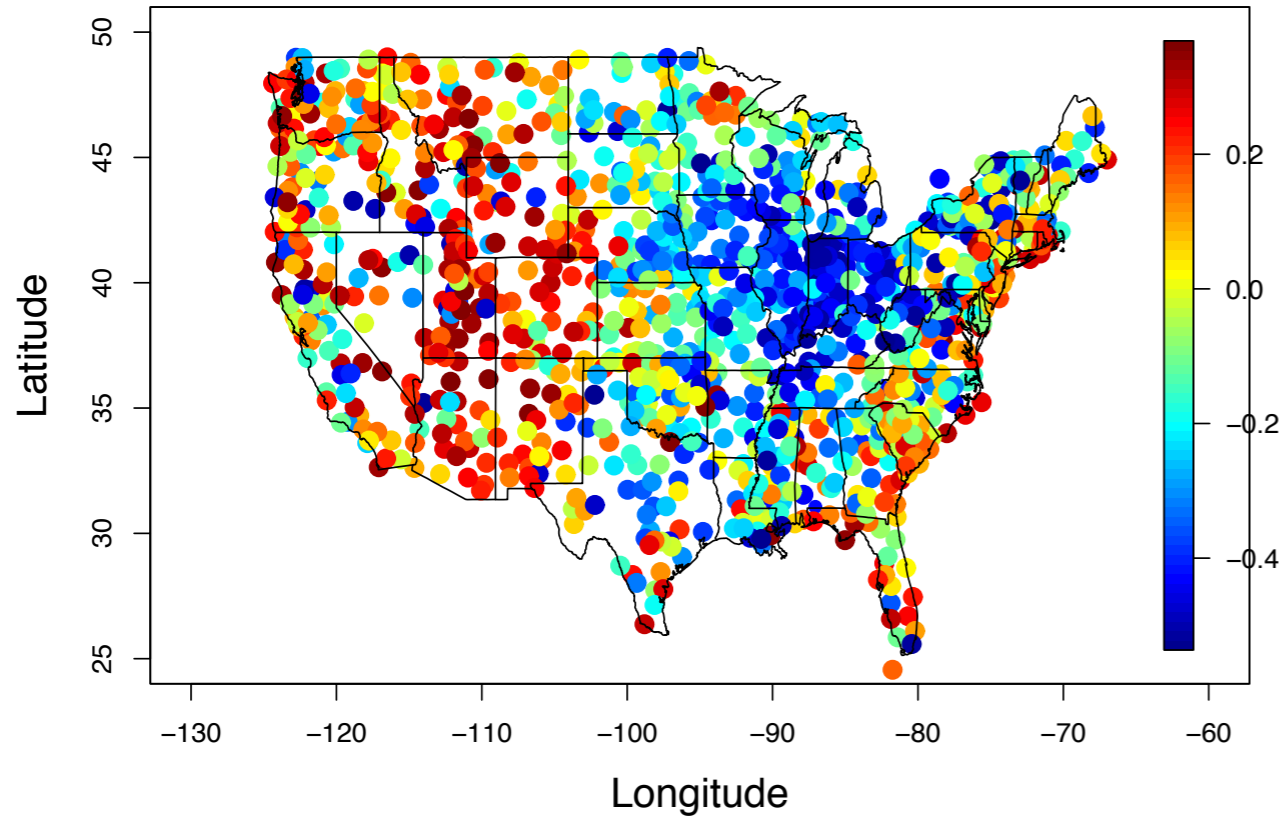
Slope on Number of TMAX Extreme Events (jul:90)



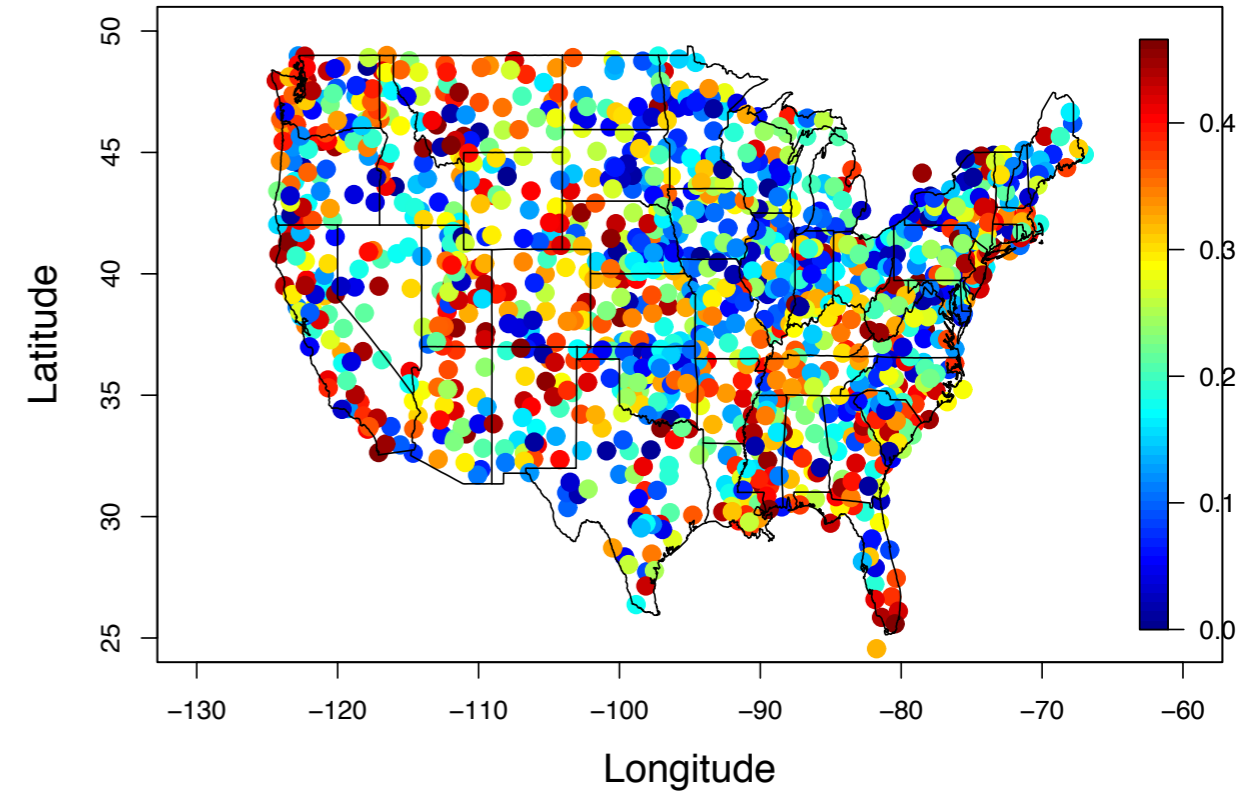


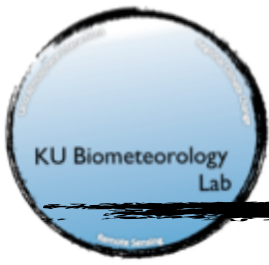
Temperature Trends

Slope on Number of TMAX Extreme Events (jul:90)



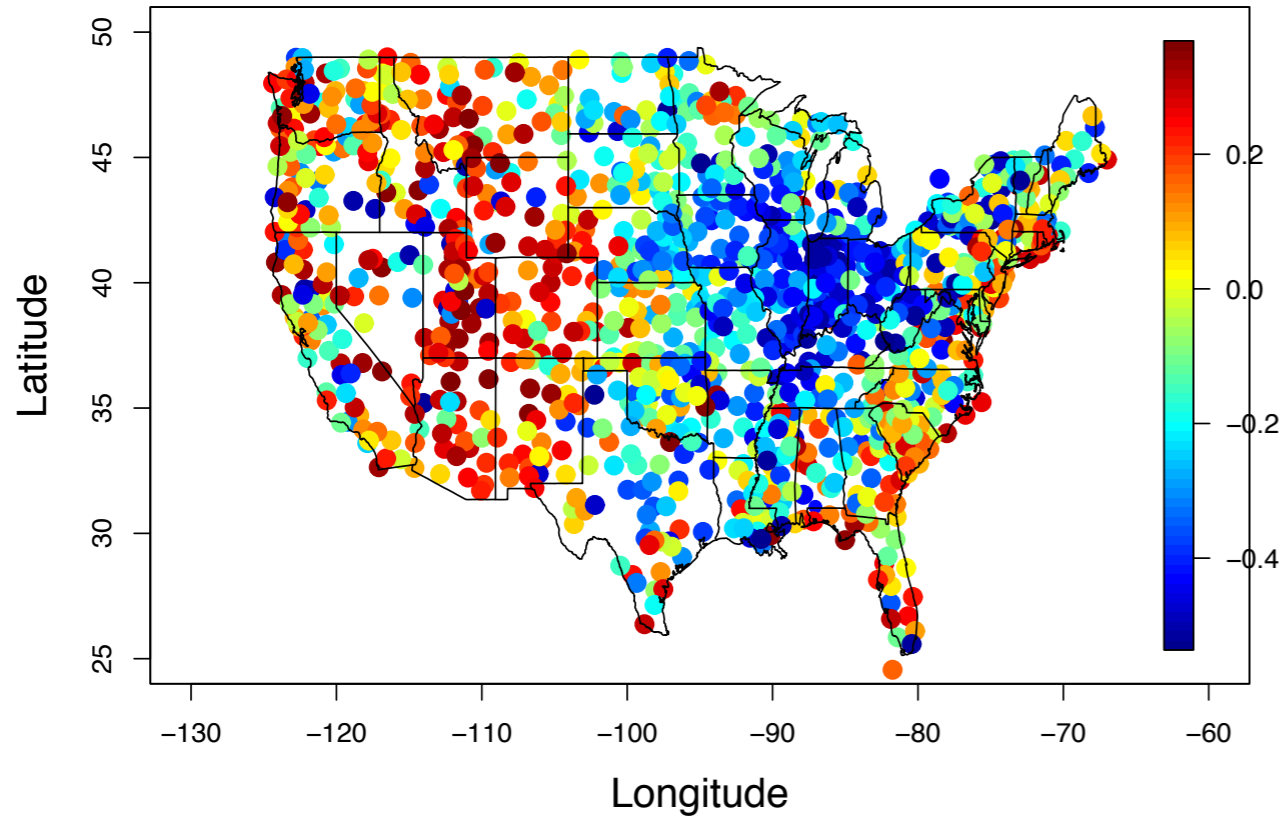
Slope of TMIN Extreme Events (Jan:10)



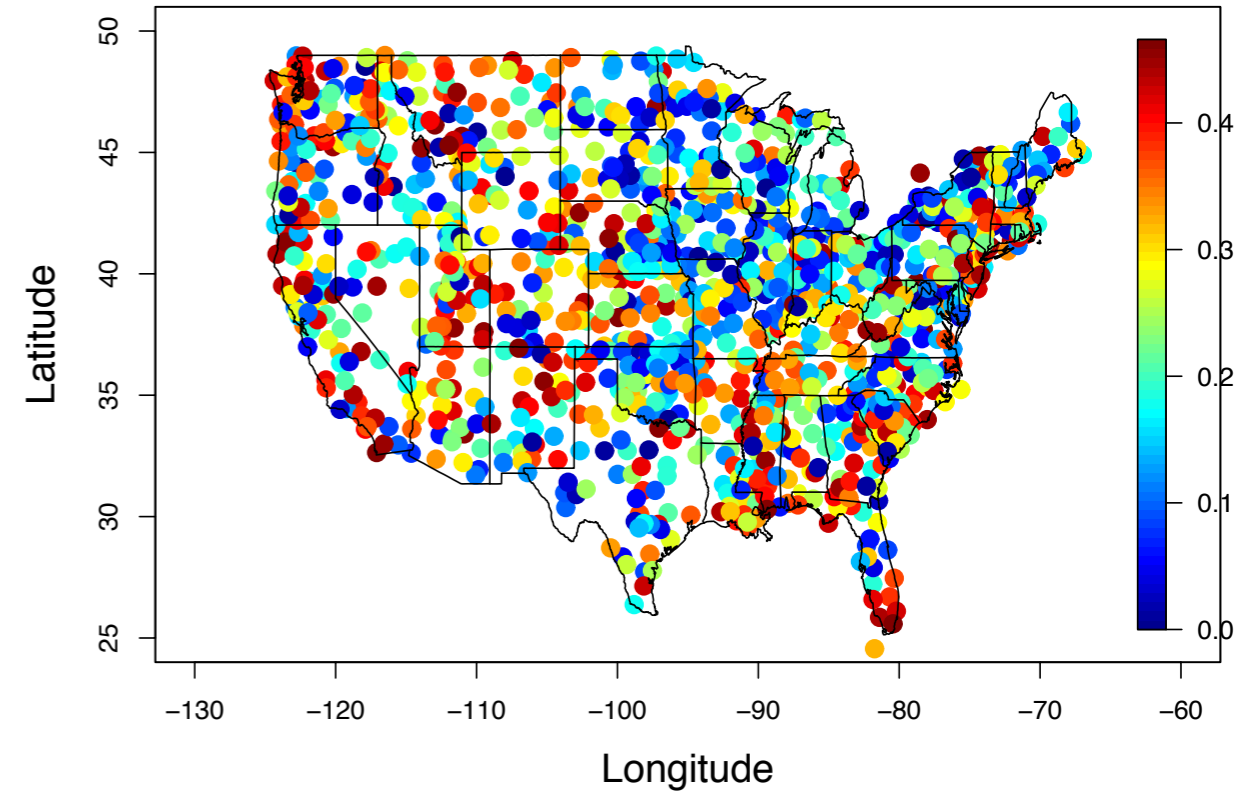


Temperature Trends

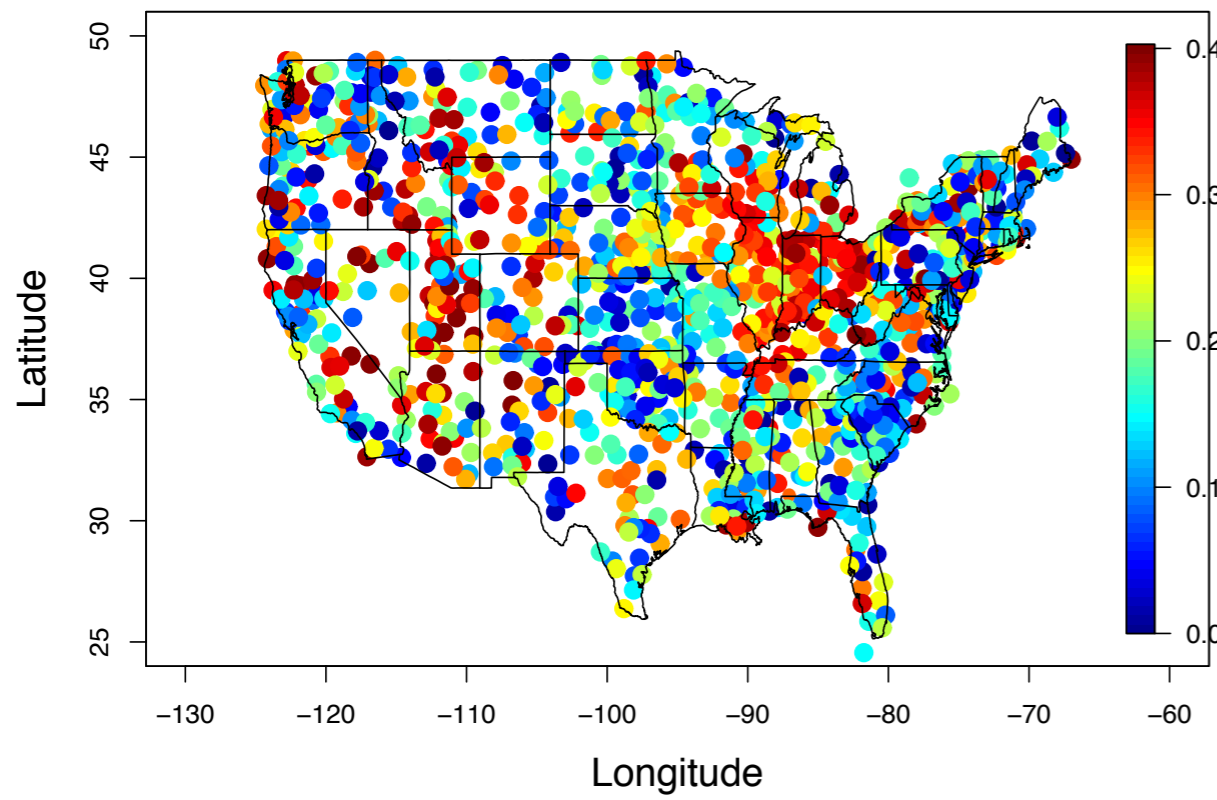
Slope on Number of TMAX Extreme Events (jul:90)



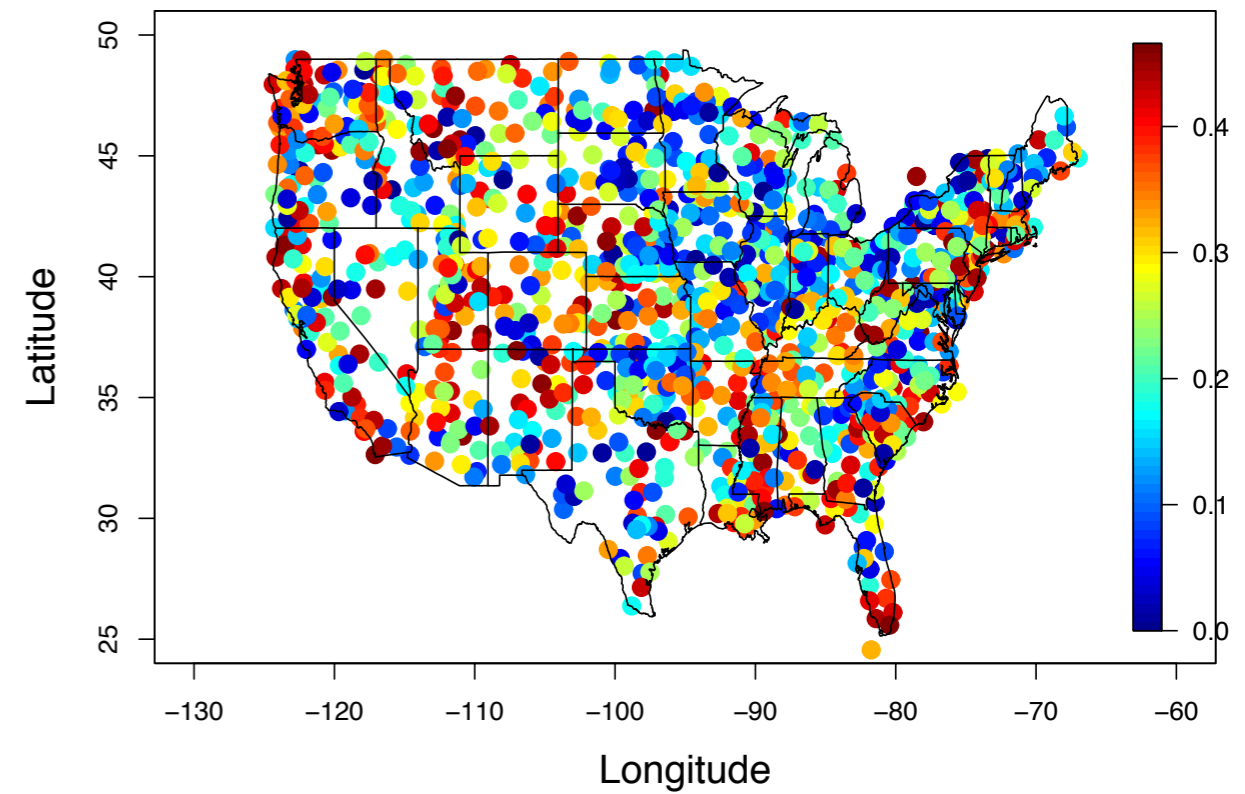
Slope of TMIN Extreme Events (Jan:10)

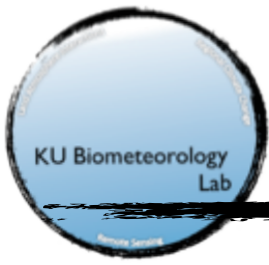


R-squared of TMAX Extreme Events (Jul:90)



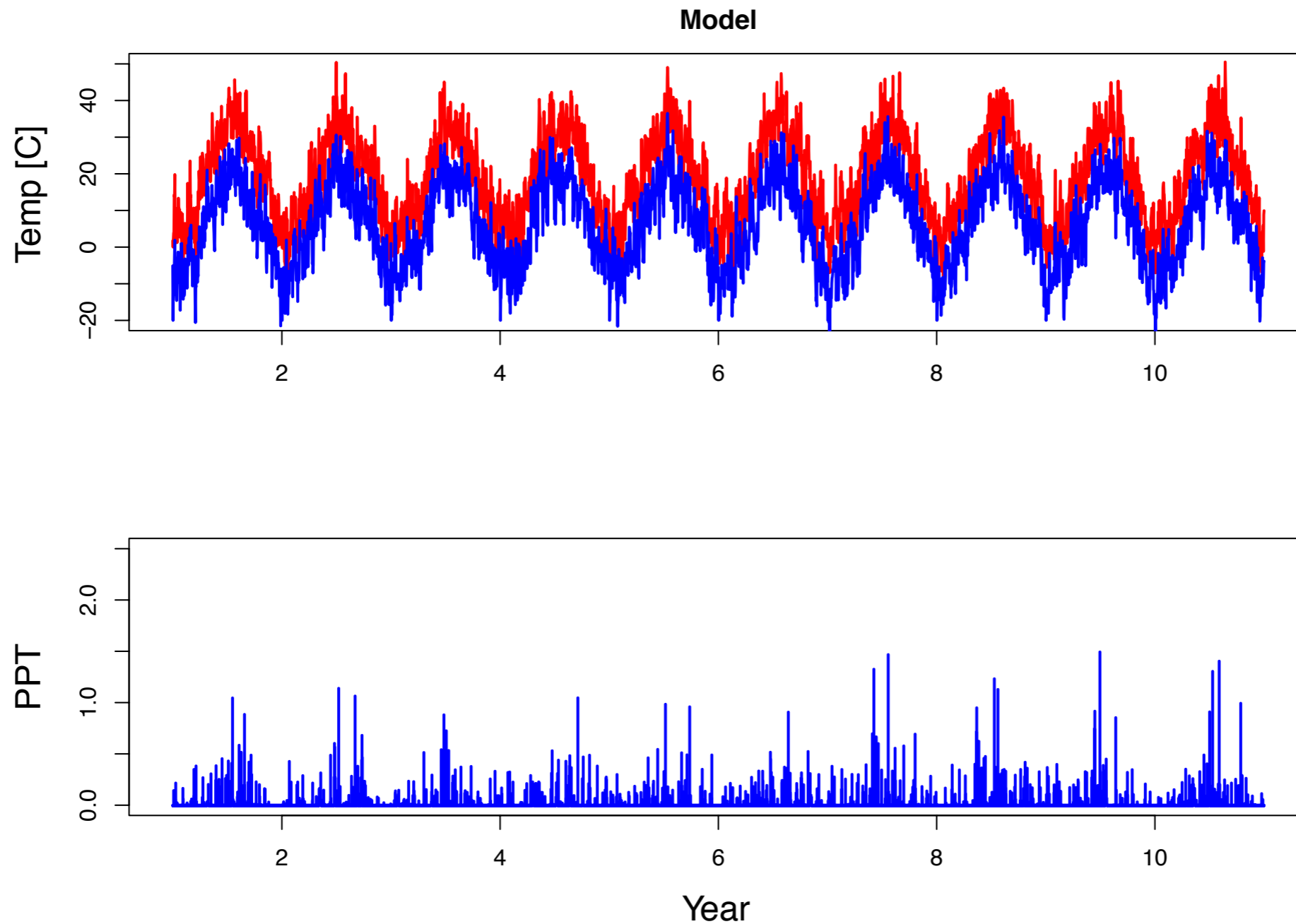
R-squared of TMIN Extreme Events (Jan:10)

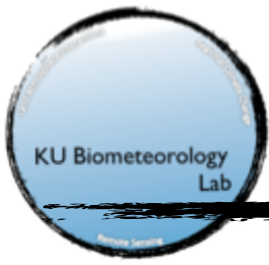




Stochastic Weather Generator

$$X_t = \mu_{X,0} + \mu_{X,1}J_t + \phi_X X_{t-1} + \psi_X Y_{t-1} + \beta_{X,1}C_t + \beta_{X,2}S_t + \epsilon_{X,t}$$



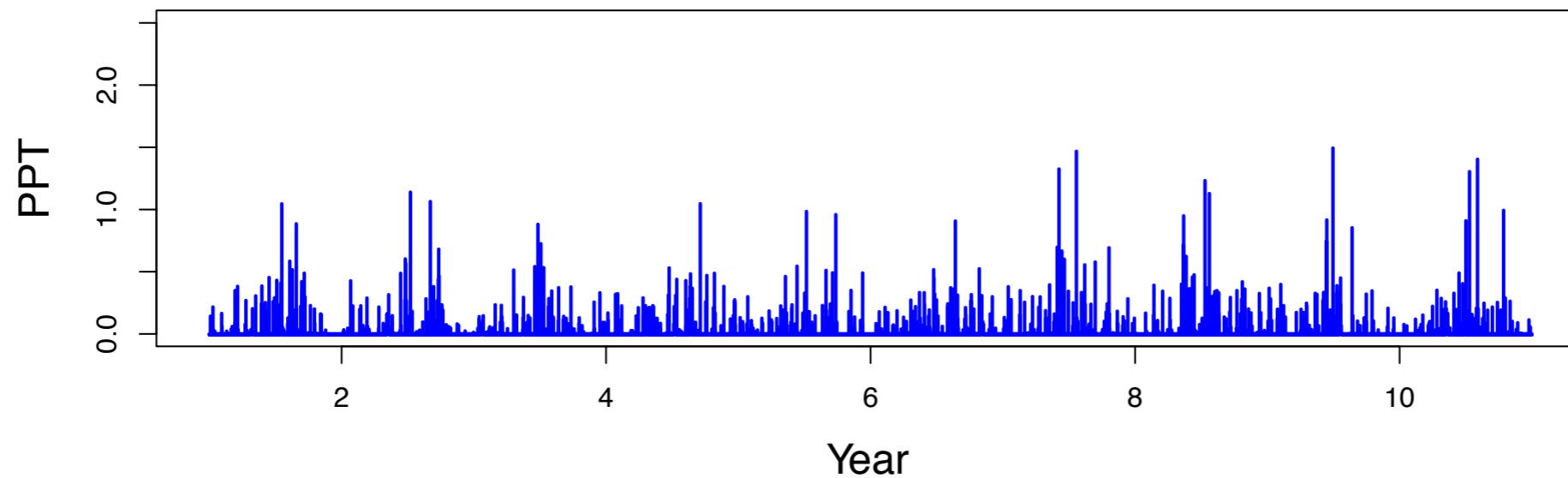
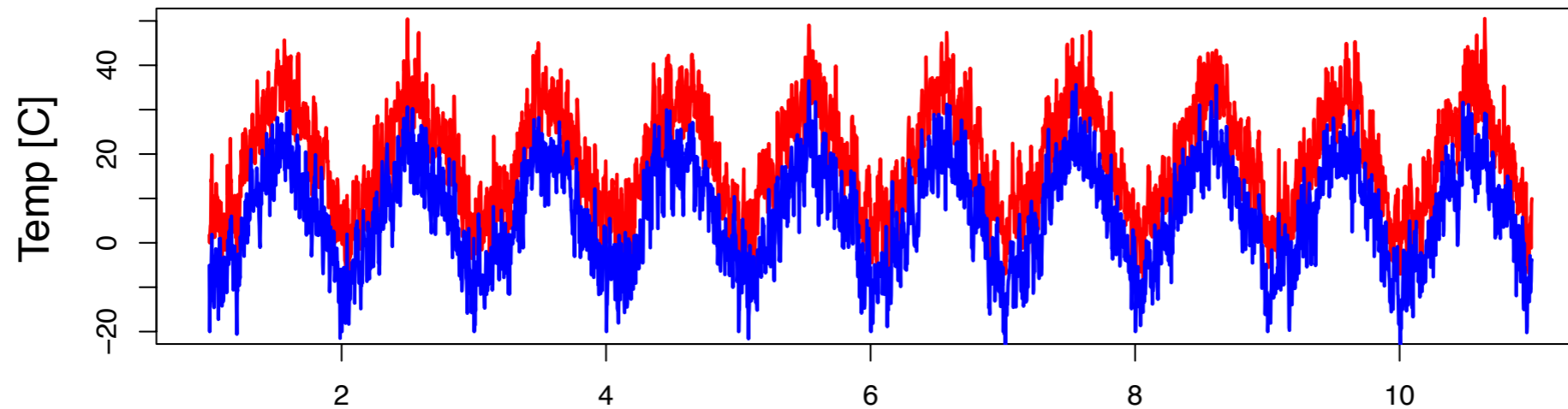


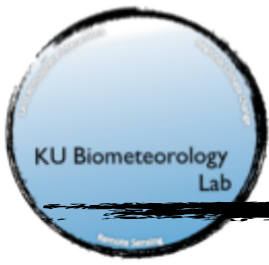
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$$+ \beta_{X,3}E_t + \beta_{X,4}P_t + \beta_{X,5}A_t$$

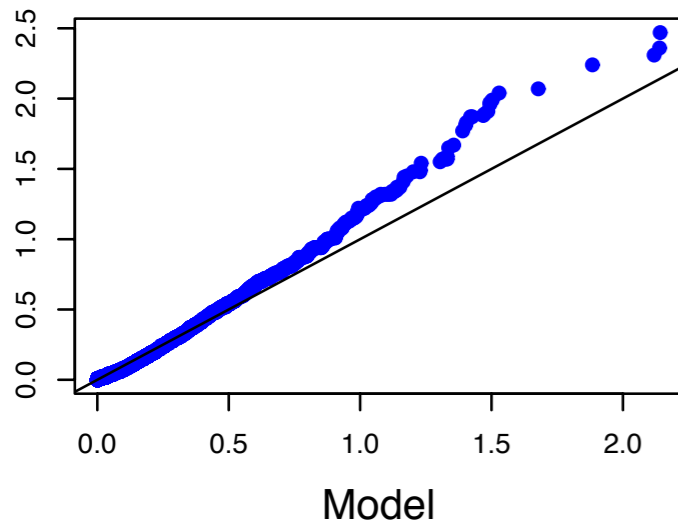
Model



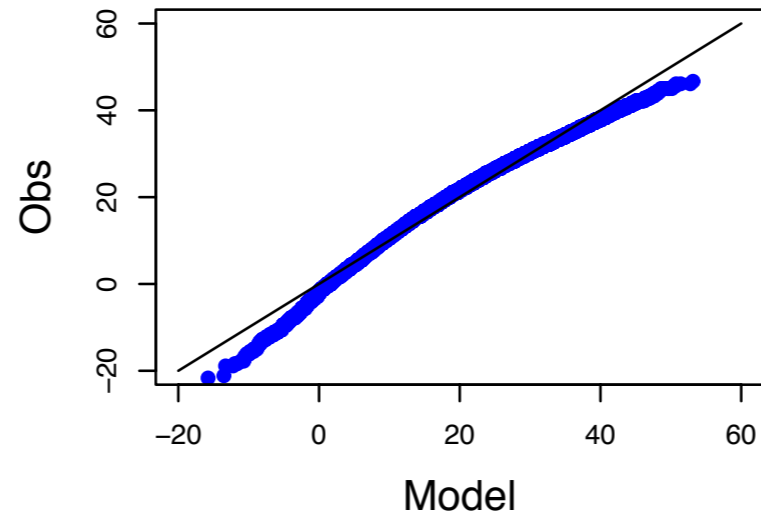


Stochastic Weather Generator

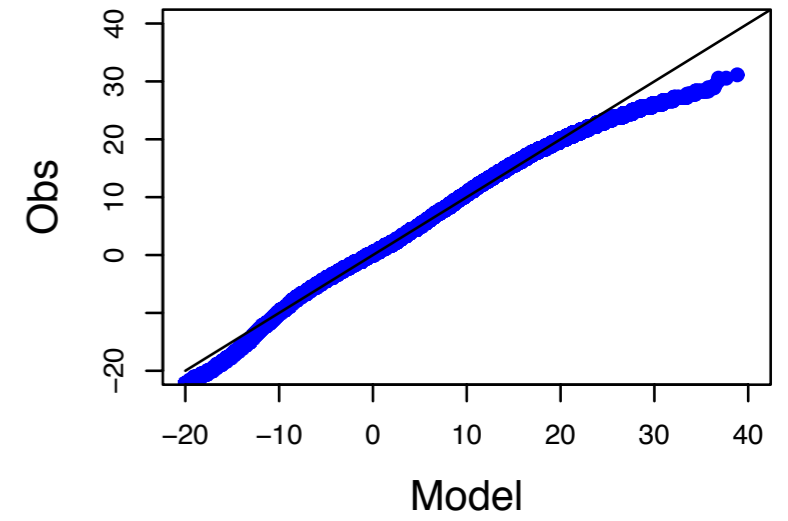
PPT

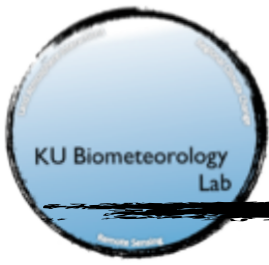


Maximum Temperature



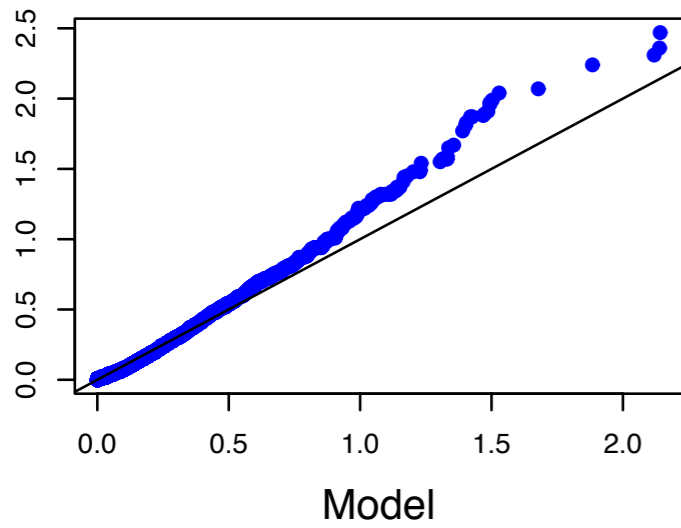
Minimum Temperature



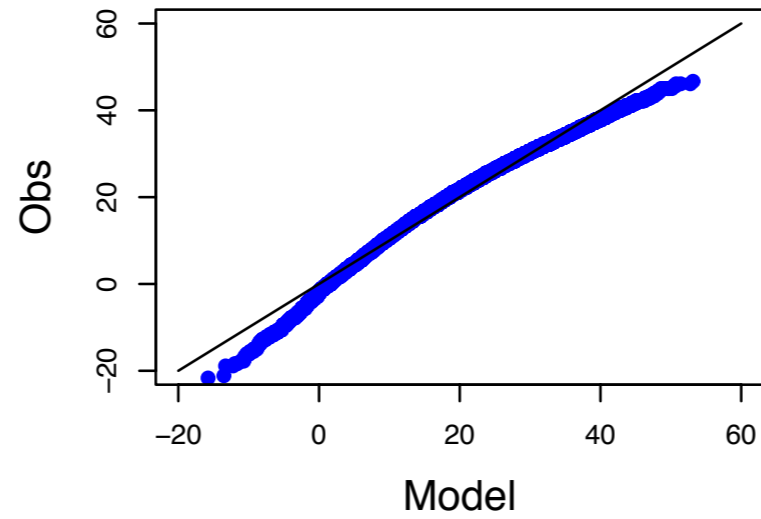


Stochastic Weather Generator

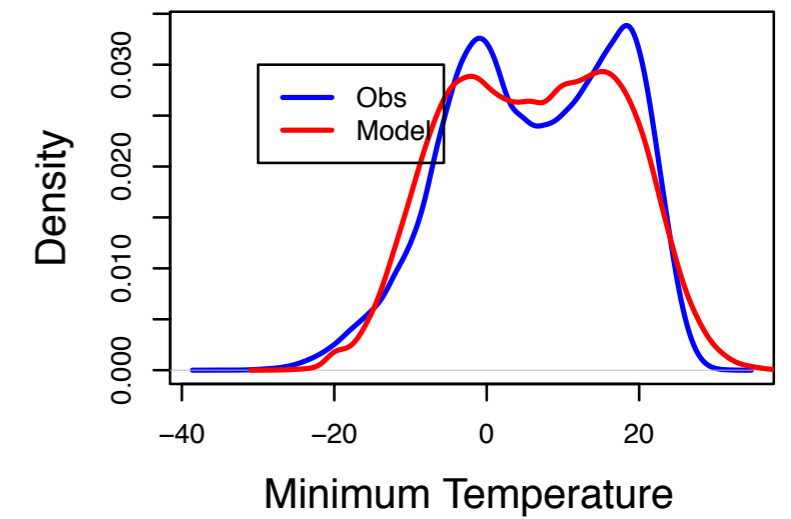
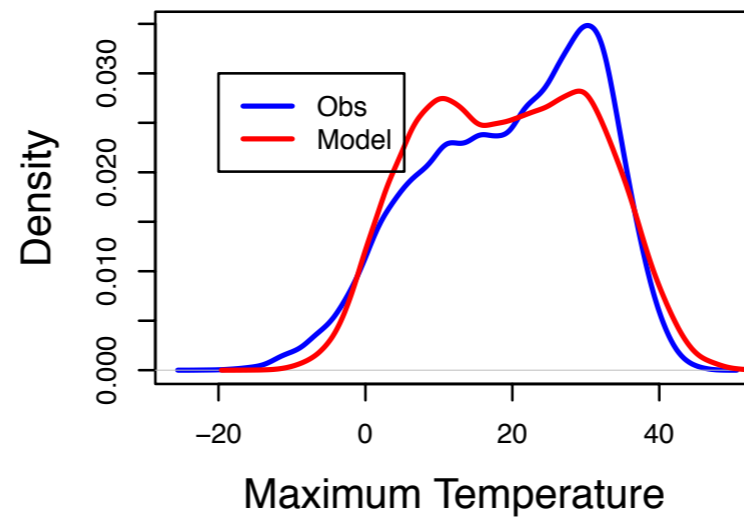
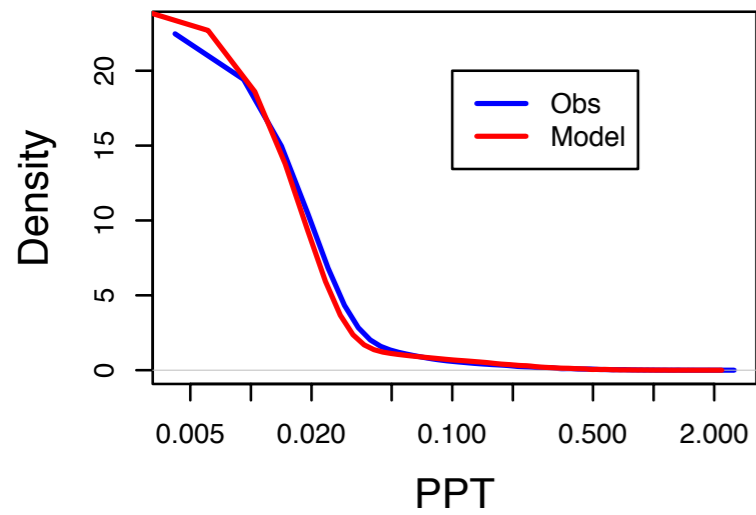
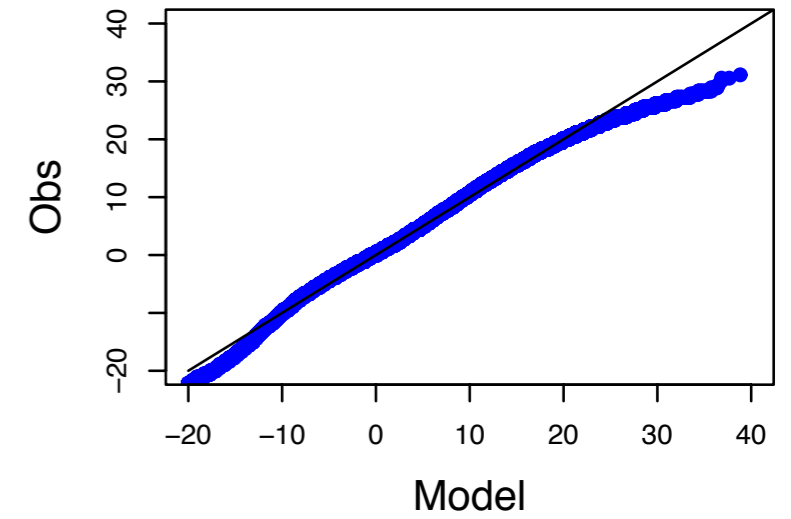
PPT

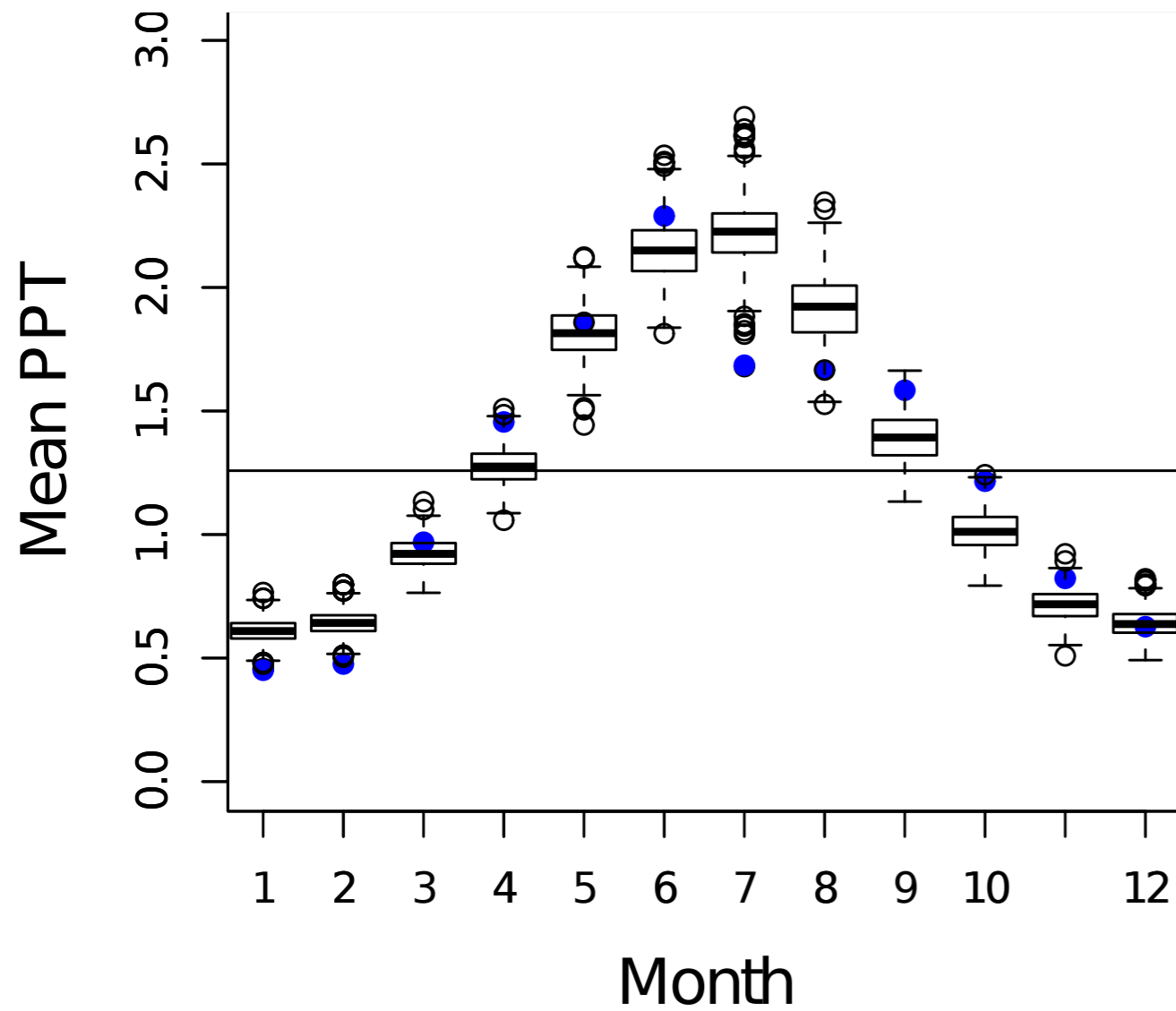


Maximum Temperature

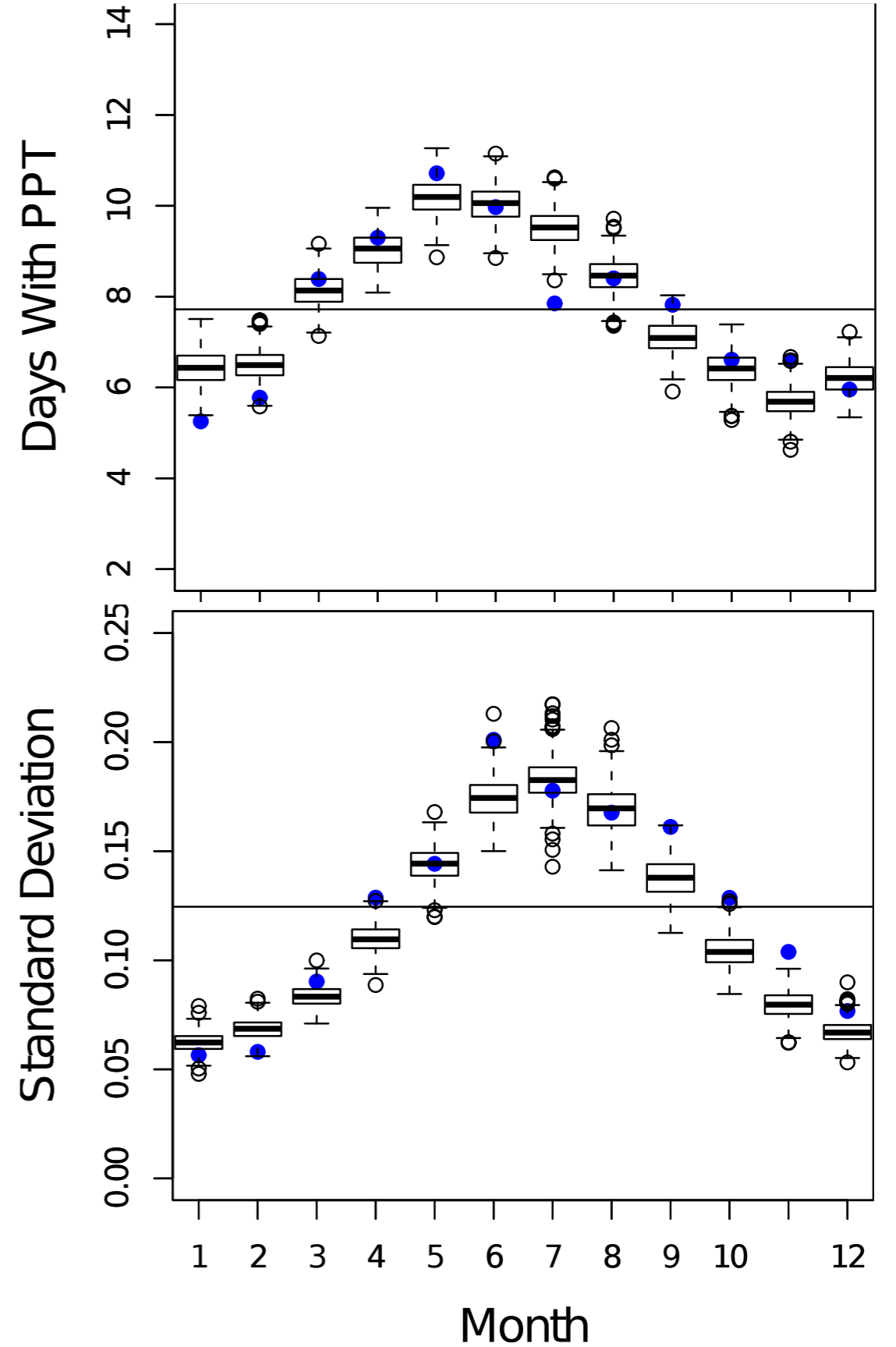
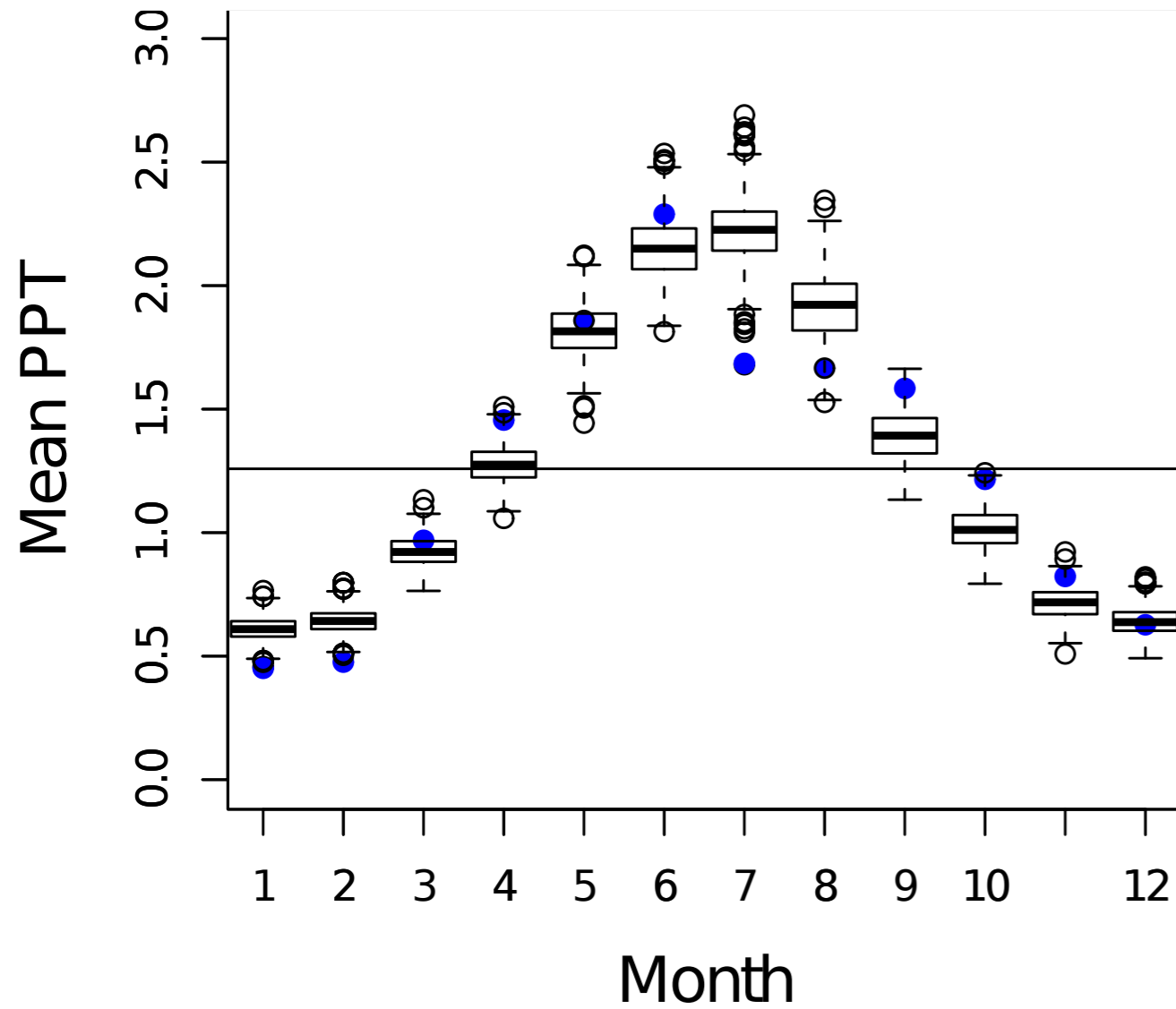


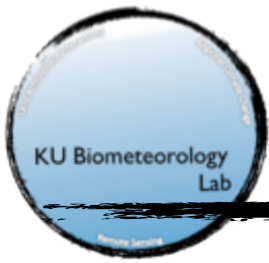
Minimum Temperature





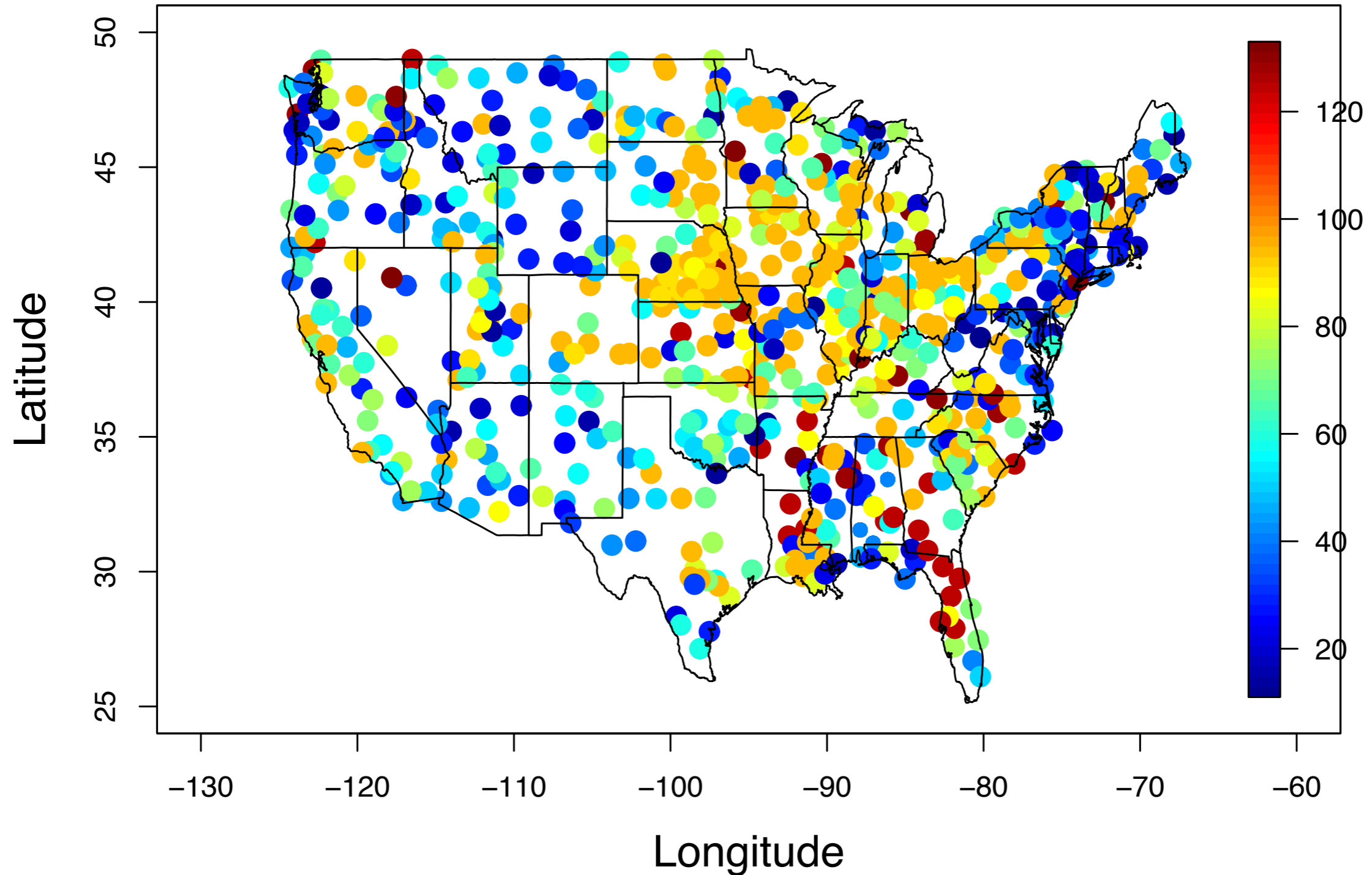
Stochastic Weather Generator

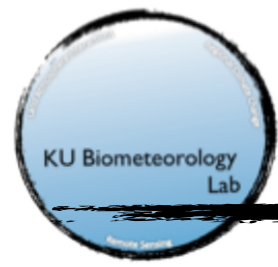




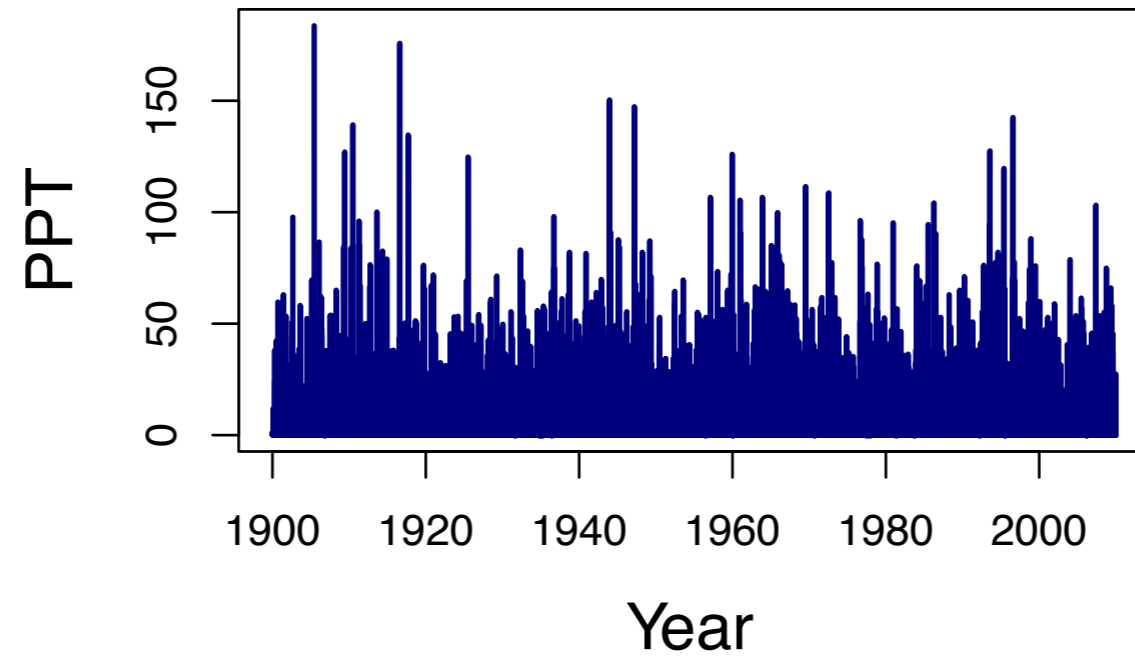
Application to USHCN

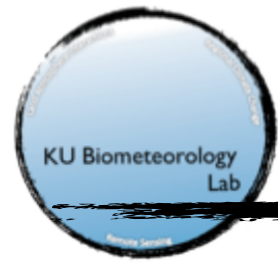
Station Length in Years



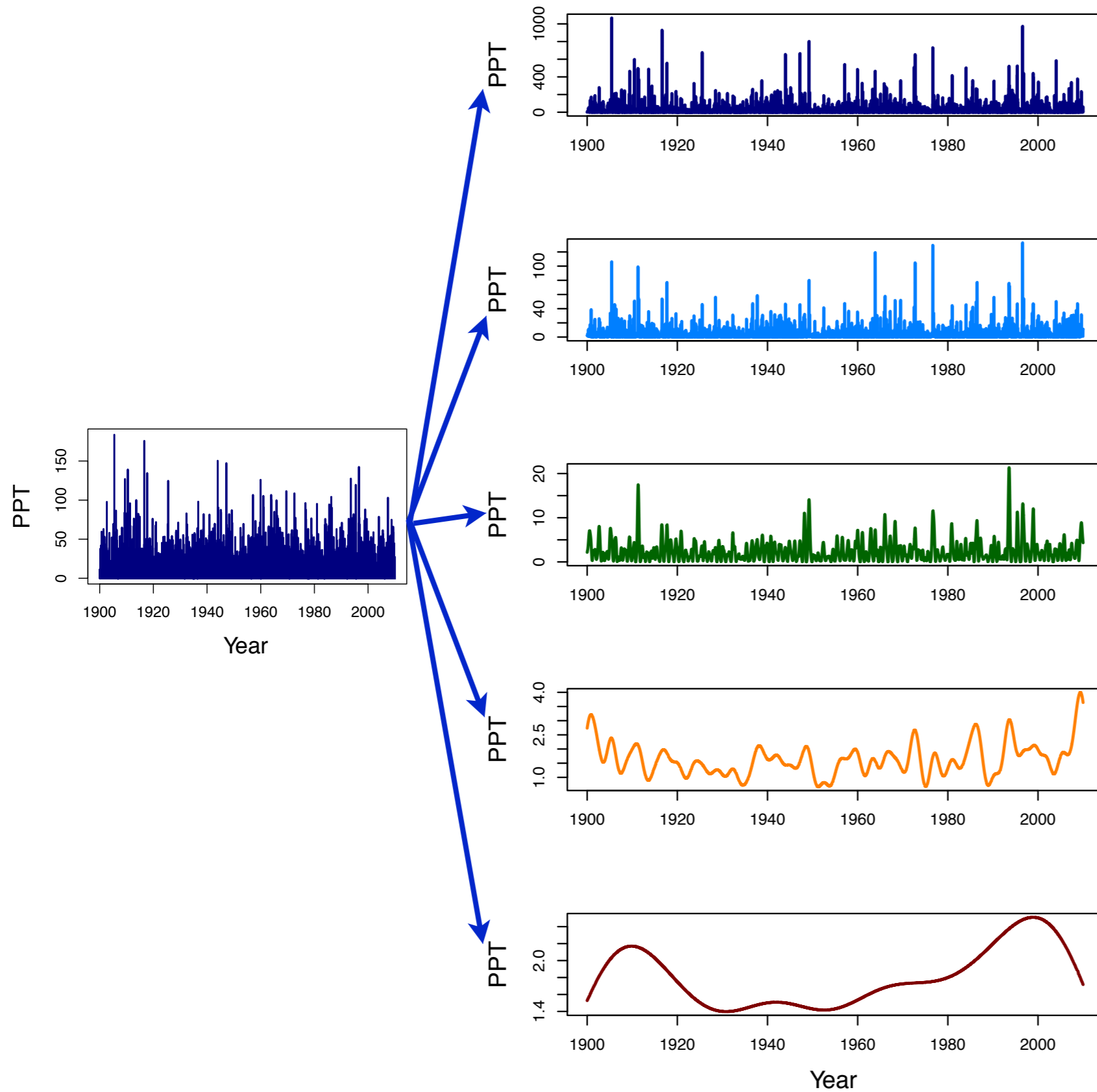


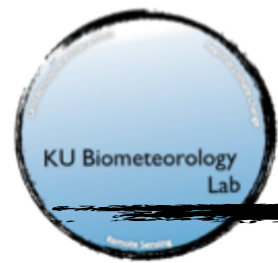
Wavelet/Information Theory Approach



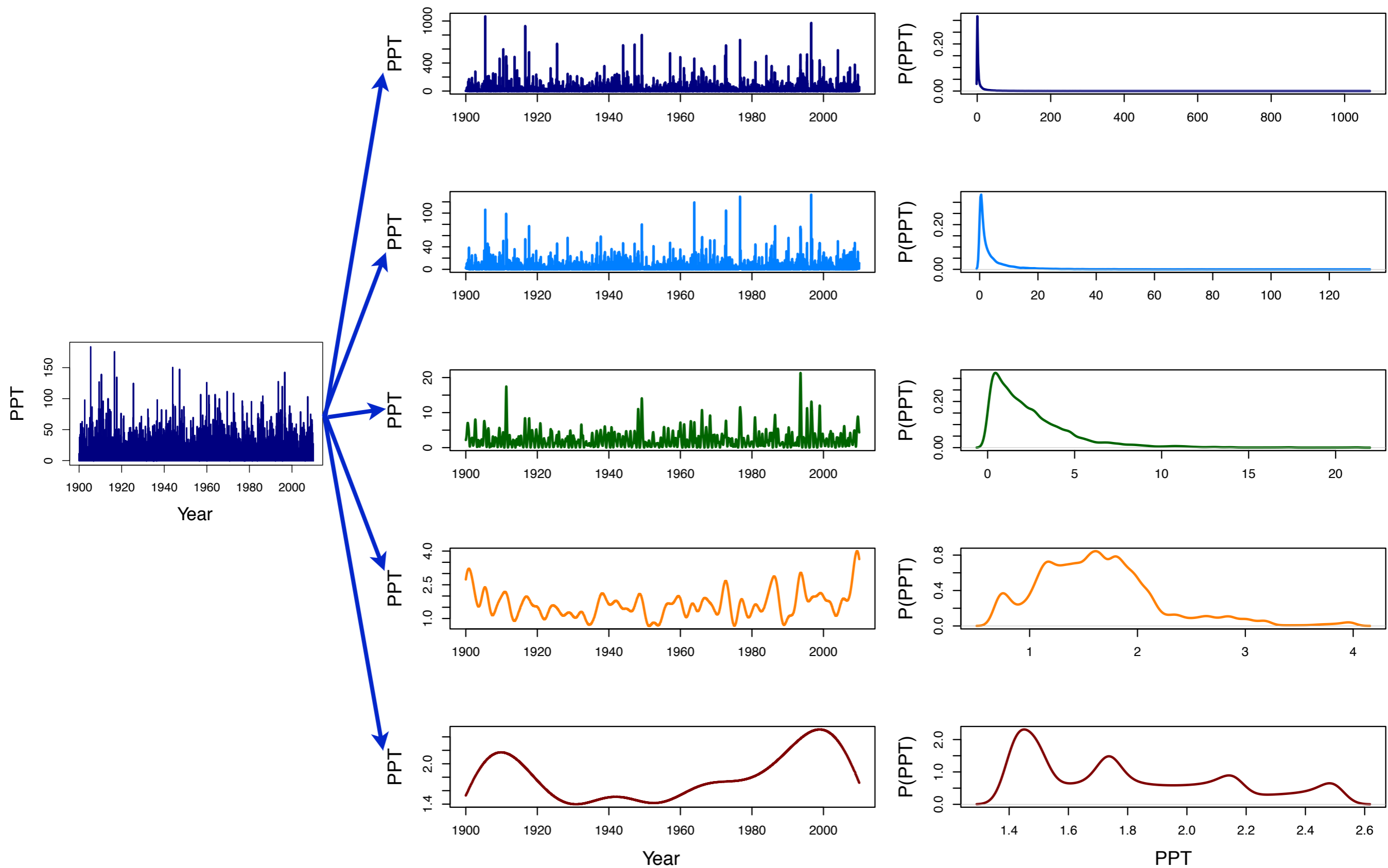


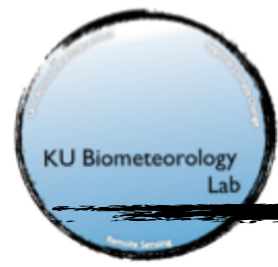
Wavelet/Information Theory Approach



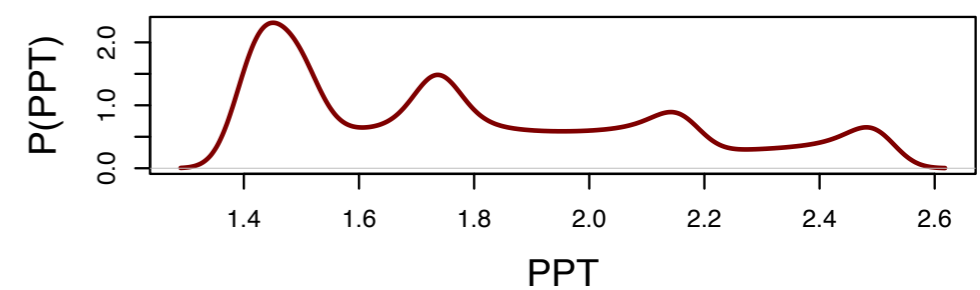
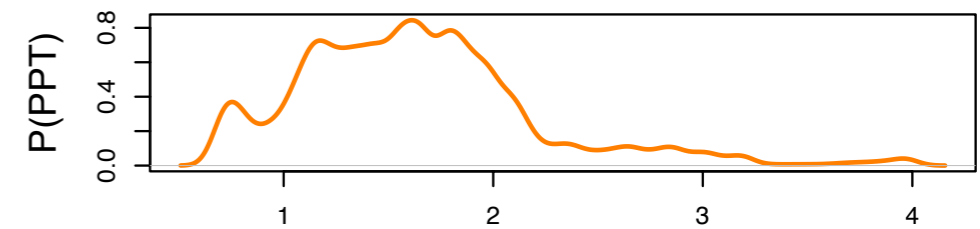
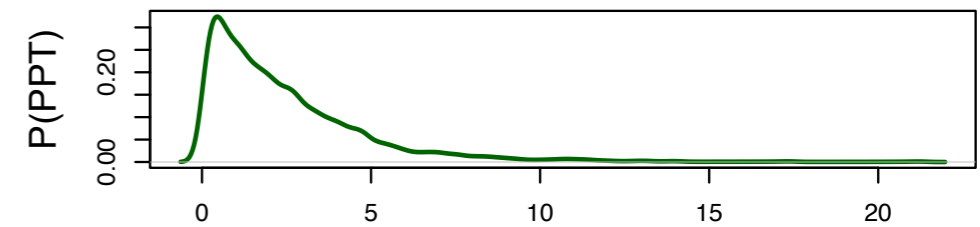
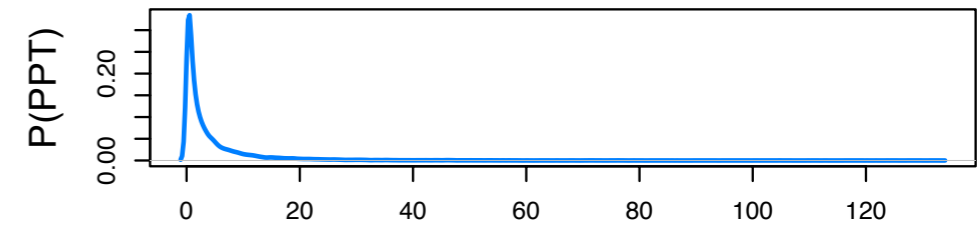
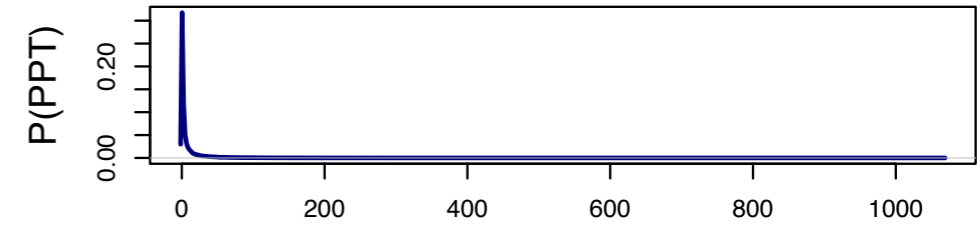
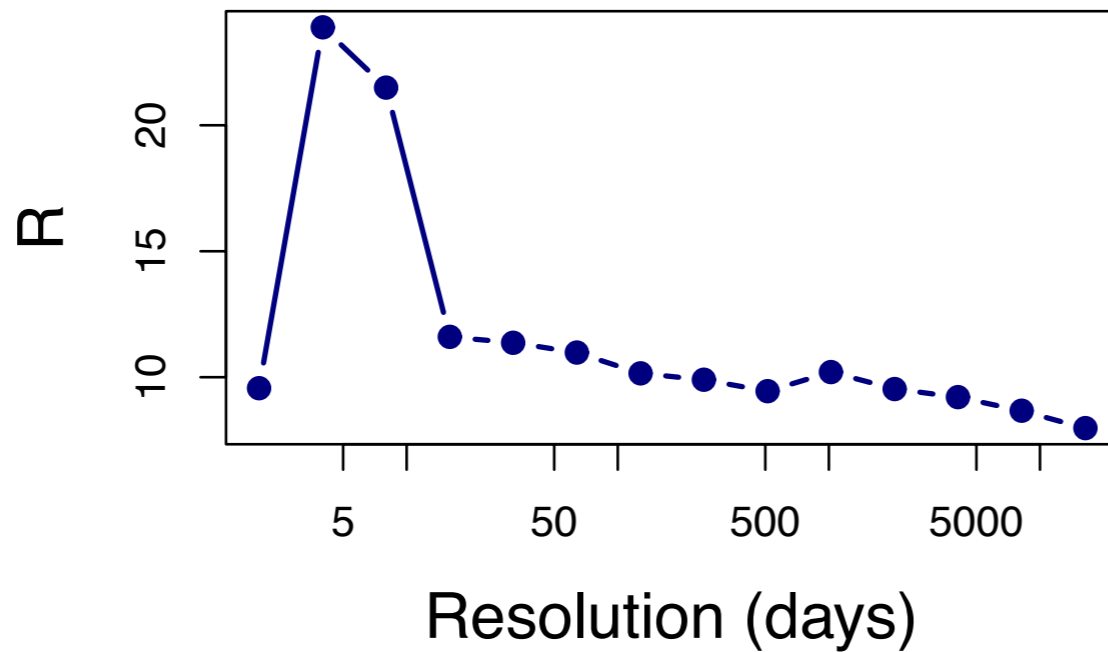
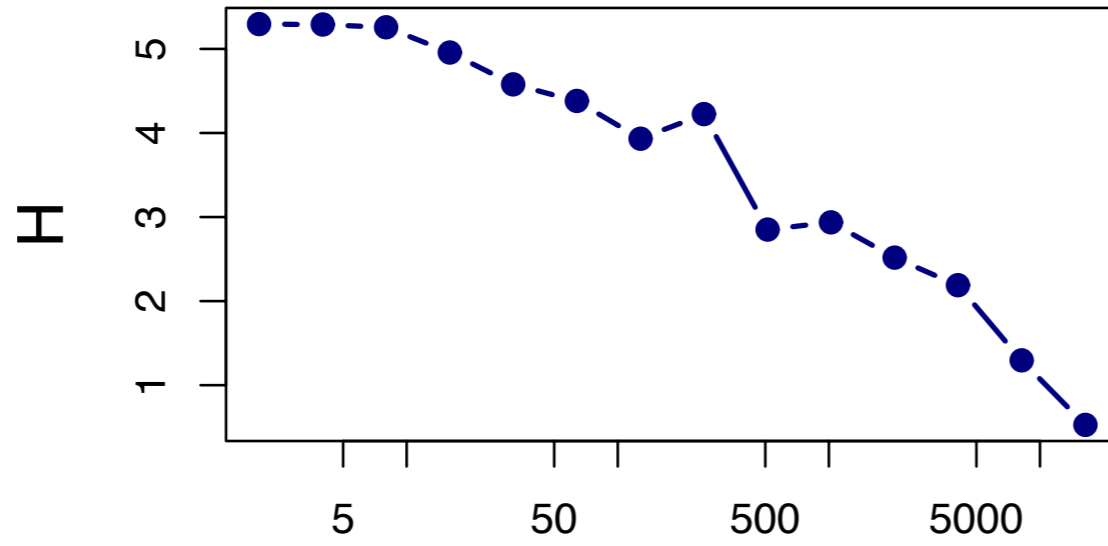


Wavelet/Information Theory Approach

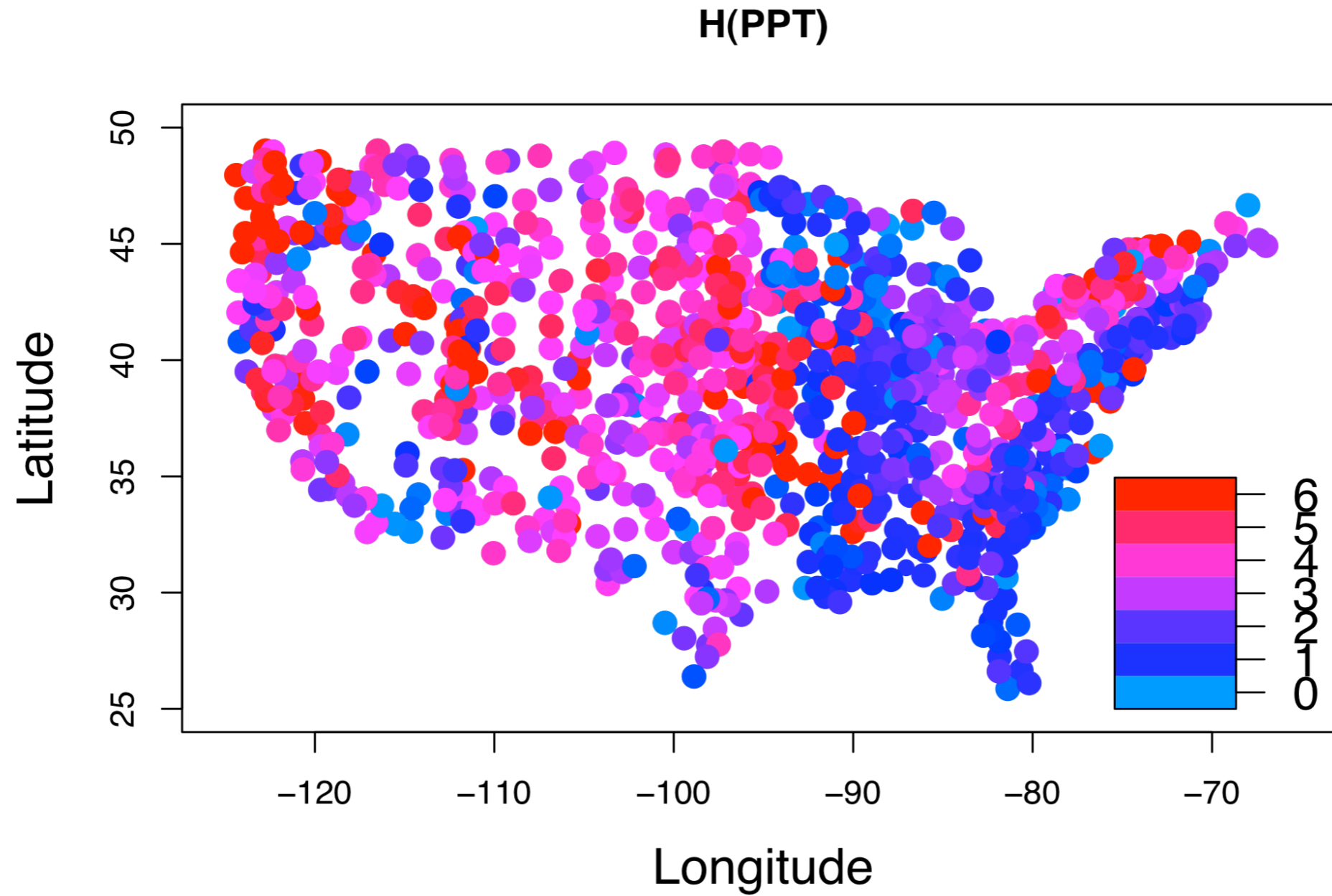




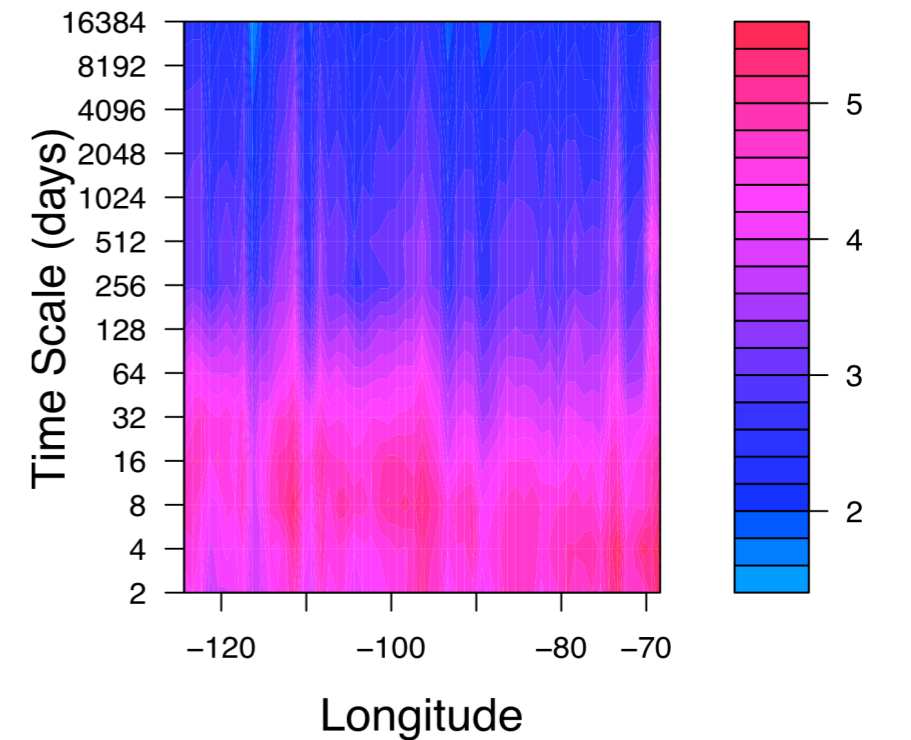
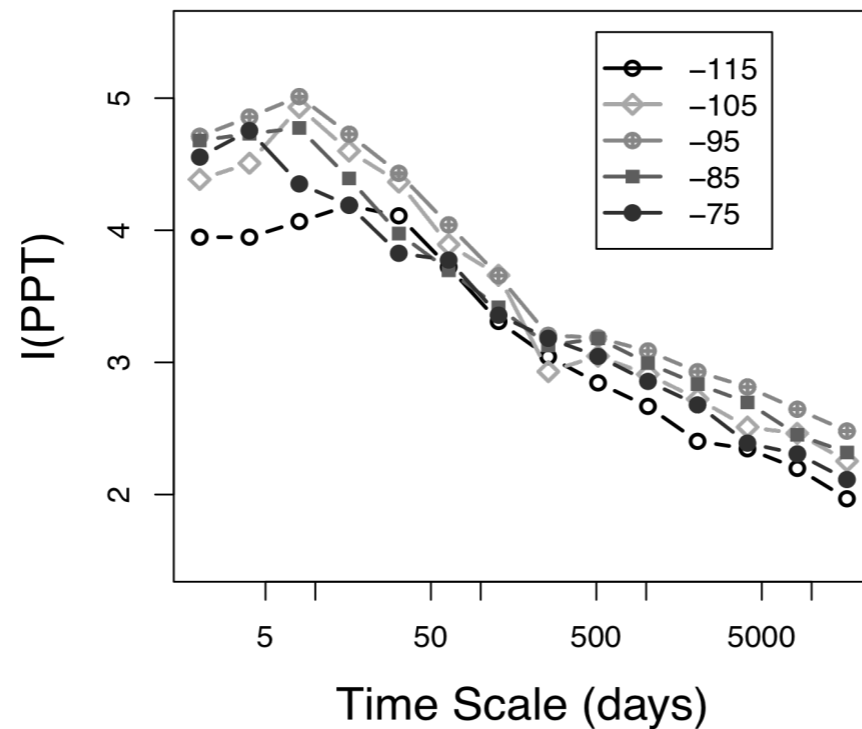
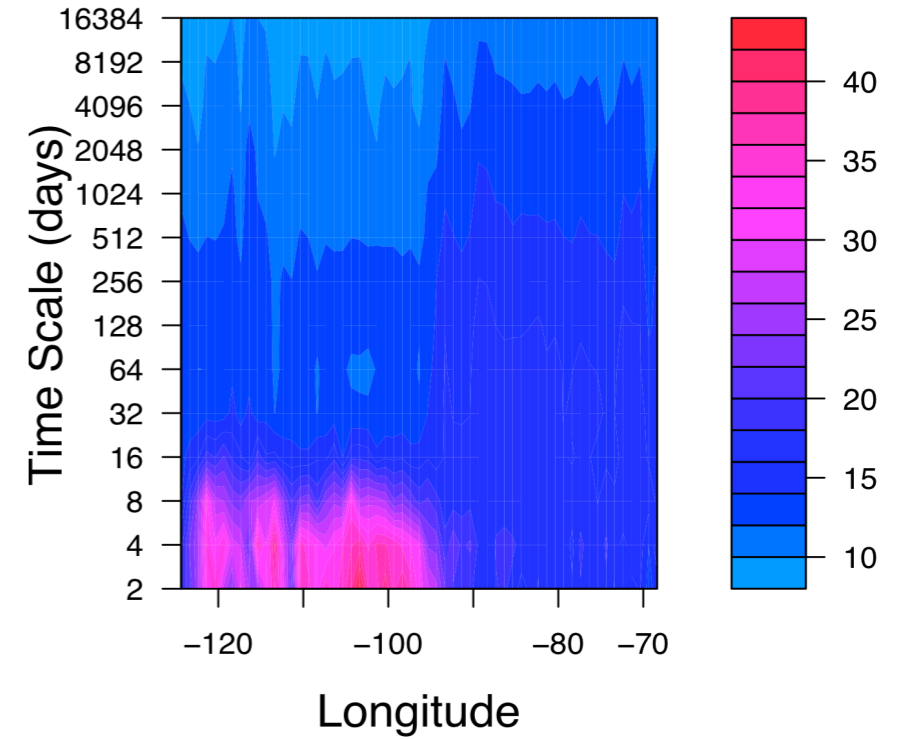
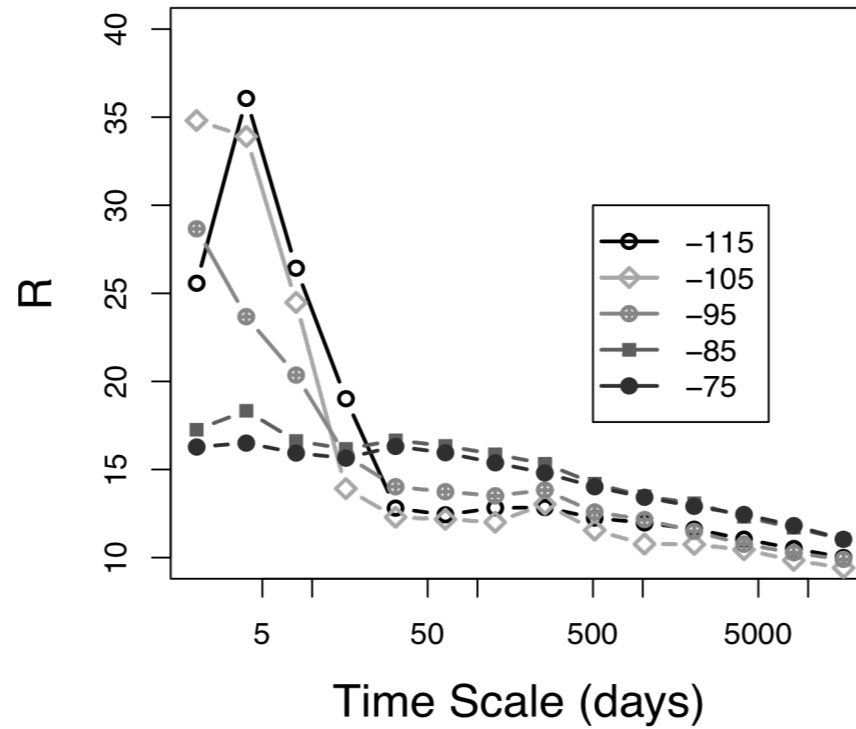
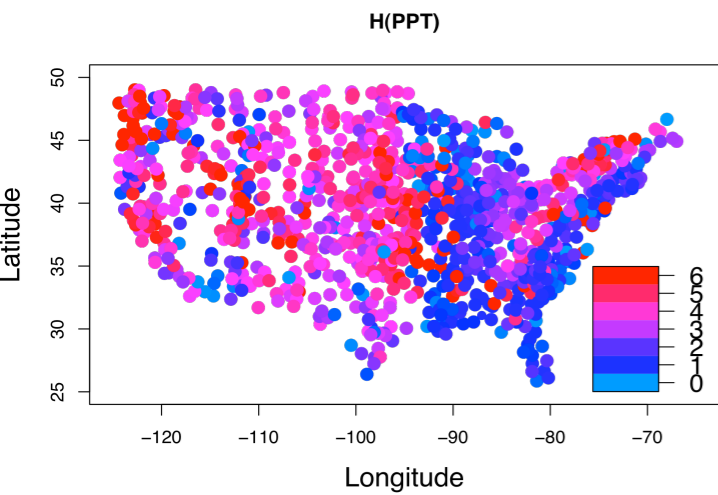
Wavelet/Information Theory Approach

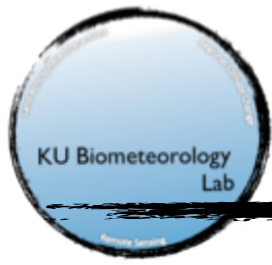


Temporal Scaling of Precipitation

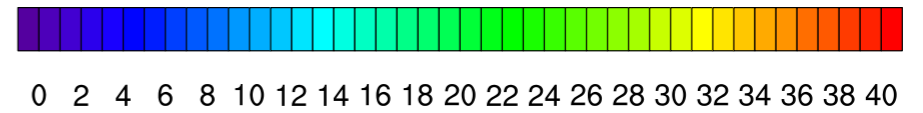
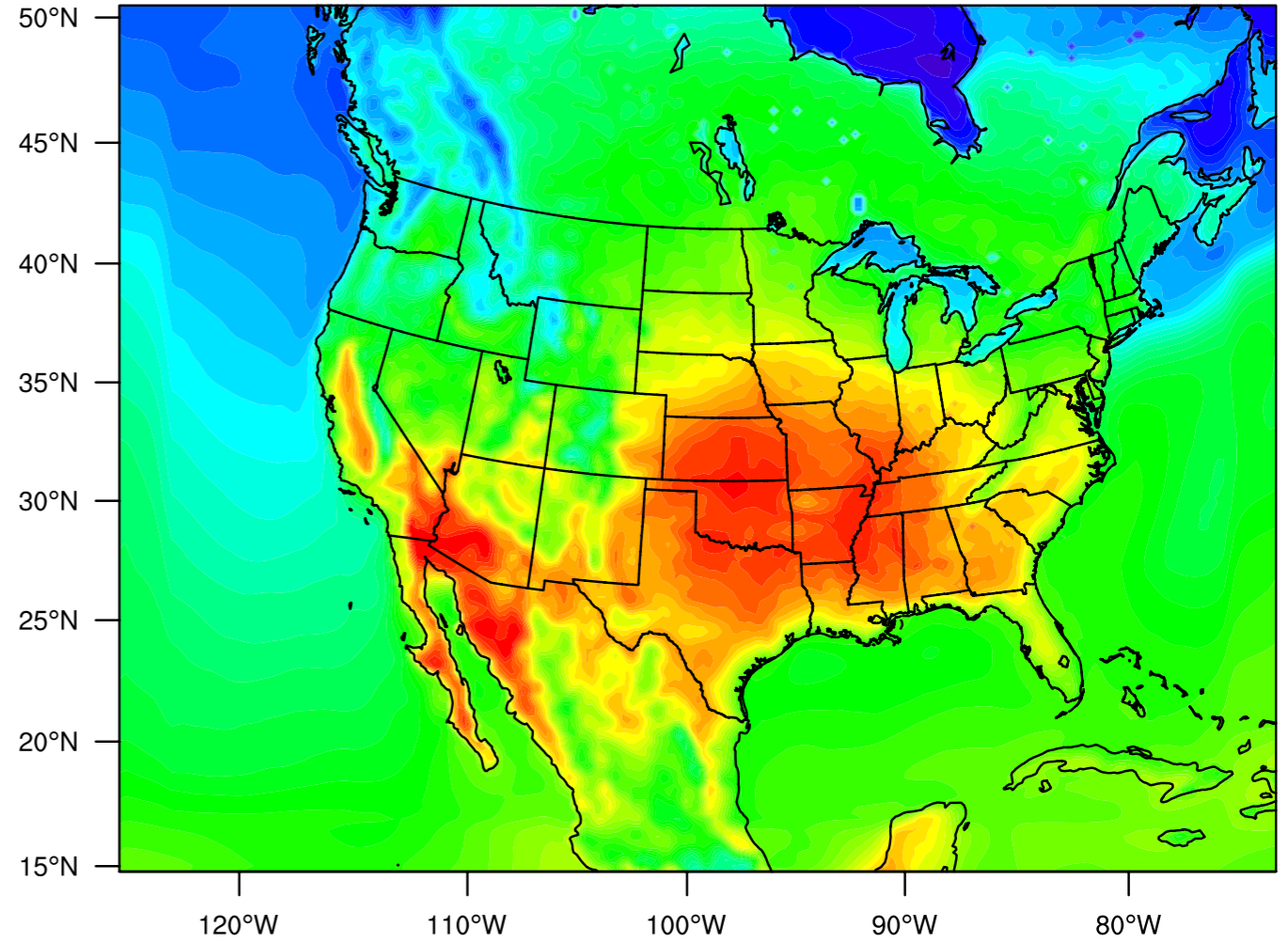
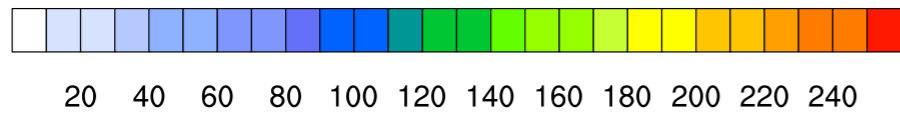
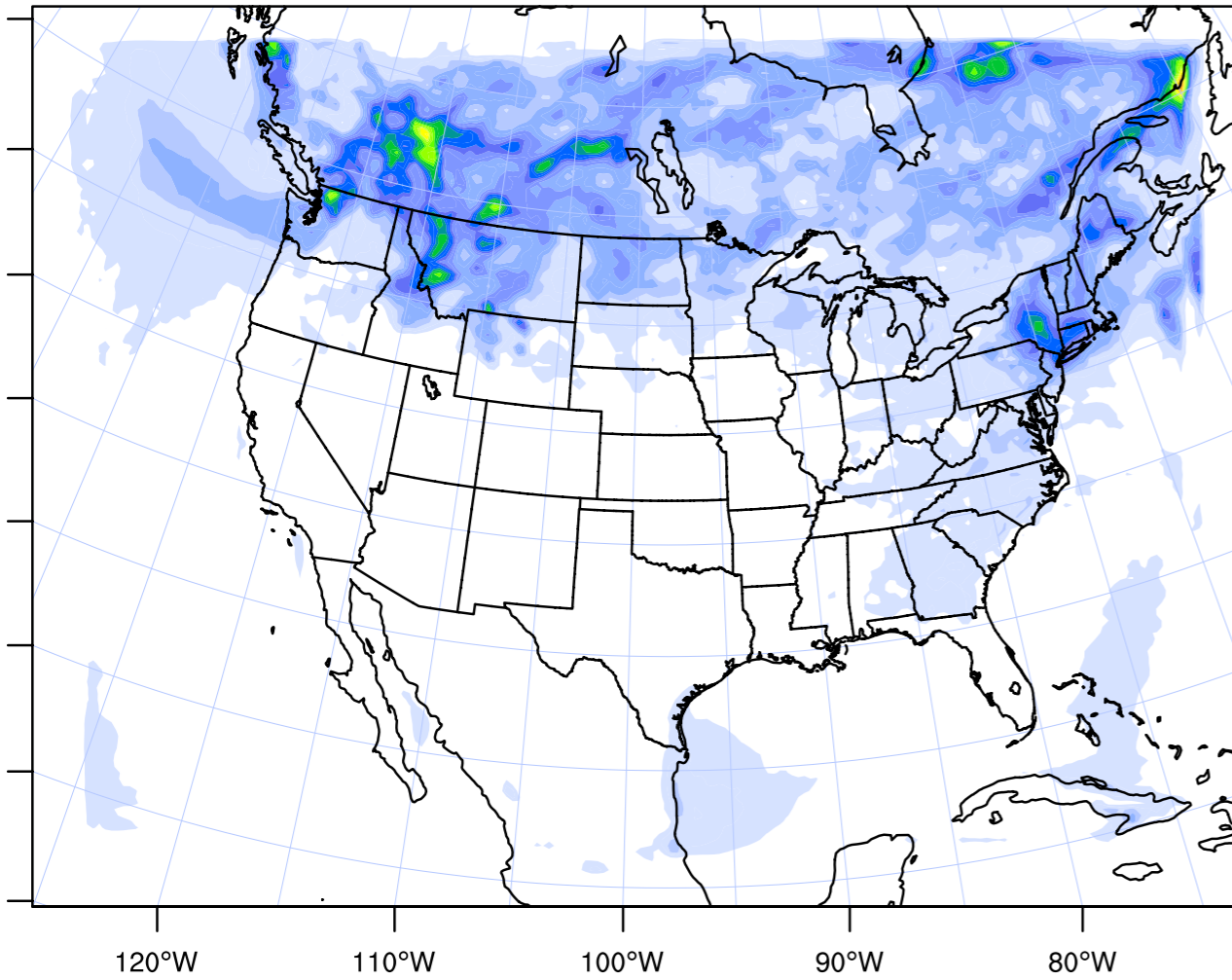


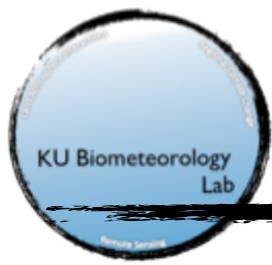
Temporal Scaling of Precipitation





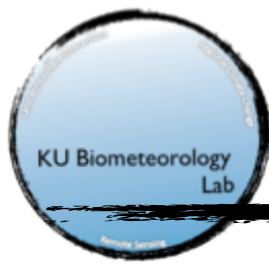
WRF Simulations





Summary

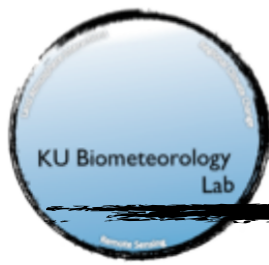
Initial results of historical data shows strong regional coherence in trend of number of extreme events



Summary

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20th century trends will be further analyzed with a wavelet-information theory technique and a stochastic weather generator



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20th century trends will be further analyzed with a wavelet-information theory technique and a stochastic weather generator

20th and 21st century trends will be assessed using the same techniques on century long WRF simulations