Model Performance Evaluation Using R. V. Ron Brown Data

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Southeast Texas Photochemical Modeling Technical Committee Meeting

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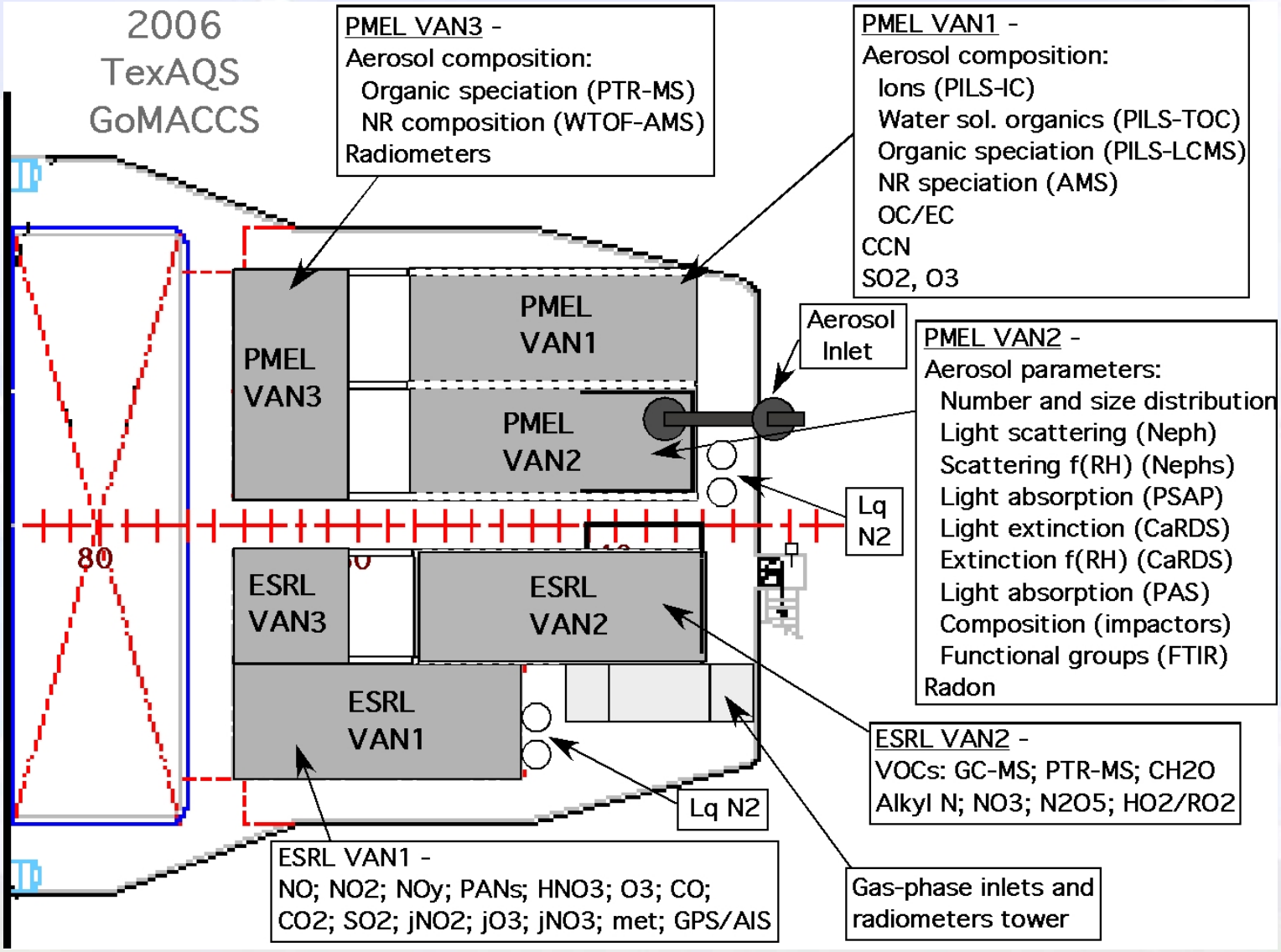
CAMx Ozone Modeling in SIP Development

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

Research Vessel Ronald H. Brown

The RV Ron Brown



RV Brown Measurements

Parameter	Method
Photolysis rates (j-values)	**Spectral radiometer**
Ozone (O3)	**UV absorbance**
Ozone	**NO chemiluminescence**
Carbon monoxide (CO)	**Nondispersive IR**
Carbon dioxide (CO2)	**Nondispersive IR**
Sulfur dioxide (SO2)	**Pulsed UV fluorescence**
Nitric oxide (NO)	**Chemiluminescence**
Nitrogen dioxide (NO2)	**Photolysis/chemiluminescence**
Total reactive nitrogen oxides (NOy)	**Au tube/chemiluminescence**
Peroxyacyl nitric anhydrides (PANs)	**Gas Chromatograph (GC)/ Electron Capture Detector (ECD)**
Alkyl nitrates (RONO2)	**GC/Mass Spectrometer (GC/MS)**
Nitrate radical (NO3); Dinitrogen pentoxide (N2O5)	**Cavity ring-down spectrometry**
Nitric acid (HNO3)	**Mist chamber/Ion Chromatograph**
Water vapor (H2O)	**Nondispersive IR**
Continuous Speciation of VOCs	**PTR-MS/Chem Ionization MS**
VOC Speciation	**GC/MS**

RV Brown Measurements (Cont.)

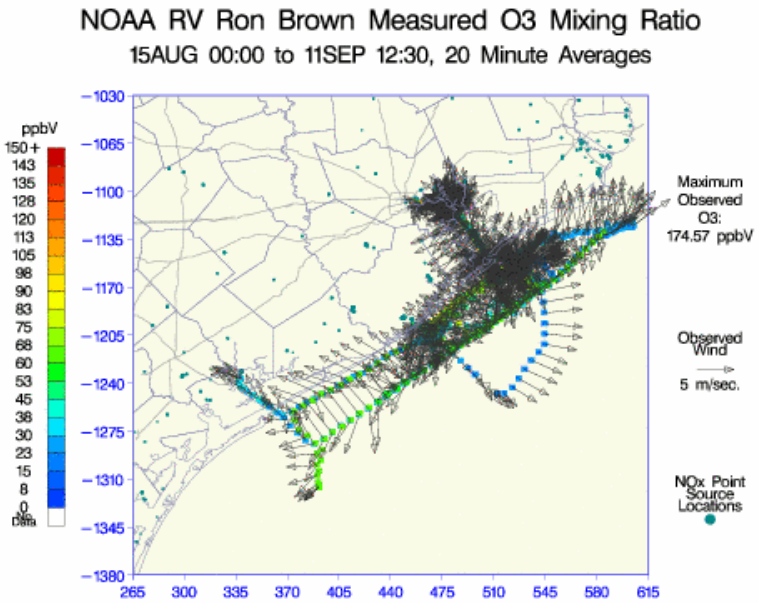
Parameter	Method
Formaldehyde (HCHO)	**1,3-cyclohexanedione (CHD) fluorimetry**
Radon (Rn)	**Radon gas decay**
Seawater/atmospheric CO2	**Nondispersive IR**
Enhanced measurement of radiative fluxes	**Spectral radiometers**
Aerosol optical depth	**Total Ozone Portable Spectrometer (MicroTOPS)**
Irradiance	**Portable Radiation Package (PRP)**
Size-resolved aerosol composition and gravimetric mass	**Impactors (Ion Chromatograph (IC), X-Ray Fluoresence (XRF), and thermal-optical OC/EC)**
Organic Carbon/Elemental Carbon (OC/EC)	**On-line thermal optical**
Ionic Aerosol Composition	**Particle Into Liquid Sampler (PILS)**
Aerosol Size and Composition	**Aerosol Mass Spectrometer**
Organic function groups	**Fourier Transform Infrared spectrometer (FTIR)**
Aerosol scattering (400, 550, 700 nm)	**TSI Model 3563 Nephelometer**
Aerosol absorption (400, 550, 700nm)	**Radiance Research Particle Soot Absorption Photometer (PSAP)**
Aerosol number	**Condensation Nuclei Counter (CNC)**
Aerosol size distribution	**Twin Differential Mobility Analyzers (DMA) and an Aerodynamic Particle Sizer (APS)**

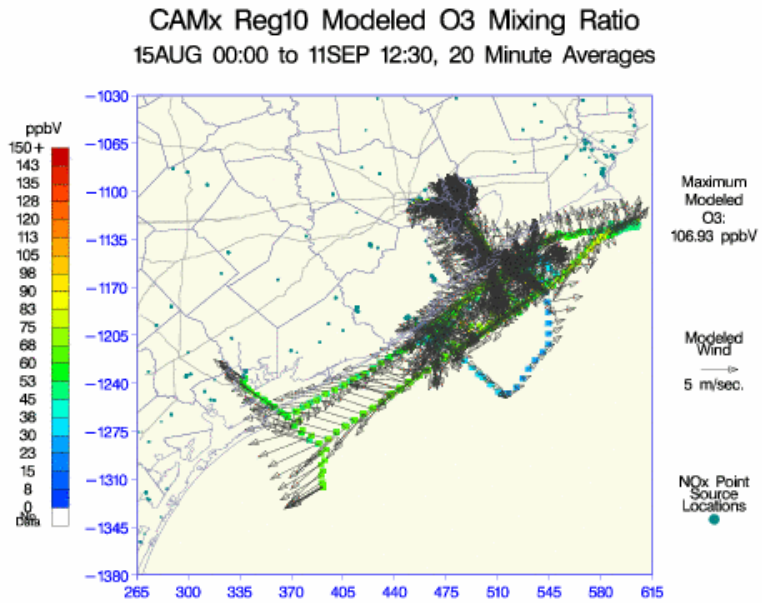
RV Brown Measurements (Cont.)

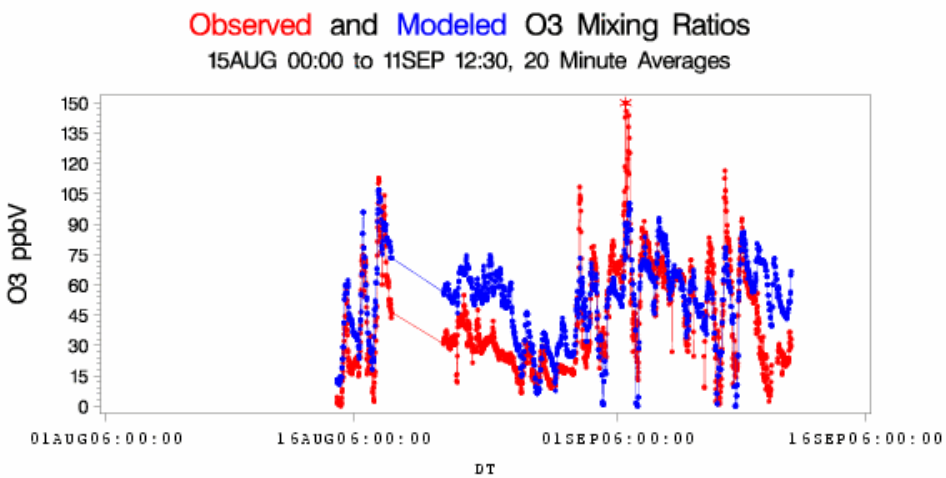
Parameter	Method
Aerosol light scattering hygroscopic growth f(RH)	**Twin TSI 3563 nephelometers**
Aerosol size hygroscopic growth g(RH)	**Tandem DMAs**
Aerosol light extinction hygroscopic growth f(RH)	**Cavity ring-down spectrometer**
Total and sub-micron aerosol extinction	**Cavity ring-down spectrometer**
Ozone/aerosol vertical profiles	**O3/Aerosol Lidar (OPAL)**
Wind/temperature vertical profiles	**915 MHz wind Radar**
High-resolution Boundary Layer (BL) winds/aerosol	**High-Resolution Doppler Lidar (HRDL)**
Wind profiles/microscale turbulence	**C-band radar**
Temperature/relative humidity profiles	**Radiosondes**
Surface energy balance (fluxes)	**Eddy covariance (bow mounted)**
High resolution BL turbulence structure	**Doppler mini-Sodar**

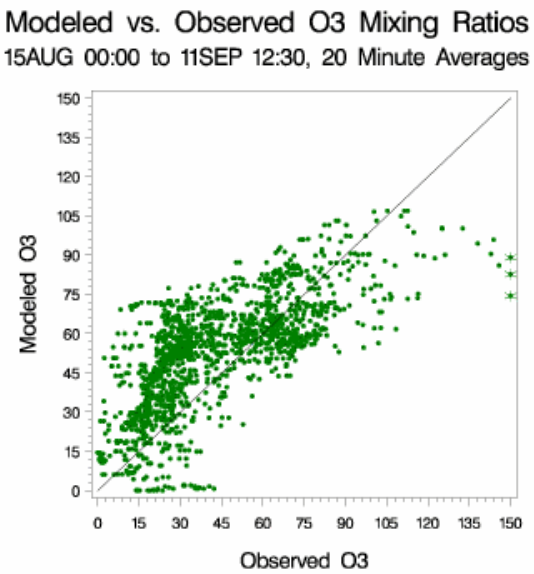
Source: http://esrl.noaa.gov/csd/2006/

The Voyage of the Brown









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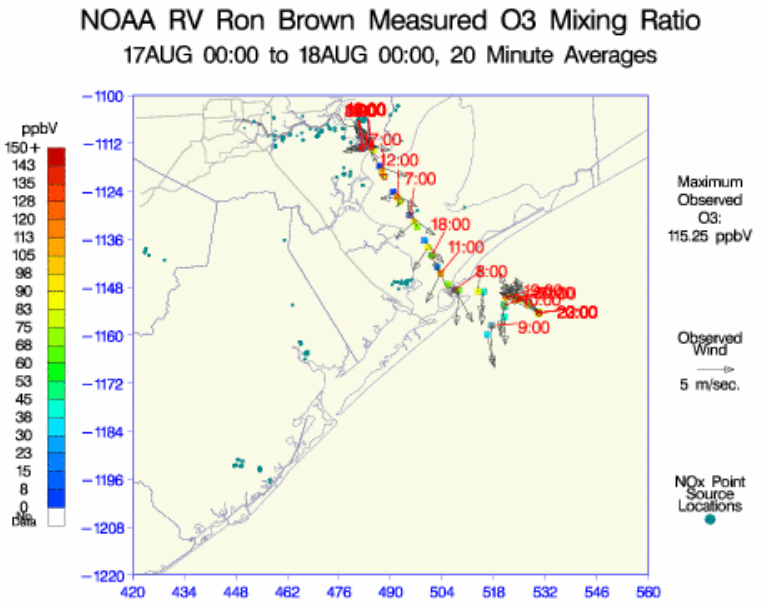
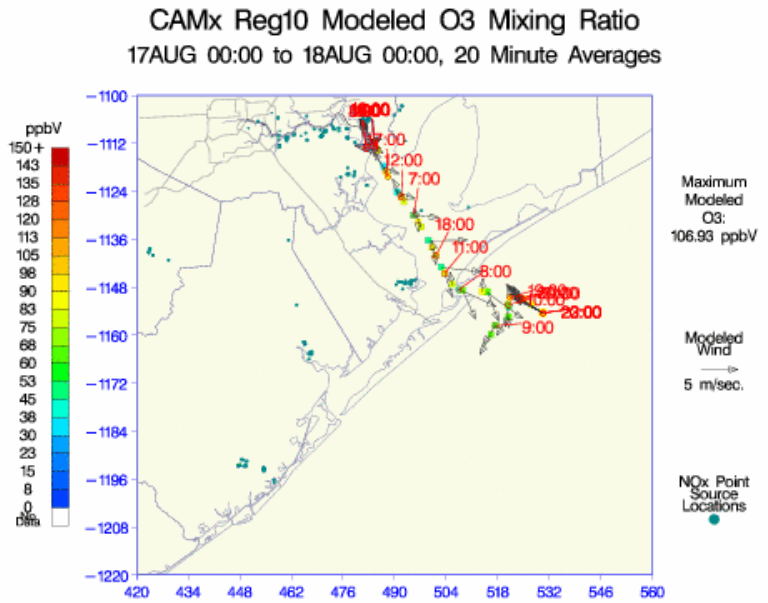
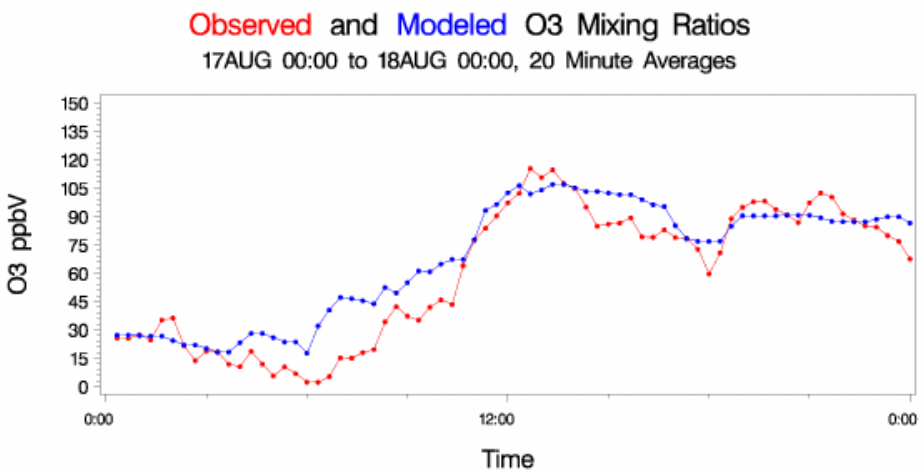
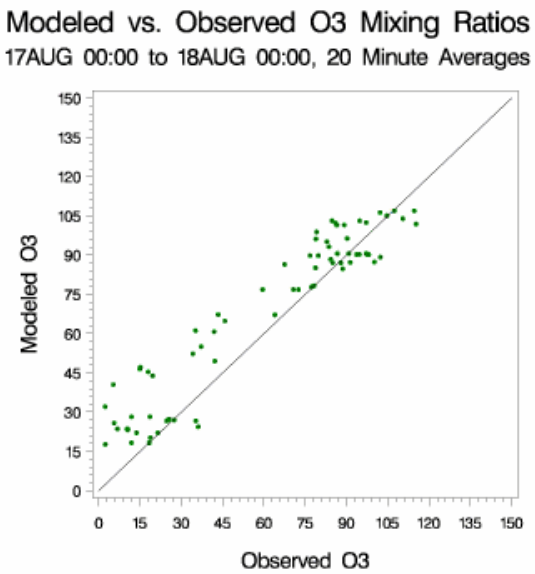
August 17 Example









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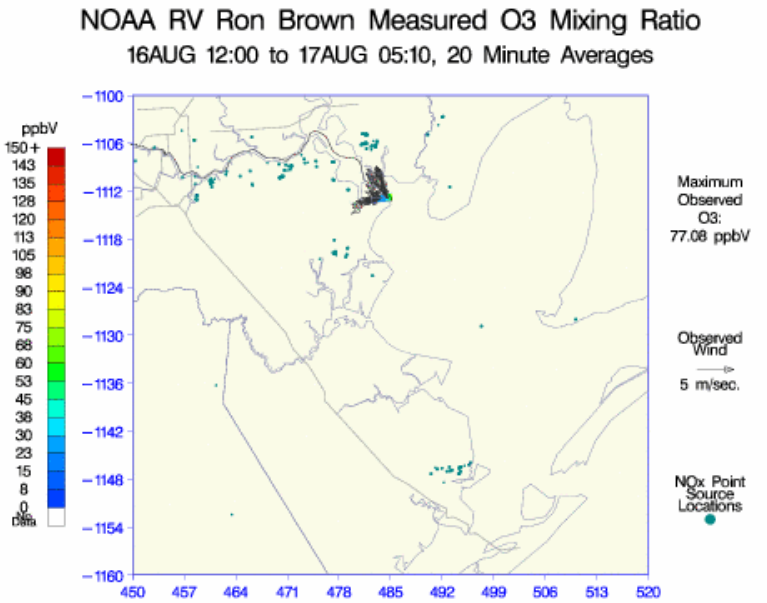

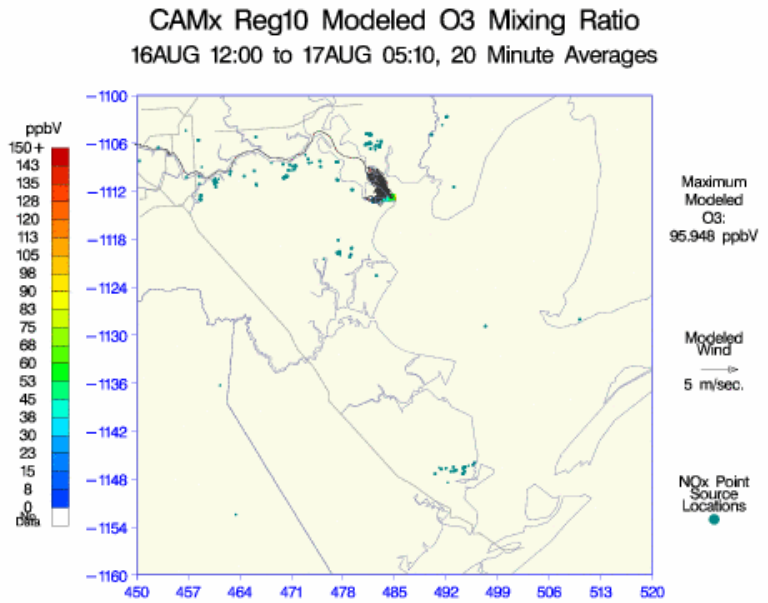

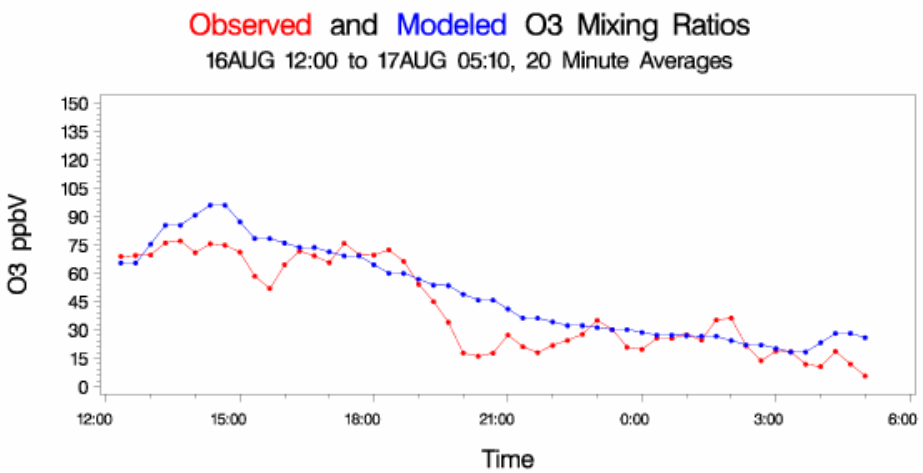

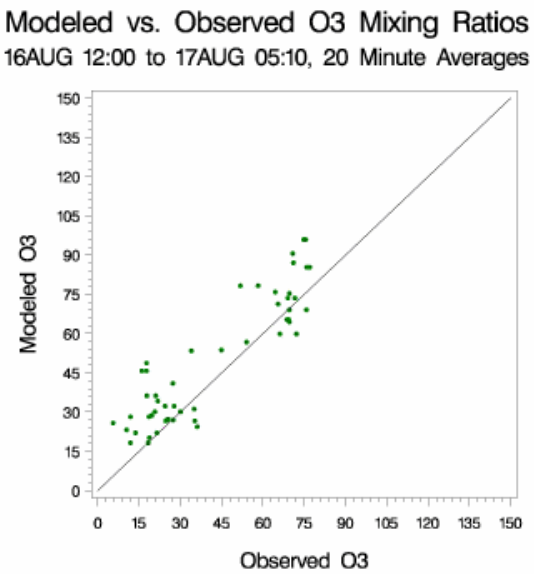

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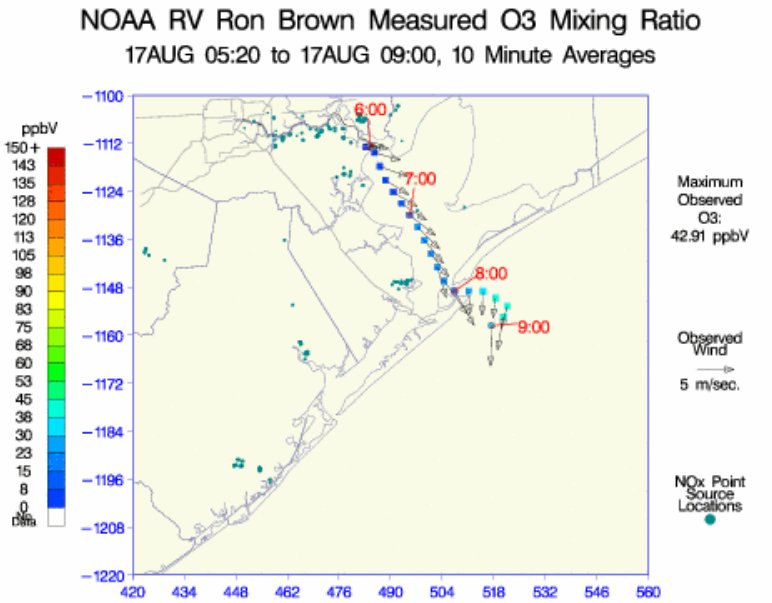

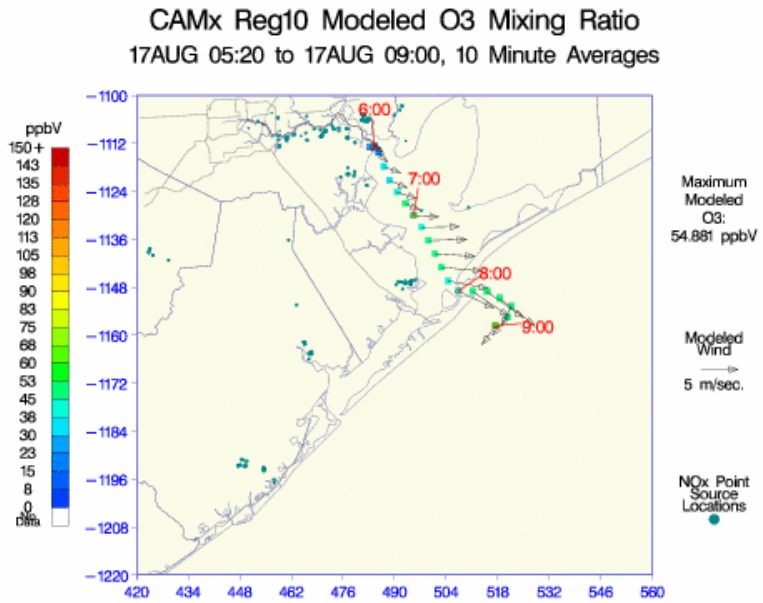

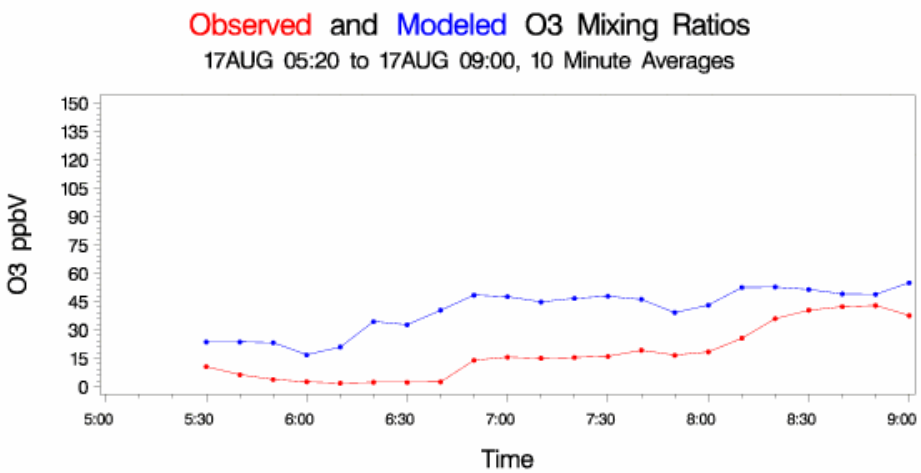

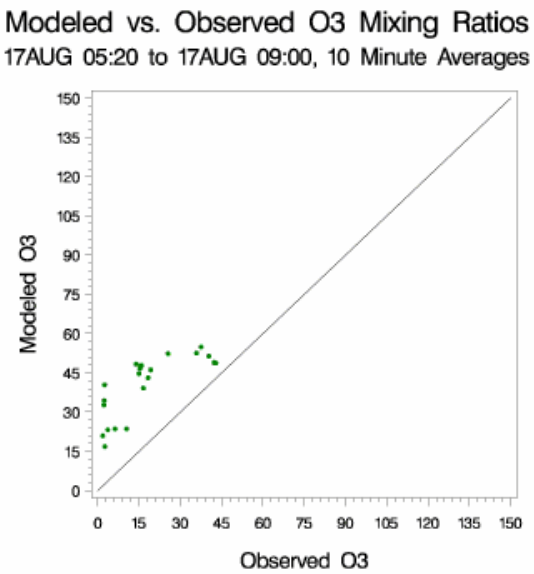

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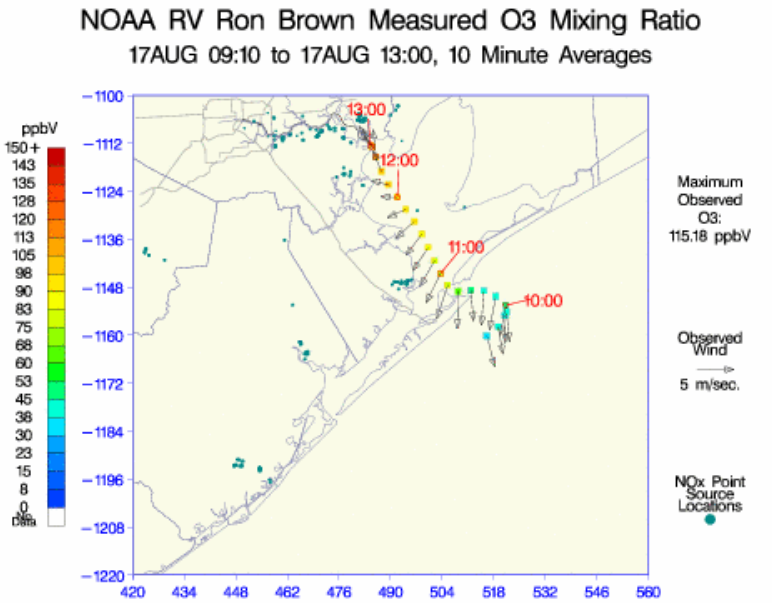

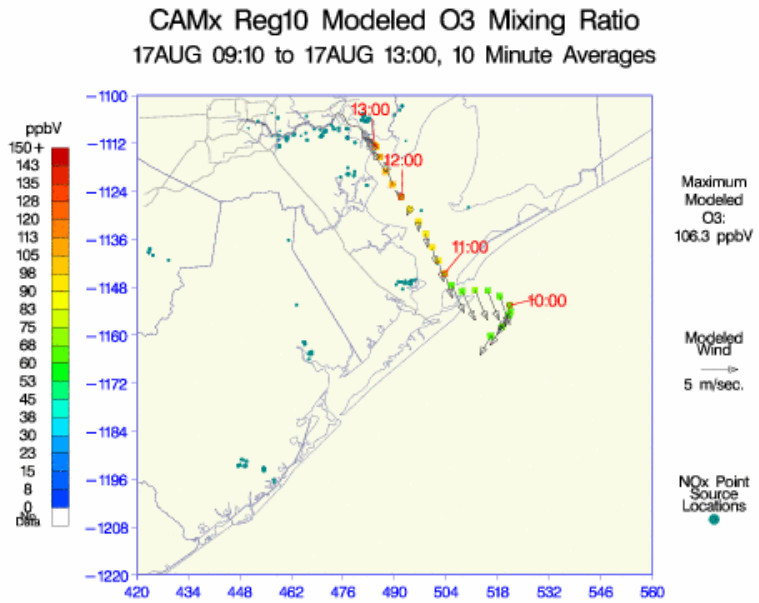

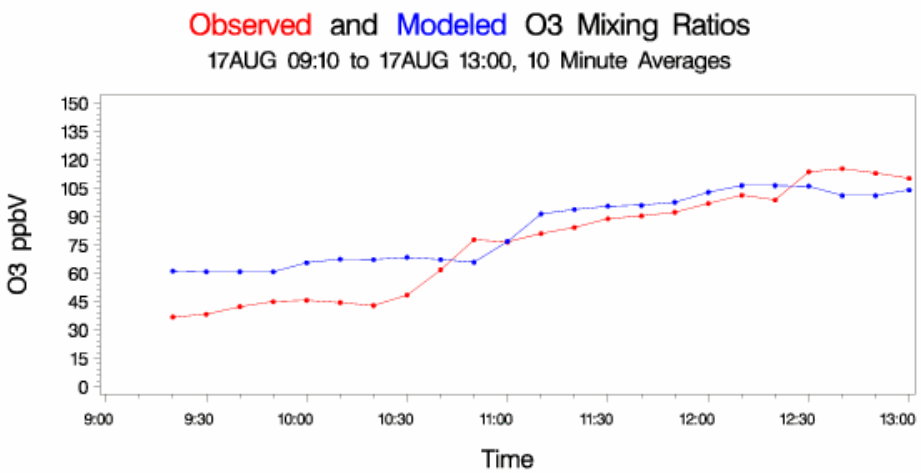

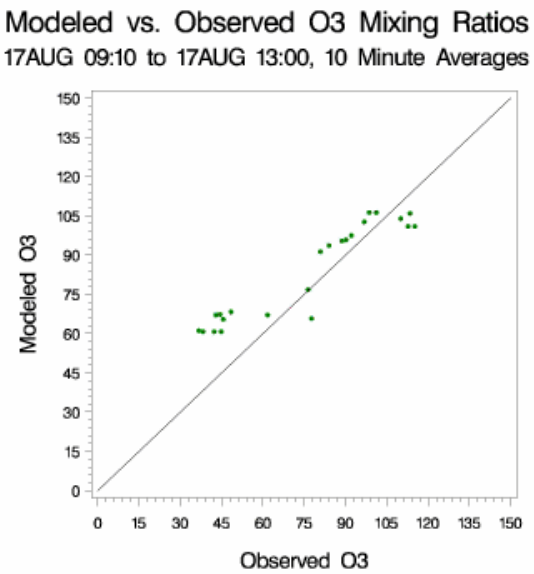

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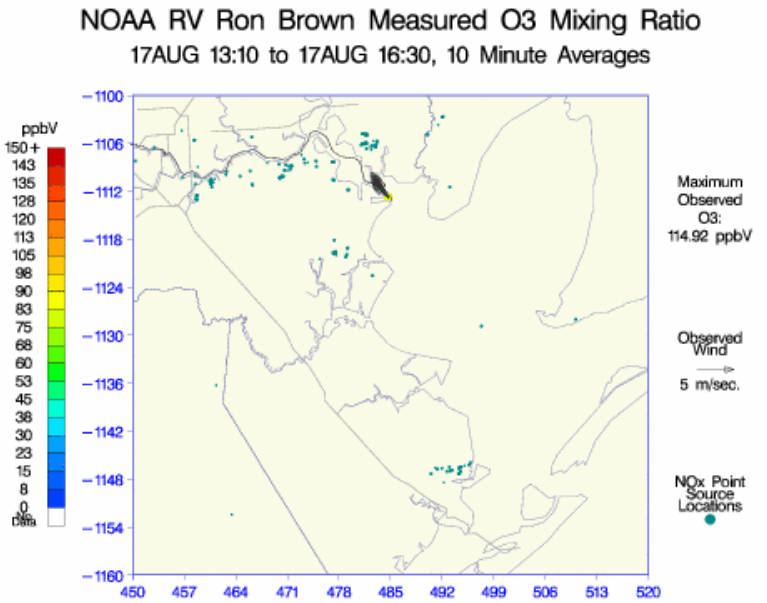

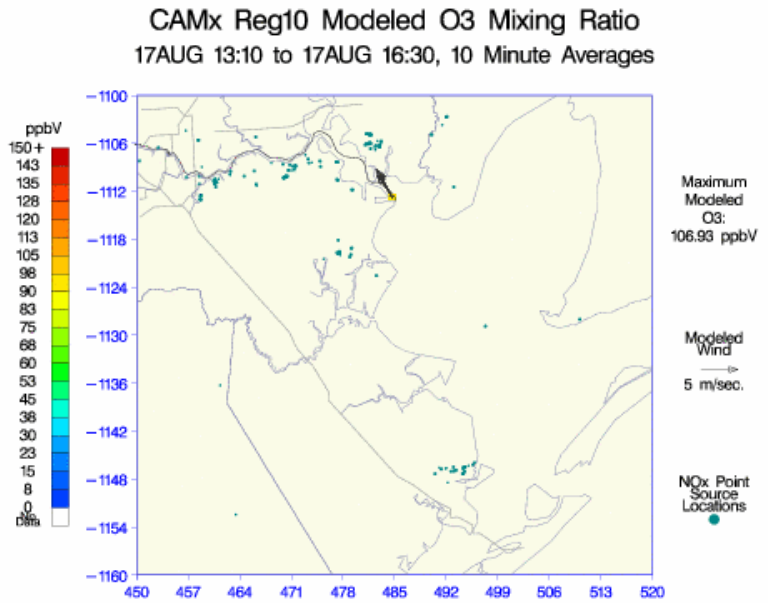

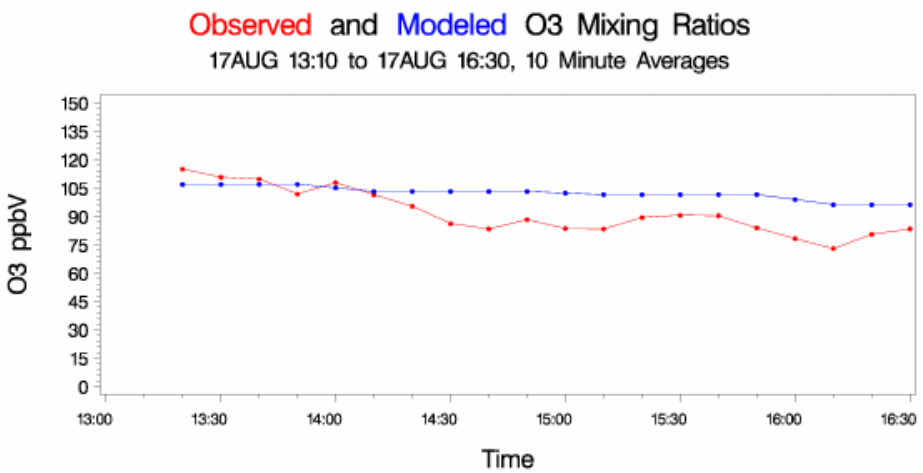

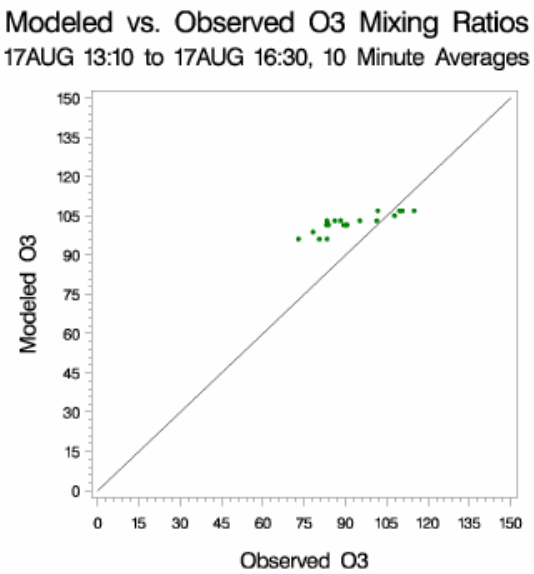

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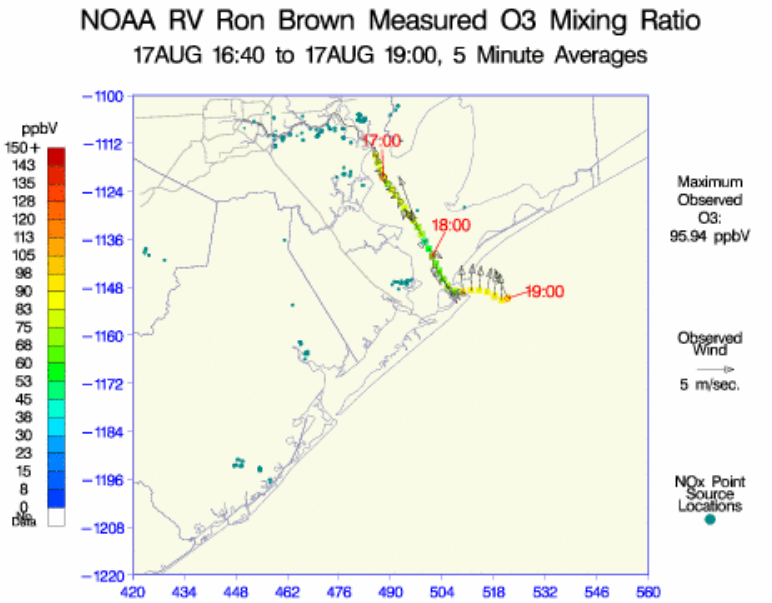

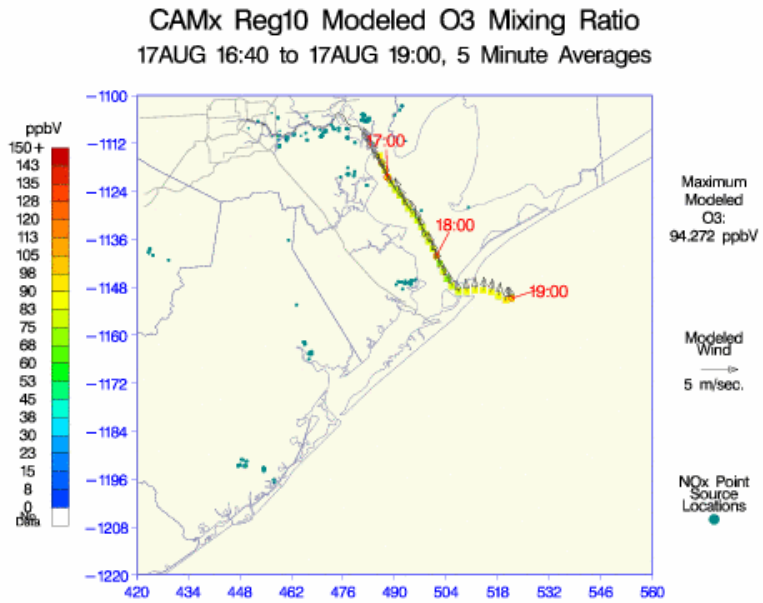

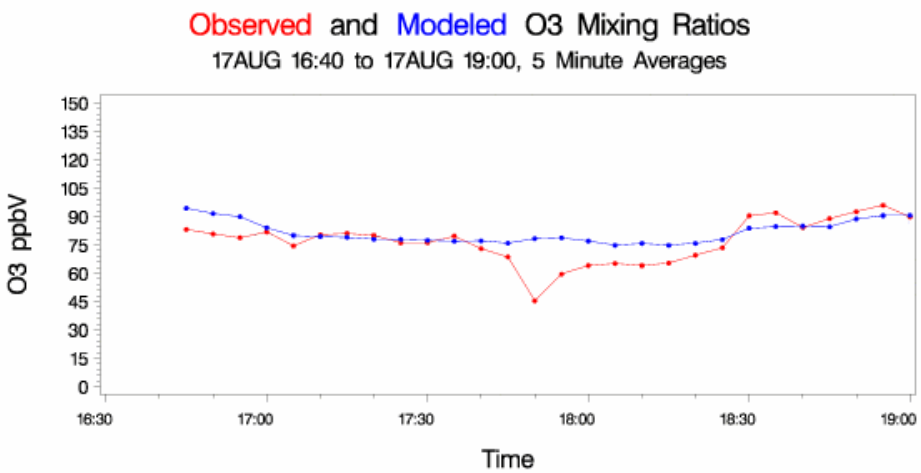

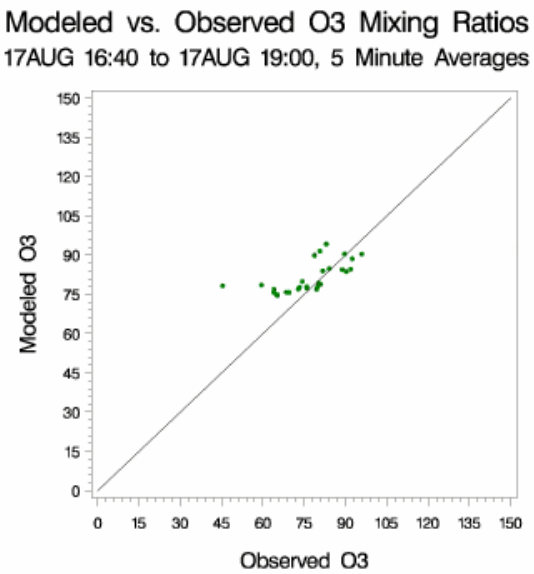

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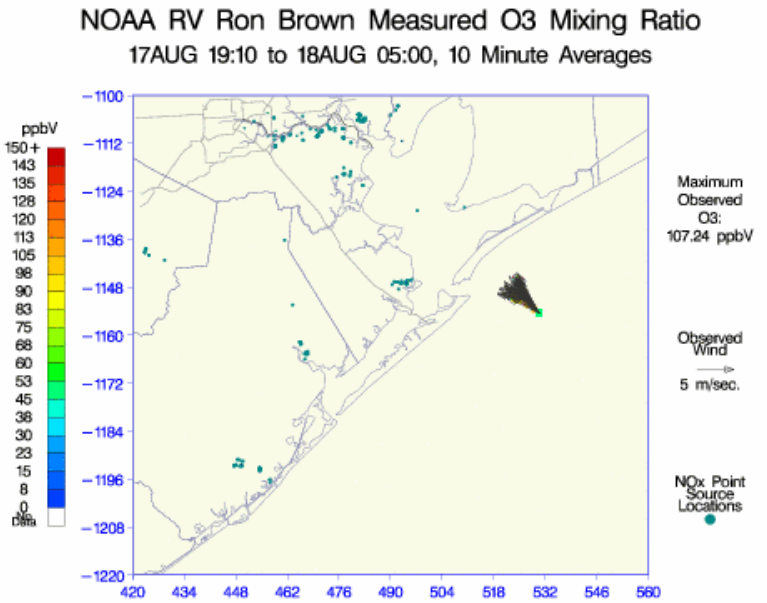

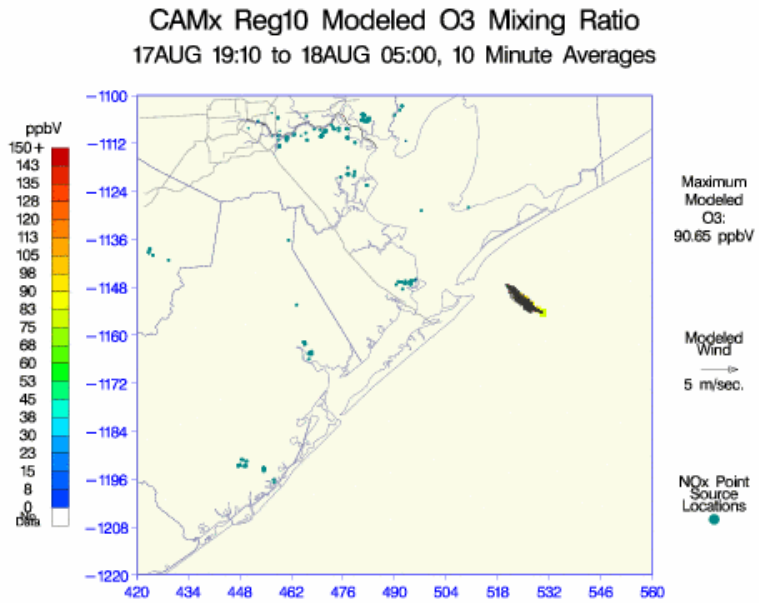

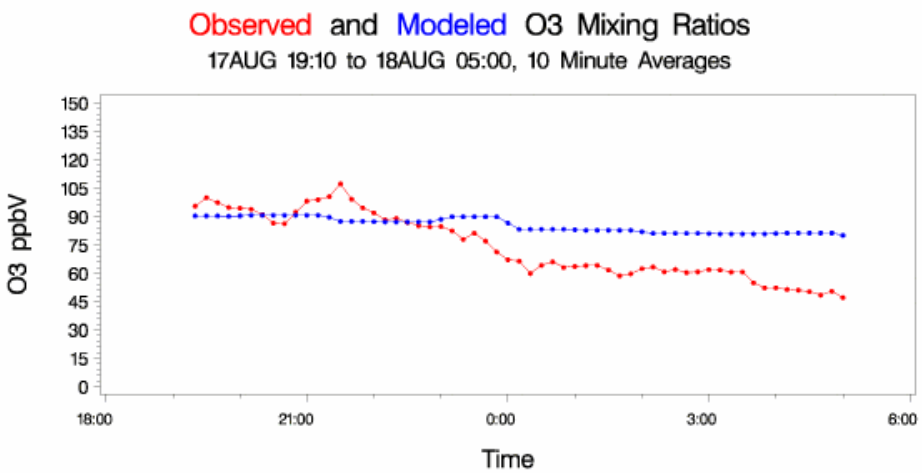

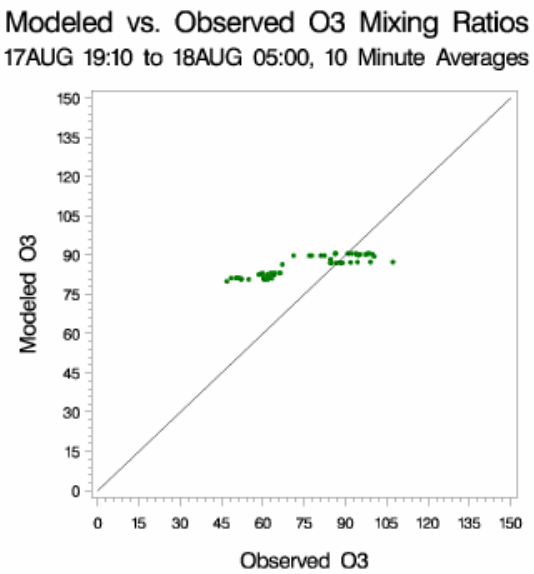

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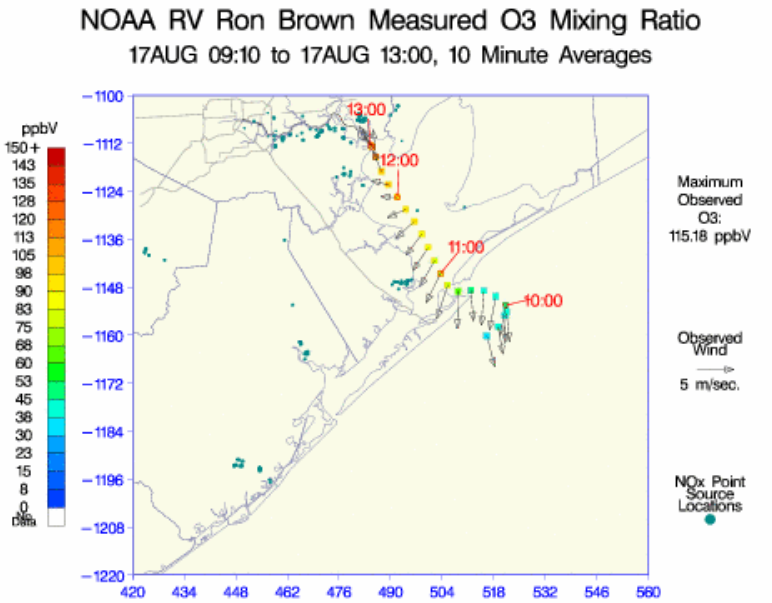
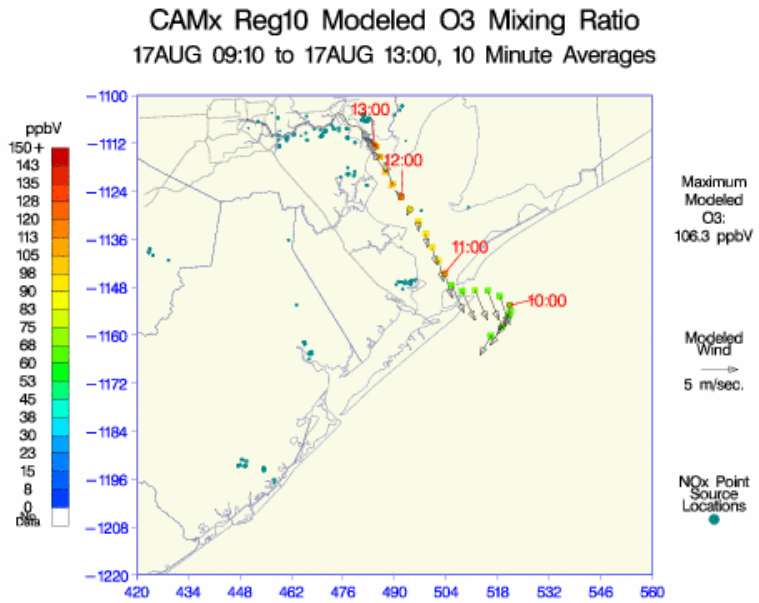
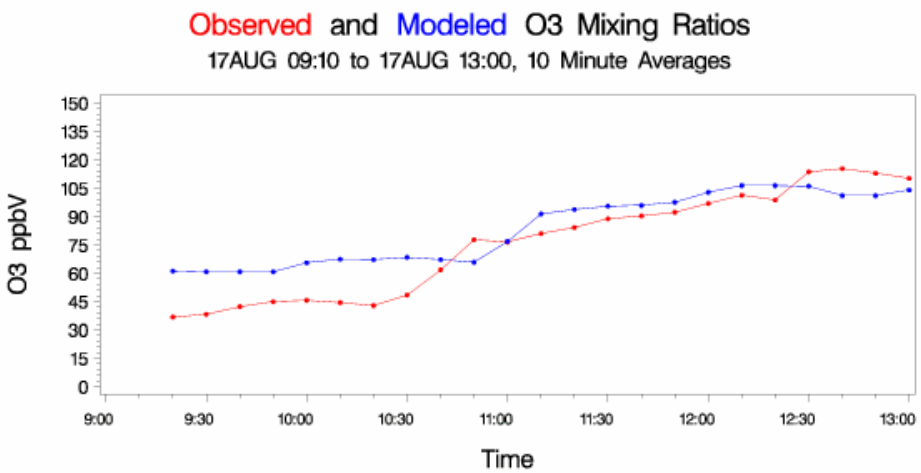
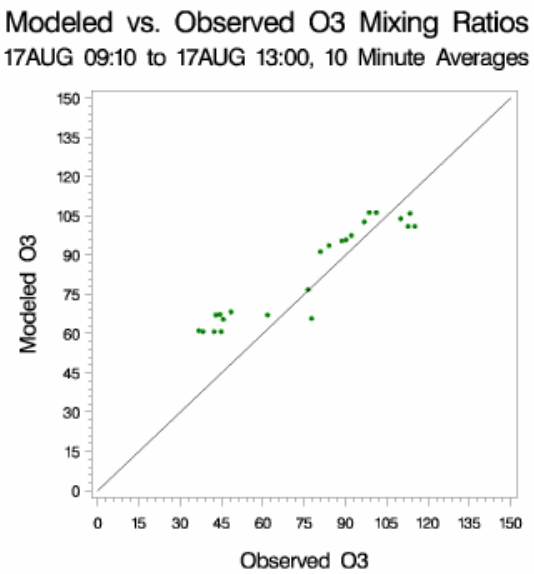
August 17 – Segment 3 Details









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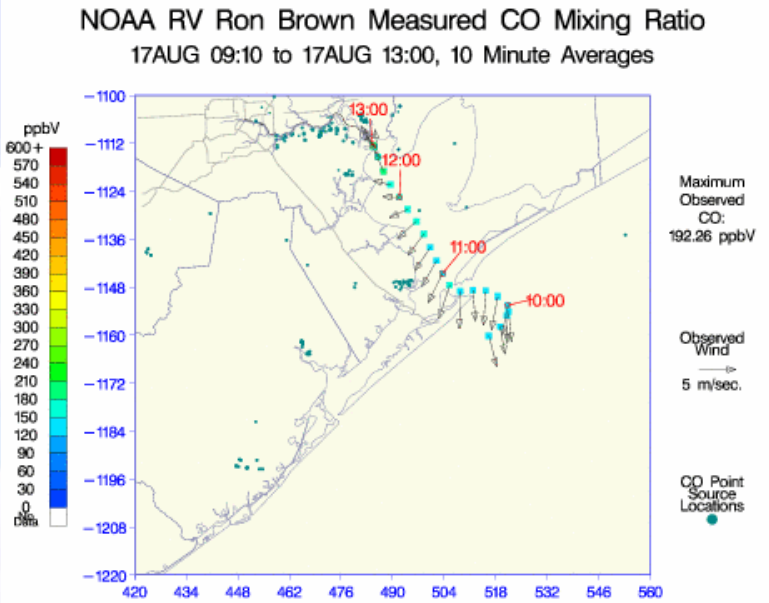

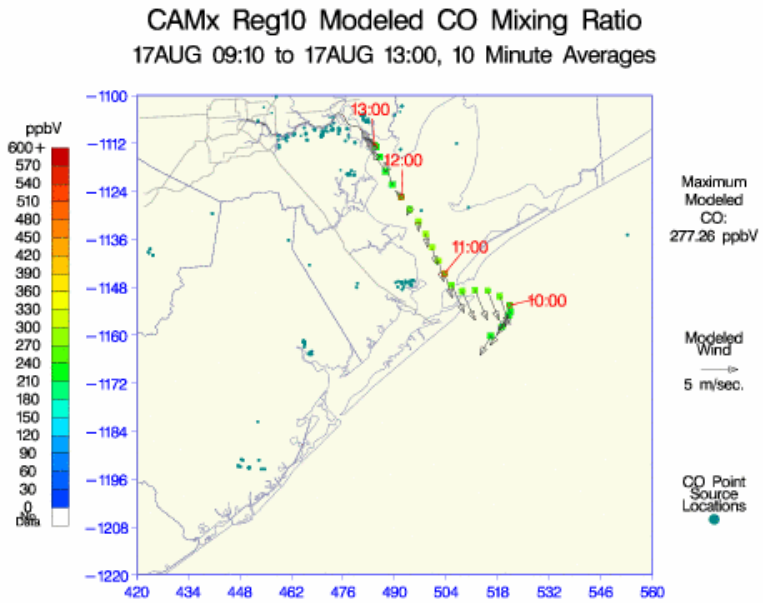

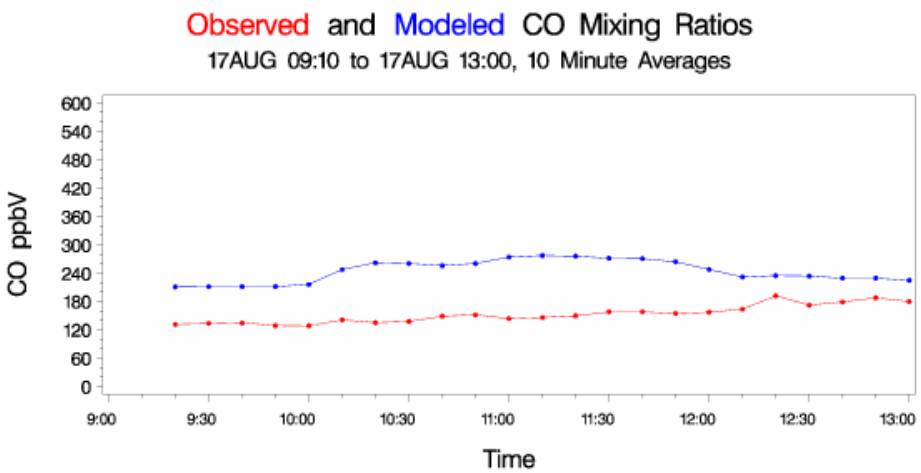

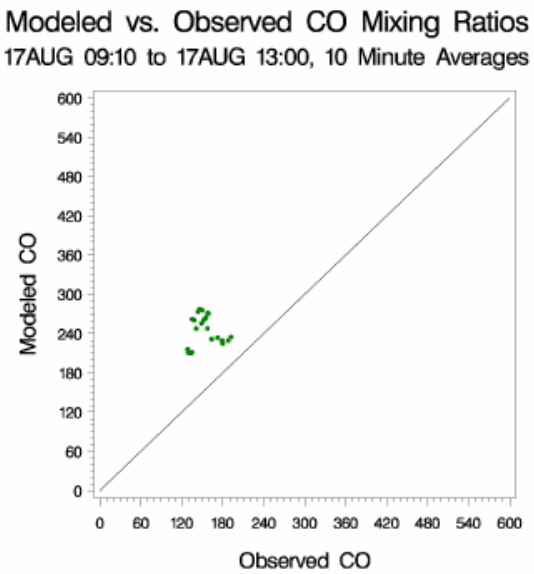

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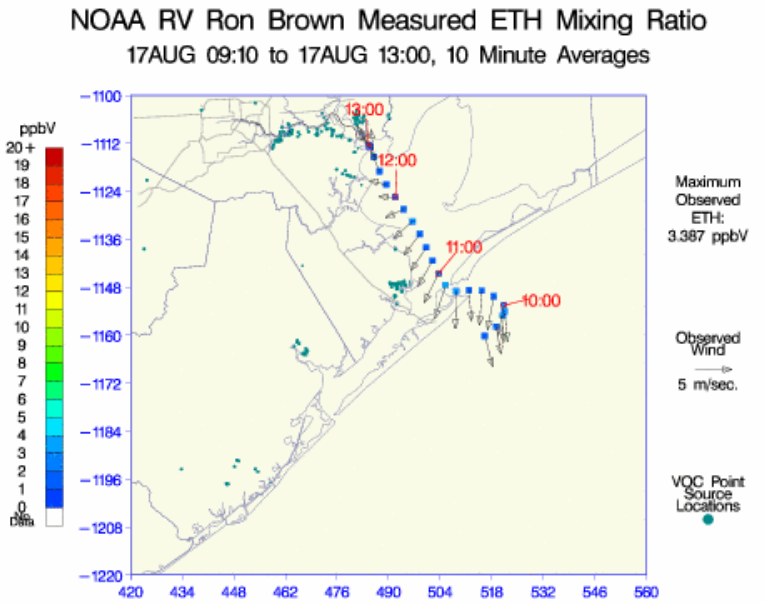

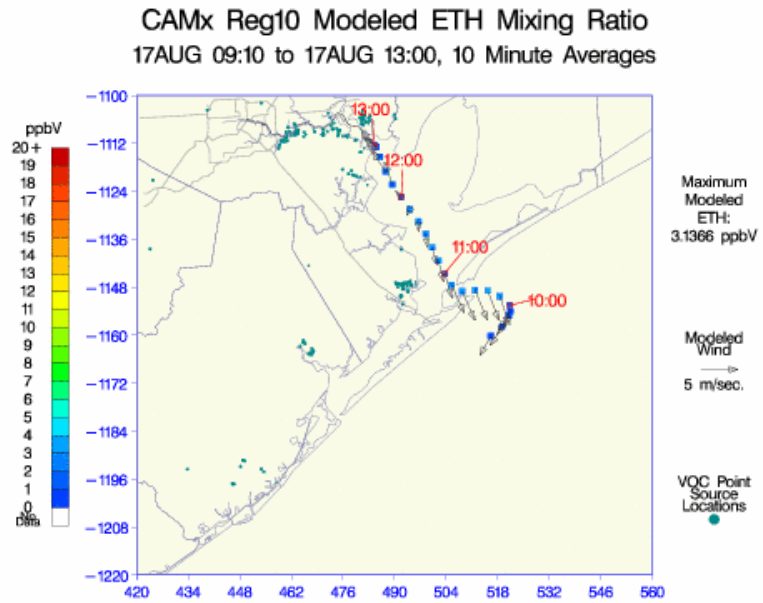

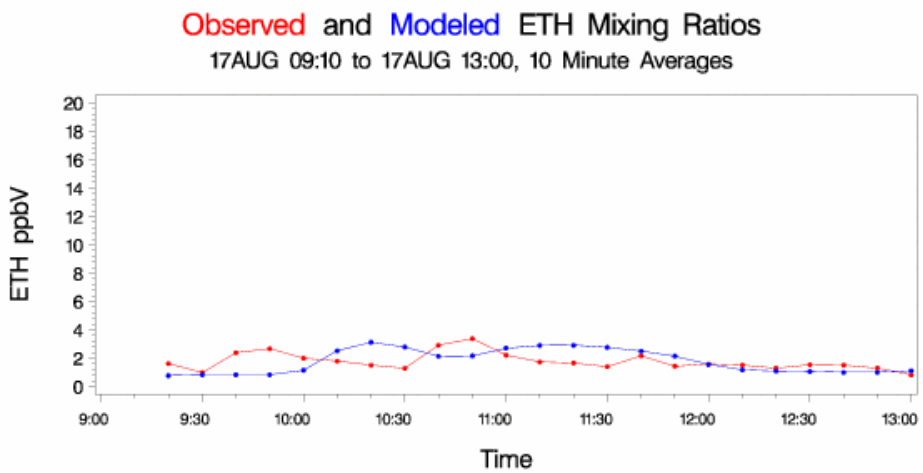

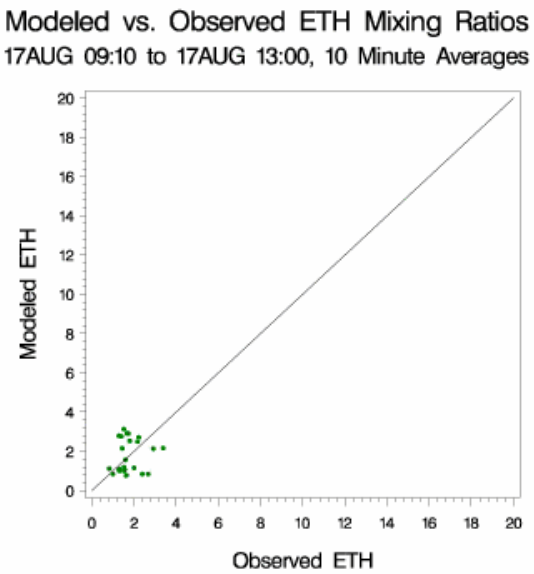

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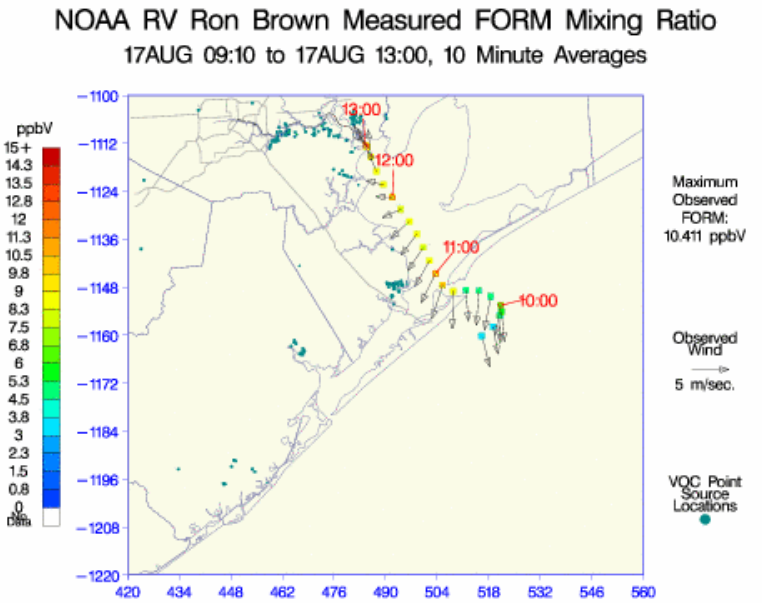

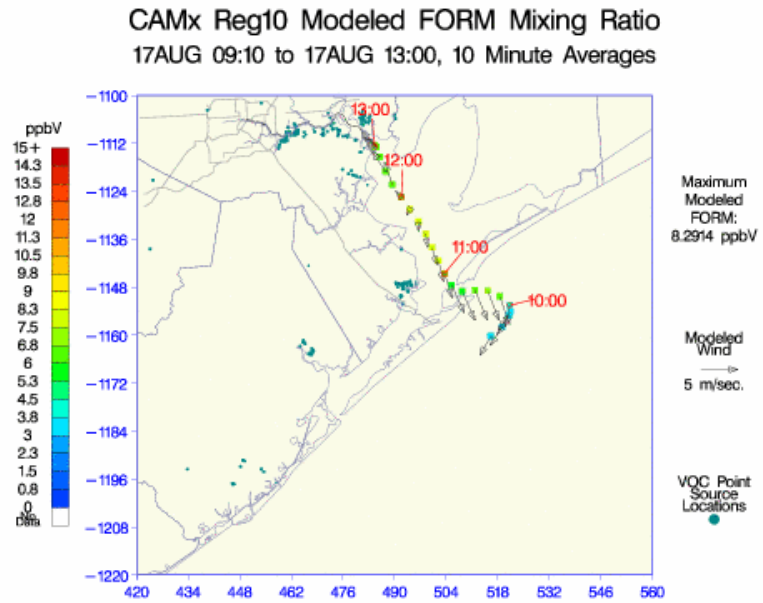

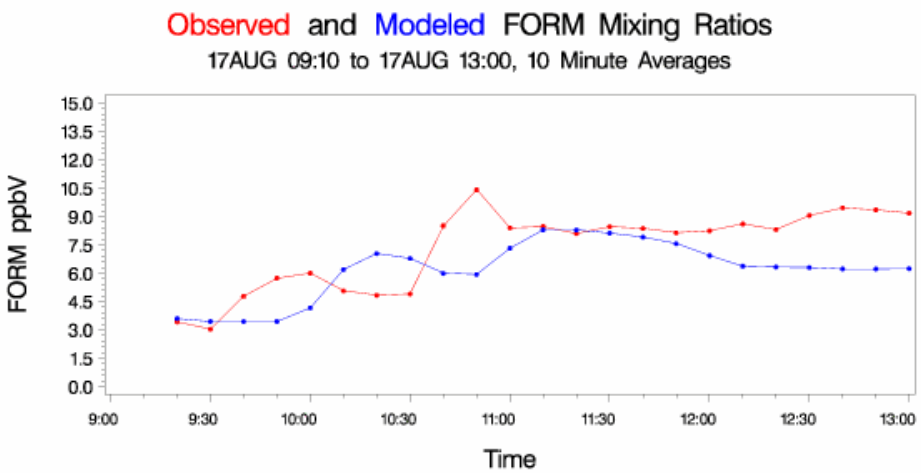

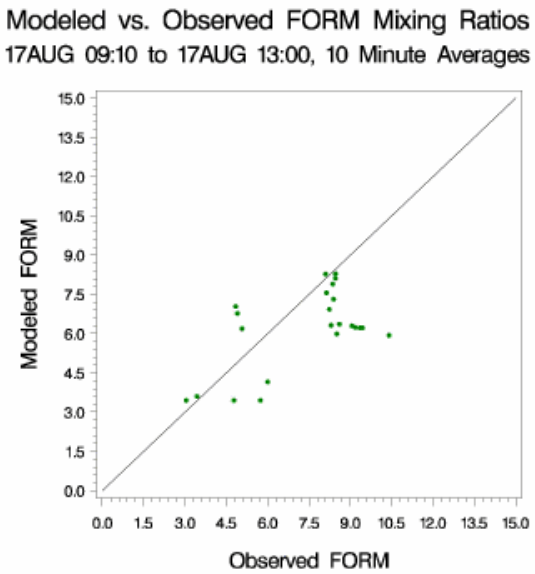

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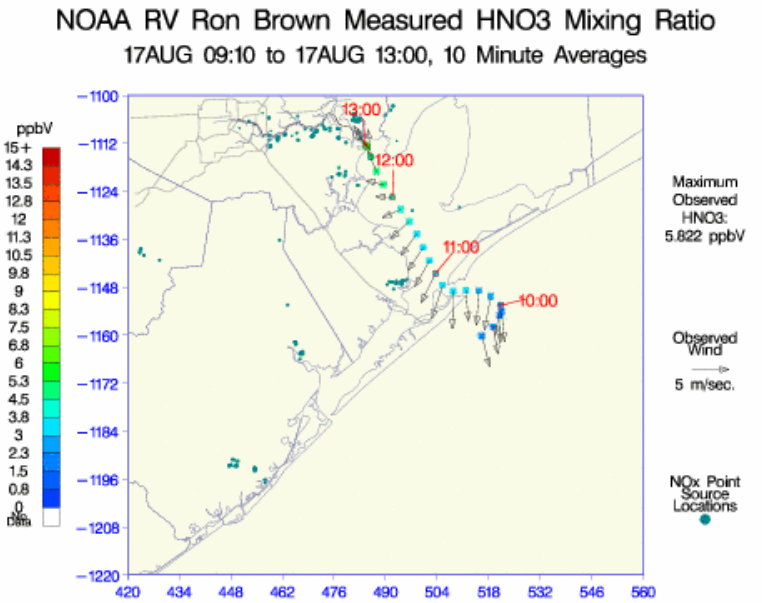
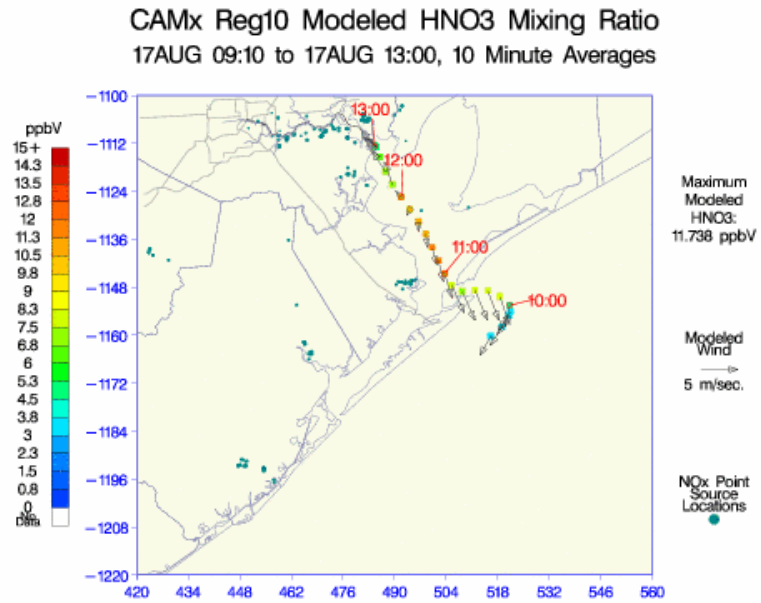
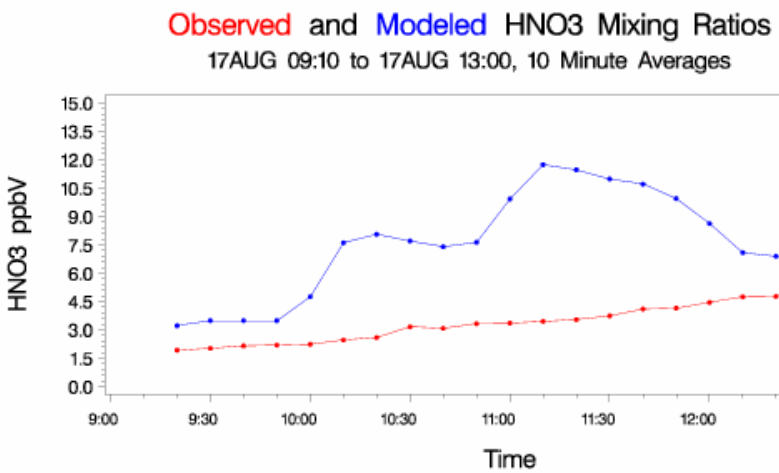
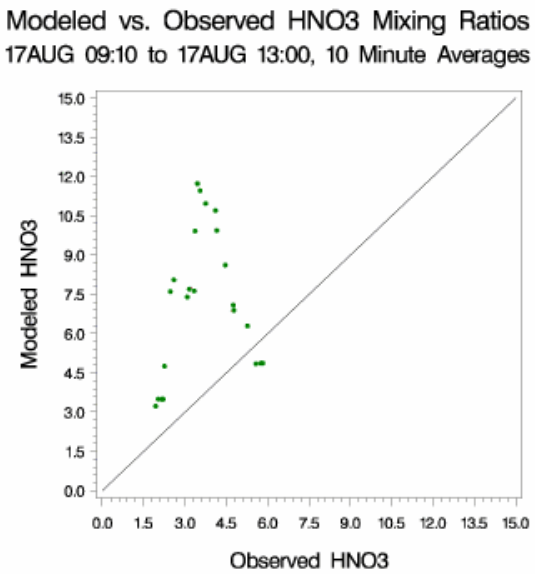
August 17 – Segment 3 Details



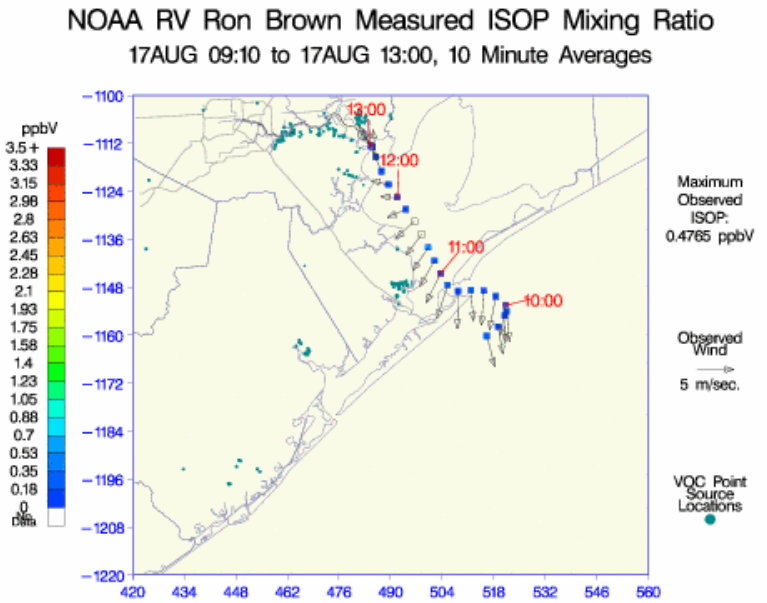


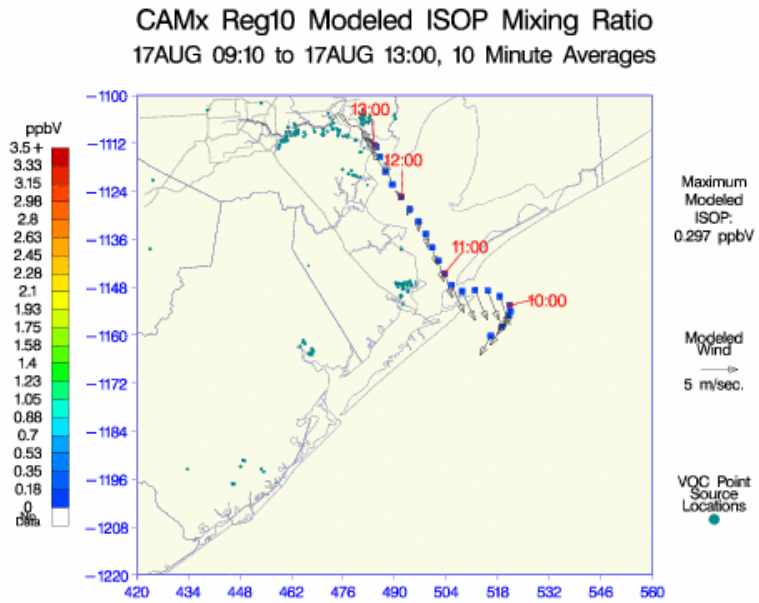


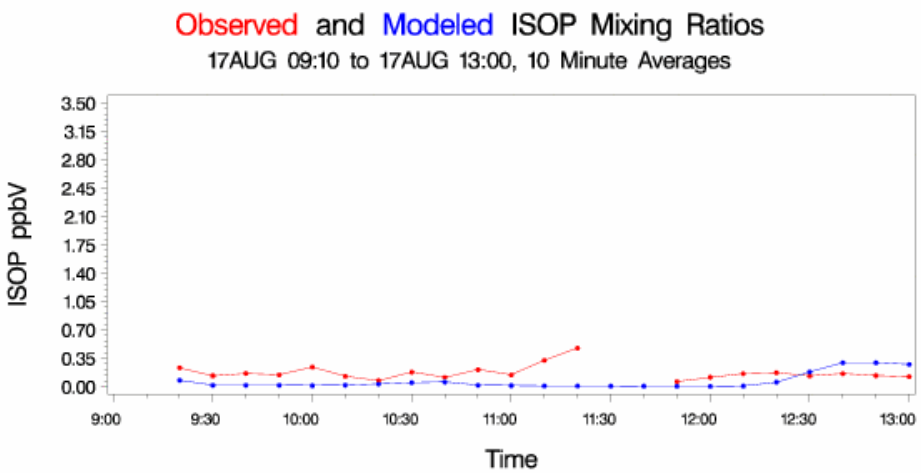


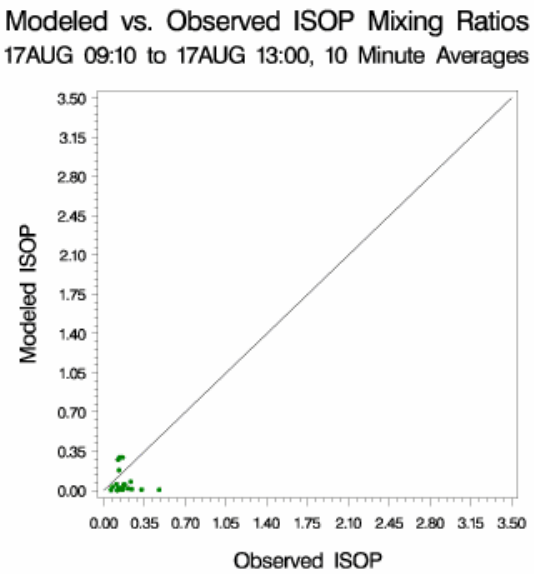
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 17 – Segment 3 Details









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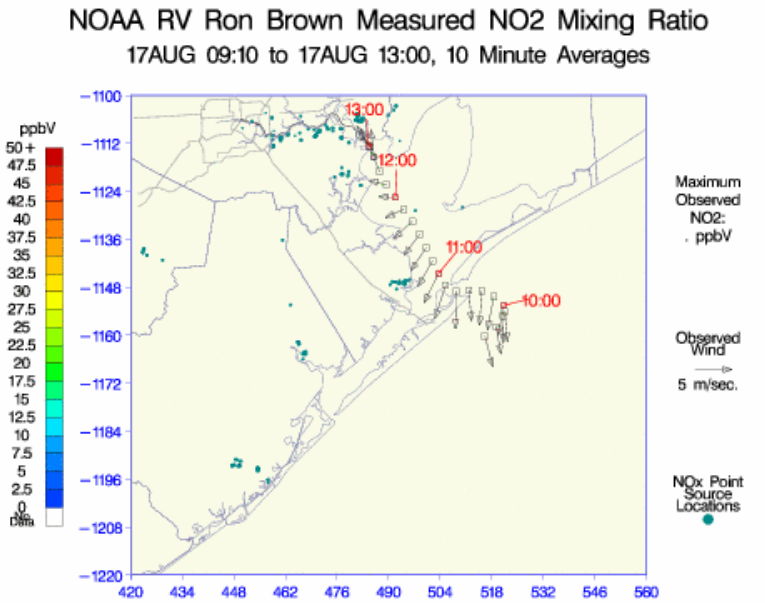
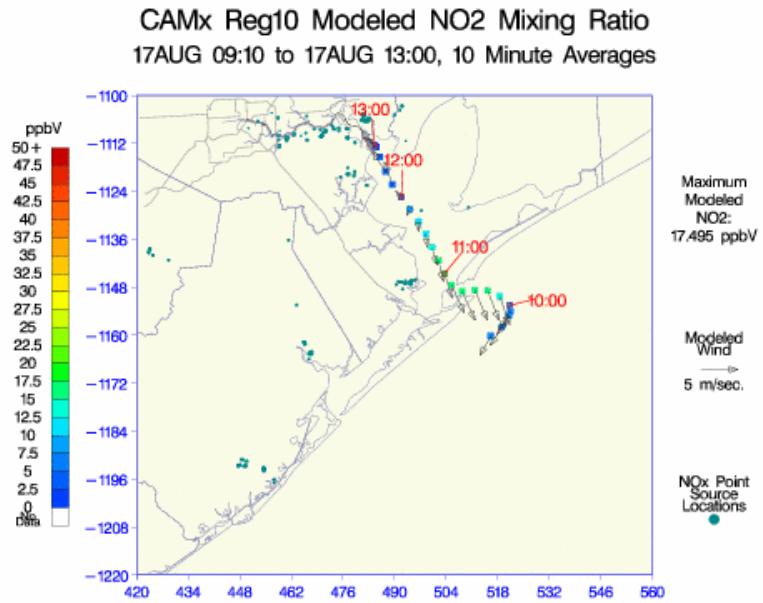
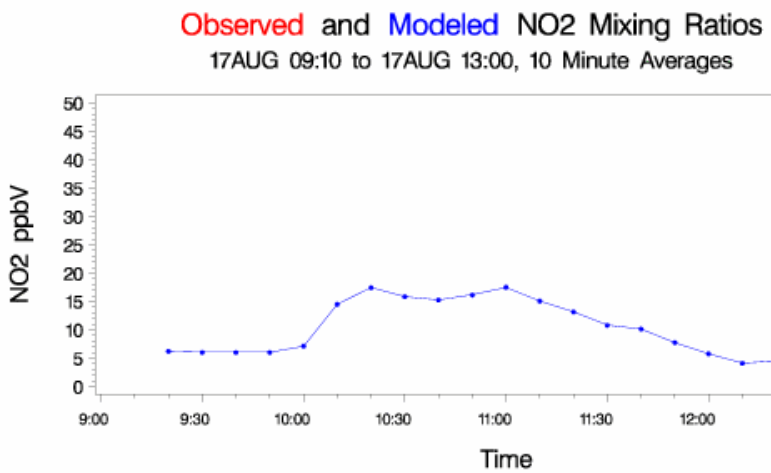
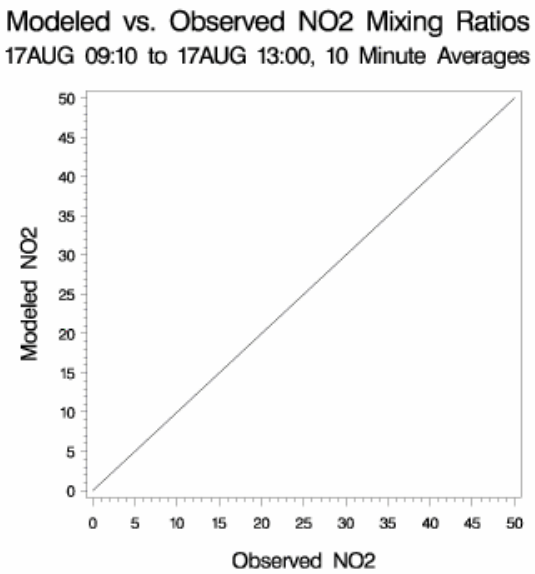
August 17 – Segment 3 Details



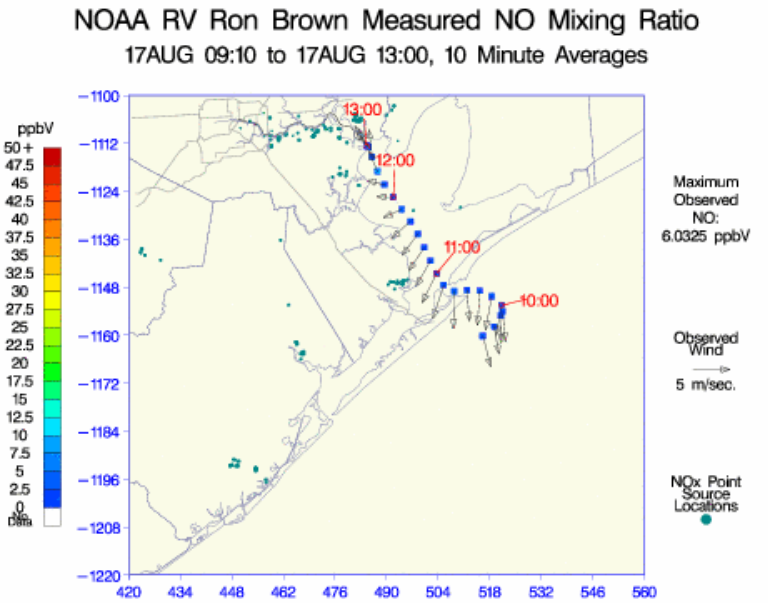


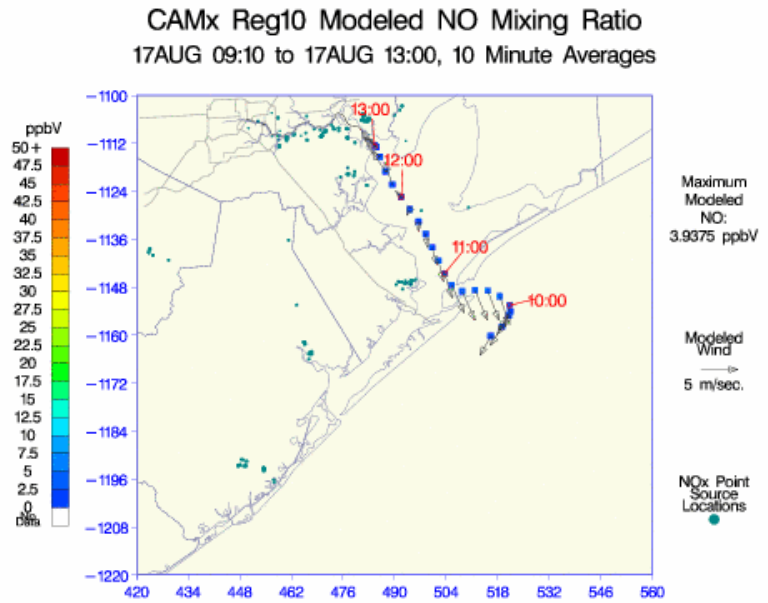


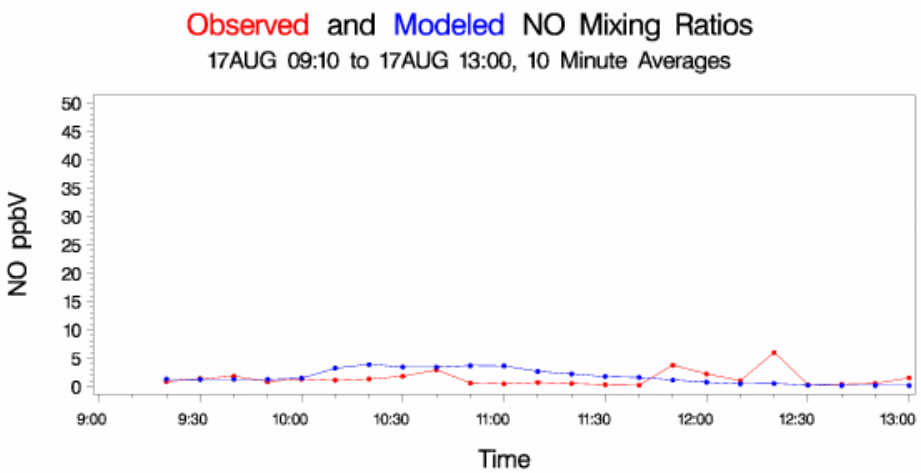


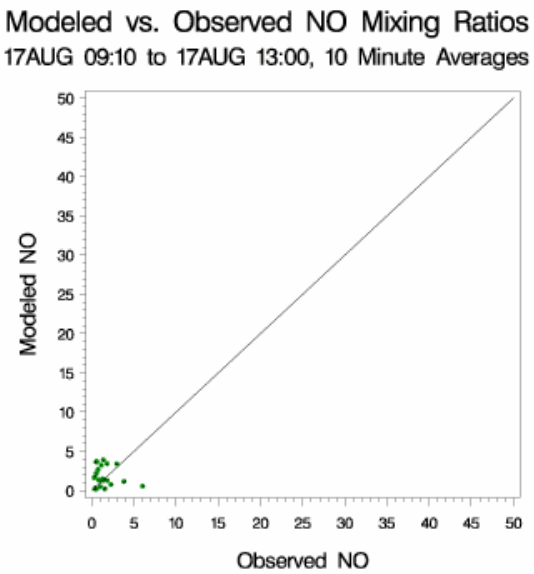
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 17 – Segment 3 Details









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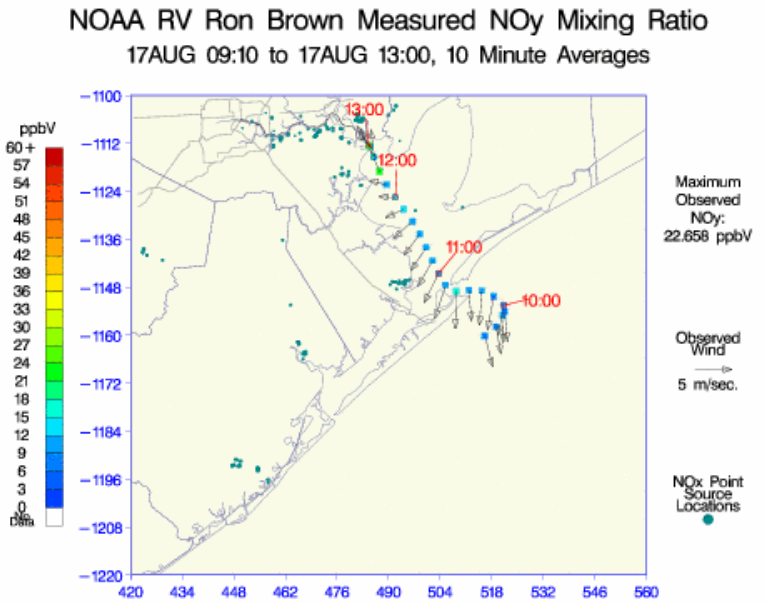
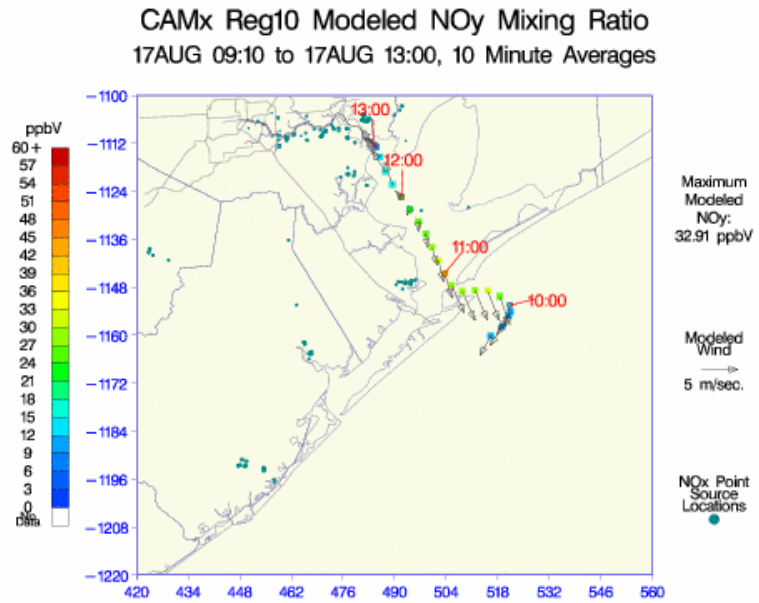
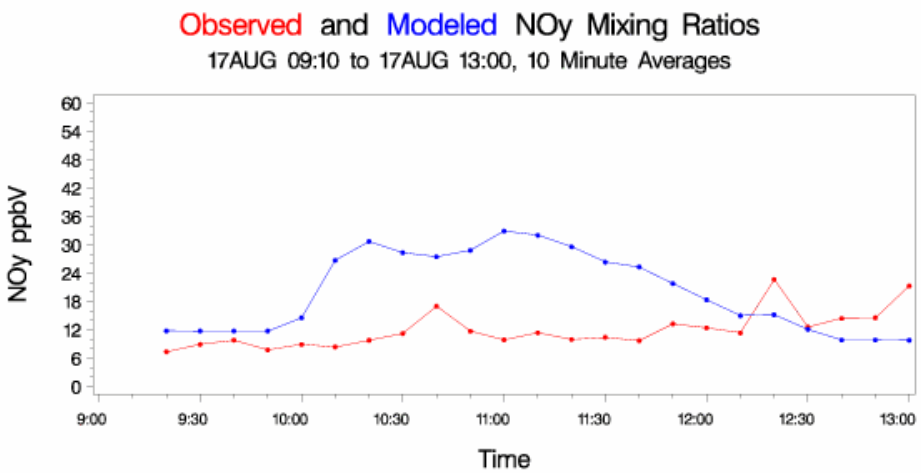
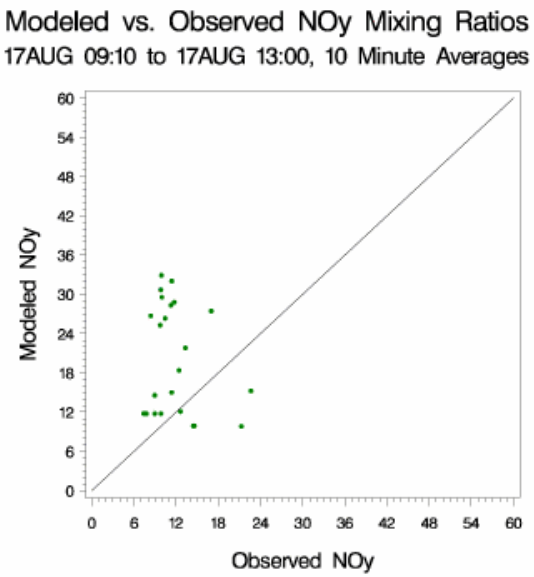
August 17 – Segment 3 Details



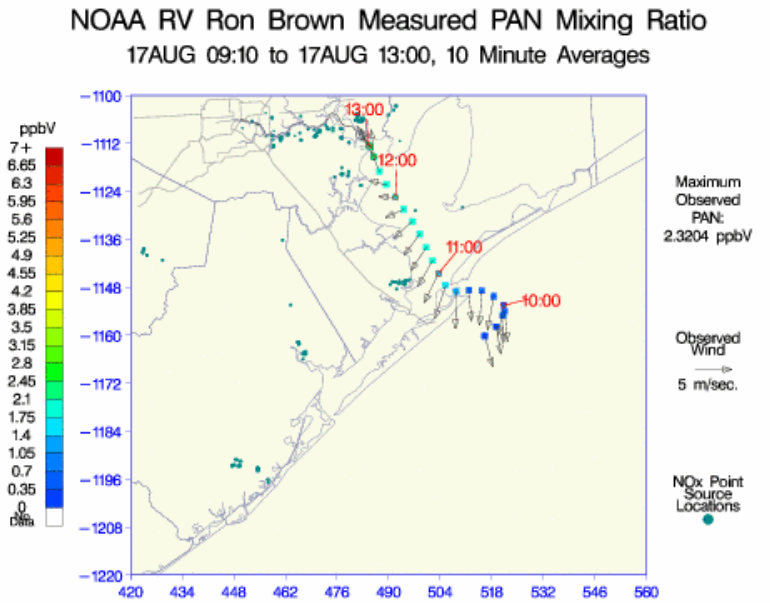


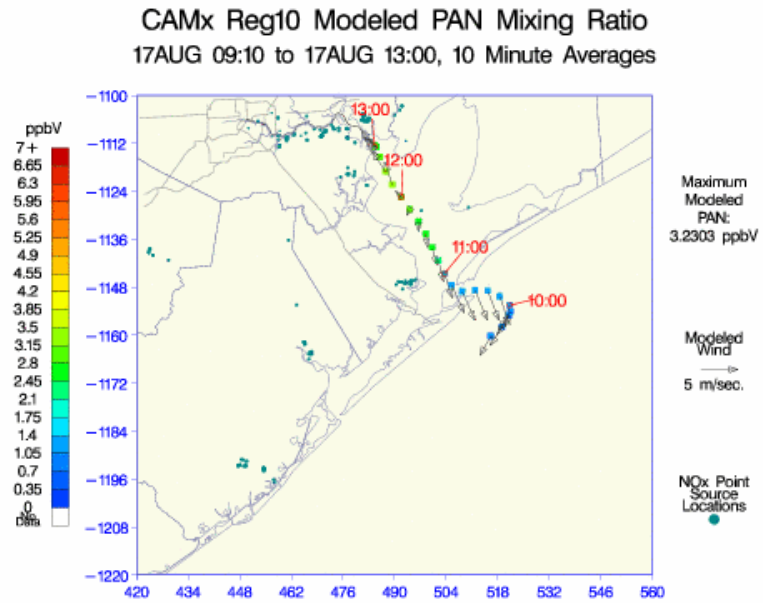


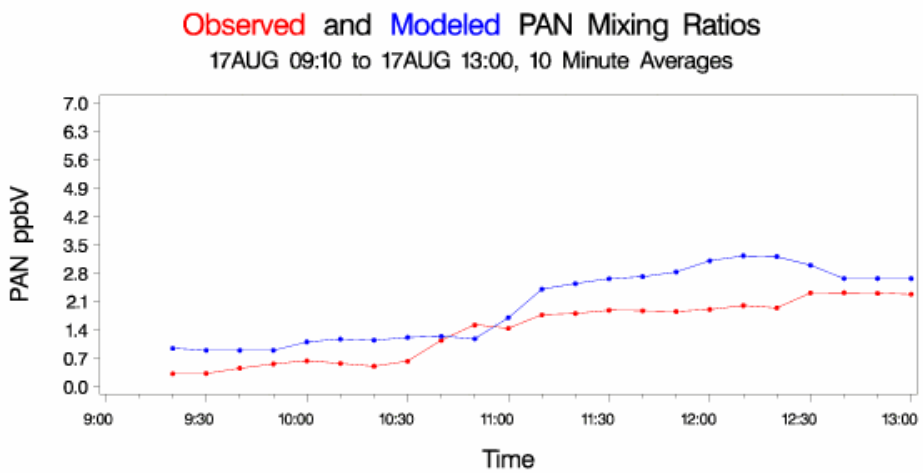


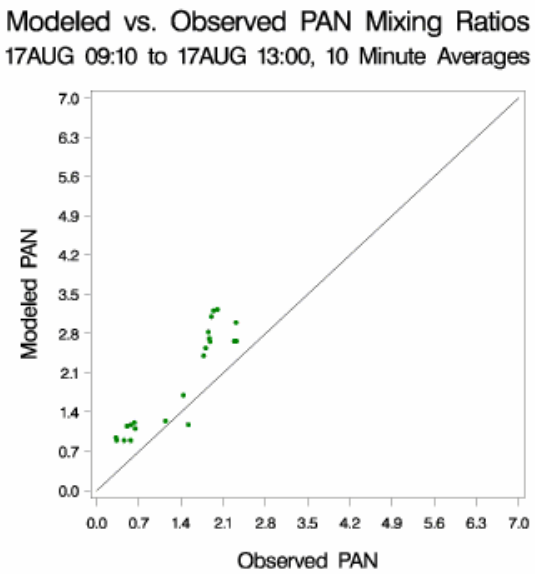
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 17 – Segment 3 Details



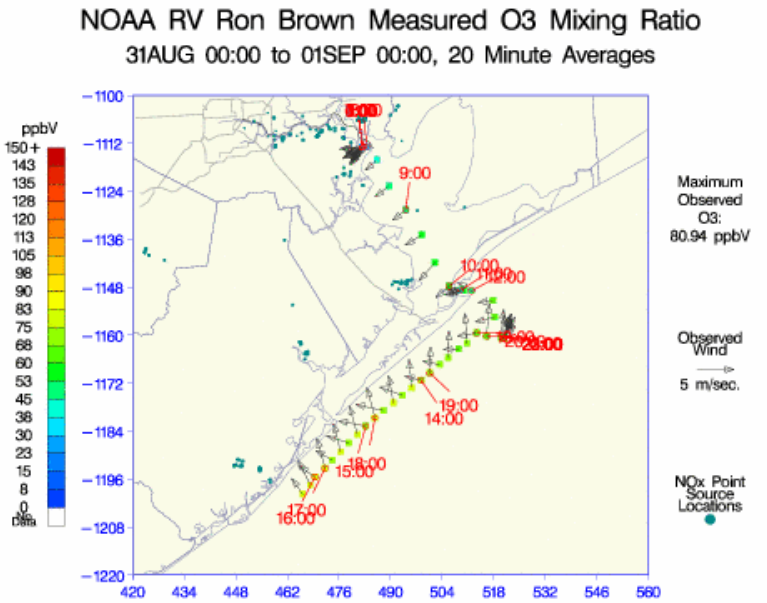


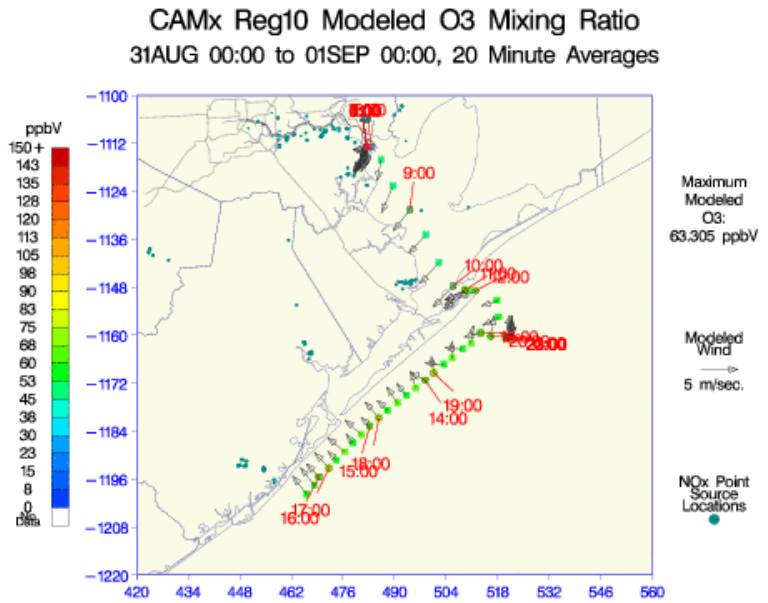


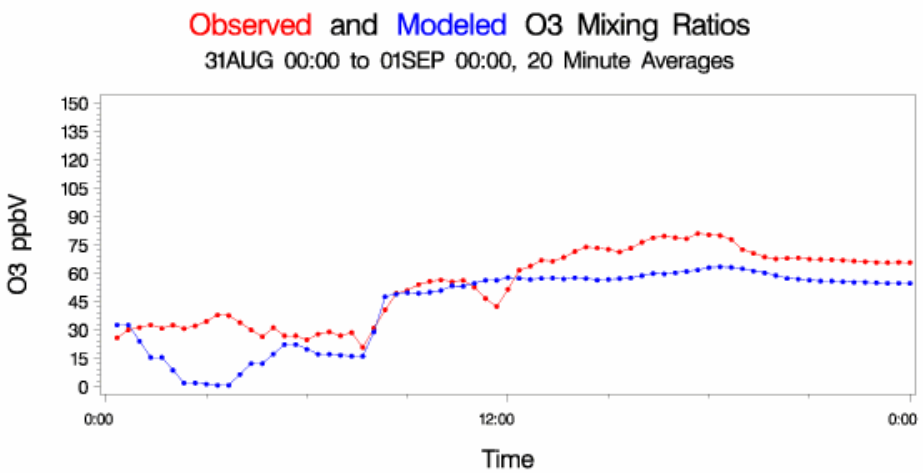


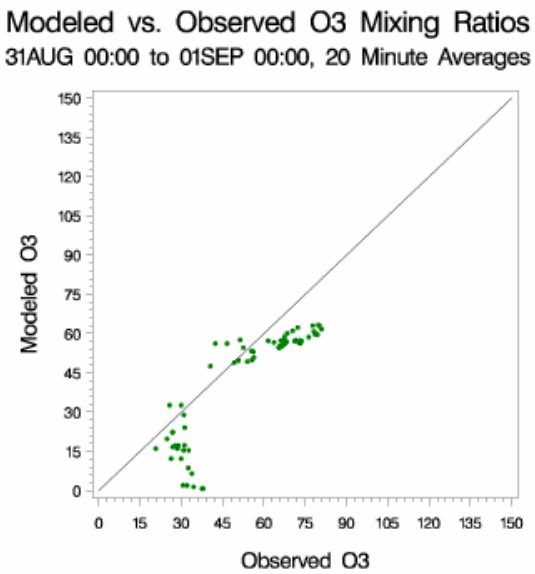
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 Example



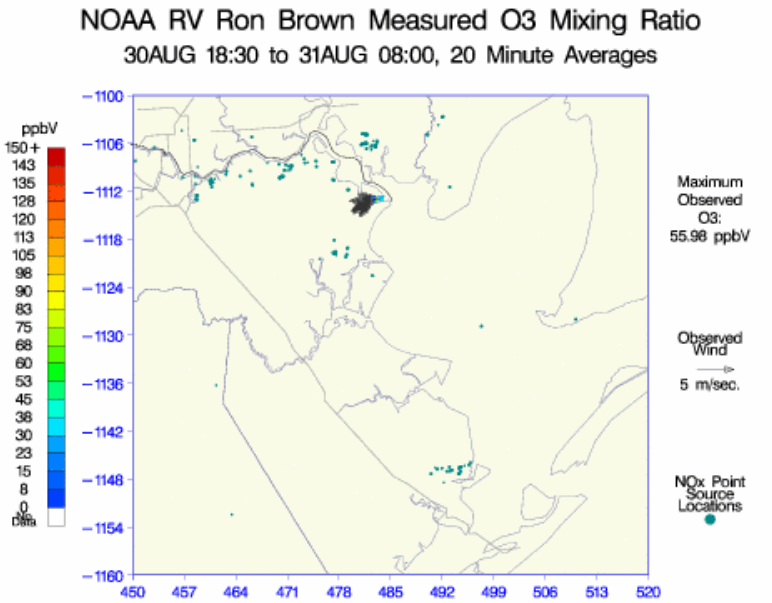


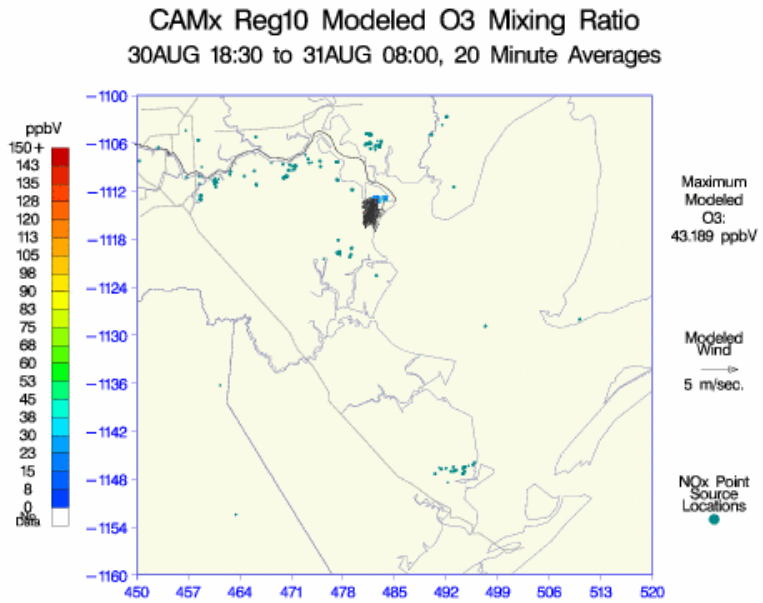


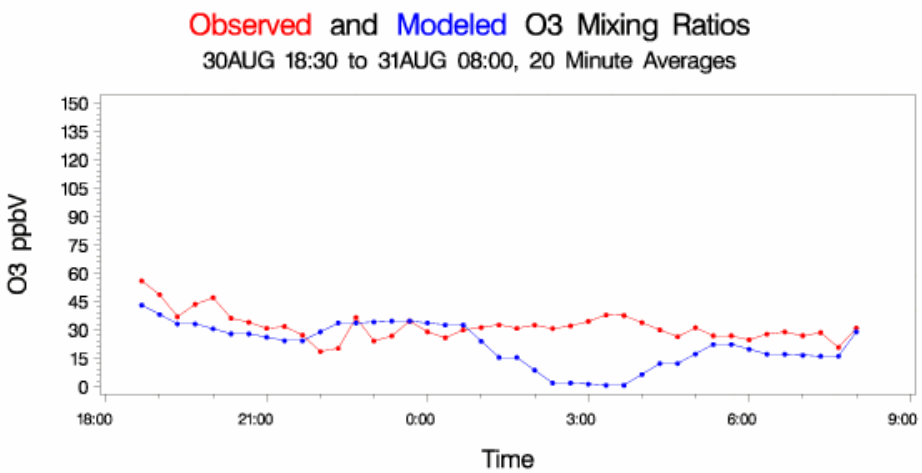


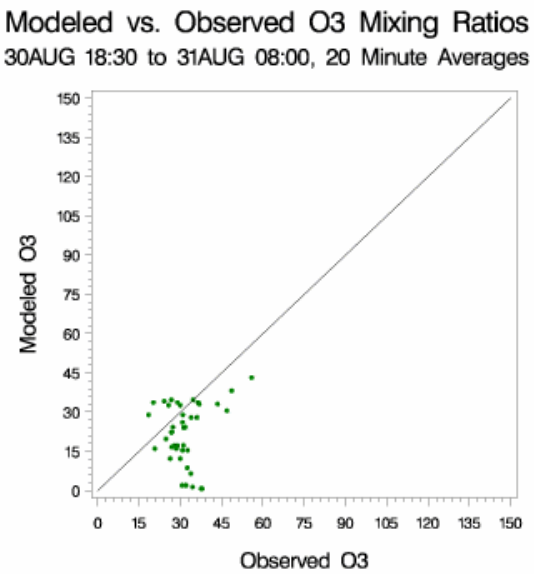
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 1









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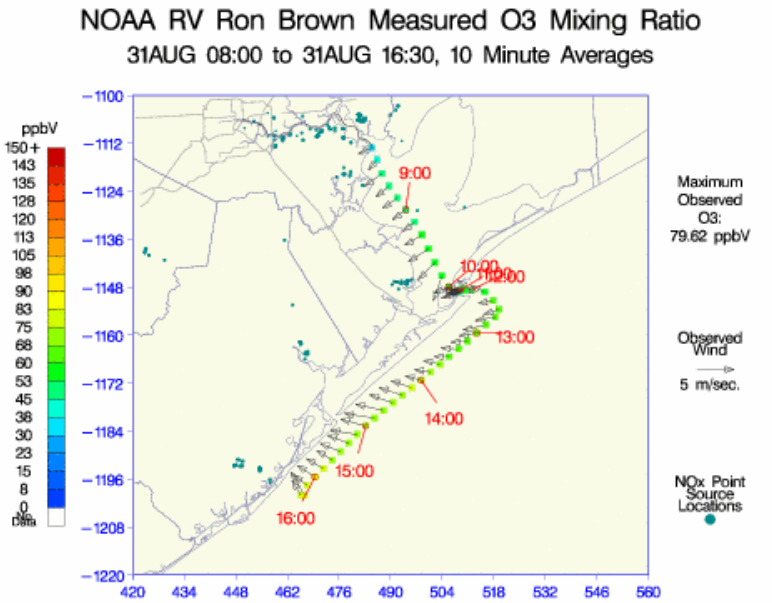
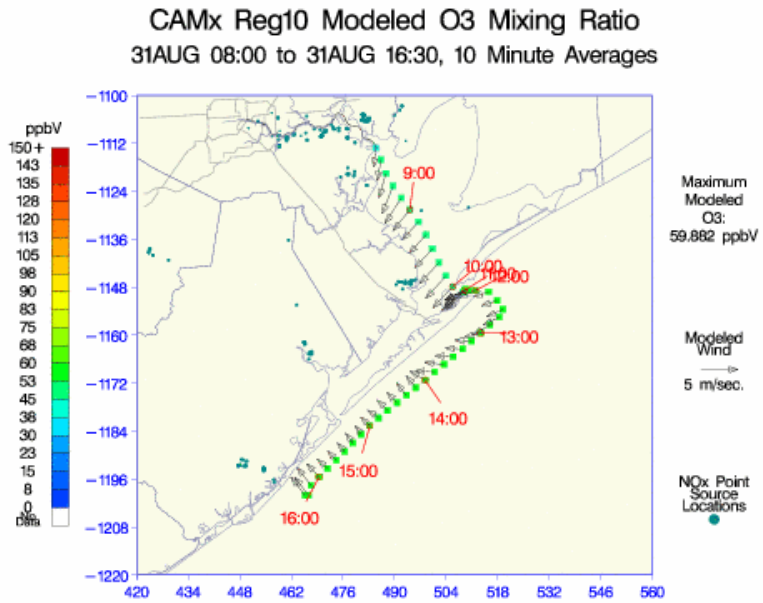
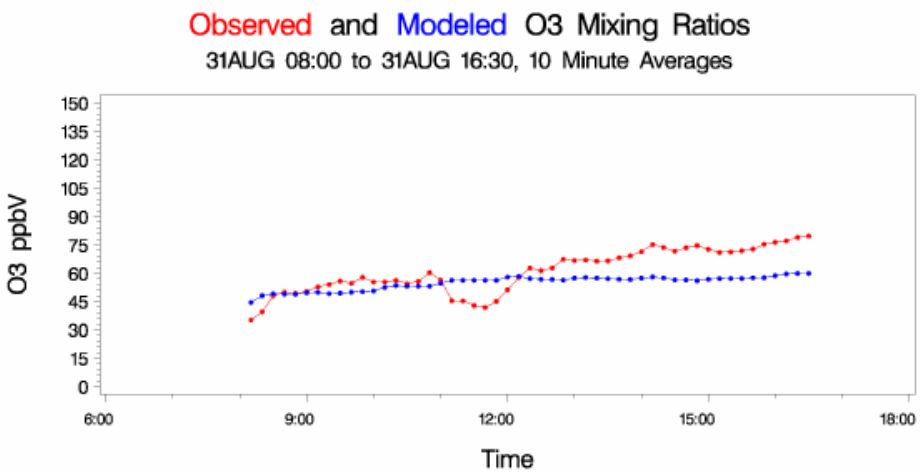
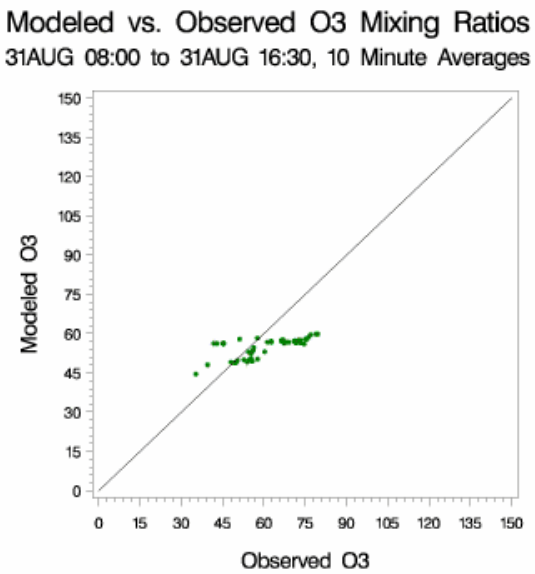
August 31 – Segment 2









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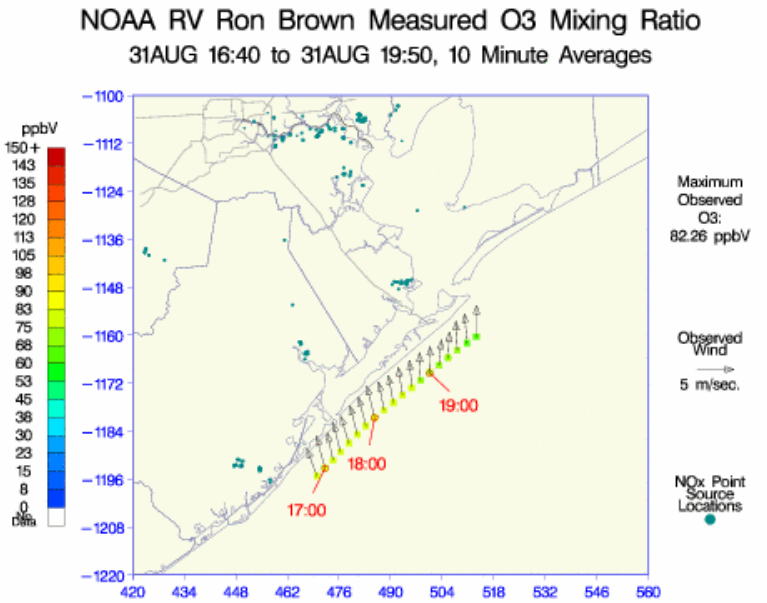
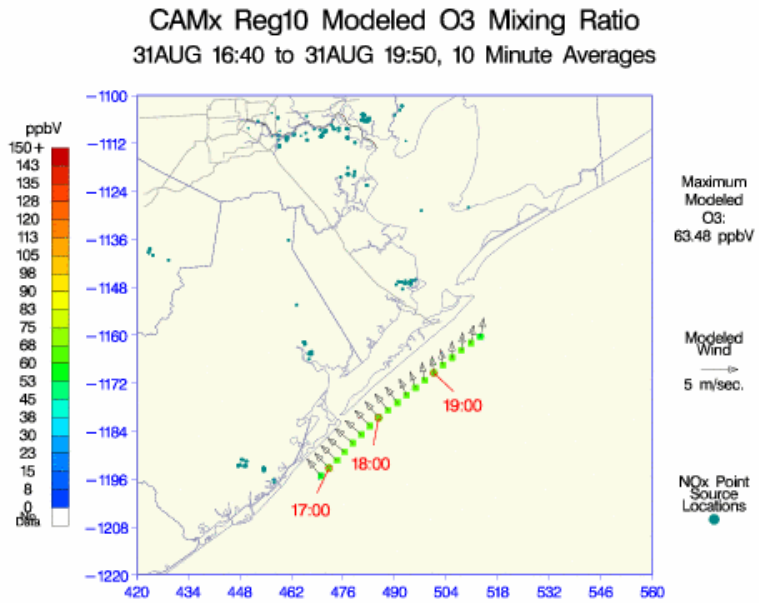
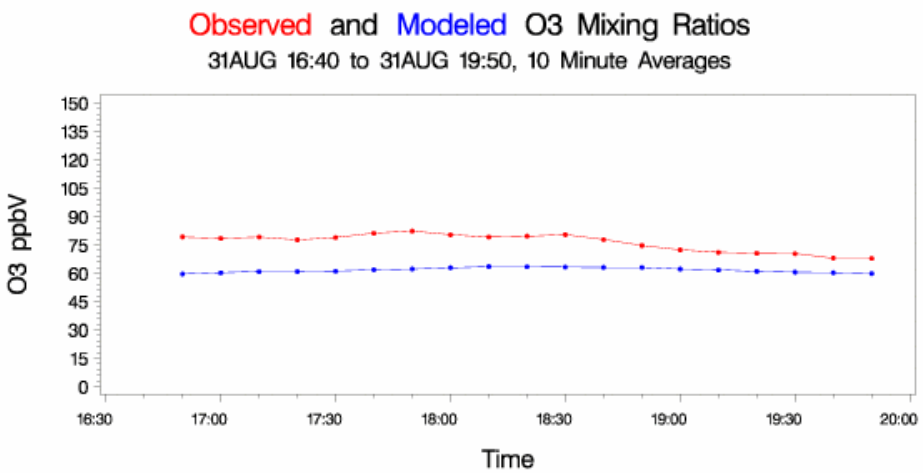
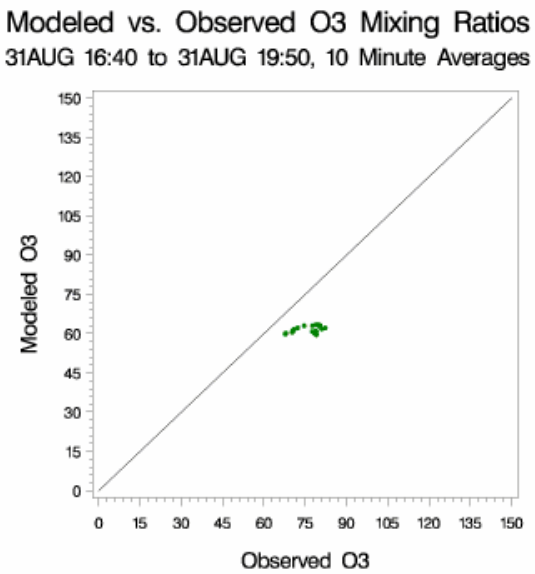
August 31 – Segment 3



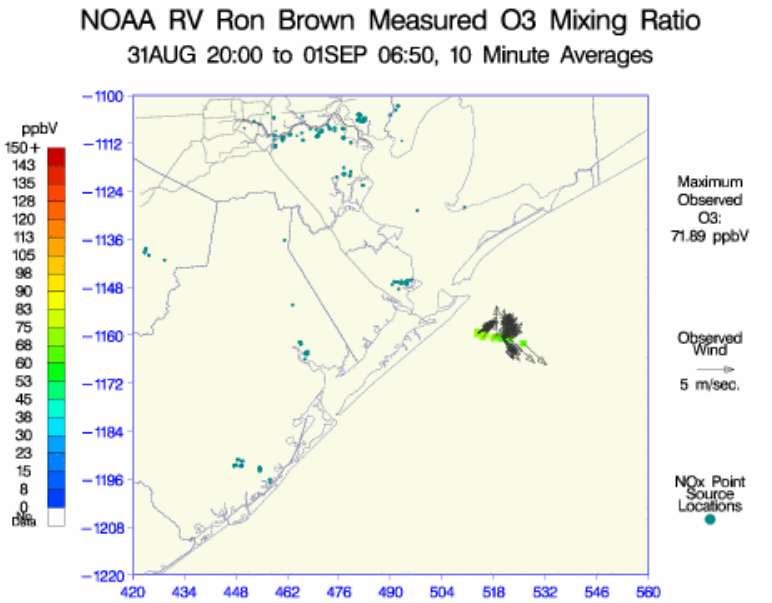


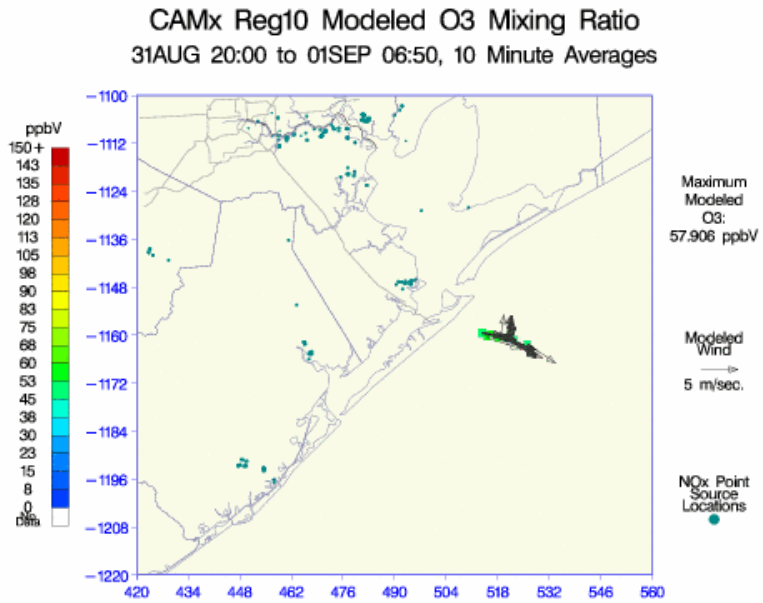


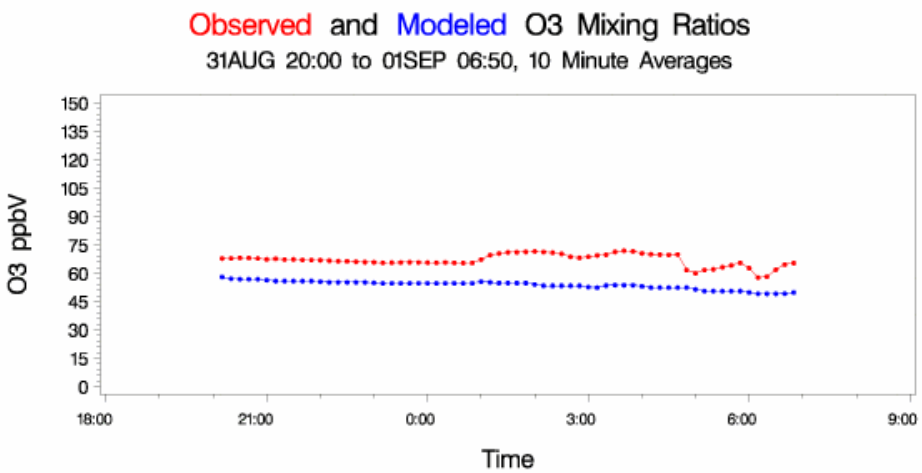


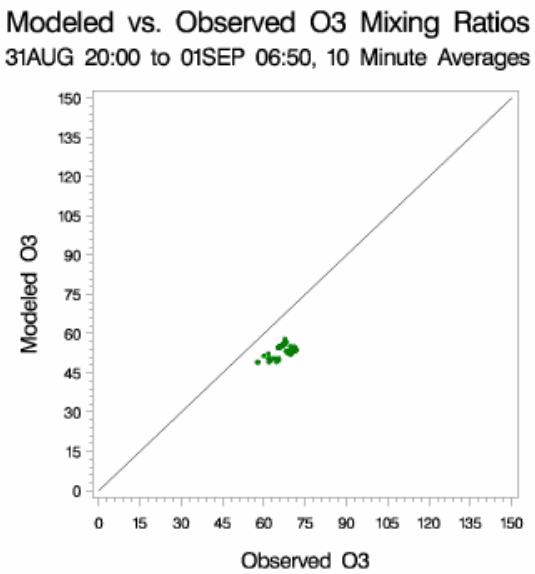
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 4



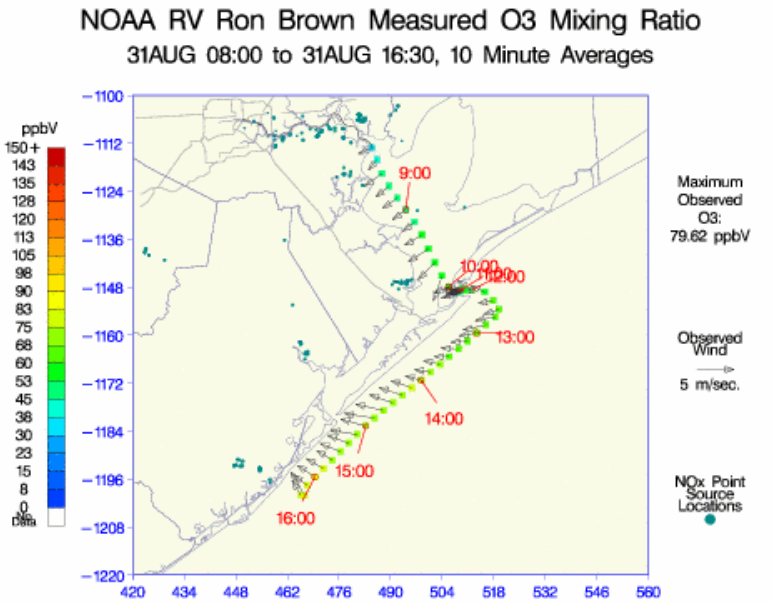


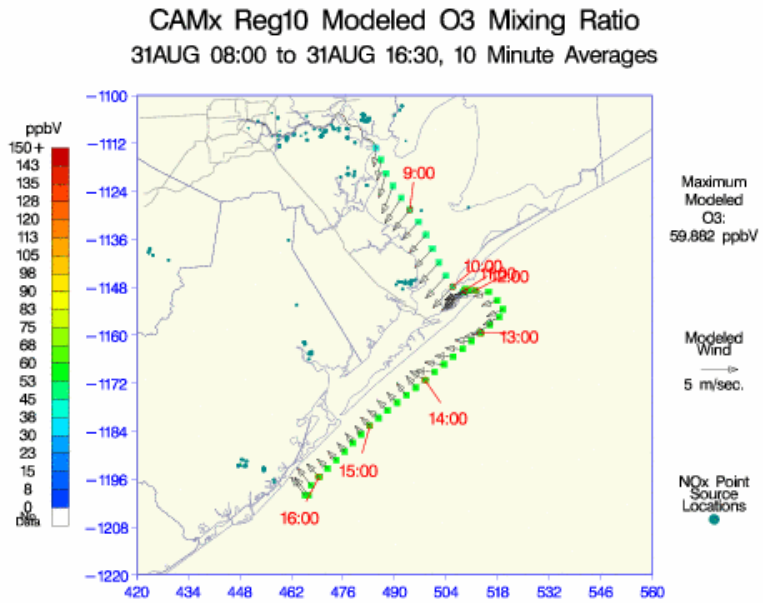


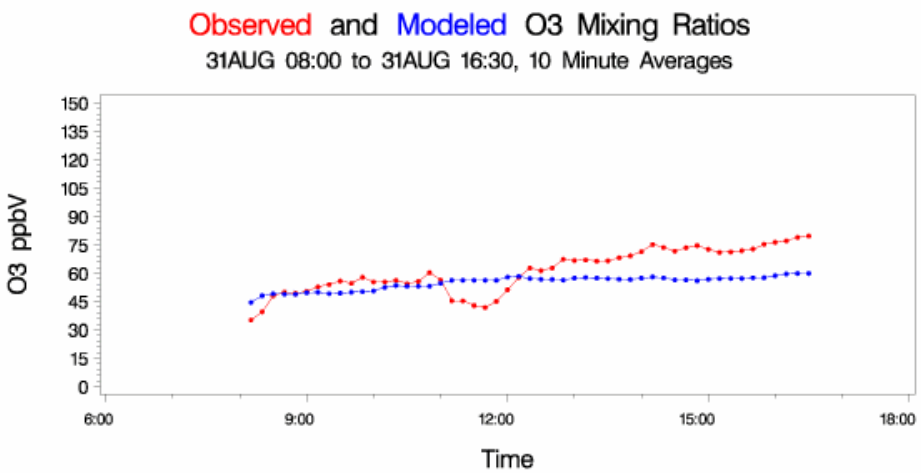


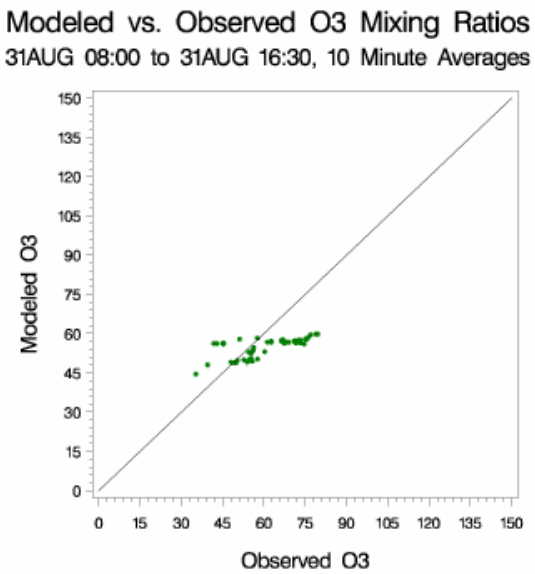
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 2 Details



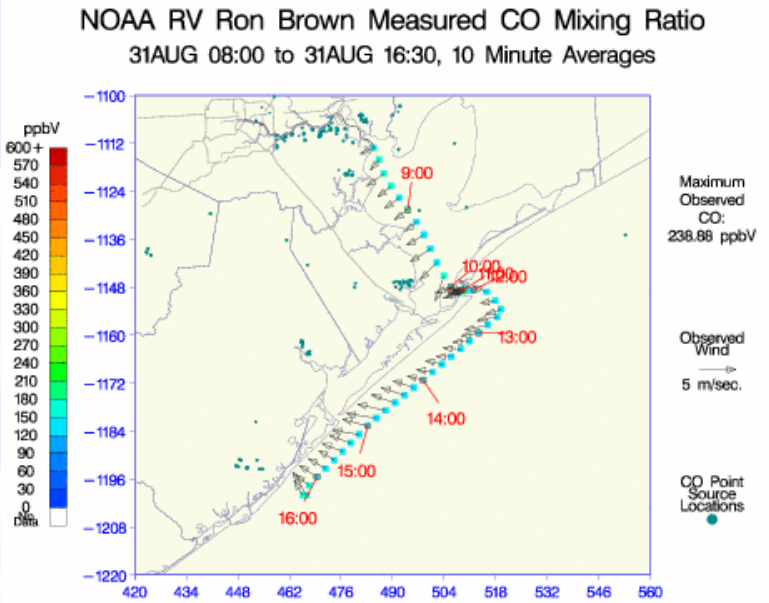


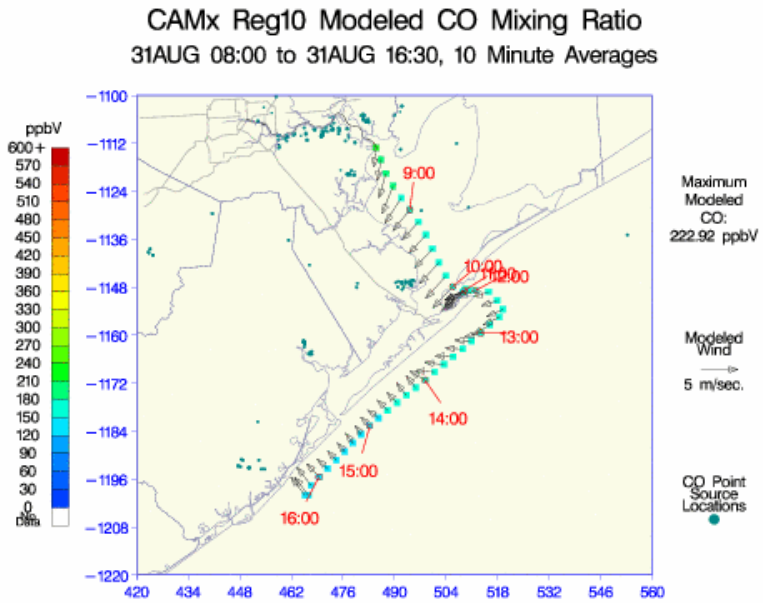


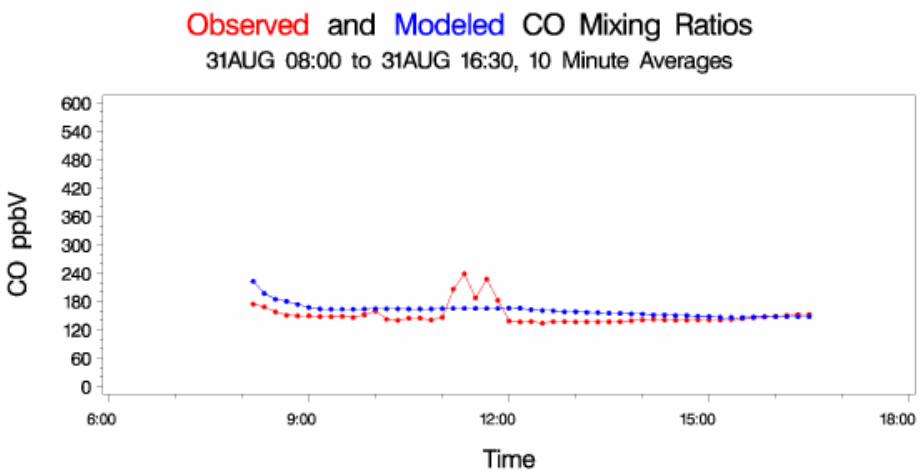


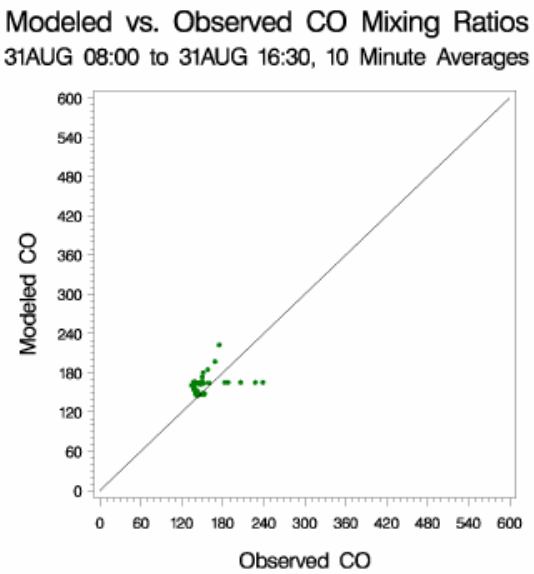
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 2 Details



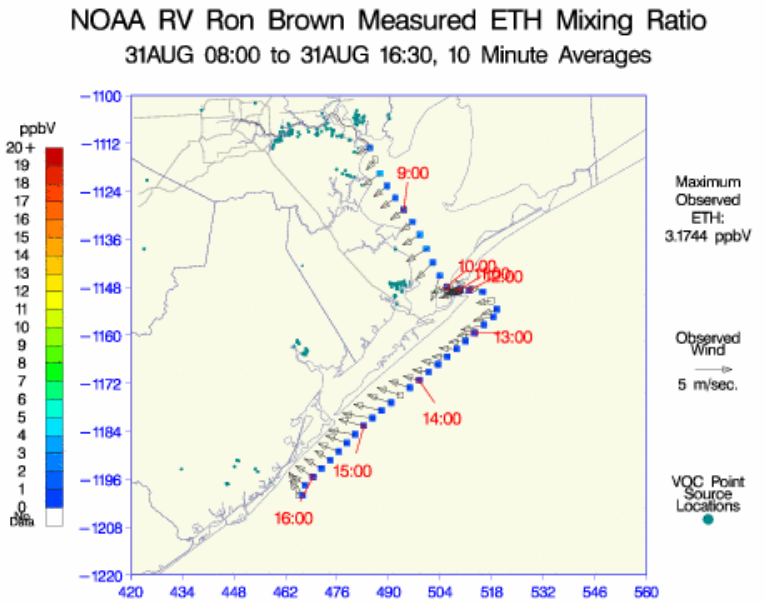


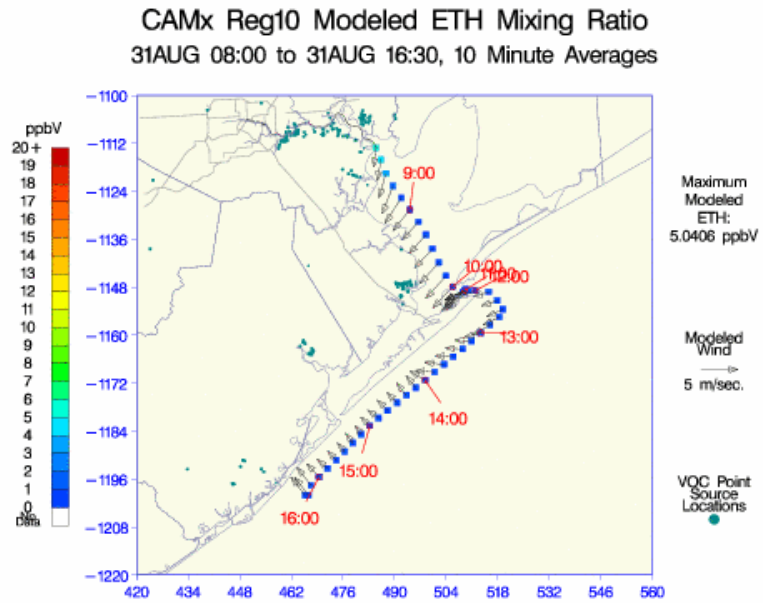


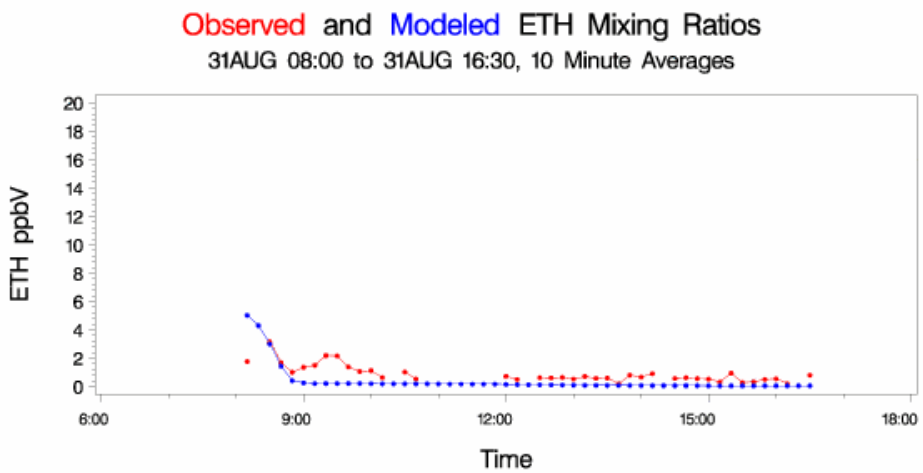


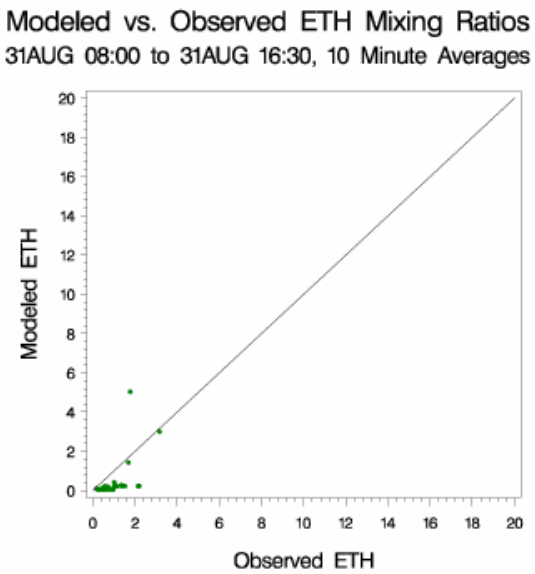
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 2 Details





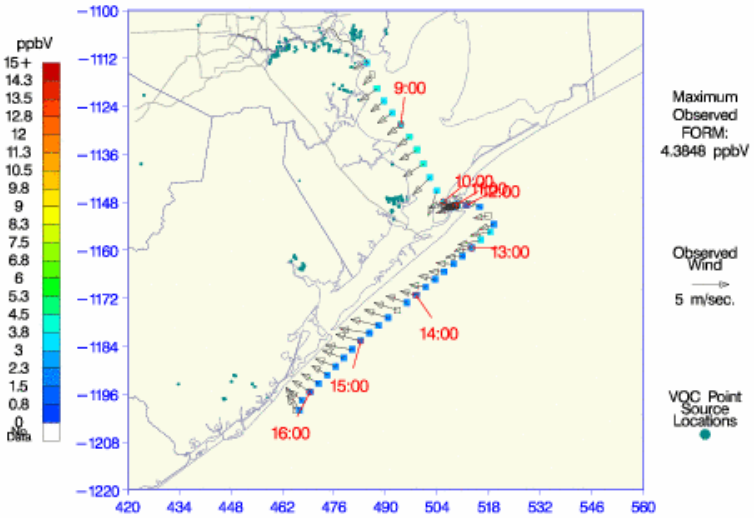




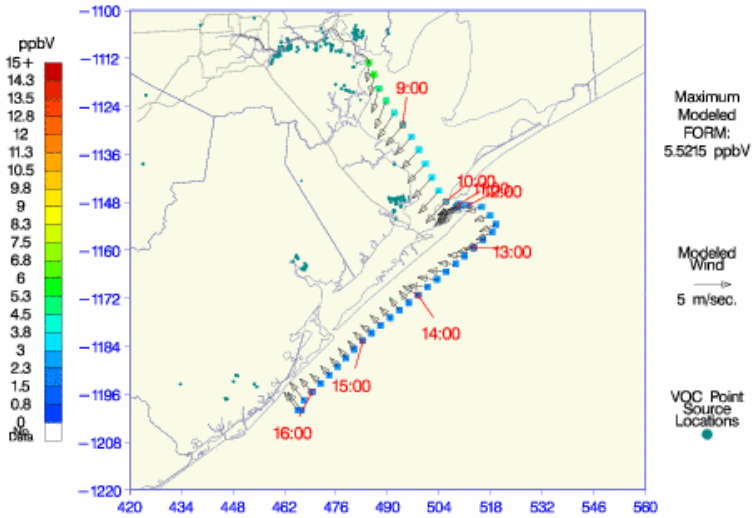
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 2 Details

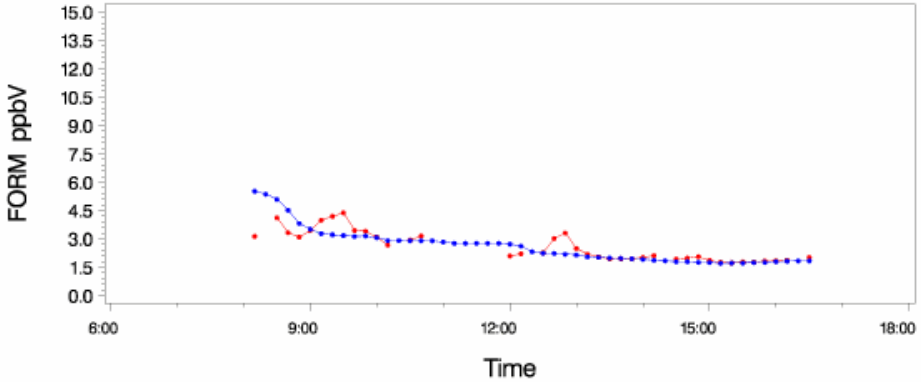
NOAA RV Ron Brown Measured FORM Mixing Ratio
31AUG 08:00 to 31AUG 16:30, 10 Minute Averages



CAMx Reg10 Modeled FORM Mixing Ratio
31AUG 08:00 to 31AUG 16:30, 10 Minute Averages



Observed and Modeled FORM Mixing Ratios
31AUG 08:00 to 31AUG 16:30, 10 Minute Averages



Modeled vs. Observed FORM Mixing Ratios
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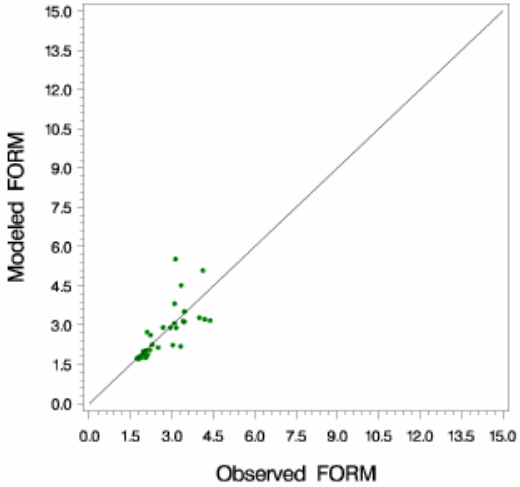
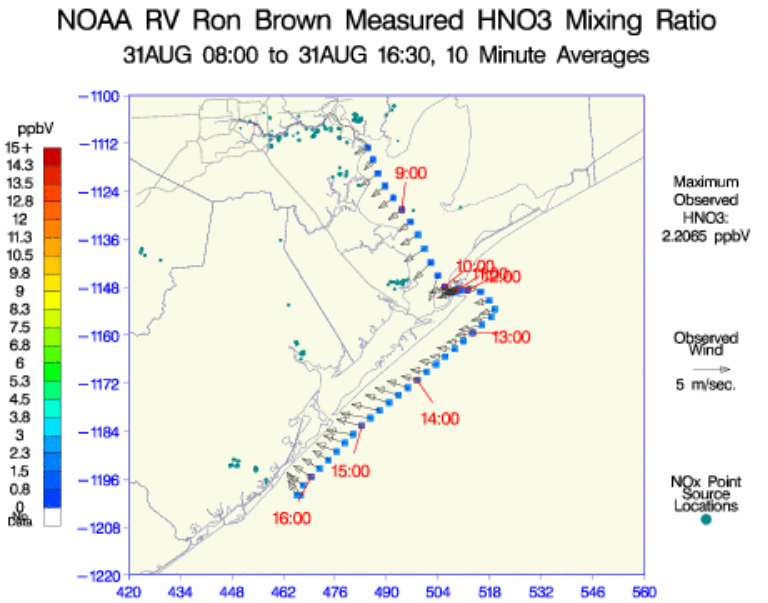
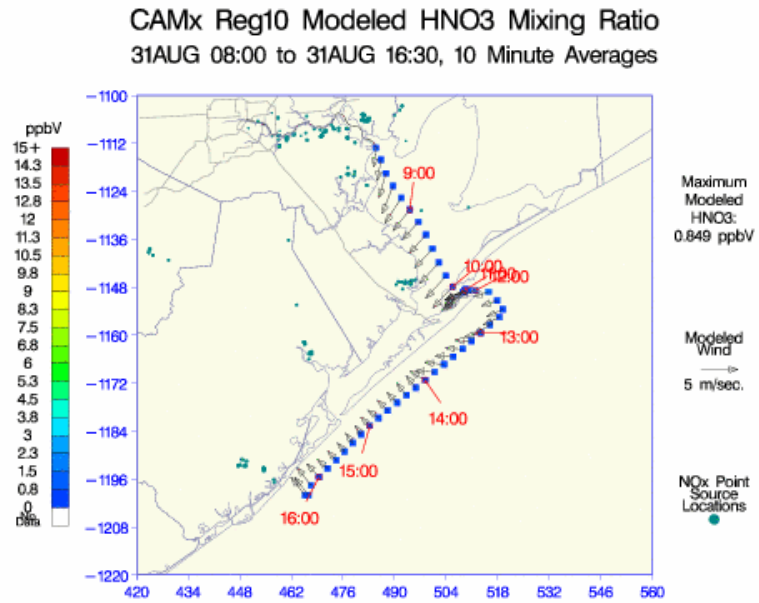
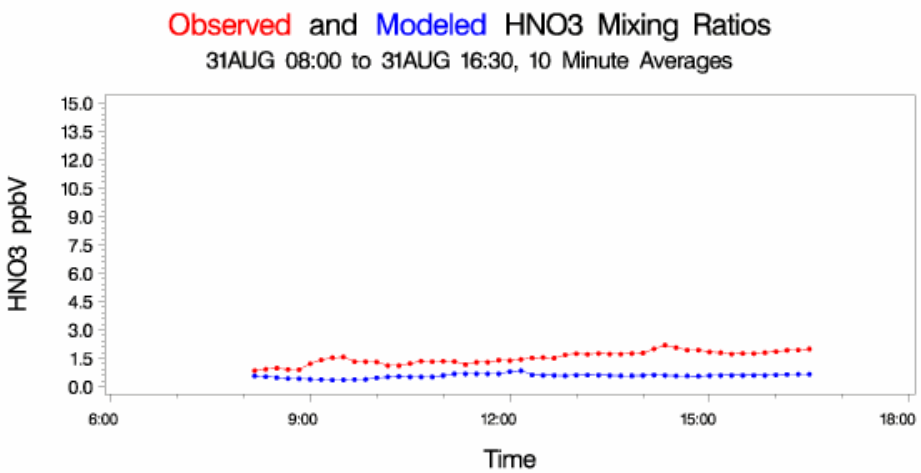


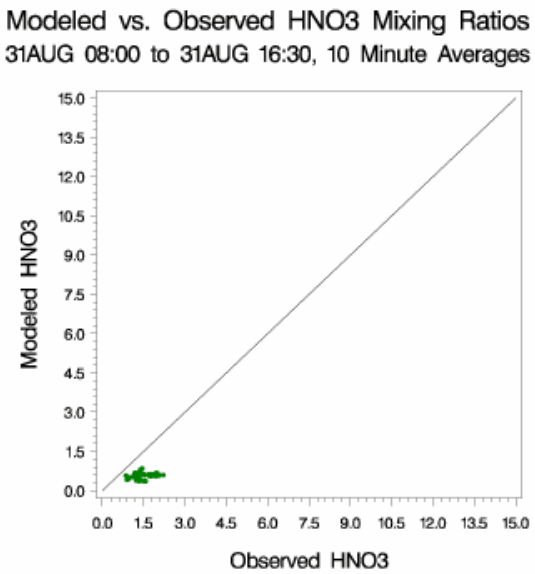
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 2 Details



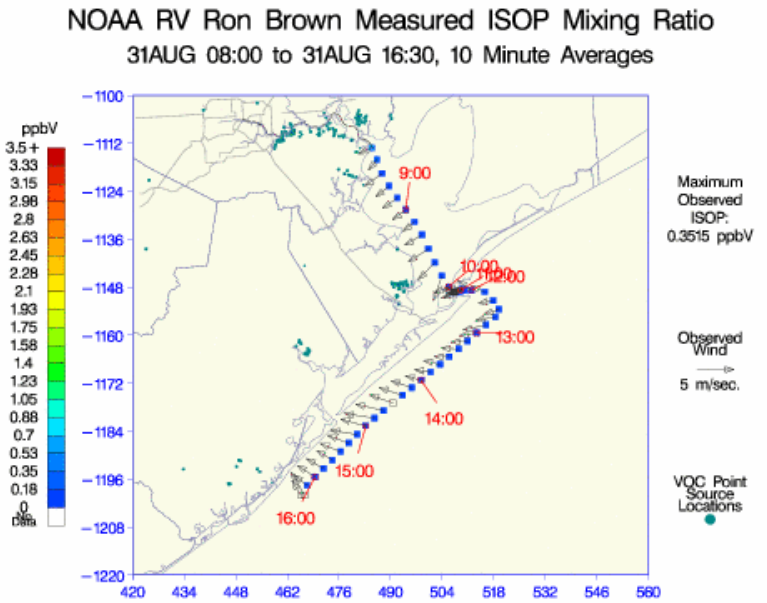


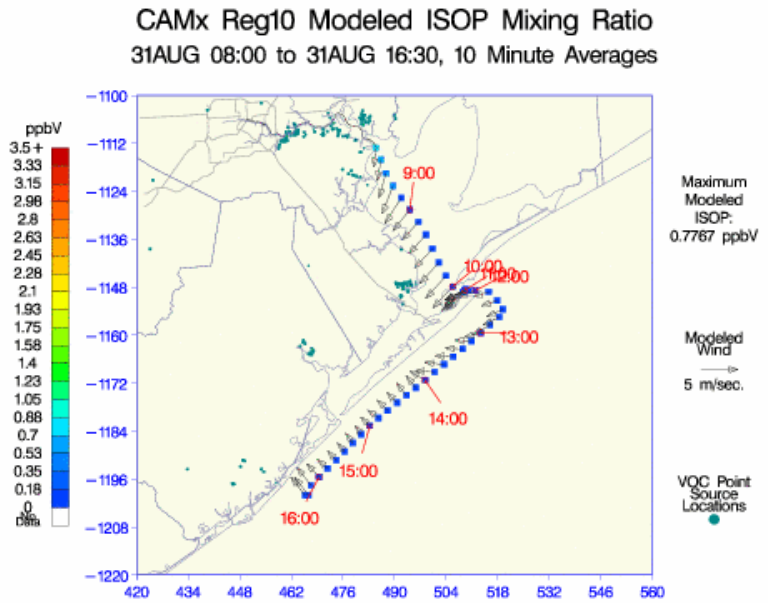


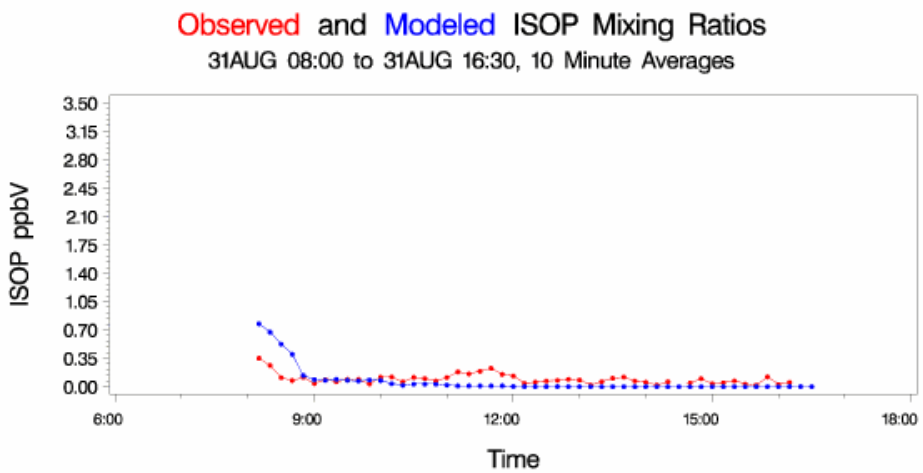


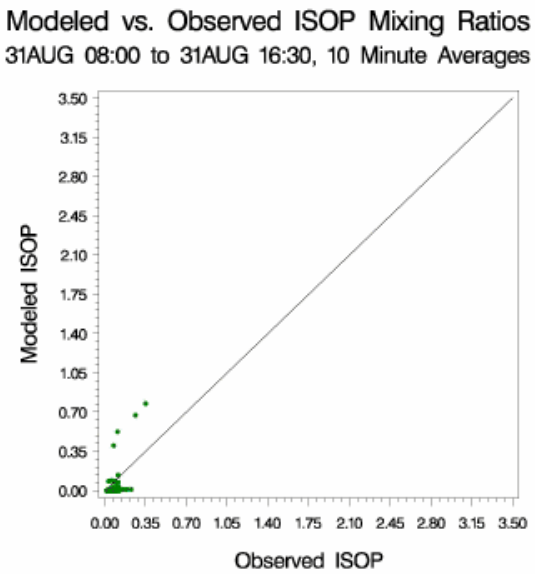
Run Name: camx453_cb05.bc06aqs.reg10.2006ep1_eta_dbemis_fddats_newuhsst_newutcsrlulc_grell

August 31 – Segment 2 Details









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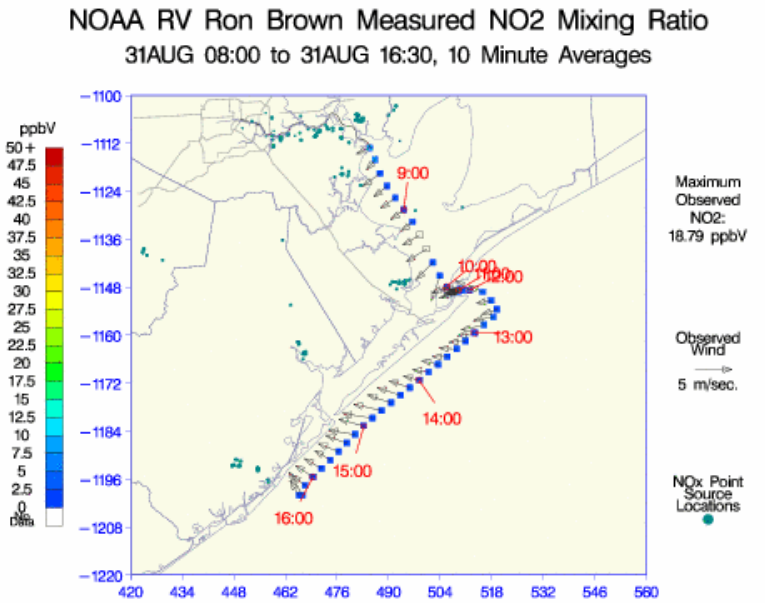
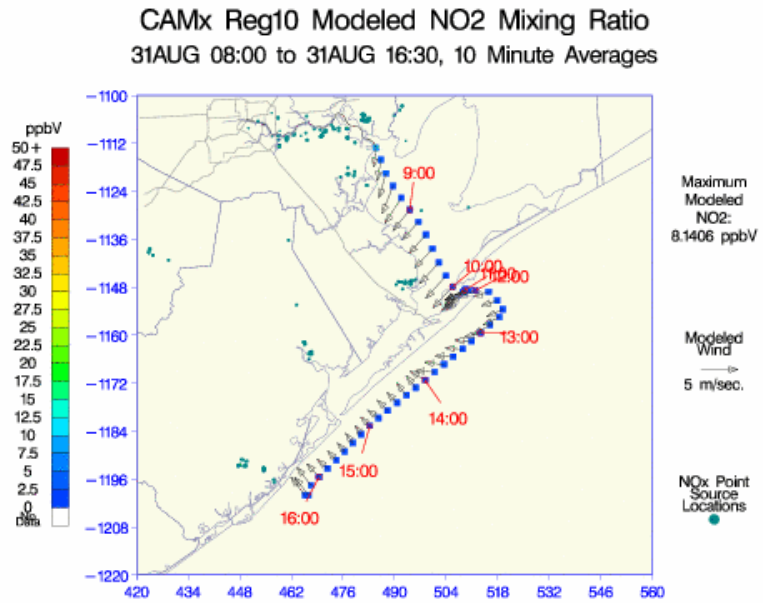
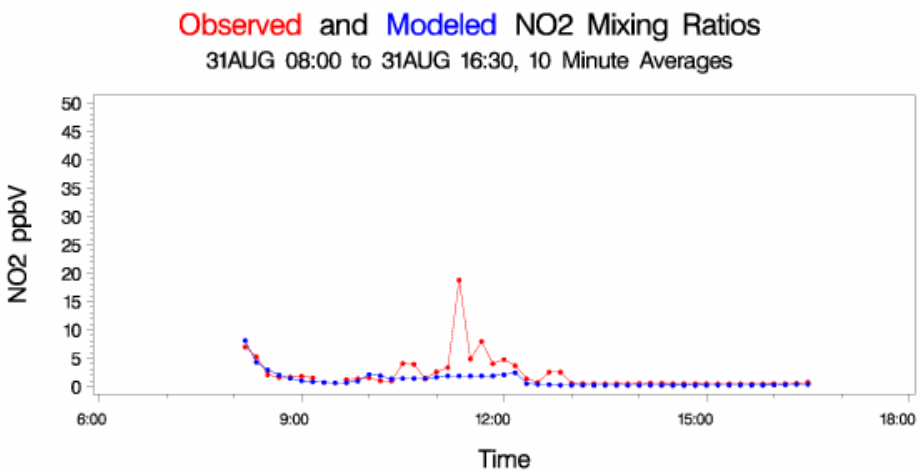
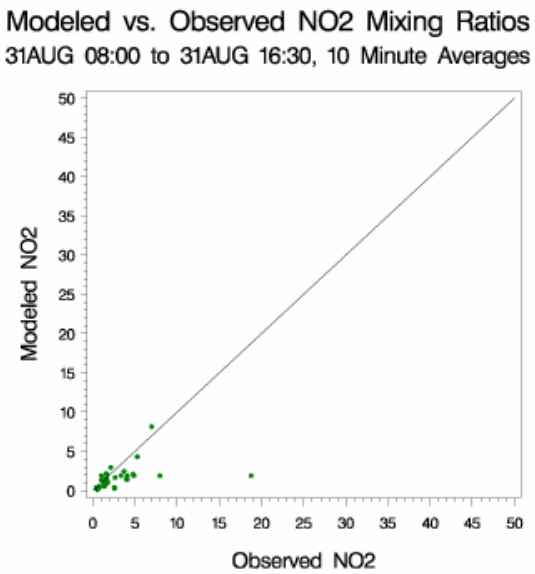
August 31 – Segment 2 Details









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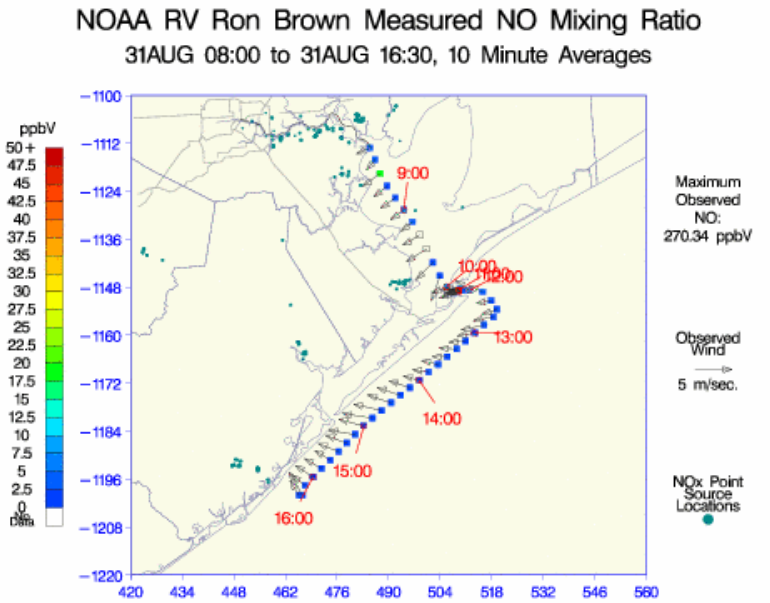
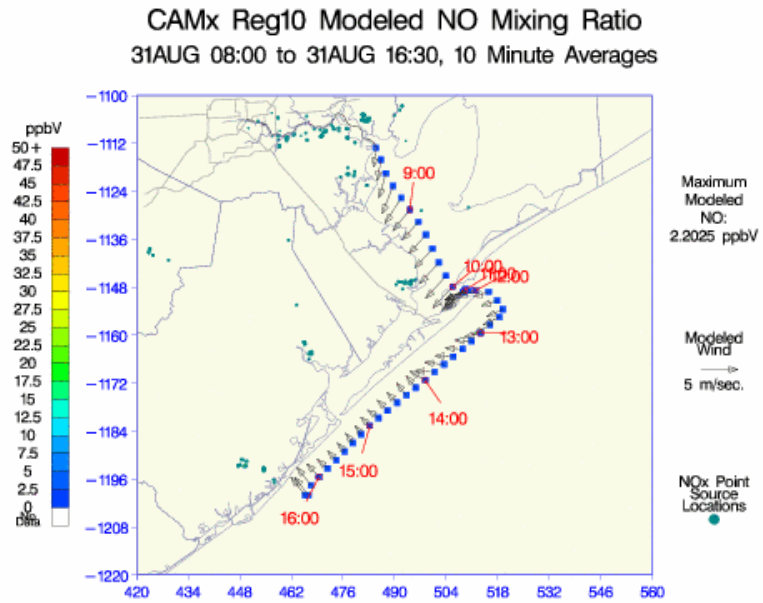
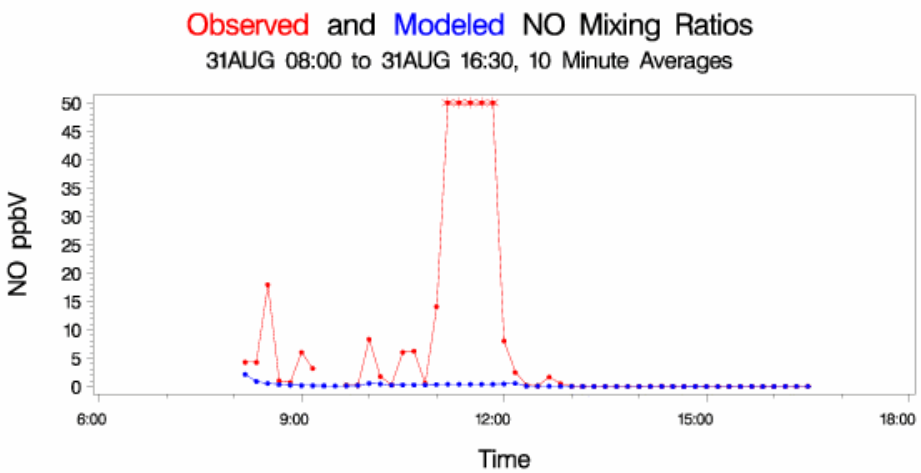
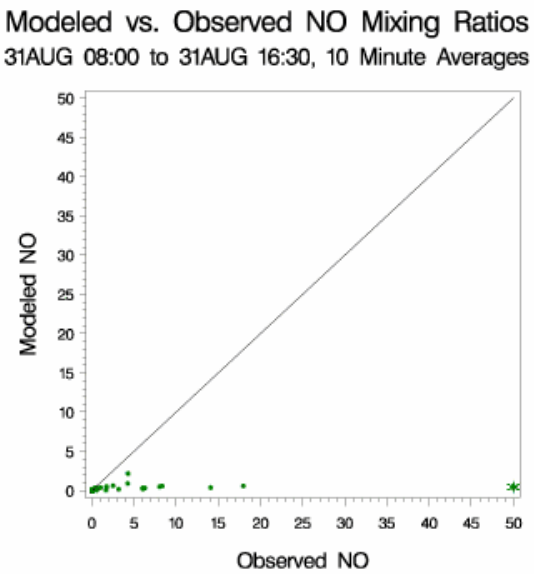
August 31 – Segment 2 Details









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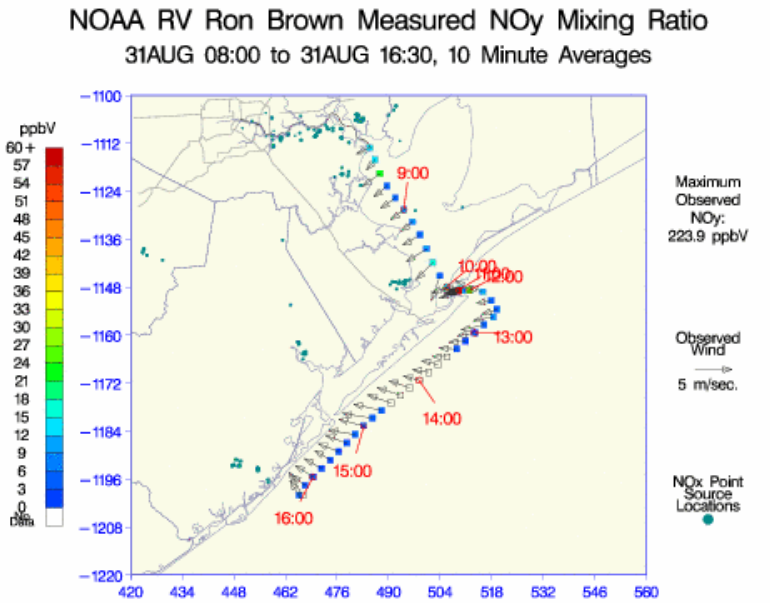
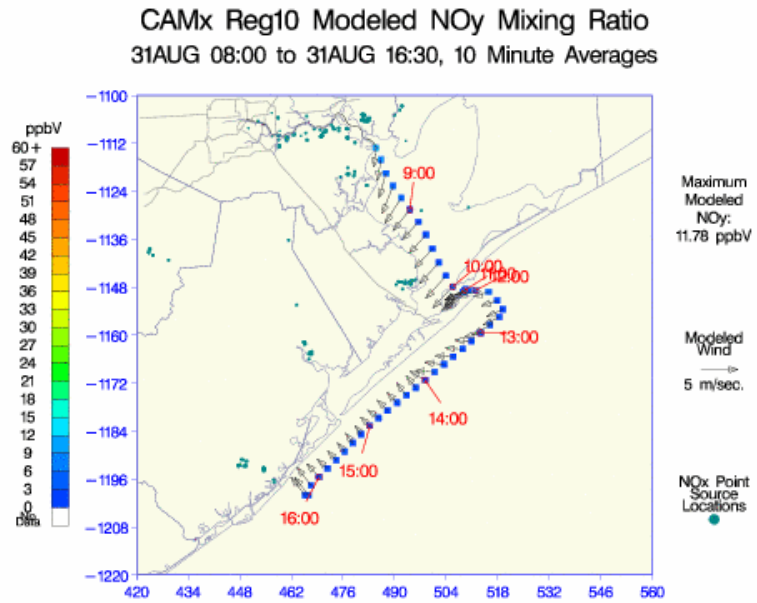
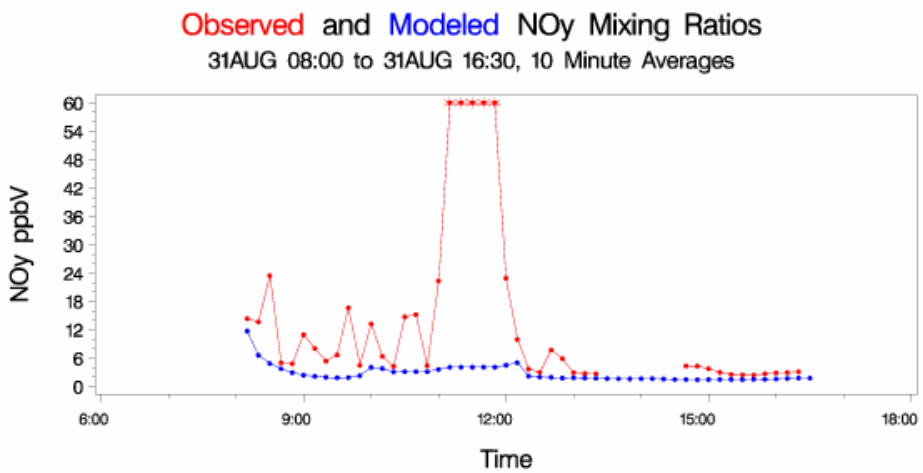
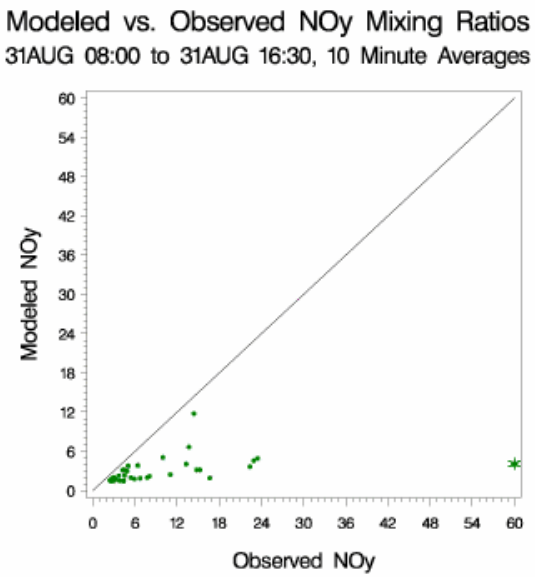
August 31 – Segment 2 Details









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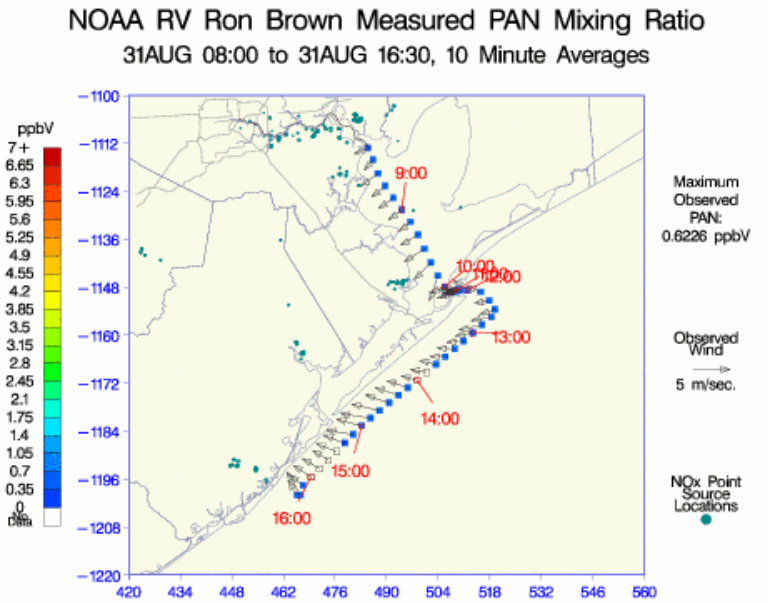
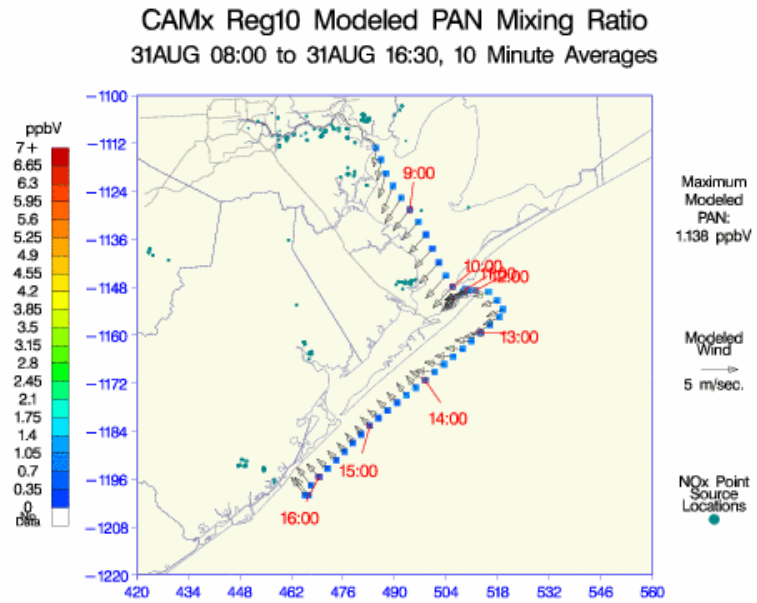
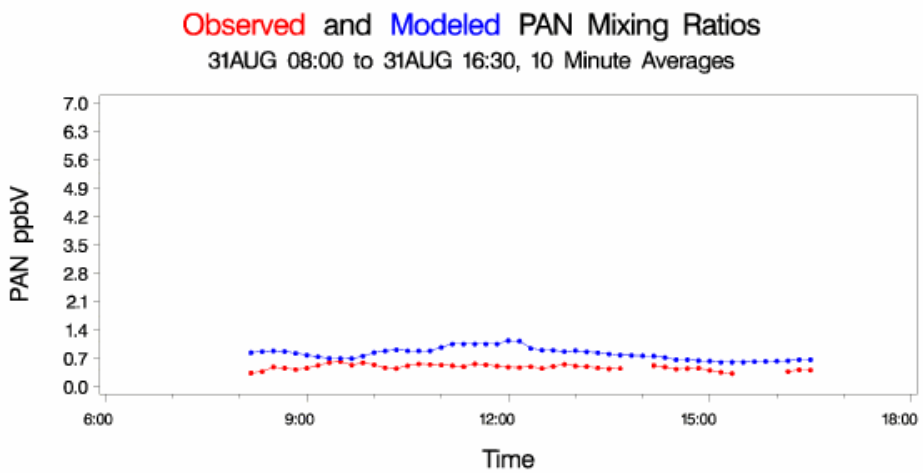
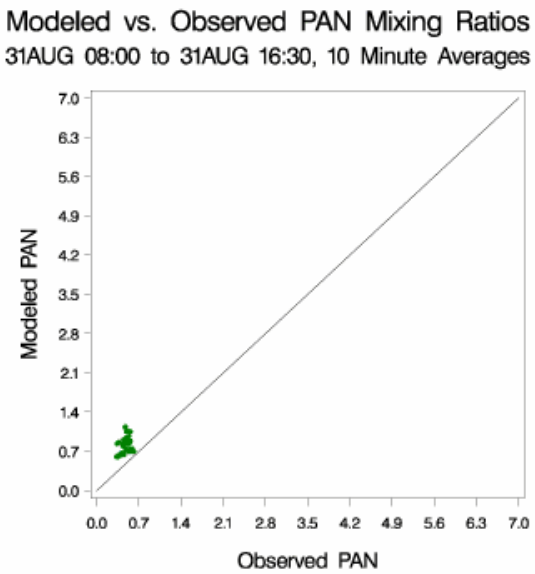
August 31 – Segment 2 Details









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