

Signal, Noise, and Recognition: Changing Weather Patterns in Oklahoma

Hank Jenkins-Smith, Carol Silva, and Joseph Ripberger

National Institute for Risk and Resilience

University of Oklahoma

What do we Know about Public Recognition of the Changing Climate?

- Discussion of *climate change* is highly charged and affected by politically motivated reasoning (PMR)
- Identity protective mechanisms undermine both collective policy discussion and individual-level actions to address climate change
 - Non-identity contexts appear to be less affected by PMR
- But do identity protective mechanisms preclude accurate recognition of changing climate patterns?
 - Current studies, based on cross-sectional data, suggest that PMR has undermined citizens' abilities to perceive climate "signals"
- The Oklahoma Observatory, and the M-SISNet survey, were designed to provide a better test of citizens capacities to recognize and act on local climate variability

HISTORY OF THE M-SISNET

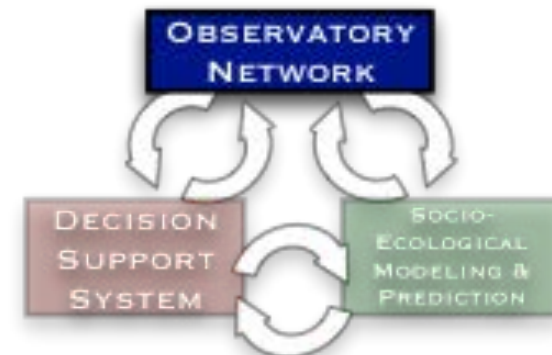
Ecological/Weather/Climate Data

- Current resources/infrastructure in OK
 - Oklahoma MESONET
 - NOAA presence
- Building Additional Infrastructure & Measurement Capabilities
 - Remote sensing
 - Ground water monitoring
 - Soil moisture monitoring
 - Stream flow monitoring



Social/Behavioral Data

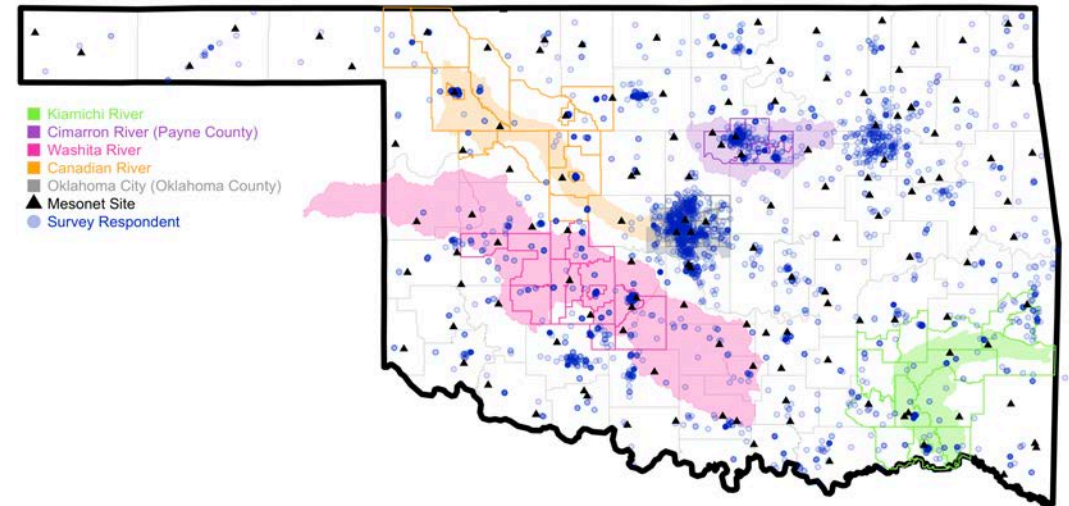
- Decades Behind
- No systematic time series data
 - Perceptions
 - Behaviors, decisions
- No data → No model input
- Infrastructure investment
 - Build the socio-ecological observatory
 - Collect the empirical data



BUILDING THE M-SISNET

The Meso-Scale Integrated Socio-geographic Net

- Five year panel survey of 2,500+ households in OK
 - Address based random sample
- Spatially and temporally integrated with the OK MESONET
- Measure perceptions about weather and climate and behaviors related to energy, land, and water usage
 - To date, we have interviewed 3,999 different Oklahomans, who completed a total of 27,296 surveys, and answered more than 700 different questions
- Developed the infrastructure to design surveys with collaborators, administer surveys on phone and web platforms, and distribute data to participants and researchers



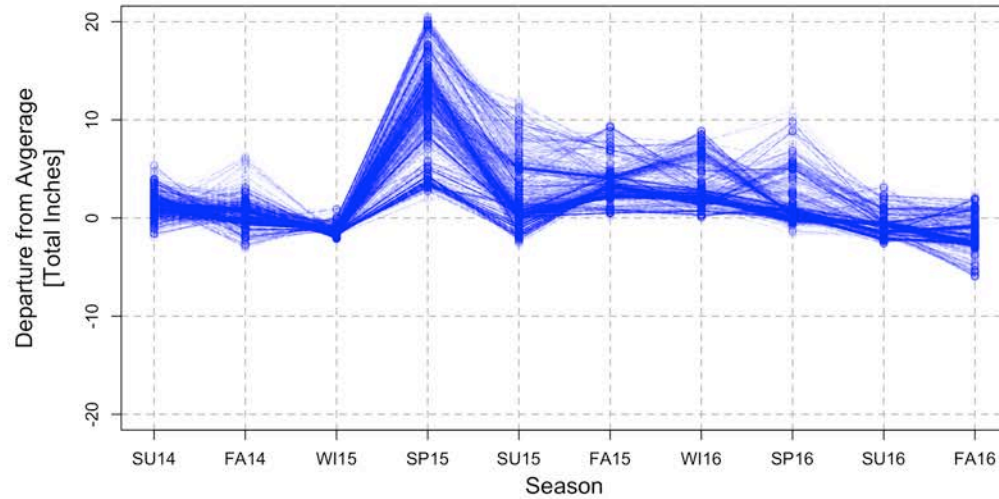
Data: <http://crcm.ou.edu/epscordata/>

MOTIVATING RESEARCH QUESTIONS

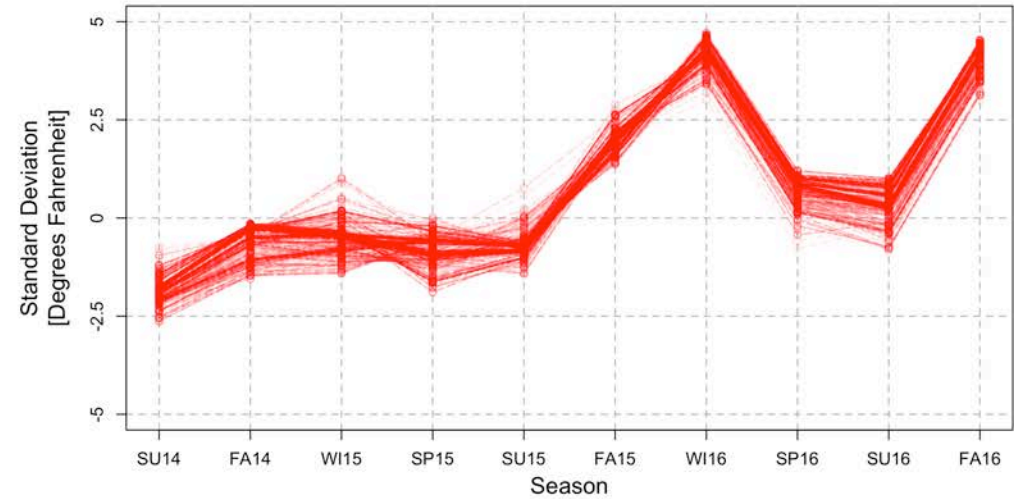
1. Do residents of Oklahoma recognize weather/climate anomalies?
 2. What factors interrupt or facilitate recognition?
 - a) Strength of the signal
 - b) Clarity of the signal
 - c) Exposure to the signal
 - d) Heuristics & biases (motivated cognition)
- MESONET DATA:
 - Departure from 15-year average daily precipitation (RAIN) – by {SEASON} & {RESPONDENT}
 - Departure from 15-year average daily temperature (TAVG) – by {SEASON} & {RESPONDENT}
 - M-SISNet DATA:
 - In the area around where you live, would you say that the amount of precipitation that fell this {SEASON} was more, less, or about the same amount as in previous {SEASON}s?
 - In the area around where you live, would you say that this {SEASON} has been warmer, cooler, or about the same as previous {SEASON}s?

RECOGNITION OF CLIMATE ANOMALIES: DATA

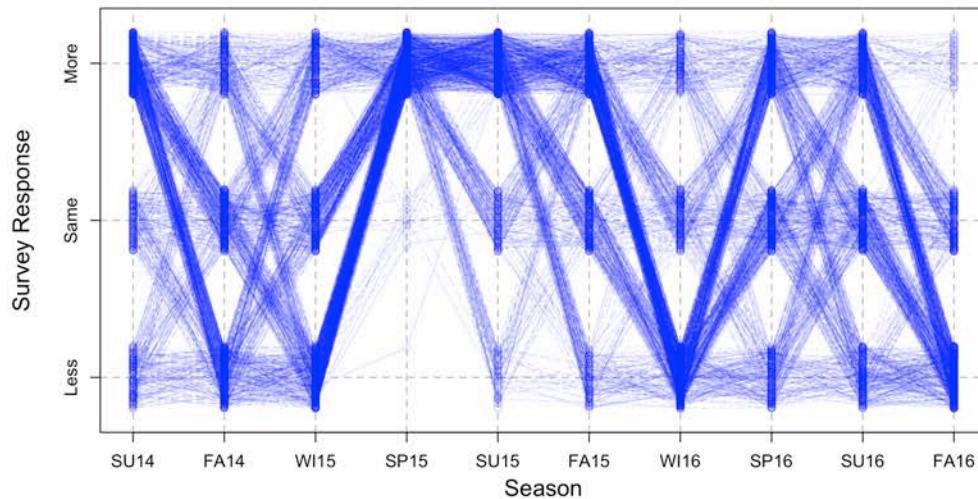
Seasonal Precipitation Anomaly (Mesonet)



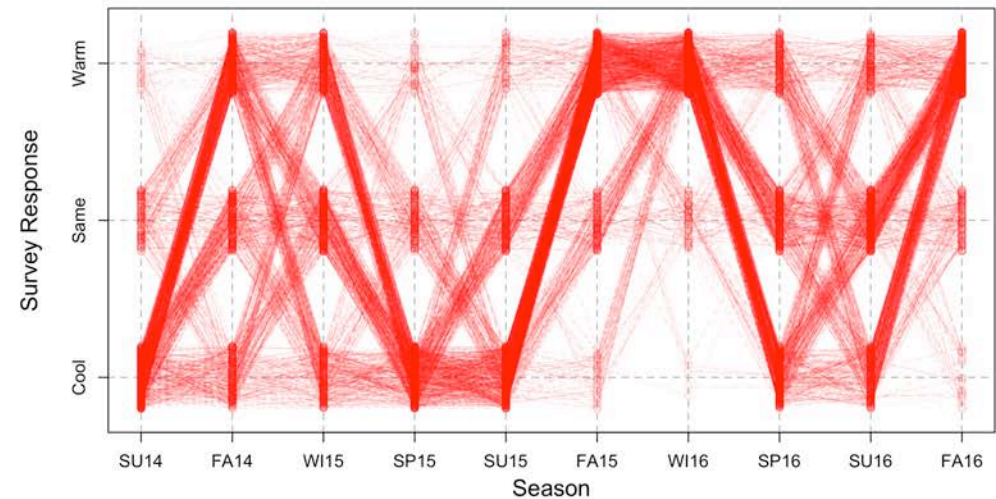
Seasonal Temperature Anomaly (Mesonet)



Seasonal Precipitation Anomaly (M-SISNet)

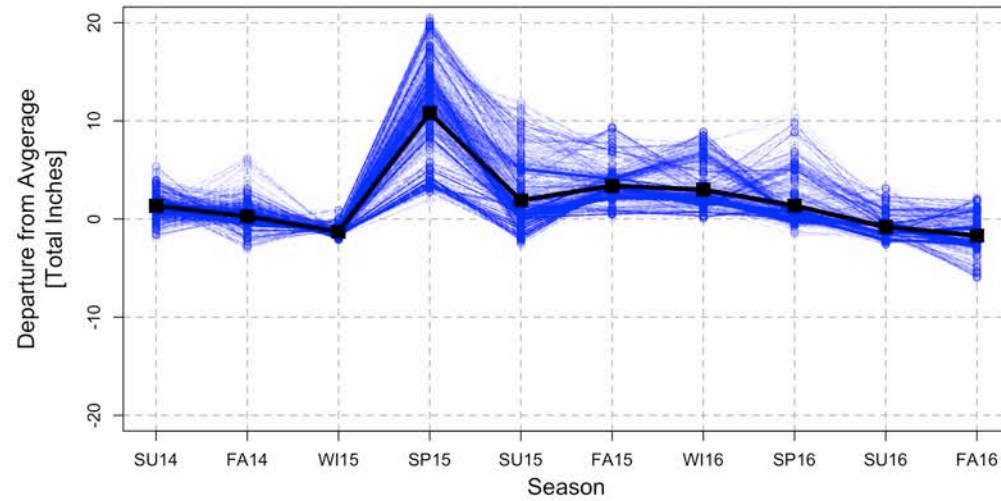


Seasonal Temperature Anomaly (M-SISNet)

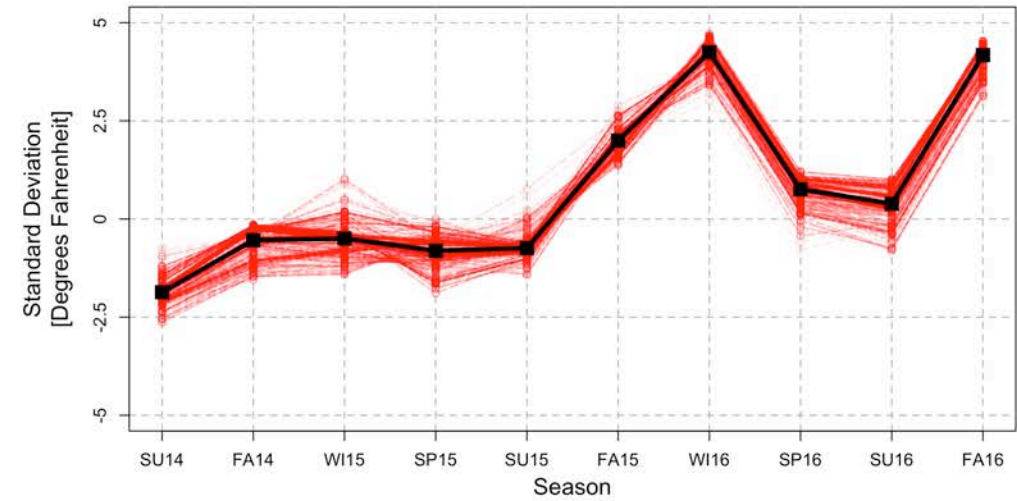


RECOGNITION OF CLIMATE ANOMALIES: AVERAGE

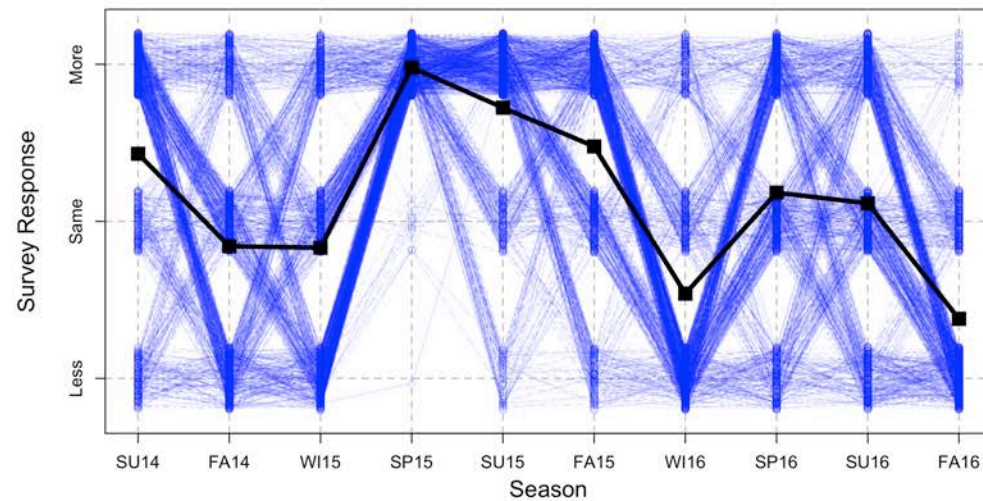
Seasonal Precipitation Anomaly (Mesonet)



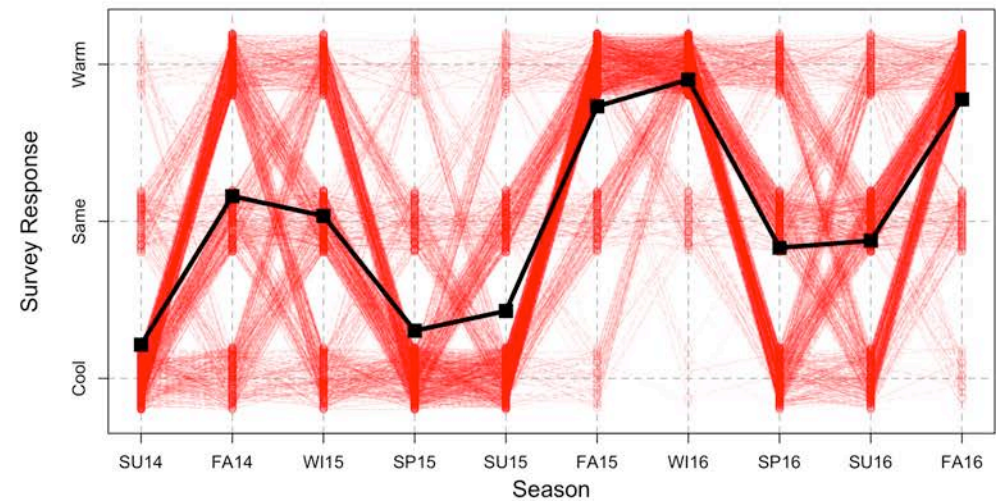
Seasonal Temperature Anomaly (Mesonet)



Seasonal Precipitation Anomaly (M-SISNet)

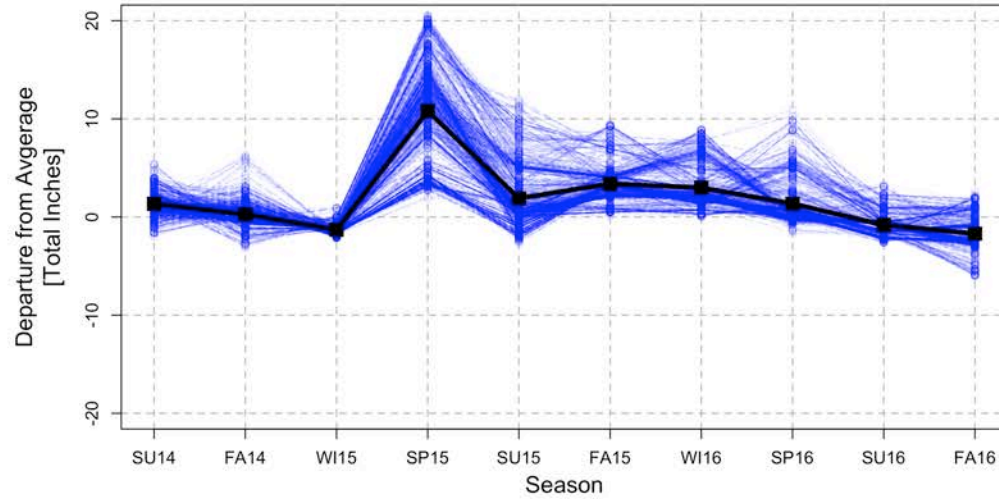


Seasonal Temperature Anomaly (M-SISNet)

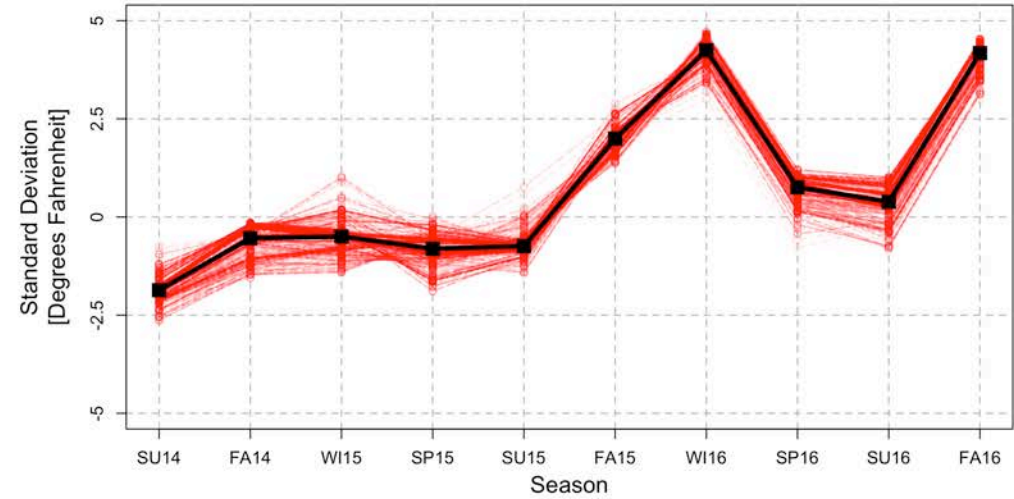


RECOGNITION OF CLIMATE ANOMALIES: BIAS?

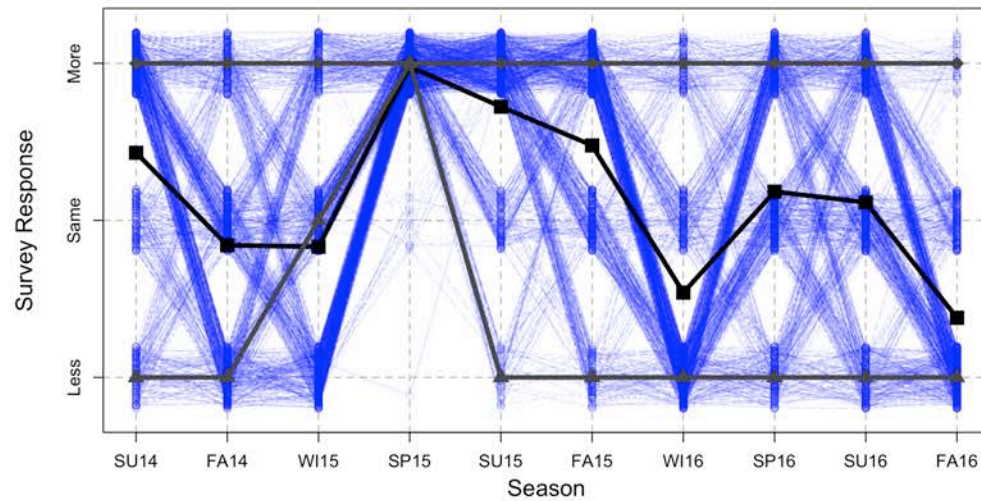
Seasonal Precipitation Anomaly (Mesonet)



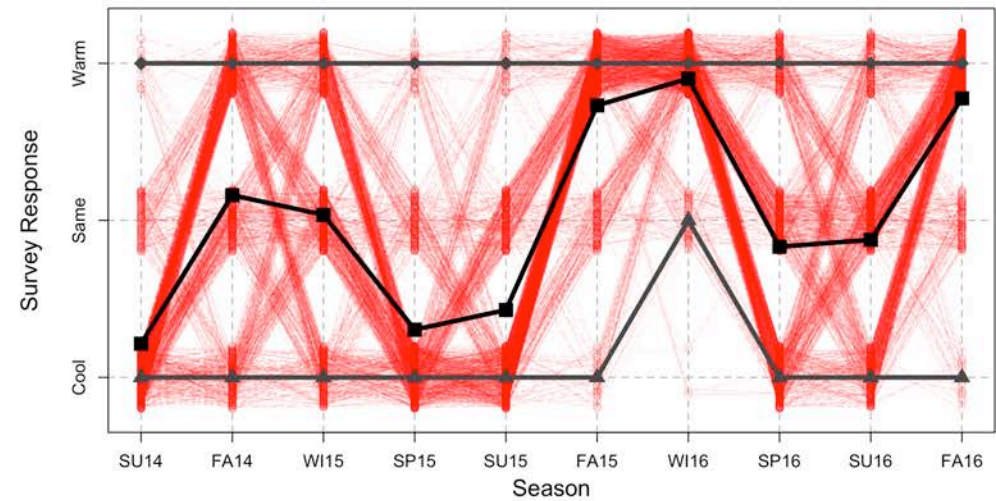
Seasonal Temperature Anomaly (Mesonet)



Seasonal Precipitation Anomaly (M-SISNet)



Seasonal Temperature Anomaly (M-SISNet)



RECOGNITION OF CLIMATE ANOMALIES: MODELS

Explaining
Aggregate Perceptions

Explaining
Directional Deviations

Explaining
Non-Directional Accuracy

Dependent variable:

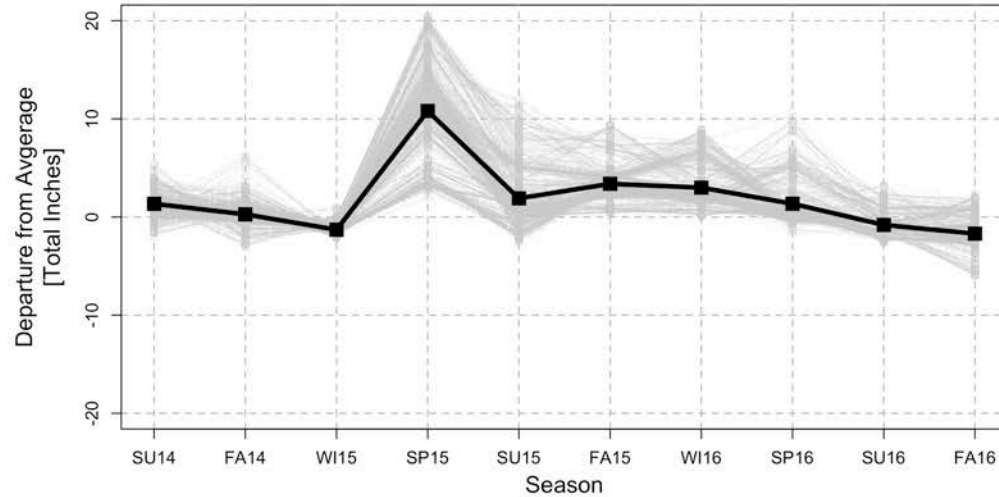
	ssn_precip panel linear (1)	ssn_tmp panel linear (2)	fe_precip OLS (3)	fe_tmp OLS (4)	abs(fe_precip) OLS (5)	abs(fe_tmp) OLS (6)
z.ssn_precip_15yr_depart	1.28*** (0.06)					
z.ssn_precip_15yr_depart:z.ssn_precip_sd	-0.33*** (0.03)					
z.ssn_tmp_15yr_depart		1.57*** (0.07)				
z.ssn_tmp_15yr_depart:z.ssn_tmp_sd		-0.34*** (0.05)				
z.ideol.imp			0.04* (0.02)	-0.06*** (0.02)		
z.H_rate.imp			0.02 (0.02)	0.01 (0.02)		
z.I_rate.imp			-0.02 (0.02)	-0.03* (0.02)		
z.F_rate.imp			-0.03 (0.02)	0.03** (0.02)		
z.E_rate.imp			-0.06** (0.02)	0.06*** (0.02)		
factor(time_outside2)1					-0.06 (0.03)	-0.07** (0.03)
factor(time_outside2)3					-0.07* (0.04)	-0.07** (0.03)
ranch_farm2			0.09** (0.04)	-0.04 (0.03)	0.06** (0.02)	0.003 (0.02)
home_lot2					-0.02* (0.01)	0.01 (0.01)
Constant			0.01 (0.04)	0.05 (0.03)	0.31*** (0.03)	0.26*** (0.03)
Observations	9,410	9,410	941	941	938	938
R2	0.17	0.41	0.03	0.06	0.01	0.01
Adjusted R2	0.07	0.34	0.02	0.05	0.01	0.003
Residual Std. Error			0.31 (df = 934)	0.24 (df = 934)	0.18 (df = 933)	0.15 (df = 933)
F Statistic	843.15*** (df = 2; 8467)	2,931.98*** (df = 2; 8467)	4.29*** (df = 6; 934)	9.68*** (df = 6; 934)	2.30* (df = 4; 933)	1.64 (df = 4; 933)

Note:

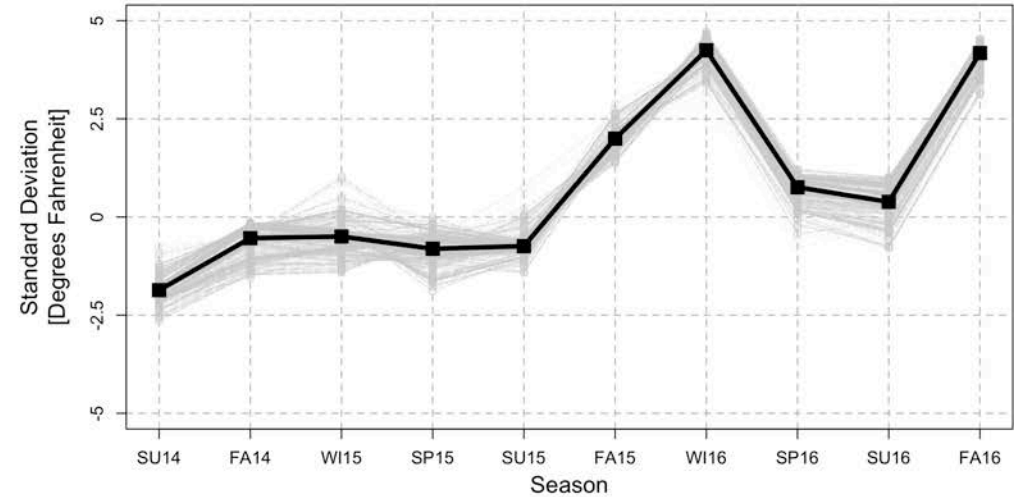
*p<0.1; **p<0.05; ***p<0.01

TO WHAT EXTENT DOES POLITICAL IDEOLOGY INFLUENCE WEATHER PATTERN PERCEPTIONS?

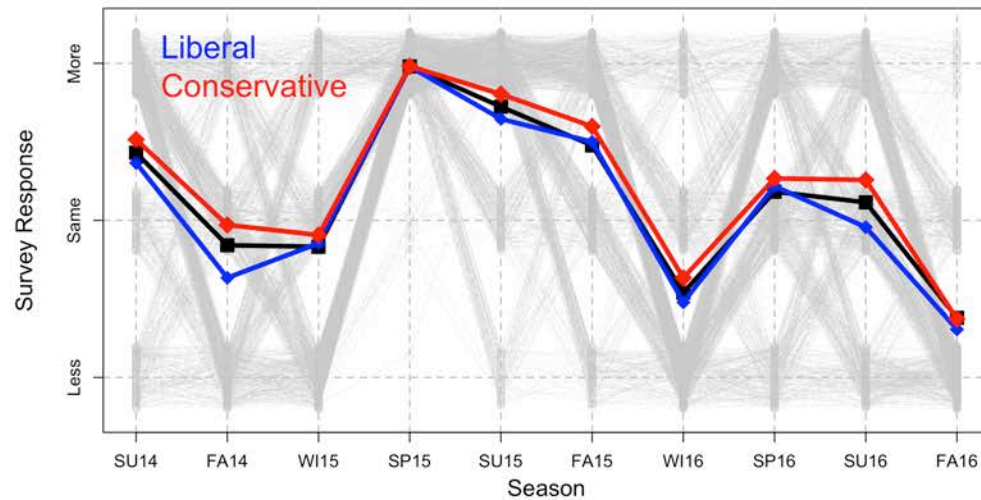
Seasonal Precipitation Anomaly (Mesonet)



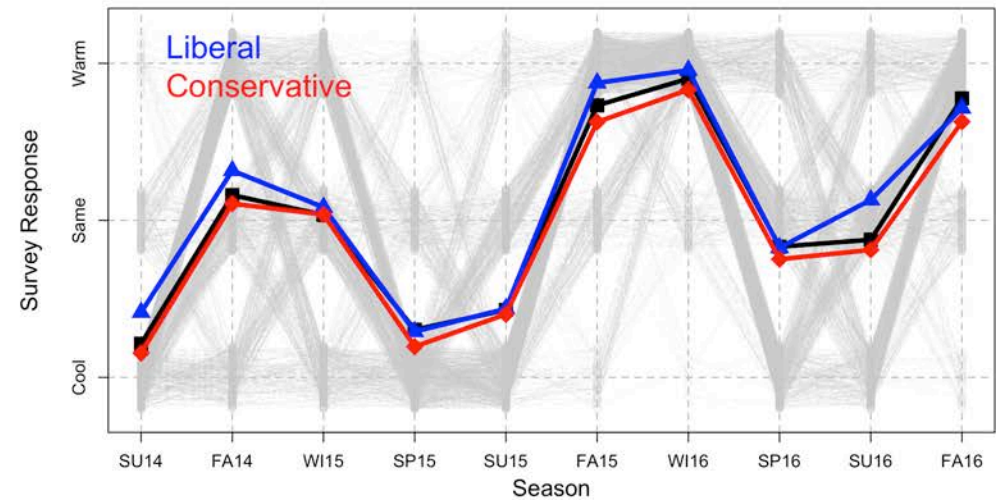
Seasonal Temperature Anomaly (Mesonet)



Seasonal Precipitation Anomaly (M-SISNet)

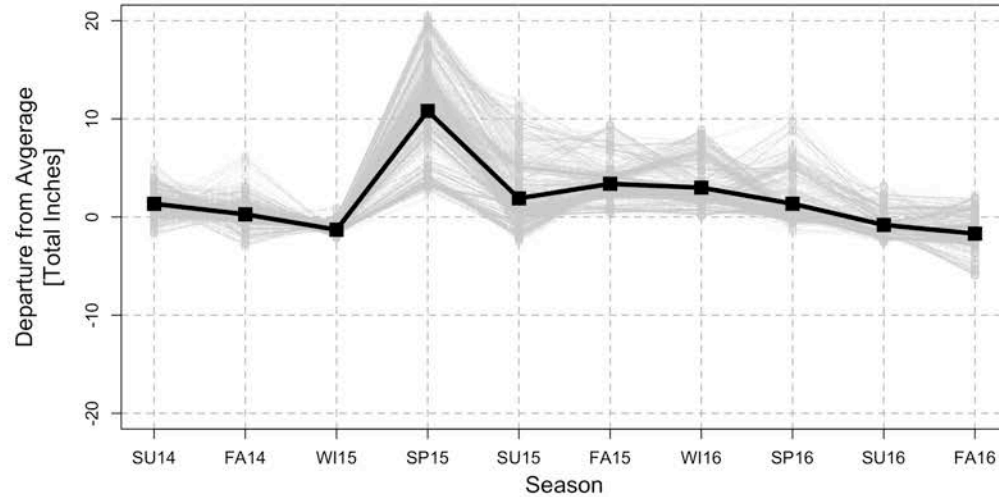


Seasonal Temperature Anomaly (M-SISNet)

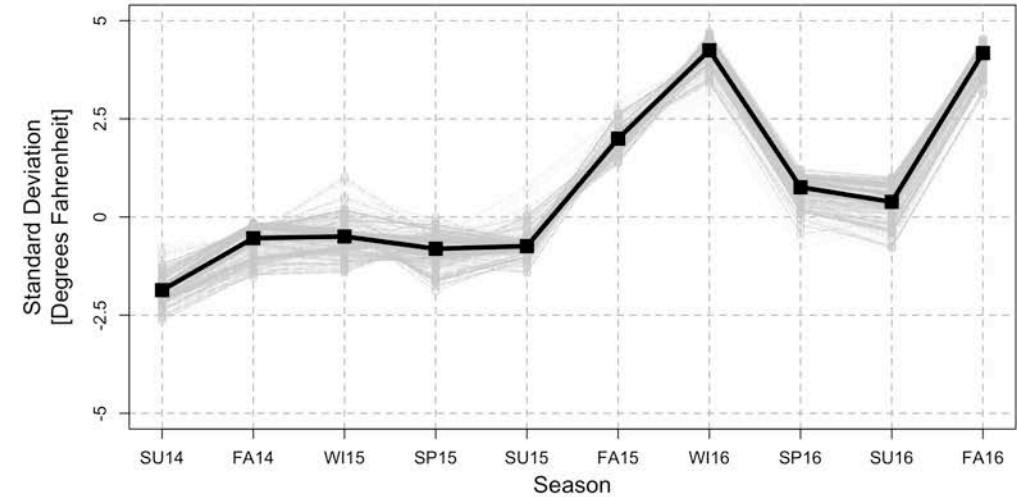


TO WHAT EXTENT DOES TIME SPENT OUTSIDE INFLUENCE WEATHER PATTERN PERCEPTIONS?

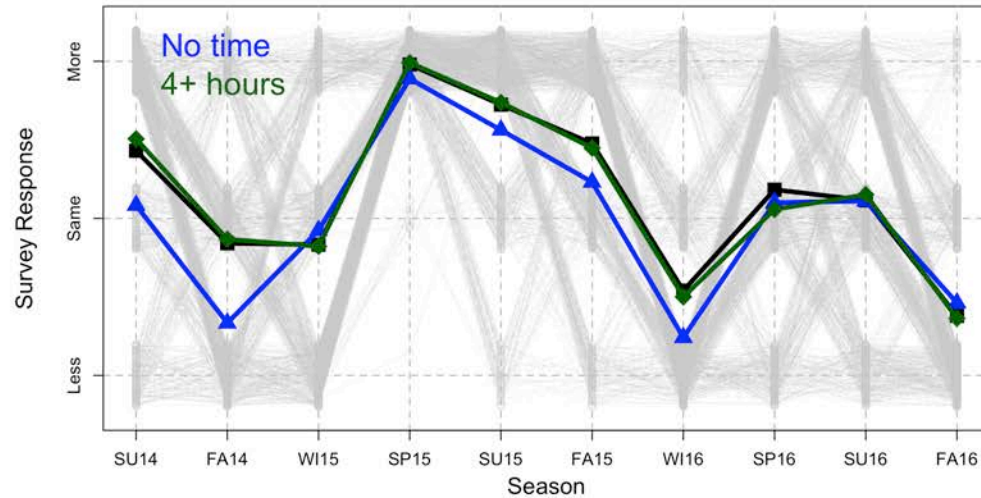
Seasonal Precipitation Anomaly (Mesonet)



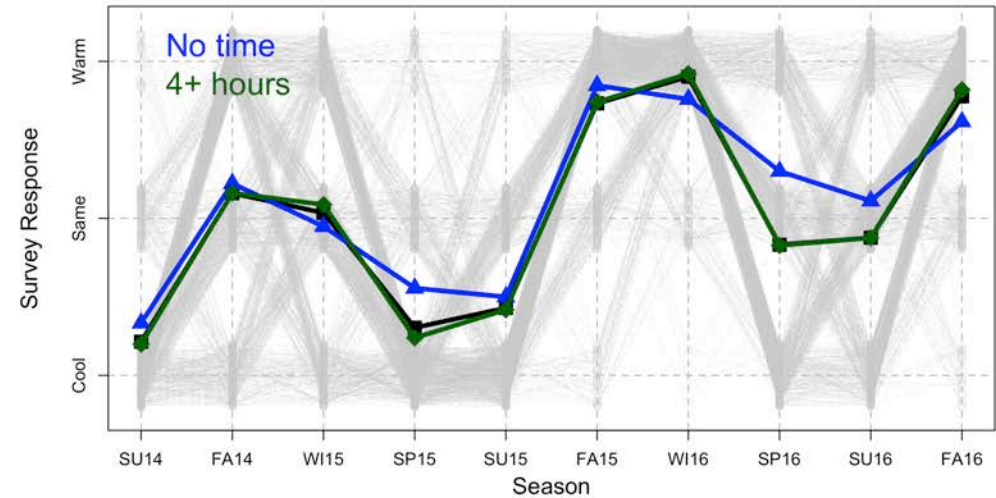
Seasonal Temperature Anomaly (Mesonet)



Seasonal Precipitation Anomaly (M-SISNet)



Seasonal Temperature Anomaly (M-SISNet)



Public Perceptions are *Primarily* Grounded in Actual Weather Patterns

- Panel data allow assessment of recognition of patterns of change, obscured by cross-sectional data
- Changing weather patterns predict changes in perceived threats posed by climate change
 - Deviations from long-term patterns toward hotter and drier seasons predict greater perceived risks of climate change
- Perceived risks of climate change (modestly) predict changes in water use