

Modeling Northeast Texas Ozone for the Summer of 2002

Presentation to the NETAC
Technical and Policy Committees

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ENVIRON

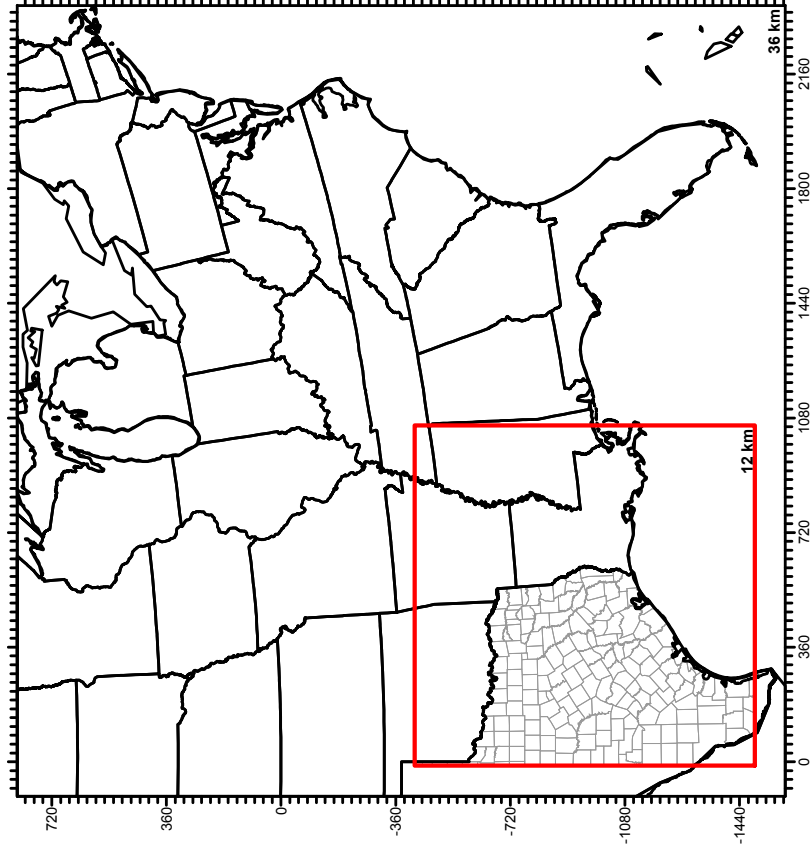
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Objectives

- Develop seasonal ozone model for summer 2002
- Evaluate model performance using EPA guidelines
- Assess contributions of regional transport and local sources on high ozone days in NE Texas

The 2002 Seasonal Ozone Model

- MM5 meteorology from CENRAP, IDNR
- Model run for May-September, 2002
- 36 km/12 km nested grids in CAMx
- Emissions based on 2002 CENRAP EI with updated on-road mobile sources

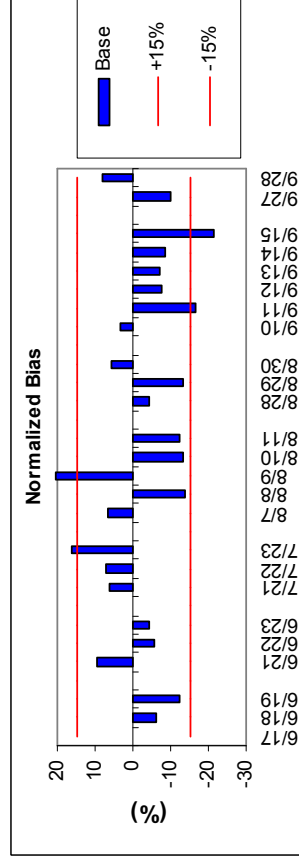


Model Performance Evaluation

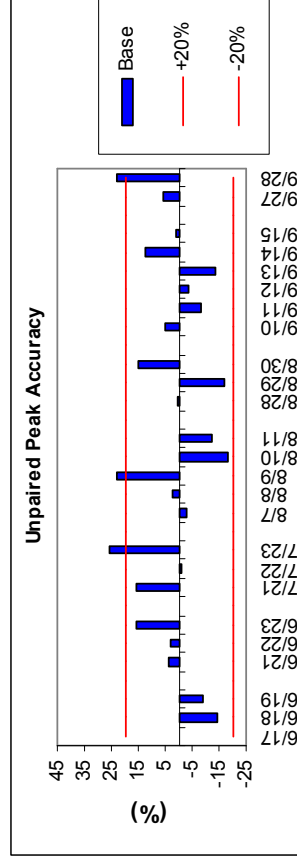
- Examine performance during high 8-hour ozone events
- Daily statistics/EPA benchmarks averaged over all NE Texas monitors
- Compare observed and predicted time series of ozone at each monitor in NE Texas
- Focus today on Episode 1, which includes a multi-day high ozone period

Comparison with EPA Benchmarks

Normalized Bias (%)



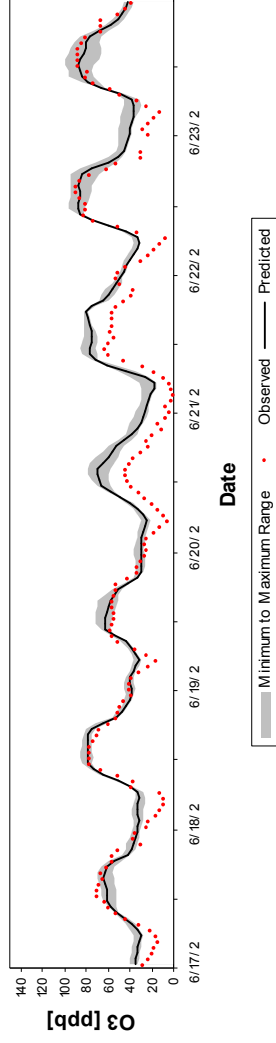
Unpaired Peak Accuracy (%)



- Model within benchmark for 22/26 days for NB and UPPA
- Within benchmark for all days for normalized error (not shown)
- No clear over- or underprediction bias

1-hour Ozone Time Series for Longview and Karnack

481830001: Longview C19 491.000 -813.000



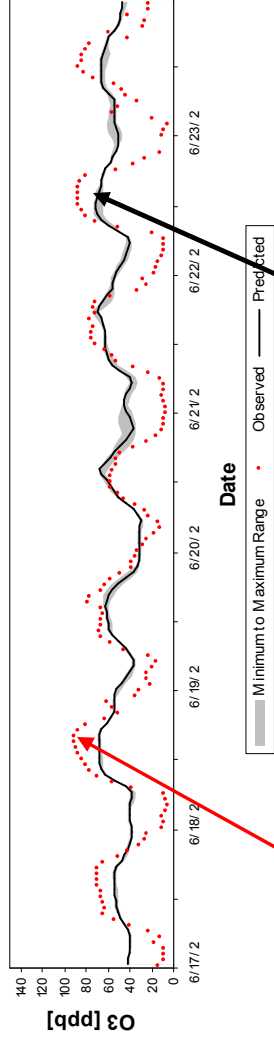
- Episode 1: June 18-22.

• Typical performance

• Good performance at Longview

• Underestimation of peaks at Karnack

482030002: Karnack C85 540.000 -778.000



Red: Observed **Black: CAMx**

– low on O₃ transport?

Model Performance Summary (1)

- Model meets EPA benchmarks on 22 out of 26 high ozone days. Good performance.
- Model could be further developed for evaluating control strategies in Northeast Texas.
- The model reproduces observed hourly ozone time series at Tyler and Longview well.
- Model more effective in simulating high ozone periods than low ozone periods.

Model Performance Summary (2)

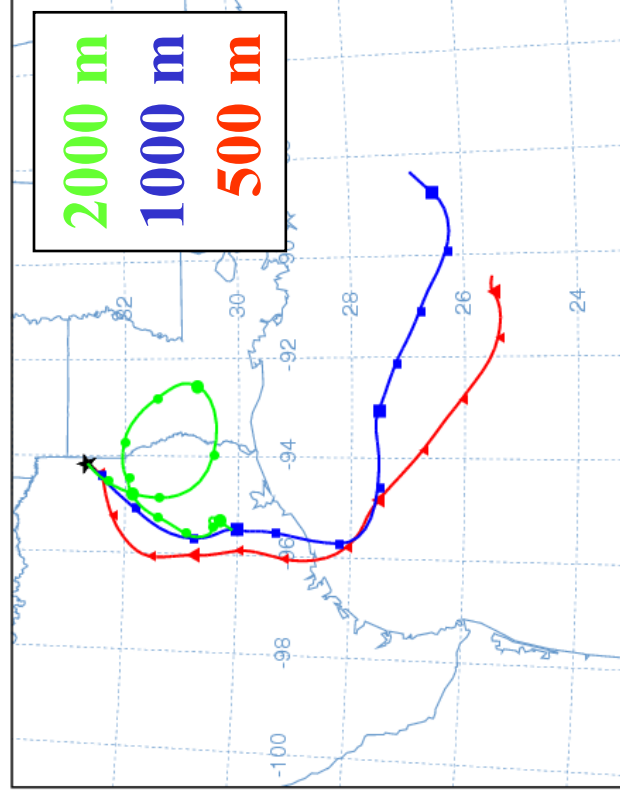
- Model underestimates peak hourly surface NOx concentrations associated with local sources and plume impacts; most pronounced at Karnack
 - Need 4-km grid to study local point source impacts
- At Karnack, ozone peaks are consistently underestimated. The reason for this is unclear, but should be investigated

Regional Transport on 8-Hour Ozone Exceedance Days

- Will local control strategies be effective?
- Assess role of transport of ozone and precursors from regions outside of NE Texas
- Ozone transport analyzed using CAMx
Anthropogenic Precursor Culpability
Assessment (APCA) source apportionment tool

Local Event: 85 ppb at Karnack, July 22

Karnack Monitor



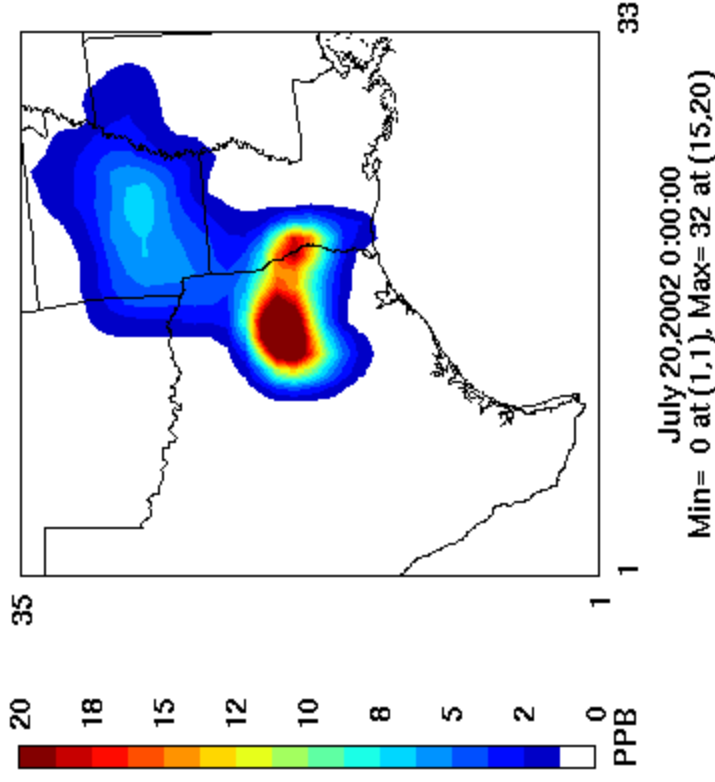
HYSPLIT Model 72 hour
back trajectories

Source Regions ≥ 1 ppb

1. NE Texas (38 ppb)
2. Houston (4 ppb)
3. Mexico/Gulf (2 ppb)
4. Central Texas (1 ppb)
5. South Louisiana (1 ppb)

- Light winds mean local sources play key role
- Largest Houston contribution during 2002

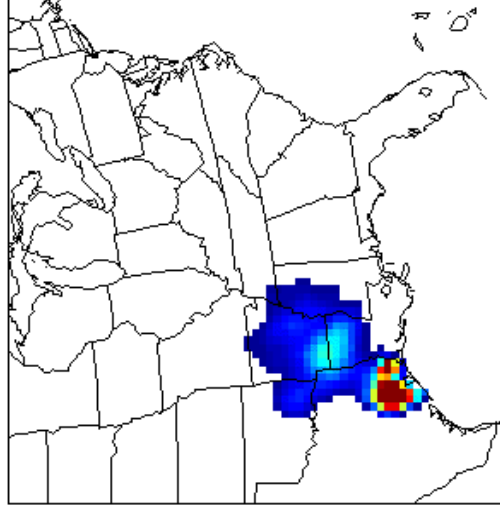
Overnight Ozone Transport From Houston to Northeast Texas on July 20-21



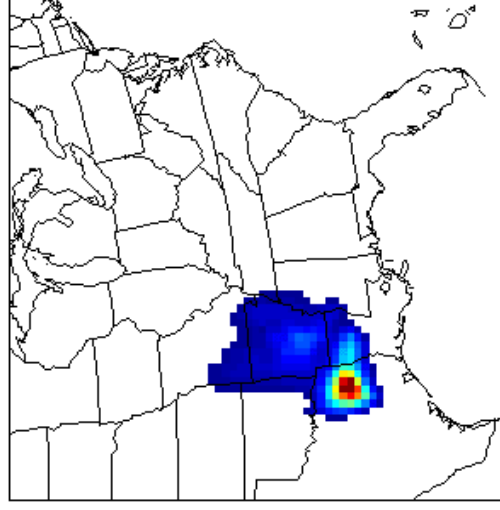
- On July 22, Karnack monitor measures 85 ppb

Houston's Influence on Northeast Texas Ozone on July 21/22, 2002.

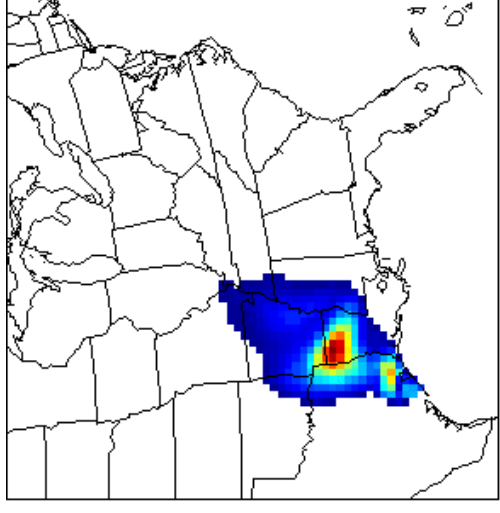
July 21, 3 pm



July 22, 3 am



July 22, 9 am

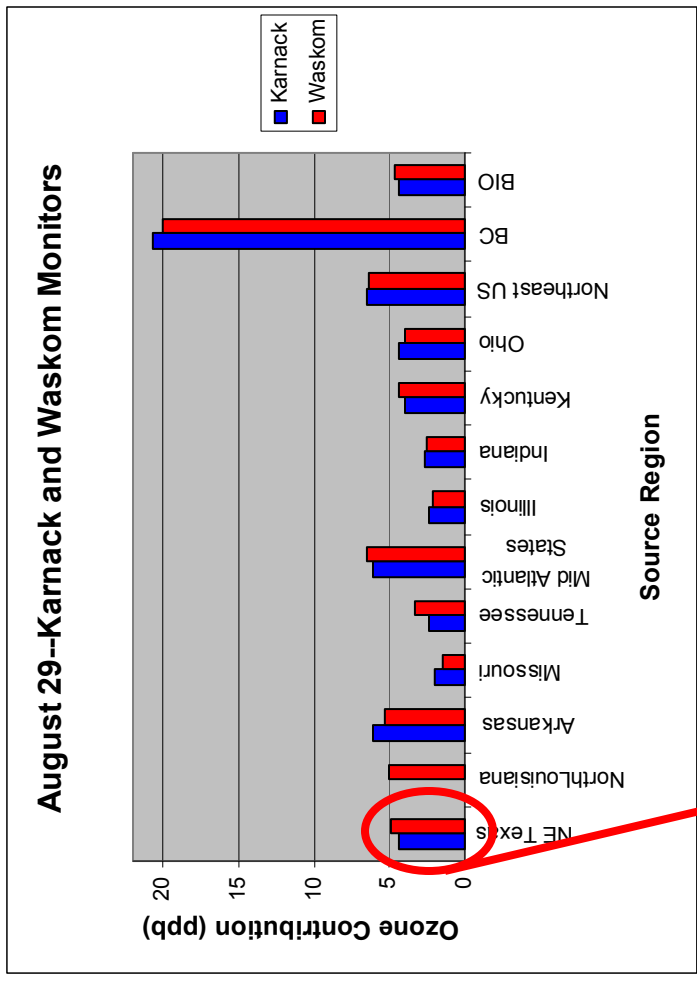
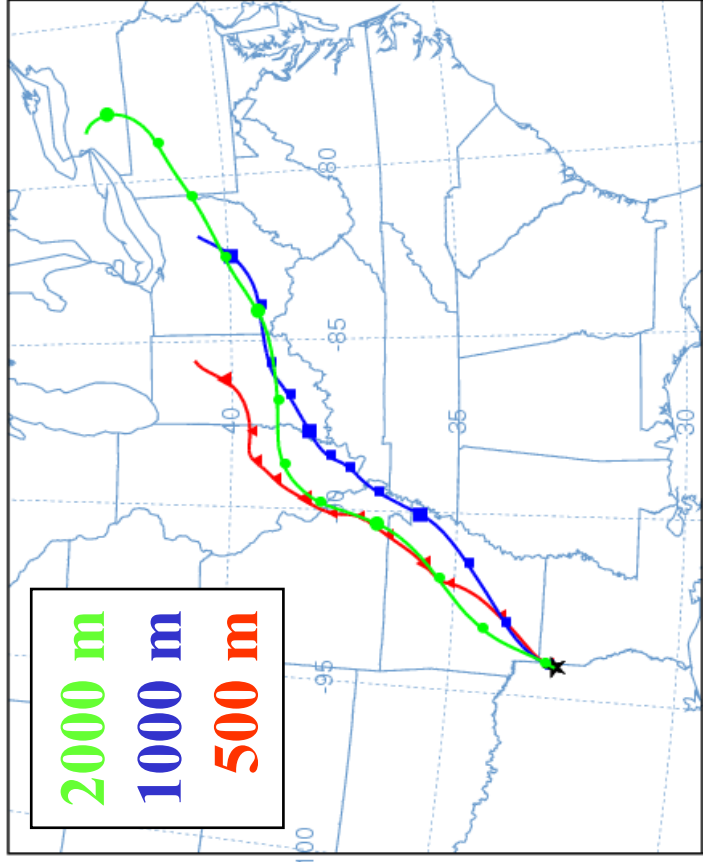


- Region of enhanced ozone travels north toward NE Texas.
- Arrives at monitor area on the morning of July 22.
- Contribution of 14 ppb at 3 am. Houston contribution at time of 8-hour peak is 4 ppb, mainly northeast of Karnack.

Regional Transport Event: 88 ppb at Karnack and 86 ppb at Waskom, August 29

Karnack Monitor

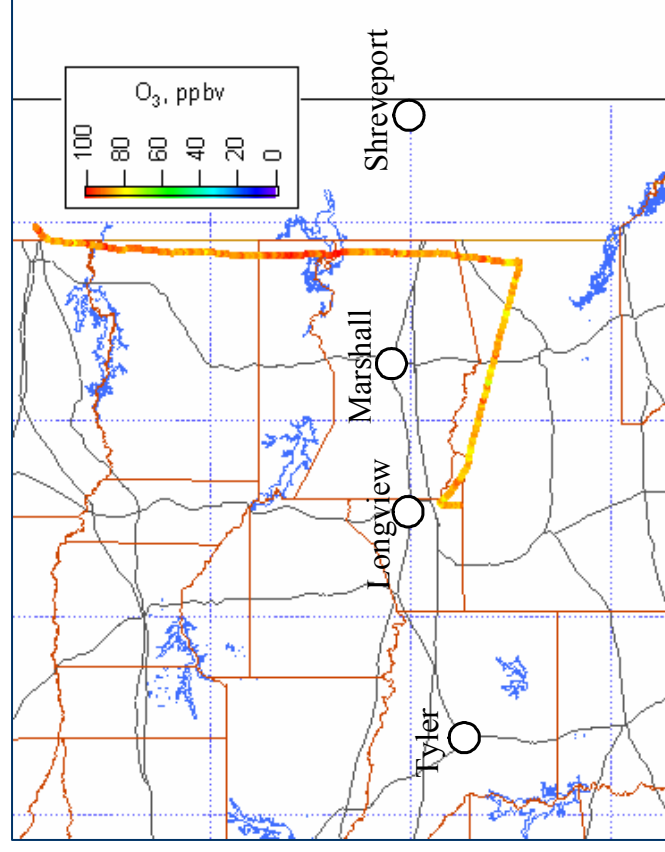
CAMx: Karnack (69 ppb), Waskom (71 ppb)



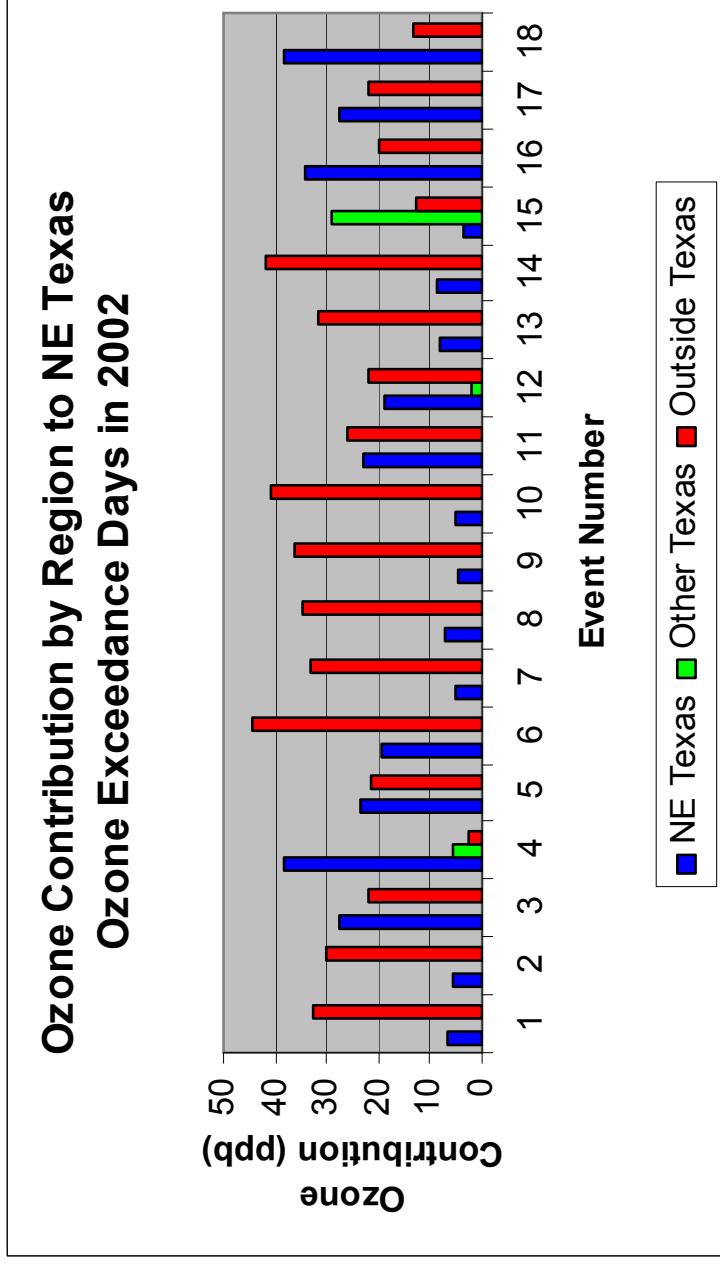
- HYSPLIT Model 72 hour back trajectories
- ~5 ppb from NE Texas sources
- Transport from AR, LA, KY, MO, OH, IL, TN, Mid-Atlantic, NE U.S.

NETAC Aircraft Data for 29 August, 2002

- Data from NETAC sponsored flight by Baylor's Cessna 172
- Observed 80-90 ppbv of ozone aloft at Texas border
- 2002 modeling finds that ozone was transported from as far as the Ohio Valley and Northeastern US



Transport or Local Sources?



- In **11 of 18 events**, sources outside TX contribute more to high NE TX ozone than local sources
- Other sources within TX generally less important

Conclusions

- 2002 model exhibits good performance during high ozone events
- Could be developed for control strategy testing, but conditions are 4 years ago and no 4-km meteorology available
- Both local sources and transport play important roles in high ozone events in NE Texas
- Local control measures likely to be effective