Assessing the Impact on Air Quality Associated with Operations of the Proposed Las Brisas Power Plant

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Las Brisas Power Plant Proposal

"Las Brisas Energy Center (LBEC) proposes to construct and operate new steam-electric utility generating facilities using four circulating fluidized bed (CFB) boilers, each with 300 MW net electric output. The net electric output of the LBEC is about 1,200 MW. The proposed fuel is petroleum coke." (SOURCE: From the document "Las Brisas Technical Review" at Las Brisas Energy Center website http://www.lasbrisasenergy.com/environment.html)

Two photochemical air quality modeling runs were designed to evaluate the potential air quality impacts associated with routine emissions from the four boilers.

Las Brisas Power Plant Modeled Emission Rates

Pollutant	NOx	VOC	CO	SO2	PM2.5
TPD	14.784	0.740	16.272	34.272	3.264

Las Brisas Power Plant Emission Release Parameters

Emissions Point Name	LCPx (km)	LCPy (km)	Height (m)	Diameter (m)	Temperature (K)	Velocity (mps)
CFB-1/CFB-2	250.6448	-1332.376	152.4	4.877	344	20.39
CFB-3/CFB-4	250.5043	-1332.346	152.4	4.877	344	20.39

Source for both tables: TCEQ Table(a) provided to UT by Randy Hamilton.

Legend:
- ▲ Las Brisas Plant Location
- ◻ Corpus Christi Monitors
- Corpus Christi Area
- 12km Grid Outline
- 36km Grid Outline

Area Enlarged Below

San Patricio

Tuloso

West

Nueces
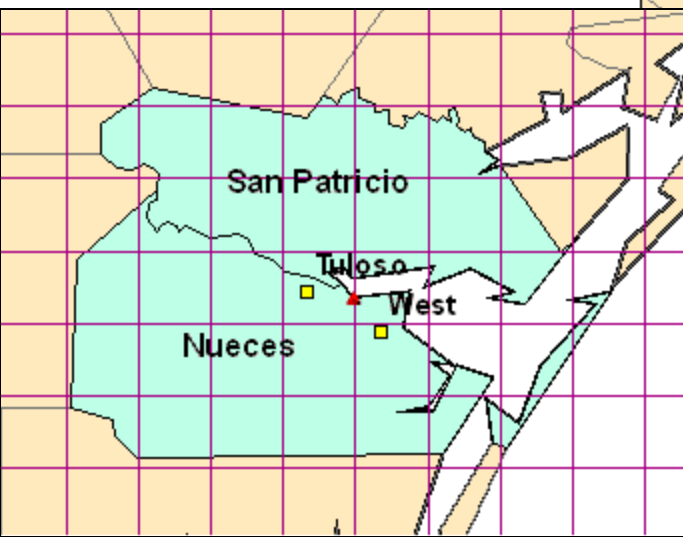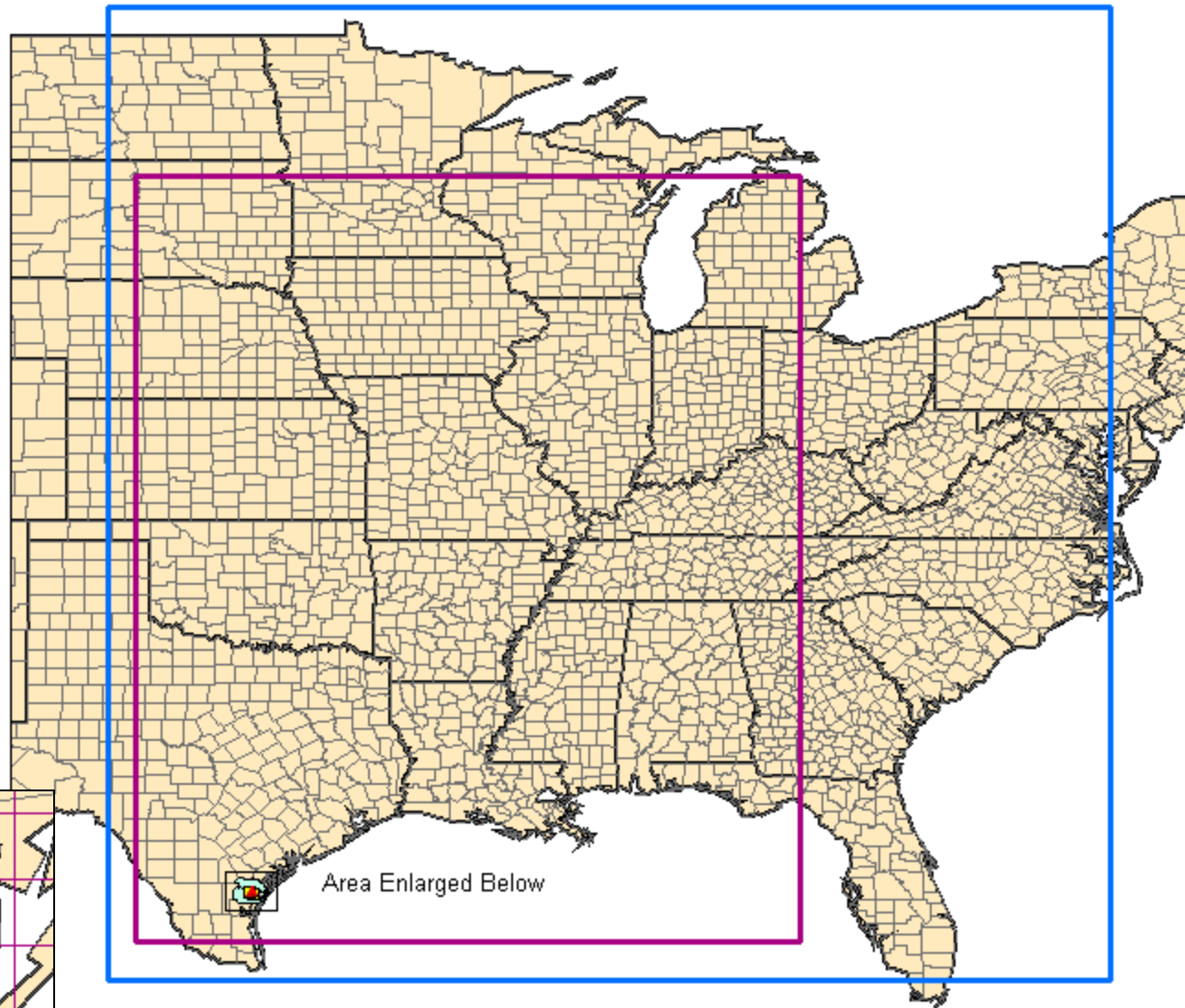
Modeling Domain and Plant Location

CAMx Modeling Runs

- Basecase
  - May through September 2002 Episode, originally developed by CENRAP, expanded by the city of Victoria and UT-Austin working with ENVIRON. EI is Victoria Actual 2002. (Source: ENVIRON Feb. 2009. "Developing Regional Modeling Emission Inventories for the 2002 Ozone Season Using EPS3 to Support Air Quality Planning in Victoria, Texas.")

- Testcase
  - Identical to Basecase with the addition of Las Brisas proposed emissions for four boilers as provided by TCEQ.

Model Performance Evaluation for Daily Max 8-hour Ozone

- Model performance conducted on Basecase
- Evaluation of CAMS Monitor data within the Corpus Christi Area only (West and Tuloso monitoring stations)
- EPA guidelines used to evaluate model performance for Ozone
  - Mean Normalized Bias
  - Mean Normalized Error
  - Time Series Charts presenting Observed Ozone Values versus Modeled Ozone Values
- Model over predicts days with daily maximum 8-hour ozone < 40 ppb
- Model under predicts days with daily maximum 8-hour ozone > 60 ppb

Tuloso Monitor Obs vs Modeled 8hr Daily Max Ozone
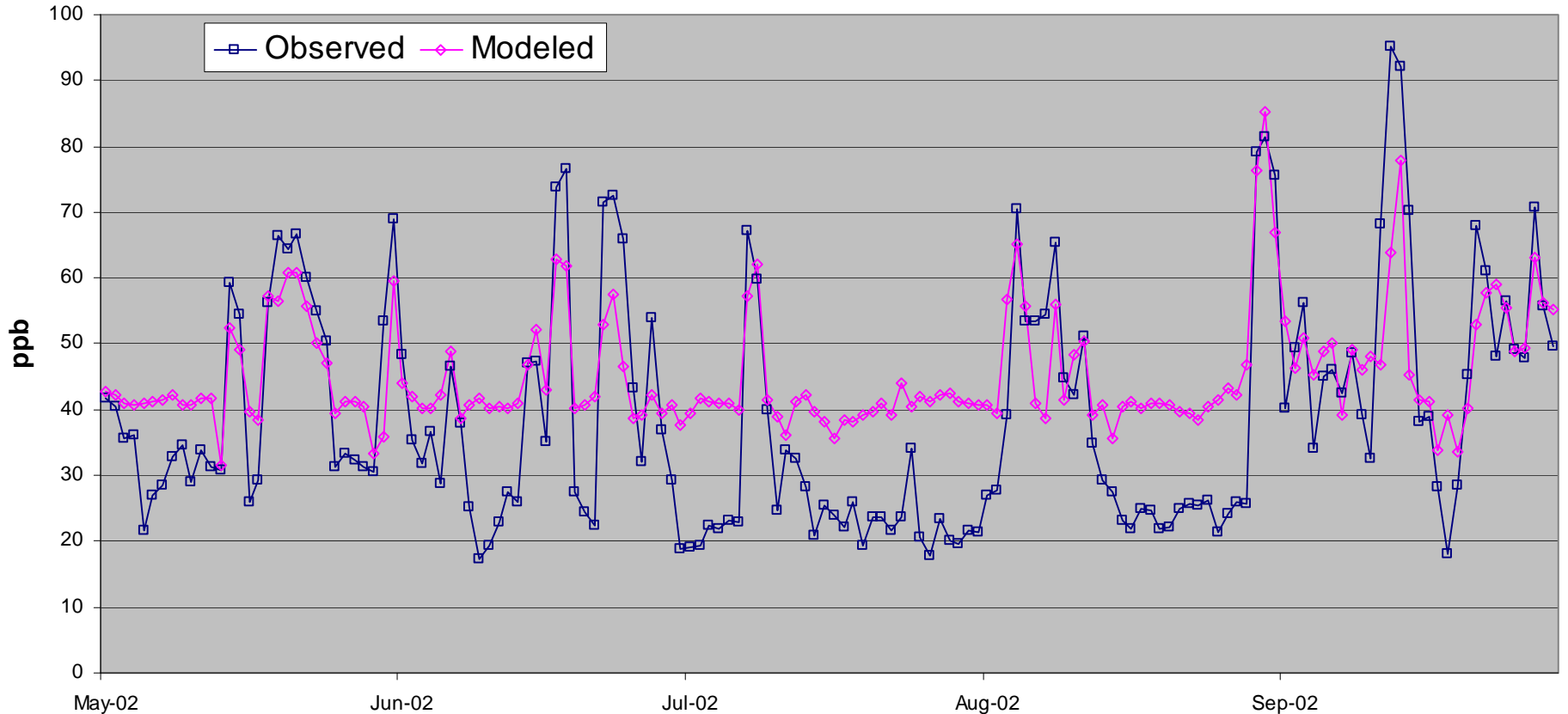
West Monitor Obs vs Modeled 8hr Daily Max Ozone
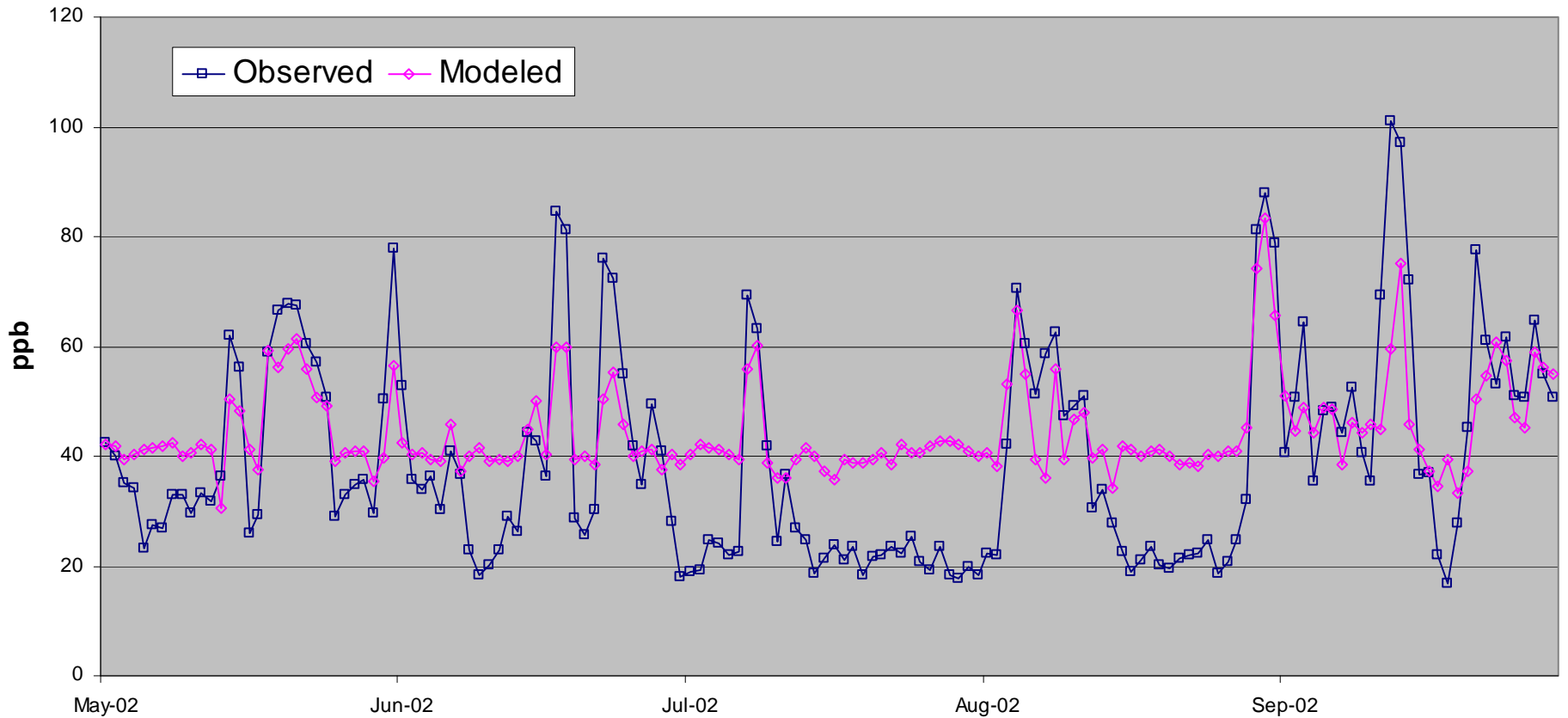
Model Performance Statistics Summary at Monitors

Hourly	Ozone Hourly Statistics Obs > 40 ppb		Ozone Hourly Statistics Obs > 60ppb	
	MNB	MNGE	MNB	MNGE
Tuloso	-11.1%	18.0%	-18.6%	19.9%
West	-17.0%	21.2%	-24.6%	24.9%
8-Hour	Ozone Daily 8-Hr Max All Days		Ozone Daily 8-Hr Max Obs > 60ppb	
	MNB	MNGE	MNB	MNGE
Tuloso	31.2%	38.7%	-15.6%	16.0%
West	31.3%	42.0%	-18.7%	18.7%

Modeling Results

- For each grid cell, calculate the difference in the daily maximum 8-hour ozone concentrations between the Las Brisas Test Case and the Base Case.

- Generate maps showing differences in maximum 8-hour ozone concentrations for each of the ten days with the highest daily maximum 8-hour ozone concentrations.

- Report the maximum daily differences for four regions: the 12km Domain, the 2-county Corpus Christi Area, and the two monitor stations in CC.

- For each grid cell, calculate the difference concentrations of select criteria pollutants based on NAAQS averaging periods.

8-Hour Ozone Air Quality Impacts

- 12-km Domain
  - Maximum increase in daily max 8-hour ozone up to 0.98 ppb on June 17
  - Average across all days was 0.39 ppb
- Corpus Christi Area
  - Maximum increase in daily max 8-hour ozone up to 0.47 ppb on August 30
  - Average across all days was 0.08 ppb
  - Average across all days > 60ppb was 0.12 ppb
- Monitor Locations
  - West shows 0.12 ppb decrease in the fourth highest daily maximum 8-hr ozone concentrations
  - Tuloso shows 0.01 ppb increase in 4th highest daily maximum 8-hr ozone

Ten Days with Highest Daily Max 8-Hour Ozone Modeled Anywhere within the Entire Corpus Christi 2-County Area

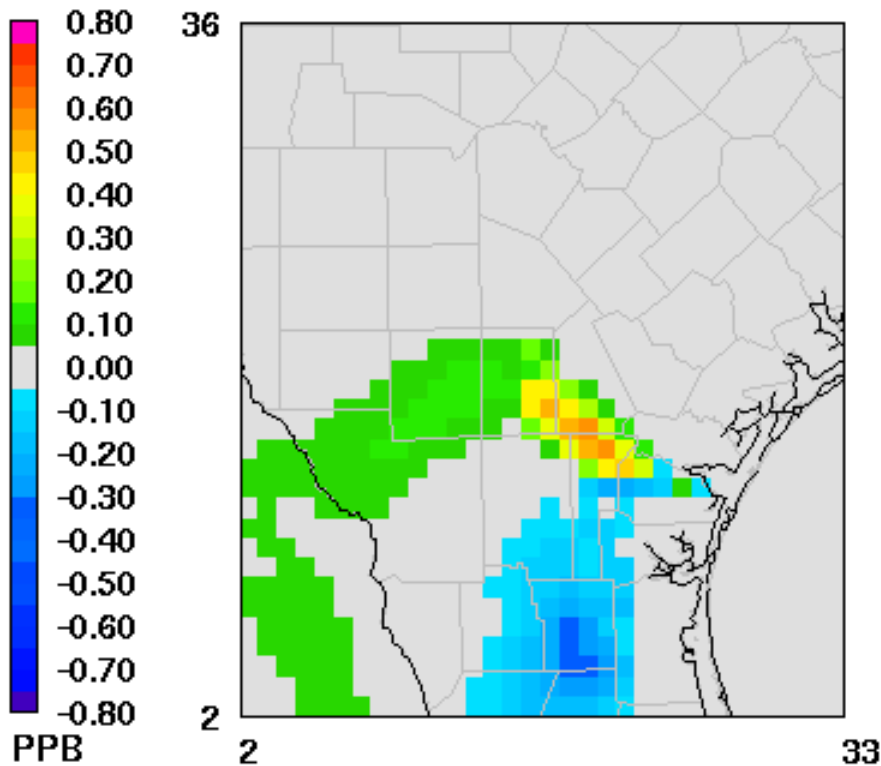|	Date	Basecase	Testcase	Difference
1	08/30	88.08	88.07	-0.01
2	08/29	80.82	80.85	0.03
3	09/13	79.72	79.67	-0.04
4	09/23	74.93	74.93	0.00
5	08/04	70.57	70.56	-0.01
6	09/12	69.23	69.20	-0.03
7	08/31	69.05	69.05	0.00
8	06/17	68.39	68.40	0.00
9	09/27	66.85	66.85	0.00
10	09/24	66.17	66.17	0.00

Shown on the following slides in order of rank

Ten days with highest Daily Max 8-Hour Ozone in CC Area
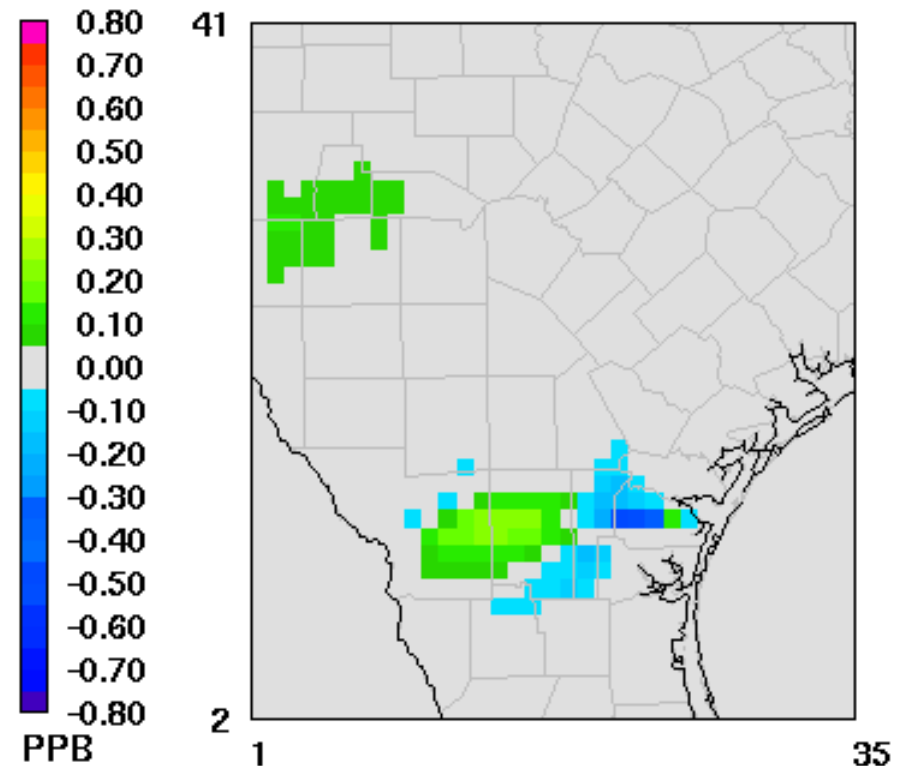

Difference in Daily Max 8-hr Ozo

Las Brisas Testcase – Basecase

August 30,2002 0:00:00
Min= -0.33 at (19,5), Max= 0.57 at (21,15)

Difference in Daily Max 8-hr Ozone
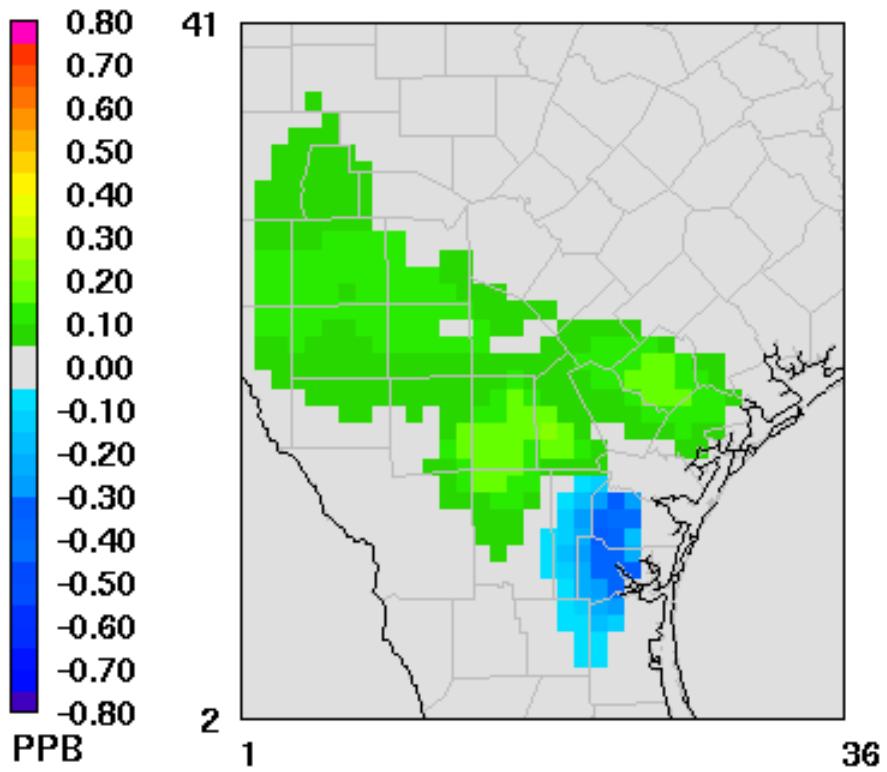
Las Brisas Testcase – Basecase

August 29,2002 0:00:00
Min= -0.52 at (23,13), Max= 0.24 at (15,13)

Ten days with highest Daily Max 8-Hour Ozone in CC Area Cont'd
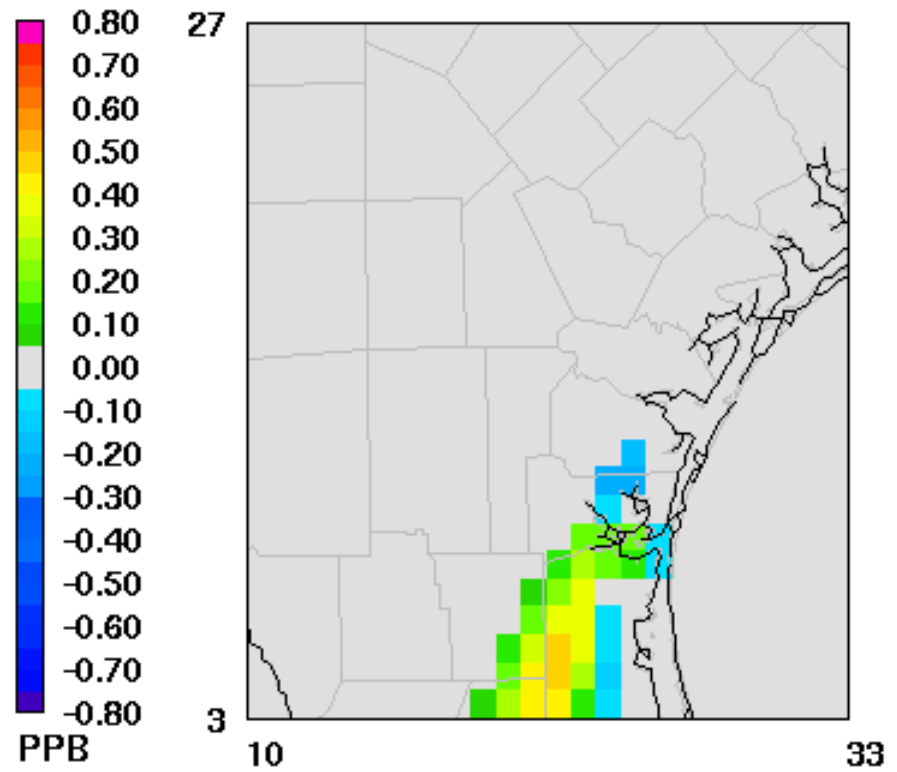

Difference in Daily Max 8-hr Ozo

Las Brisas Testcase – Basecase

September 13,2002 0:00:00
Min= -0.42 at (23,13), Max= 0.21 at (19,18)

Difference in Daily Max 8-hr Ozone
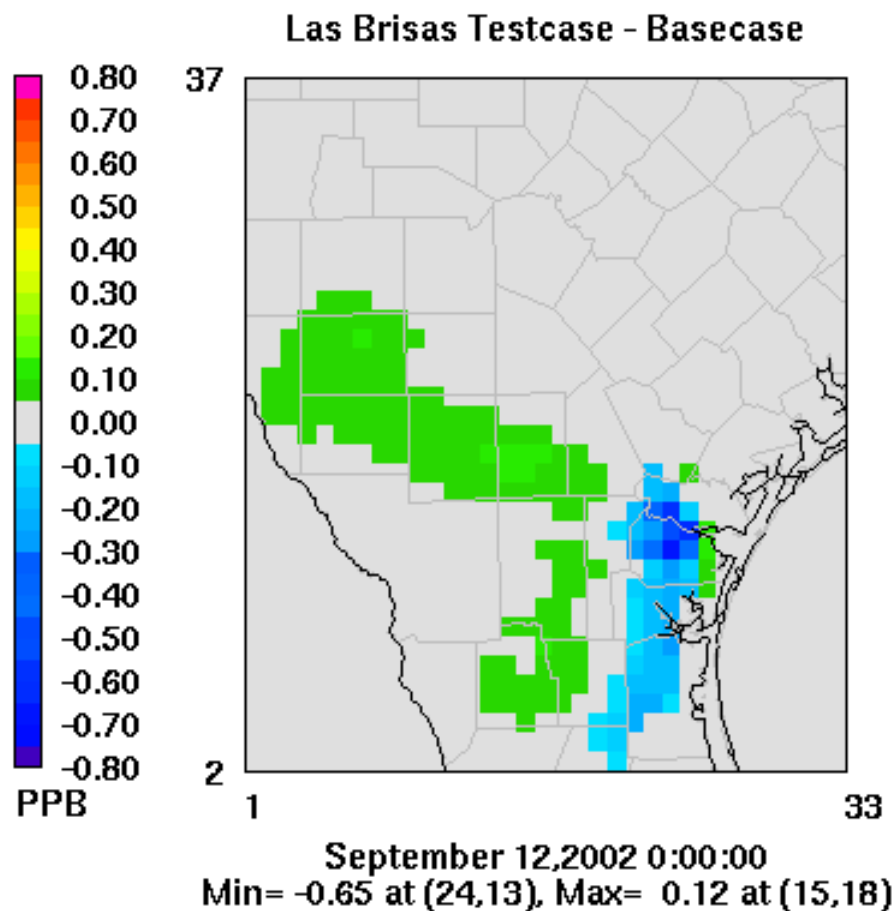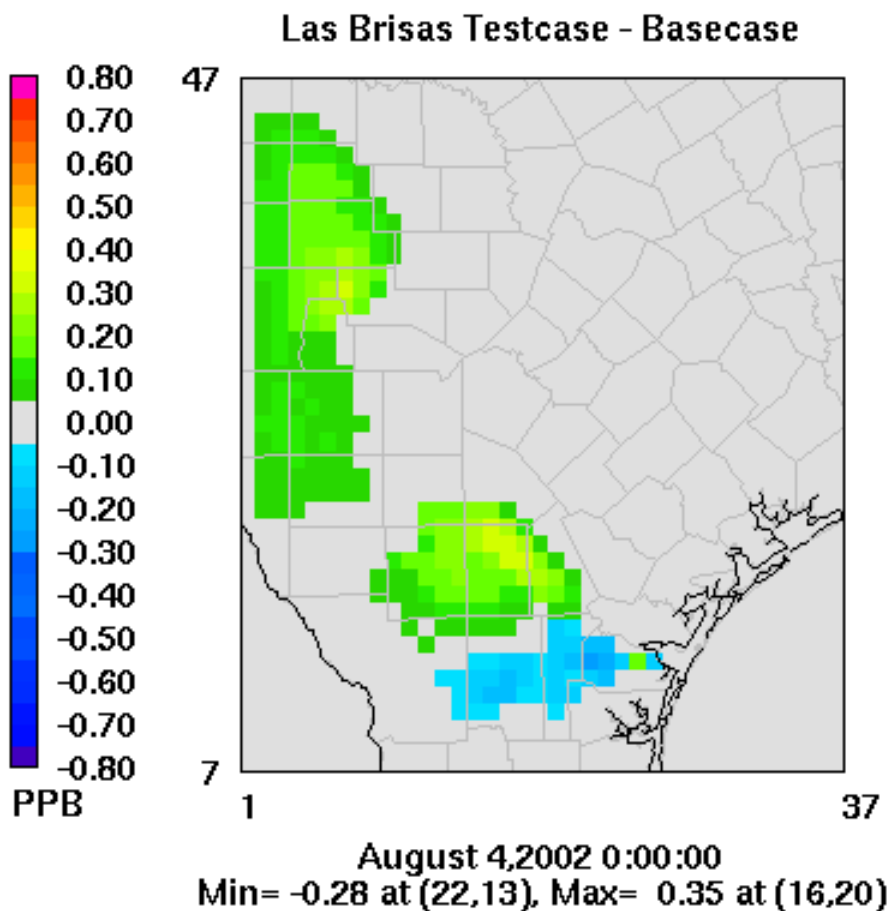
Las Brisas Testcase – Basecase

September 23,2002 0:00:00
Min= -0.21 at (24,11), Max= 0.48 at (22,4)

Ten days with highest Daily Max 8-Hour Ozone in CC Area Cont'd

Difference in Daily Max 8-hr Ozo

Las Brisas Testcase – Basecase

August 4,2002 0:00:00
Min= -0.28 at (22,13), Max= 0.35 at (16,20)

Difference in Daily Max 8-hr Ozone

Las Brisas Testcase – Basecase

September 12,2002 0:00:00
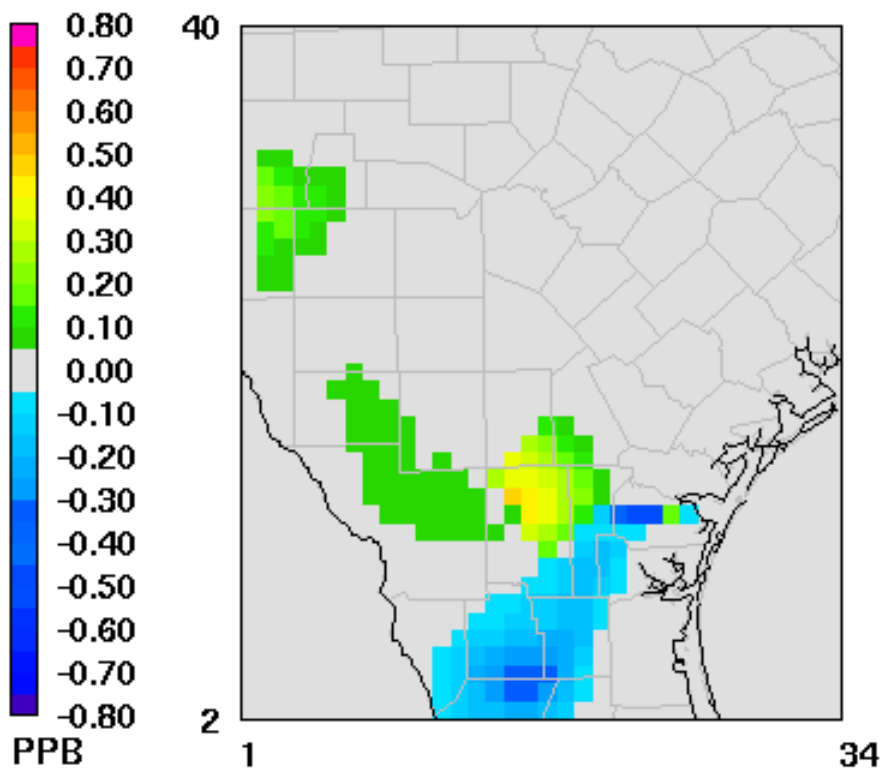Min= -0.65 at (24,13), Max= 0.12 at (15,18)

Ten days with highest Daily Max 8-Hour Ozone in CC Area Cont'd

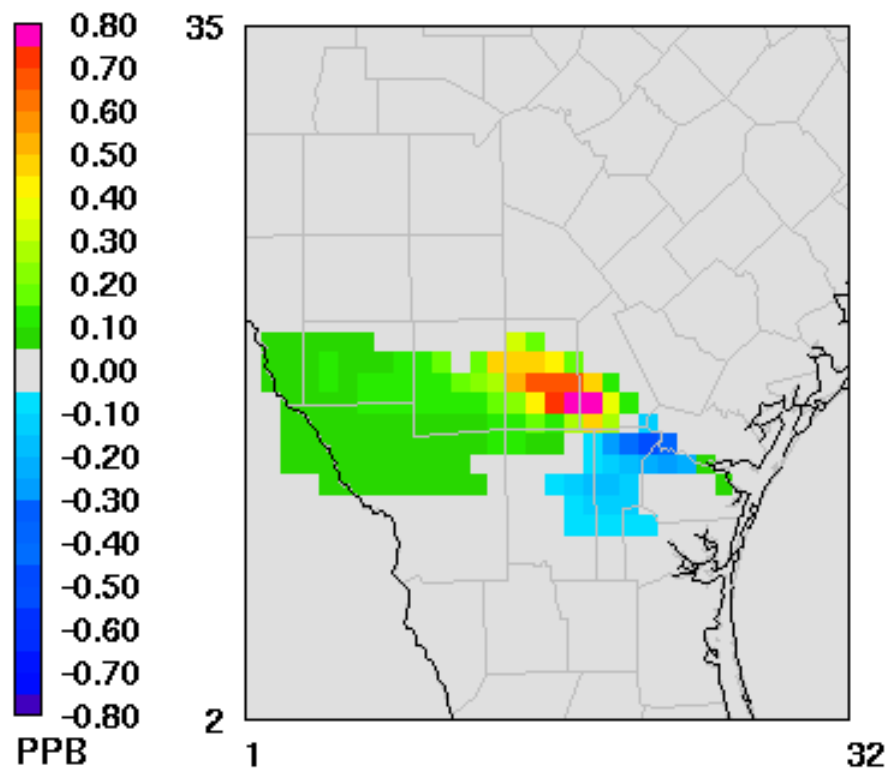**Difference in Daily Max 8-hr Ozo**

Difference in Daily Max 8-hr Ozone

Las Brisas Testcase – Basecase

August 31,2002 0:00:00
Min= -0.54 at (23,13), Max= 0.45 at (16,14)
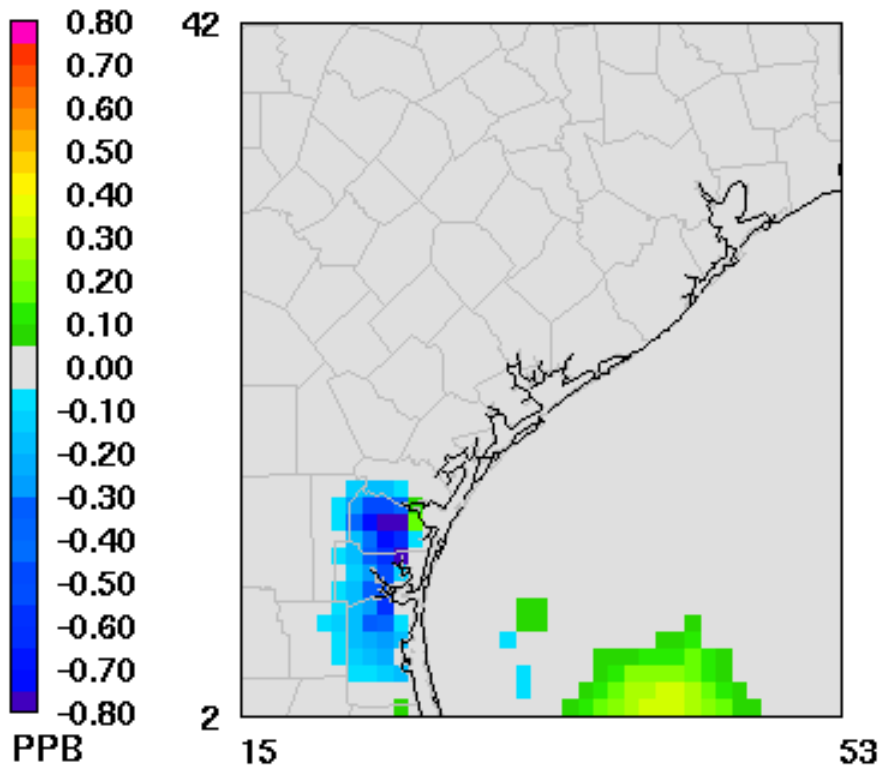
Las Brisas Testcase – Basecase

June 17,2002 0:00:00
Min= -0.50 at (22,15), Max= 0.98 at (18,17)

Ten days with highest Daily Max 8-Hour Ozone in CC Area Cont'd

Difference in Daily Max 8-hr Ozo
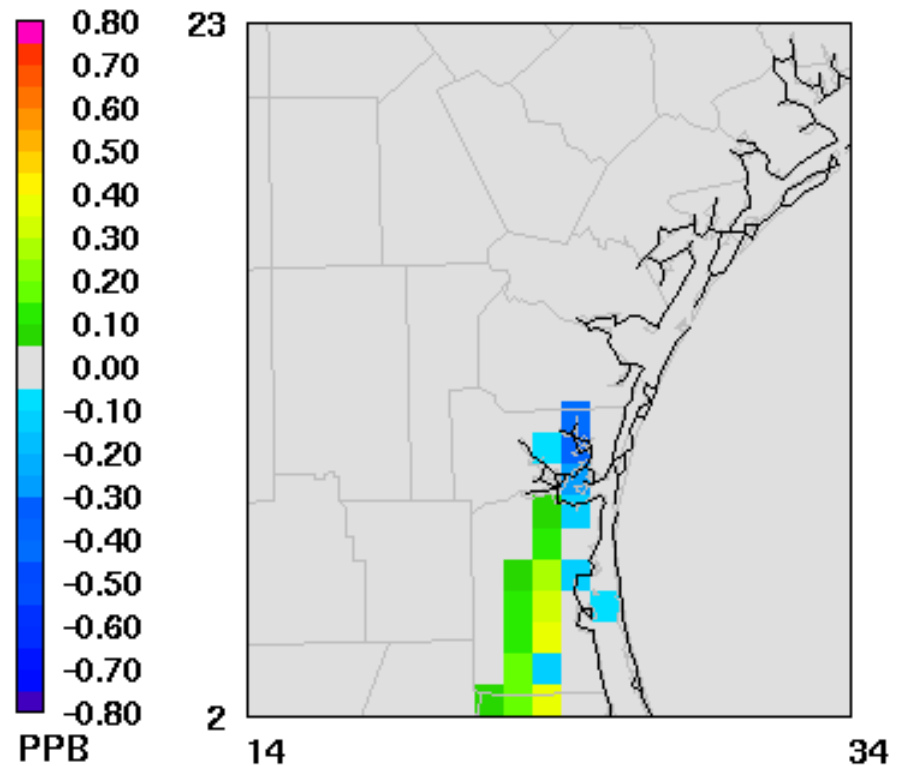
Las Brisas Testcase - Basecase

September 27,2002 0:00:00
Min= -1.40 at (25,13), Max= 0.34 at (42,2)

Difference in Daily Max 8-hr Ozone

Las Brisas Testcase - Basecase

September 24,2002 0:00:00
Min= -0.42 at (25,11), Max= 0.39 at (24,2)

Criteria Pollutants of Interest

National Ambient Air Quality Standards (NAAQS)		
Pollutant	**Standard**	**Averaging Time**
Carbon Monoxide (CO)	9,000 ppb	8-hour
	35,000 ppb	1-hour
Nitrogen Dioxide (NO2)	53 ppb	Annual (Arithmetic Mean)
	$(100\ \mu g/m^3)$	
Particulate Matter (PM2.5)	$15.0\ \mu g/m^3$	Annual (Arithmetic Mean)
	$35\ \mu g/m^3$	24-hour
Ozone	75 ppb	8-hour
Sulfur Dioxide (SO2)	30 ppb	Annual (Arithmetic Mean)
	140 ppb	24-hour

Air Quality Impacts Summary Criteria Pollutants

Pollutant	Averaging Time	Maximum Impact 12km Domain[1]	Maximum Impact 2-County Corpus Christi Area[1]
Carbon Monoxide (CO)	8-hour	5.84 ppb[2]	5.84 ppb[2]
	1-hour	5.08 ppb[3]	4.48 ppb[3]
Nitrogen Dioxide (NO2)	Seasonal (5 months)	0.29 ppb[4]	0.13 ppb[4]
Particulate Matter (PM2.5)	Seasonal (5 months)	0.08 ug/m3[5]	0.08 ug/m3[5]
	24-hour	0.42 ug/m3[6]	0.42 ug/m3[6]
Ozone	8-hour	0.98 ppb[7]	0.47 ppb[7]
Sulfur Dioxide (SO2)	Seasonal (5 months)	0.28 ppb[8]	0.28 ppb[8]
	24-hour	2.02 ppb[9]	2.02 ppb[9]

*Please see next slide for notes 1-9

Notes from previous slide

1. Values reported are maximum increase values predicted for any grid cell located within the entire domain specified here and as pictured in slide 4.

2. Maximum increase in the daily maximum 8-hr CO concentration on any day within the five month modeling period.

3. Maximum increase in the daily maximum 1-hr CO concentration on any day within the five month modeling period.

4. Maximum increase in the 5-month average NOx concentration measured at any grid cell within the domain.

5. PM reported is sulfate only, as directly emitted as H2SO4, or as oxidized to H2SO4 from SO2.

6. Maximum increase in the 24-hr average on any day within the five month modeling period.

7. Maximum increase in the daily maximum 8-hr O3 concentration on any day within the five month modeling period.

8. Maximum increase in the 5-month average SO2 concentration measured at any grid cell within the domain.

9. Maximum increase in the 24-hr average on any day within the five month modeling period.

Summary

- Model over-predicts days with 8-hour max ozone < 40 ppb and under-predicts days with 8-hour max ozone > 60 ppb

- Addition of proposed Las Brisas emissions showed 0.12 ppb decrease in the fourth highest daily maximum 8-hr ozone concentrations at West and a 0.01 ppb increase in 4th highest daily maximum 8-hr ozone concentration at Tuloso

- Largest increases in daily max 8-hour ozone occurred downwind of Corpus Christi area

Questions
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