

Houston 8-hr Ozone Coalition OSAT Modeling & USB Analyses

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SET PMTC Meeting
July 26, 2016

Presentation Outline

- Two recent projects to discuss
 - 2012 episodic OSAT ensemble results
 - Zero out background contribution modeling

2012 OSAT Modeling

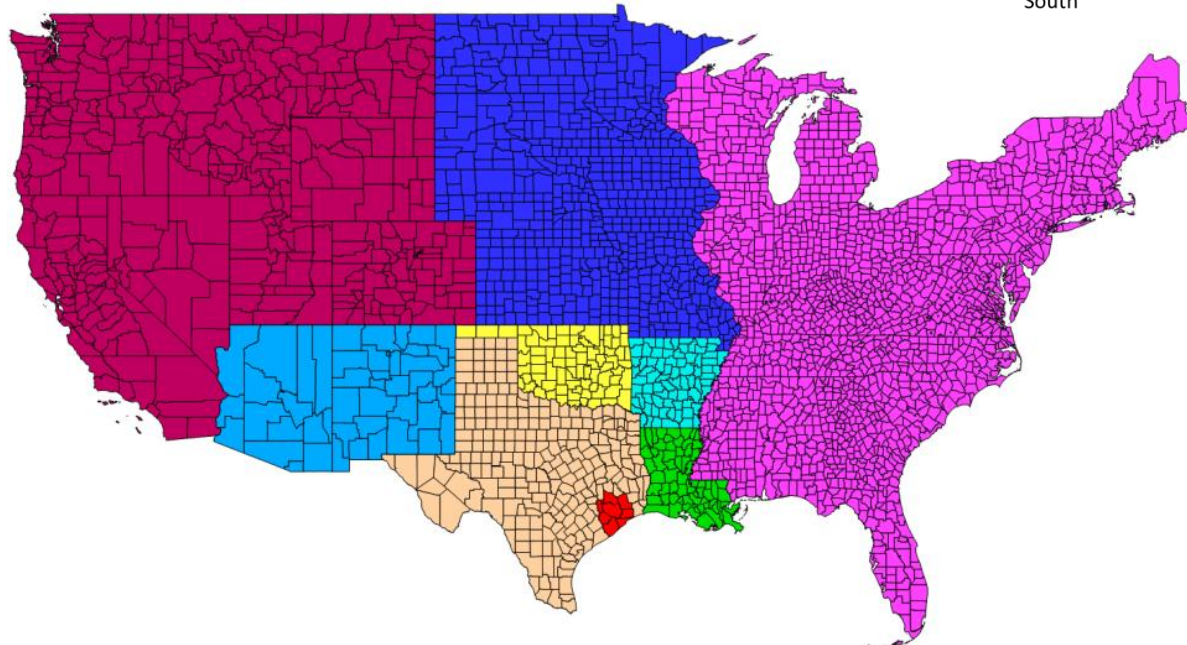
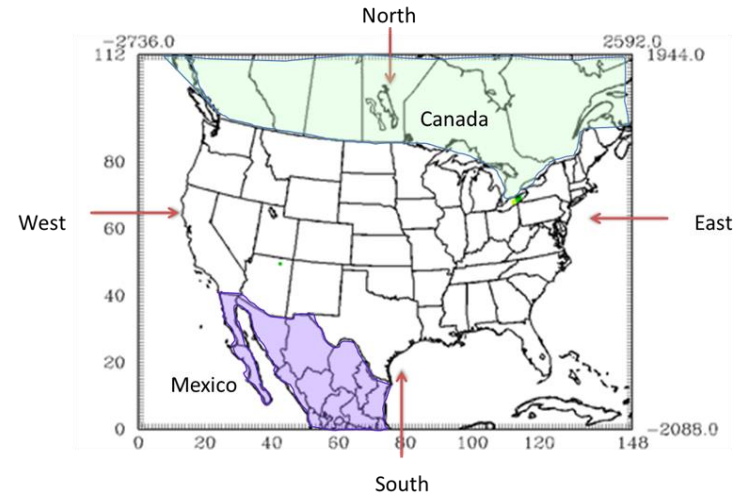
- Run OSAT with various meteorological configurations using same 2012 emissions platform
- Determine if relative contributions change on episodic and/or daily basis depending on the met differences
 - Provides summary and support for ensemble modeling to assist in development of policy decisions and control strategies

Ensemble MET Configurations

Physics Option	Run.b	Run.c	Run.d	Run.e
Microphysics	WSM3 (3)	WSM6 (6)	WSM6 (6)	WSM6 (6)
Longwave Radiation	RRTMG (4)	RRTM (1)	RRTMG (4)	RRTMG (4)
Shortwave Radiation	RRTMG (4)	RRTM (1)	RRTMG (4)	RRTMG (4)
Surface Layer	Revised MM5 (1)	Revised MM5 (1)	Pleim-Xiu (7)	Revised MM5 (1)
Land Surface	Noah LSM (2)	Noah LSM (2)	Pleim-Xiu (7)	5-Layer (1)
Planetary Boundary Layer	YSU (1)	YSU (1)	ACM2 (7)	YSU (1)
Cumulus Parameterization	Kain-Fritsch (1)	Kain-Fritsch (1)	Kain-Fritsch (1)	Kain-Fritsch (1)

2012 OSAT Regions

Number	Group
1	HGB 8-County Nonattainment Area
2	Balance of Texas
3	Louisiana
4	Arkansas
5	Oklahoma
6	Arizona, New Mexico
7	Western States (CA, CO, ID, MT, NV, OR, UT, WA, WY)
8	Central States (IA, KS, MN, MO, NE ND SD)
9	Eastern States
10	Canada/Mexico/Offshore



Individual Tagged Categories

Biogenics	Off-shore
Fire	BC-North
EGUs	BC-South
Non-EGU	BC-East
Motor Vehicle	BC-West
Non-Road	BC-Top
Non-Point	Initial Conditions
Can-Mex-Water	

Example Results (Tabular)

Monitor 480391004

Manvel Croix

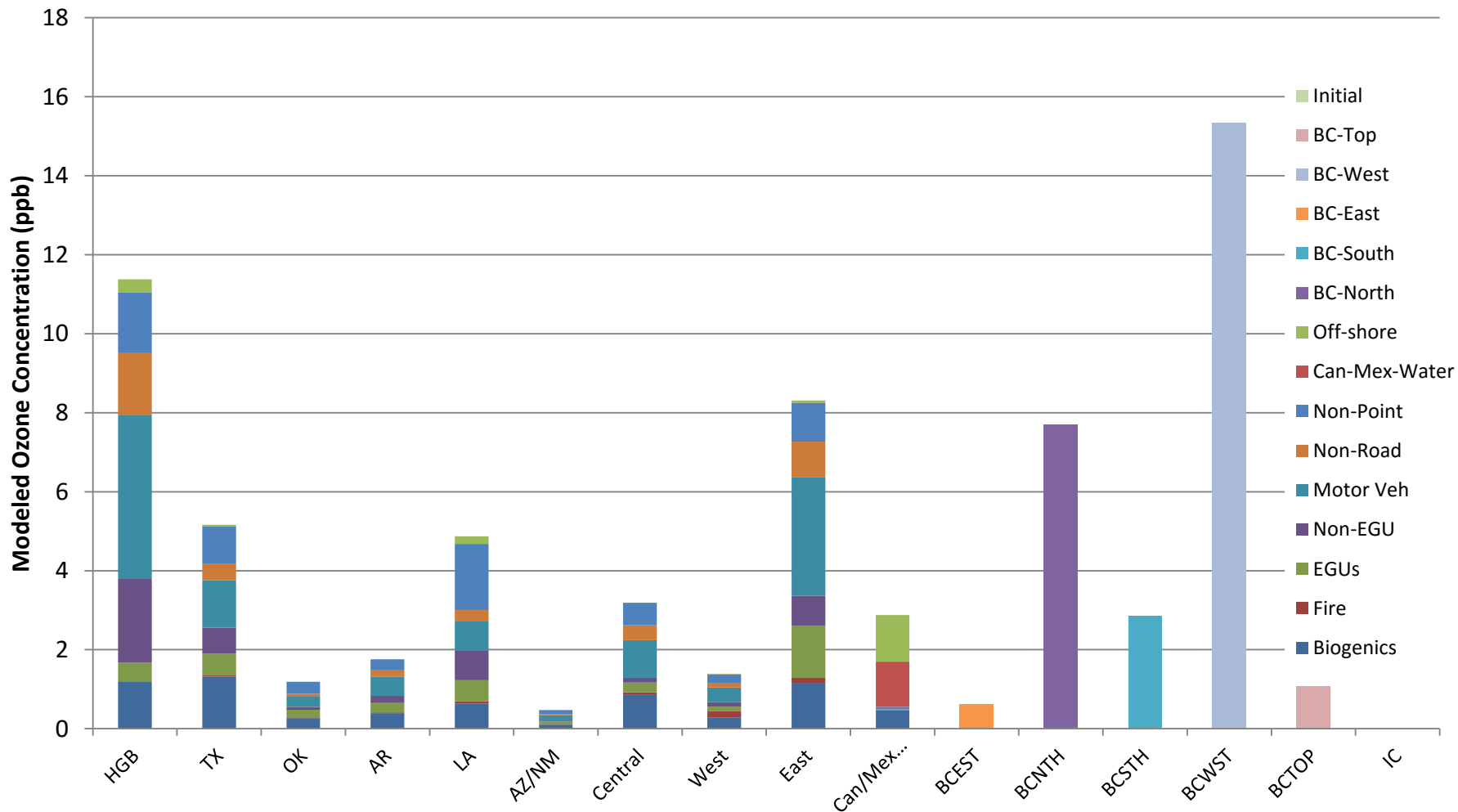
60 ppb Modeling Threshold

2012a2.WRF.RUNc

Data (Modeled Ozone Contribution ppb)																
Region	Biogenics	Fire	EGUs	Non-EGU	Motor Veh	Non-Road	Non-Point	Can-Mex-Water	Off-shore	BC-North	BC-South	BC-East	BC-West	BC-Top	Initial	Total
HGB	1.19	0.01	0.47	2.12	4.14	1.58	1.53	0	0.34	0	0	0	0	0	0	11.38
TX	1.32	0.03	0.55	0.66	1.2	0.41	0.96	0	0.03	0	0	0	0	0	0	5.16
OK	0.27	0.02	0.19	0.07	0.26	0.07	0.31	0	0	0	0	0	0	0	0	1.19
AR	0.39	0.02	0.24	0.18	0.49	0.17	0.27	0	0	0	0	0	0	0	0	1.76
LA	0.64	0.06	0.53	0.74	0.76	0.27	1.68	0	0.19	0	0	0	0	0	0	4.87
AZ/NM	0.1	0.01	0.07	0.01	0.15	0.03	0.1	0	0	0	0	0	0	0	0	0.47
Central	0.87	0.05	0.25	0.12	0.95	0.38	0.57	0	0	0	0	0	0	0	0	3.19
West	0.29	0.15	0.12	0.11	0.37	0.12	0.21	0.01	0.01	0	0	0	0	0	0	1.39
East	1.16	0.13	1.32	0.76	2.99	0.91	0.98	0.01	0.05	0	0	0	0	0	0	8.31
Can/Mex/Off	0.47	0	0	0	0.02	0.01	0.05	1.15	1.18	0	0	0	0	0	0	2.88
BCEST	0	0	0	0	0	0	0	0	0	0	0	0.62	0	0	0	0.62
BCNTH	0	0	0	0	0	0	0	0	0	7.7	0	0	0	0	0	7.7
BCSTH	0	0	0	0	0	0	0	0	0	0	2.86	0	0	0	0	2.86
BCWST	0	0	0	0	0	0	0	0	0	0	0	0	15.33	0	0	15.33
BCTOP	0	0	0	0	0	0	0	0	0	0	0	0	0	1.07	0	1.07
IC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	6.7	0.48	3.74	4.77	11.33	3.95	6.66	1.17	1.8	7.7	2.86	0.62	15.33	1.07	0	68.18

Example Results (Graphical)

Manvel Croix



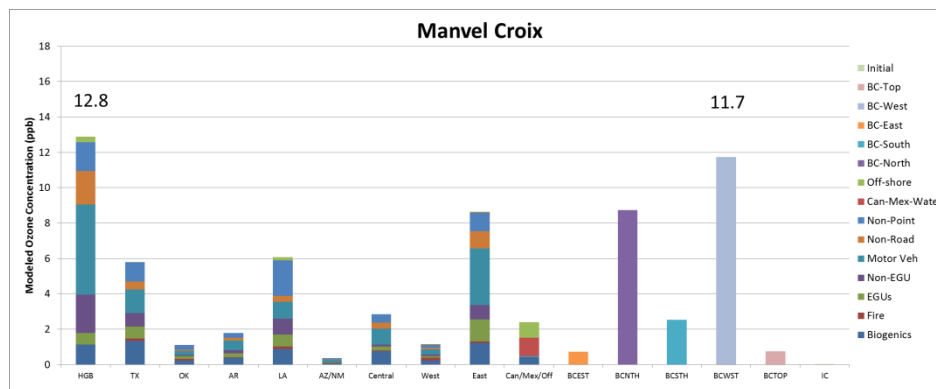
Comparisons (60 ppb threshold)

Changing boundary conditions (international transport) contribution with differing MET configurations

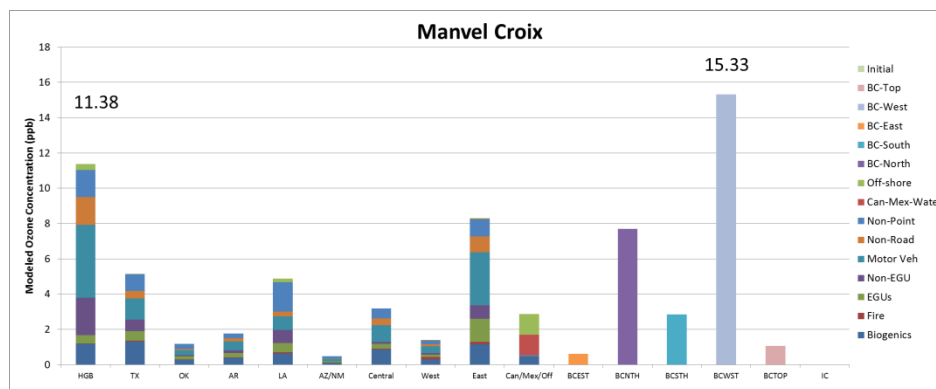
$b < c < d$

Differing “local” contribution (HGB) with differing MET configurations

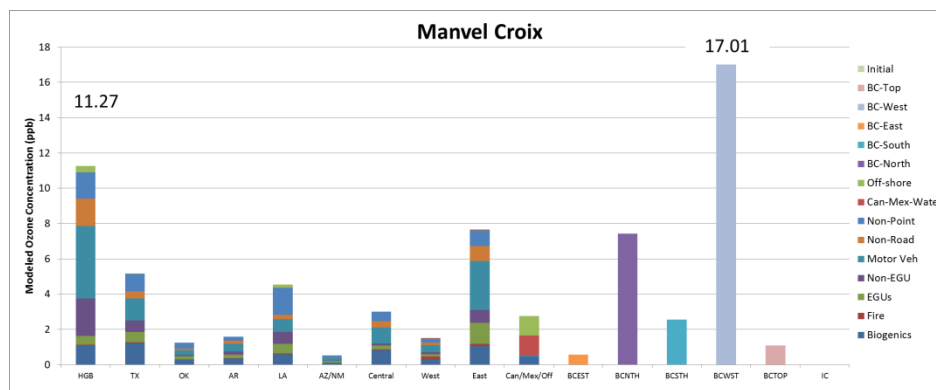
$b > c > d$



Run.b



Run.c

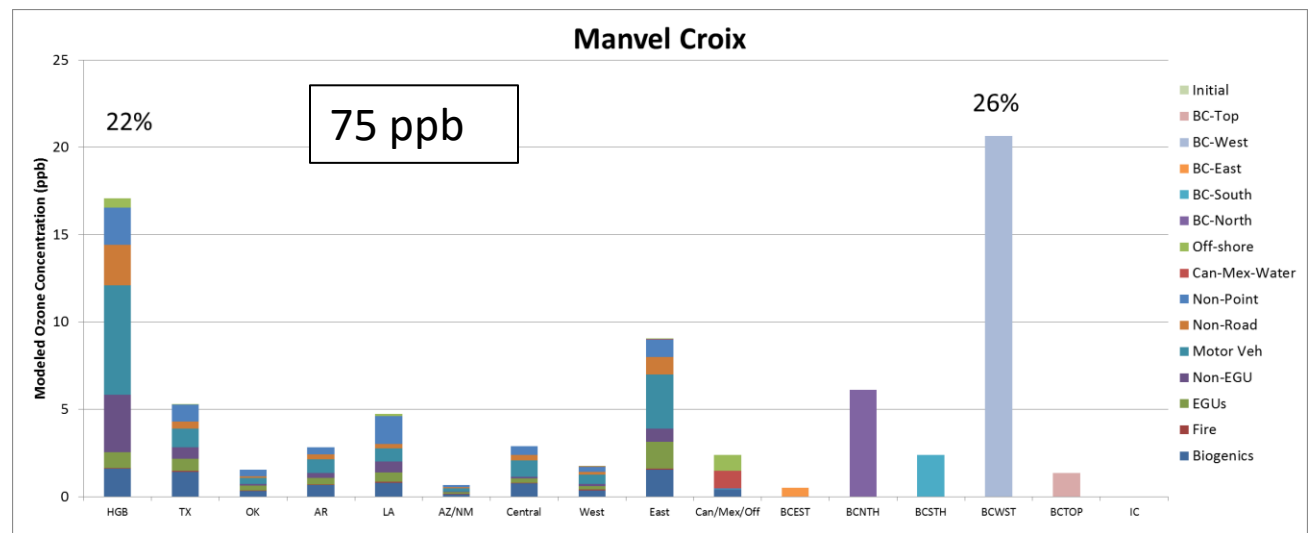
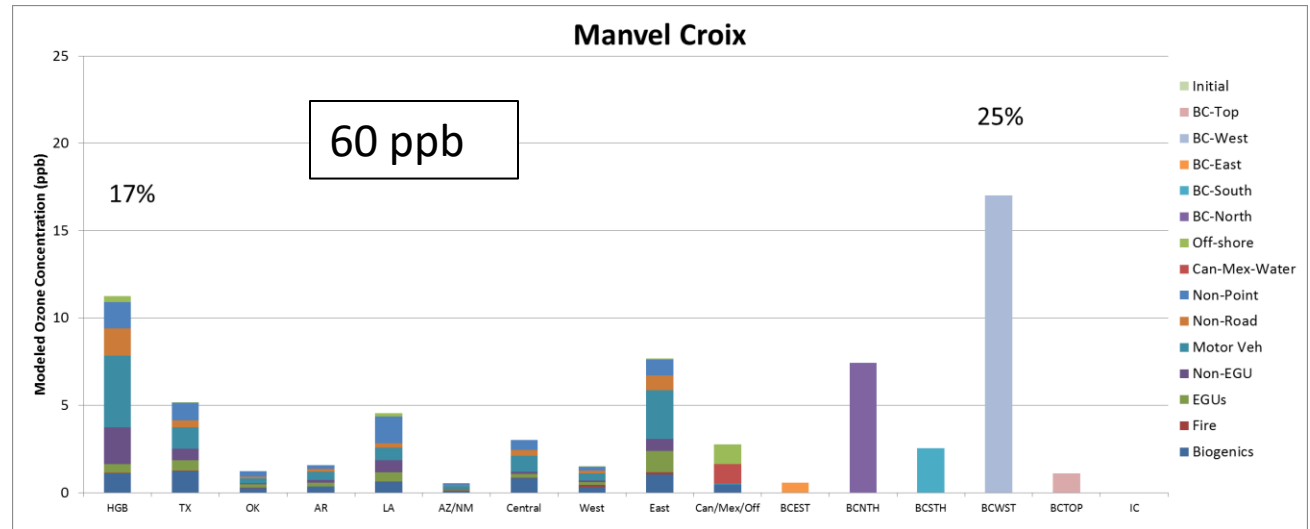


Run.d

Comparisons (60 vs 75 ppb threshold) Run.d

Boundary condition contribution consistent with differing thresholds

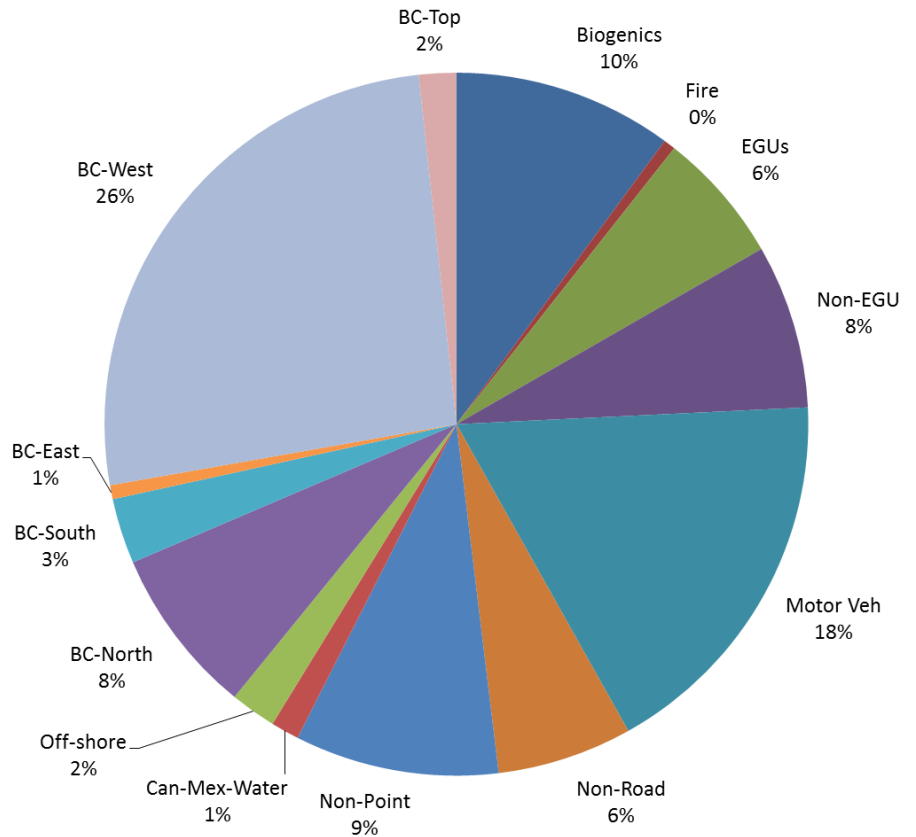
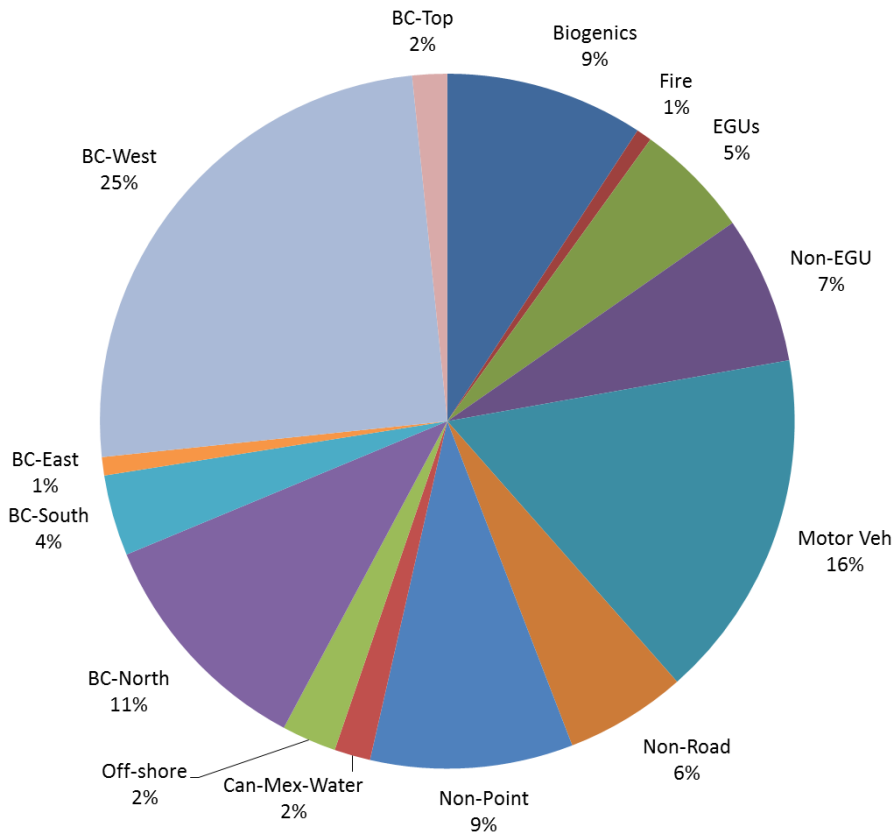
Similar contribution seen from “local” emissions (HGB) with differing thresholds



Relative Contribution – Run.d Comparisons (60 vs 75 ppb threshold)

60 ppb

75 ppb

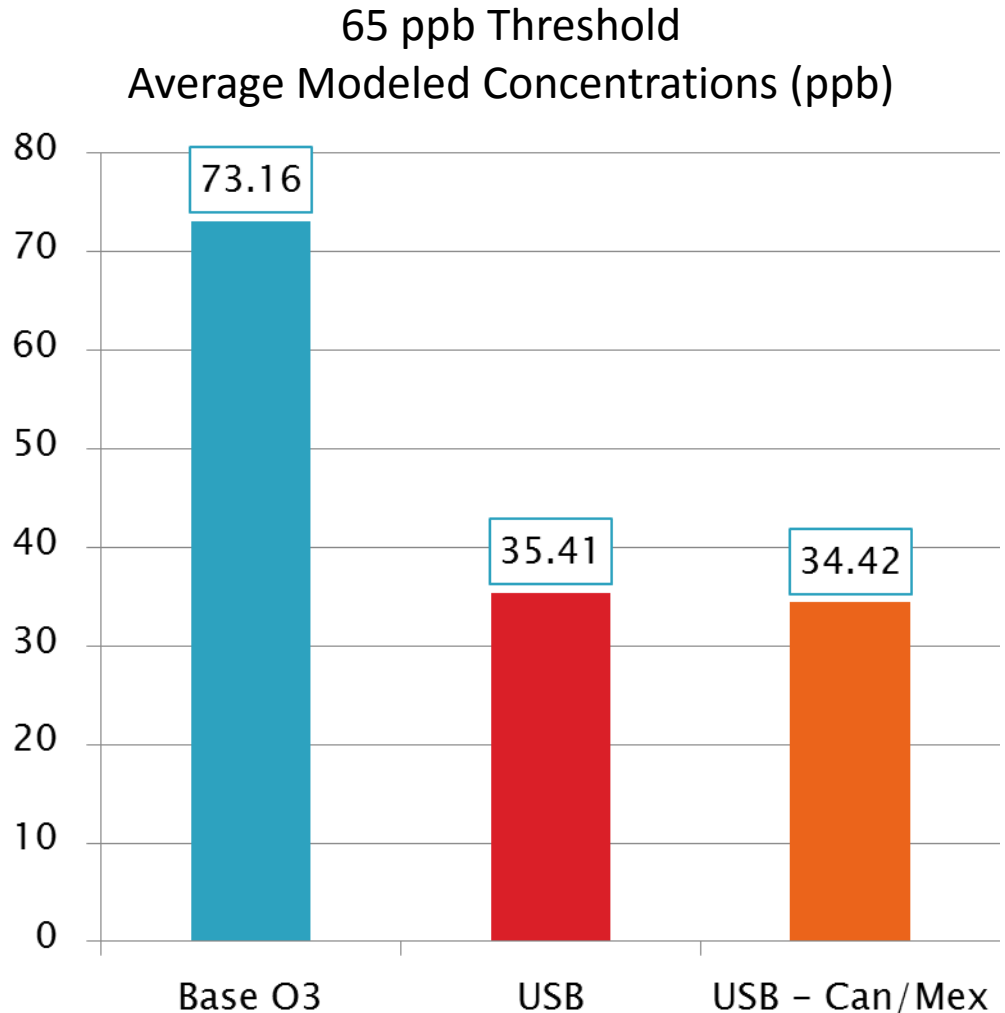


Zero Out USB Modeling

- Using same ensembles, zeroed out US and North American anthropogenic emissions to determine USB / USB+Can/Mex contributions
 - Removed U.S. Anthro -> USB
 - Removed U.S. Anthro + Can/Mex -> USB-Can/Mex
- Results compare favorably with OSAT contribution analyses

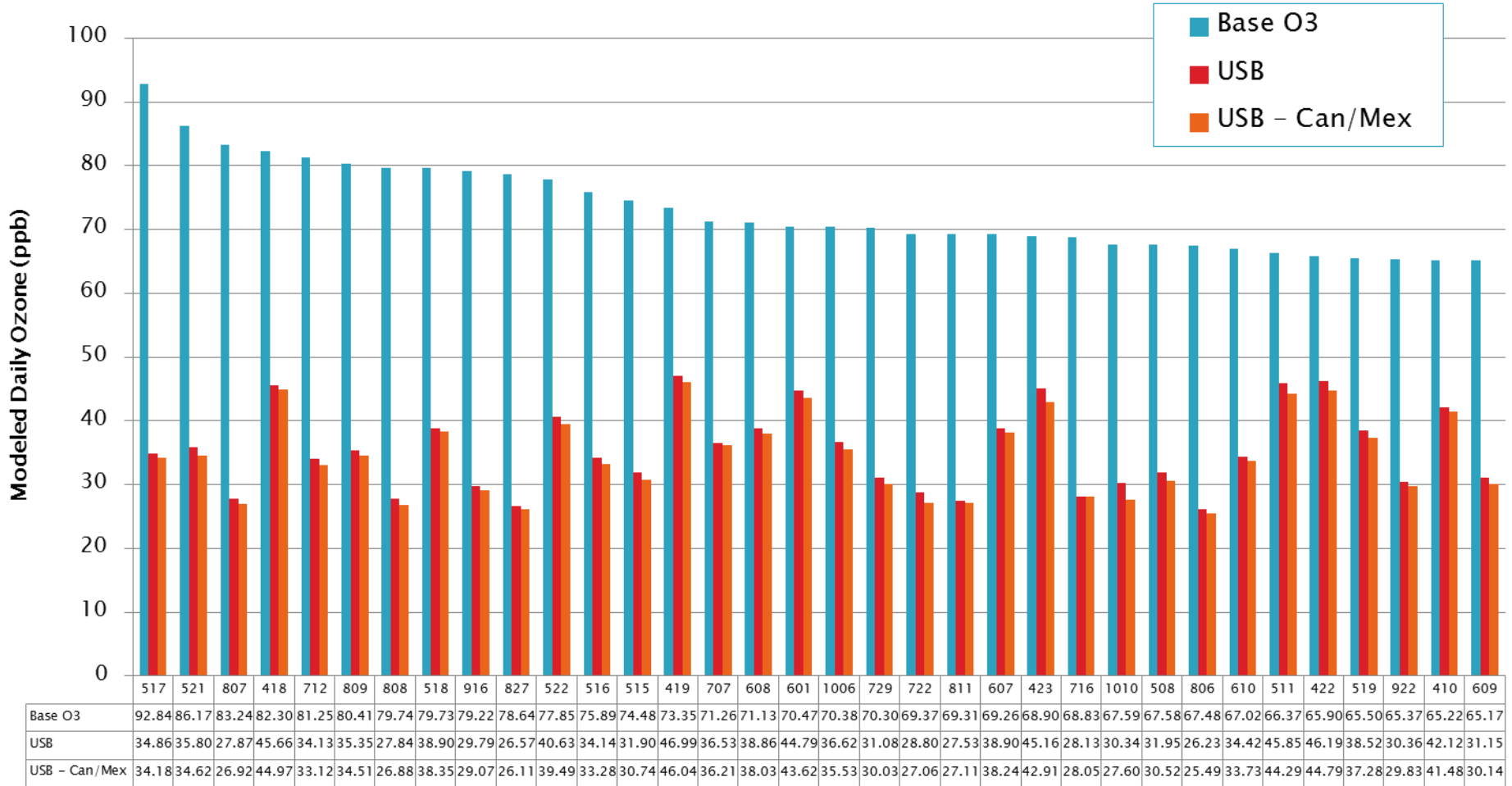
2012 Run.b Simulation

Monitor	480391004	Manvel Croix	
Modeled Data			
Date	Base O3	USB	USB - Can/Mex
517	92.84	34.86	34.18
521	86.17	35.80	34.62
807	83.24	27.87	26.92
418	82.30	45.66	44.97
712	81.25	34.13	33.12
809	80.41	35.35	34.51
808	79.74	27.84	26.88
518	79.73	38.90	38.35
916	79.22	29.79	29.07
827	78.64	26.57	26.11
522	77.85	40.63	39.49
516	75.89	34.14	33.28
515	74.48	31.90	30.74
419	73.35	46.99	46.04
707	71.26	36.53	36.21
608	71.13	38.86	38.03
601	70.47	44.79	43.62
1006	70.38	36.62	35.53
729	70.30	31.08	30.03
722	69.37	28.80	27.06
811	69.31	27.53	27.11
607	69.26	38.90	38.24
423	68.90	45.16	42.91
716	68.83	28.13	28.05
1010	67.59	30.34	27.60
508	67.58	31.95	30.52
806	67.48	26.23	25.49
610	67.02	34.42	33.73
511	66.37	45.85	44.29
422	65.90	46.19	44.79
519	65.50	38.52	37.28
922	65.37	30.36	29.83
410	65.22	42.12	41.48
609	65.17	31.15	30.14



Daily Results – 2012 Run.b

Manvel Croix



Average Concentrations – Run.b

Average of Days Modeled => 65 ppb

Monitor	Modeled Ozone Concentration (ppb)			Percent Compared to Base (%)	
	Base	USB	USB+NA	USB	USB+NA
Alabama-Coushatta	69.26	38.19	37.11	55%	54%
Aldine	71.35	35.46	34.43	50%	48%
Bayland Park	73.99	35.75	34.80	48%	47%
Baytown Garth	71.49	36.01	34.96	50%	49%
Beaumont Downtown	69.65	34.84	33.84	50%	49%
Beauregard	69.01	37.19	36.03	54%	52%
Carlyss	69.71	35.42	34.30	51%	49%
Channelview	71.87	35.67	34.64	50%	48%
Clinton Ave	72.72	35.14	34.24	48%	47%
Clute	69.33	34.60	33.66	50%	49%
Conroe	71.58	36.52	35.53	51%	50%
Conroe Airport	71.77	36.17	35.16	50%	49%
Crawford & Polk Intersection	72.80	36.96	35.95	51%	49%
Croquet	73.93	35.29	34.37	48%	46%
Deer Park	71.92	36.64	35.57	51%	49%
Galveston	72.38	36.46	35.47	50%	49%
Hamshire	70.37	36.30	35.21	52%	50%
HouEast	72.26	36.72	35.67	51%	49%
HouRegOff	72.51	36.89	35.90	51%	50%
Jefferson Airport	69.86	34.83	33.73	50%	48%
Lake Jackson	70.04	35.42	34.52	51%	49%
Lang	72.76	36.72	35.61	50%	49%
Lynchburg Ferry	71.94	37.02	36.07	51%	50%
Manvel Croix	73.16	35.41	34.42	48%	47%
Monroe	72.63	35.83	34.78	49%	48%
Nederland HS	69.54	34.56	33.49	50%	48%
NW Harris	72.01	34.77	33.65	48%	47%
Park Place	72.42	36.68	35.65	51%	49%
Port Arthur C628	70.26	33.40	32.35	48%	46%
Port Arthur West	70.42	35.00	33.97	50%	48%
Sabine Pass	71.24	35.82	34.78	50%	49%
Seabrook	70.66	36.25	35.30	51%	50%
Texas City	71.87	35.51	34.51	49%	48%
Vinton	69.67	36.14	34.97	52%	50%
Wayside	72.35	36.95	35.87	51%	50%
West Lake	67.96	34.27	33.02	50%	49%
West Orange	69.91	35.10	34.10	50%	49%
West Orange B	70.77	37.08	35.95	52%	51%
Westhollow	73.63	36.02	35.03	49%	48%
Grand Average	71.64	35.94	34.91	50%	49%

Initial Observations

- Results disagree with EPA's conclusion that USB is important only in the west
 - Based on our modeling, US Background is significant at the monitors in the HGB 4km domain
 - Consistently > 45% at all monitors in all ensemble runs
- Largest contributing anthropogenic emissions category is onroad motor vehicle emissions for all monitors across all ensembles and reporting thresholds
 - Typically twice as large as next highest anthro category
- Relative contribution by category generally similar based on reporting threshold
 - Additional detailed review in process

Additional Associated Work

- Continue investigation of daily contributions to determine upwind source regions / categories contributing to downwind concentrations
 - Based on common days between ensembles and/or best performing days
- Develop OSAT contribution trends using 2010 and 2011 modeling platform data
 - Determine impact of different MET years on ozone
 - Determine control phase-in seen in modeling platform
- Other projects of interest to TCEQ?