

Modeling Northeast Texas Ozone for May-June 2005

Presentation to the NETAC
Technical Committee

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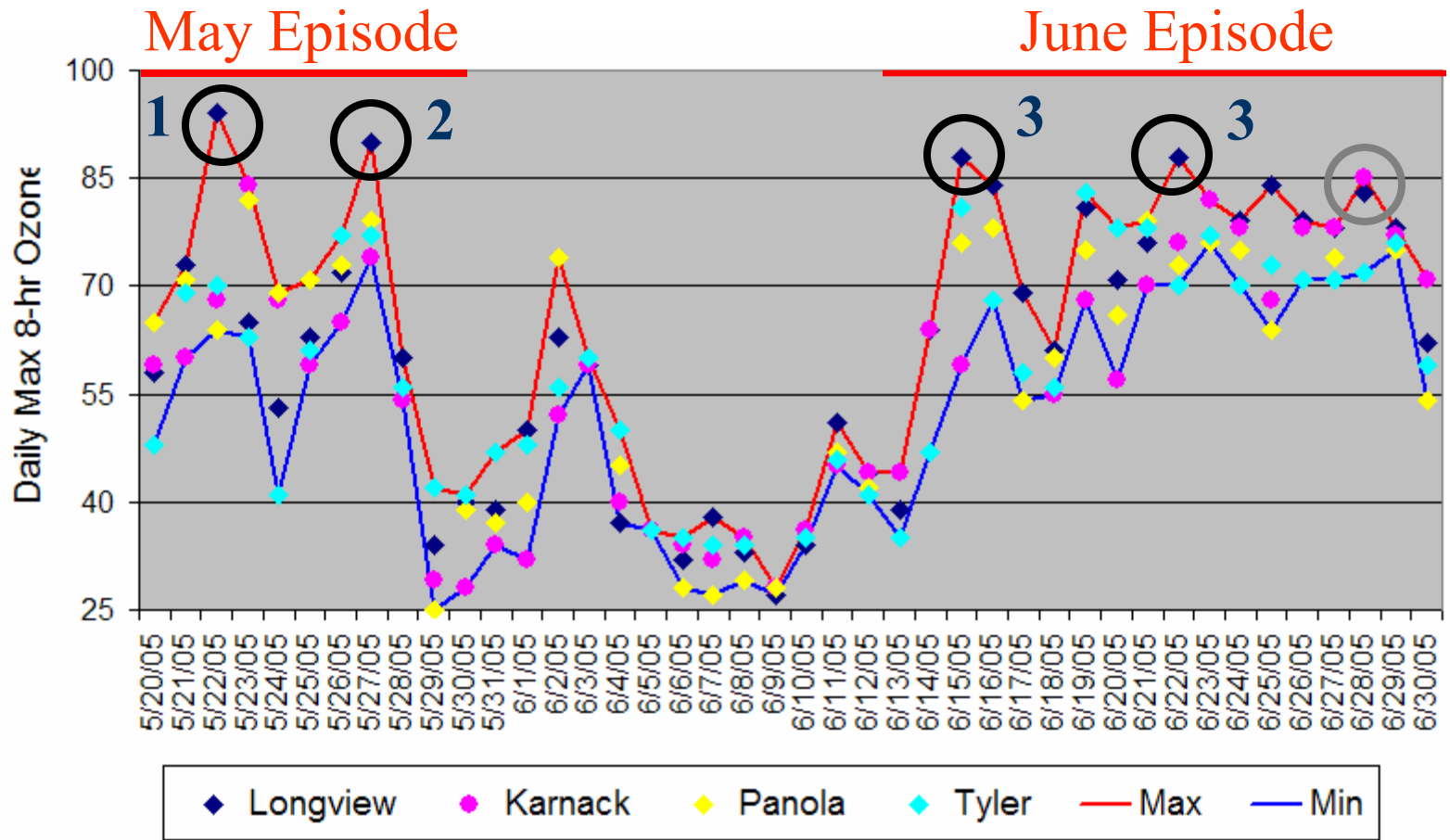
Background

- Use modeling to improve understanding of conditions leading to high 8-hour ozone concentrations in NE Texas
- 2005 high ozone days at Longview drive recent design values
- Model can be used to project future design values and evaluate control strategies

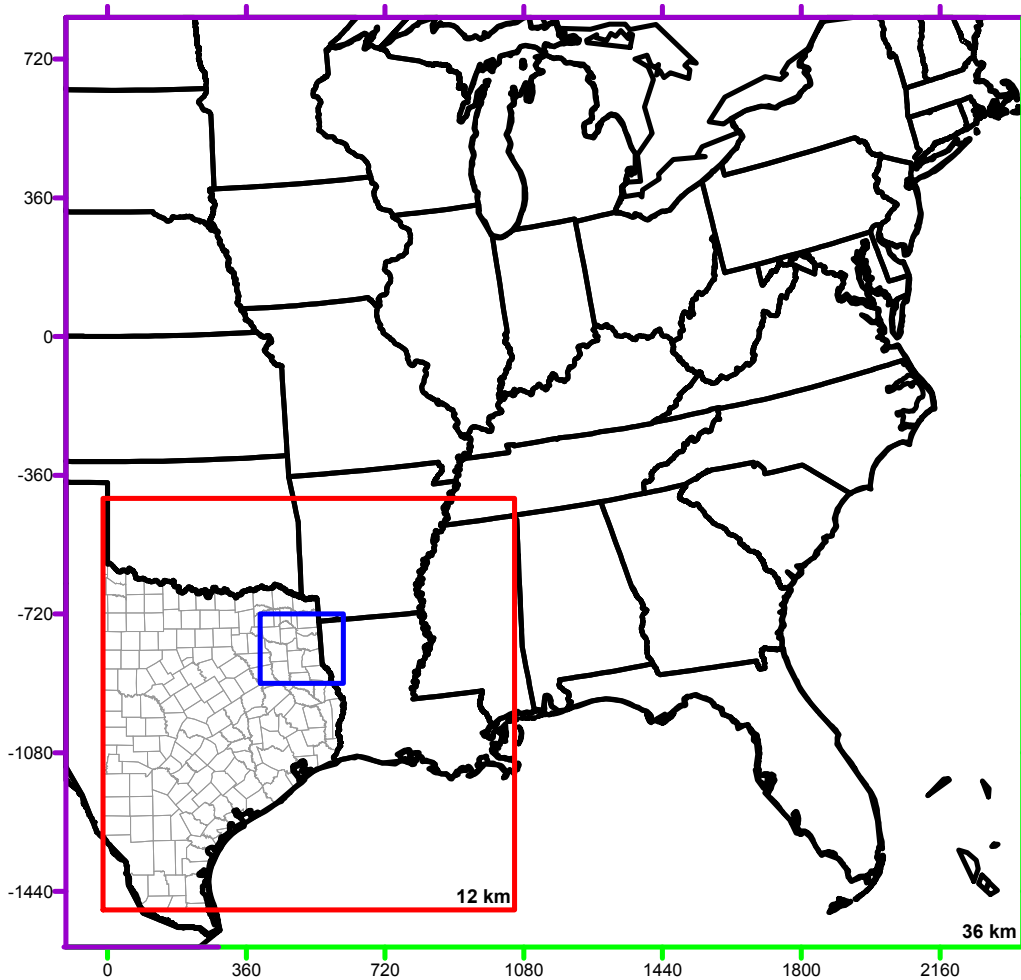
Objectives for Initial CAMx Ozone Modeling

- Initial model runs to evaluate performance of new model components
 - New meteorological modeling database for 36/12/4 km Northeast Texas domain
- Set performance baseline for future runs incorporating new emission inventory and other model components

Modeling Period: May-June 2005



2005 CAMx Ozone Modeling Domain



- 36 km/12 km/4 km nested grids in CAMx
- MM5 meteorology
- Draft 2005 Emissions
- Model period May 20-June 30, 2005

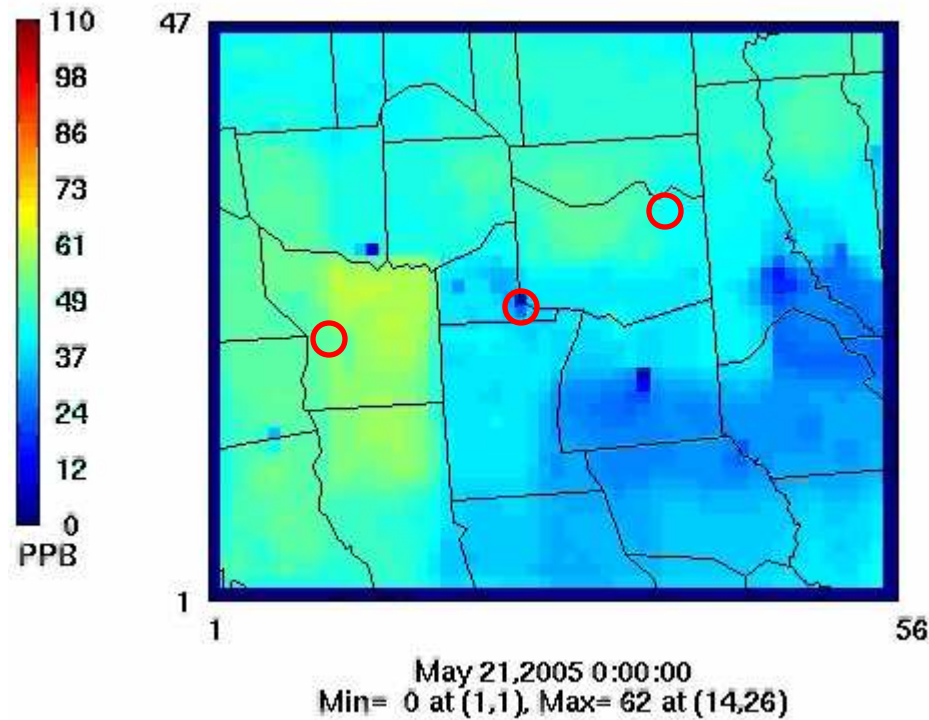
Meteorological Database

- MM5 model
- Configuration based on TCEQ 2005/2006 MM5 modeling setup.
 - Same 36/12 km domain, different 4 km
 - Model Physics
- Nudge MM5 surface winds to observed winds using TexAQS II and NOAA profiler data.

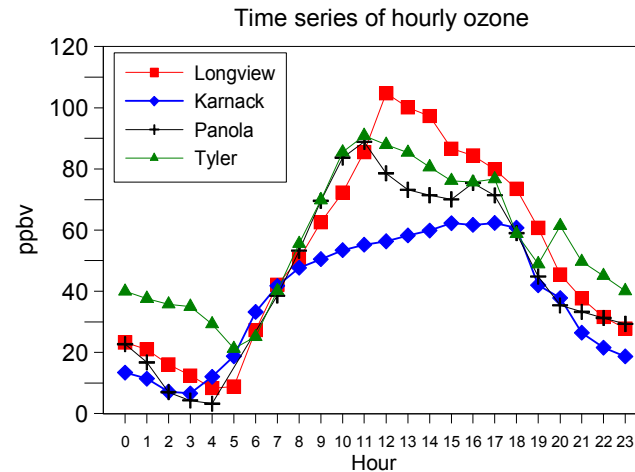
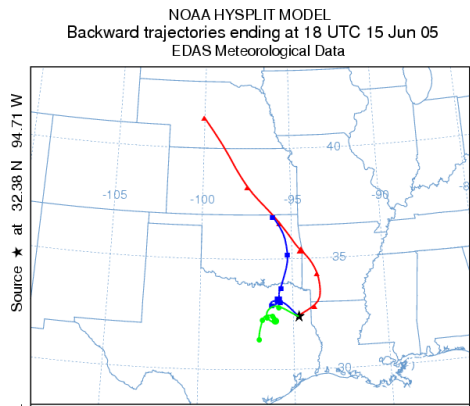
Draft 2005 Emission Inventory

- Inventory developed from previous CAMx seasonal/episodic modeling of 2005
- Based on 2002 National Inventory (NEI) and adapted from 2002 to 2005
- For June 18-23 only
 - Hourly CEM data for large NO_x sources in Texas and Louisiana.

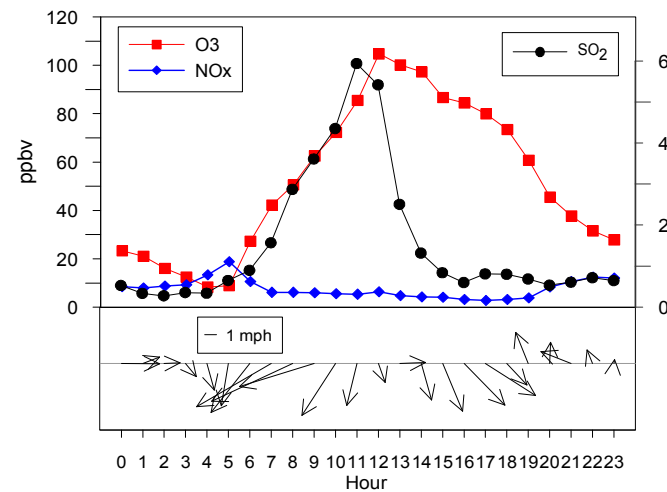
Surface Layer Ozone May 21-27, 2005



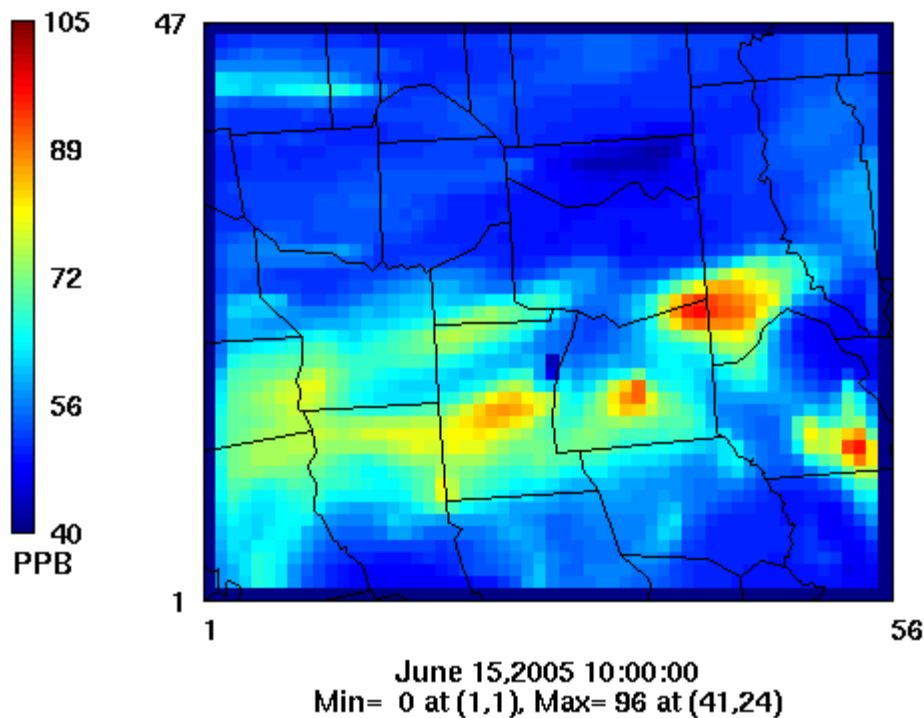
June 15: 88 ppb at Longview



- Longview peak 15 to 40 ppb higher than other sites
- North winds, but variable
- Some SO₂ at Longview, but not very high
- Local or regional event? Needs more analysis

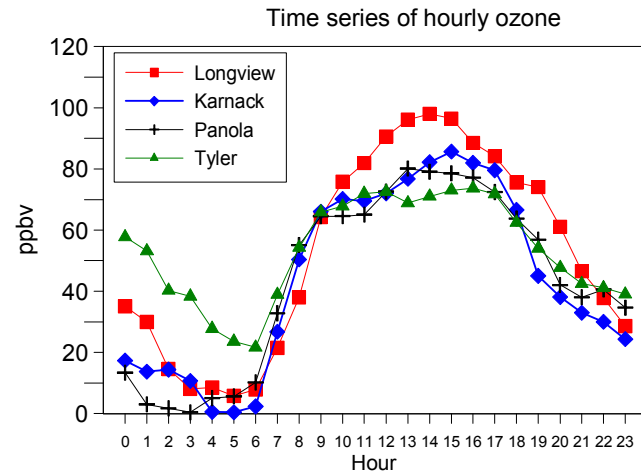
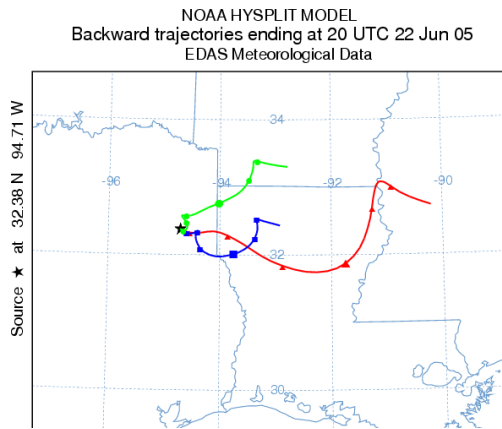


June 15: Modeled Ozone

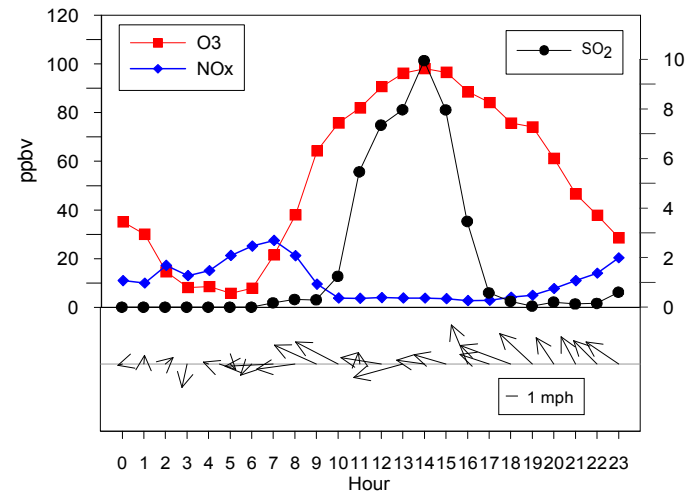


- Complicated wind patterns
- Model shows Pirkey plume impact at Longview
- Longview, Tyler peaks underestimated (~20 ppb)
- Karnack peak value well-simulated
- Background 50-60 ppb--likely underestimated

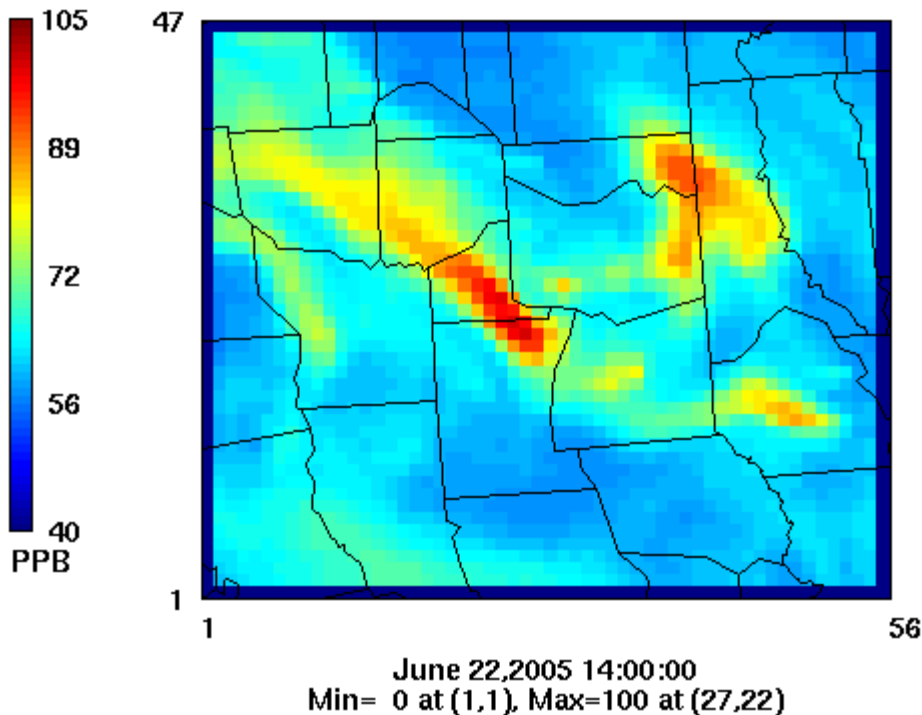
June 22: 88 ppb at Longview



- Longview peak ~15 ppb higher than other sites
- East winds
- Some SO₂ at Longview, but not very high
- Local or regional event? Needs more analysis



June 22: Modeled Ozone



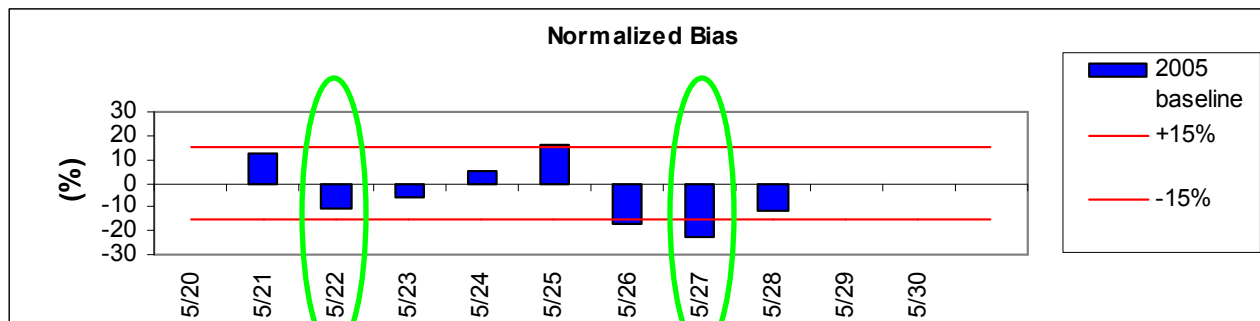
- Winds from the southeast
- Model shows Martin Lake plume impact
- Longview, Tyler peaks well-simulated
- Hourly CEM data for this day
- Karnack peak ~15 ppb low
- Background ~60 ppb

CAMx Model Performance Evaluation

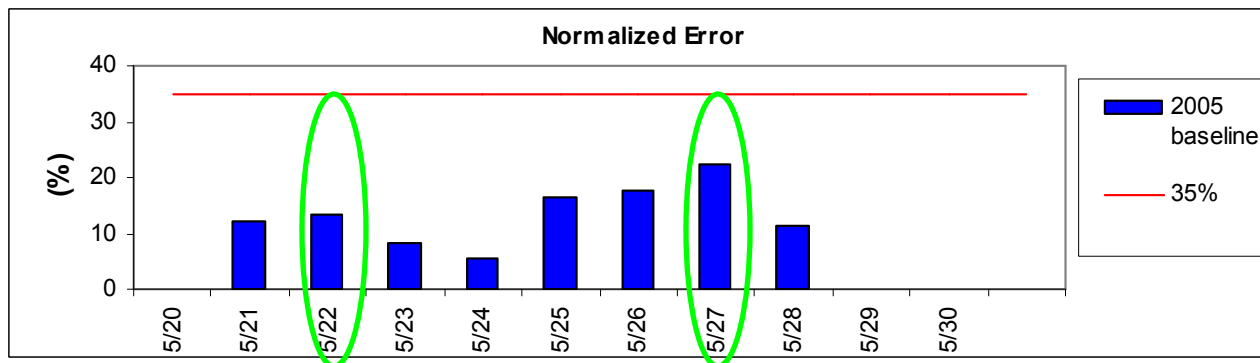
- Compare 2005 base case predictions on 4 km grid with CAMS observed ozone
- Longview, Tyler, and Karnack monitors
- Initial evaluation methodology
 - Bias, error
 - Measure how well model predictions agree with observed ozone at the monitors
 - Model meets error benchmark

Model Performance: May Episode

Bias



Error



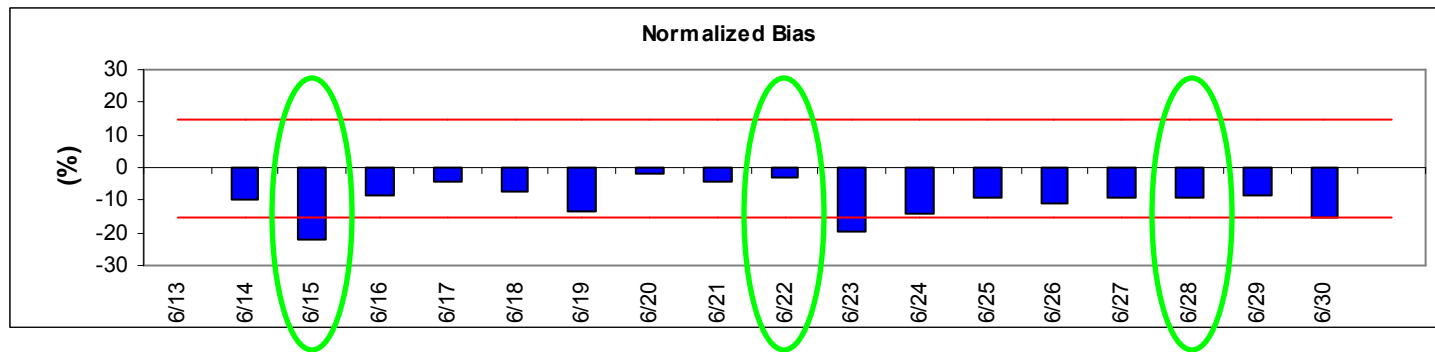
May 22

May 27

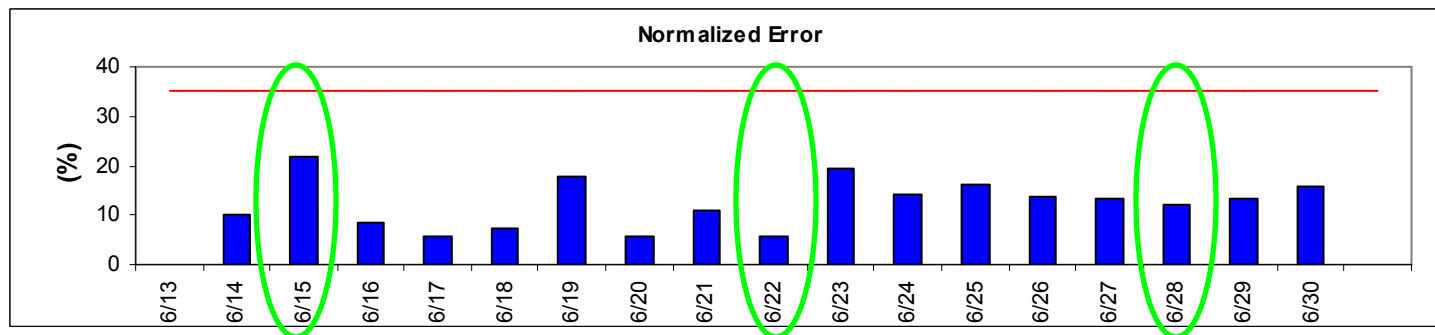
- Performance generally within benchmarks
- Low bias on high ozone days
- Hourly CEM data expected to improve May episode

Model Performance: June Episode

Bias



Error



- Generally within benchmarks
- Overall low bias
- Low background ozone

June 15

June 22

June 28

Summary

- Model provides a good starting point
- Performance better in the June episode than in the May episode
- Regional background ozone is underestimated

Future Work: 2005 Emission Inventory

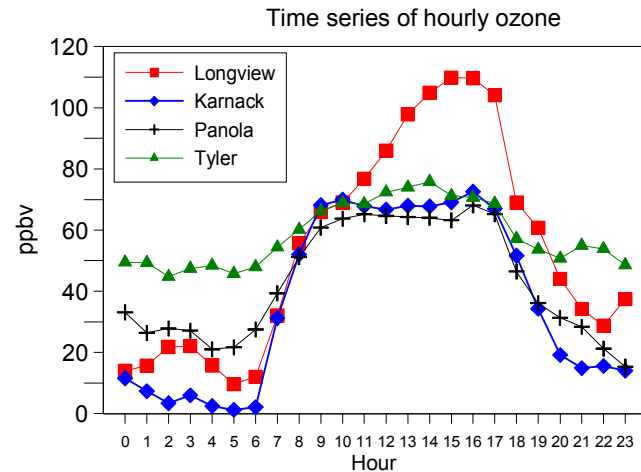
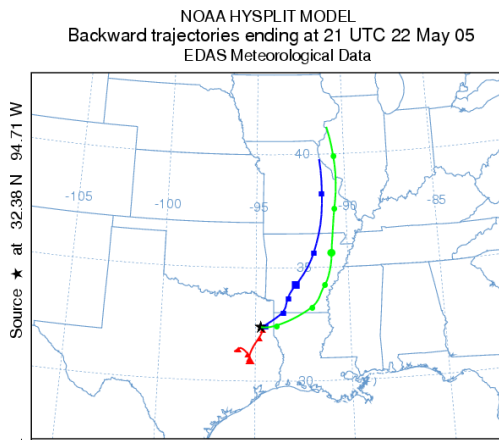
- Incorporate newly available TCEQ 2005 inventory
- Incorporate hourly CEM data for large NO_x sources for entire May-June period
- Integrate NETAC 2005 gas compressor engine inventory

Future Work: Other Model Components

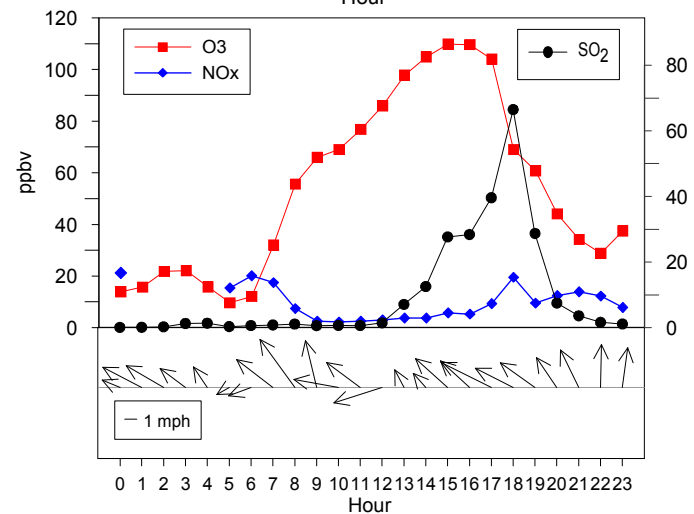
- Test new ozone deposition scheme
 - May improve simulation of regional background
- New biogenic emissions models
 - TCEQ has new landcover data for GloBEIS
 - There is a new model called MEGAN
- New CB05 chemical mechanism

End

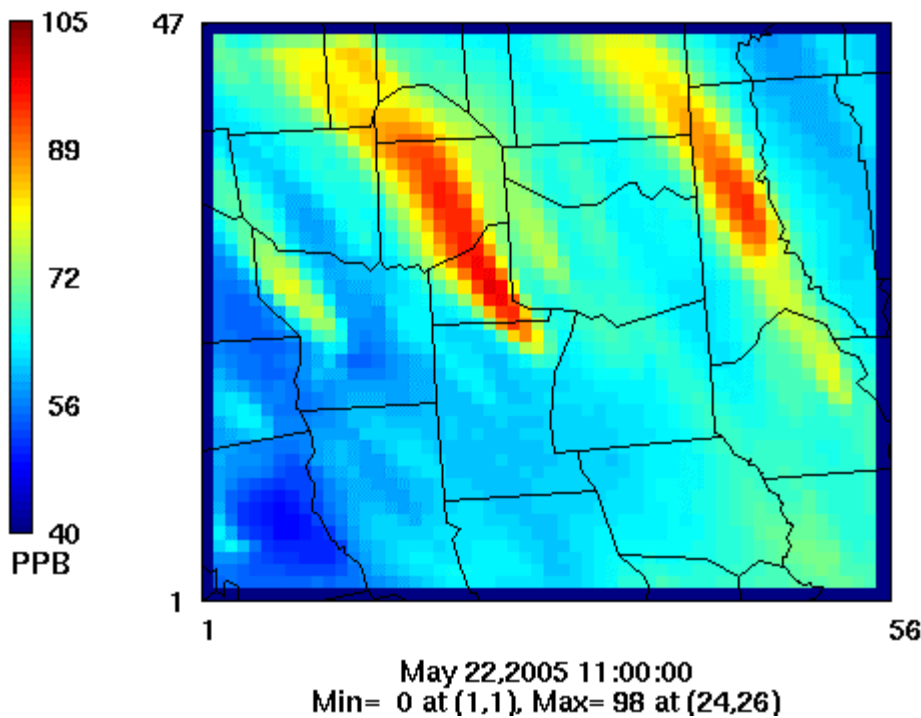
May 22: 94 ppb at Longview



- Longview peak ~40 ppb higher than other sites
- High SO₂ at Longview suggests local power plant plume
- Southeast winds during plume impact

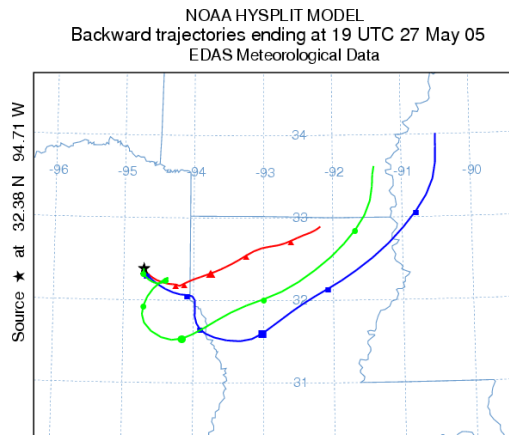


May 22: Modeled Ozone

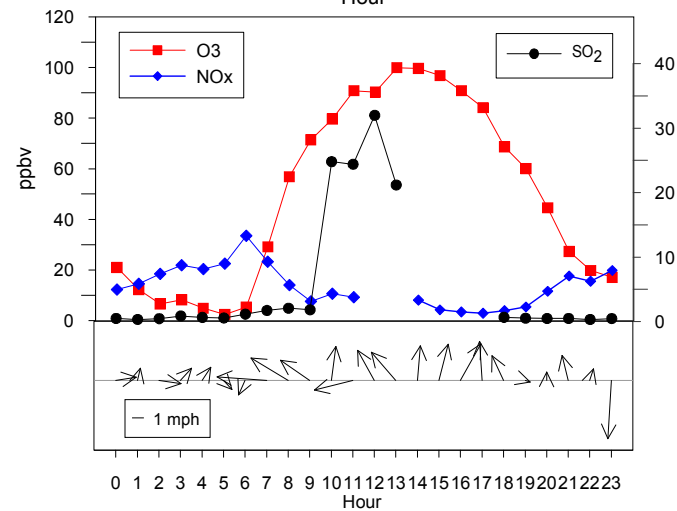
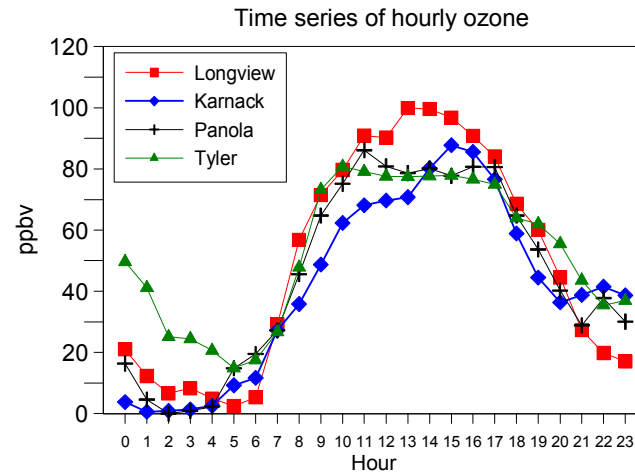


- Regional background ~65 ppb
- Model shows Martin Lake plume impact
- Peak ozone at Longview 20 ppb too low
- Peaks at Karnack and Tyler well simulated
- Wind from southeast, but plume crosses monitor too early

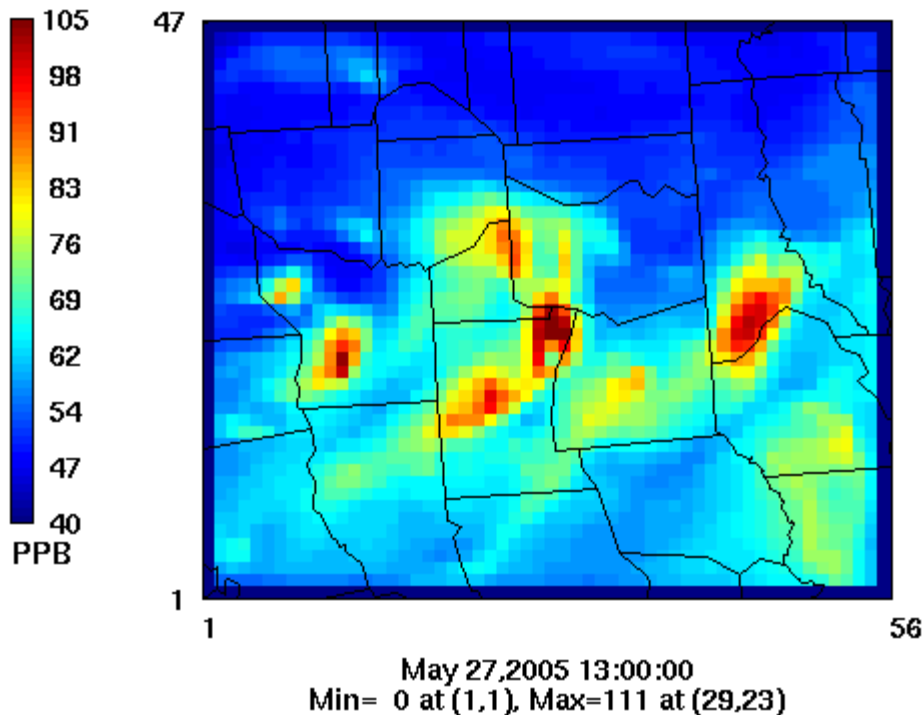
May 27: 90 ppb at Longview



- Longview peak ~15 ppb higher than other sites
- High regional background
- High SO₂ at Longview suggests local power plant plume
- South winds during plume impact

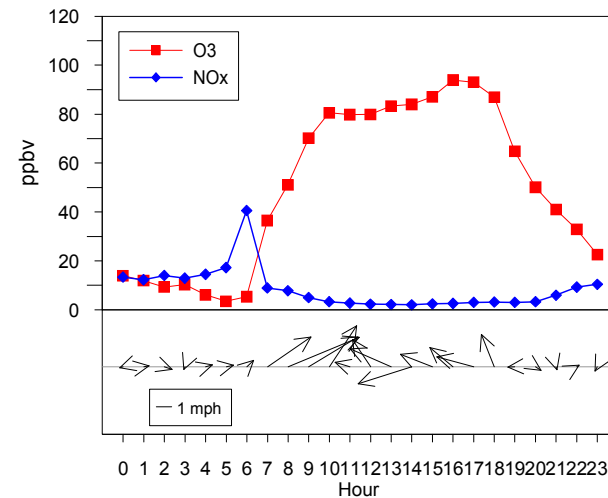
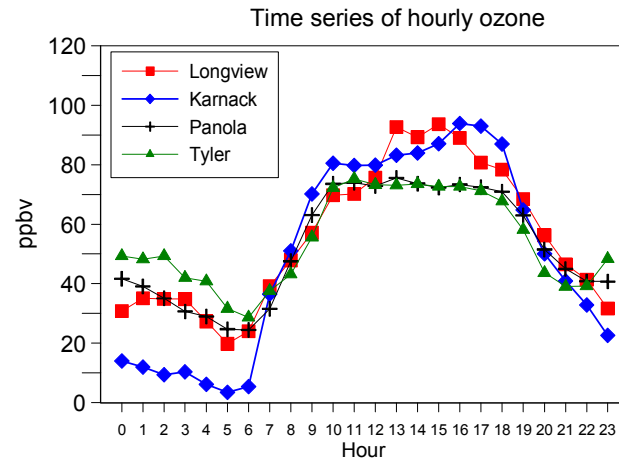
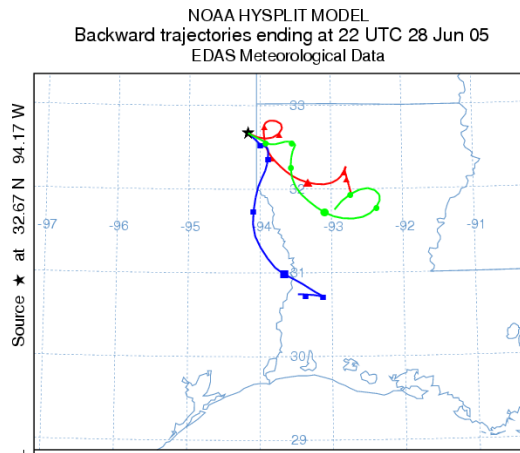


May 27: Modeled Ozone



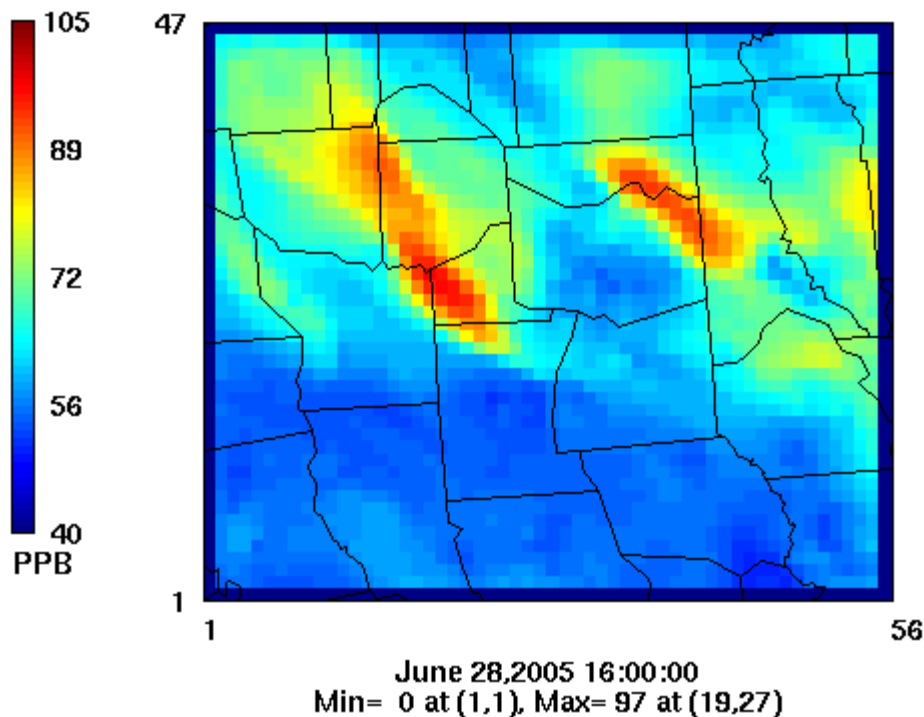
- Wind from southwest during Longview plume impact
- Wind reversal
- Peak ozone at Longview is 25 ppb too low
- Karnack peak 20 ppb low, Tyler ~5 ppb low
- Regional background 50-60 ppb

June 28: 85 ppb at Karnack



- Karnack (and Longview) ~15 ppb higher than other sites
- Wind reversal and trajectories indicate stagnation
- Karnack peak late in day, likely the Shreveport plume

June 28: Modeled Ozone



- Karnack impact from Shreveport plume
- Karnack peak too low
- Longview impact from Martin Lake plume
- Longview peak well simulated
- Model shows wind reversals