Climate change or natural cycle? Not sure, but it gets 2 hot and 2 cold 4 sure

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Introduction

Perceiver experience → increased awareness

 Perceived personal experience of global warming increases personal awareness of the risk of climate changing.

(Akerlof, Maibach, Fitzgerald, Cedeno, & Neuman, 2013).

 Perceived experience and motivated reasoning of extreme weather are going to increase belief certainty of extreme weather

(Myers, Maibach, Roser-Renouf, Akerlof, & Leiserowitz, 2013).

 Climate message increases public perception of climate science consensus and the spatial variation is that conservative part of US have higher responsiveness (Zhang et al., 2018).

Hypothesis

• The extremes of weather observed in recent years increases people's awareness and expressions about weather on twitter.

• Due to the variation in climate between different geographical regions as well as political polarization at the state level, people's perception and expression of weather extremes may exhibit geographic variation.

Data & Methods

- Twitter data from March 2014 Feb 2015
 - One year time span
 - 7 million tweets
 - Separated in seasons
 - Twitter Streaming API: geo-located tweets in the US

keywords

- 215 weather-related keywords
- E.g. arid, cloudy, coldfront, cumulus, etc.

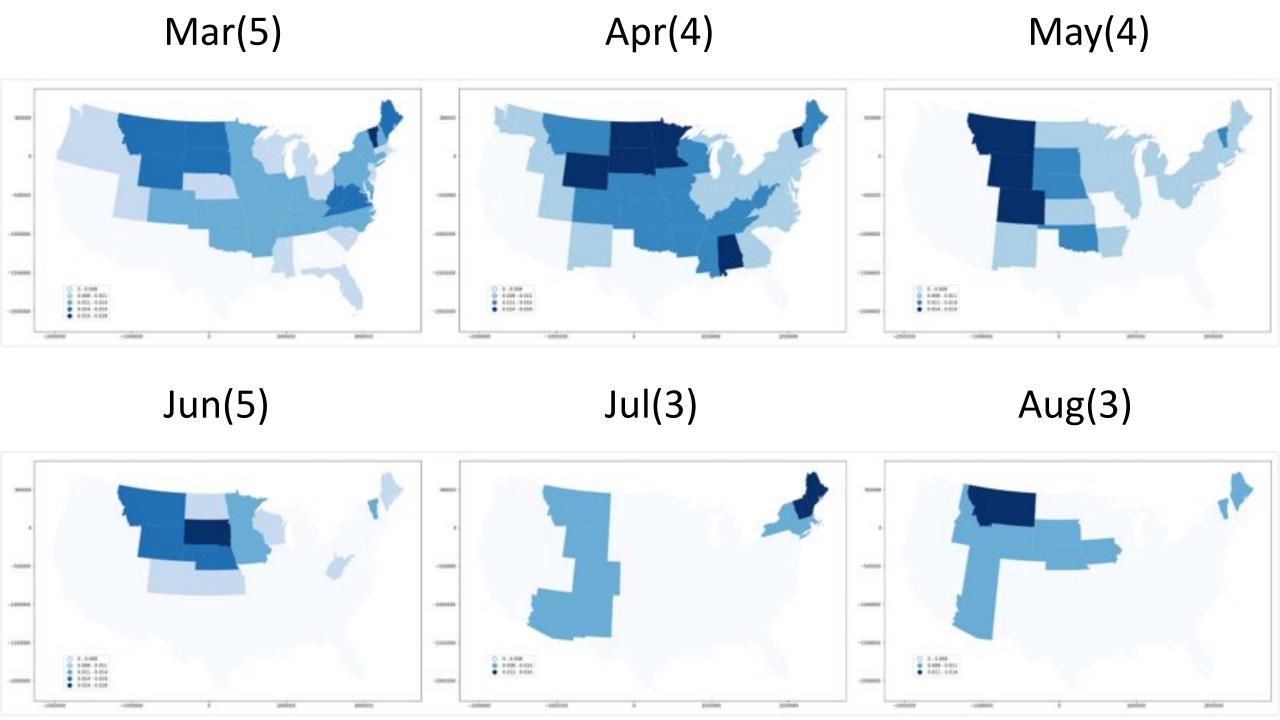
Definition

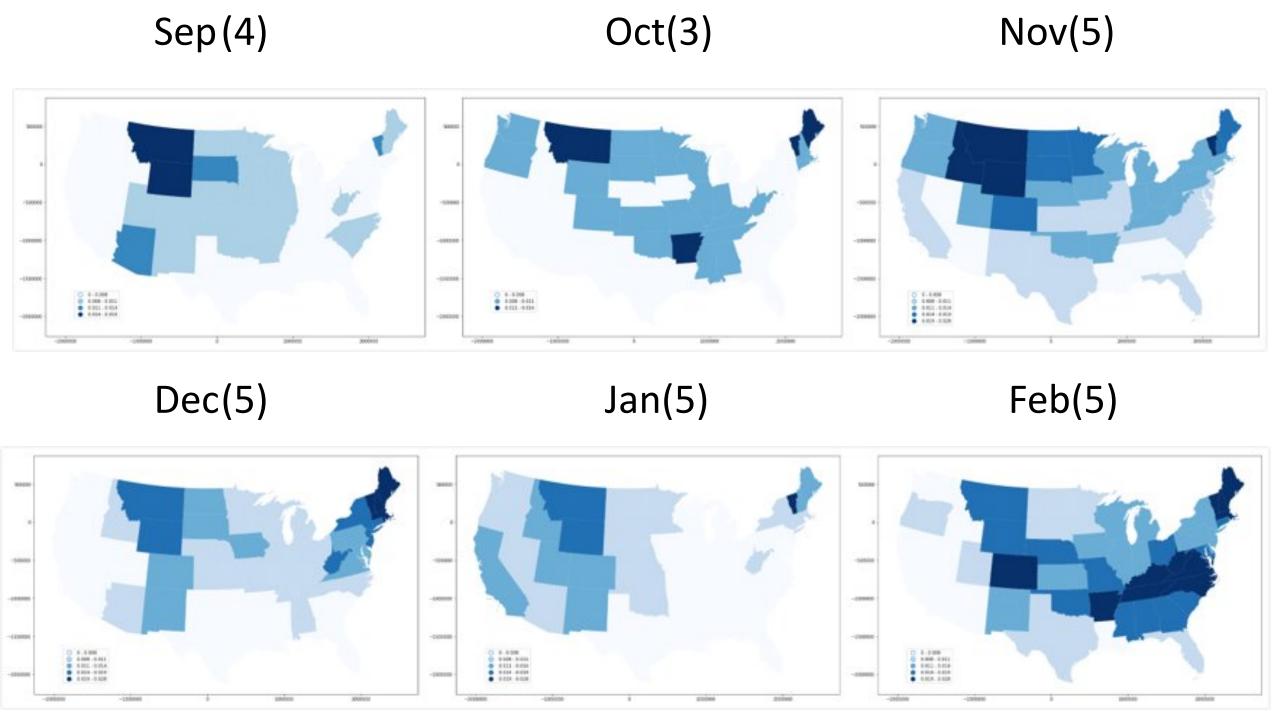
- Containing at least one keyword → weather tweet
- Monthly, tweet at least on weather tweet
 — weather user

- Variables to visualize
 - Weather tweet ratio
 - Weather user ratio

Weather Tweet Ratio = weather tweets/All tweets

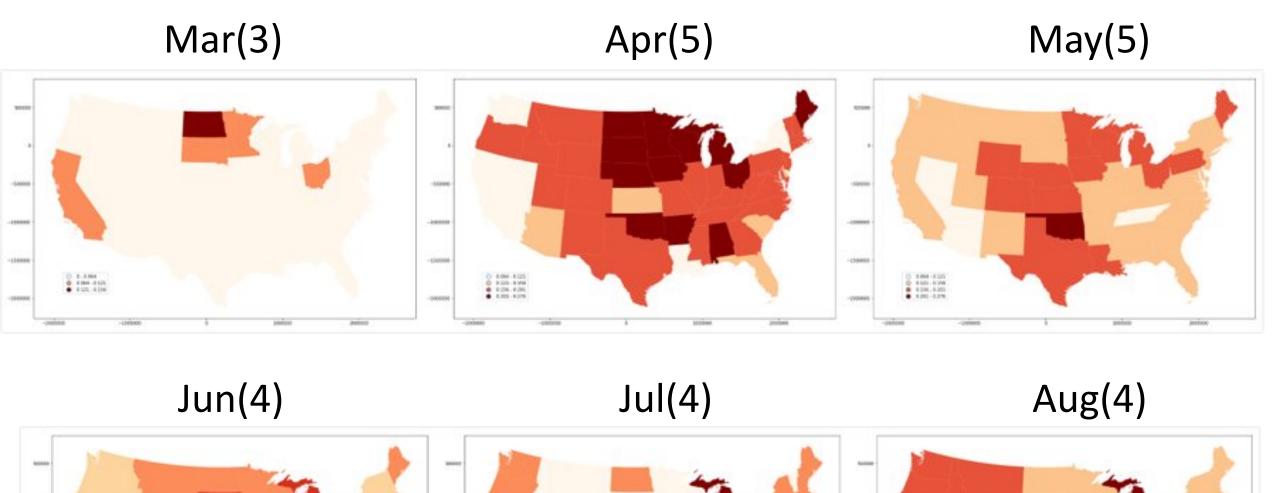
Lower	Upp	er	Count
======			=====
	x[i] <= 0.	008	234
0.008 <	x[i] <= 0.	011	168
0.011 <	$x[i] \le 0.$	014	113
0.014 <	$x[i] \le 0.$	019	50
0.019 <	$x[i] \le 0.$	027	23

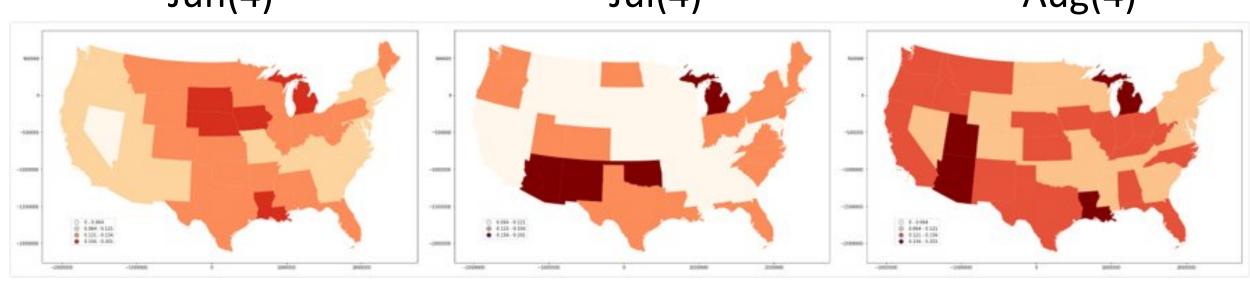


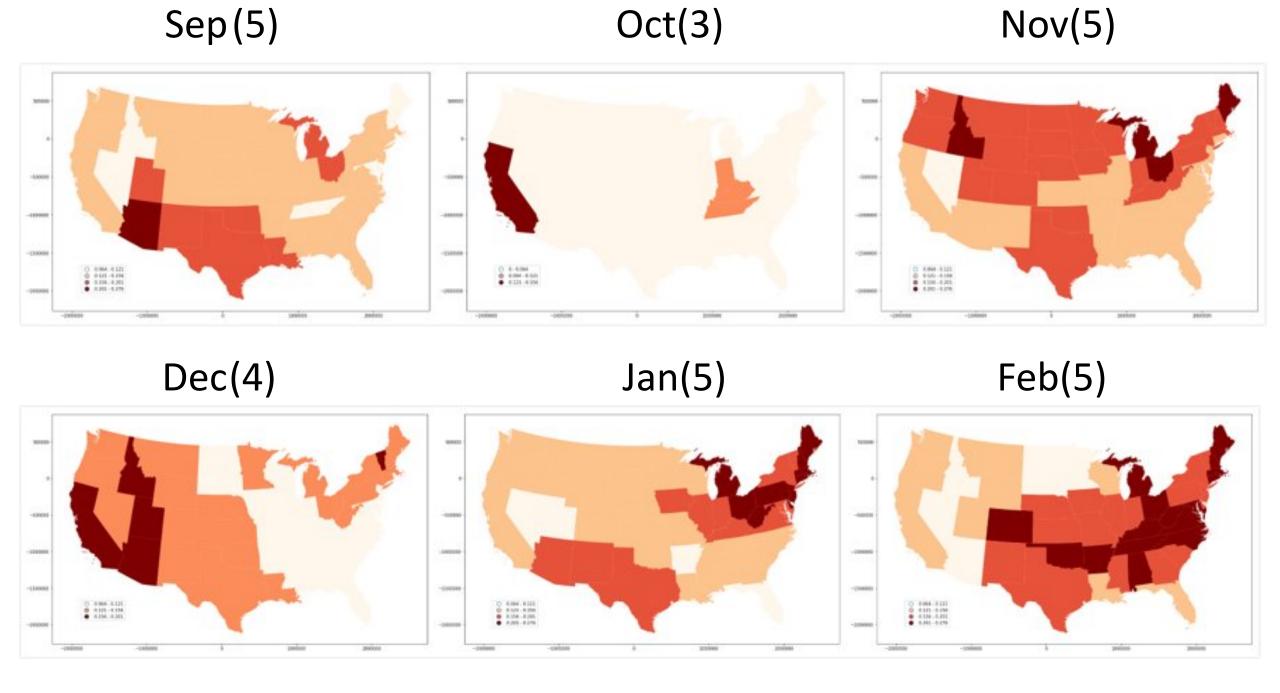


Weather User Ratio = Weather Users / All Users

Lower	Upper	Count
======		
	$x[i] \le 0.064$	93
0.064 <	$x[i] \le 0.121$	133
0.121 <	$x[i] \le 0.156$	203
0.156 <	$x[i] \le 0.201$	115
0.201 <	$x[i] \le 0.275$	44



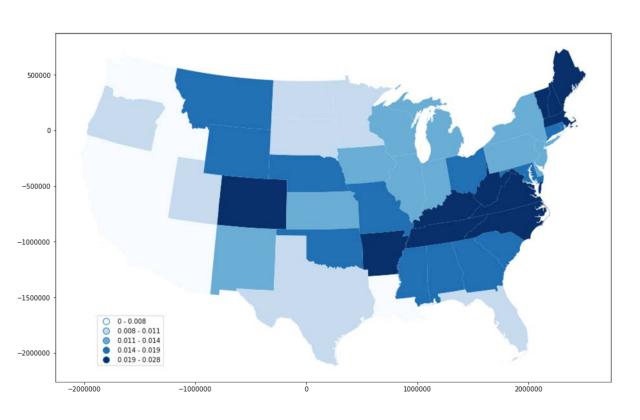


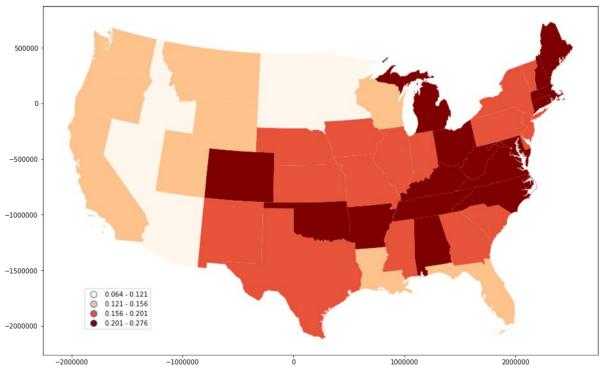


Comparison of Feb 2015

Weather Tweet Ratio

Weather User Ratio

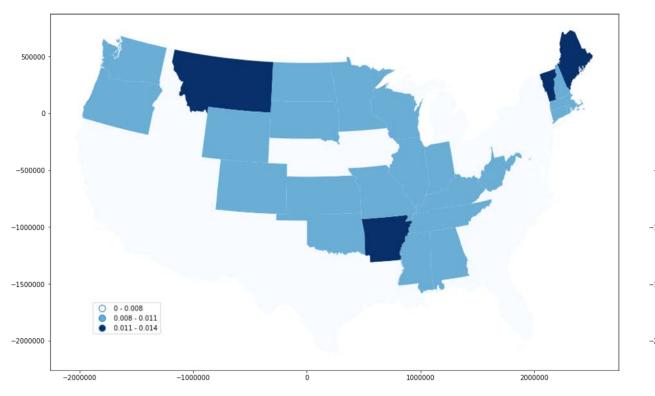


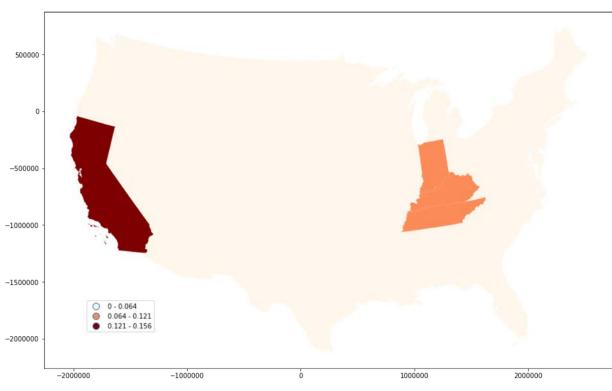


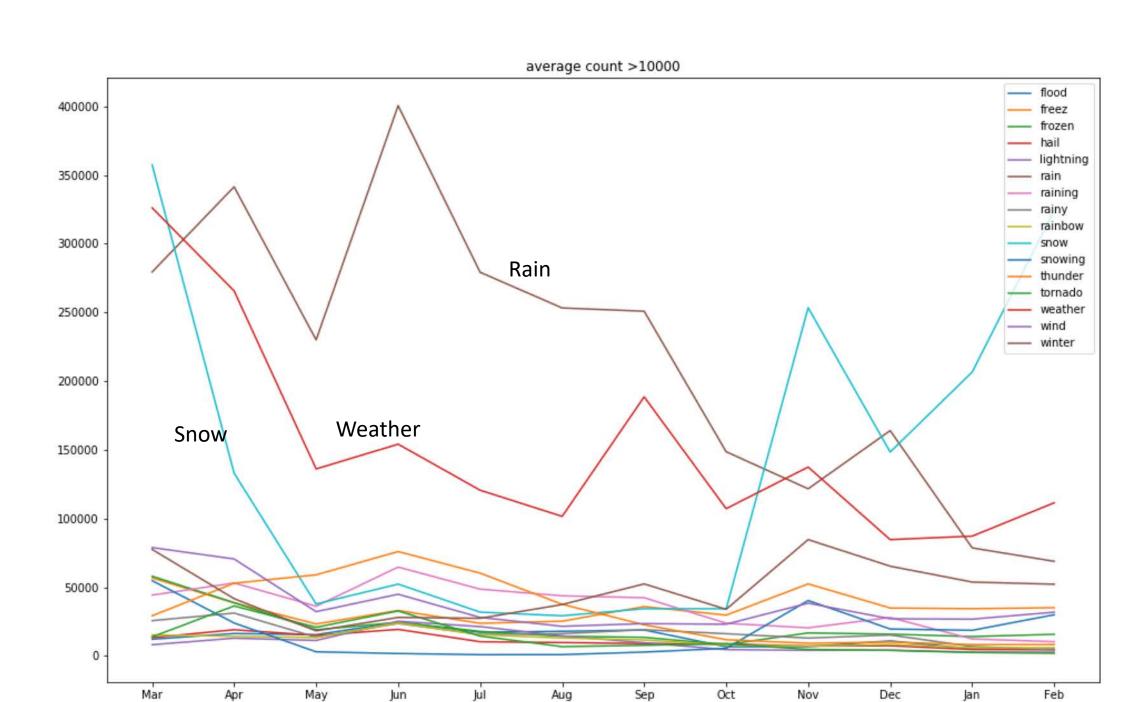
Comparison of Oct 2014

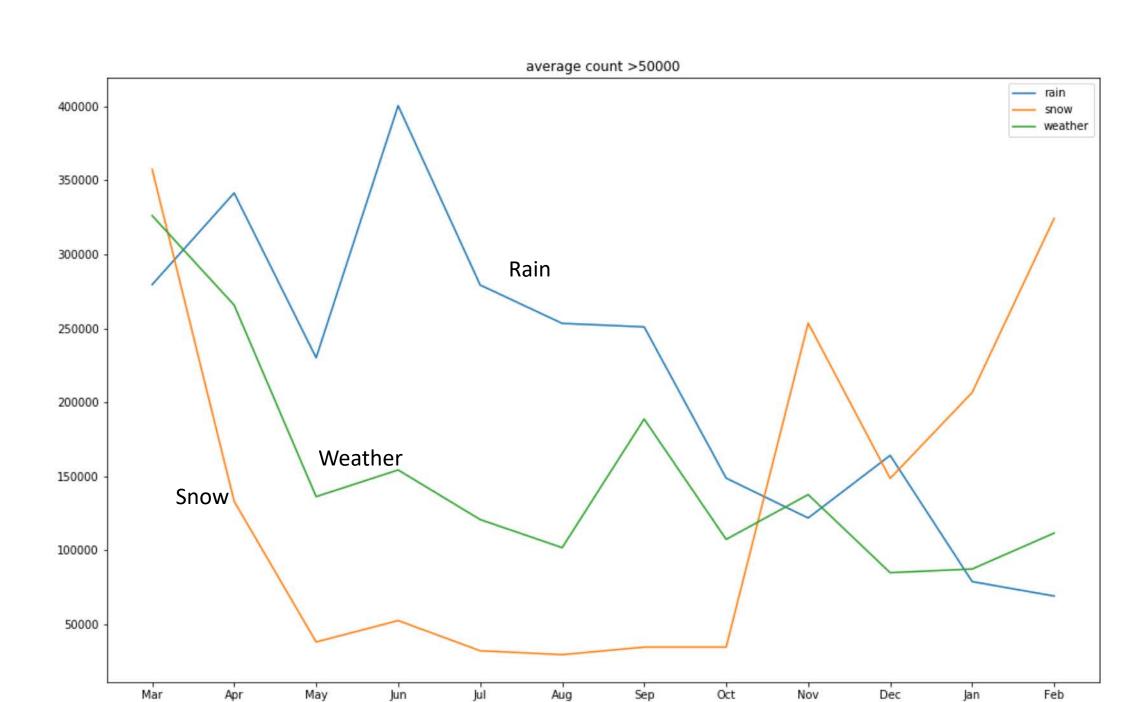
Weather Tweet Ratio

Weather User Ratio









Topic modelling



45 Topics of 7 million Tweets

wash haby bring tears isll candy drops weather rain pain waiting sunshine Storm runs shine dance purple

torecast tweet pics twitter snow live check phone channel news

room **rain** flooded flood tornado house raining dad cats water rained dogs left

vanilla freezing bell death blast freeze starburst bell freezes work

brain phone taco paja



city fun 800W weekend saturday free rainy autumn park party windy http://t.co strikes Struck bolt

thunder botts bugs crazy tampa storm flood strike lady tornado place

hair blow chill earth
wind blows hard
blowing

raining icy drive weather ride snowrain 109 safe work 100 vinter road driving

satan leaves autumn mixed king hydra queen lesus lord chris harbor hurricane sunshine

frozen sing head SONGS music listening Soundtrack radio bought singing song grapes

winter SNOW schools monday Weather hizzard week work SChool classes delay closed class

rainbow dusty in Carbon read Winter frost book trazen wind song autumn reading snowflake

drop blah kiss tsunami pouring baby fogata
Whiskey rain meet frisky Corn rainha evervitay

snowden wind energy carbon ess water flood edward air pollution drought Winter obama freeze monoxide

winter wind freezing humidity weather heat chilly high degrees hot summer temperatures feels

drought baseball playing soccer winter Weather rained game win football tans game play field year team rain raining

flooding park flooded lake area city flood Sanriver evacuated SNOW emergency diego rain street

sirens tornado severe county weather sate flood flash storm warnings Warning watch area tornadoes thunderstorm

cone school play cones shovel SNOW shoveling fun snowball work

hurricane widdire storm walks california flooding rain drought years summer acts water tornadoes waves southern

fog cloudy snow sun light ds rainbow rain winter dark wind blue autumn skies eyes moon SKY

weather north chicago check winter app city news windy airport South Coast Horida flight Snow carolina

strute hot cating bizzad
get soup
ice drink frozen
tood coffee winter beer
chicken 8110M cleam

ice winter... snow frozen frost body weather cold. freezing Water

bluff Snow snowbunny girls ICY pale red dusty winter White sunny tha bunny hair rainbow

afternoon triday thunderstorms week sunday showers chance snow partly rain Cloudy high cold sunshine forecast

> ta SNOW icy drought real rain astumn bitches will raining bitches wi tho tryna dusty

weather degree fall perfect loving nice sweater ready

warming weather obama climate earth citmatechange change ocean drop change science years carbon pollution global real praying

mice enjoy beautiful
Weather weekend perfect summer amazing degree chilly

week rain hone rains pours plans weekend Snow supposed saturday nature rained raining mother game wash

winters gameolthrones america winter twister movie captain year weather fall clothes iohn SNOW soldier menths ready Summer
warm coming formal
but autumn long weeks spring snowpiercer watching windmit

rainy sleep movie

watch bed Weather

work watching perfect stay

netflix rain movies

Snowing Winter hope

april SNOW blizzard

christmas ground degrees week

school coming supposed inches

spring

winds rain wind storms heavy snow moring hail mph west lightning taste blizzard ...rainbow... gold rainbows double north sleet inches dairy sunshine butterilies s'mores oreo cream cookie

olaf shoes Snow frozen stricked building build dick stay gay singing build called

Wearing dress snow clothes country lightning storm freezing Weather rain shorts jacket winter wear house scared lightening sleep warm boots cold pants

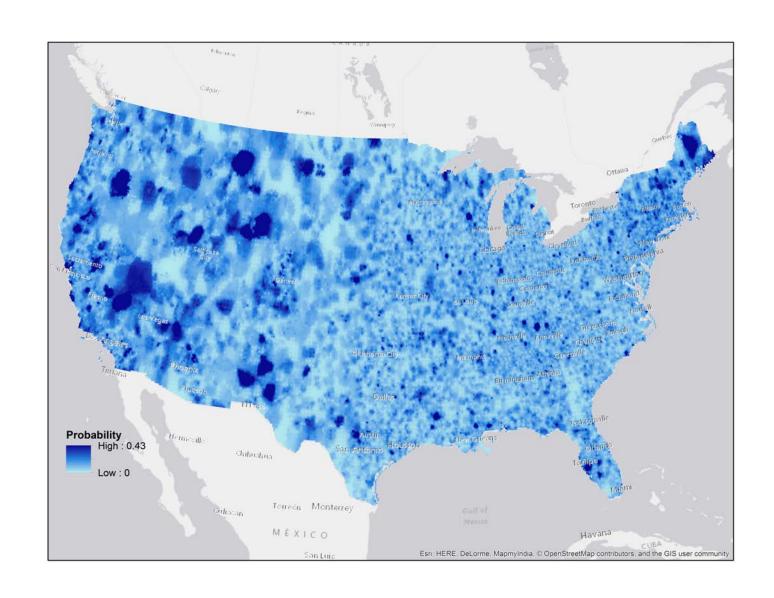
> times snowing pouring storming work hell rained started windy raining stopped with hard rain tool starts sunny haiting

freezing temperature house interally bed warm death hot sleep hear hell Cold freeze winter degrees room

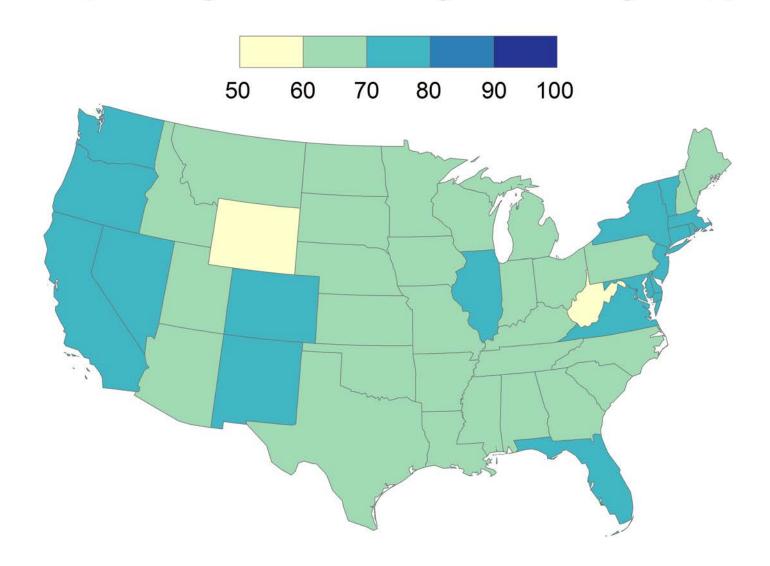
caught relaxing fall thunder thunderstorms root sleepy smell stand listening SOUND sleep asleep

umbrella pouring class rain well walked walk walked walk walked raining boots

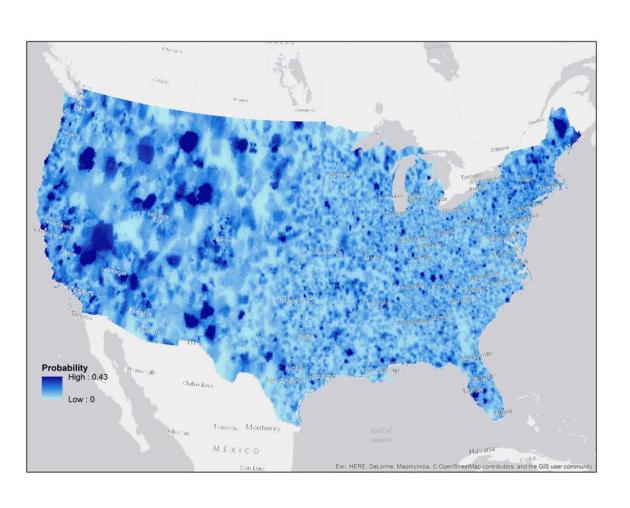
Ratio of Climate Change & Global Warming Tweets

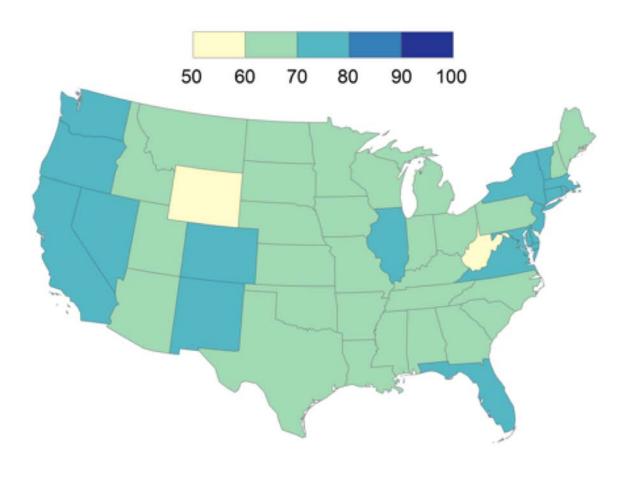


Estimated percentage who think that global warming is happening



Tweet vs. Survey





Questions & Comments?

Key finds

- Temporal & spatial variation
- Low around summer, high around winter
 - Apply more years of tweets
- Higher ratio in less populated area
 - Appropriate resolution

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