

Evaluating the Performance of a Comprehensive Regional Emissions Inventory Using Field Data

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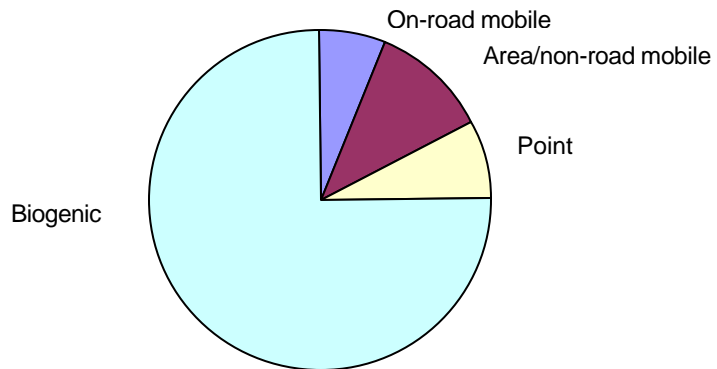
Introduction

- Data from the Texas Air Quality Study, conducted during the summer of 2000, have been used to evaluate emission inventories for southeast Texas.
- Other presentations in this meeting will report the details of performance evaluations for
 - biogenic inventories,
 - point source inventories,
 - mobile source inventories,
 - emissions from fires and
 - emissions of secondary organic aerosol precursors.

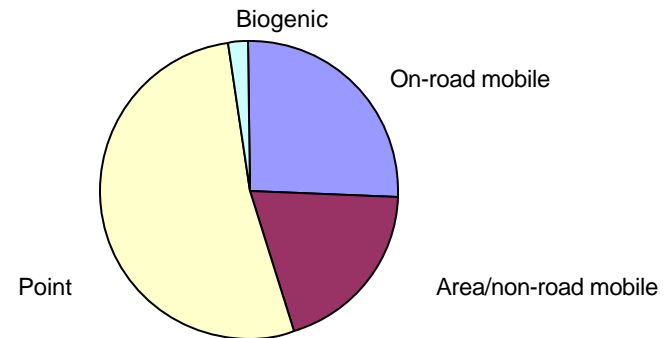
- Comparisons between modeling, based on current emission inventories, and field data were evaluated
- TexAQS 2000 Emissions inventories are based on:
 - special emissions collected during the TexAQS 2000 study
 - bottom up procedures

Houston/Galveston 2000 EI

Houston/Galveston 2000 VOC Emissions



Houston/Galveston 2000 NOx Emissions

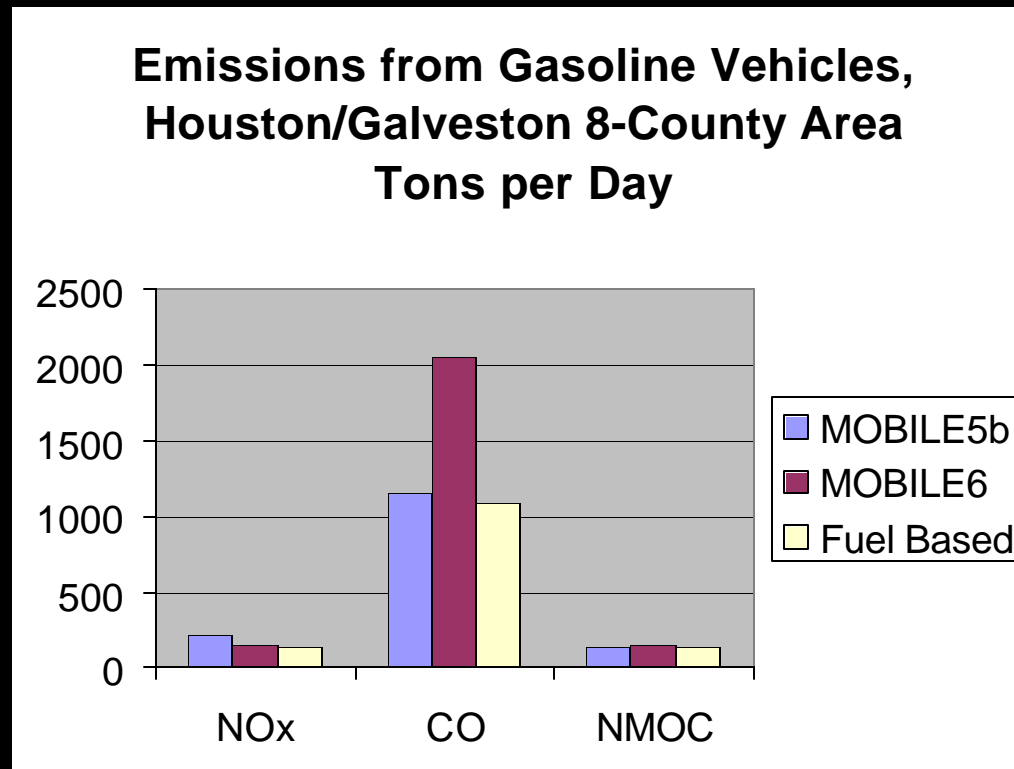


This presentation will focus on the following questions:

- 1). Are the magnitudes of the emissions correct?
- 2). Are the emissions adequately and correctly speciated?
- 3). Are the emissions correctly distributed spatially?
- 4). Are the emissions correctly distributed temporally?

Finding 1:

Based on data collected in the Washburn Tunnel, emission factors for vehicular emissions, in Houston are comparable to those observed in other urban areas.

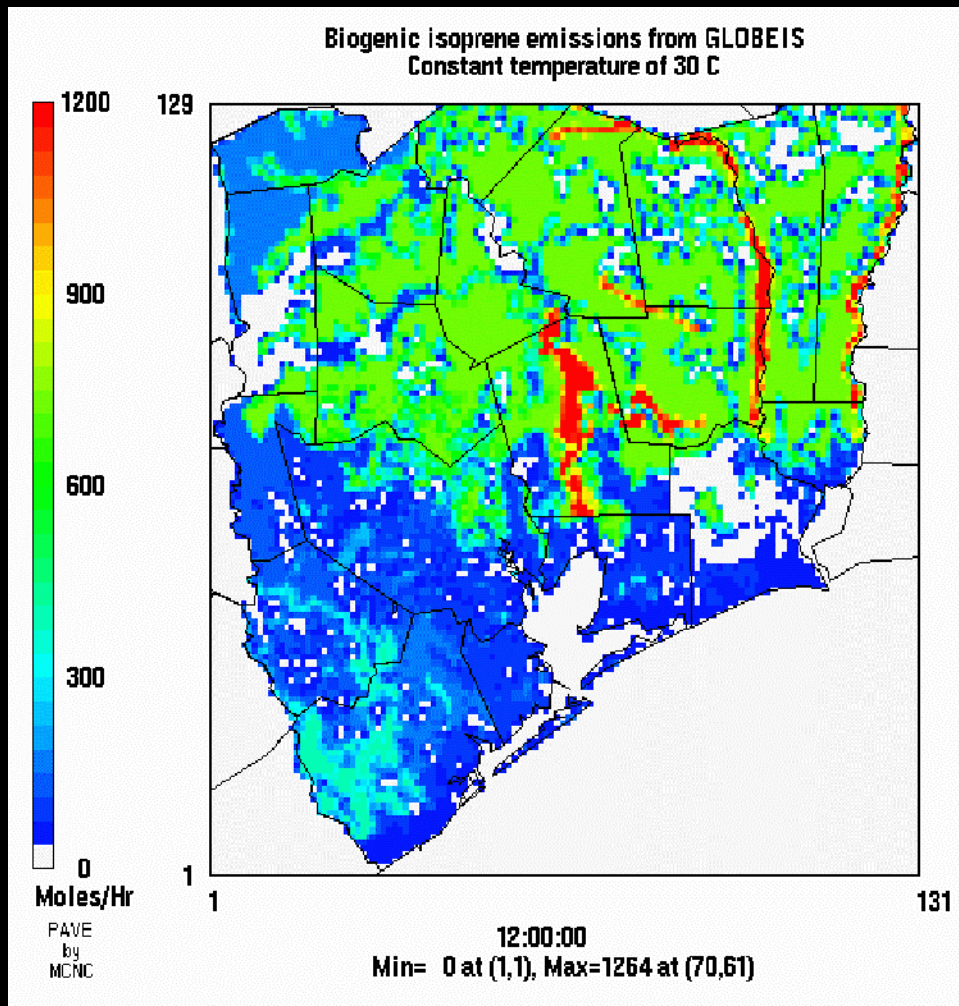


Finding 2:

Based on observational data collected during the TexAQS 2000 Study

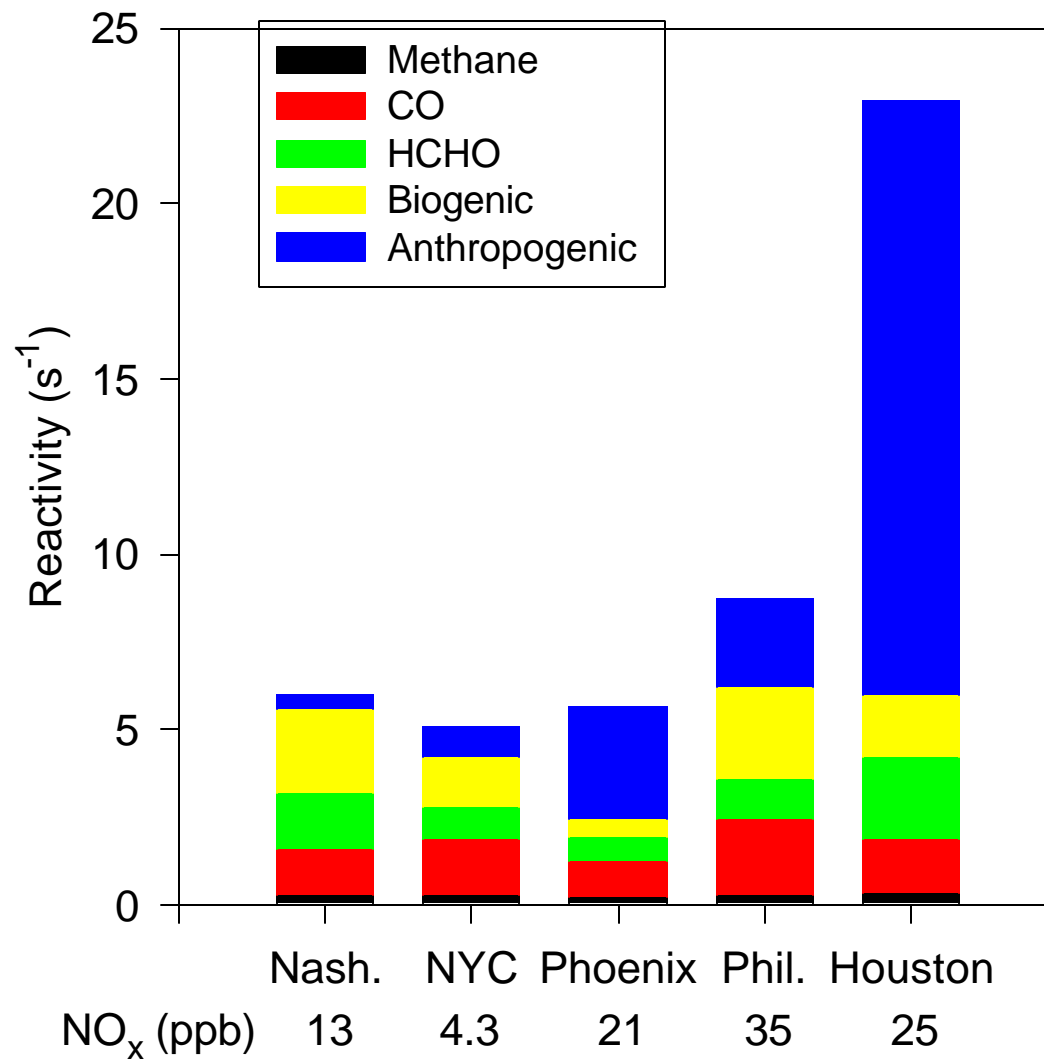
- Biogenic emissions are primarily located north of the Houston urban area, and
- Contribute relatively little to urban ozone formation

Biogenic Emissions in The H/G Area



Finding 3:

- NMOC/NO_x ratios observed by aircraft in industrial plumes, and at ground monitoring stations, are higher than values observed in other urban areas.
- NMOC concentrations observed in industrial plumes in Houston are substantially higher than concentrations observed in other urban areas,
- Observed NO_x concentrations are more typical of other urban areas with significant NO_x point sources



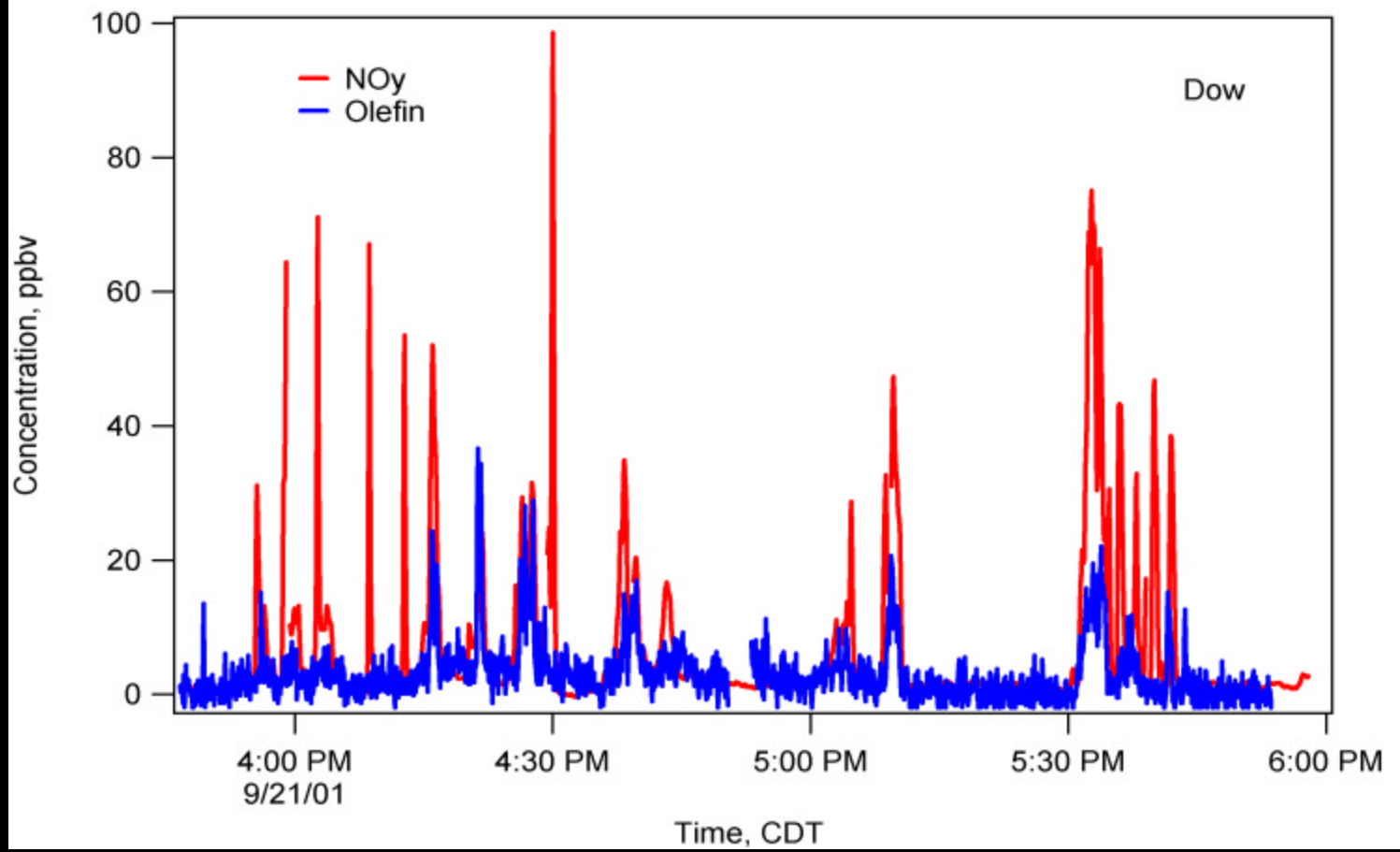
Finding 4:

- Observations made by aircraft suggest that plumes from petrochemical facilities are heterogeneous, with
 - NO_x rich regions,
 - NMOC rich regions,
 - regions rich in both NMOC and NO_x.
- Data on NMOC/NO_x ratios, taken over multiple years at ground monitoring stations in industrial source dominated areas, show substantial temporal variability.

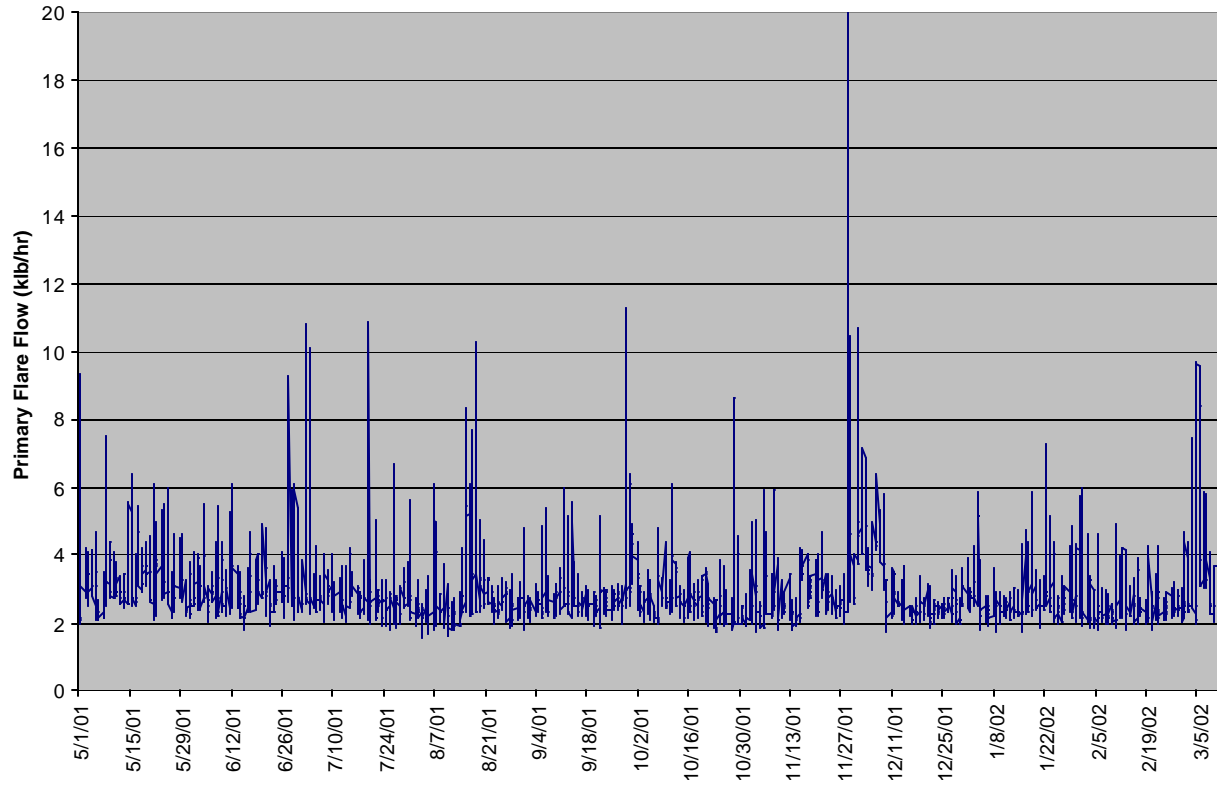
Finding 4 continued:

- Because of this spatial and temporal heterogeneity, individual measurements of NMOC/NO_x ratios must be viewed with caution.
- The ensemble of measurements available clearly indicate that average NMOC/NO_x ratios observed in industrial plumes are higher than documented in current inventories

	NOx kmole/hr	C ₂ H ₄ /NOx mole/mole	C ₃ H ₆ /NOx mole/mole
Sweeny measured	15	3.6	2
Sweeny EI	14	0.01	0.01
Dow B measured	30	1.5	0.5
Dow B EI	31	0.03	0.1



Flare Flow (May 2001 - April 2002)



Finding 5:

Most likely causes of differences between observed NMOC/NO_x ratios and NMOC/NO_x ratios in the inventories are underestimates of emissions from

- fugitive emissions
- flares
- cooling towers

Finding 6:

- Data on NMOC compositions are available at only a few locations
- At these locations, the average composition of NMOC in Houston has remained relatively constant for a decade or more.
- The composition of NMOC downwind of petrochemical facilities shows wide variability.

Finding 7:

- **Since the main uncertainties are in the point source inventory, rather than the area, non-road, on-road or biogenic inventories, spatial resolution of the inventory is not a major area of uncertainty.**
- **Audits performed during the winter of 2001-2002 showed that point source geographic locations are reasonably accurate.**

Finding 8:

- **Ground observations, taken over a period of several years, and other data, suggest that emissions exhibit significant temporal variability.**
- **NMOC/NO_x ratios will be variable, and individual plumes may have very different ozone formation potentials at different times.**
- **It has not been determined if the extent of observed variability is caused by**
 - **changes in emissions or**
 - **changes in meteorological conditions such as wind direction, vertical mixing and atmospheric stability,**

Large differences in ozone yield observed

Transects equally oxidized -
(NO_x/NO_y) ~ 0.20
Electra 08/28/00 flight data

