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## Background and Objective

- ❖ Prescribed burning (PB) is a leading source of PM<sub>2.5</sub> in Southeastern USA.
- ❖ Estimates of PB emissions are based on burned areas reported to the state agencies when applying for burn permits. When no permit records are available satellite-derived products could be used as a substitute tool to provide burned area data.
- ❖ To evaluate the uncertainty in burned areas from satellite-derived products, we conducted a comparison between PB permit records and two satellite-derived products, Blended Polar Geo Biomass Burning Emissions Product (BBEP) and Global Fire Emissions Database (GFED4s), in Georgia (GA) and Florida (FL).

## Burned area data

### Permit Records

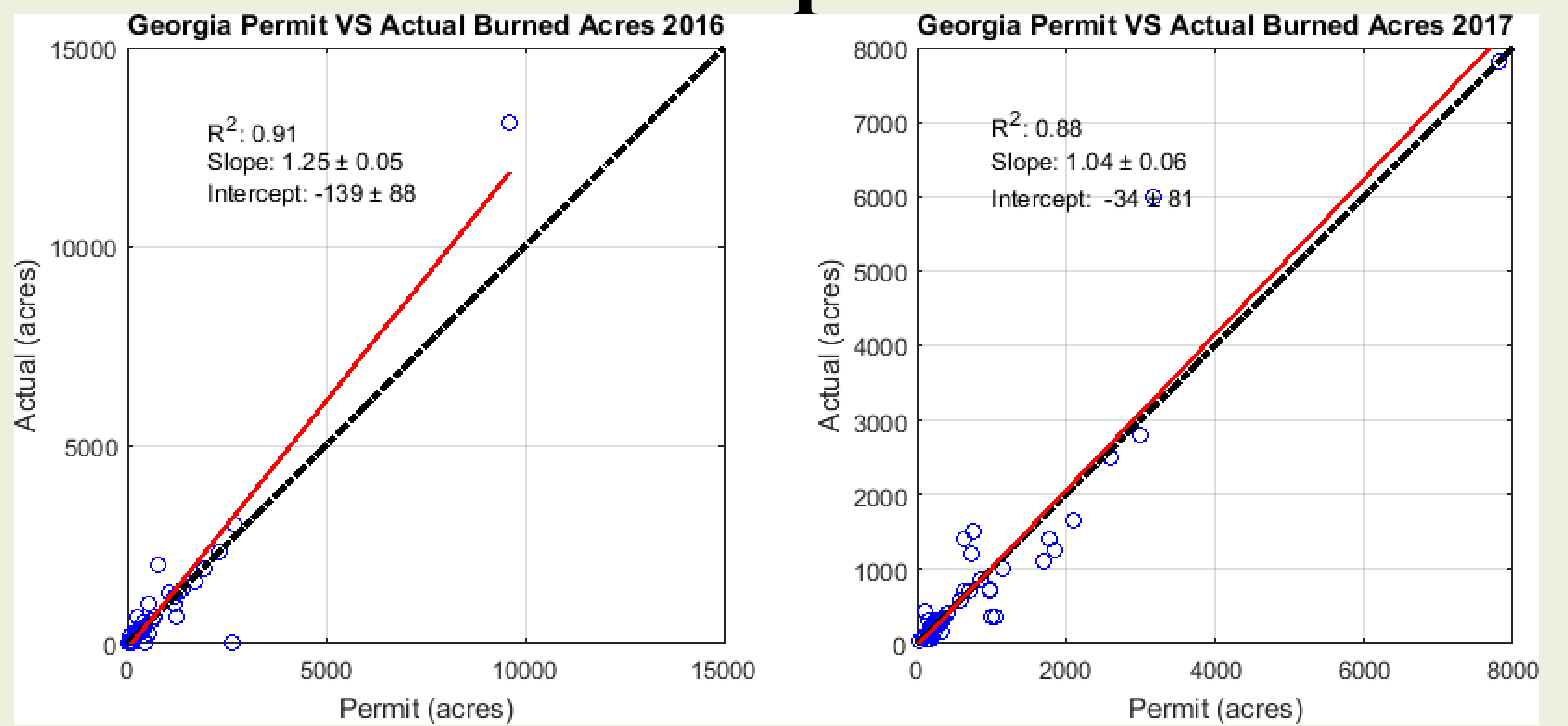
State	Period	Location Info.
GA	2015, 2016: Jan. – Apr.	Address
FL	2015, 2016: Jan. – Apr.	Lat/Lon

### Satellite-derived Products

BBEP	GFED4s
Daily	Monthly

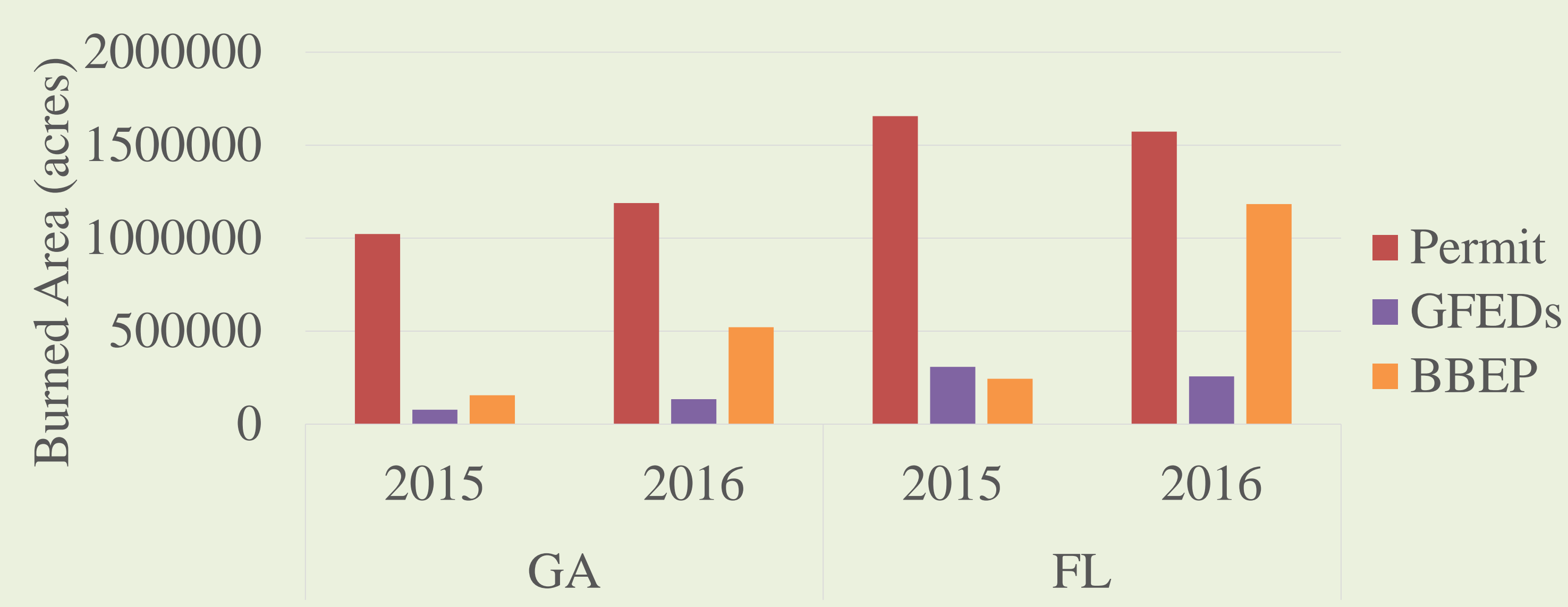
- ❖ **Blended Polar Geo Biomass Burning Emissions Product (BBEP):** GOES-East, GOES-West, MODIS and AVHRR; hourly burned area, fuel loading, combustion factor, and emission factor.
- ❖ **Global Fire Emissions Database (GFED4s):** Small fires included, combining 1-km thermal anomalies (active fires) from Terra and Aqua and 500m burned area observations from MODIS.

## How accurate are the permit burned areas?



- ❖ Each point on the plot represents the totals for one burner.
- ❖ It was difficult for many burners to remember the details of each individual burn but most of them kept records of their total burned areas.
- ❖ Our phone call survey in Georgia shows good agreement between permitted and actual burned area with  $r^2$  equal to 0.91 and 0.88 for 2016 and 2017, respectively.
- ❖ The survey results suggest larger uncertainty in 2016 permit records than 2017 with larger deviation from the diagonal. This may be simply due to better remembrance of the more recent year's burns.

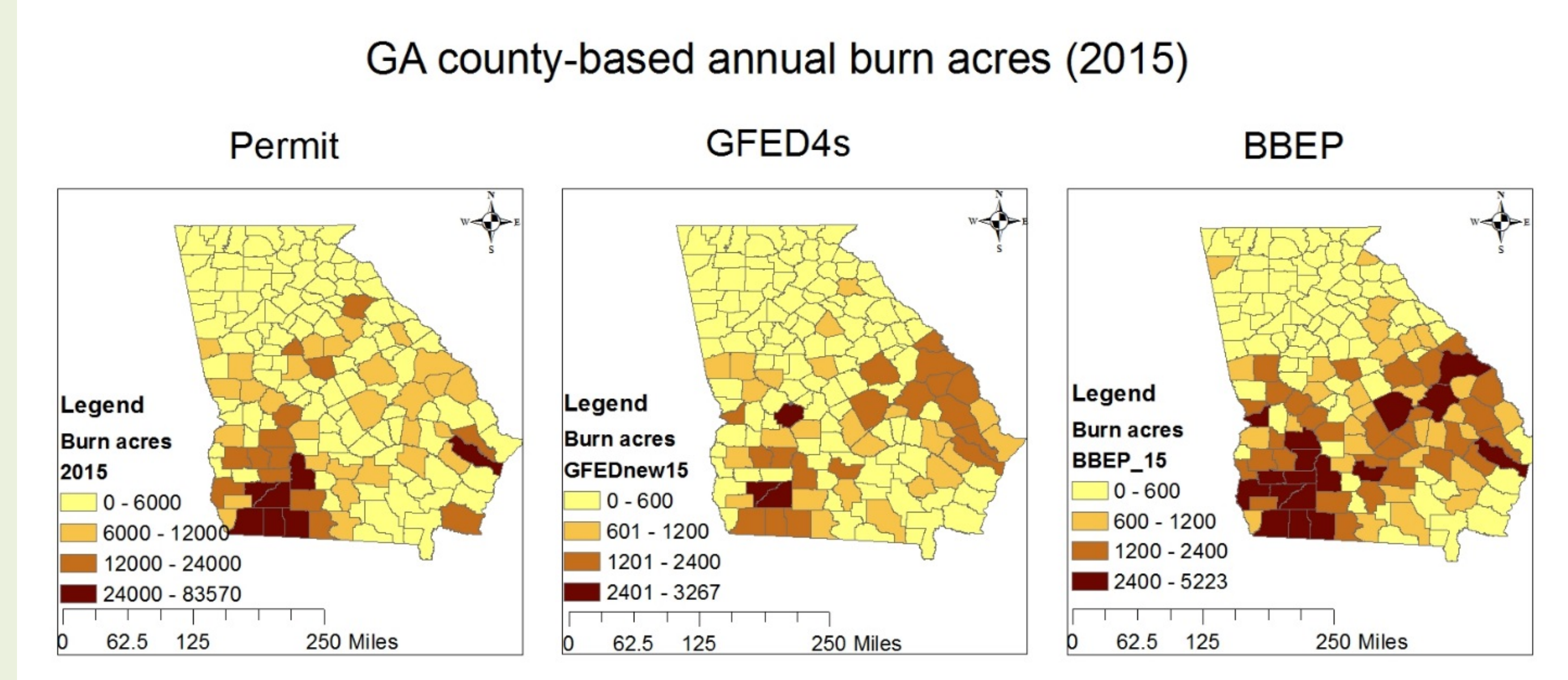
## State total burned areas from all datasets



- ❖ In GA, GFED4s only accounts for 8% and 11% of the burned areas in permit records while BBEP accounts for 15% and 44% in the first four months of 2015 and 2016, respectively.
- ❖ In FL, GFED4s' state total burned areas are 19% and 16% of those in permit records in 2015 and 2016, respectively. BBEP's are 15% and 75% of burned areas in permit records.

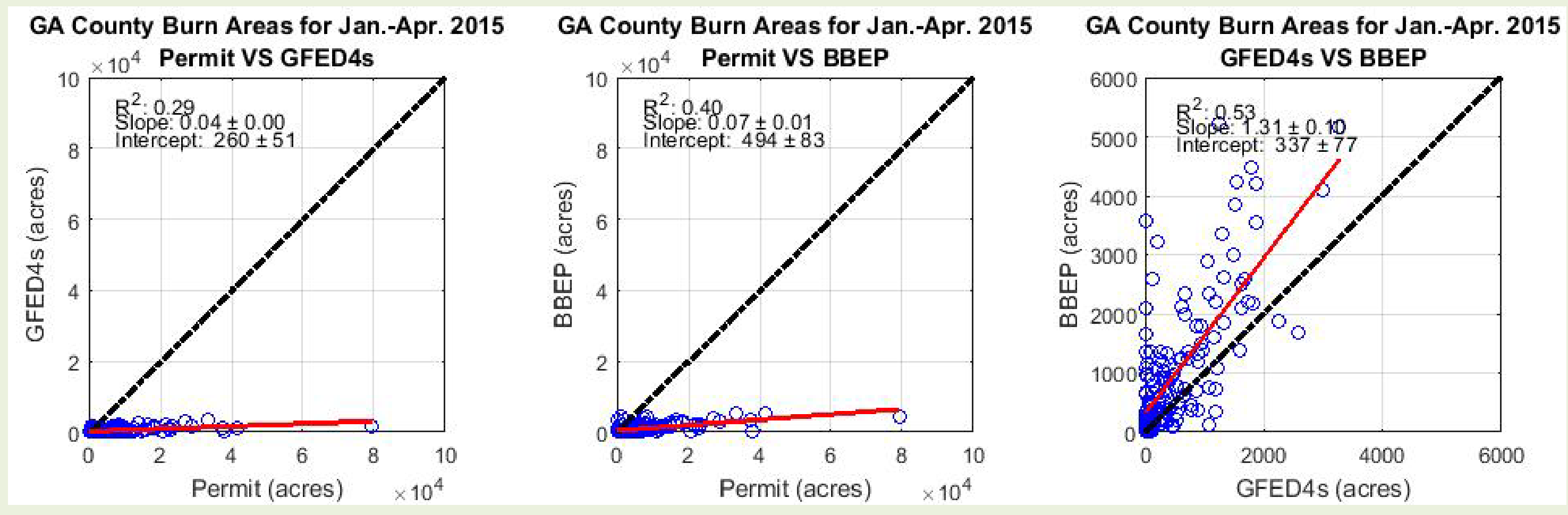
## Comparison of fire data from satellites with prescribed burn permit records

### Spatial distributions of burns



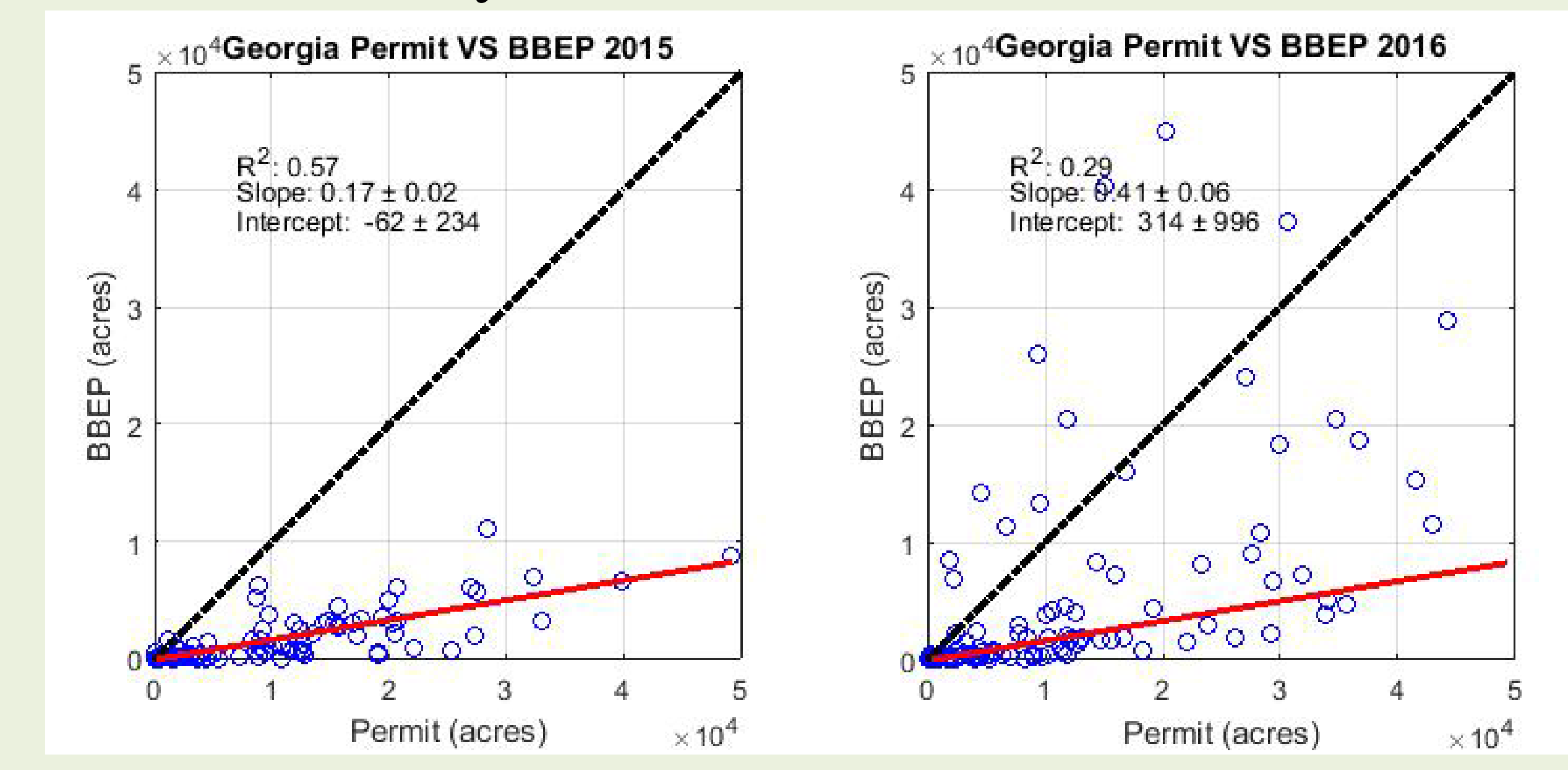
- ❖ Most prescribed burning occurs in southwest Georgia. Satellite products BBEP and GFED4s are in agreement with the geographic location of the burning but do not capture the level of burned area seen in permit records.

### Comparison of county-total burned areas



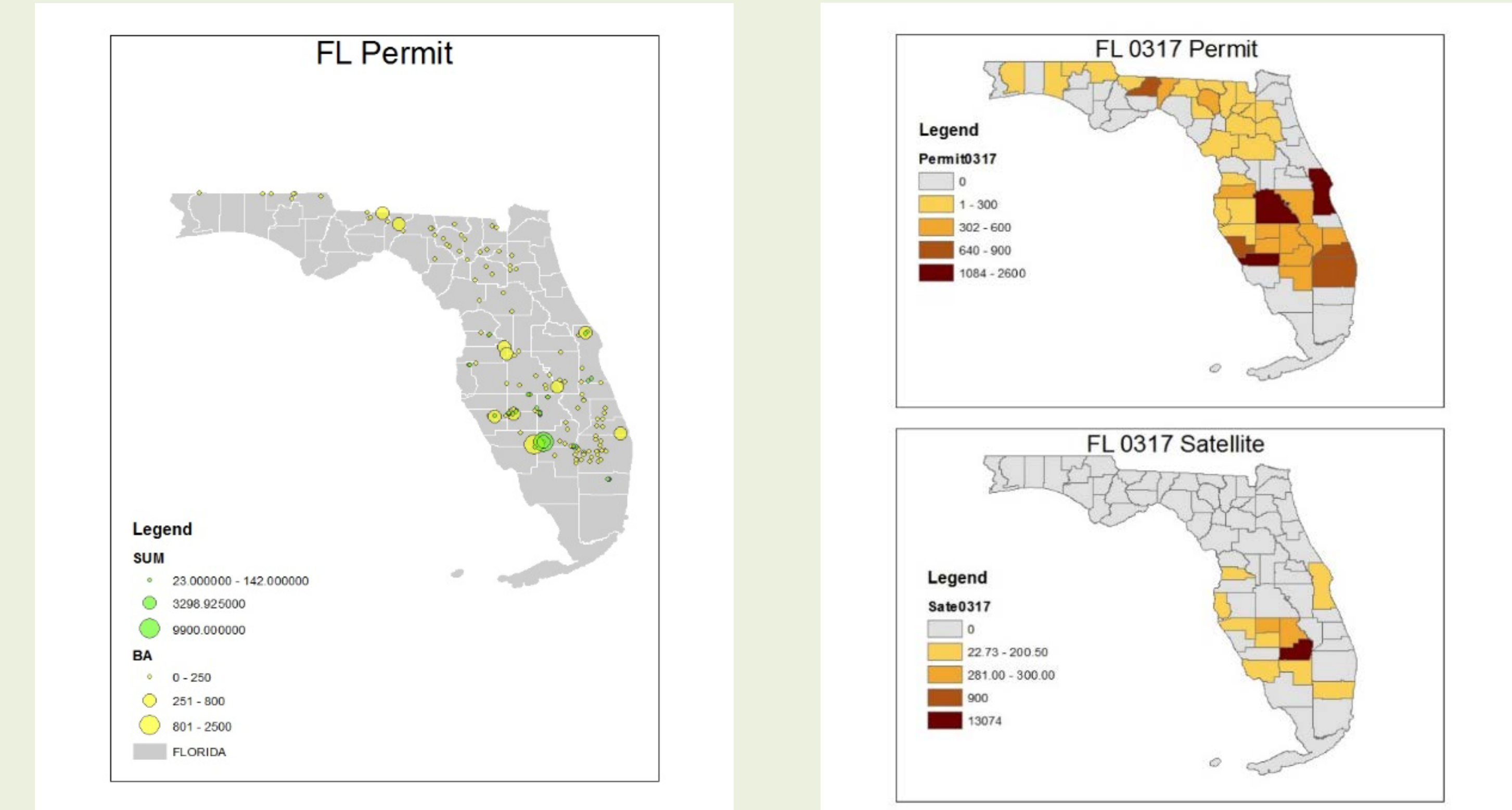
- ❖ For the first 4 months of 2015 in Georgia, BBEP is more correlated with permit record burned areas than GFED4s.
- ❖ There is a strong correlation between BBEP and GFED burned areas because both of them use data from MODIS.

## Daily state total burned areas



- ❖ BBEP burned areas are generally much smaller than burned areas in the permit records.
- ❖ BBEP is more correlated with permit records during the first four months of 2015 than the same period in 2016.

### Daily Analysis: 03/17/2016



- ❖ Although BBEP and permit record burned areas are almost the same statewide in FL (14,000 acres), the locations of the fires are quite different.
- ❖ In particular, BBEP fires do not agree with the small burns permitted in South Florida where there are only a few small fires detected by the satellite and their locations are different from those of the permitted burns. In addition, larger fires seen by the satellite in North Central Florida are in different locations, even different counties.

## Conclusions

- ❖ Current satellite products have several limitations in estimating the burned areas of small prescribed fires.
- ❖ Their views may be obstructed by the canopy in understory burns, leading to underestimation of burned areas.
- ❖ They may interpret a cluster of several small fires as one big fire, leading to overestimation of burned areas.

## Acknowledgement and Contact Information

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