Questions A, C, D, E - Emissions:
  • **Emission Inventory Targets** (Revisit 18 August discussion)

Questions F, K - VOC vs. NOx Sensitive Photochemistry
  • **Observation based analysis**
  • **Model based analysis**

Questions G, H - Regional Background O$_3$ and aerosol:
  • **Possible Ozone Advection into Texas Aug. 17-18, 2006:**
    Analysis with Rural O3 Sites (Dave Sullivan)

*http://esrl.noaa.gov/csd/2006/rss/*
25 August Preview
Rapid Science Synthesis*

Questions A, C, D, E - Emissions:
• Emission Inventory Targets (Revisit 18 August discussion)

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• Model based analysis

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Questions A, C, D, E - Emissions:

- **Emission Inventory Targets**
  (Stu McKeen, Greg Frost, Dave Allen)

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NEI 1999 = EPA NET-99 Version Point Emissions

TCEQ 1999 = TCEQ Point Emissions used in 2000

TCEQ 2005 = Latest TCEQ VOC Emissions speciated as they were in 1999

UT = 13:00-14:00 CST emissions (elevated point sources plus fugitive)

Forecast models: NEI 1999 with all ethylene and propylene emissions scaled by representative 2000 observed/inventory ratio
Observation-based methods (OBMs) for analyzing urban/regional ozone production and Ozone-NOx-VOC sensitivity.*

Dr. Sanford Sillman
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*http://www-personal.engin.umich.edu/~sillman/obm.htm

Apply to TexAQS 2000 Electra data
**Observation-based methods (OBMs) for analyzing urban/regional ozone production and Ozone-NOx-VOC sensitivity.**

Based on 6 modeling studies throughout the US

<table>
<thead>
<tr>
<th>Location</th>
<th>Photochemistry</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nashville</td>
<td>Modified Lurmann et al., 1986</td>
<td>Sillman et al., 1998</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>“</td>
<td>Sillman, 1995</td>
</tr>
<tr>
<td>Northeast Corridor</td>
<td>“</td>
<td>Sillman, 1995</td>
</tr>
<tr>
<td>Atlanta</td>
<td>CB4 (Gery et al., 1989)</td>
<td>Sillman et al., 1997</td>
</tr>
<tr>
<td>San Joaquin</td>
<td>“</td>
<td>Sillman et al., 2001</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>“</td>
<td>Godowitch et al., 1994;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sillman et al., 1997</td>
</tr>
</tbody>
</table>

Analysis focused on maximum O₃, not 8-hour average

*http://www-personal.engin.umich.edu/~sillman/obm.htm
Sillman: Observation-based methods (OBMs)
Ozone (ppbv)

NOx-sensitive

Mixed

VOCs-sensitive

NOx titration

HNO$_3$ (ppbv)

Houston Area

NOx sensitive to mixed

Sillman: Observation-based methods (OBMs)
Sillman: Observation-based methods (OBMs)
Sillman: Observation-based methods (OBMs)

NOy - NOx (ppbv)

Ozone (ppbv)

NOx sensitive to mixed

Houston Area

VOC-sensitive

Mixed

NOx-sensitive

NOy - NOx (ppbv)
Sillman: Observation-based methods (OBMs)
Sillman: Observation-based methods (OBMs)

Dallas Area

Mixed

NOy - NOx (ppbv)

Ozone (ppbv)

NOx-sensitive

Mixed

VOC-sensitive

NOx titration
Sillman: Observation-based methods (OBMs)

Ozone (ppbv) vs. HNO$_3$ (ppbv) diagram showing:
- NOx-sensitive regions
- Mixed regions
- VOC-sensitive regions

Rest of East Texas

NOx sensitive to mixed
Sillman: Observation-based methods (OBMs)

- NOy - NOx (ppbv)
- Ozone (ppbv)

- Rest of East Texas
- NOx sensitive to mixed
Questions F, K - VOC vs. NOx Sensitive Photochemistry

• Observation based analysis

Observation-based methods (OBMs) for analyzing urban/regional ozone production and Ozone-NOx-VOC sensitivity.*

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• TexAQS 2000 Electra data indicates generally NOx sensitive to mixed except Dallas area approaches VOC sensitive.
• Compare to 2006 data with presumably reduced emissions.
Questions F, K - VOC vs. NOx Sensitive Photochemistry

• Model based analysis (Kim, Frost, Hsie, Trainer, Peckham, Grell)

Compare modeled NO$_2$ and O$_3$ levels using emissions from NEI 1999 vs. NEI 1999 updated with 2004 CEMS data

Analysis focused on maximum 8-hour average O$_3$
• Model based analysis (Kim, Frost, Hsie, Trainer, Peckham, Grell)

Substantial NOx Reductions throughout East Texas
Model based analysis (Kim, Frost, Hsie, Trainer, Peckham, Grell)

4th highest 8 hour average O$_3$ in 2004

Significant Ozone Reductions in Dallas and other East Texas, but not Houston
Questions F, K - VOC vs. NOx Sensitive Photochemistry

- Observation based analysis - Houston Area NOx sensitive to mixed
- Model based analysis - Houston Area O₃ does not respond to point source NOx reductions

Devil’s Advocate - Is any of this analysis useful? Should we just reduce both NOx and VOC?
Questions G, H - Regional Background $O_3$ and aerosol:

- Possible Ozone Advection into Texas Aug. 17-18, 2006: Analysis with Rural $O_3$ Sites (Dave Sullivan)
Possible Ozone Advection into Texas Aug. 17-18, 2006: Analysis with Rural O3 Sites

Rapid Science Synthesis
Put together quickly for this call, subject to significant change.
Dave Sullivan sullivan231@mail.utexas.edu
(512)471-7805
Onset of High O3 Aug. 16

- First O3 Exceedances Since July 23 hit on Aug. 16 (Houston area).
  - Right on time, based on historical data!
- On Aug. 17, East TX had exceedances:
  - Wamba, Longview in NE TX
  - Sabine Pass, Port Arthur in SE TX
  - Houston area (of course)
- On Aug. 18, DFW had exceedances.
Distribution of O3 along Flux Lines

- Along NE, high O3 on 8/17
  - Clarksville 77 ppb, Wamba 86, Panola 81
- Along E, moderate O3
  - San Augustine 60 ppb, Newton 61, Mauriceville 54
- Along SE Gulf Coast, high O3
  - Sabine Pass 92 ppb
- IMAQS Forecast predicts high O3 one day earlier.
East Texas Pollutant Flux Lines
Back-Trajectories

- Ran Hysplit with FNL data sets, as EDAS40 were unavailable on 8/23.
- Fetch from northeast on 8/17, east on 8/18
- Following maps show trajs color-coded by rounded 8hr O3 daily peak at flux sites
  - 48-hr back traj from 20 Z start time
  - using model vertical velocity,
  - 10, 500, & 1000 m AGL starting pts
  - Sites = Clarksville, Wamba, Panola, Karnack, San Augustine, Newton, Mauriceville.
AIRNOW Suggests Possible Advection from Memphis Area

• 8 hr daily maxima across U.S. from Aug. 14 – 22
TX, LA, OK, AR O3 8hr Maxima
Aug. 17, 18 from AIRNOW Data
National AIRNOW Contours
(Using TexAQS Rural Sites)

Aug. 14 - 22
• Preliminary conclusion - air moved into NE TX on 8/17 and contributed to DFW exceedances on 8/18.