

# Applications of satellite measurements to improve prescribed fire management: Phase 1 Science results

Yuhang Wang  
Georgia Institute of Technology

In partnership with the Georgia Forestry Commission (GFC)  
and the Georgia Environmental Protection Division (EPD)



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# Research objectives

- Develop an automated system of air quality forecasts which include prescribed fire emissions in the previous days.
- Develop more realistic prescribed fire emission inventories based on satellite observations and burning permit data.
- Develop quantitative assessments of air quality impact for requested burning permits.

# Hypotheses

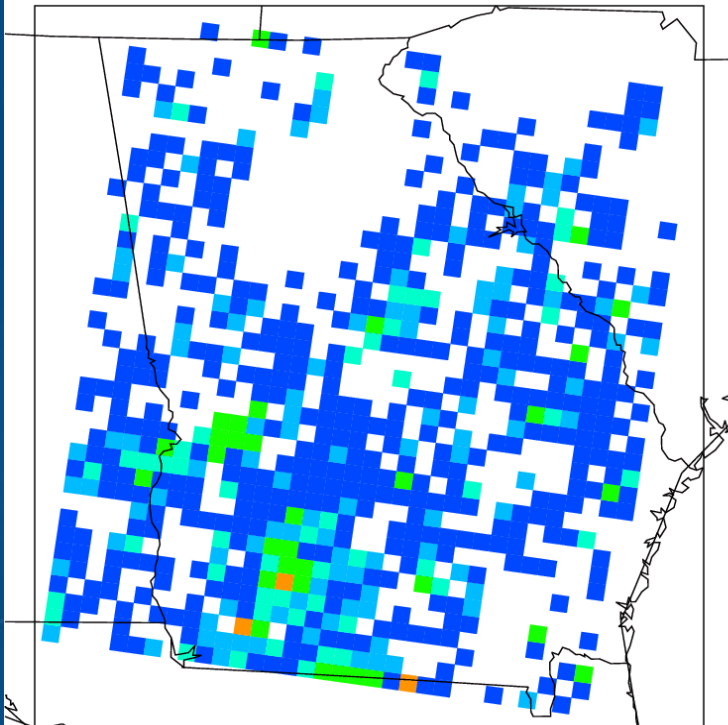
- Quantitative impact forecasts will improve prescribed fire management.
- Satellite burned area products do not adequately represent occurrences of understory prescribed fires.
- Satellite active fire products underestimate emissions from prescribed fire emissions because of low burning temperature and canopy shielding effect.
- By combining burning permit data with satellite active fire products and top-down fire emission inventories, adjustments can be made to significantly improve the prescribed fire emission estimates.

Comparison of satellite burned area estimates with those based on GA burning permit data

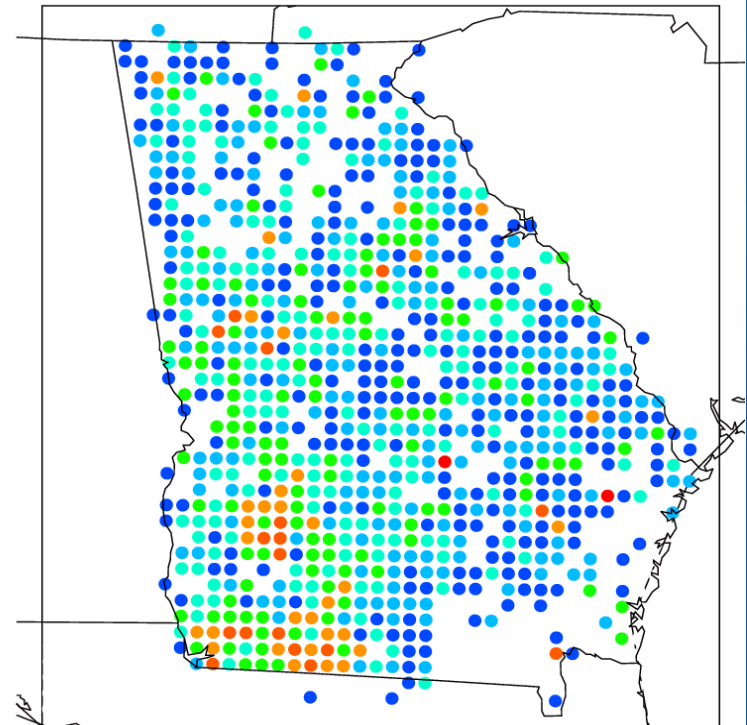
# Satellite and fire permit burned area

Burned area in March 2012

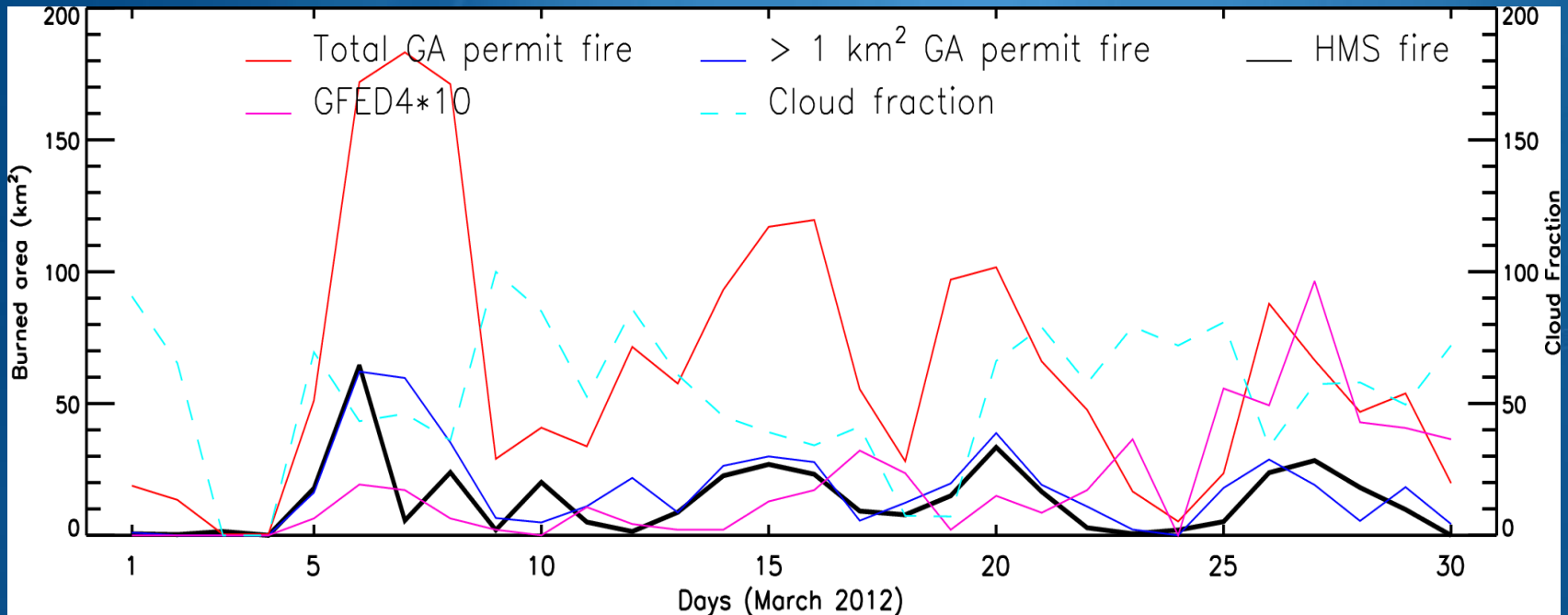
HMS



GFCP+GRITS



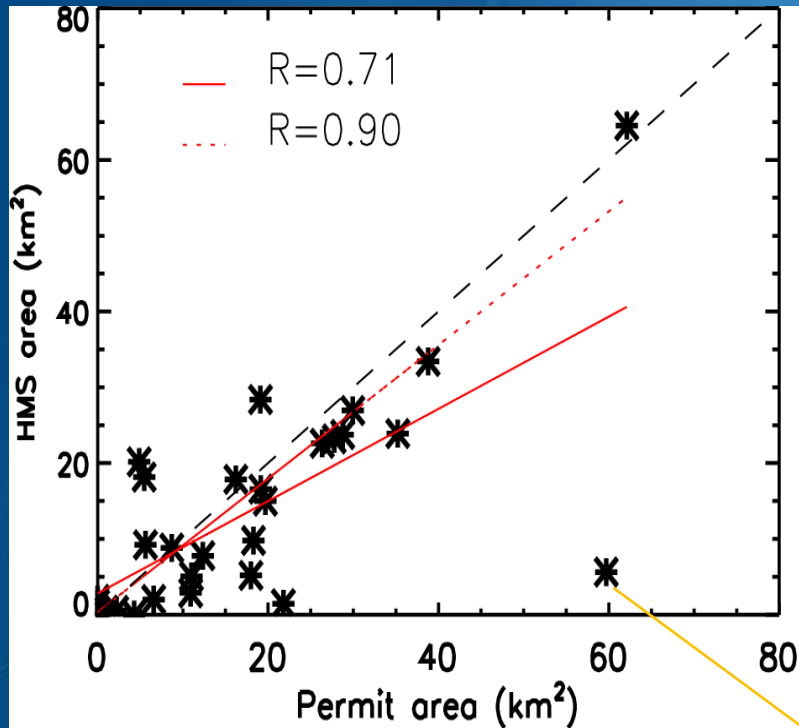
# State-total daily variation



- Fire permit data are a factor of ~5 larger than HMS active fire based estimates
- HMS estimates are in agreement with permit data of fires > 1 km², indicating large low bias for small fires
- Burned-scar based GFED4 estimates are a factor of ~10 lower than HMS.
- Cloud does not appear to be the only interference.

# Daily burned area correlation

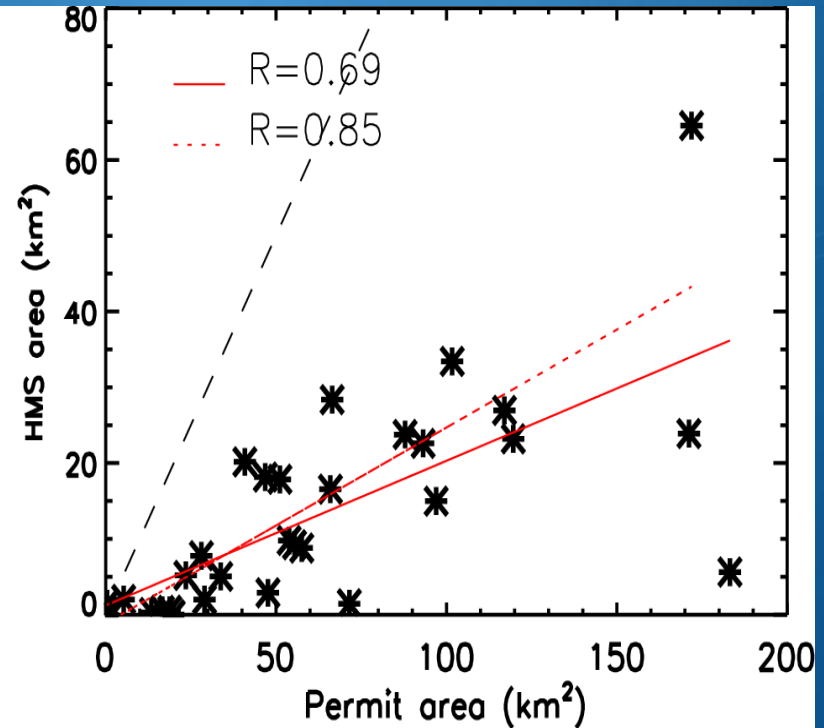
Fires > 1 km<sup>2</sup>



Some agreement with outliers

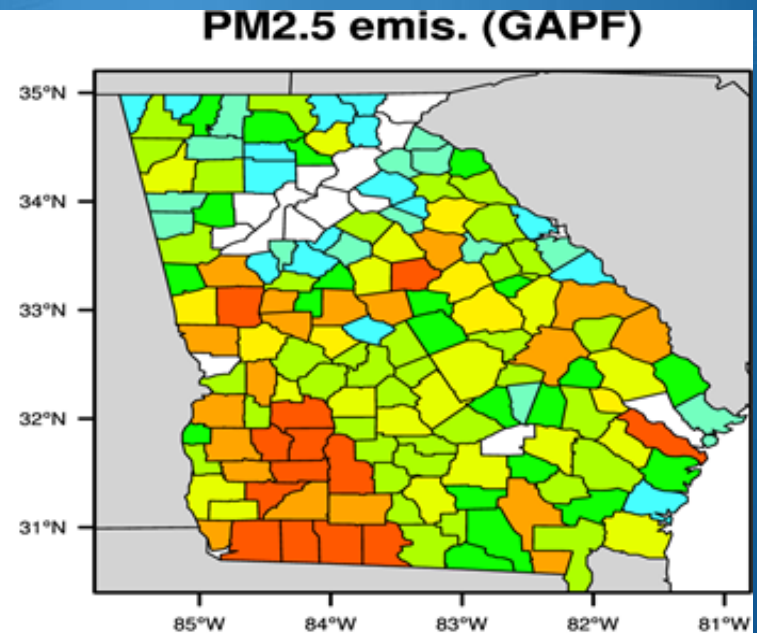
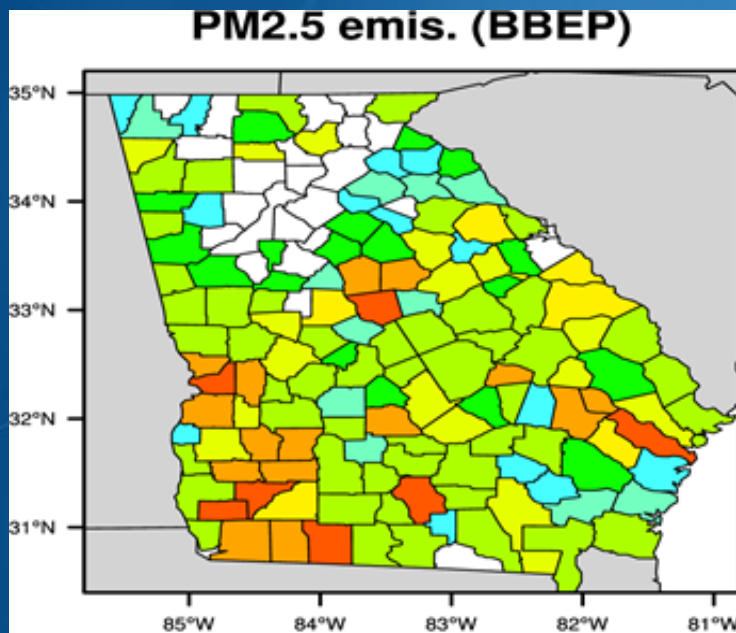
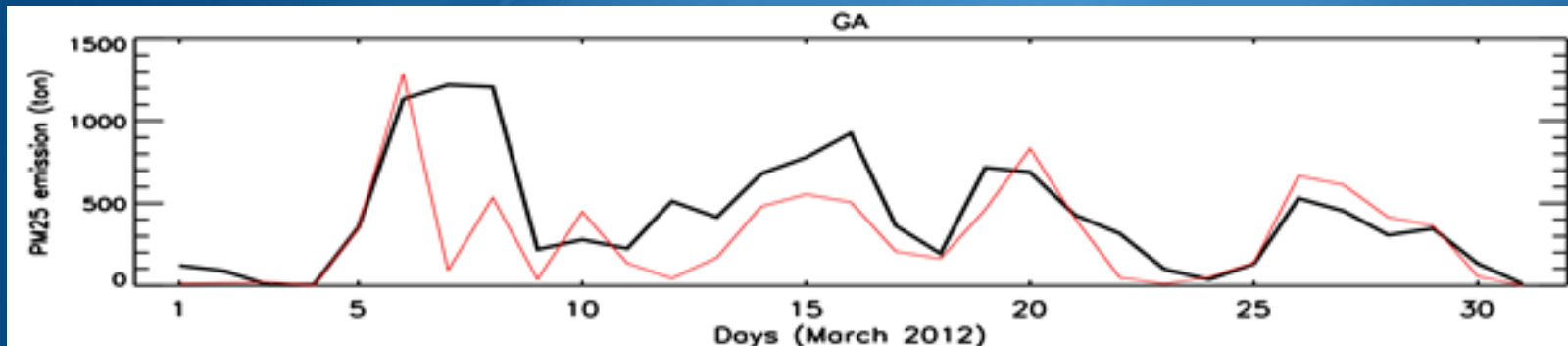
3-7-2012

All fires



HMS lower by a factor of 5

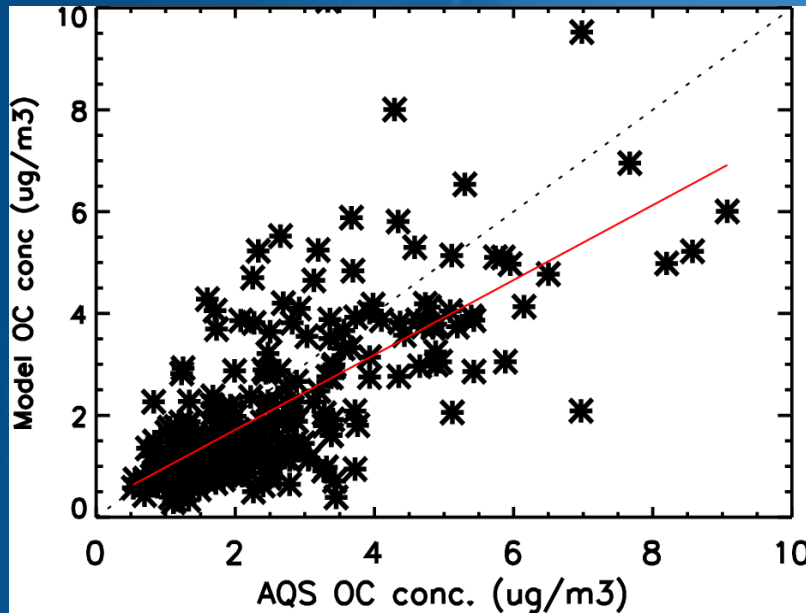
# The emission difference is smaller



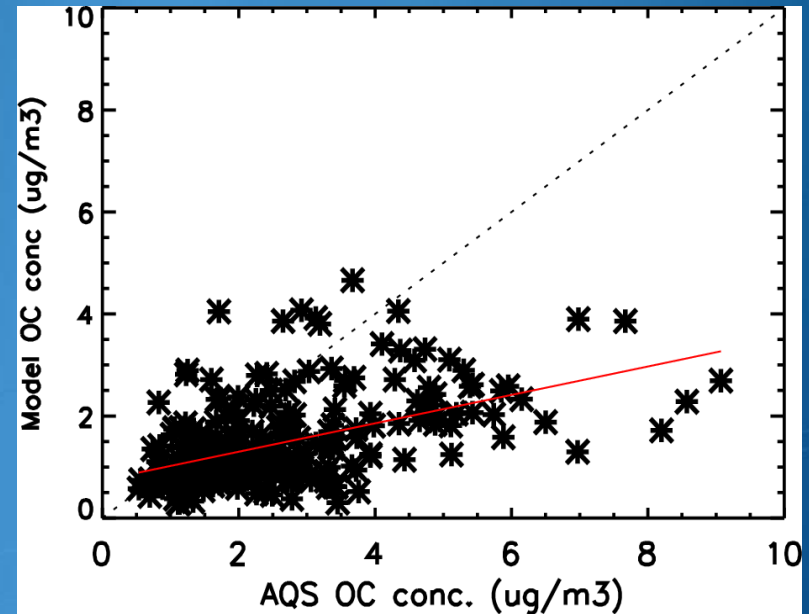
Ton/month



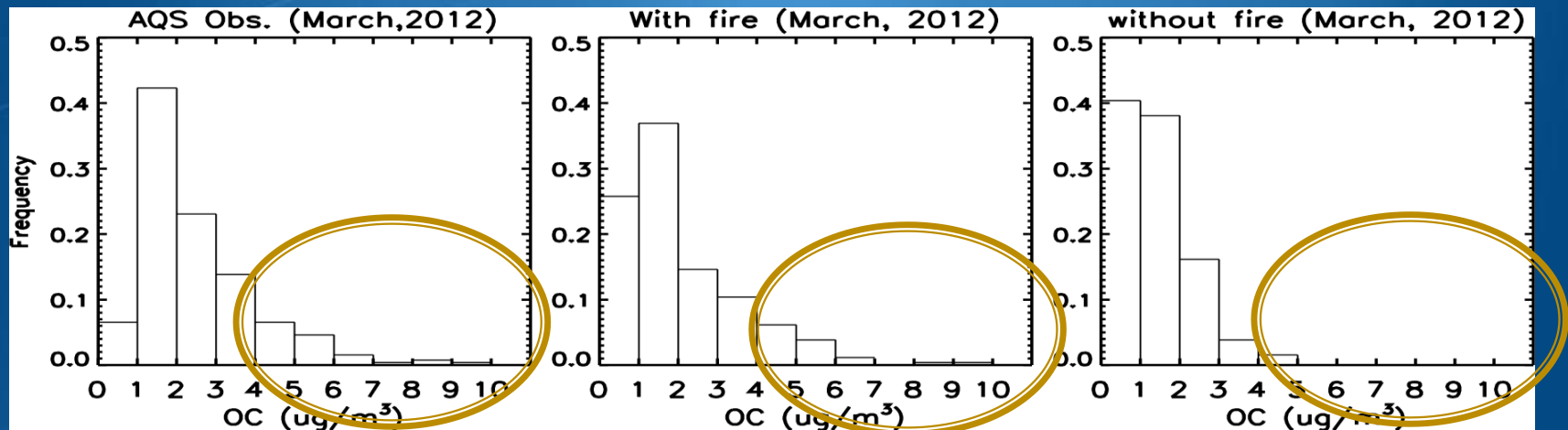
# Evaluation of CMAQ simulations



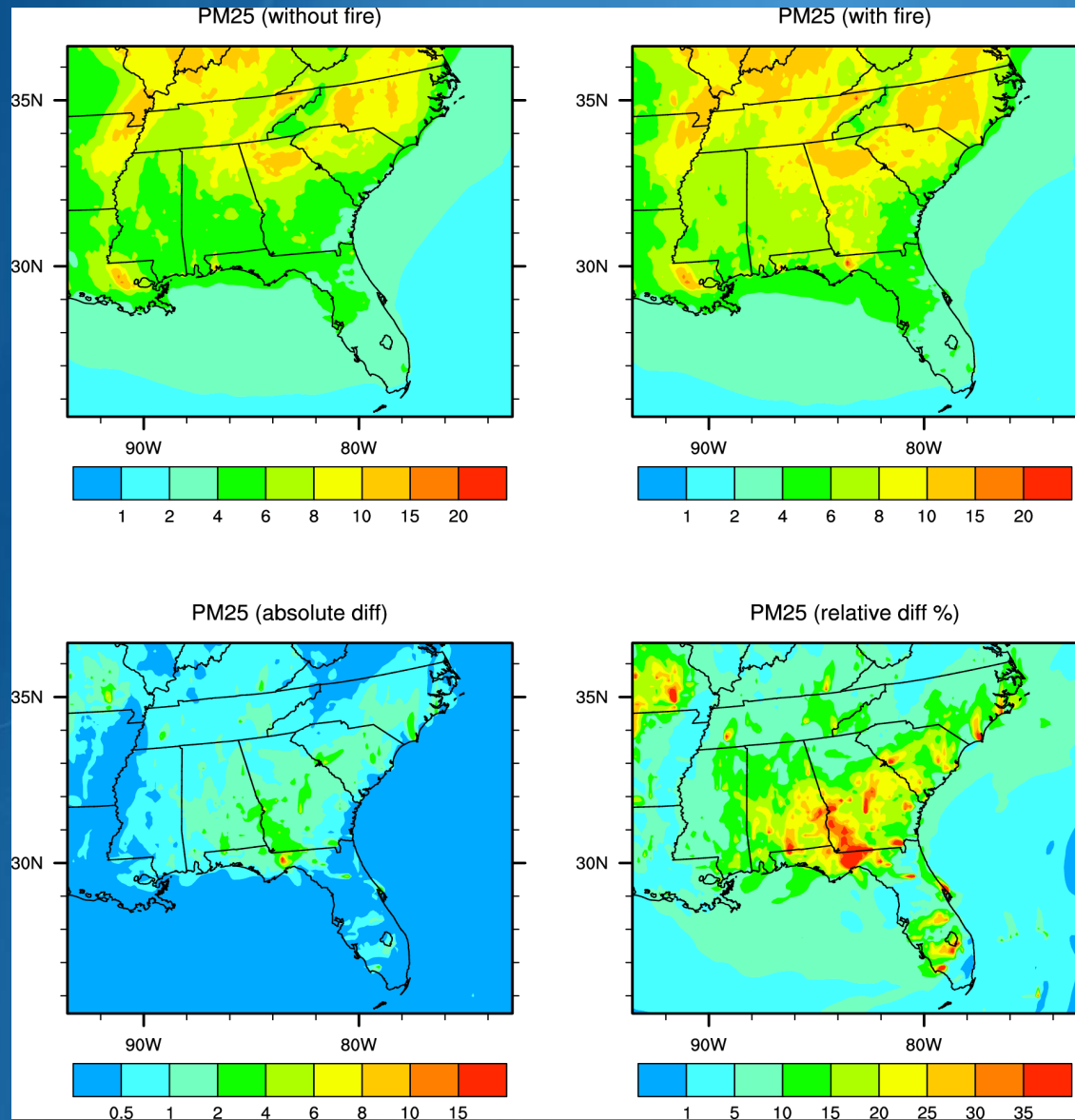
With fire



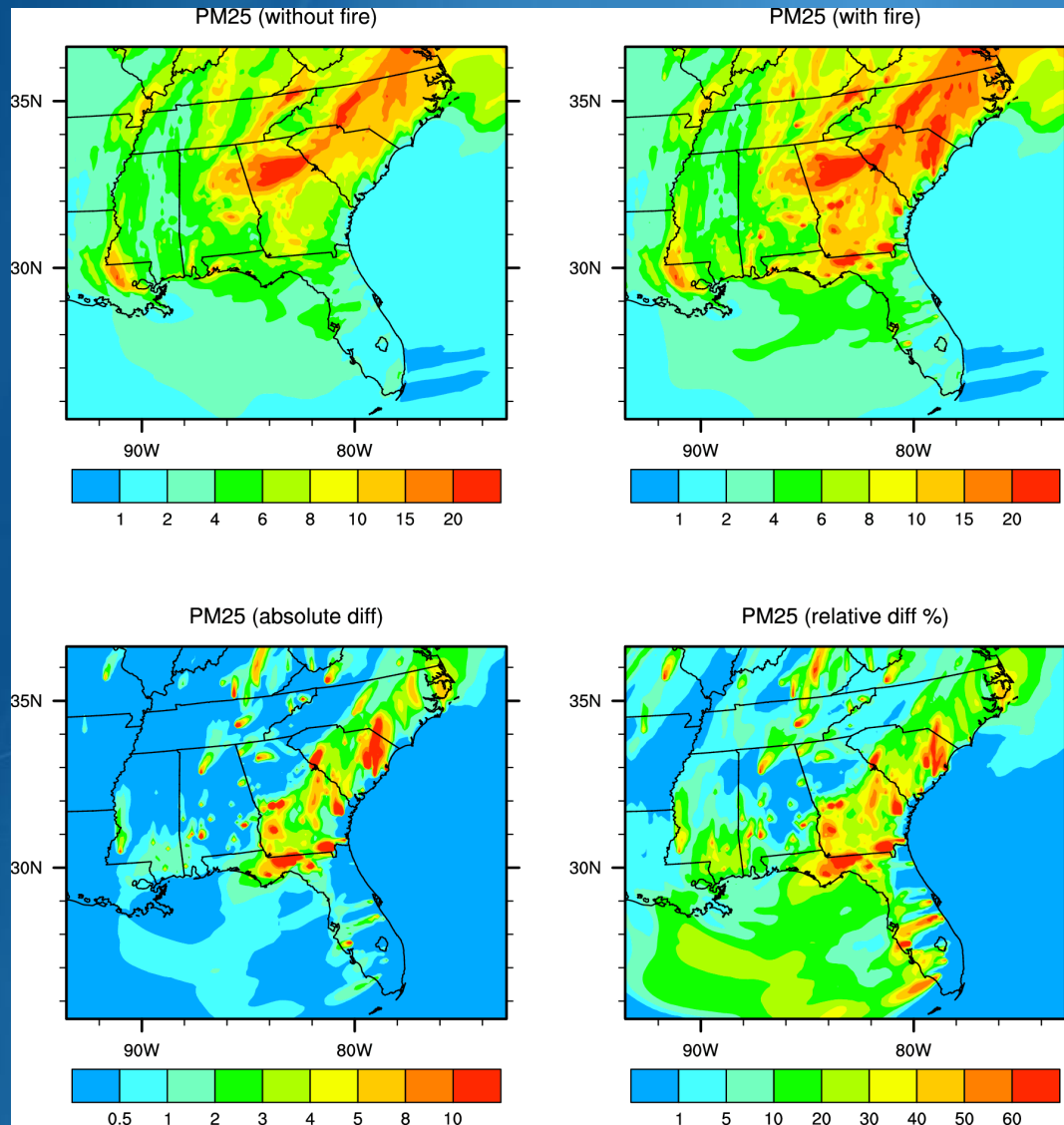
Without fire



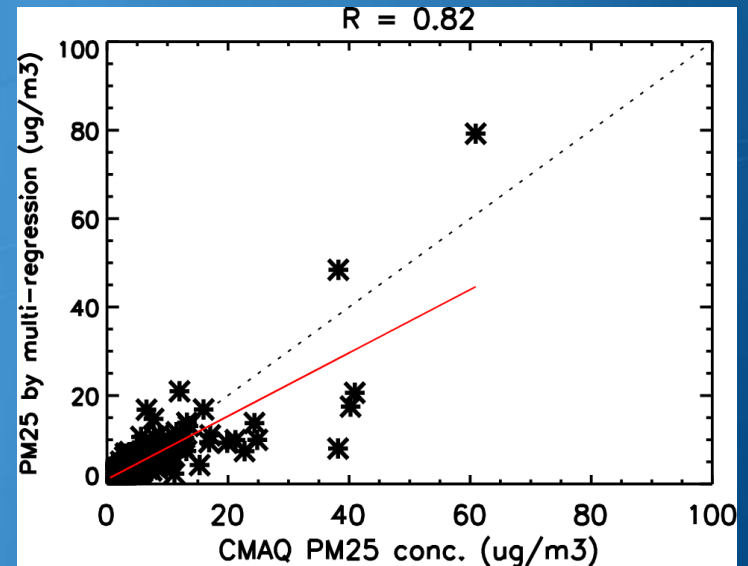
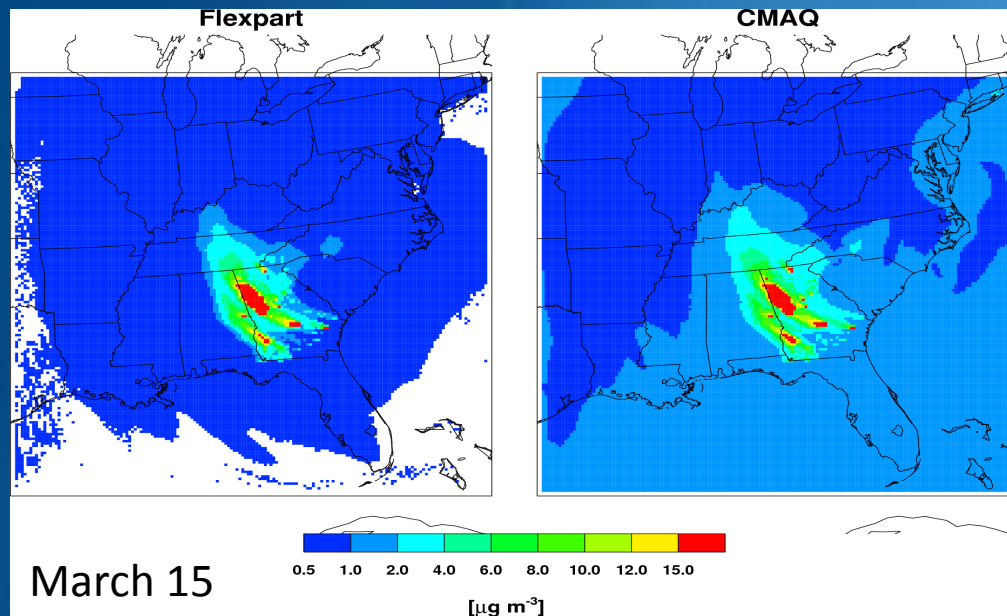
# Impact assessment: Monthly



# Impact assessment: March 15, 2012



# Computationally efficient FLEXPART and statistical modeling



The multivariate polynomial linear regression analysis is carried out between fire emissions and PM concentrations as a function of wind speed, boundary height, RH, T, P, and precipitation. The results are unsatisfactory. FLEXPART simulations are more appropriate for fire management applications.