

# **TERC Project H35 Update**

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# Project H35 (Phase I)

## Transport from Out-of-State

- Source attribution (zero-out, APCA) using:
  - Aug 13 - 22, 1999 DFW episode
  - Sep 13 - 22, 1999 Austin episode
  - Aug 22 - Sep 6, 2000 HGB episode
- TX NAAs/near-NAAs used as receptors.
- 22 source regions, including 6 in Texas, Gulf of Mexico, and 15 states in SE US.
- Significance criteria from EPA's Clean Air Interstate Rule (CAIR) adopted.

# EPA Clean Air Interstate Rule (CAIR)

- Will reduce SO<sub>2</sub>, Hg and NO<sub>x</sub> emissions in 29 eastern states and DC
- NO<sub>x</sub> emissions to be reduced by 65% in 2015
- Two phases, with Phase 1 ending in 2009
- Cap and trade program for EGUs
- Initial CAIR screening criteria for states:
  - Max contribution to 8-hr ozone above 85 ppb from APCA and zero-out > 2ppb
  - Episode average APCA contribution > 1% of 8-hr ozone above 85 ppb

# Project H35 (Phase I)

## Major Results

- CAIR criteria exceeded by the following States and/or source regions:
  - LA, OK, AR, MS, AL, TN, KY, and Gulf of Mexico
- Missouri may also sufficiently impact TX near-NAAs for 8-hr ozone > 75 ppb.
- Out-of-State EGUs contribute to high 8-hr O<sub>3</sub> in BPA, HGB, NE TX, esp. from W. LA
  - Dolet Hills, Rodemacher, RS Nelson
- 25% NO<sub>x</sub> reduction in out-of-state EGUs can lower 8-hr ozone by 3 ppb in BPA.

# Project H35 (Phase 2)

## Further Refinement

- 10 CAMx sensitivity runs to investigate changes in model assumptions on 1999 DFW episode performance statistics
- Process analysis of revised 1999 base case (Run 34) and two other scenarios
- Sensitivity analysis of APCA results:
  - Impact of CAIR Rule
  - Change in APCA method (APCA2)
  - Change in MM5 convection physics

# Project H35 (Phase 2)

## Process Analysis Runs

- New 1999 base case assumptions (Run 34):
  - Expanded domain to Atlantic and Canada
  - Model top at ~14 km instead of ~4 km
  - NOAH/Eta PBL scheme
  - Enhanced Kv near surface
  - Extended inorganic chemistry (NOx recycling)
- Two other scenarios:
  - Pleim-Xiu PBL and TCEQ's "Kv3" (Run 33)
  - 30% less mobile NOx in core counties (Run 35)
- Performance evaluation ranking:
  - Run 35 (better), Run 34, Run 33 (poorer)
  - Lacking justification to select Run 35

# Project H35 (Phase 2)

## Process Analysis Results

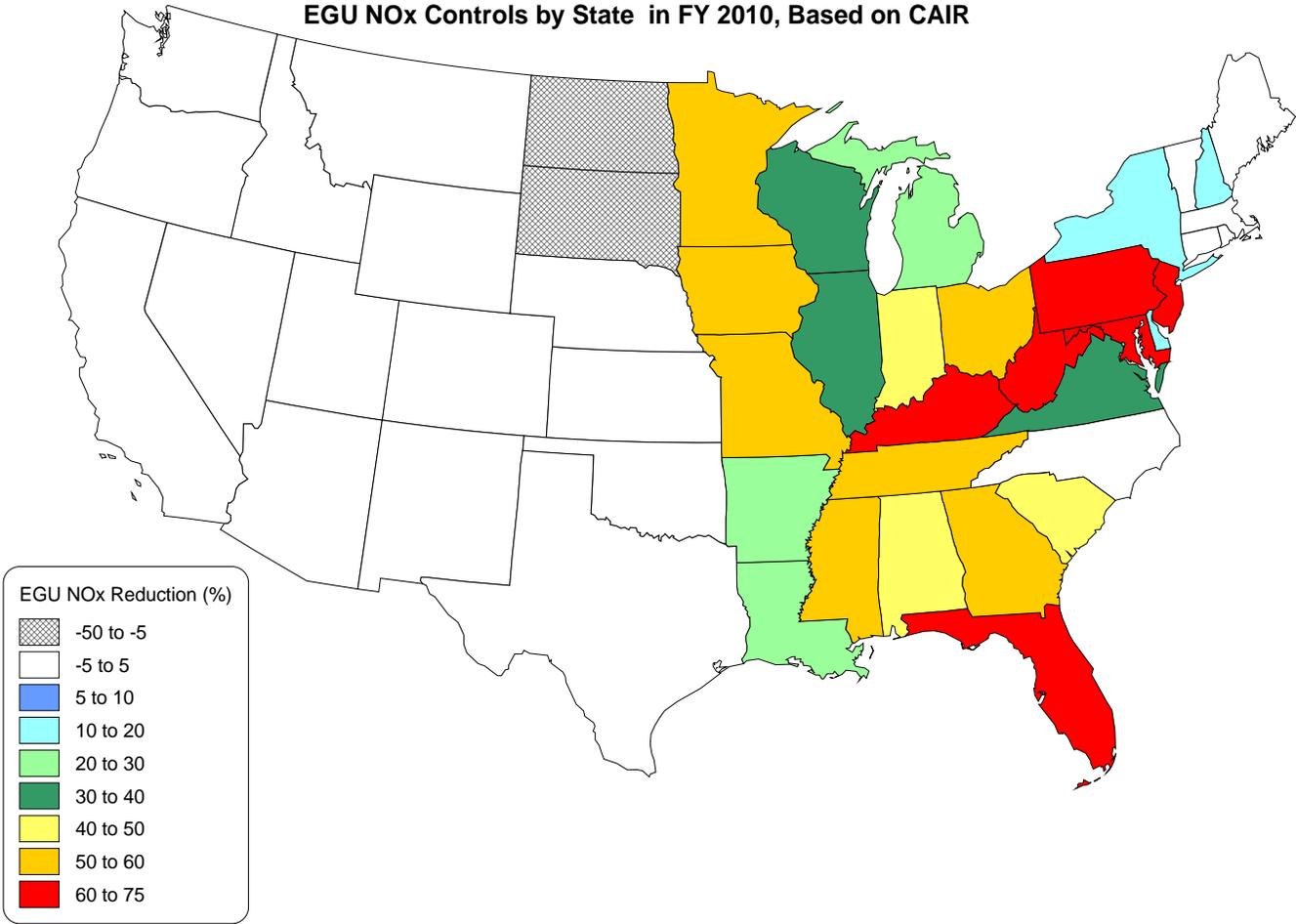
- Areas of most intense O<sub>3</sub> production tend to be VOC-limited on all days, esp. Aug 17
- VOC-limited areas:
  - Dallas, Ft. Worth, Waco urban areas
  - Near Big Brown and Limestone EGUs
- When mobile NO<sub>x</sub> reduced 30%, O<sub>3</sub> prod. became NO<sub>x</sub>-limited except on Aug 17
- Biogenics important in E and NW areas, less so near I-35 from Waco to DFW

# Project H35 (Phase 2)

## **APCA 2010 Sensitivity**

- Use new base case (Run 34)
- Reduced EGU NO<sub>x</sub> in 2010 due to CAIR
- Change from Kain-Fritsch to Grell scheme
- Changes APCA to better represent O<sub>3</sub> destruction during transport (APCA2)

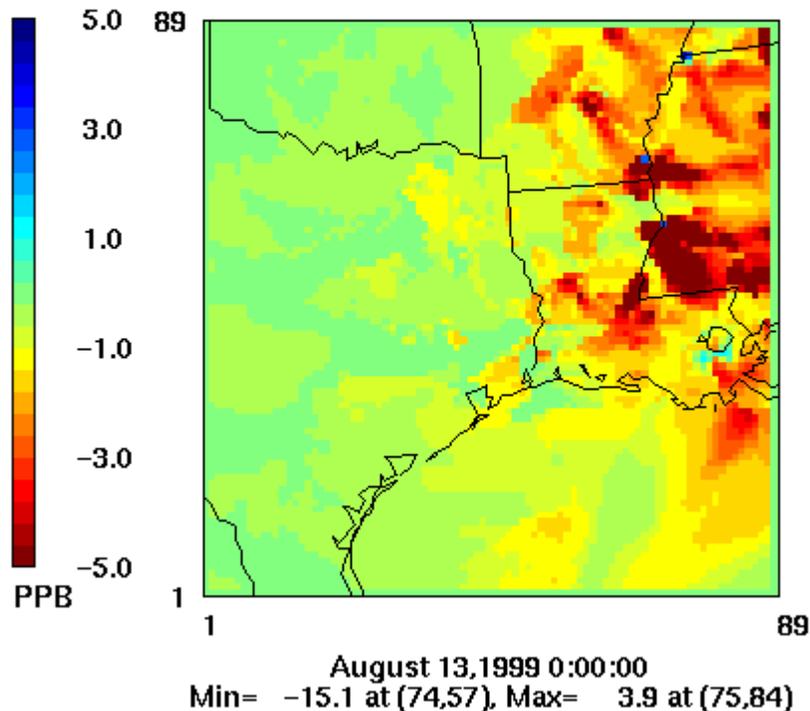
# %NOx Reductions due to CAIR



# Ozone Impact of CAIR Rule

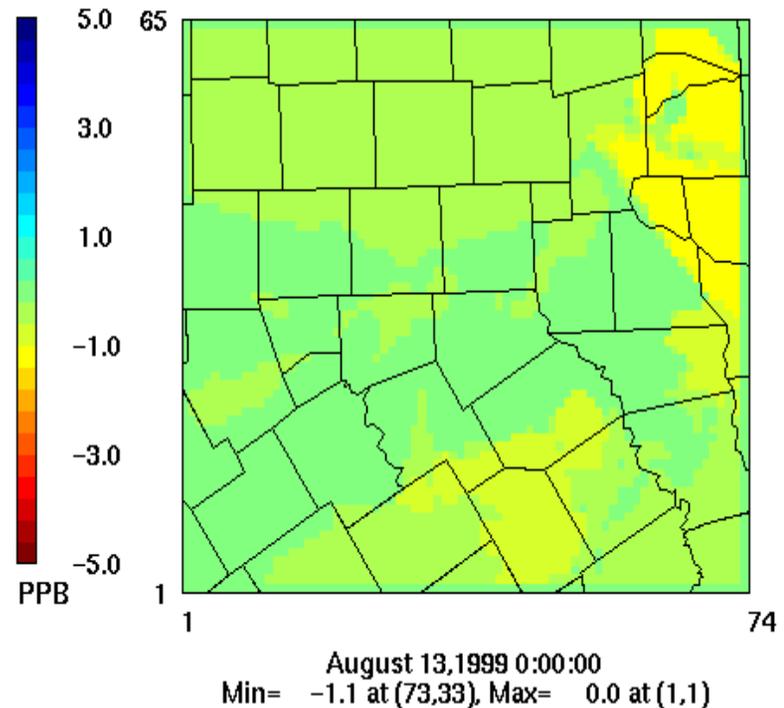
## Difference in Episode Max 8-Hour Ozone

CAMx FY 2010: Run 36 - Run 34



## Difference in Episode Max 8-Hour Ozone

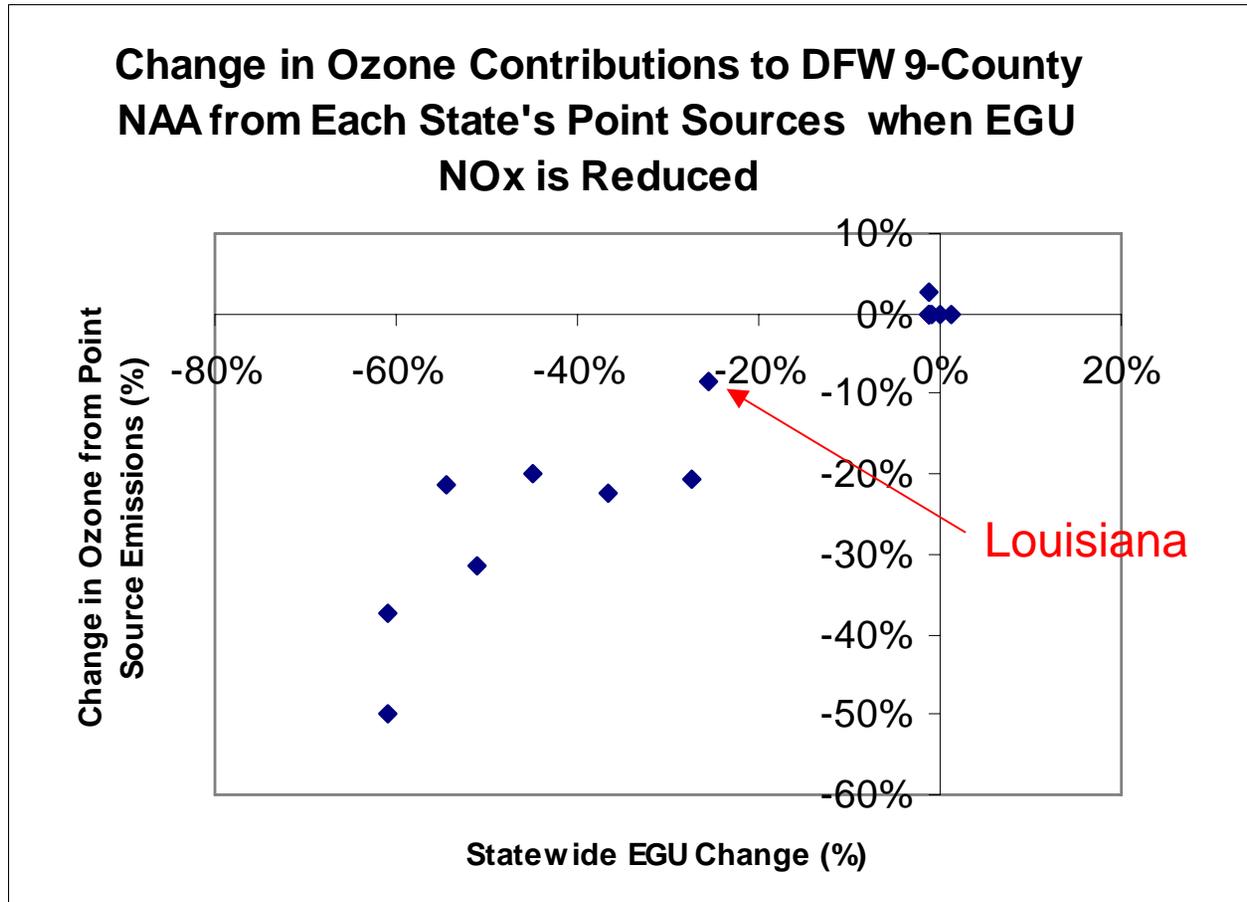
CAMx FY 2010: Run 36 - Run 34



# Impacts of CAIR Reductions

- States with largest EGU NO<sub>x</sub> controls generally had the largest percent reduction in ozone contribution
  - Texas point source emissions reduced by 1%
- Ozone reductions were smaller than reductions in emissions
  - Louisiana, with a 26% EGU NO<sub>x</sub> reduction, reduced its ozone contribution from point sources by 8%
- As EGU NO<sub>x</sub> emissions are reduced, ozone production from other NO<sub>x</sub> sources becomes more efficient

# Efficiency of CAIR Rule Changes



# Convection Physics

- Local sources and sources N and E of DFW contributed more to DFW high O<sub>3</sub> with Grell convection scheme
- Source regions south of DFW except Houston contributed less with Grell
- Contributions from States more distant than OK, LA, and AR changed < 0.1 ppb
- Boundary condition contributions went down by ~1.5 ppb with Grell scheme

# Change in APCA Method

- Improved APCA chemistry algorithm
  - APCA tracks net effect of ozone chemistry
  - APCA2 separately tracks ozone production and destruction chemistry
- Changes in O<sub>3</sub> contributions with APCA2
  - Increase local, decrease distant contributions
    - DFW Local Sources: +3.5 ppb (+8%)
    - NE TX Sources: +0.36 ppb (+22%)
    - LA Sources: +0.49 ppb (+14%)
    - Boundary Conditions: -5.5 ppb (-16%)