

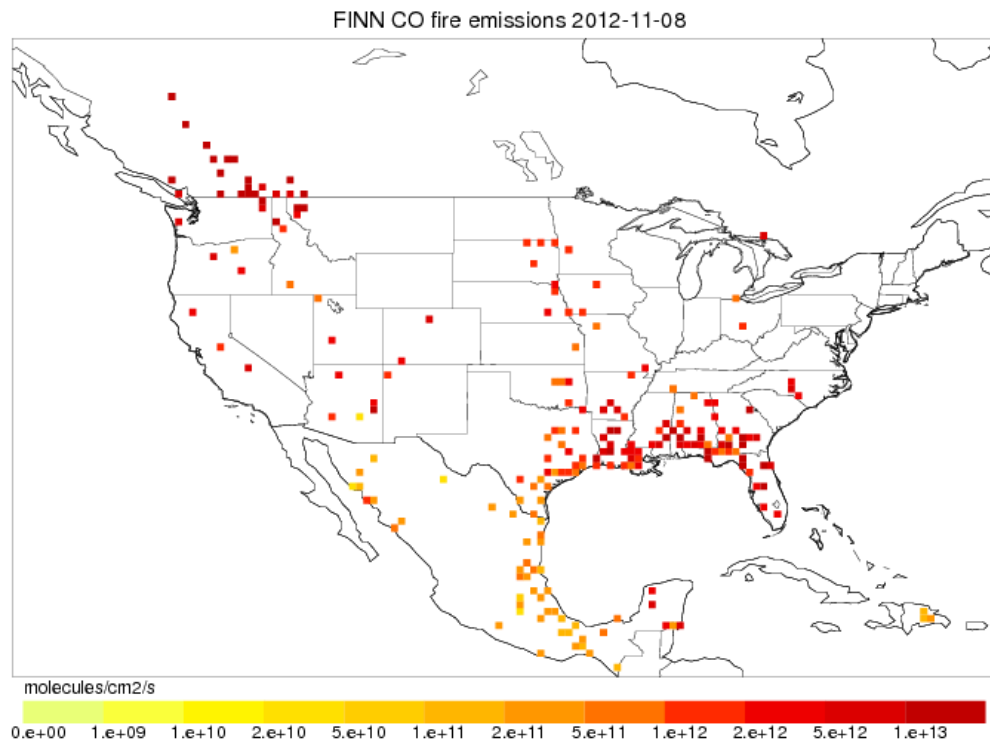
NCAR Modeling Support for NOMADSS

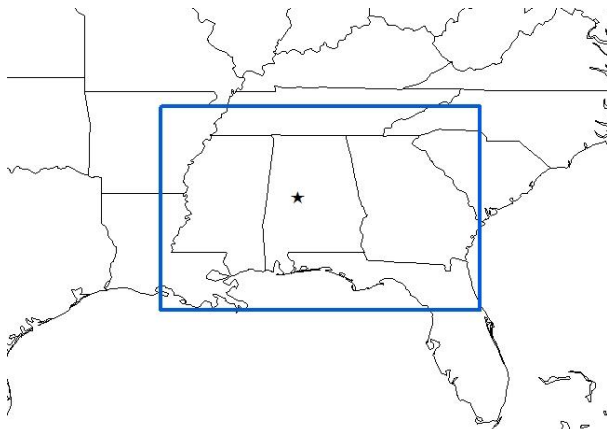
Louisa Emmons

Mary Barth, Alma Hodzic, Christoph Knote,
Steve Arnold, Xiaoyan Jiang,
Christine Wiedinmyer

Fire Emissions: Fire INventory from NCAR (FINN)

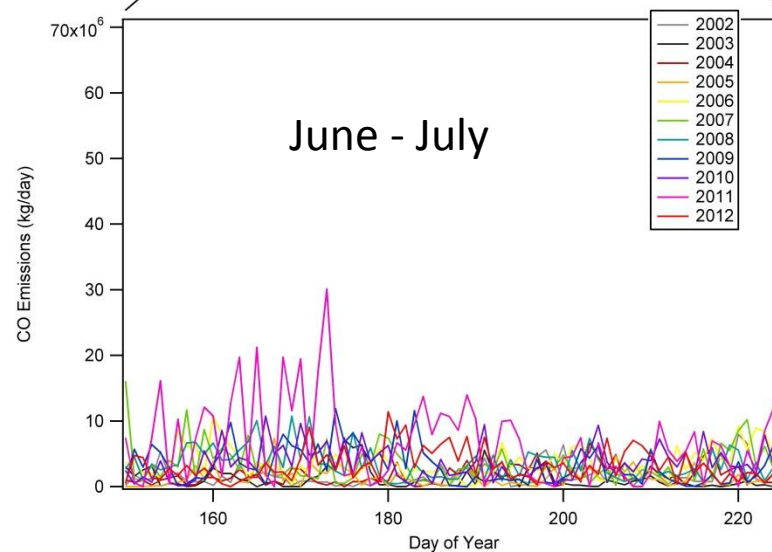
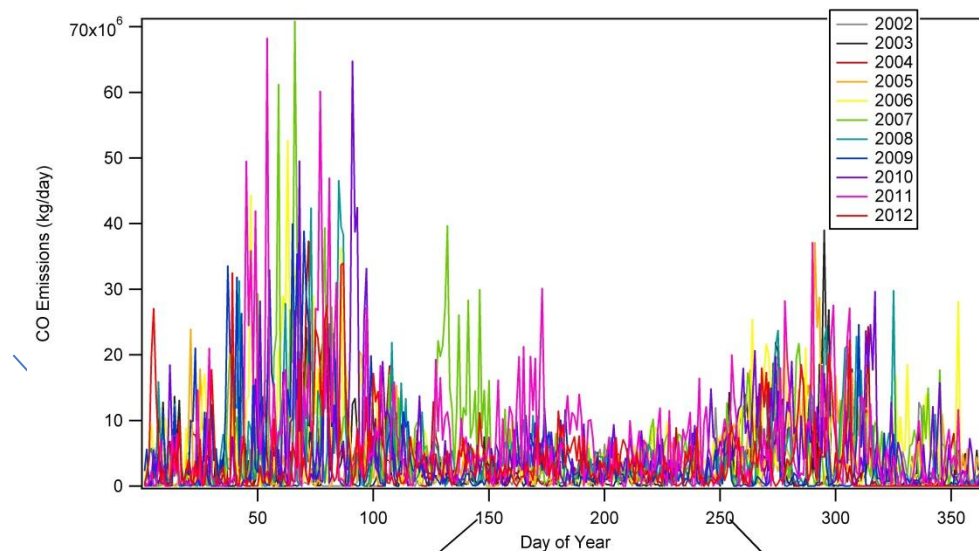
- Daily fire emissions of trace gases and particles
 - Can include Hg emissions if requested
- FINN is run in real-time based on MODIS Rapid Response fire counts
<http://www.acd.ucar.edu/acresp/forecast/fire-emissions.shtml>
- Plots and data files available for forecasts and hindcasts



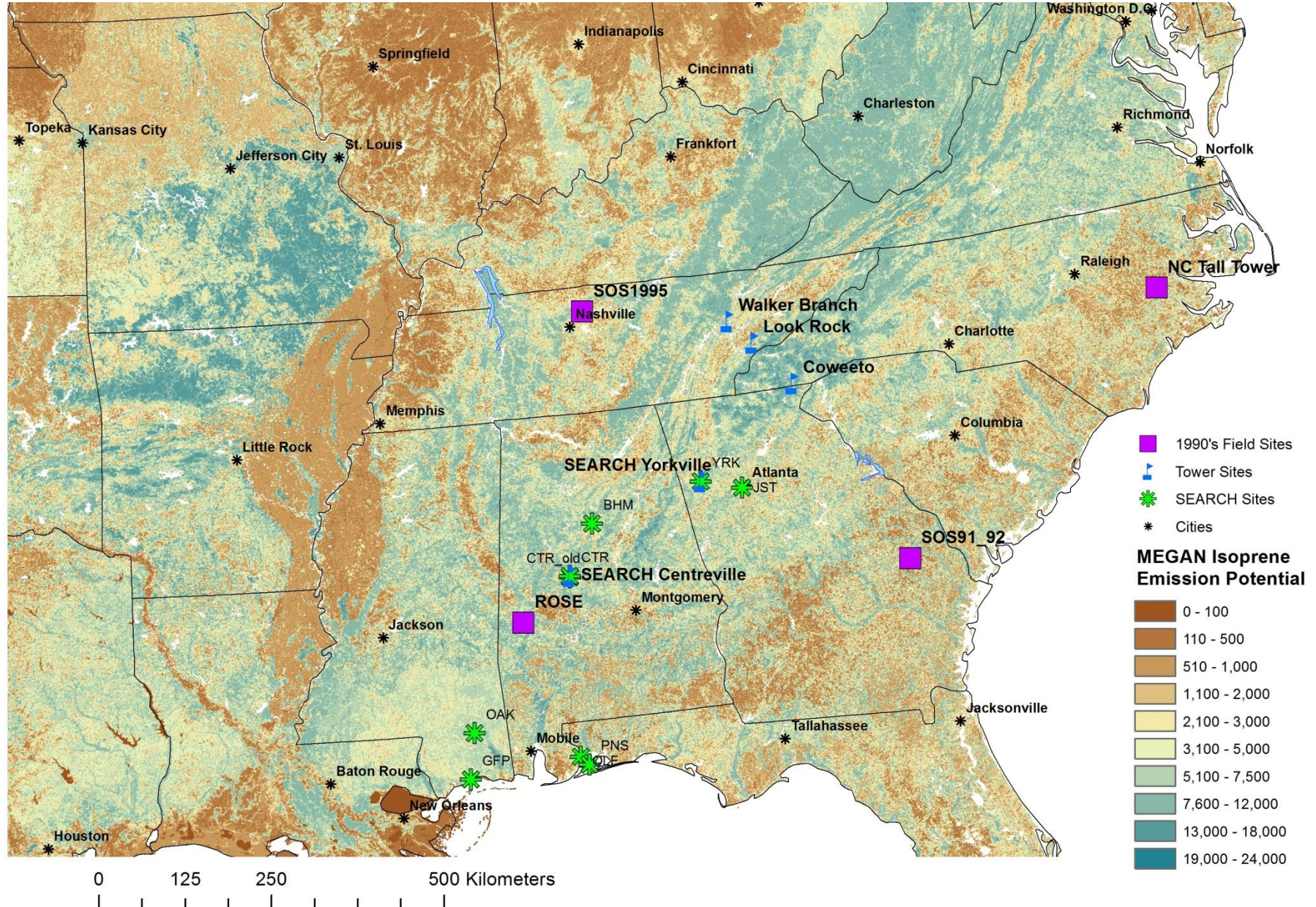


Fire activity and emissions during June and July are relatively low in SE U.S.

CO Emissions from Fires (Blue Box)

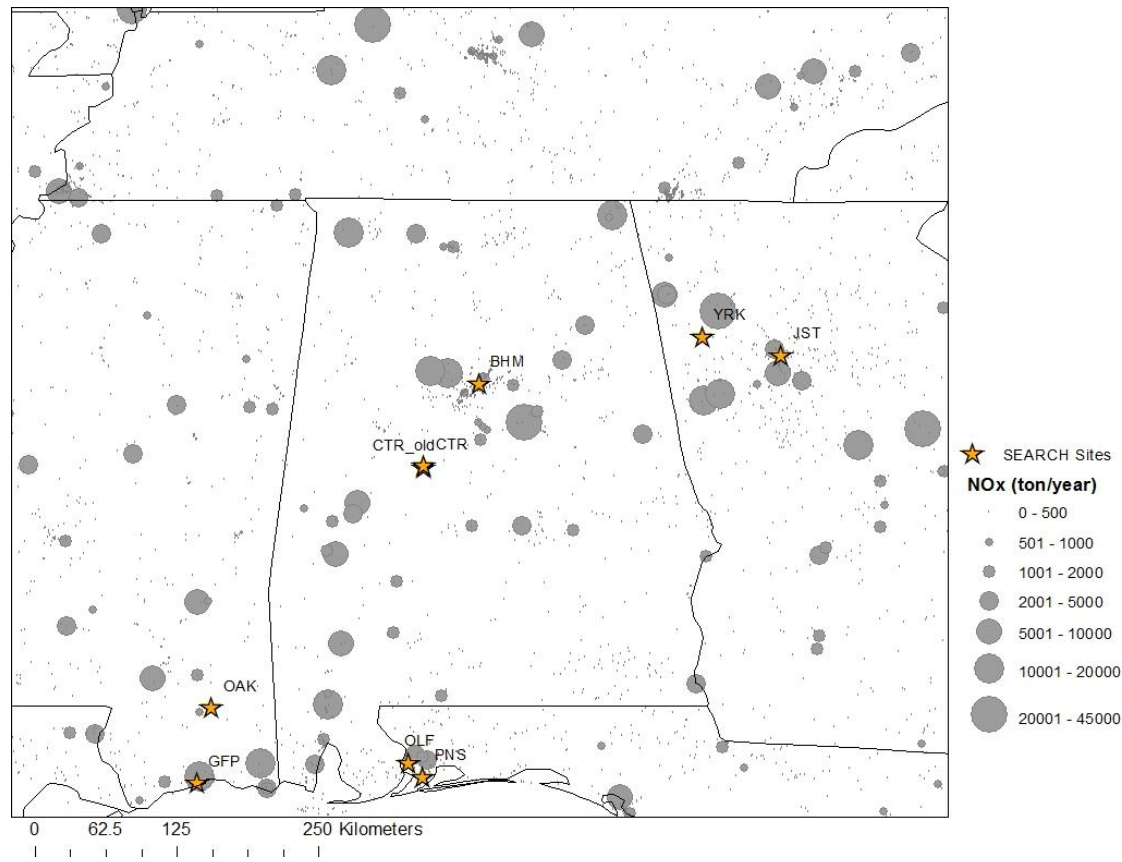


MEGAN: biogenic emissions model – offline and online in MOZART, CAM-chem/CLM, WRF-chem



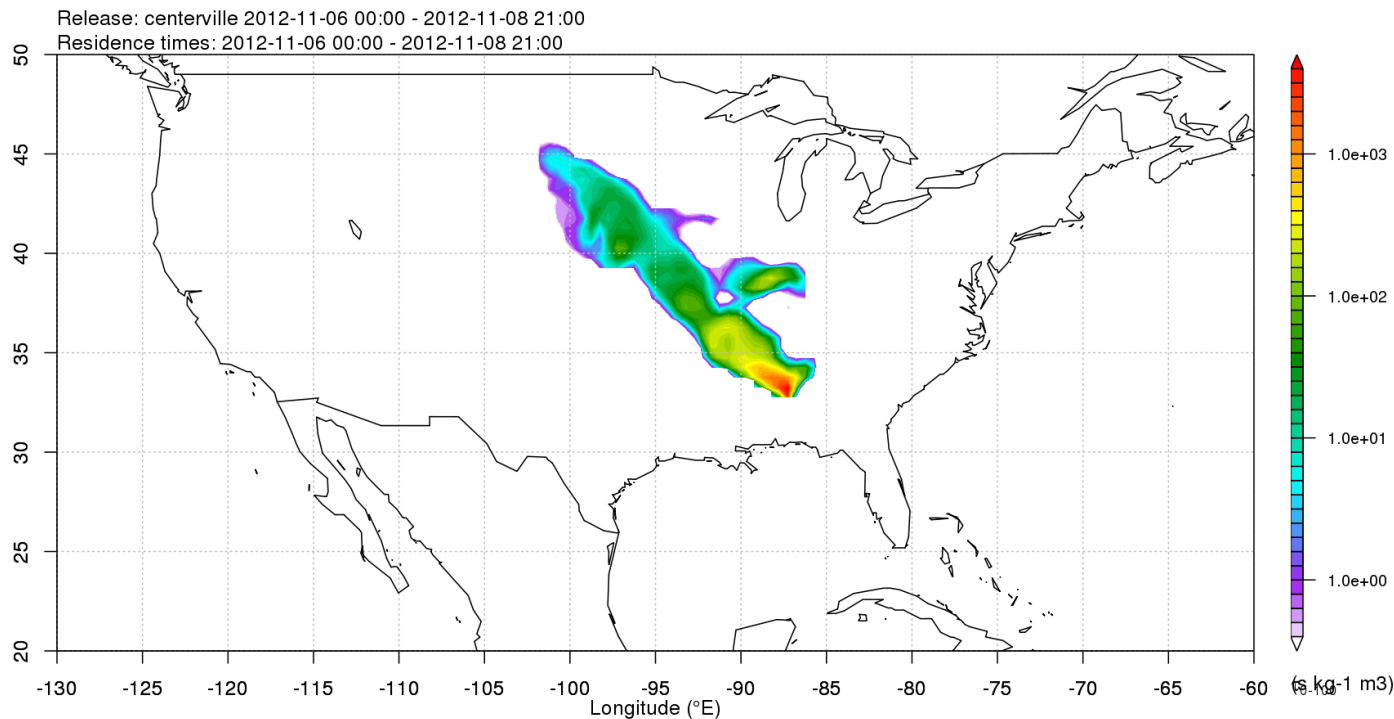
Anthropogenic Emissions

- NCAR will work with Pinder et al. (EPA) to coordinate a consistent emissions inventory for post-campaign modeling studies
- For flight planning purposes, we can use current datasets (e.g., NEI 2008)



FLEXPART – possible products

- Driven by GFS or WRF forecasts
- Back trajectories from ground site(s)
- Forward trajectories from major pollution sources
- Trajectories from select aircraft locations to identify location of air mass next day



WRF with Tracers

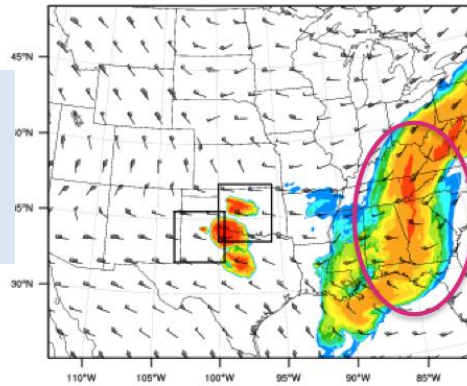
- WRF forecasts – 1-5 km, to be determined; domain also TBD
- Tracers from urban and biogenic sources with different lifetimes to estimate plume age
- Use in combination with forward trajectories from FLEXPART
 - WRF may over-estimate diffusion while FLEXPART under-estimates

Example of using WRF-Tracers and Flexpart

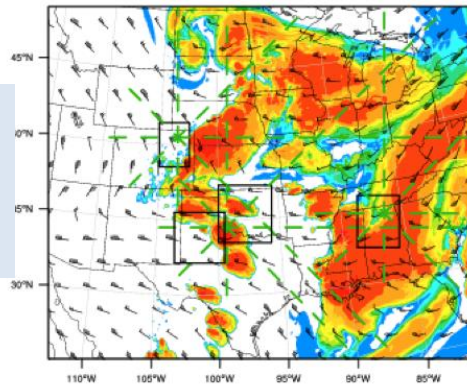
WRF ($\otimes x=3\text{km}$)
with PBL tracers

2012-05-31_00:00:00

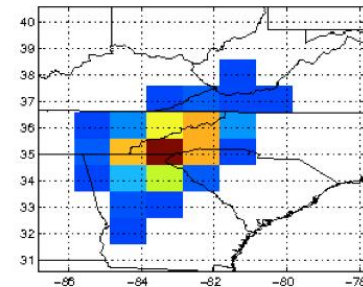
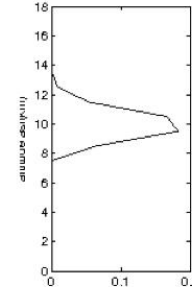
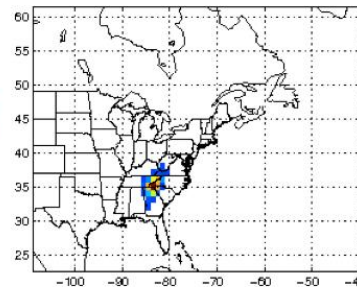
8-16 column Oklahoma Tracer (%)
Wind (kts) at 11 km



8-16 column BL Tracer (%)
Wind (kts) at 11 km



Tracers & Flexpart Trajectory Forecast



Tracer forecast from Flexpart initialized at ~01 UTC 05-30 at the latitudes, longitudes, and altitudes of the GV anvil passes. Results are valid for 18 UTC 05-30.

PBL tracer from Oklahoma/West Texas at 11 km

PBL tracer from entire domain in UT

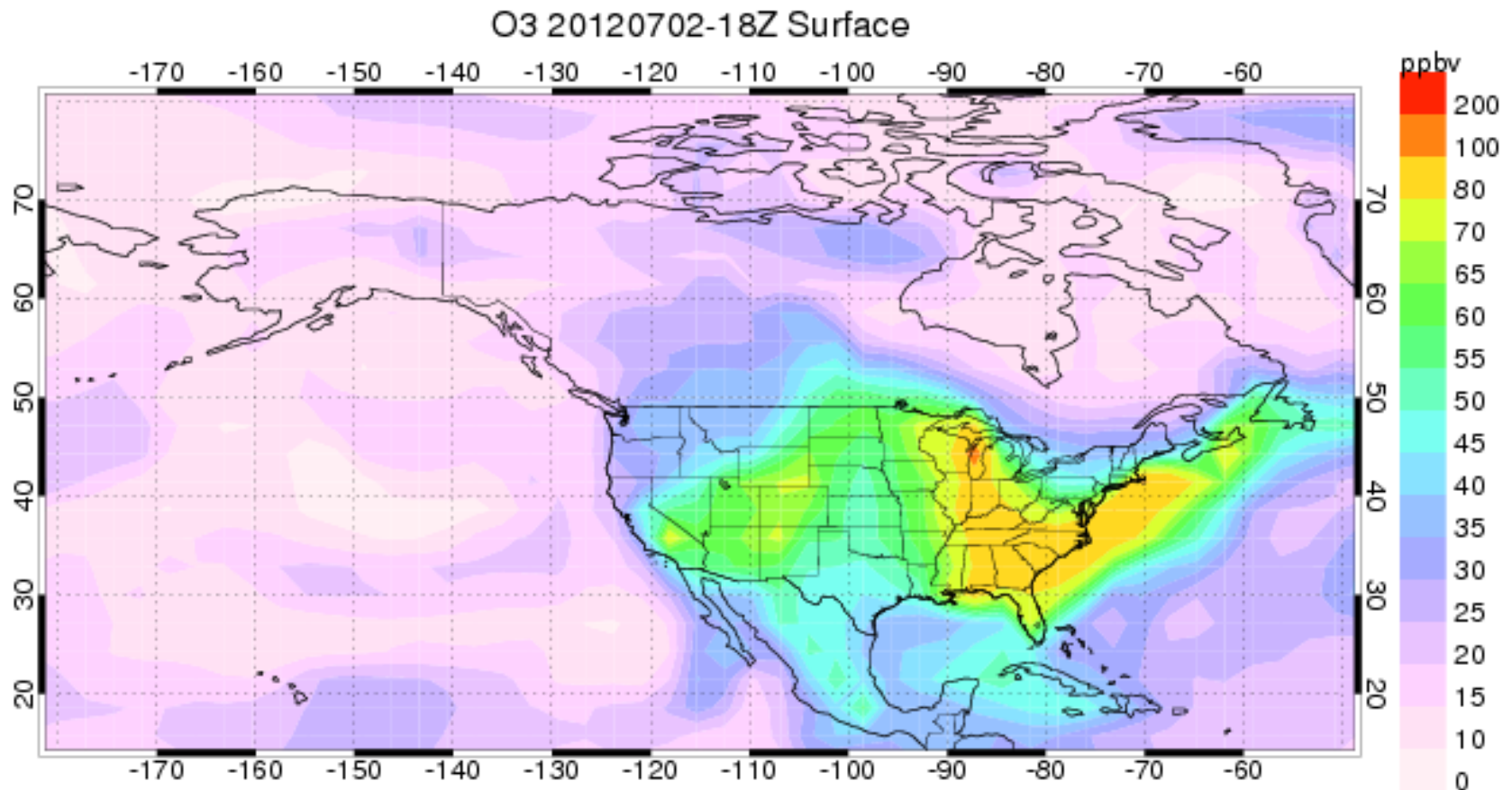
Tracer forecast from NCAR WRF initialized at 12UTC 05-29

MOZART-4 driven by GEOS-5

Full chemistry at $1.9^\circ \times 2.5^\circ$

<http://www.acd.ucar.edu/acresp/forecast/>

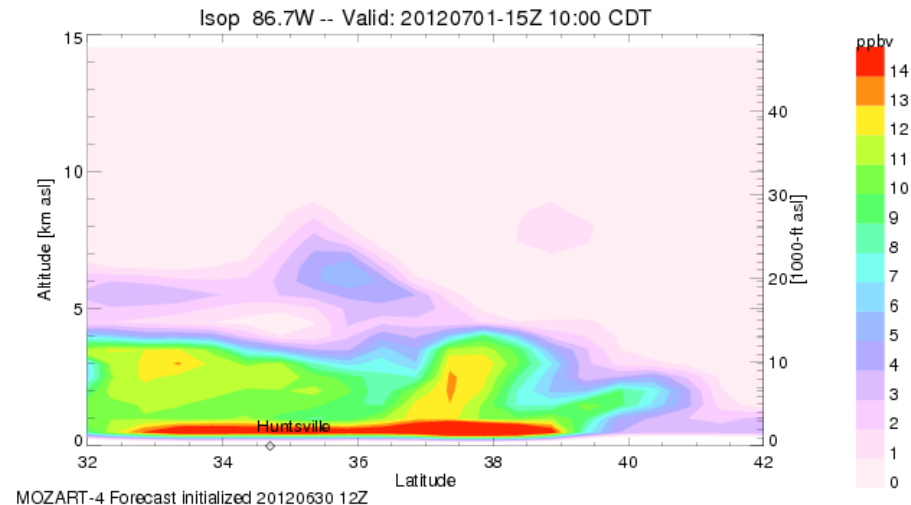
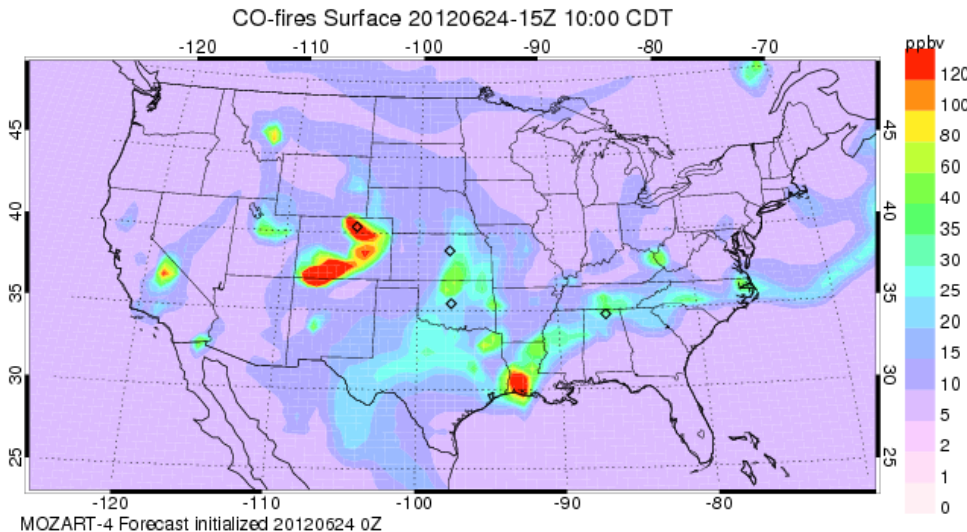
5-day forecasts, hourly output, currently operational



MOZART-4 Tracers

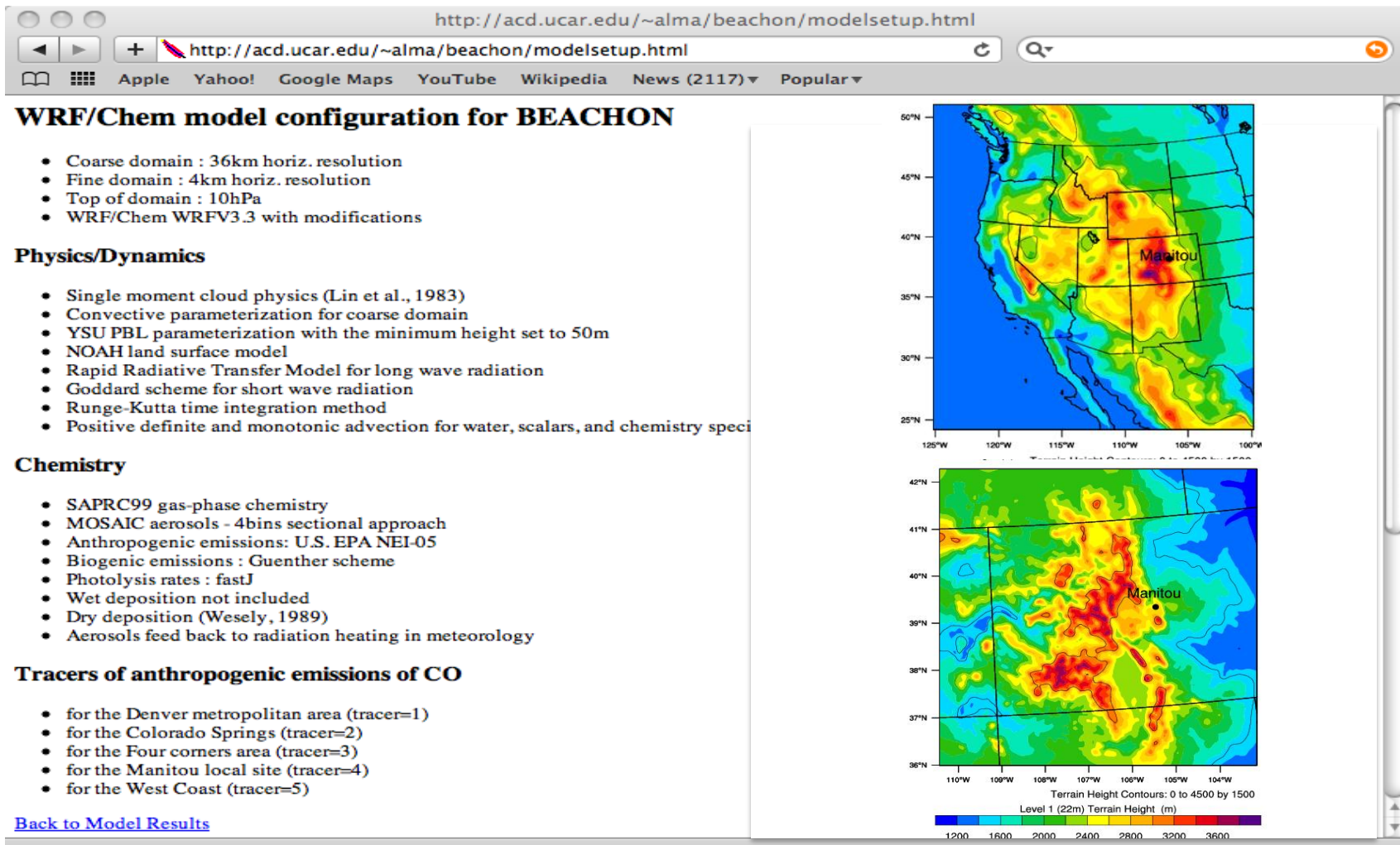
Forecasts of tracers only at 0.5° horizontal resol.

- Isoprene-like tracer based on MEGAN isoprene emissions
- Anthropogenic NO_x tracer from individual cities and/or regions
- Fire CO tracer for various regions
- Others?
- Similar to forecasts for DC3 (<http://www.acd.ucar.edu/acresp/dc3/>), will be run specifically for NOMADSS



Near-real time WRF-chem simulations

- WRF-chem will be run in near-real-time, providing full chemistry simulations for in-field analysis of observations



Other Air Quality forecasts

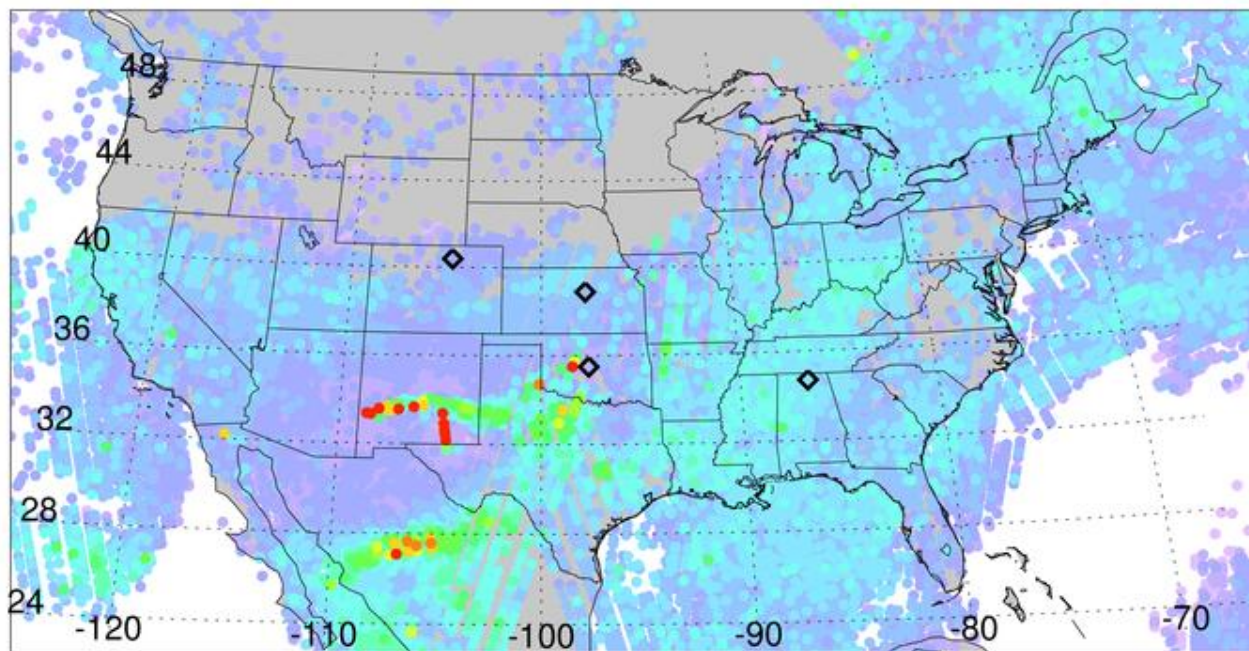
Other operational air quality forecasts will be identified and used when available

- NOAA Rapid Refresh with Chemistry
(http://ruc.noaa.gov/wrf/WG11_RT/)
- GIT – Yuhang Wang
(<http://apollo.eas.gatech.edu/forecast.html>)
- Yang Zhang?

Chemistry Satellite Observations

- MOPITT CO – available within a day of overpass
- IASI CO – about 2-day delay, global coverage 2x/day

NCAR/FORLI IASI CO Total Column Effective VMR 24 May 2012



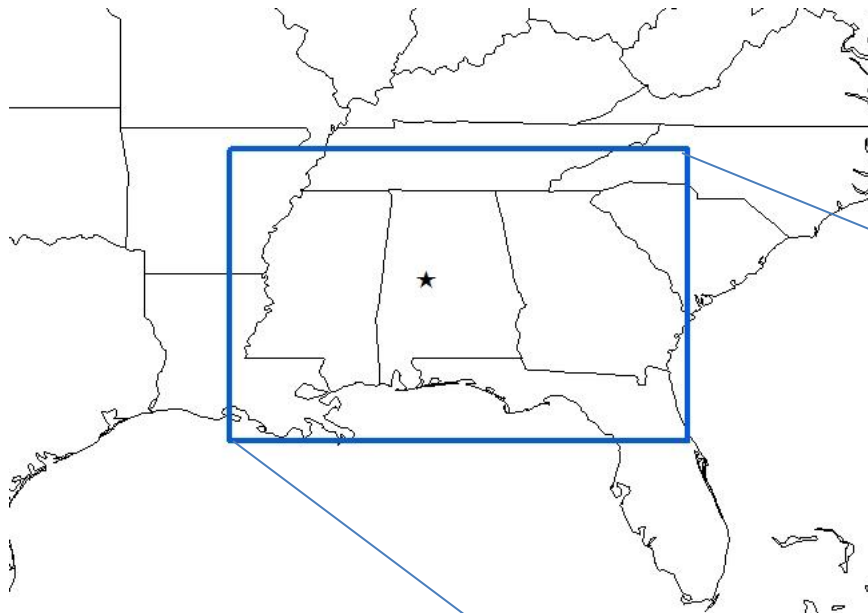
Next Steps

- Run WRF-chem for previous year(s) to identify types of events that could be sampled by aircraft and design sample flight plans
 - Frequency of urban plumes reaching Centreville
 - Regions of alternating clean and polluted conditions
 - Possibility of identifying 2-day old plumes
- Set a daily schedule for forecasting; determine at what time each day products will be ready
- Schedule a “dry run” for forecasting in May using the products we plan to have in the field

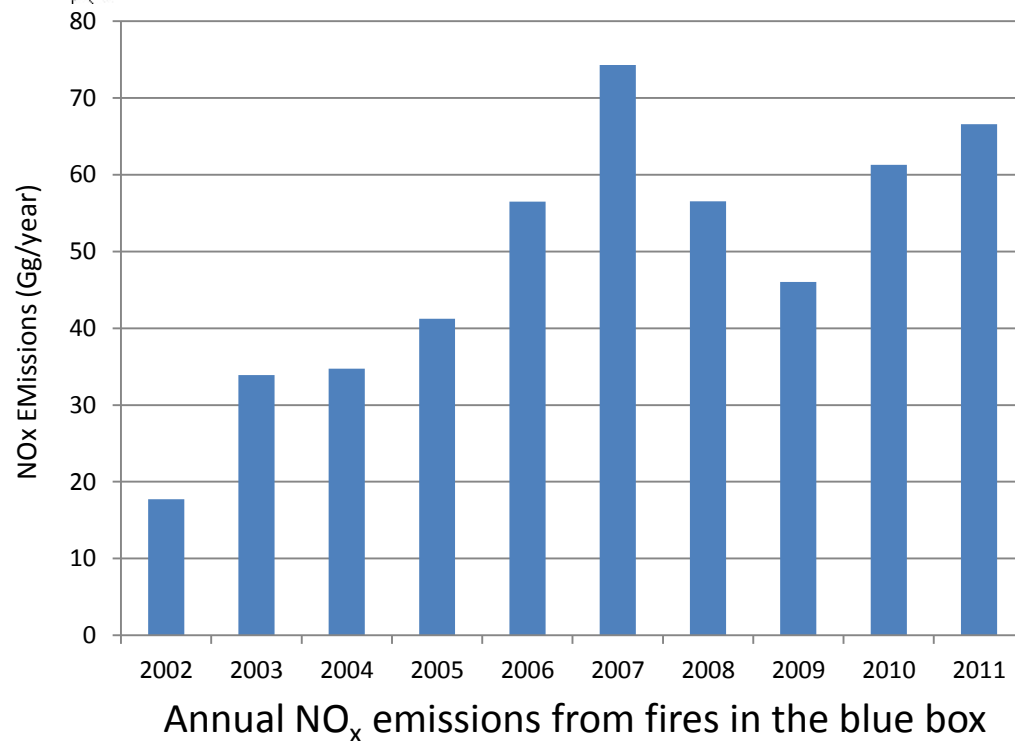
Discussion

- Suggestions on prioritizing these products?
- Needs for other tracers, etc.?
- Volunteers to help with forecasting?

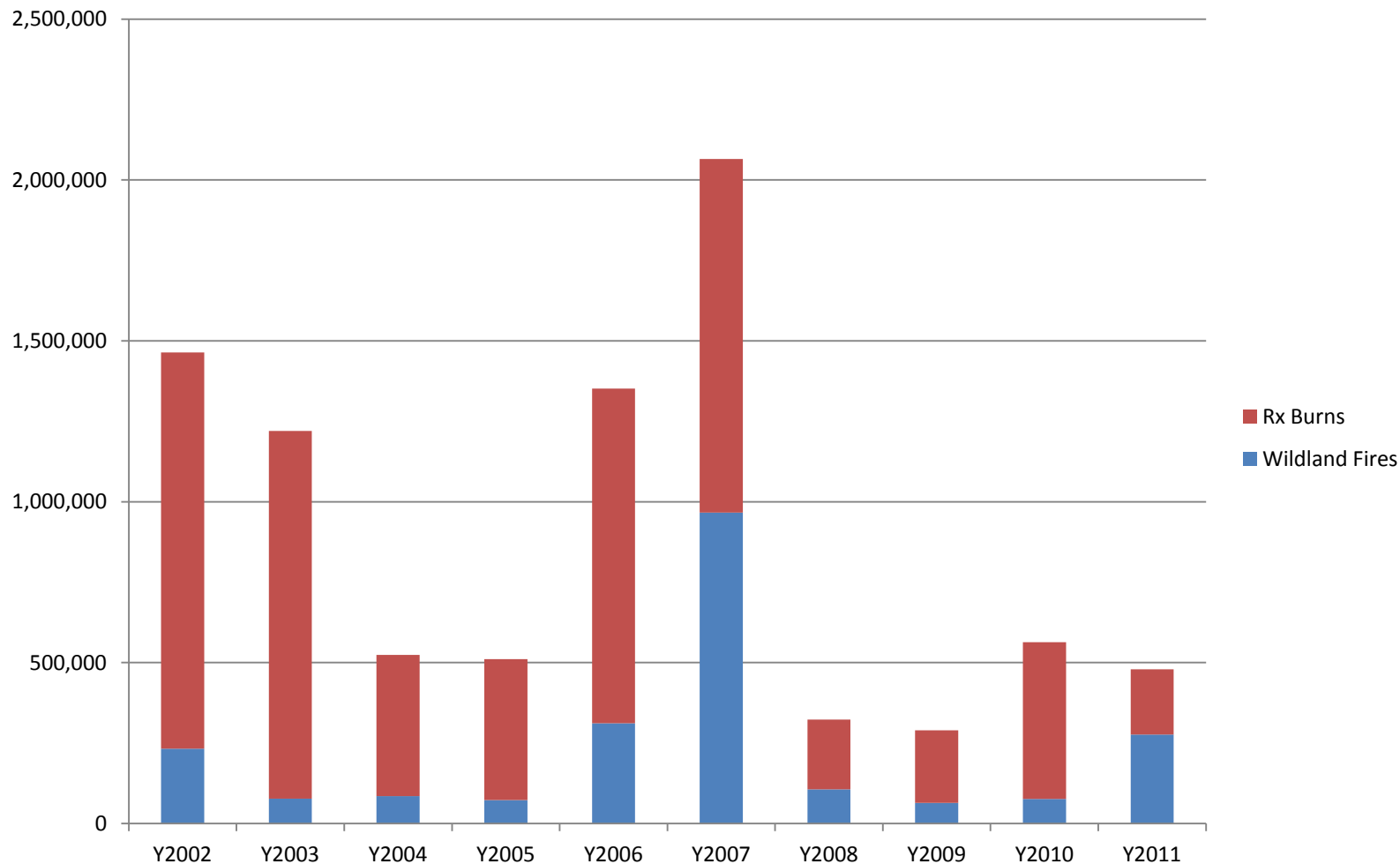
Annual fire emissions in the SE U.S.



Anthropogenic NO_x from point
sources in the box:
673 Gg/year (NEI 2008)

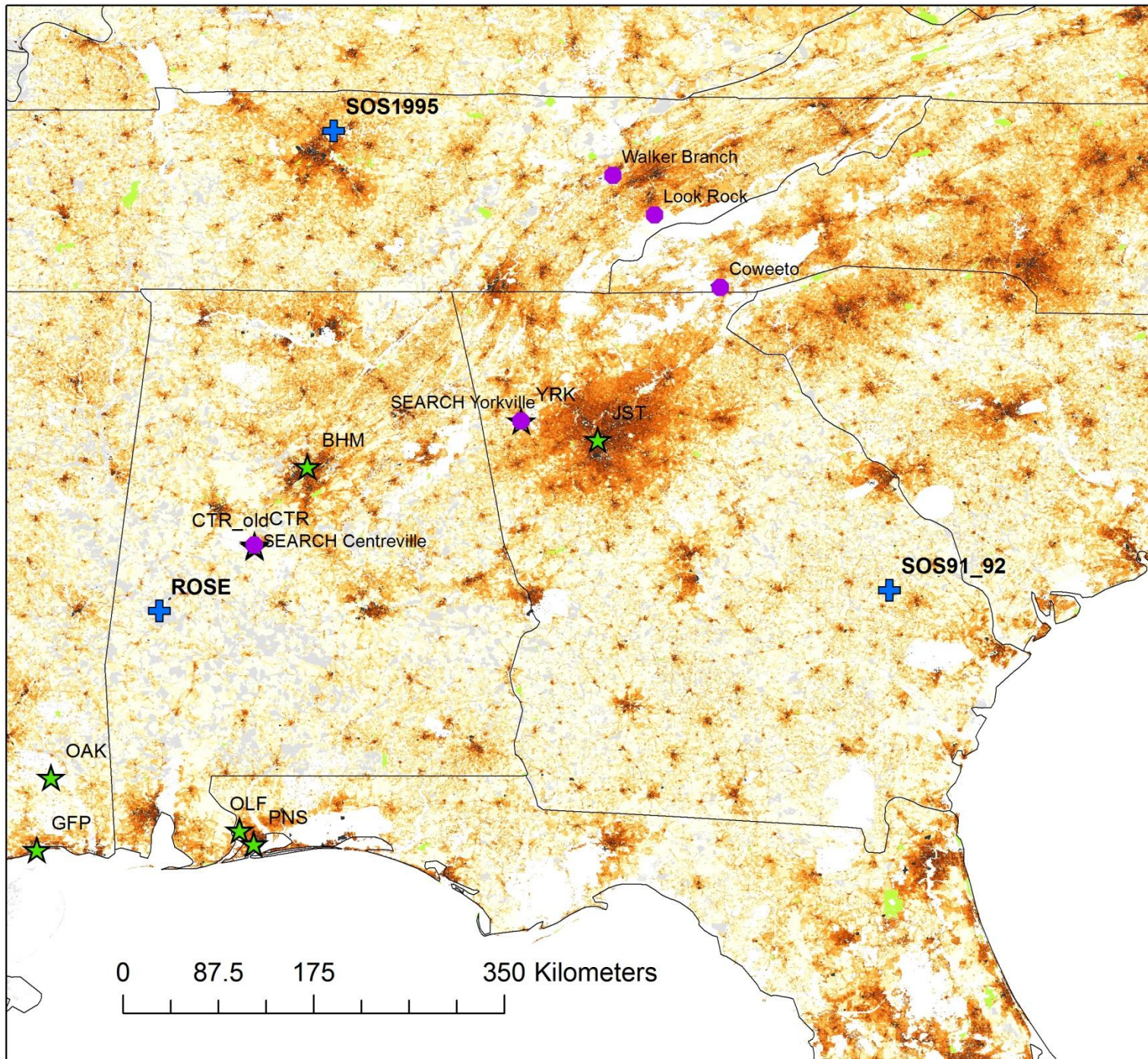


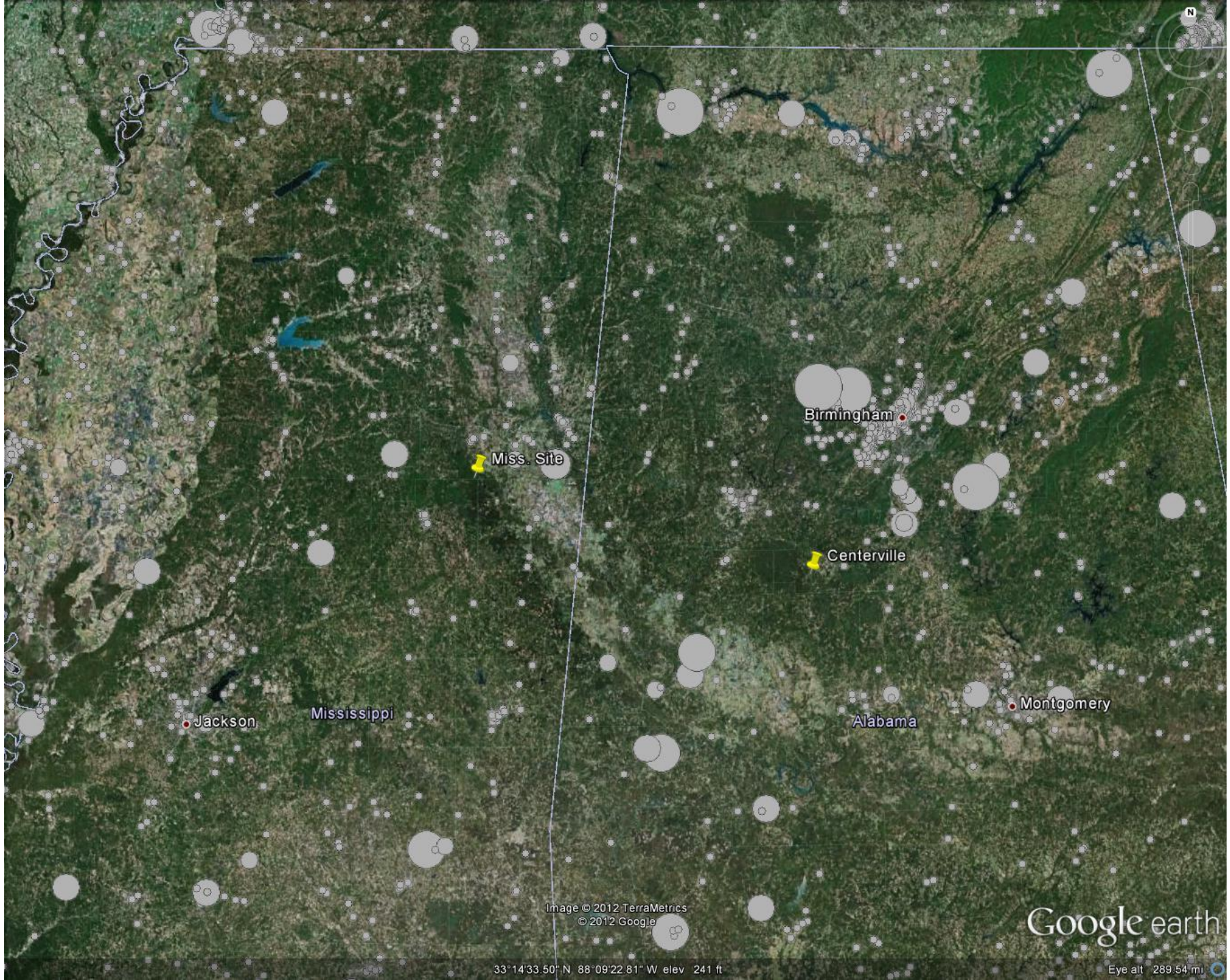
Annual Acres Burned for MS, AL, GA, TN



http://www.nifc.gov/fireInfo/fireInfo_statistics.html

Map of population Density





Miss. Site

Birmingham

Centerville

Jackson

Mississippi

Alabama

Montgomery

Image © 2012 TerraMetrics
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Google earth

33°14'33.50" N 88°09'22.81" W elev 241 ft

Eye alt 289.54 mi