Developing a near real-time regional system for modeling air quality impacts of prescribed fire

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Raleigh, North Carolina

Cast of characters

- US Forest Service
  - Scott Goodrick *(emissions/visualization)*
  - Gary Achtemeier *(plume modeling)*
  - Yongqiang Liu *(CMAQ)*
- Florida Division of Forestry
  - Jim Brenner *(fire activity data)*

Overview

- Background
- Florida Fire Management Information System (FMIS)
- Southern High Resolution Modeling Consortium (SHRMC)
- Southern Smoke Simulation System (4S)
- Future

Background

- 1998 Interim Air Quality Policy on Wildland and Prescribed Fire
- States urged to create a smoke management program
- Other issues such as regional haze have made smoke management plans even more important

Florida Fire Management Information System

- Integral component of Florida's SMP
- Manages almost all aspects of the Florida Division of Forestry's fire business
- Integrates GIS, Oracle database, numerical weather prediction (mm5) and a smoke screening system

Smoke Management

- Primary focus of smoke management directed toward public safety – smoke on the highway

FMIS Smoke Screening

- Prototype smoke screening tool used Vsmoke
- Eventually switched to a system combining HySplit trajectories with Vsmoke source strength model
- Focus on smoke concentrations (PM2.5) that would cause a visibility hazard
- Used for every prescribed fire authorized by the Florida Division of Forestry

Shift in Smoke Management Focus

- Air quality a growing concern as National Ambient Air Quality Standards (NAAQS) are tightened
- Allowable particulate matter emissions nearly cut in half

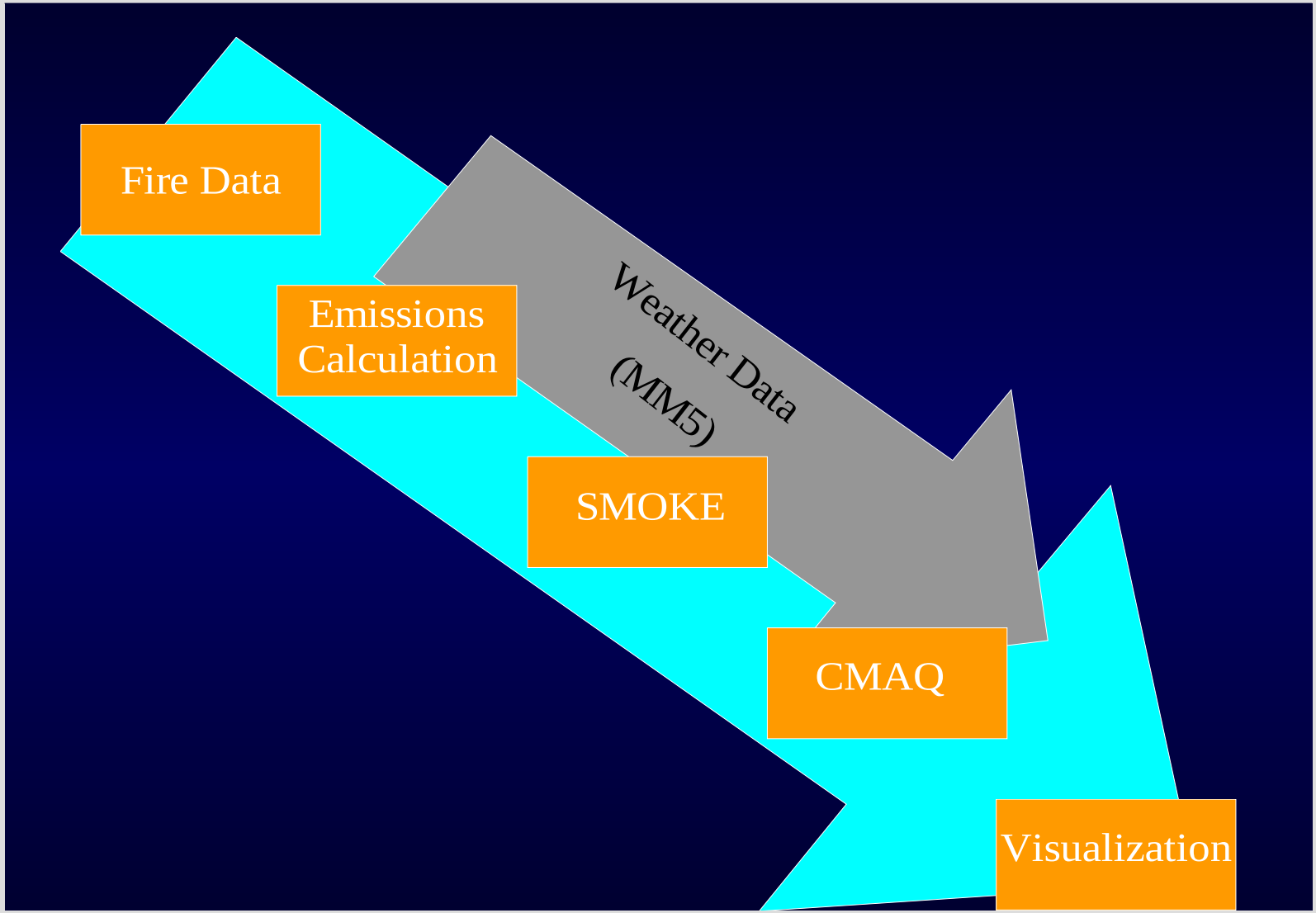
SHRMC

- One of 5 Fire Consortia for Advanced Modeling of Meteorology and Smoke (FCAMMS) funded by the National Fire Plan
- Focus on developing weather and smoke products to support fire operations
- Began producing operational products in 2002

Southern Smoke Simulation System

- Designed to assess prescribed fire impacts on air quality
- Conceptually similar to the BlueSky smoke modeling framework
- Use CMAQ to assess a wider range of air quality impacts than possible with BlueSky

Southern Smoke Simulation System



Partnership

- Florida Division of Forestry has a need for air quality information
- SHRMC needs fire activity data

Fire Activity Data

- Location
- Date / Time
- Size
- Ignition Method
- *Fuel Type / Load*
- *Fuel Moisture*

Importance of Ignition Method

- Changes emission factors due to changes in combustion efficiency and variation in percent of fuel consumed during flaming or smoldering phase
- Impacts plume buoyancy and structure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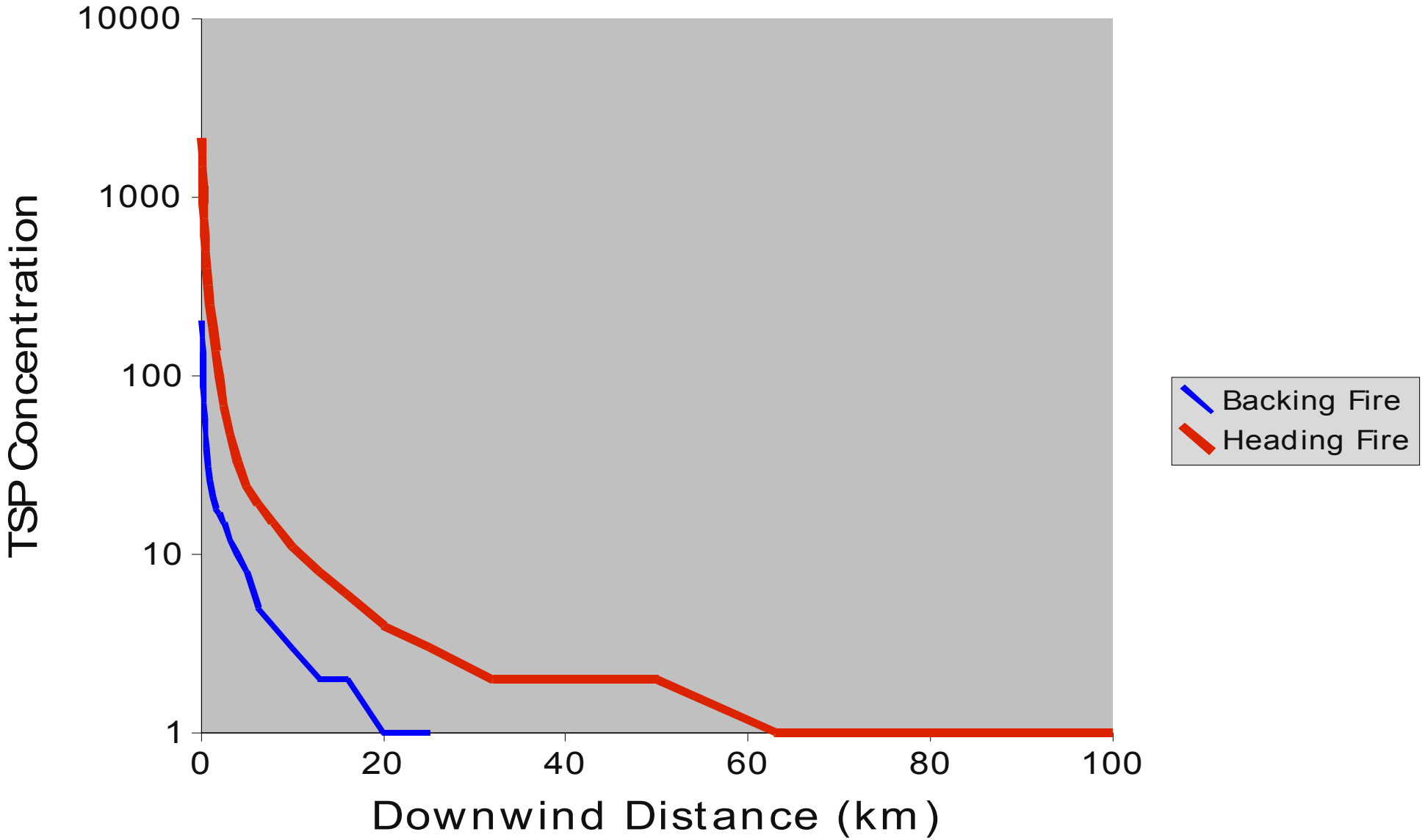
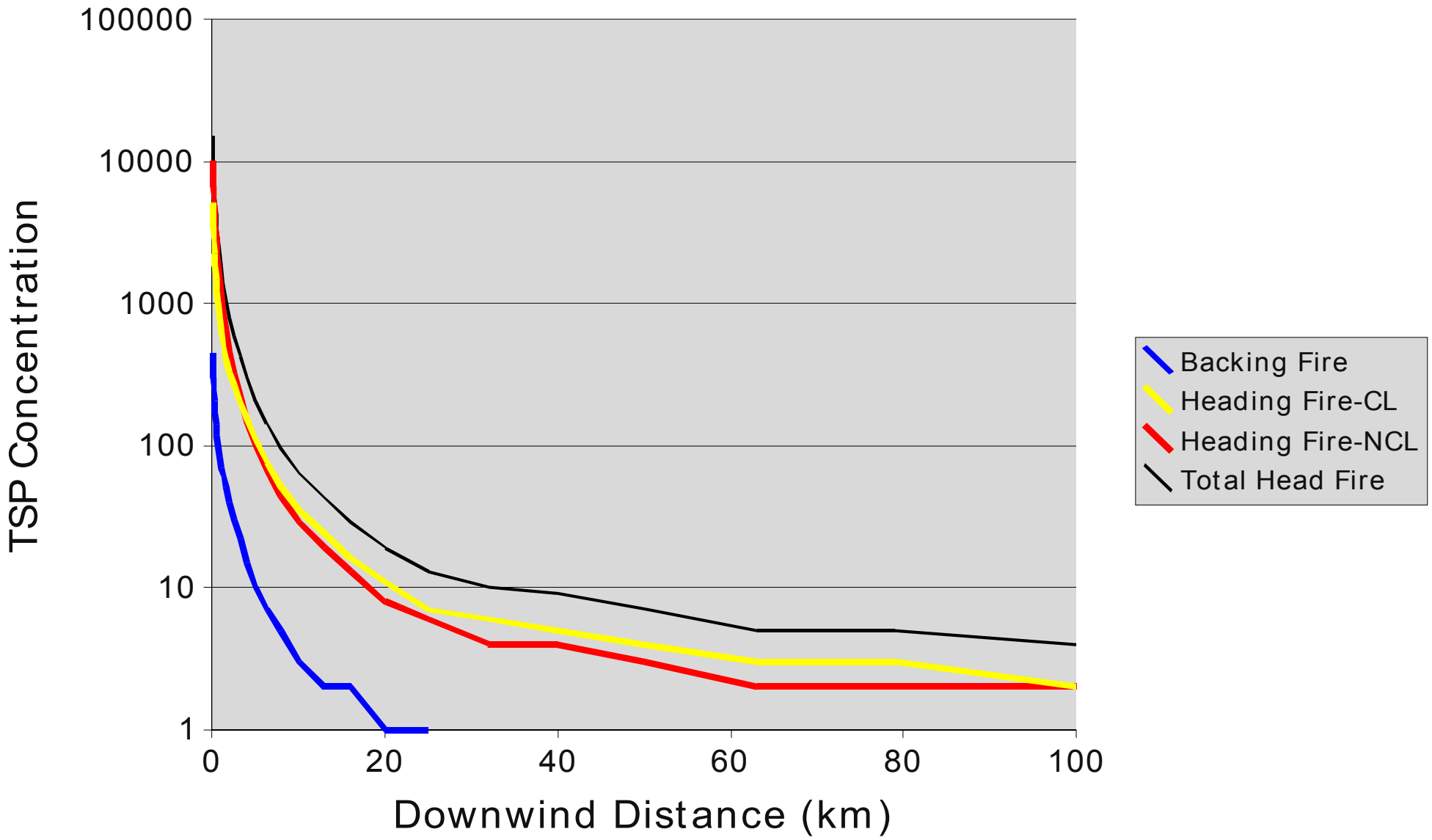
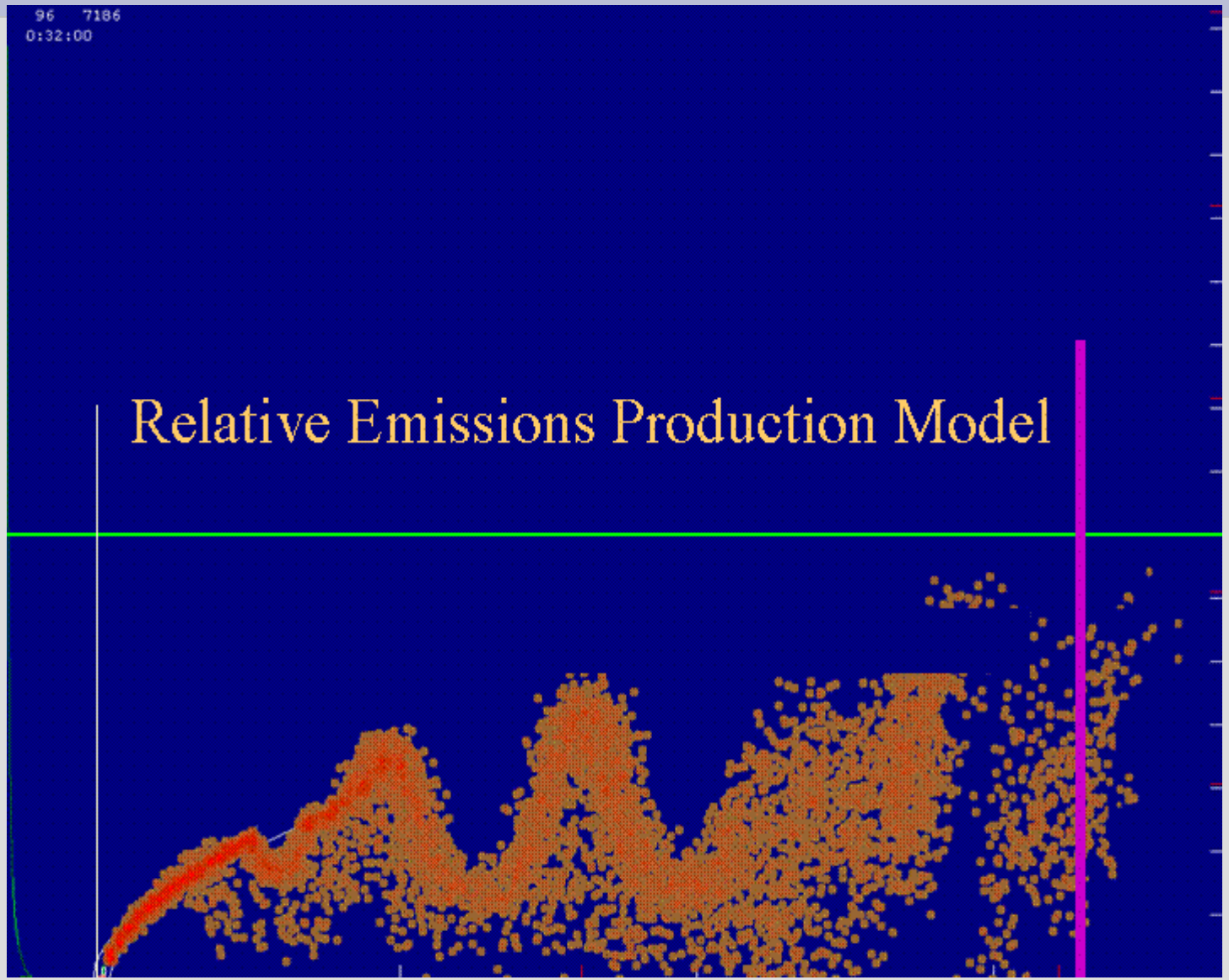
Modeling Prescribed Fire Emissions



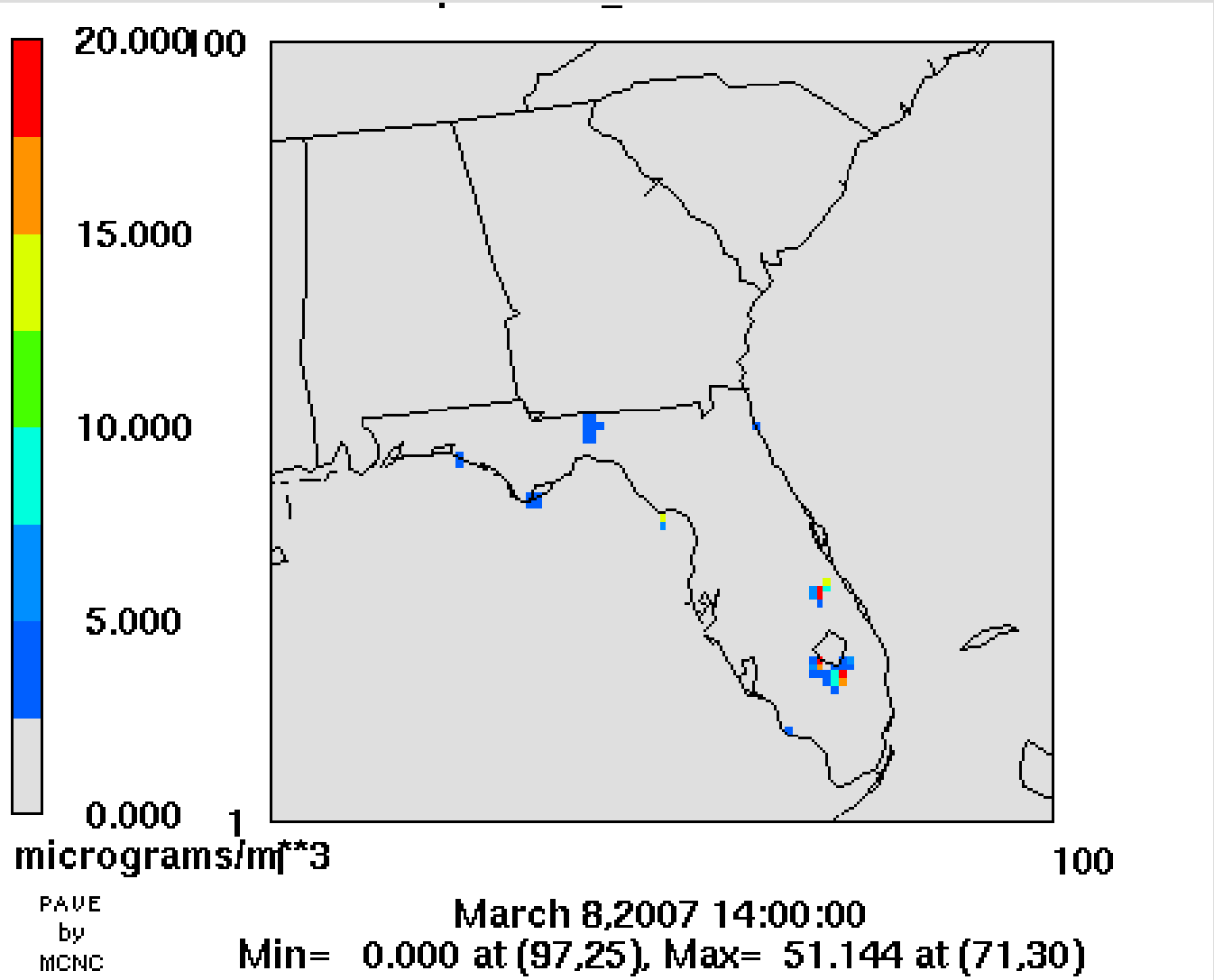
Modeling Prescribed Fire Emissions



Plume Modeling



CMAQ Forecasts



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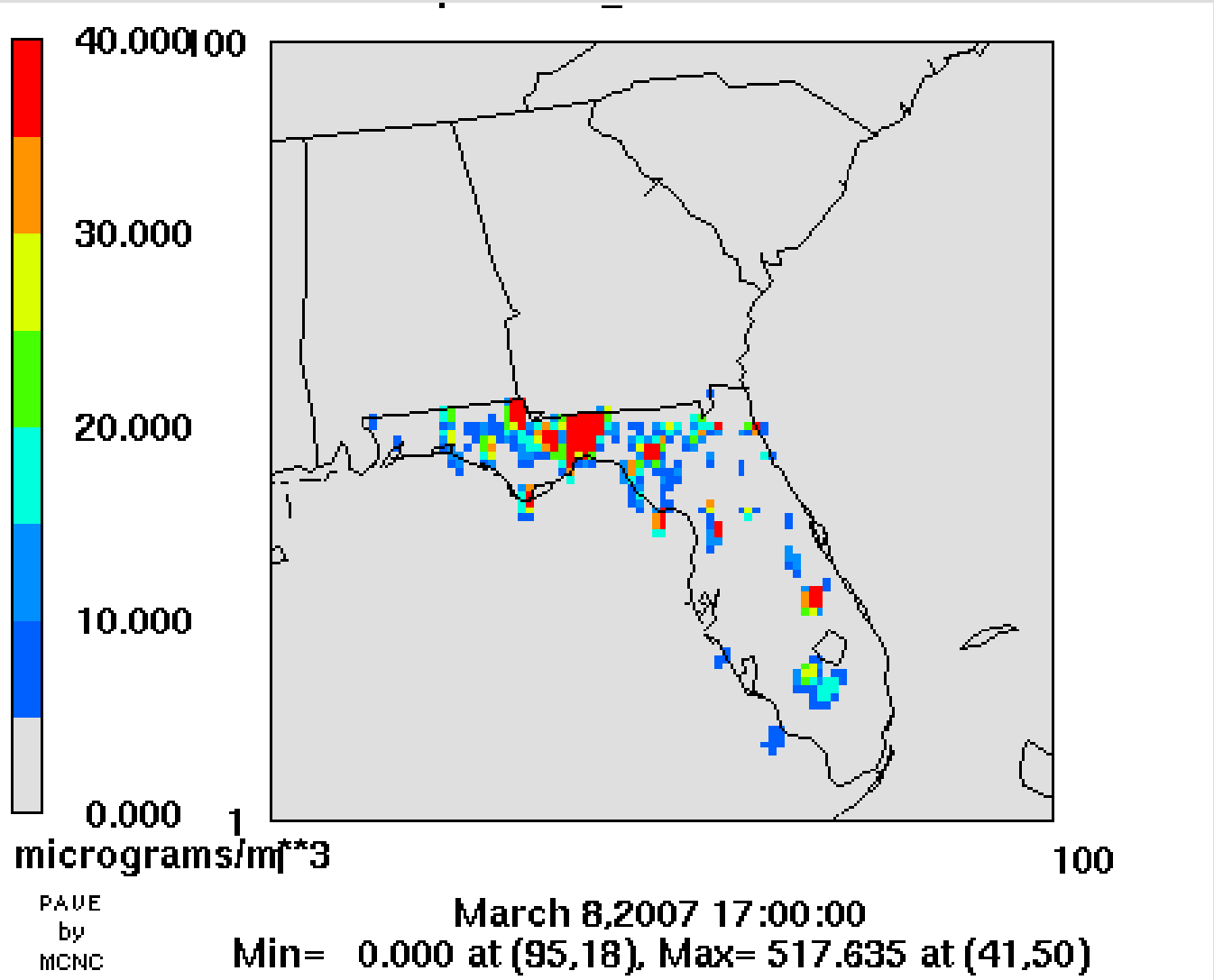

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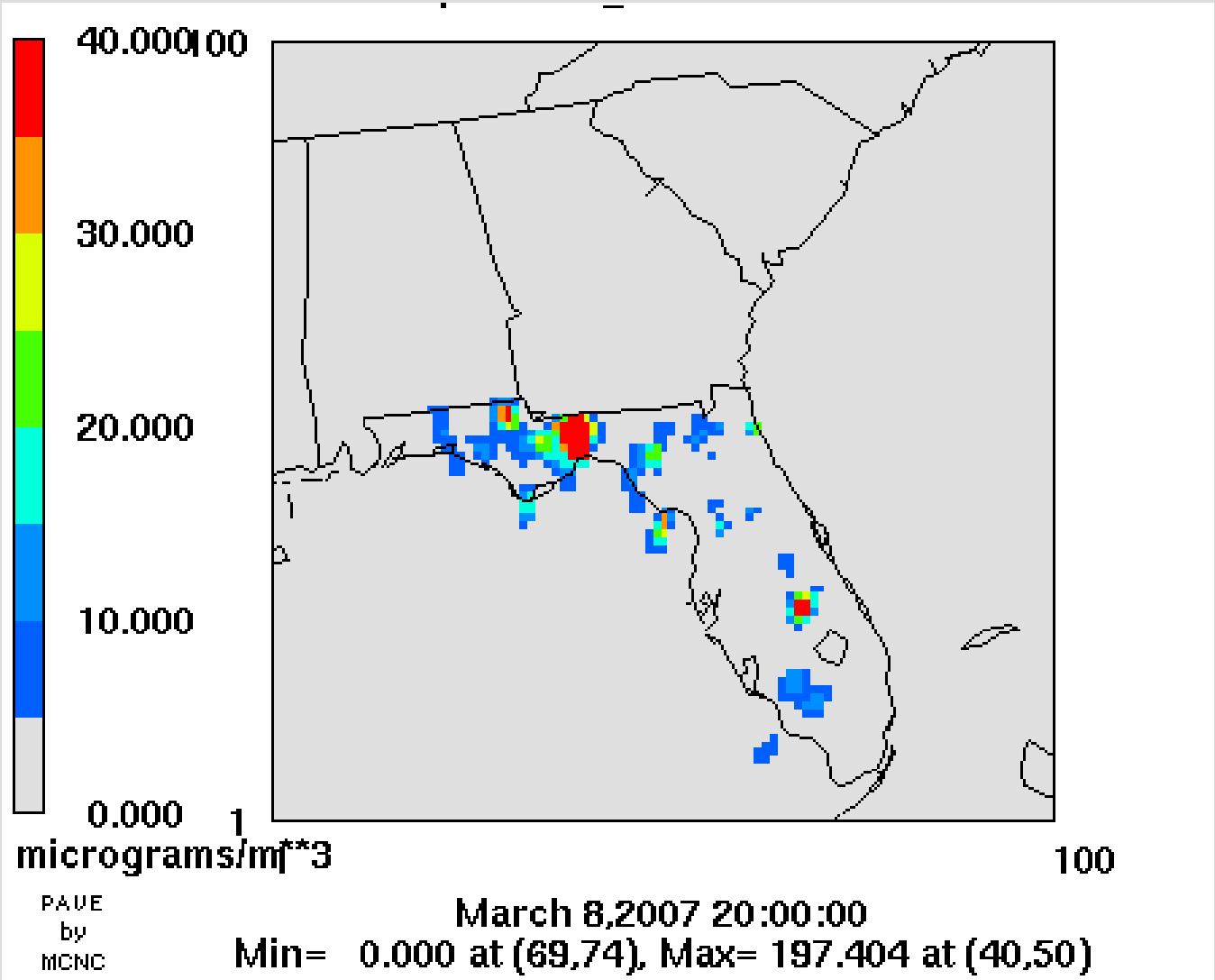

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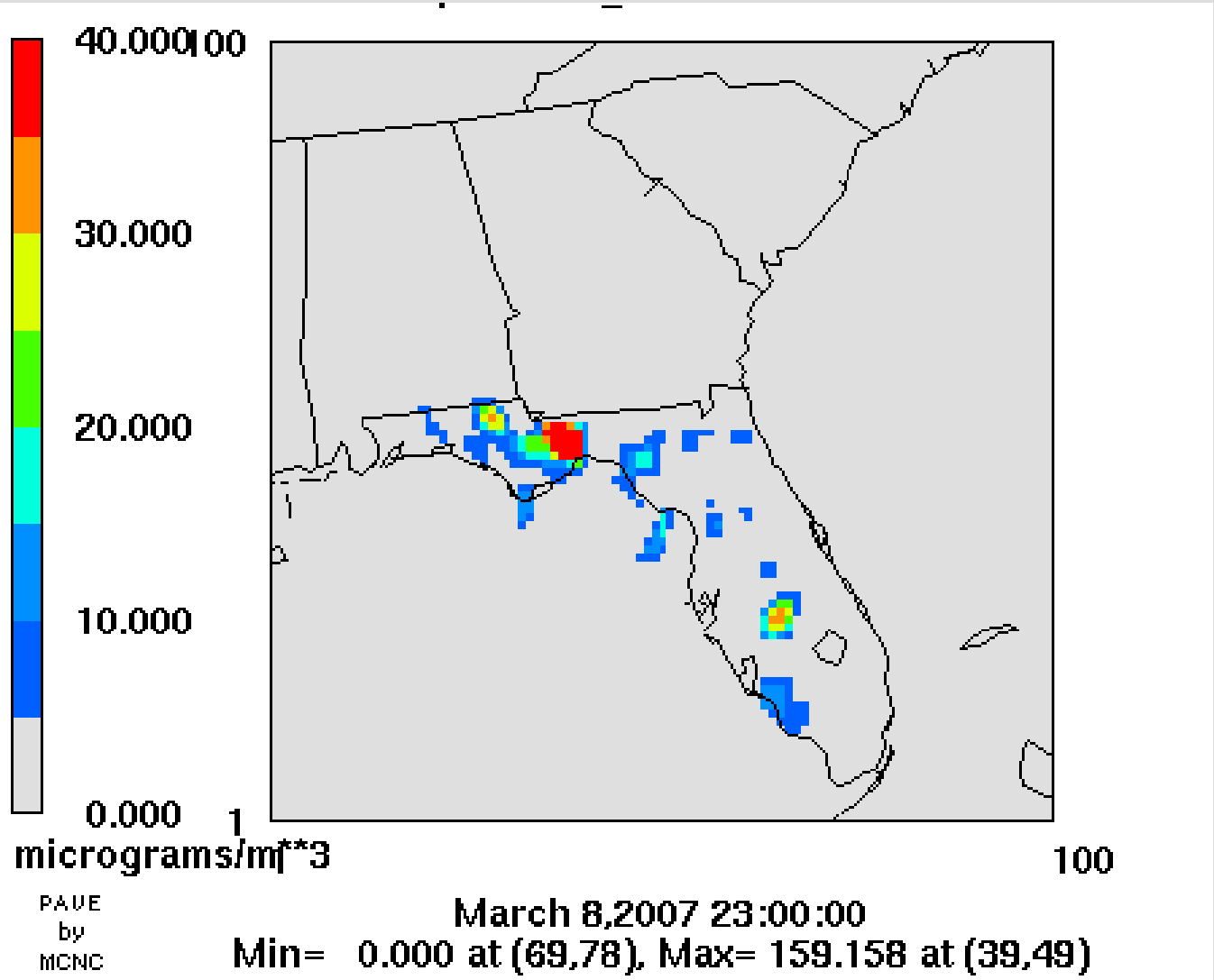
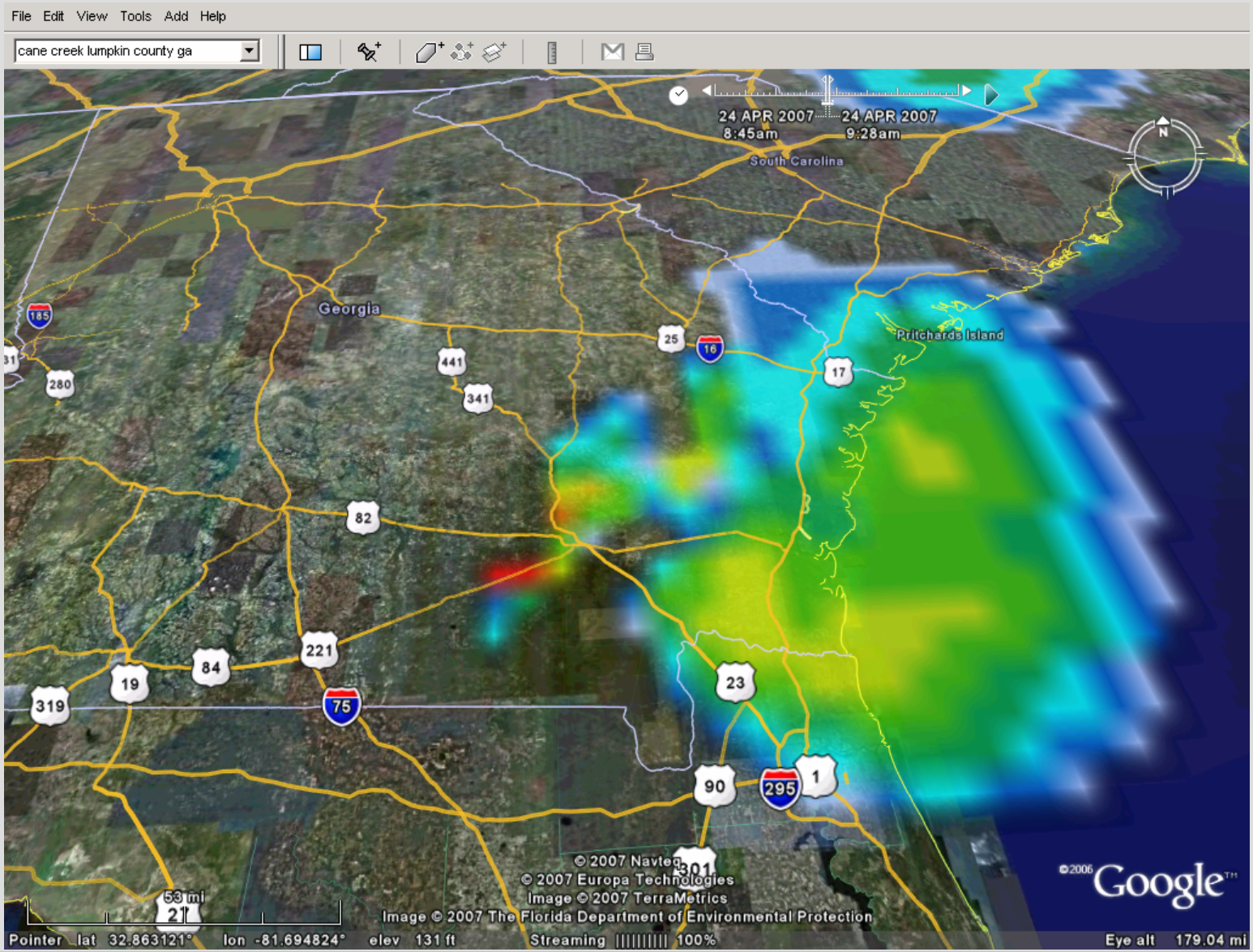
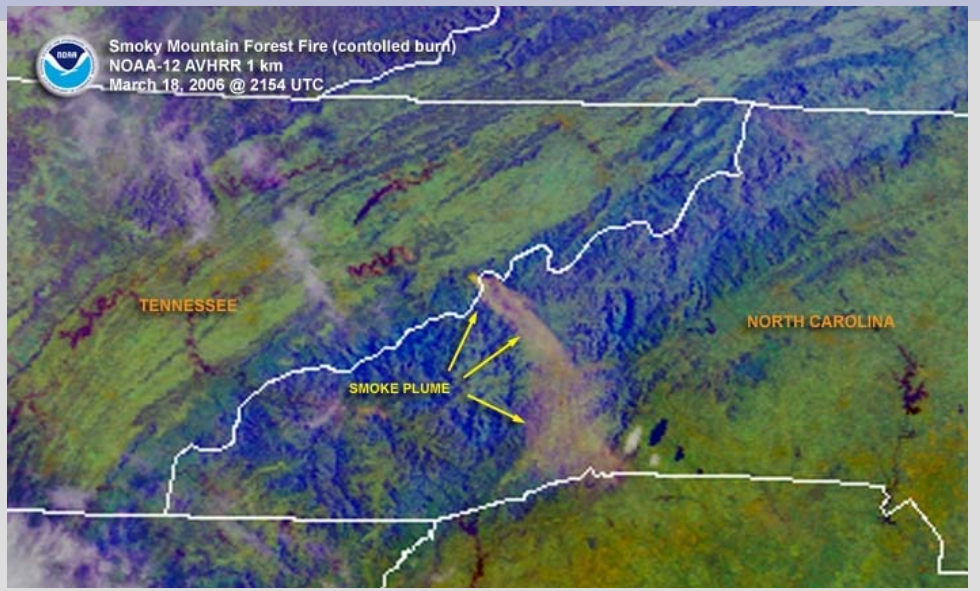


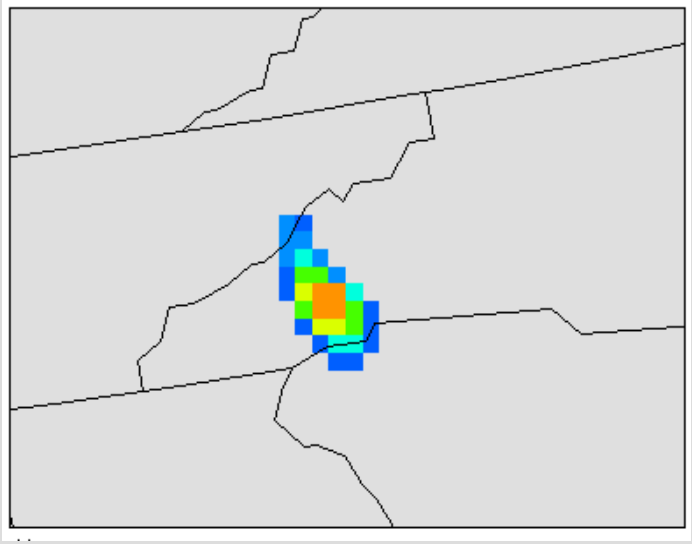
Visualization



Future Plans

- Case Studies
- Implement system for Florida on daily basis
- Add other state's fire activity data (currently working with North Carolina)





Acknowledgments

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