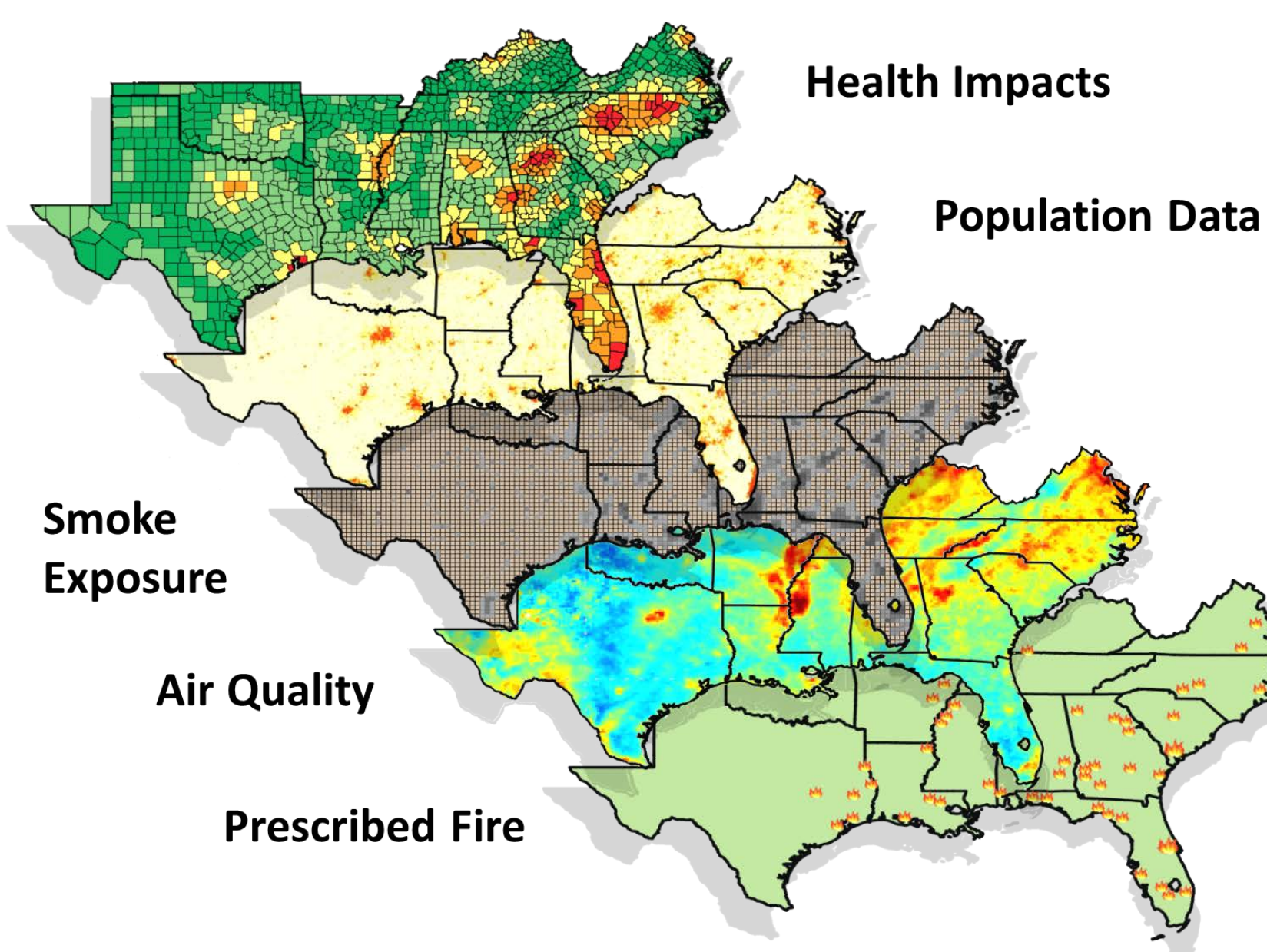


Motivation

Prescribed fire is used extensively in the United States to reduce hazardous wildfire risk and pursue different ecological objectives. Prescribed fires are also one of the largest sources of emissions in the country and can adversely impact air quality. Each year the South experiences the largest number of wildland fires in the U.S., the vast majority of which are prescribed. In this region, a large population lives within a 167 million acre urban-wildland interface, neighboring or intermixed with undeveloped fire-prone land. It is important that burning programs in the South consider their potential air quality impacts. We are developing a unified prescribed fire database for the Southern U.S. based on burn permit records from agencies across Southern states by systematizing available fire records into a single database. In addition, we find discrepancies with satellite-derived fire estimates and show that remote sensing inventories may fail capture include low-intensity fires. The unified database can improve representations of prescribed fire sources in emissions inventories and will be the basis of integrated prescribed fire and air quality information system.

Southern Integrated Prescribed Fire Information System:



Objective: To develop an integrated prescribed fire and air quality information system for the U.S. South that can be used to assess the impacts of prescribed burning on air quality, smoke exposure and associated health effects.

Prescribed fire data records

Permit-based prescribed fire database:

	2010	2011	2012	2013	2014	2015	2016	2017
FL			✓	✓	✓	✓	✓			
GA	✓	✓	✓	✓	✓	✓	✓			
MS	✓	✓	✓	✓	✓	✓	✓			
NC					✓	✓	✓			
TN*			✓	✓	✓	✓	✓			
Tall Timbers**	✓	✓	✓	✓	✓	✓	✓			

* Summary data
** Fire frequencies

Please share your data

Satellite-derived products frequently omit low-intensity fires, including many prescribed burns in the South.

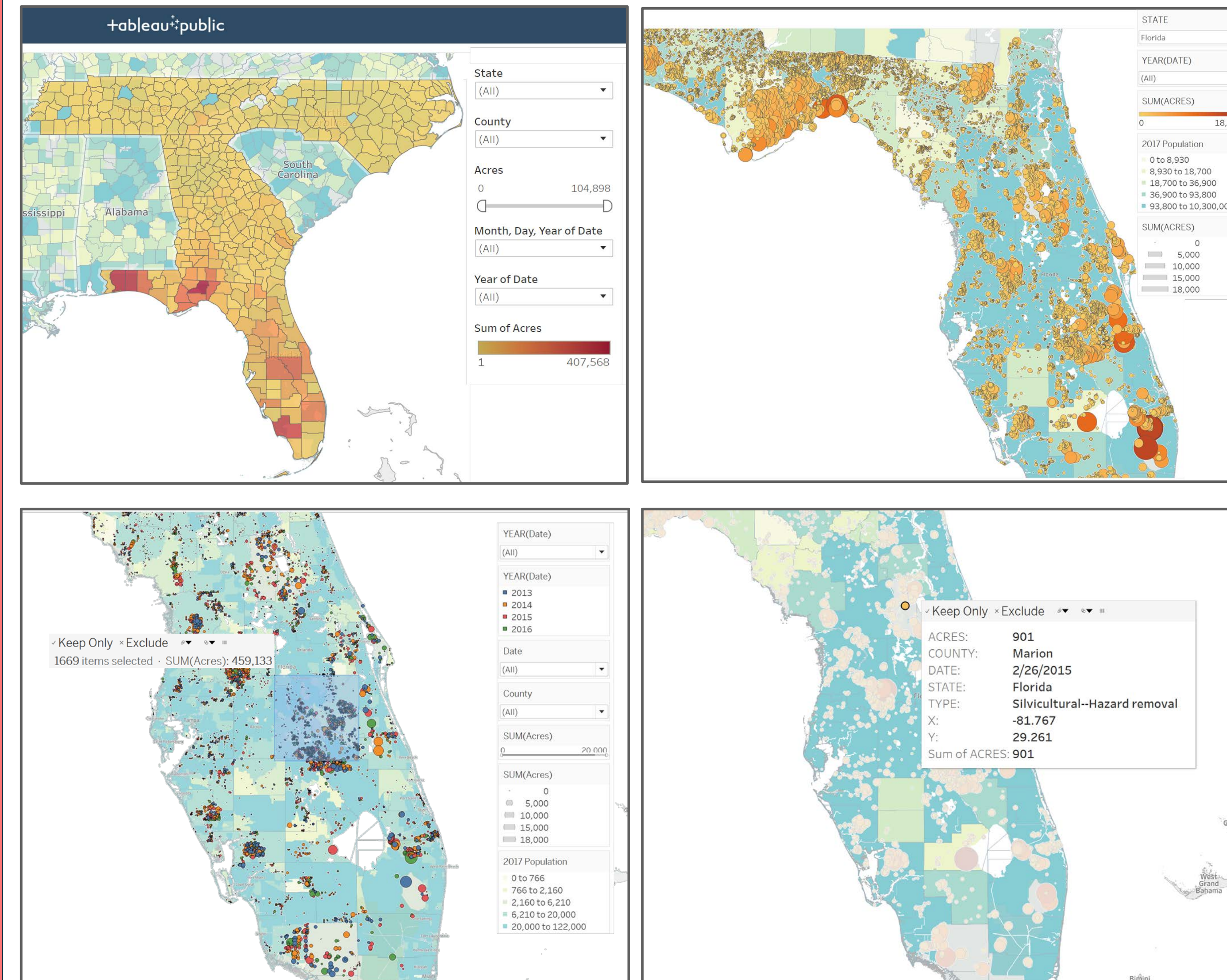
- Bottom-up records, including burning permits, may provide additional data.
- We have compiled burning permits for five states (and expect to gather more).
- Permit data varies widely across different states and agencies.
- Records in some states are grouped into county totals, others have individual fires.
- Data fields captured in state prescribed fire records vary significantly.
- Although permit-based records include a larger number of fires, there are considerable uncertainties associated with this data.

Commonalities and differences across state records:

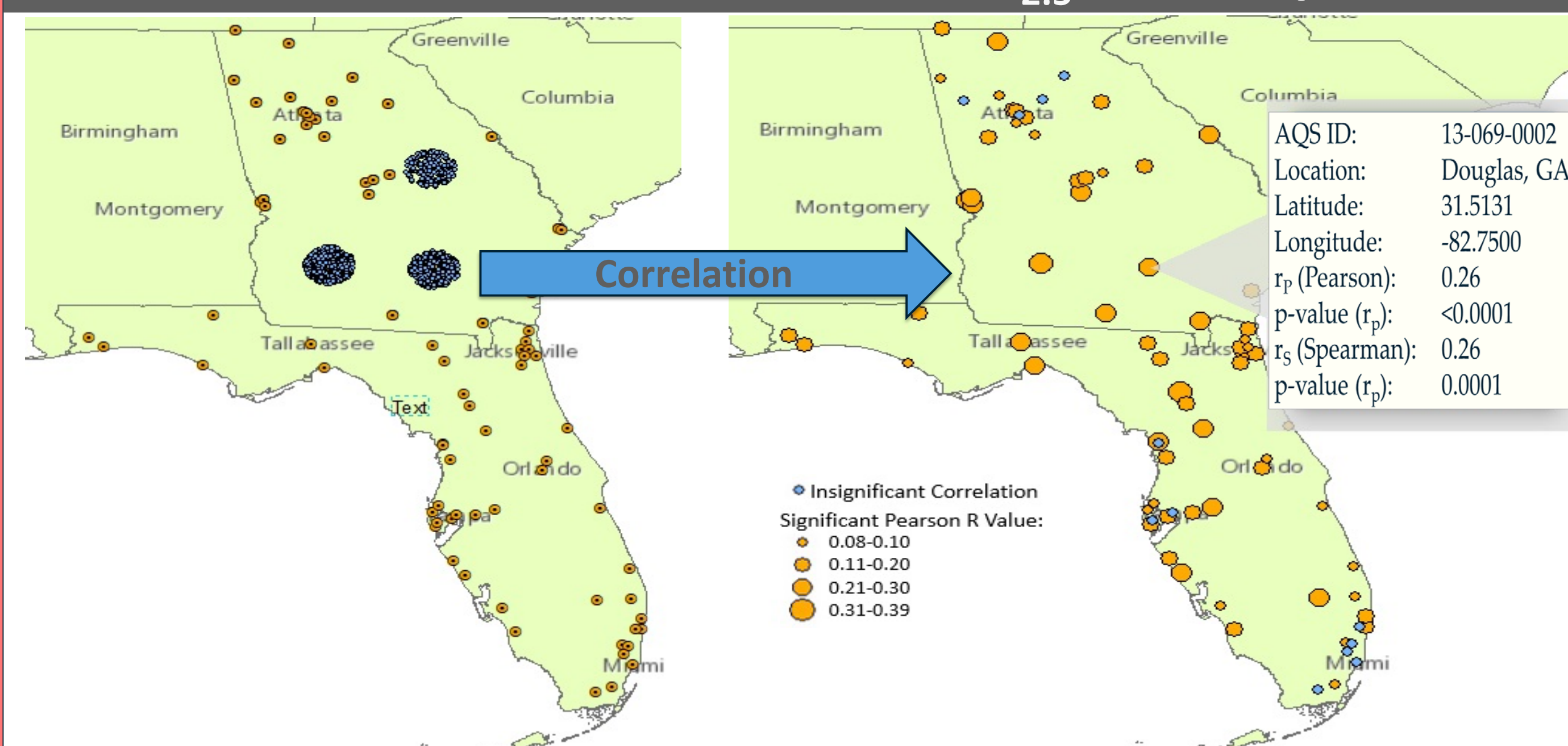
	NC	GA	FL
Spatial Information:			
Record ID	✓	✓	✓
Geographic coordinates	✓	✓	✓
Address	✓	✓	
County	✓	✓	
Shapefile			✓
Temporal Information:			
Scheduled date	✓	✓	
Scheduled time	✓		
Burning end time	✓	✓	✓
Burning start time	✓	✓	✓
Burn Information:			
Burn type	✓		✓
Estimated acres	✓	✓	✓
Estimated fuel consumption	✓		
Fuel Type	✓		

A unified prescribed fire record for the Southern U.S.

All fire data compiled will be made publicly available through a web portal that includes data for individual fires and allows grouping by region, time period and fire characteristics:



Correlations between observed PM_{2.5} and fire permits

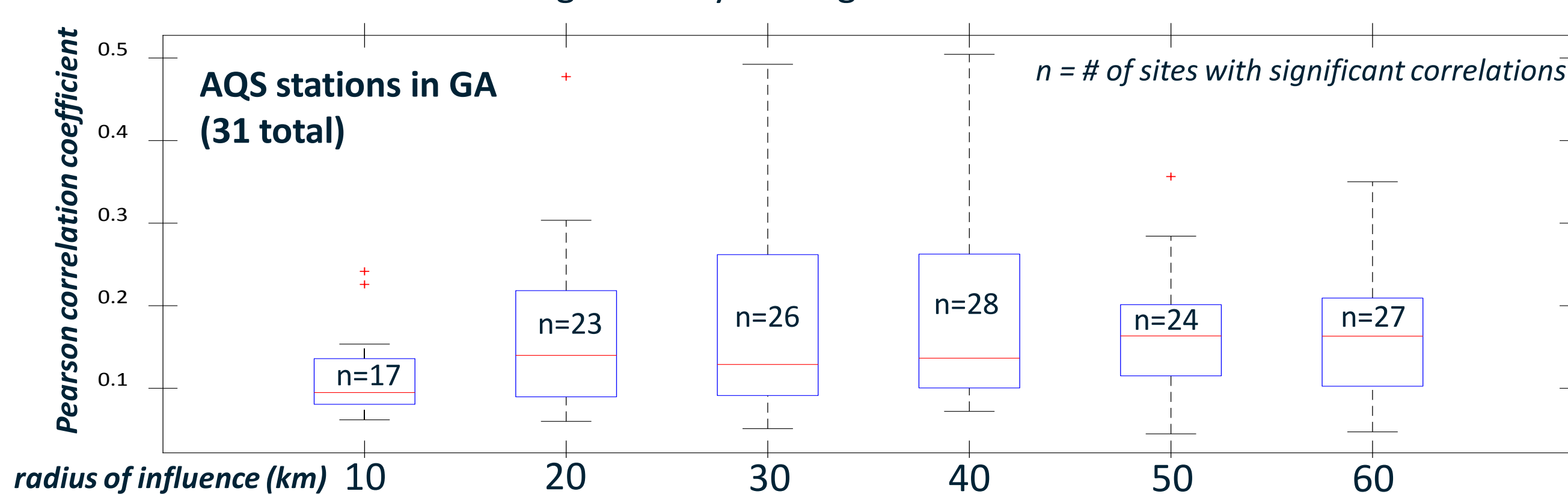


Correlation between 24-h PM_{2.5} at AQS stations and fire permits:

- We explore the influence of permitted burn area on measured PM_{2.5} at AQS sites at different spatial and temporal scales.
- Most stations in FL and GA show a significant correlation between 24-h PM_{2.5} and permits.
- Nearly 90% of the stations (out of 80) reflect a positive correlation between 24-h PM_{2.5} and increasing burn area, explaining as much as 25% of the variance in observed concentration.
- Stations with no significant correlation are often near large urban centers.

Area of influence of prescribed fire activity on PM_{2.5}:

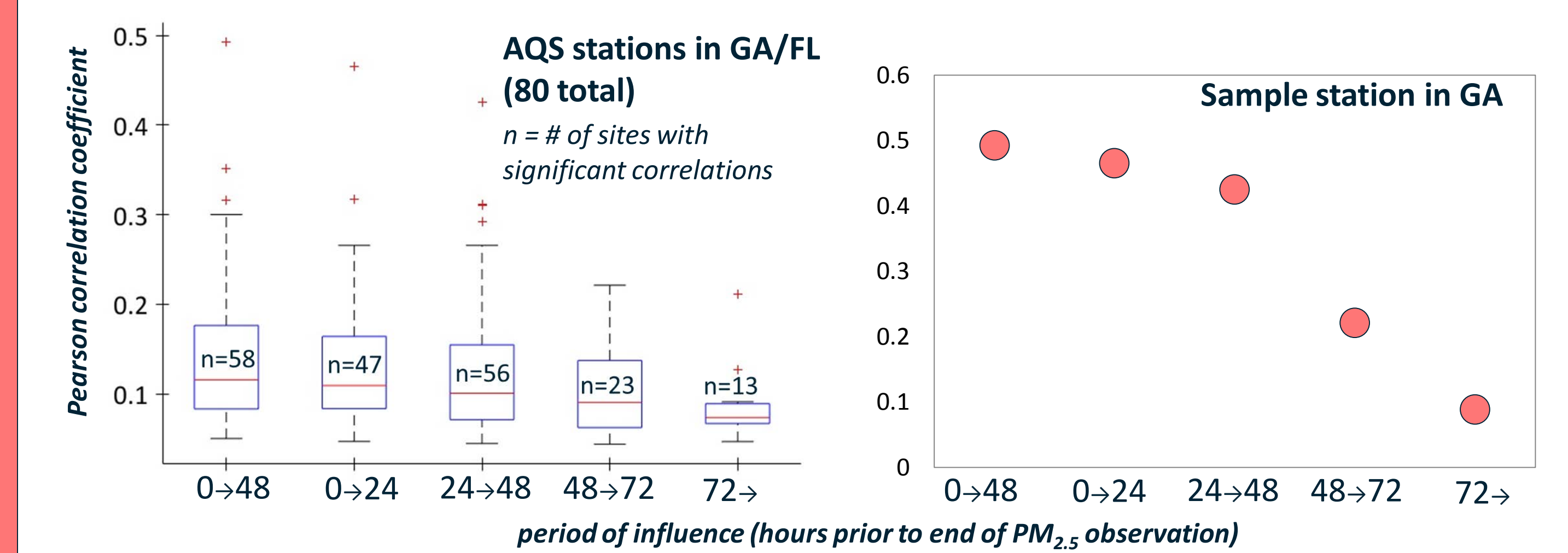
- At most sites there is a significant correlation within a 20 km to 60 km radius of influence.
- The radius of influence varies significantly among locations.



Correlations between observed PM_{2.5} and fire permits

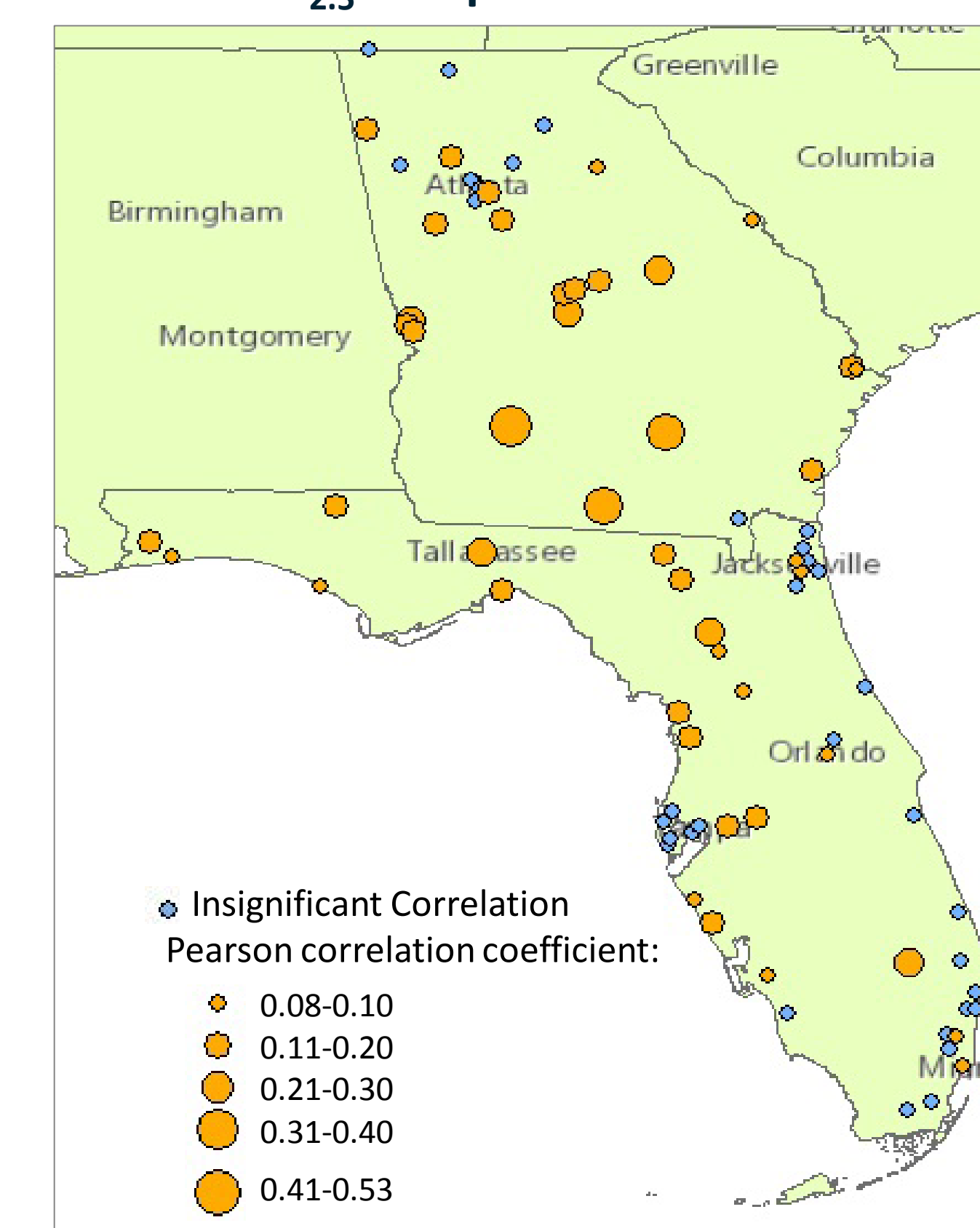
Period of influence of prescribed fire activity on PM_{2.5}:

- The correlations between observed PM_{2.5} and permitted fire activity are strongest for burns during the 48 hours prior to the observation.
- The influence of prescribed fire on observed PM_{2.5} drops significantly beyond this period, and does so consistently across most locations.

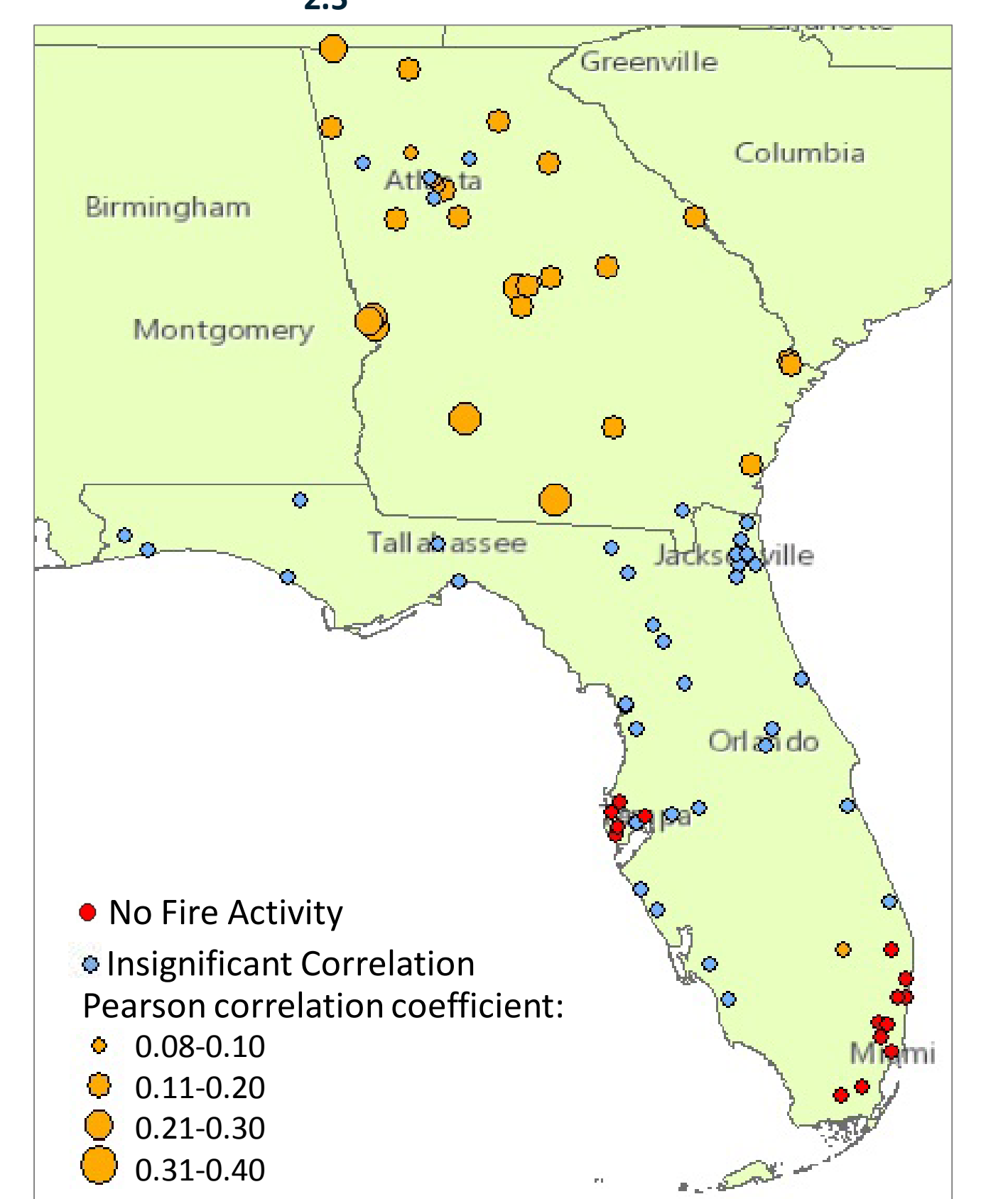


Permit-based and satellite-derived fire data

24-h PM_{2.5} and permitted burn area



24-h PM_{2.5} and satellite burn area:



- We compare the correlations of measured PM_{2.5} to permitted and satellite-derived burn areas from NOAA's Blended Global Biomass Burning Emissions Product, over a 22 month period.
- Most sites show a stronger correlation between observed PM_{2.5} and permitted prescribed fire.
- Only a single FL site has a significant correlation with satellite-detected fire activity.
- A few GA stations show a significant correlation with satellite-detected burn area only.

Insights

- The majority of air quality monitoring station in GA and FL show a significant correlation between observed 24-h PM_{2.5} and permitted fire burn area.
- Prescribed burning has an influence on local PM_{2.5} concentrations that persists for approximately 2 days at most locations, and extends 20 to 60 km away from each site.
- At most stations, PM_{2.5} has a significantly stronger correlation with the burn area recorded in fire permit records than that derived from satellite products.
- These results demonstrate the importance of bottom-up records of prescribed fire activity to assess potential impacts on air quality.
- There is a need for greater coordination across states and fire/air quality communities to integrate data. A unified prescribed fire record would advantageous to both groups.

Contact information and funding

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