

Houston SIP Modeling Update

2nd Interim Base Case Modeling: 2005 Episodes

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Southeast Texas Photochemical

Modeling Committee

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CAMx Ozone Modeling in SIP Development

The Big Picture

Base Case

Day-specific meteorology and emissions;
replicate what actually happened

Baseline Case

Day-specific meteorology and Typical emissions;
used in RRF to predict future design values

Future Base Case

Apply future growth + on-the-books controls
to estimate future ozone

Control Strategy Testing

Determine control strategies that will
effectively reduce ozone

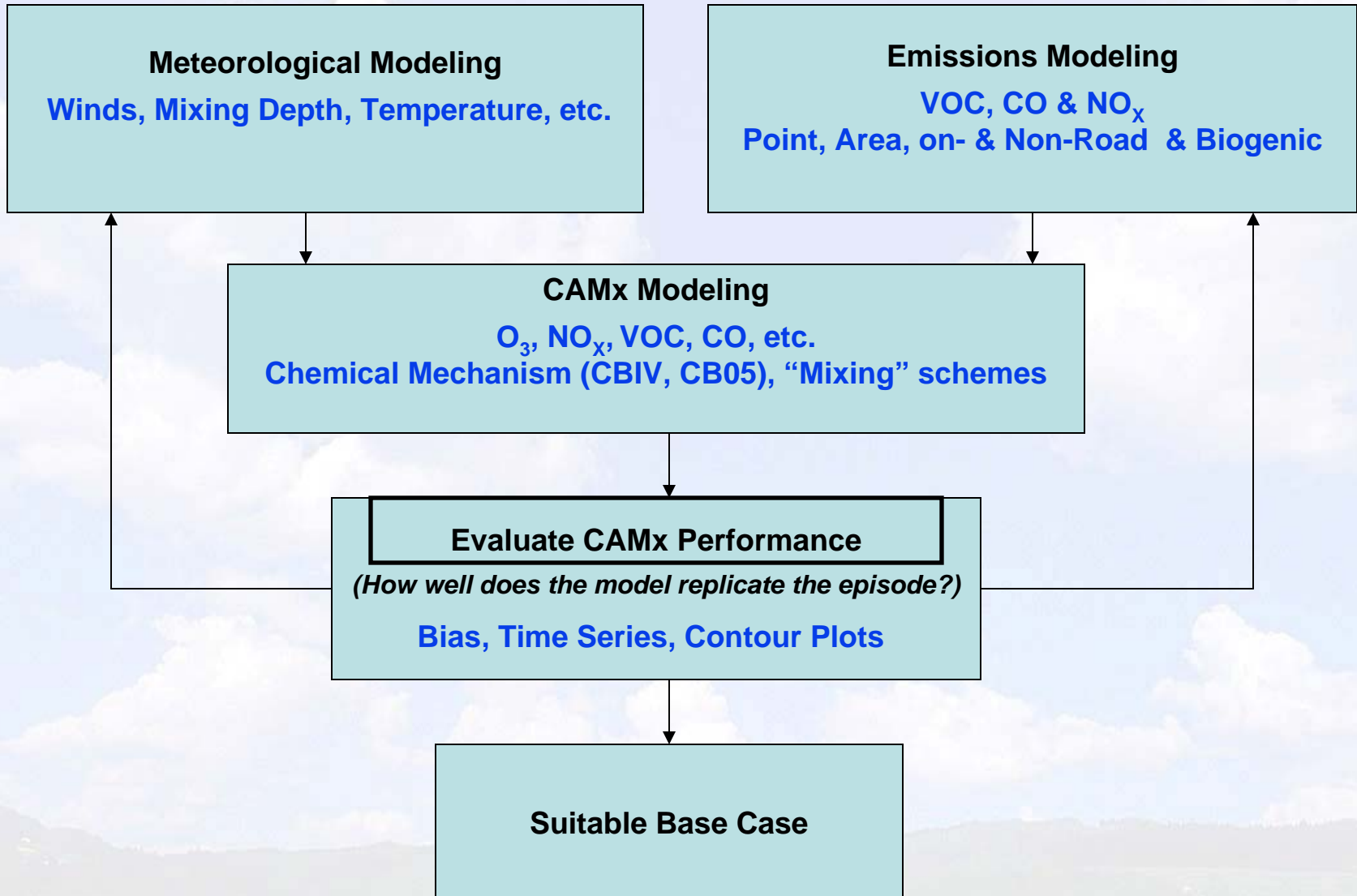
SIP

Document modeling procedures



CAMx Ozone Modeling in SIP Development

Base Case – Historical Episode Replication





2nd Interim Base Case Modeling: 2005 Episodes

- Episode0: May 19 through June 3, 2005
- Episode1: June 17 through June 30, 2005
- Episode2: July 27 through August 8, 2005
(note: All episodes were modeled with HGB 2x2 km domain)



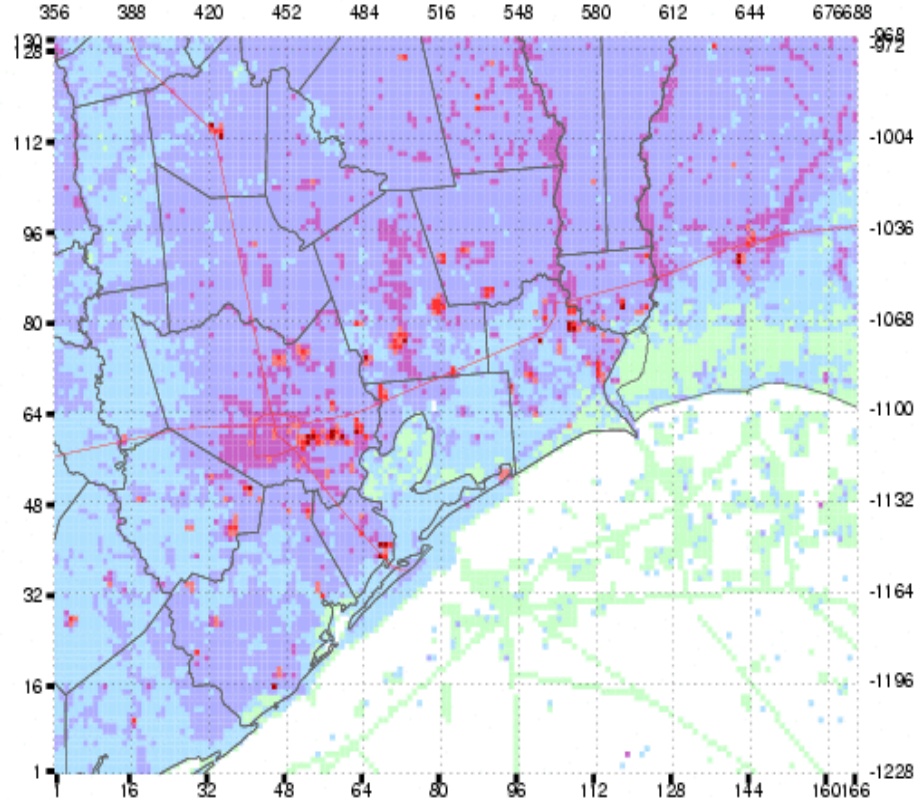
Emissions and Meteorology Updates

- Emissions Update (Regular3 - Regular7a)
 - Hourly Tank Landing Loss
 - TFS fires
- Meteorology Updates (ncepsst – uhsst.utcsrulc)
 - FDDA Nudging with time-shift
 - NOAA Land Surface Model with UT-CSR LU/LC
 - U of H hourly SST

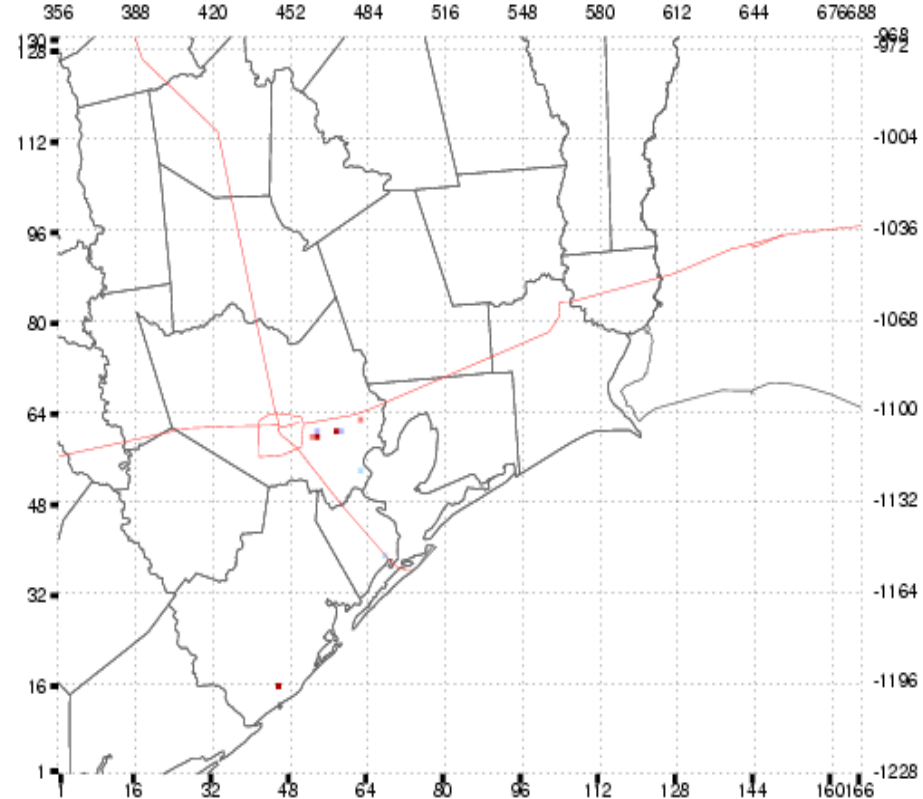


Emissions Update

- Hourly Tank Landing Loss: Total VOC vs TLL VOC
- TFS fires: Total NO_x vs TFS NO_x

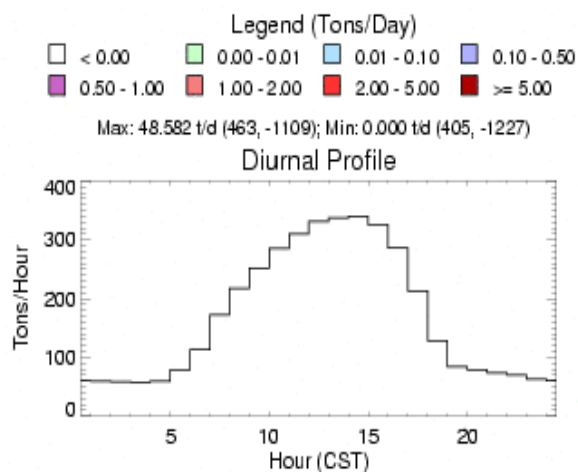


hgb8h2.bc05jun.reg7a.hgbpa_02km Total Emissions, 06/28/2005: VOC

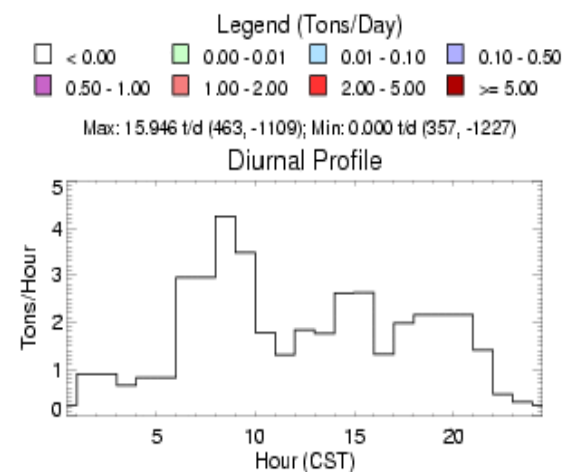


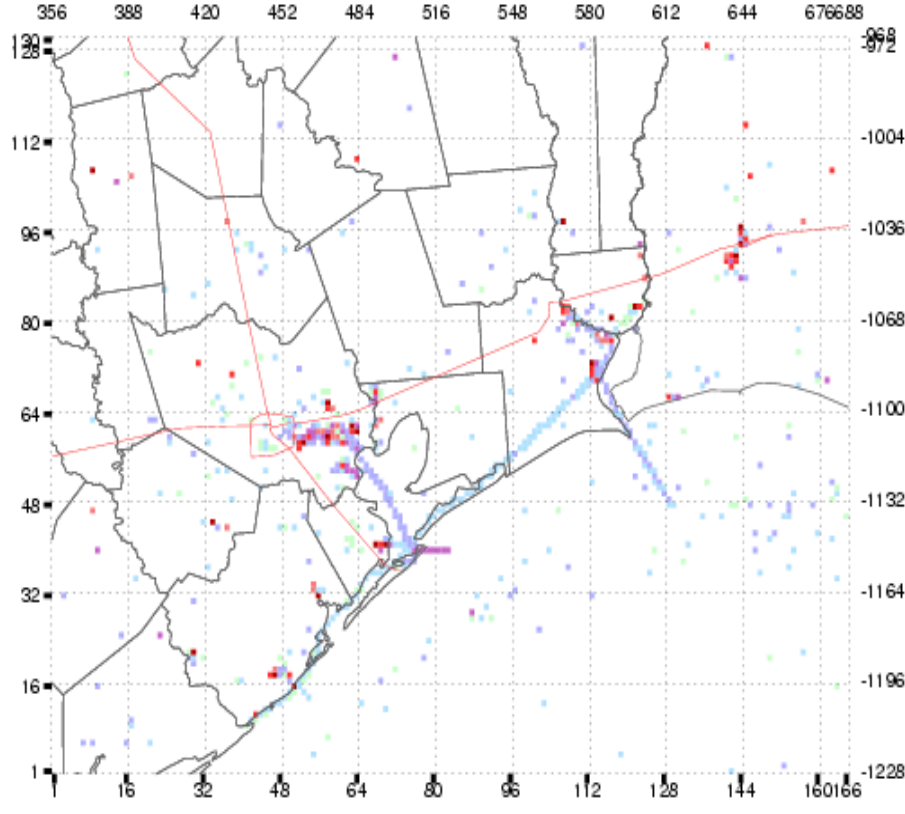
hgb8h2.by05b.hgbpa_02km Tank Landing Loss Emissions, 06/28/2005: VOC

Emissions Plotted	
County	Tons/Day
Brazoria	193.65
Chambers	72.95
Fort Bend	106.67
Galveston	105.51
Harris	611.81
Liberty	310.31
Montgomery	196.25
Waller	35.98
HGB SUBTOTAL:	1633.13
Hardin	213.98
Jefferson	197.25
Orange	102.54
BPA SUBTOTAL:	513.77
MAP TOTAL:	4057.44

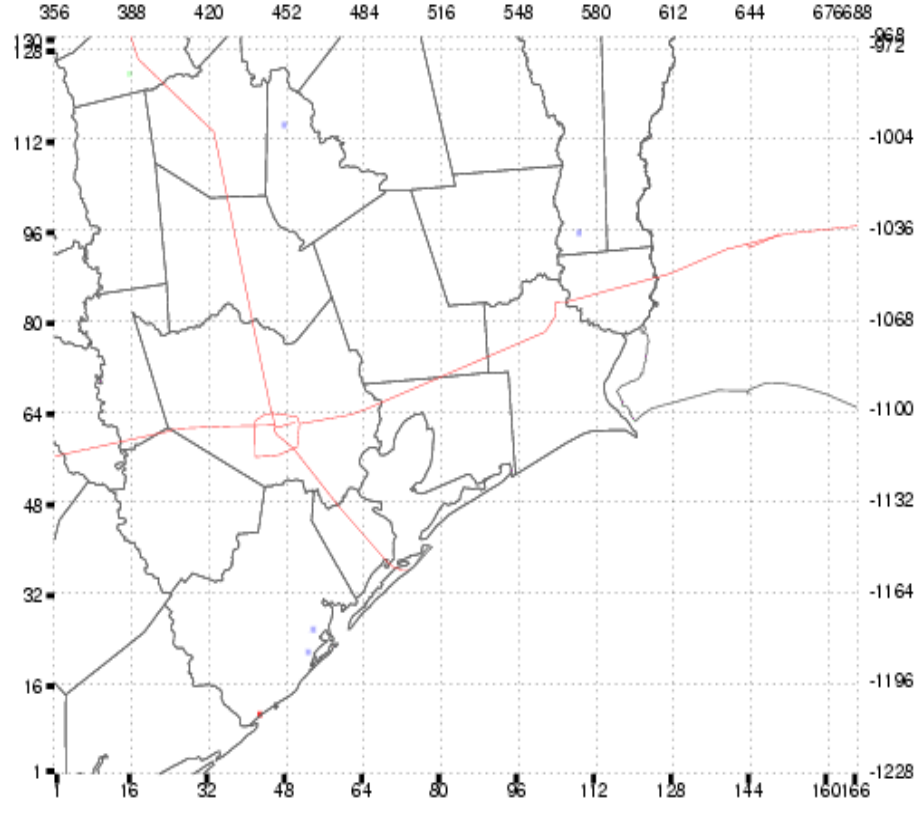


Emissions Plotted	
County	Tons/Day
Brazoria	10.60
Chambers	0.00
Fort Bend	0.00
Galveston	0.07
Harris	31.17
Liberty	0.00
Montgomery	0.00
Waller	0.00
HGB SUBTOTAL:	41.83
Hardin	0.00
Jefferson	0.00
Orange	0.00
BPA SUBTOTAL:	0.00
MAP TOTAL:	41.83



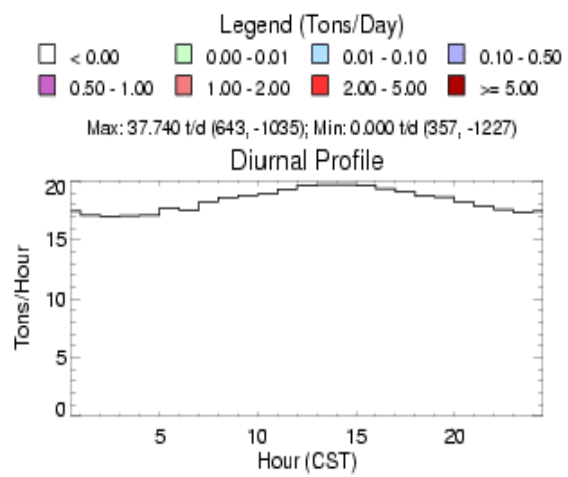


hgb8h2.bc05jul.reg7a.hgbpa_02km All Elevated Emissions, 08/07/2005: NO_x

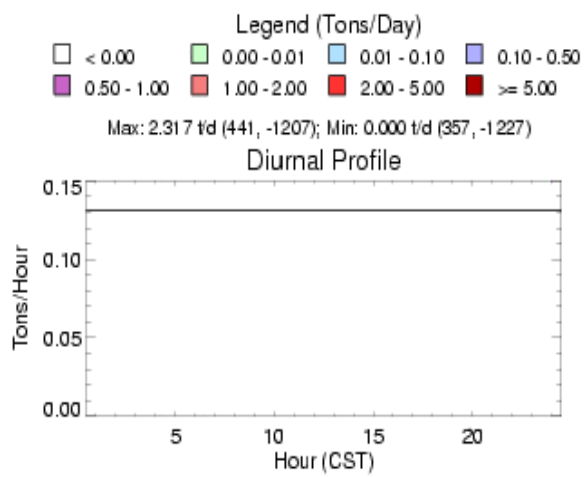


TxAQS2_tfs_tx.hgbpa_02km Elevated Fire Emissions, 08/07/2005: NO_x

Emissions Plotted	
County	Tons/Day
Brazoria	46.83
Chambers	11.86
Fort Bend	16.70
Galveston	28.58
Harris	100.97
Liberty	0.75
Montgomery	2.21
Waller	0.68
HGB SUBTOTAL:	208.57
Hardin	1.10
Jefferson	43.40
Orange	25.46
BPA SUBTOTAL:	69.95
MAP TOTAL:	440.04



Emissions Plotted	
County	Tons/Day
Brazoria	2.64
Chambers	0.00
Fort Bend	0.00
Galveston	0.00
Harris	0.00
Liberty	0.00
Montgomery	0.00
Waller	0.00
HGB SUBTOTAL:	2.64
Hardin	0.00
Jefferson	0.00
Orange	0.00
BPA SUBTOTAL:	0.00
MAP TOTAL:	3.15





Meteorology Updates

(ncepsst vs uhsst.utcsrulc)

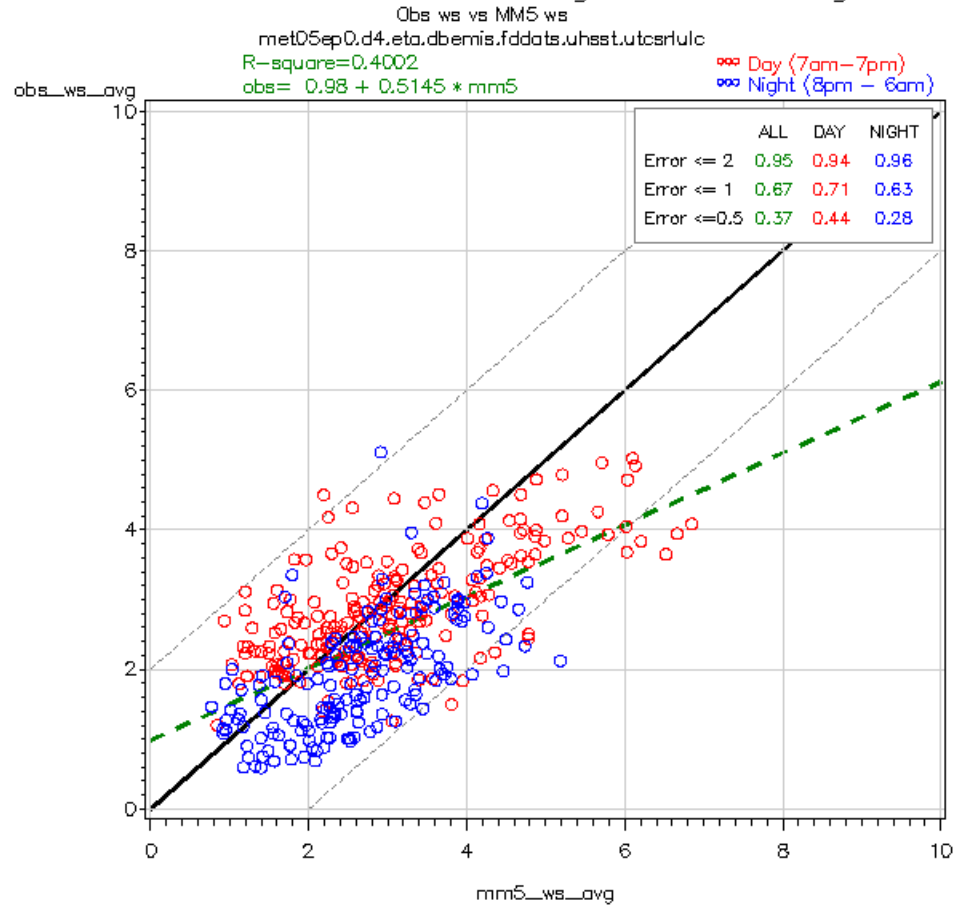
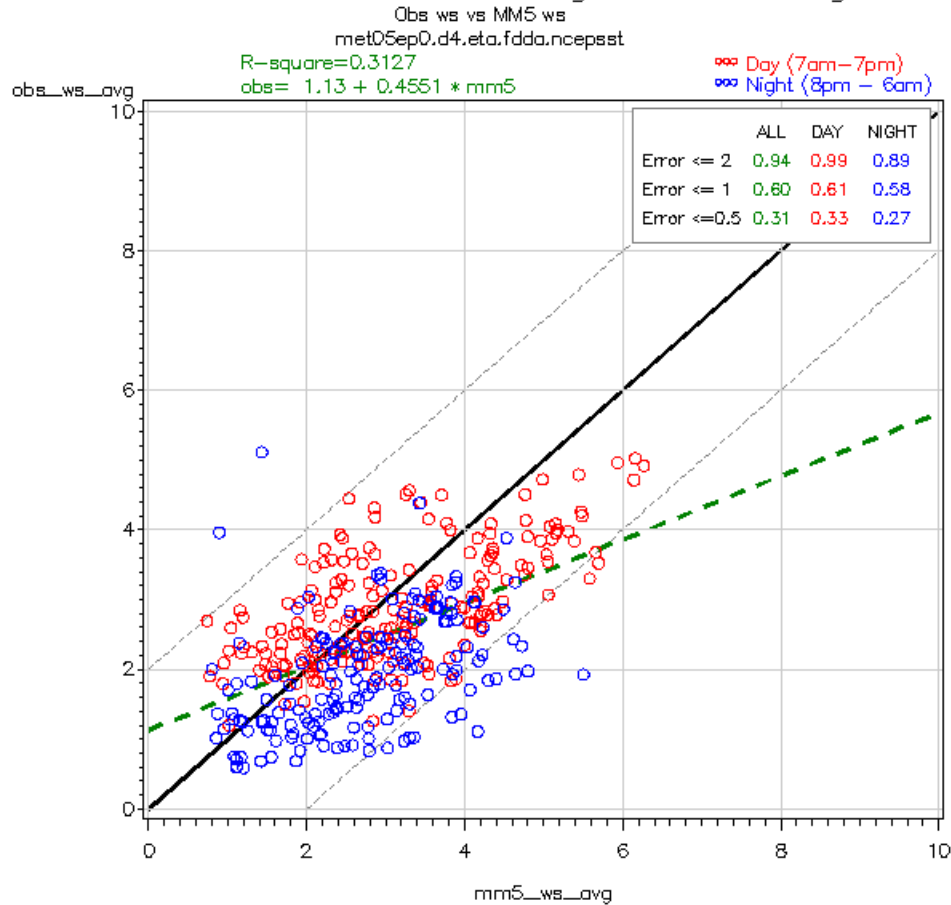
- Wind Speed Scatter Plots
- Plume Plot Trajectories



Wind Speed Scatter Plots: Average All Sites

Houston-Galveston – Region 12 Average

Houston-Galveston – Region 12 Average



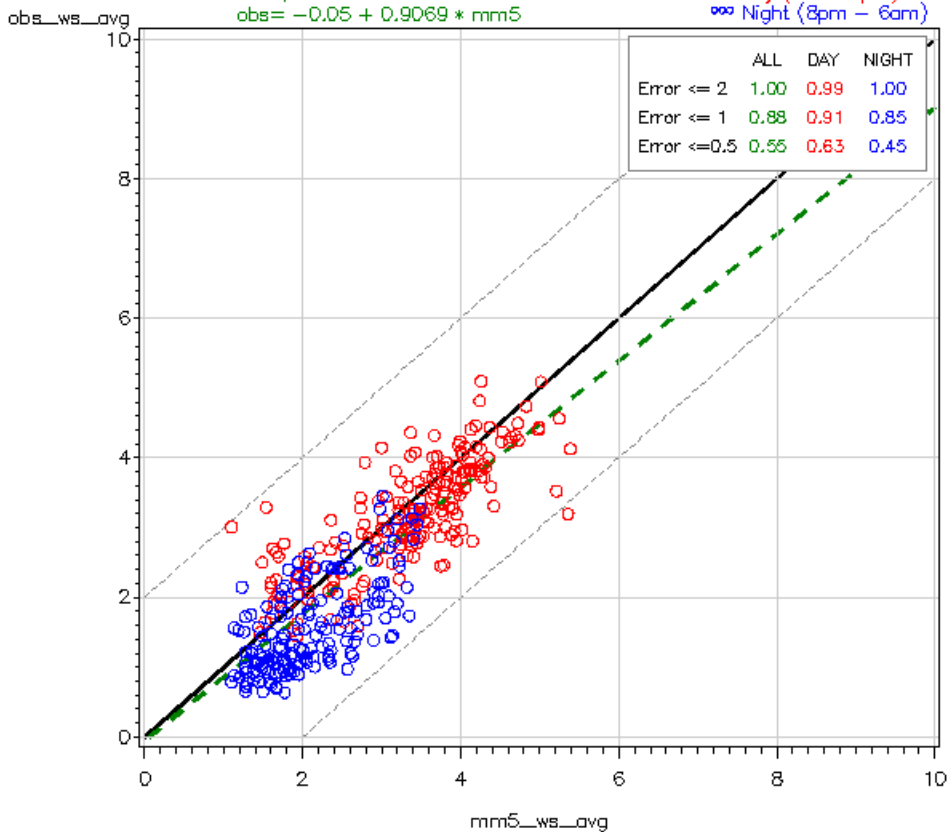


Wind Speed Scatter Plots: Average All Sites

Houston-Galveston – Region 12 Average

Obs ws vs MMS ws
met05ep1.d4.eta.dbemis.fdda.ncepst
R-square=0.7154
obs = $-0.05 + 0.9069 * mm5$

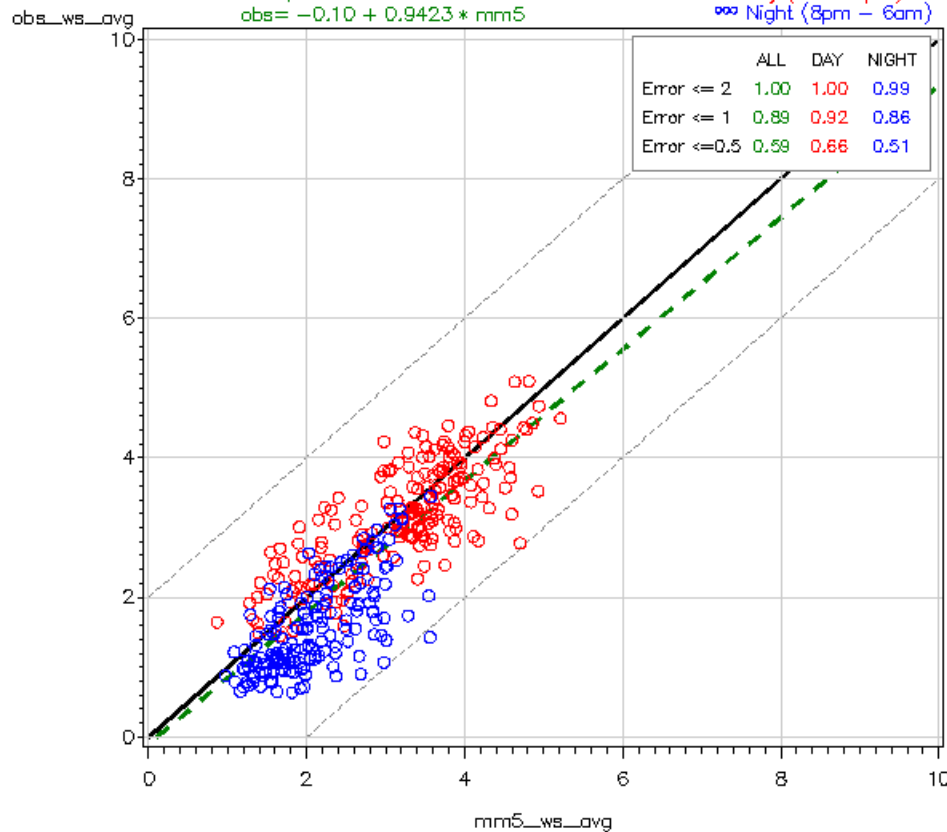
Day (7am-7pm)
Night (8pm-6am)



Houston-Galveston – Region 12 Average

Obs ws vs MMS ws
met05ep1.d4.eta.dbemis.fddats.uhast.utcsrulc
R-square=0.7044
obs = $-0.10 + 0.9423 * mm5$

Day (7am-7pm)
Night (8pm-6am)





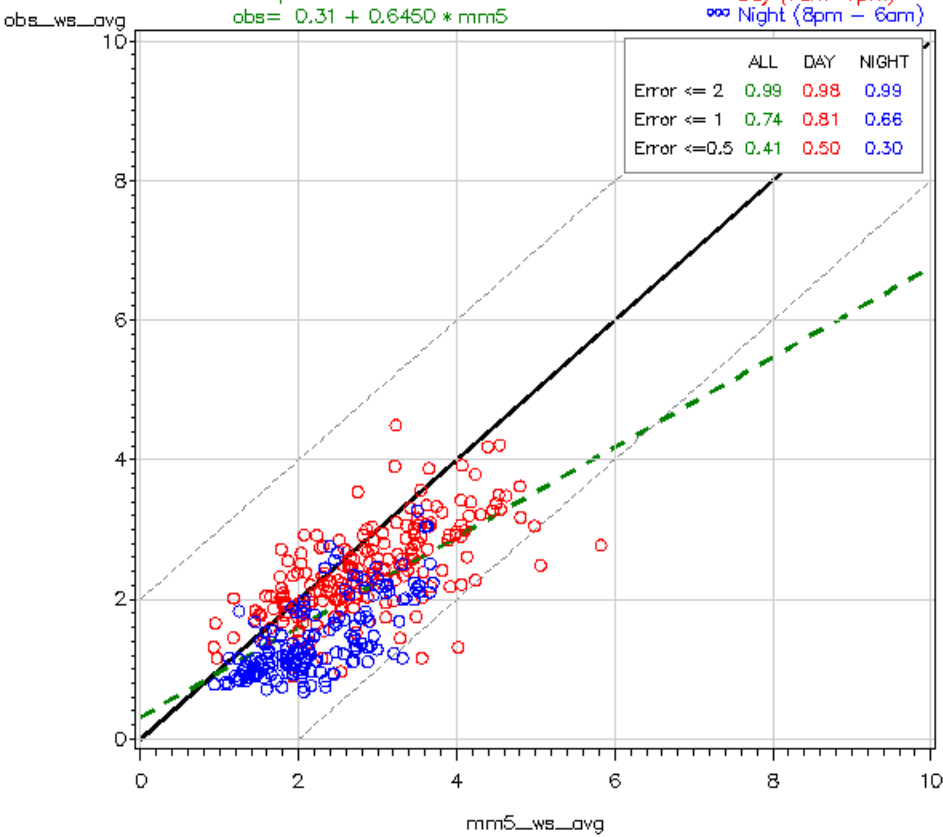
Wind Speed Scatter Plots: Average All Sites

Houston-Galveston – Region 12 Average

Obs ws vs MMS ws
met05ep2.d4.eta.dbemis.fdda.ncepst
R-square=0.5182
obs = 0.31 + 0.6450 * mms

○ Day (7am–7pm)
○ Night (8pm – 6am)

	ALL	DAY	NIGHT
Error <= 2	0.99	0.98	0.99
Error <= 1	0.74	0.81	0.66
Error <= 0.5	0.41	0.50	0.30

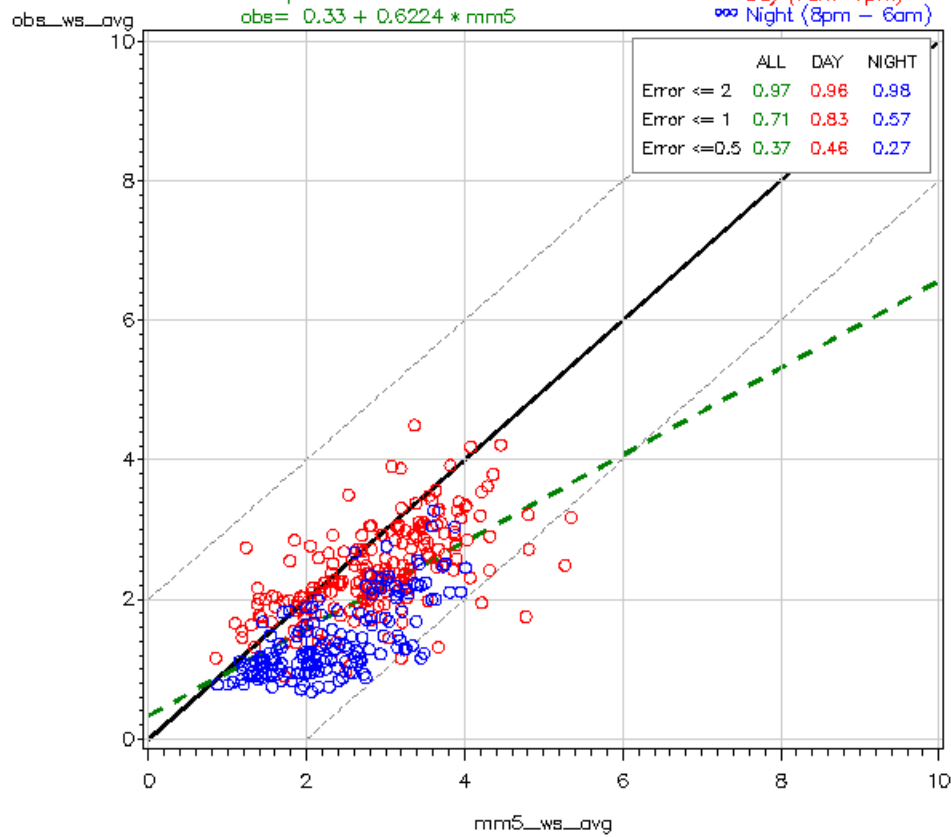


Houston-Galveston – Region 12 Average

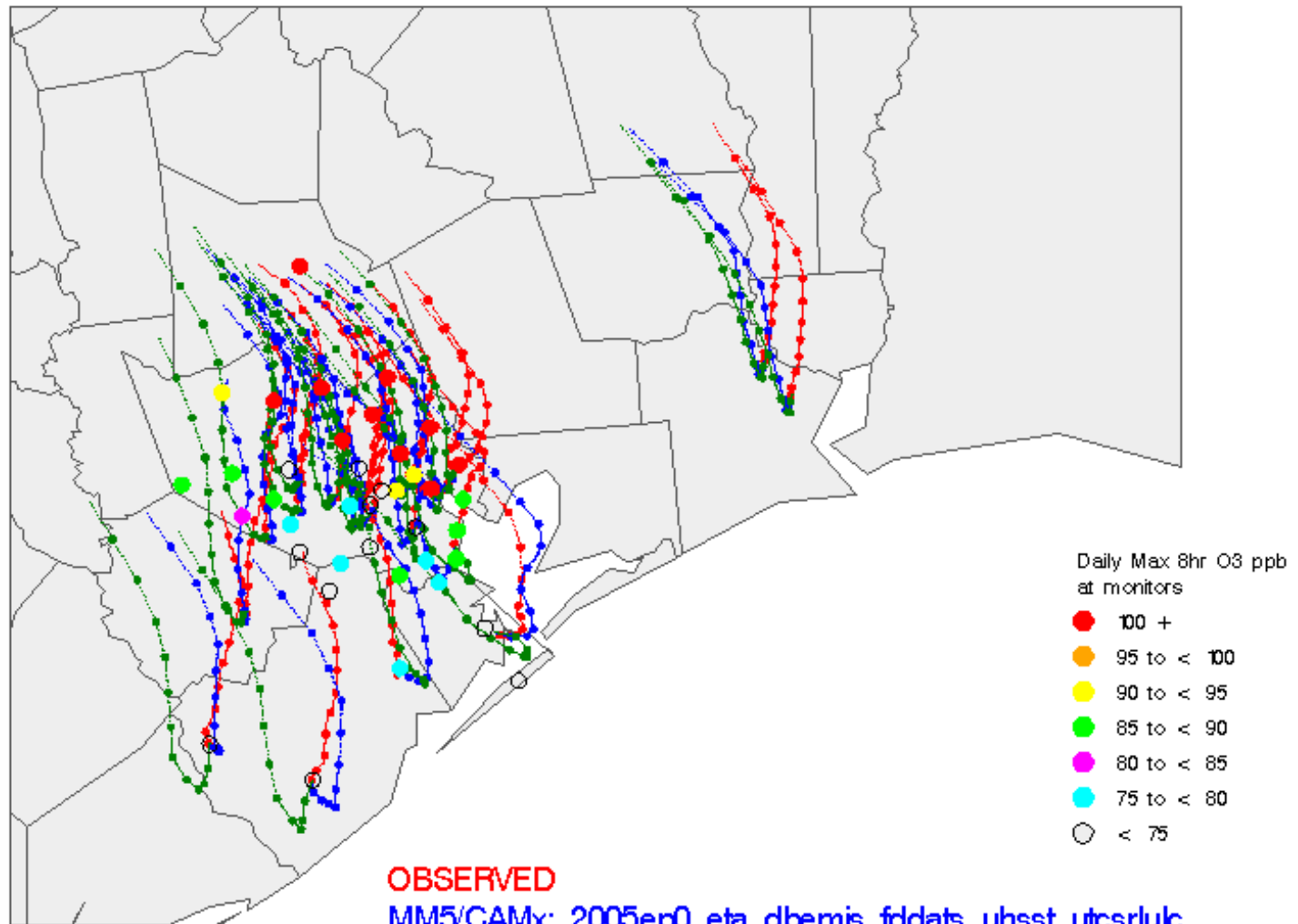
Obs ws vs MMS ws
met05ep2.d4.eta.dbemis.fddats.uhast.utcsrulc
R-square=0.4539
obs = 0.33 + 0.6224 * mms

○ Day (7am–7pm)
○ Night (8pm – 6am)

	ALL	DAY	NIGHT
Error <= 2	0.97	0.96	0.98
Error <= 1	0.71	0.83	0.57
Error <= 0.5	0.37	0.48	0.27



Plume Plot Trajectories



OBSERVED

MM5/CAMx: 2005ep0_eta_dbemis_fcdats_uhsst_utcsrluk

MM5/CAMx: 2005ep0_eta_fcdla_ncepsst

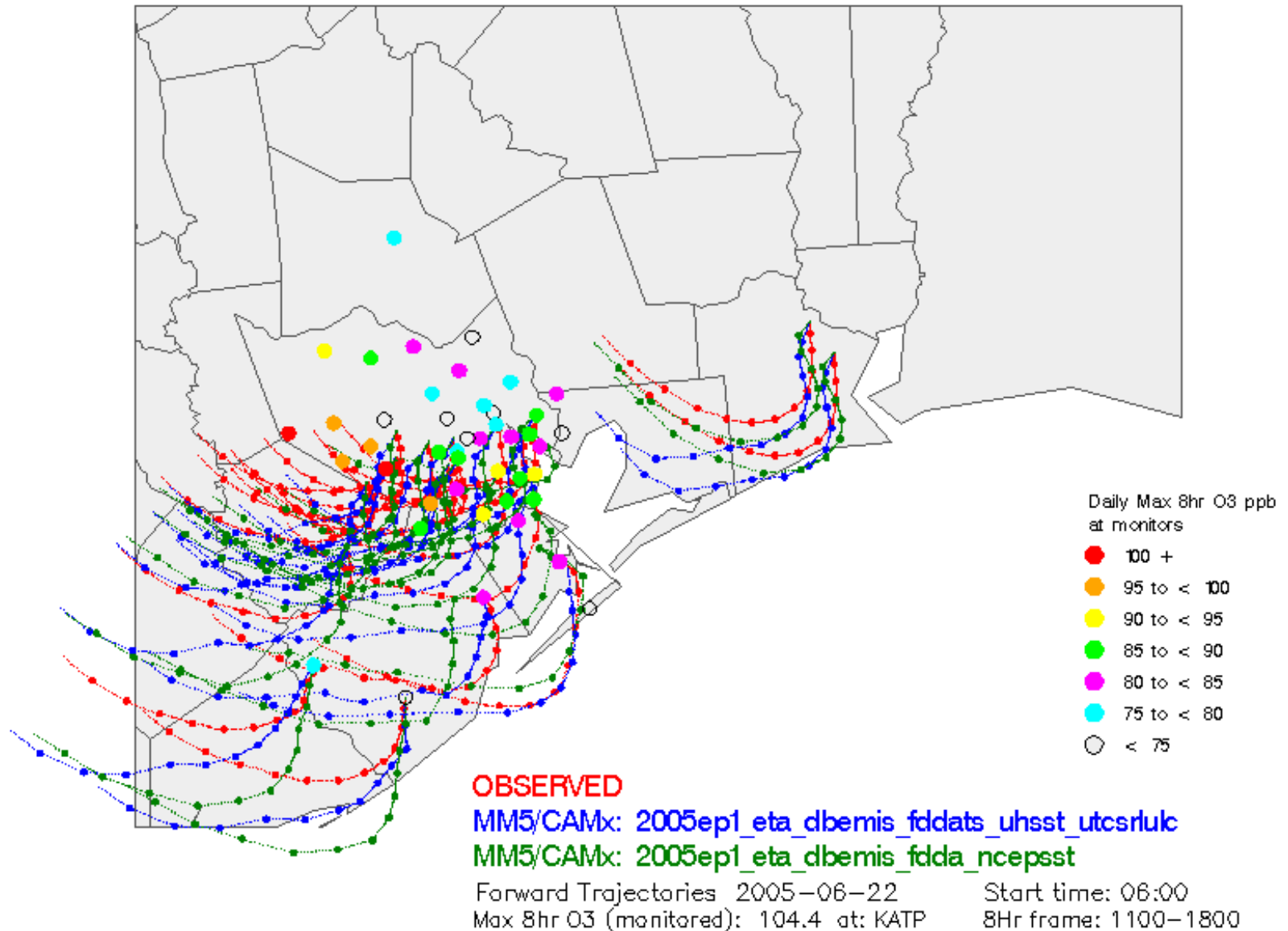
Forward Trajectories 2005-06-02

Start time: 06:00

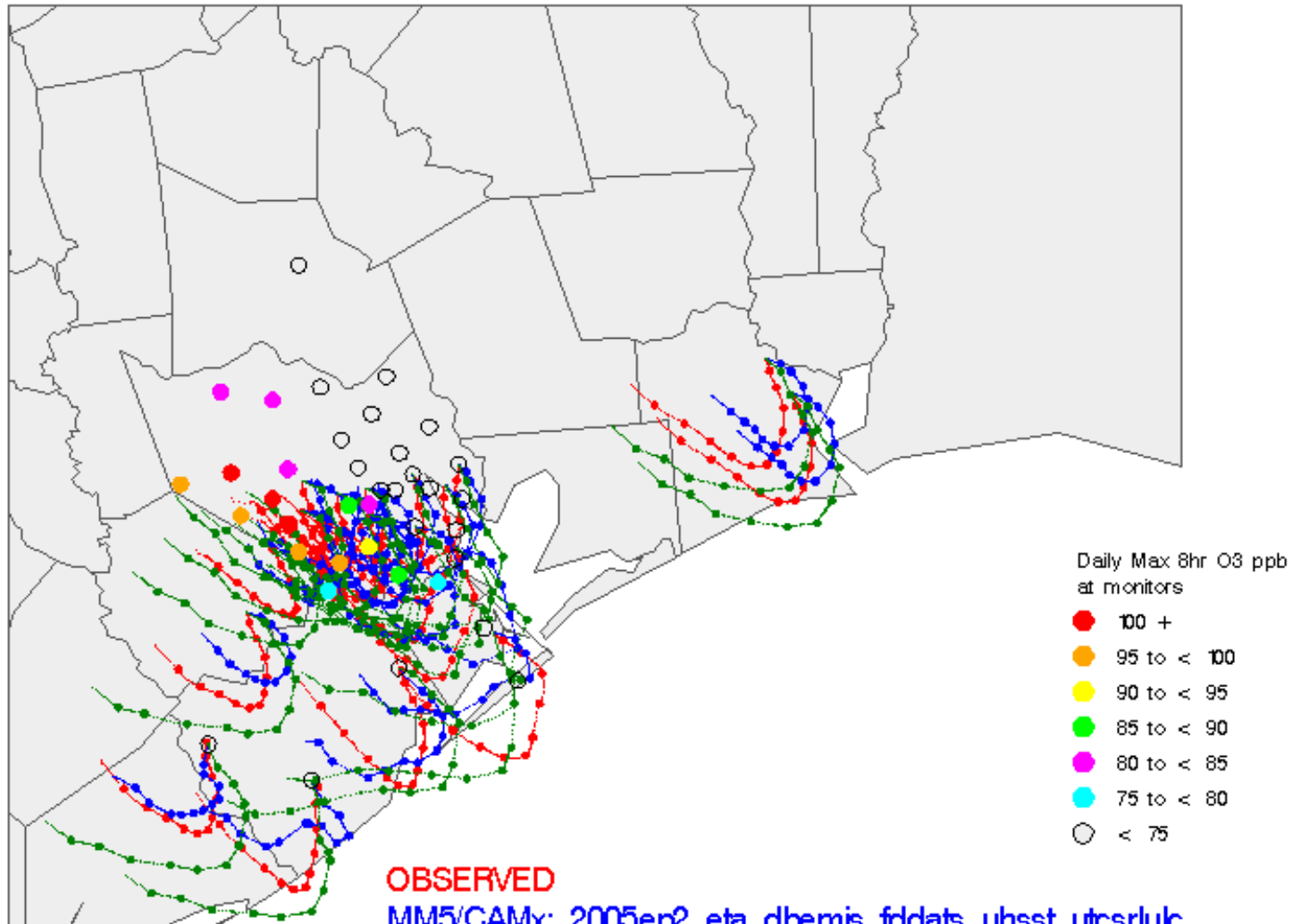
Max 8hr O3 (monitored): 125.8 at: CRBL

8Hr frame: 1000-1700

Plume Plot Trajectories



Plume Plot Trajectories



OBSERVED

MM5/CAMx: 2005ep2_eta_dbemis_fcdats_uhsst_utcsrluc

MM5/CAMx: 2005ep2_eta_dbemis_fdda_ncepsst

Forward Trajectories 2005-08-02 Start time: 06:00

Max 8hr O3 (monitored): 104.6 at: WHOU 8Hr frame: 1100-1800



Model Performance Evaluation

- **Statistical Performance**
 - Measured vs modeled peak 1-hour and 8-hour ozone concentration
 - Relative bias (%) 1-hour ozone > 60 ppb and site average peak 8-hour ozone
 - Relative error (%) 1-hour ozone > 60 ppb and site average peak 8-hour ozone
- **Graphical Performance**
 - Time series of measured vs modeled 1-hour ozone for selected sites
 - Time series of measured vs modeled precursors for selected sites
 - Daily maximum 8-hour ozone tile plots for selected episode days
 - Scatter-plots of ETH, OLE & IOLE for selected sites



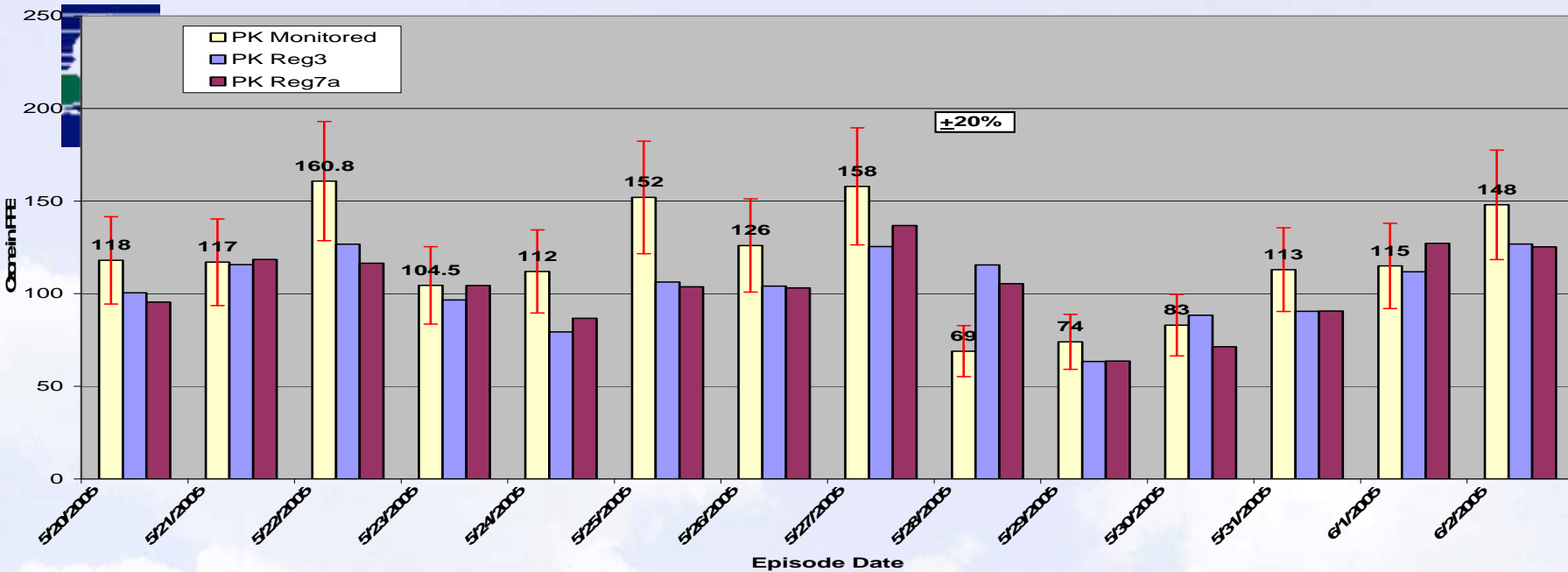
Statistical Performance Evaluation

Monitored vs modeled peak ozone concentrations

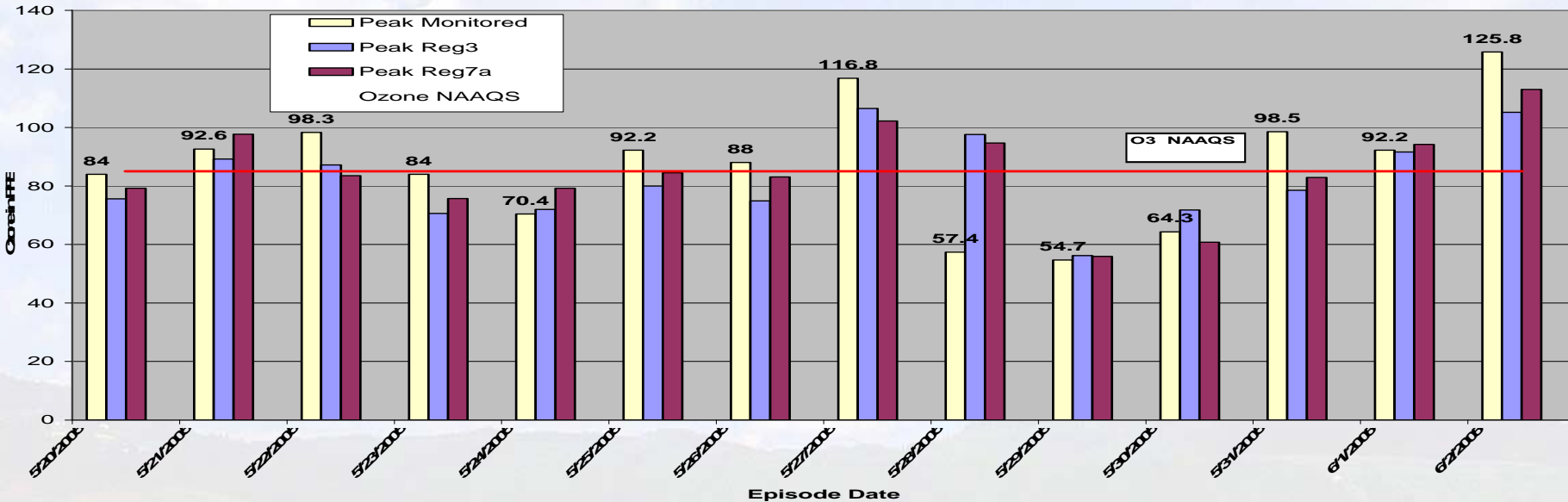
Relative Bias: Regular7a vs Regular3 ozone concentration

Relative Error: Regular7a vs Regular3 ozone concentration

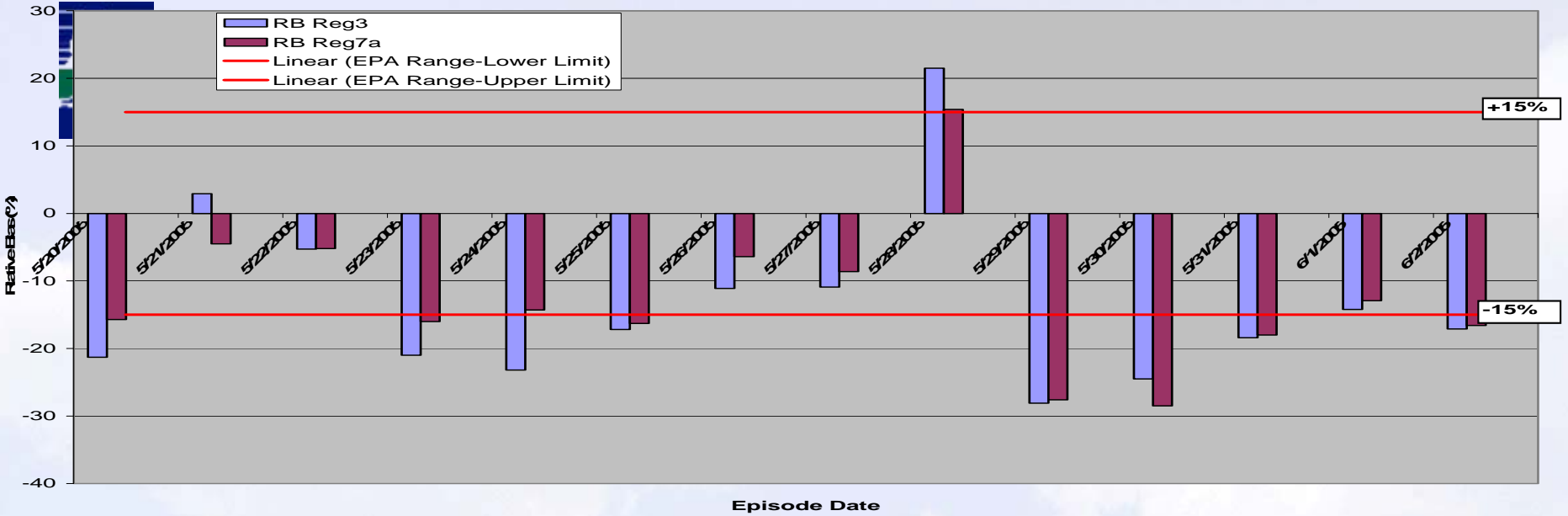
Episode0: Monitored vs Modeled Peak Hourly Ozone Concentration



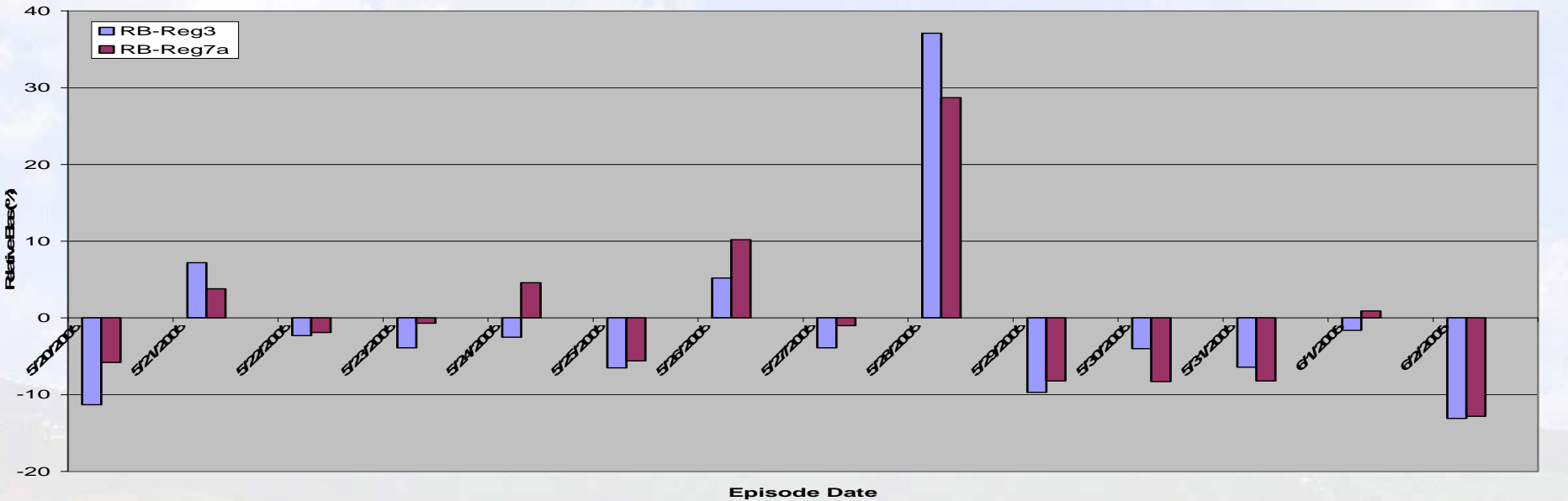
Episode0: Monitored vs Modeled 8-Hour Ozone Concentration



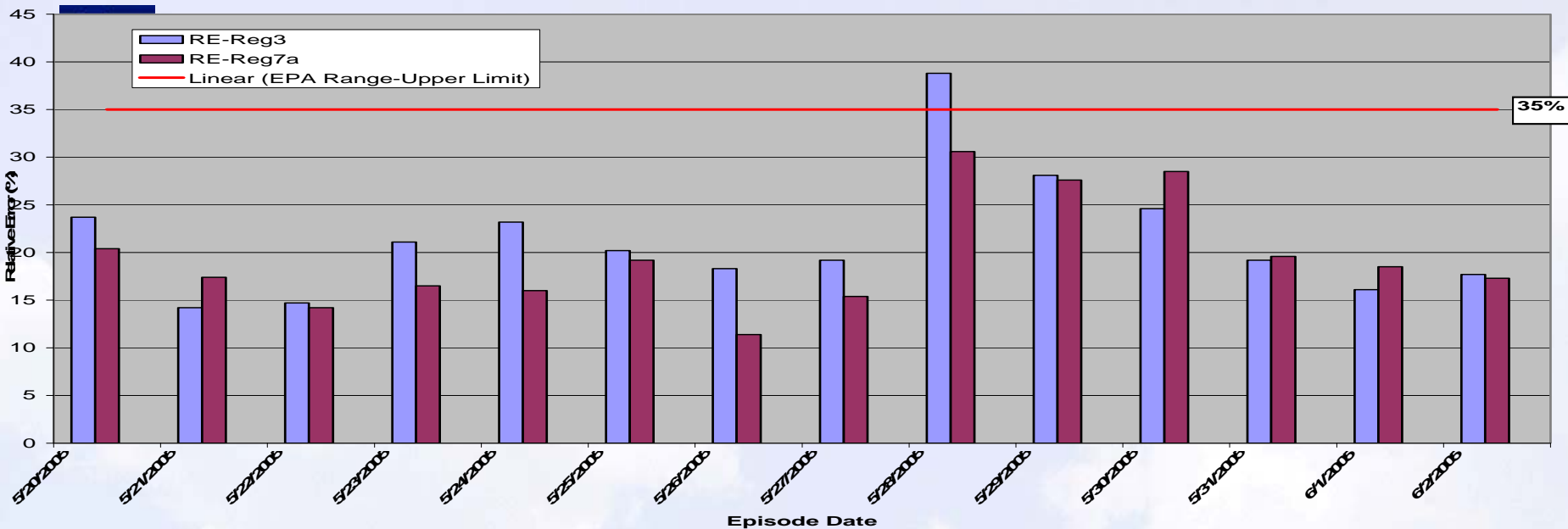
Episode0: Relative Bias of Modeled Hourly Ozone Concentration



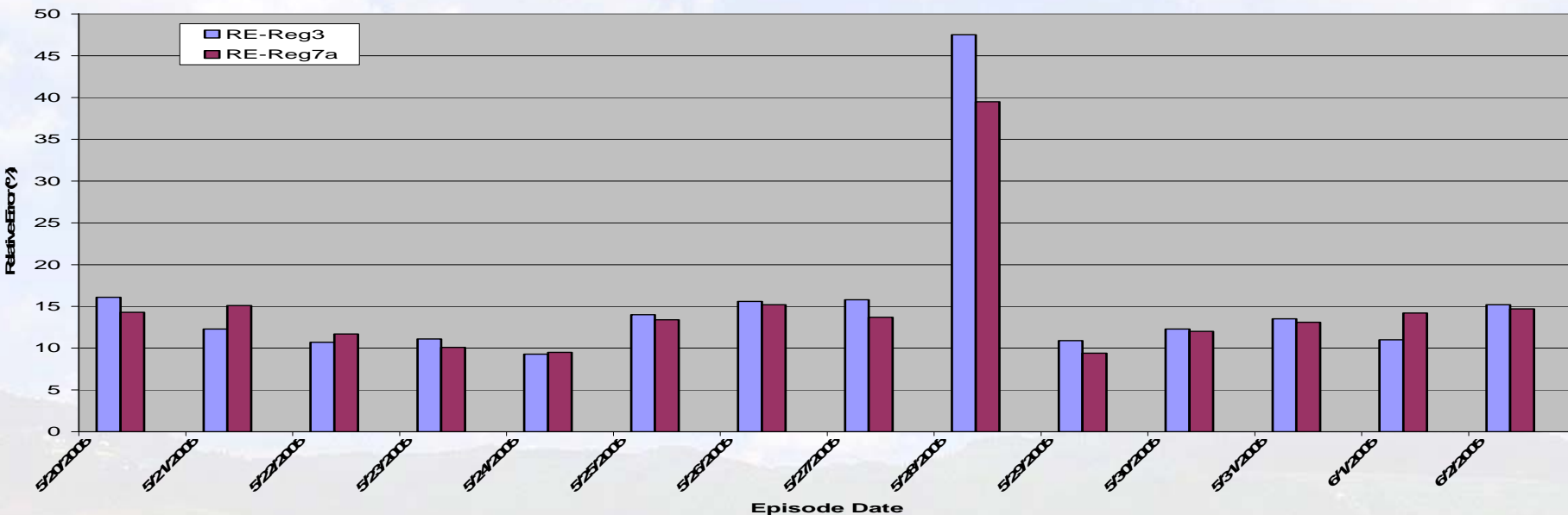
Episode0: Relative Bias of Modeled 8-Hour Ozone Concentration



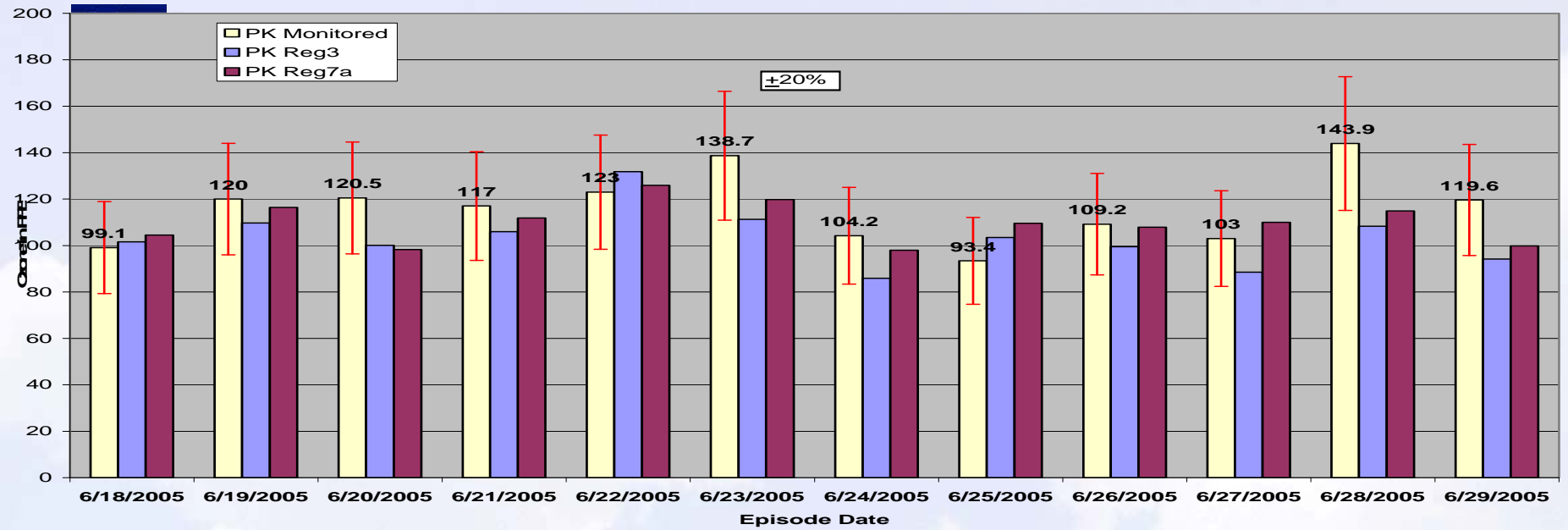
Episode0: Relative Error of Modeled Hourly Ozone Concentration



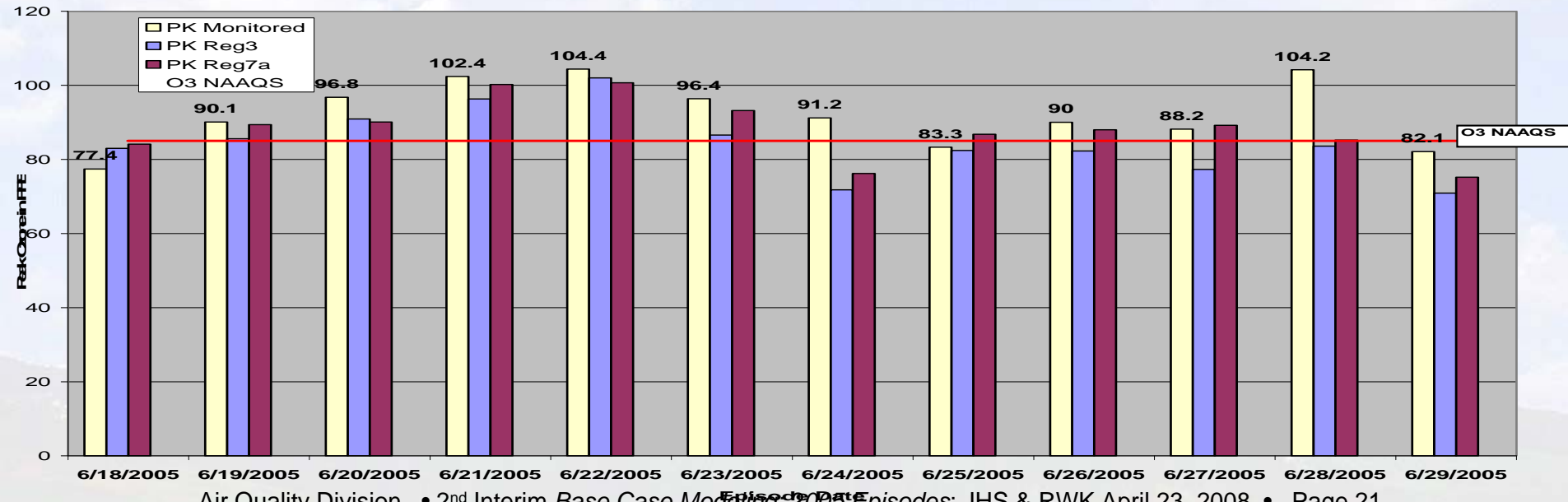
Episode0: Relative Error of Modeled 8-Hour Ozone Concentration



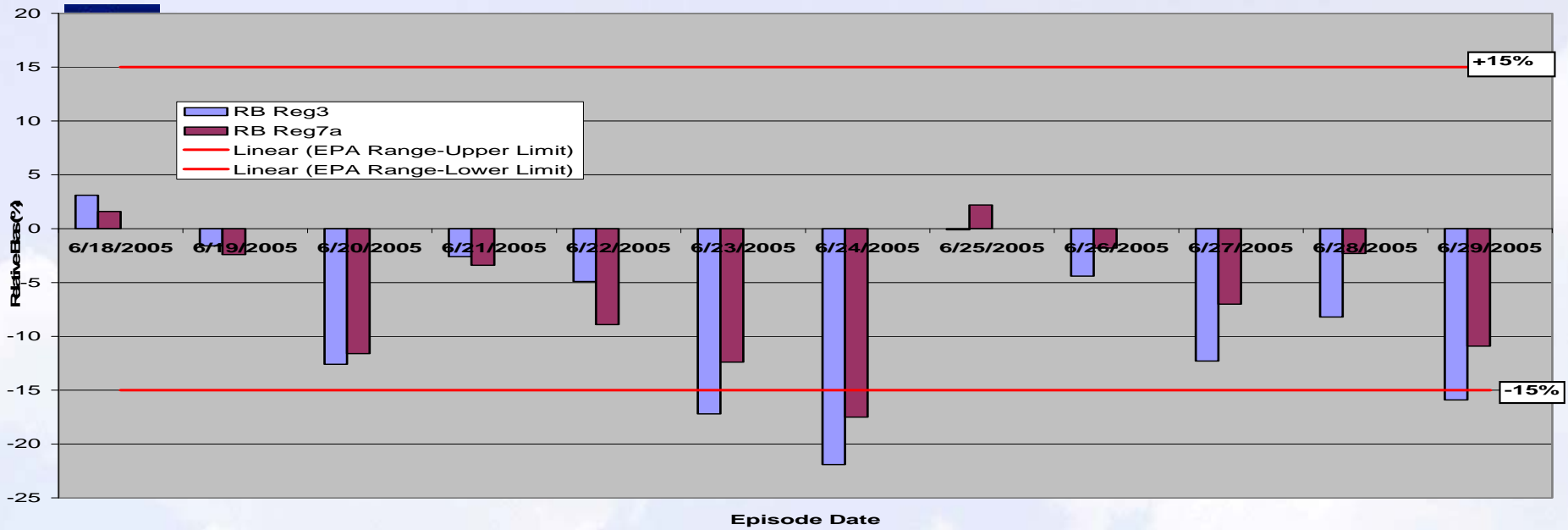
Episode1: Monitored vs Modeled Peak Hourly Ozone Concentration



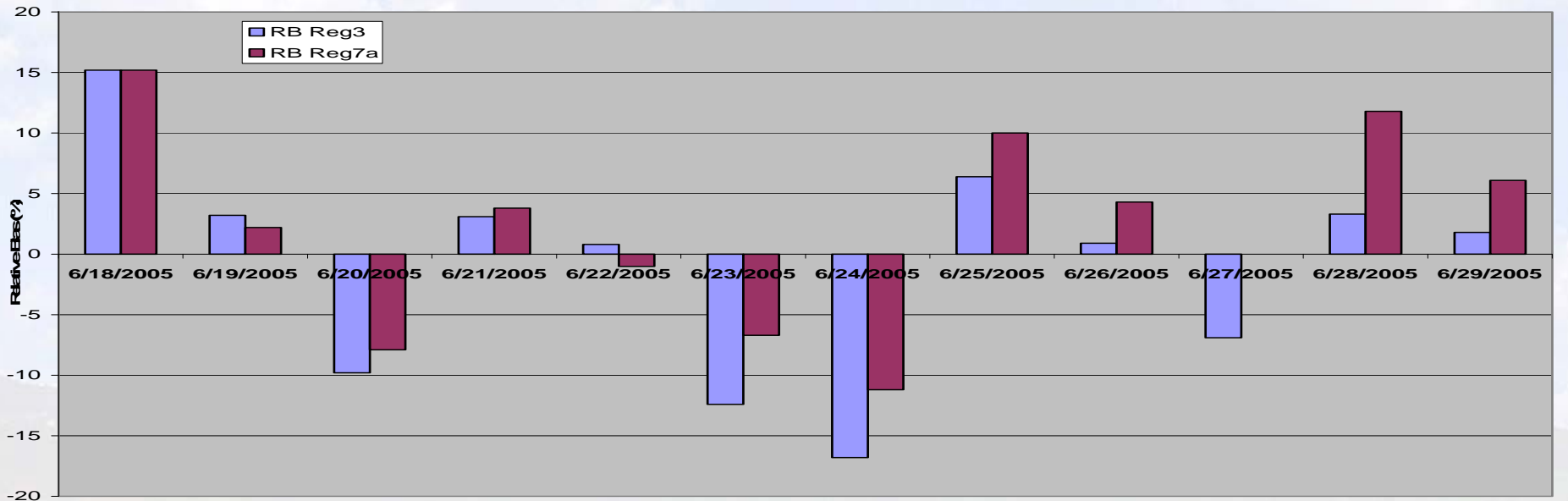
Episode1: Peak Monitored vs Modeled 8-Hour Ozone Concentration



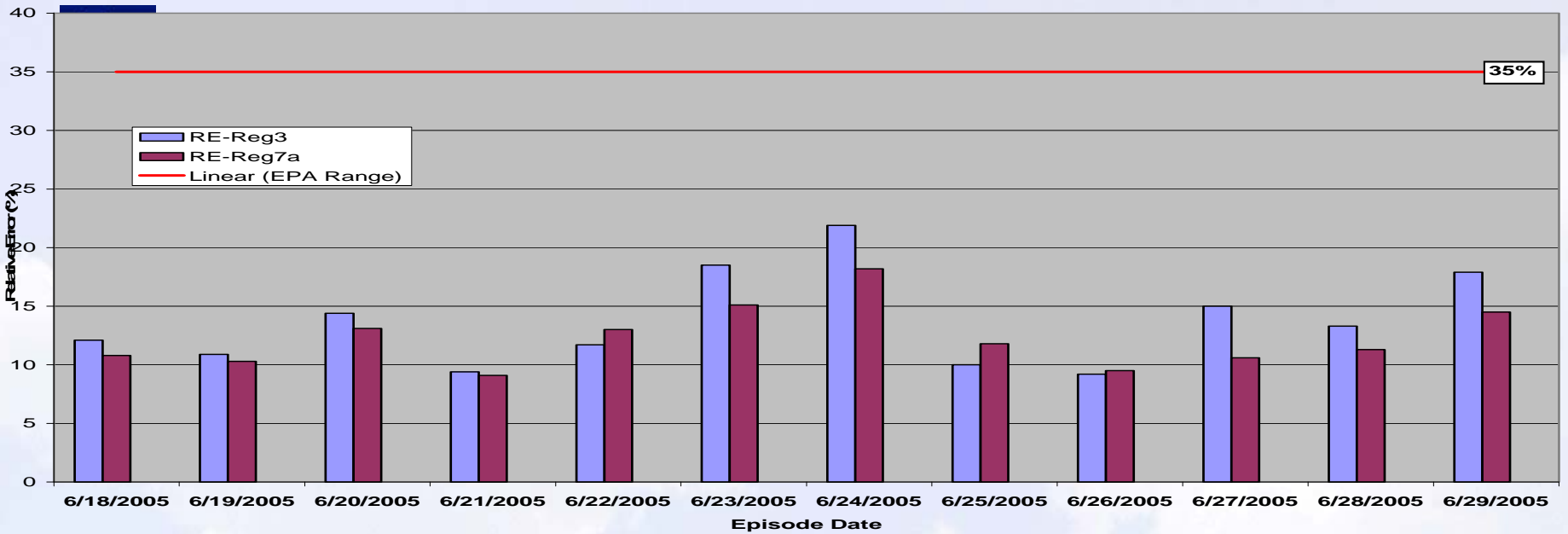
Episode1: Relative Bias of Modeled Hourly Ozone Concentration



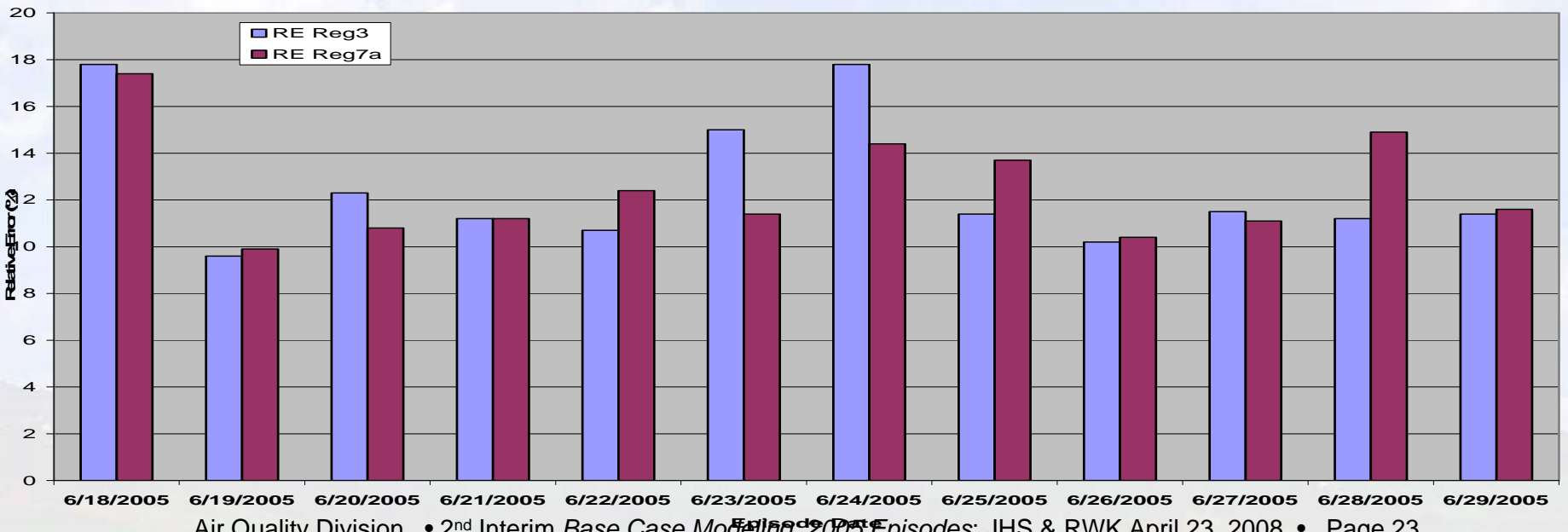
Episode1: Relative Bias of Modeled 8-Hour Ozone Concentration



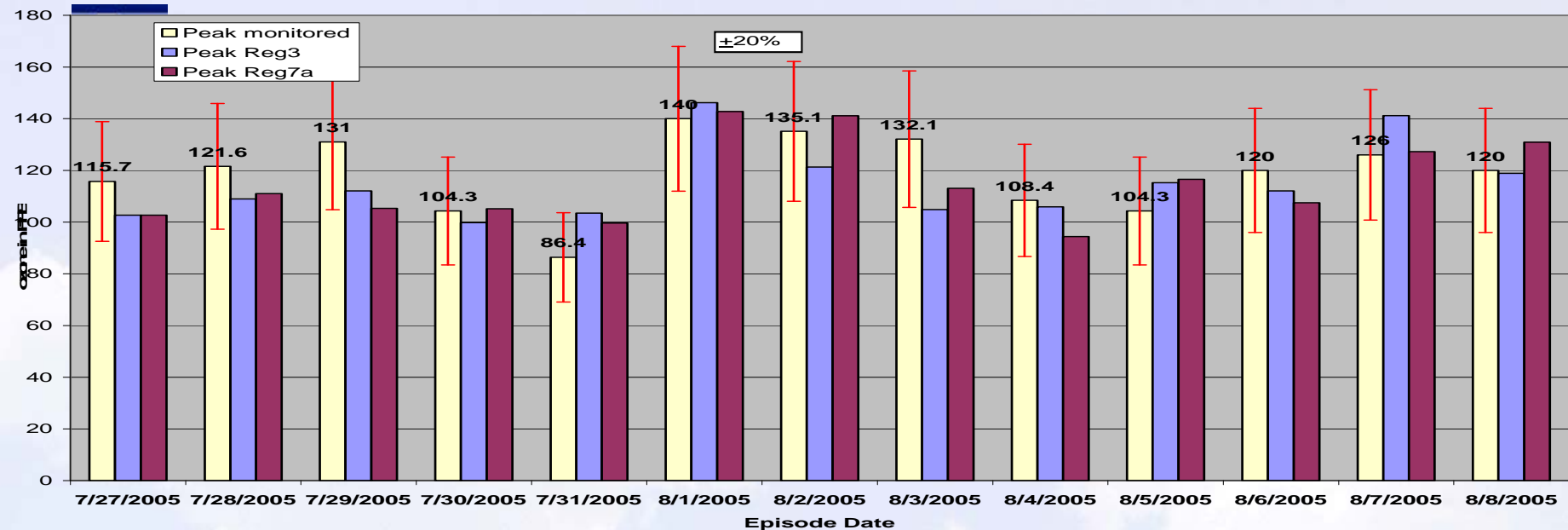
Episode1: Relative Error of Modeled Hourly Ozone Concentration



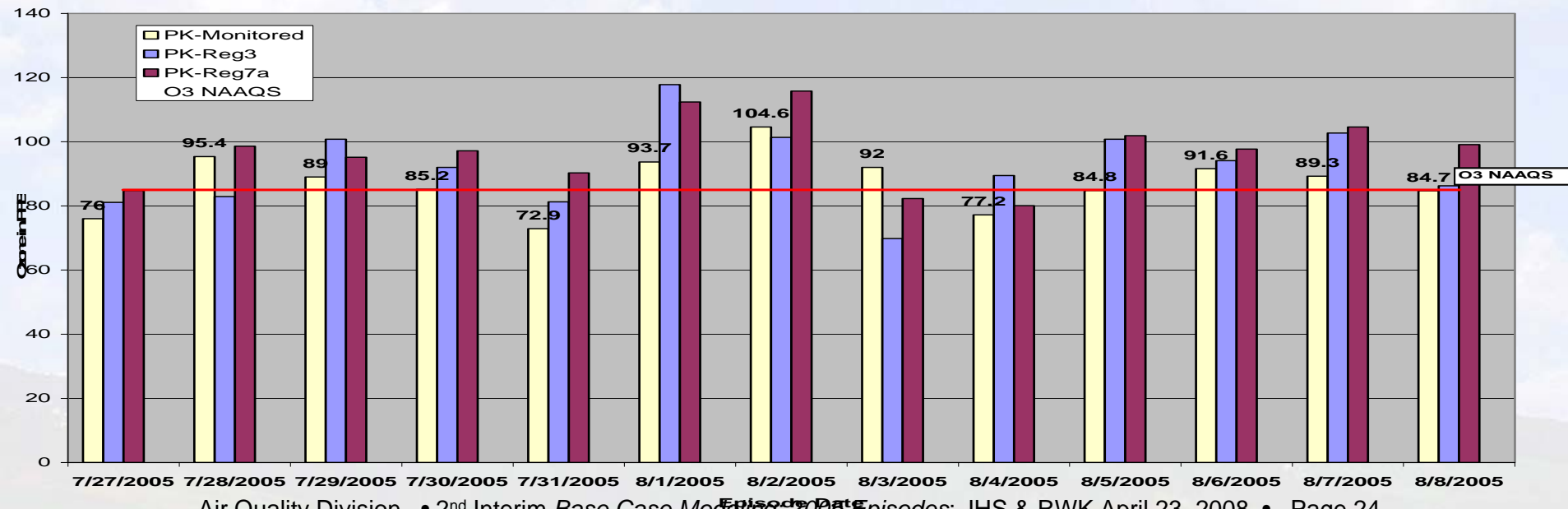
Episode1: Relative Error of Modeled 8-Hour Ozone Concentration



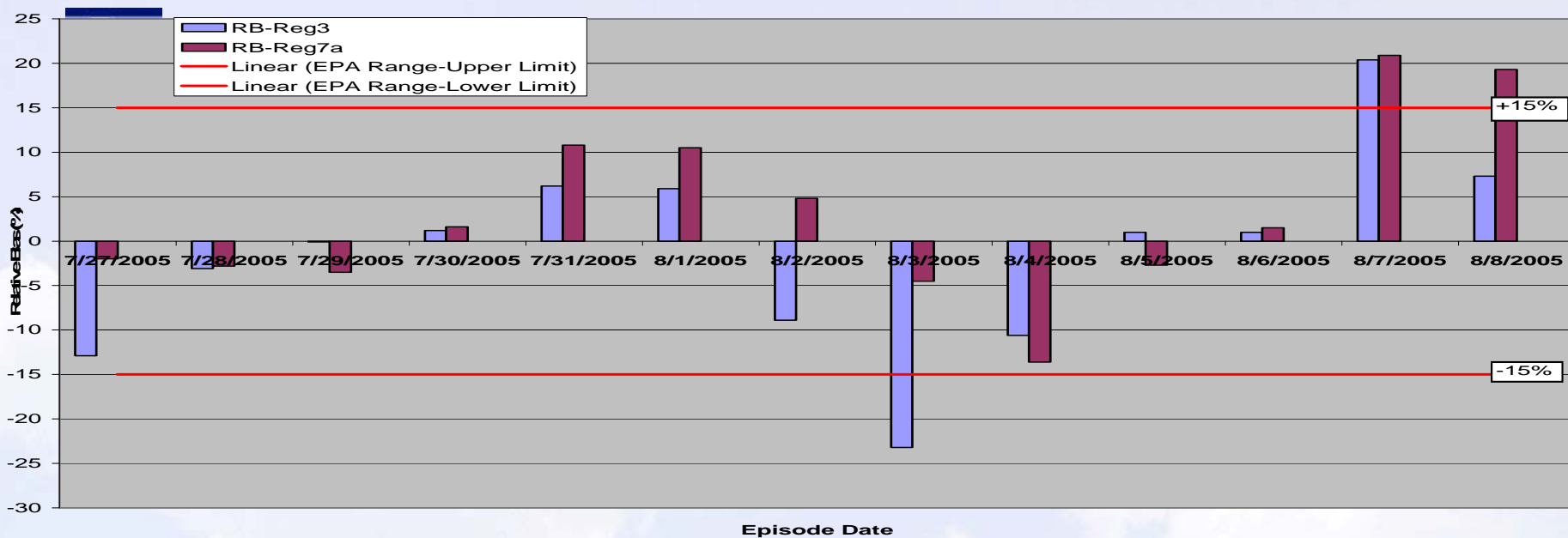
Episode2: Peak Monitored vs Peak Modeled Hourly Ozone Concentrations



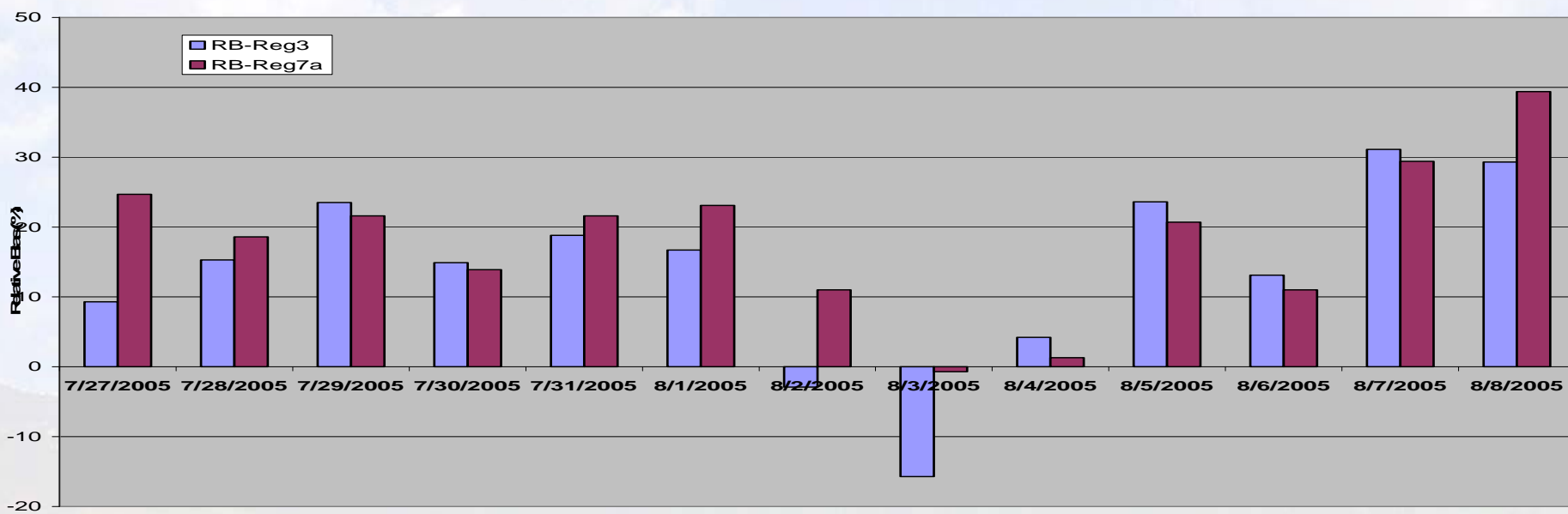
Episode2: Monitored vs Modeled Peak 8-Hour Ozone Concentration



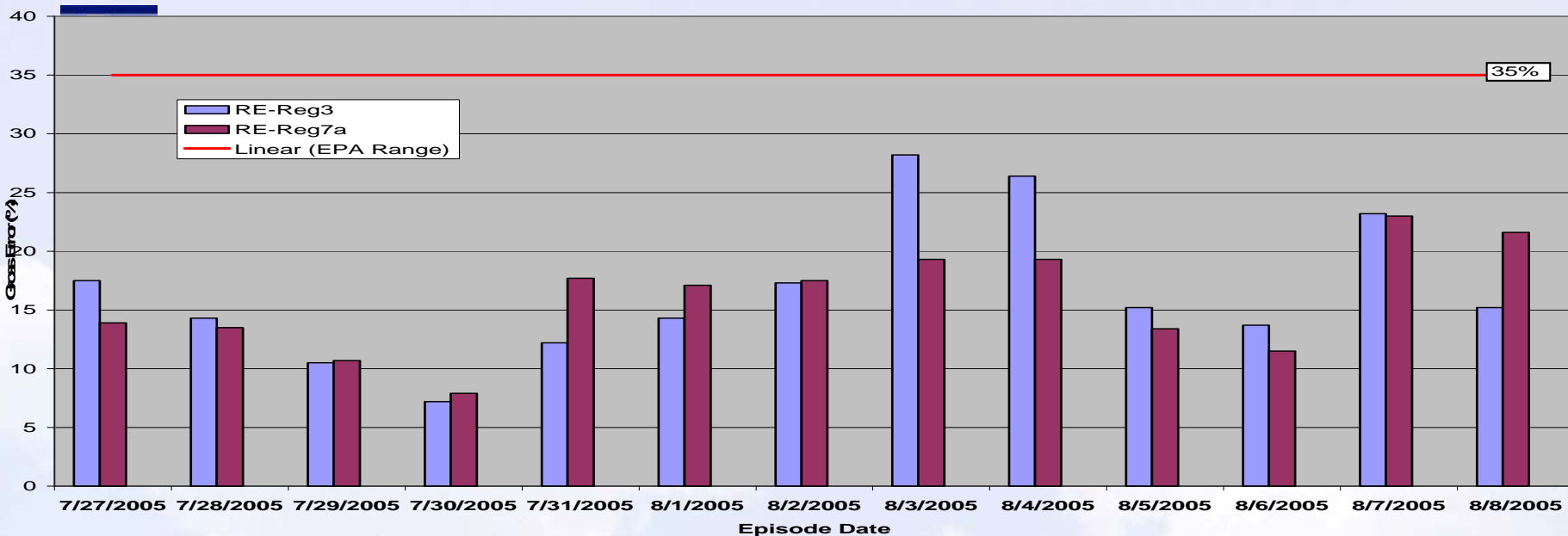
Episode2: Relative Bias Of Modeled Ozone Concentration



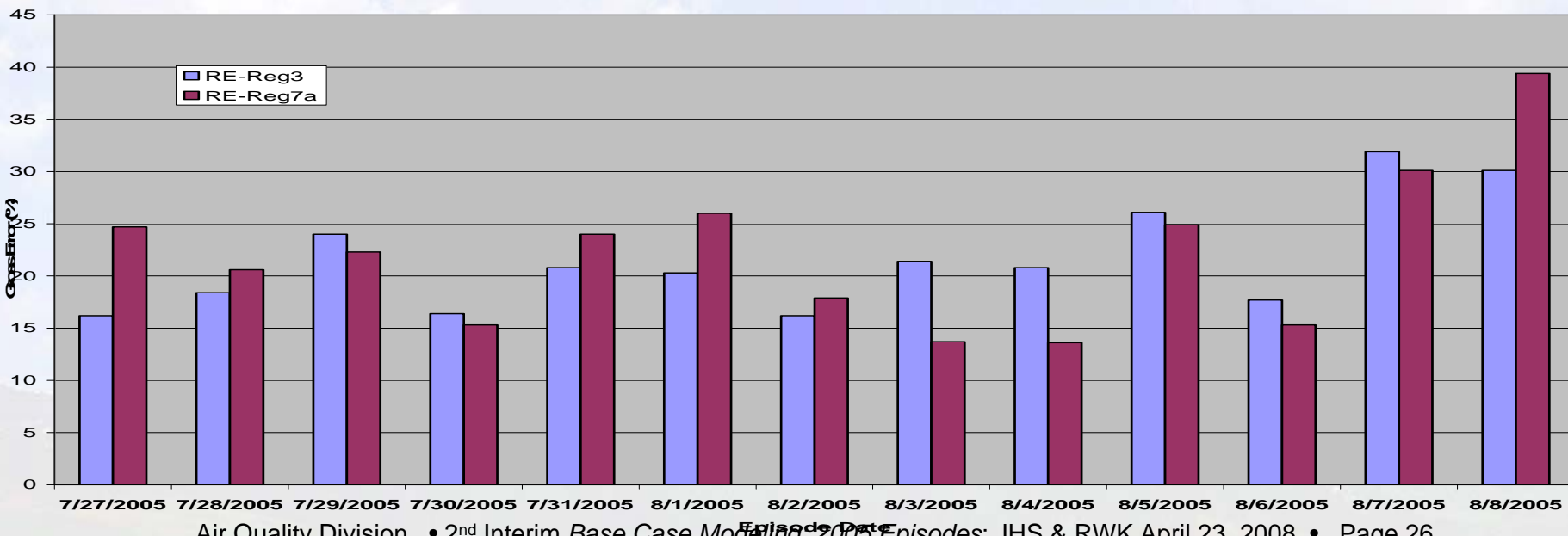
Episode2: Relative Bias of Modeled 8-Hour Ozone Concentration



Episode2: Gross Error of Modeled Hourly Ozone Concentration



Episode2: Gross Error of Modeled 8-Hour Ozone Concentration

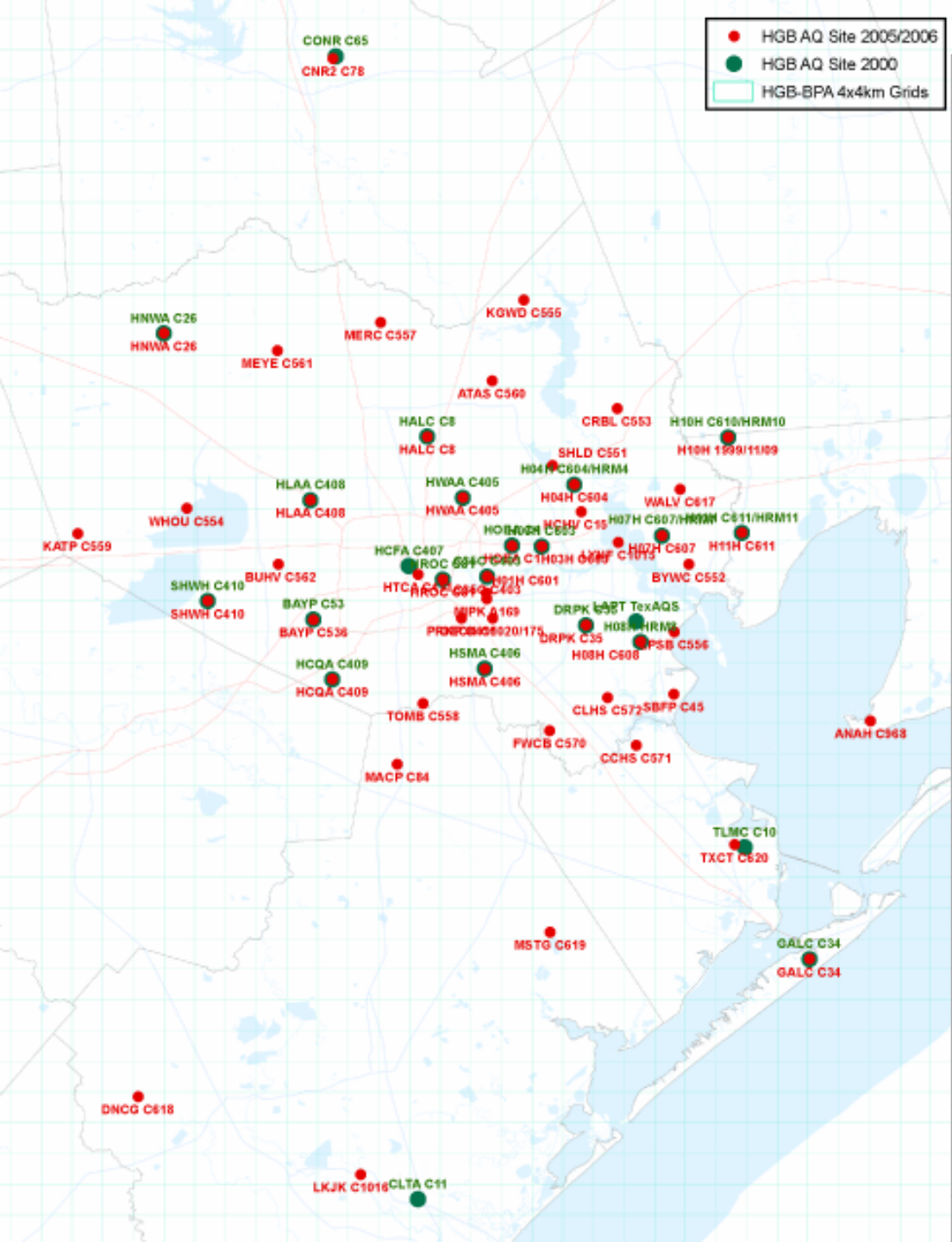




Graphical Performance Evaluation: Time Series

Time series of measured vs modeled 1-hour ozone and ozone precursors at selected sites

- BAYP – Bayland Park
- HNWA – Houston Northwest
- H03H – HRM3
- DRPK – Deer Park



- HGB AQ Site 2005/2006
- HGB AQ Site 2000
- HGB-BPA 4x4km Grids

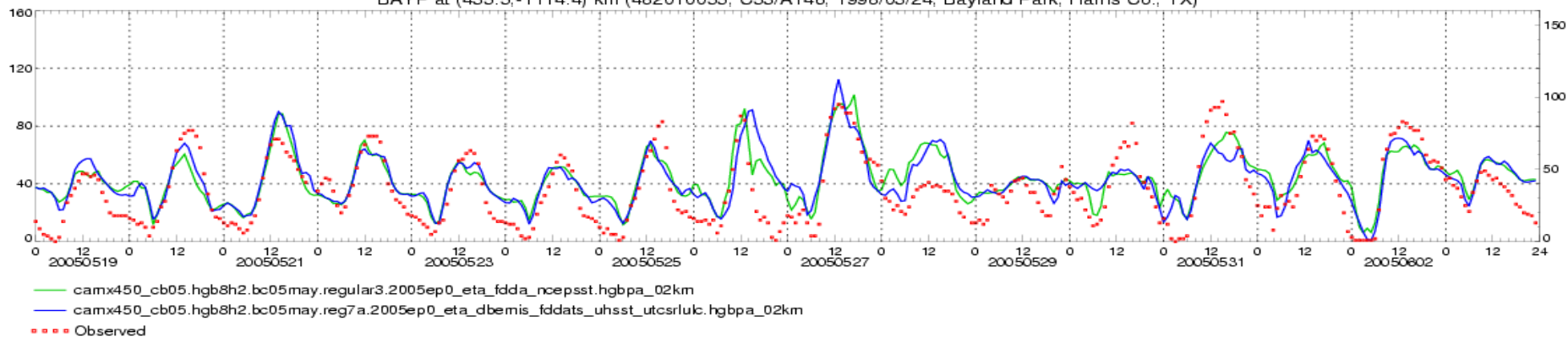
Monitor Site Codes and Locations

Site Code	Site Location
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

O₃ Concentration (ppb) at Layer 1 (20050519-20050603)

camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrulk.hgbpa_02km

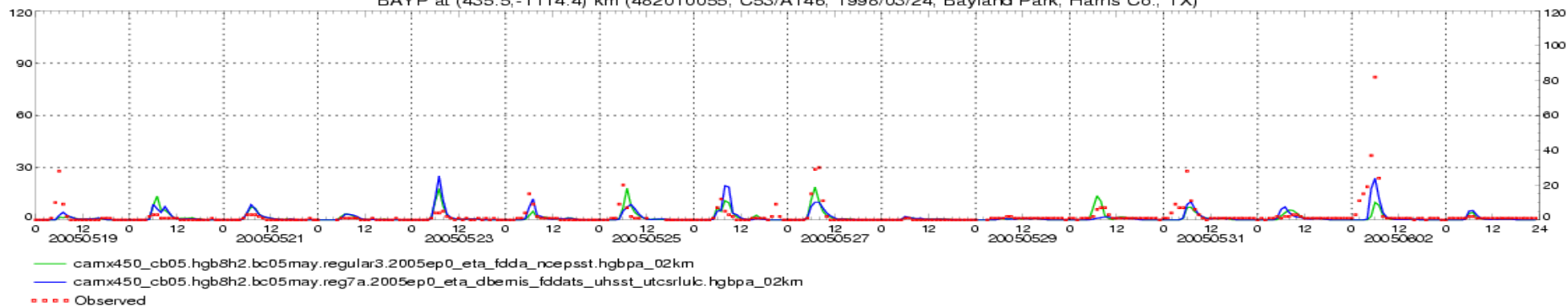
BAYP at (435.5, -1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)



NO Concentration (ppb) at Layer 1 (20050519-20050603)

camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrulk.hgbpa_02km

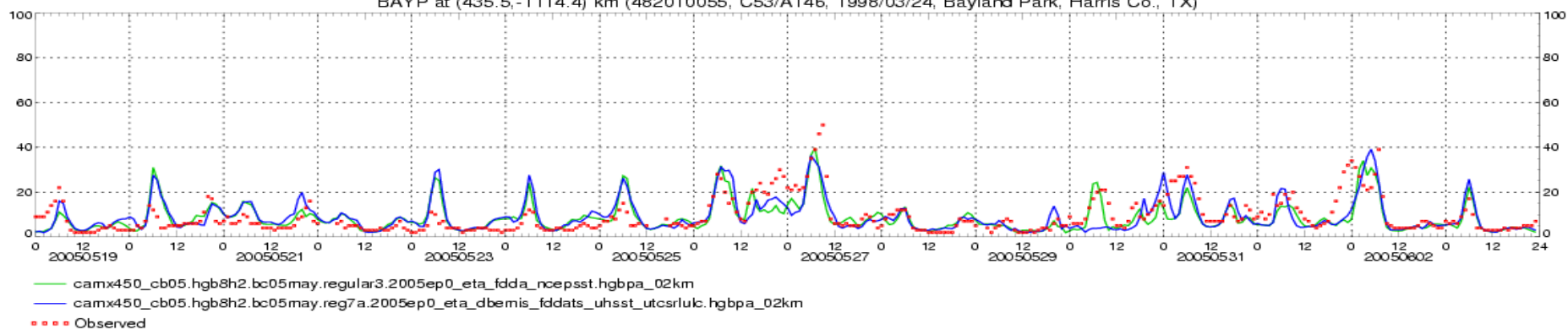
BAYP at (435.5, -1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)



NO₂ Concentration (ppb) at Layer 1 (20050519-20050603)

camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrulk.hgbpa_02km

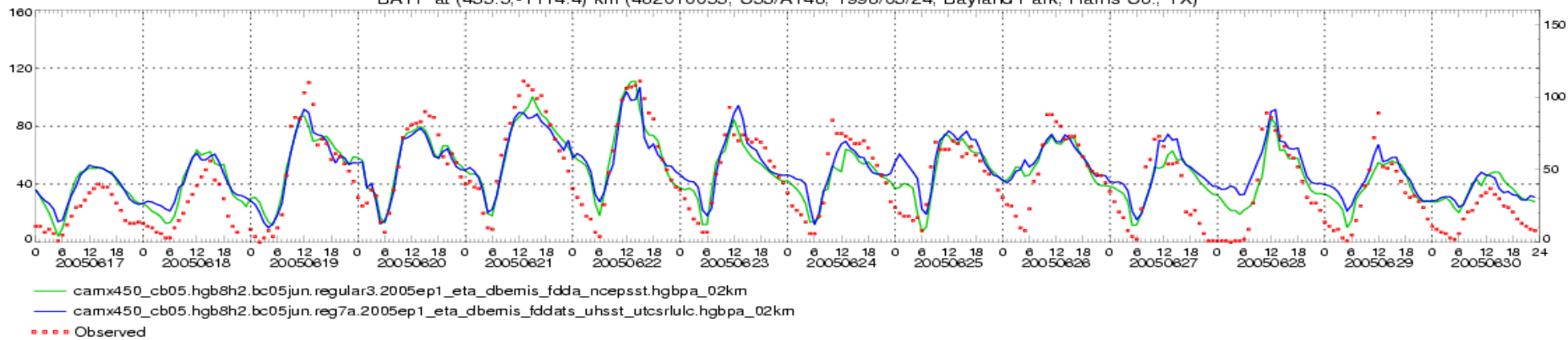
BAYP at (435.5, -1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)



O₃ Concentration (ppb) at Layer 1 (20050617-20050630)

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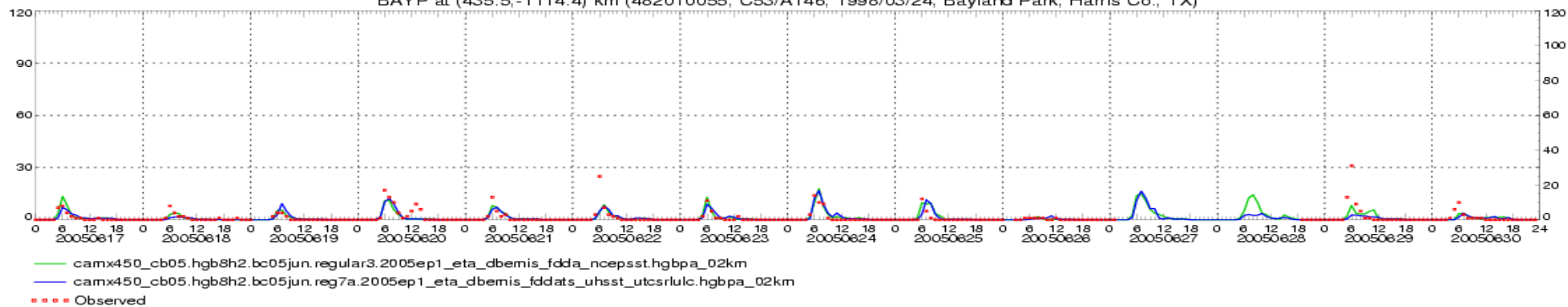
BAYP at (435.5, -1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)



NO Concentration (ppb) at Layer 1 (20050617-20050630)

camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrulc.hgbpa_02km

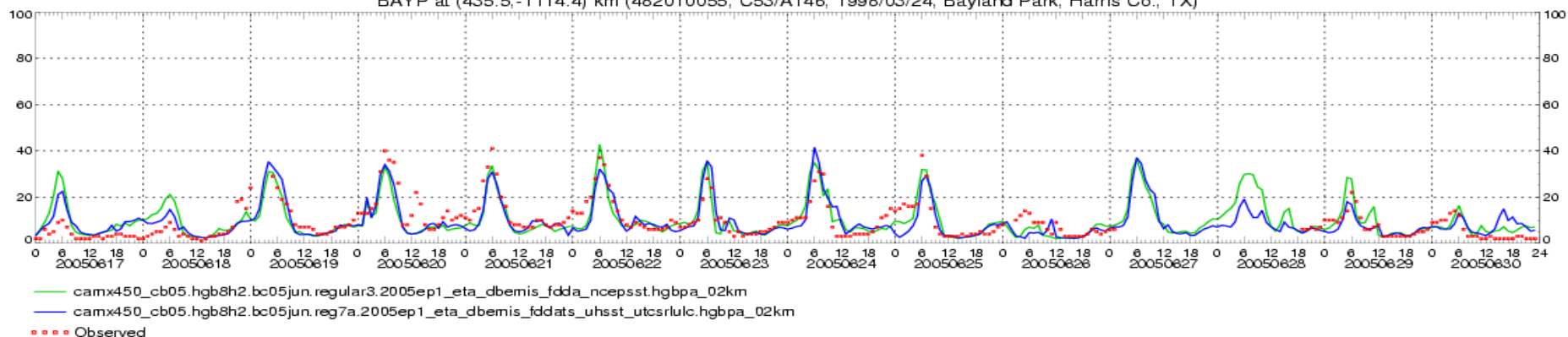
BAYP at (435.5, -1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)



NO₂ Concentration (ppb) at Layer 1 (20050617-20050630)

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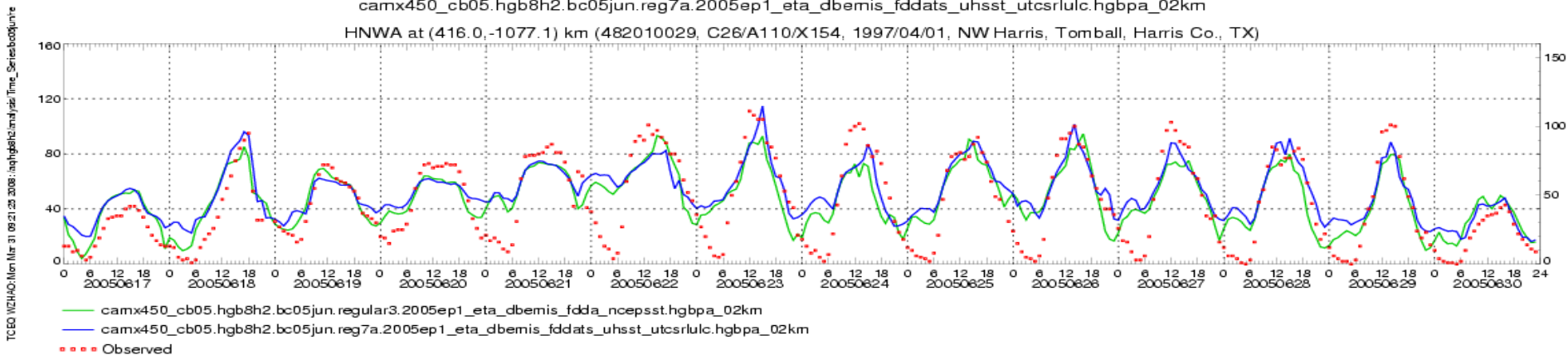
BAYP at (435.5, -1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)



O₃ Concentration (ppb) at Layer 1 (20050617-20050630)

camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlluc.hgbpa_02km

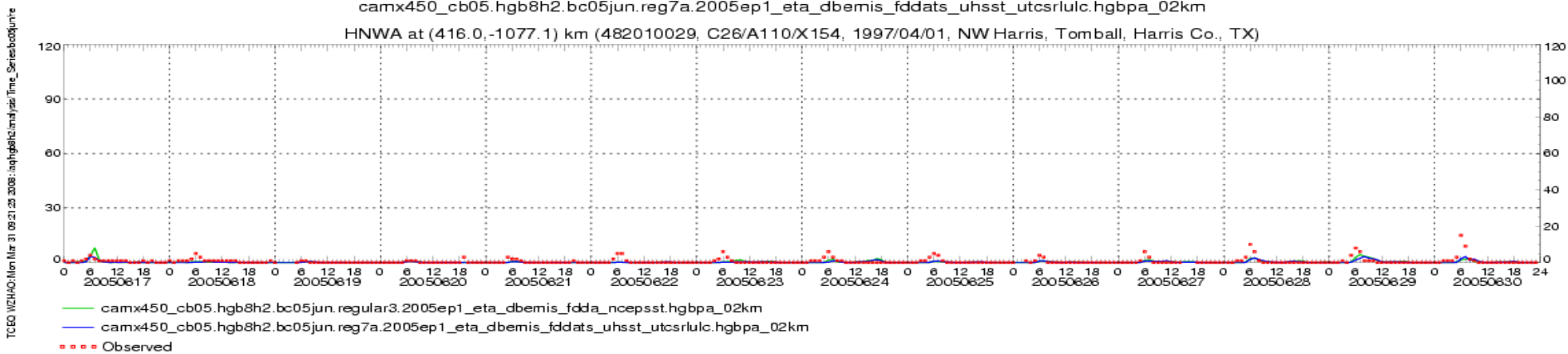
HNWA at (416.0,-1077.1) km (482010029, C26/A110/X154, 1997/04/01, NW Harris, Tomball, Harris Co., TX)



NO Concentration (ppb) at Layer 1 (20050617-20050630)

camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlluc.hgbpa_02km

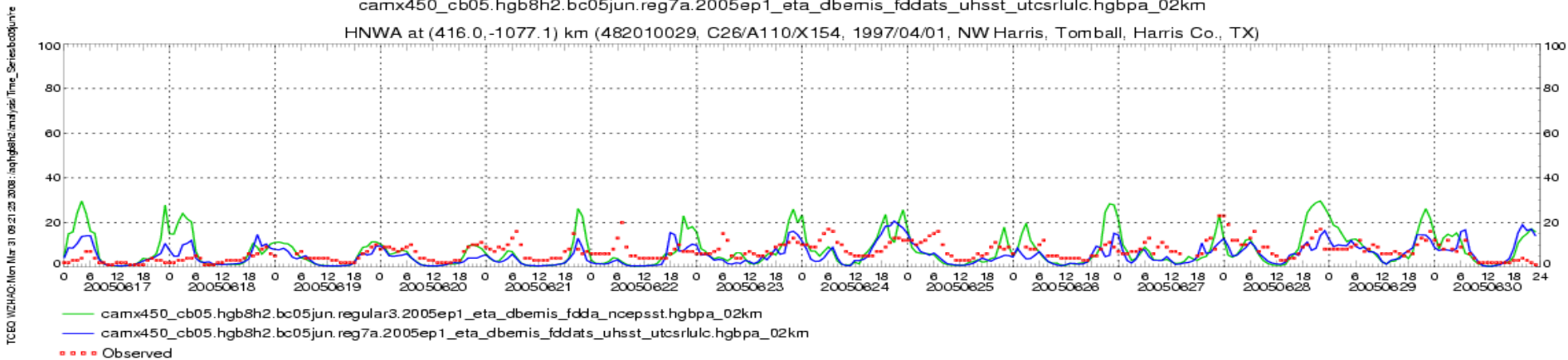
HNWA at (416.0,-1077.1) km (482010029, C26/A110/X154, 1997/04/01, NW Harris, Tomball, Harris Co., TX)



NO₂ Concentration (ppb) at Layer 1 (20050617-20050630)

camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlluc.hgbpa_02km

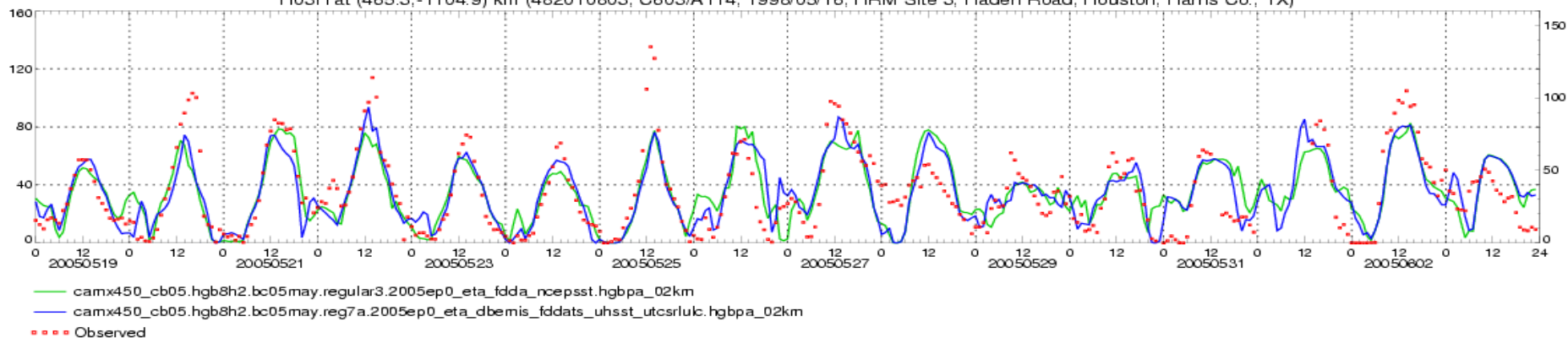
HNWA at (416.0,-1077.1) km (482010029, C26/A110/X154, 1997/04/01, NW Harris, Tomball, Harris Co., TX)



O₃ Concentration (ppb) at Layer 1 (20050519-20050603)

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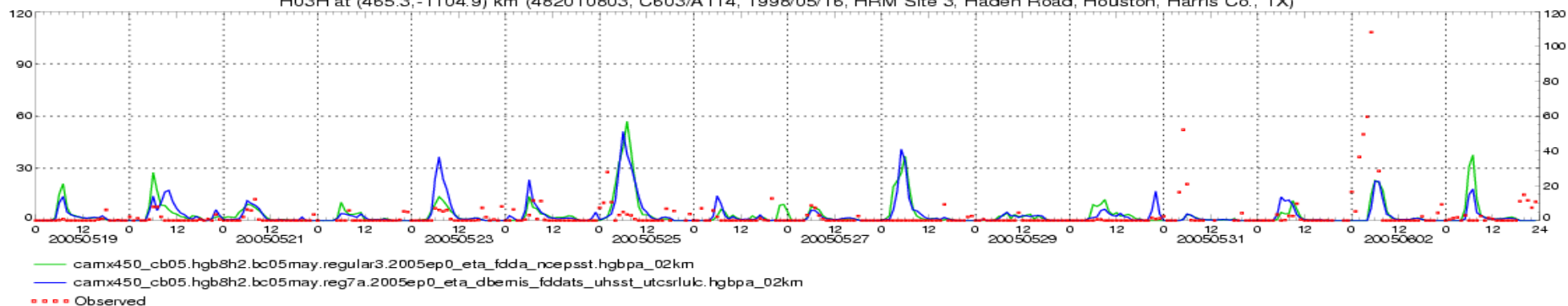
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)



NO Concentration (ppb) at Layer 1 (20050519-20050603)

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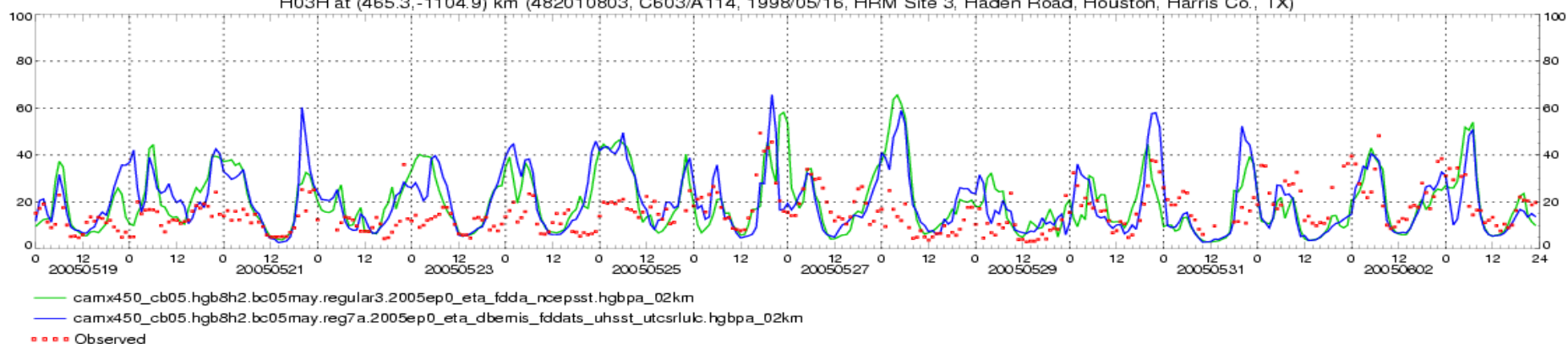
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)



NO₂ Concentration (ppb) at Layer 1 (20050519-20050603)

camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsruluc.hgbpa_02km

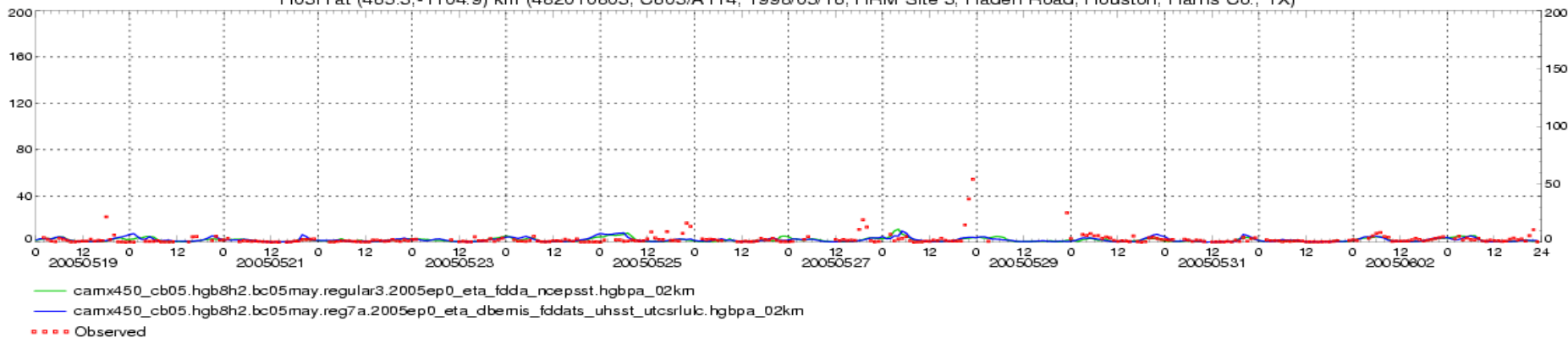
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)



ETH Concentration (ppb) at Layer 1 (20050519-20050603)

camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrluc.hgbpa_02km

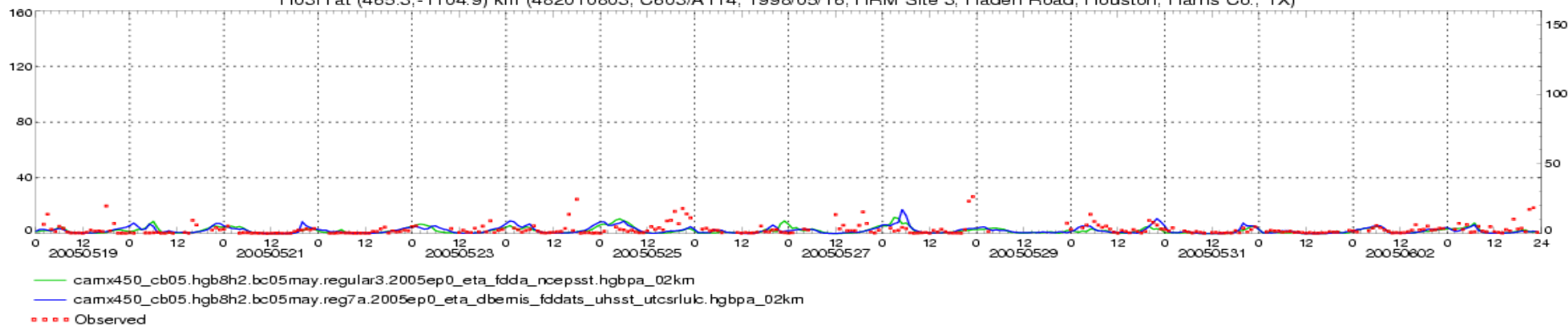
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)



OLE Concentration (ppb) at Layer 1 (20050519-20050603)

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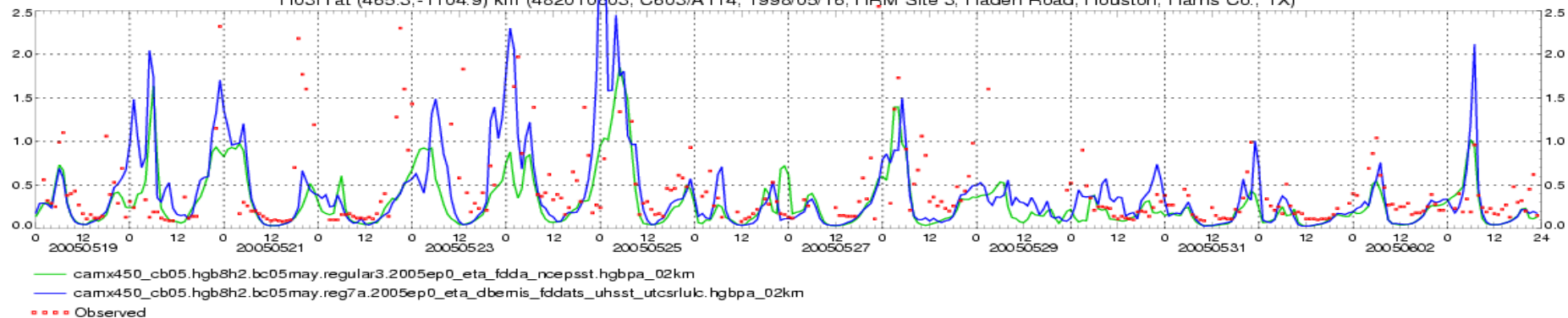
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)



IOLE Concentration (ppb) at Layer 1 (20050519-20050603)

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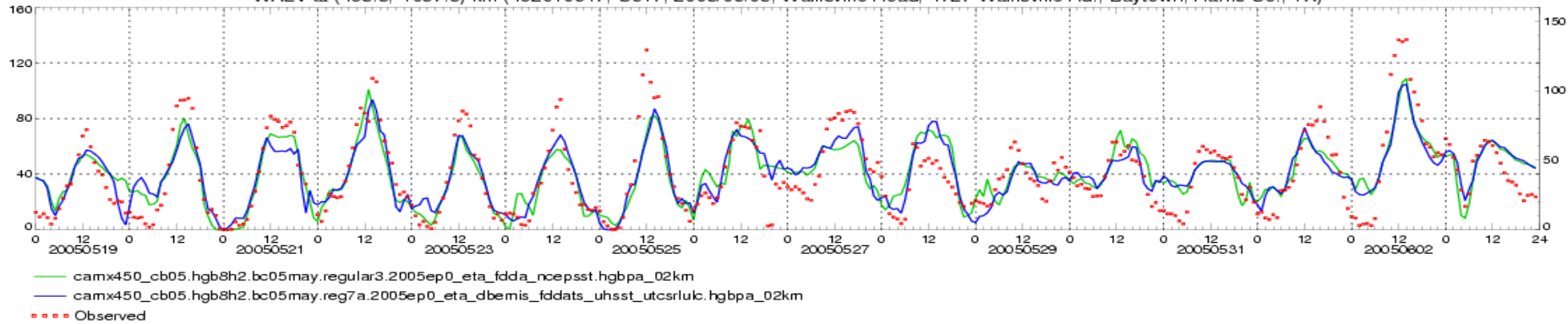
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)



O₃ Concentration (ppb) at Layer 1 (20050519-20050603)

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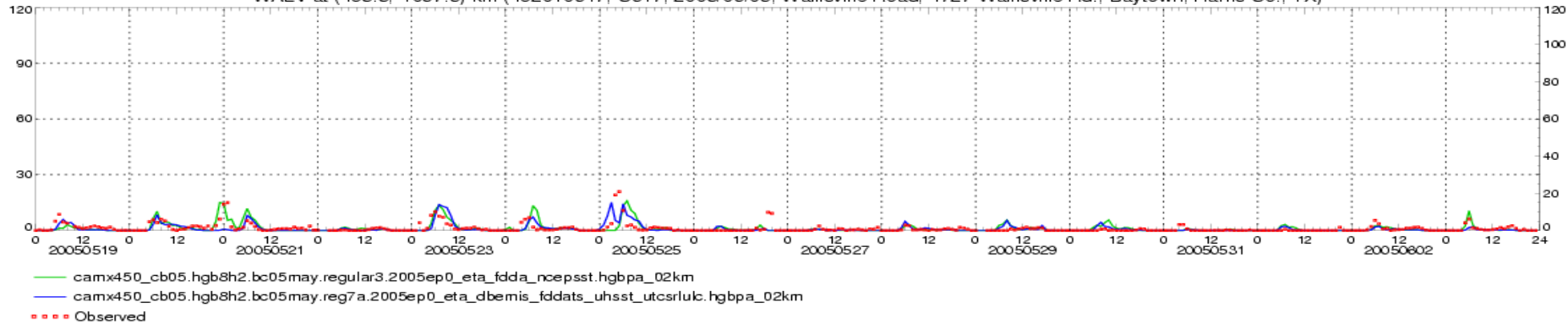
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)



NO Concentration (ppb) at Layer 1 (20050519-20050603)

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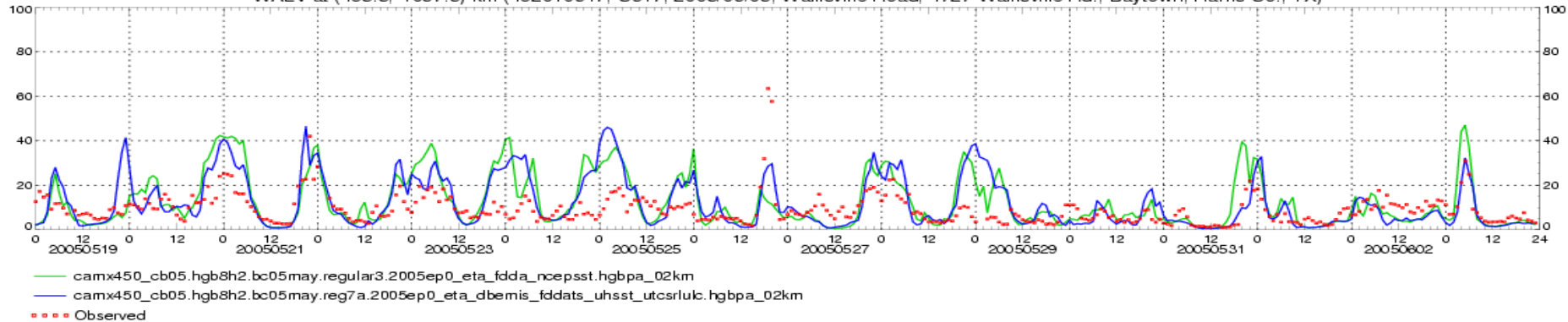
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)



NO₂ Concentration (ppb) at Layer 1 (20050519-20050603)

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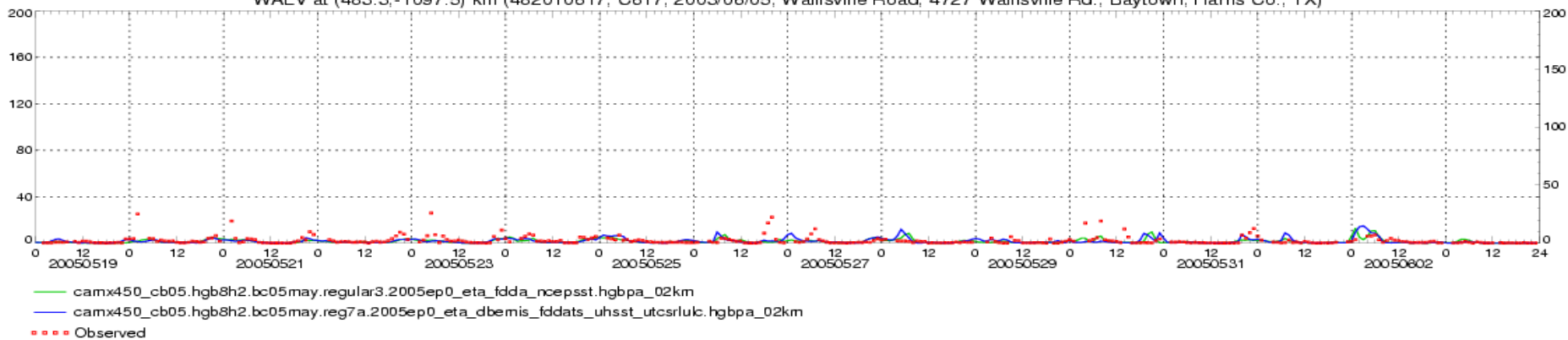
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)



ETH Concentration (ppb) at Layer 1 (20050519-20050603)

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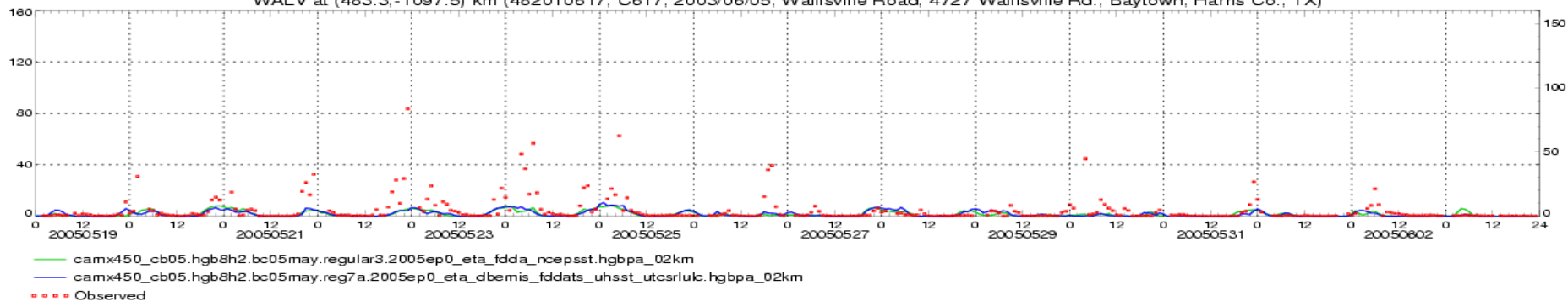
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)



OLE Concentration (ppb) at Layer 1 (20050519-20050603)

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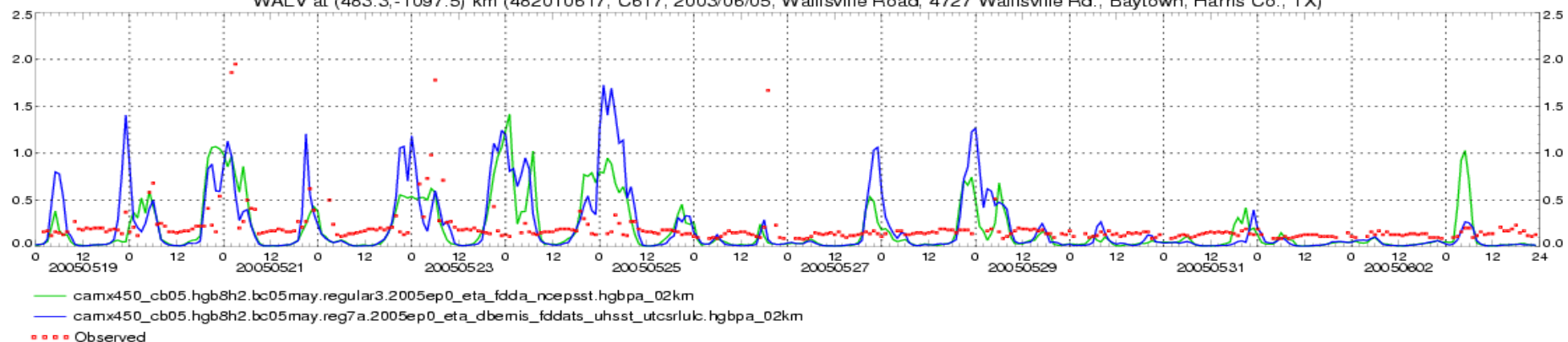
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)



IOLE Concentration (ppb) at Layer 1 (20050519-20050603)

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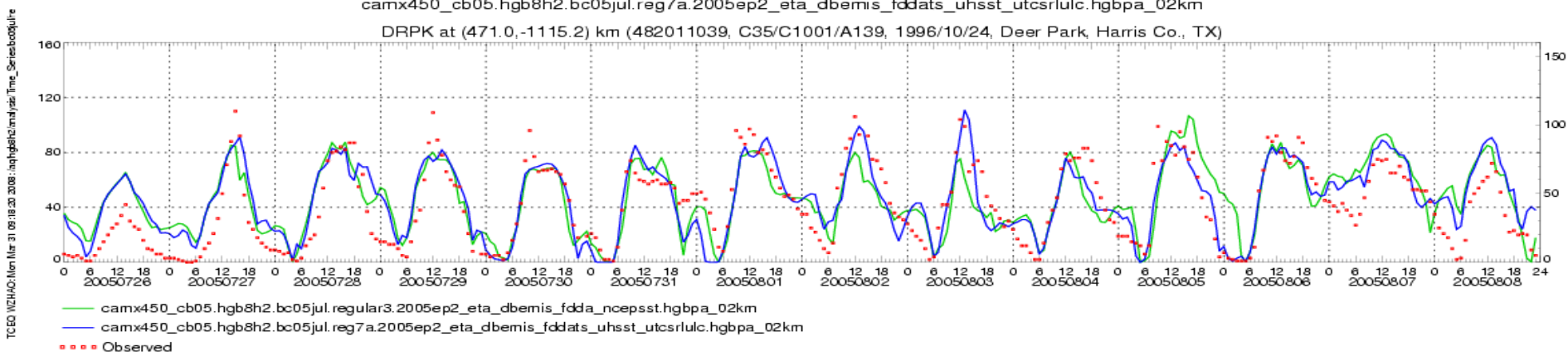
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)



O₃ Concentration (ppb) at Layer 1 (20050726-20050808)

camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrulc.hgbpa_02km

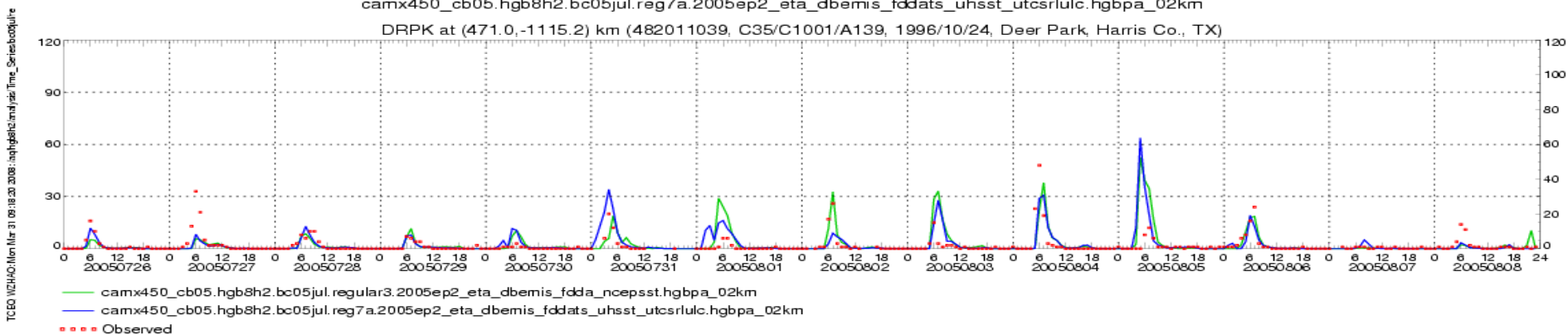
DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)



NO Concentration (ppb) at Layer 1 (20050726-20050808)

camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrulc.hgbpa_02km

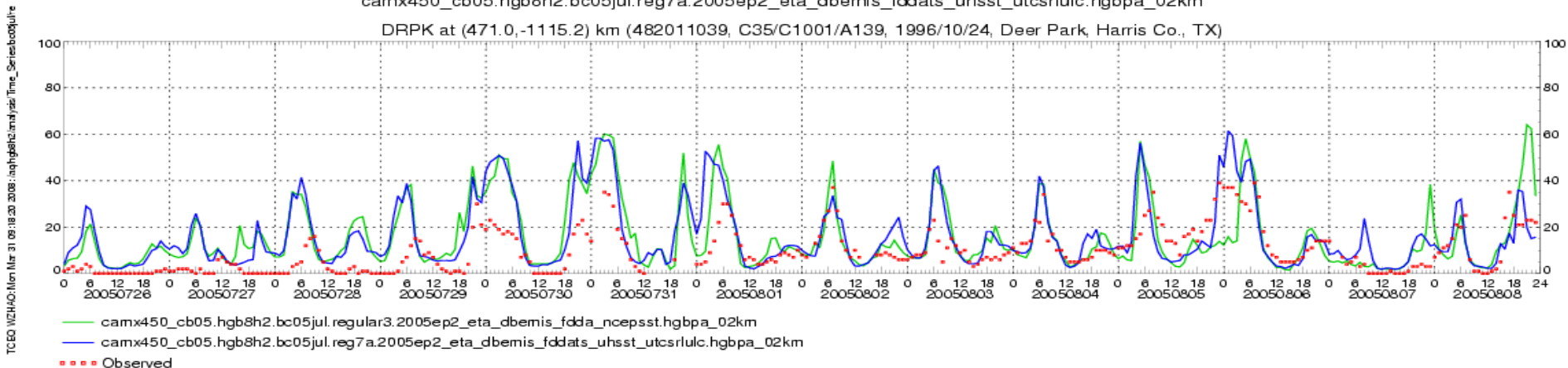
DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)



NO₂ Concentration (ppb) at Layer 1 (20050726-20050808)

camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrulc.hgbpa_02km

DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)





Graphical Performance Evaluation: Daily Maximum Ozone Tile Plots

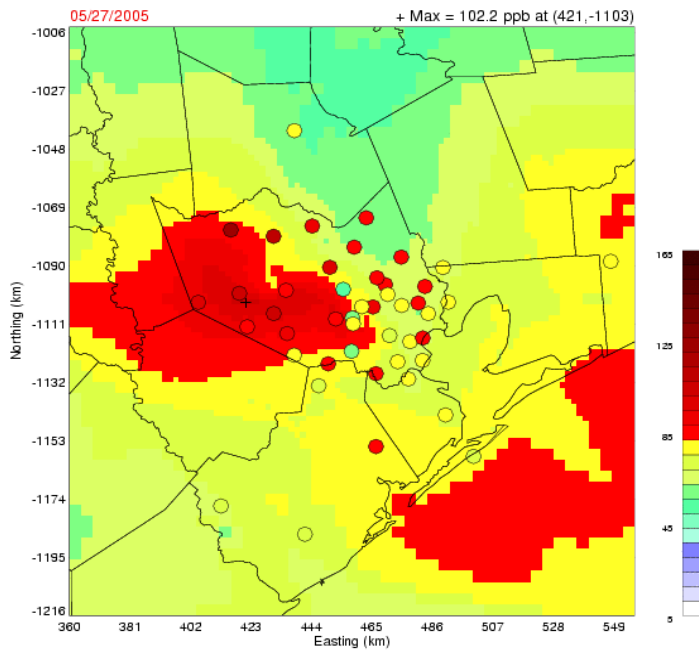
Daily maximum 8-hour ozone map for selected days from each episode

- EP0: May 27 and June 2, 2005
- EP1: June 21 and June 22, 2005
- EP2: August 1 and August 2, 2005



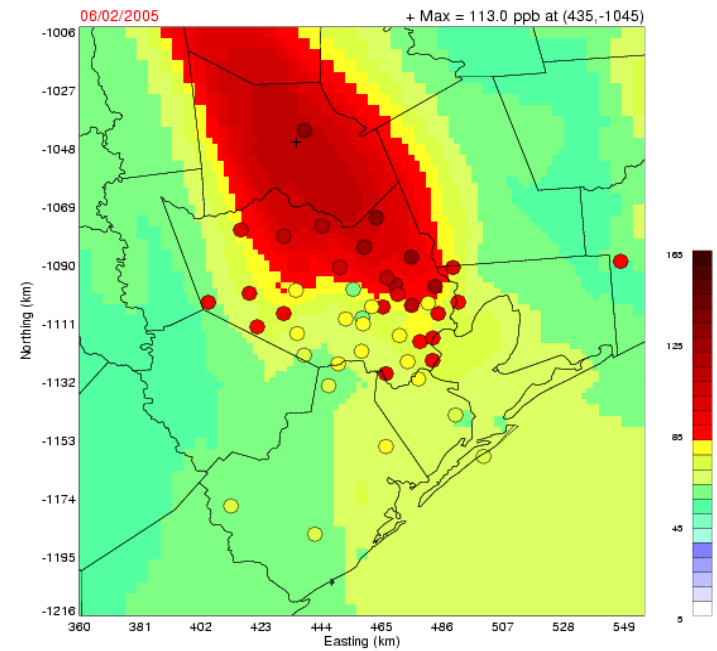
Daily Maximum 8-Hour Ozone Tile Plot

Layer 1 Daily Max of 8-Hour Ozone Concentration (ppb)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhst_utcsrlluc.hgbpa_02km



May 27, 2005

Layer 1 Daily Max of 8-Hour Ozone Concentration (ppb)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhst_utcsrlluc.hgbpa_02km

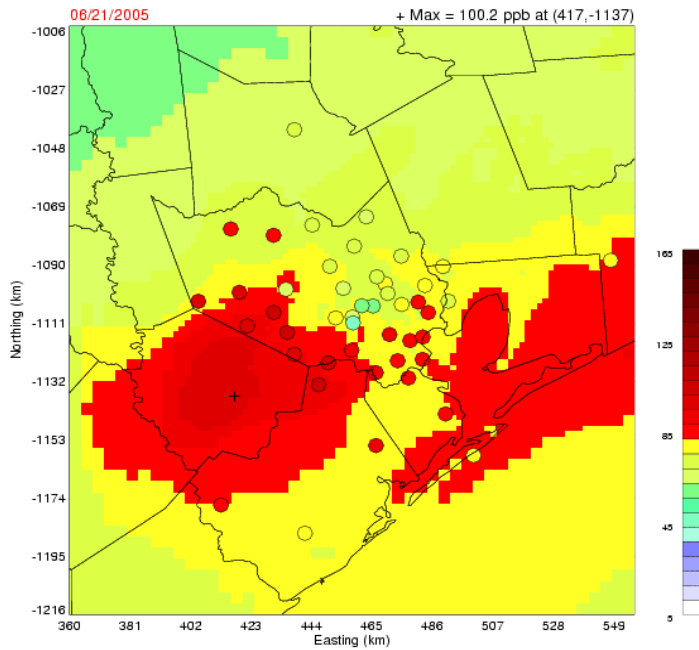


June 2, 2005



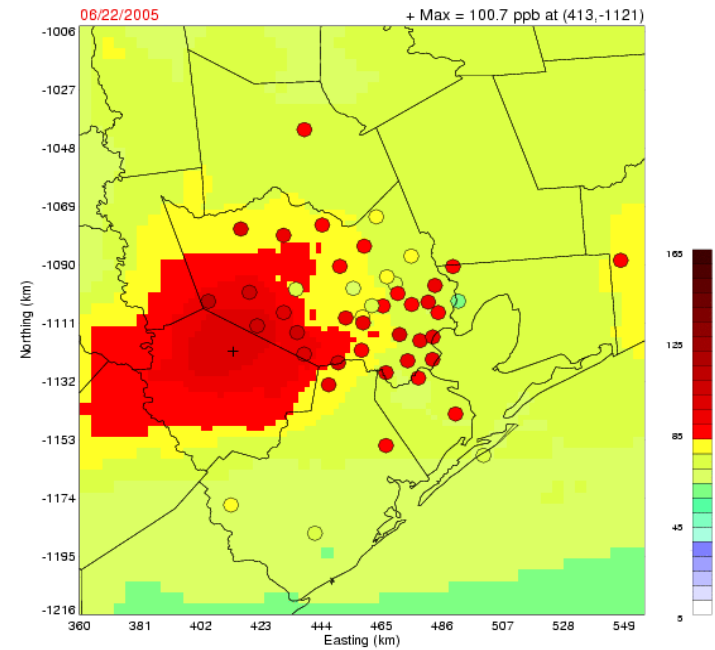
Daily Maximum 8-Hour Ozone Tile Plot

Layer 1 Daily Max of 8-Hour Ozone Concentration (ppb)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrllc.hgbpa_02km



June 21, 2005

Layer 1 Daily Max of 8-Hour Ozone Concentration (ppb)
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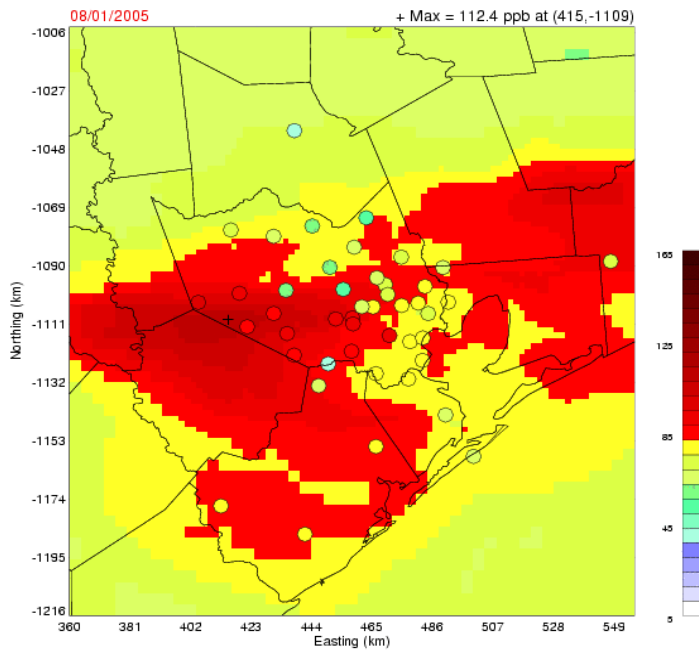


June 22, 2005



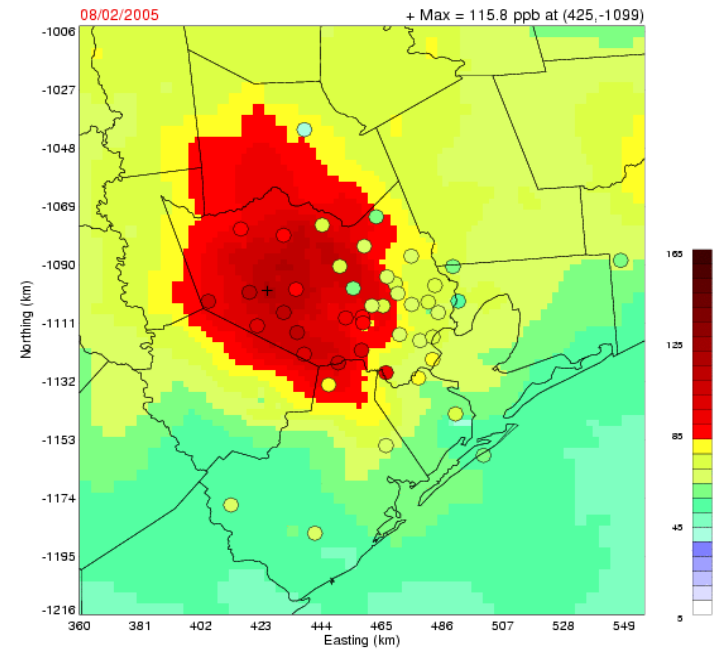
Daily Maximum 8-Hour Ozone Tile Plot

Layer 1 Daily Max of 8-Hour Ozone Concentration (ppb)
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Aug. 1, 2005

Layer 1 Daily Max of 8-Hour Ozone Concentration (ppb)
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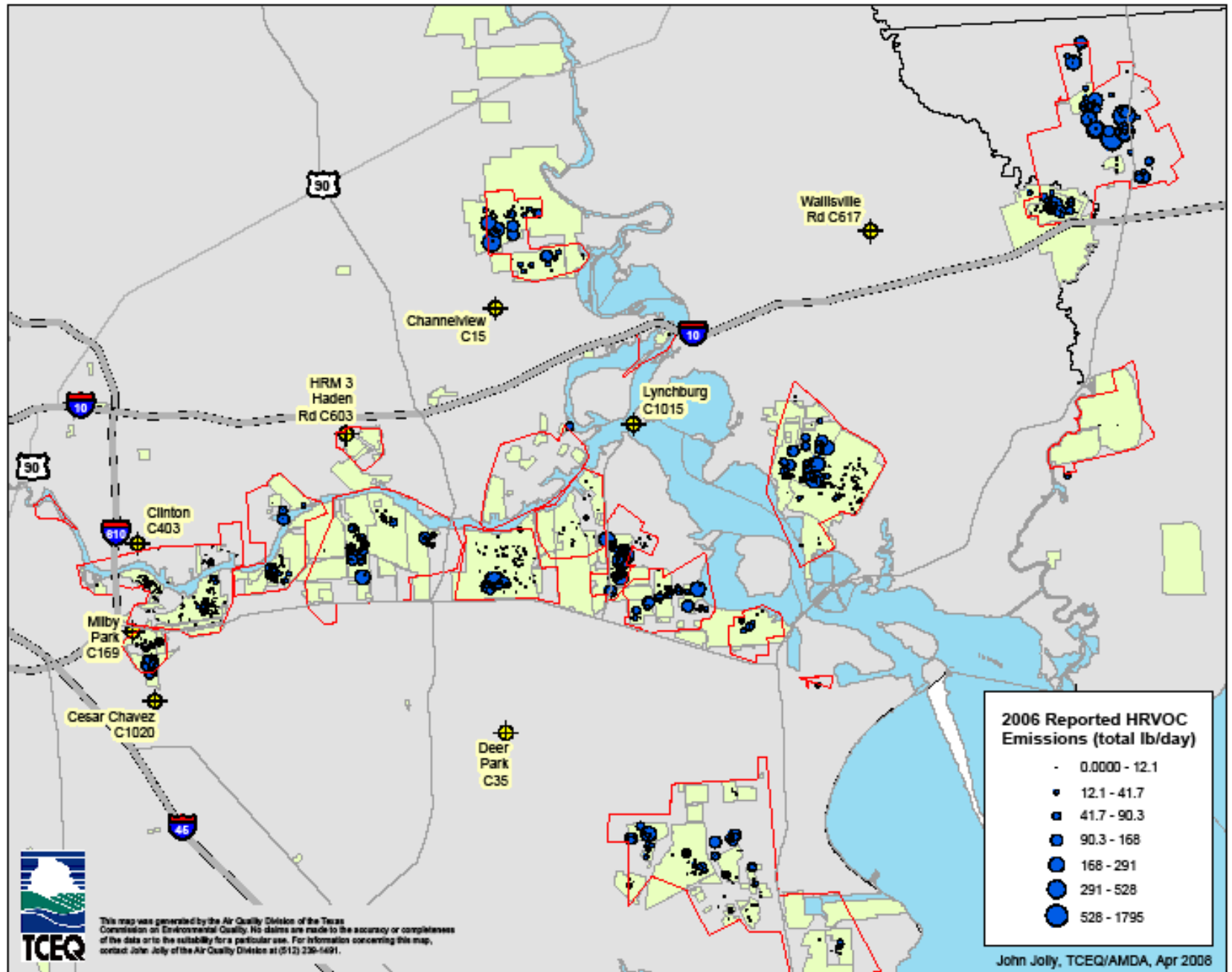
Aug. 2, 2005



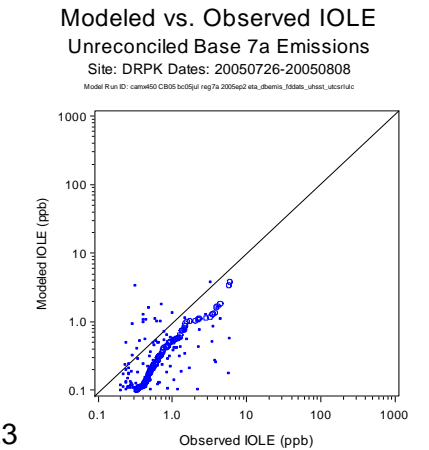
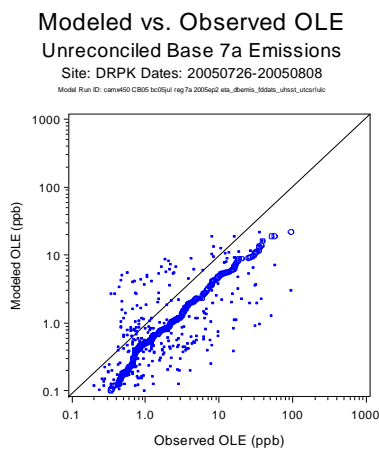
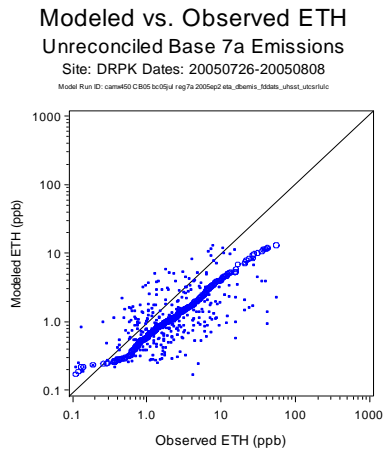
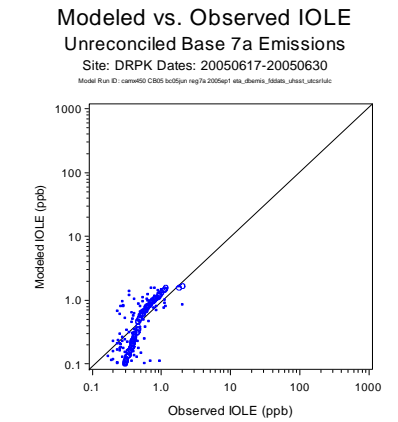
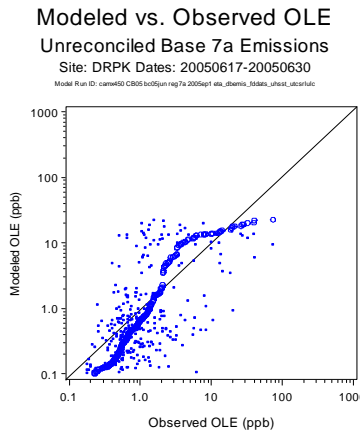
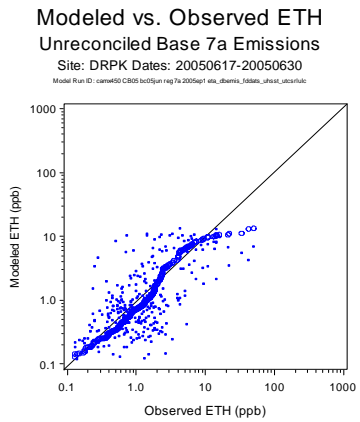
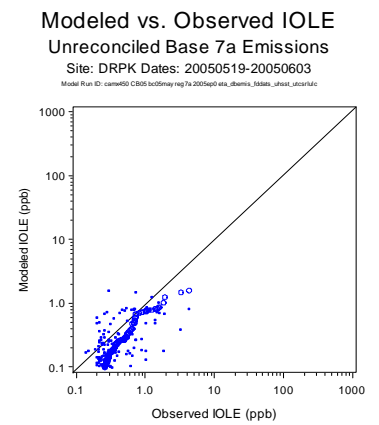
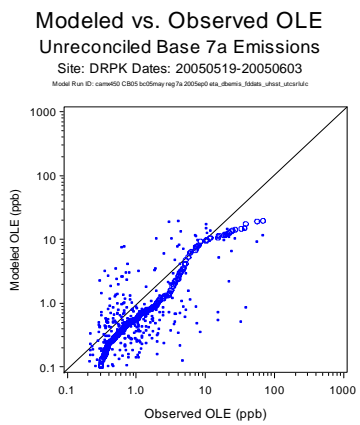
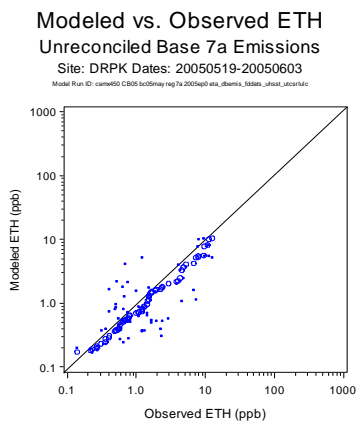
Graphical Performance Evaluation: Scatter-plots

- Scatter-plots of hourly measured vs modeled HRVOC at selected sites
 - Ethene (ETH)
 - Terminal olefins (OLE)
 - Internal olefins (IOLE)

Houston Ship Channel Auto-GC Monitors and HRVOC Point Sources (2006 Annual EI)



Deer Park (DRPK) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)



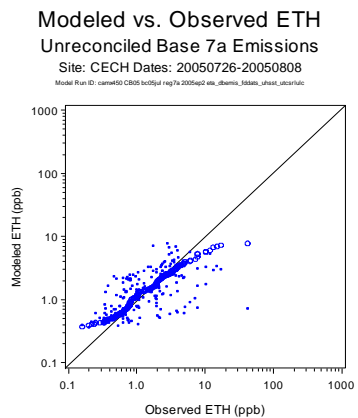
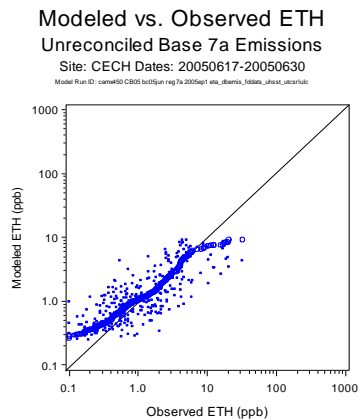
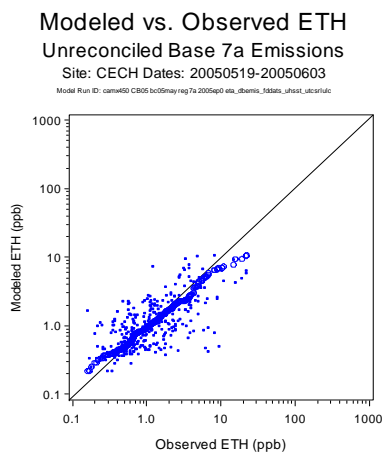
Air Quality

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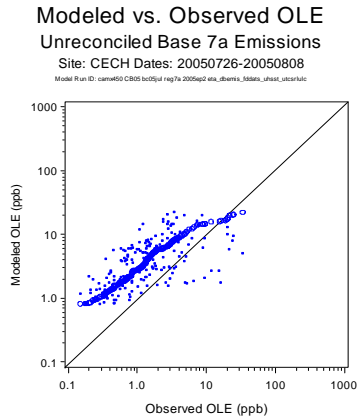
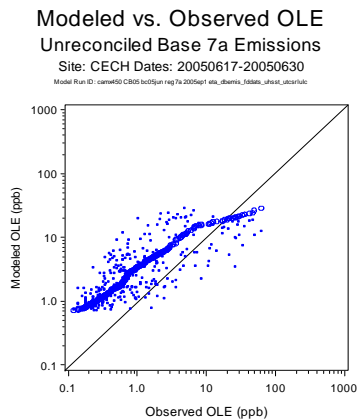
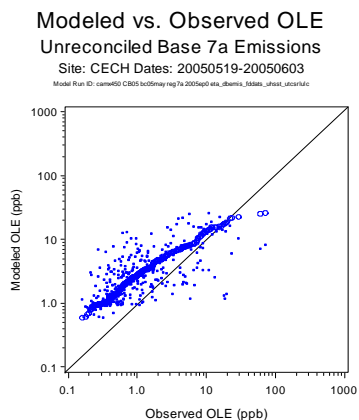
'K April 23

Cesar Chavez (CECH) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)

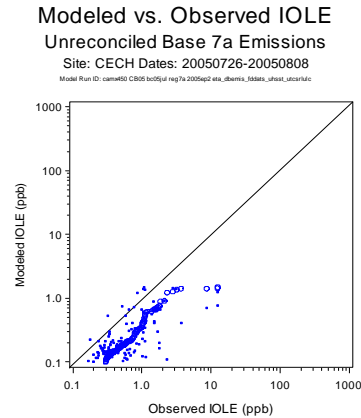
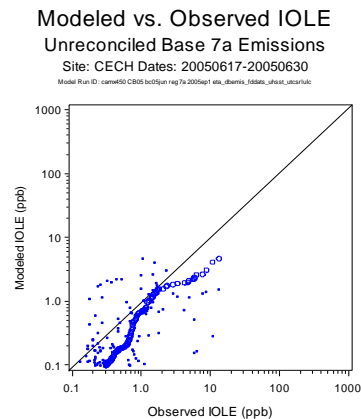
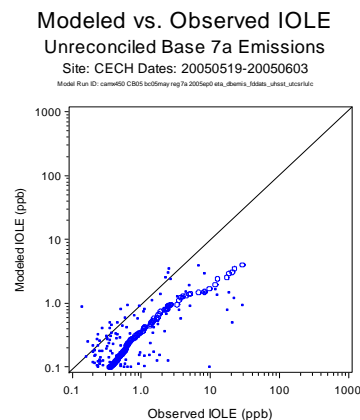
Air Quality



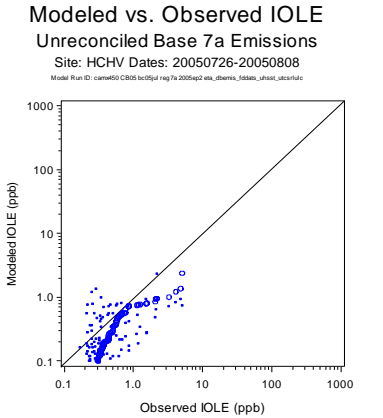
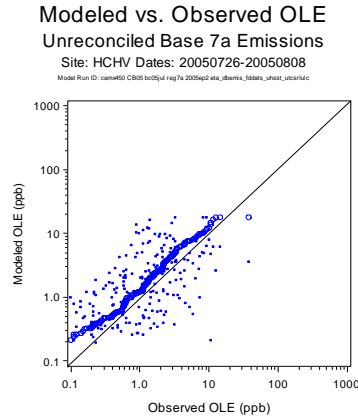
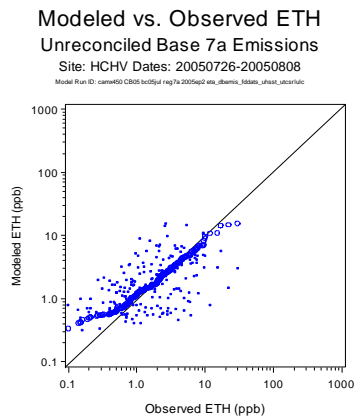
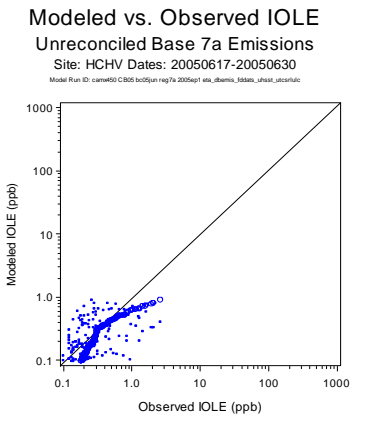
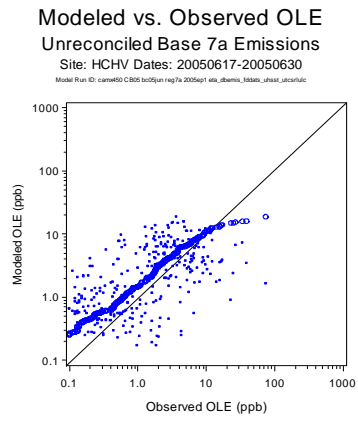
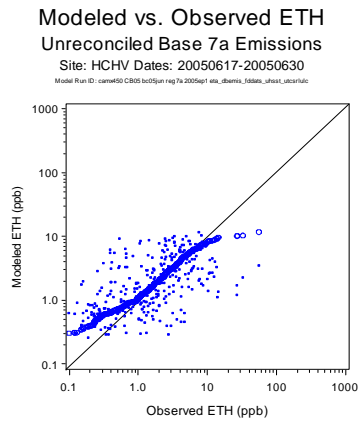
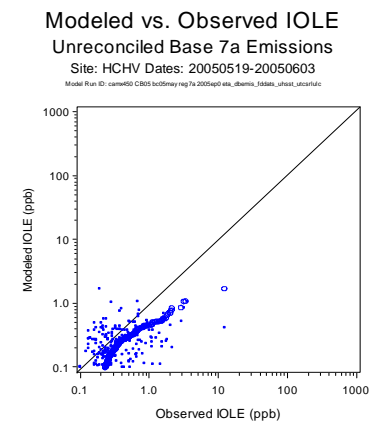
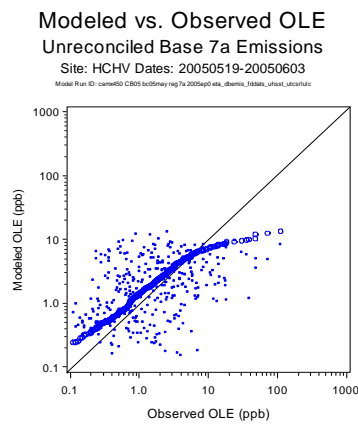
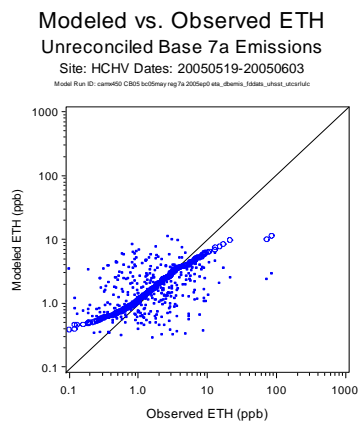
Case Moa



RWK April 23



Channelview (HCHV) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)

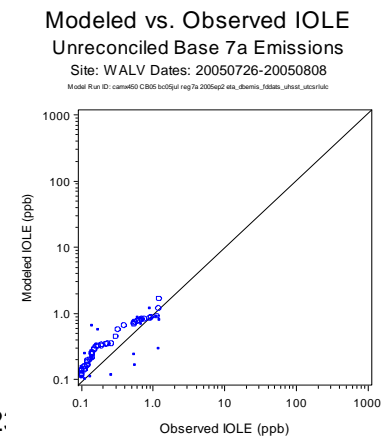
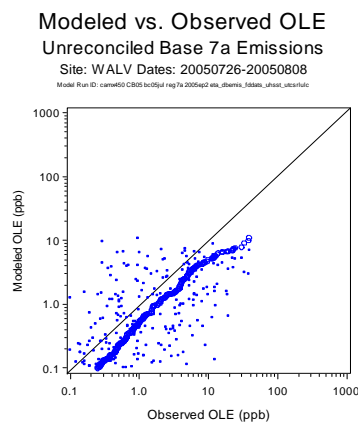
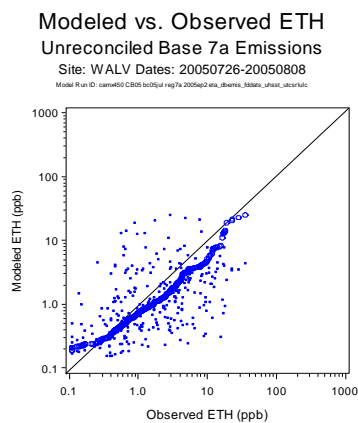
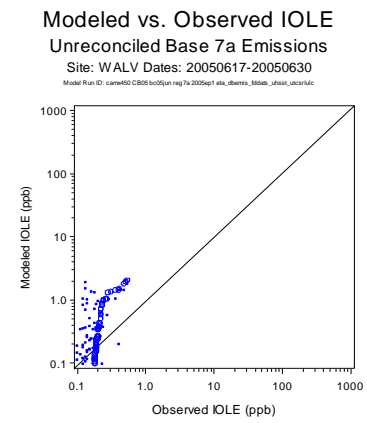
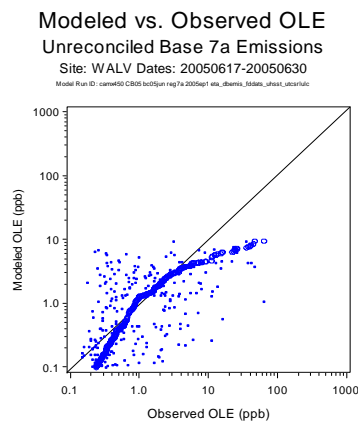
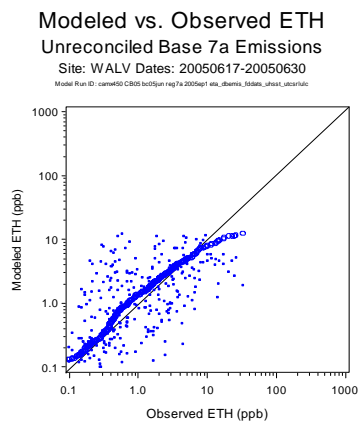
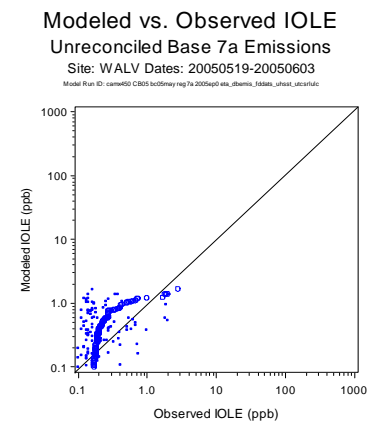
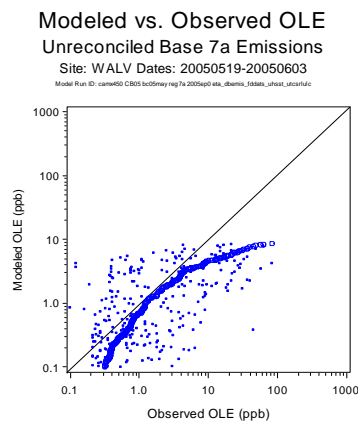
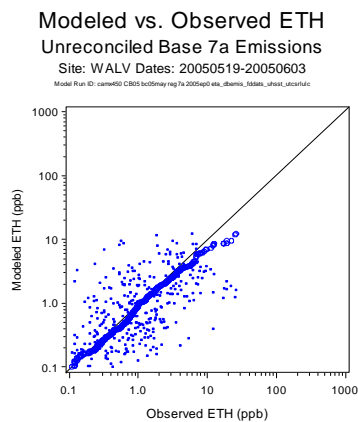


Air Quality

Case Mode

RWK April ;

Wallisville (WALV) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)



Air Quality

Case Mode

RWK April 2:



General Summary Comments

- **Statistical Performance Evaluation**
 - Generally, Reg7a improves performance for Episode0 and Episode1, while there was some degradation to Episode2
 - Specific to the 8-hour ozone, Reg7a improved performance on those days with the most monitors in exceedance for Episode0 and Episode1, while somewhat degrading performance on those days with the most monitors in exceedance for Episode2
- **Graphical Performance Evaluation**
 - Time series of Reg7a hourly ozone at selected sites show improved performance on days with peaks greater than 120 ppb
 - Time series of NO and NO₂ at selected sites is not well replicated, with a general over prediction of NO₂



General Summary Comments

- **Graphical Performance Evaluation** (continued)
 - Time series of Reg7a hourly ETH, OLE and IOLE at WALV and H03H for Episode0 are generally comparable to Reg3, although Reg7a IOLE concentrations are greater
 - Time series of Reg7a hourly ETH, OLE and IOLE at DRPK for Episode2 are generally comparable to Reg3, although Reg7a IOLE concentrations are greater
 - Modeled area of maximum daily 8-hour ozone ≥ 85 ppb misses a number of monitors with 8-hour ozone ≥ 85 ppb in Episode0 and Episode1
 - Modeled area of maximum daily 8-hour ozone ≥ 85 ppb includes a number of monitors with 8-hour ozone < 85 ppb in Episode2



General Summary Comments

- **Graphical Performance Evaluation** (continued)
 - Scatter-plots of Reg7a ETH, OLE and IOLE show a general tendency for the model to under predict the higher measurements at the selected sites
 - Scatter-plots of Reg7a OLE at CECH show the model generally over predicts measurements, except for the highest concentrations, for all three 2005 episodes
 - Internal olefin model performance shows a strong tendency to under predict ambient measurements at the selected sites



Future Modeling Updates for the 2005 Episode Base Cases

- Emissions
 - Update fire emissions
 - Reconcile HRVOC emissions with ambient concentrations
- Other
 - New boundary conditions derived from the GEOS-CHEM model
 - Chemical process analysis to explore performance evaluation