Why UH Moody Tower Site is a special site…..

Bernhard Rappenglueck

with contributions from:

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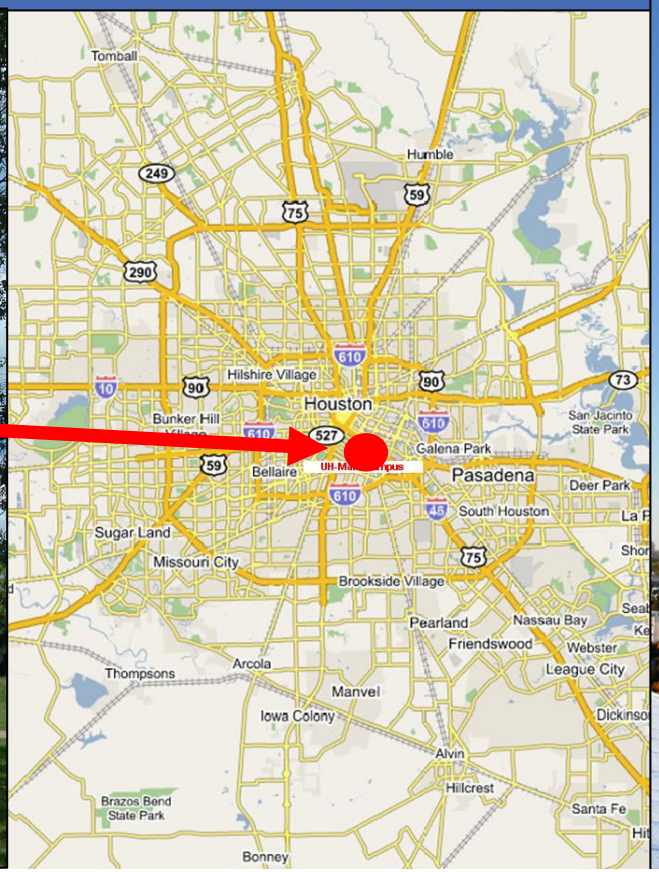
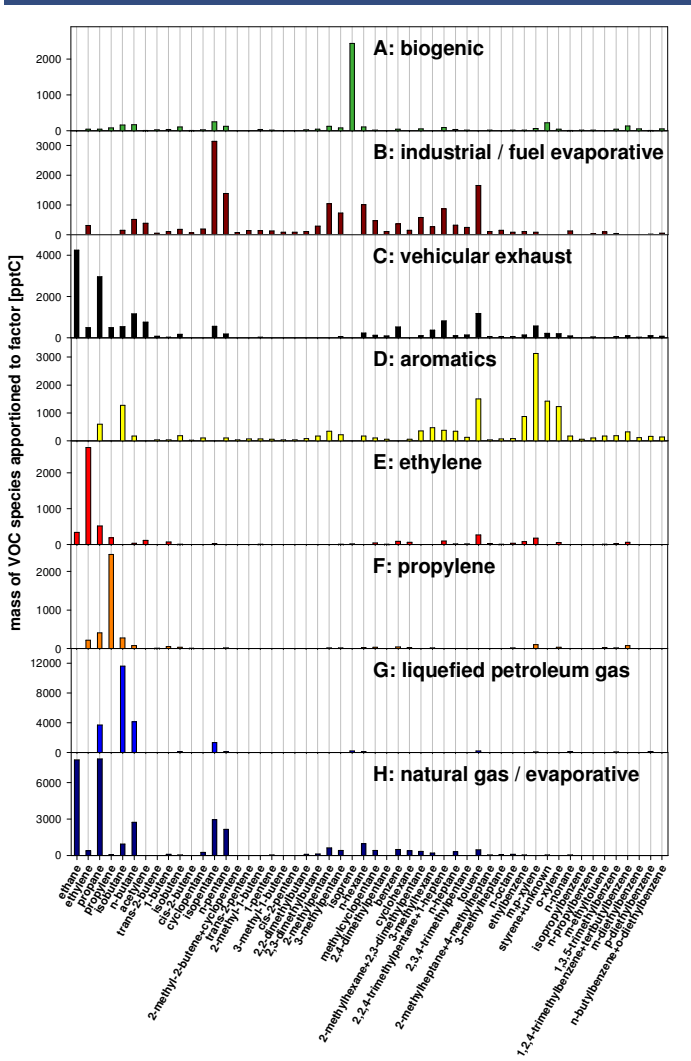
Department of Earth & Atmospheric Sciences
Institute for Multi-dimensional Air Quality Studies (IMAQS)
University of Houston (UH)

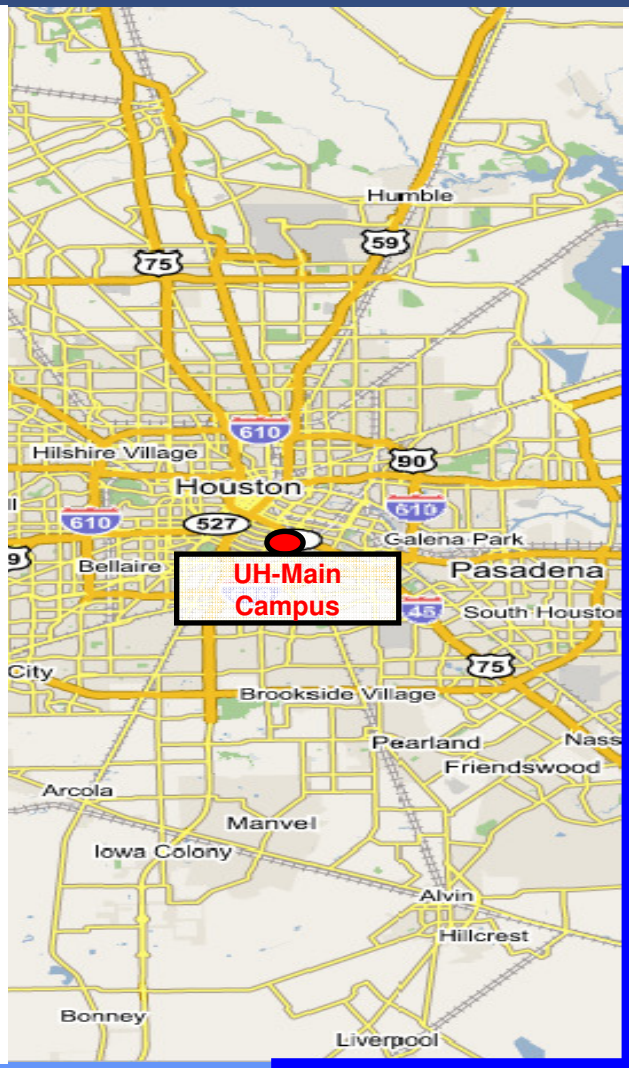
Evaluation of Modeling with UH Main Campus – Moody Tower Chemistry Super Site Data

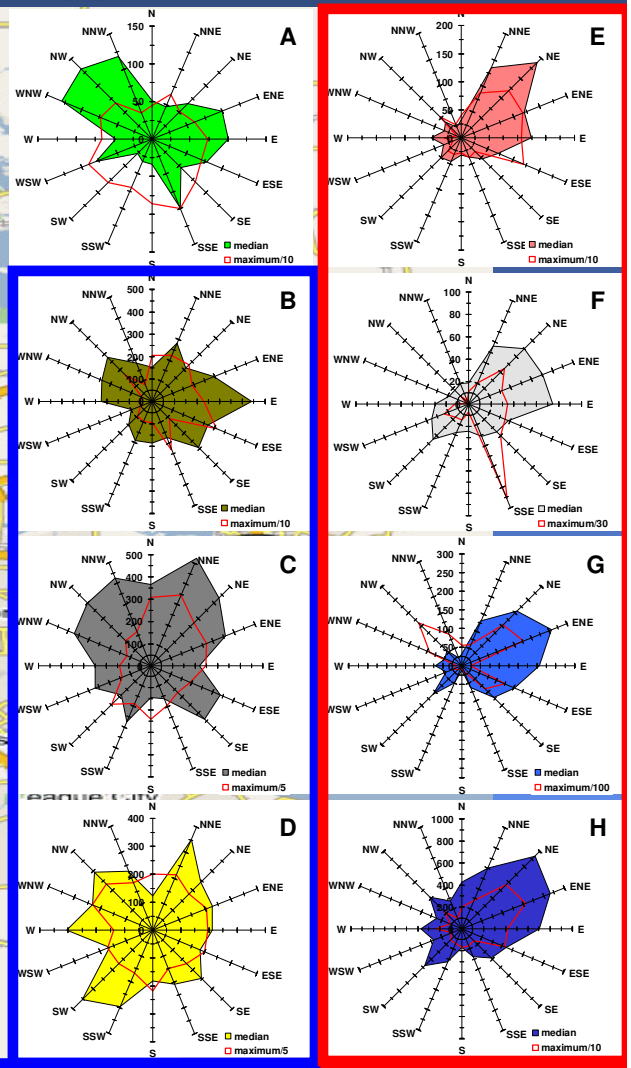
- student dormitory on UH campus
- south of downtown Houston
- 60 m a.g.l.



VOC speciation at UH Moody Tower– under different wind directions





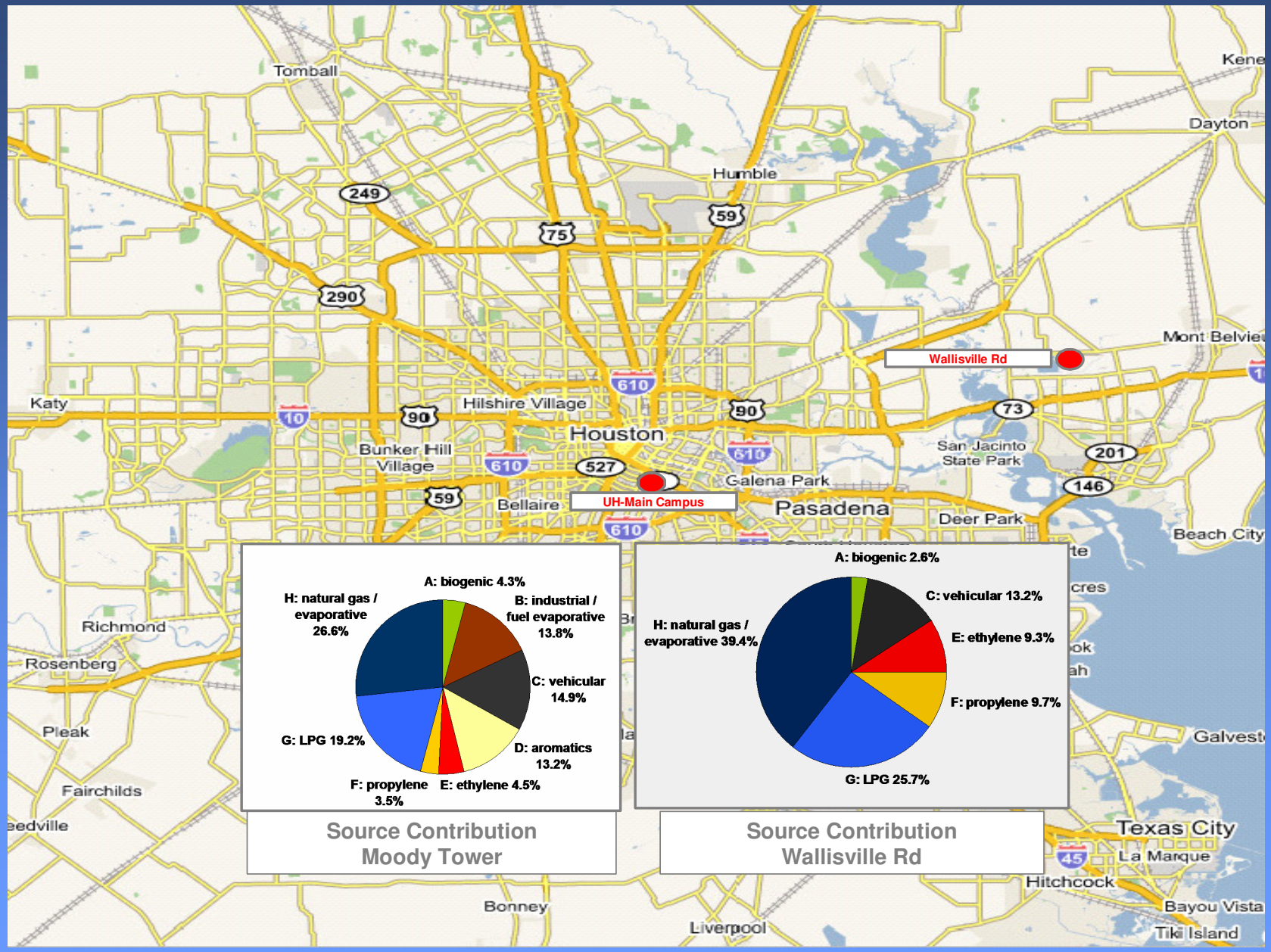


VOC source composition profiles for eight factors resolved by PMF analysis at the Moody Tower

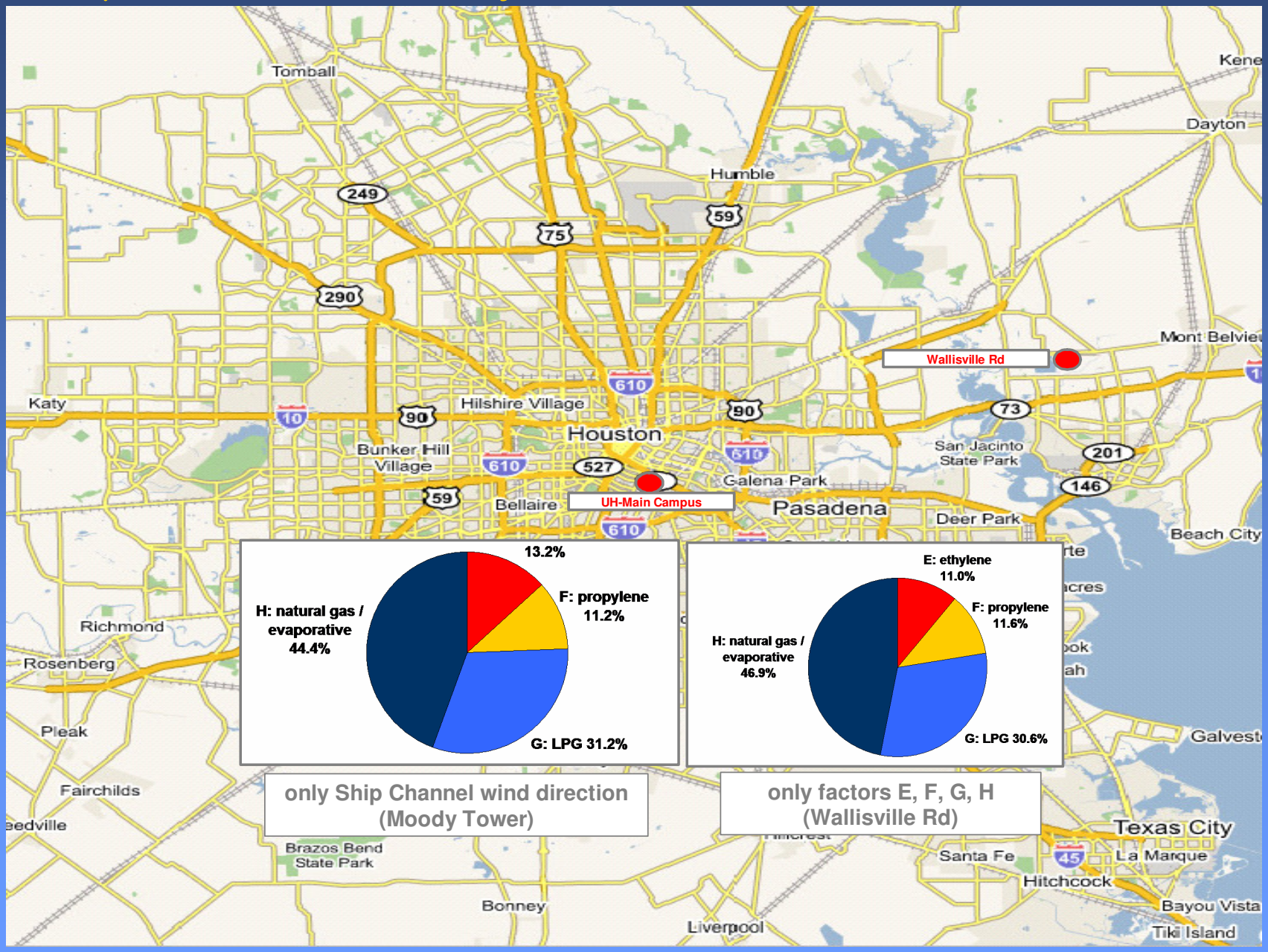
Mobile and urban sources (B/C/D) show elevated values from northern directions coinciding with urban air masses.

Petrochemical, refining and evaporative sources (E/F/G/H) clearly associated with Ship Channel directions.

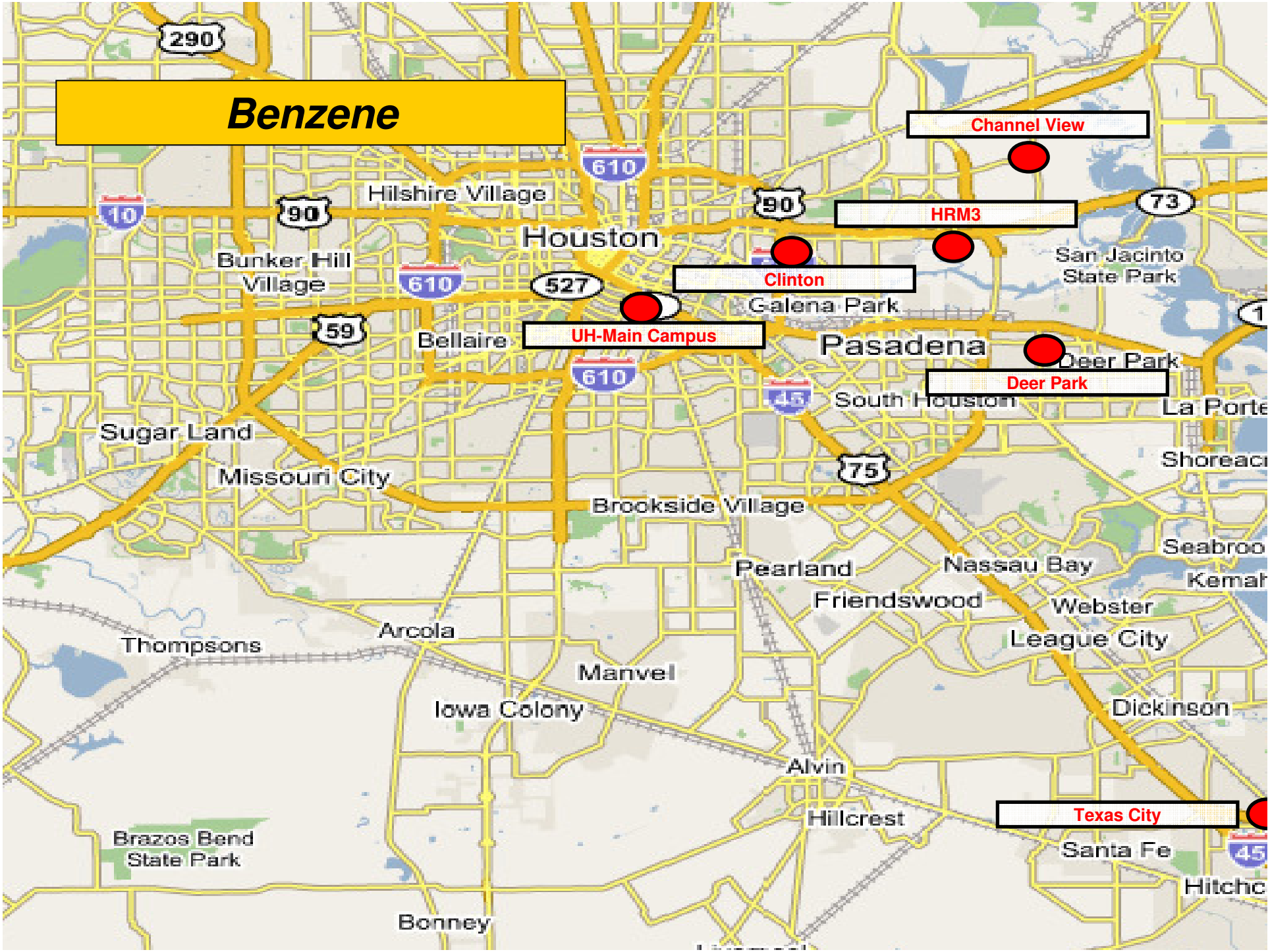
VOC speciation at UH Moody Tower– when winds are from other places



VOC speciation at UH Moody Tower– when winds are from industrial sites



Benzene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Bellaire
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South Houston
La Porte
San Jacinto State Park
Sugar Land
Missouri City
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Pearland
Nassau Bay
Friendswood
Webster
League City
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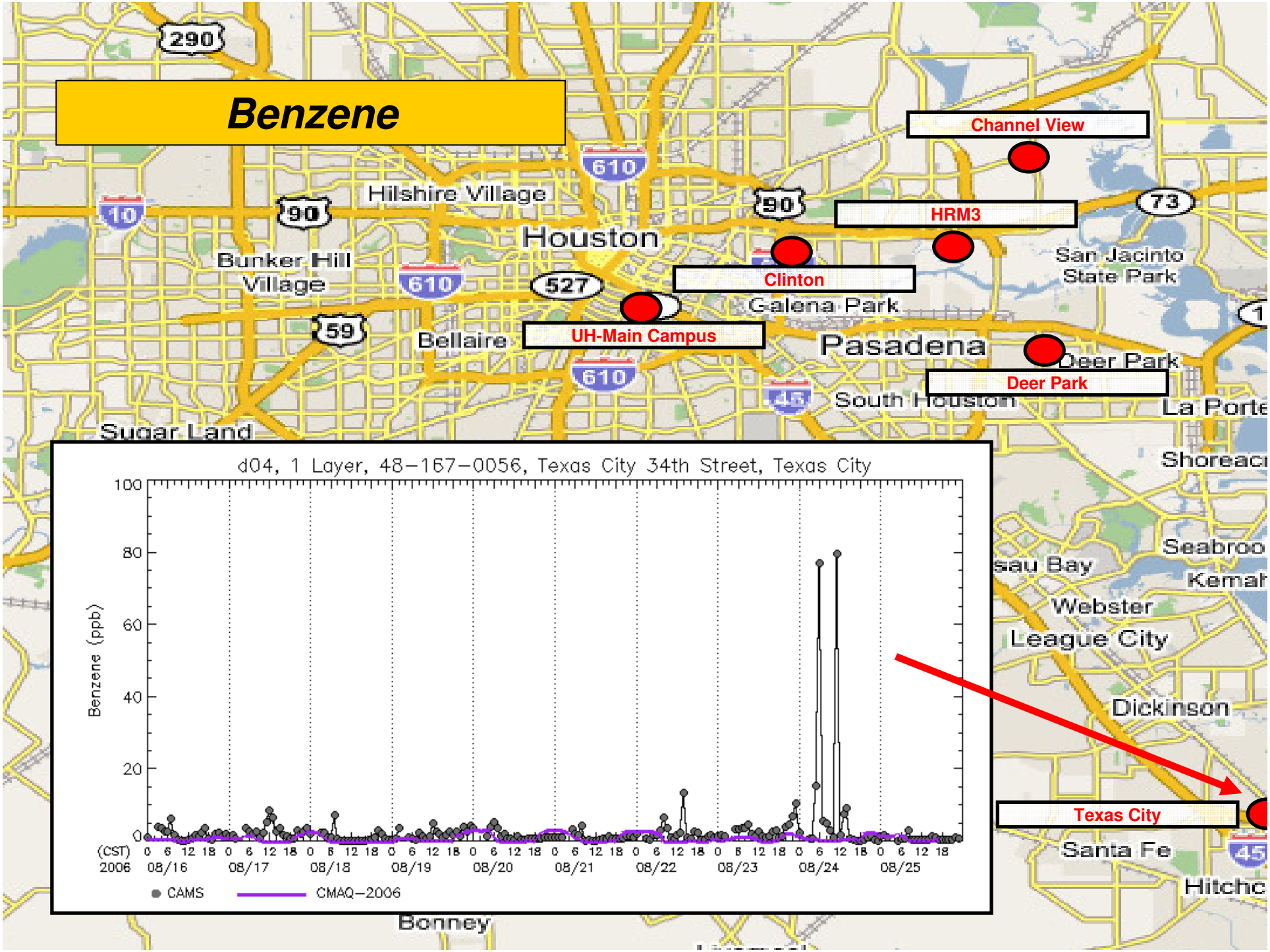
Benzene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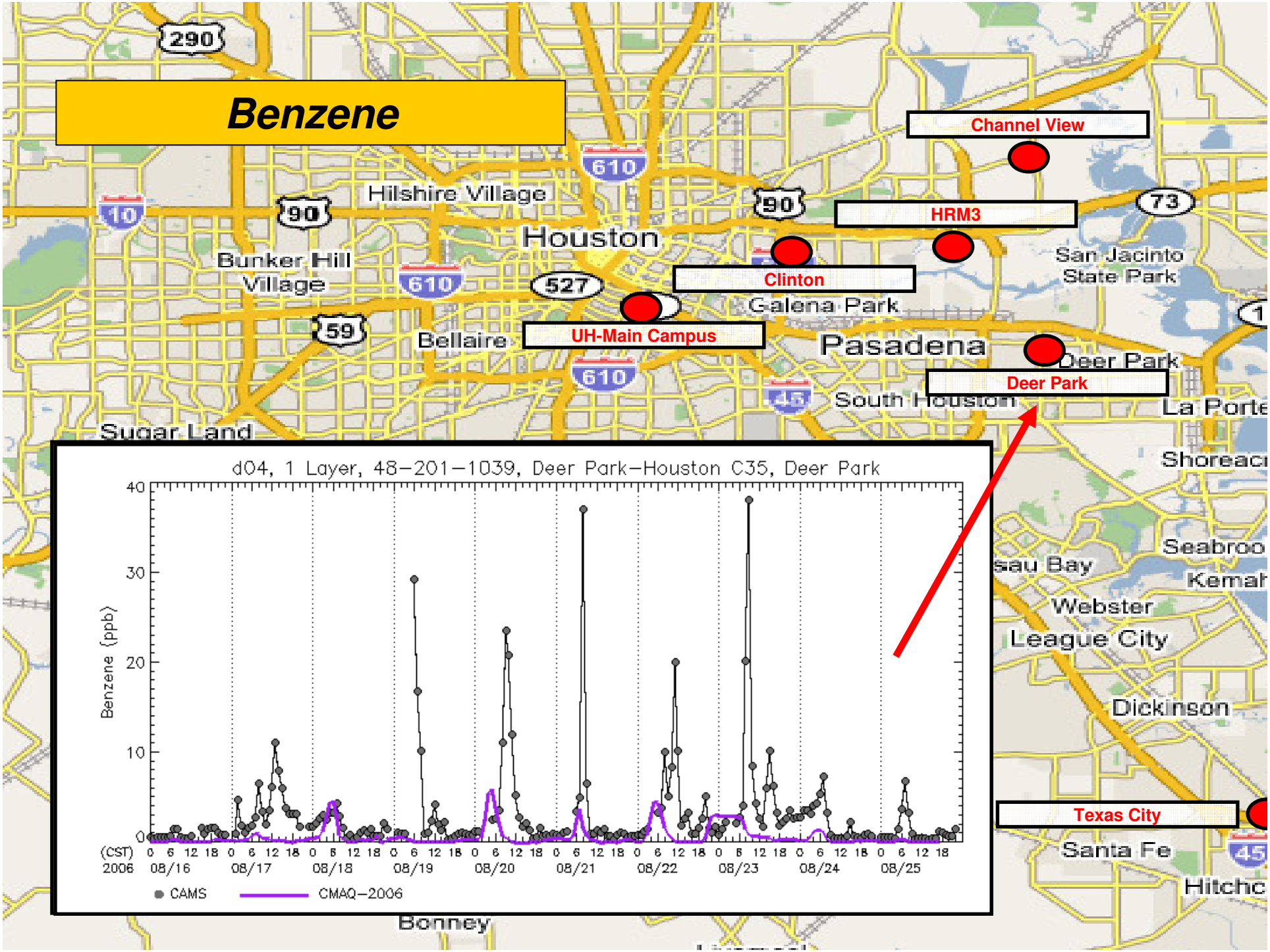
Benzene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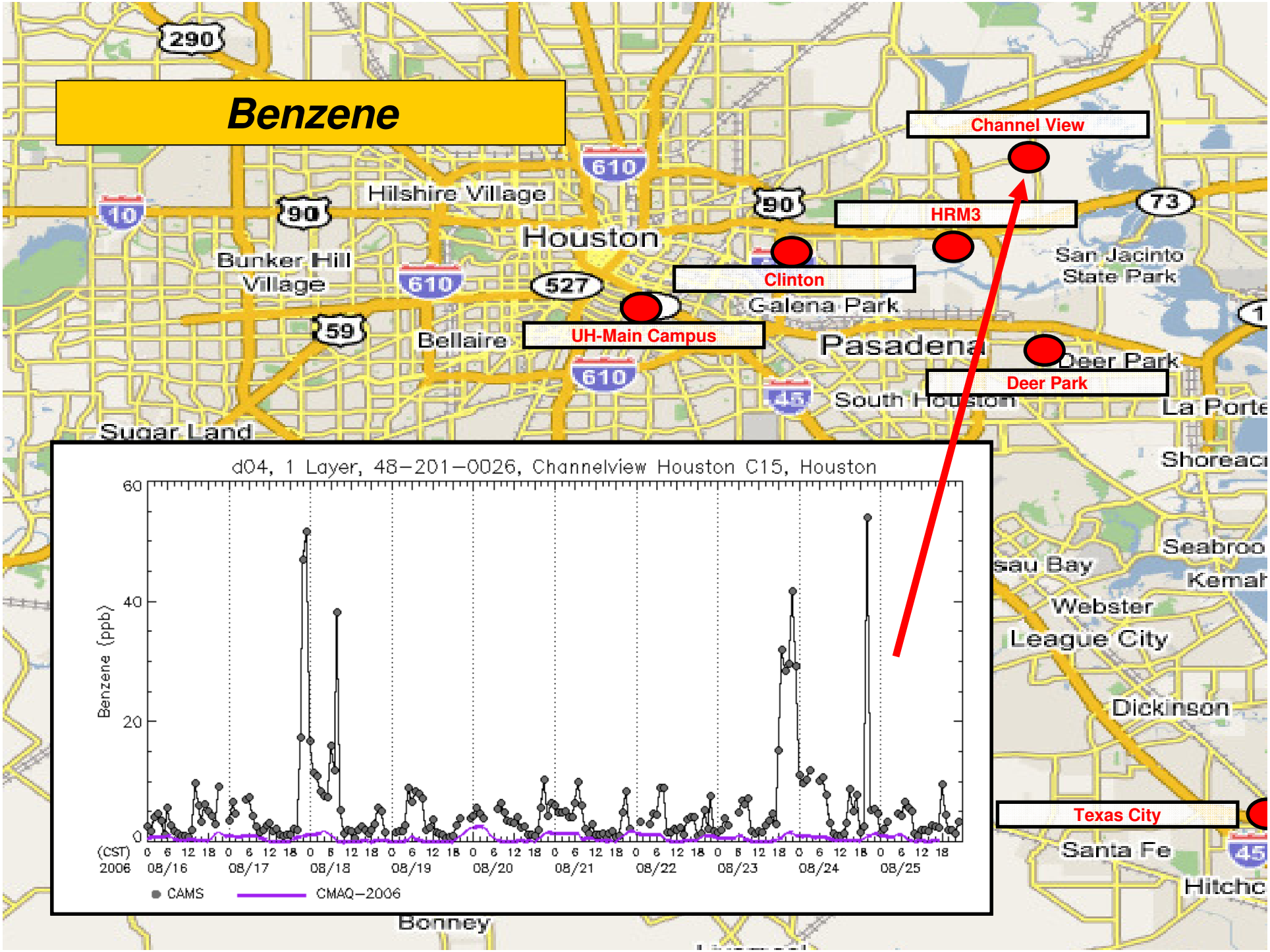
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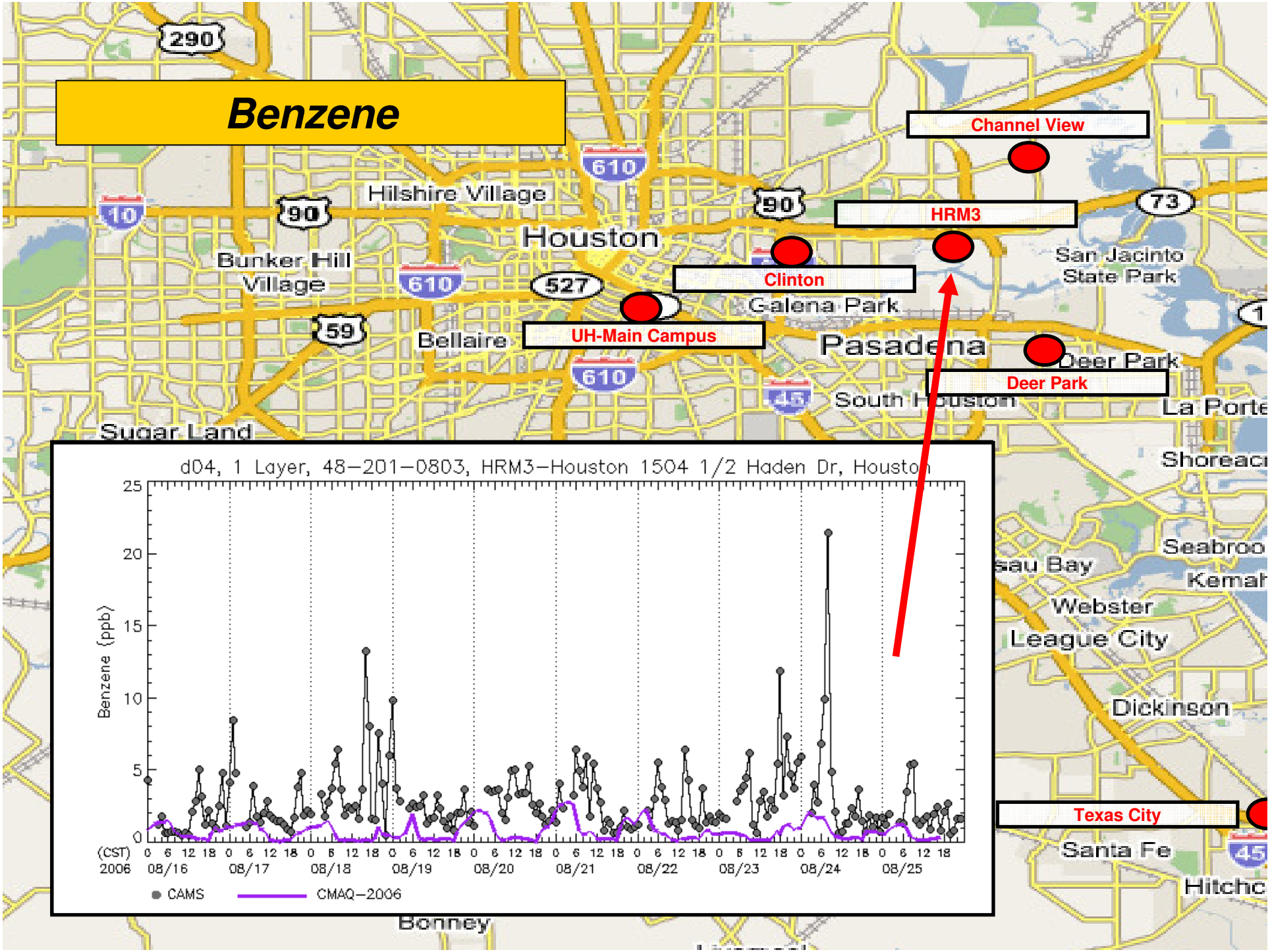
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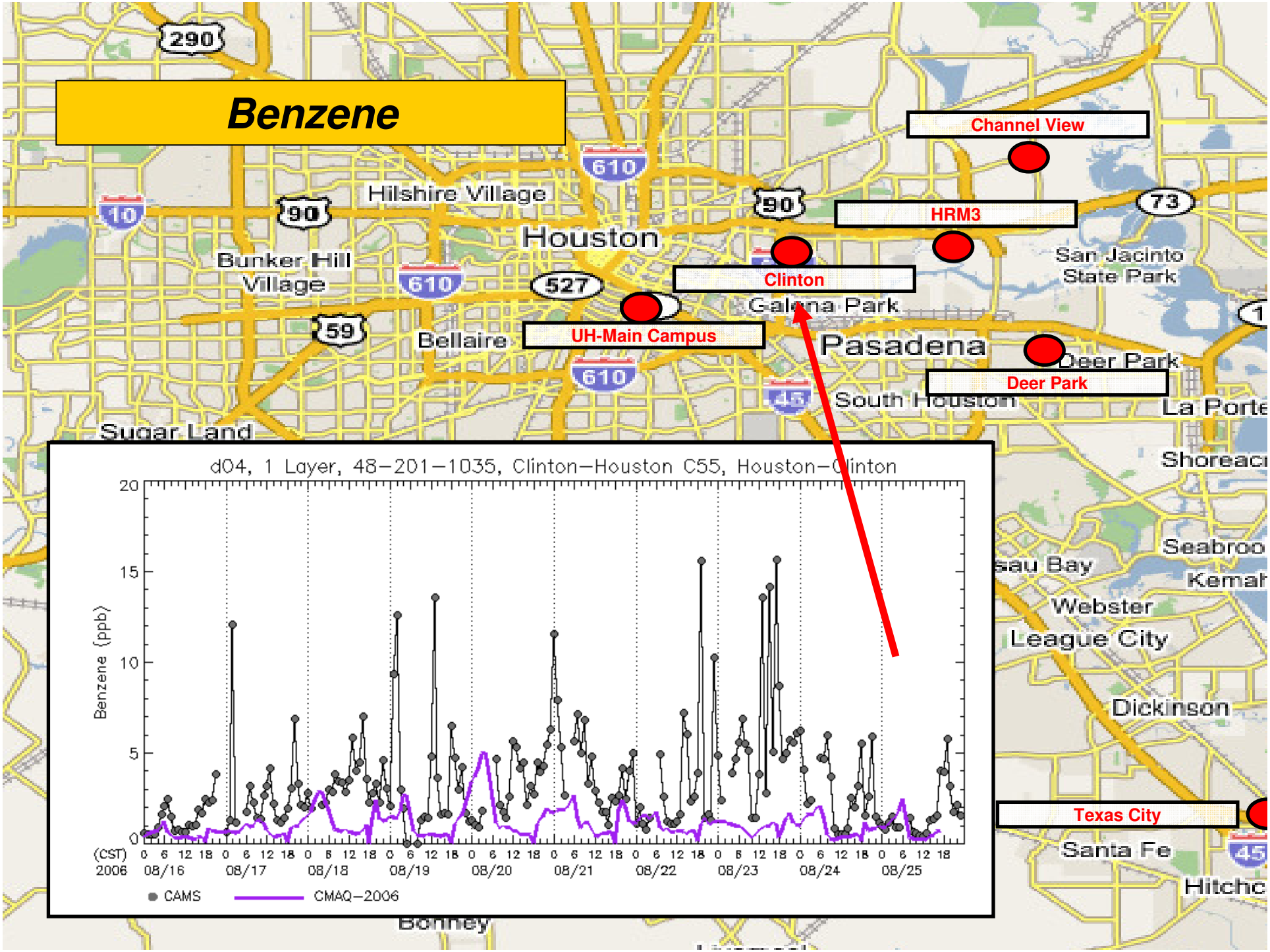
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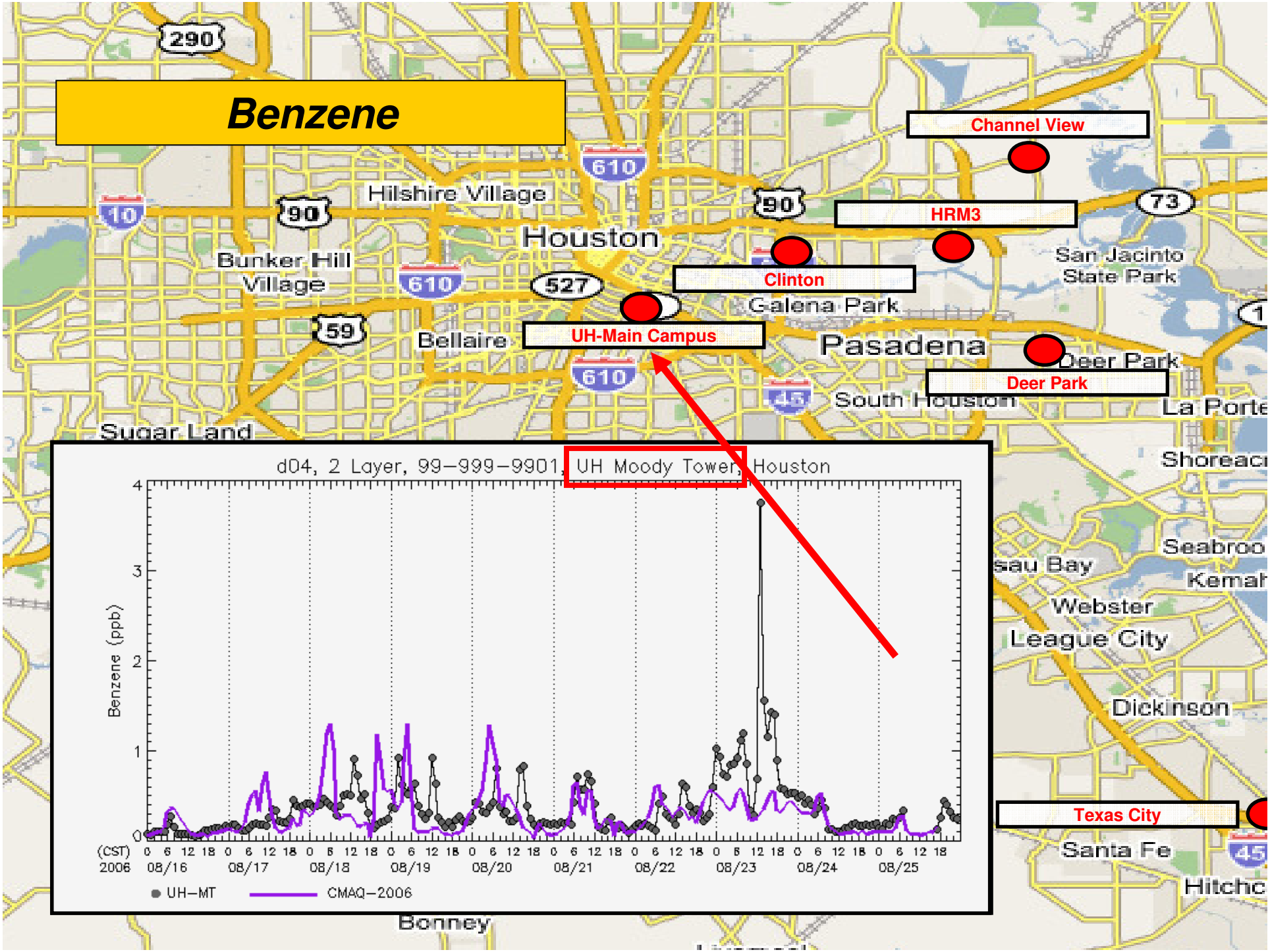
Benzene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Peroxyacyl nitrates (PANs)

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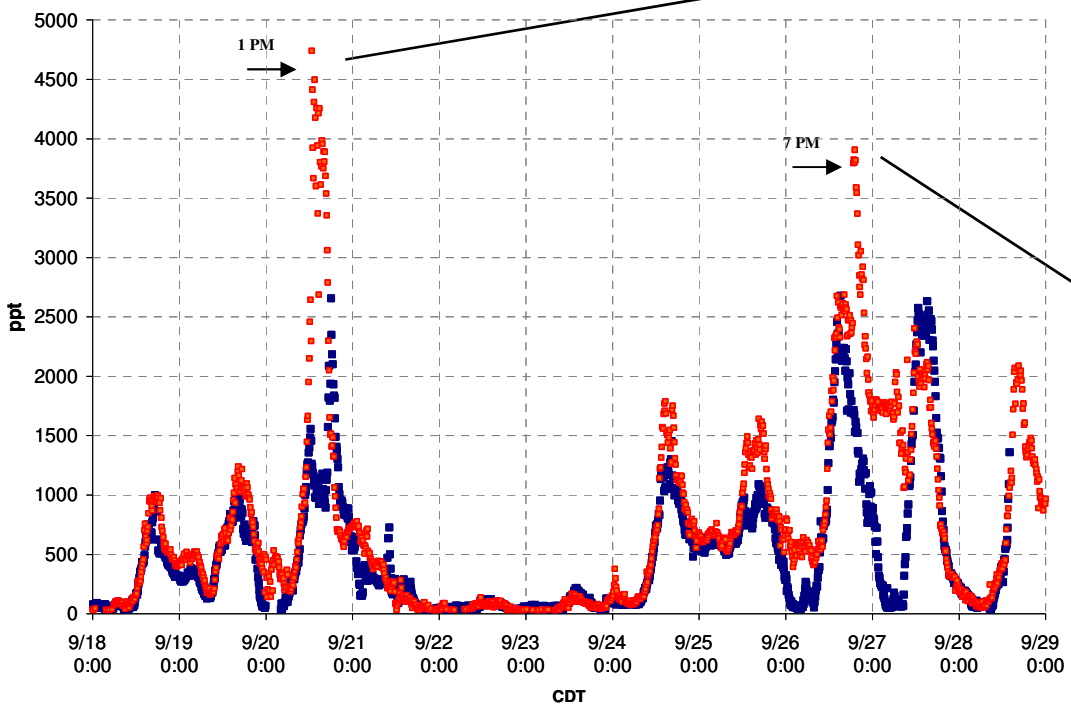

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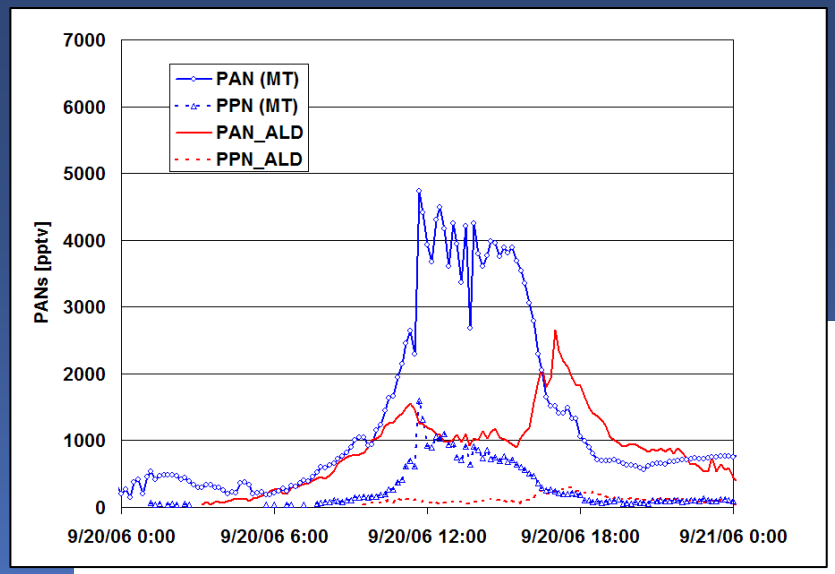

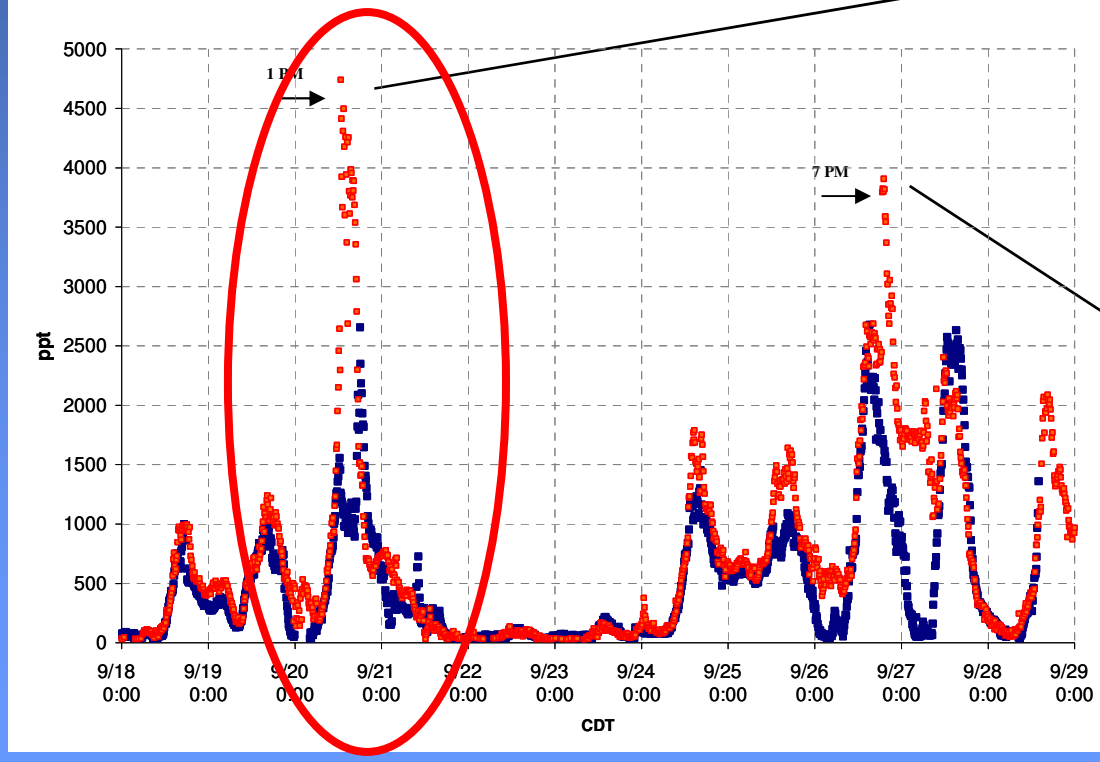

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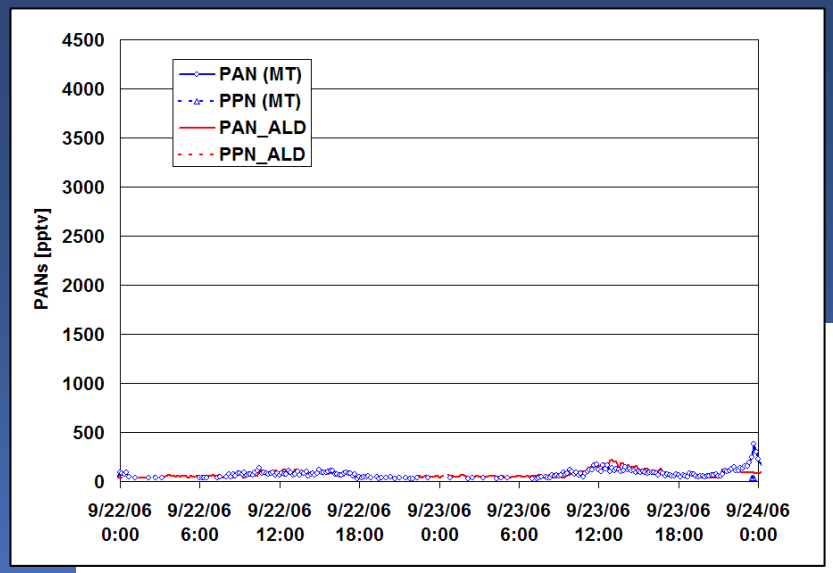

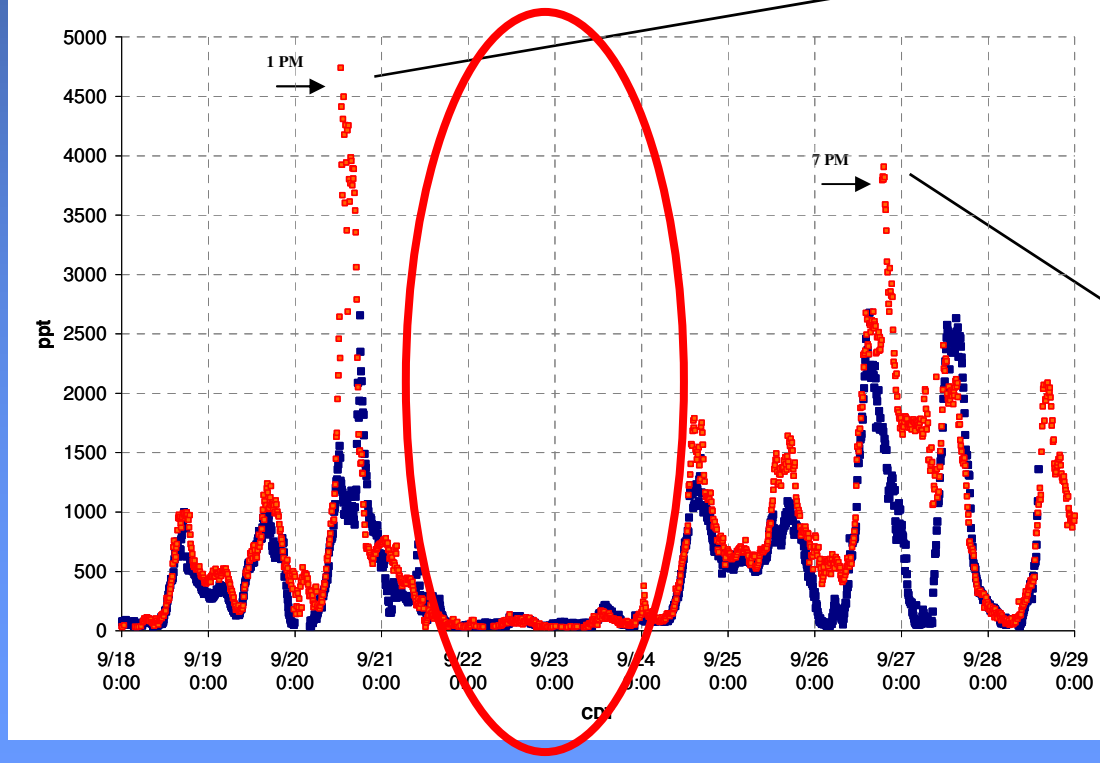

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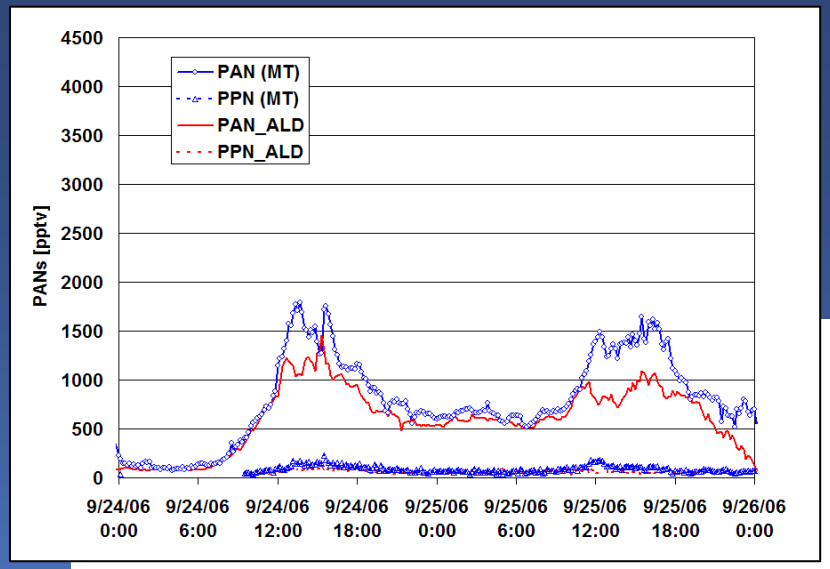

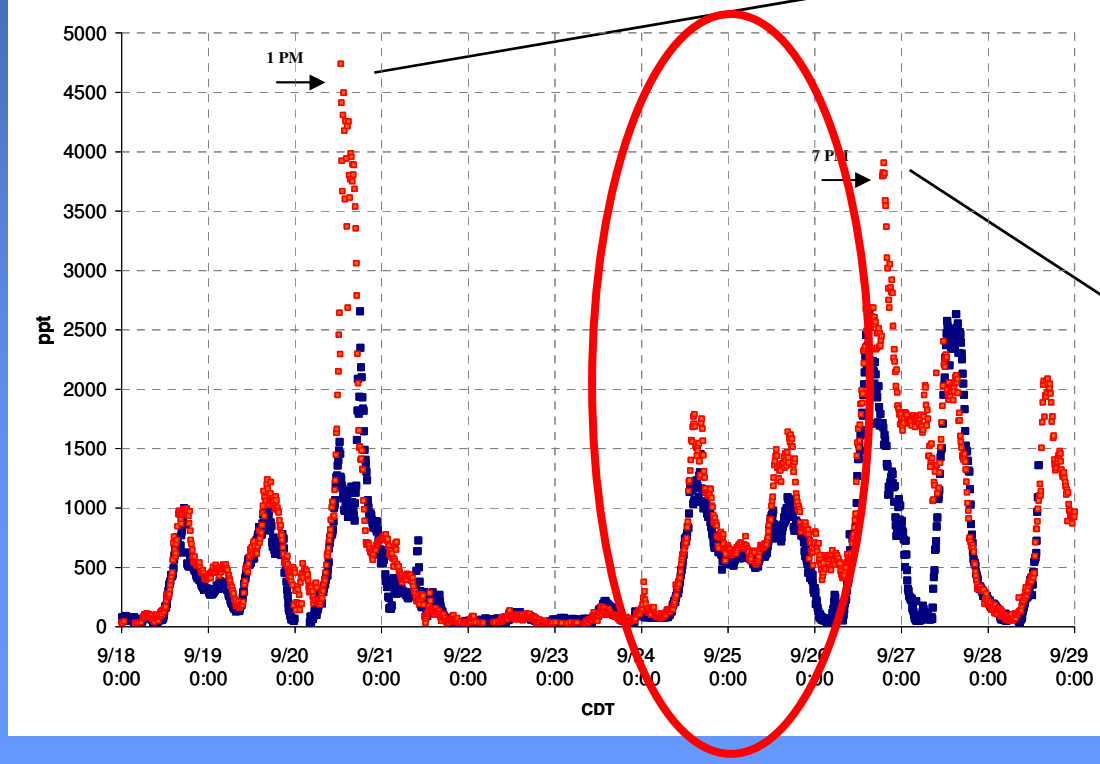

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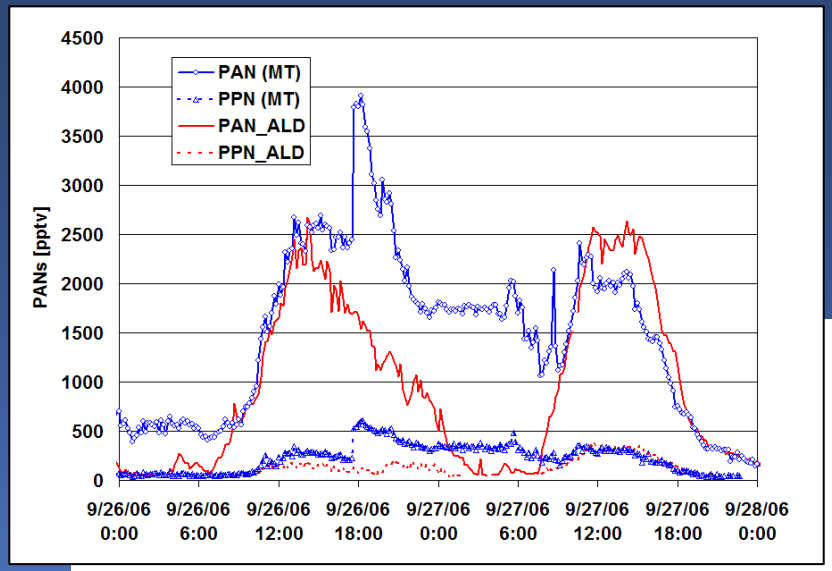

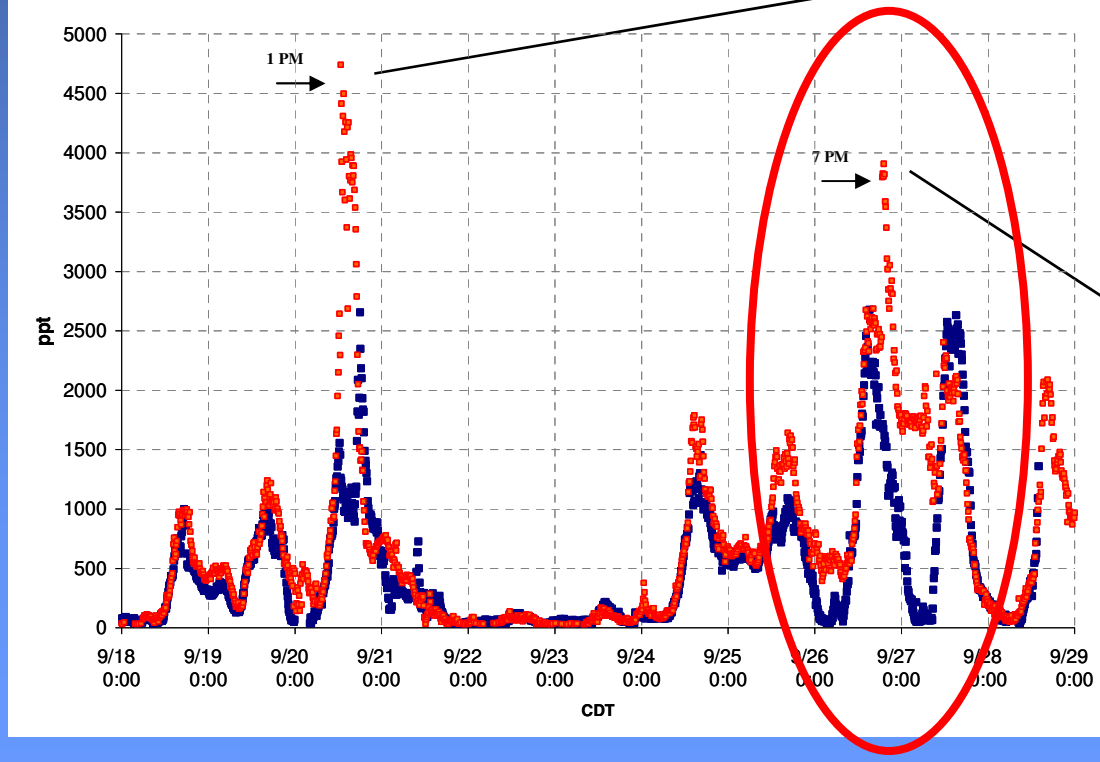

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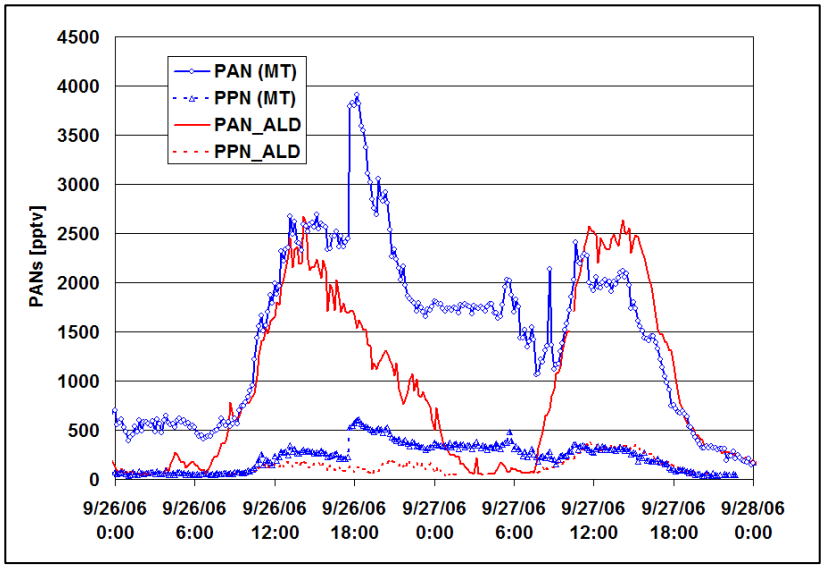
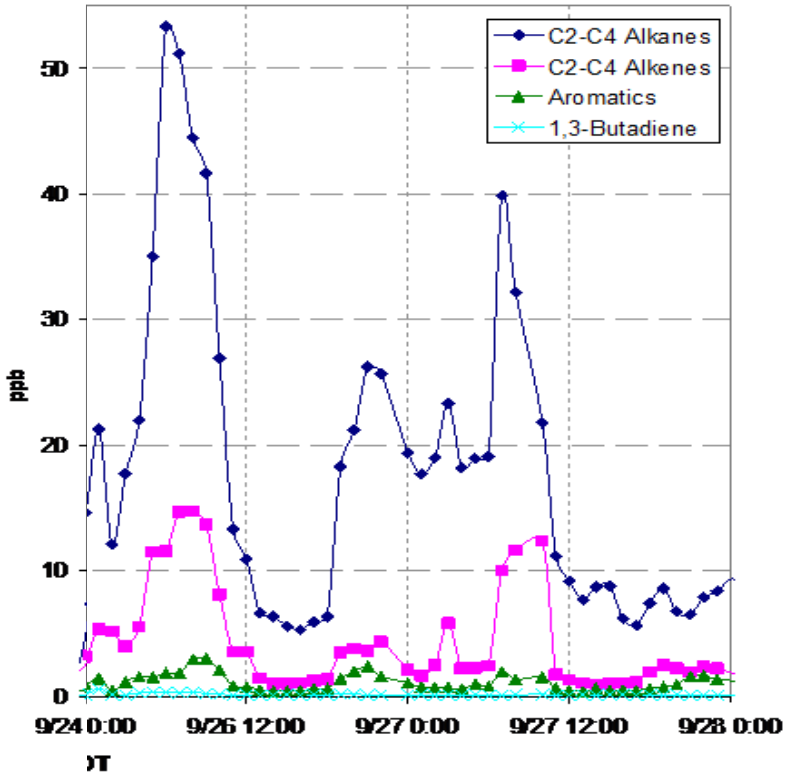
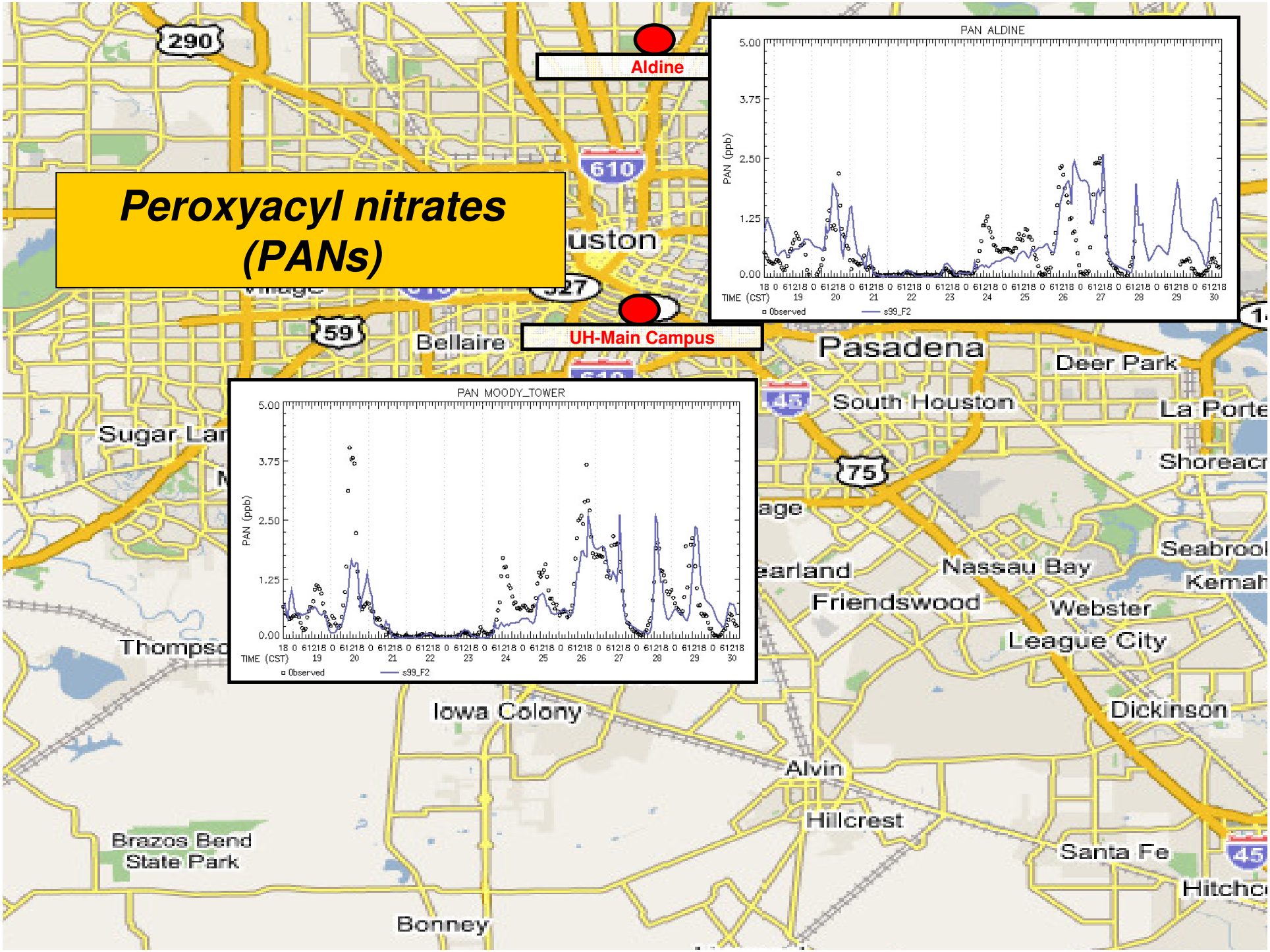




Increased levels of C_2-C_4 alkanes found during the night of high PAN peak.

Peroxyacyl nitrates (PANs)



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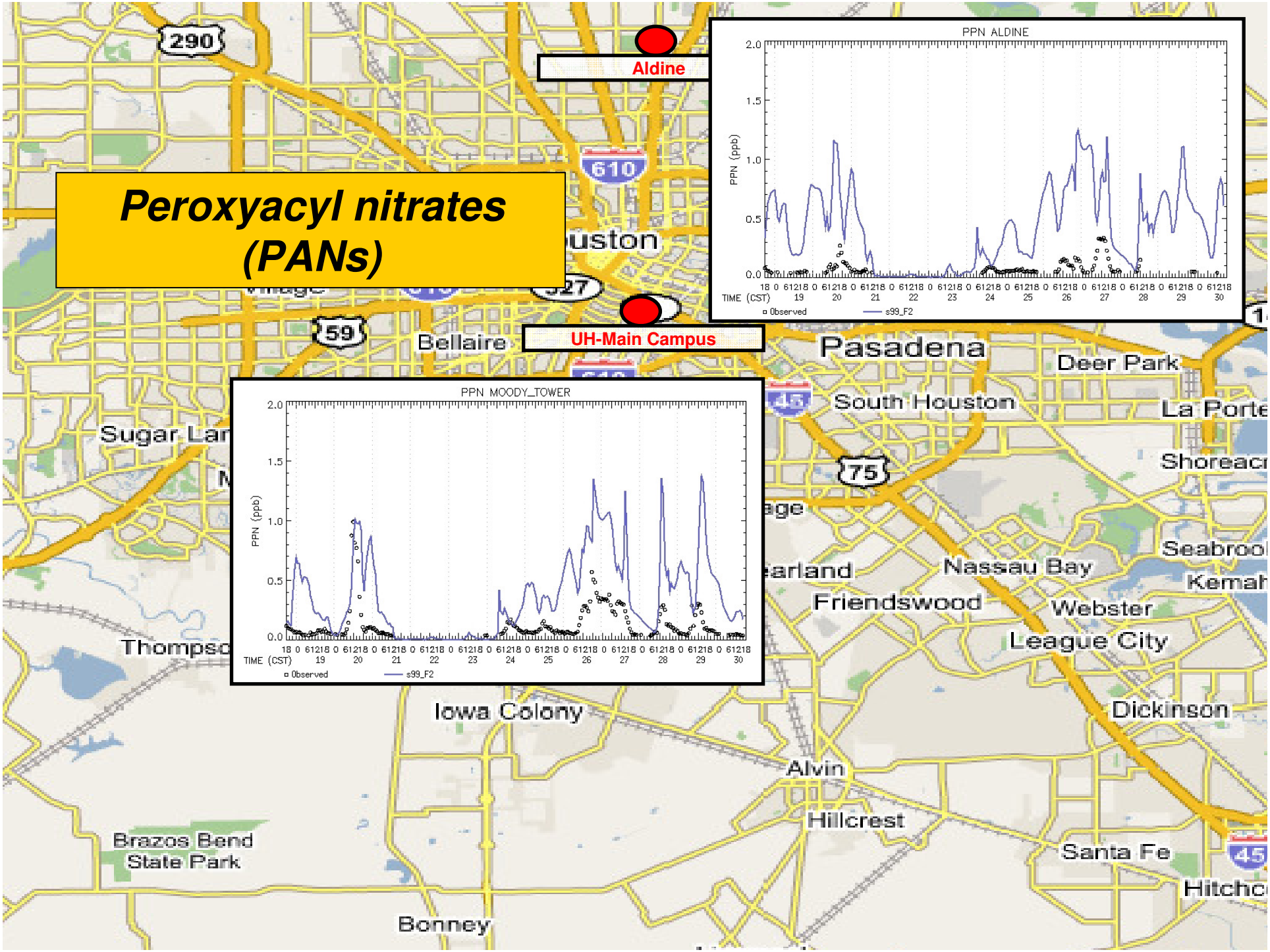
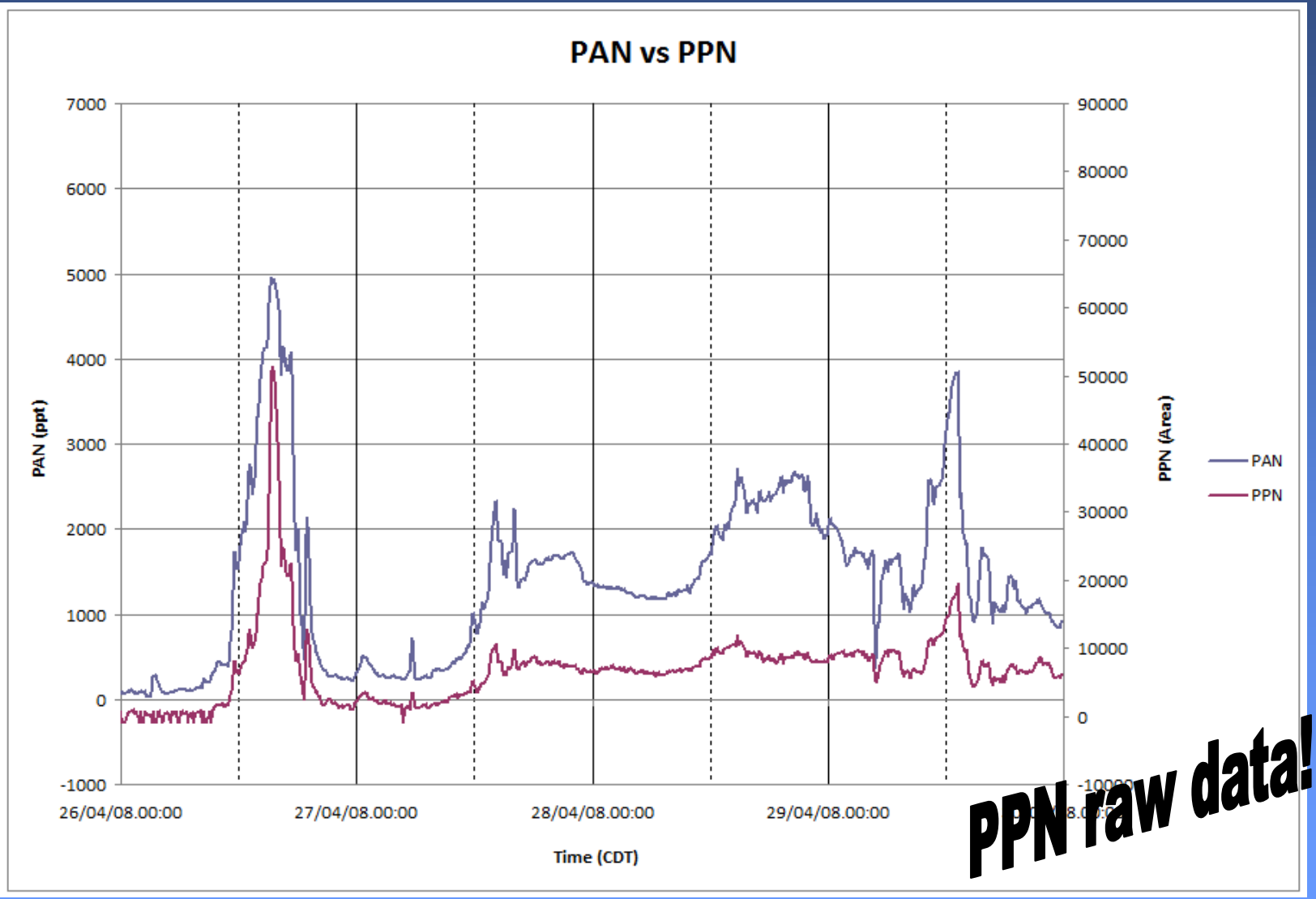
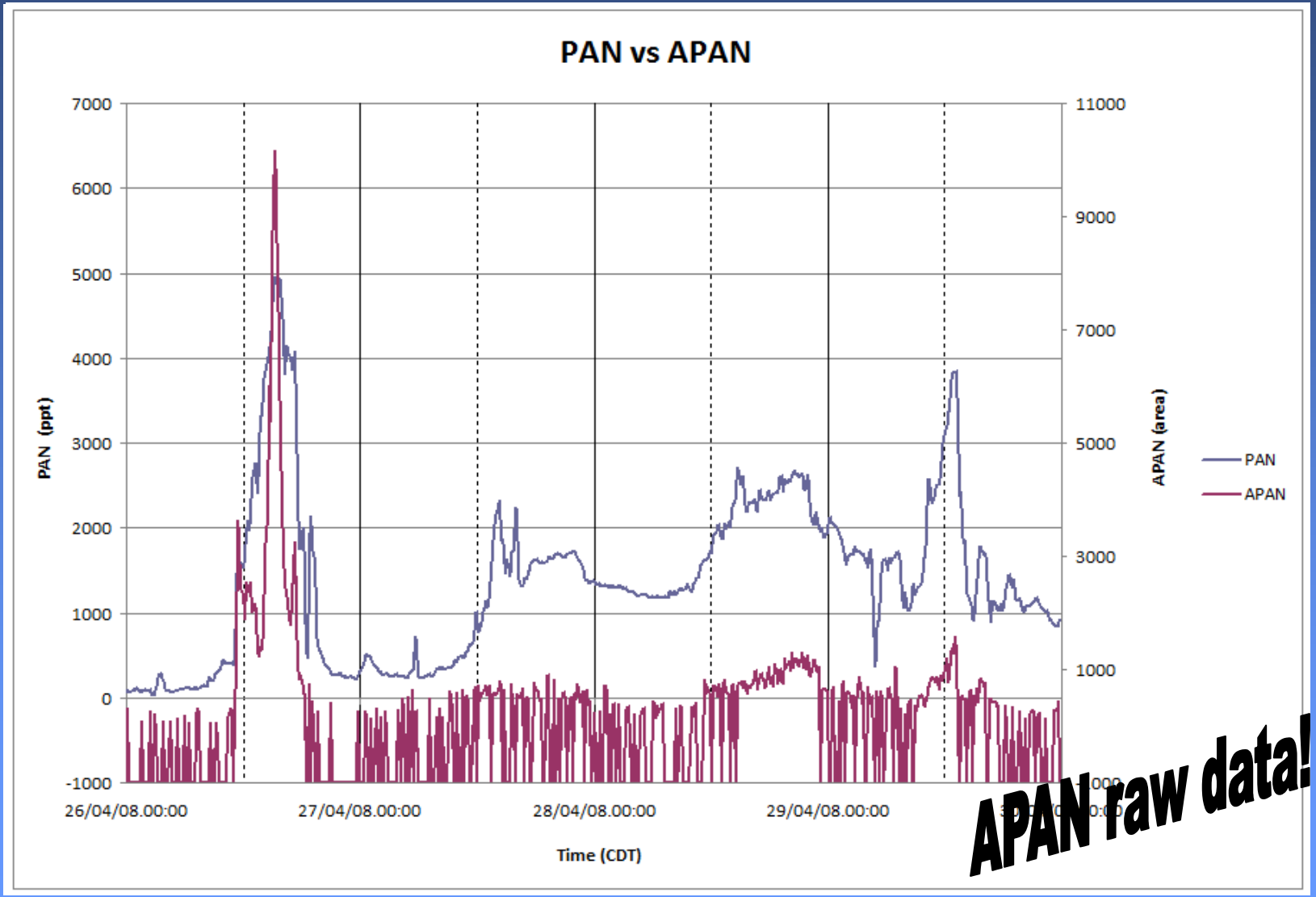


just a few days in spring (Moody Tower)…



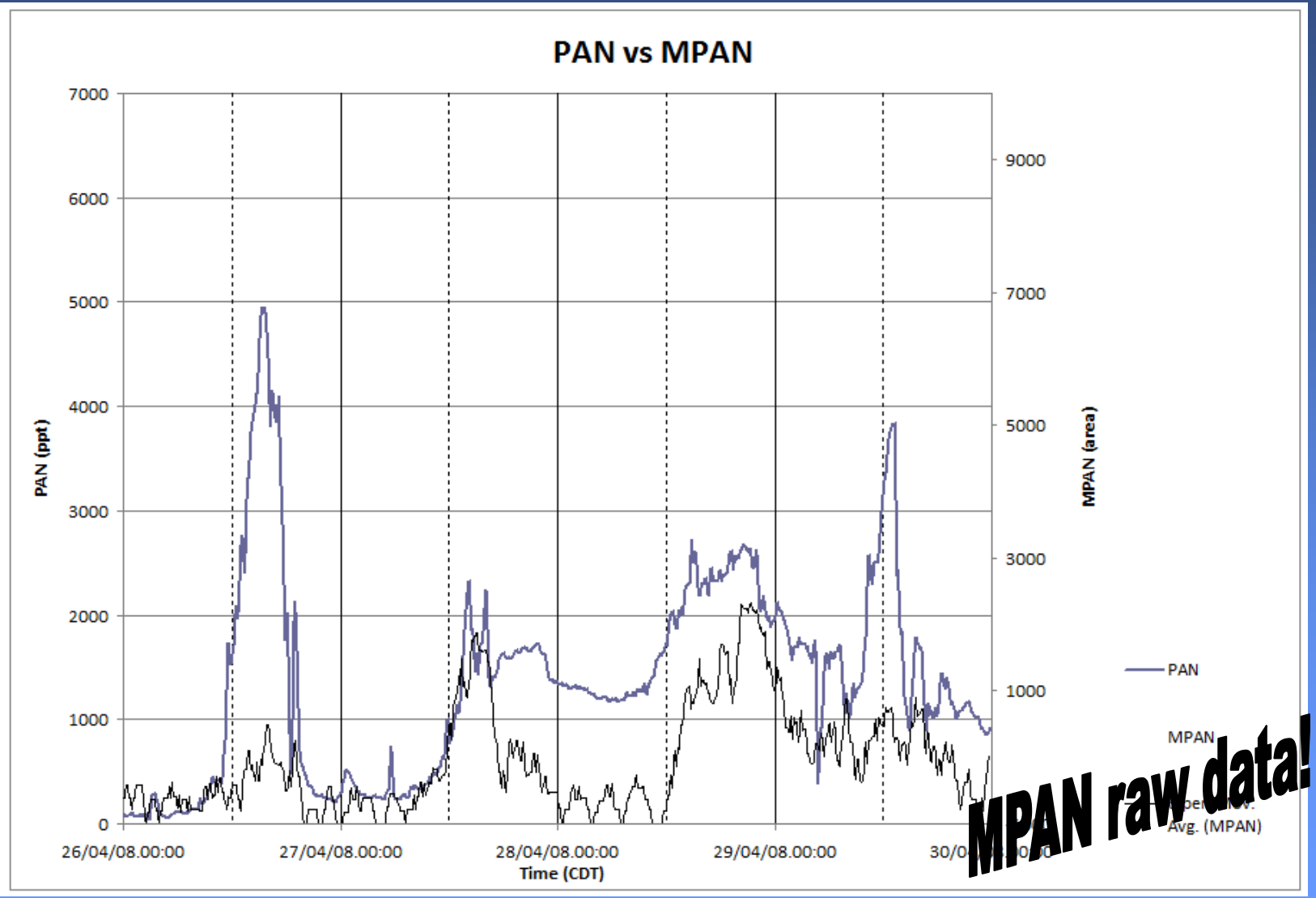
PPN raw data!

just a few days in spring (Moody Tower)…

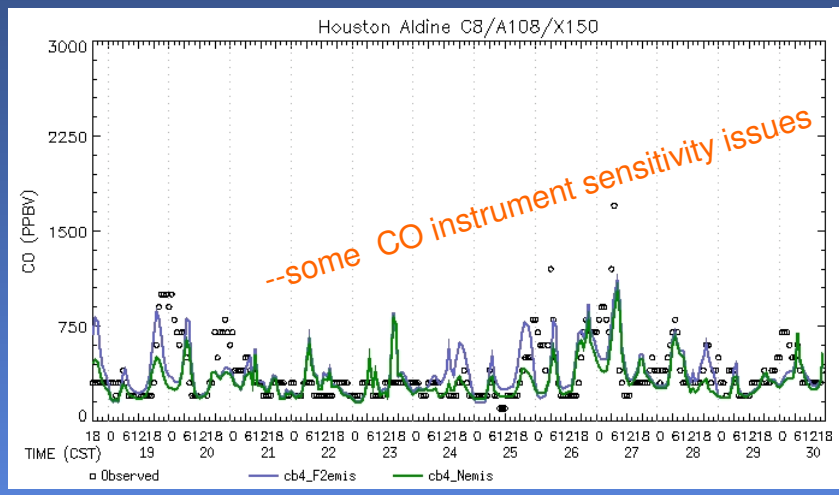


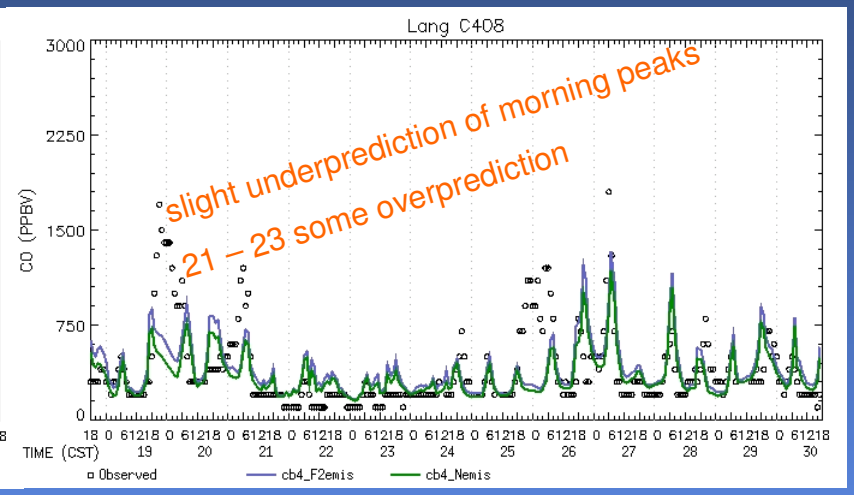
APAN raw data!

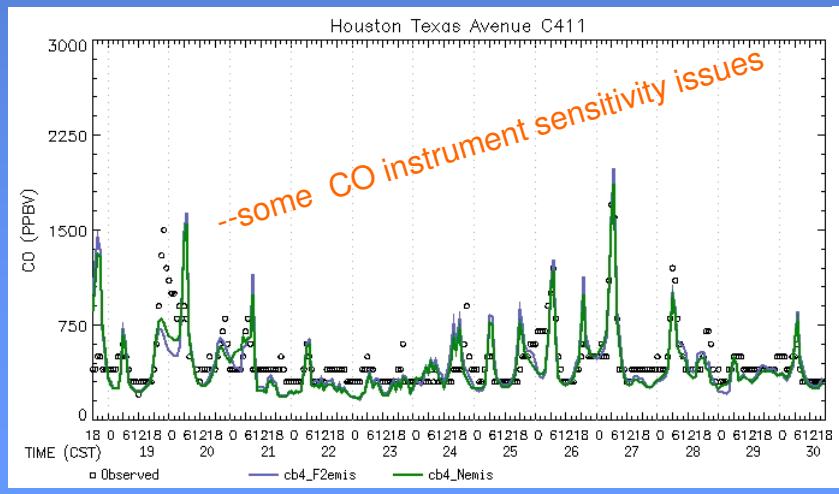
just a few days in spring (Moody Tower)…

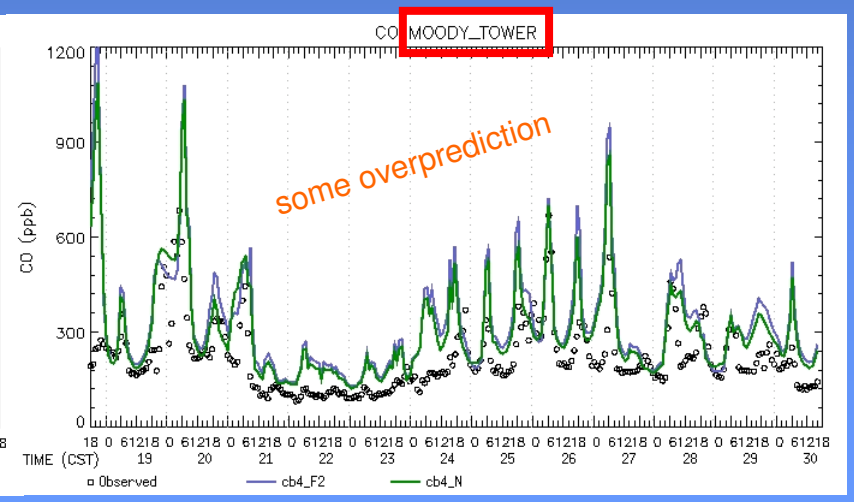


CO, CB-4 F2 emission vs. F2-new

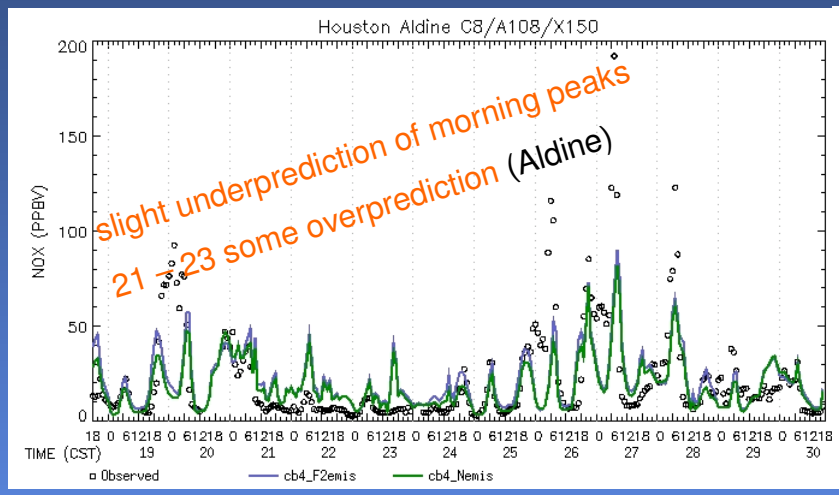


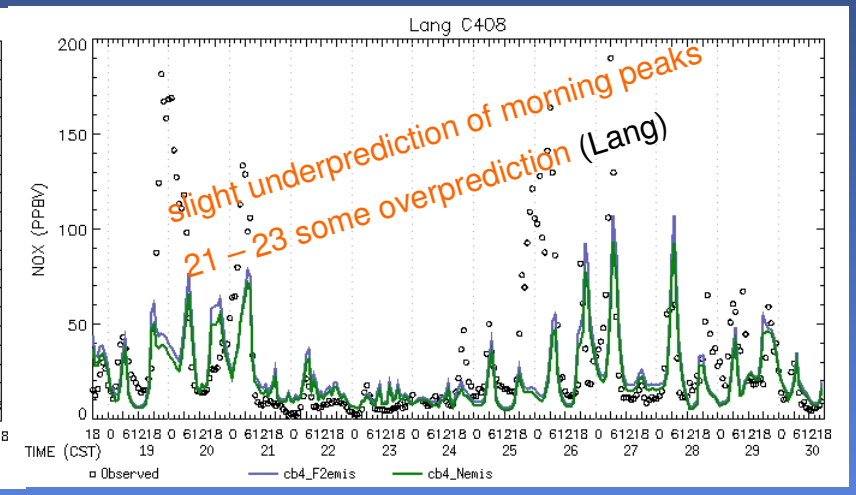


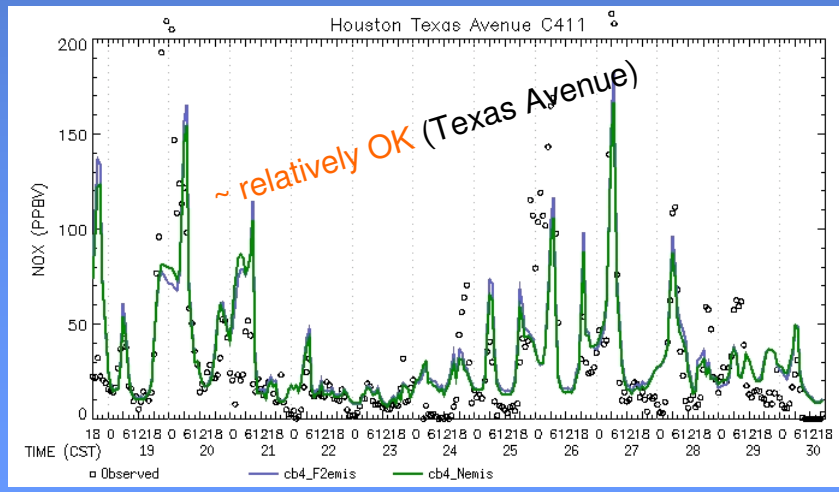


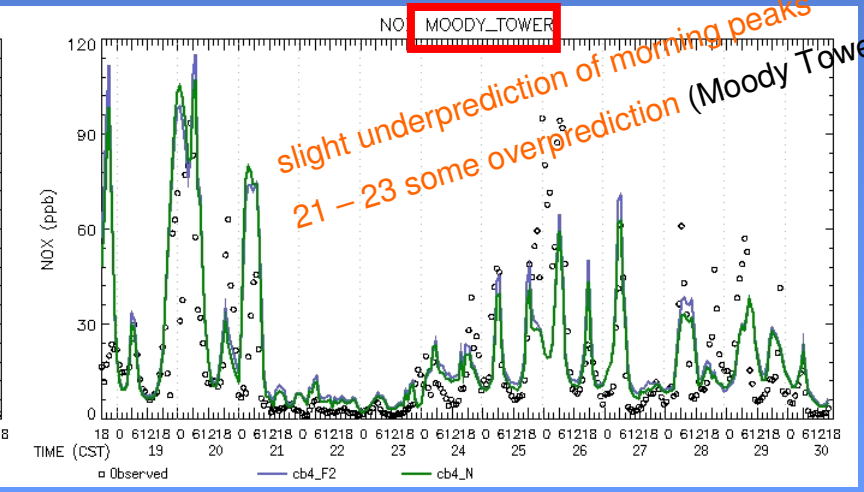


NO_x, CB-4 F2 emission vs. F2-new

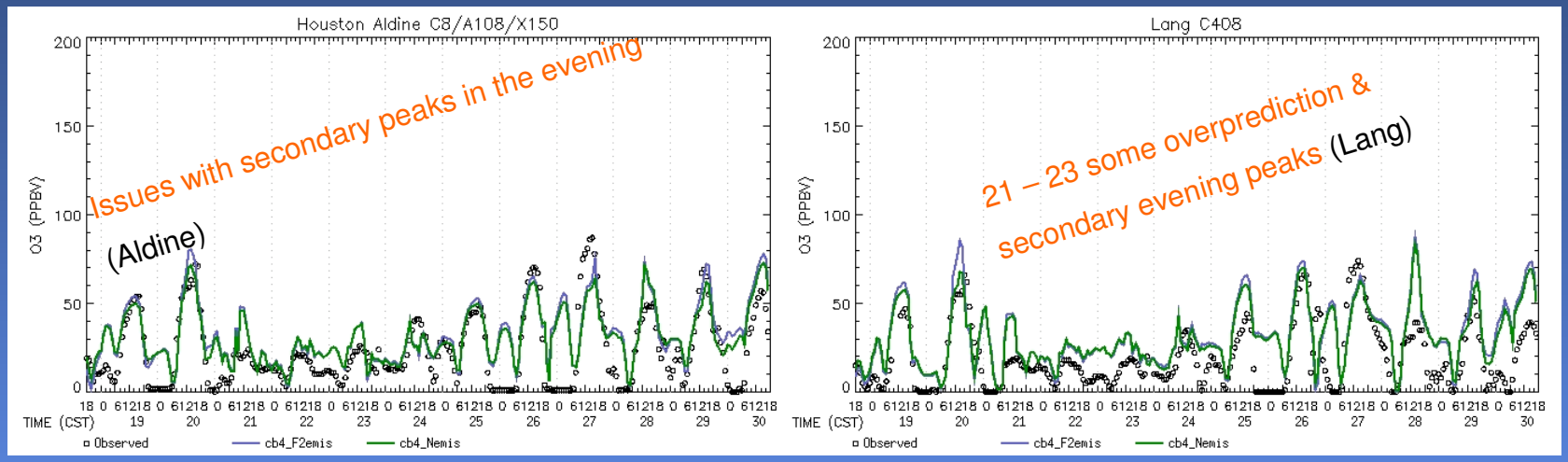


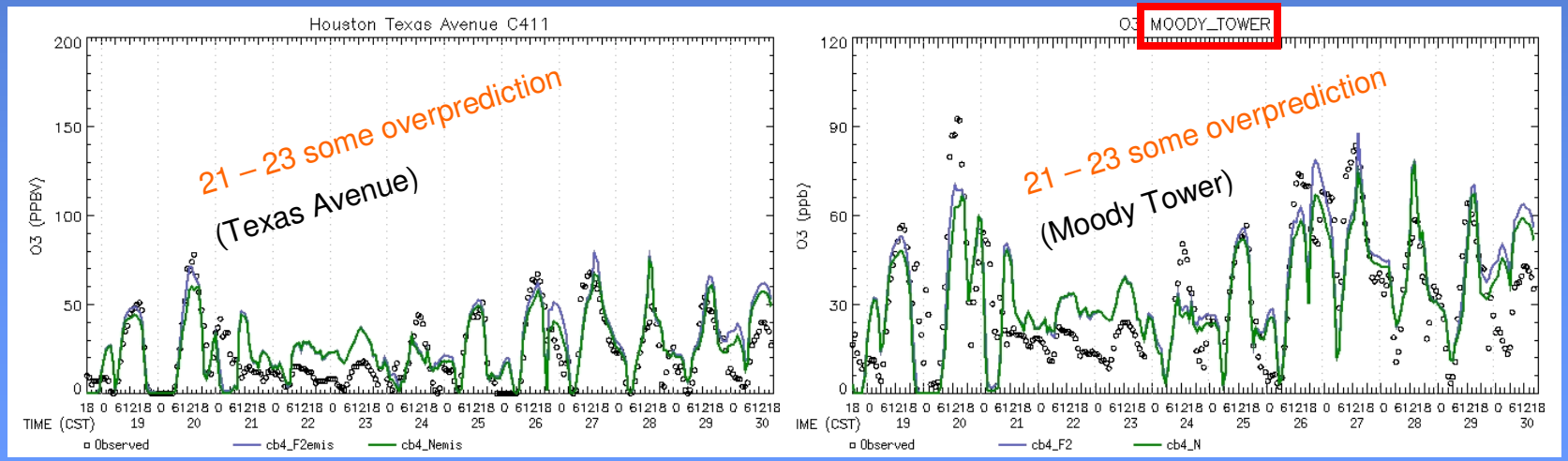




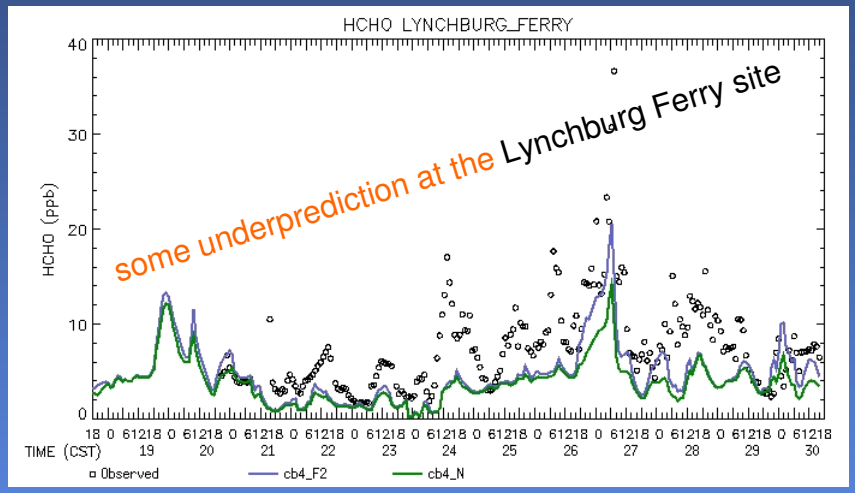


O_3, CB-4 F2 emission vs. F2-new

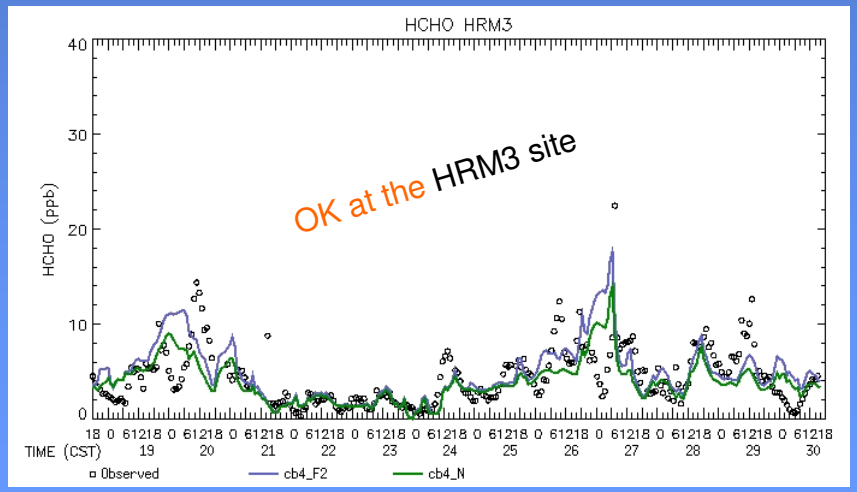


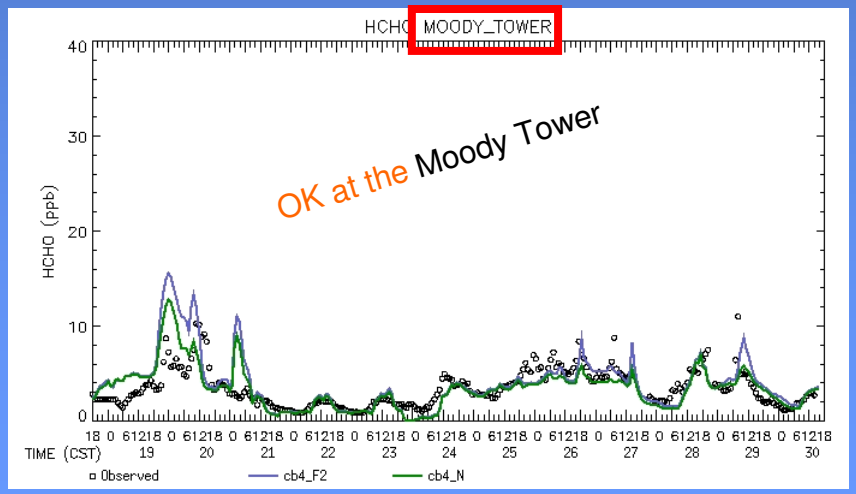


HCHO, CB-4 F2 emission vs. F2-new



We may need alkene emissions imputation
At 2000 level.....





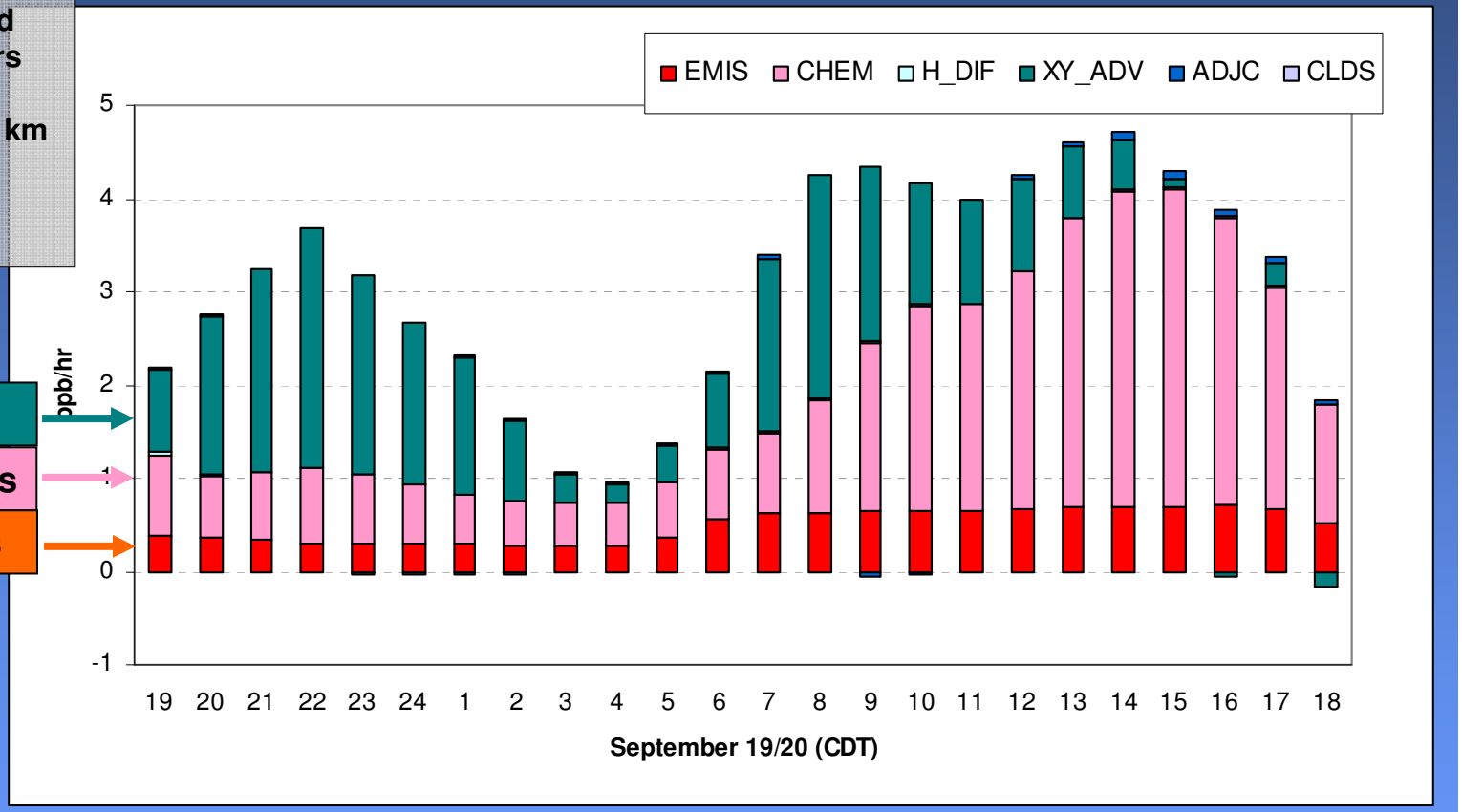
Case Study: September 19/20, 2006

- values averaged over a box with 9 horizontal grid cells and 1-2 model layers
- overall size 12 km * 12 km
- Moody Tower in the center grid cell

xy advection

chemical reactions

HCHO emissions



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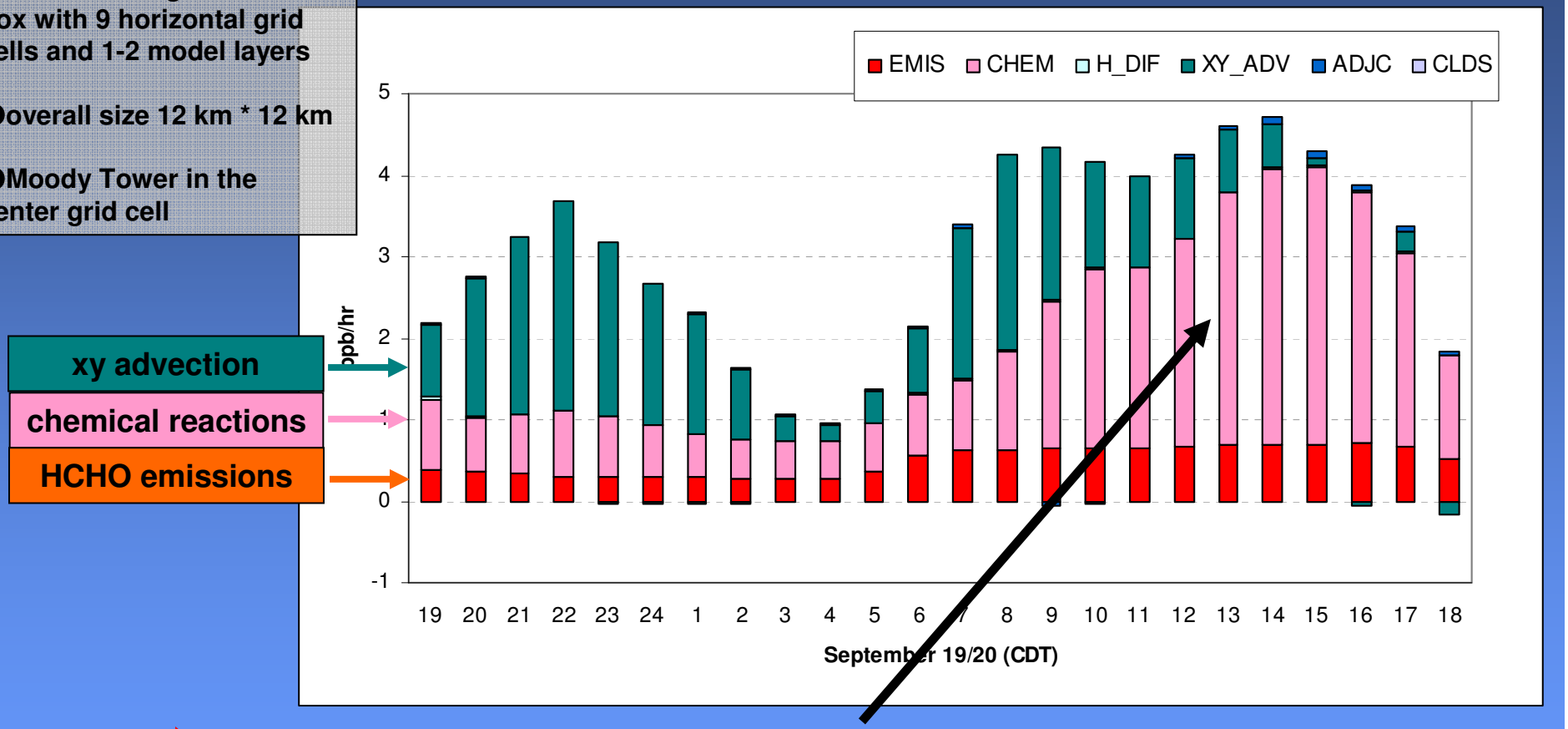

CMAQ analysis for Moody Tower site indicates:
- during daytime: photochemical production dominant

Case Study: September 19/20, 2006

- values averaged over a box with 9 horizontal grid cells and 1-2 model layers
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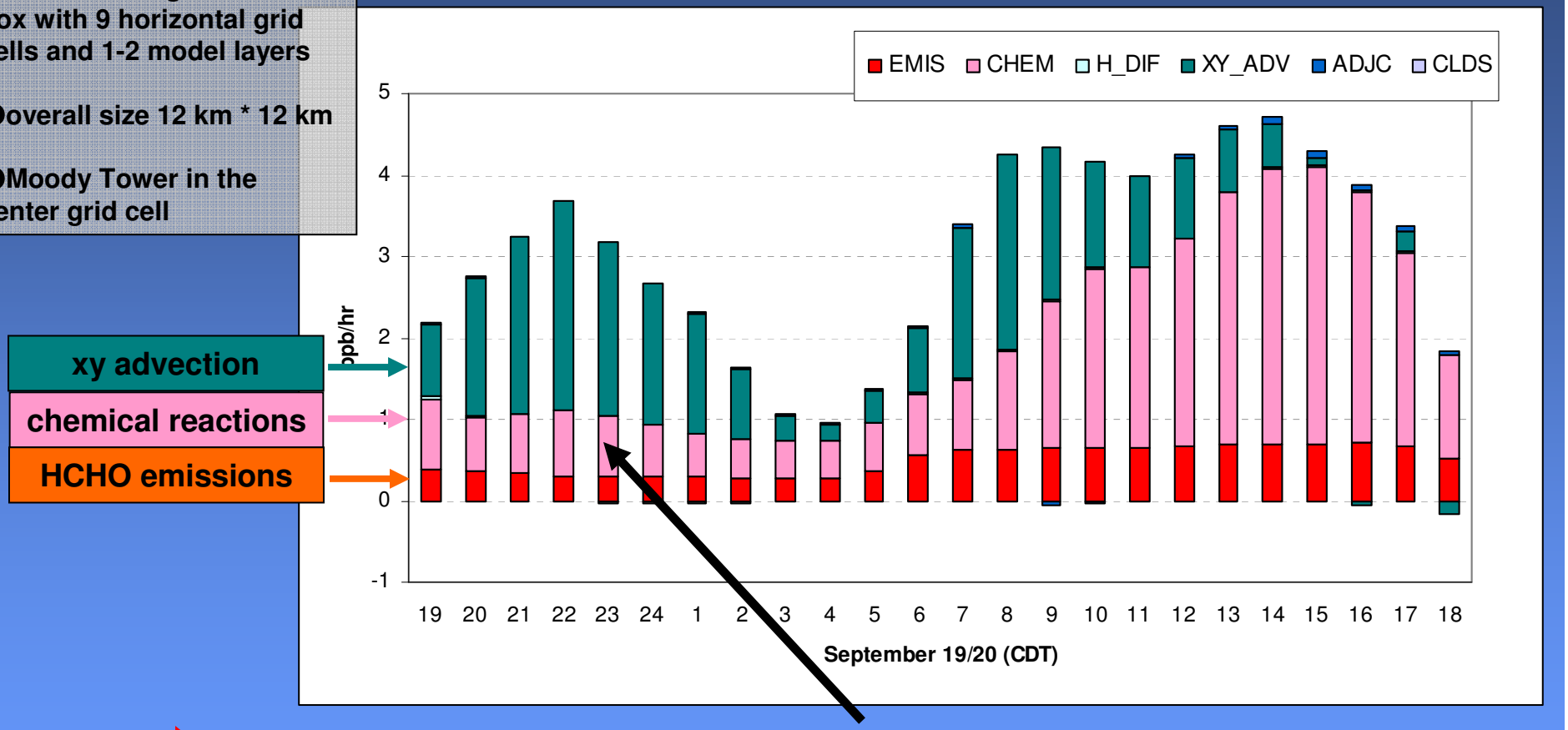
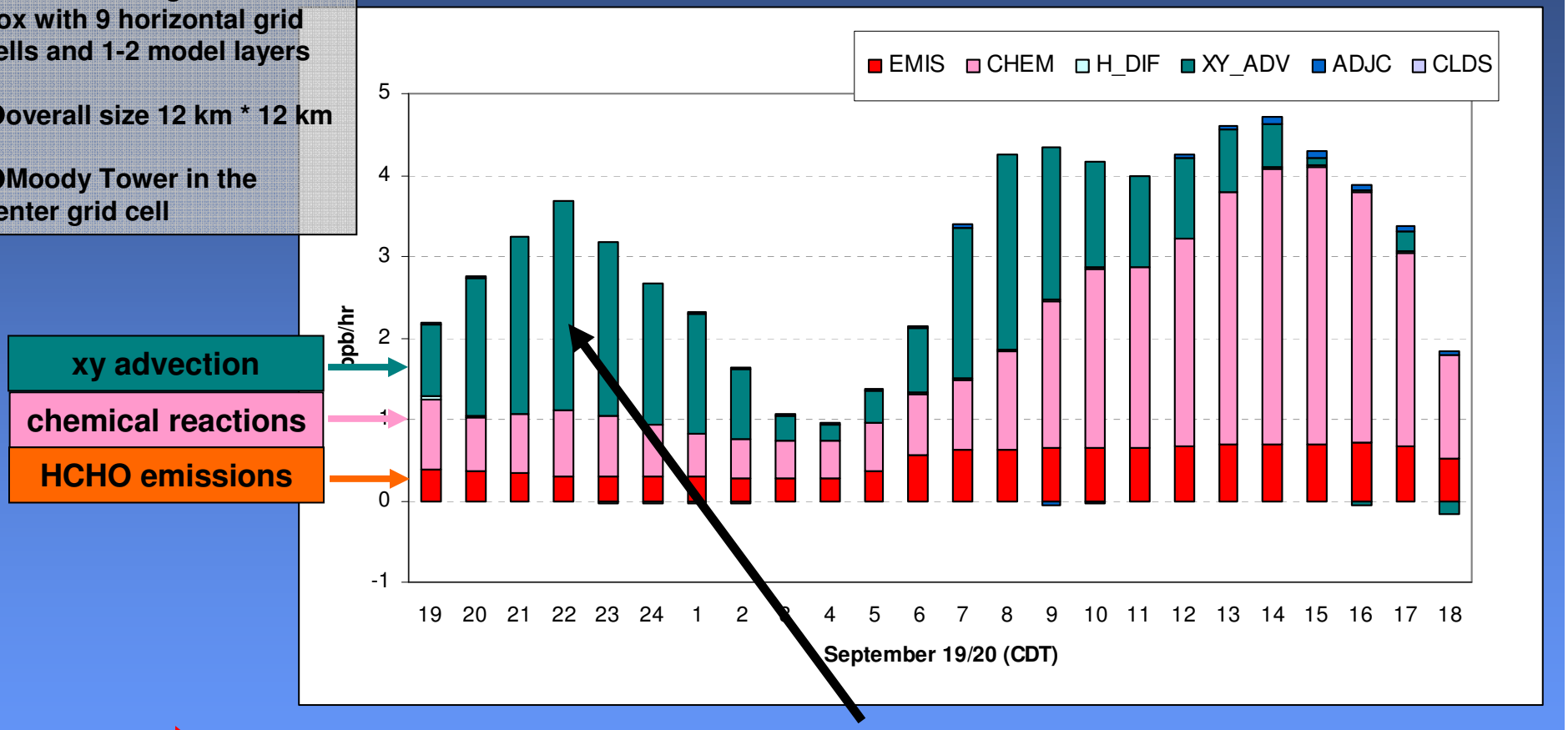


CMAQ analysis for Moody Tower site indicates:
- during nighttime:
non-negligible contributions from chemical reactions
(most likely olefin-ozone reactions)

Case Study: September 19/20, 2006

- values averaged over a box with 9 horizontal grid cells and 1-2 model layers
- overall size 12 km * 12 km
- Moody Tower in the center grid cell



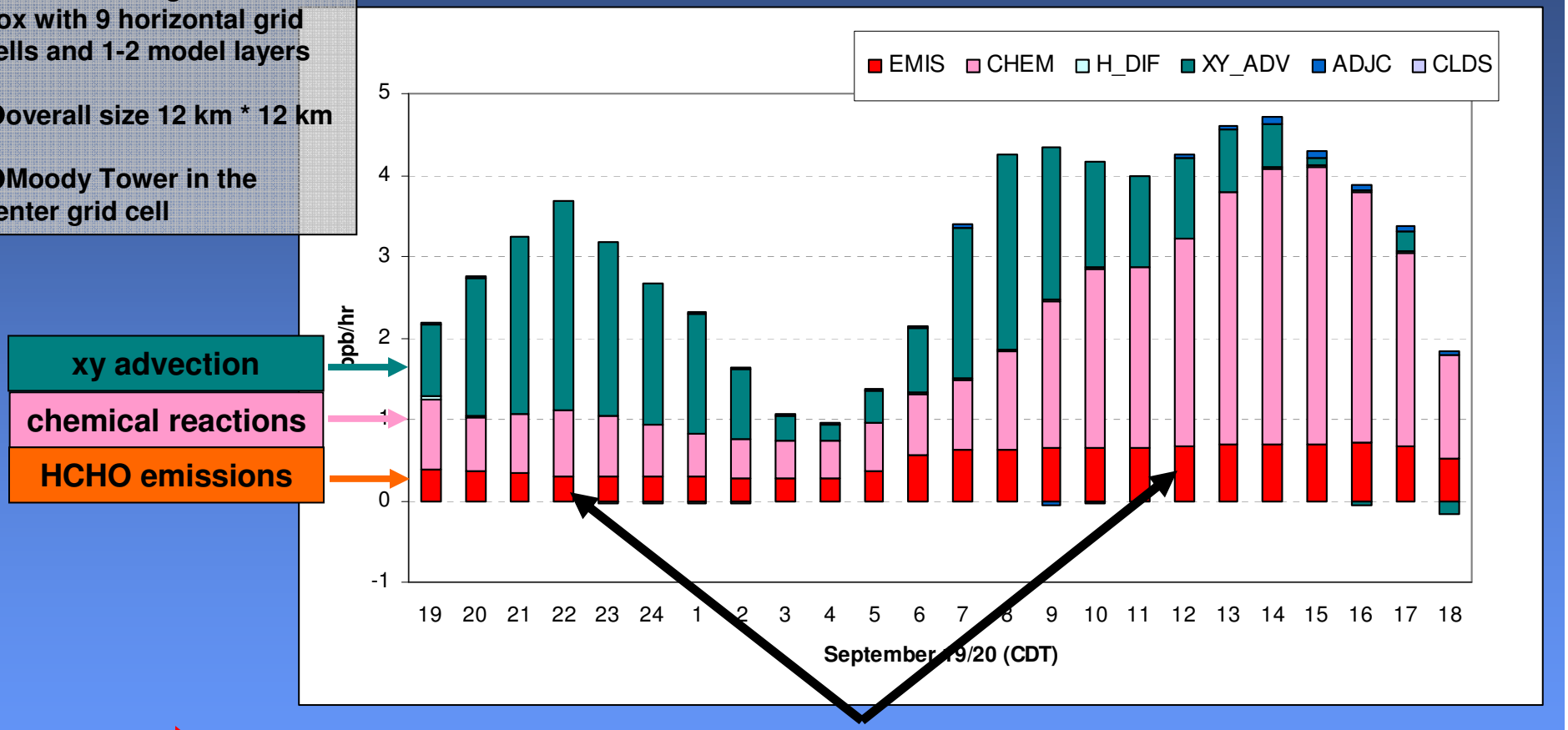
CMAQ analysis for Moody Tower site indicates:

- during nighttime:
  significant transport of HCHO

(note: Ship Channel grids outside these 9 grid cells)

Case Study: September 19/20, 2006

- values averaged over a box with 9 horizontal grid cells and 1-2 model layers
- overall size 12 km * 12 km
- Moody Tower in the center grid cell



CMAQ analysis for Moody Tower site indicates:
- during nighttime and daytime:
non-negligible emissions of HCHO

(…very short) Summary

- **UH Moody Tower Measurements:**
  - **Excellent site to reveal science processes involved in air pollution episodes !**

Acknowledgements: HARC, TCEQ, EPA