ALPINE GEOPHYSICS

TCEQ Modeling Platform OSAT Modeling – June 2012

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SET PMTC Meeting
October 19, 2015

Objective

- Inform Houston 8-hr Coalition and TCEQ on relative importance of boundary conditions

Technical Approach

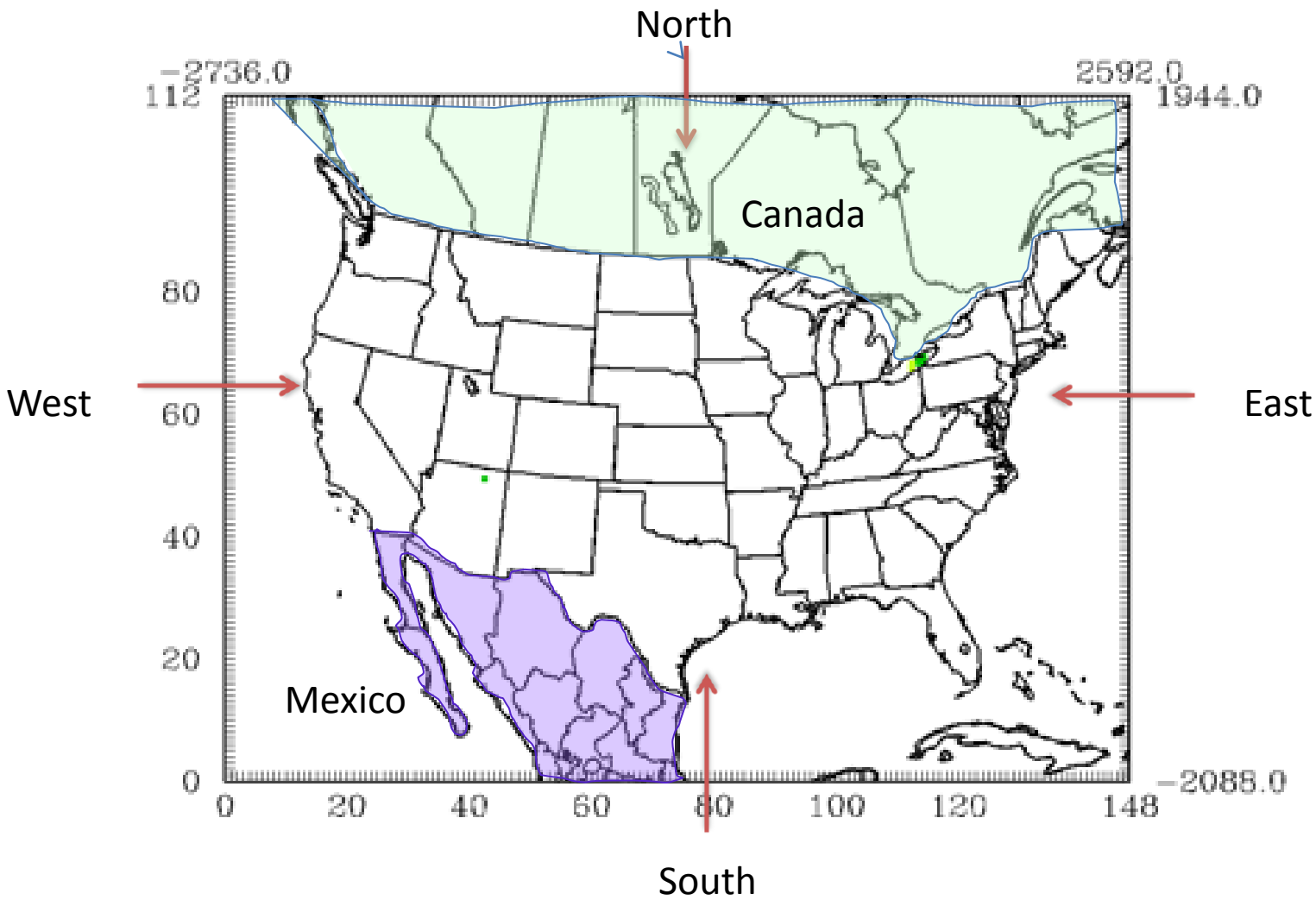
- Utilize TCEQ's most recent 2012 modeling platform* to determine relative contribution of international emissions on HGB monitors
  - bc12_12jun.reg3a.2012_wrf361_p2a_i2_a
  - https://www.tceq.texas.gov/airquality/airmod/data/tx2012

- Alpine ran CAMx/OSAT with TCEQ platform to generate daily and episodic source apportionment results for all monitors in TCEQ 4km modeling domain

*TCEQ 2012 platform is in progress with frequent updates

TCEQ 4km Modeling Domain

OSAT 36km Modeling Domain and Regions



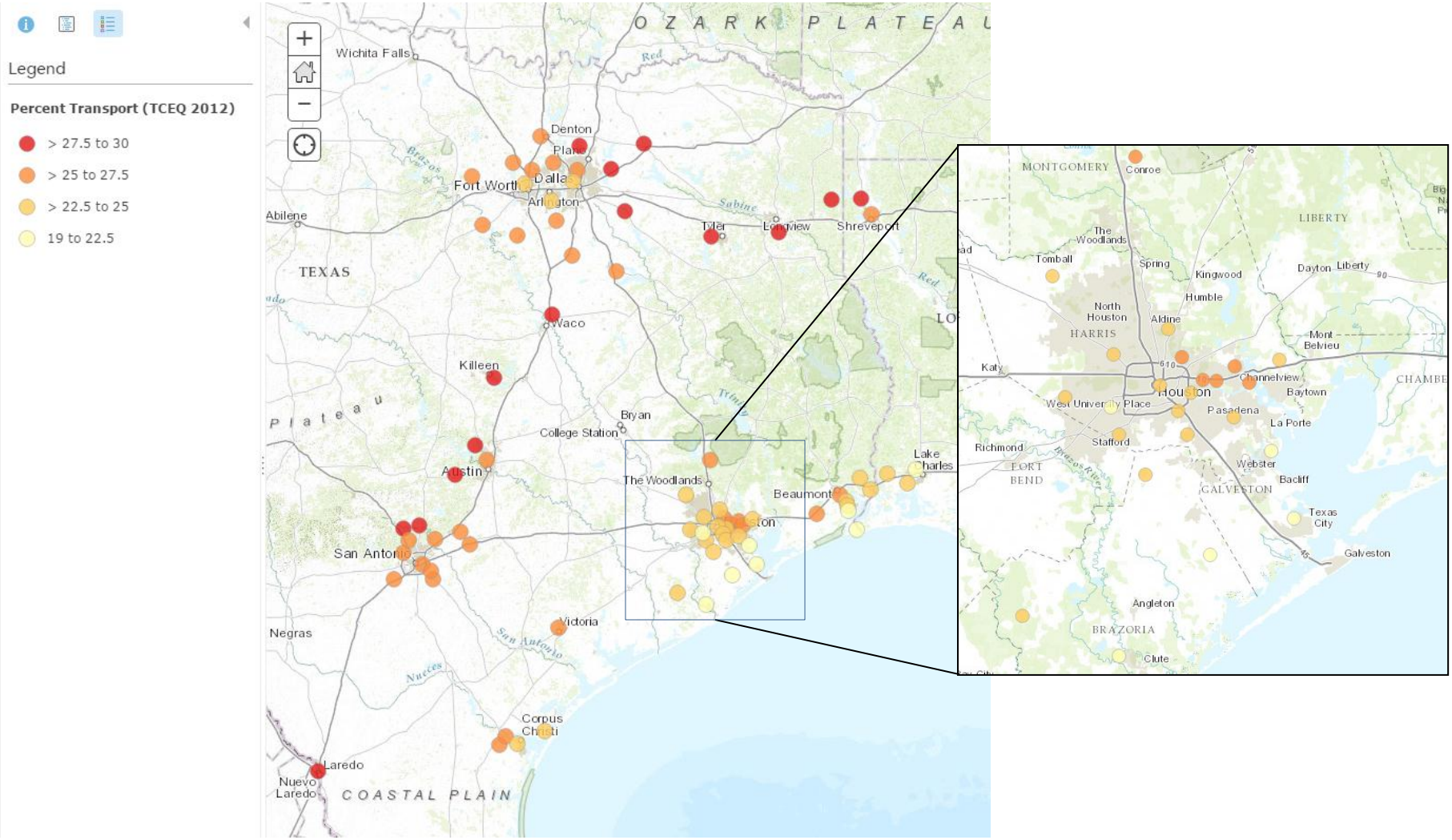
Data Extraction and Results

- Modeled OSAT results extracted at each monitor for days where modeled MDA8 concentrations equaled or exceeded 60 ppb

- Results prepared and presented at monitor:
  - In aggregate for all days combined >= 60 ppb
  - Individually for each day >= 60 ppb

Modeled % Ozone from Transport

Aggregate of 60ppb+ Modeled Days

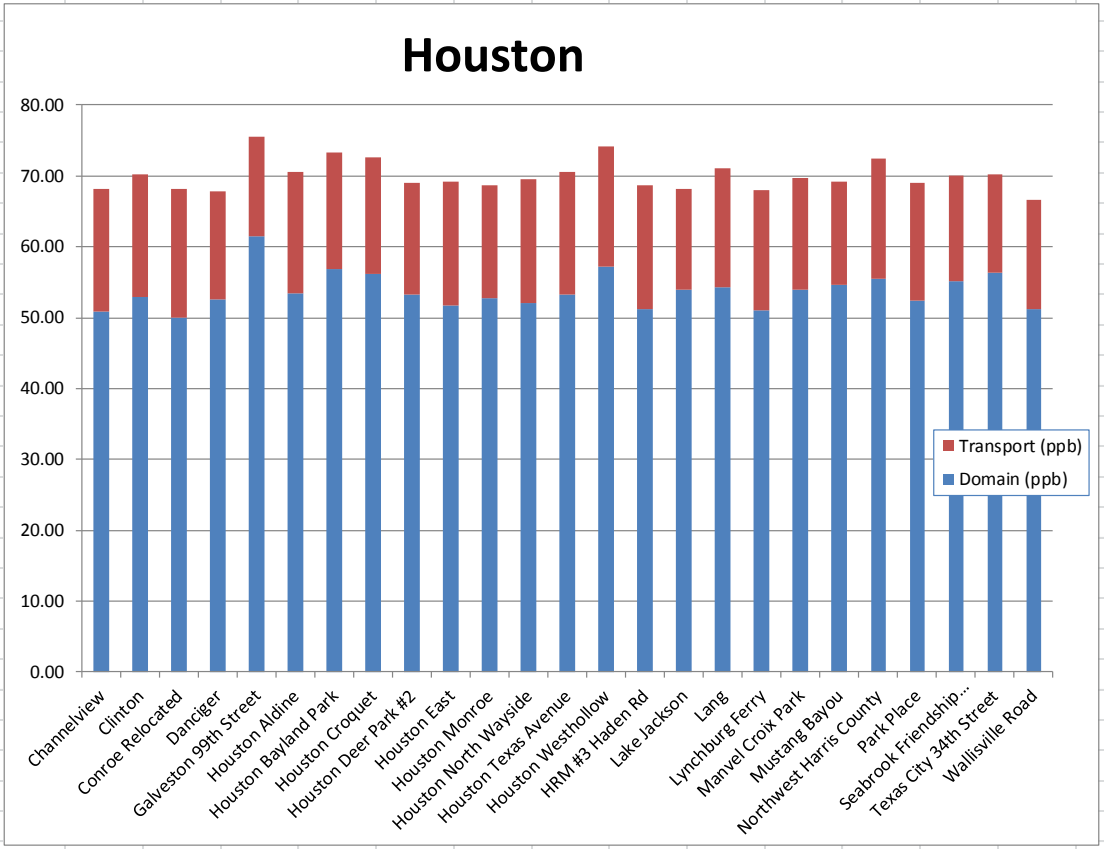


Houston Monitor Transport

Aggregate of 60ppb+ Modeled Days

Region	Houston

Monitor	Domain (ppb)	Transport (ppb)
Channelview	50.92	17.29
Clinton	52.84	17.45
Conroe Relocated	50.05	18.07
Danciger	52.50	15.30
Galveston 99th Street	61.53	13.99
Houston Aldine	53.38	17.11
Houston Bayland Park	56.82	16.45
Houston Croquet	56.18	16.41
Houston Deer Park #2	53.28	15.77
Houston East	51.71	17.56
Houston Monroe	52.81	15.83
Houston North Wayside	52.05	17.49
Houston Texas Avenue	53.23	17.28
Houston Westhollow	57.17	16.93
HRM #3 Haden Rd	51.14	17.49
Lake Jackson	53.90	14.33
Lang	54.26	16.87
Lynchburg Ferry	50.98	17.06
Manvel Croix Park	54.00	15.71
Mustang Bayou	54.66	14.52
Northwest Harris County	55.46	17.03
Park Place	52.43	16.67
Seabrook Friendship Park	55.13	14.95
Texas City 34th Street	56.34	13.95
Wallisville Road	51.24	15.40



Aggregate results show 22-28% ozone contribution from international transport sources.

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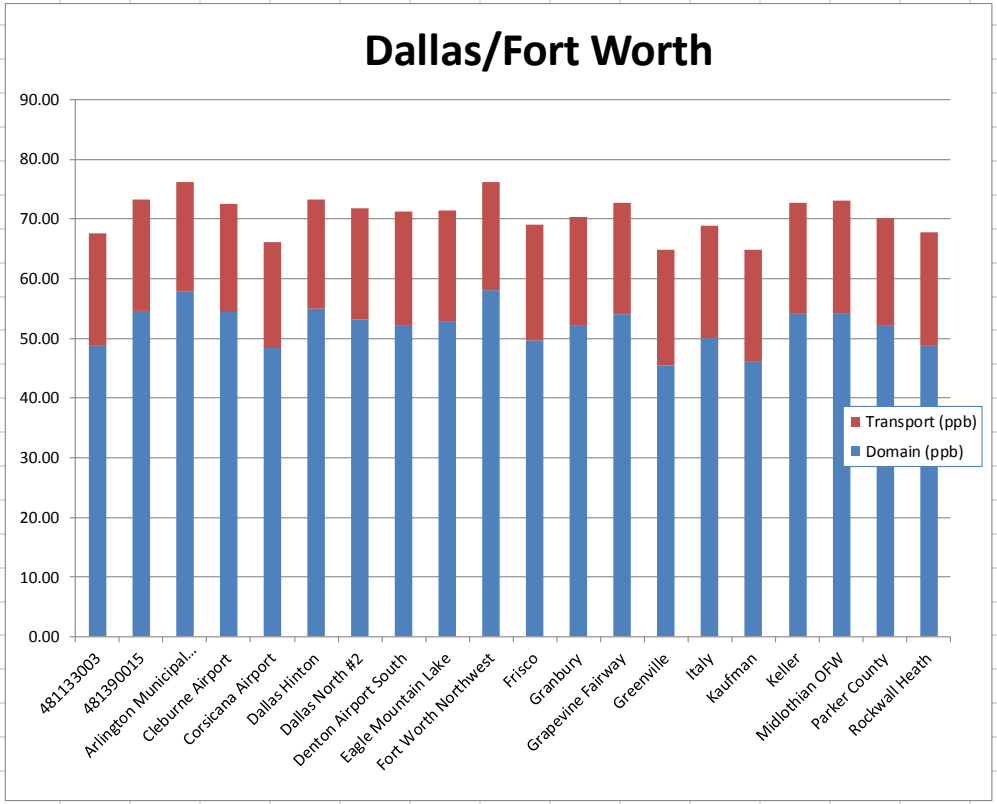
Dallas/Fort Worth Monitor Transport

Aggregate of 60ppb+ Modeled Days

Region	Dallas/Fort Worth	
Monitor	**Domain (ppb)**	**Transport (ppb)**
481133003	48.71	18.86
481390015	54.59	18.73
Arlington Municipal Airport	57.92	18.31
Cleburne Airport	54.43	18.16
Corsicana Airport	48.29	17.91
Dallas Hinton	55.00	18.20
Dallas North #2	53.07	18.72
Denton Airport South	52.14	19.10
Eagle Mountain Lake	52.85	18.63
Fort Worth Northwest	58.00	18.10
Frisco	49.73	19.35
Granbury	52.25	18.14
Grapevine Fairway	54.00	18.62
Greenville	45.38	19.45
Italy	49.98	18.81
Kaufman	46.22	18.62
Keller	54.14	18.61
Midlothian OFW	54.30	18.75
Parker County	52.17	18.03
Rockwall Heath	48.73	19.02



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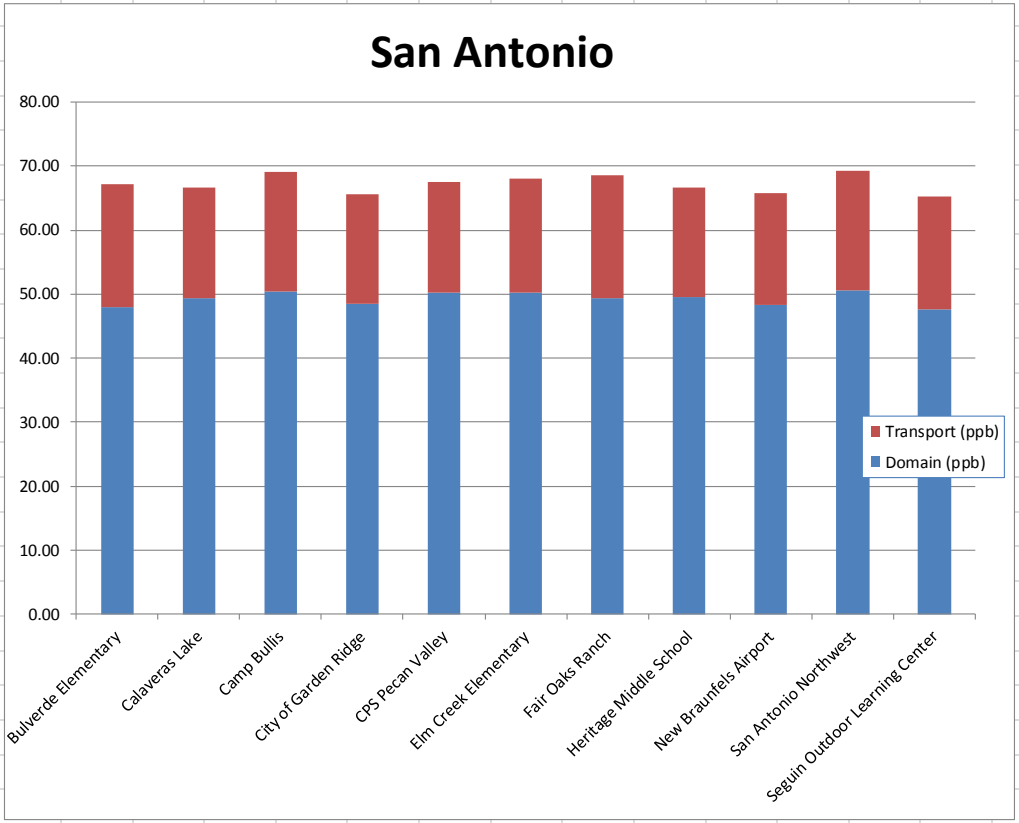
San Antonio Monitor Transport

Aggregate of 60ppb+ Modeled Days

Region	San Antonio	
Monitor	**Domain (ppb)**	**Transport (ppb)**
Bulverde Elementary	47.99	19.22
Calaveras Lake	49.39	17.30
Camp Bullis	50.50	18.51
City of Garden Ridge	48.43	17.23
CPS Pecan Valley	50.23	17.35
Elm Creek Elementary	50.32	17.79
Fair Oaks Ranch	49.40	19.20
Heritage Middle School	49.61	17.07
New Braunfels Airport	48.34	17.40
San Antonio Northwest	50.63	18.56
Seguin Outdoor Learning Center	47.69	17.54



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Aldine Monitor Transport – All Days

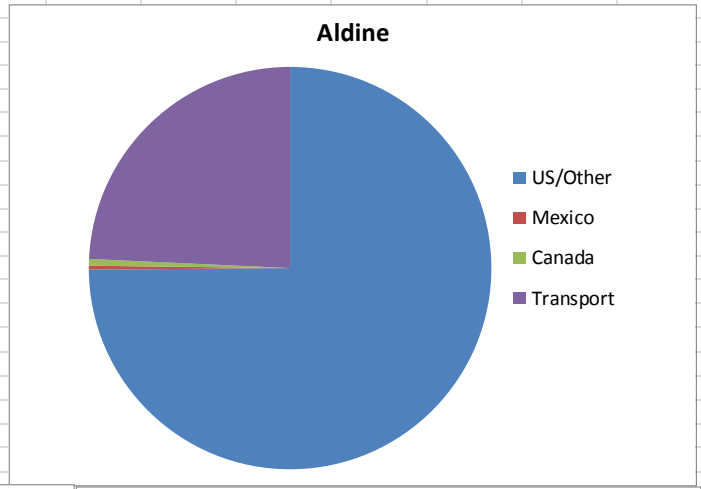
monitor	482010024	Aldine

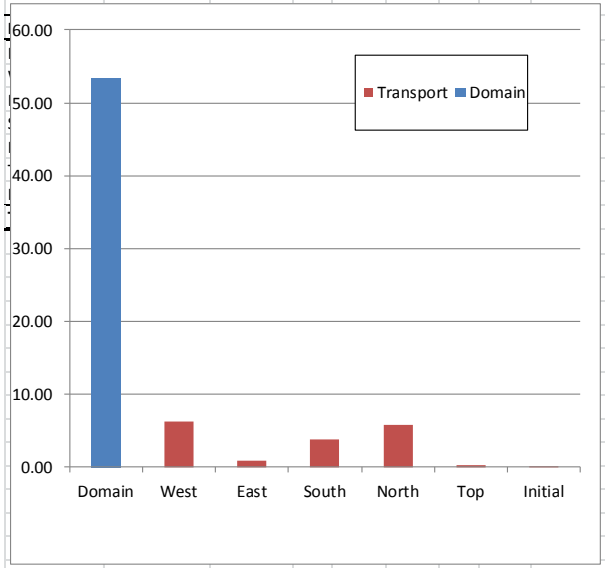
	Data								
region	Domain	West	East	South	North	Top	Initial	Total (ppb)	Total (%)
BCEST	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.91	1.3%
BCNTH	0.00	0.00	0.00	0.00	5.75	0.00	0.00	5.75	8.2%
BCSTH	0.00	0.00	0.00	3.87	0.00	0.00	0.00	3.87	5.5%
BCTOP	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.28	0.4%
BCWST	0.00	6.29	0.00	0.00	0.00	0.00	0.00	6.29	8.9%
Can	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.5%
IC	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.0%
Mex	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.3%
US/Other	52.78	0.00	0.00	0.00	0.00	0.00	0.00	52.78	74.9%
Grand Total	**53.38**	**6.29**	**0.91**	**3.87**	**5.75**	**0.28**	**0.01**	**70.49**	**100.0%**

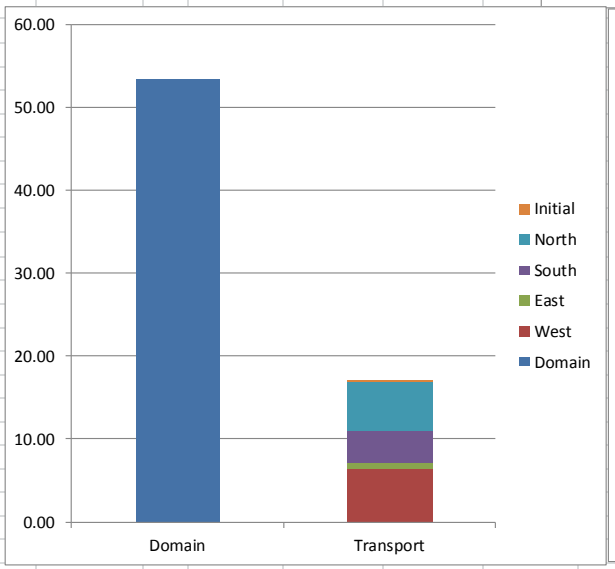
	Modeled Ozone	
Region	ppb	% of Total
Domain	53.38	75.7%
Transport	17.11	24.3%
Total	**70.49**	**100.0%**

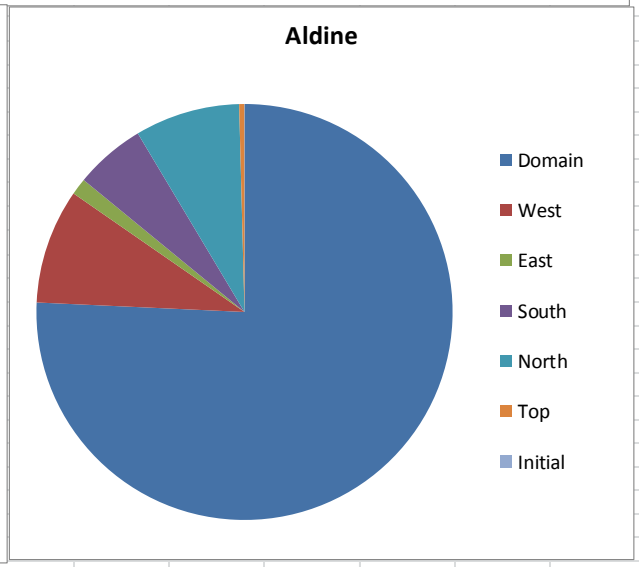
Region	ppb	% of Total
US/Other	52.78	74.9%
Mexico	0.22	0.3%
Canada	0.38	0.5%
Transport	17.11	24.3%
Total	**70.49**	**100.0%**

Region	Domain	West	East	South	North	Top	Initial	Total
Domain	53.38	0.00	0.00	0.00	0.00	0.00	0.00	53.38
Transport	0.00	6.29	0.91	3.87	5.75	0.28	0.01	17.11
Total	**53.38**	**6.29**	**0.91**	**3.87**	**5.75**	**0.28**	**0.01**	**70.49**









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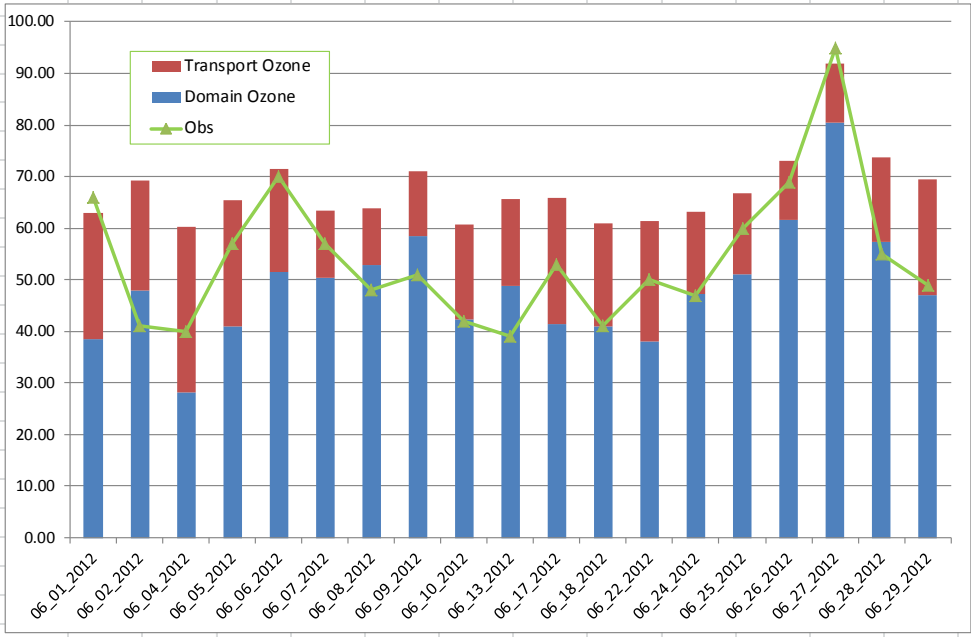
OSAT Day Specific Results

- While aggregate episode monitor-level results indicate ~25% of regional ozone is from international transport, significant day-to-day variation

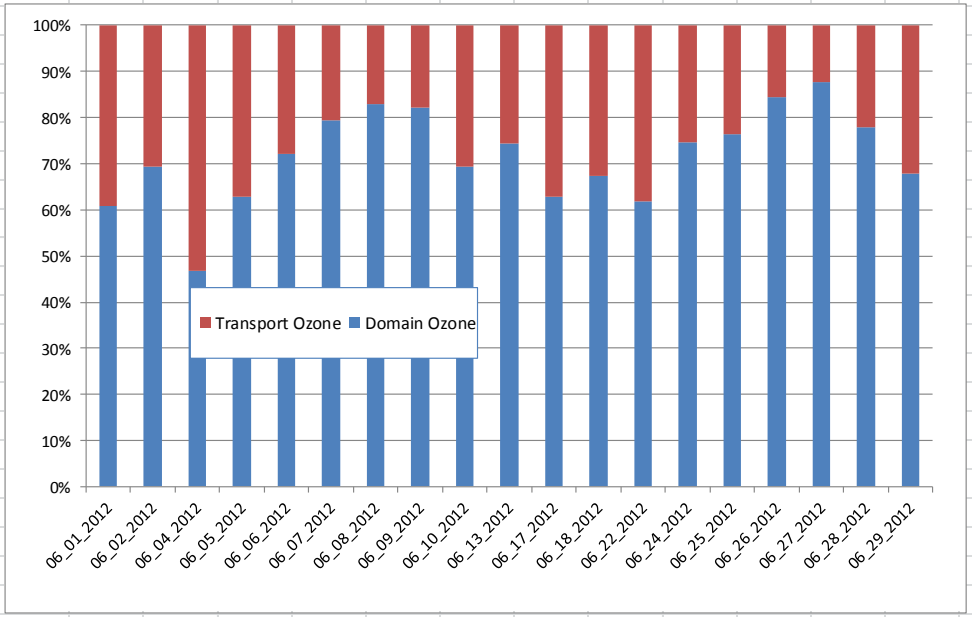
- Some monitors present results greater than 50% of ozone concentration from international transport

	Modeled Ozone Concentrations (ppb)		
Date	Domain Ozone	Transport Ozone	Obs
06_01_2012	38.39	24.62	66
06_02_2012	47.92	21.25	41
06_04_2012	28.23	32.01	40
06_05_2012	41.00	24.37	57
06_06_2012	51.44	19.97	70
06_07_2012	50.39	13.06	57
06_08_2012	52.92	10.85	48
06_09_2012	58.47	12.63	51
06_10_2012	42.21	18.55	42
06_13_2012	48.76	16.86	39
06_17_2012	41.42	24.45	53
06_18_2012	41.06	19.79	41
06_22_2012	38.01	23.37	50
06_24_2012	47.28	15.99	47
06_25_2012	50.96	15.83	60
06_26_2012	61.64	11.44	69
06_27_2012	80.56	11.32	95
06_28_2012	57.41	16.37	55
06_29_2012	47.08	22.34	49



Aldine - Daily Modeled Contribution
TCEQ 2012 Modeling Platform
Alpine Generated OSAT Results (60 pbb Threshold)

	Modeled Relative Contribution (%)		
Date	Domain Ozone	Transport Ozone	Obs
06_01_2012	60.9%	39.1%	66
06_02_2012	69.3%	30.7%	41
06_04_2012	46.9%	53.1%	40
06_05_2012	62.7%	37.3%	57
06_06_2012	72.0%	28.0%	70
06_07_2012	79.4%	20.6%	57
06_08_2012	83.0%	17.0%	48
06_09_2012	82.2%	17.8%	51
06_10_2012	69.5%	30.5%	42
06_13_2012	74.3%	25.7%	39
06_17_2012	62.9%	37.1%	53
06_18_2012	67.5%	32.5%	41
06_22_2012	61.9%	38.1%	50
06_24_2012	74.7%	25.3%	47
06_25_2012	76.3%	23.7%	60
06_26_2012	84.3%	15.7%	69
06_27_2012	87.7%	12.3%	95
06_28_2012	77.8%	22.2%	55
06_29_2012	67.8%	32.2%	49



Aldine Daily Transport – June 1

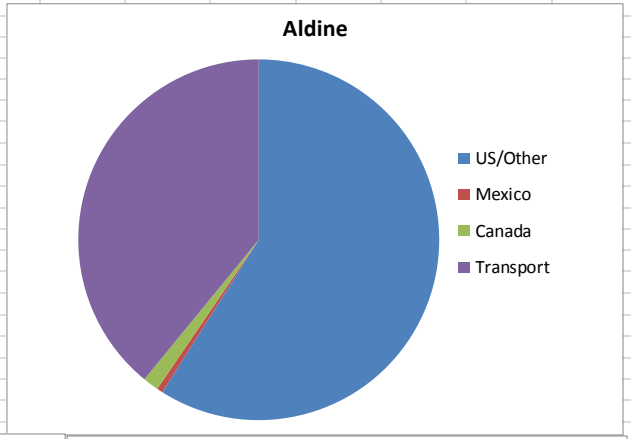
Monitor	06_01_2012	Aldine

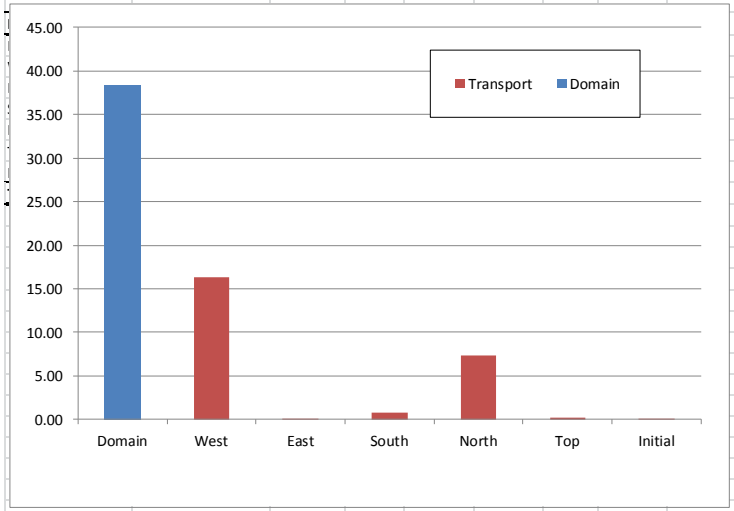
	Data								
Region	**Domain**	**West**	**East**	**South**	**North**	**Top**	**Initial**	**Total (ppb)**	**Total (%)**
IC	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.1%
Canada	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.89	1.4%
East	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.0%
Mexico	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.5%
North	0.00	0.00	0.00	0.00	7.32	0.00	0.00	7.32	11.6%
South	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.78	1.2%
Top	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.16	0.3%
US	37.16	0.00	0.00	0.00	0.00	0.00	0.00	37.16	59.0%
West	0.00	16.29	0.00	0.00	0.00	0.00	0.00	16.29	25.9%
Grand Total	**38.39**	**16.29**	**0.02**	**0.78**	**7.32**	**0.16**	**0.05**	**63.01**	**100.0%**

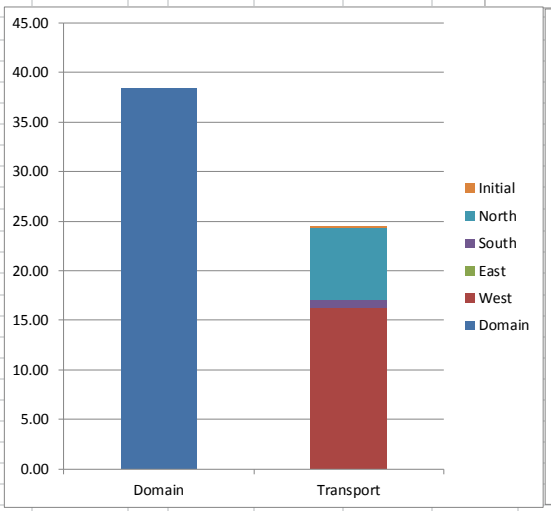
	Modeled Ozone	
Region	**ppb**	**% of Total**
Domain	38.39	60.9%
Transport	24.62	39.1%
Total	**63.01**	**100.0%**

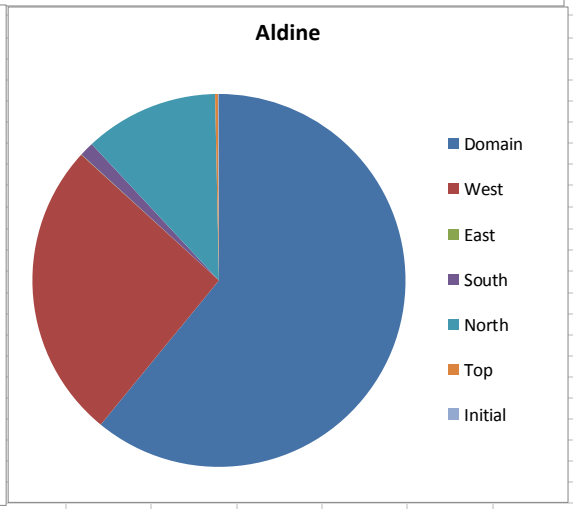
Region	**ppb**	**% of Total**
US/Other	37.16	59.0%
Mexico	0.34	0.5%
Canada	0.89	1.4%
Transport	24.62	39.1%
Total	**63.01**	**100.0%**

Region	**Domain**	**West**	**East**	**South**	**North**	**Top**	**Initial**	**Total**
Domain	38.39	0.00	0.00	0.00	0.00	0.00	0.00	38.39
Transport	0.00	16.29	0.02	0.78	7.32	0.16	0.05	24.62
Total	**38.39**	**16.29**	**0.02**	**0.78**	**7.32**	**0.16**	**0.05**	**63.01**









Aldine Daily Transport – June 4

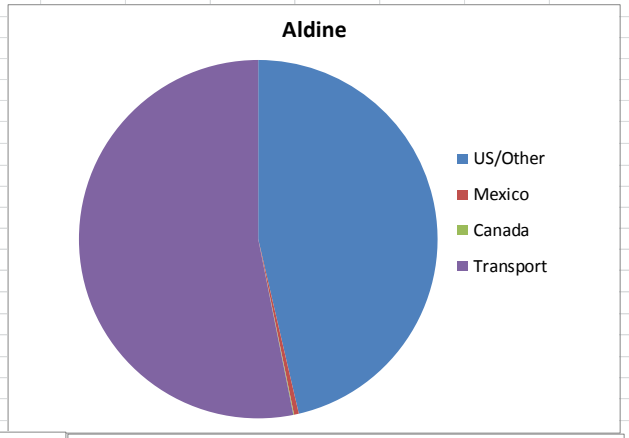
Monitor	06_04_2012	Aldine

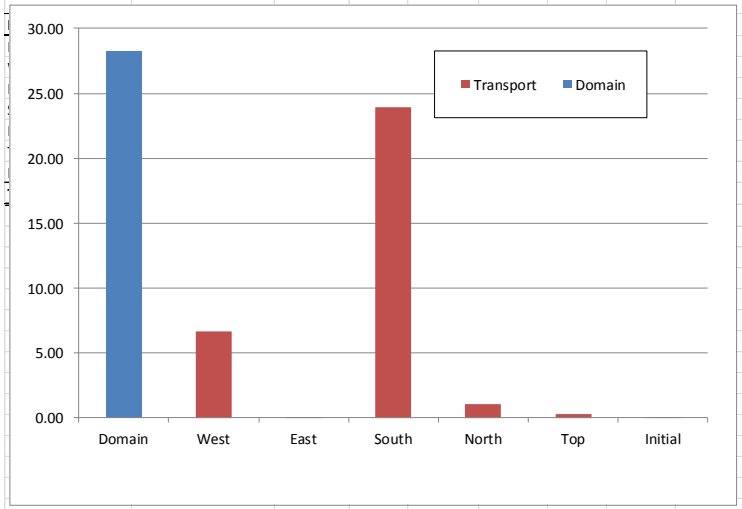
	Data								
Region	**Domain**	**West**	**East**	**South**	**North**	**Top**	**Initial**	**Total (ppb)**	**Total (%)**
IC	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.1%
Canada	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.1%
East	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.06	0.1%
Mexico	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.4%
North	0.00	0.00	0.00	0.00	1.03	0.00	0.00	1.03	1.7%
South	0.00	0.00	0.00	23.94	0.00	0.00	0.00	23.94	39.7%
Top	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.29	0.5%
US	27.93	0.00	0.00	0.00	0.00	0.00	0.00	27.93	46.4%
West	0.00	6.65	0.00	0.00	0.00	0.00	0.00	6.65	11.0%
Grand Total	**28.23**	**6.65**	**0.06**	**23.94**	**1.03**	**0.29**	**0.04**	**60.24**	**100.0%**

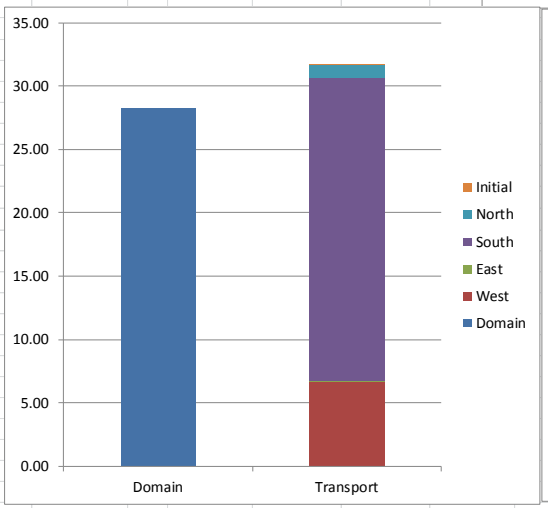
	Modeled Ozone	
Region	**ppb**	**% of Total**
Domain	28.23	46.9%
Transport	32.01	53.1%
Total	**60.24**	**100.0%**

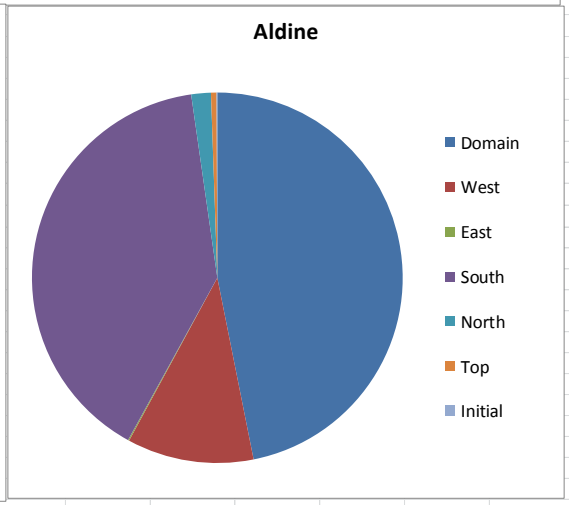
Region	**ppb**	**% of Total**
US/Other	27.93	46.4%
Mexico	0.26	0.4%
Canada	0.04	0.1%
Transport	32.01	53.1%
Total	**60.24**	**100.0%**

Region	**Domain**	**West**	**East**	**South**	**North**	**Top**	**Initial**	**Total**
Domain	28.23	0.00	0.00	0.00	0.00	0.00	0.00	28.23
Transport	0.00	6.65	0.06	23.94	1.03	0.29	0.04	32.01
Total	**28.23**	**6.65**	**0.06**	**23.94**	**1.03**	**0.29**	**0.04**	**60.24**









Aldine Daily Transport – June 27

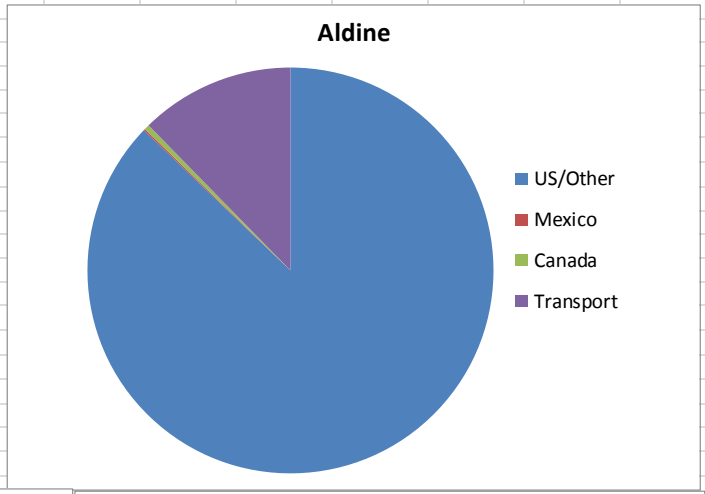
Monitor	06_27_2012	Aldine

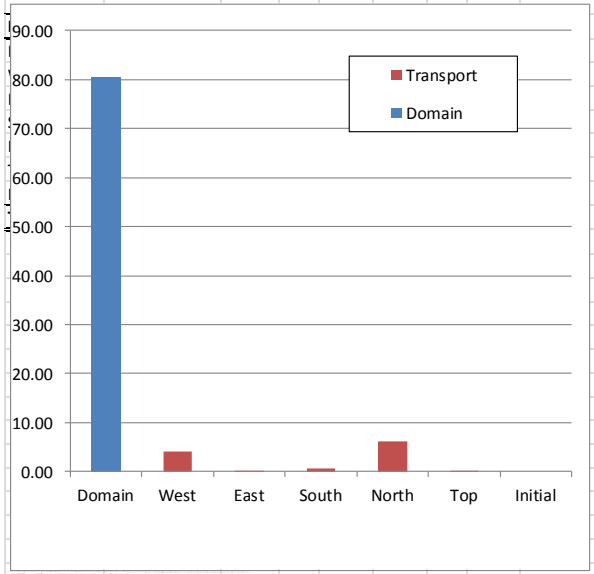
	Data								
Region	Domain	West	East	South	North	Top	Initial	Total (ppb)	Total (%)
IC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Canada	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.4%
East	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.27	0.3%
Mexico	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.1%
North	0.00	0.00	0.00	0.00	6.15	0.00	0.00	6.15	6.7%
South	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.73	0.8%
Top	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.16	0.2%
US	80.07	0.00	0.00	0.00	0.00	0.00	0.00	80.07	87.1%
West	0.00	4.01	0.00	0.00	0.00	0.00	0.00	4.01	4.4%
Grand Total	**80.56**	**4.01**	**0.27**	**0.73**	**6.15**	**0.16**	**0.00**	**91.88**	**100.0%**

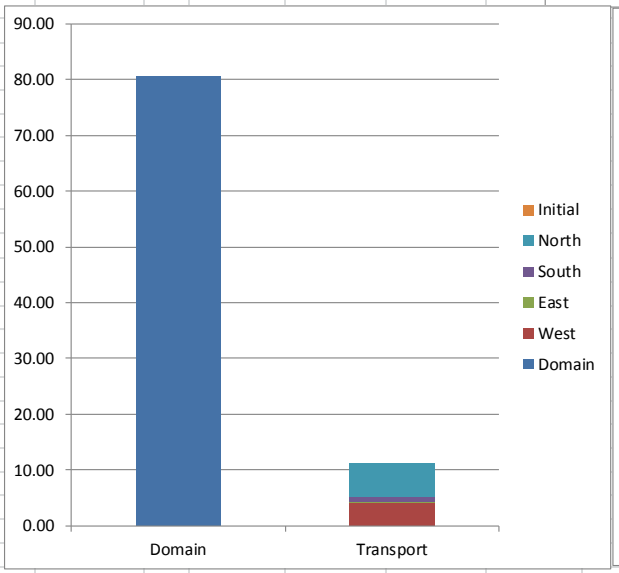
	Modeled Ozone	
Region	ppb	% of Total
Domain	80.56	87.7%
Transport	11.32	12.3%
Total	**91.88**	**100.0%**

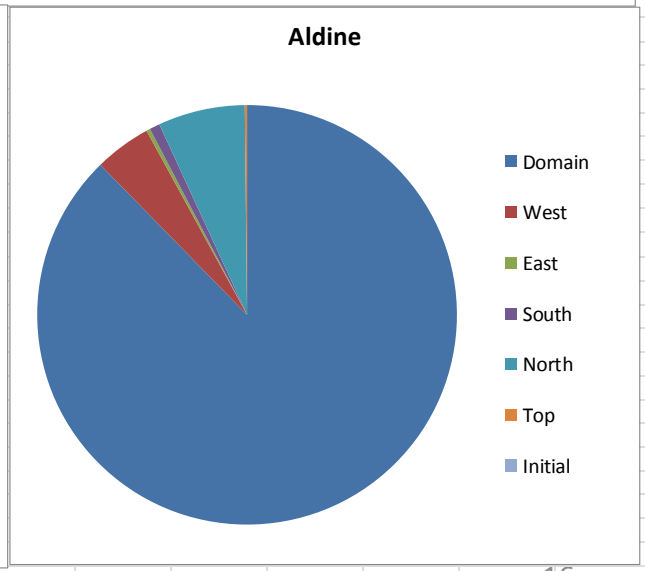
Region	ppb	% of Total
US/Other	80.07	87.1%
Mexico	0.12	0.1%
Canada	0.37	0.4%
Transport	11.32	12.3%
Total	**91.88**	**100.0%**

Region	Domain	West	East	South	North	Top	Initial	Total
Domain	80.56	0.00	0.00	0.00	0.00	0.00	0.00	80.56
Transport	0.00	4.01	0.27	0.73	6.15	0.16	0.00	11.32
Total	**80.56**	**4.01**	**0.27**	**0.73**	**6.15**	**0.16**	**0.00**	**91.88**

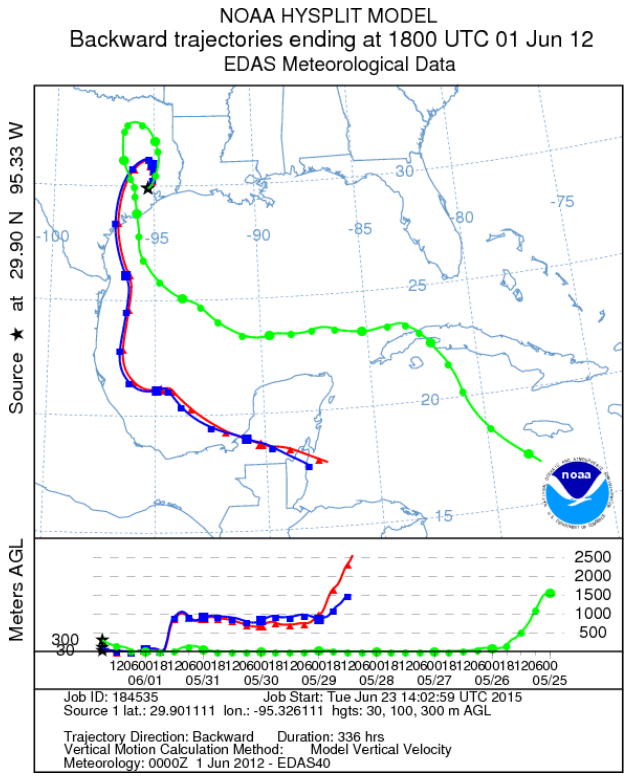




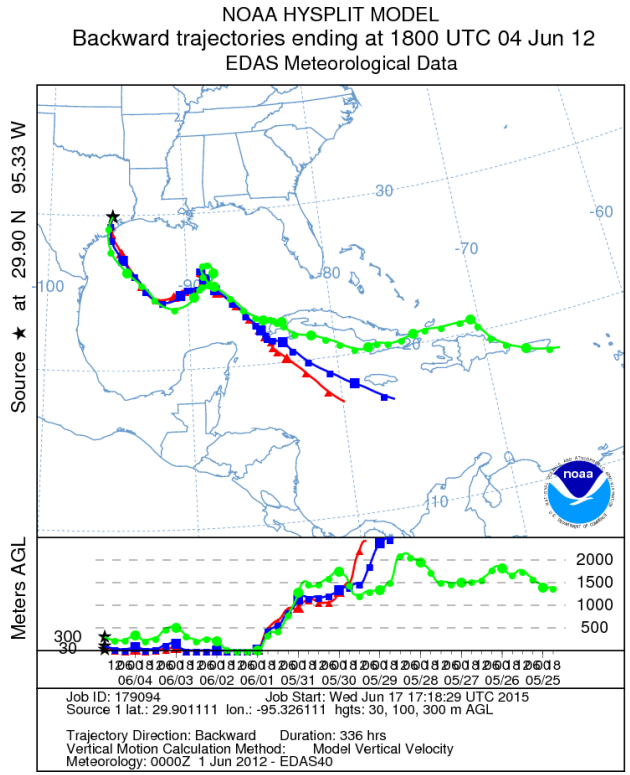




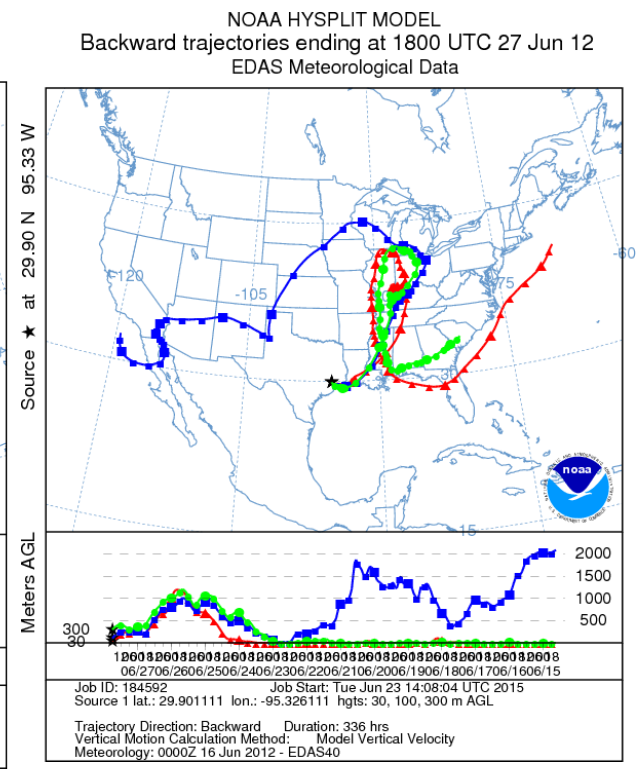
14 Day Back Trajectories - Aldine



Jun 1, 2012
39% Transport



Jun 4, 2012
53% Transport



Jun 27, 2012
12% Transport

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Observations

- All five studied HGB monitors show:
  - International transport influence (25-35%) from western boundary during early June
  - Influence increases (35-45%) and shifts to southern contribution around June 4
  - International transport influence (40-55%) from northern boundary during June 17-22 period
  - International transport influence (15%) seen during highest observation days (June 26-27)

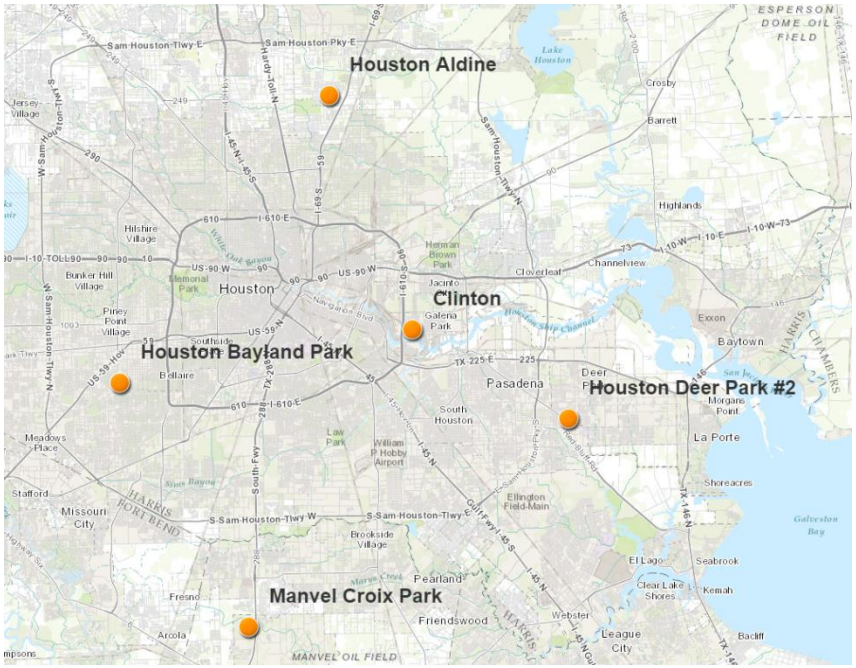
Additional Results Available

- Results for other monitors in HGB and in TCEQ 4km domain show similar results
- Aggregate June 2012 data fall within 22-28% international transport contribution
- Day-specific results show greater contribution percentages during the June 2012 episode

Other TCEQ 4km Monitors

- Episode aggregate results prepared and available for entire 4km domain

- Day-specific results prepared and available for multiple HGB monitors
  - Aldine
  - Manvel Croix
  - Deer Park
  - Clinton Avenue
  - Bayland Park



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