Fueling the Flames: Statistical Testing of Forest Fire Factors

Sijmen kroon, Job Stouthart , Mees Kerssens

Introduction

- ## Motivation

  Felt like world was aflame, are forest fires becoming more common?

- ## Research Questions

  1. Which parameters significantly affect the amount of forest fires.
     - Air temperature
     - Sea surface temperature (SST)
     - Drought

  2. Are there certain areas which receive relatively more forest fires?
     And are these explained by extreme drought?

Datasets

Forest fires (1992 - 2015)

Strength:

- Many data points

Weakness:

- Range of only 1992-2015

Climate data texas

Strength:

- Daily data

Weakness:

- Average for entire state

Sea Surface Temp (SST)

Strength:

- Lots of data points

Weakness:

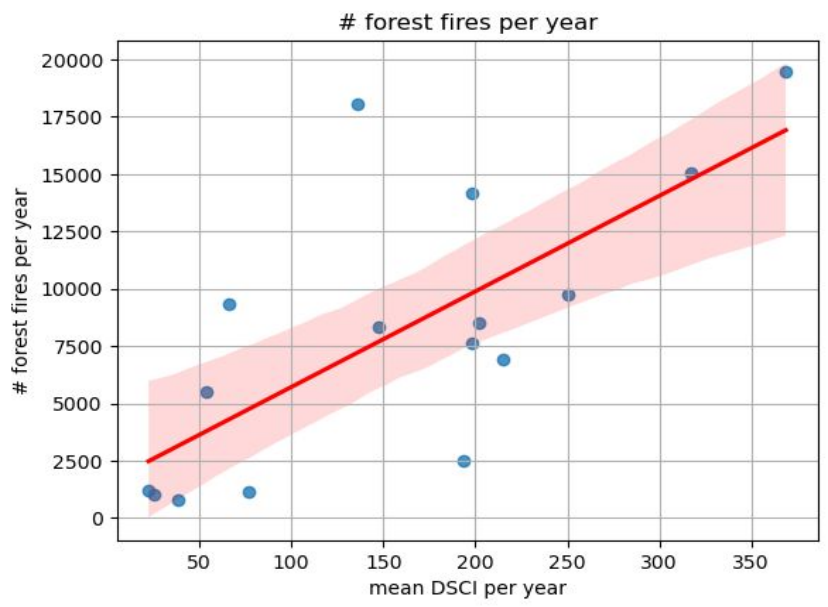
- Small area in massive ocean

Drought

Strength:

- Weekly data per county or state

Yearly drought against fire count



Pearson

0.72

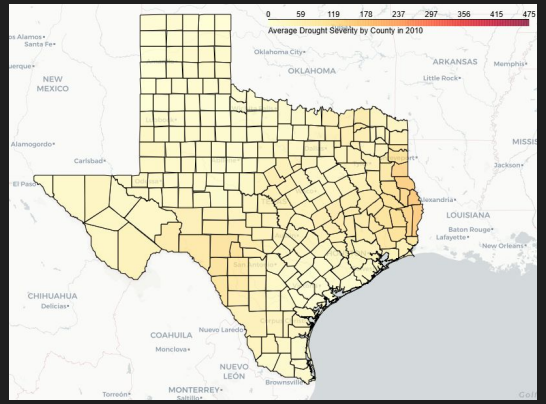
P value

0.002

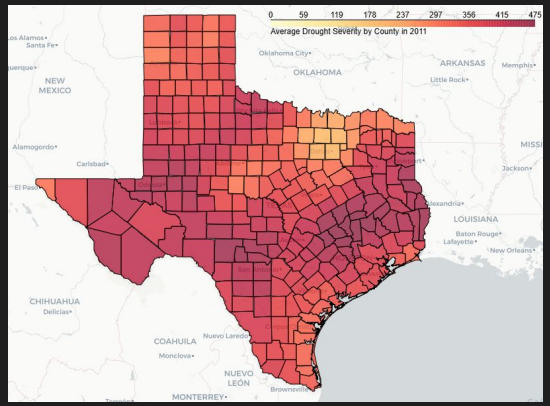
DSCI

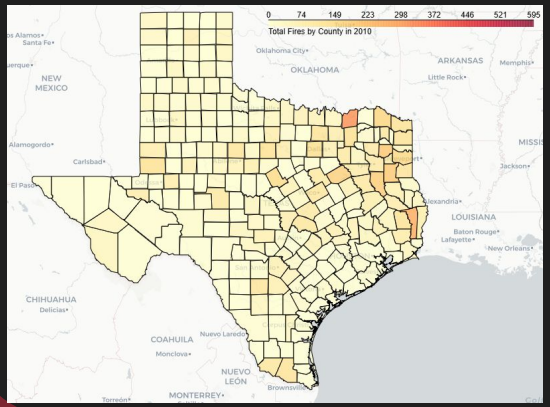
Drought Severity and Coverage Index

Comparing 2010 and 2011

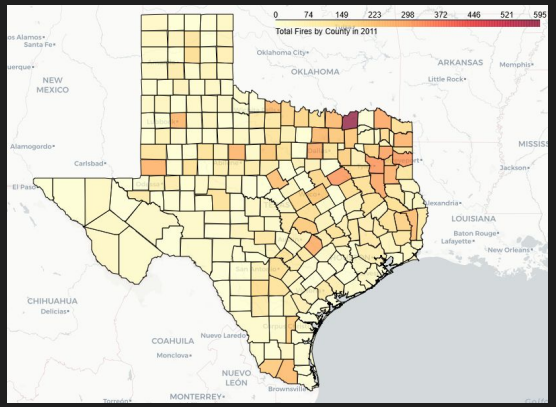


42 → 383

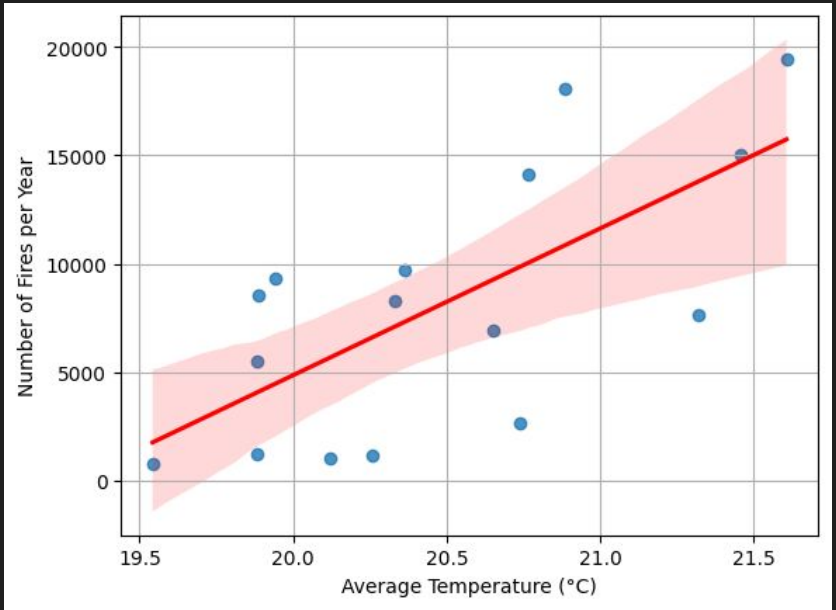




9351 → ~ 2x → 19453



Yearly air temperature against fire count



Pearson

0.69

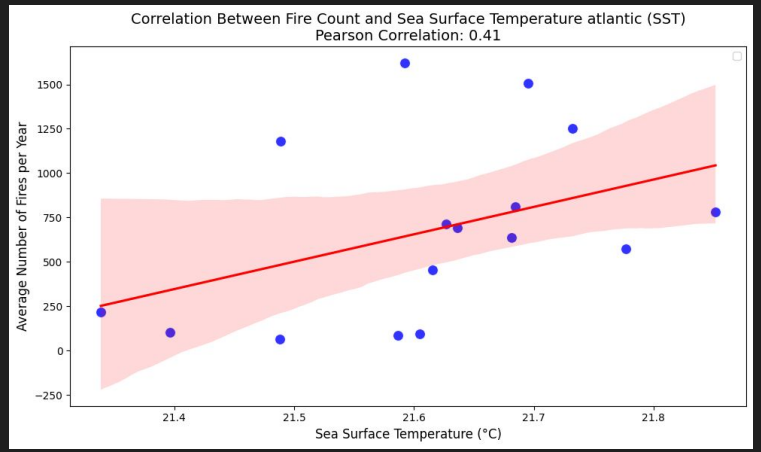
P value

0.003

Sea Surface Temperature (SST)

Why

- Drought conditions

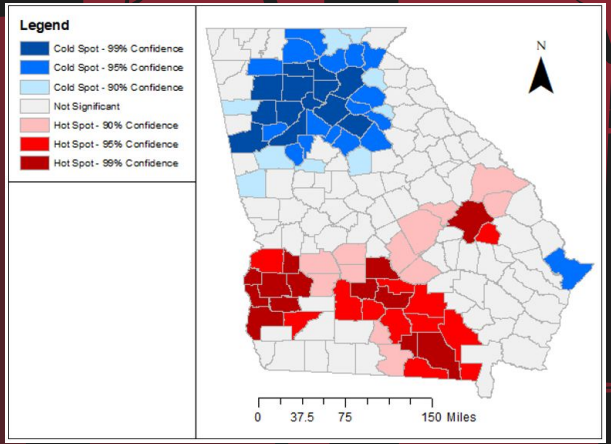


Sea's

- El Niño/La Niña
- Atlantic
- Mexican gulf

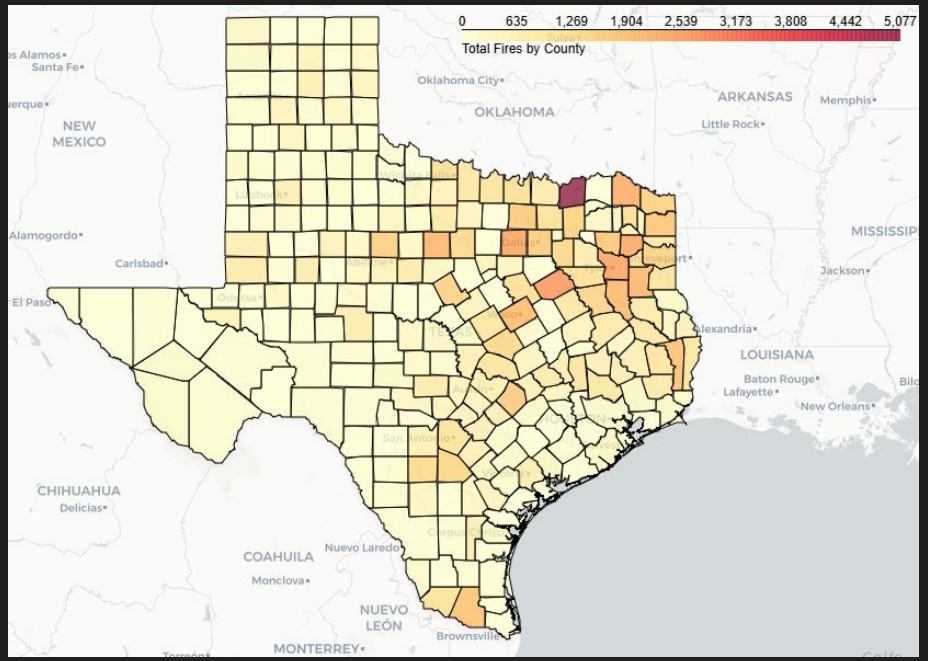
Getis-Ord Gi*

- Identifies hot and cold spots through spatial analysis
- Transforms the area into a weighted graph to model relationships
- Nearby areas influence each other’s values
- Calculates a Z-score and assumes data follows a normal distribution



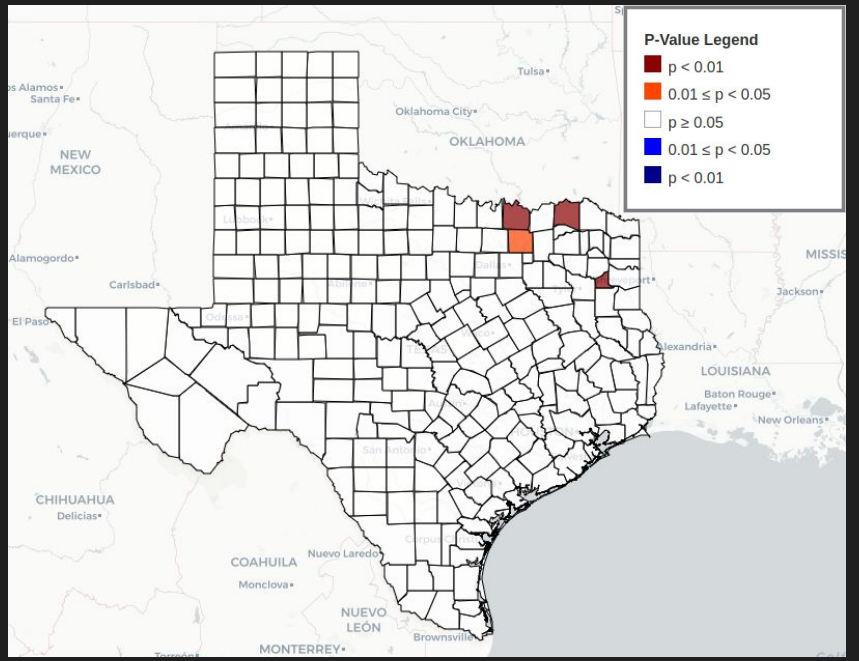
Total forest fire over the dataset

- Total amount of forest fires
- Visual hotspot in north-east of the state



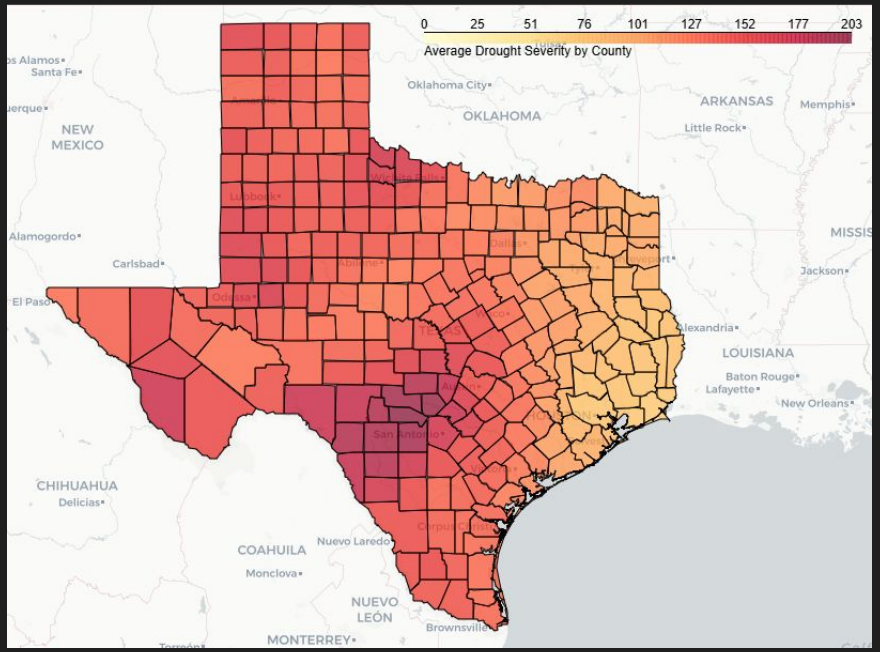
Getis-Ord Gi* fires

- Hotspots in the north-east of the state
- Does the drought have the same hot spots?



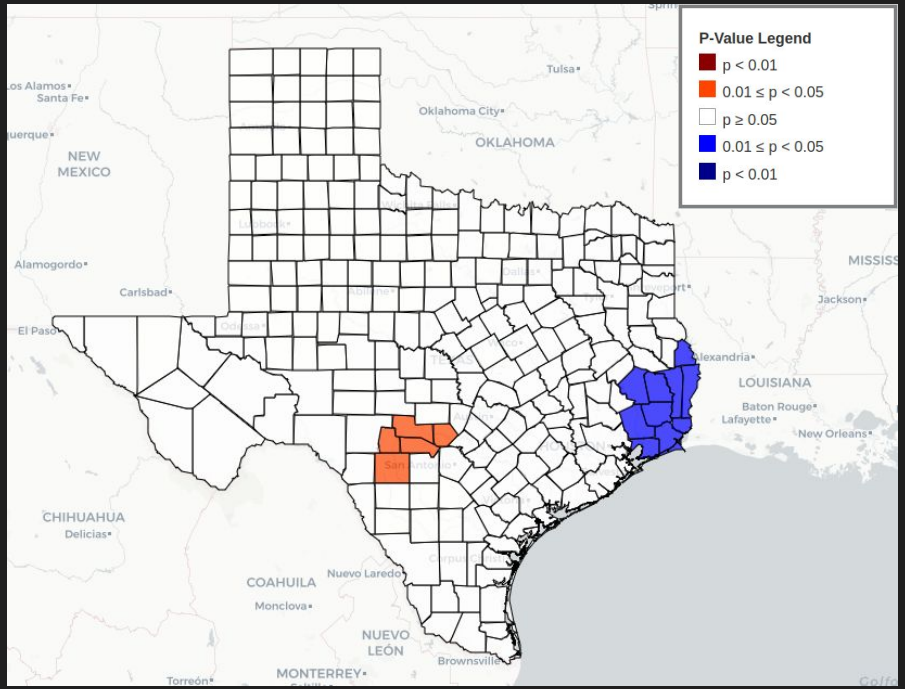
Drought

- Average drought per county
- Lot of drought in middle of state



Getis-Ord Gi* drought

- Drought hotspots do not seem to be in the same area
- Can be caused by vegetation differences



Conclusion

Which parameters significantly affect the amount of forest fires in Texas?

- Air temperature
- Sea surface temperature (SST)
- Drought

Are there certain areas which receive relatively more forest fires caused by local drought?

Conclusion

Which parameters significantly affect the amount of forest fires in Texas.

Air temperature –> increased temperature increases forest fires

Sea surface temperature (SST)

Drought

Are there certain areas which receive relatively more forest fires caused by local drought?

Conclusion

Which parameters significantly affect the amount of forest fires in Texas.

Air temperature –> increased temperature increases forest fires

Sea surface temperature (SST) –> no effect found

Drought

Are there certain areas which receive relatively more forest fires caused by local drought?

Conclusion

Which parameters significantly affect the amount of forest fires in Texas.

Air temperature –> increased temperature increases forest fires

Sea surface temperature (SST) –> no effect found

Drought –> increased drought increased forest fires

Are there certain areas which receive relatively more forest fires caused by local drought?

Conclusion

Which parameters significantly affect the amount of forest fires in Texas.

Air temperature –> increased temperature increases forest fires

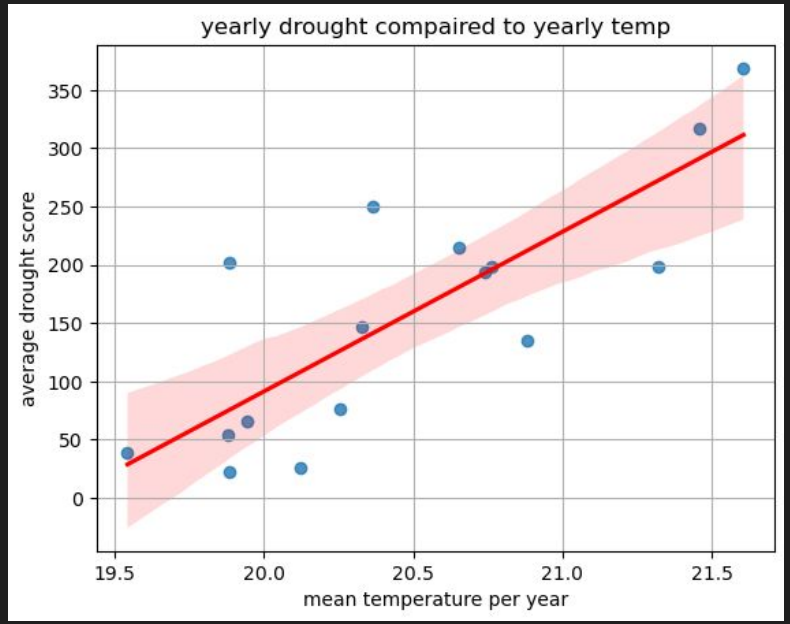
Sea surface temperature (SST) –> no effect found

Drought –> increased drought increased forest fires

Are there certain areas which receive relatively more forest fires caused by local drought?

Yes! –> but not entirely caused by drought

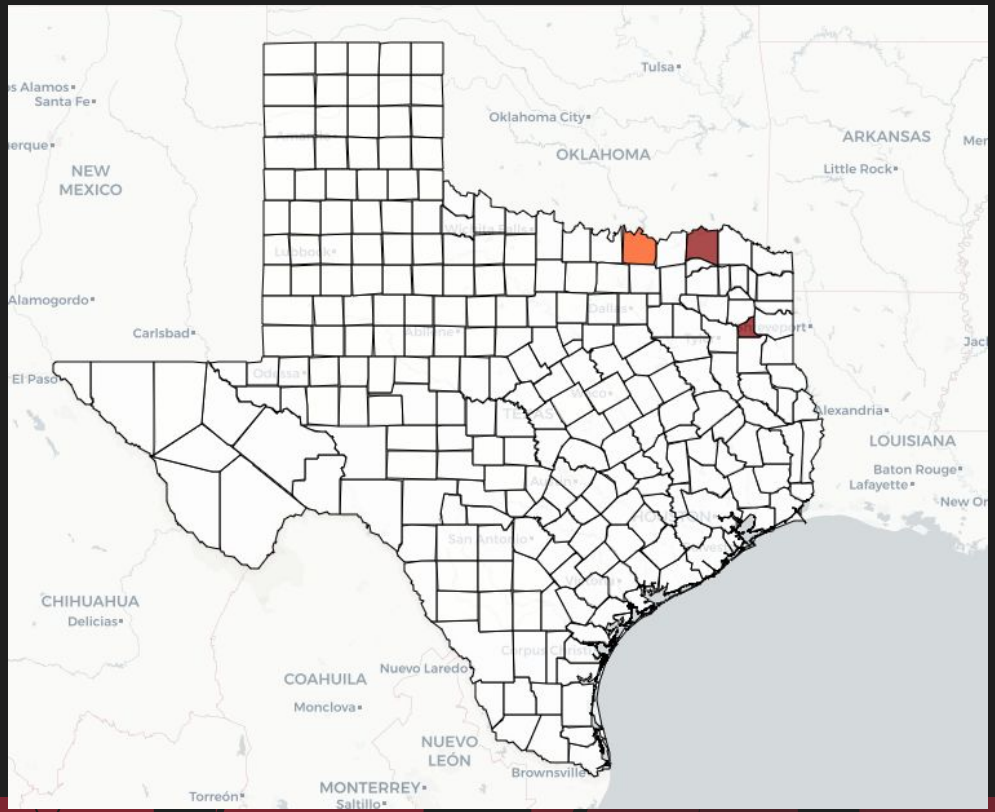
End of presentation.


yearly drought compaired to yearly temp
average drought score
mean temperature per year
350
300
250
200
150
100
50
0
19.5
20.0
20.5
21.0
21.5

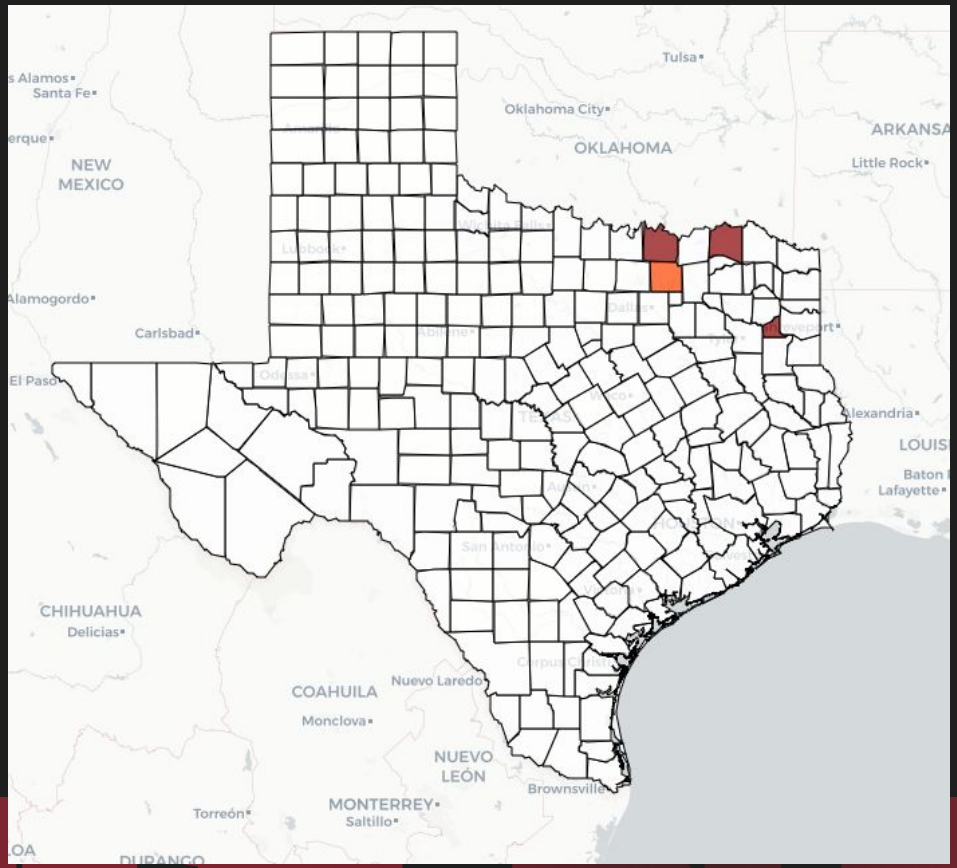
APPENDIX

Total acres burned

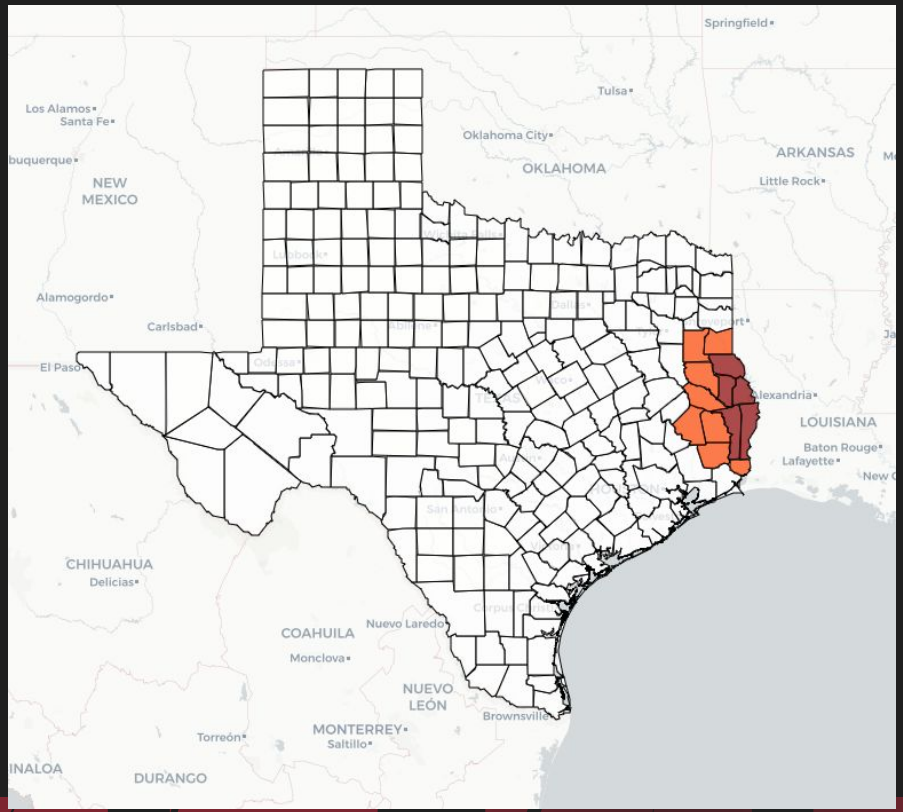
Getis ord gi 2010 total fires



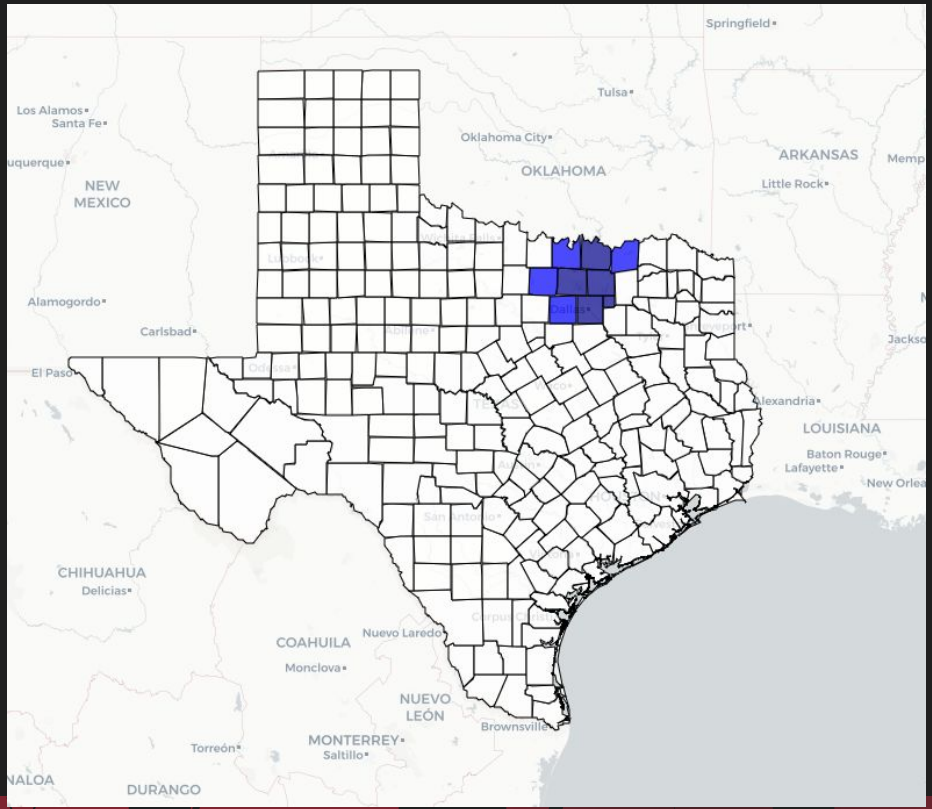
Getis ord gi 2011 total fires



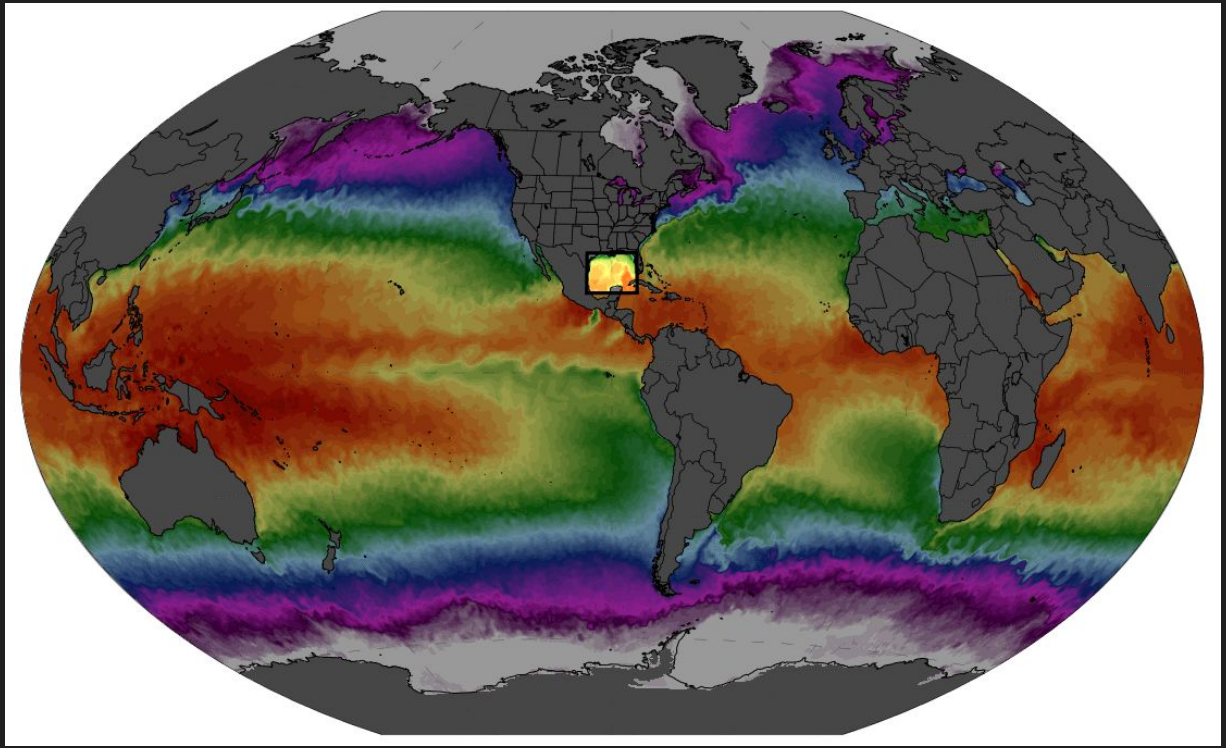
Getis ord gi drought 2010

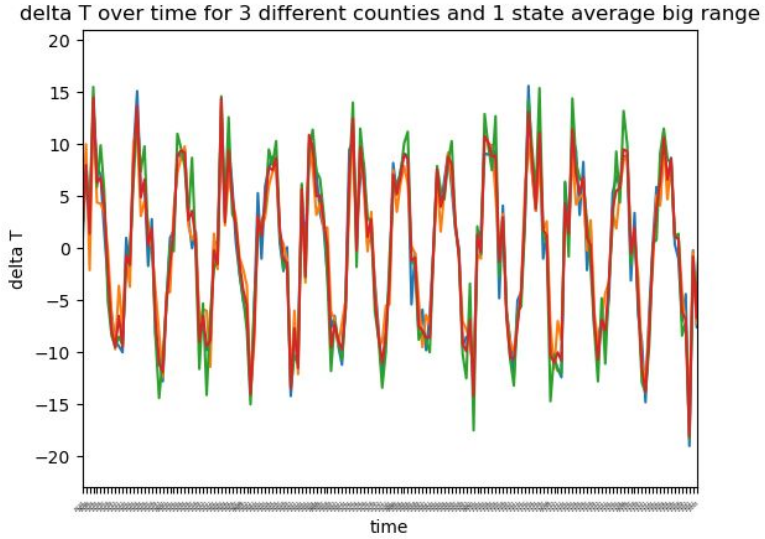


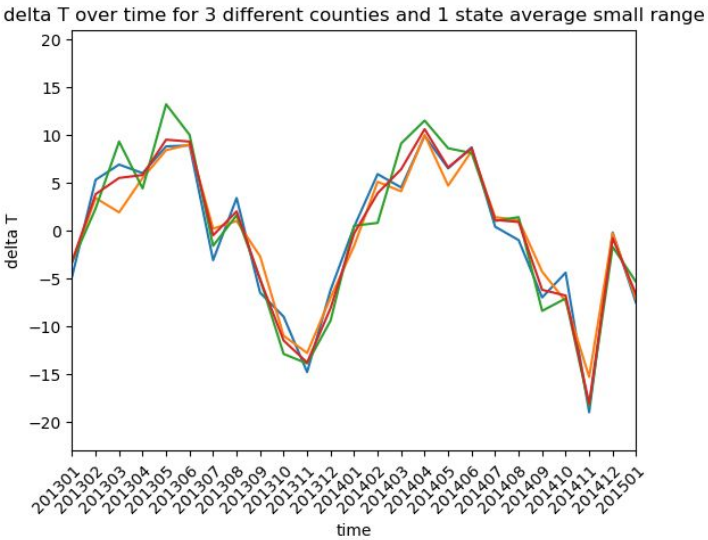
Getis ord gi drought 2011

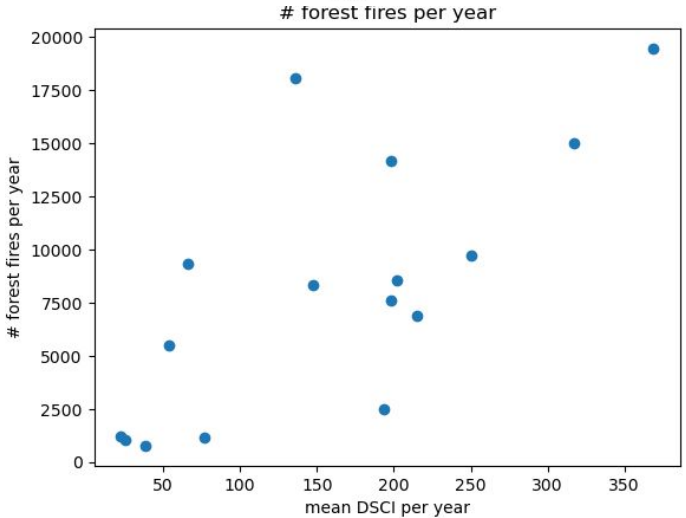


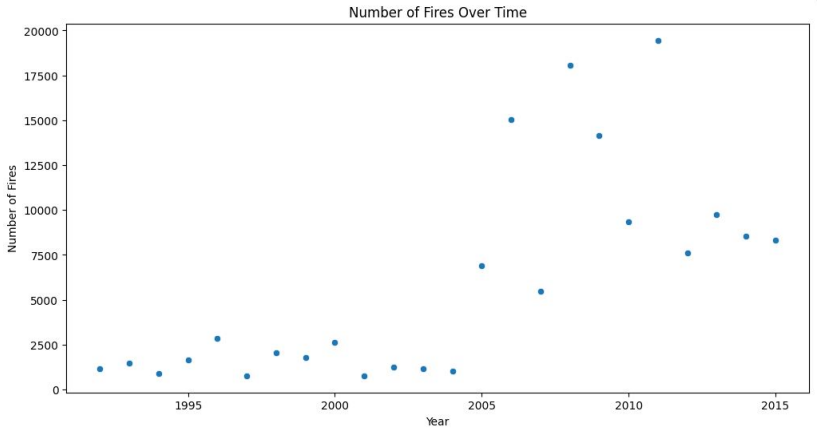
Gulf of mexico

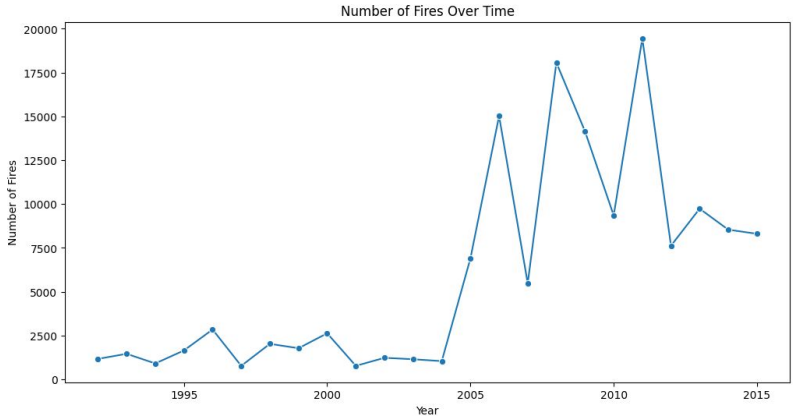



delta T over time for 3 different counties and 1 state average big range
delta T
time


delta T over time for 3 different counties and 1 state average small range
delta T
time


forest fires per year
forest fires per year
mean DSCI per year


Number of Fires Over Time
Number of Fires
Year
0
2500
5000
7500
10000
12500
15000
17500
20000
1995
2000
2005
2010
2015


Number of Fires Over Time
Number of Fires
Year
0
2500
5000
7500
10000
12500
15000
17500
20000
1995
2000
2005
2010
2015