



Texas Commission on Environmental Quality

HGB Ozone Modeling Update

Southeast Texas Photochemical Modeling
Technical Committee

February 15, 2006



Modeling Overview

- New base case modeling has been completed for the August 16-September 6, 2000, TexAQS Episode.
- The modeling uses a meteorological characterization originally developed by the University of Houston, modified by TCEQ modeling staff.
- Staff are confident that the new base case overall is the best modeling ever performed for the Houston area.
- New 2000 baseline and 2009 future base inventories are nearing completion. New 2009 results are expected to be completed in the next two weeks.



Contents

- **Meteorology Overview (B. Dornblaser)**
 - Discussion of newest meteorological characterization.
 - Whisker Plots.
 - Vertical wind speed & direction plots.
 - MM5 Predicted PBL Height vs Profiler PBL Heights.
- **CAMx Model Overview (D. Karp)**
 - Emissions updates.
 - Model performance statistics.
 - Time series.
 - Ozone video.



Discussion of newest meteorological characterization

- NOAH Land Surface Model with new land use categories developed by the University of Houston.
- Emissivity values from NASA study.
- Eta PBL scheme.
- Vertical mixing (K_v) for CAMx derived from Turbulent Kinetic Energy (TKE).

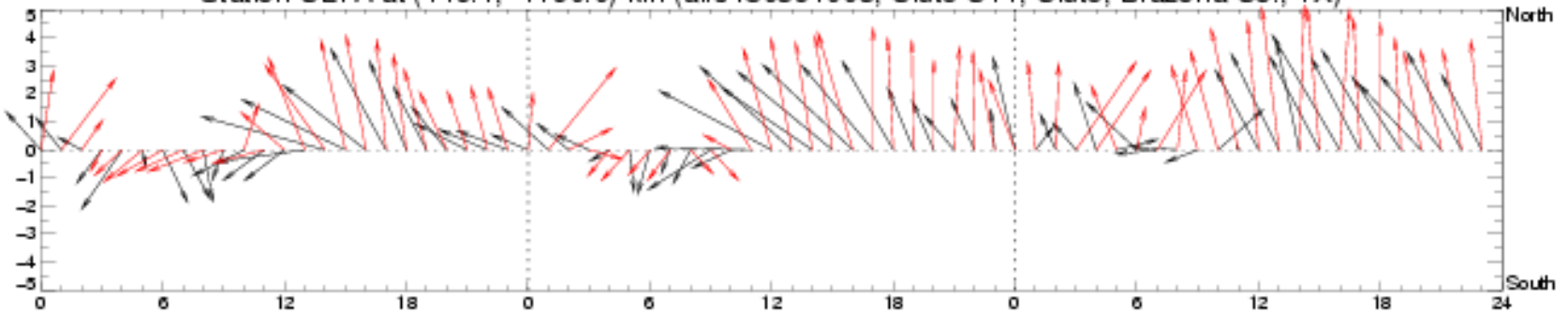


Whisker plots

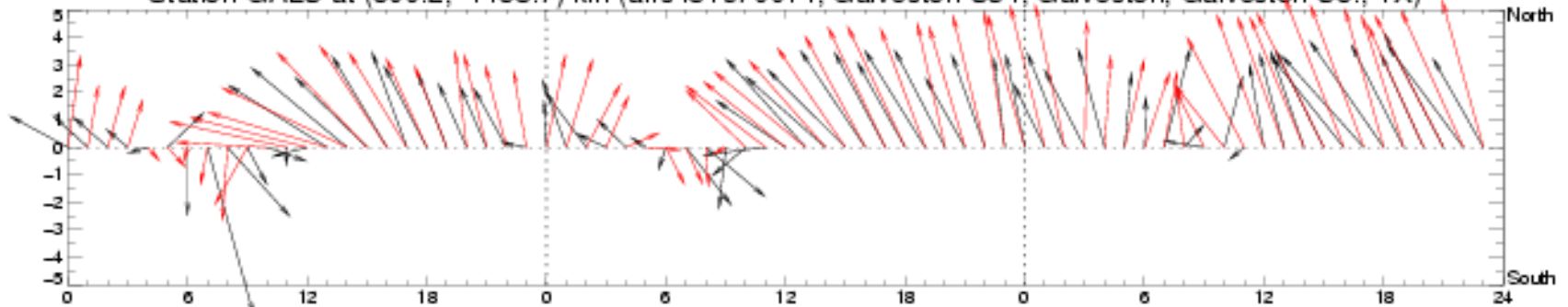
- Whisker plots compare modeled wind speed and direction with observations at surface stations.

Horizontal Wind (m/s) at Layer 1 (08/25/2000-08/27/2000)
MM5 NOAH LSM Eta-pbl CAMx Horizontal Wind (cell values)

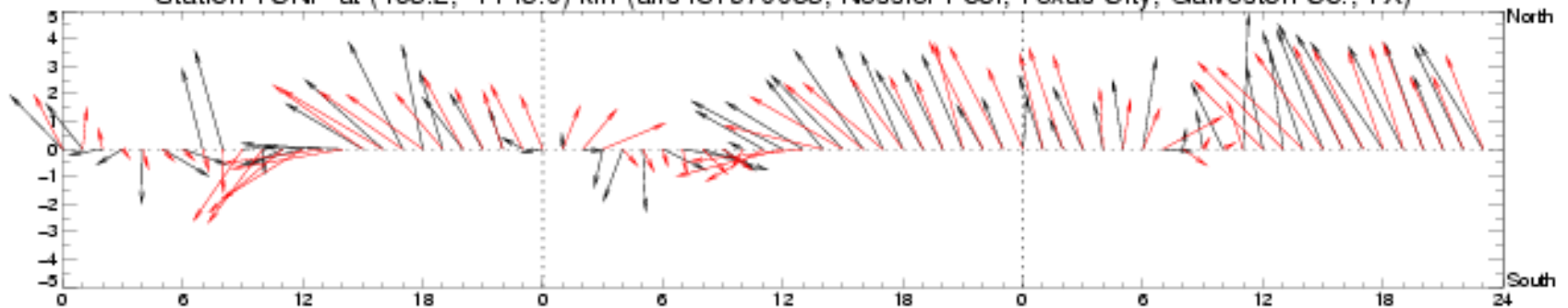
Station CLTA at (449.1, -1190.0) km (airs480391003, Clute C11, Clute, Brazoria Co., TX)



Station GALC at (500.2, -1158.7) km (airs481670014, Galveston C34, Galveston, Galveston Co., TX)



Station TCNP at (493.2, -1145.0) km (airs481670053, Nessler Pool, Texas City, Galveston Co., TX)



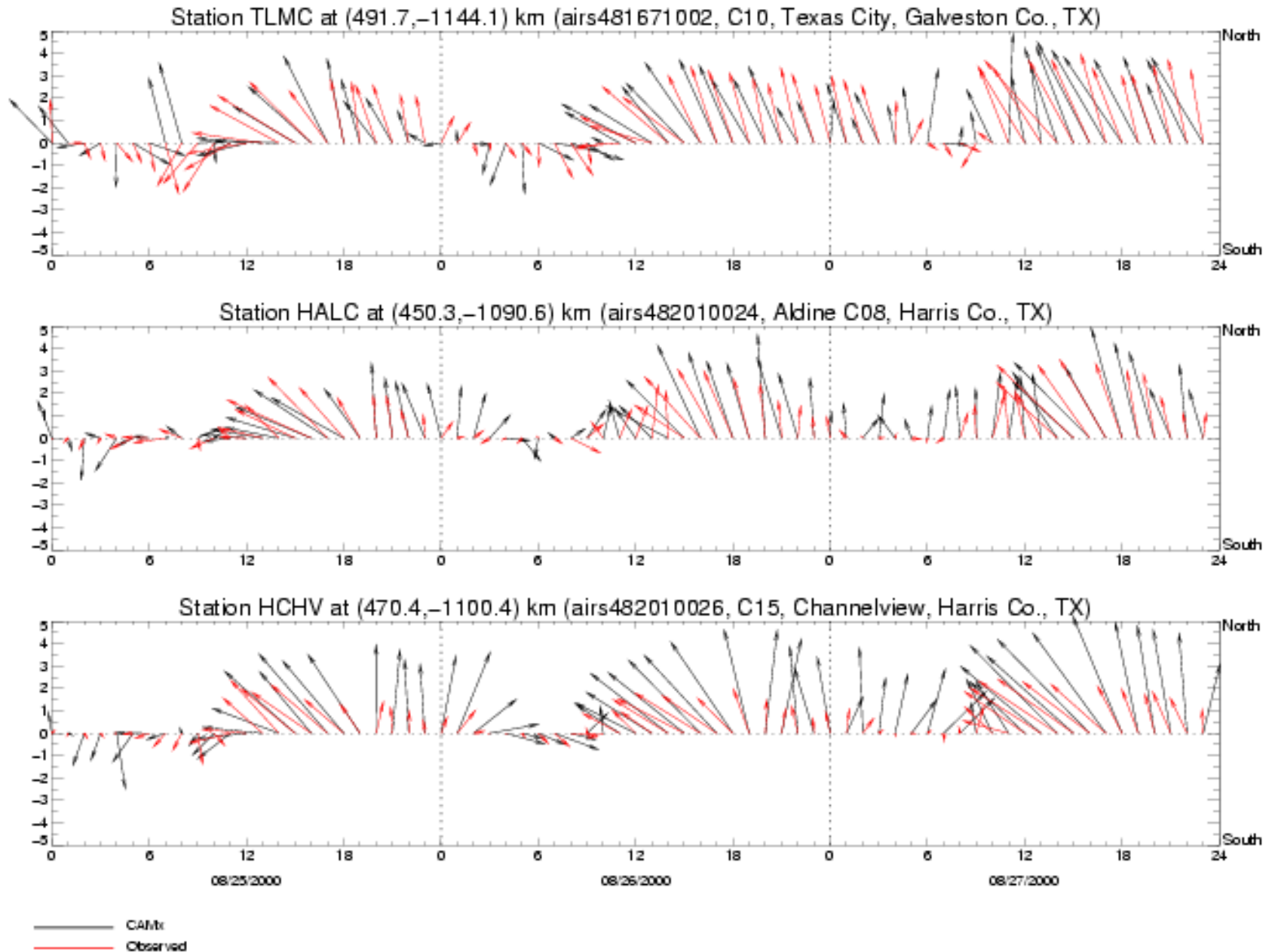
08/25/2000

08/26/2000

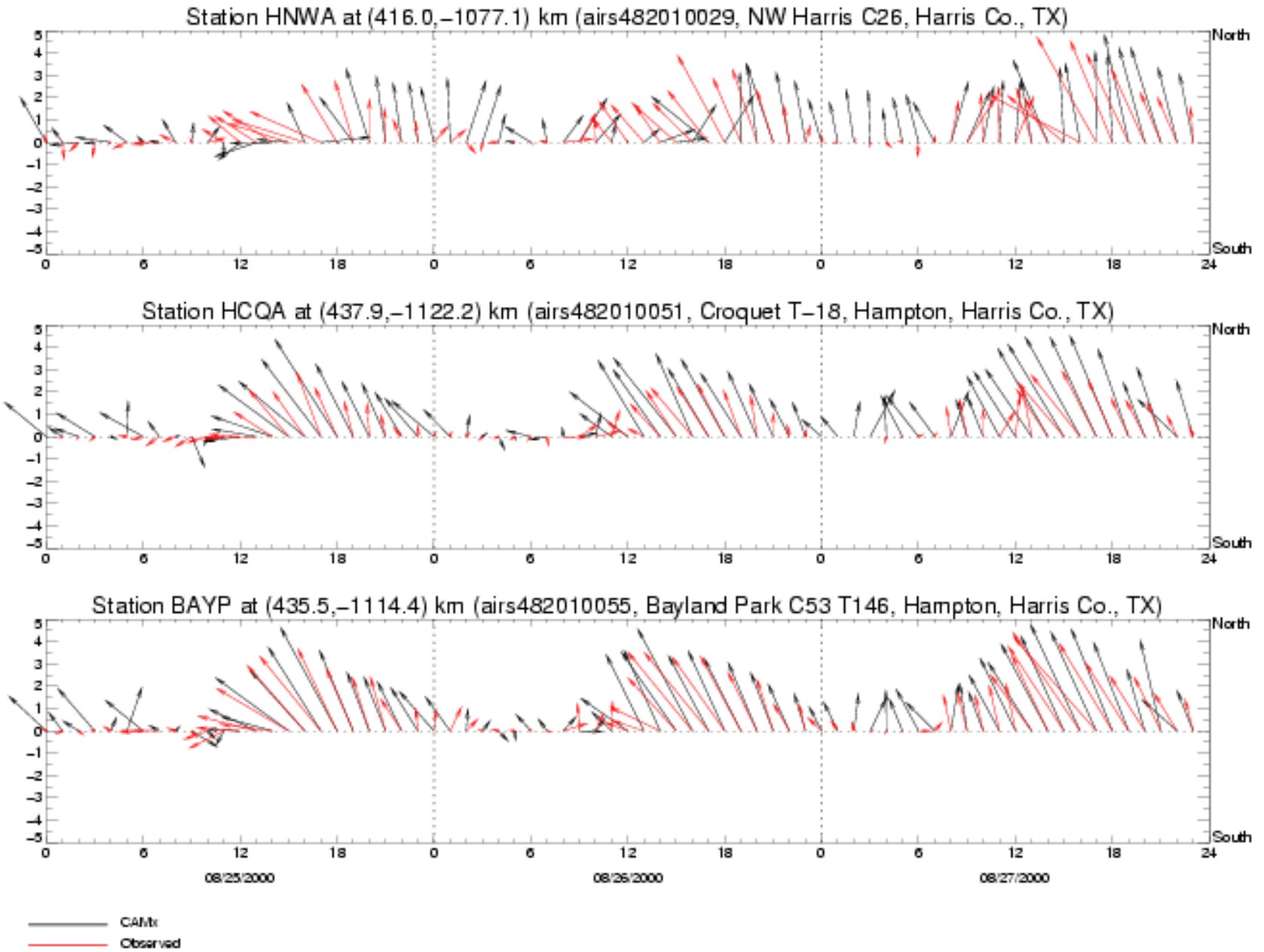
08/27/2000

— CAMx
— Observed

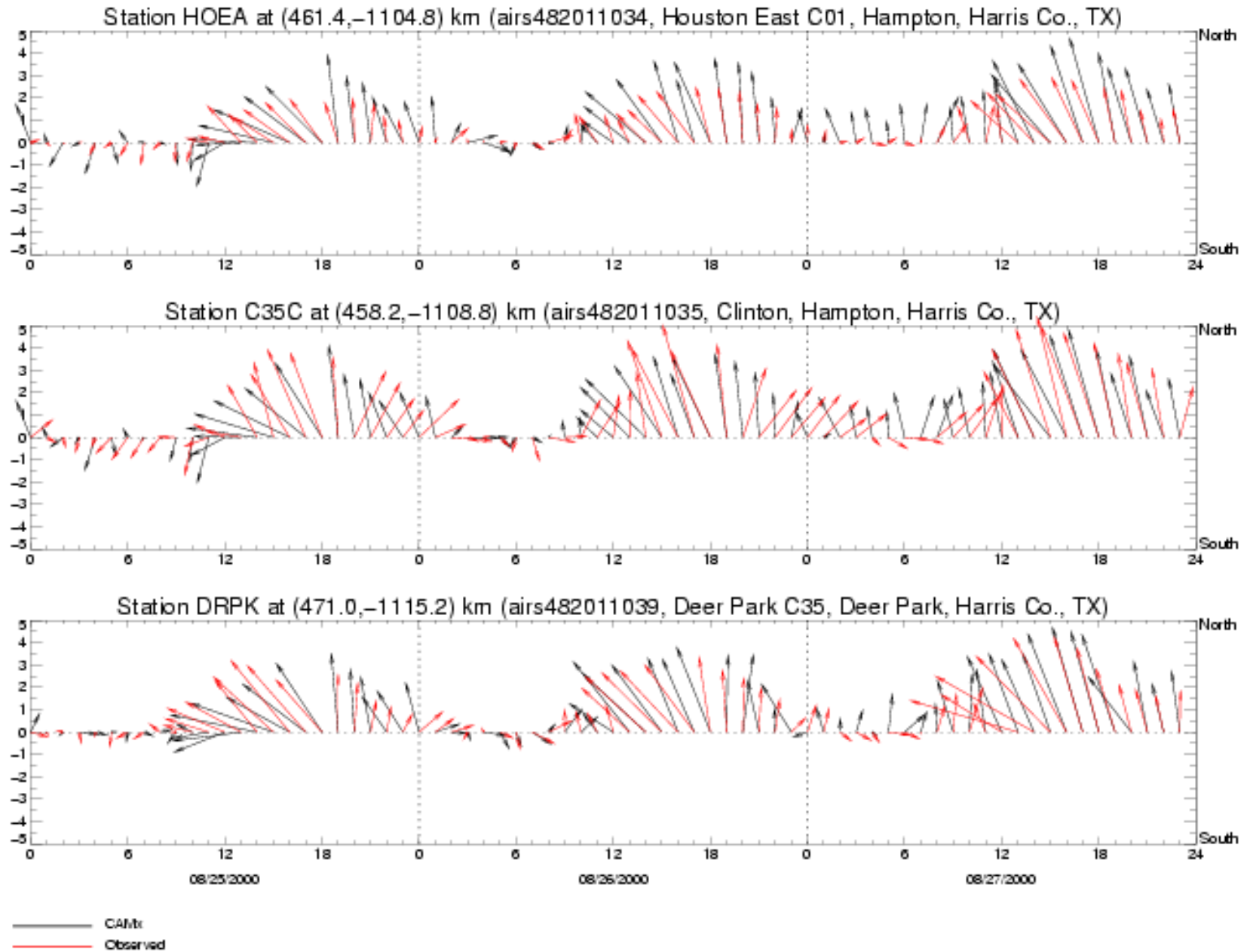
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MM5 NOAH LSM Eta-pbl CAMx Horizontal Wind (cell values)



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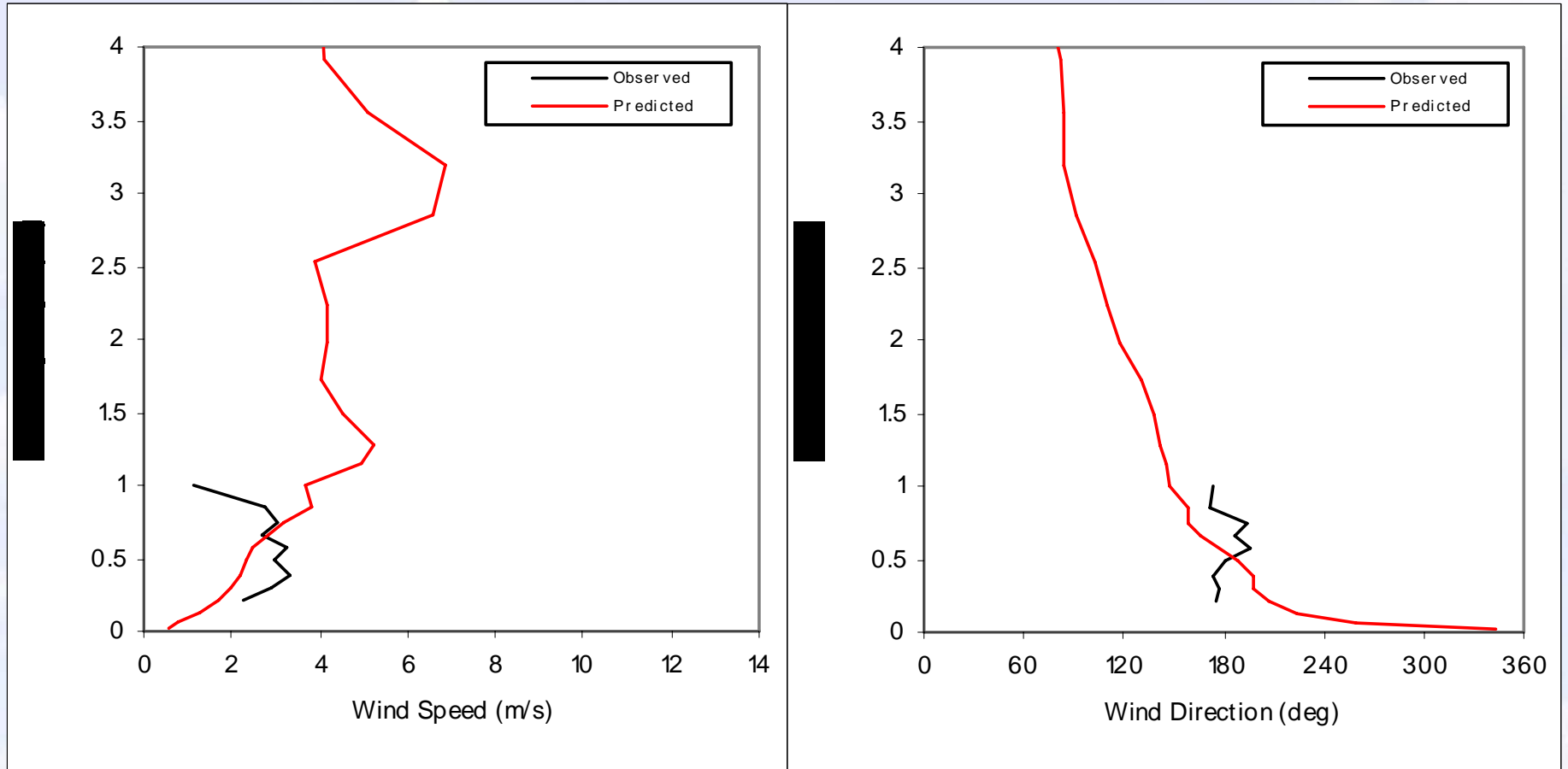


Vertical wind speed & direction plots

- Vertical wind speed & direction plots compare modeled wind speed & direction with measurements made by sondes (balloons).

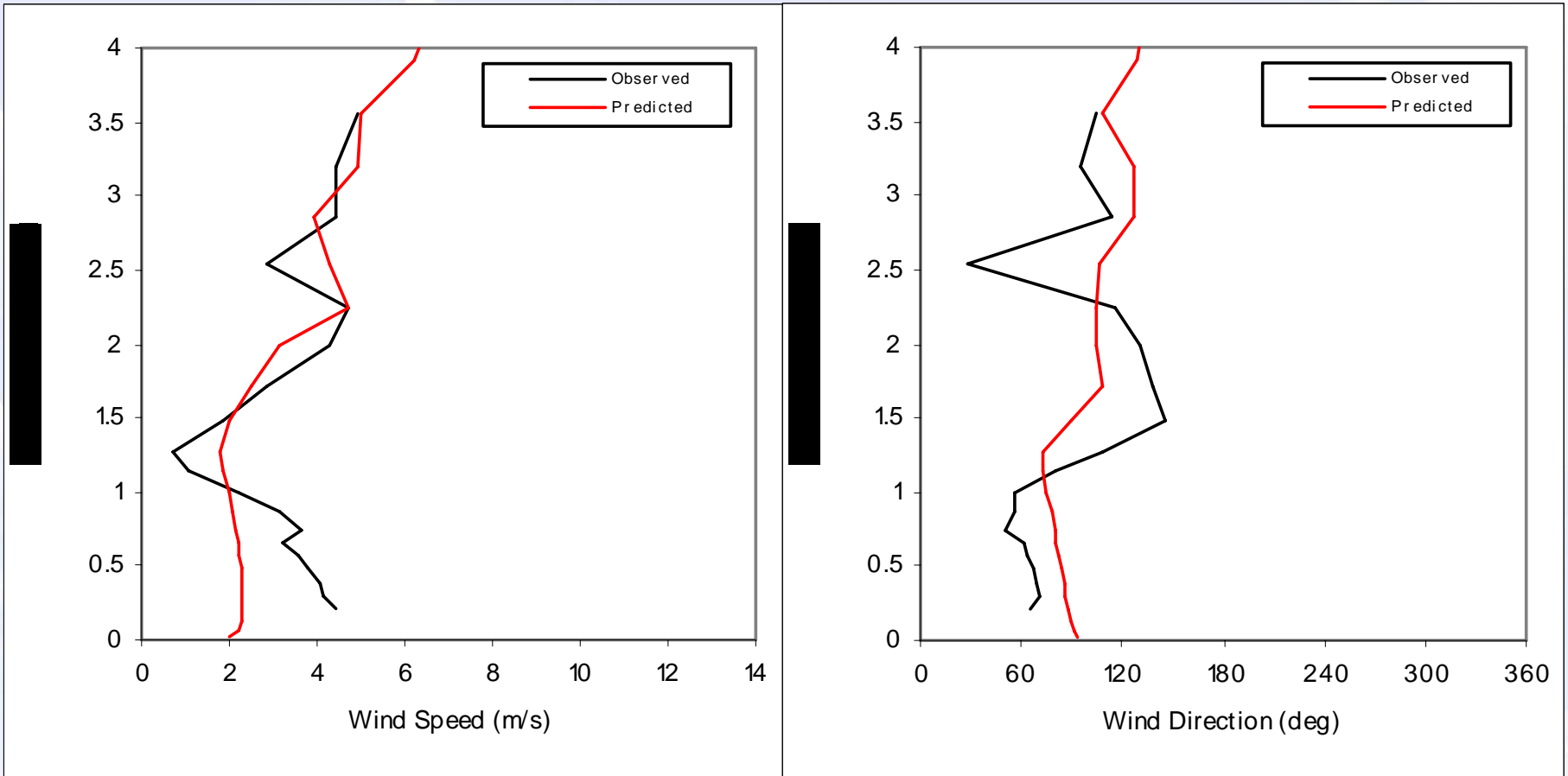


Ellington Field August 25, 2000 – 6:00 am



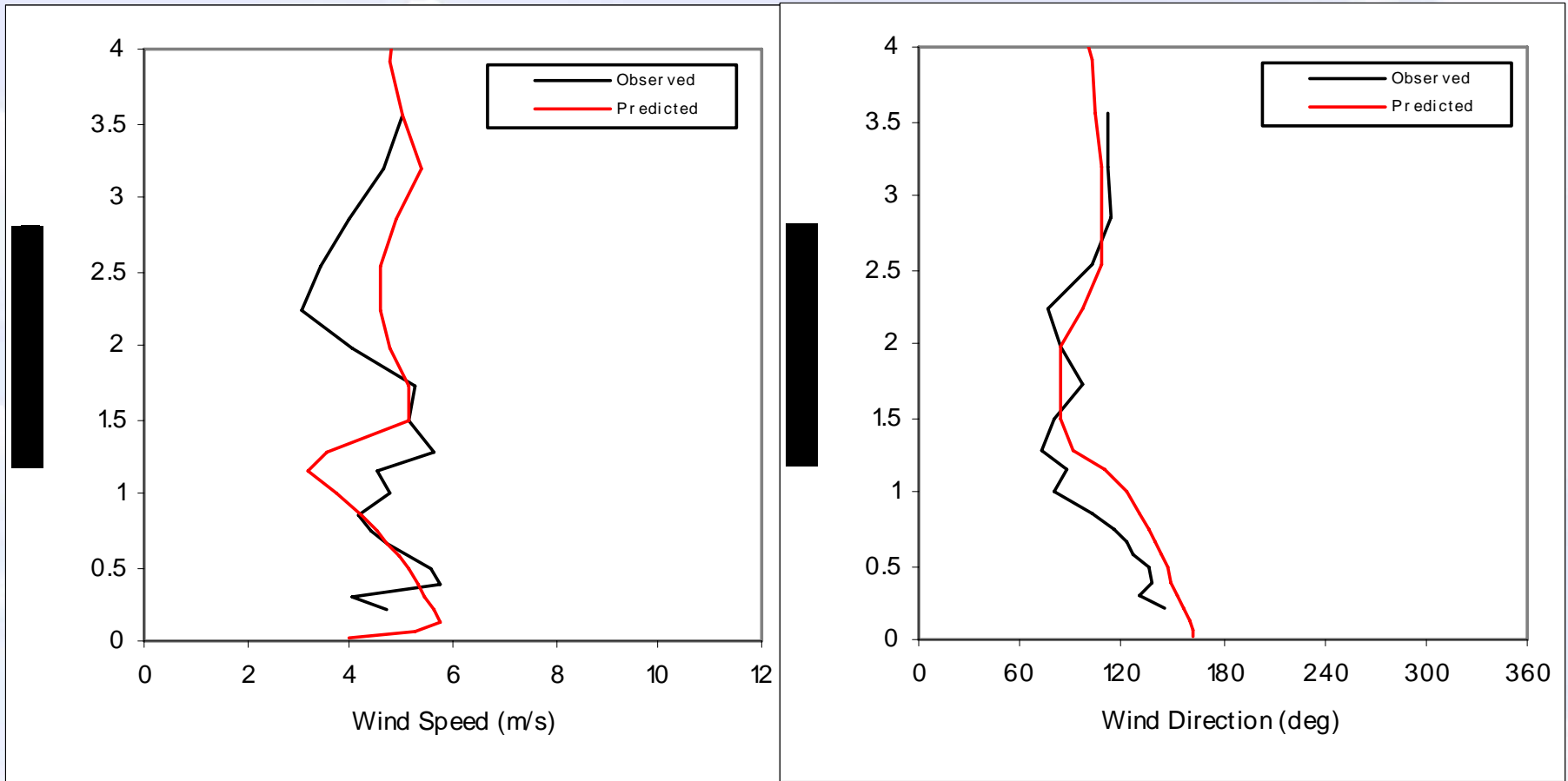


Ellington Field August 25, 2000 – 12 Noon



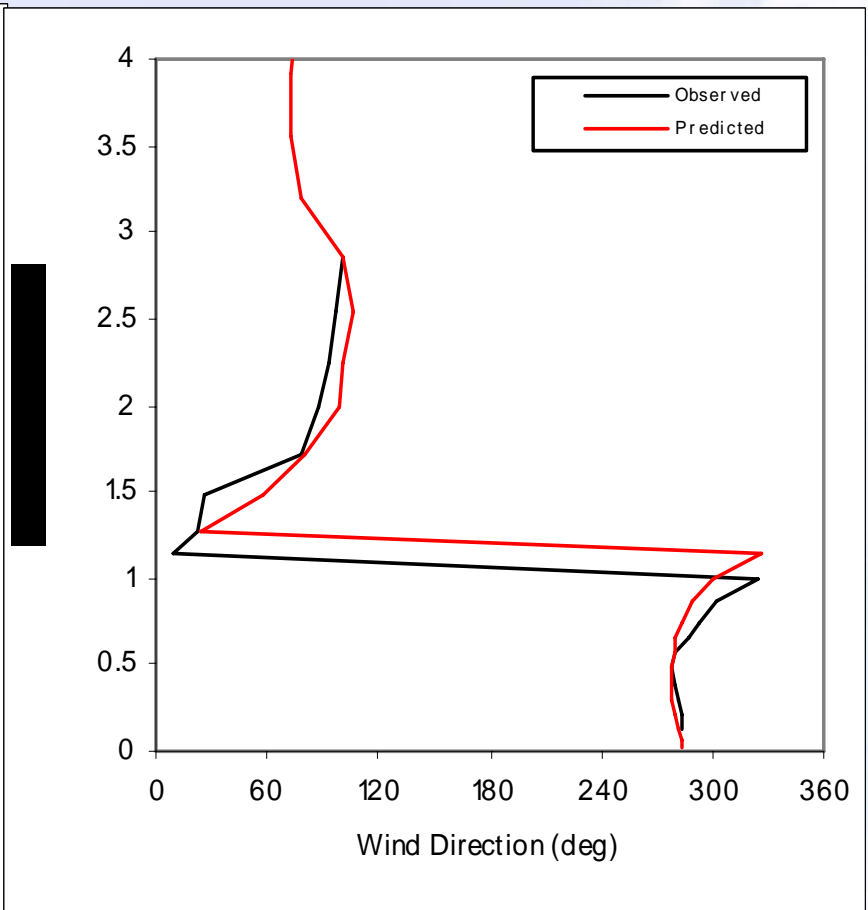
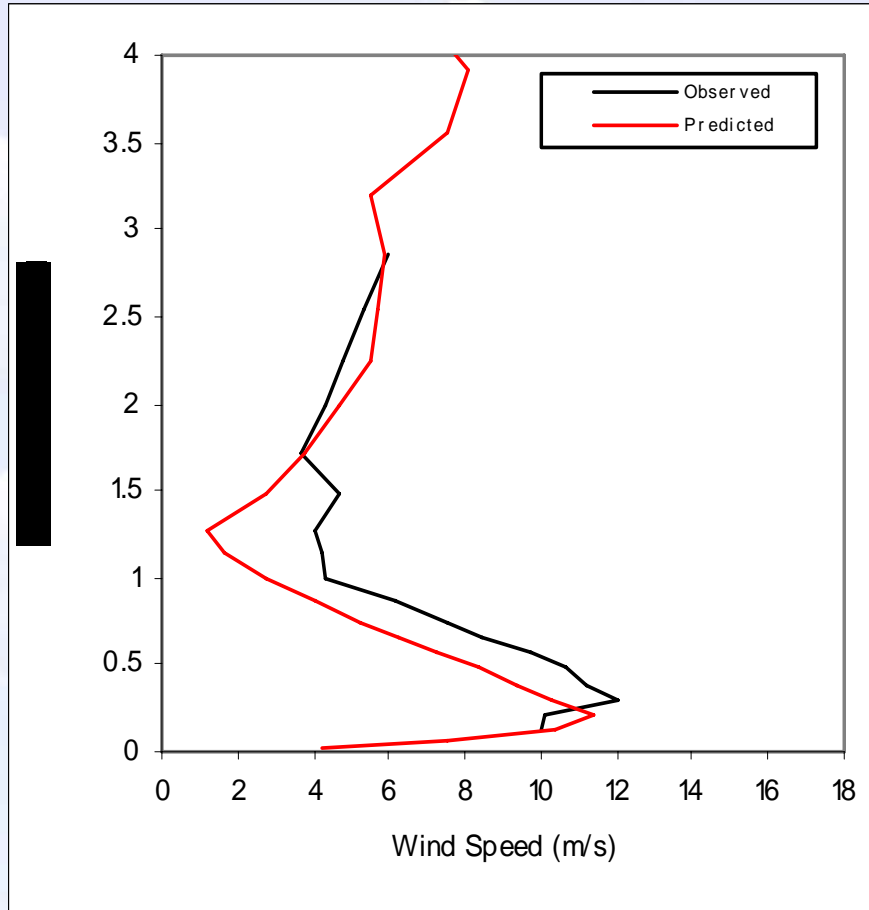


Ellington Field August 25, 2000 – 6:00 pm



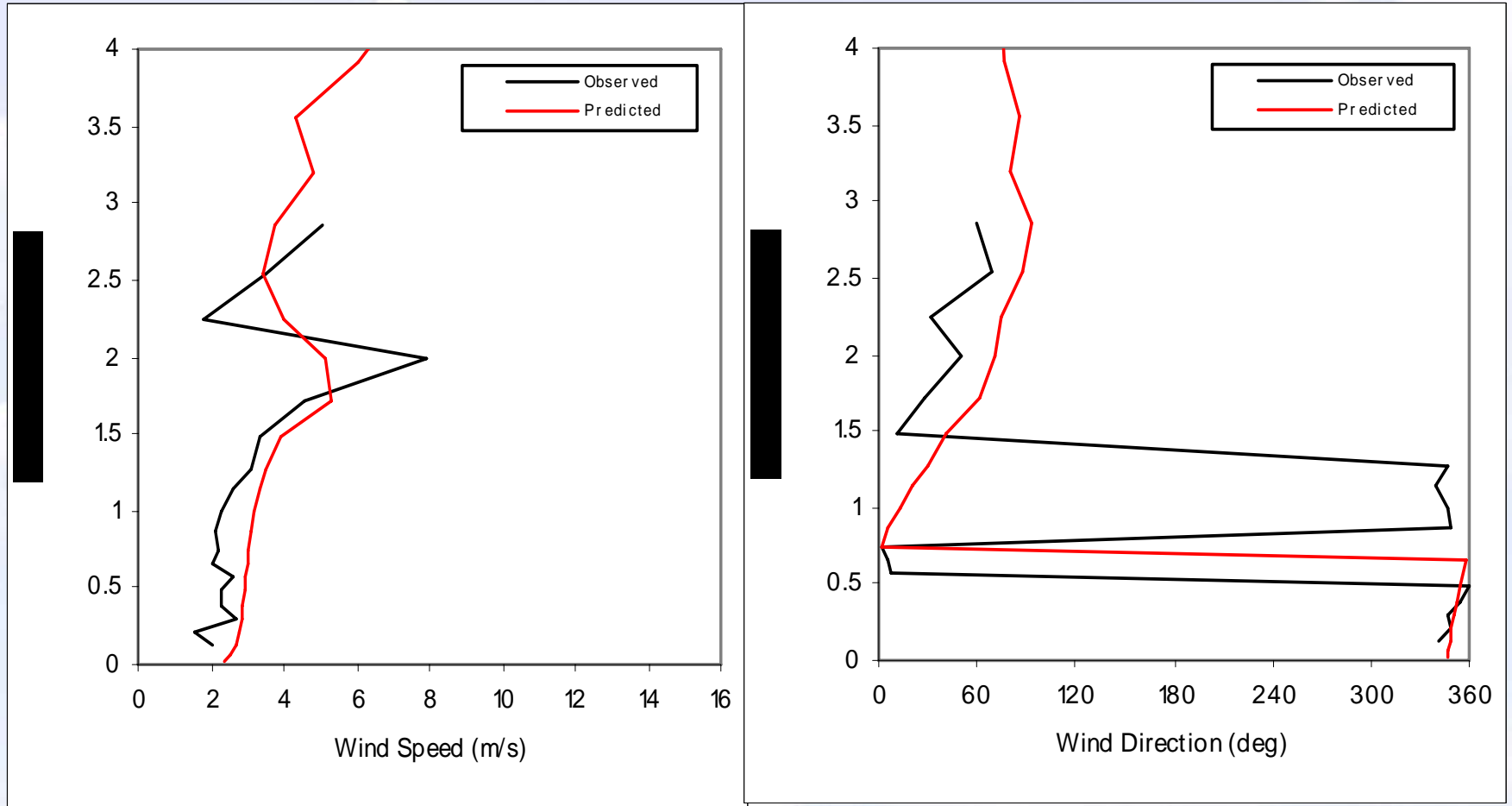


Liberty County August 31, 2000 – 6:00 am



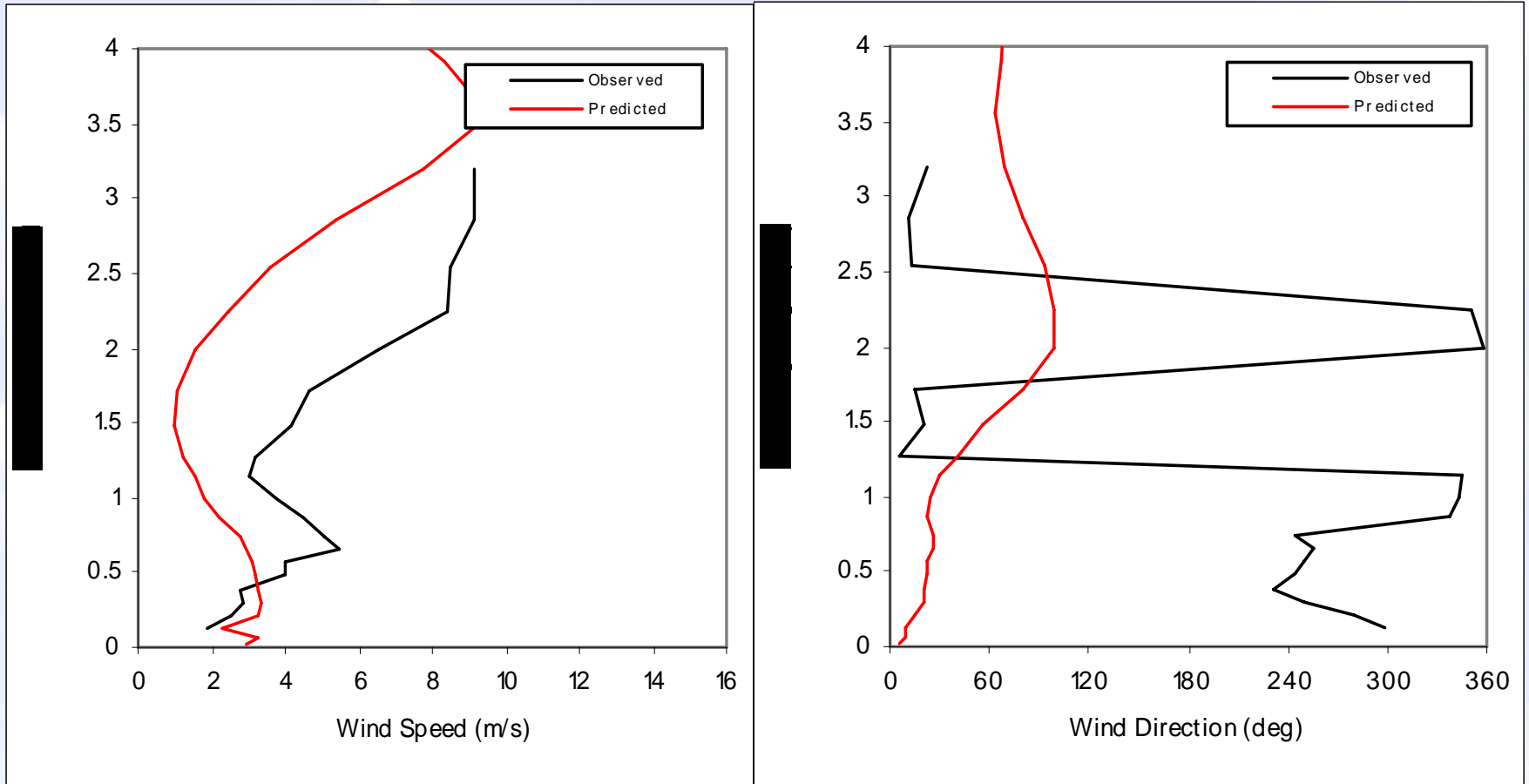


Liberty County August 31, 2000 - 12 Noon





Liberty County August 31, 2000 – 6:00 pm





MM5 Predicted PBL vs Profiler PBL Heights

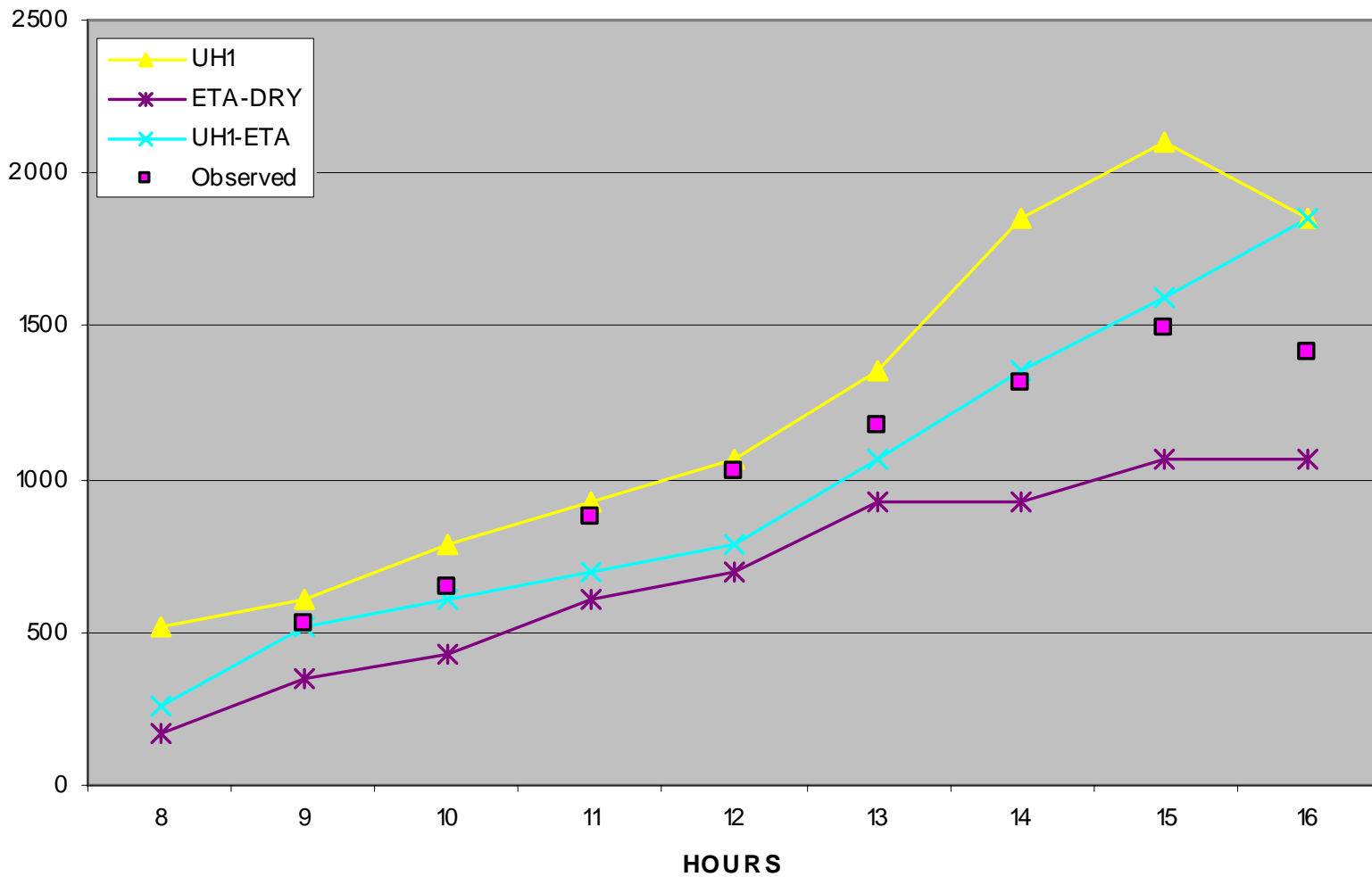
- Compares the predictions of PBL Height by different configurations of MM5 with Profiler Observations.
- MM5 PBL Heights extracted from grid cells where profilers are geographically located.
- Morning PBL growth may be as important as afternoon maximum heights.

MM5 Predicted PBL vs Measured PBL

Ellington Field Profiler, August 30, 2000



ELL Various PBLs vs OBS Aug 30th

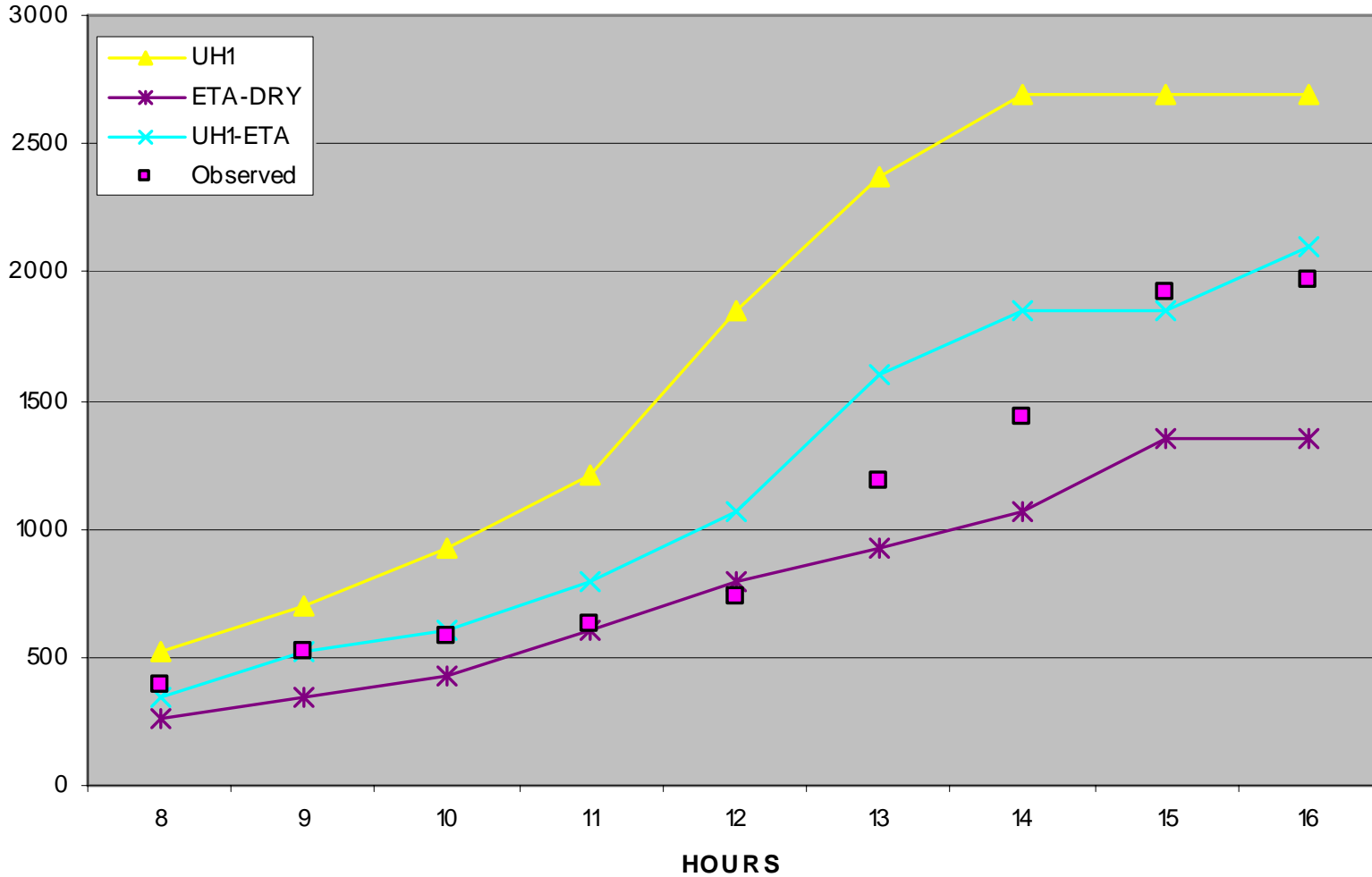


MM5 Predicted PBL vs Measured PBL

Ellington Field Profiler, September 1, 2000



ELL Various PBLs vs OBS Sep 1st

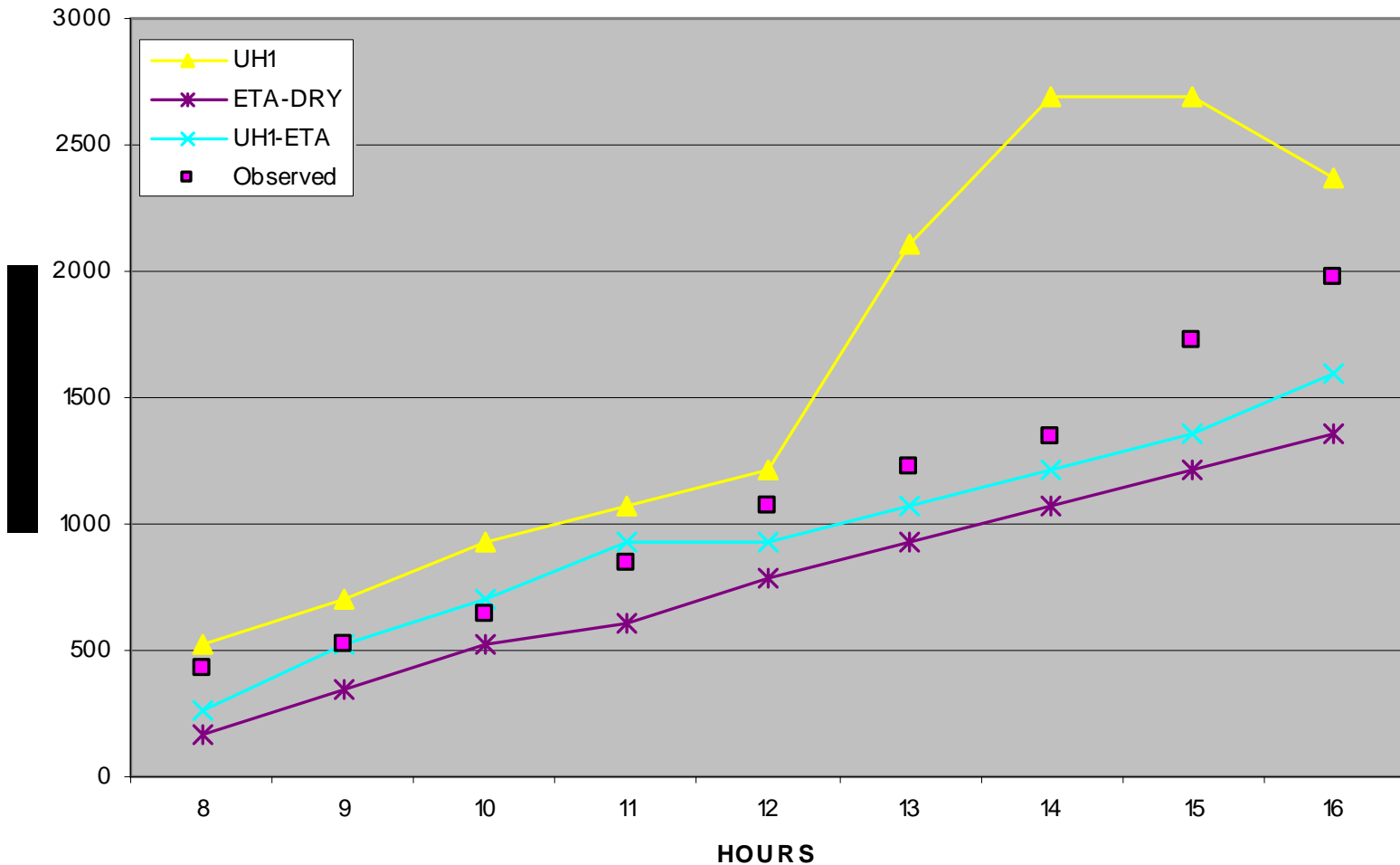


MM5 Predicted PBL vs Measured PBL

Houston Southwest Profiler, August 30, 2000



HOU Various PBLs vs OBS Aug 30th

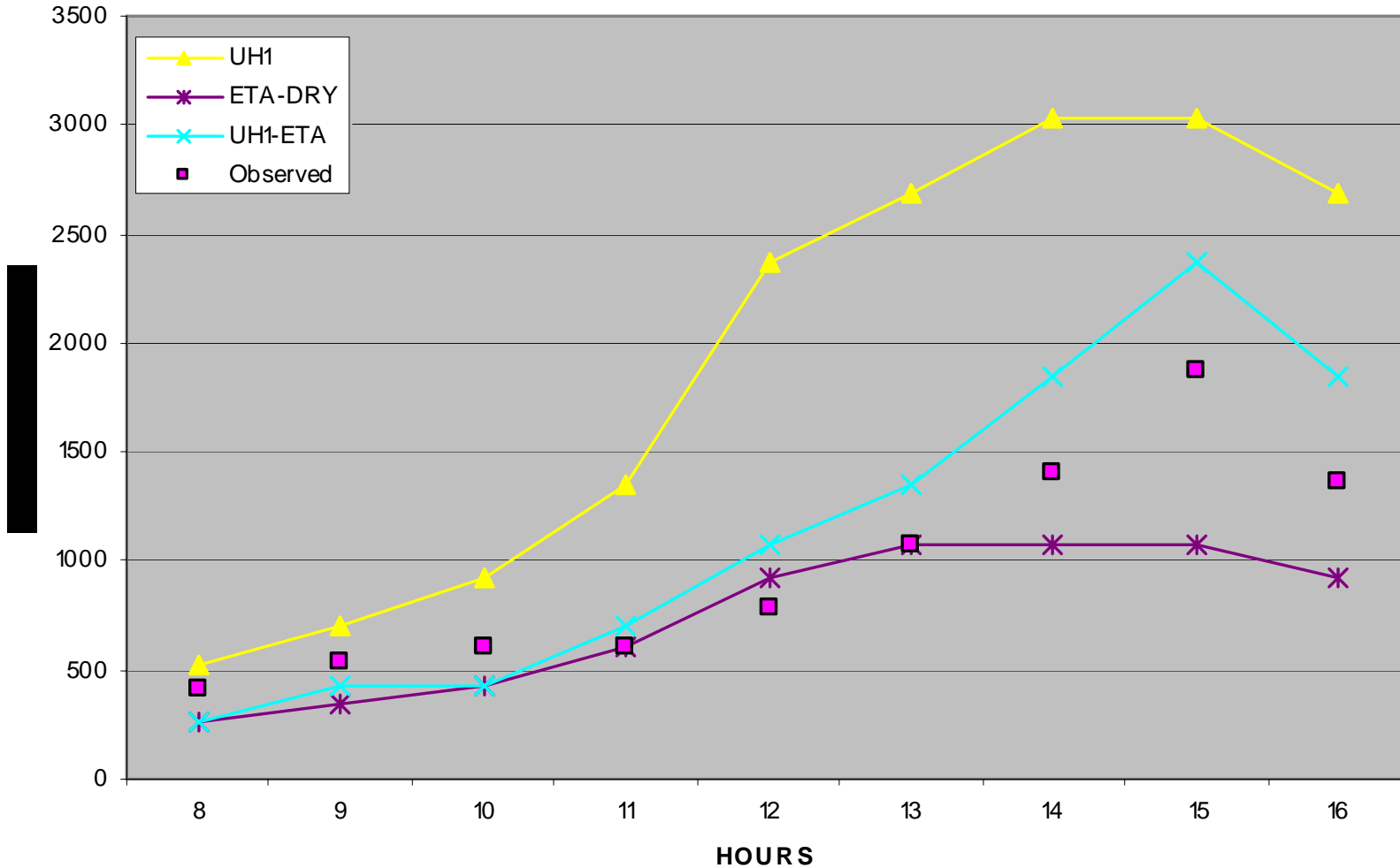




MM5 Predicted PBL vs Measured PBL

Houston Southwest Profiler, September 1, 2000

HOU Various PBLs vs OBS Sep 1st

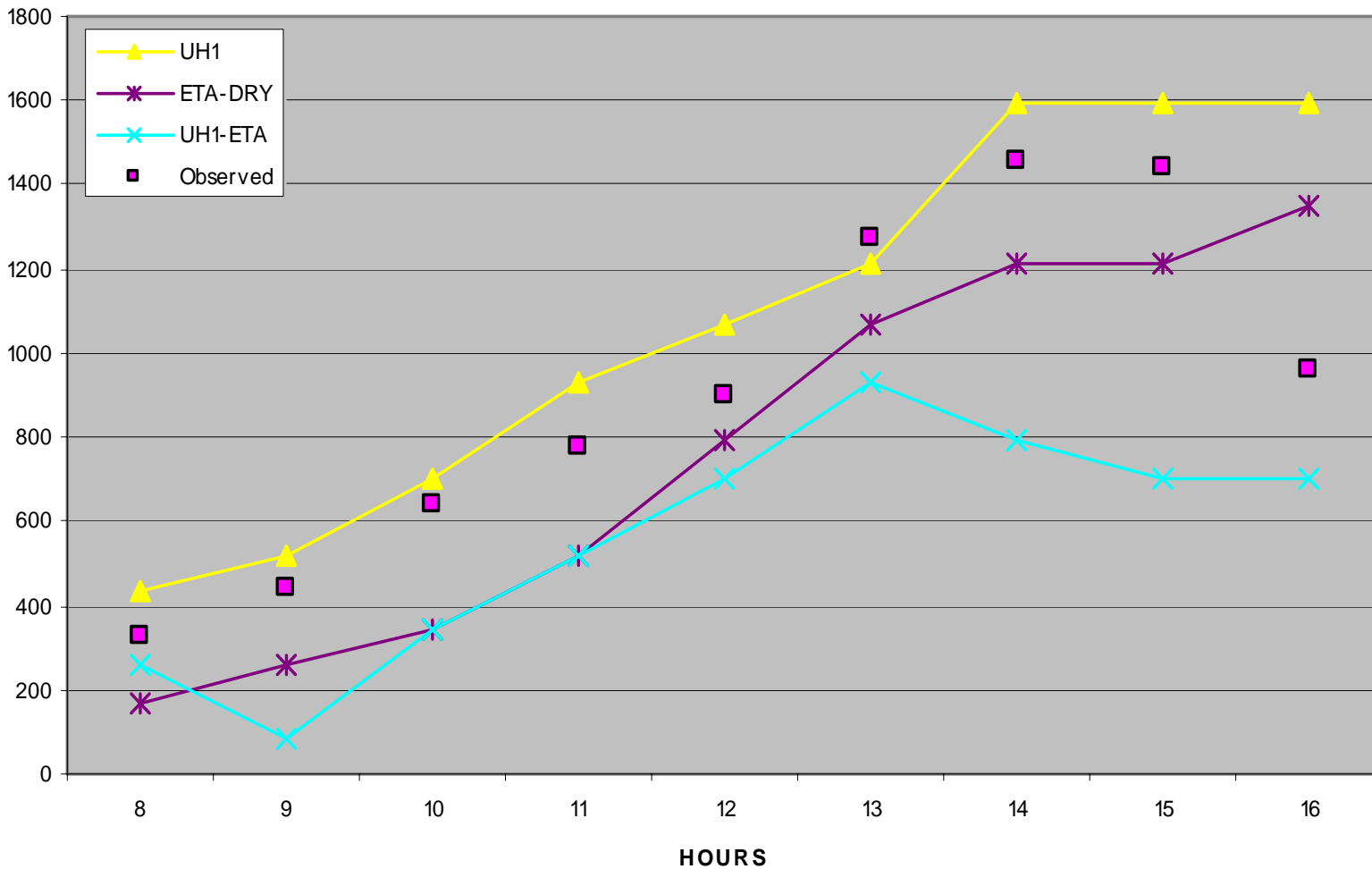




MM5 Predicted PBL vs Measured PBL

Liberty County Profiler, August 30, 2000

LMA Various PBLs vs OBS Aug 30th

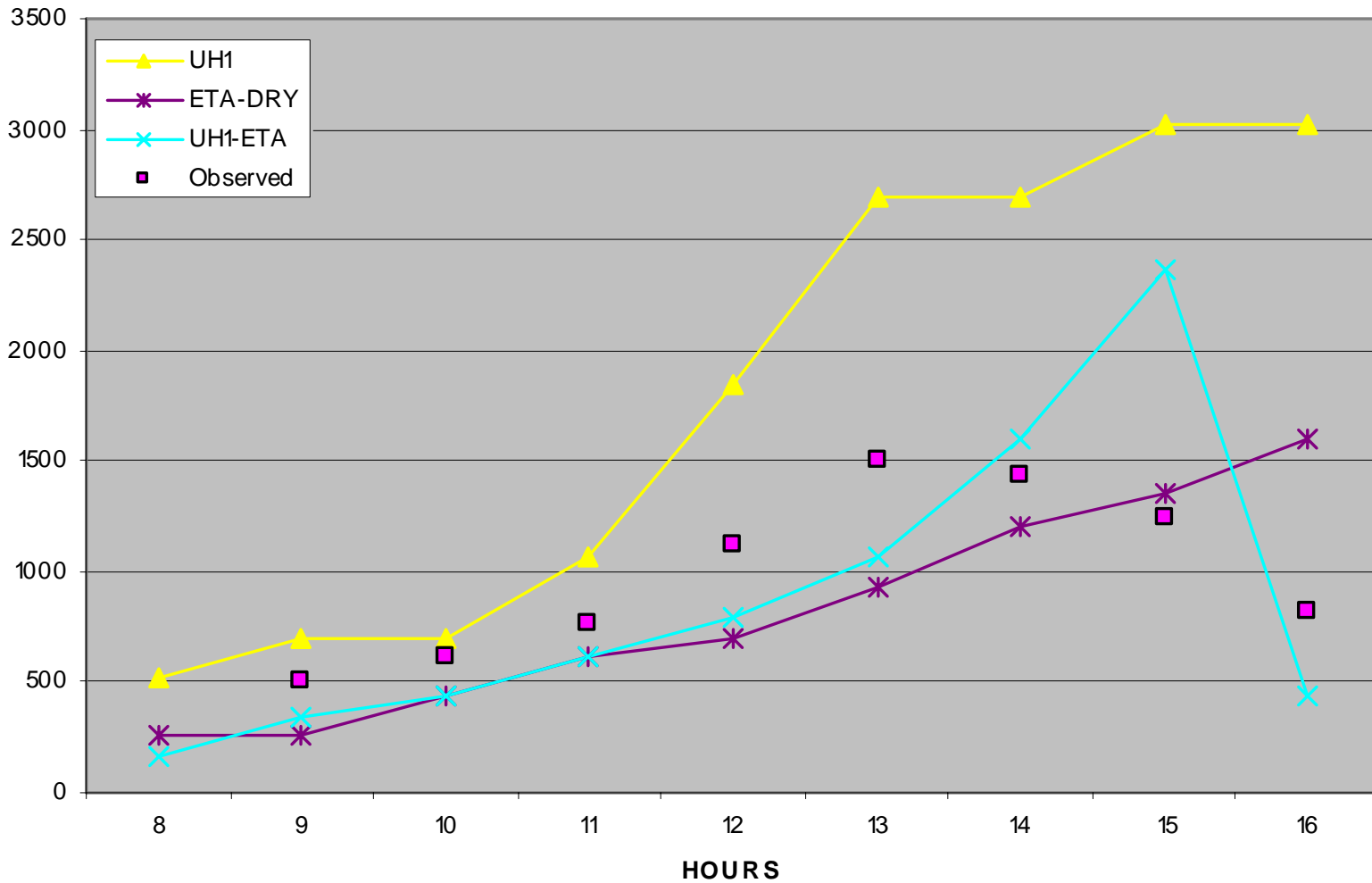


MM5 Predicted PBL vs Measured PBL

Liberty County Profiler, September 1, 2000



LMA Various PBLs vs OBS Sep 1st





CAMx Model Overview

- Model episode now runs from August 16 to September 6, 2000.
- Expanded Domain – Entire Eastern U.S.
- Emissions updates:
 - Updated area/nonroad emissions
 - New offshore emissions from Gulf of Mexico Air Quality Study (GMAQS)
 - Emissions for expanded modeling domain, including Canada



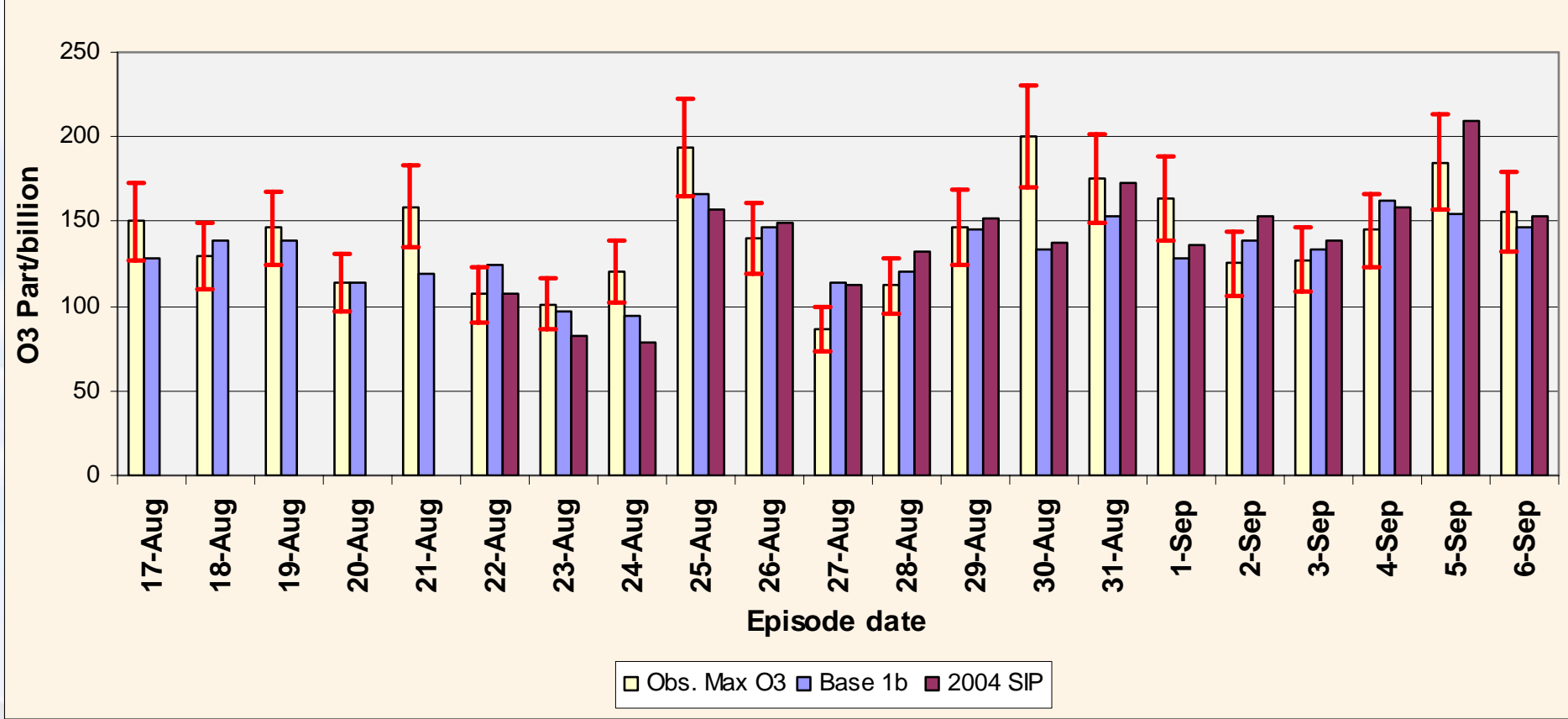
Model Performance Statistics

- Provide a summary of how well the model replicates observed ozone on each day of the episode.



1-Hour Unpaired Peak Accuracy

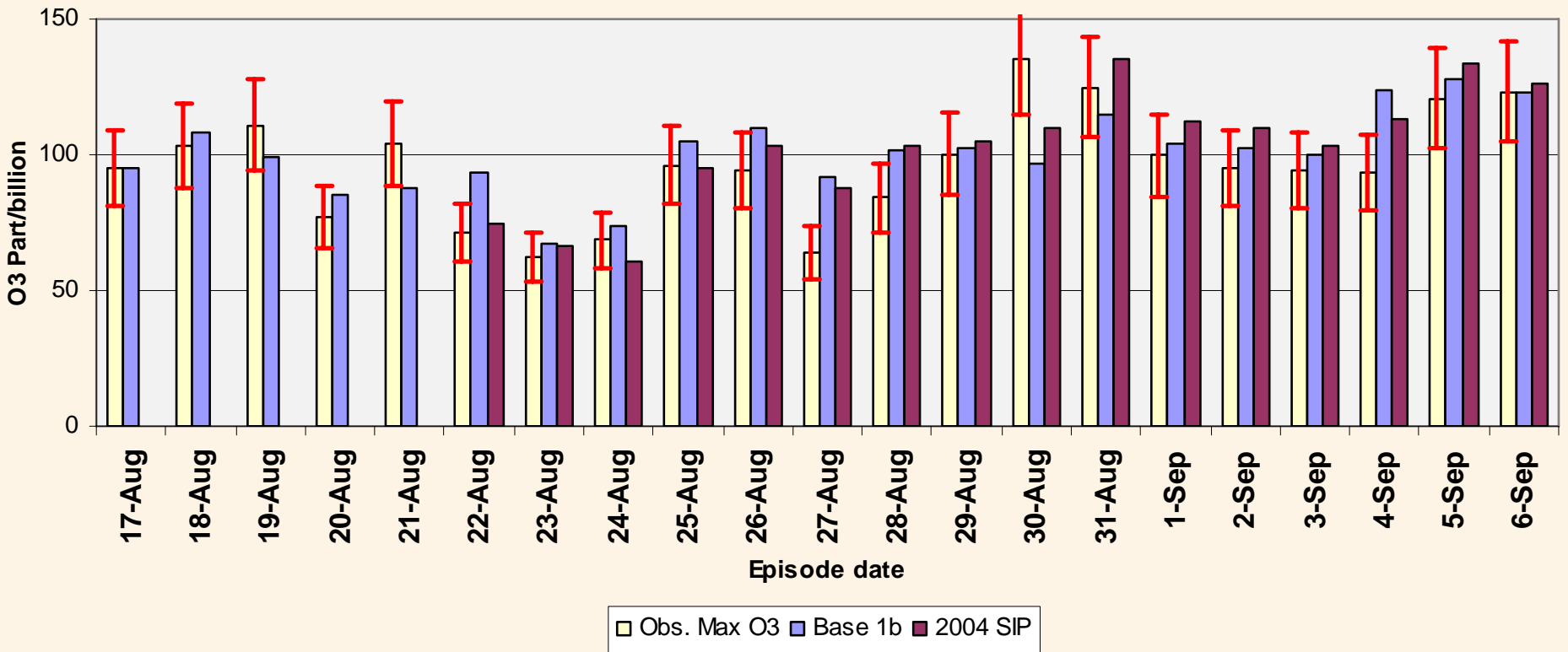
Measured vs. Modeled Peak Ozone Concentration





8-Hour Unpaired Peak Accuracy

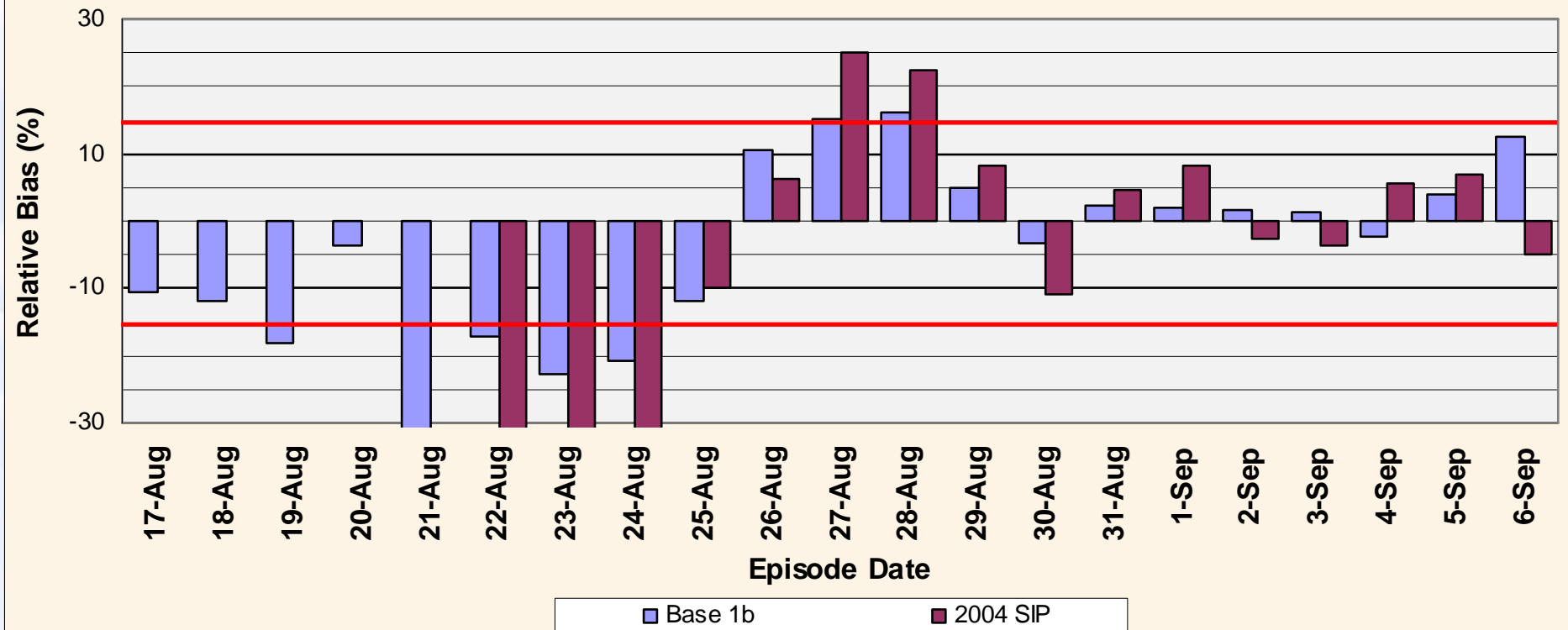
Measured vs. Modeled Peak 8-HR Ozone Concentration





1-Hour Bias

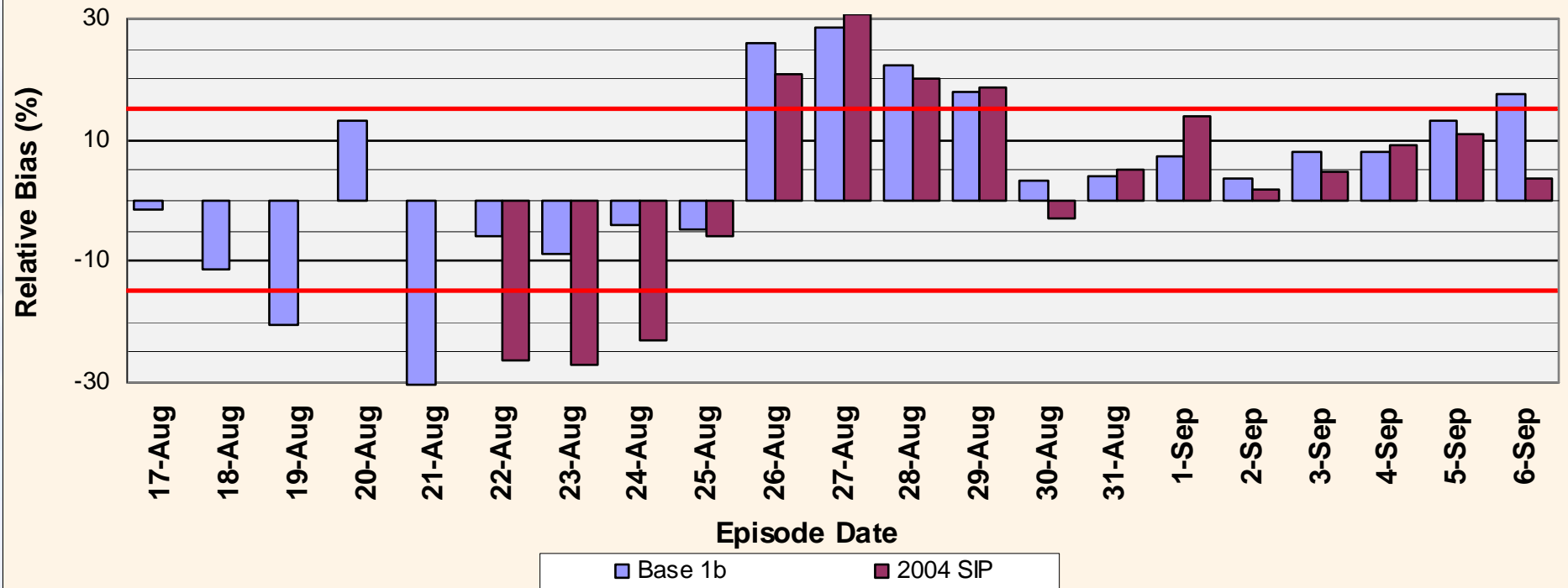
1-Hour Bias (HGB)





8-Hour Bias

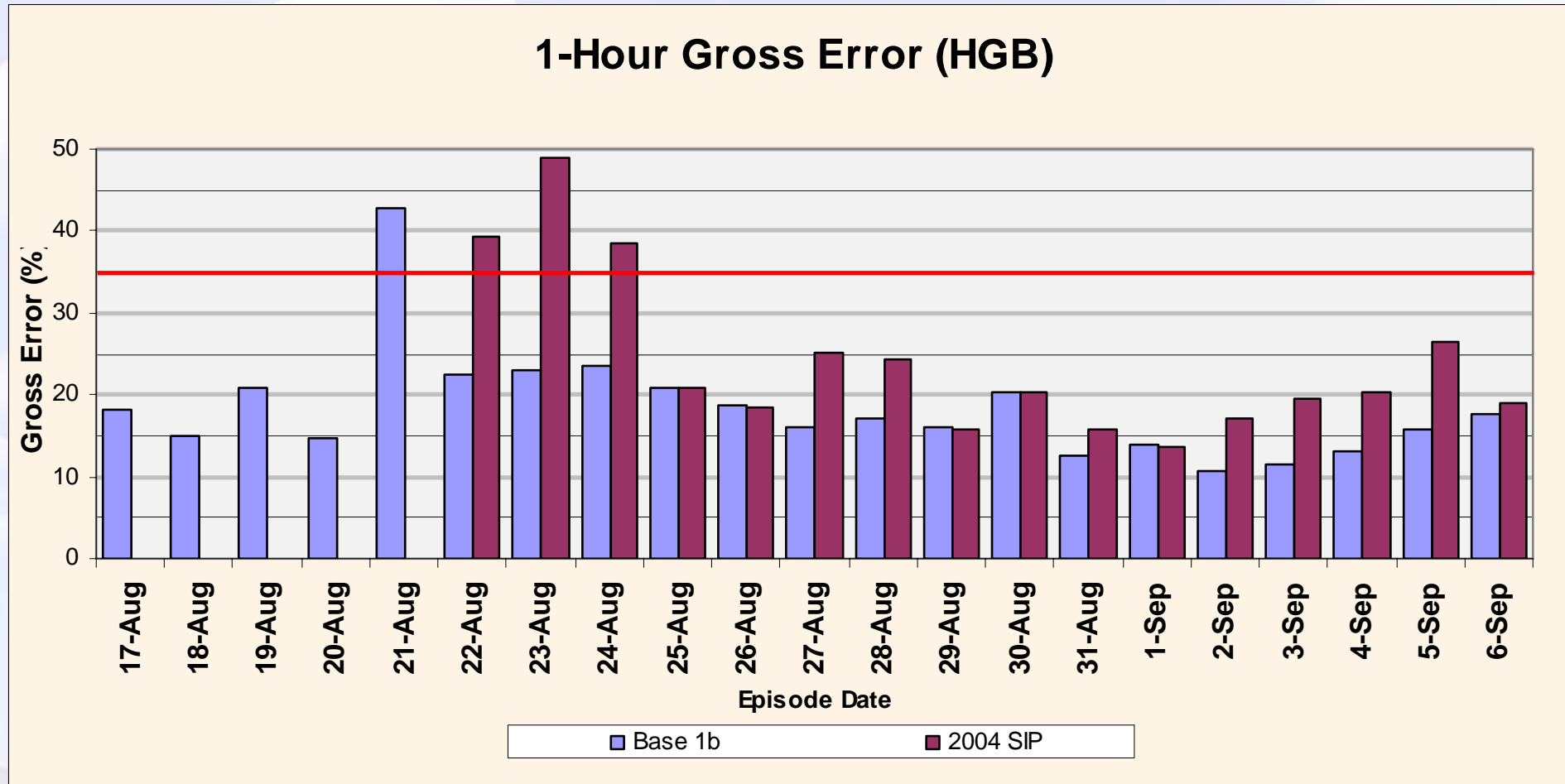
8-Hour Bias (HGB)





1-Hour Gross Error

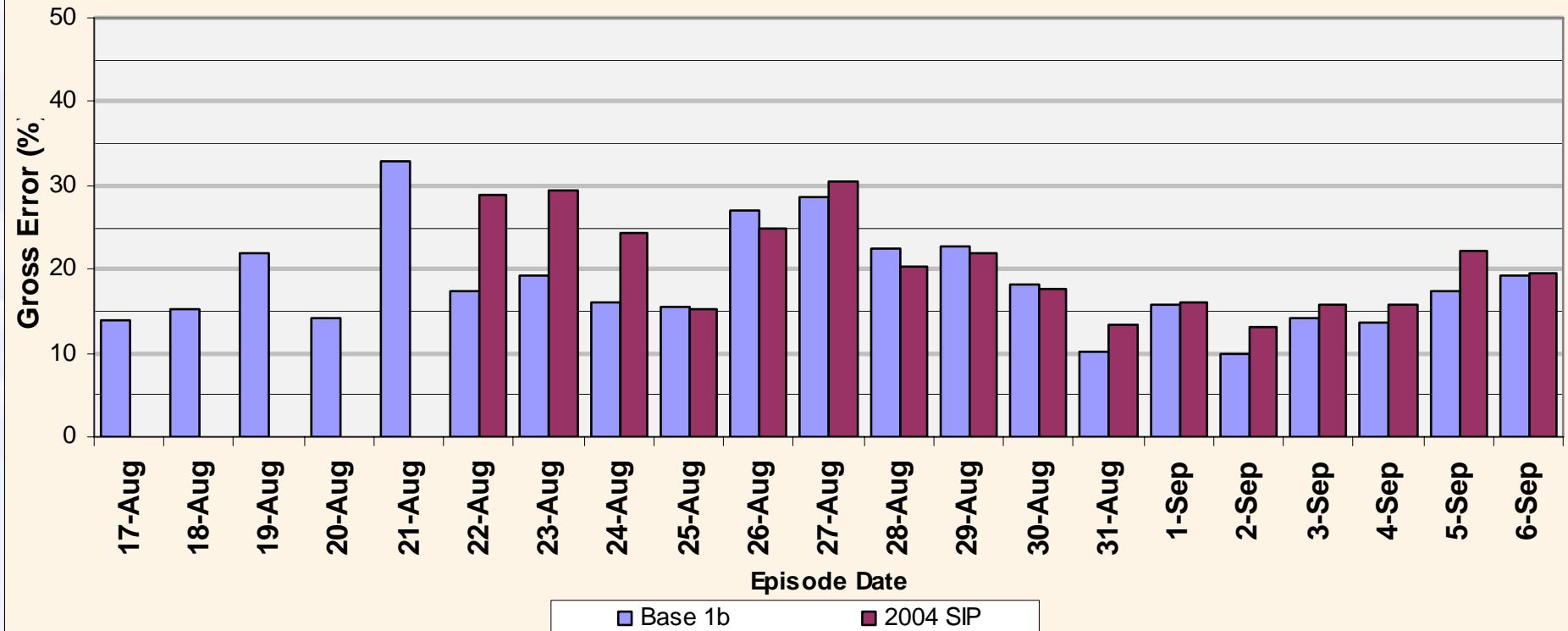
1-Hour Gross Error (HGB)





8-Hour Gross Error

8-Hour Gross Error (HGB)

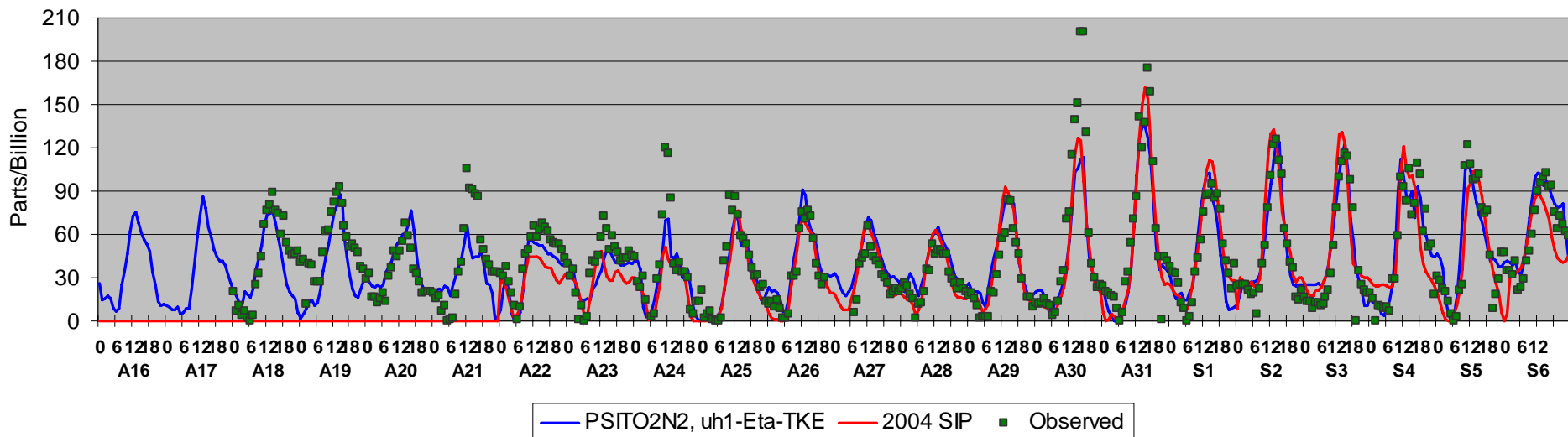




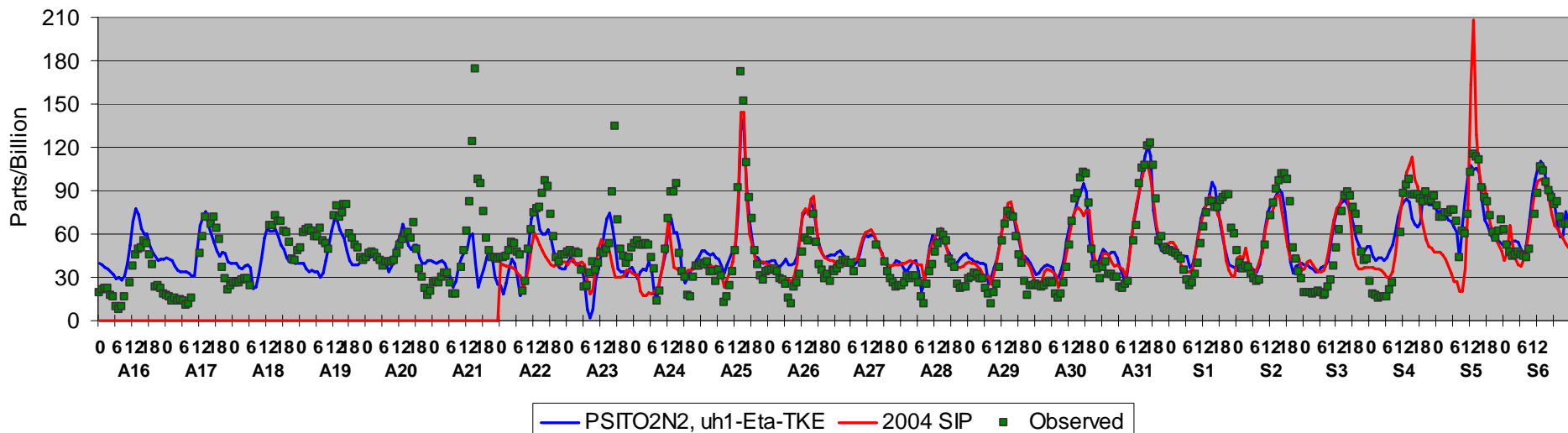
Time Series

- Time series plots compare modeled concentrations of ozone and precursors with observations at surface stations.

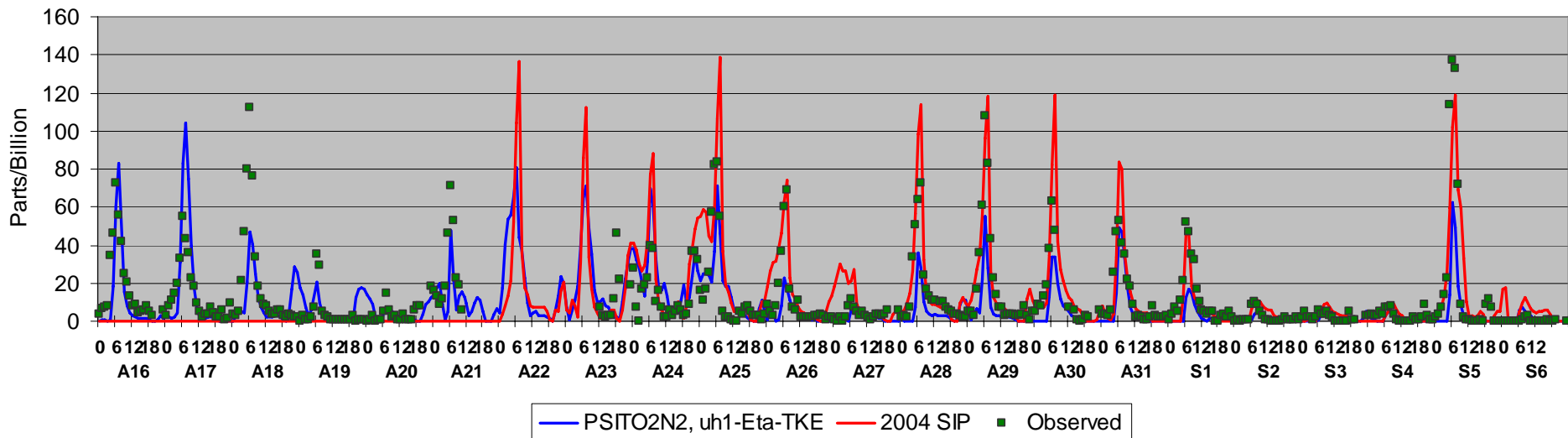
La Porte Supersite Ozone Concentrations



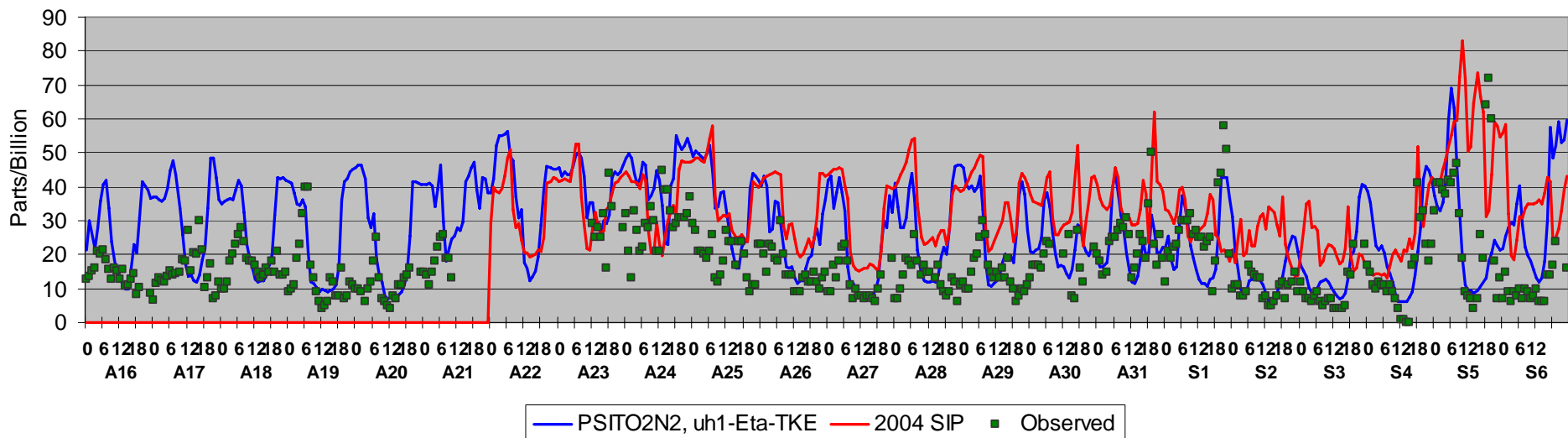
Williams Tower Supersite Ozone Concentrations



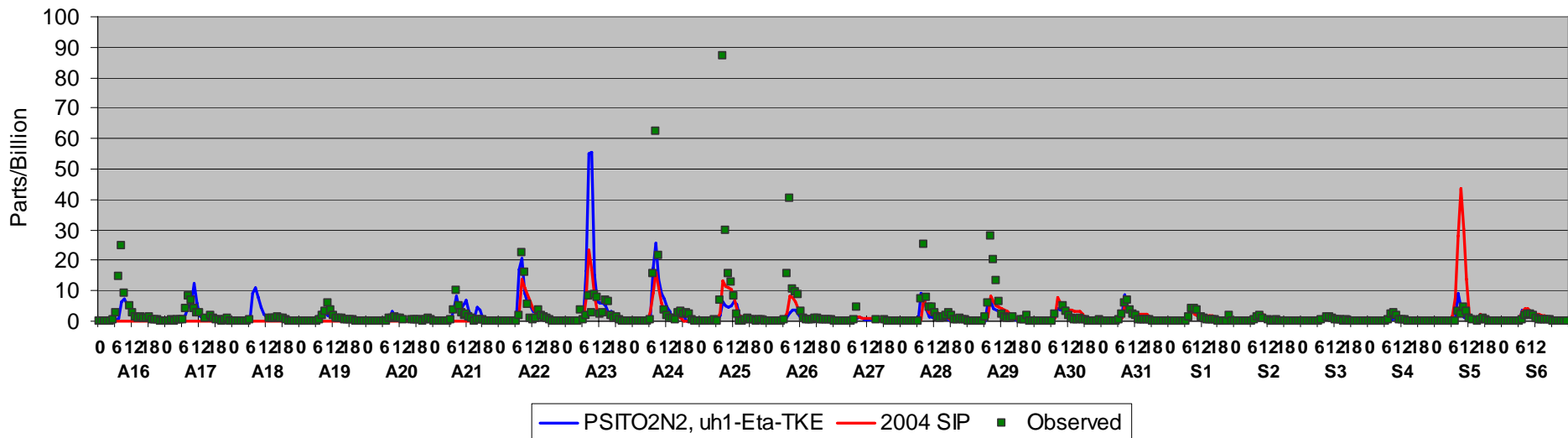
Clinton Drive NO Concentrations



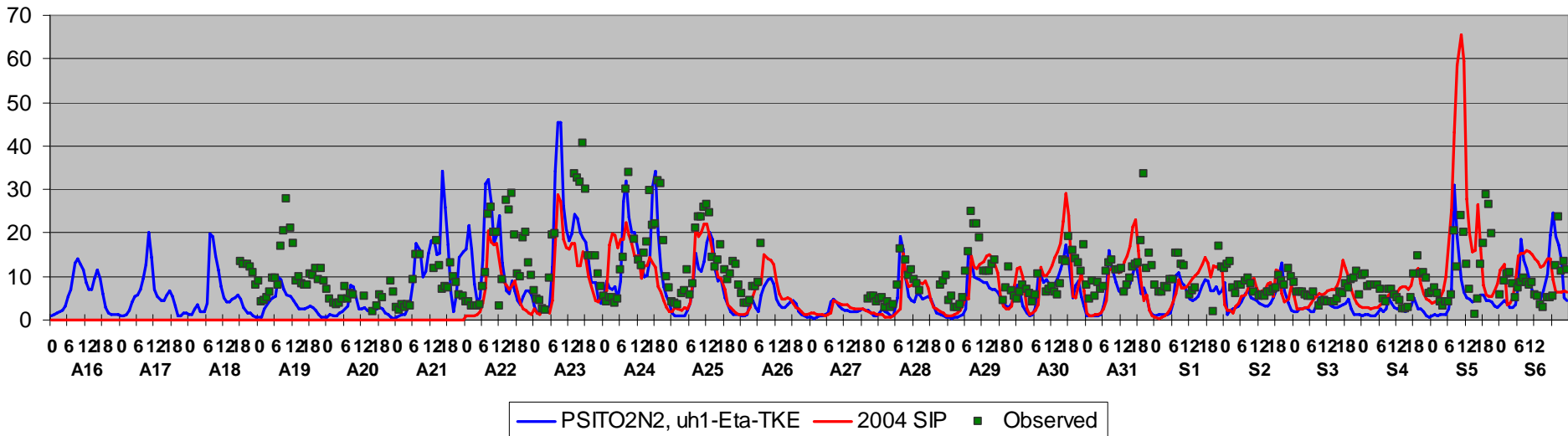
Clinton Drive NO2 Concentrations



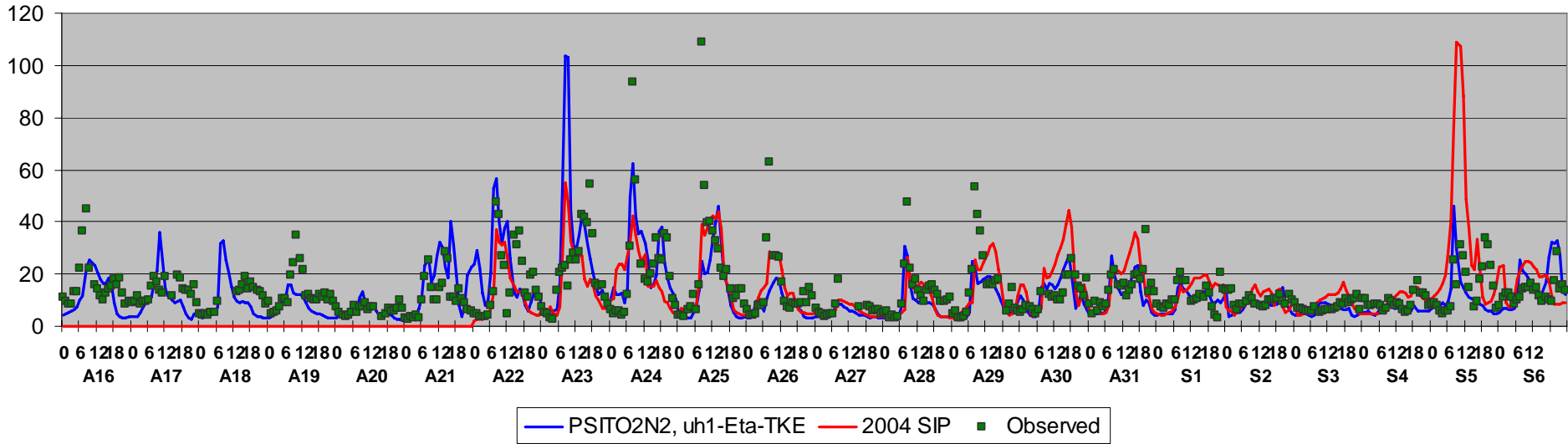
Williams Tower Supersite NO Concentrations



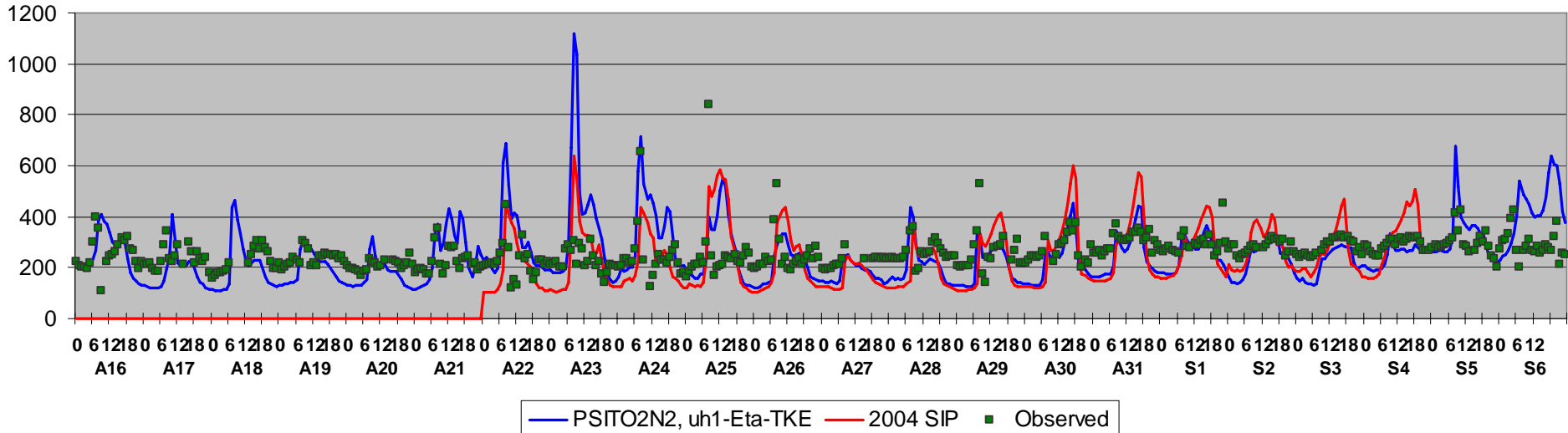
Williams Tower Supersite NO2 Concentrations



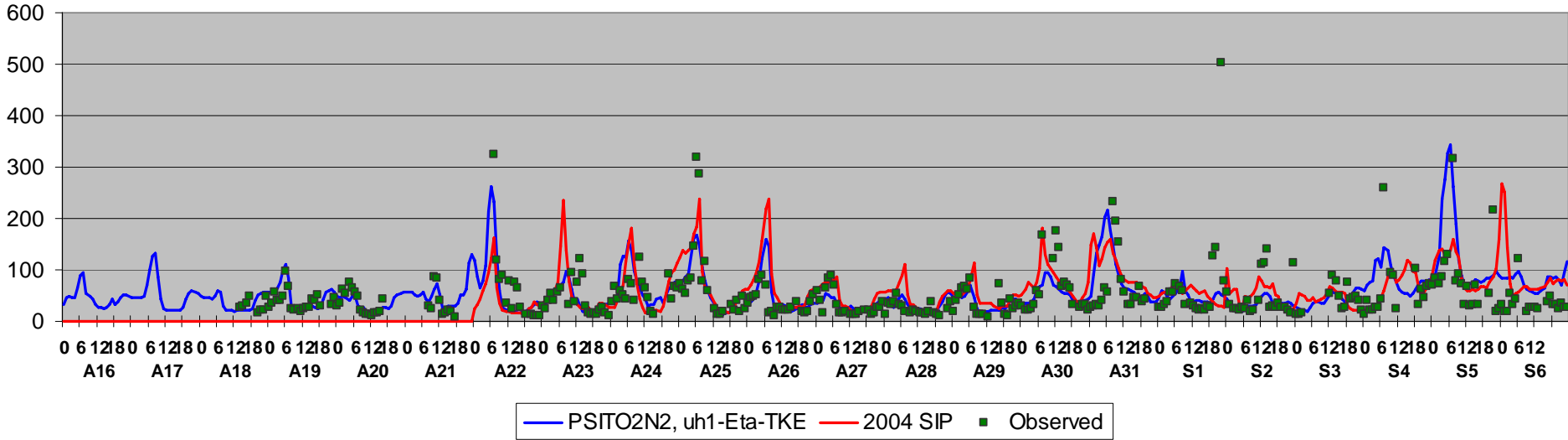
Williams Tower Supersite NOy Concentrations



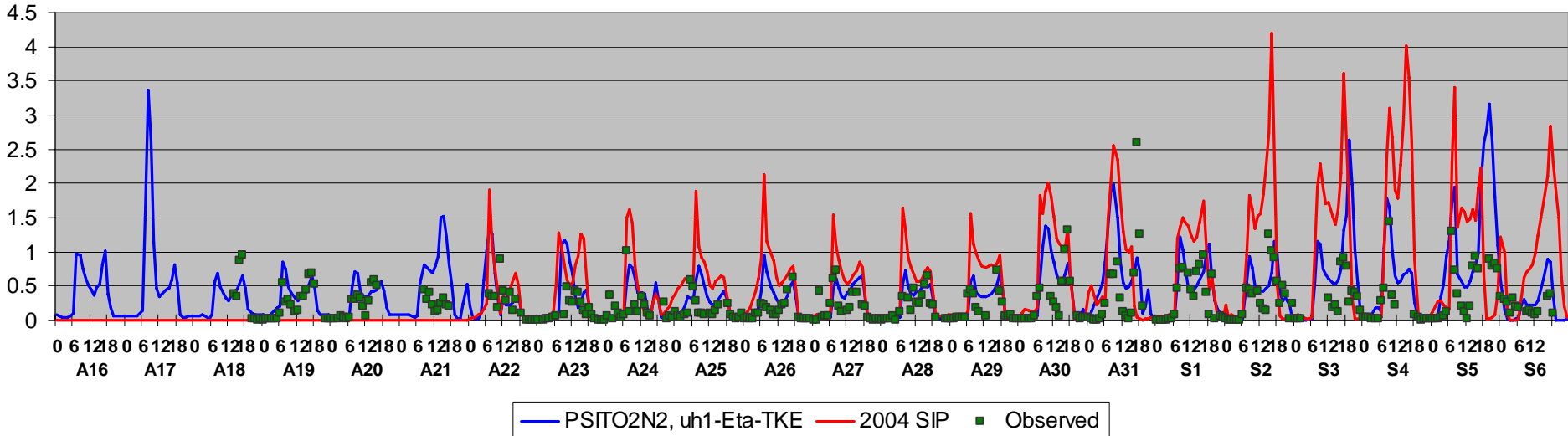
Williams Tower Supersite CO Concentrations



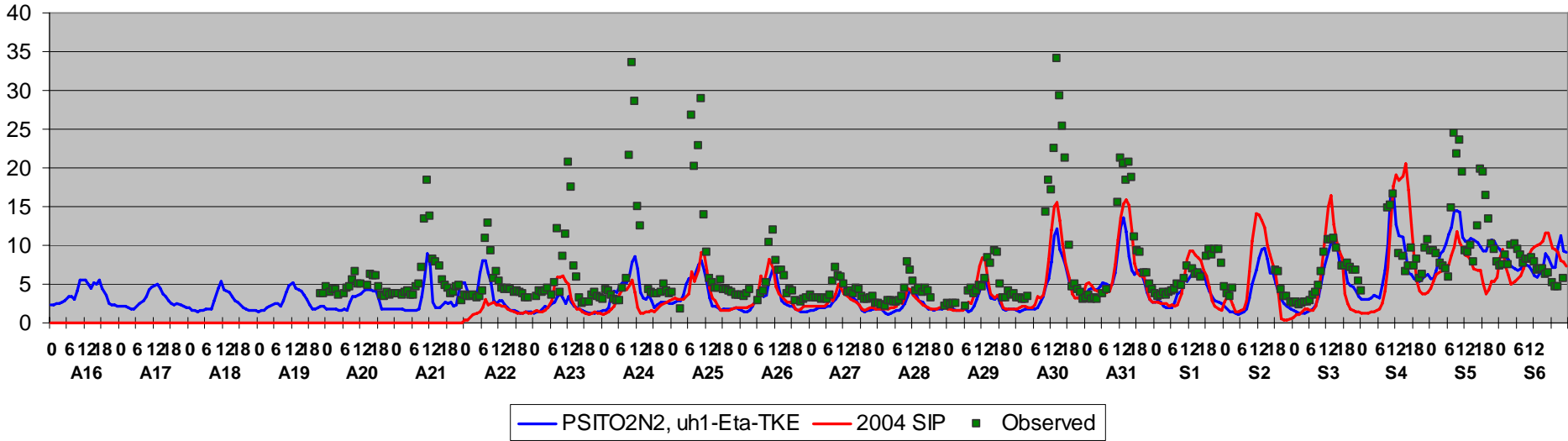
La Porte Supersite PAR Concentrations



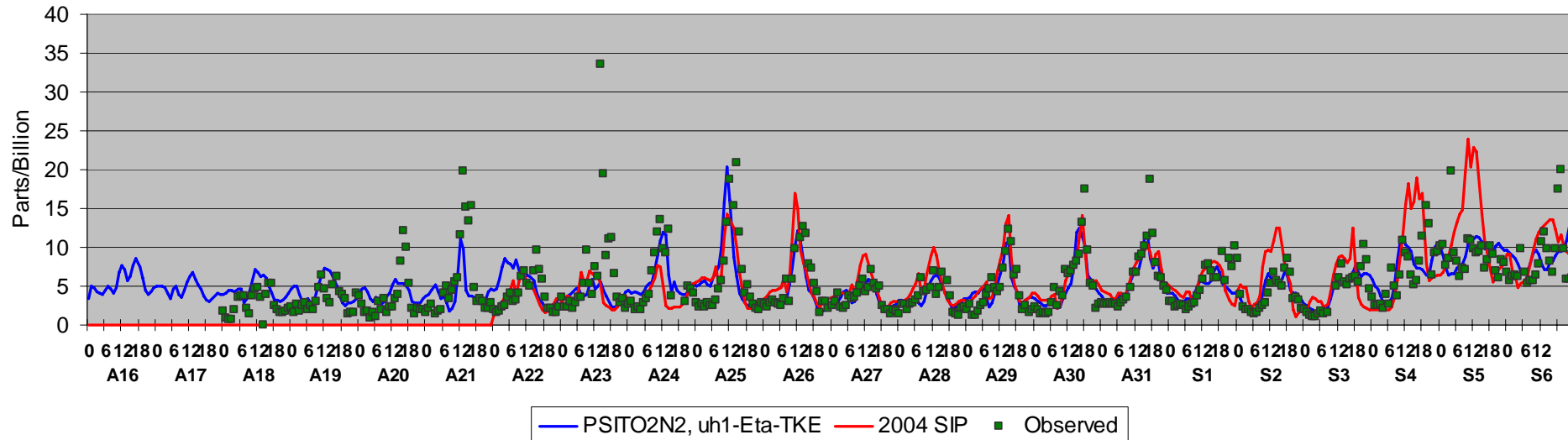
La Porte Supersite ISOP Concentrations



La Porte Supersite HCHO Concentrations



HRM Site 3 HCHO Concentrations





Ozone Movie

- Would you like butter on your popcorn?
- Remember, It's Only a Movie.
- Any similarity between the events depicted and actual events is purely coincidental*.

* (Not really)