Study of Wildfires in USA

ECE 143: Final Project Presentation

Group 20

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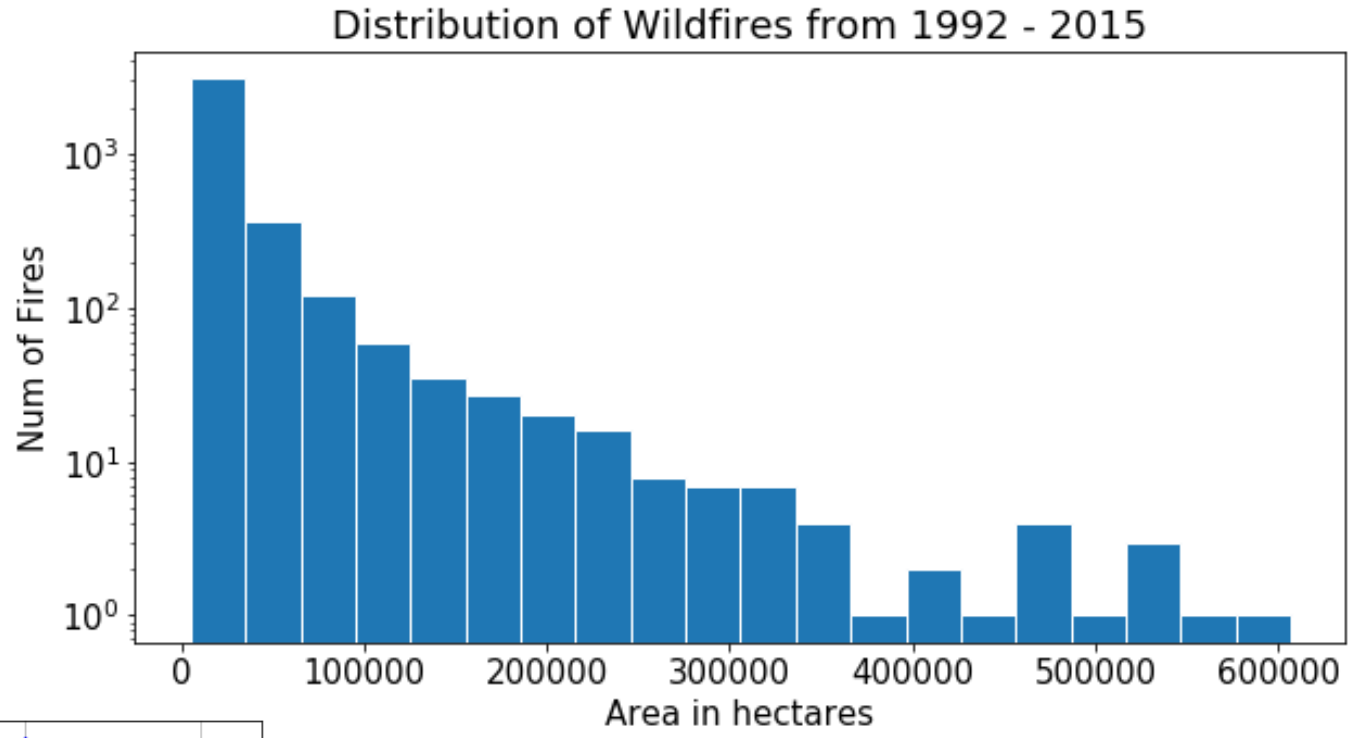
Wildfires in the US

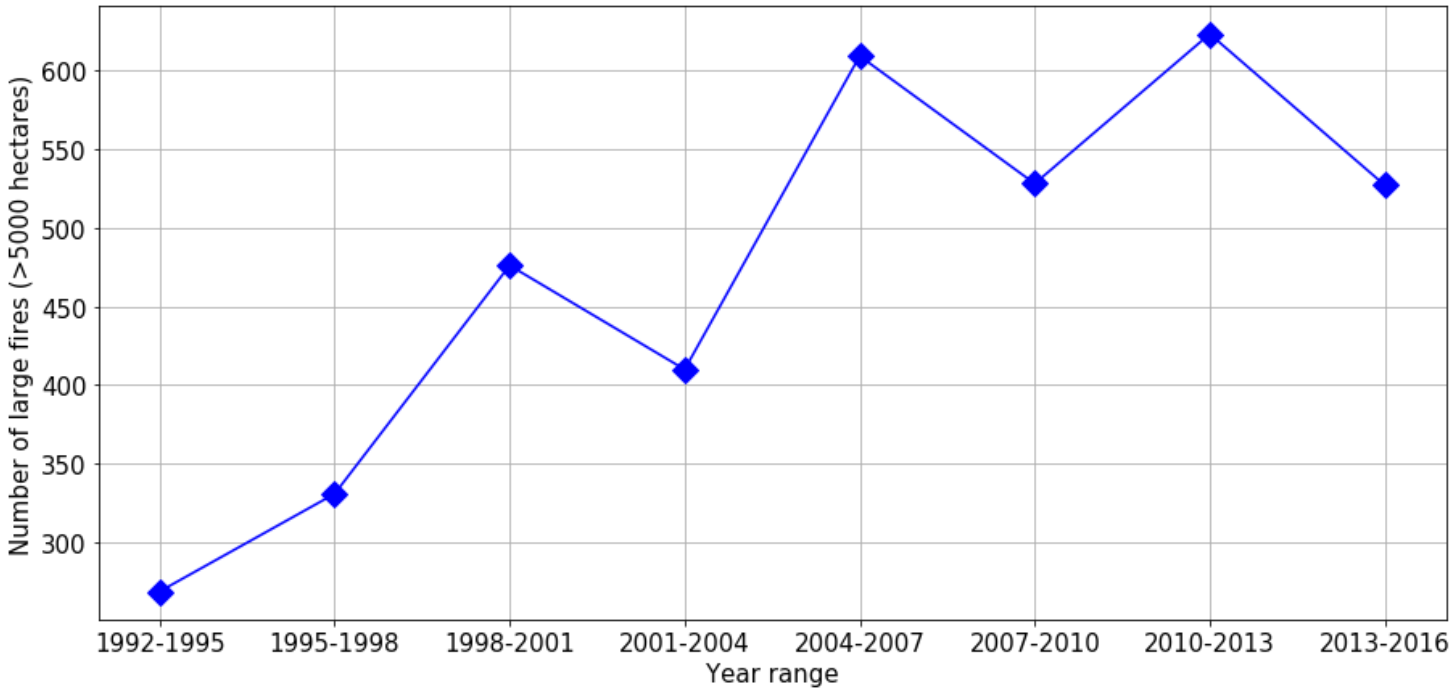
- Over *90 percent* due to man-made activities
- In 2018, costed over *$24 billion*
- *8.7 million acres* burnt (10-year average: 6.8 million acres) conditions
- Warmer temperatures and drier increase severity and frequency
- Health: Increase eye and respiratory illnesses

(Source: Center for Climate and Energy Solutions)

Our focus here

Description of Problem





What is burning, why is it so large and why is it increasing?

Dataset Description and Our Approach

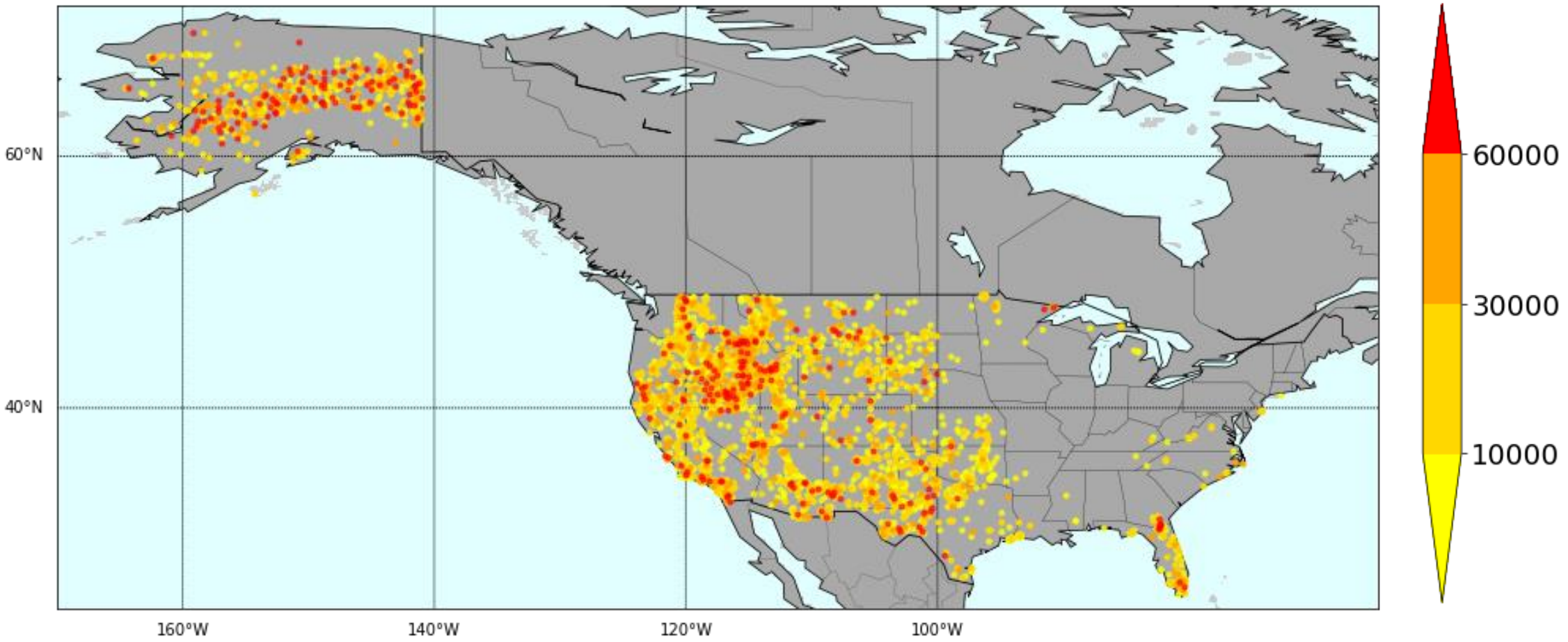
Datasets sourced for 1992 - 2015

1. Wildfire Information
2. Surface Temperature
3. Rainfall (mm/day)
4. Wind and Air Pressure
5. Vegetation – NDVI Value
6. GHG Emissions in tons

Our Approach

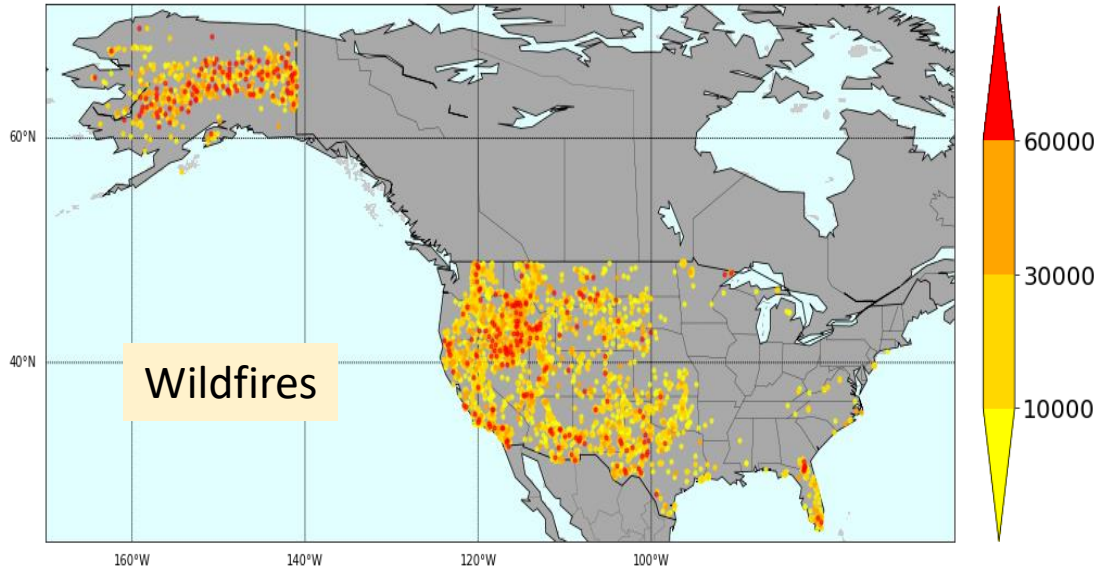
1. Visualization – Geographic scatter
2. Quantitative metric – Correlation
3. Case Study – Alaska
4. Feedback loop – GHG Emission

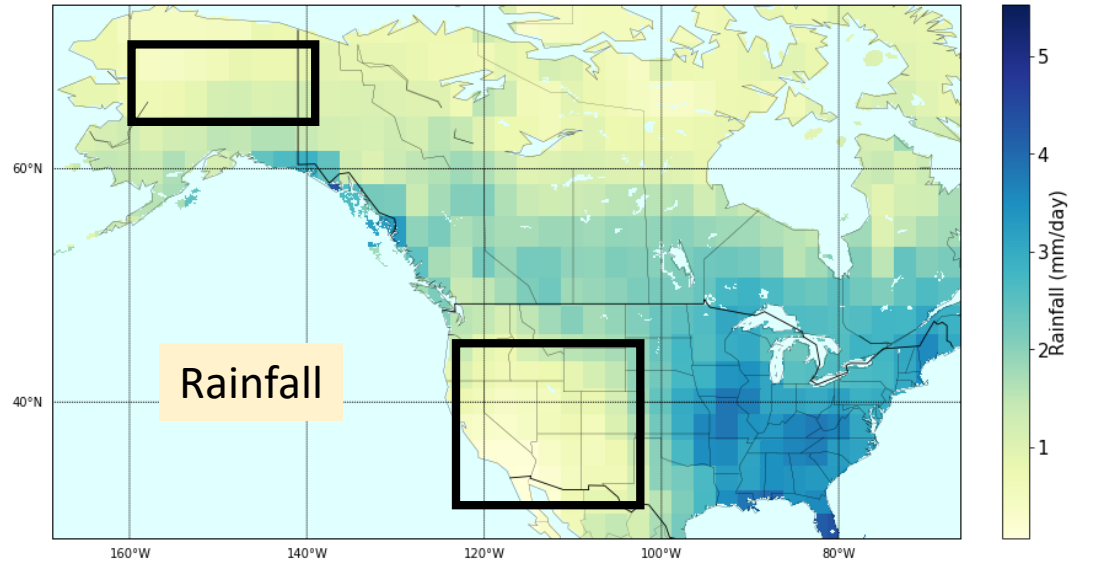
Wildfires Distribution for USA

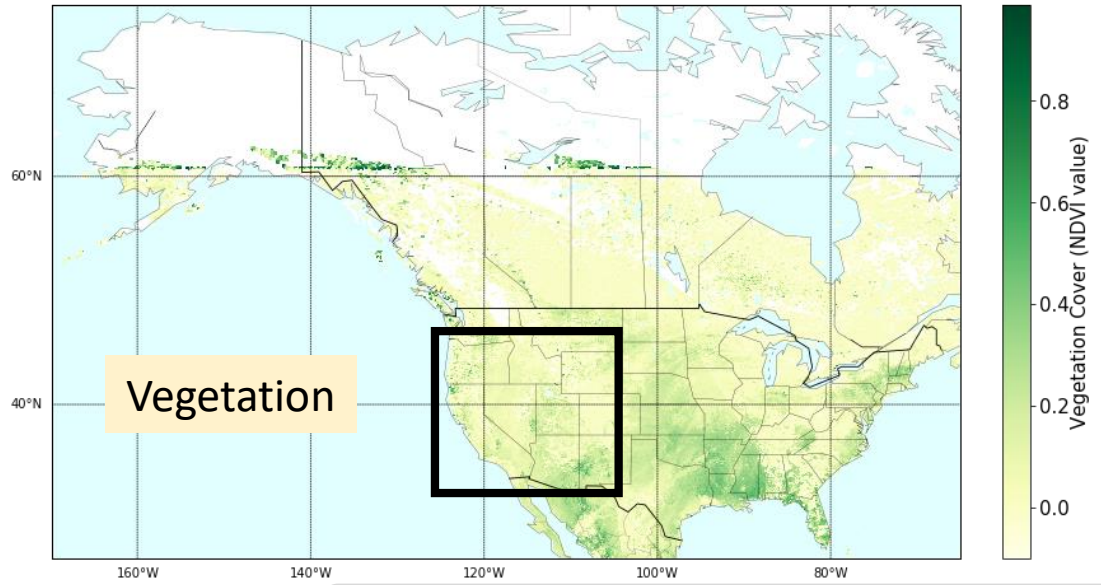


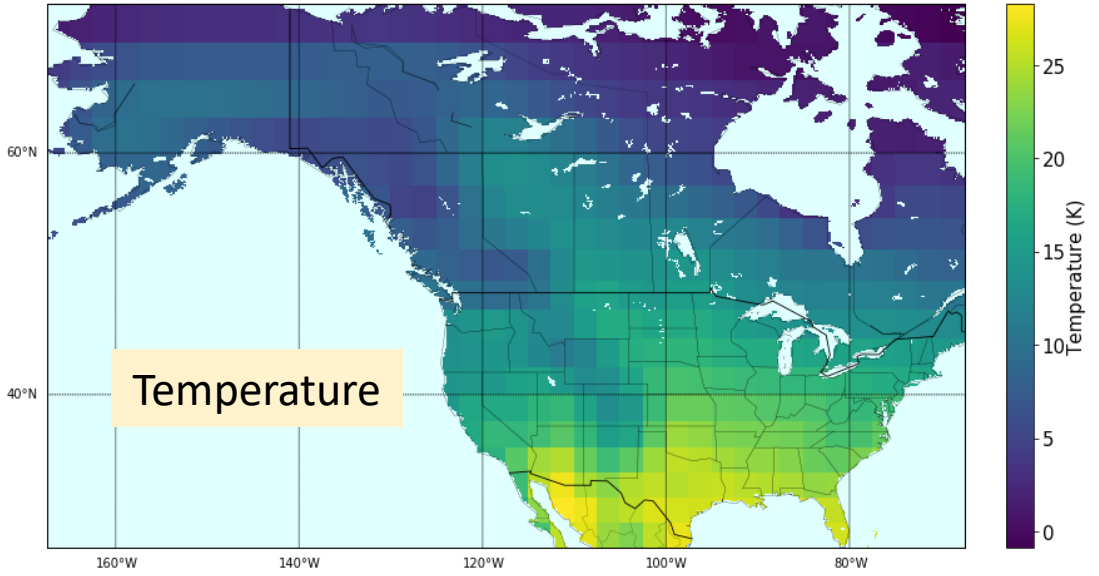
Distribution of damaged area in hectares from 1992 - 2015

Are Climate and Vegetation Responsible?





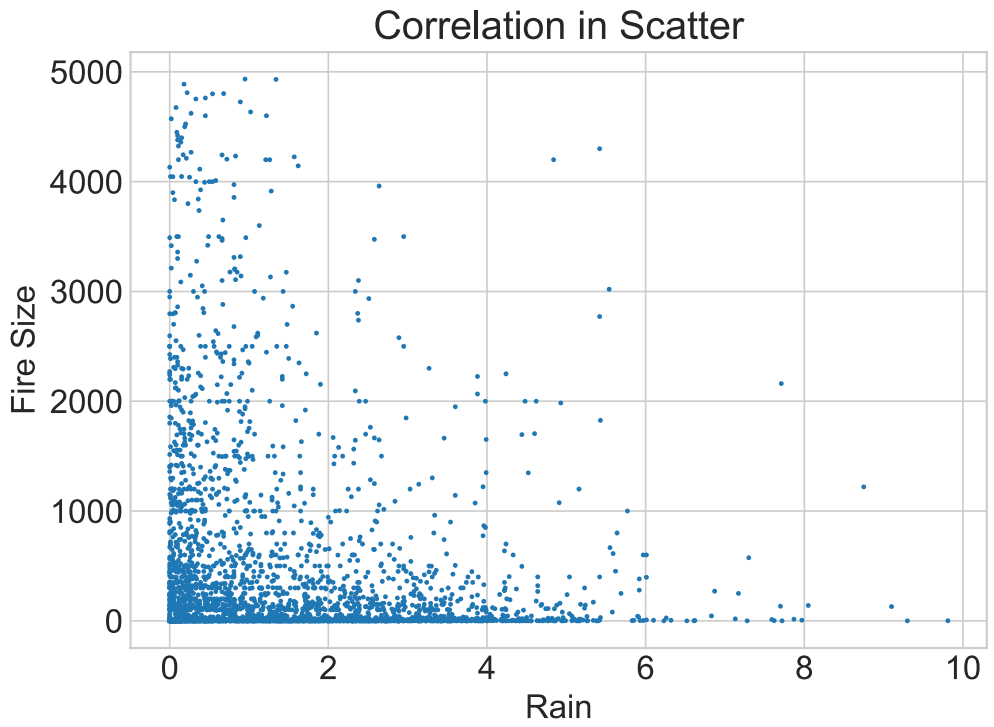




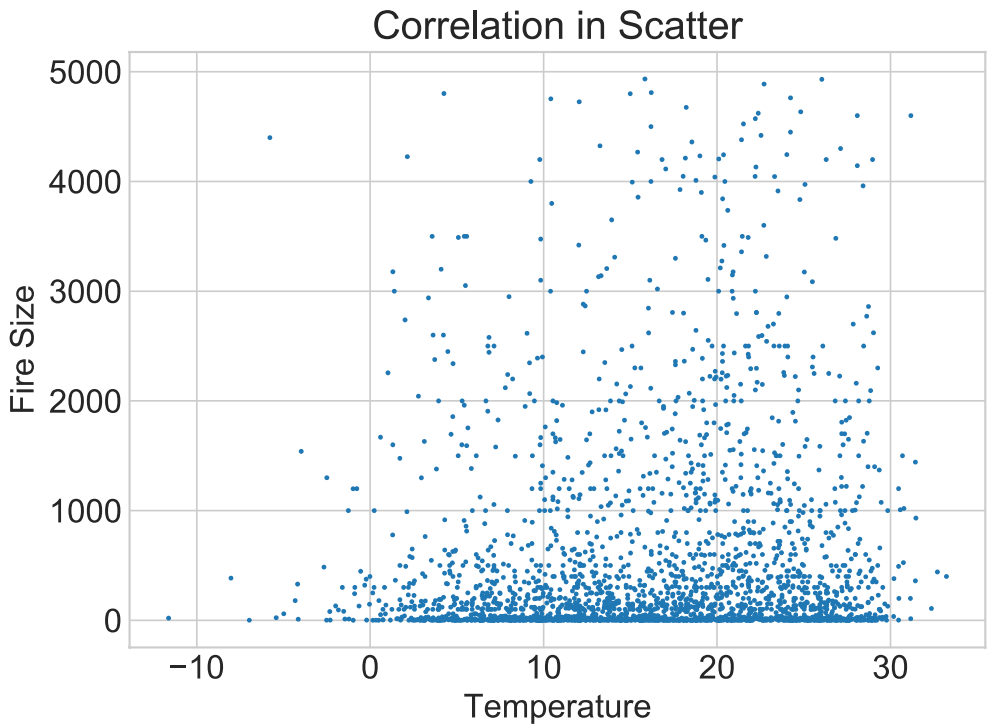
Reduced rainfall and very specific vegetation predominate here

Correlation Scatter

- Fire instances are highly centered where rain-fall is low



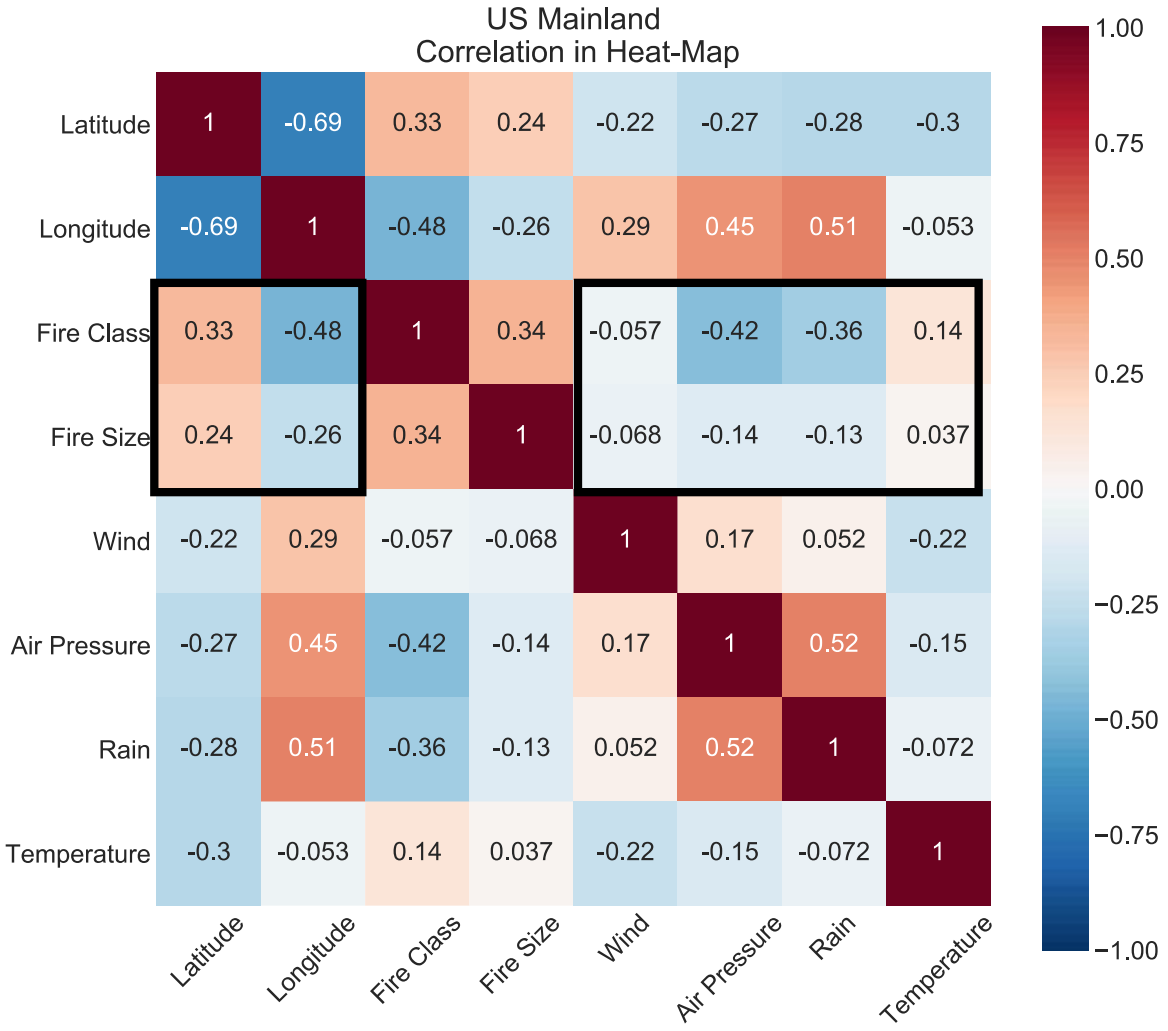
- Fire instances are increasing as temperature increasing



More clustering for rainfall shows that it plays a larger role

How about some numbers?

- Wild fire is positively with temperature
- Negatively correlated with rain-fall and air-pressure



Magnitude of correlation represents relative importance

Wait, why Alaska?

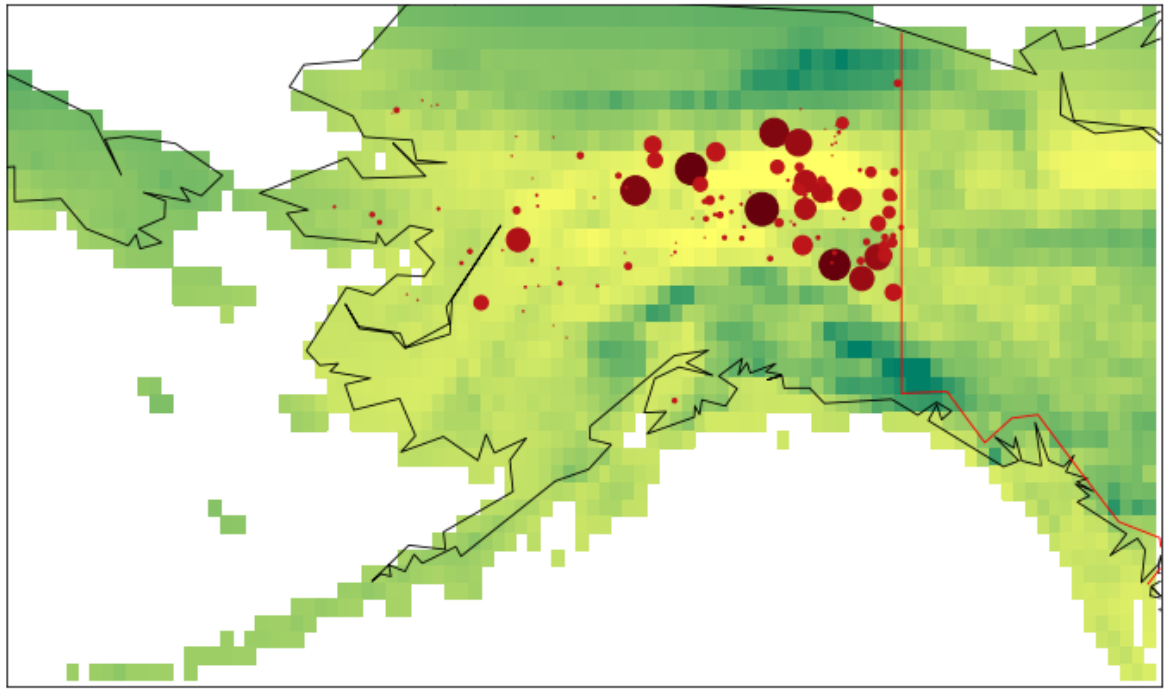
- Alaska warms at a rate at least twice the global average
- **2004 Alaska fire season:** Worst on record in terms of area burnt (6.5 million acres)
- Terrain and climate further restricts accessibility

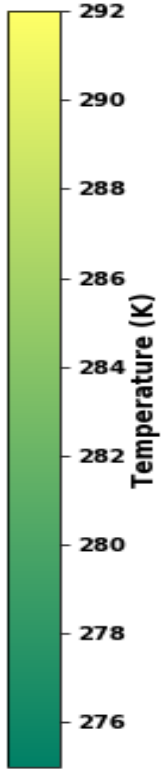
Taylor Complex Fire (August 09 - September 12, 2004)

Extremes of temperature and dried out vegetation cause frequent wildfires

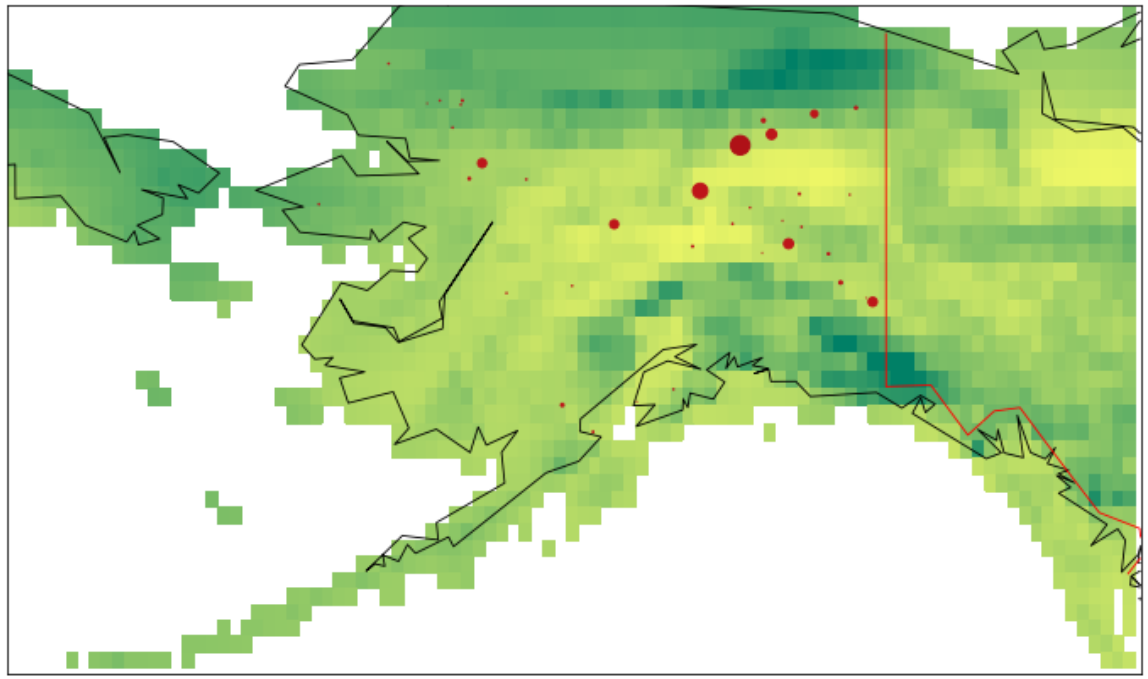
Local Temperature Effects on Wildfires

2004





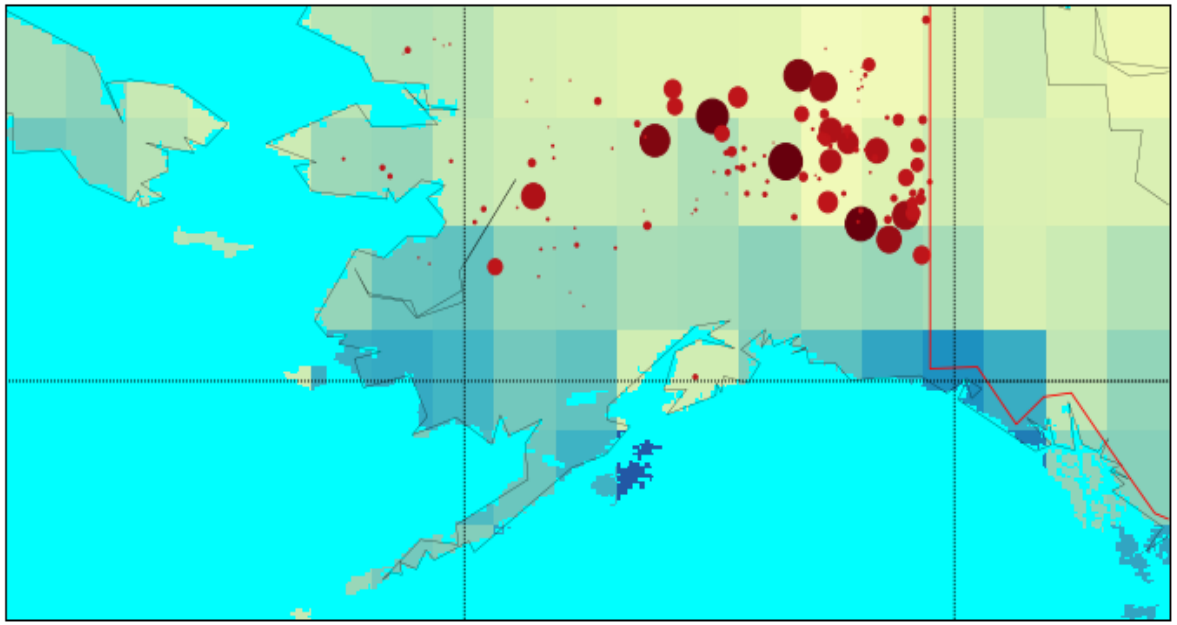
2003

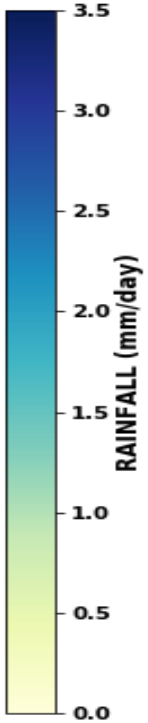


Increased Summer temperatures in 2004 Alaska Fire Season

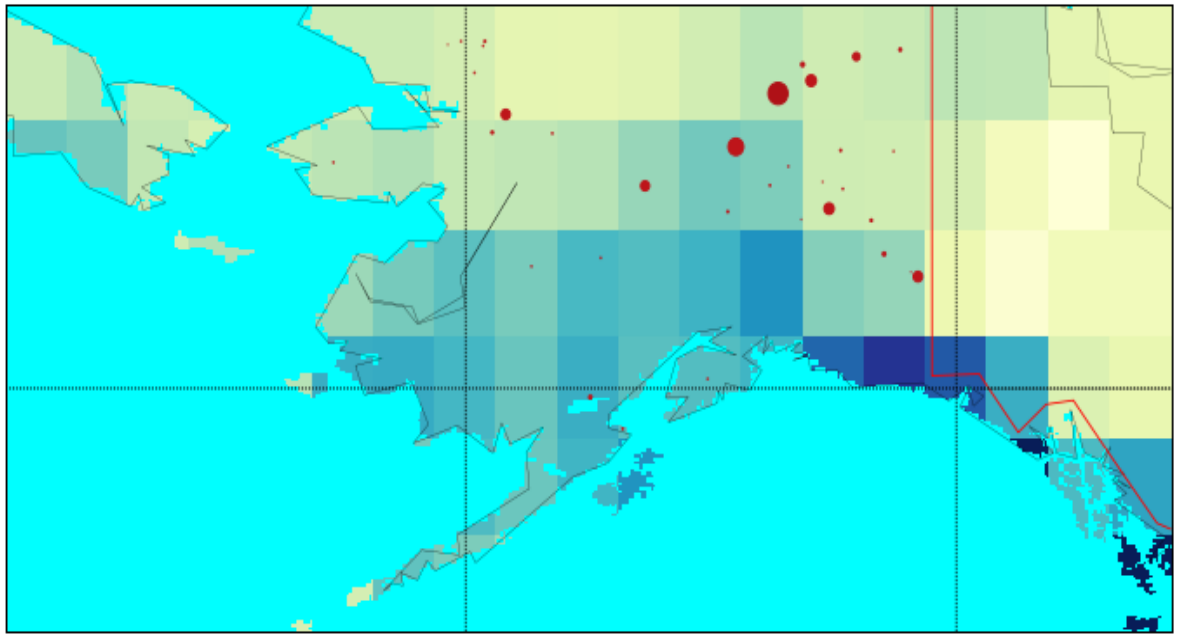
Local Rainfall Effects on Wildfires

2004



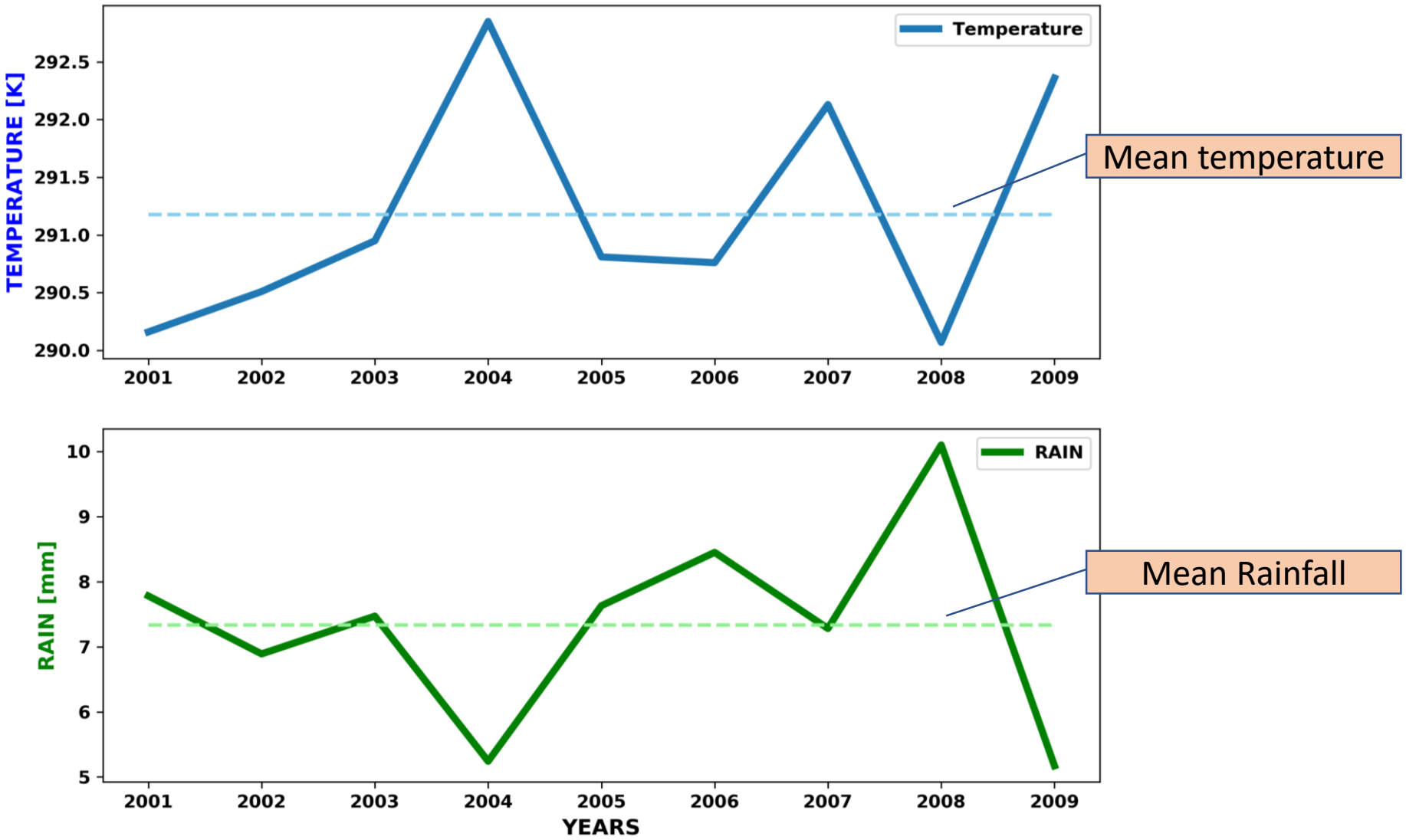


2003



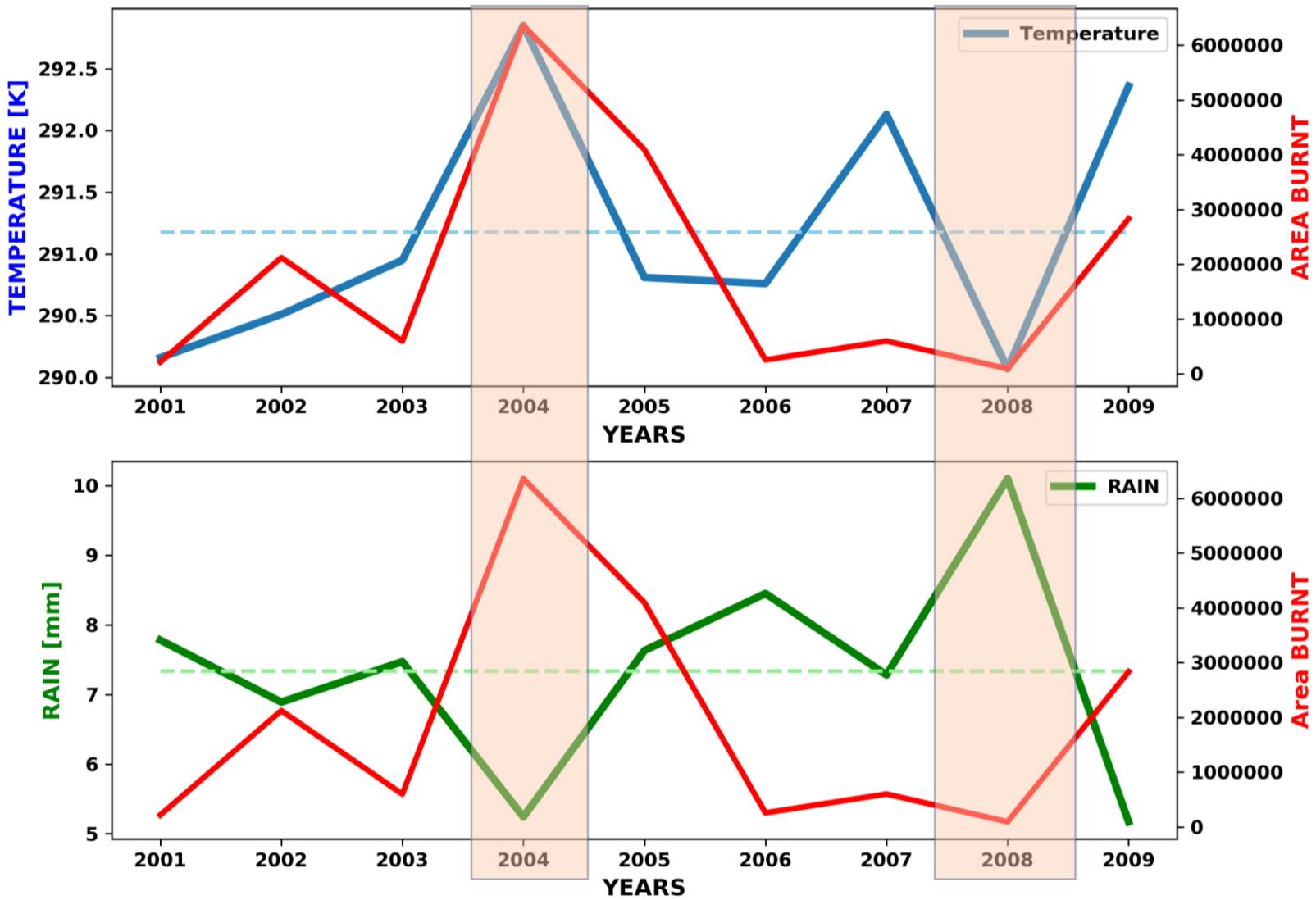
Minimal rainfall in 2004 responsible for 2004 Alaska Fire Season

Temporal Analysis of Temperature/Rainfall in Alaska



Significant variations in weather conditions over a decade

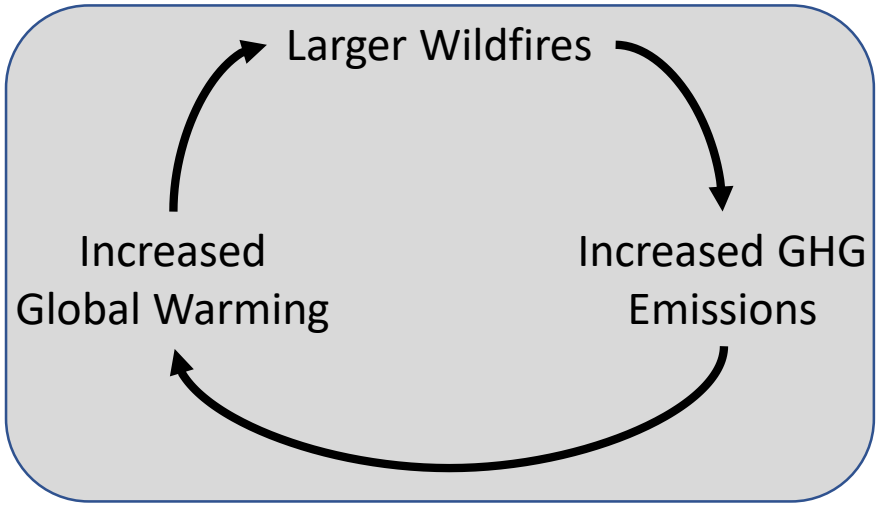
Temporal Analysis of Temperature/Rainfall in Alaska

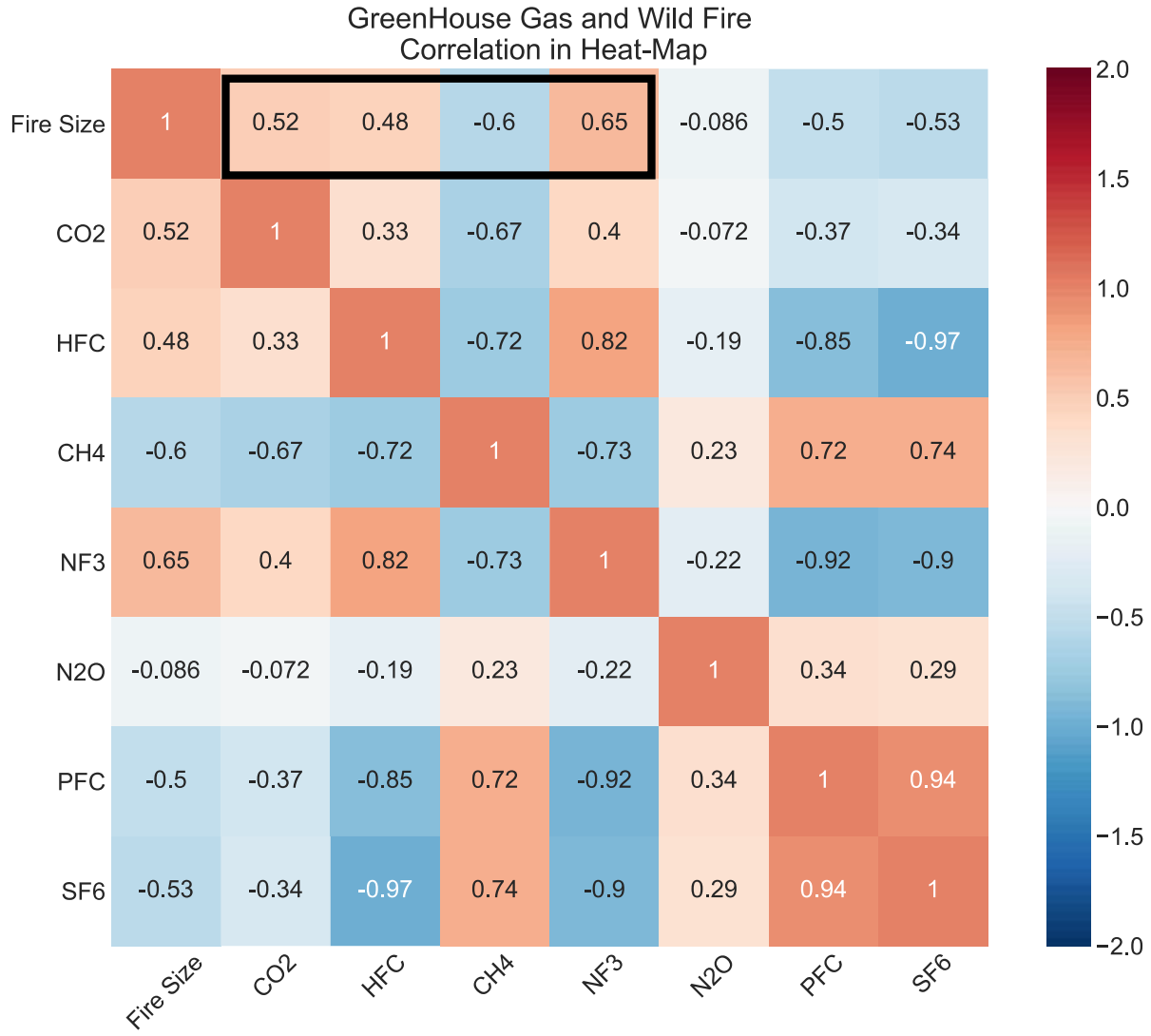


Wildfires coherent to weather conditions

Greenhouse Gases: A Dangerous Feedback

- Highly correlated for CO_2, HFC, NF_3
- And negatively correlated with CH_4, PFC, SF_6





Conclusion

Where we are now?

- Human activities is primary cause *(Ignition)*
- Climate and vegetation affect wildfire size, location and scale *(Fuel)*
- Also showed GHG released as a result *(Positive Feedback)*

Where do we go from here?

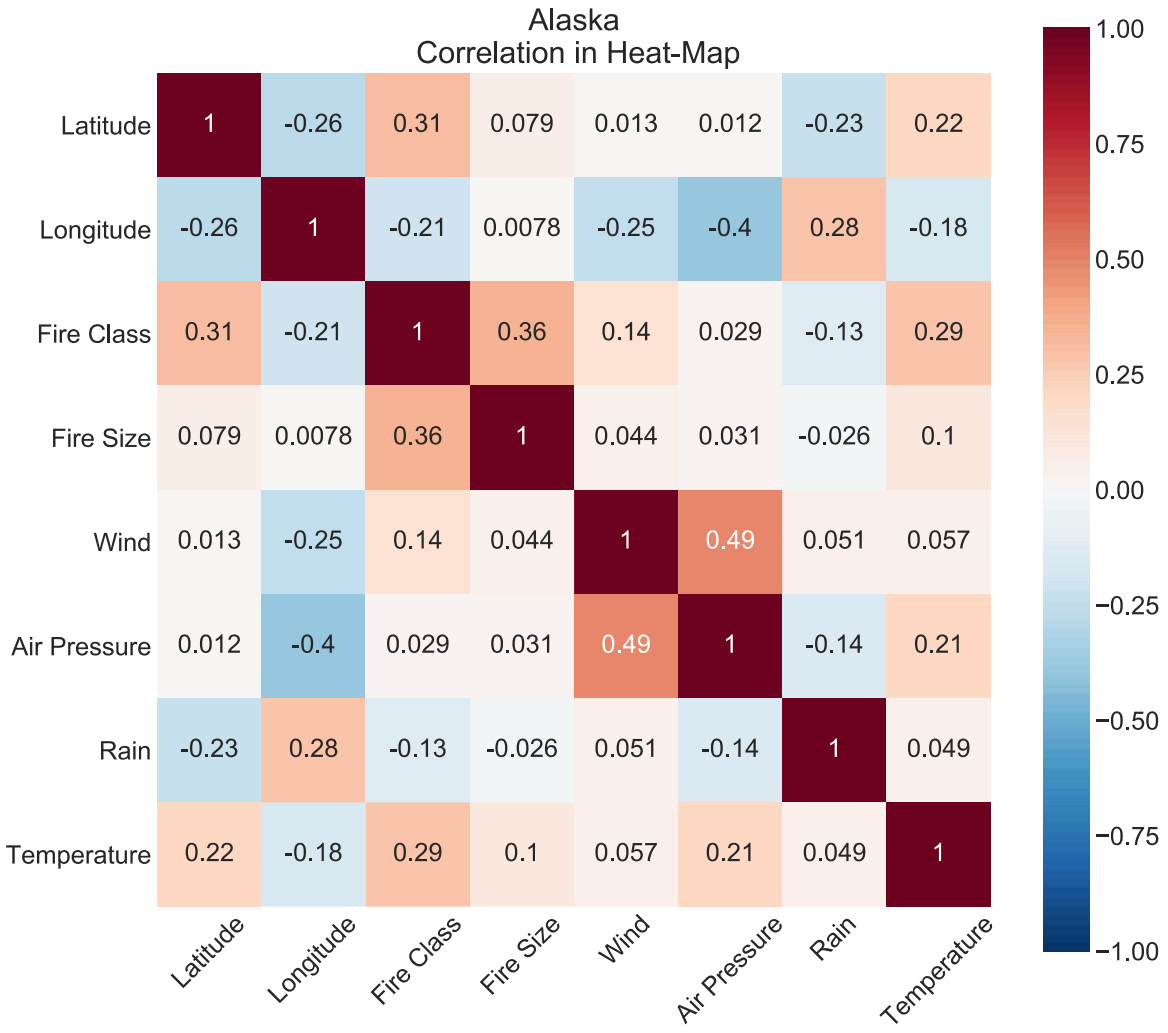
- Prediction map: Sophisticated models beyond correlation
- How can human factors be quantified similar to climate factors

Reducing our carbon footprint will control these wildfires (obviously?)

Thank You

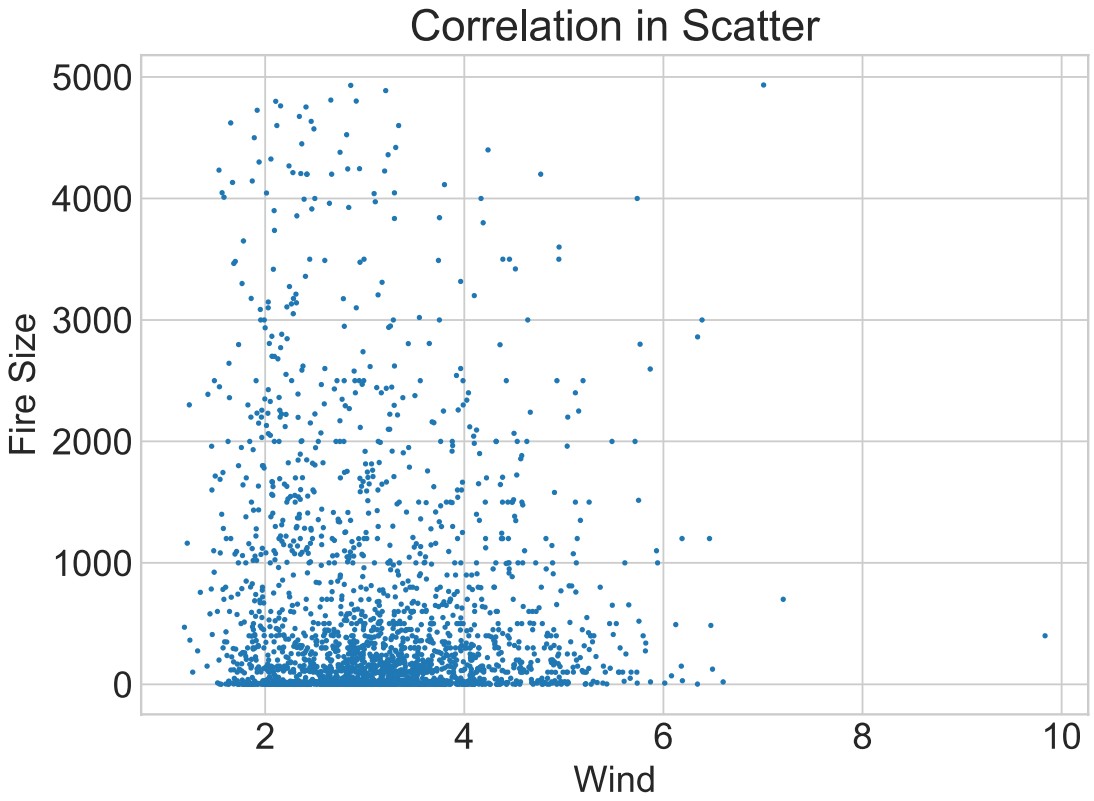
Correlation in Alaska

- In Alaska, correlation with temperature increases
- In Alaska, correlation with rain-fall and air-pressure decreases



Correlation Scatter

- Fire instances are lightly centered where wind-speed is low



- Fire instances are lightly centered where air-pressure is high