# HGB On- and Non-Road Emissions Modeling Update

Dick Karp
Air Modeling & Data Analysis Section

## 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**

# On- and Non-Road Emissions Modeling

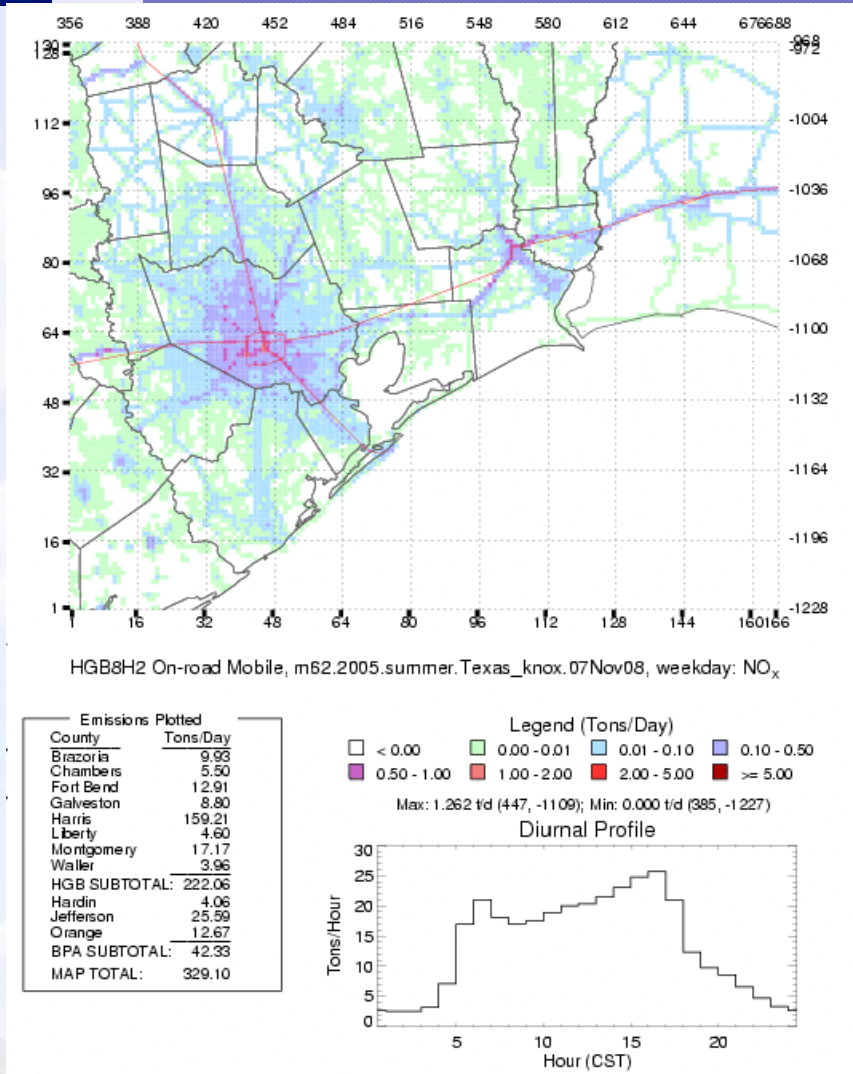
- The on-road mobile source link-based modeling emissions developed by TTI with the HGB TDM had an error in the spatial distribution of the network links

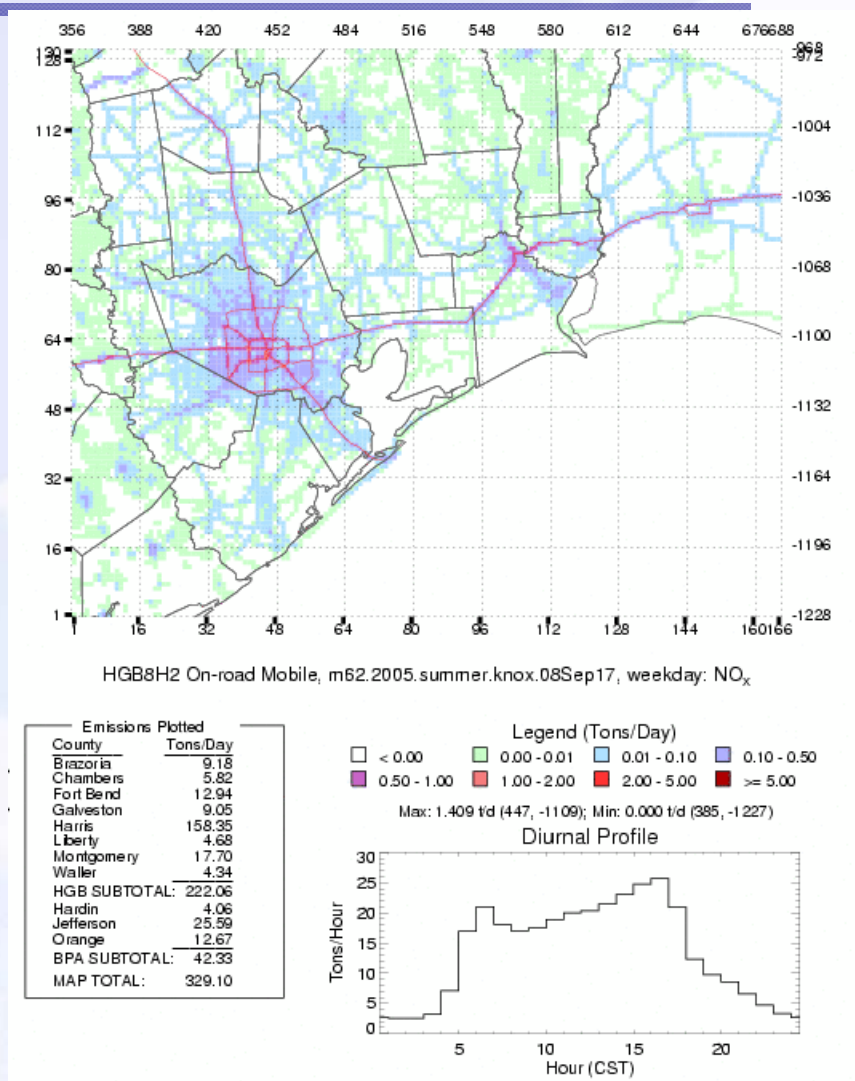
- The non-road mobile source construction emissions spatially distributed with the “urban” land use surrogate were found to be poorly distributed

# On-Road Mobile Sources

- The TCEQ and TTI determined that the errors in the link assignments (i.e., geographical coordinates) applied to only two of the four daily time periods:
  - 4 pm to 7 pm and 7 pm to 5 am
- TTI corrected the link assignments and submitted revised link files to the TCEQ
- The TCEQ processed the revised link data
  - Built new LBASE files
  - Processed through EPS3

# On-Road Mobile Sources



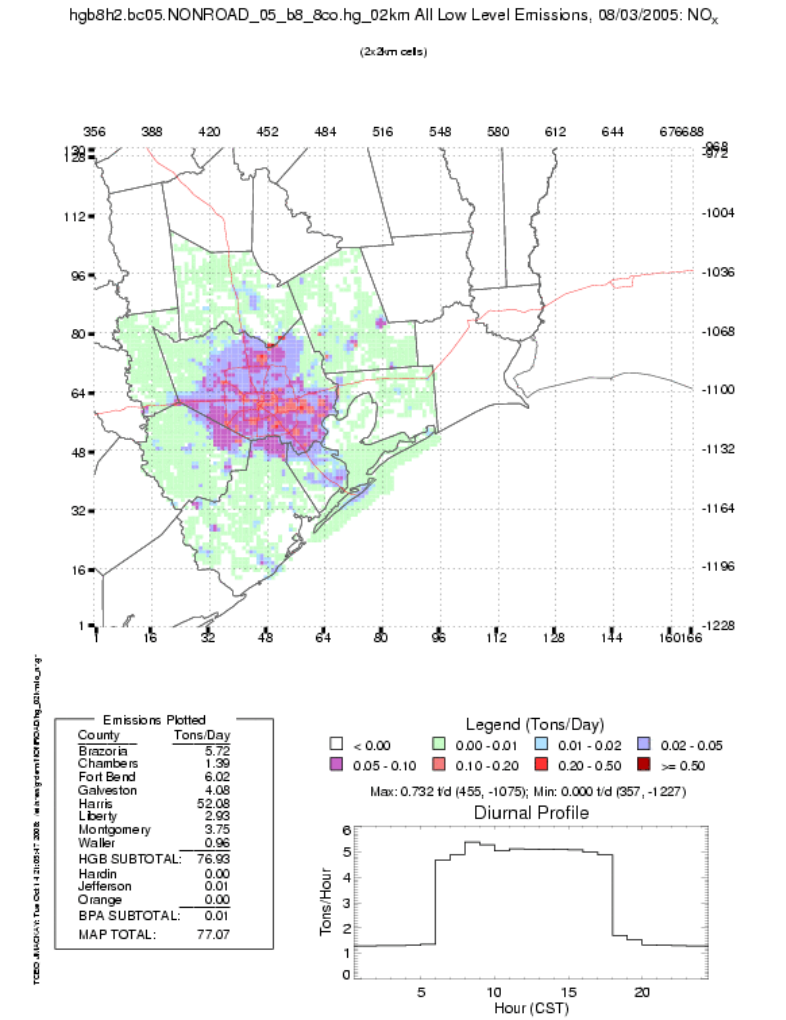



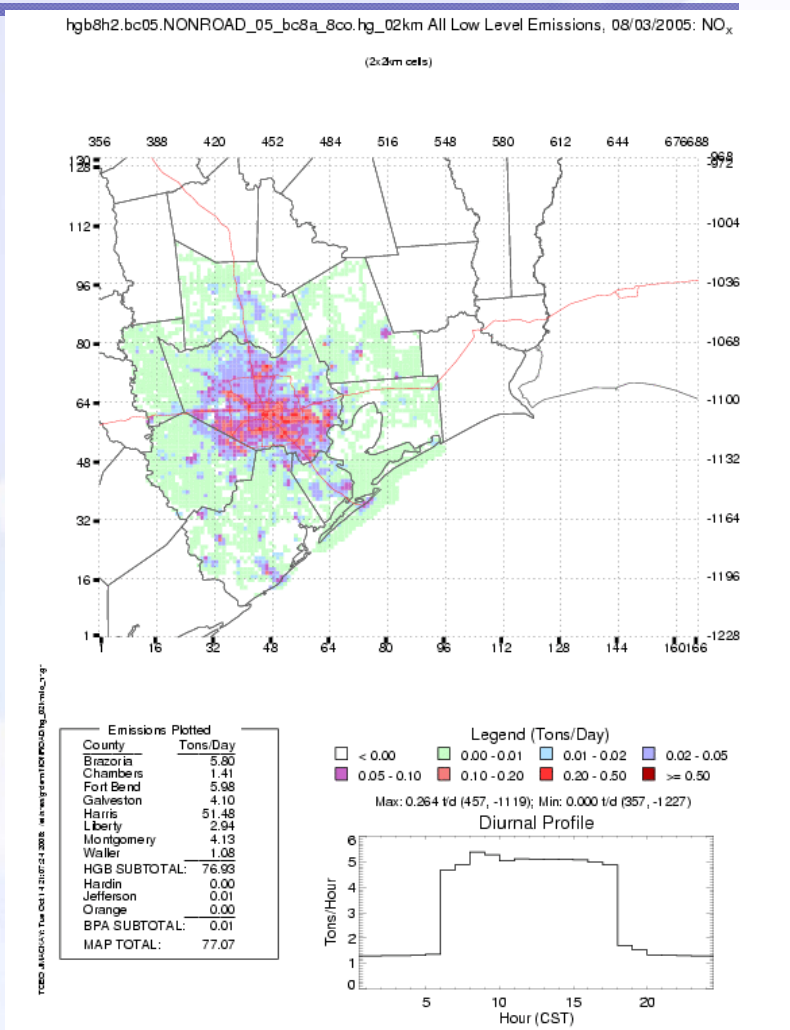
# Non-Road Mobile Sources

- Developed new surrogate for construction emissions combining commercial, residential and industrial land use categories

- Used new TexN non-road model developed by ERG, designed especially for Texas

# Non-Road Mobile Sources

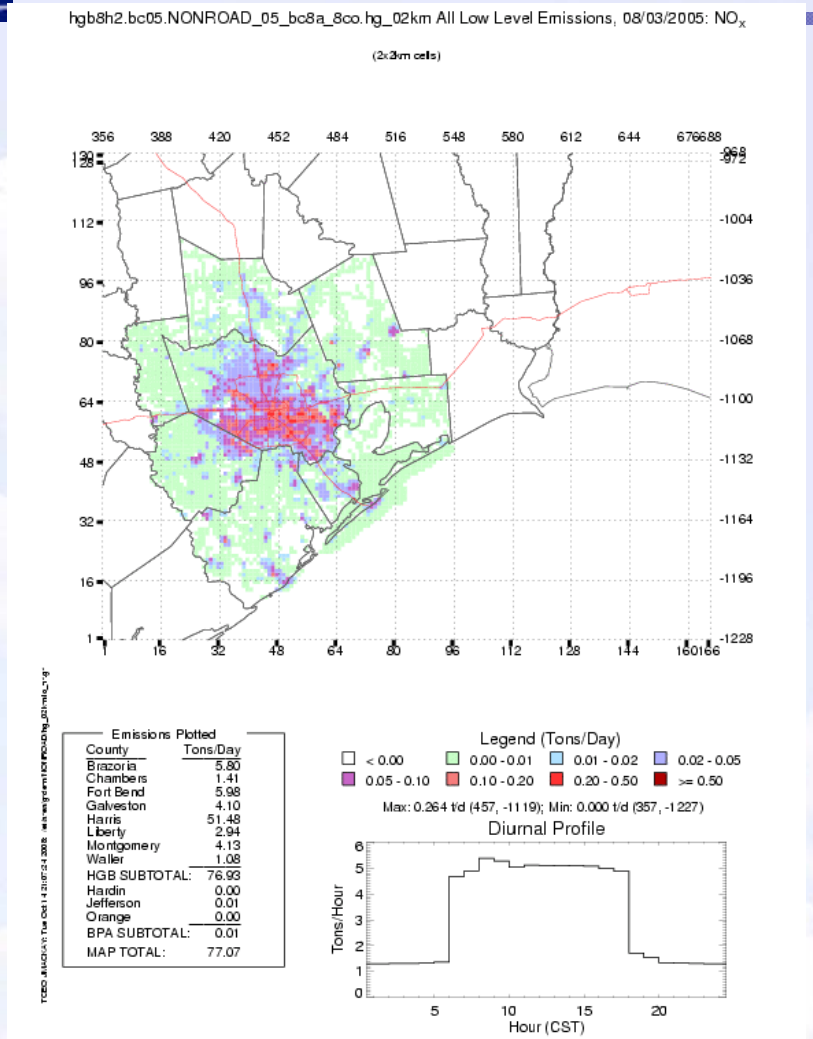


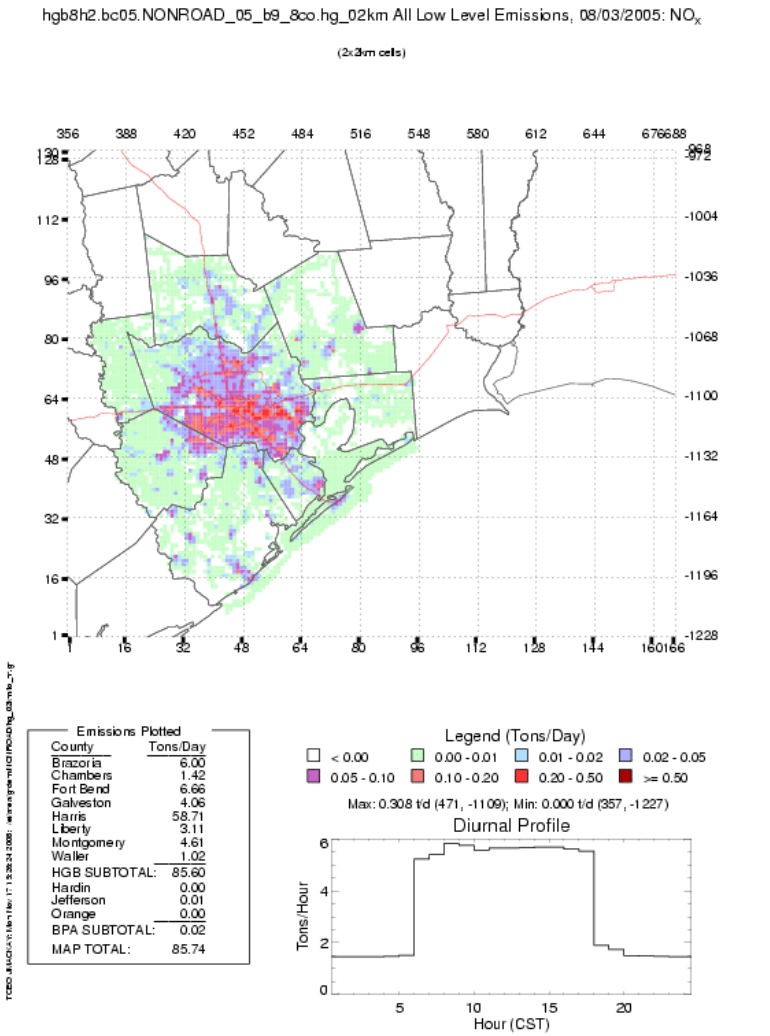



# New TexN Non-Road

| Non-Road Emissions Update | | | | |
|---|---|---|---|---|
| Source Categories | New TexN $NO_X$ (tpd) | Prior TexAER $NO_X$ (tpd) | New TexN VOC (tpd) | Prior TexAER VOC (tpd) |
| RECE | 0.24 | 0.29 | 6.44 | 6.21 |
| CONSTR | 38.68 | 34.77 | 7.56 | 7.80 |
| INDSTRL | 25.04 | 19.69 | 6.97 | 4.93 |
| COMM_LG | 1.30 | 1.37 | 7.12 | 6.82 |
| RES_LG | 1.17 | 1.41 | 13.85 | 13.09 |
| AG | 2.93 | 2.59 | 0.41 | 0.41 |
| COMM | 7.84 | 7.85 | 11.72 | 10.66 |
| LOG | 0.27 | 0.23 | 0.164 | 0.16 |
| GSE | 0.77 | 0.68 | 0.086 | 0.084 |
| OILGAS | 6.49 | 6.84 | 0.25 | 0.25 |
| RECBOAT | 1.02 | 1.29 | 18.10 | 17.709 |
| RRMAINT | 0.068 | 0.072 | 0.014 | 0.014 |
| Totals | 85.75 | 77.07 | 72.70 | 68.145 |

# Non-Road Mobile Sources



# Revised Base Case Modeling

- On- and non-road mobile source updates tested with June 2005 episode (ep1)

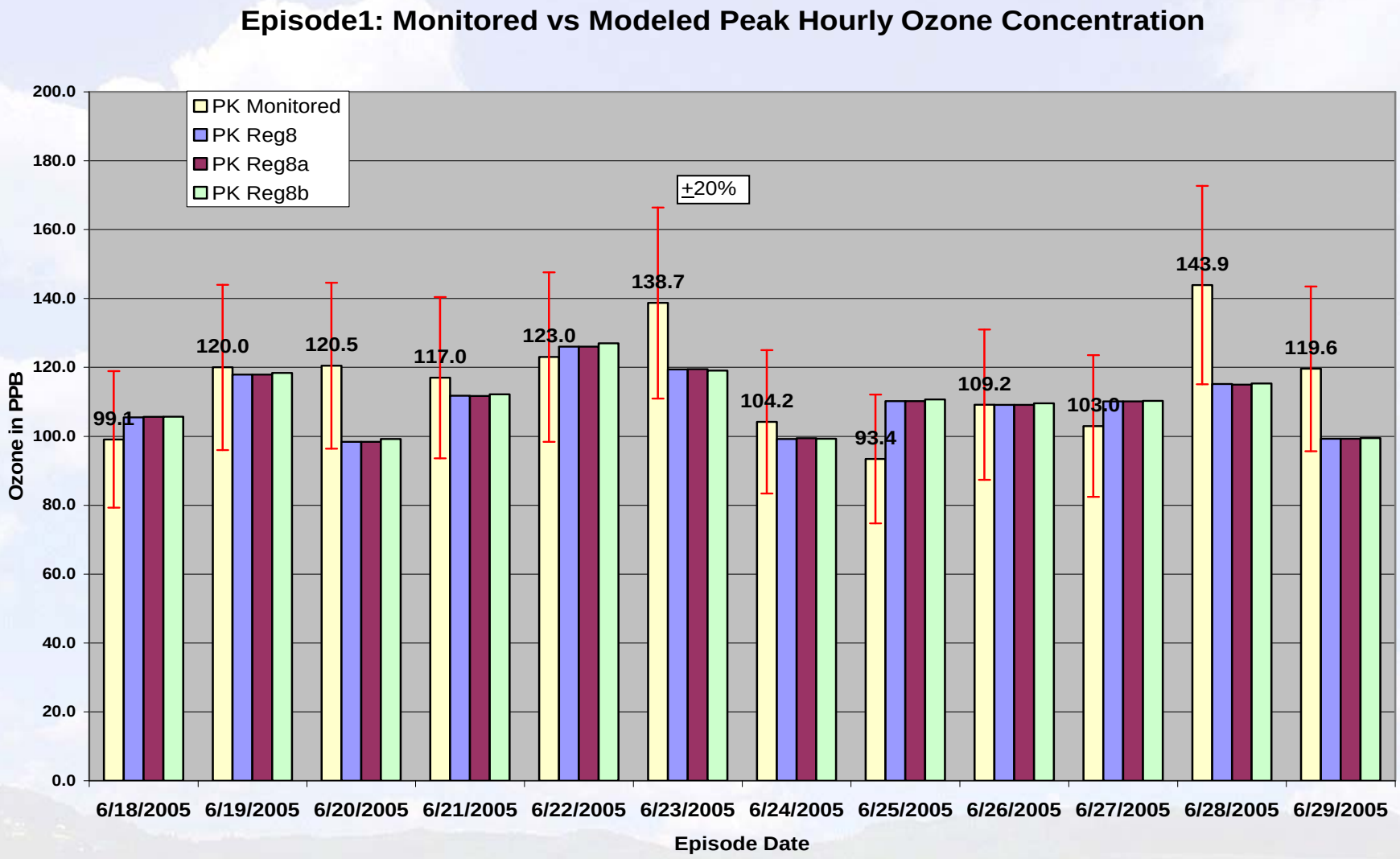
- CAMx modeling (designated Reg8a)
  - corrected on-road link spatial distribution

- CAMx modeling (designated Reg8b)
  - corrected on-road link spatial distribution (Reg8a)
  - new construction surrogate and
  - new TexN non-road model

# Revised Base Case Modeling

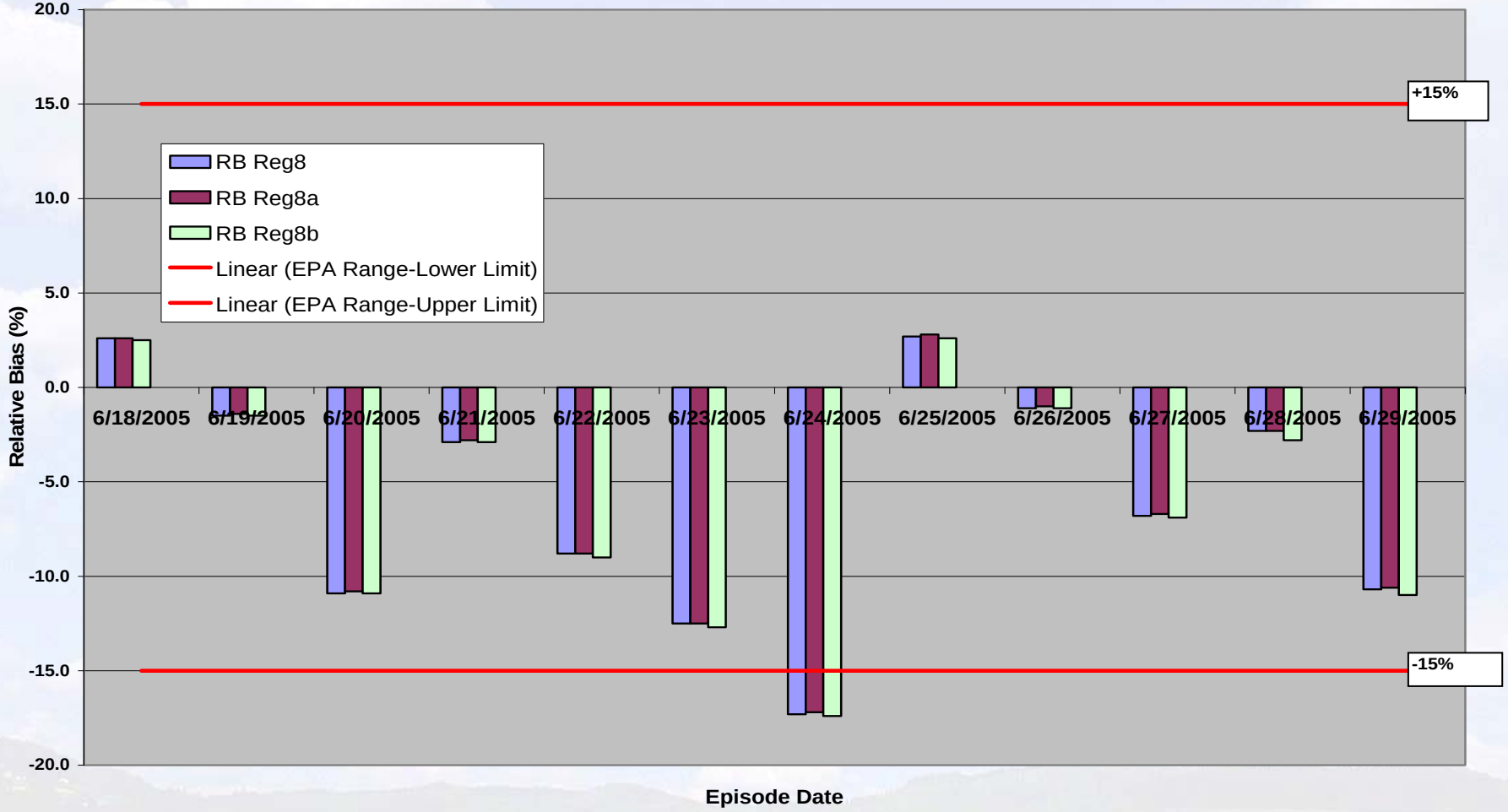
- Comparison of Statistical Measures
  - Peak hourly (PK-Obs, PK-Reg8, PK-Reg8a, PK-Reg8b)
  - Relative bias hourly
  - Peak 8-hour
- Comparison of Graphical Measures
  - Time series (hourly $O_3$, NO, $NO_2$)
  - Tile plots (maximum daily 8-hour $O_3$)

# Comparison of Statistical Measures

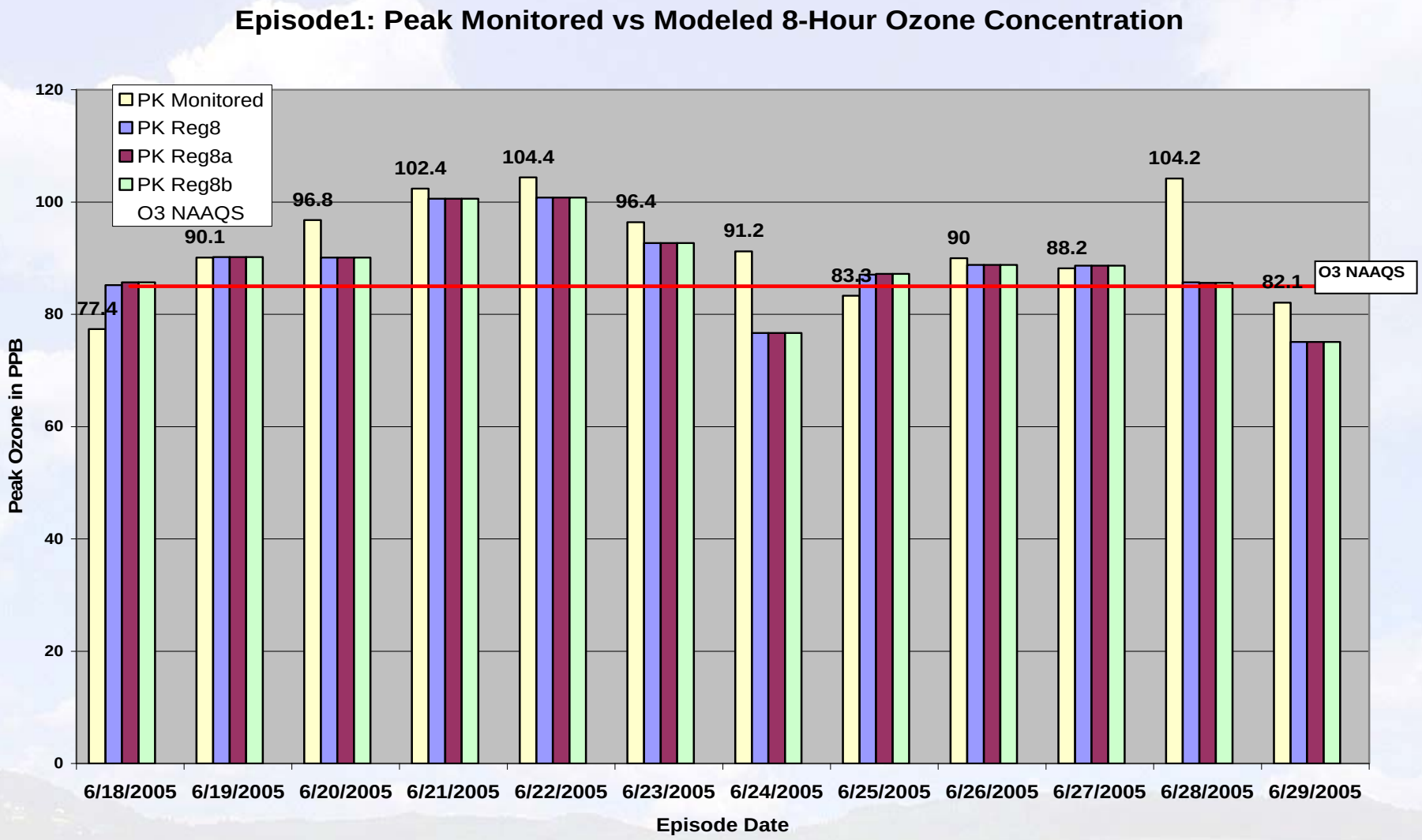


# Comparison of Statistical Measures

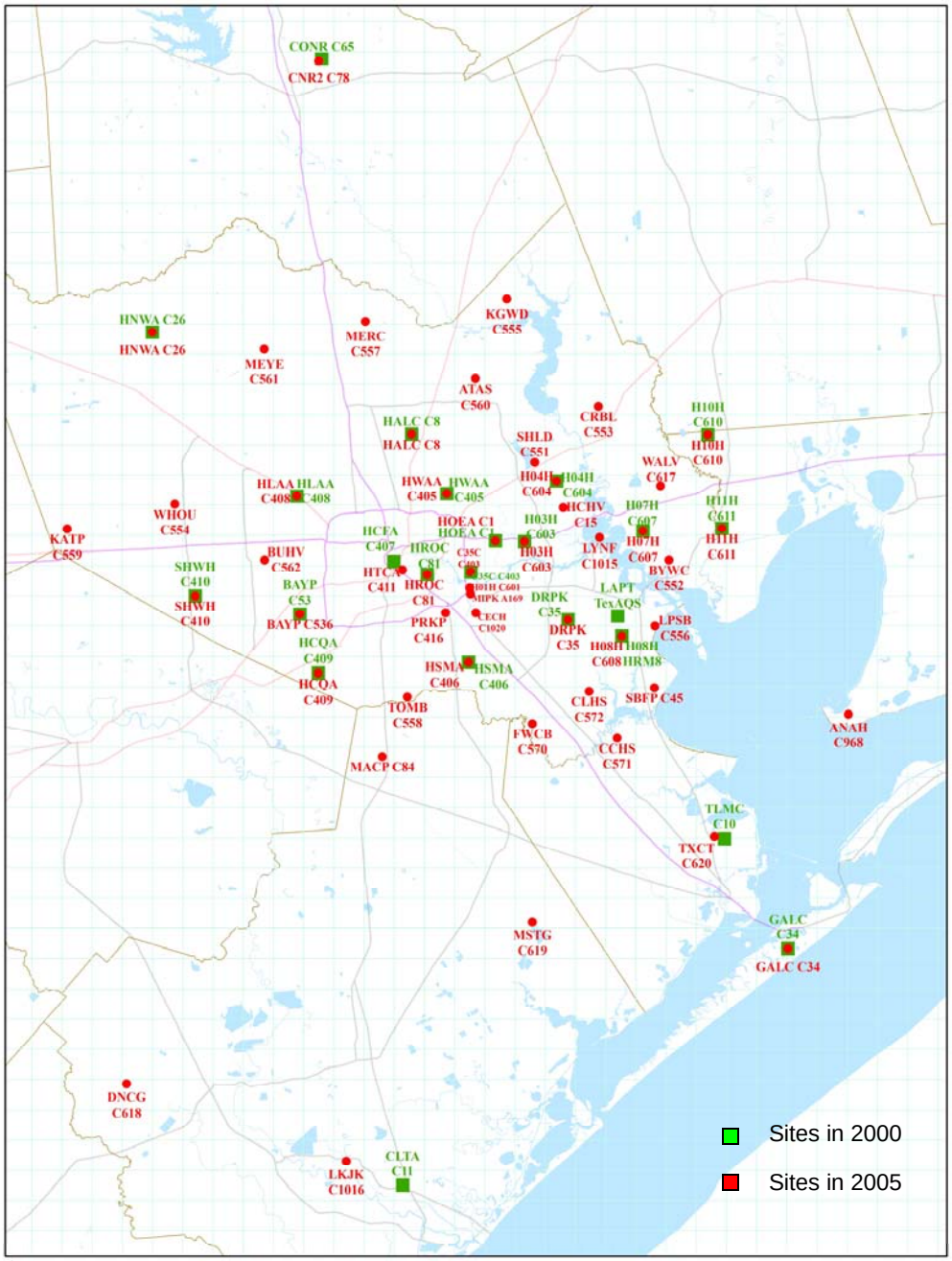
**Episode1: Relative Bias of Modeled Hourly Ozone Concentration**



# Comparison of Statistical Measures



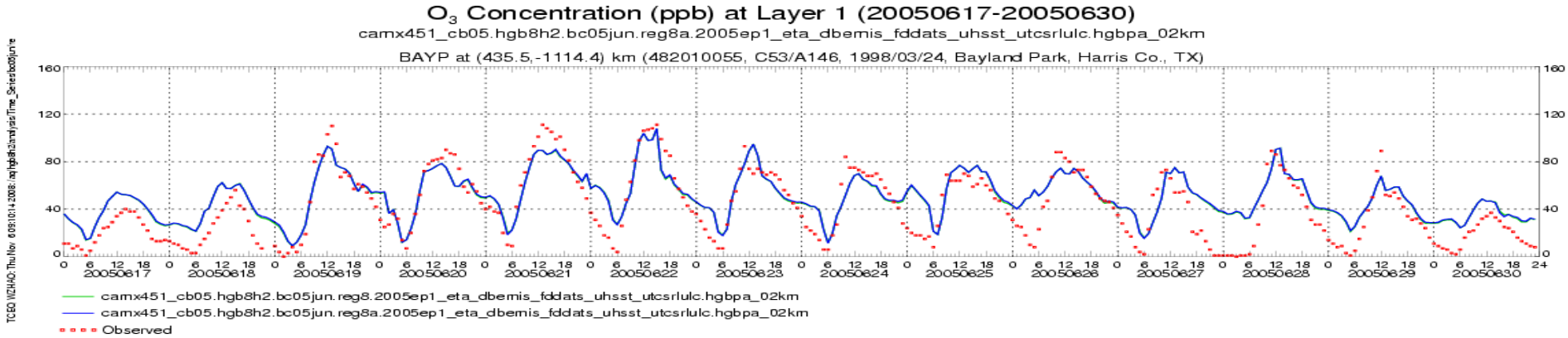
# HGB Ozone Monitoring Sites

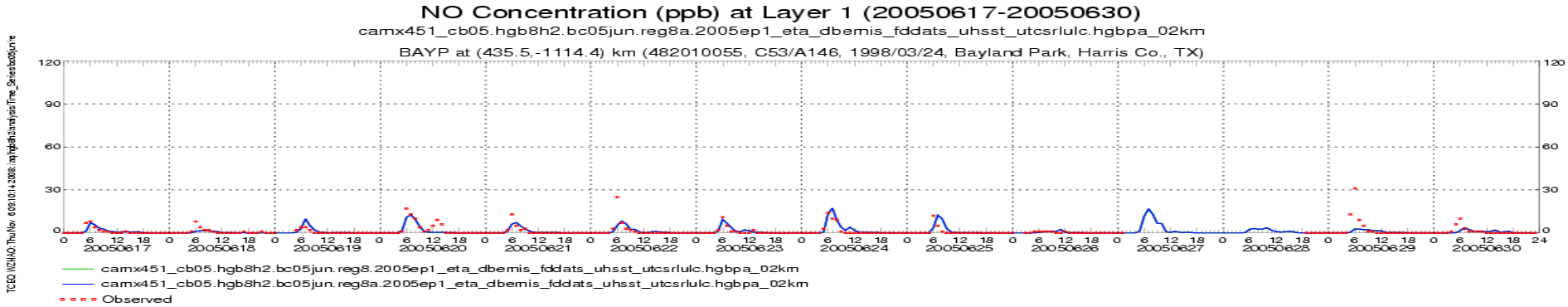


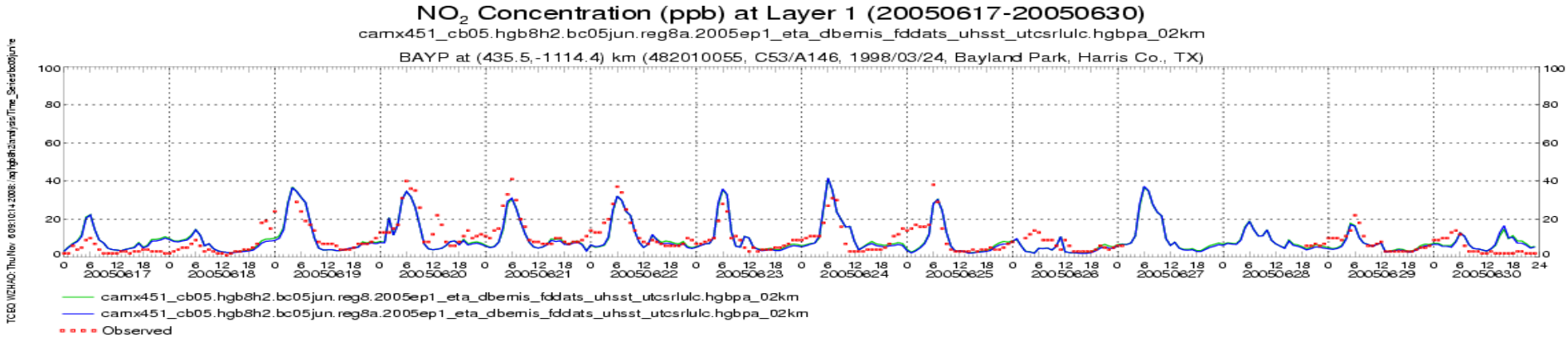

| Site Code | Selected Site Name |
|---|---|
| BAYP | Bayland Park, Harris Co., TX |
| C35C* | Clinton, Harris Co., TX |
| CNR2 | Conroe Relocated, Montgomery Co., TX |
| DRPK* | Deer Park, Harris Co., TX |
| GALC | Galveston, Galveston Co., TX |
| H03H* | HRM-3, Haden Road, Harris Co., TX |
| H08H | 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 |

* Sites with an auto-GC

# Comparison of Graphical Measures



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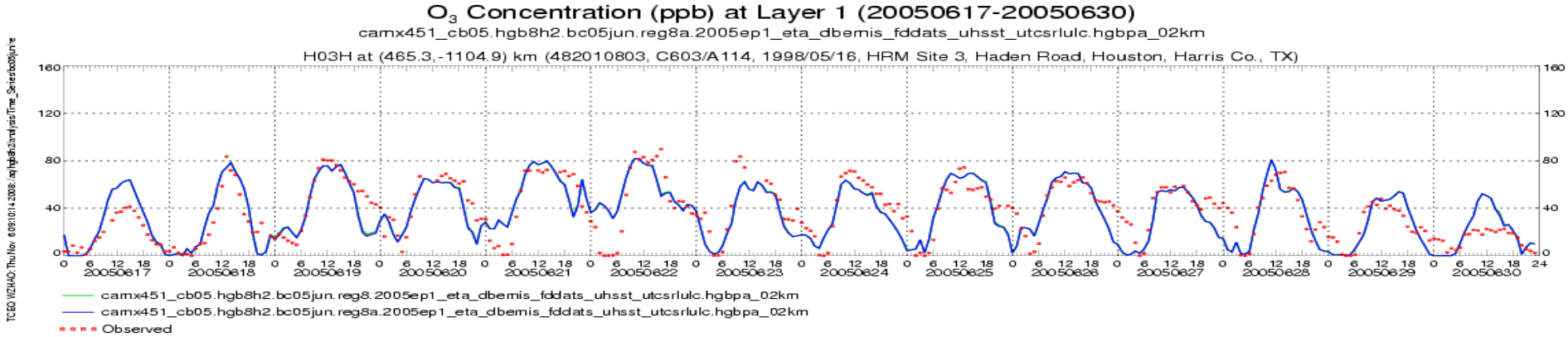


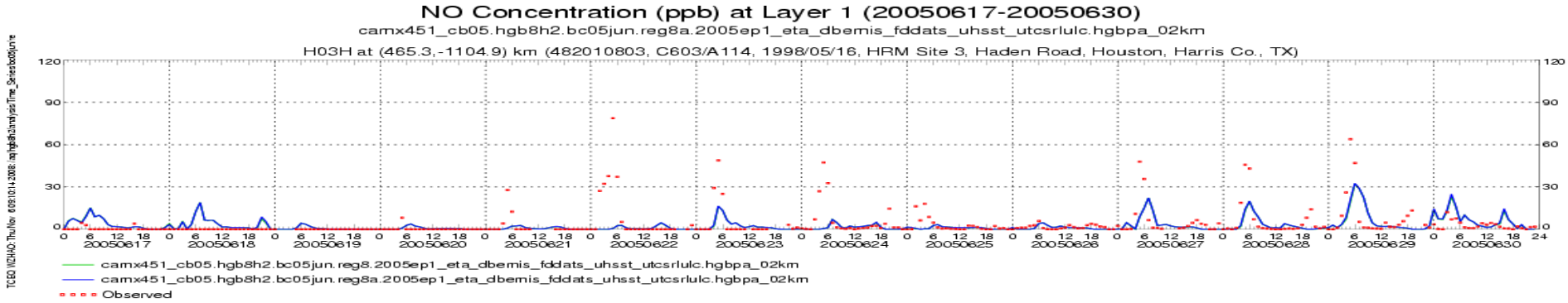


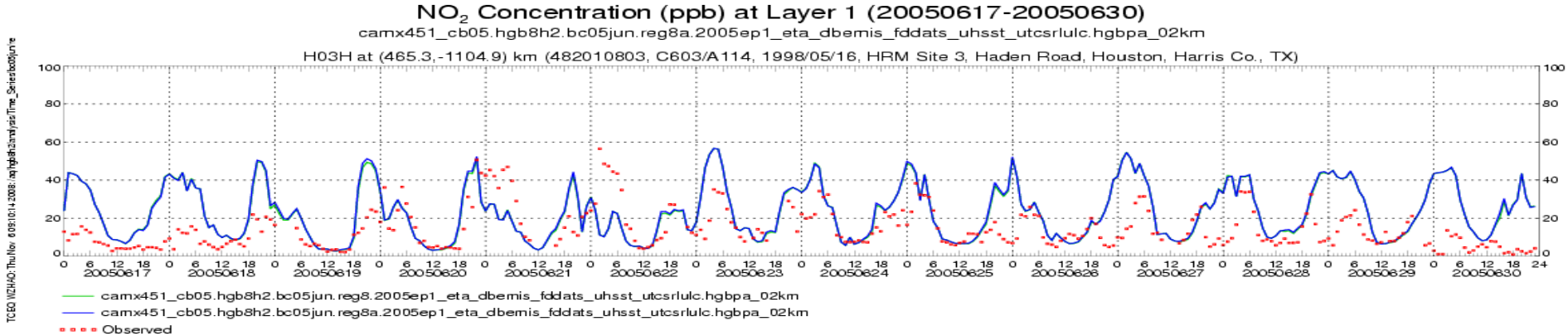

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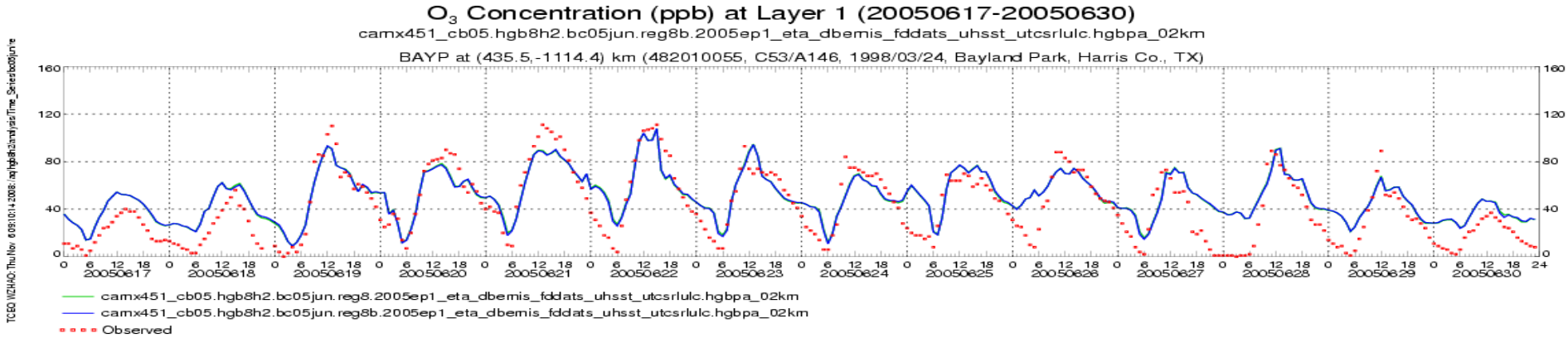


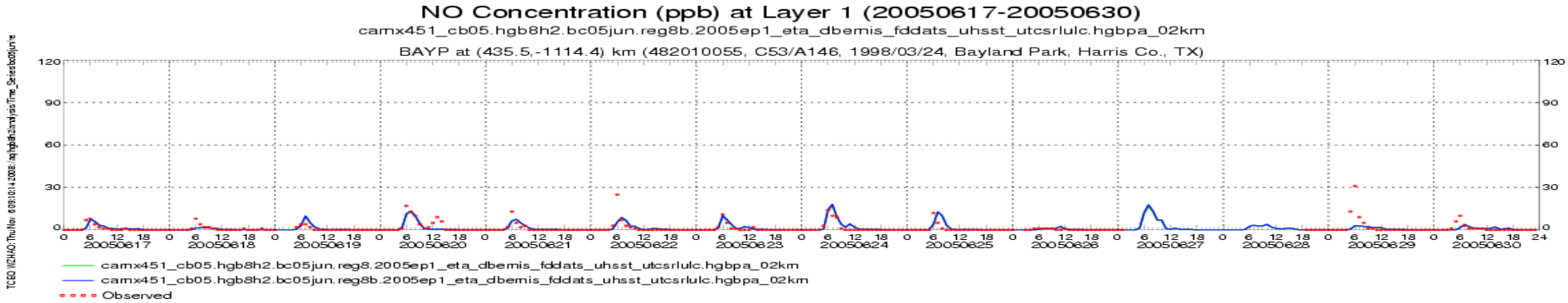


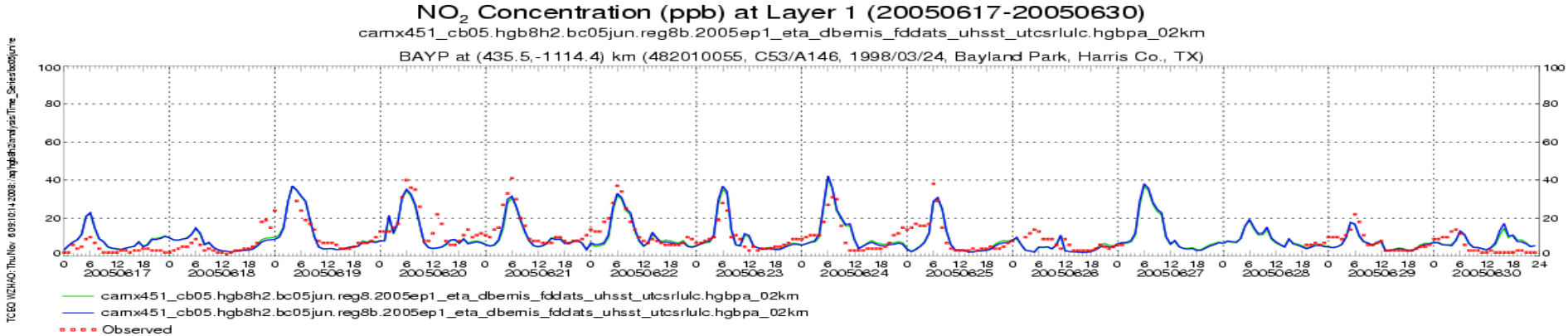

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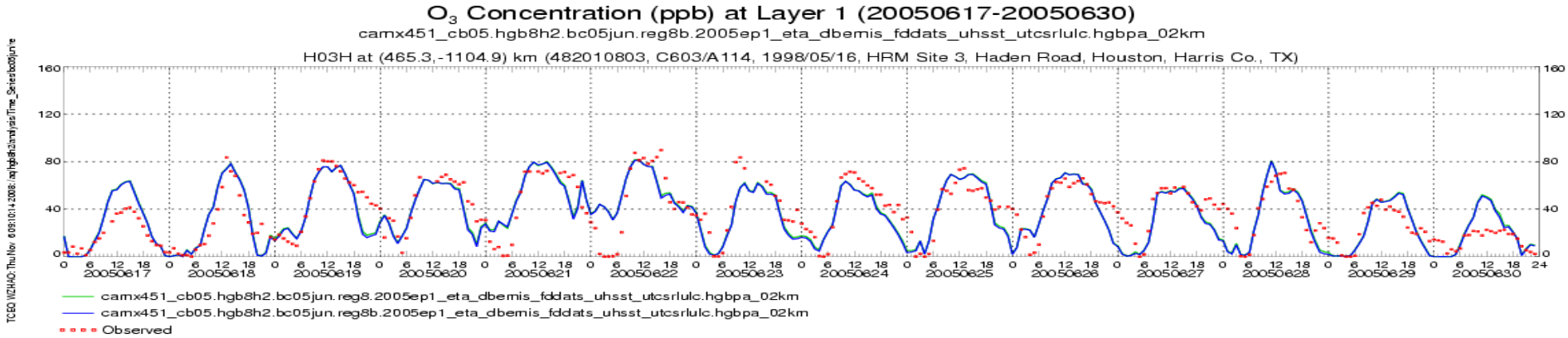
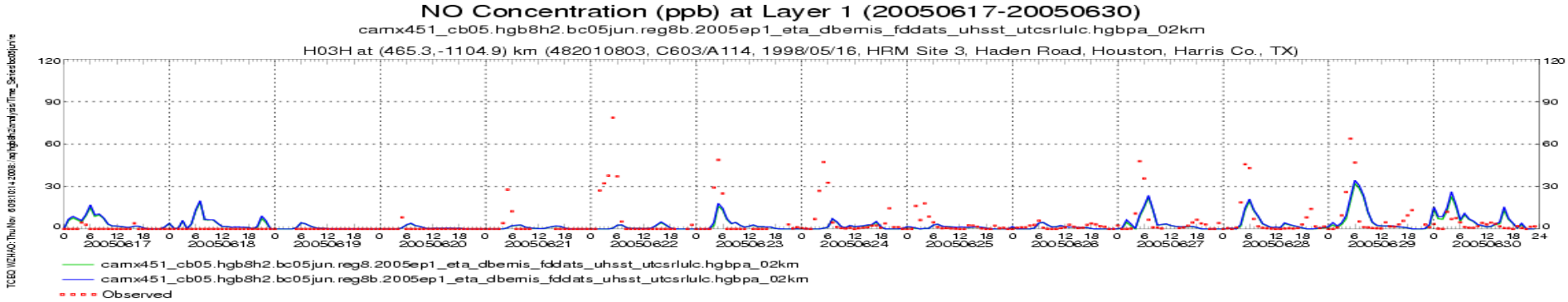
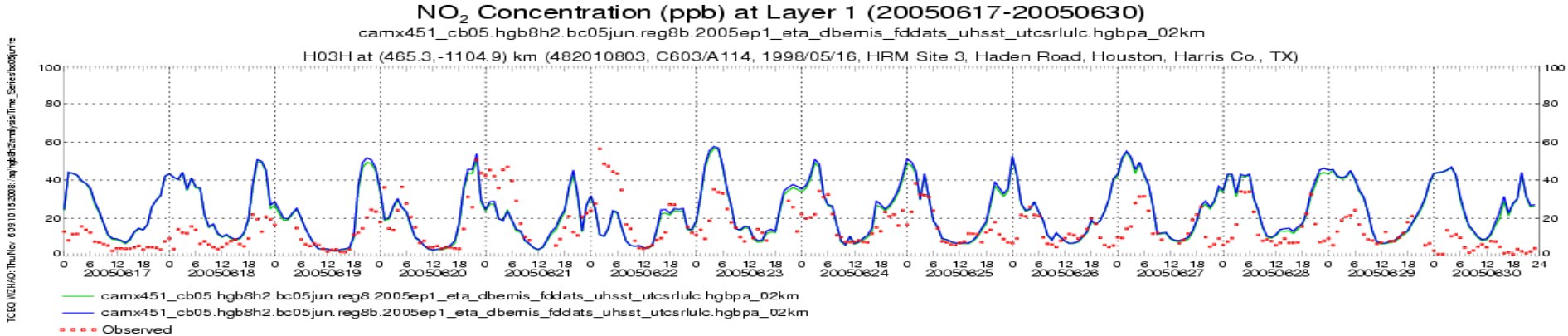
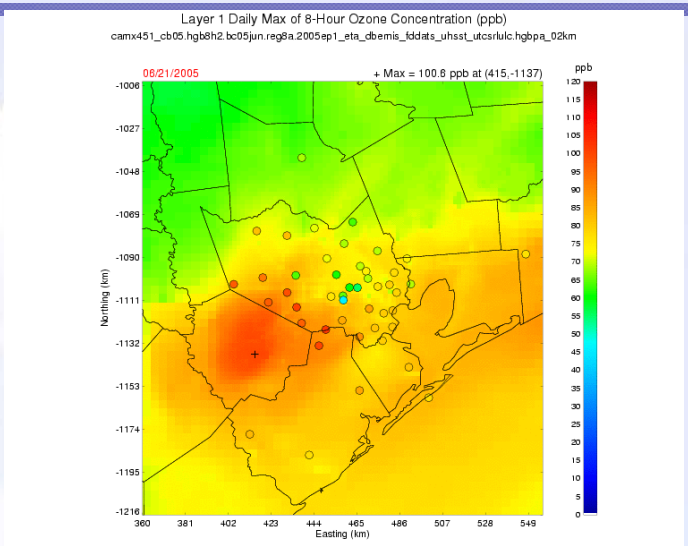


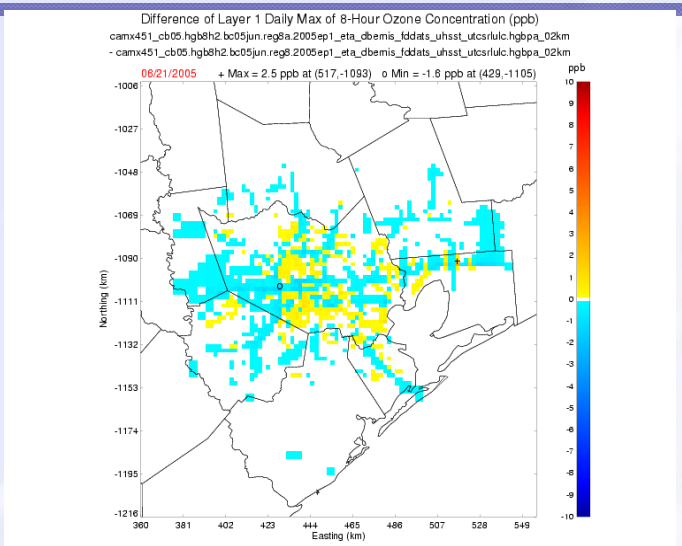



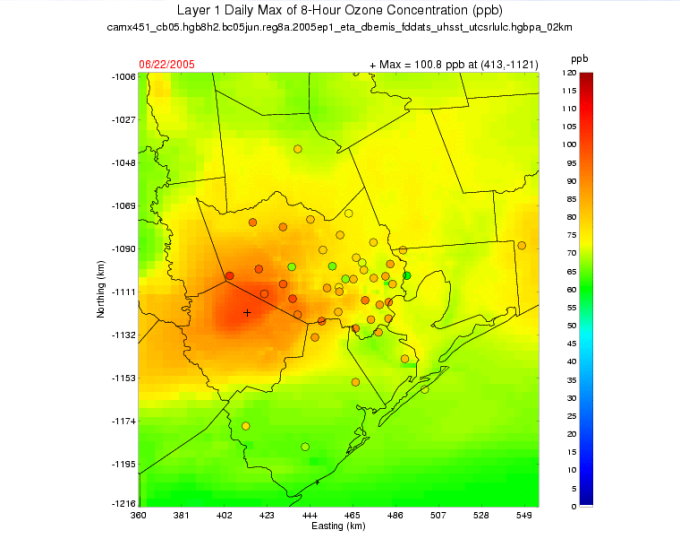
# Comparison of Graphical Measures

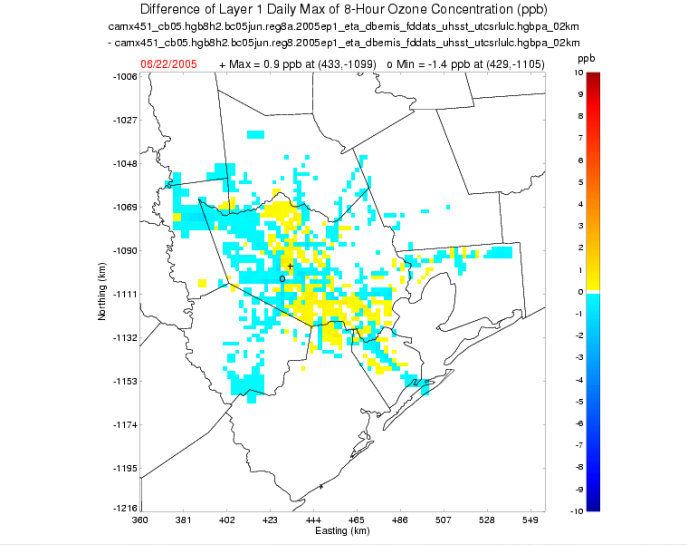
**June 21, 2005**




**June 22, 2005**



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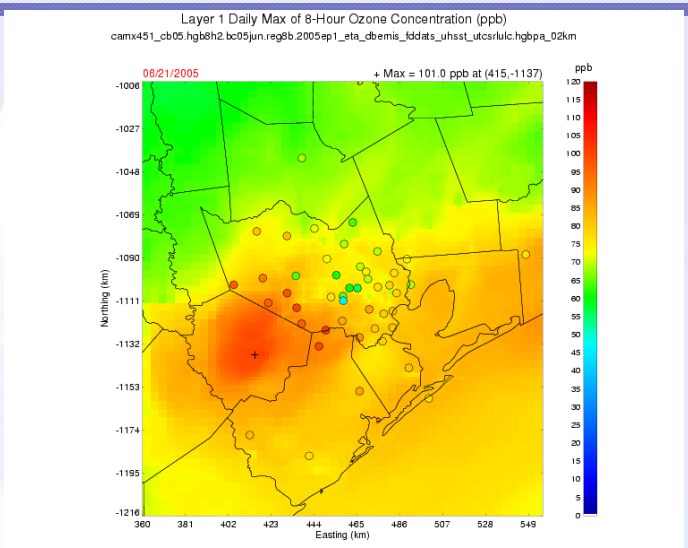


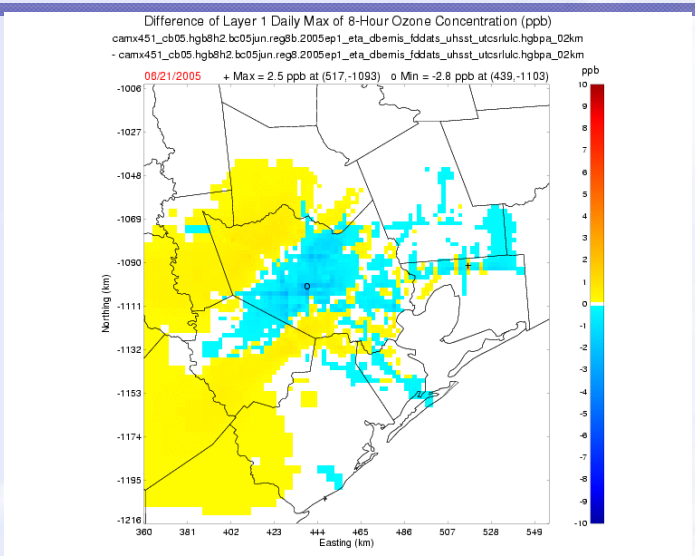


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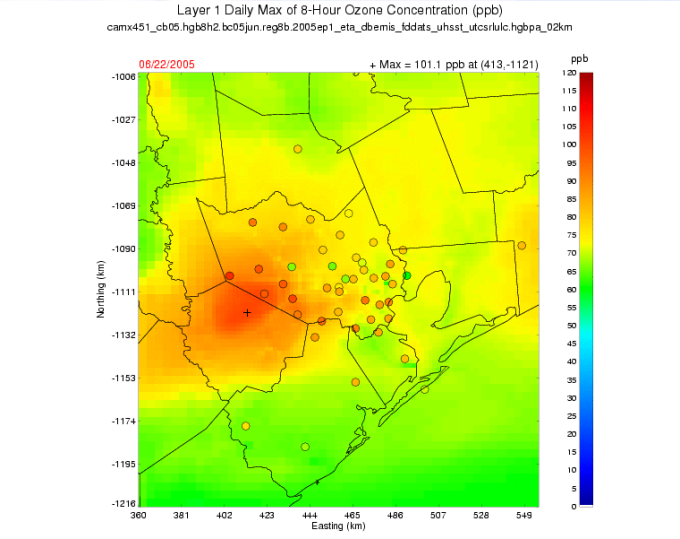


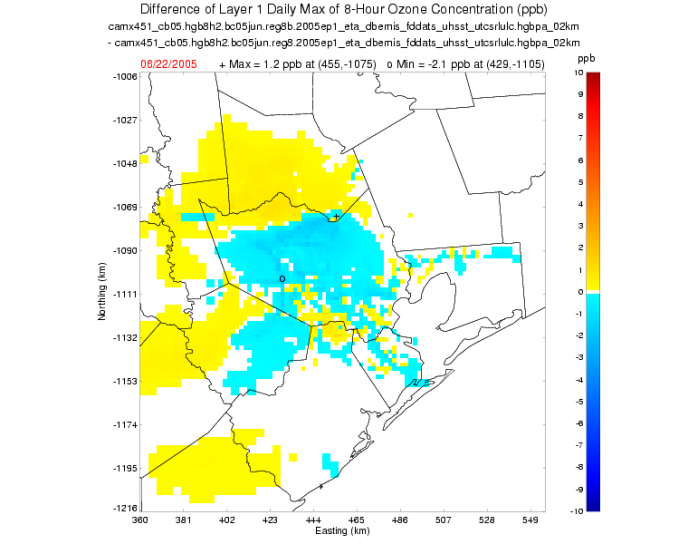

# Summary

- Emission Adjustments
  - The on-road update redistributed emissions during the 4 pm – 7 pm and 7 pm – 5 am time periods
  - Non-road update
    - Redistributed construction emissions
    - Revised emissions added 8.7 tpd $NO_X$ and 4.6 tpd VOC
- Modeling Results
  - Statistical Measures
    - Minor changes to the hourly peak ozone and relative bias
    - No change to the maximum daily 8-hour ozone
  - Graphical Measures
    - Minor changes to hourly time series of $O_3$, NO and $NO_2$
    - Minor changes in the geographical distribution of the maximum daily 8-hour ozone