Reviewing the benefits of PAMS measurements in the South Central U.S.

Mark Sather (sather.mark@epa.gov)
U.S. EPA Region 6
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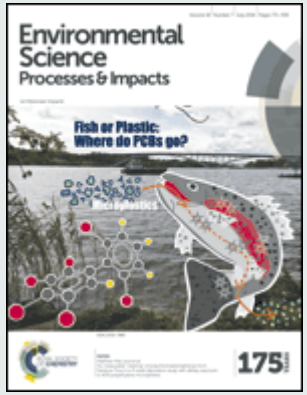
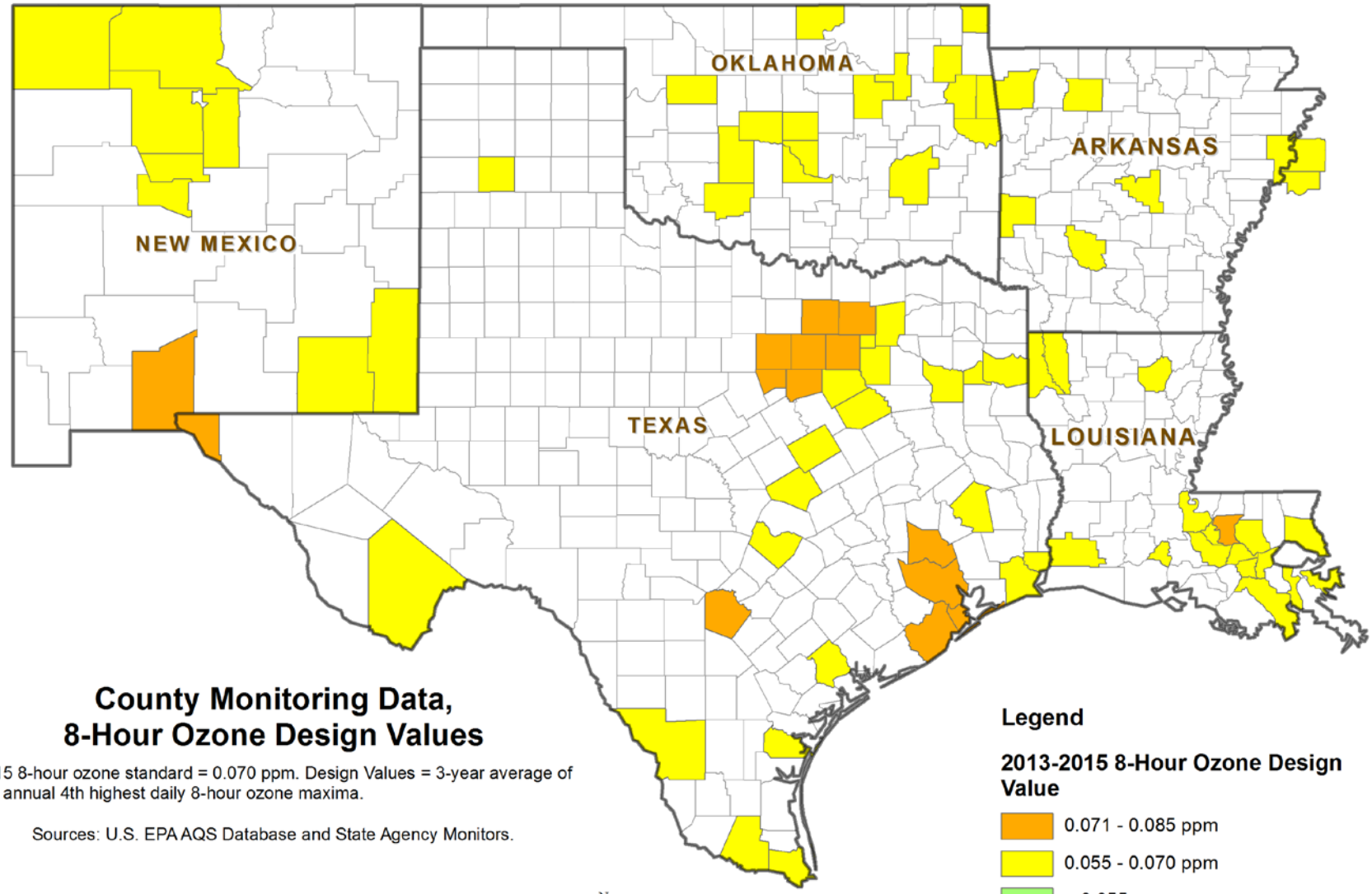
August 10, 2016

Update on long-term trends analyses of ambient 8-hour ozone and precursor monitoring data in the south central U.S.

- Past 30 years: 1986-2015
- 4 cities: El Paso, Baton Rouge, Houston, DFW
- Significant progress made concerning simultaneous reductions of ambient ozone and precursor concentrations
- National and local precursor controls over time
- New challenge: 2015 70 ppb 8-hour ozone standard
- Details in July, 2016 paper in journal *Environmental Science: Processes & Impacts*, published by Royal Society of Chemistry
- New Photochemical Assessment Monitoring Stations (PAMS) program requirements, including new enhanced monitoring plans, should continue to provide valuable ozone and precursor monitoring data for the future



Region 6 Ground Level Ozone Concentrations



County Monitoring Data, 8-Hour Ozone Design Values

2015 8-hour ozone standard = 0.070 ppm. Design Values = 3-year average of the annual 4th highest daily 8-hour ozone maxima.

Sources: U.S. EPA AQS Database and State Agency Monitors.

Legend

2013-2015 8-Hour Ozone Design Value

- 0.071 - 0.085 ppm
- 0.055 - 0.070 ppm
- < 0.055 ppm

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June 29, 2016

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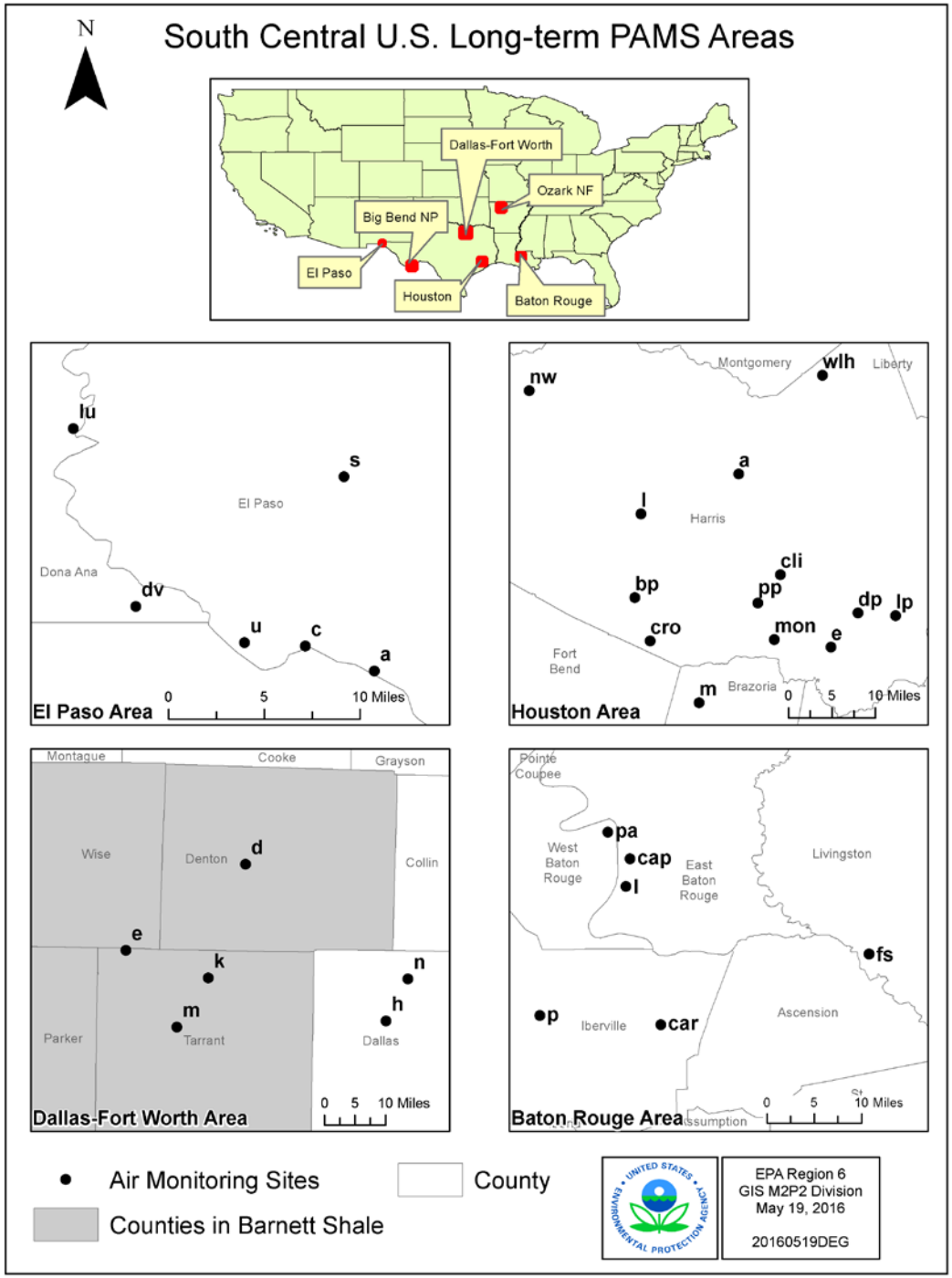
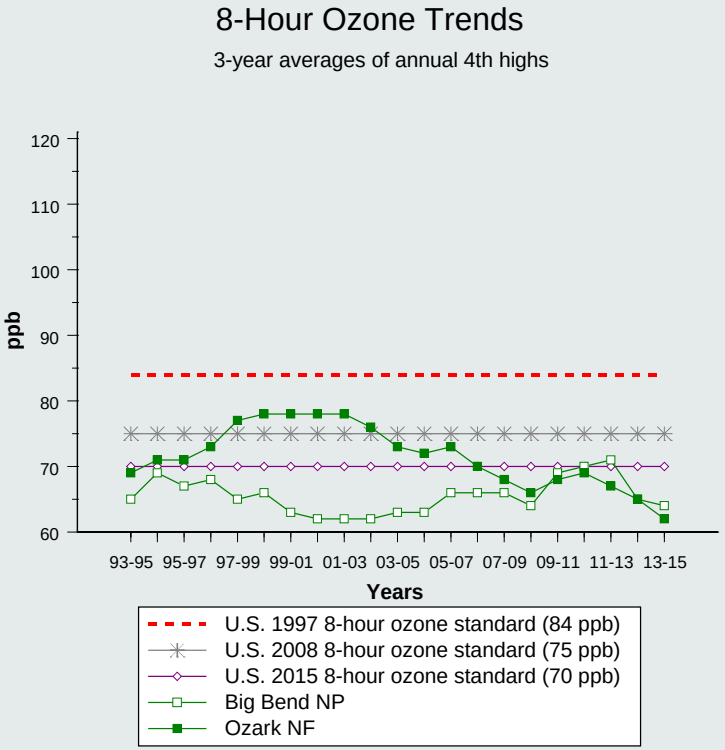
N W E S

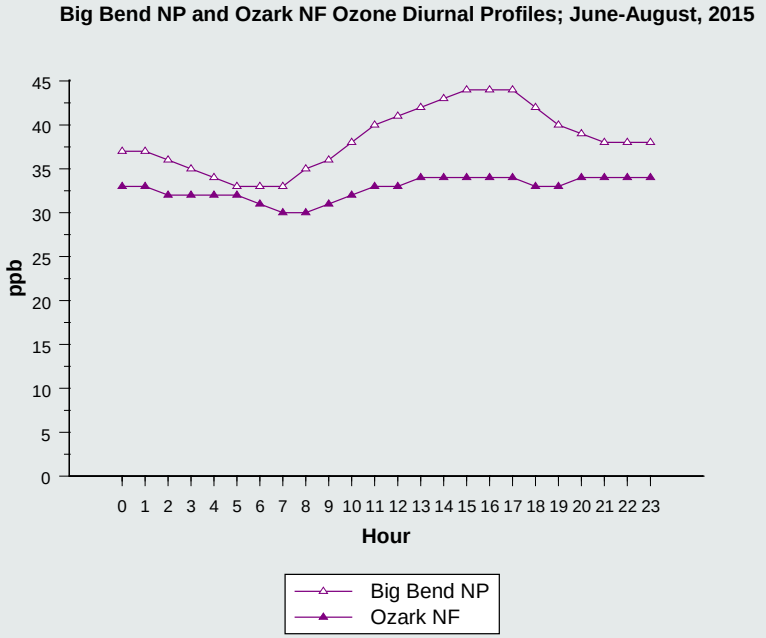
0 50 100 200 300 400 500 Miles


South Central U.S. Long-term PAMS Areas
N
Dallas-Fort Worth
Ozark NF
Big Bend NP
El Paso
Houston
Baton Rouge
lu
s
El Paso
Dona Ana
dv
u
c
a
El Paso Area
0 5 10 Miles
Montgomery
wlh
Liberty
nw
a
l
Harris
cli
bp
pp
dp
lp
cro
mon
e
Fort Bend
m
Brazoria
Houston Area
0 5 10 Miles
Montague
Cooke
Grayson
Wise
Denton
d
Collin
e
k
n
m
h
Parker
Tarrant
Dallas
Dallas-Fort Worth Area
0 5 10 Miles
Pointe Coupee
pa
West Baton Rouge
cap
East Baton Rouge
l
Livingston
fs
p
Iberville
car
Ascension
Baton Rouge Area
Assumption
0 5 10 Miles
Air Monitoring Sites
County
Counties in Barnett Shale
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
EPA Region 6
GIS M2P2 Division
May 19, 2016
20160519DEG



Big Bend NP and Ozark NF considered representative regional rural background ozone sites according to criterion from Saylor et al. 1998

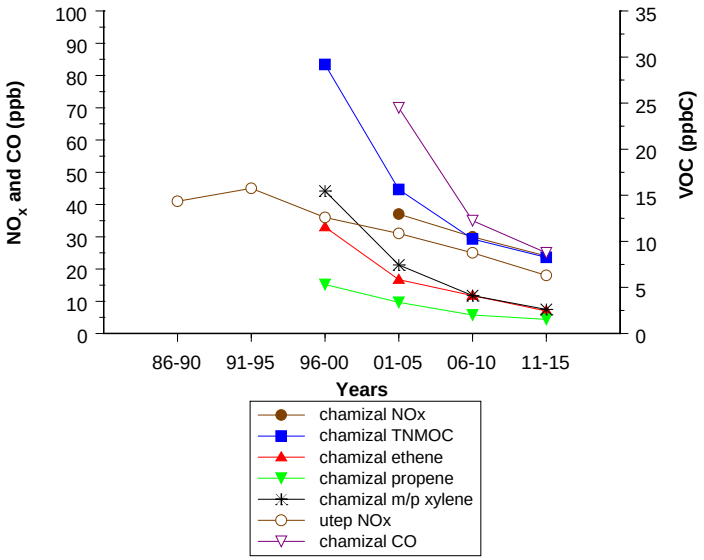
-1.3 ppb/3-year rolling time period O3 reduction rate at Ozark NF from 2001-2003 to 2013-2015



El Paso area

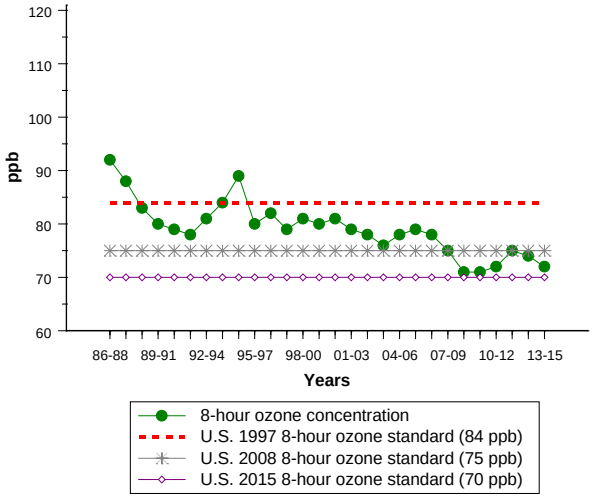
NO_x/CO/VOC Concentration Trends

June-August Weekdays; 0500-0800 LST; TNMOC and CO concentrations x 10



8-Hour Ozone Trends

3-year averages of annual 4th highs
highest site in network each 3-year period



High Temperature/Solar Radiation/Stagnation/Precipitation Trends

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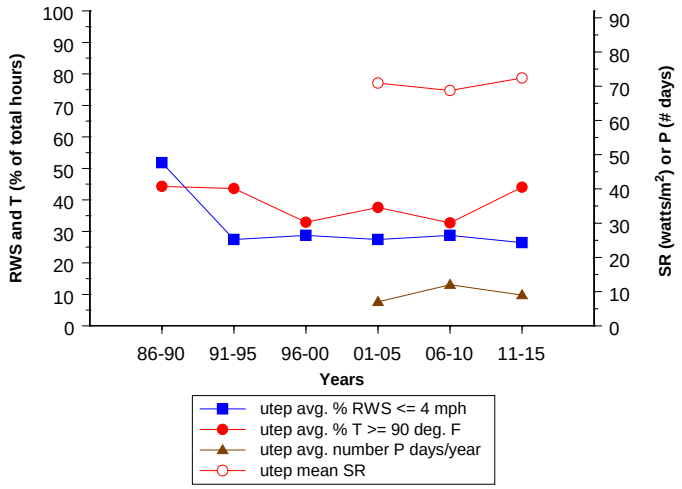

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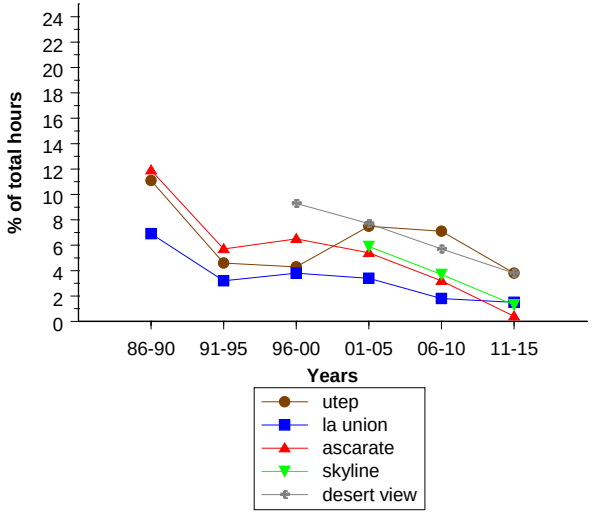
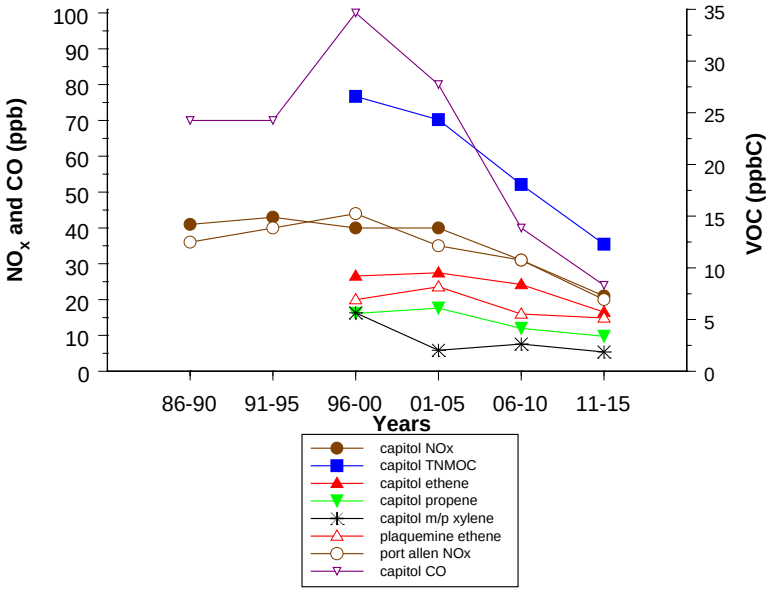


Baton Rouge

NO_x/CO/VOC Concentration Trends

June-August Weekdays; 0500-0800 LST (0300-0900 LST for 3-hr speciated VOC data);
TNMOC and CO concentrations x 10



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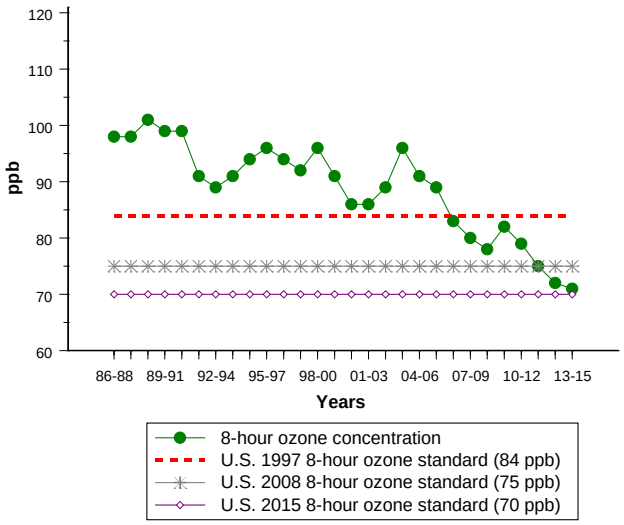

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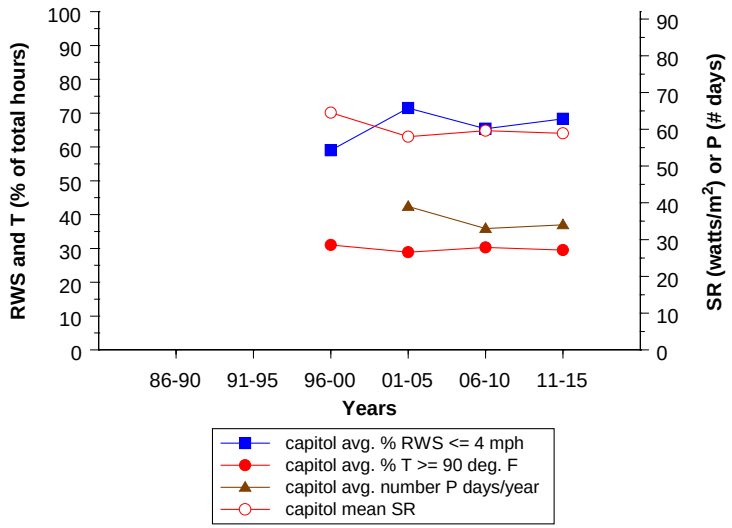

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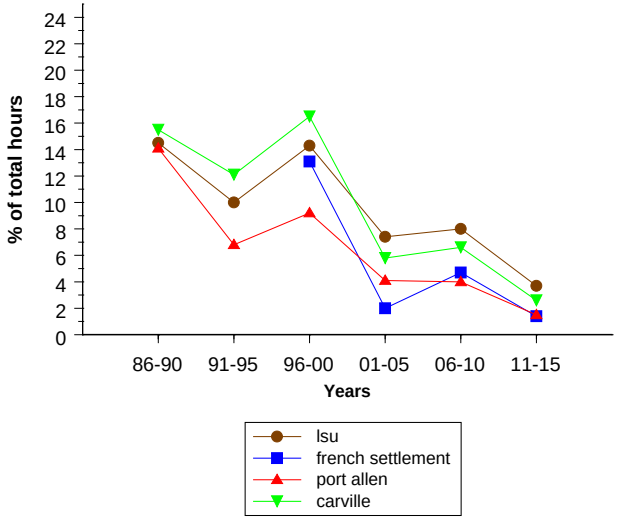

Houston

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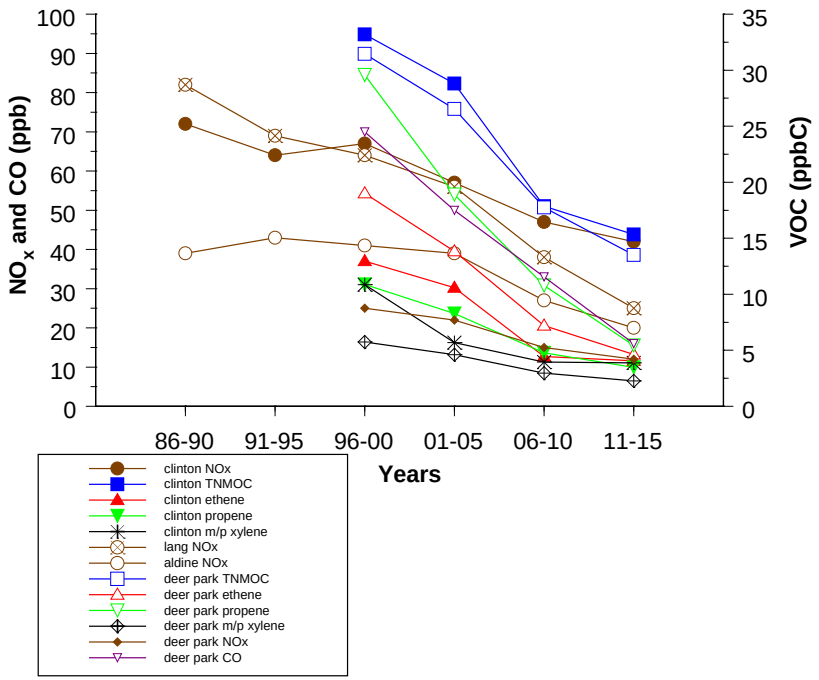

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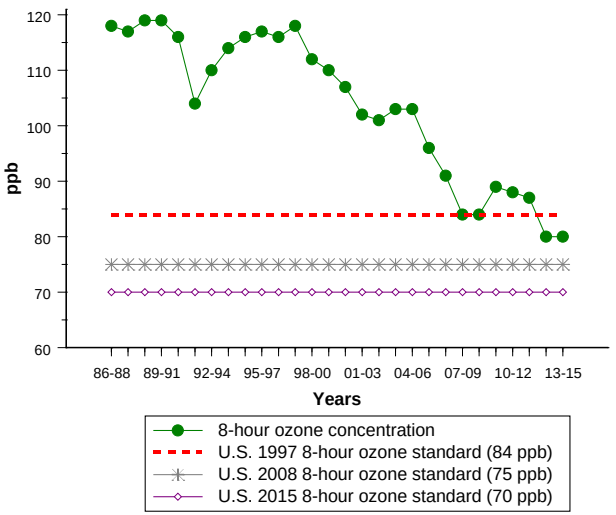

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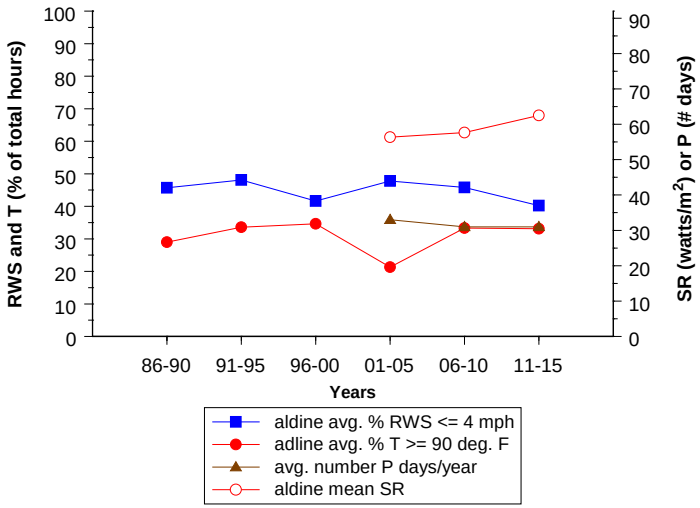

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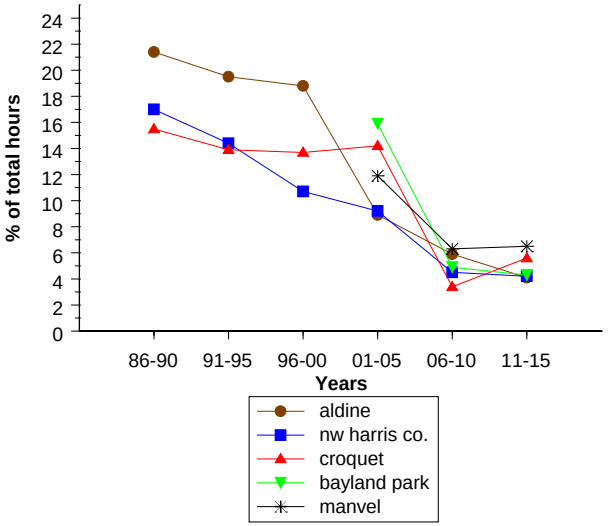

Dallas-Fort Worth

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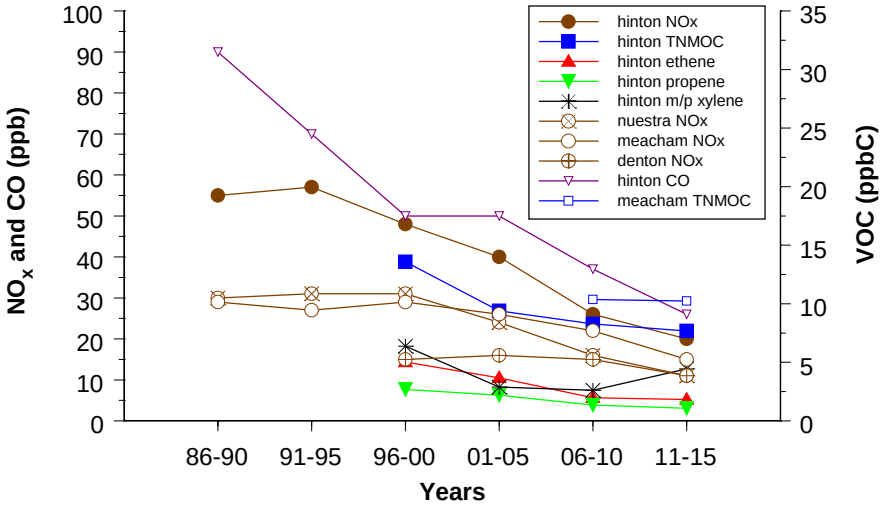

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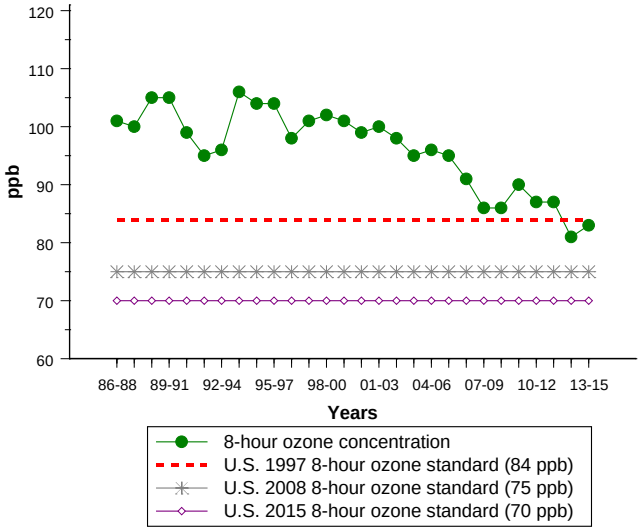

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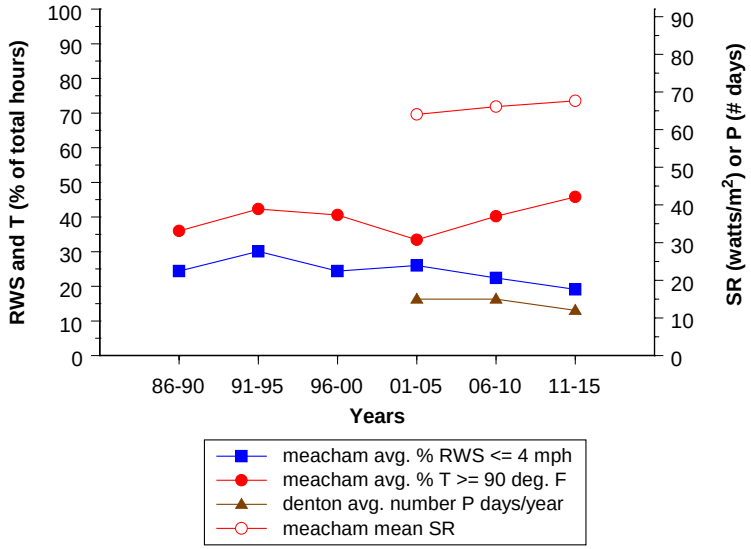

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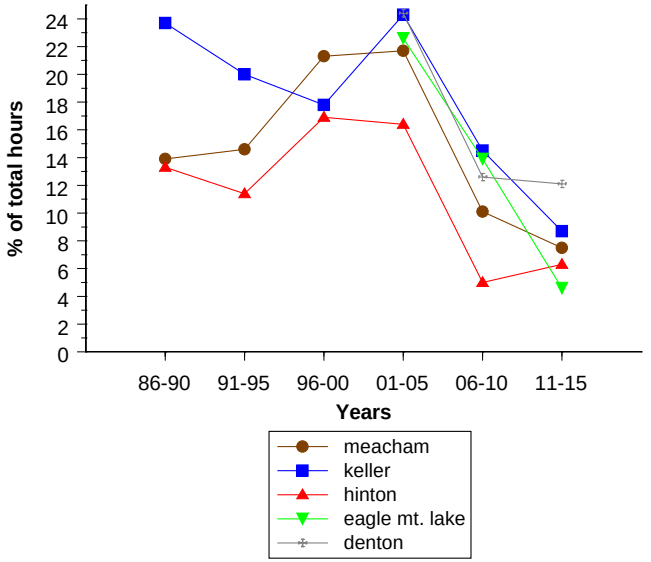
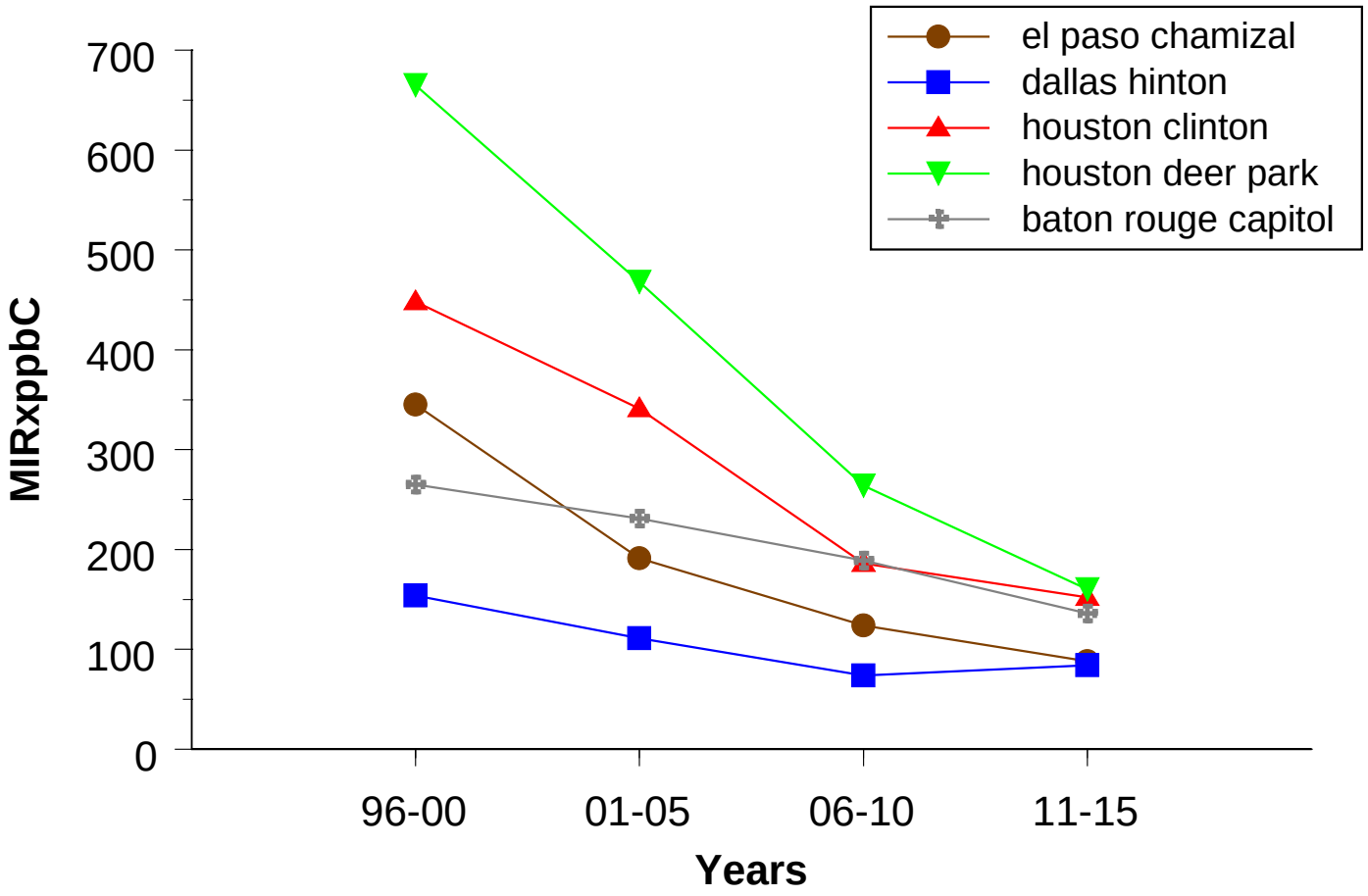


VOC Reactivity

Sum of Mean MIRxppbC for 9 species: ethene, propene, m/p xylene, trans-2-butene, cis-2-butene, 1-butene, ethane, propane, n-butane



MIR = Maximum Incremental Reactivity
as per Carter 2010

45-76% decline

City	8-hour O_3 conc. reduction rate (ppb per 3-year rolling time period)	2013-2015 8-hour O_3 design value	Estimated # of 3-year rolling time periods to meet 70 ppb standard
El Paso area	-0.7 ppb	72 ppb	2
Baton Rouge	-1.0 ppb	71 ppb	1
Houston	-1.4 ppb	80 ppb	7
Dallas	-0.7 ppb	83 ppb	18
Big Bend NP	-0.05 ppb	64 ppb	NA
Ozark NF	-0.35 ppb	62 ppb	NA

Conclusions

- Over the past 30 years (1986-2015) significant progress has been made in the south central U.S. regarding simultaneous reductions of ozone and ozone precursor ambient concentrations
- Regional rural background ozone concentrations have decreased in the northeastern section of the south central U.S. and have remained generally the same in the southwestern section of the south central U.S.
- The U.S. 1997 8-hour ozone standard (84 ppb) is now being attained in all south central U.S. cities. El Paso and Baton Rouge are also meeting the 2008 8-hour ozone standard (75 ppb)
- All four cities face the challenge of meeting the new 2015 8-hour ozone standard of 70 ppb, especially DFW

Findings of Interest

- Statistically significant m/p-xylene (and o-xylene) concentration increases at the Dallas Hinton site over the past 5 year period 2011-2015, coinciding with notable ozone concentration increase at the same site
- Overall flat ambient Total Non-Methane Organic Compounds (TNMOC) trend for the past 5 years in DFW