TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TCEQ

Modeling Update:
HGB MOVES SIP Revision Modeling

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Air Quality Division

Presented to Southeast Texas Photochemical Modeling
Technical Committee
August 23, 2012

Background

- The MOVES grace period for mobile source conformity analyses ends March 2, 2013, which is prior to the next scheduled attainment demonstration SIP.
- Since H-GAC must demonstrate conformity with the current MOBILE-based MVEBs, new transportation projects will be extremely limited in the HGB area until SIP-quality MOVES-based MVEBs are deemed adequate.
- To avoid transportation conformity problems, the TCEQ is modifying the March 2010 HGB AD and RFP SIP revisions for the 1997 eight-hour ozone standard.
- The modification will replace the MOBILE6.2-based MVEBs with larger MOVES-based MVEBs.
- The TCEQ will process this modification as a SIP revision, including a technical analysis sufficient to demonstrate attainment by 2018.

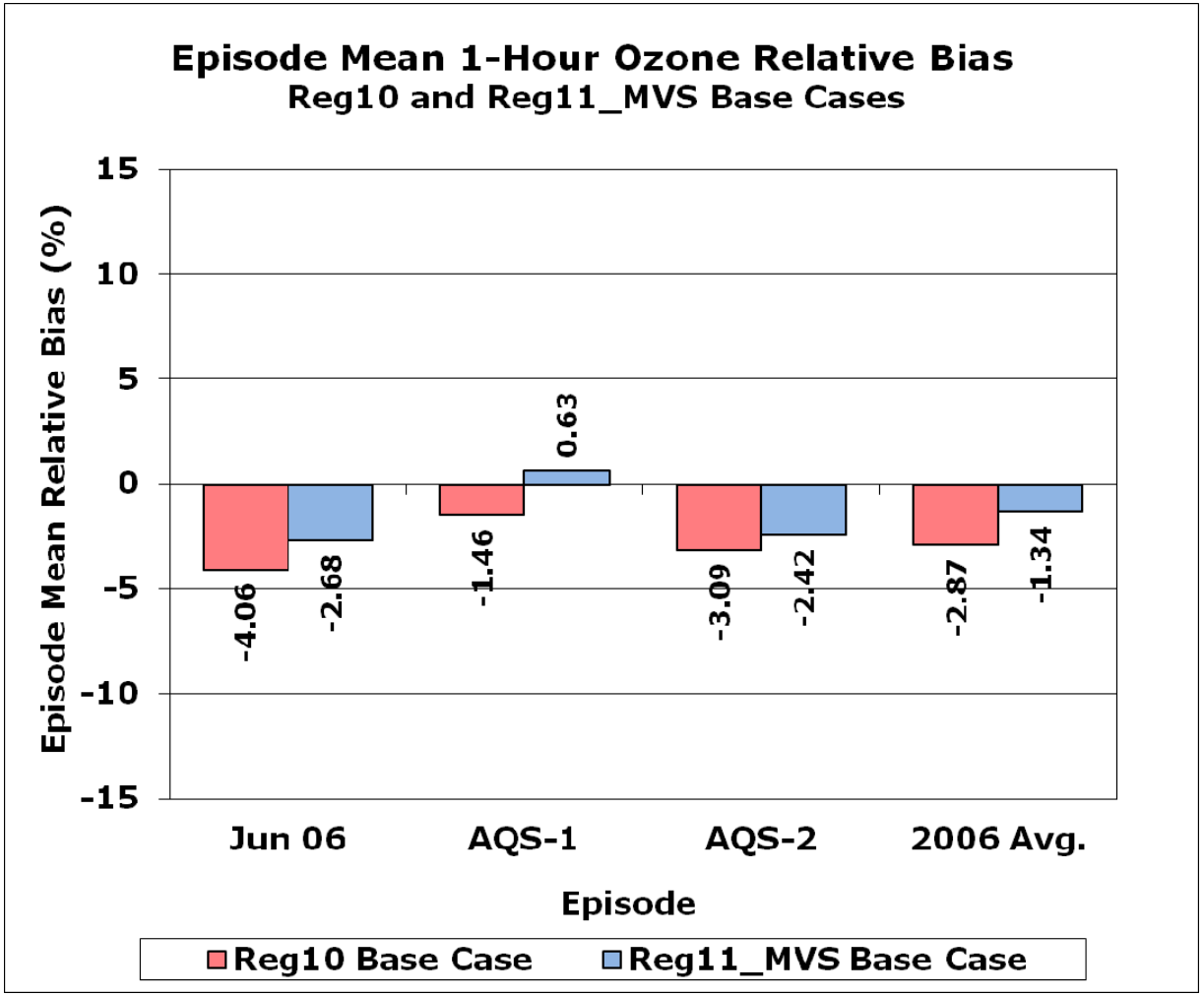
Technical Analysis

- Model performance evaluation of the 2006 episodes using SIP-quality MOVES-based on-road emissions
- Modeling sensitivity analyses identical to the analyses included in the March 2010 AD SIP, only using on-road mobile source modeling emissions developed with the MOVES emission factor model:
  - Retrospective modeling analysis backcast to 2000
  - Weekday versus weekend analysis
- Modeling providing an estimate of the projected 2018 eight-hour ozone design values for HGB using SIP-quality MOVES-based on-road emissions for the 2006 baseline and the 2018 future years
- An update to the ambient ozone and precursor concentration trend analyses included in the March 2010 AD SIP revision, adding monitoring data for 2010 and 2011

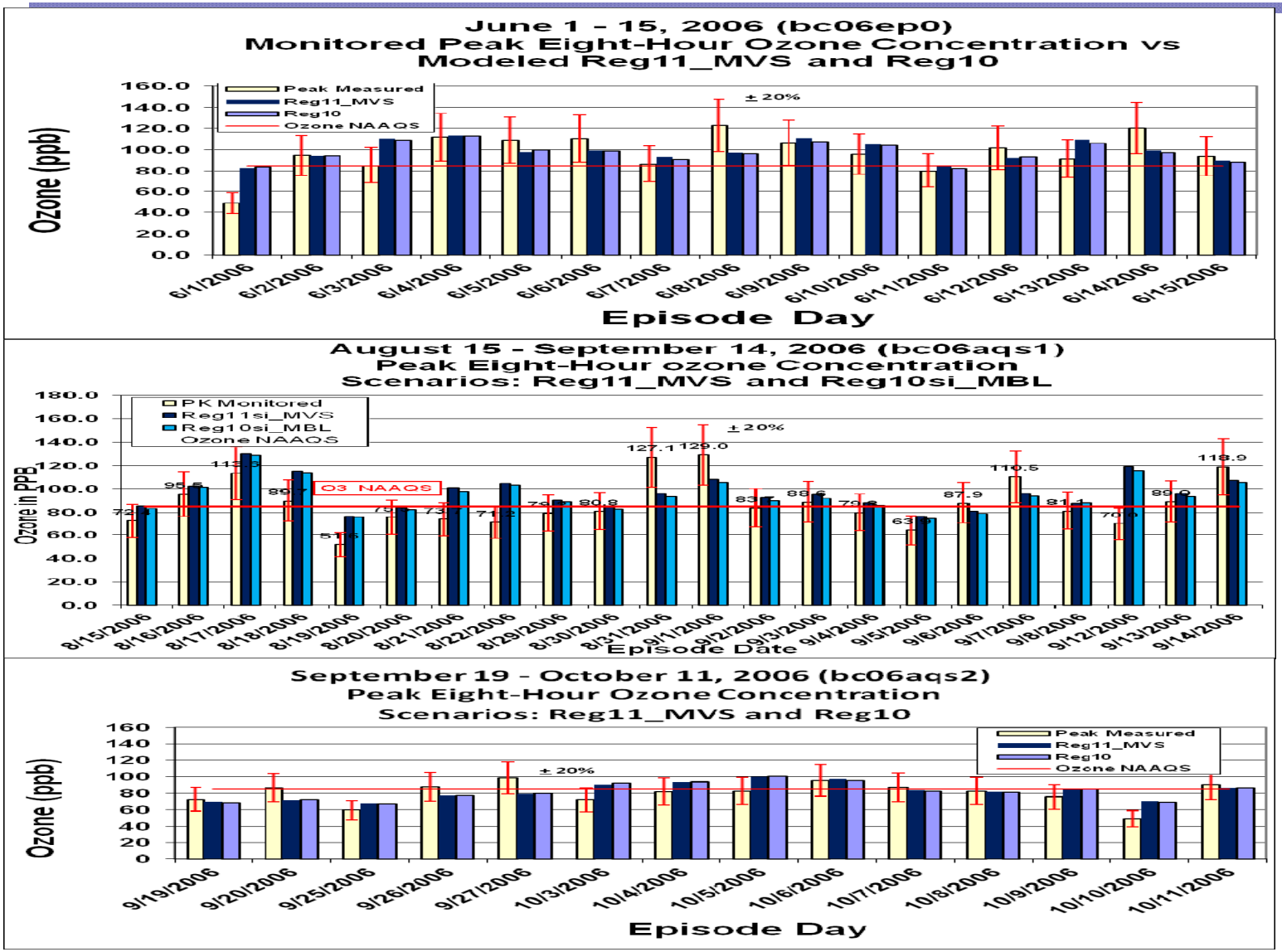
Model Performance Evaluation 2006 Episodes

- Relative bias for one-hour ozone
- Unpaired Peak Accuracy (UPA) for eight-hour ozone
- Mean Normalized Bias (MNB) and Mean Normalized Gross Error (MNGE) for eight-hour ozone
- Time series of one-hour ozone and NO_X for Bayland Park (BAYP; CAMS 53)
- Daily maximum eight-hour ozone tile plots for selected days from each of the three 2006 episodes
- Retrospective modeling – 2000 Backcast
- Observational modeling – Weekday/Weekend

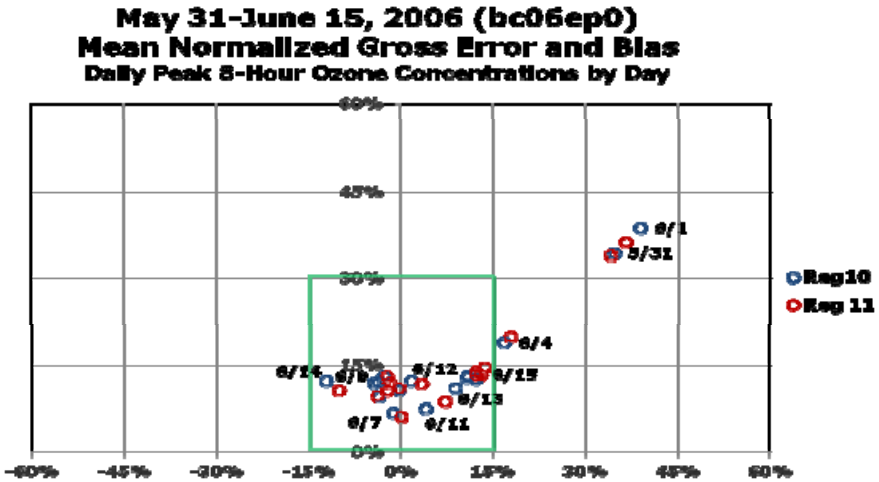
Relative Bias for One-Hour Ozone

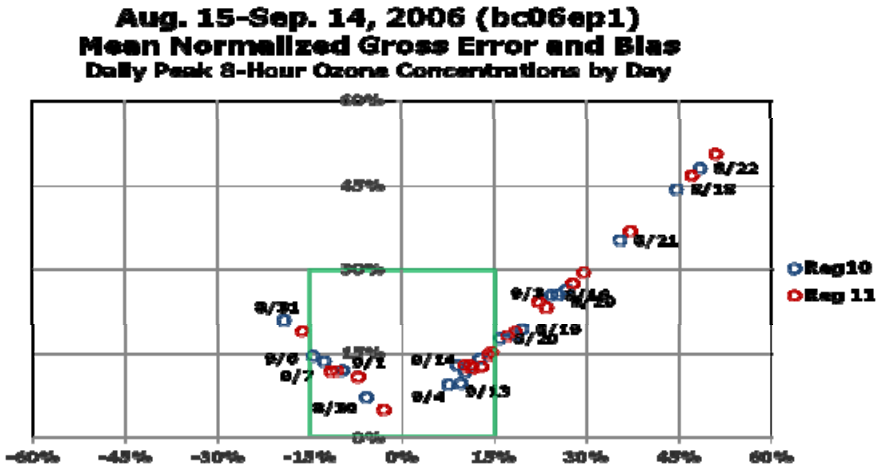


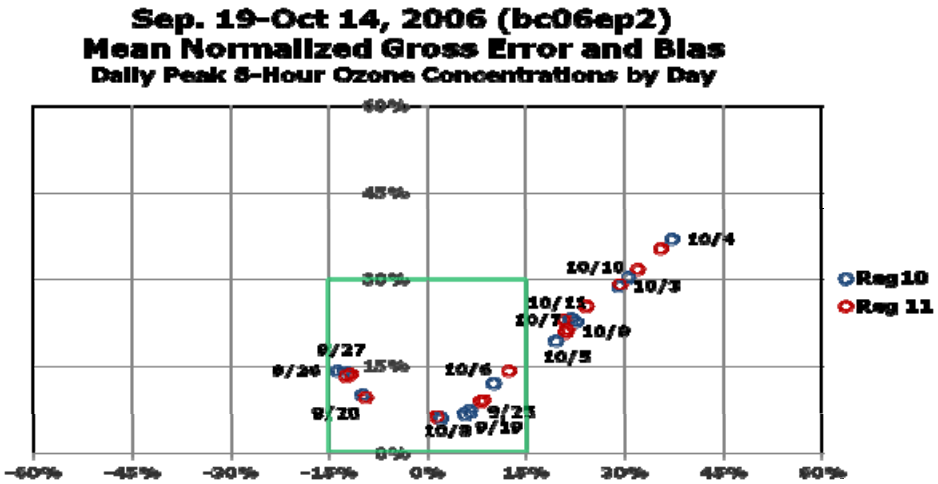
UPA for Eight-Hour Ozone



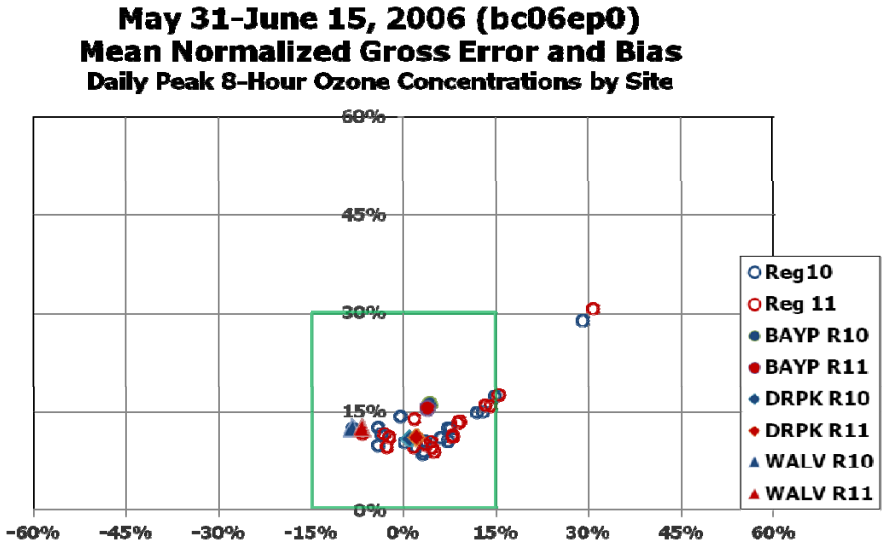
MNB and MNGE for Eight-Hour Ozone by Day

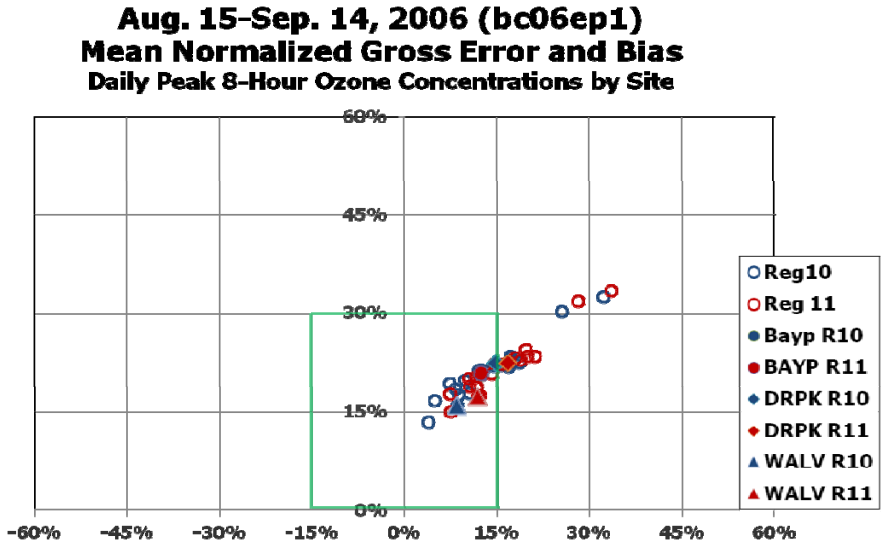


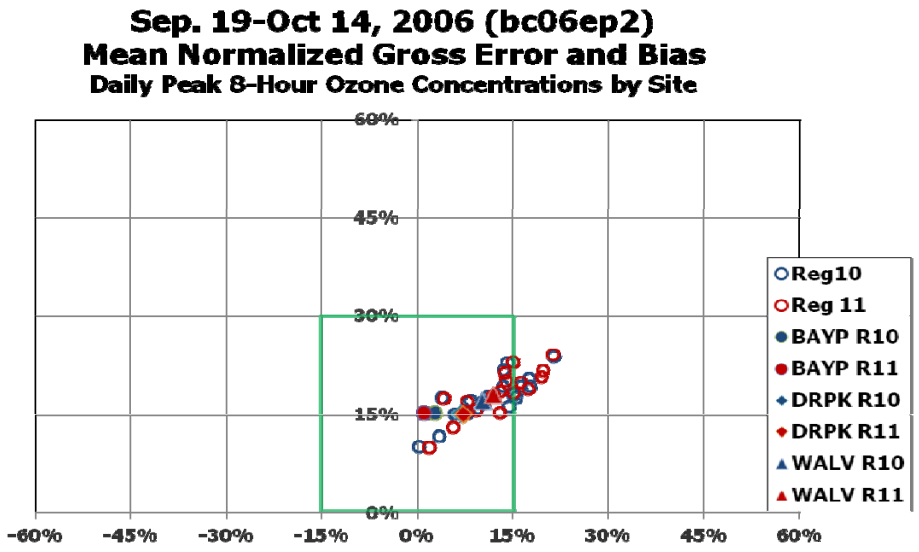




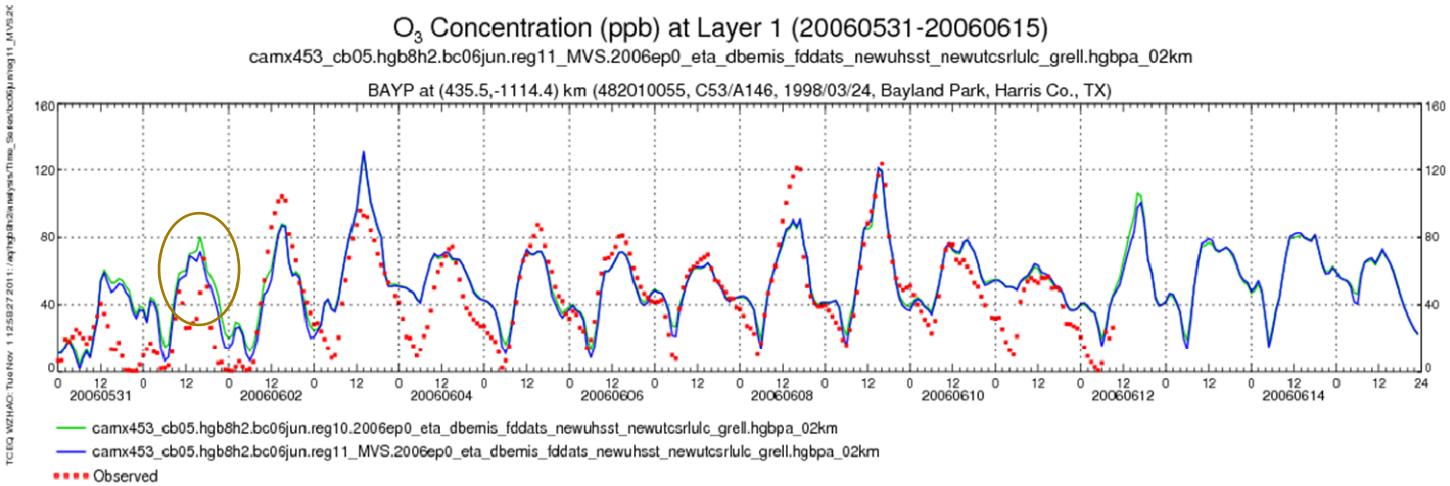
MNB and MNGE for Eight-Hour Ozone by Monitor

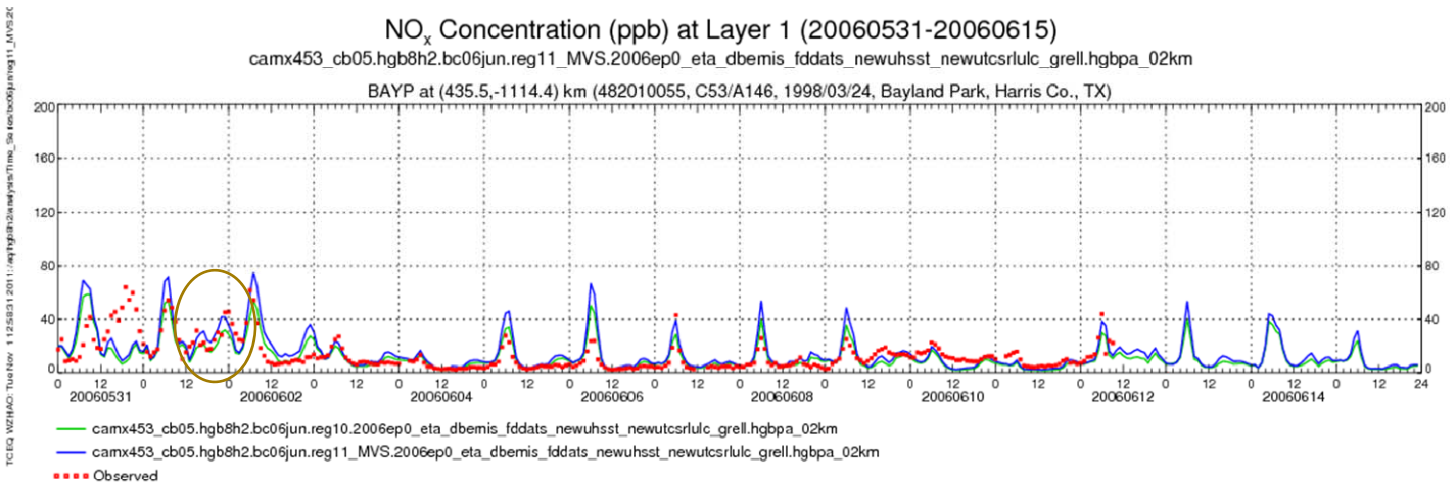






Time series of One-Hour Ozone and NO_X for BAYP (CAMS 53)





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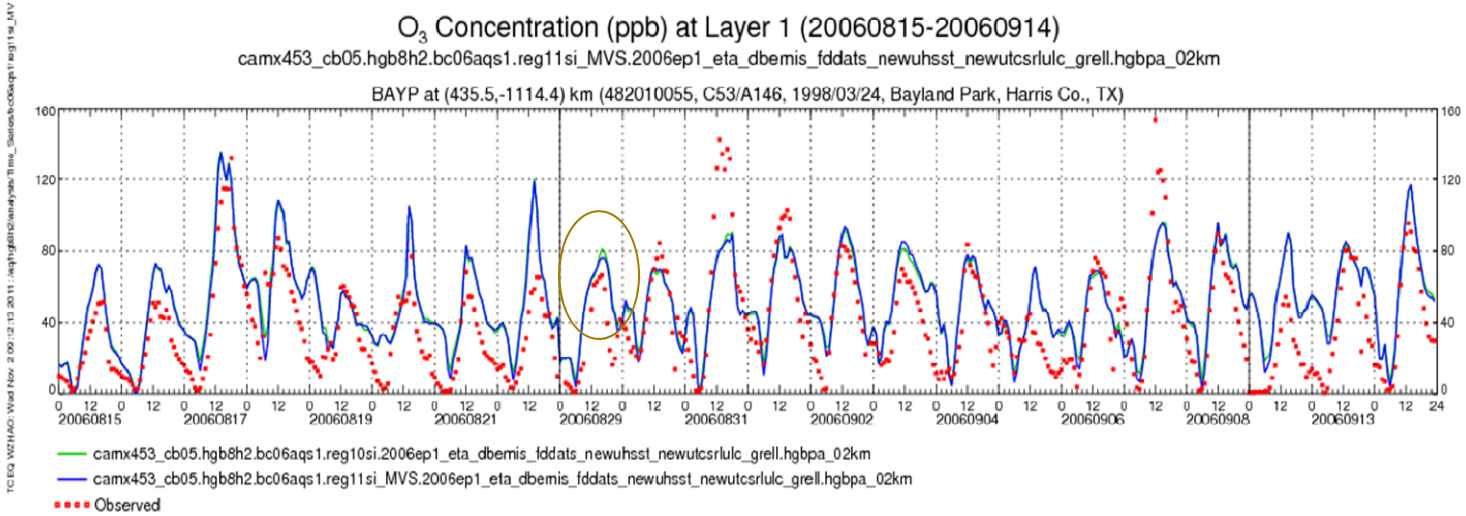

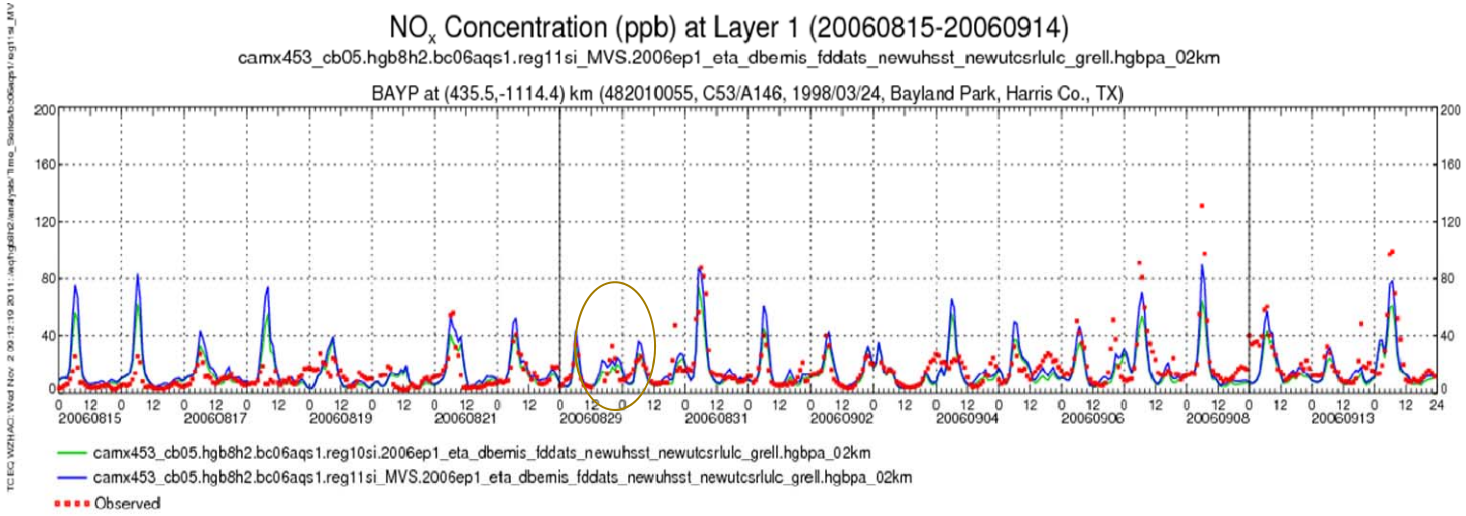

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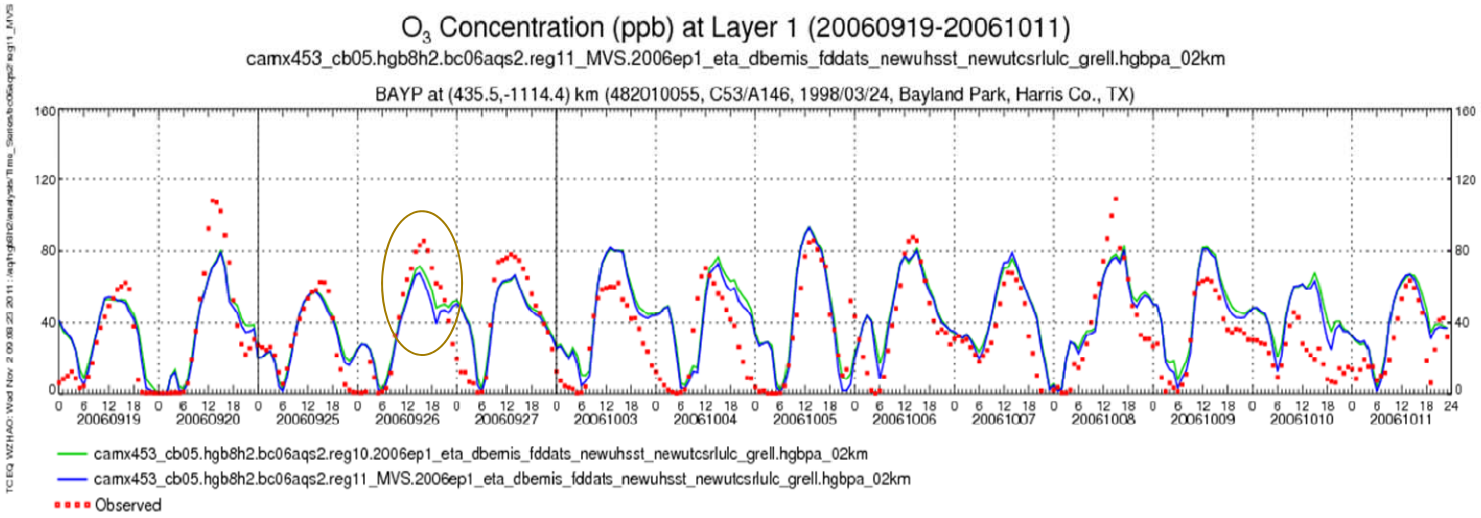
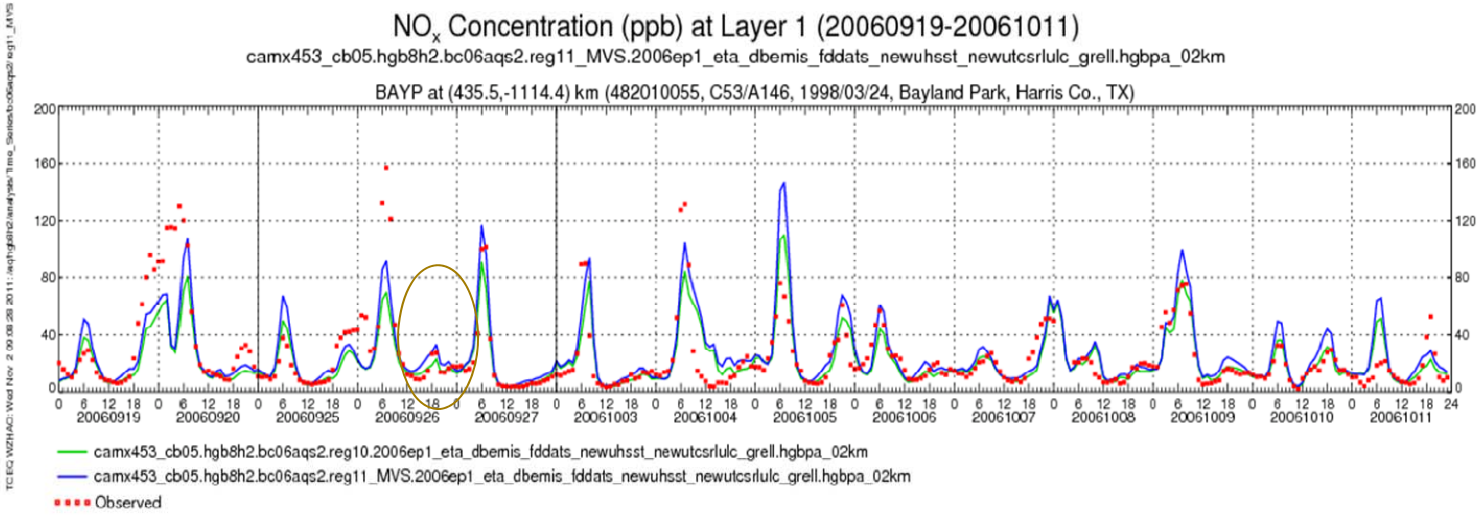
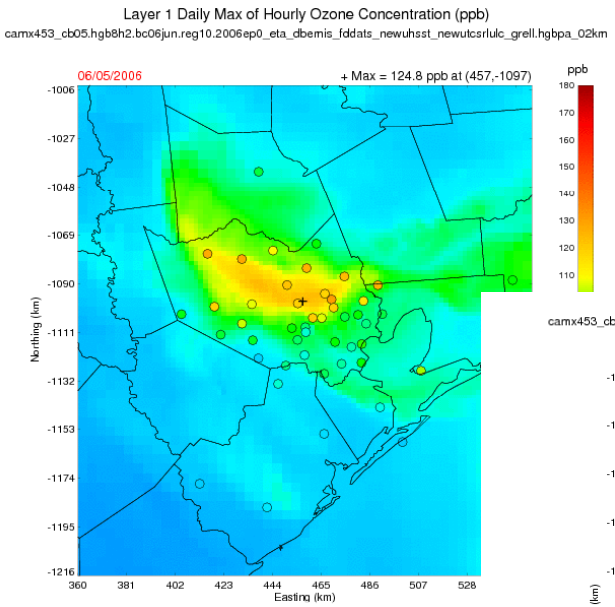
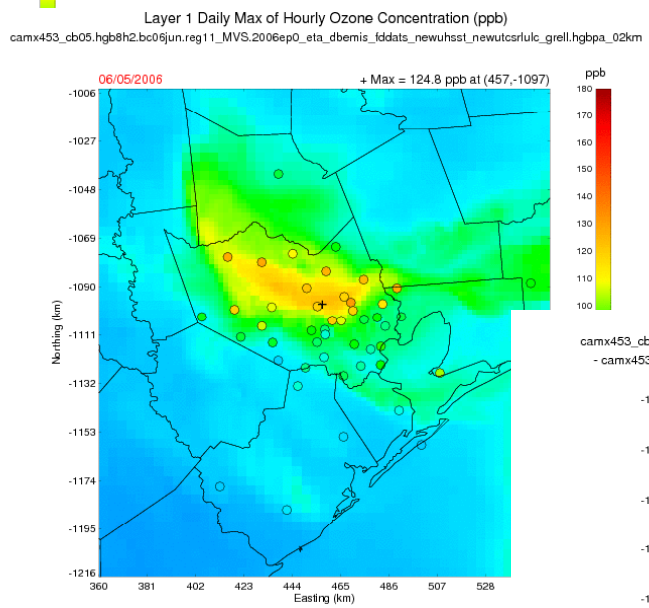
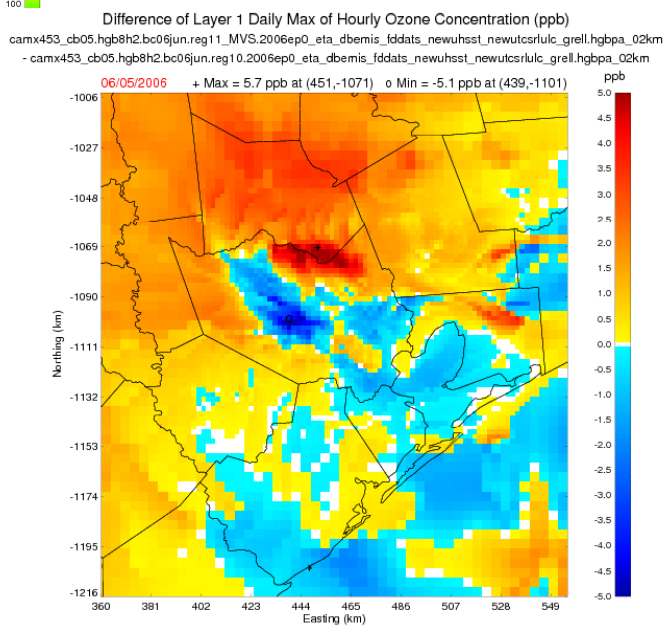




Daily Maximum Eight-Hour Ozone Tile Plots for Selected Day



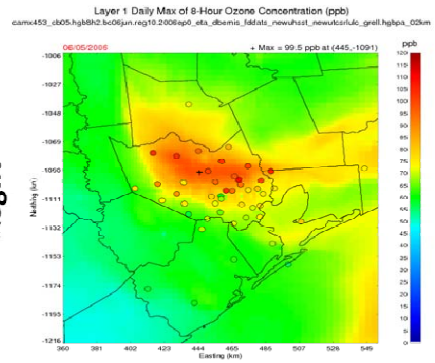


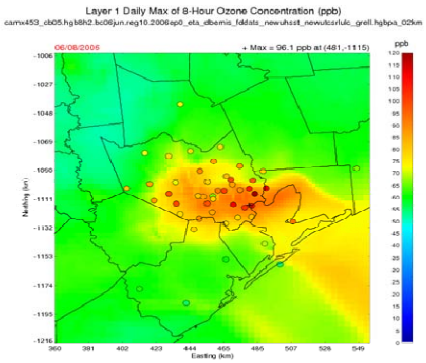


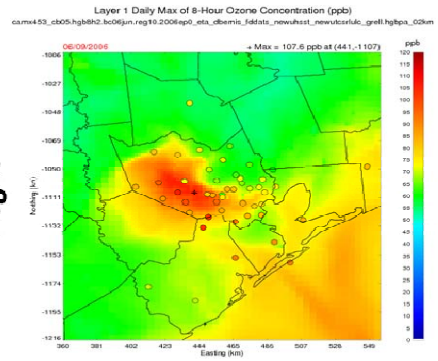
Daily Maximum Eight-Hour Ozone Tile Plots for Selected Days

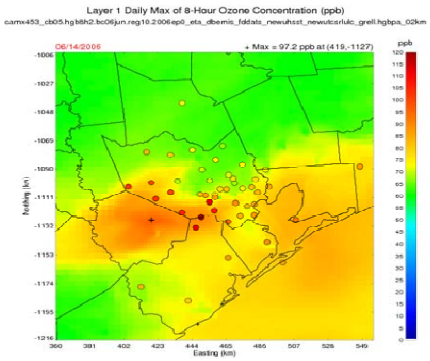
June 5, 2006 | June 8, 2006 | June 9, 2006 | June 14, 2006

Reg10

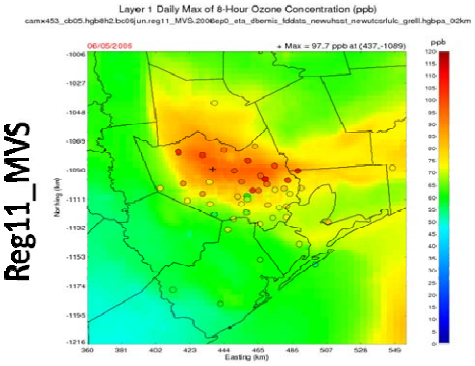


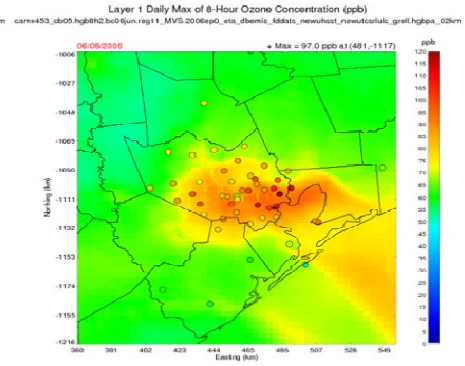


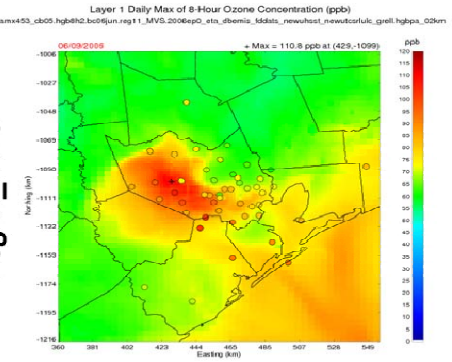


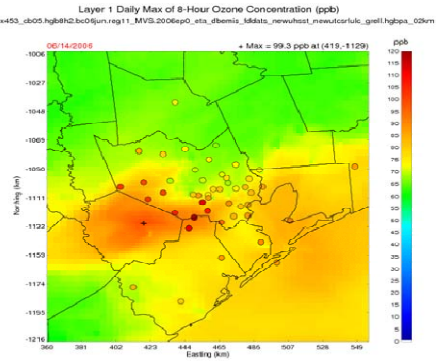


Reg11_MVS

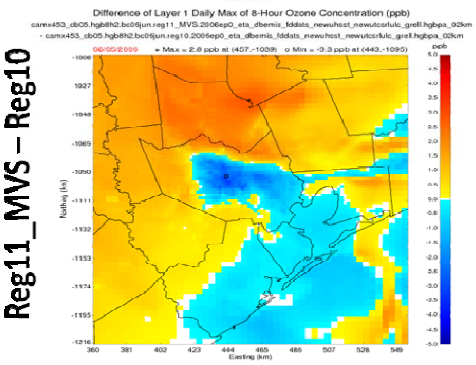


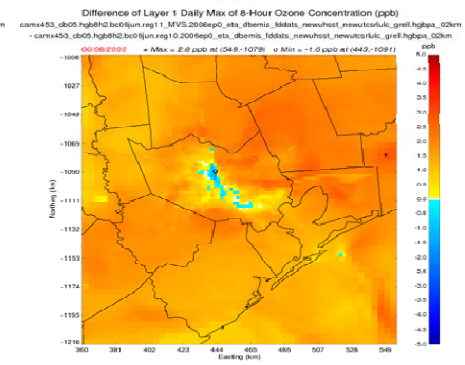


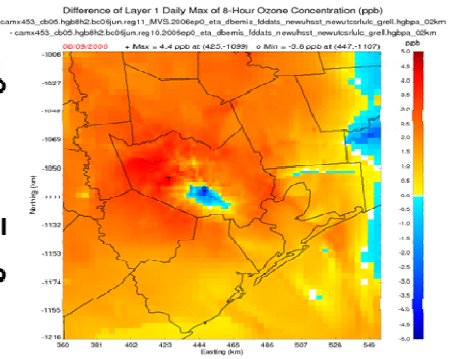


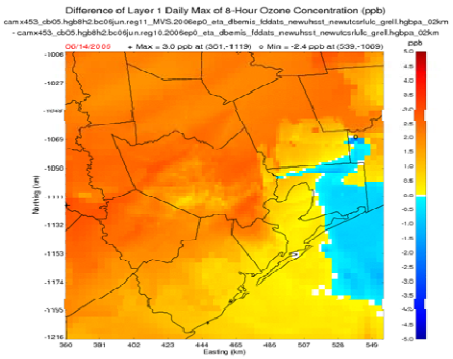


Reg11_MVS – Reg10





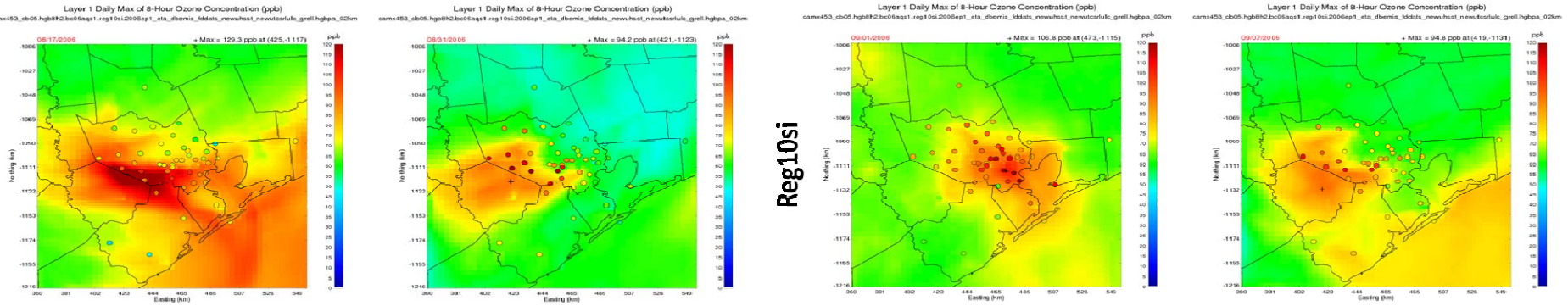




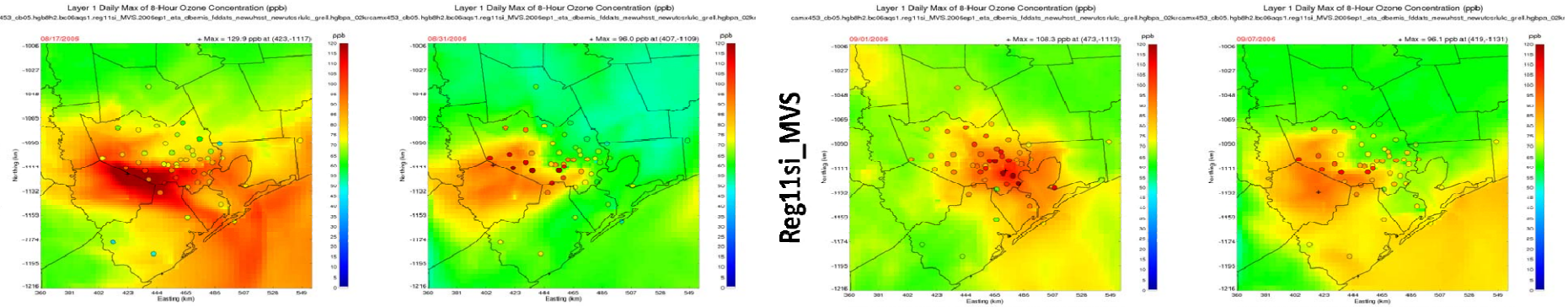
Daily Maximum Eight-Hour Ozone Tile Plots for Selected Days

August 17, 2006 | August 31, 2006 | September 1, 2006 | September 7, 2006

Reg10si



Reg11si_MVS



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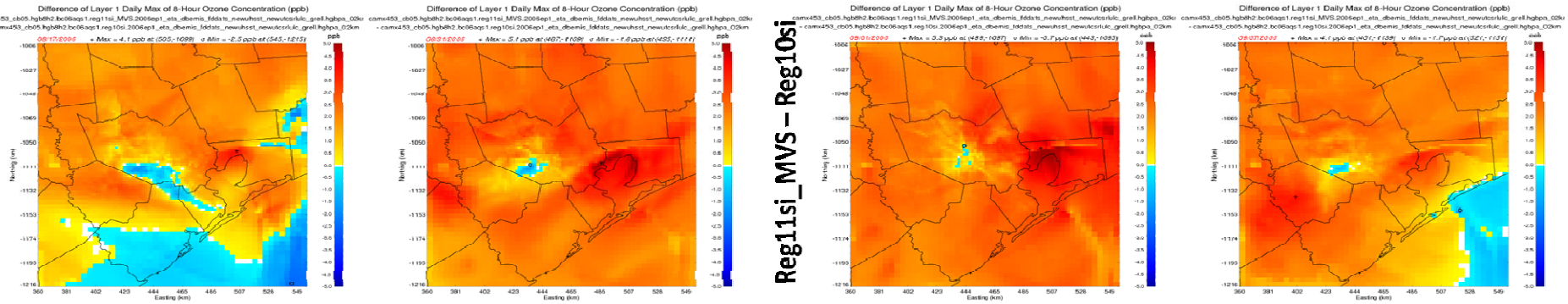
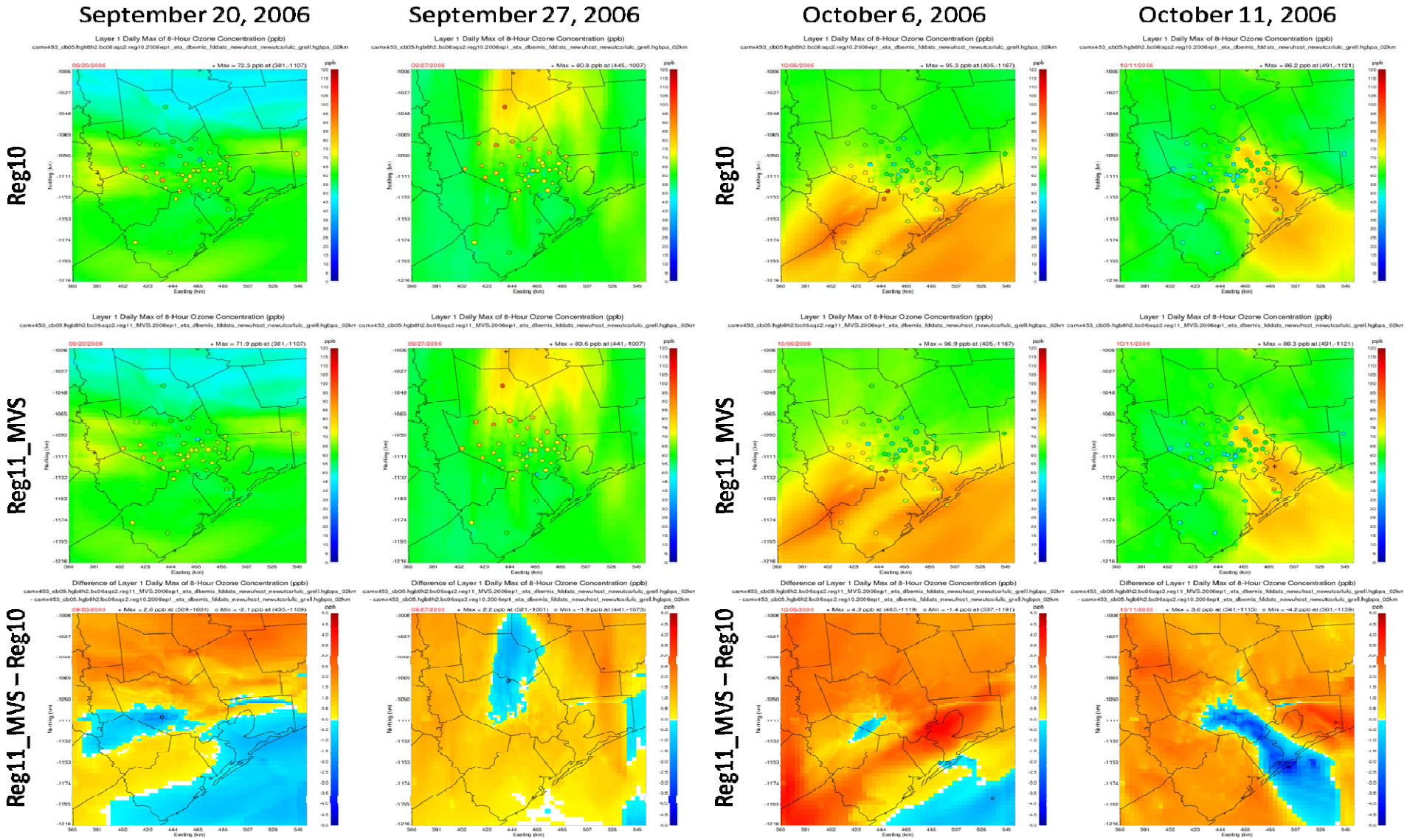


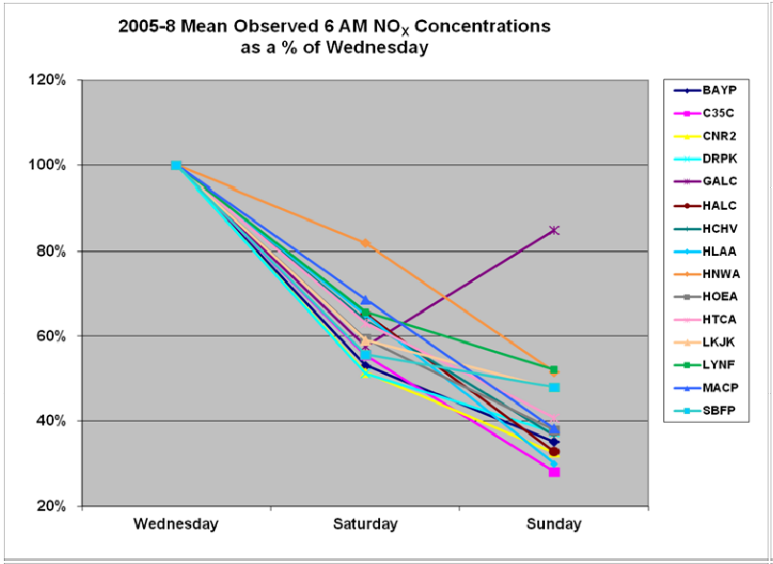
Daily Maximum Eight-Hour Ozone Tile Plots for Selected Days

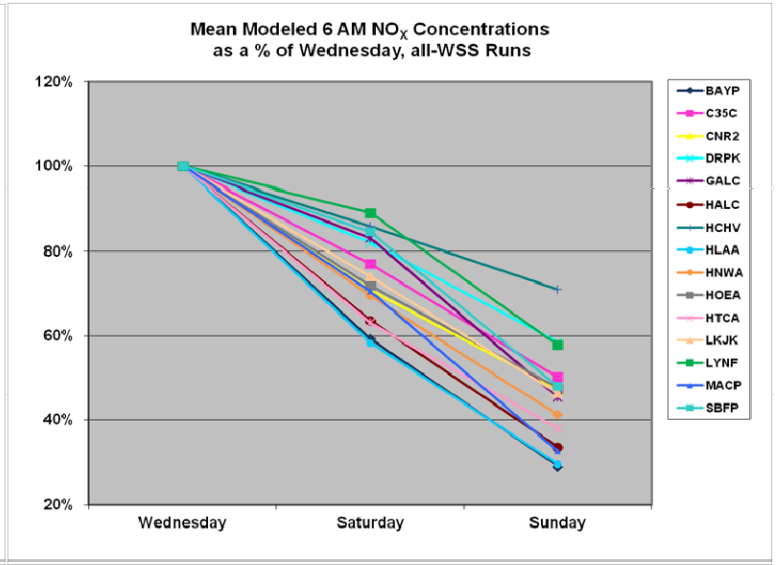


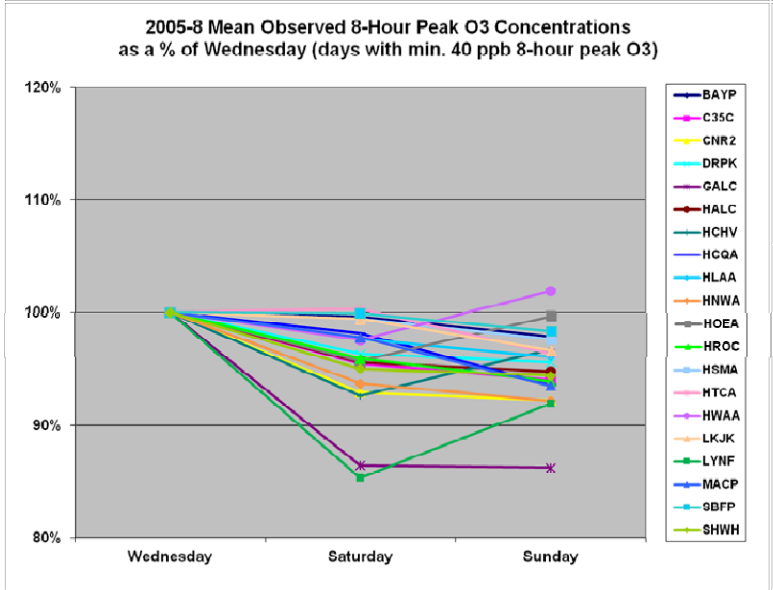
Retrospective Modeling – 2000 Backcast

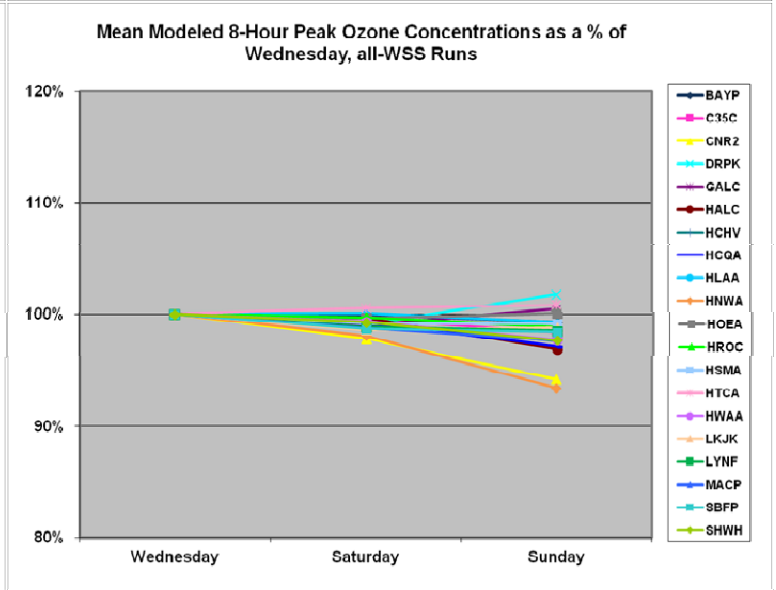
Modeling Site Code	CAMS Number	2006 Baseline Design Value (ppb)	2000/2006 Relative Response Factor	2000 Projected Design Value (ppb)	2000 Baseline Design Value (ppb)
BAYP	53	96.7	1.11	107.0	107.0
C35C	403	79.0	1.18	93.5	97.0
DRPK	35	92.0	1.18	108.1	107.7
GALC	34	81.7	1.11	90.7	98.3
HALC	8	85.0	1.15	97.9	108.7
HCQA	409	87.0	1.13	98.6	105.3
HLAA	408	77.7	1.11	86.4	90.0
HNWA	26	89.0	1.13	100.4	104.7
HOEA	1	80.3	1.17	94.0	102.0
HROC	95	79.7	1.15	91.6	95.0
HSMA	406	90.3	1.16	104.8	96.3
HWAA	405	76.3	1.14	86.9	97.3
SHWH	410	92.3	1.11	102.9	100.3

Observational Modeling – Weekday / Weekend





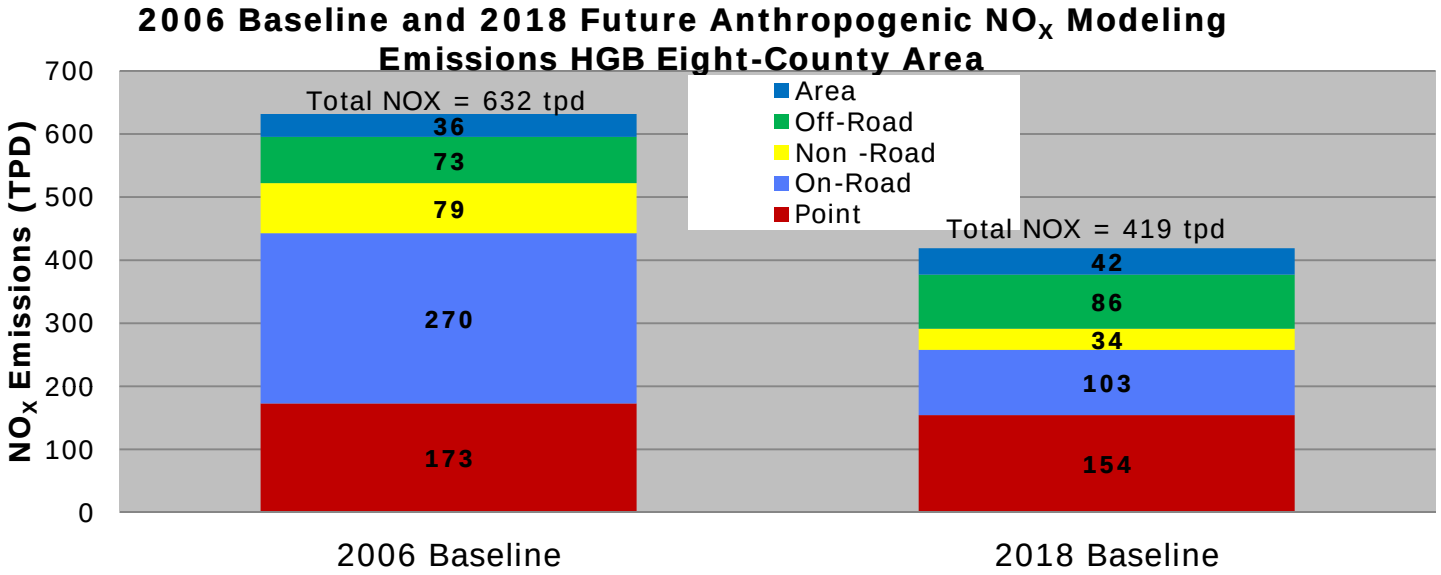


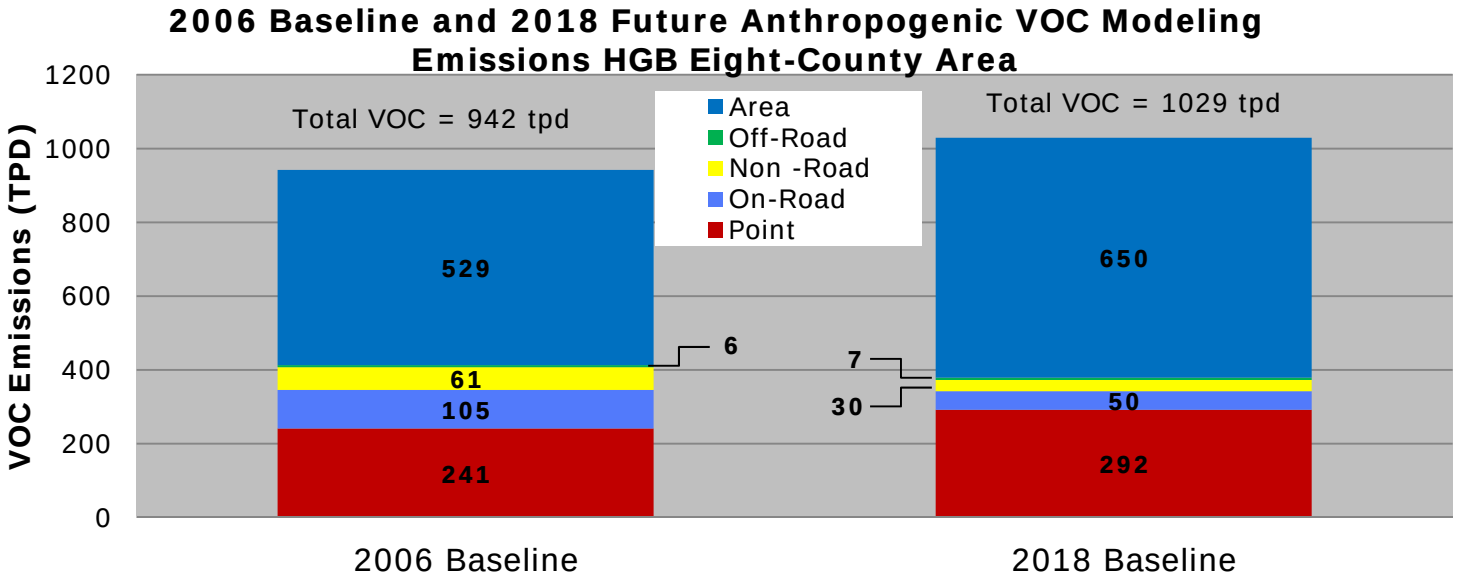


Baseline (2006) and Future Case (2018) Modeling

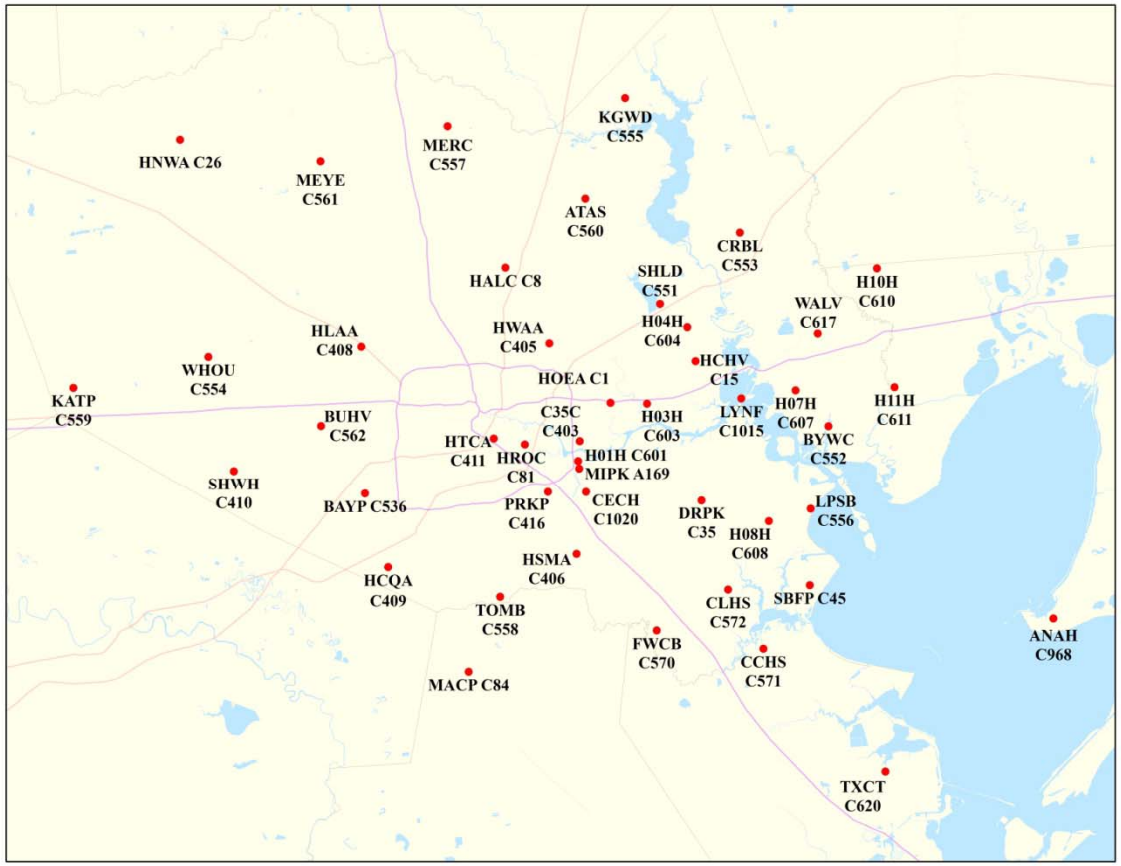
- Modeling Emissions
- Future (2018) Design Values (DV_f)
  - without enhanced HECT
  - with enhanced HECT
- Matrix Modeling
- Source Apportionment Modeling (OSAT/APCA)
- Un-monitored Area Analysis

Modeling Emissions





Map of Monitoring Sites



Site Code	Selected Site Name
BAYP	Bayland Park, Harris Co., TX
C35C*	Clinton, Harris Co., TX
CNR2	Conroe Relocated, Montgomery Co., TX
DRPK*	Deer Park, Harris Co., TX
GALC	Galveston, Galveston Co., TX
H03H*	HRM-3, Haden Road, Harris Co., TX
H08H	HRM Site 8, La Porte, Harris Co., TX
H10H	HRM-10, Mt Belvieu, Chambers Co., TX
H11H	HRM-11. , Chambers Co., TX
HALC	Aldine, Houston, Harris Co., TX
HCHV*	Channelview, Houston, Harris Co., TX
HCQA	Croquet, Houston, Harris Co., TX
HNWA	NW Harris, Tomball, Harris Co., TX
HOEA	Houston East, Houston, Harris Co., TX
HROC	Houston Regional Office, Harris Co., TX
HSMA	Swiss and Monroe., Harris Co., TX
HTCA	Texas Avenue, Houston, Harris Co., TX
HWAA	North Wayside, Houston, Harris Co., TX
LYNF*	Lynchburg Ferry, Harris Co., TX
MACP	Manvel Croix Park, Brazoria Co., TX
MSTG*	Mustang Bayou, Brazoria Co., TX
SBFP	Seabrook Friendship Park, Harris Co., TX
SHWH	Westhollow, Houston, Harris Co., TX
TXCT*	Texas City, Galveston Co., TX
WALV*	Wallisville Road, Harris Co., TX

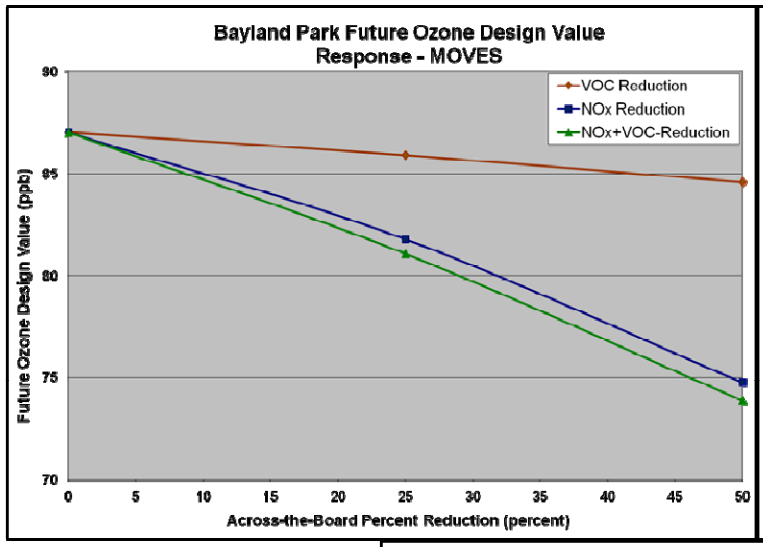
Future (2018) Design Values (DV_f)

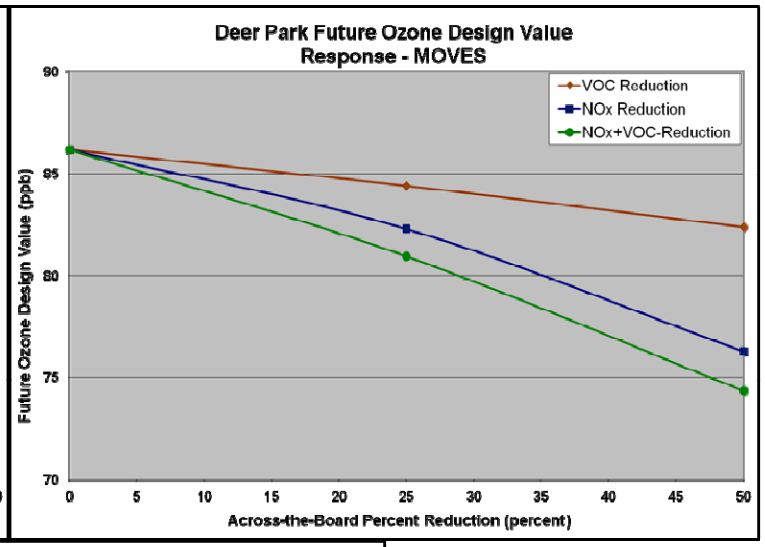
Monitor Designation	Site Code	2006 DV_B (ppb)**	RRF	2018 DV_F (ppb)**	RRF w/HECT	2018 DV_F (ppb)**
Houston East (CAMS 1)	HOEA	80.3	0.943	75.8	0.942	75.6
Aldine (CAMS 8)	HALC	85.0	0.918	78.0	0.916	77.9
Channelview (CAMS 15)	HCHV	82.7	0.940	77.7	0.937	77.5
Northwest Harris County (CAMS 26	HNWA	89.0	0.878	78.1	0.887	78.1
Galveston Airport (CAMS 34)	GALC	81.7	0.928	75.8	0.927	75.7
Deer Park (CAMS 35)	DRPK	92.0	0.937	86.2	0.936	86.1
Seabrook Friendship Park (CAMS 45)	SBFP	85.3	0.925	78.9	0.924	78.8
Bayland Park (CAMS 53)	BAYP	96.7	0.900	87.0	0.899	87.0
Conroe Relocated (CAMS 78)	CNR2	83.0	0.878	72.9	0.877	72.8
Houston Regional Office (CAMS 81)	HROC	79.7	0.951	75.8	0.949	75.7
Manvel Croix Park (CAMS 84)	MACP	90.7	0.891	80.8	0.890	80.7
Clinton (CAMS 403)	C35C	79.0	0.949	75.0	0.947	74.8
North Wayside (CAMS 405)	HWAA	76.3	0.934	71.3	0.932	71.2
Swiss and Monroe (CAMS 406)	HSMA	90.3	0.919	83.0	0.917	82.9
Lang (CAMS 408)	HLAA	77.7	0.898	69.7	0.897	69.6
Croquet (CAMS 409)	HCQA	87.0	0.898	78.2	0.897	78.1
Shell Westhollow (CAMS 410)	HWH	92.3	0.869	80.2	0.868	80.1
Houston Texas Avenue (CAMS 411)	HTCA	79.3	0.939	74.5	0.937	74.3
Haden Road (CAMS 603)*	H03H	84.0	0.945	79.4	0.943	79.2
Wallisville Road (CAMS 617)*	WALV	92.0	0.936	86.2	0.935	86.0
Danciger (CAMS 618)*	DNCG	80.3	0.882	70.8	0.881	70.8
Mustang Bayou (CAMS 619)*	MSTG	84.7	0.901	76.3	0.901	76.3
Texas City (CAMS 620)*	TXCT	84.3	0.922	77.7	0.921	77.7
Lynchburg Ferry (CAMS 1015)	LYNF	81.7	0.944	77.1	0.942	76.9
Lake Jackson (CAMS 1016)	LKJK	77.0	0.892	68.6	0.891	68.6

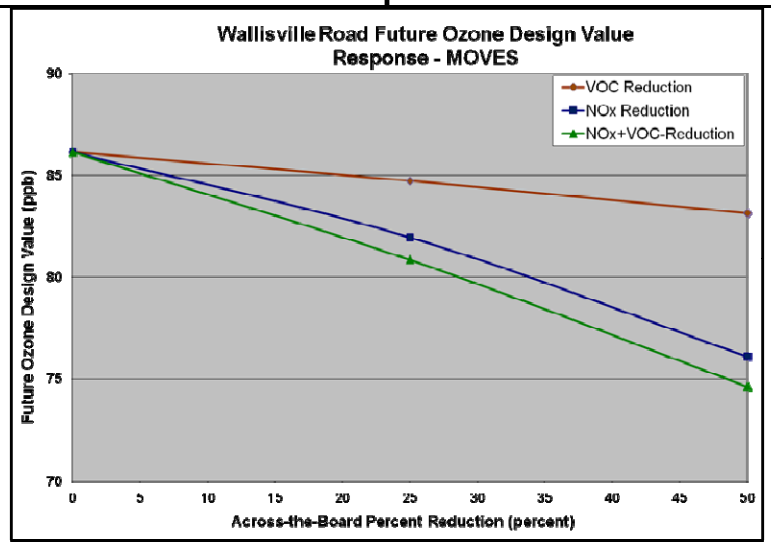
* Non-regulatory, industry-sponsored monitor

** Values 85 ppb or greater are shown in red.

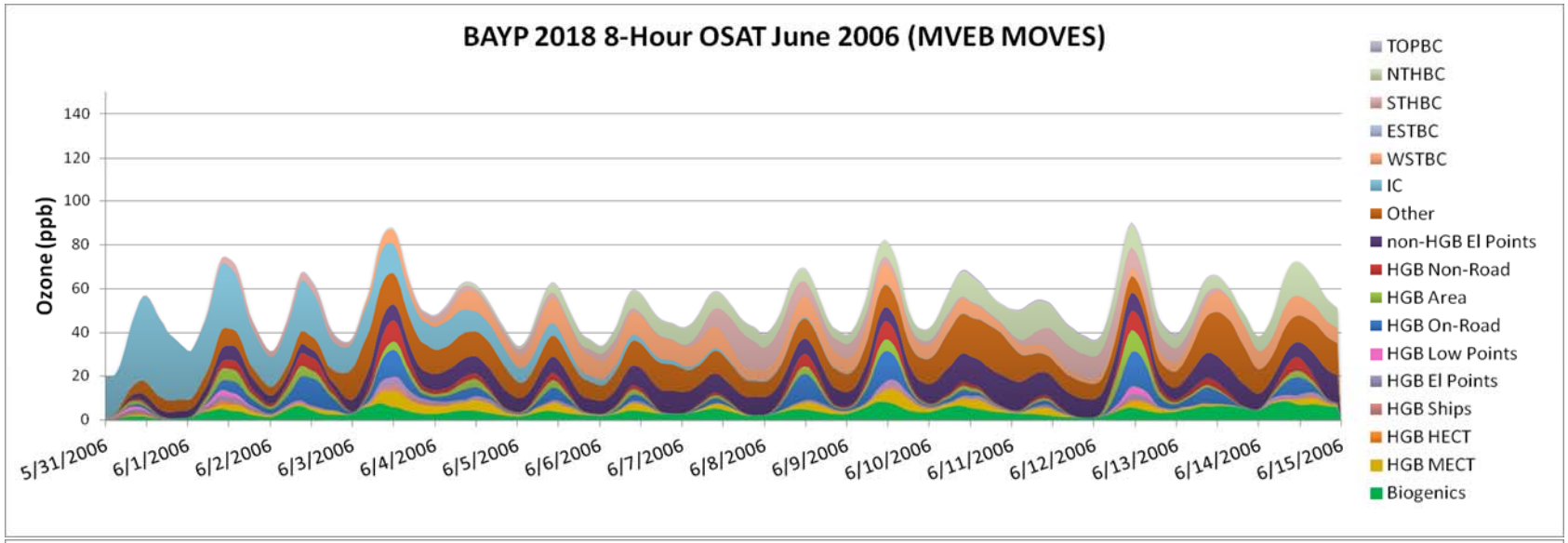
Matrix Modeling

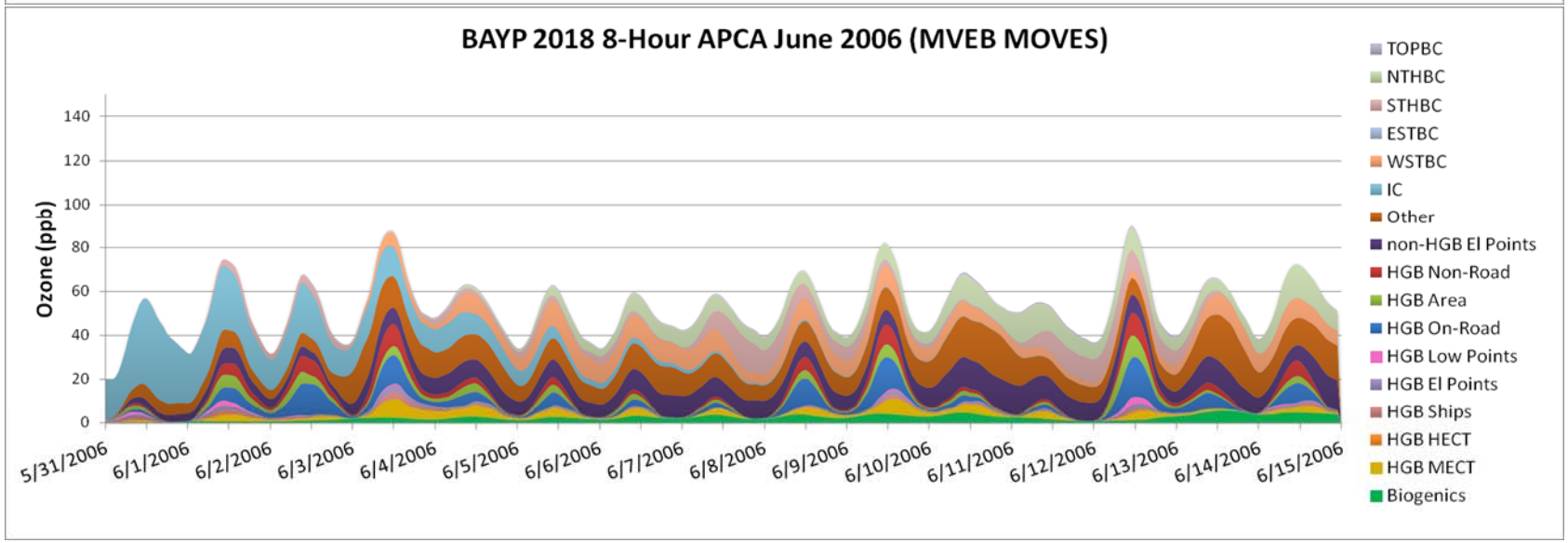






Source Apportionment Modeling (OSAT / APCA)





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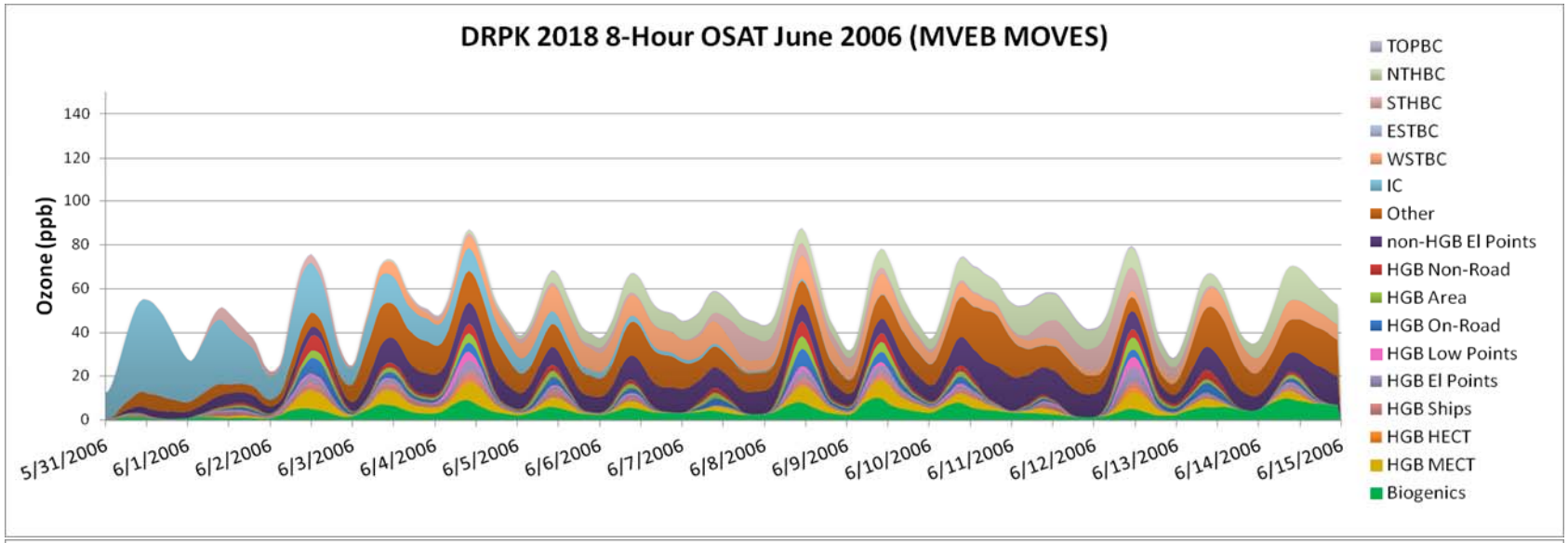

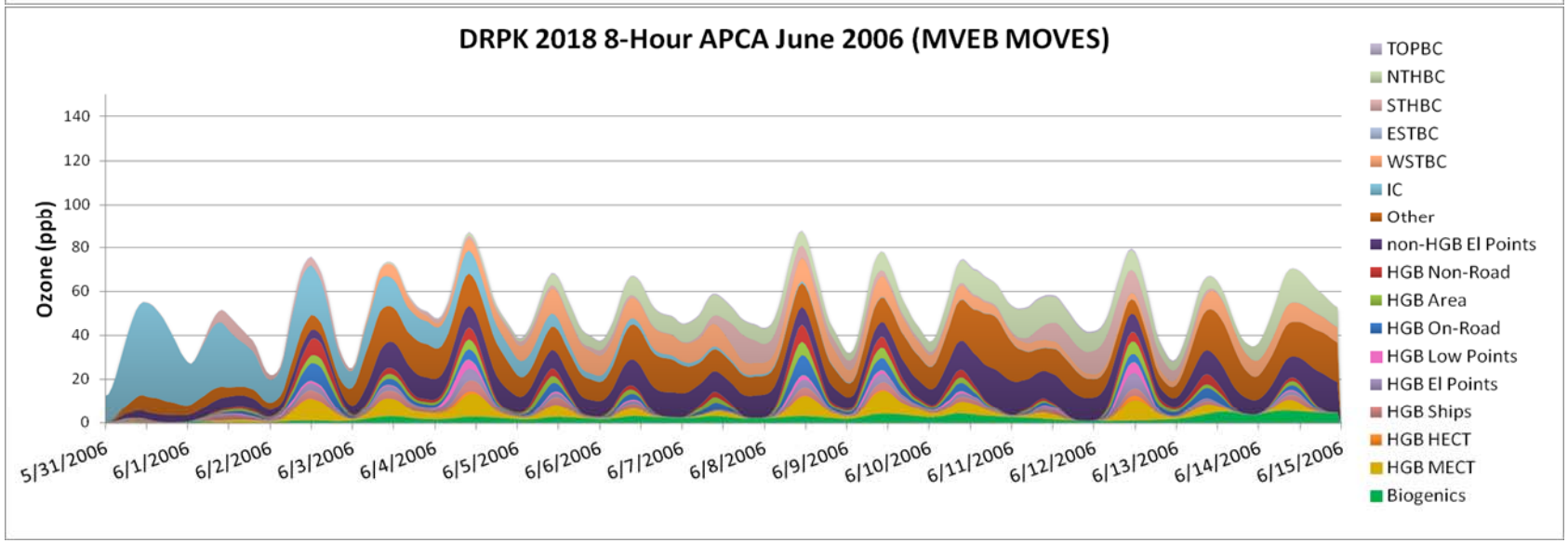

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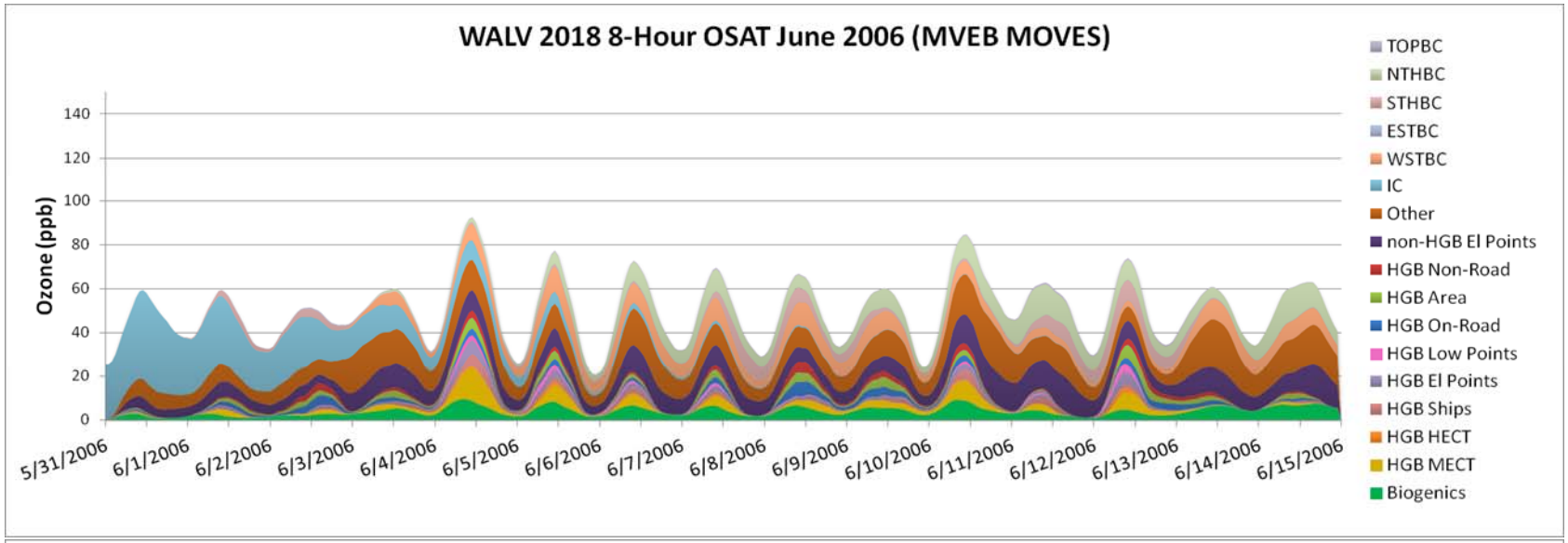
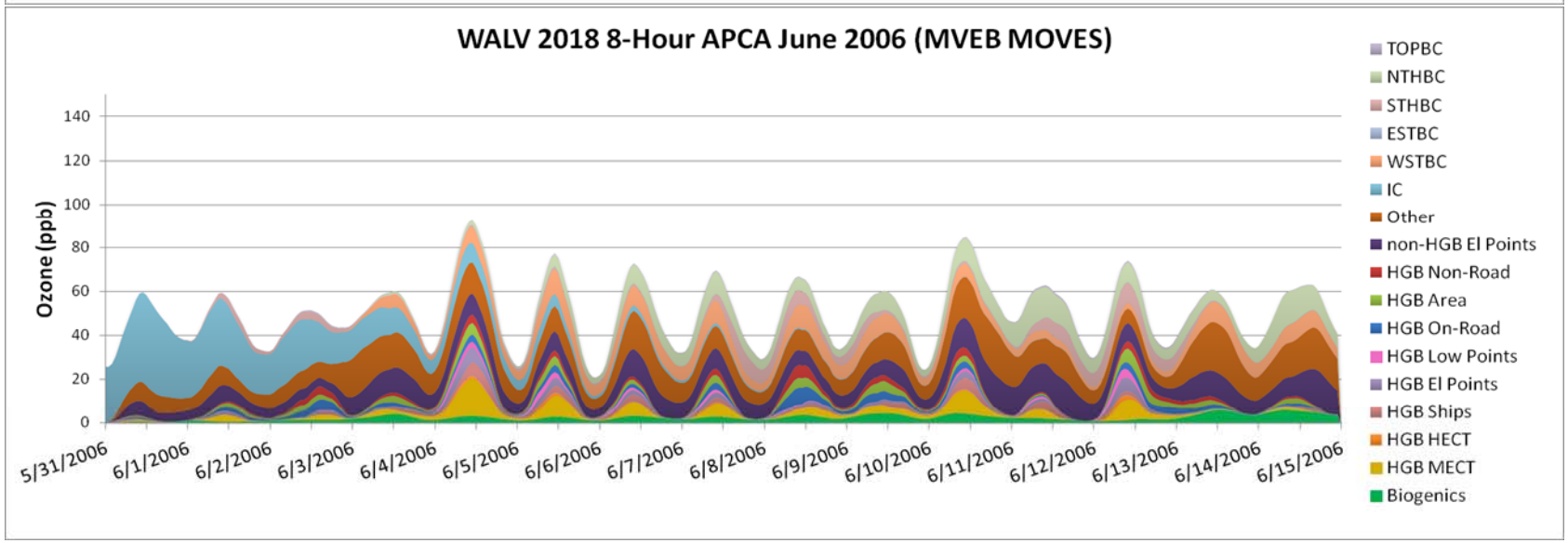
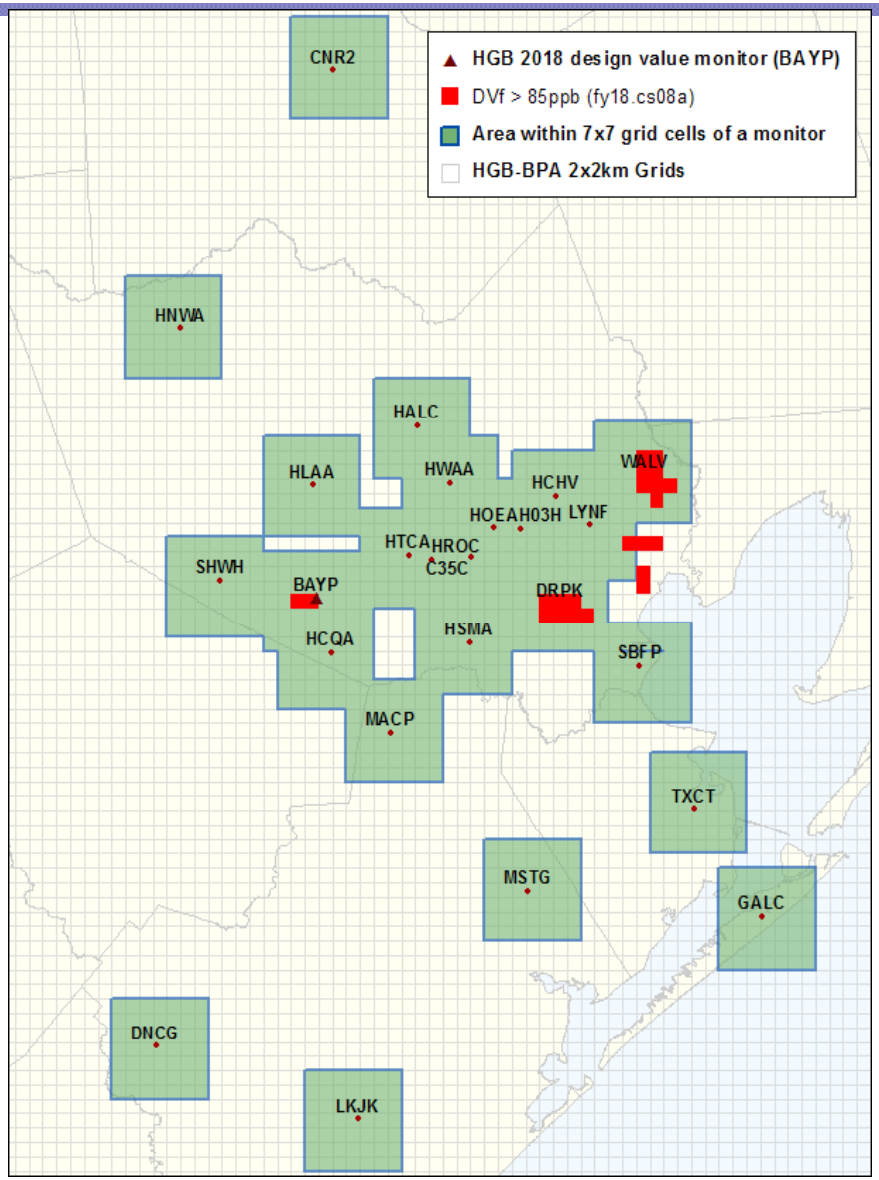




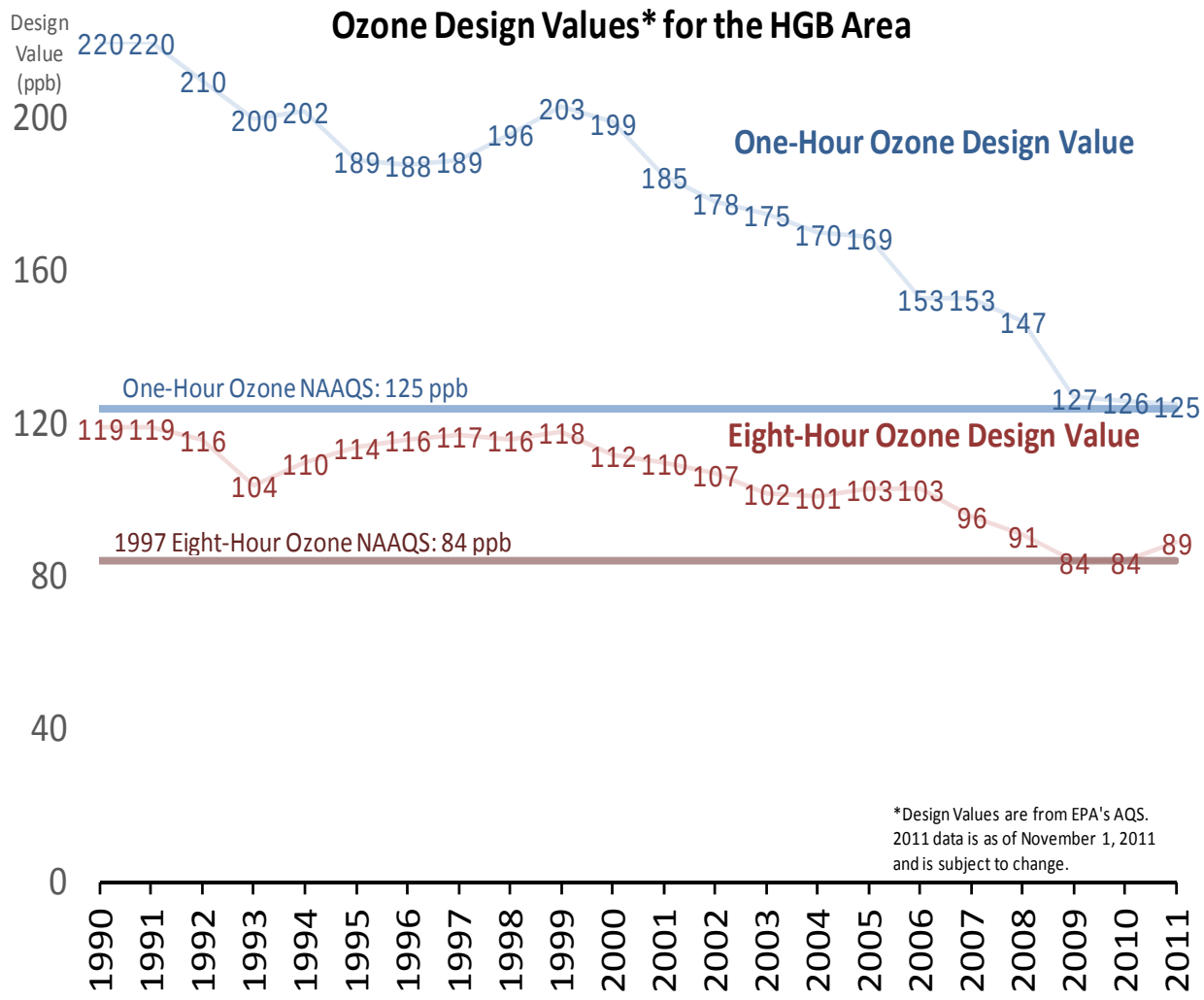
Un-monitored Area Analysis



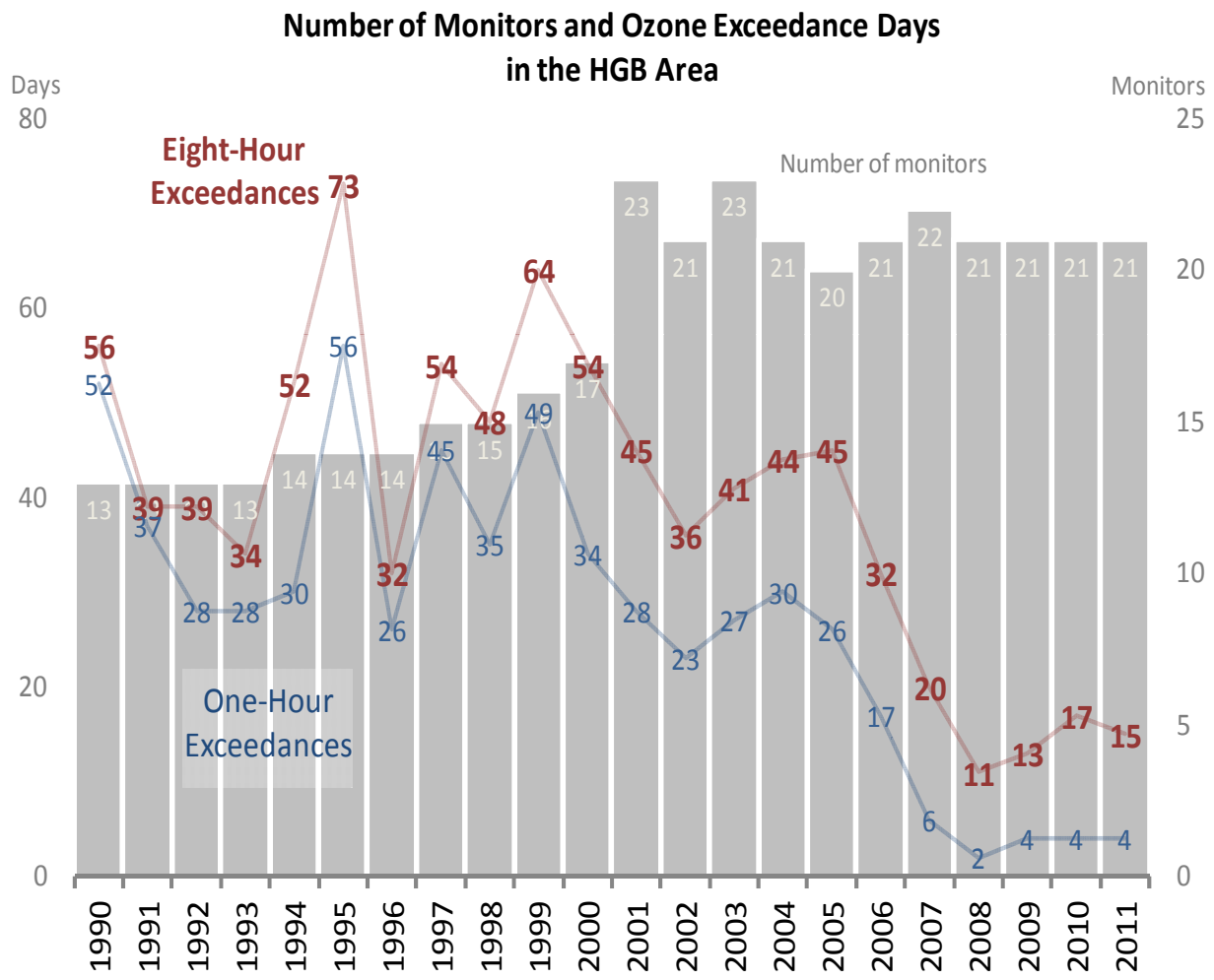
Update of Ambient Ozone and Precursor Concentration Trends

- Trend in ozone design values
- Trend in ozone exceedance days
- Trend in NO_X concentrations
- Trend in ethylene and propylene concentrations

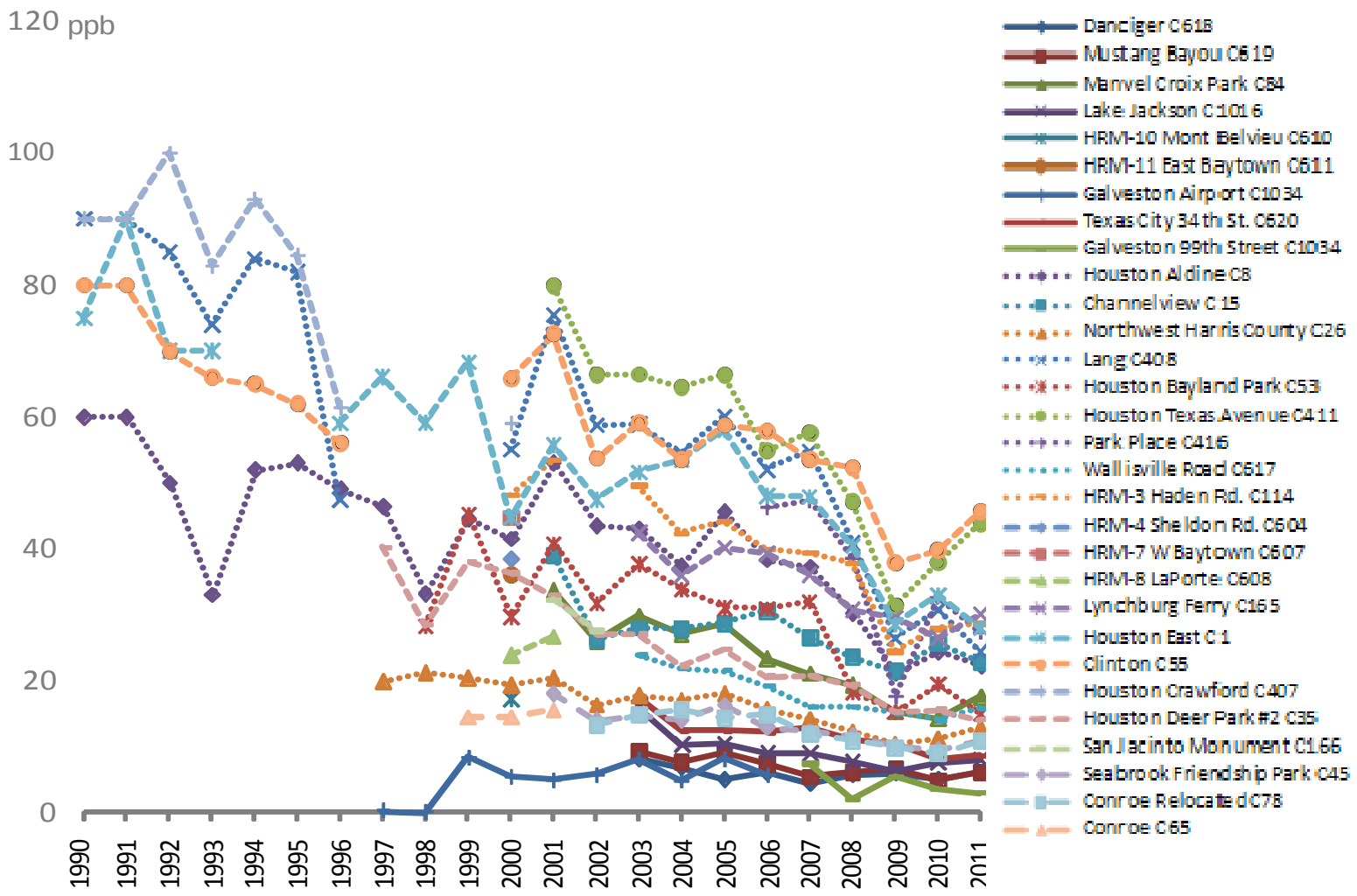
Trend in Ozone Design Values



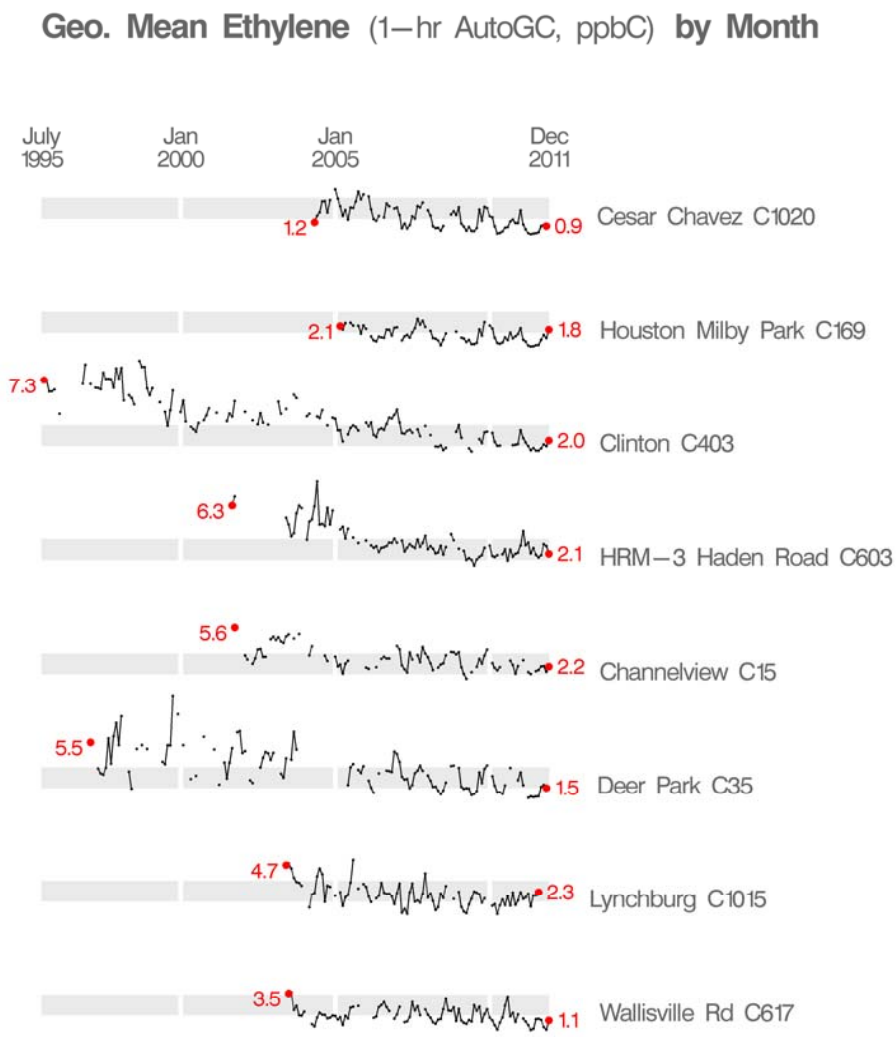
Trend in Ozone Exceedance Days



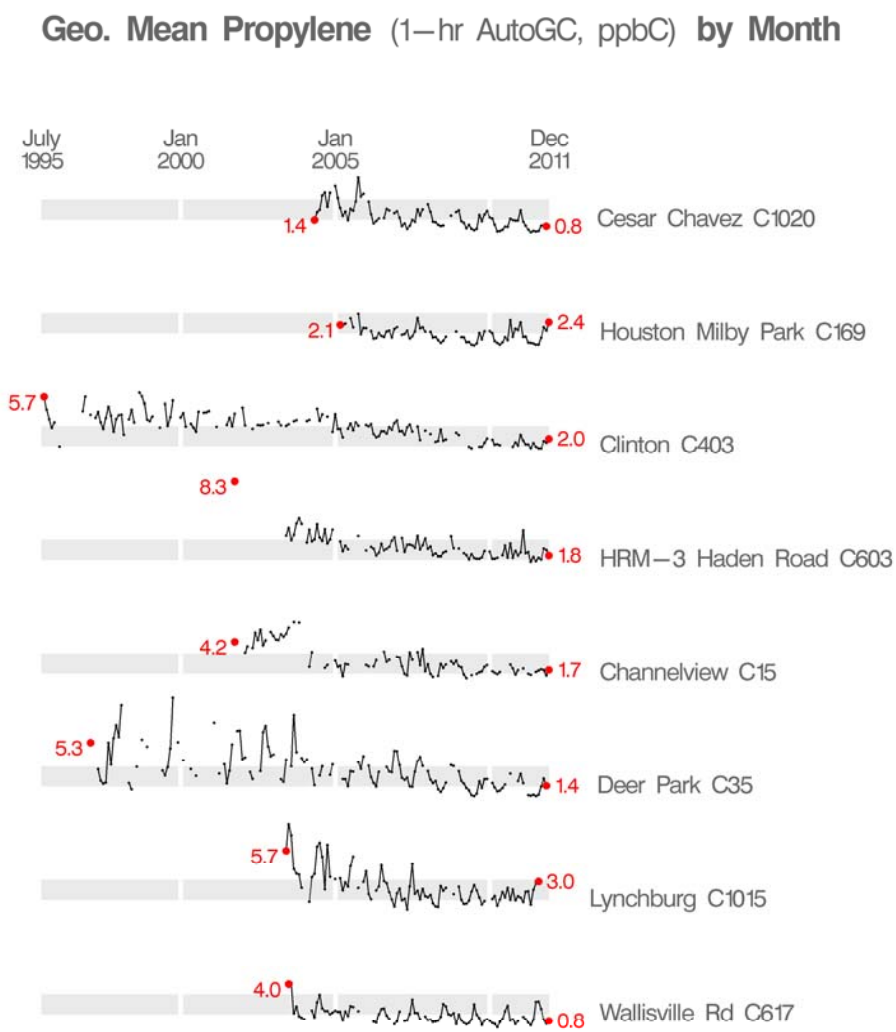
Trend in NO_X Concentrations



Trend in Ethylene Concentrations



Trend in Propylene Concentrations



Concluding Remarks

- Although using MOVES increased base case on-road NO_X and VOC emissions 63% and 14%, respectively, model performance is slightly improved and acceptable for SIP modeling.
- Sensitivity modeling using MOVES indicates that, similar to the modeling using MOBILE6.2, the modeled ozone concentration is not as responsive to NO_X emission reductions as the actual airshed. Therefore, the NO_X emission reductions scheduled to occur between 2006 and 2018 are likely to be more effective in reducing ozone than the model predicts.
- Modeling with MOVES predicts that BAYP (CAMS 53) will be the design value setting monitor in 2018 with a DV_f of 87 ppb, which is within the recommended range set by EPA for use of corroborative analyses (weight of evidence) to supplement the modeled attainment test.
- Although the ozone design value increased somewhat in 2011 (89 ppb), the long-term trend in design values shows a steady decrease. Additionally, the trends in both NO_X and VOC precursor concentrations are decreasing, which supports the decrease in ozone concentrations. Finally, given that for both 2009 and 2010, the design value was 84 ppb, it seems quite likely that the 2018 ozone design value will be less than or equal to 84 ppb.

Contact Information

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SETPMTC Web Site

- http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html