Status Report on Coalition Modeling:
Protocol and Technical Refinements

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presented to

Southeast Texas Photochemical Modeling Technical Committee

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Recent Activities

- Draft protocol sent to TCEQ (3 Nov ’10)
- 9 Nov ’10 Workshop with TCEQ Modelers
  - Constructive technical exchange with agency modelers
  - Detailed protocol comments & suggestions received
  - Re-structuring certain modeling tasks necessary in view of TCEQ’s 2013 SIP modeling schedule
- 10 Nov ’10 Briefing with Commissioner Rubinstein & TCEQ
  - Briefing continued the open technical exchange
  - Next briefing tentatively ~mid-March 2011.
- Draft protocol sent to EPA (8 Dec ’10) with request for comments
- Model inputs completed for first 2009 ensemble run
  - (WRF/CAMx/EI-nominal)

Schedule Restructuring

- Highest priority Coalition results submitted to TCEQ by Dec 2012 to allow consideration for HGB ozone Control Strategy and SIP narrative (due late spring 2013).

- Pragmatically, Coalition modeling data, results and TSD should be supplied by ~Sept 2012 to allow for TCEQ examination and possible consideration with respect to agency SIP modeling

- This necessitates a two-phased Coalition modeling emphasis:
  - Provide highest priority ensemble modeling information to TCEQ consistent with agency timeframe, and
  - Provide enhanced modeling information to Coalition throughout CY-2013 and subsequent public review process (post SIP submittal)

Modeling Workshop Highlights

- Significant uncertainty exists with respect to EPA decision on new NAAQS (now mid-2011?) and implementation guidance (could be a 'game-changer')

- General agreement that formal separation of ozone formation phenomena should occur after the model evaluation phase rather than an *a priori* definition based on measurement data alone. This will require re-casting certain aspects of the protocol but has no major impact on technical approach or study resources.

- Discussed WRF simulations performed by each research group. Discovered differences in physics selection between simulations. Preparing to run WRF with TCEQ prescription. Also running 2008 MM5 and 2009 MM5 simulations.

- Discussed inventory construction for use in ozone ensemble modeling. Instead of constructing simple high and low estimates of emissions, consideration will be given to properly sampling estimates to construct inventories that reflect observed ranges in VOC-to-NOx ratios.

Conceptual Model Refinement

- We seek to test the following proposition regarding the peak 8-hr ozone processes most relevant to the NAAQS in Houston.
  - 1. Most ozone days in HGB, including the 4th highest, are adequately simulated with current photochemical models and data base development methods.
  - 2. A limited number of the 4th highest ozone days in HGB arise from phenomena inadequately captured in the current model physics, input data sets, and/or modeling procedures; these Non-Typical Ozone Change (NTOC) days may arise from one or more causes, including industrial emissions events, meteorological phenomena, transport from upwind areas, or other causes.
  - 3. While initial aerometric data analyses may help identify the potential number of NTOC days at HGB monitors, actual classification and separation of days must await completion of the base case model performance evaluations for the three base years (i.e., 2008, 2009, and 2010).
  - 4. Specialized modeling methods coupled with day-by-day, monitor-by-monitor analysis will likely be required to address NTOC days at individual HGB monitors.
  - 5. A few days may simply be 'unmodelable' with current science, necessitating their elimination from the days used for SIP strategy development so that the simulation results are not contaminated by obviously flawed periods.
  - 6. However, though 'unmodelable' days may be excluded from SIP strategy development, any resulting strategy will still be evaluated against these days.

Revised Modeling Approach

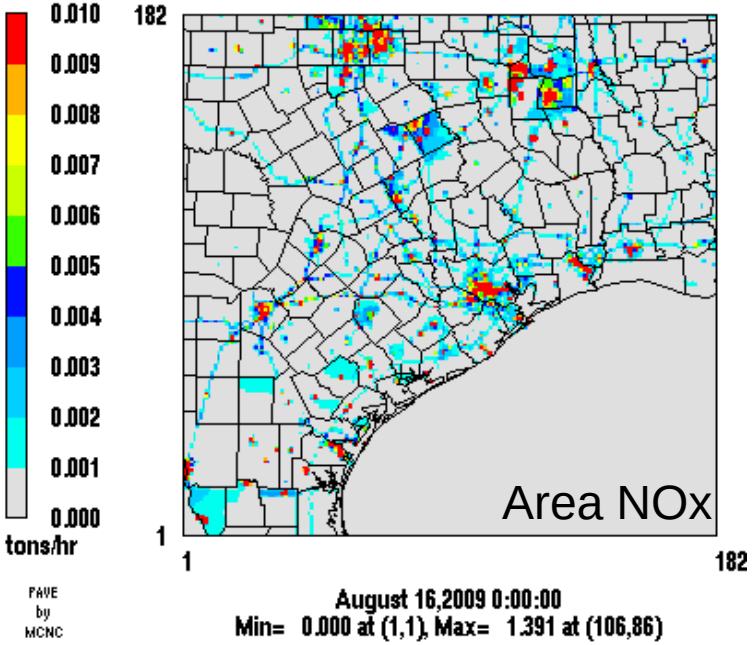
- Modeling targeted on results by Sept ’12
  - Temporarily drop 2011 as model year and concentrate on readily available data (2008-2010)
  - Truncate simulation period to ~186 days, i.e., 15 April to 18 October
  - Suspend focus on 1-2 km modeling
  - Focus on six priority ozone ensemble models (OEMS): MM5/CAMx/EI-low; MM5/CAMx/EI-nominal; MM5/CAMx/EI-high; WRF/CMAQ/EI-low; WRF/CMAQ/EI-nominal; and WRF/CMAQ/EI-high

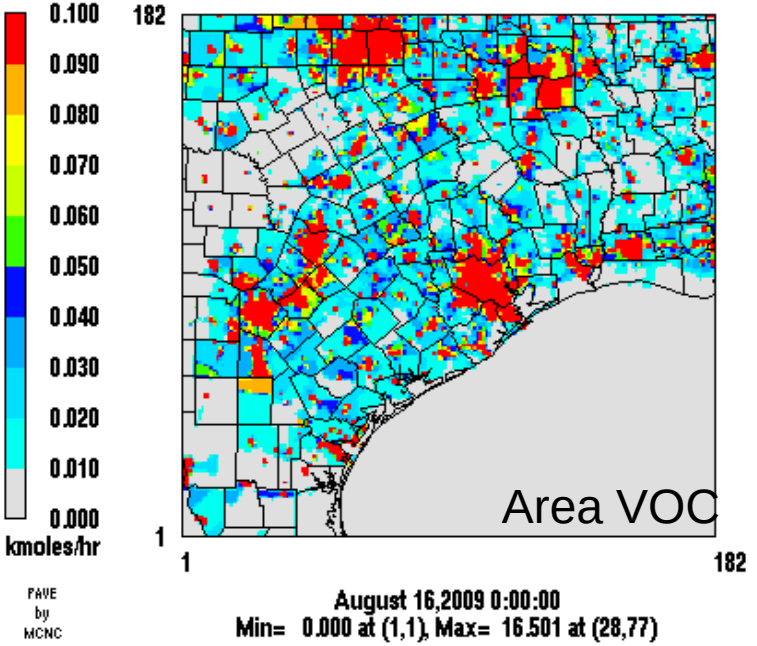
- Modeling targeted on more complete results by Dec 2013 or later in the public comment and EPA SIP review period
  - Extend modeling data bases to cover 2011 and/or 2012 (i.e., add another year or two)
  - Expand number of ensembles to include:
    - Focused testing of 1-2 km grids
    - Use of SAPRC07 chemical mechanism as alternative to CB06
    - Emergent WRF science configurations ‘that work’ (especially for precipitation)
    - Update lateral boundary conditions for base years & future years from global transport models

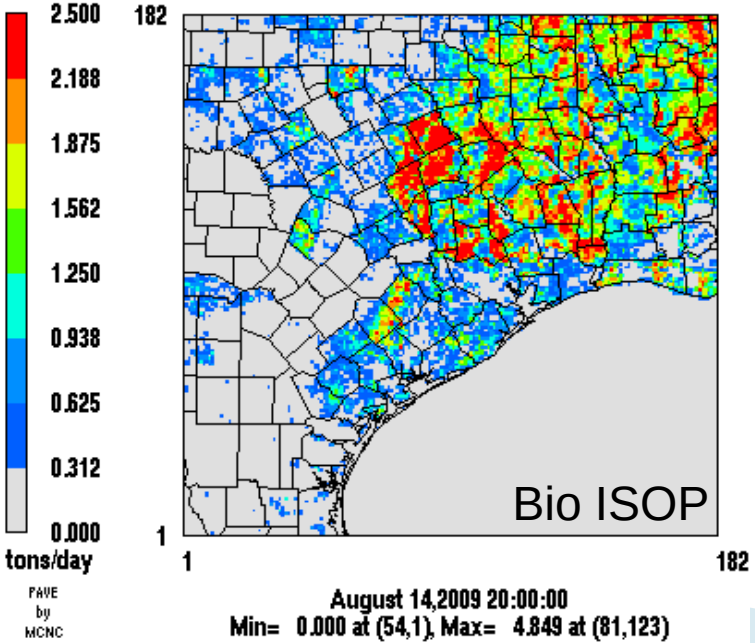
Status of 2009 Base Case Modeling

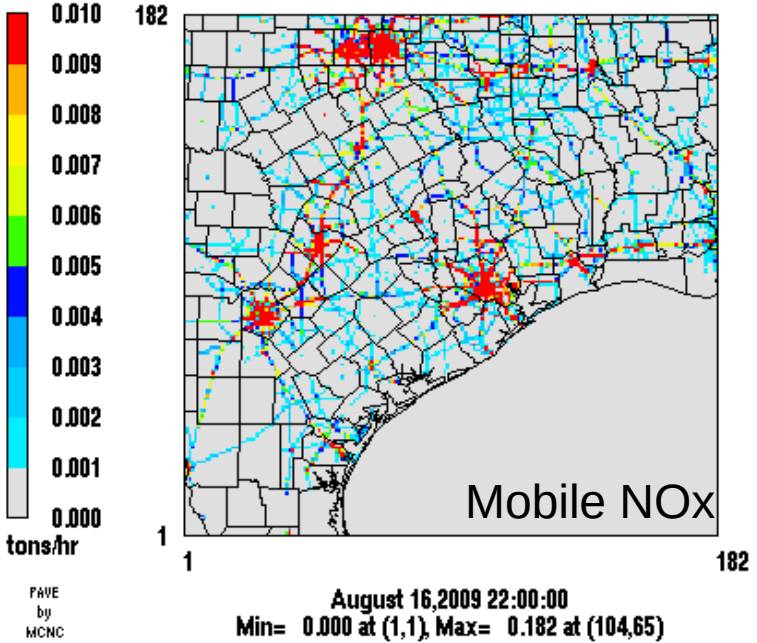
- Meteorological Modeling
  - Completed first two initial 2009 WRF simulations
  - Conducted 15 episodic diagnostic WRF simulations
    - Continue to experience overestimation in precipitation
    - However, temperature/winds/mixing ratios continue to perform well
  - Acquired MADIS and NAM (12 km) observations and initialization fields for 2007 through 2010
  - Adapted MM5 to utilize MADIS and NAM data sets (major accomplishment)
  - Completed 2008 MM5 preprocessing; model simulation underway
  - Completed 2009 MM5 preprocessing; model simulation underway
- Emissions Modeling
  - On-road, non-road, area, commercial marine shipping, locomotives, aircraft, oil & gas, fires, and offshore completed for 2009
  - Canada and Mexico emissions complete
  - Major stationary sources complete
  - Biogenics (BEIS3 complete; GloBEIS [17-Dec]; MEGAN [31-Dec])
- Air Quality Modeling
  - Completed 2009 CAMx preprocessing
  - Discovered bug in CAMx v.5.3 (also likely in v.5.2.1); ENVIRON currently diagnosing

2009 Emissions









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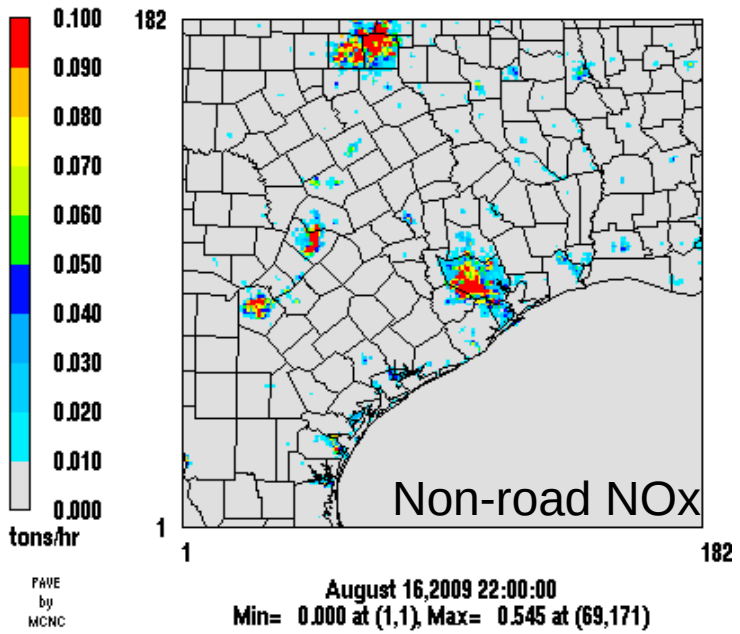
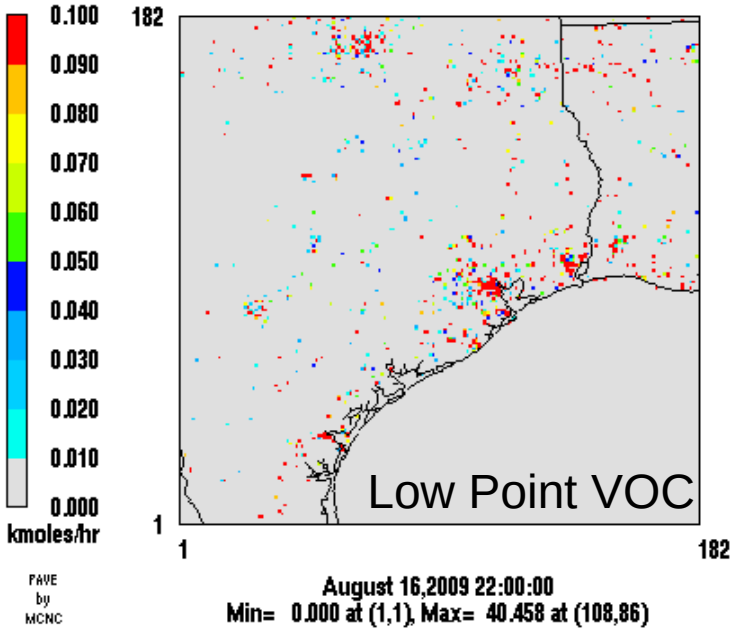
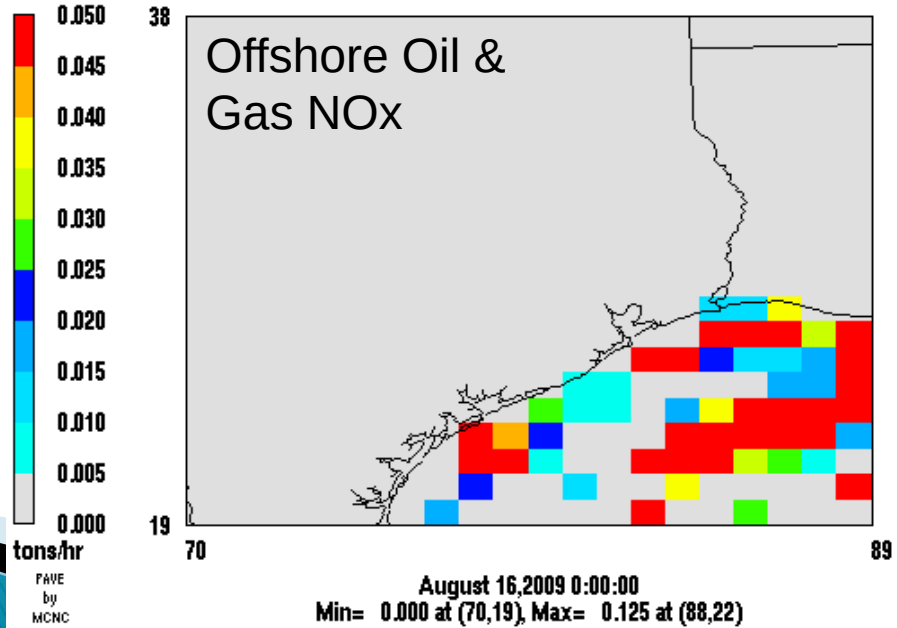
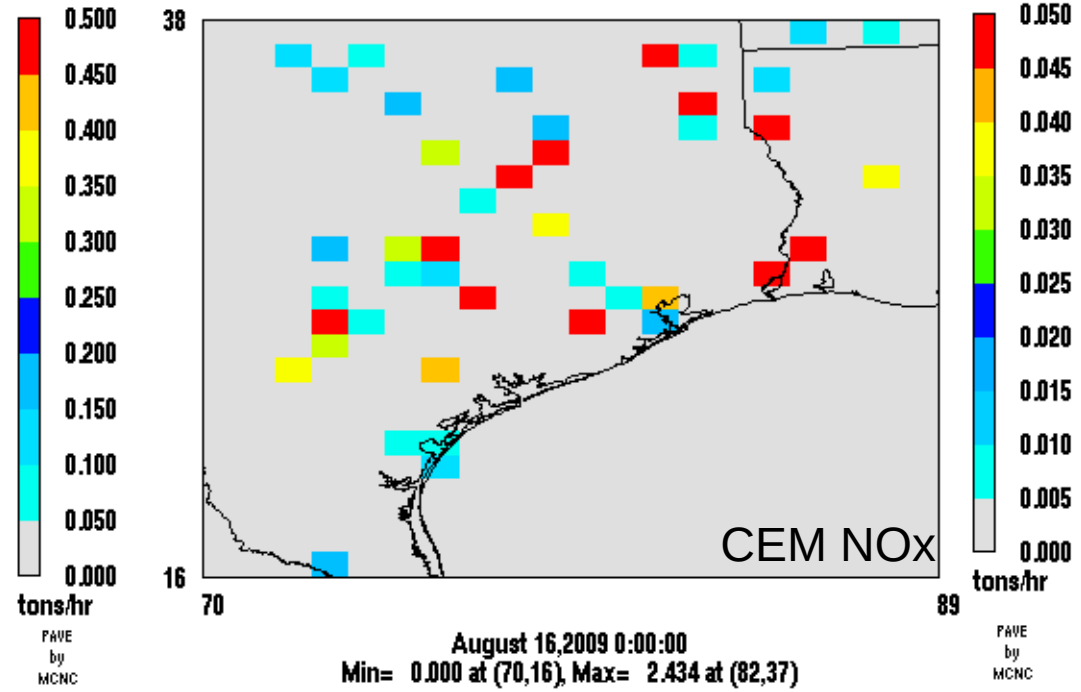
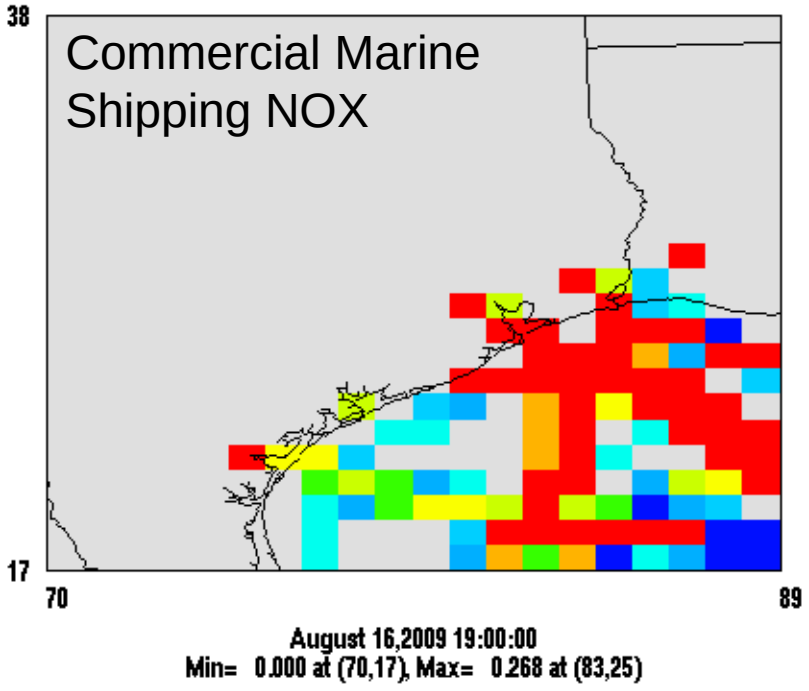




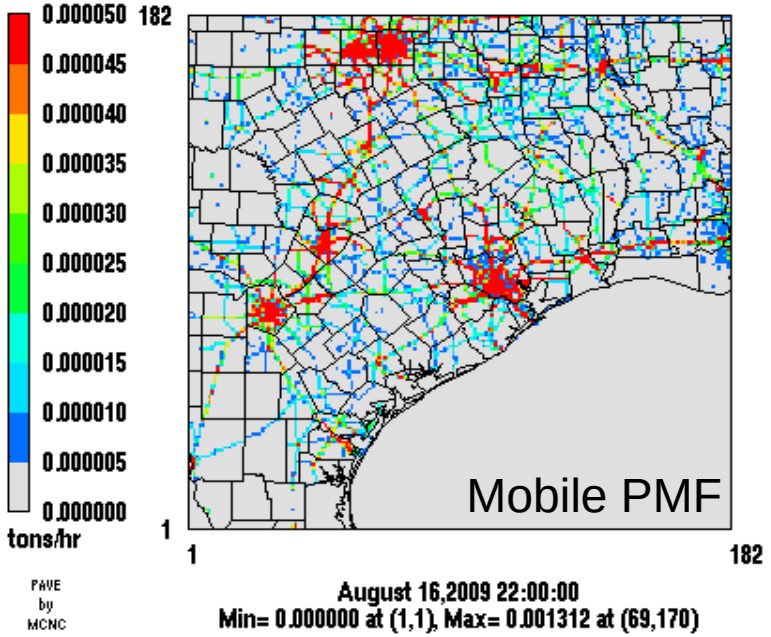


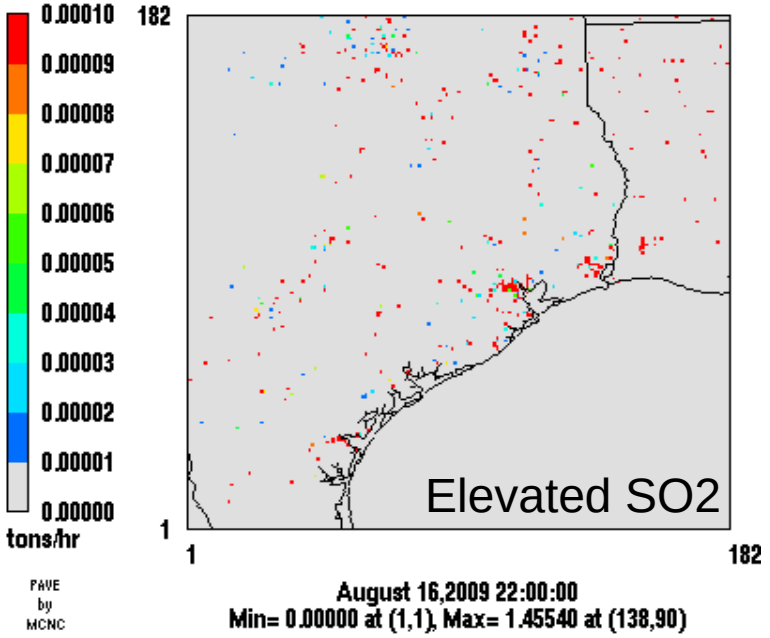
2009 Emissions (continued)

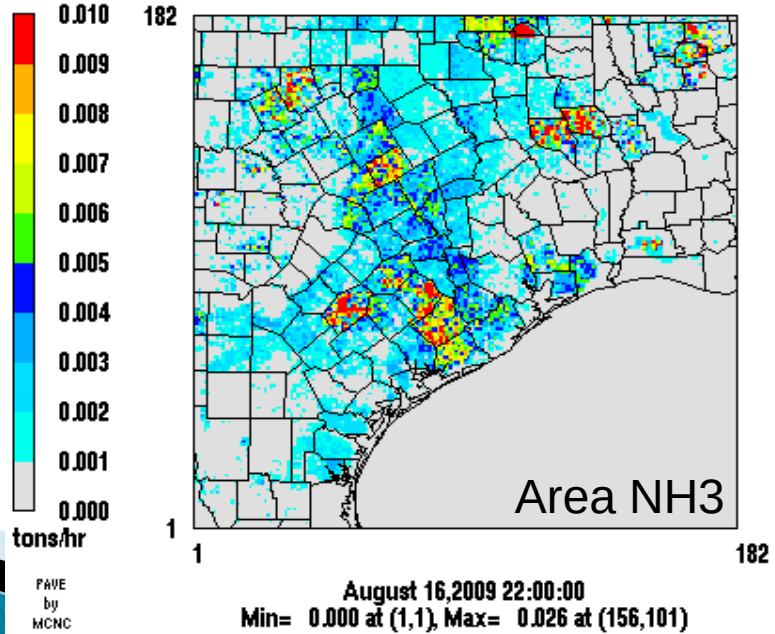




2009 Emissions (concluded)







Pertinent Research Papers

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