Houston SIP Modeling Update

2nd Interim Base Case Modeling: 2005 Episodes

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Southeast Texas Photochemical

Modeling Committee

April 23, 2008

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

Meteorological Modeling

Winds, Mixing Depth, Temperature, etc.

Emissions Modeling

VOC, CO & NO_X

Point, Area, on- & Non-Road & Biogenic

CAMx Modeling

O_3, NO_X, VOC, CO, etc.

Chemical Mechanism (CBIV, CB05), "Mixing" schemes

Evaluate CAMx Performance

(How well does the model replicate the episode?)

Bias, Time Series, Contour Plots

Suitable Base Case

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)

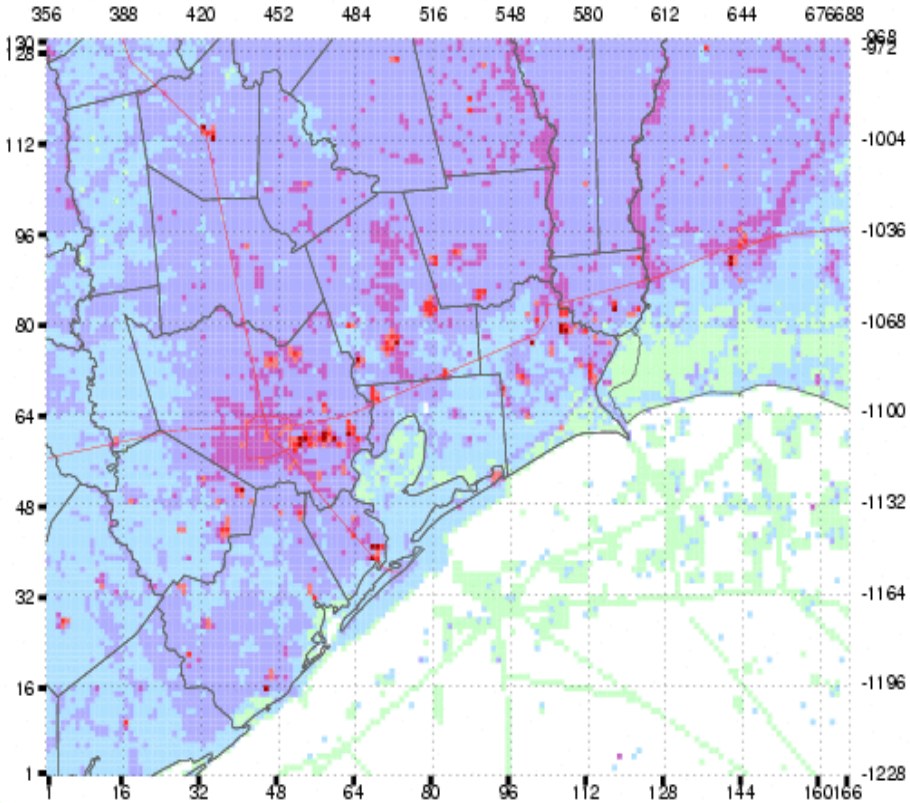
Emissions and Meteorology Updates

- Emissions Update (Regular3 - Regular7a)
  - Hourly Tank Landing Loss
  - TFS fires

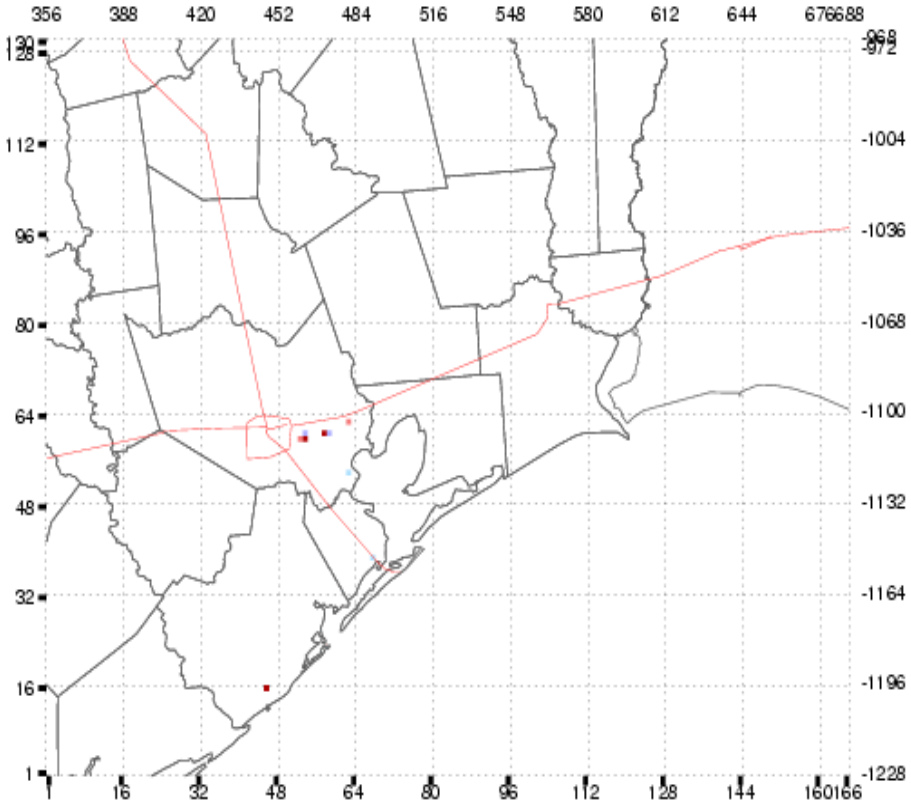
- Meteorology Updates (ncepsst – uhsst.utcsrlulc)
  - FDDA Nudging with time-shift
  - NOAH Land Surface Model with UT-CSR LU/LC
  - U of H hourly SST

Emissions Update

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



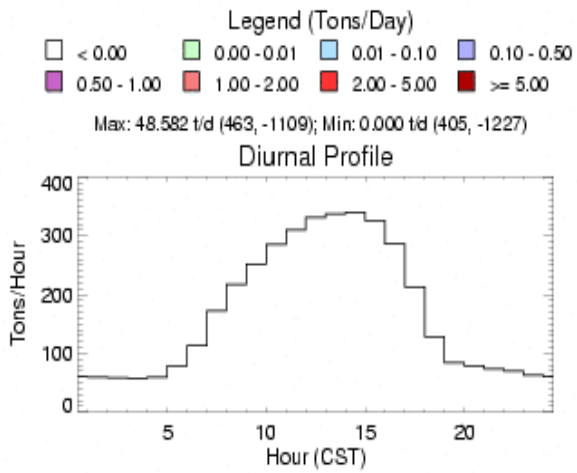
hgb8h2.bc05jun.reg7a.hgbpa_02km Total Emissions, 06/28/2005: VOC



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

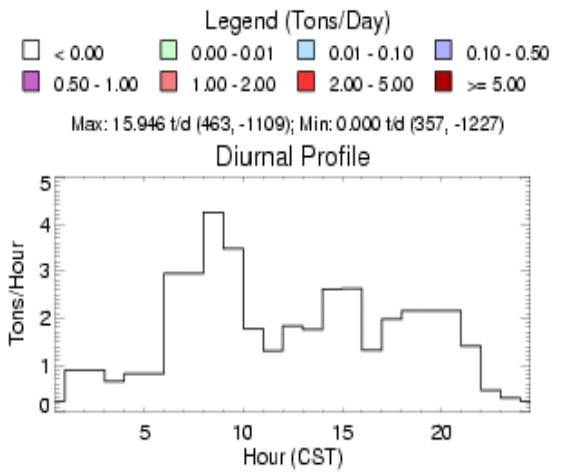
Emissions Plotted

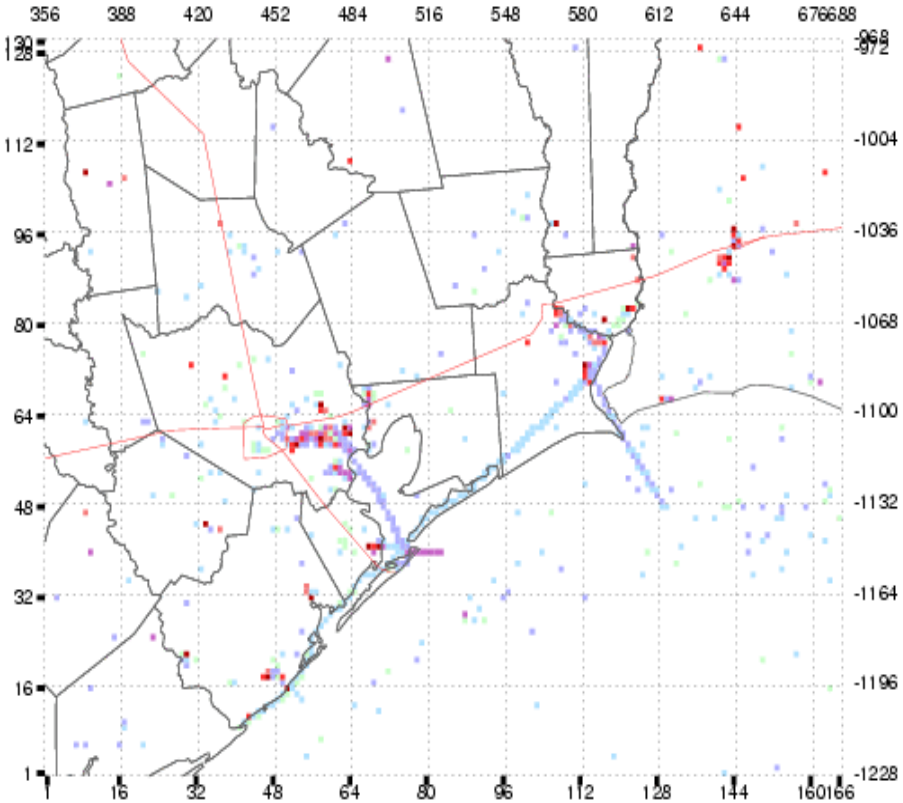
County	Tons/Day
Brazoria	193.65
Chambers	72.95
Fort Bend	106.67
Galveston	105.51
Harris	611.81
Liberty	310.31
Montgomery	196.25
Waller	35.98
HGB SUBTOTAL:	1633.13
Hardin	213.98
Jefferson	197.25
Orange	102.54
BPA SUBTOTAL:	513.77
MAP TOTAL:	4057.44



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

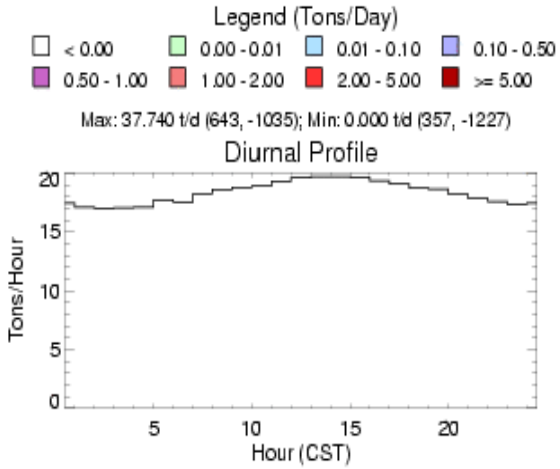


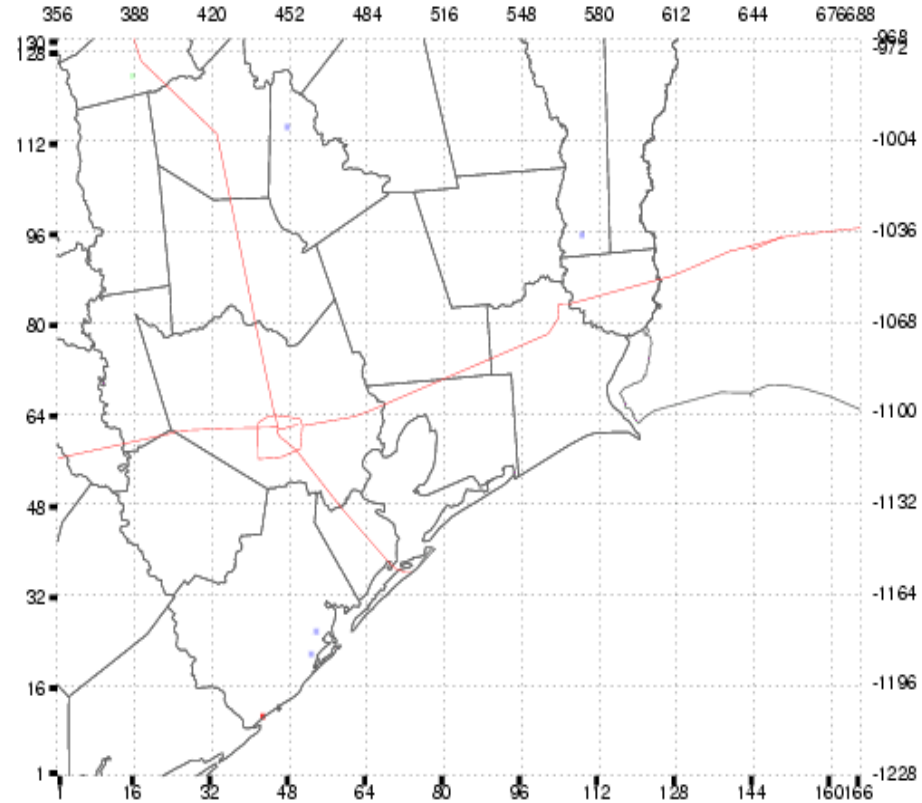


hgb8h2.bc05jul.reg7a.hgbpa_02km All Elevated Emissions, 08/07/2005: NO_x

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

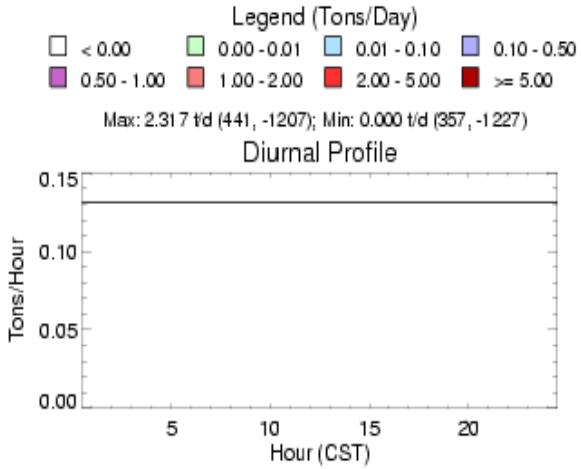




TxAQS2_tfs_tx.hgbpa_02km Elevated Fire Emissions, 08/07/2005: NO_x

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

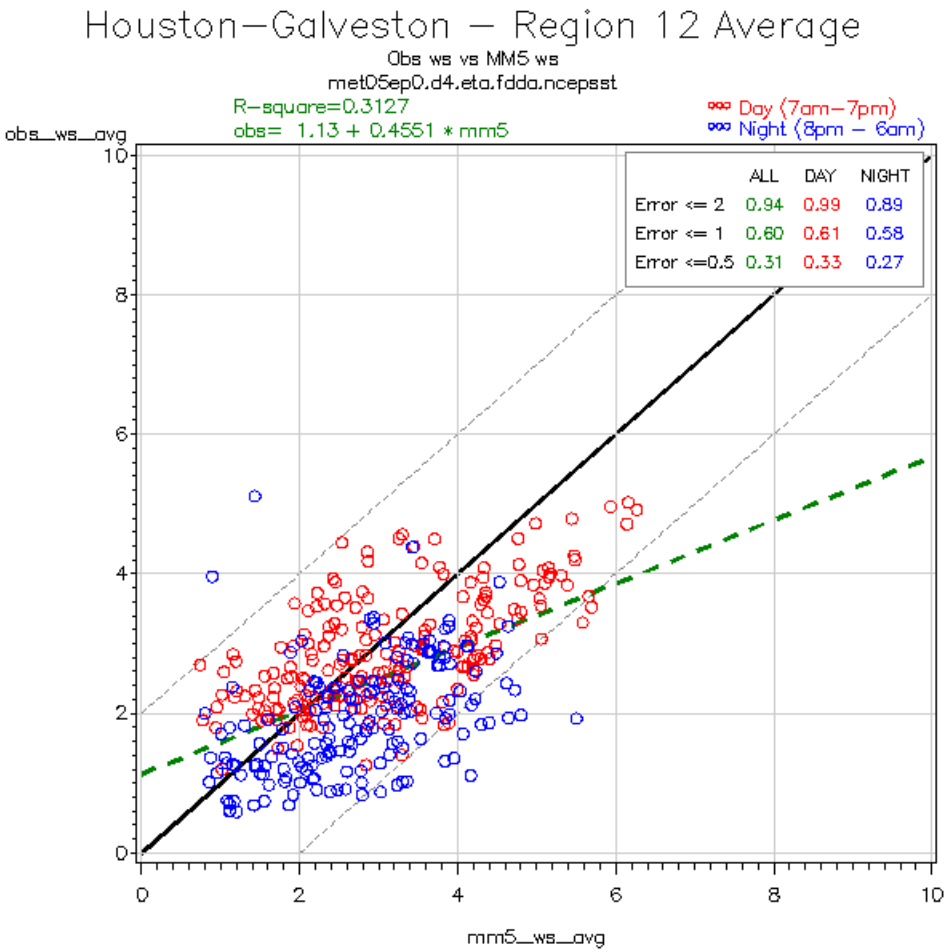


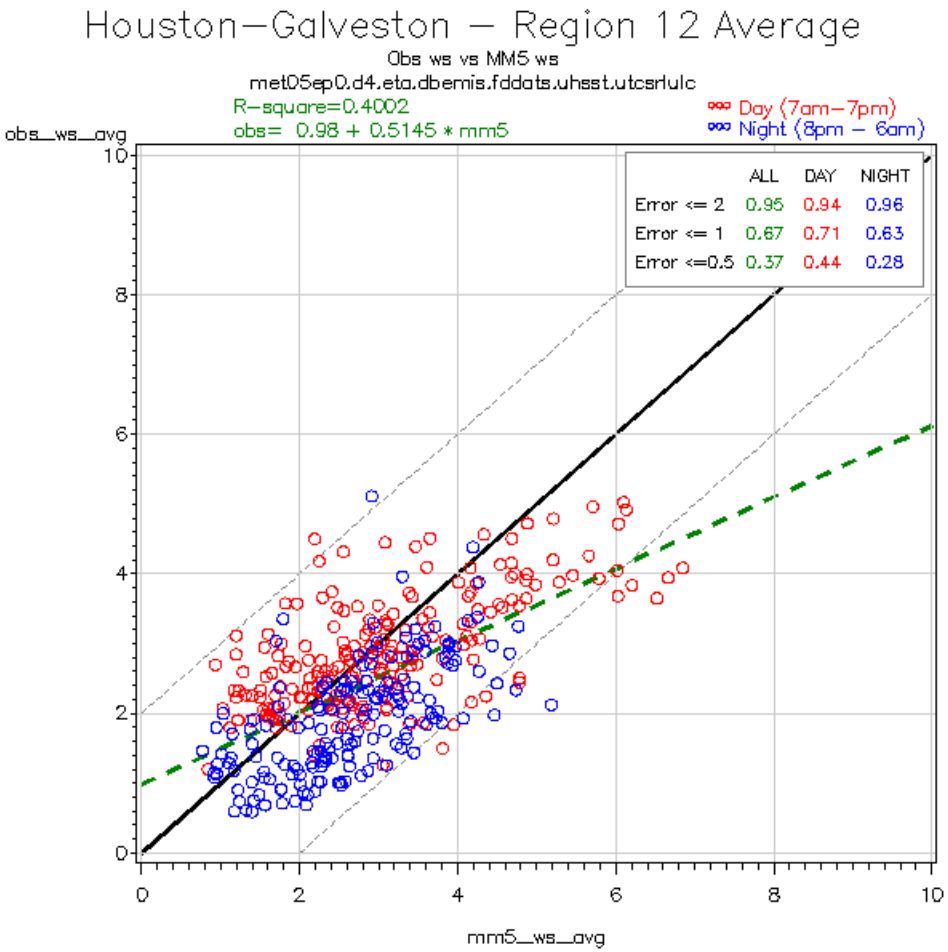
Meteorology Updates

(ncepsst vs uhsst.utcsrlulc)

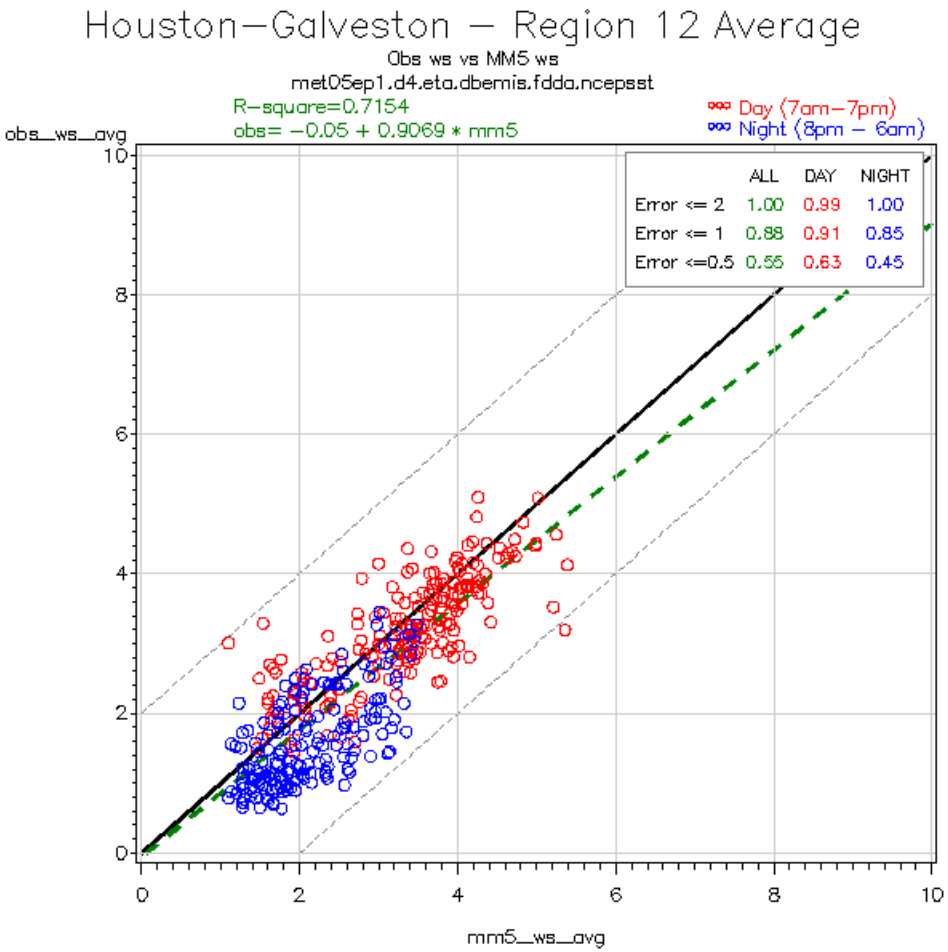
- Wind Speed Scatter Plots
- Plume Plot Trajectories

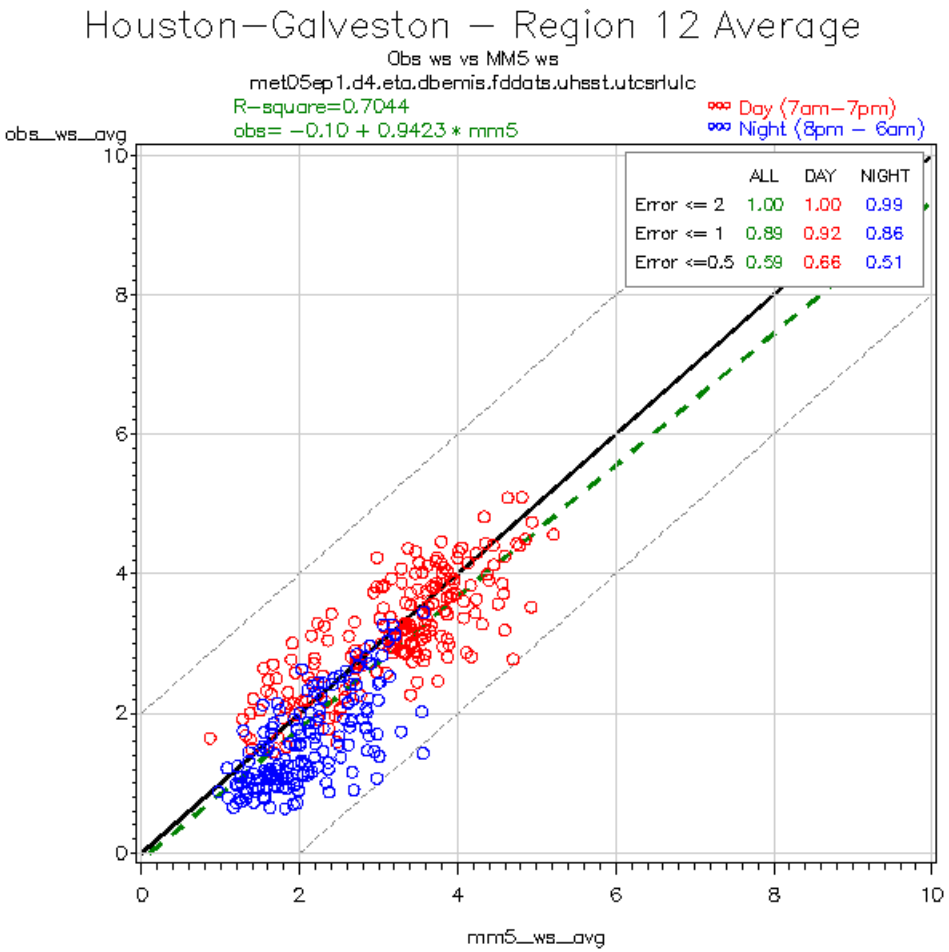
Wind Speed Scatter Plots: Average All Sites



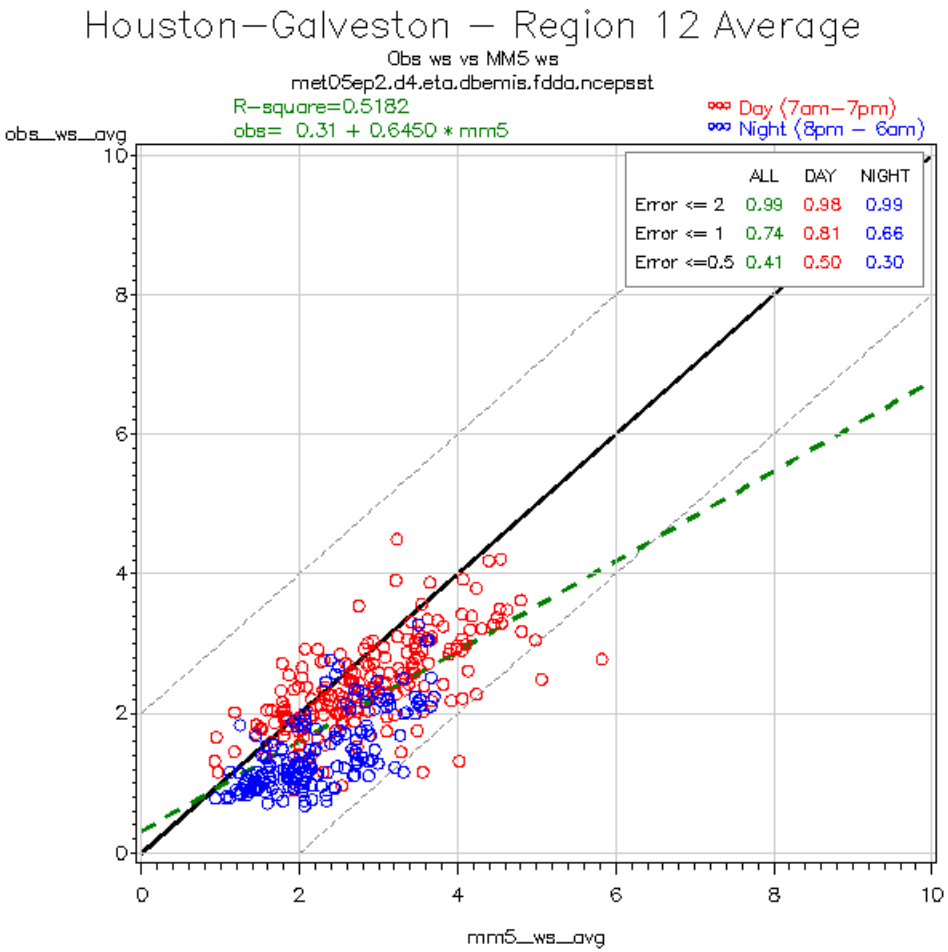


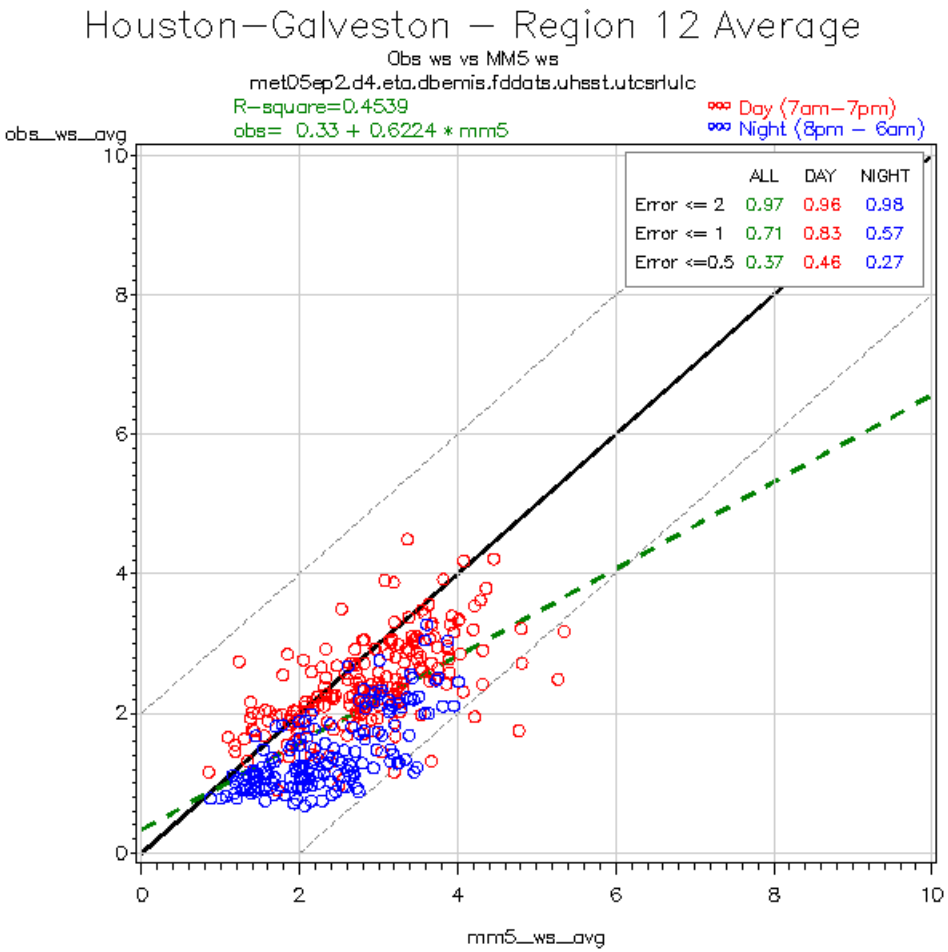
Wind Speed Scatter Plots: Average All Sites



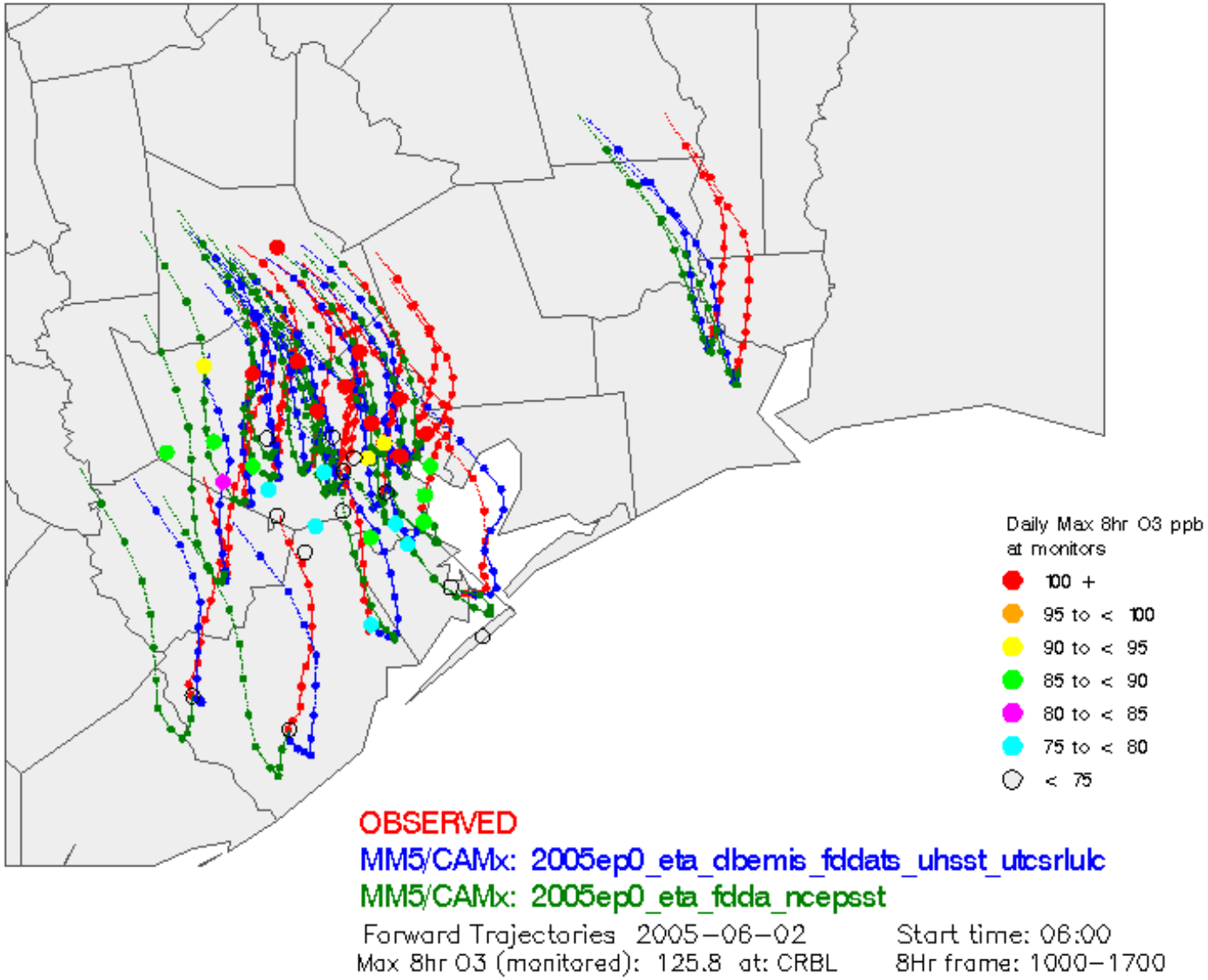


Wind Speed Scatter Plots: Average All Sites

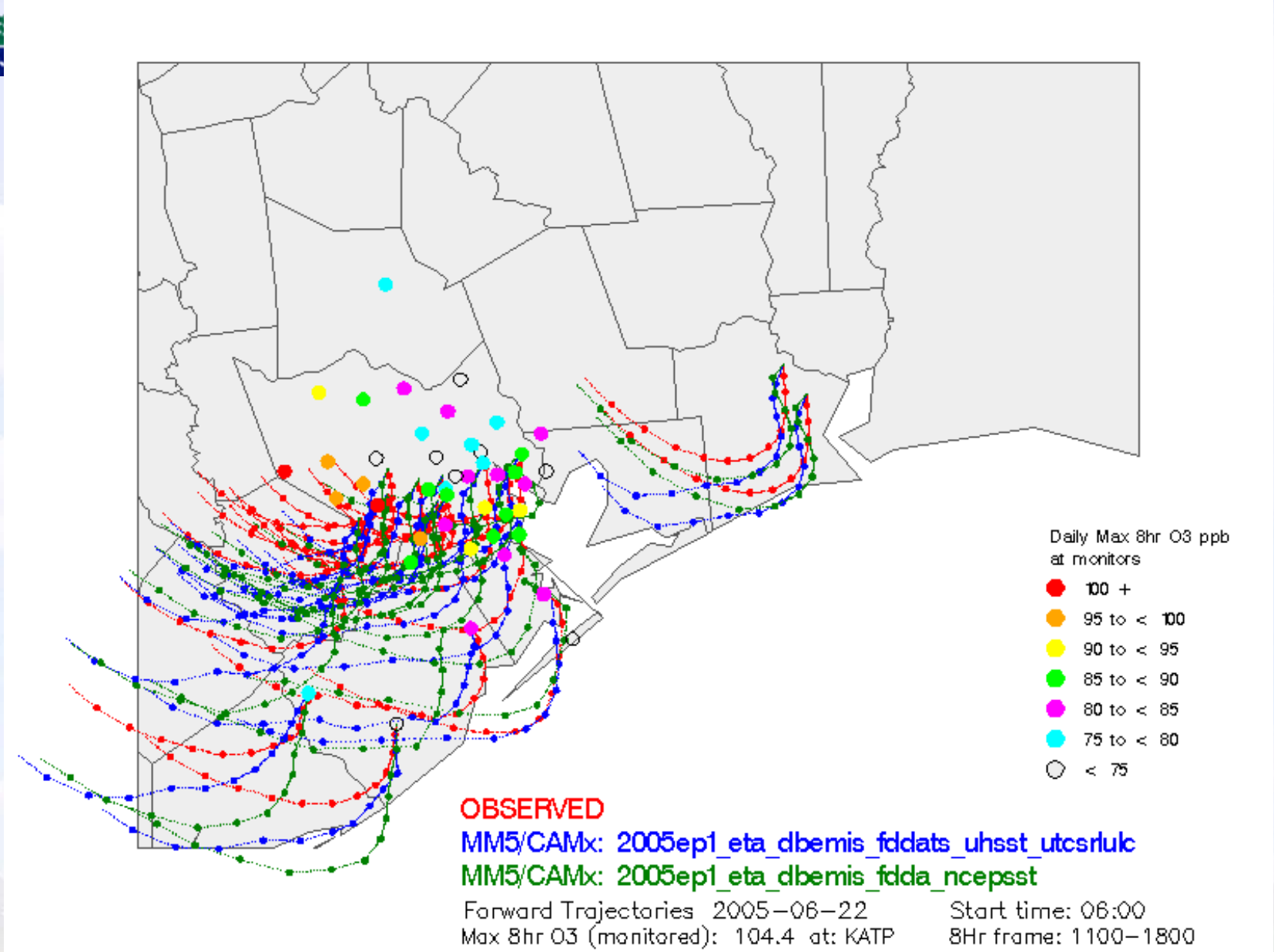




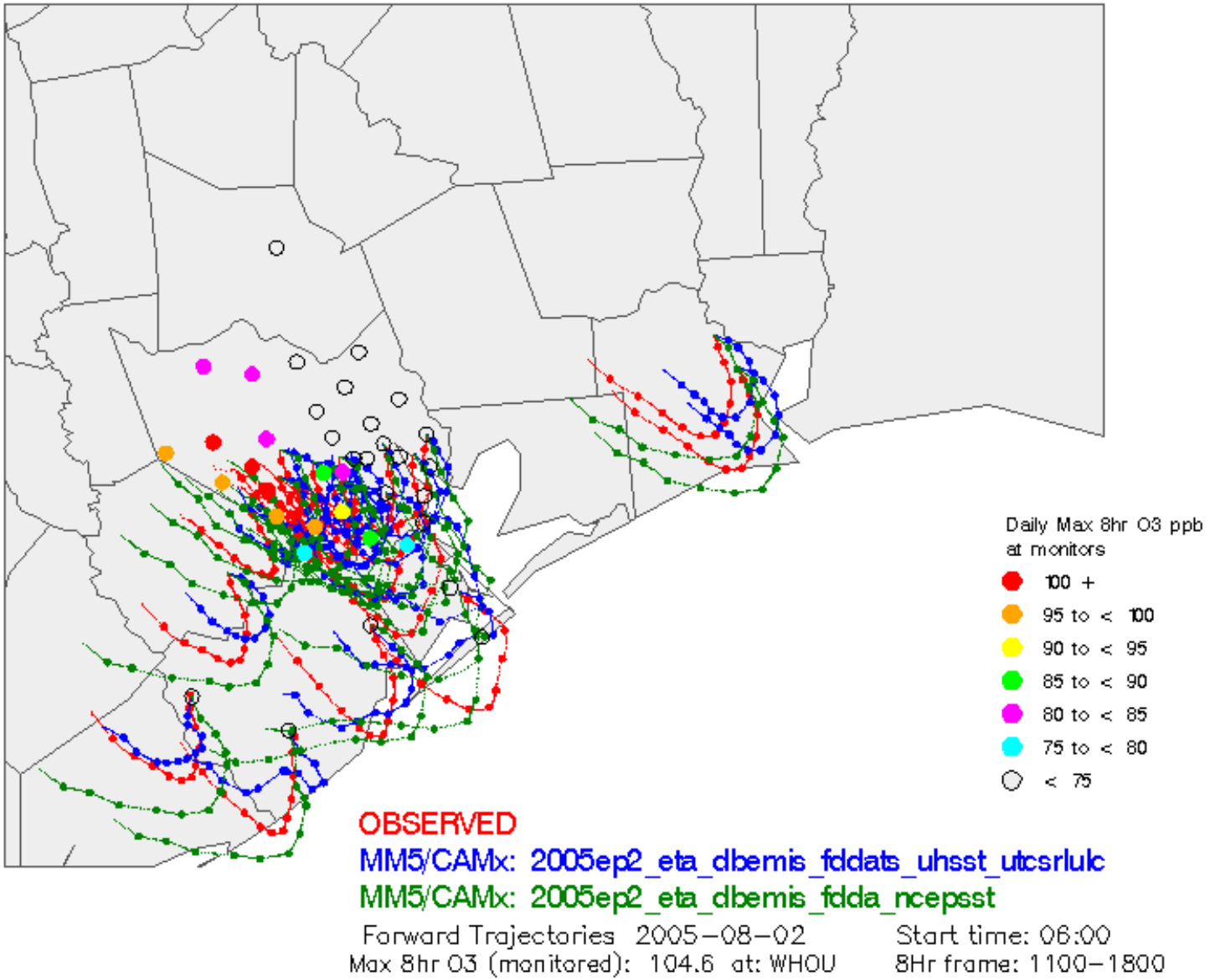
Plume Plot Trajectories



Plume Plot Trajectories



Plume Plot Trajectories



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

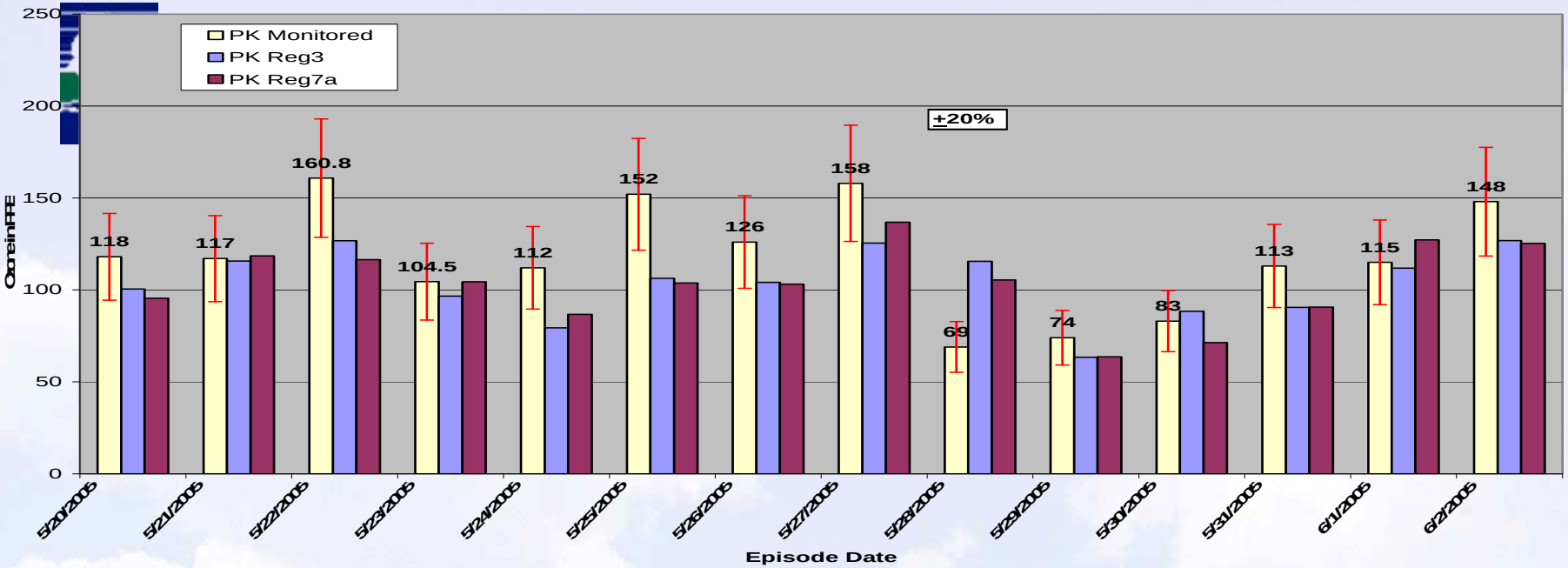
Statistical Performance Evaluation

Monitored vs modeled peak ozone concentrations

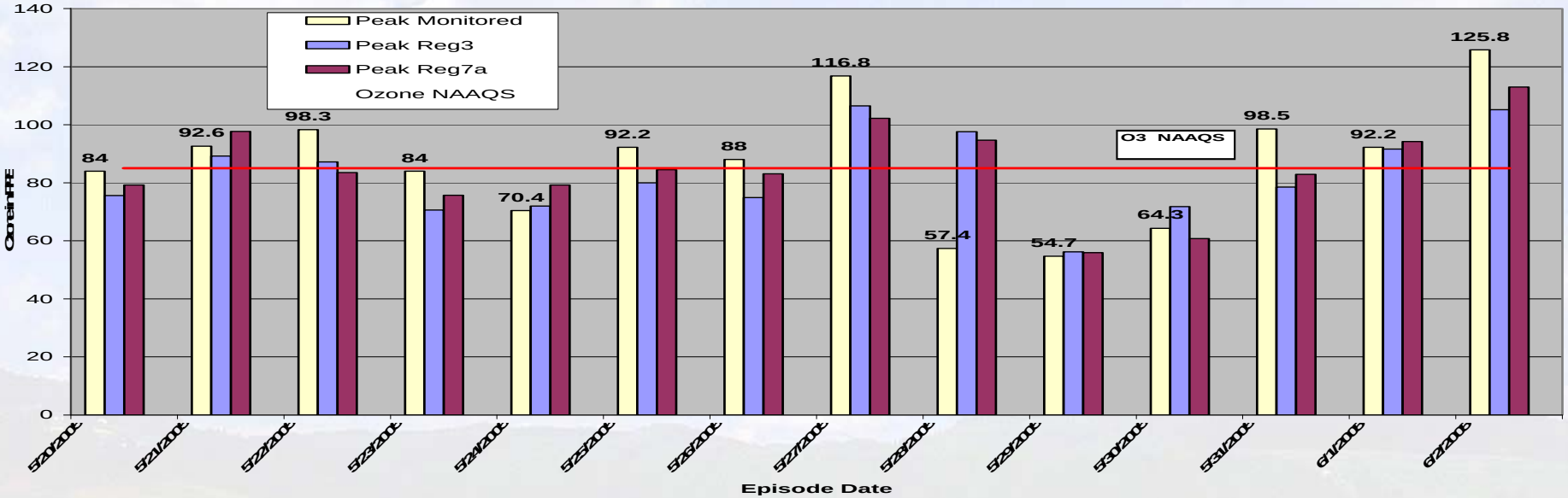
Relative Bias: Regular7a vs Regular3 ozone concentration

Relative Error: Regular7a vs Regular3 ozone concentration

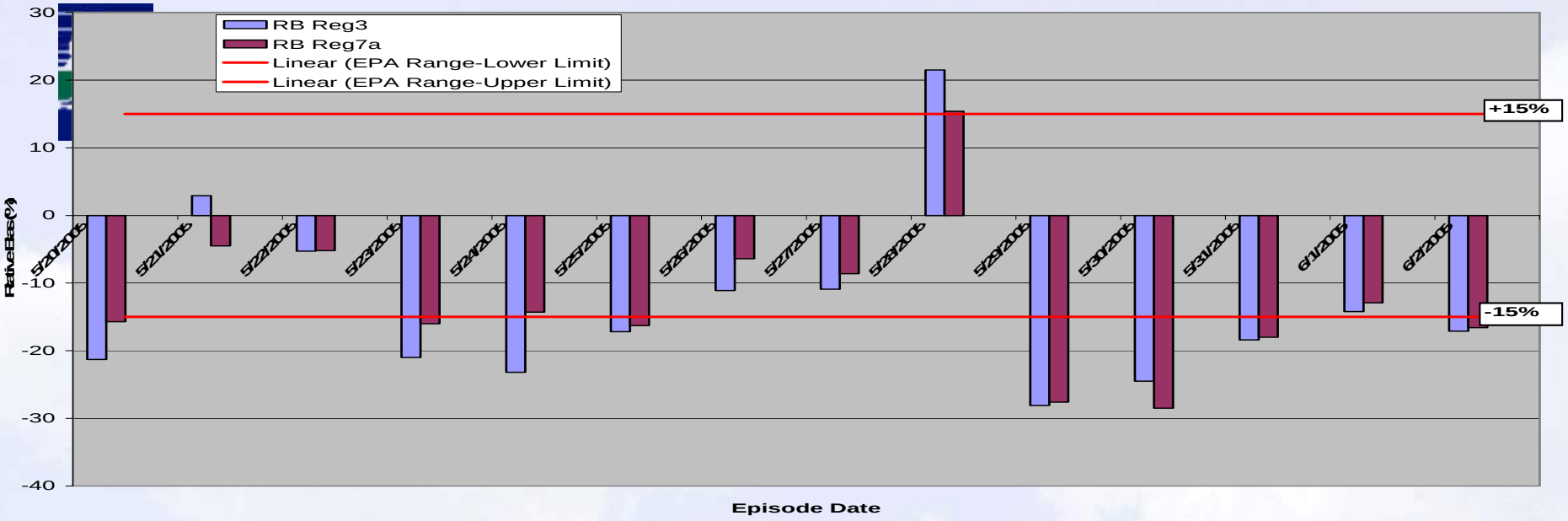
Episode0: Monitored vs Modeled Peak Hourly Ozone Concentration



Episode0: Monitored vs Modeled 8-Hour Ozone Concentration



Episode0: Relative Bias of Modeled Hourly Ozone Concentration



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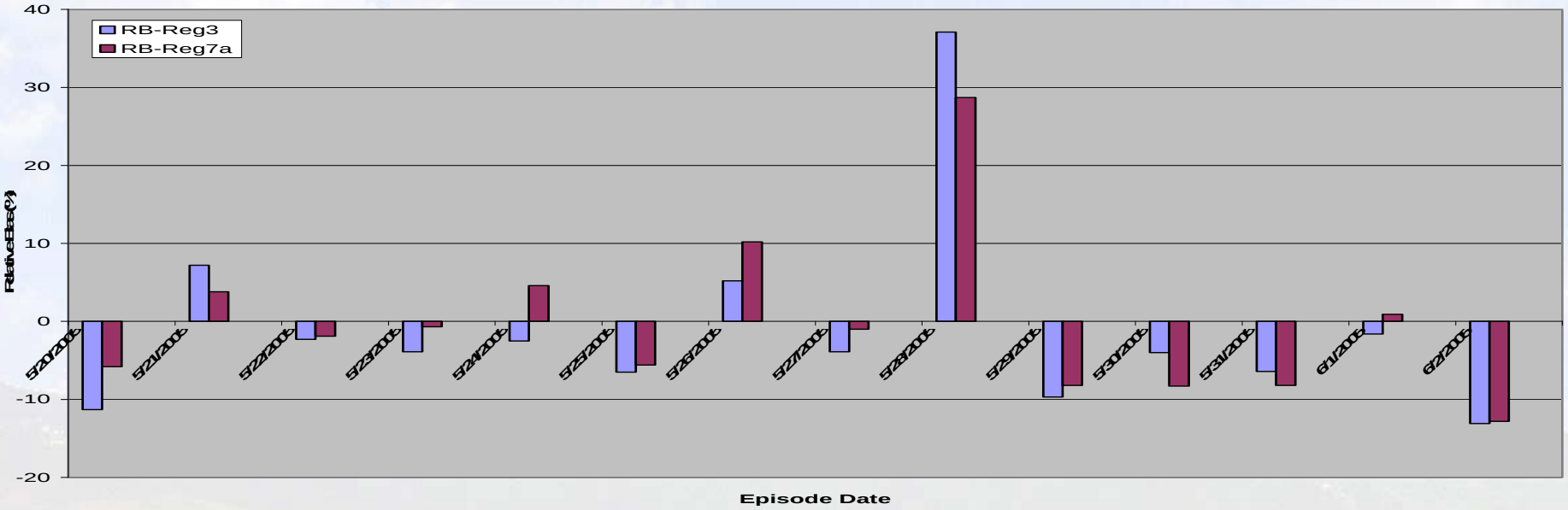
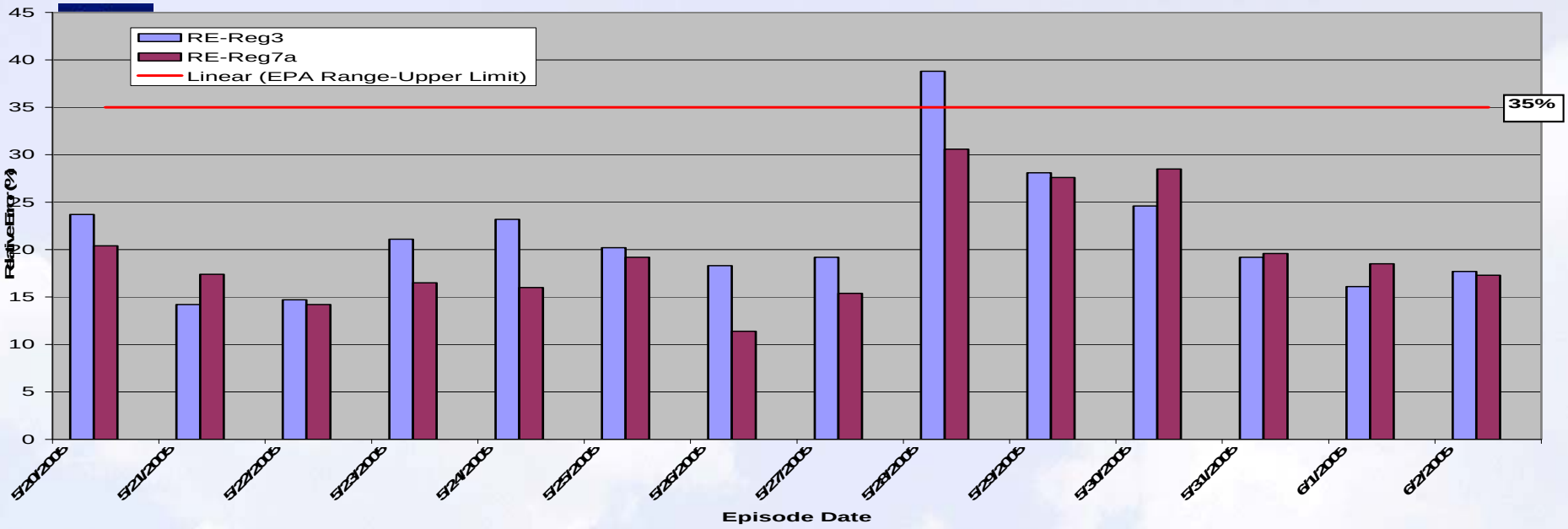


Episode0: Relative Error of Modeled Hourly Ozone Concentration



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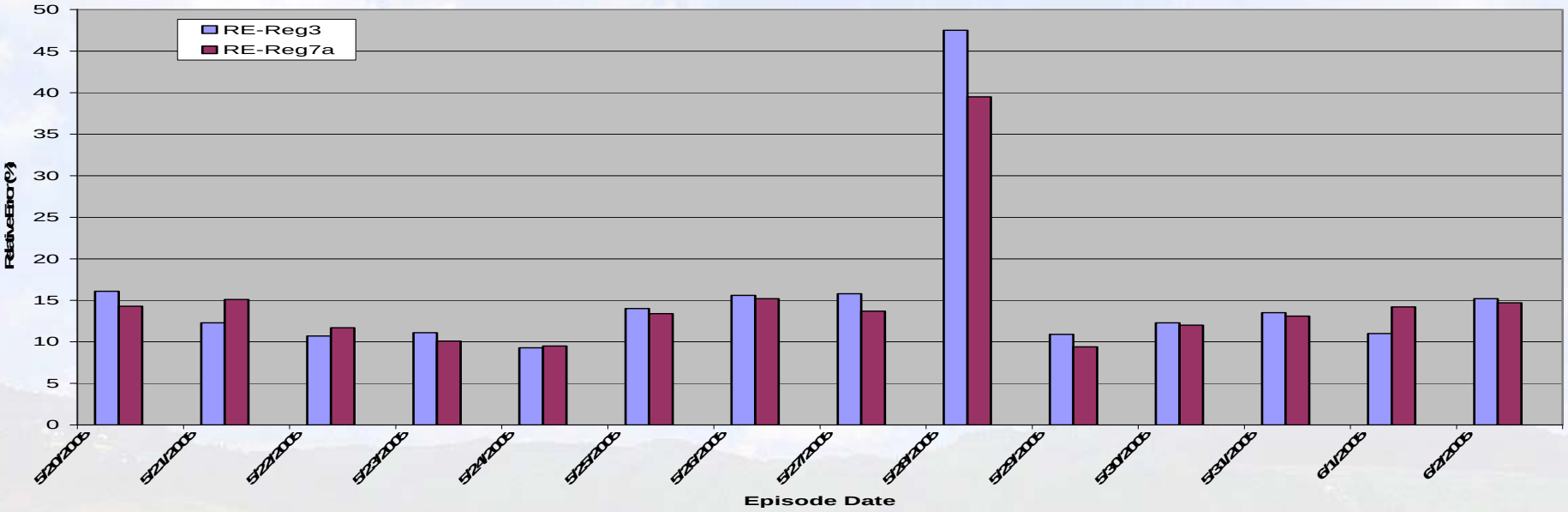
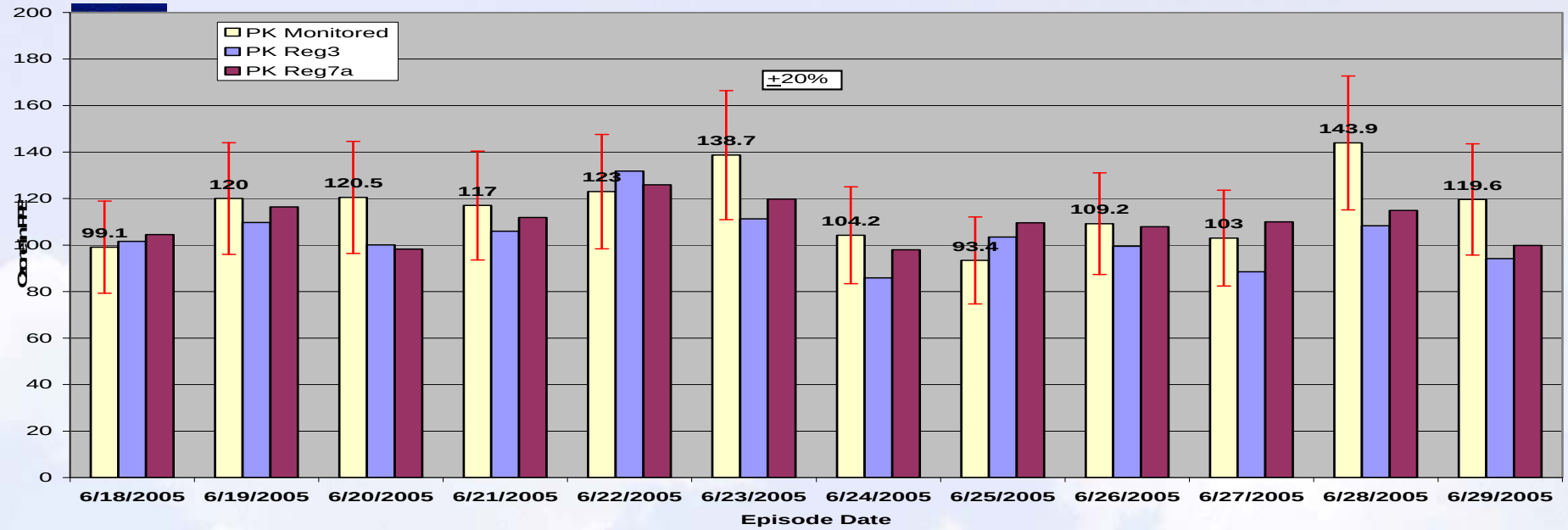
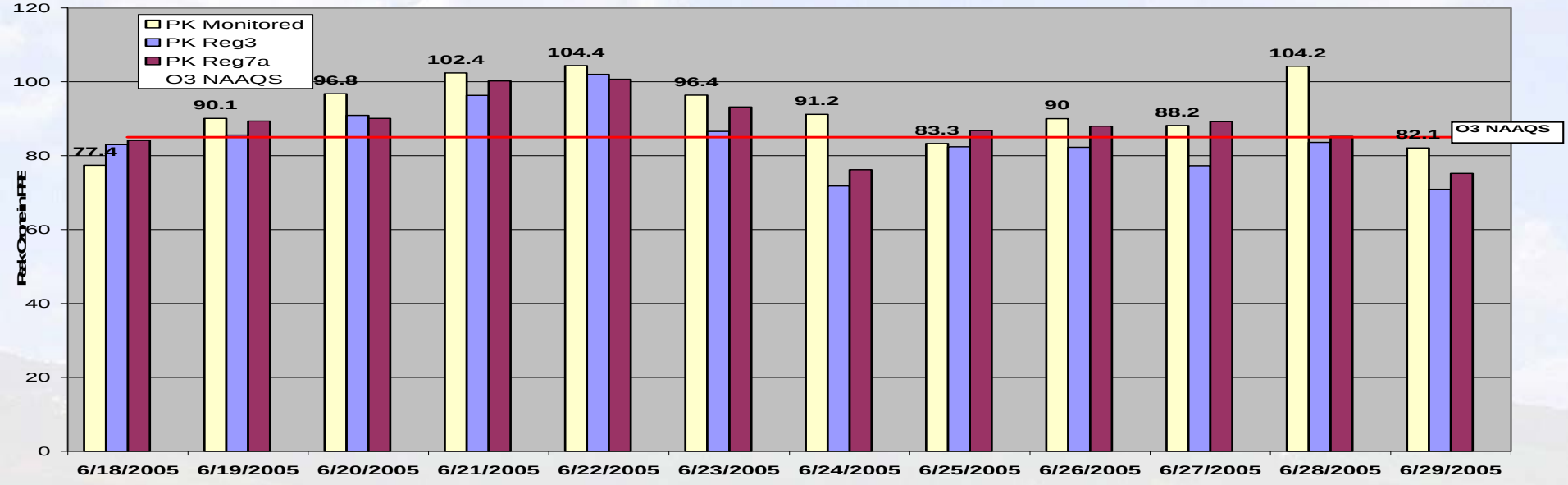


Episode1: Monitored vs Modeled Peak Hourly Ozone Concentration



Episode1: Peak Monitored vs Modeled 8-Hour Ozone Concentration



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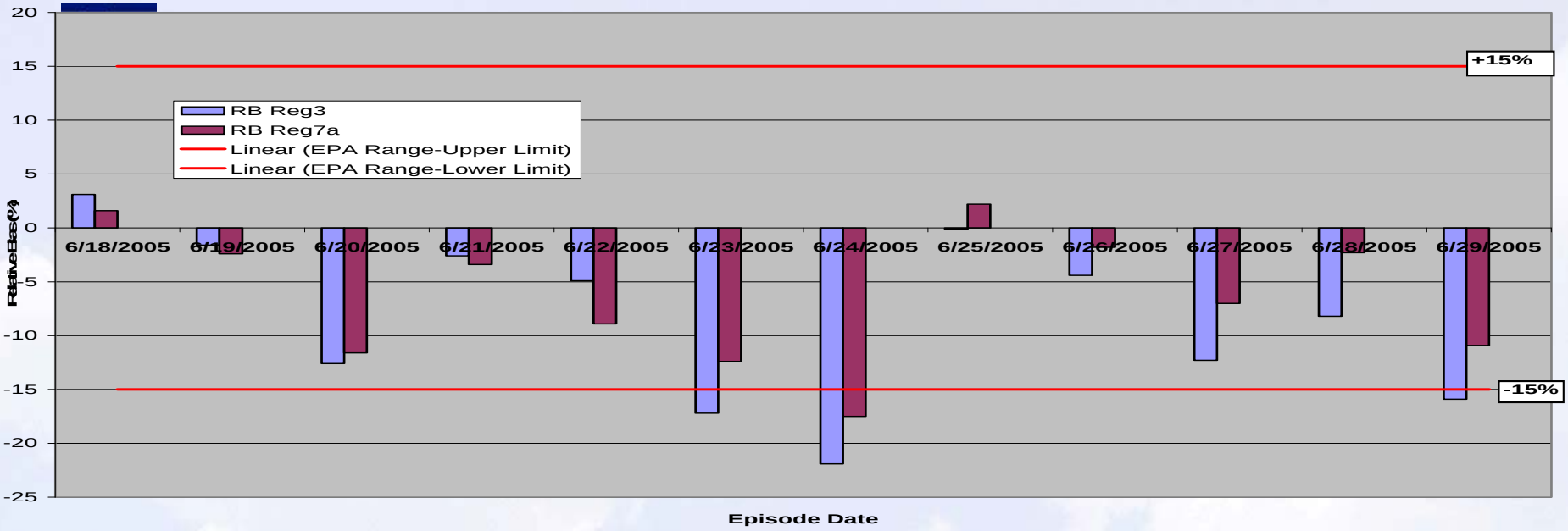
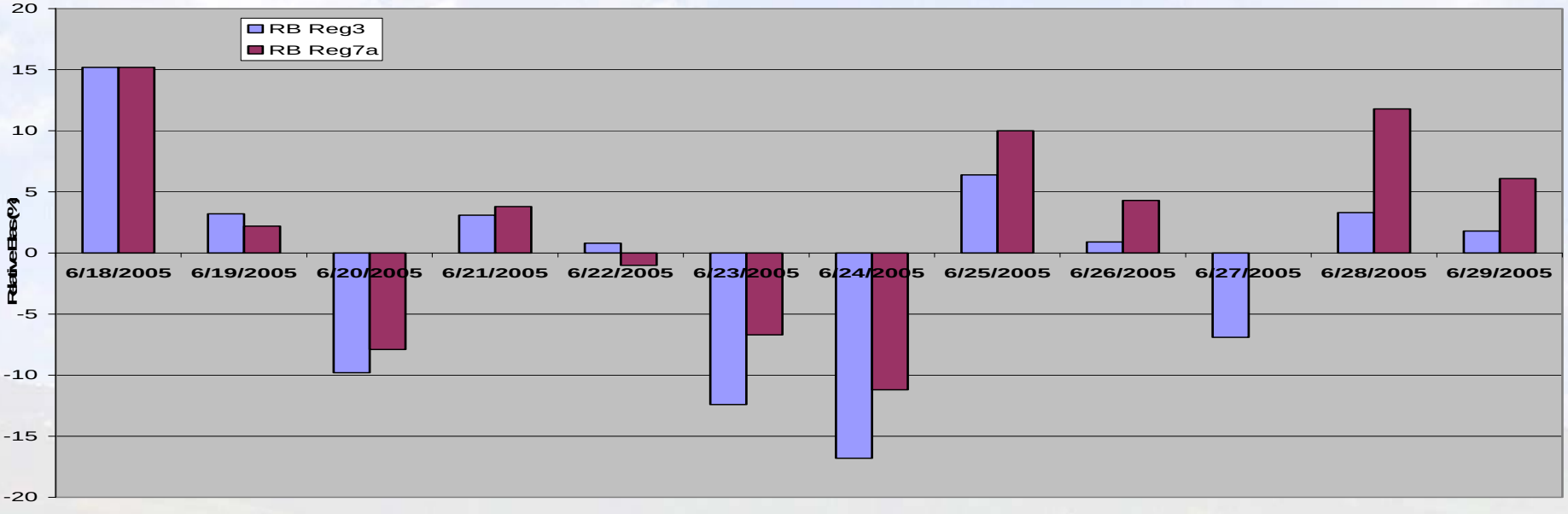
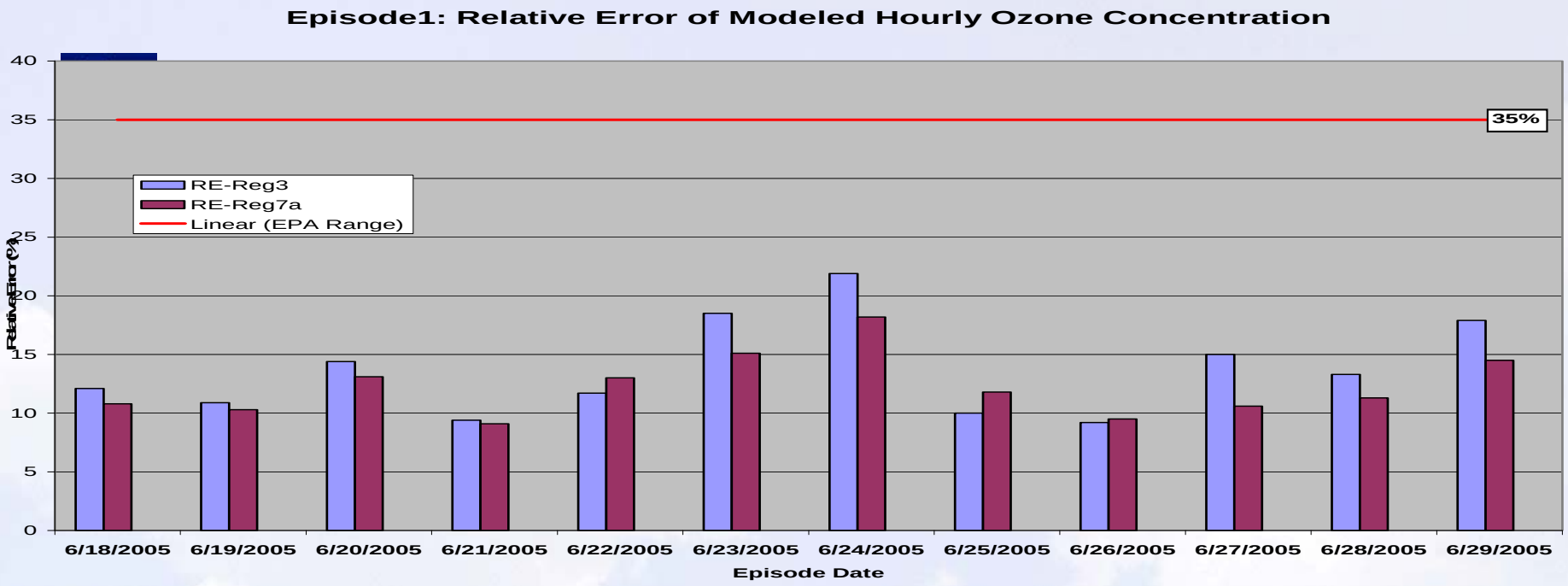
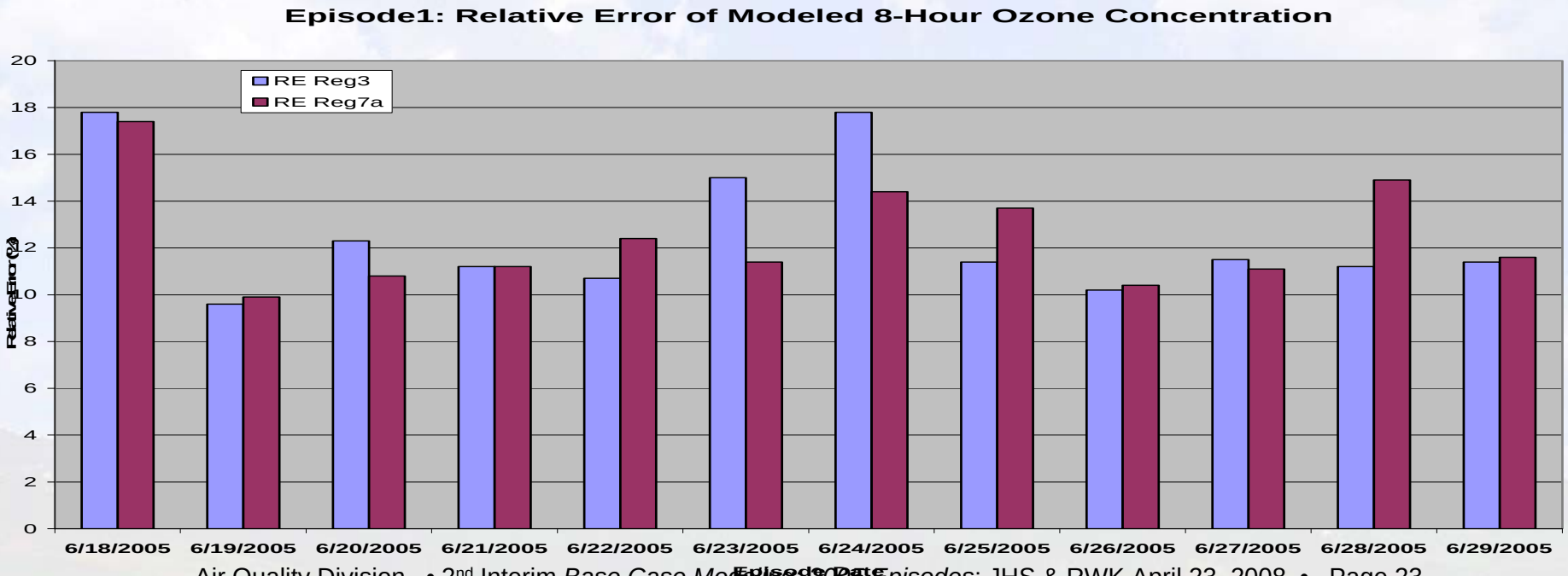


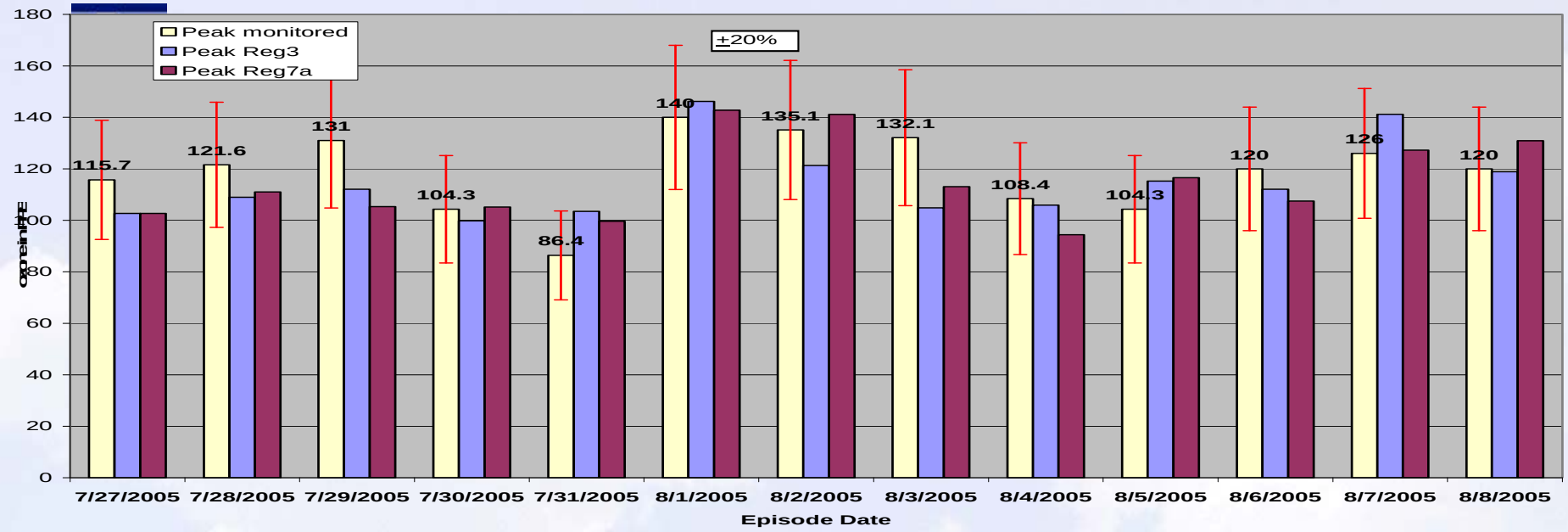
Episode1: Relative Bias of Modeled 8-Hour Ozone Concentration



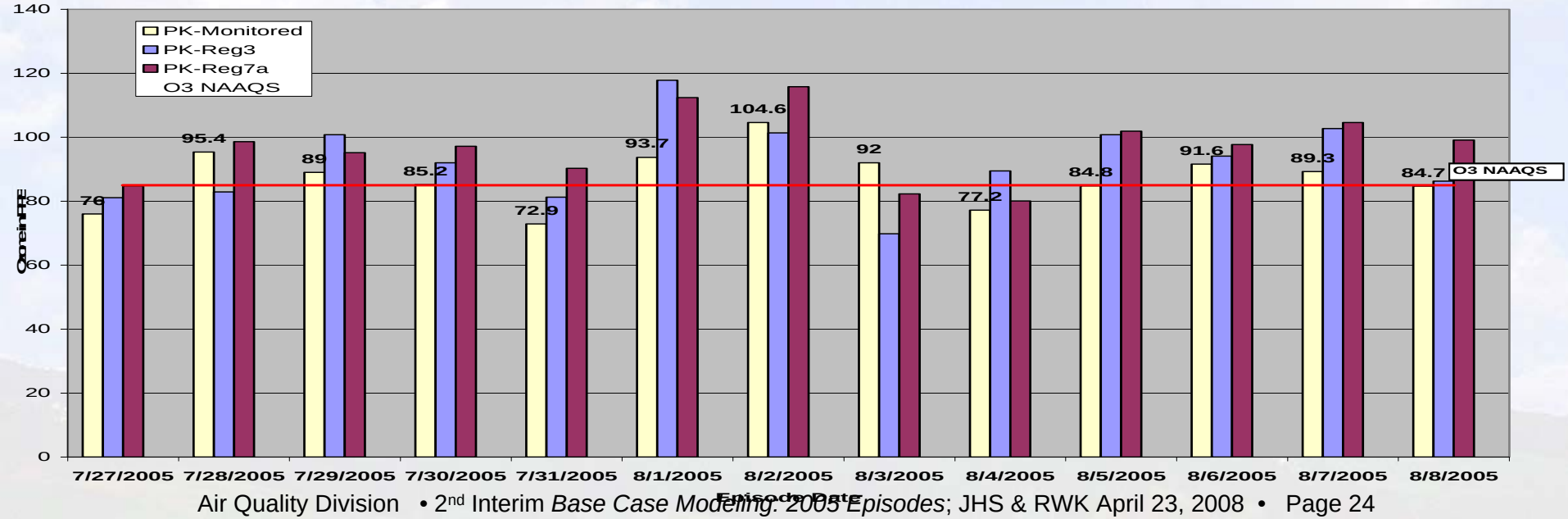

Episode1: Relative Error of Modeled Hourly Ozone Concentration
40
35
30
25
20
15
10
5
0
35%
RE-Reg3
RE-Reg7a
Linear (EPA Range)
6/18/2005
6/19/2005
6/20/2005
6/21/2005
6/22/2005
6/23/2005
6/24/2005
6/25/2005
6/26/2005
6/27/2005
6/28/2005
6/29/2005
Episode Date


Episode1: Relative Error of Modeled 8-Hour Ozone Concentration
20
18
16
14
12
10
8
6
4
2
0
RE Reg3
RE Reg7a
6/18/2005
6/19/2005
6/20/2005
6/21/2005
6/22/2005
6/23/2005
6/24/2005
6/25/2005
6/26/2005
6/27/2005
6/28/2005
6/29/2005
Episode Date

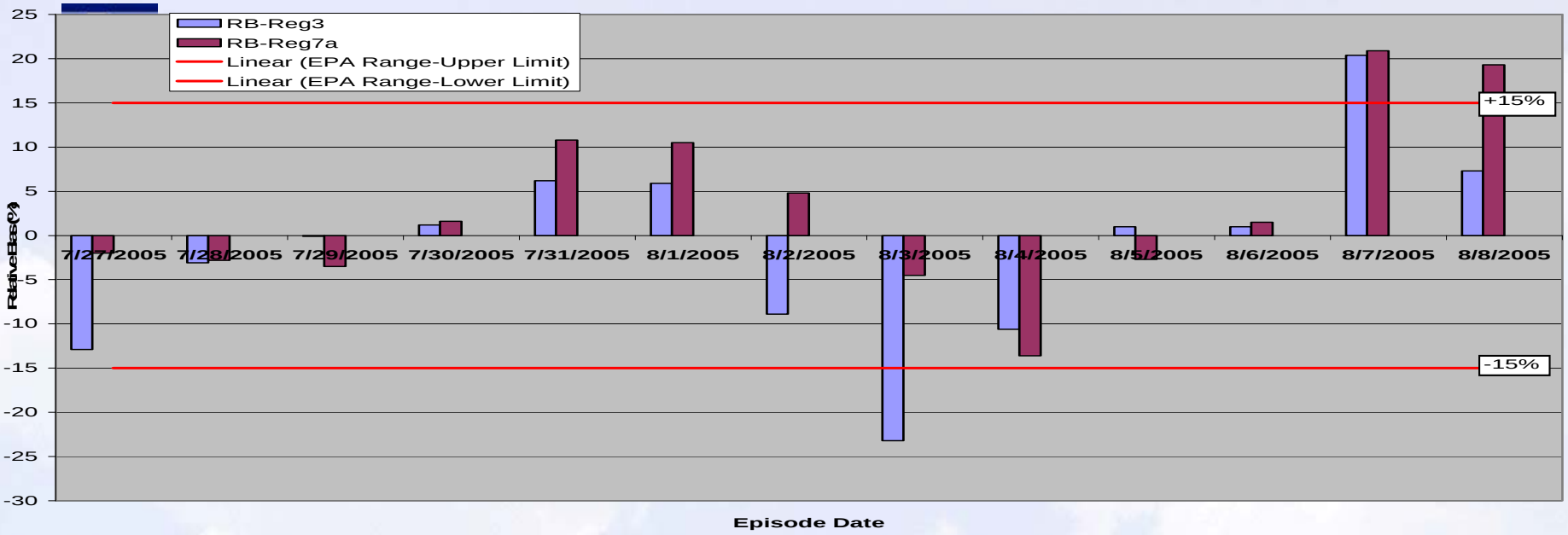
Episode2: Peak Monitored vs Peak Modeled Hourly Ozone Concentrations



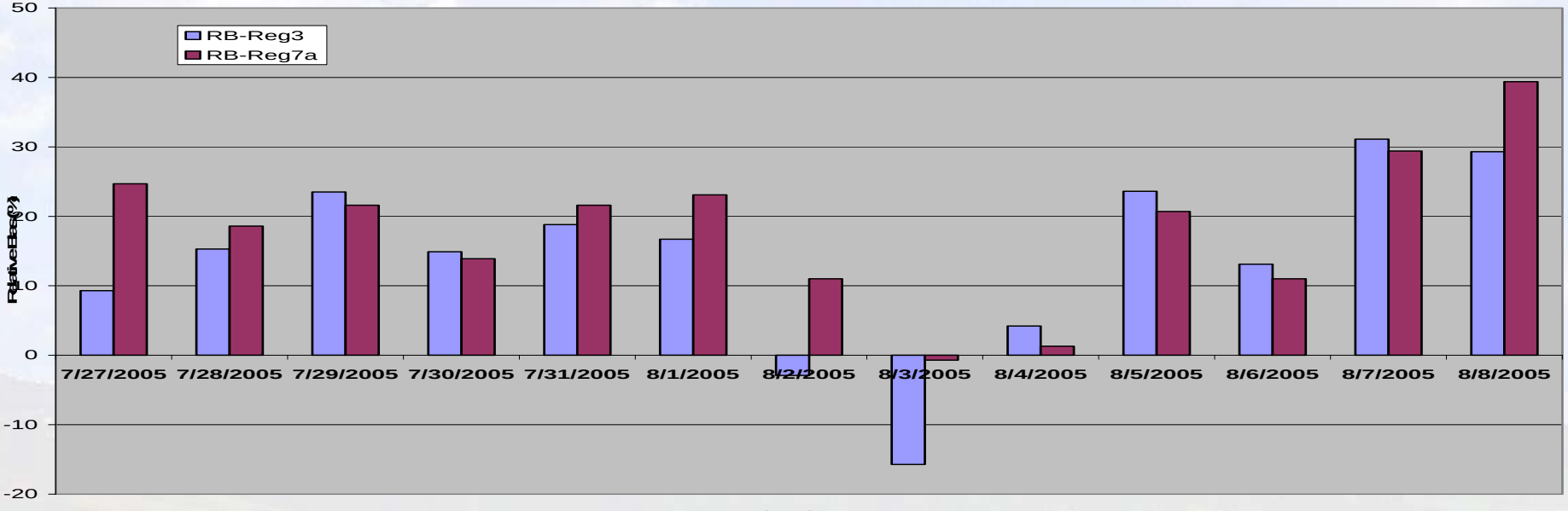
Episode2:Monitored vs Modeled Peak 8-Hour Ozone Concentration

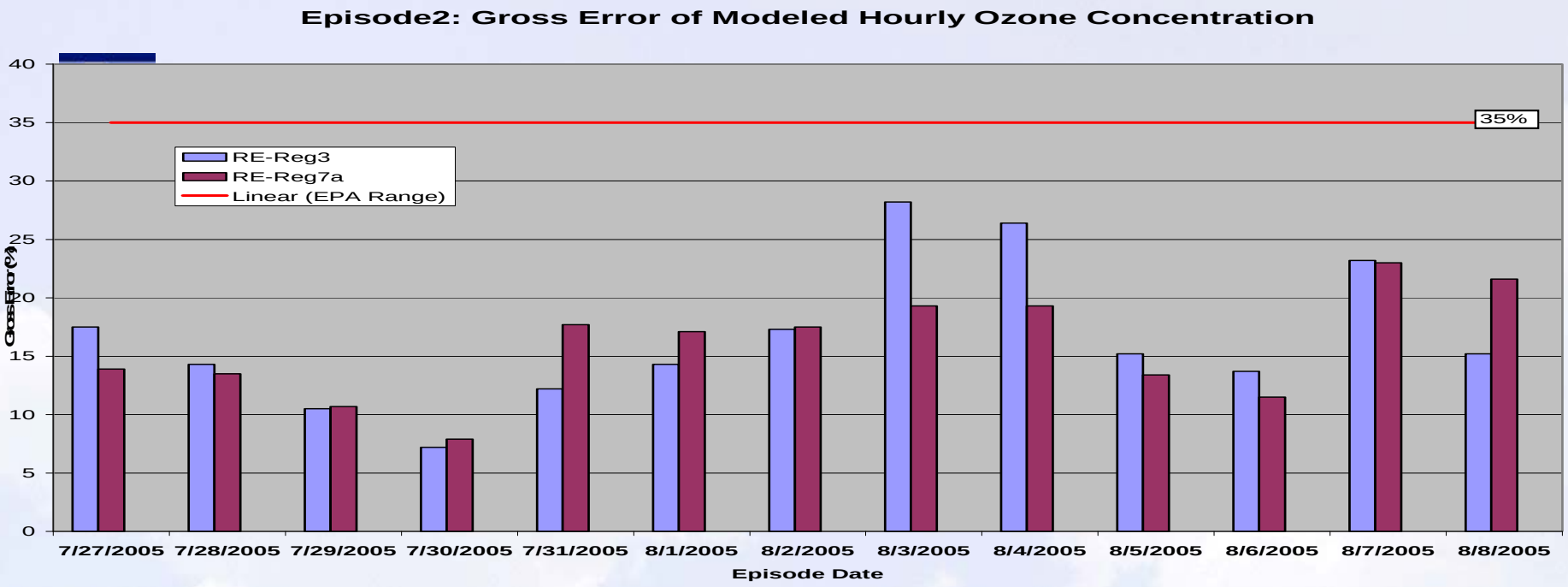


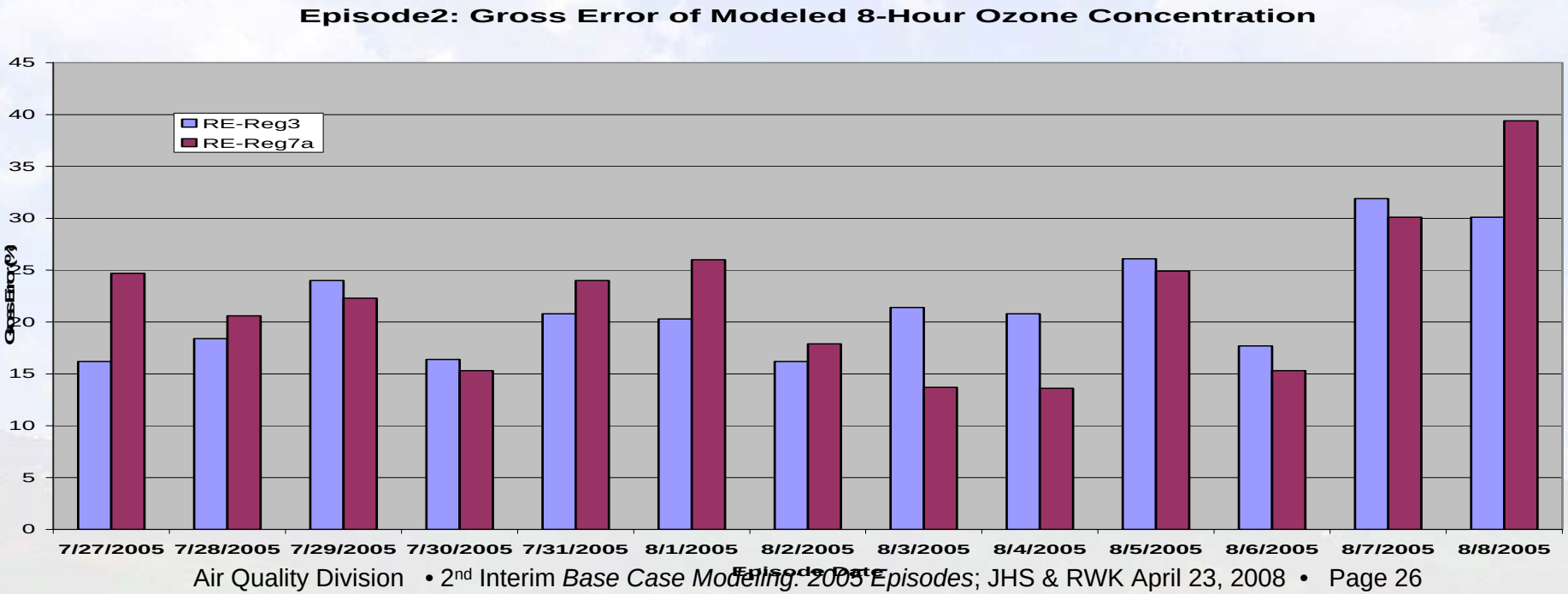
Episode2: Relative Bias Of Modeled Ozone Concentration



Episode2: Relative Bias of Modeled 8-Hour Ozone Concentration



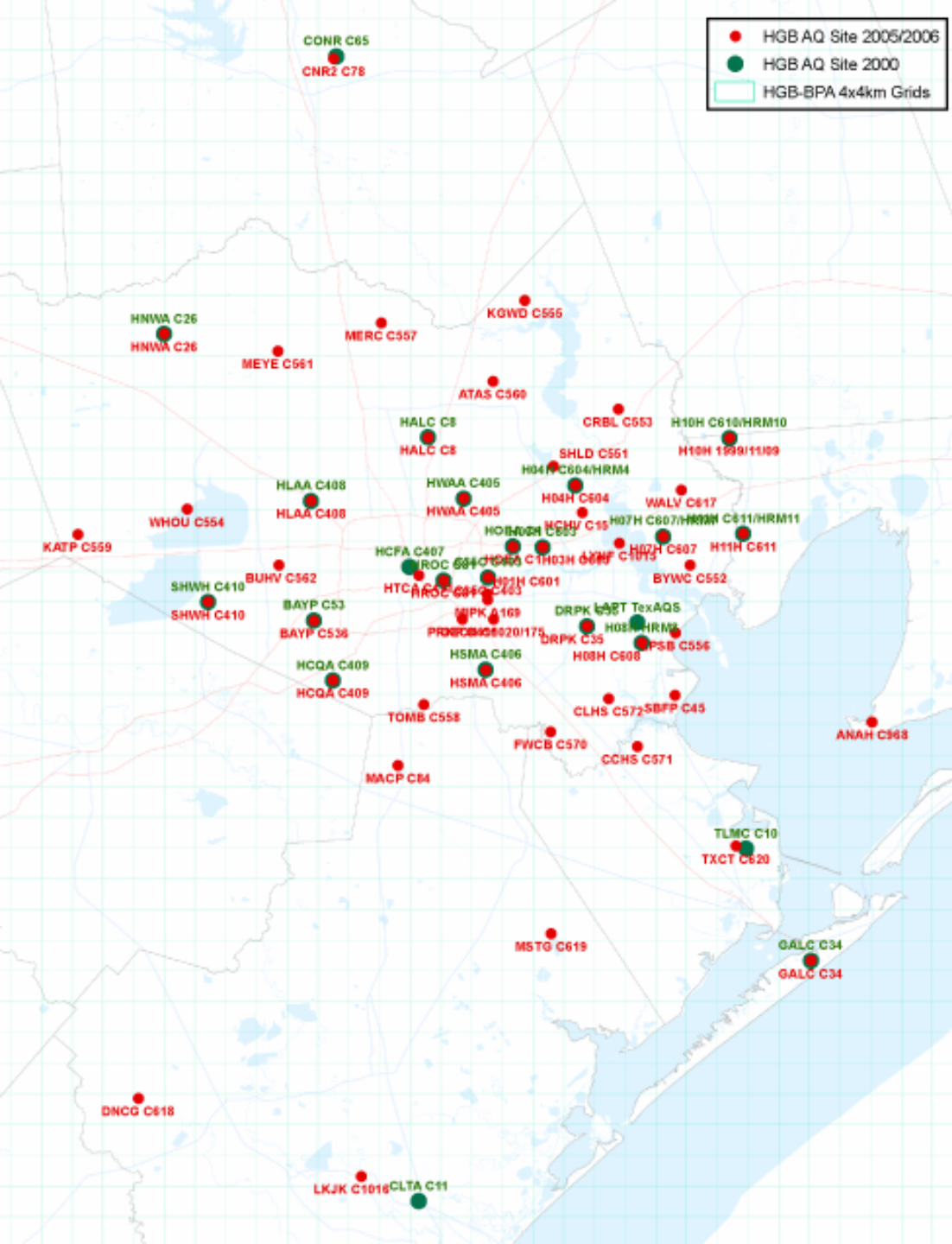

Episode2: Gross Error of Modeled Hourly Ozone Concentration
RE-Reg3
RE-Reg7a
Linear (EPA Range)
35%
Gross Error (%)
0
5
10
15
20
25
30
35
40
7/27/2005
7/28/2005
7/29/2005
7/30/2005
7/31/2005
8/1/2005
8/2/2005
8/3/2005
8/4/2005
8/5/2005
8/6/2005
8/7/2005
8/8/2005
Episode Date


Episode2: Gross Error of Modeled 8-Hour Ozone Concentration
RE-Reg3
RE-Reg7a
Gross Error (%)
0
5
10
15
20
25
30
35
40
45
7/27/2005
7/28/2005
7/29/2005
7/30/2005
7/31/2005
8/1/2005
8/2/2005
8/3/2005
8/4/2005
8/5/2005
8/6/2005
8/7/2005
8/8/2005
Episode Date

Graphical Performance Evaluation: Time Series

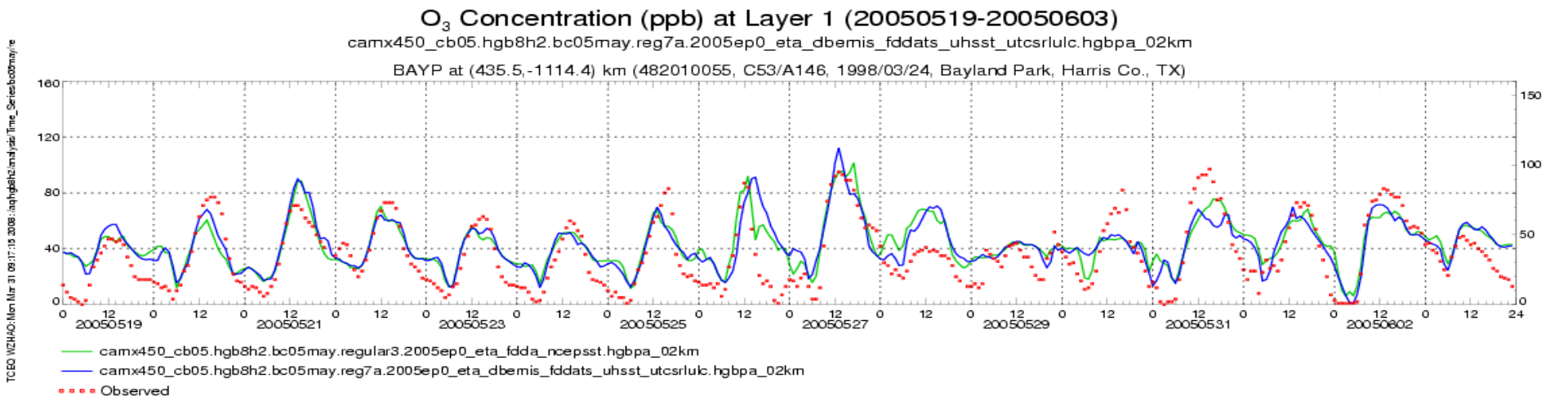
Time series of measured vs modeled 1-hour ozone and ozone precursors at selected sites

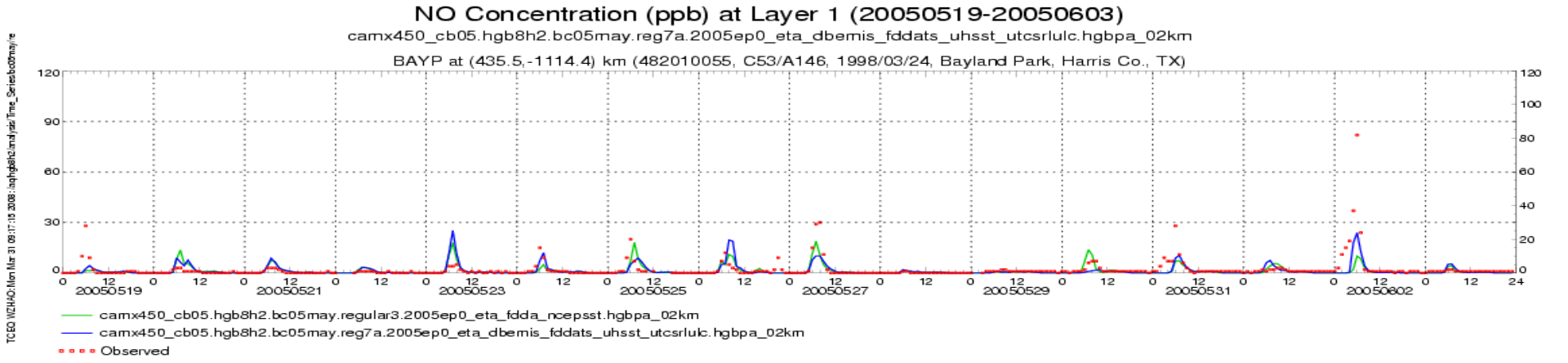
- BAYP – Bayland Park
- HNWA – Houston Northwest
- H03H – HRM3
- DRPK – Deer Park

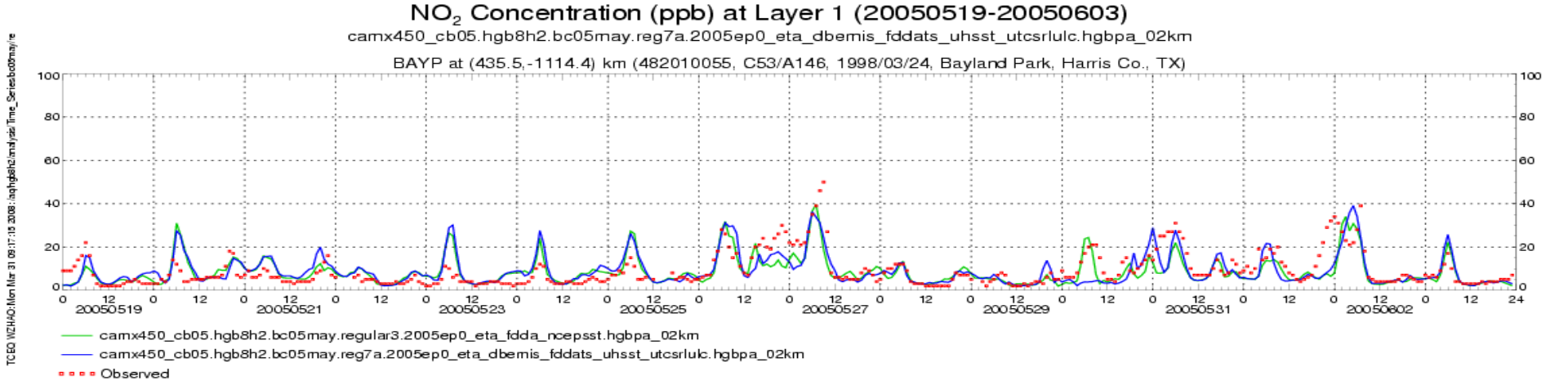


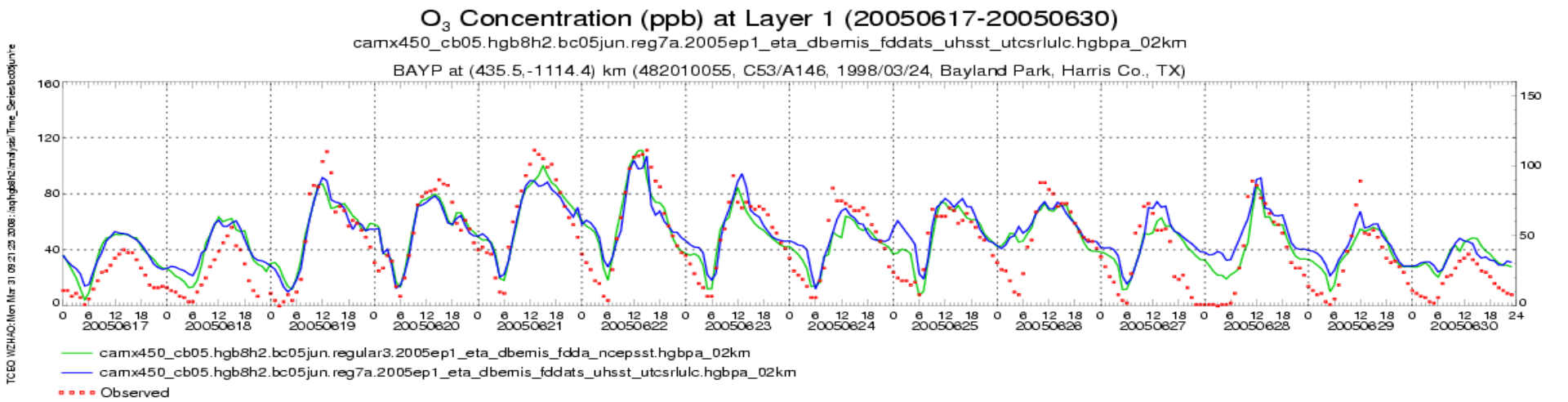
Monitor Site Codes and Locations

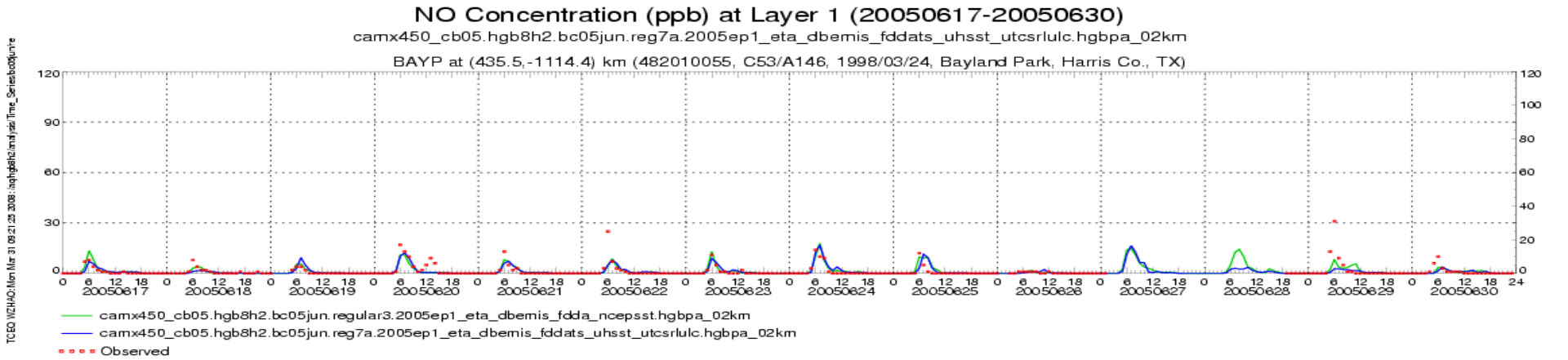
Site Code	Site Location
BAYP	Bayland Park, Harris Co., TX
C35C	Clinton, Harris Co., TX
CNR2	Conroe Relocated, Montgomery Co., TX
DRPK	Deer Park, Harris Co., TX
GALC	Galveston, Galveston Co., TX
H03H	HRM-3, Haden Road, Harris Co., TX
H08H	HRM Site 8, La Porte, Harris Co., TX
H10H	HRM-10, Mt Belvieu, Chambers 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

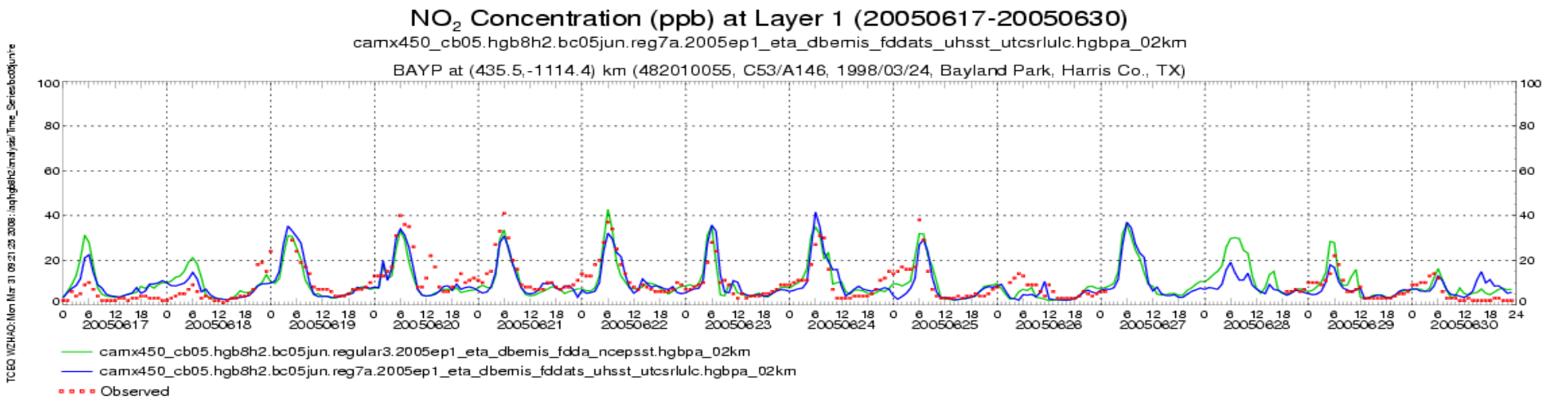

O_3 Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

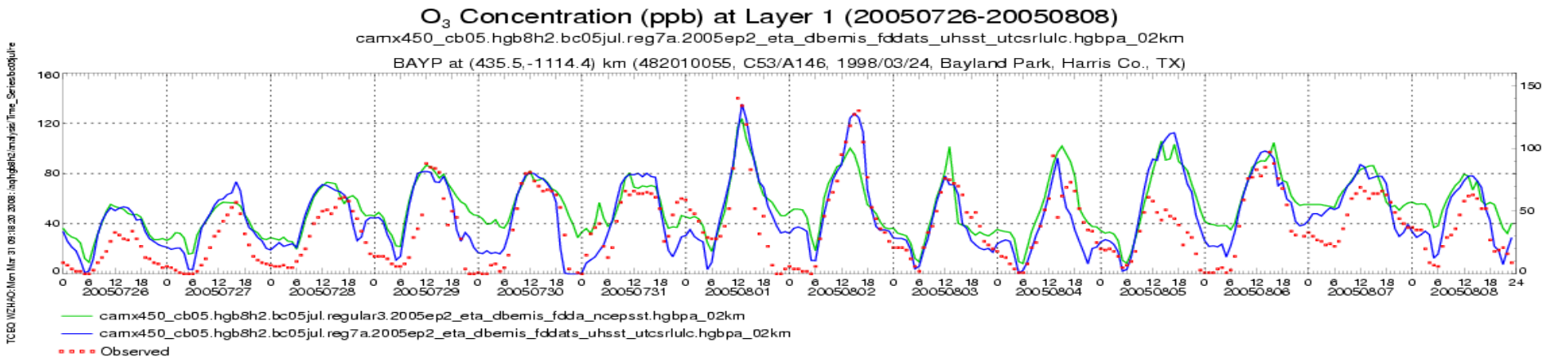

NO Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO_2 Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


O_3 Concentration (ppb) at Layer 1 (20050617-20050630)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jun.regular3.2005ep1_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO Concentration (ppb) at Layer 1 (20050617-20050630)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jun.regular3.2005ep1_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO_2 Concentration (ppb) at Layer 1 (20050617-20050630)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jun.regular3.2005ep1_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


O3 Concentration (ppb) at Layer 1 (20050726-20050808)
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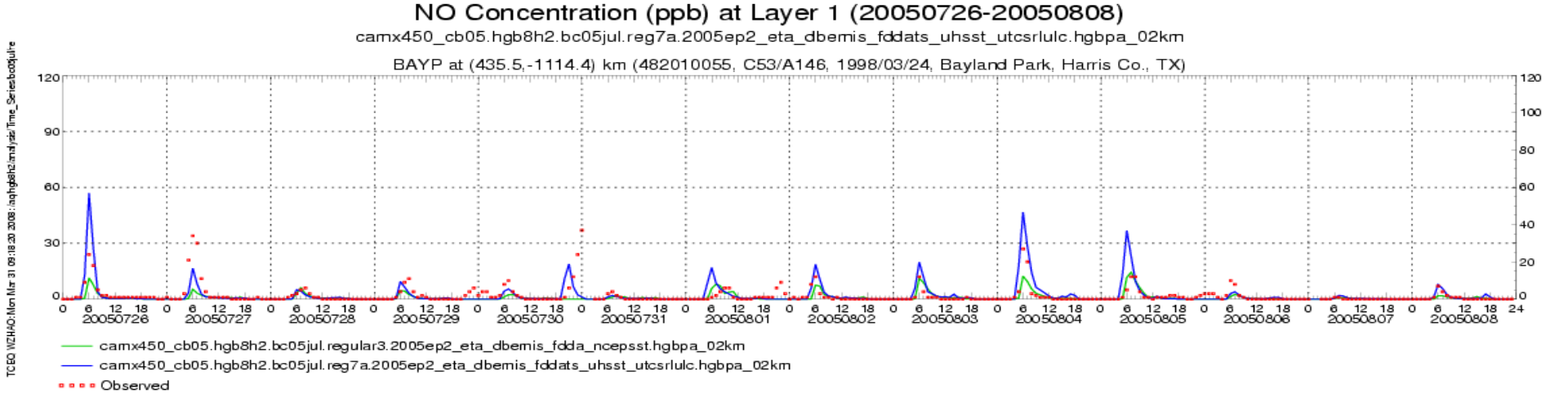
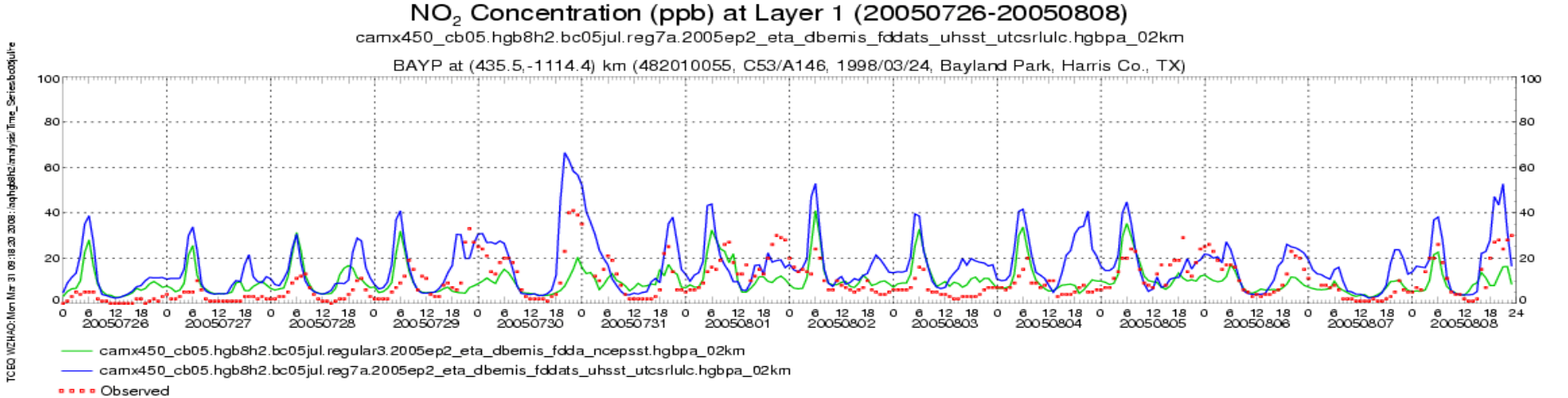
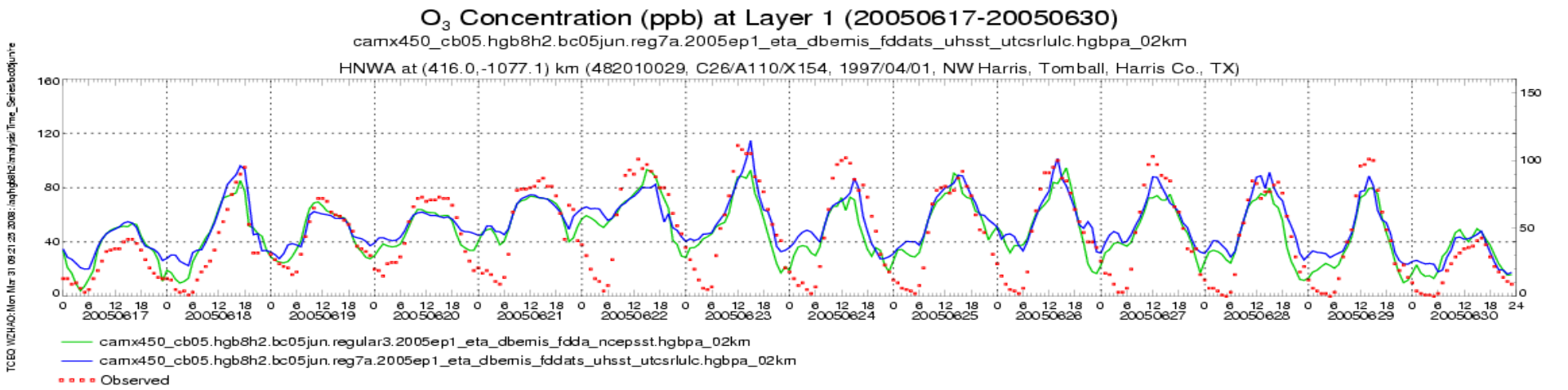
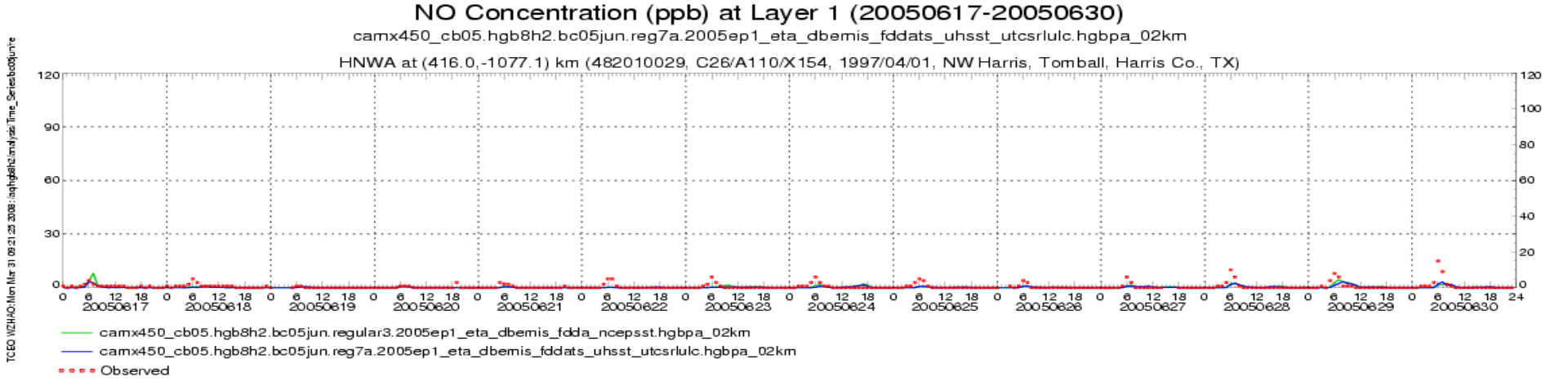
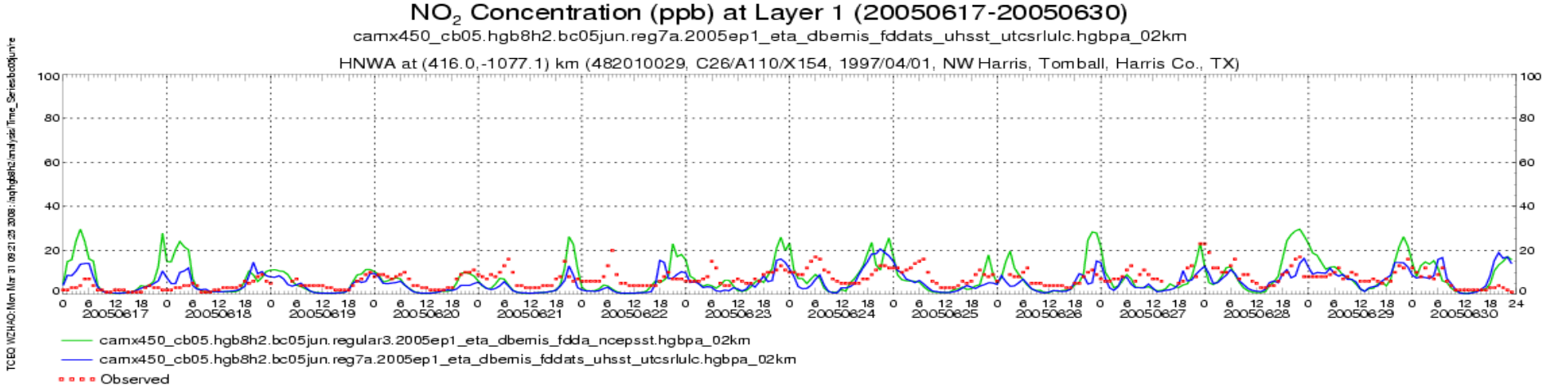
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

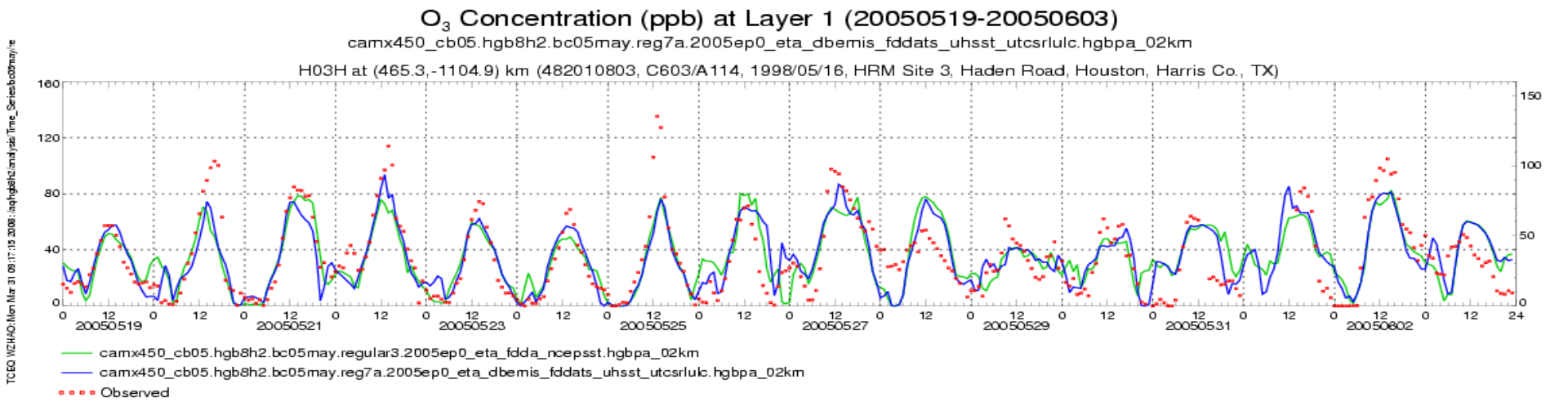

NO Concentration (ppb) at Layer 1 (20050726-20050808)
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

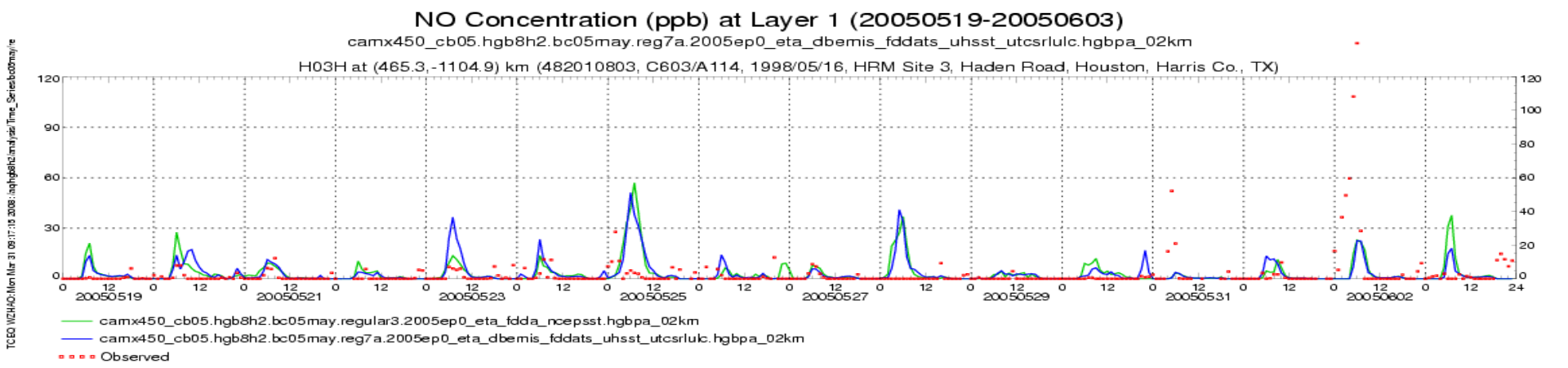

NO2 Concentration (ppb) at Layer 1 (20050726-20050808)
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
BAYP at (435.5,-1114.4) km (482010055, C53/A146, 1998/03/24, Bayland Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

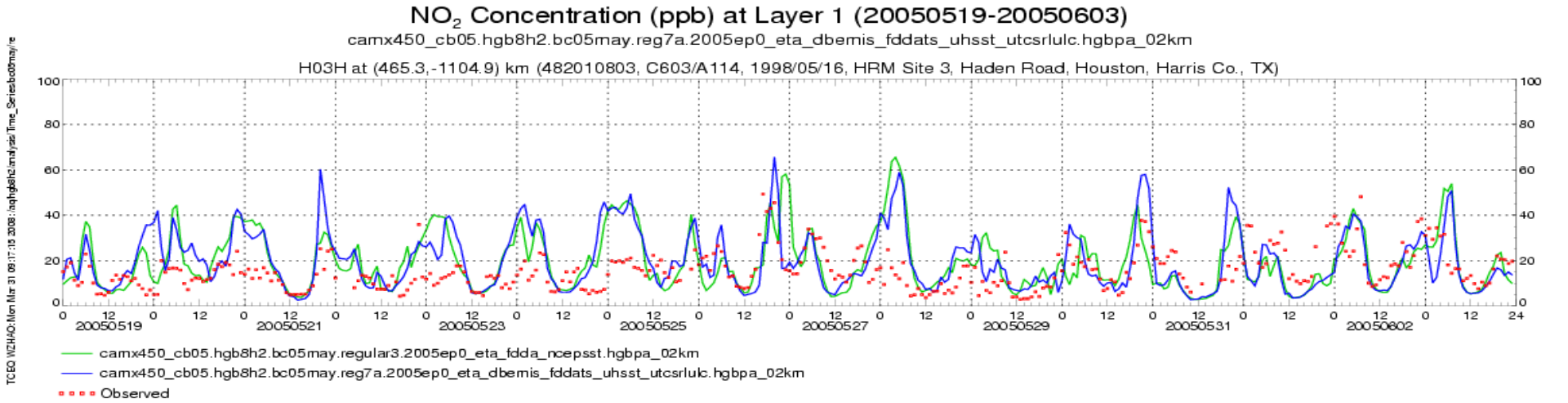

O3 Concentration (ppb) at Layer 1 (20050617-20050630)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
HNWA at (416.0,-1077.1) km (482010029, C26/A110/X154, 1997/04/01, NW Harris, Tomball, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jun.regular3.2005ep1_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

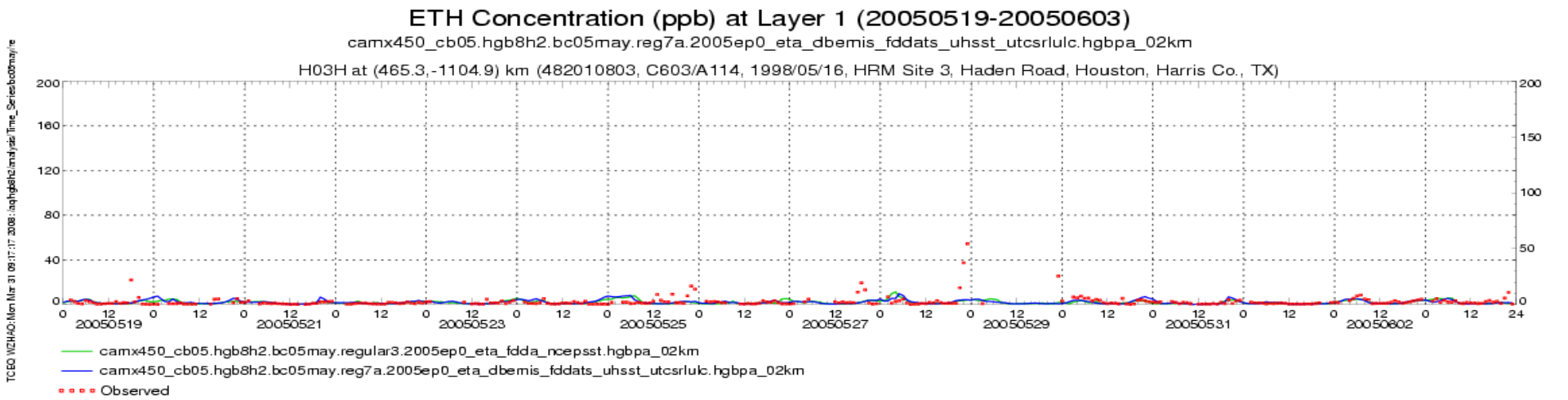

NO Concentration (ppb) at Layer 1 (20050617-20050630)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
HNWA at (416.0,-1077.1) km (482010029, C26/A110/X154, 1997/04/01, NW Harris, Tomball, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jun.regular3.2005ep1_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO2 Concentration (ppb) at Layer 1 (20050617-20050630)
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
HNWA at (416.0,-1077.1) km (482010029, C26/A110/X154, 1997/04/01, NW Harris, Tomball, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jun.regular3.2005ep1_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jun.reg7a.2005ep1_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


O_3 Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO_2 Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


ETH Concentration (ppb) at Layer 1 (20050519-20050603)
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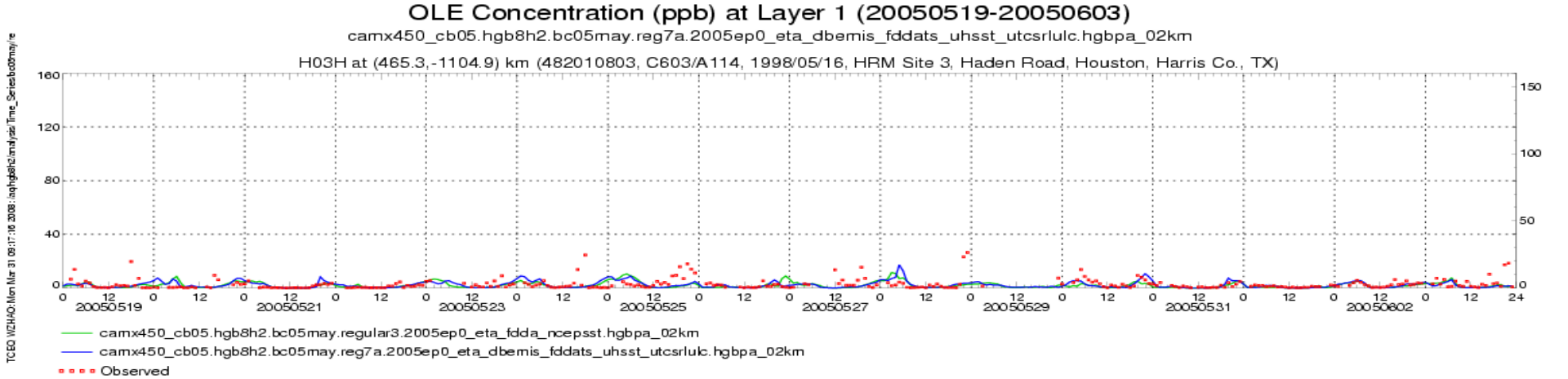
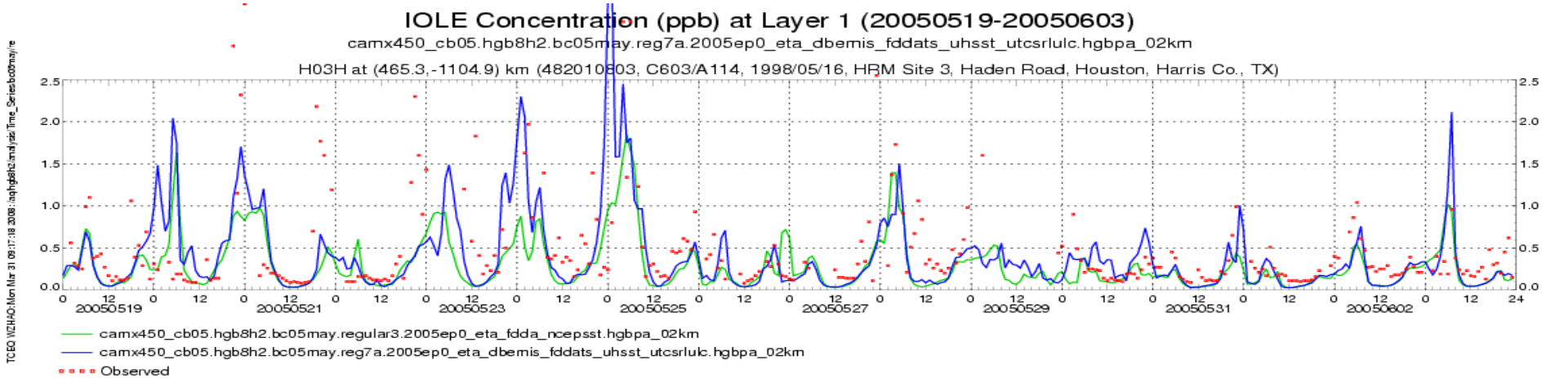
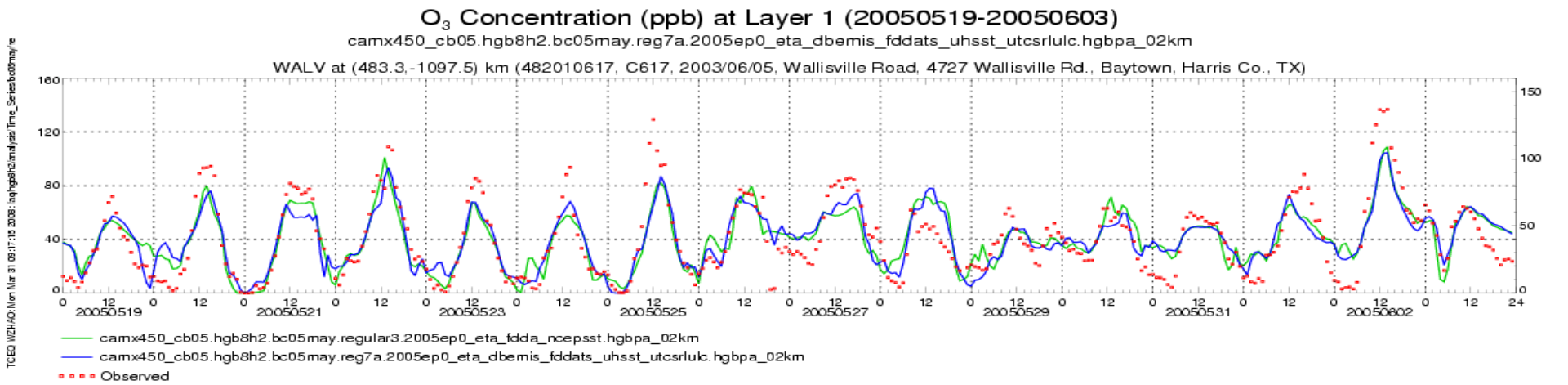
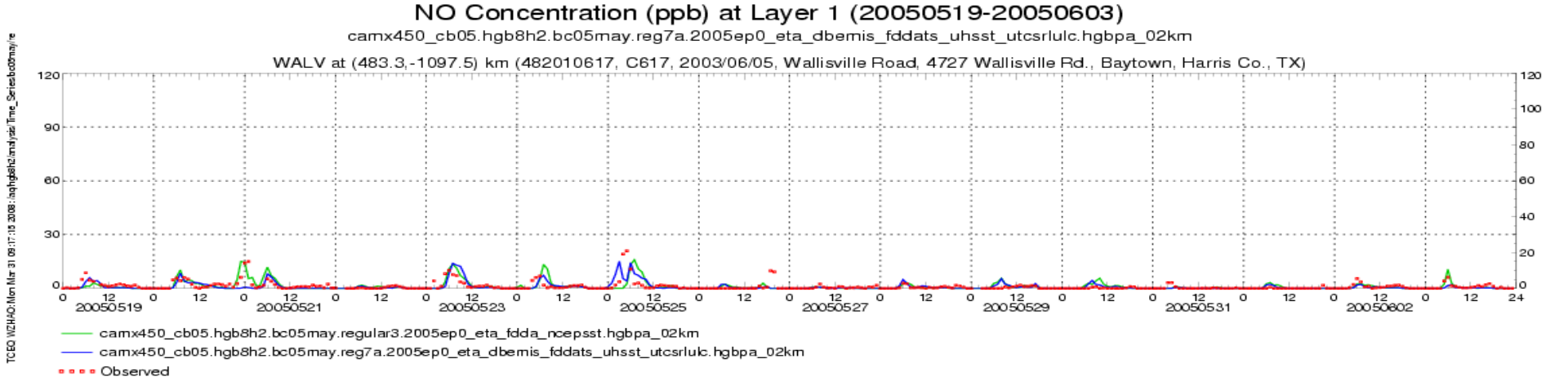
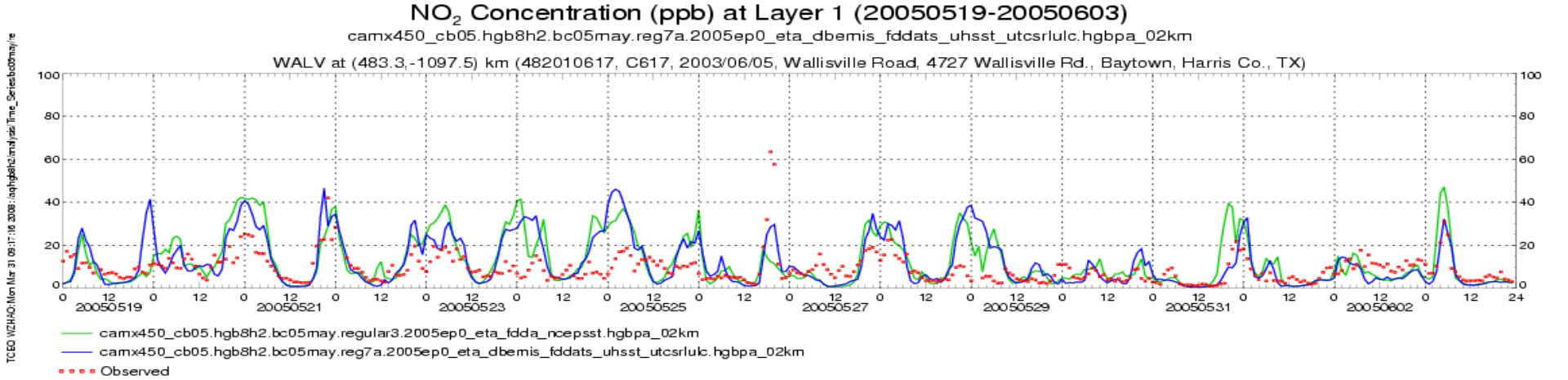
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

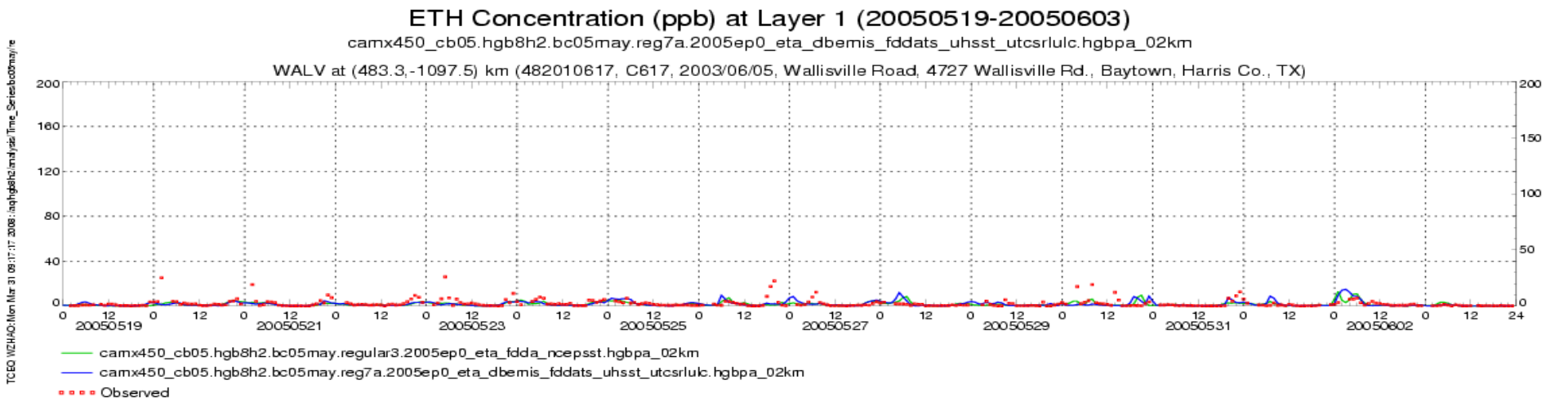

OLE Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


IOLE Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
H03H at (465.3,-1104.9) km (482010803, C603/A114, 1998/05/16, HRM Site 3, Haden Road, Houston, Harris Co., TX)
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


O_3 Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


NO_2 Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)
20050519
20050521
20050523
20050525
20050527
20050529
20050531
20050602
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


ETH Concentration (ppb) at Layer 1 (20050519-20050603)
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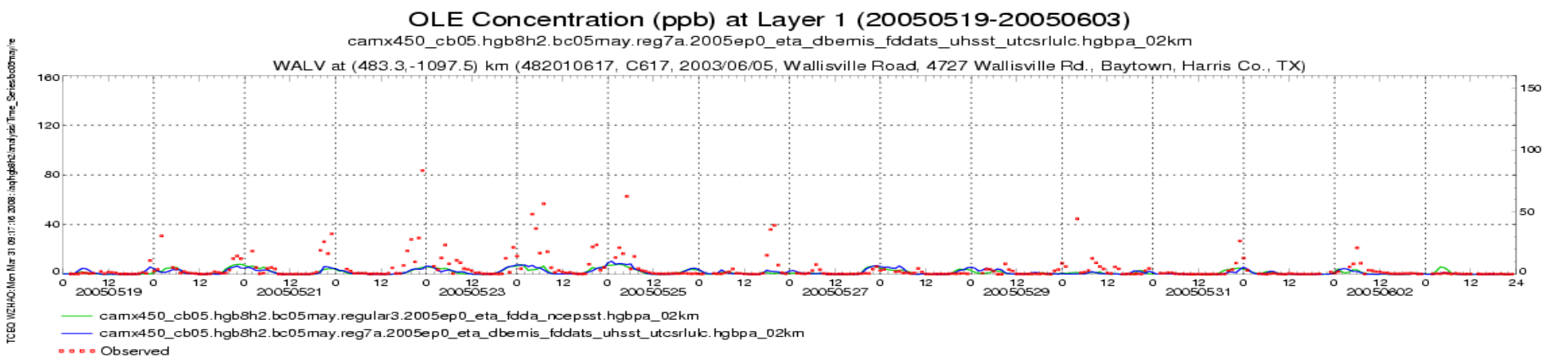
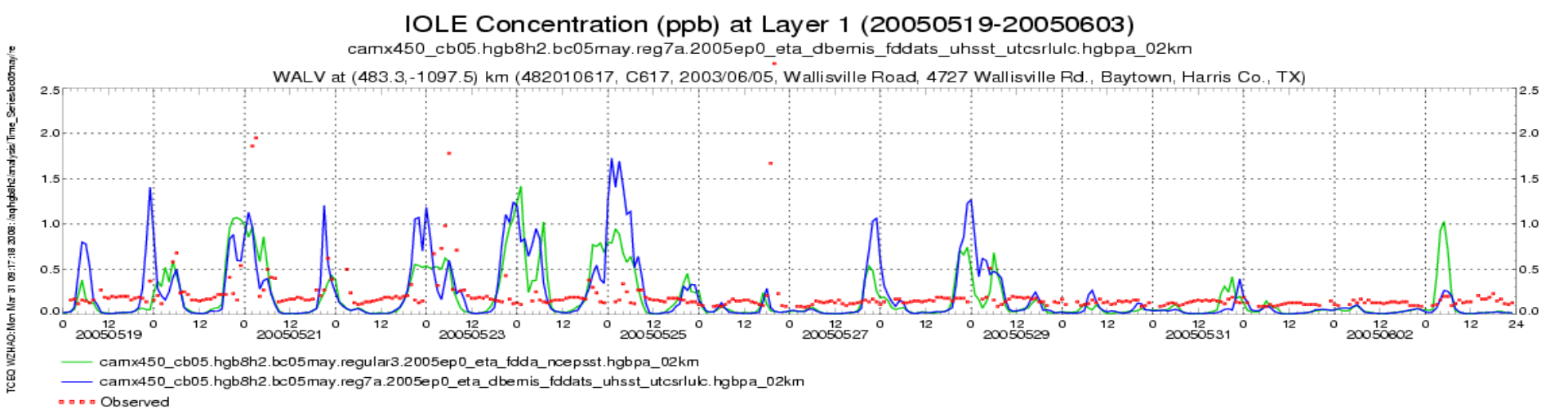
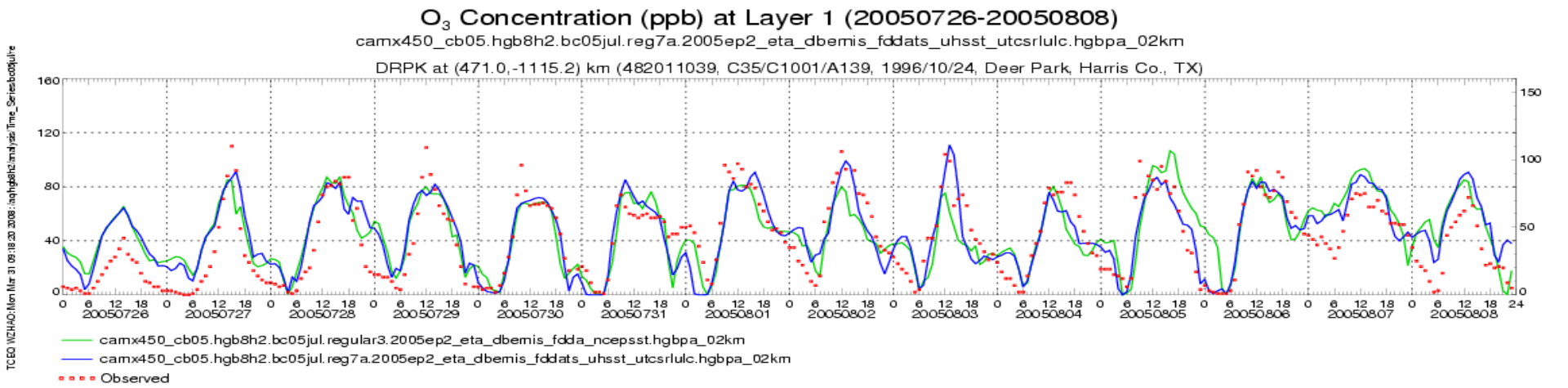
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


OLE Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


IOLE Concentration (ppb) at Layer 1 (20050519-20050603)
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
WALV at (483.3,-1097.5) km (482010617, C617, 2003/06/05, Wallisville Road, 4727 Wallisville Rd., Baytown, Harris Co., TX)
camx450_cb05.hgb8h2.bc05may.regular3.2005ep0_eta_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05may.reg7a.2005ep0_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed


O_3 Concentration (ppb) at Layer 1 (20050726-20050808)
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
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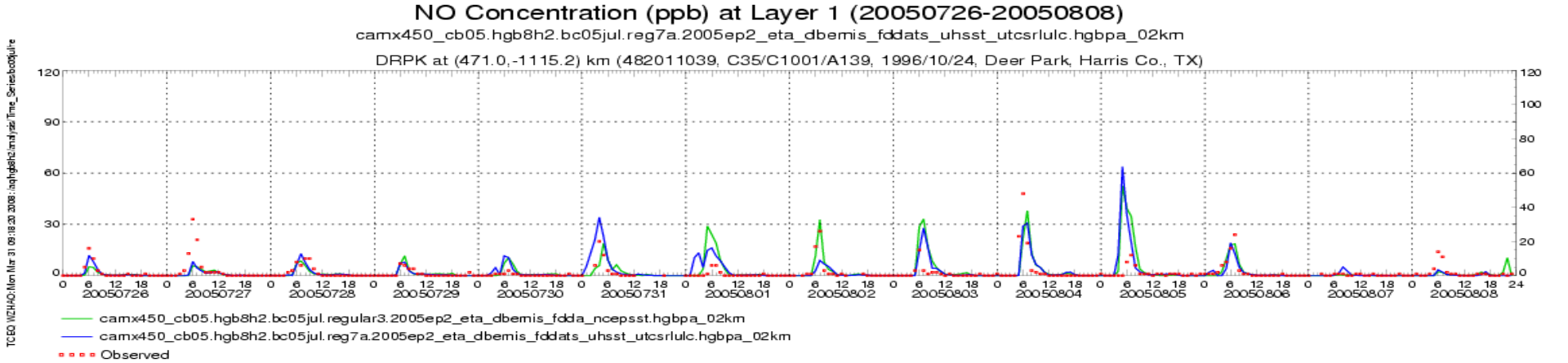
Observed


NO Concentration (ppb) at Layer 1 (20050726-20050808)
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DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
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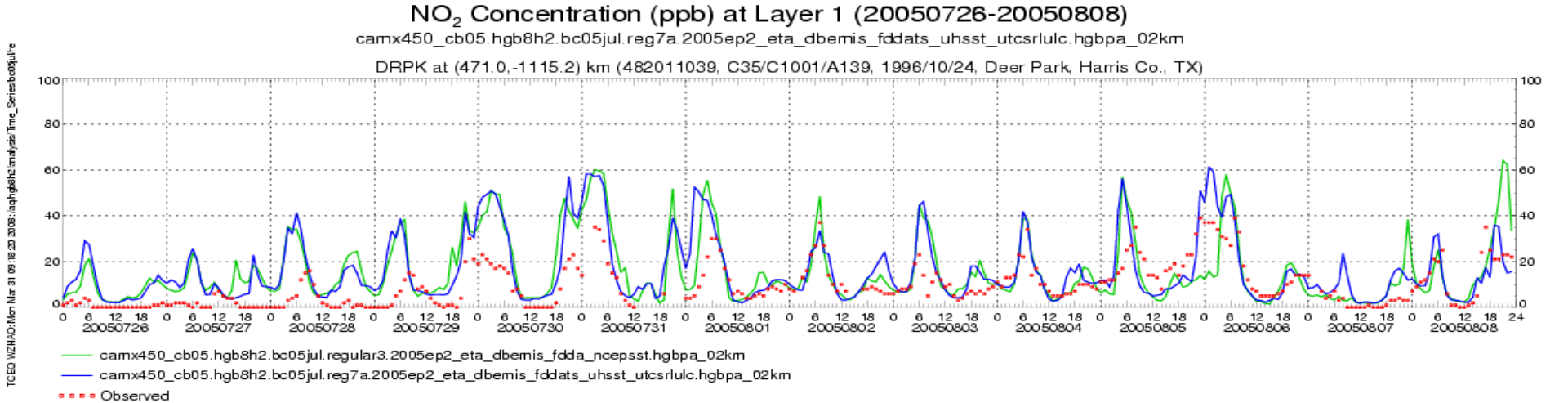
Observed


NO_2 Concentration (ppb) at Layer 1 (20050726-20050808)
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DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
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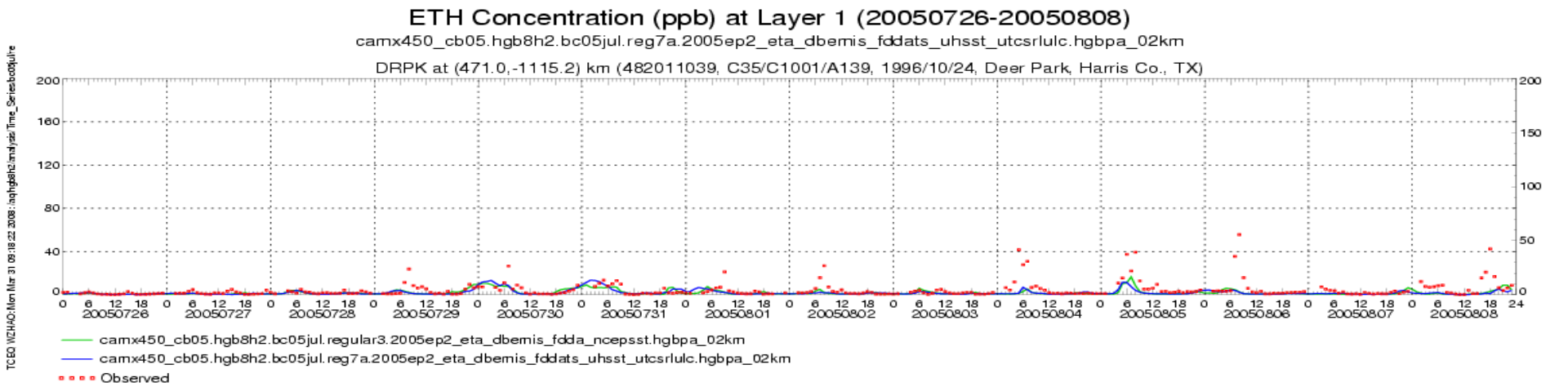
Observed


ETH Concentration (ppb) at Layer 1 (20050726-20050808)
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DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
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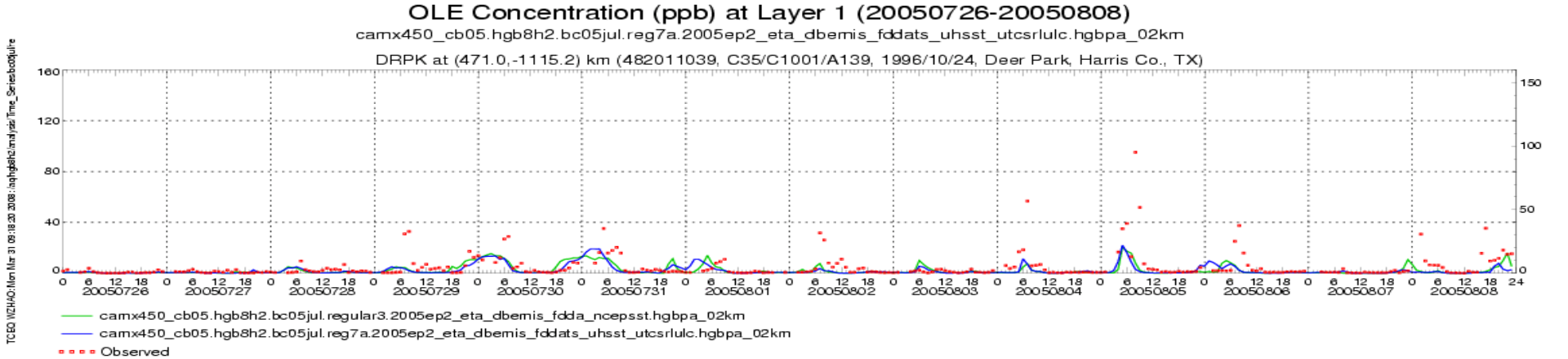
Observed


OLE Concentration (ppb) at Layer 1 (20050726-20050808)
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
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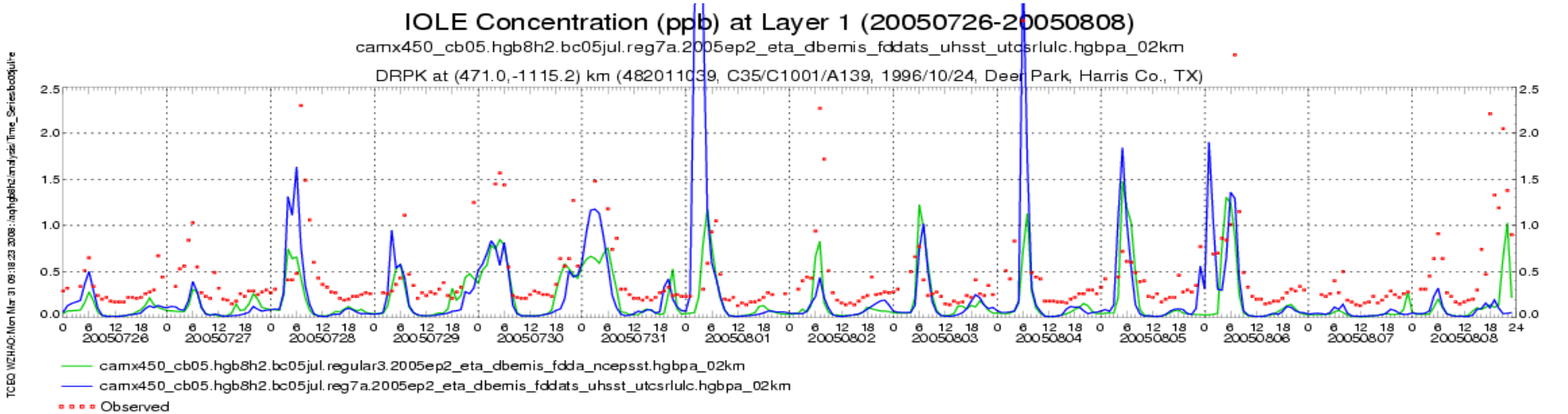
Observed

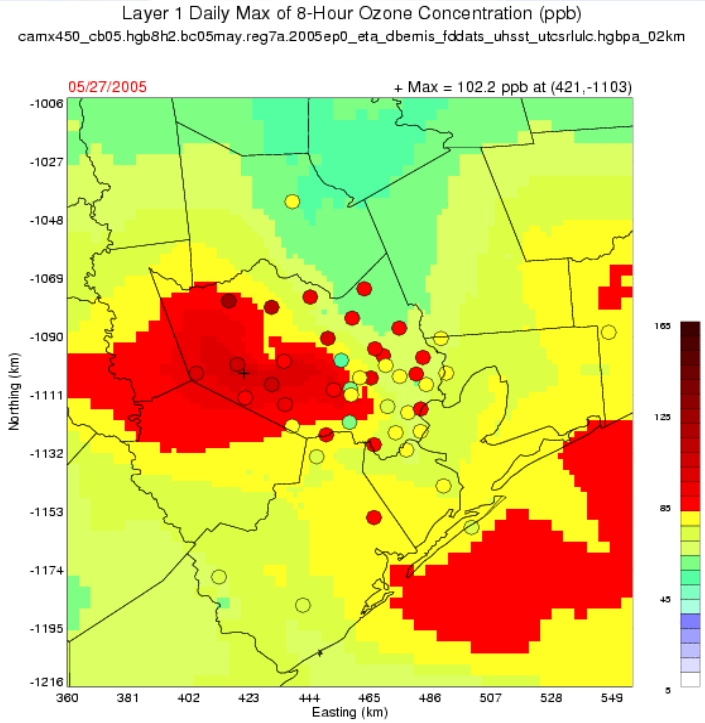

IOLE Concentration (ppb) at Layer 1 (20050726-20050808)
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
DRPK at (471.0,-1115.2) km (482011039, C35/C1001/A139, 1996/10/24, Deer Park, Harris Co., TX)
camx450_cb05.hgb8h2.bc05jul.regular3.2005ep2_eta_dbemis_fdda_ncepsst.hgbpa_02km
camx450_cb05.hgb8h2.bc05jul.reg7a.2005ep2_eta_dbemis_fddats_uhsst_utcsrlulc.hgbpa_02km
Observed

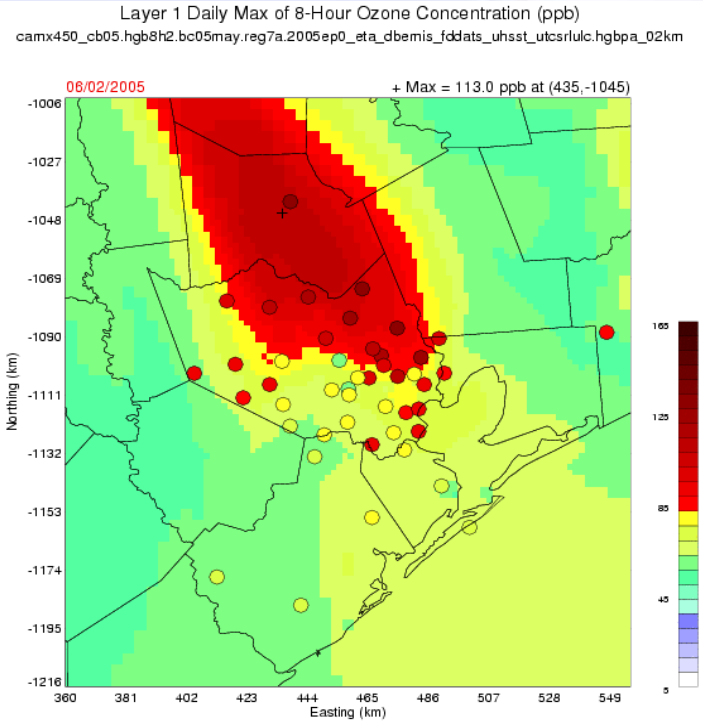
Graphical Performance Evaluation: Daily Maximum Ozone Tile Plots

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

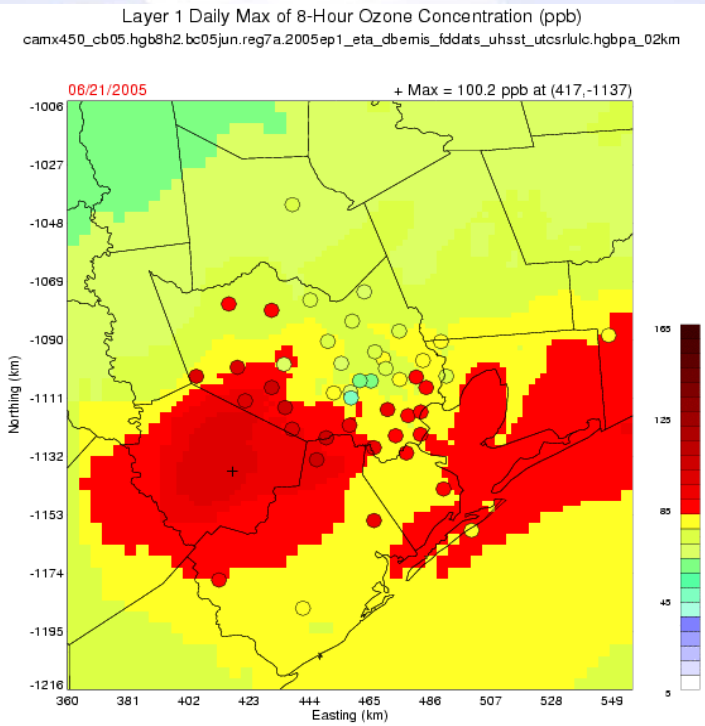


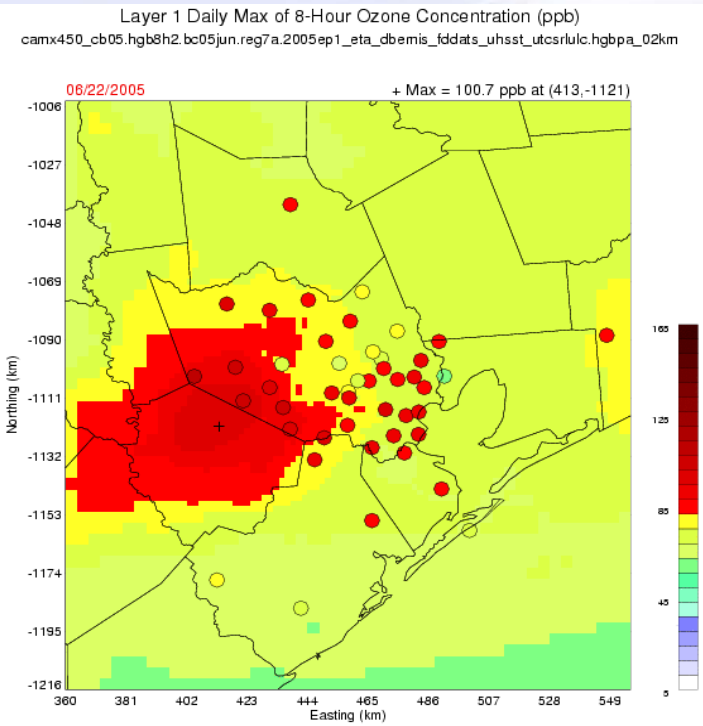


May 27, 2005

June 2, 2005

Daily Maximum 8-Hour Ozone Tile Plot

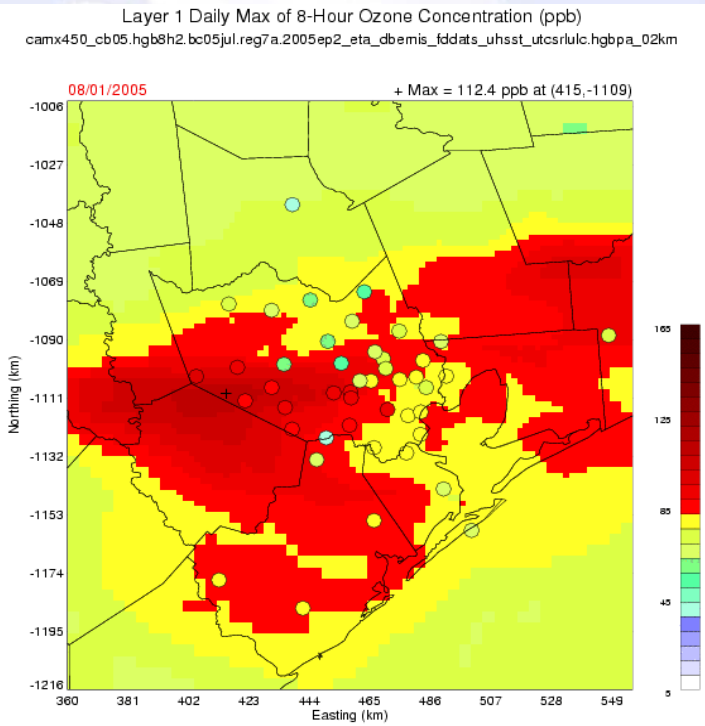


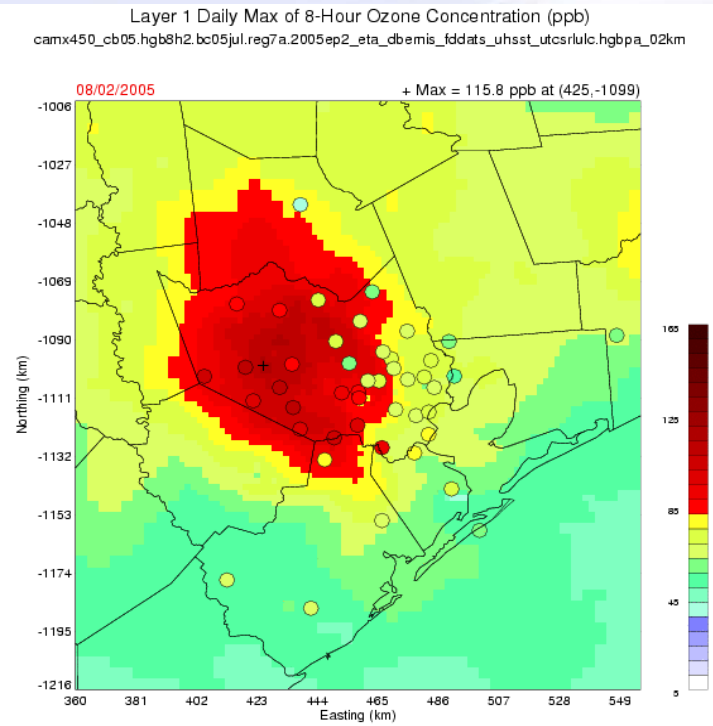


June 21, 2005

June 22, 2005

Daily Maximum 8-Hour Ozone Tile Plot





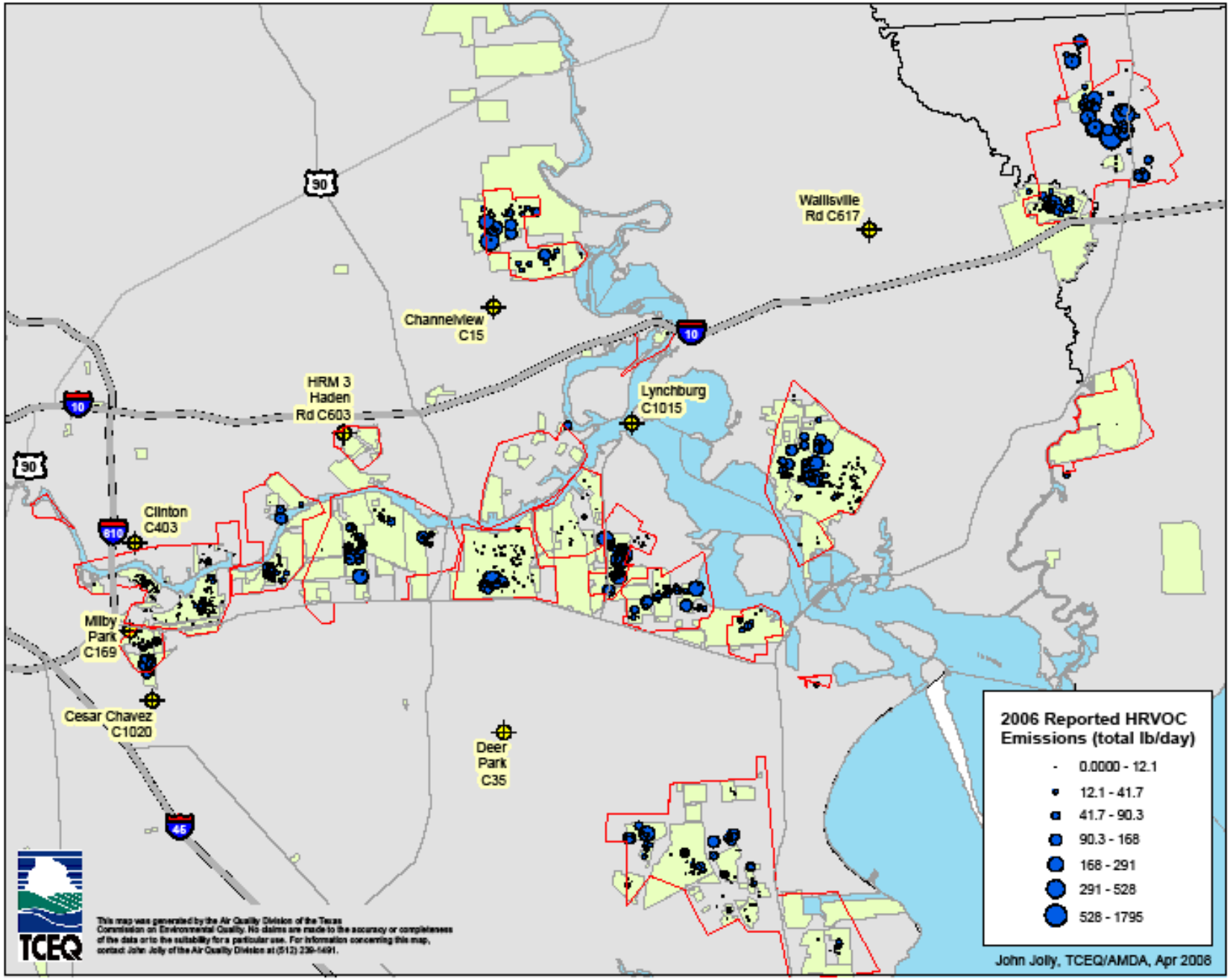
Aug. 1, 2005

Aug. 2, 2005

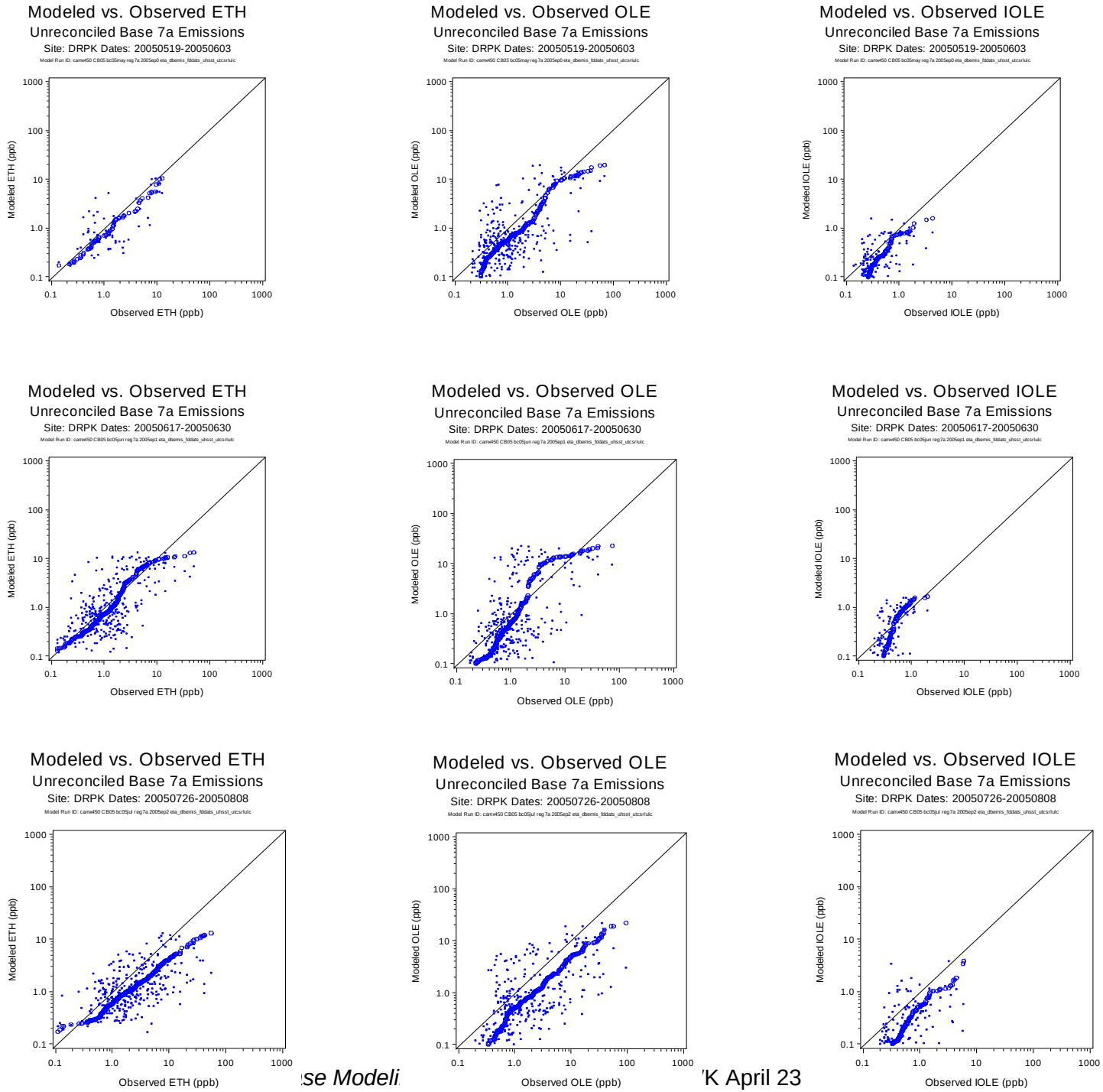
Graphical Performance Evaluation: Scatter-plots

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

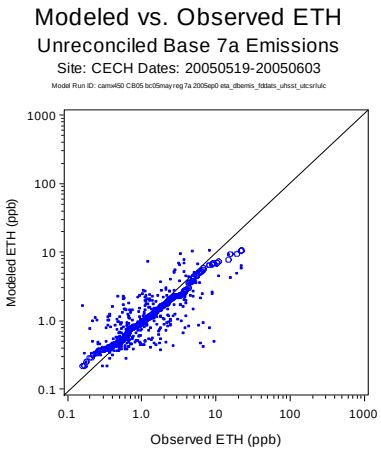
Houston Ship Channel Auto-GC Monitors and HRVOC Point Sources (2006 Annual EI)

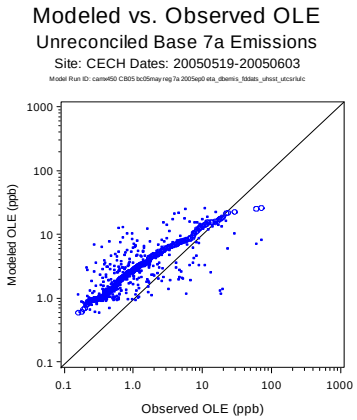


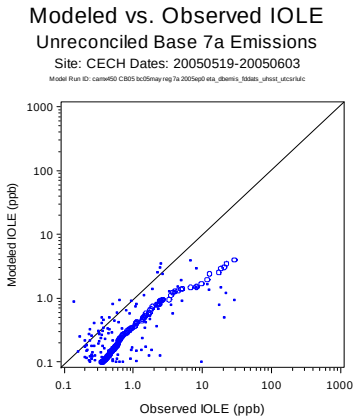
Deer Park (DRPK) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)

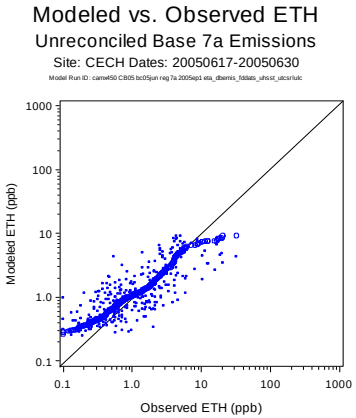


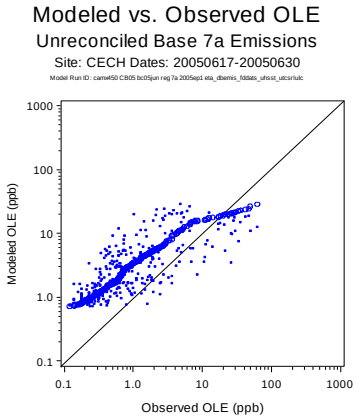
Cesar Chavez (CECH) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)

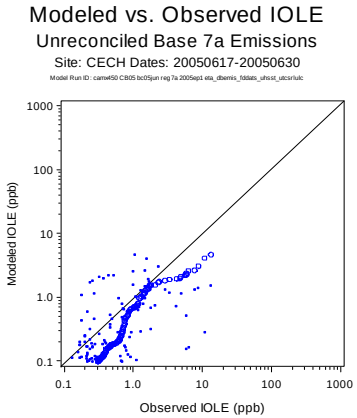


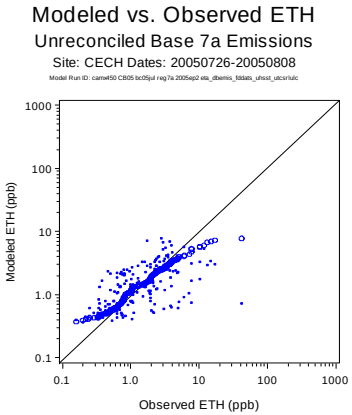


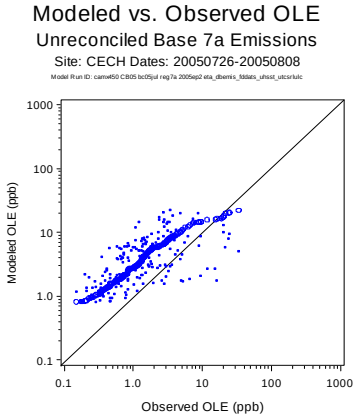


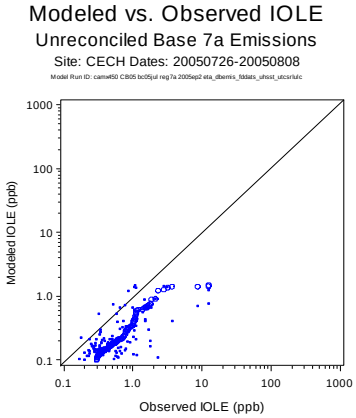




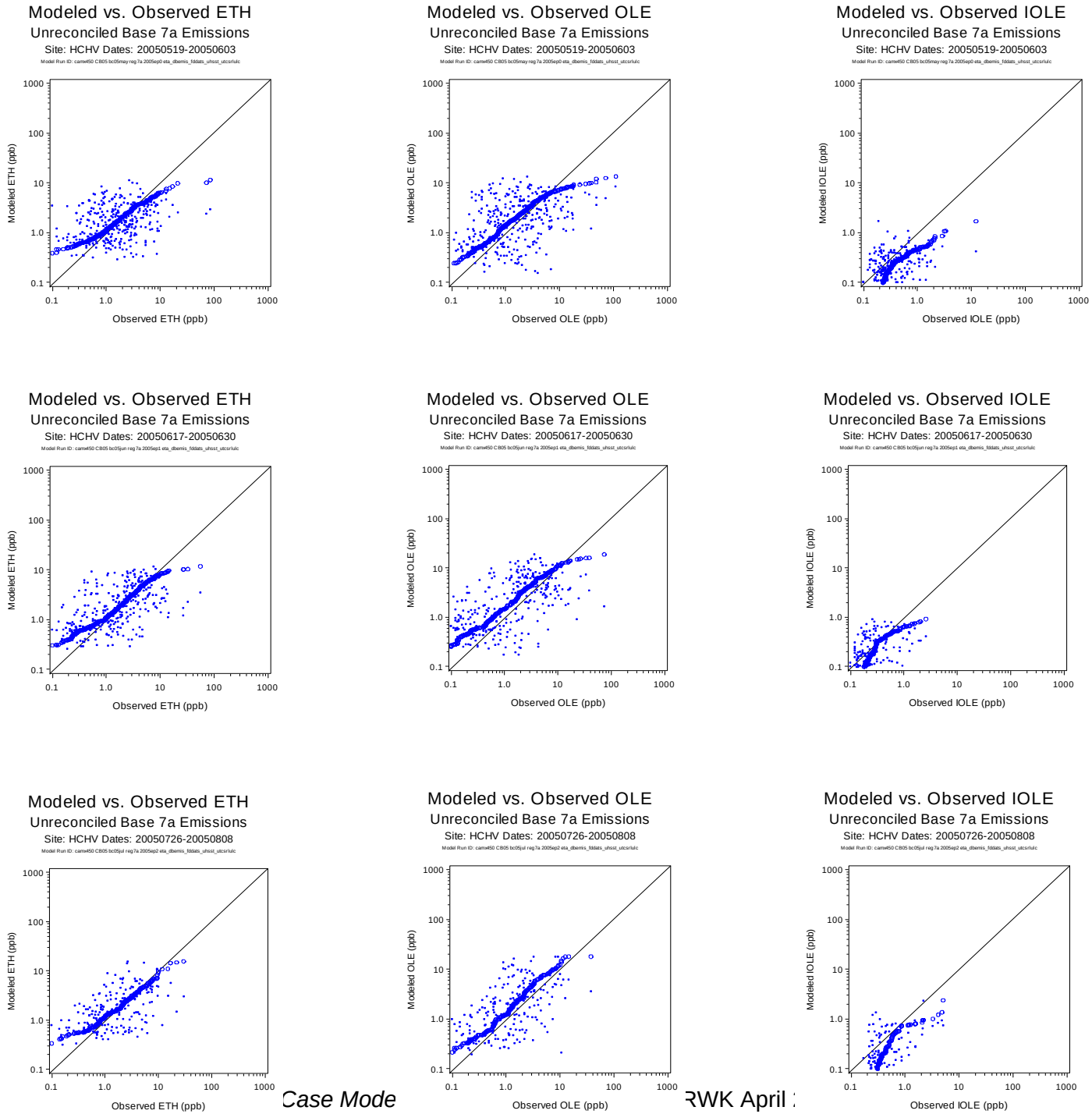




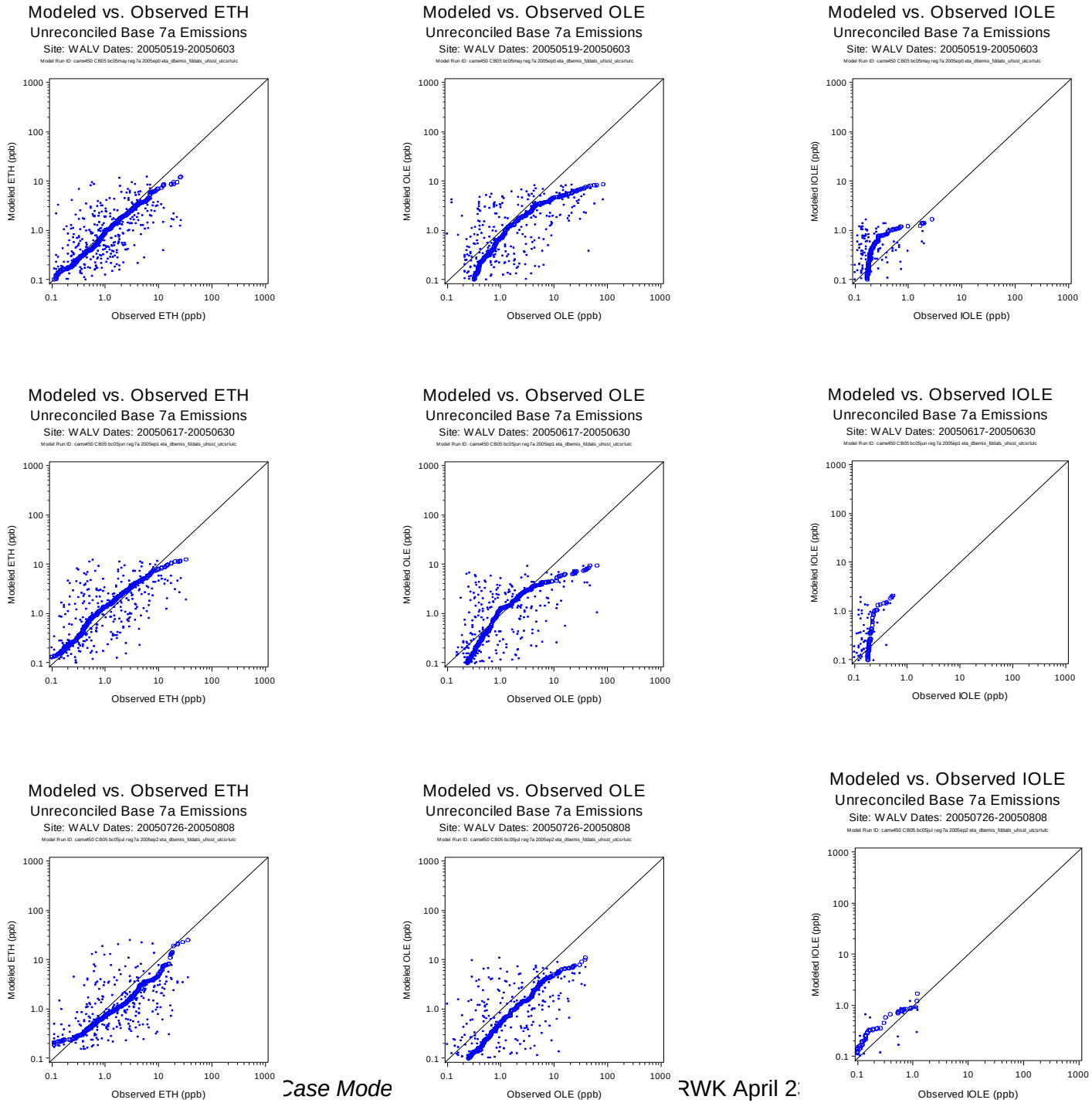




Channelview (HCHV) Measured vs Modeled CB05-HRVOC (ETH, OLE & IOLE)



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



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 NO_2 at selected sites is not well replicated, with a general over prediction of NO_2

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 $\geq$ 85 ppb misses a number of monitors with 8-hour ozone $\geq$ 85 ppb in Episode0 and Episode1
  - Modeled area of maximum daily 8-hour ozone $\geq$ 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