



Aerosol satellite products: Gulf coast perspective

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AQ Forecaster

Monitoring Division

Texas Commission on Environmental Quality



- Agencywide, the TCEQ uses aerosol satellite products to assist with several program goals, including:

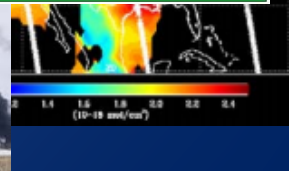
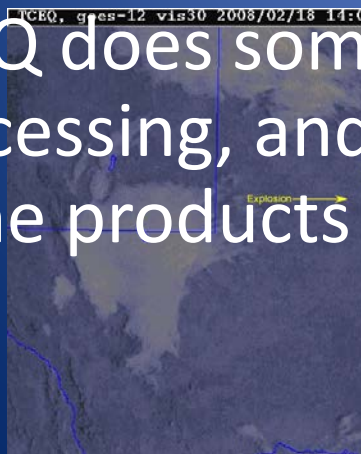
- Daily air quality forecasts
- Exceptional event investigations
- Long-term air quality trends
- Special air quality investigations



Forecast based on EPA's Air Quality Index (AQI)

Forecast Region (Click name for AIPNOW version)	Tue	Wed	Thu	Fri
	08/30/2016	08/31/2016	09/01/2016	09/02/2016
Austin	Good	Good	Ozone	Ozone
Beaumont-Port Arthur	Good	Good	Good	Good
Brownsville-McAllen	Good	Good	Good	Good
Corpus Christi	Good	Good	Ozone	Good
Dallas-Fort Worth	Ozone	Ozone	Ozone	Good
El Paso	Good	Good	Good	Ozone
Houston	Good	Ozone	Ozone	Ozone
Lubbock	Good	Good	Good	Good
Lubbock	Good	Good	Good	Good
Midland-Odessa	Good	Good	Good	Good
San Antonio	Good	Good	Ozone	Ozone
Tyler-Longview	Good	Ozone	Good	Good
Victoria	Good	Good	Good	Good
Waco-Killeen	Good	Ozone	Good	Good

- TCEQ does some processing, and some products





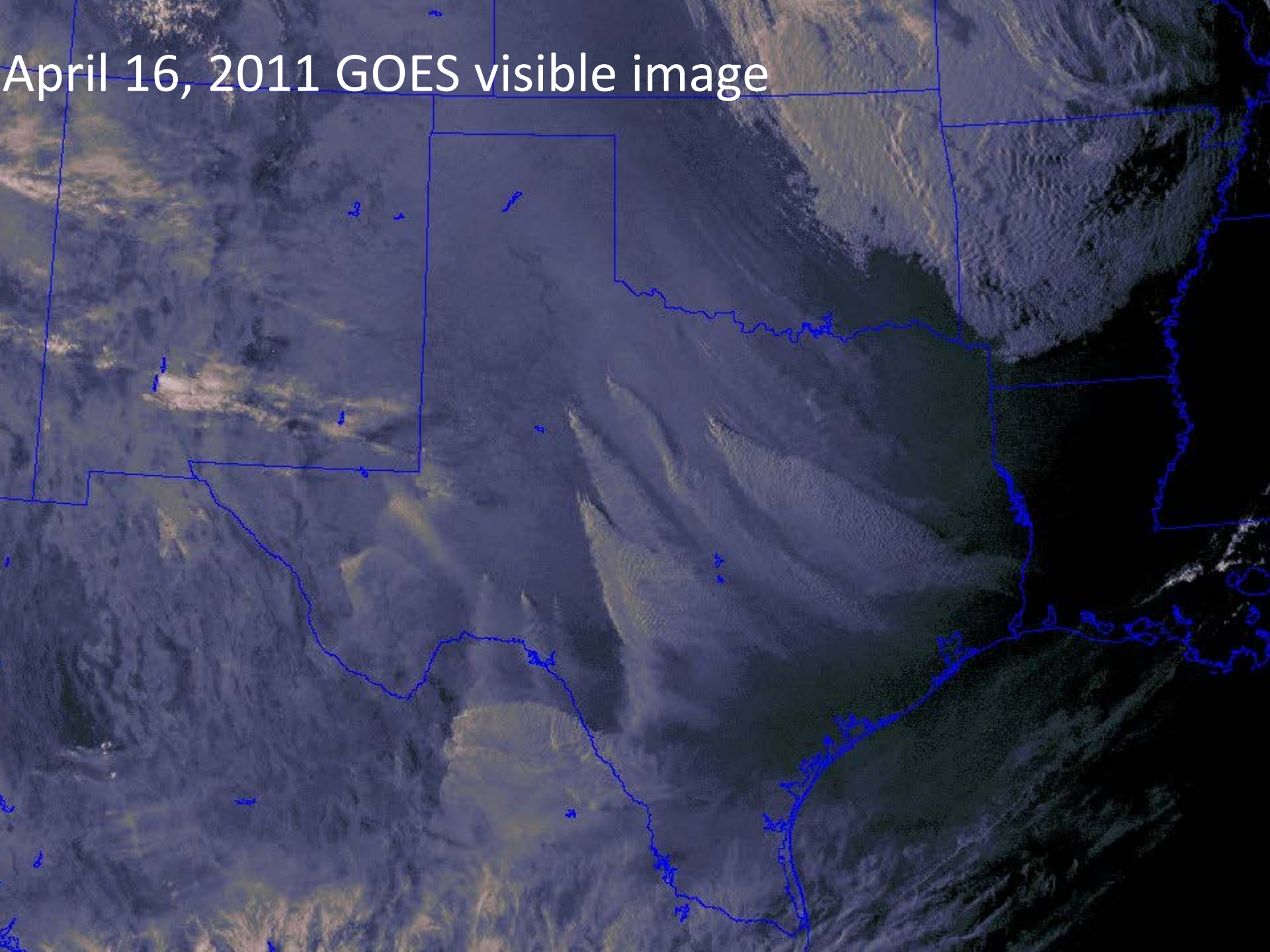
In Texas, we experience a wide range of aerosols that can impact air quality...



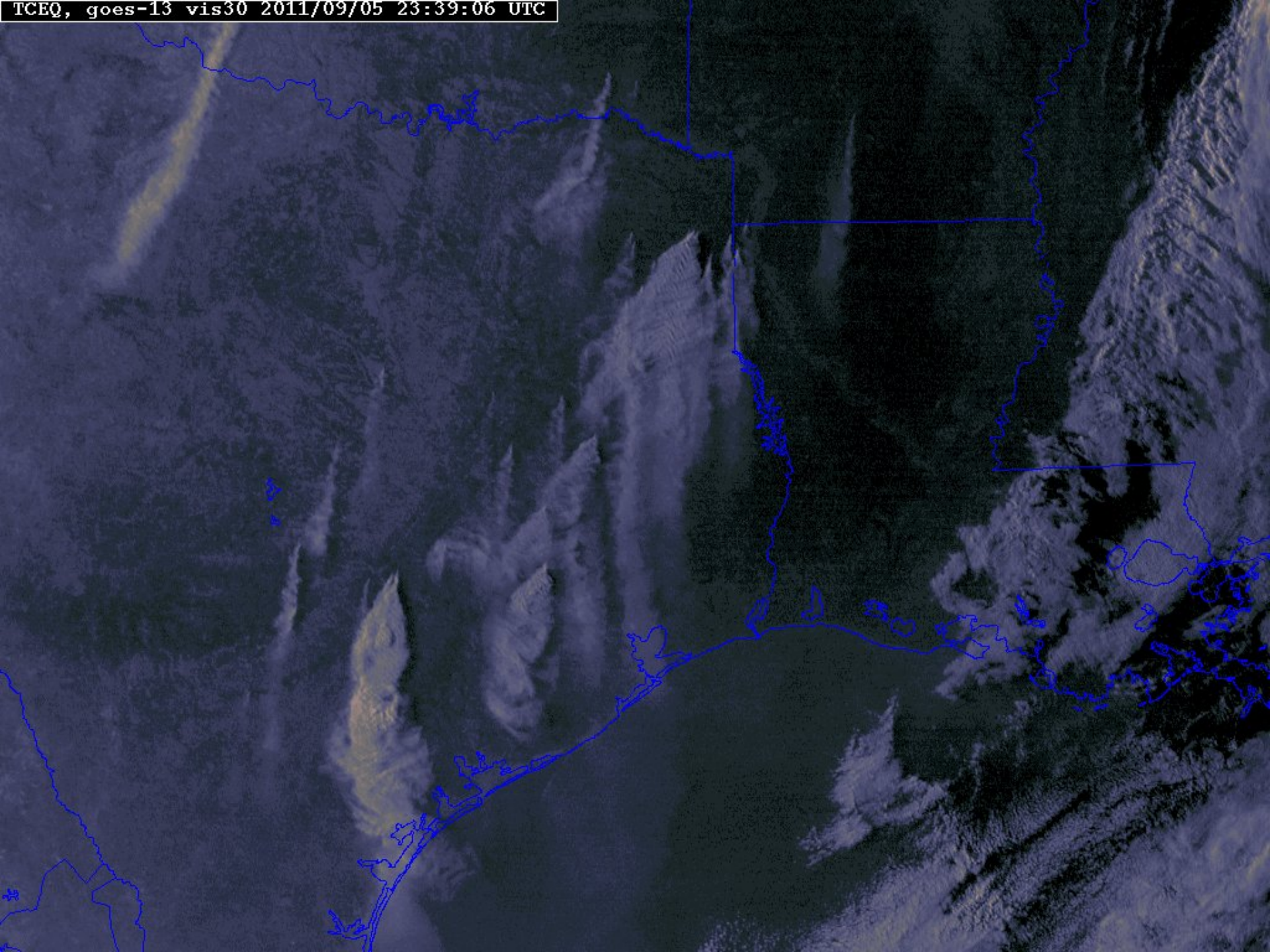


SMOKE FROM WILDFIRES

April 16, 2011 GOES visible image



TCEQ, goes-13 vis30 2011/09/05 23:39:06 UTC

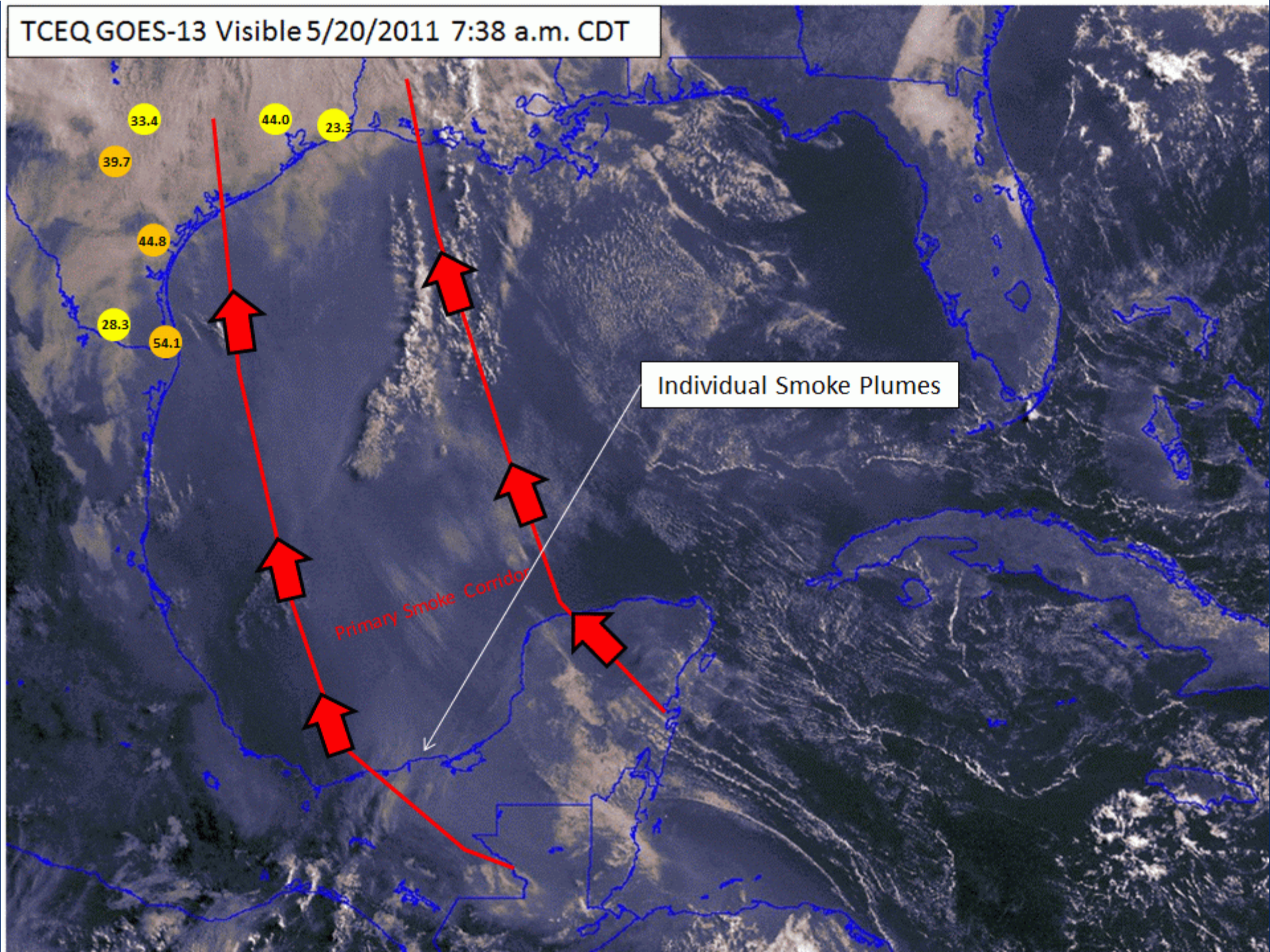




Late March through early June from agricultural and industrial burning

SMOKE FROM MEXICO & CENTRAL AMERICA

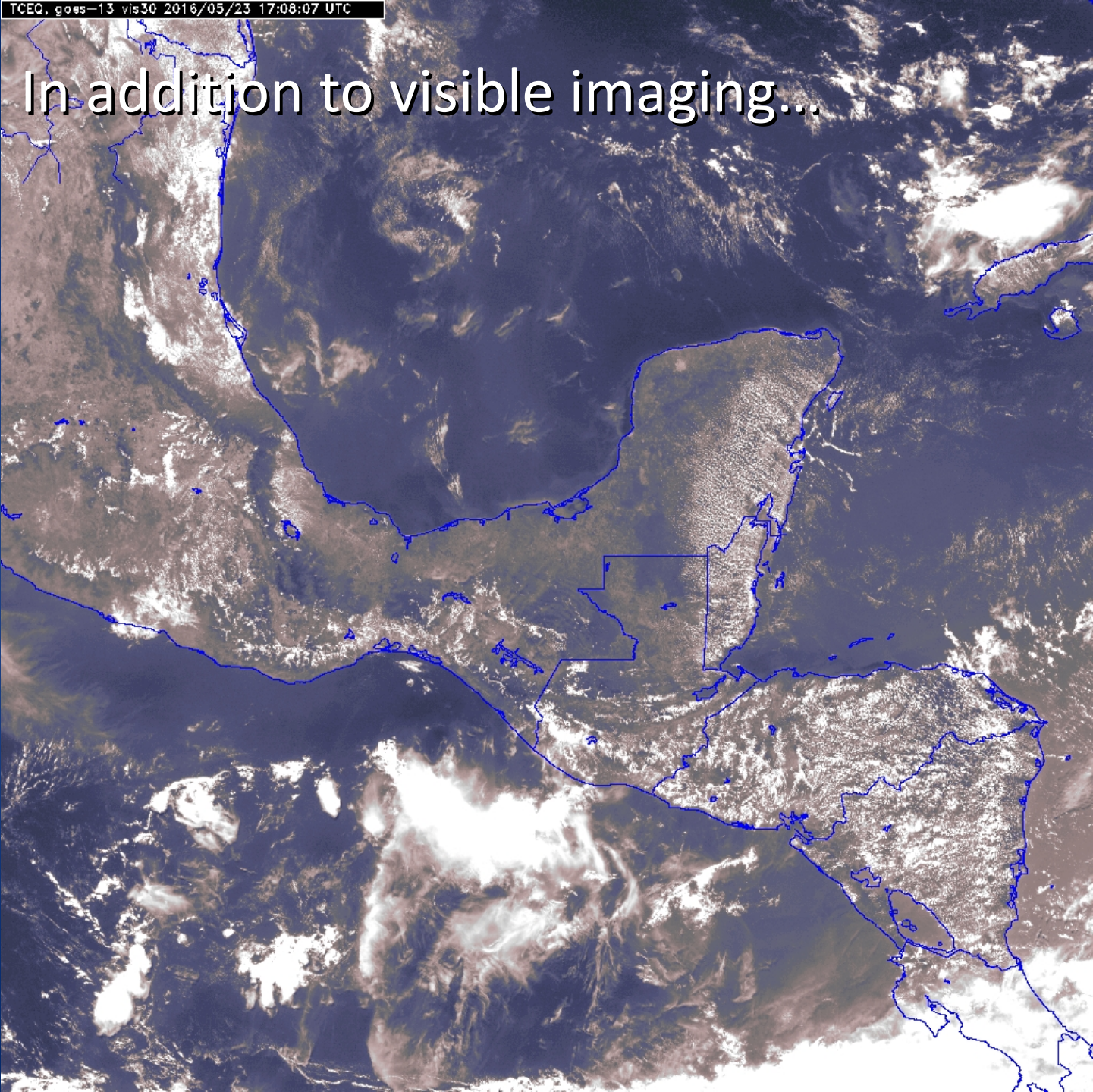
TCEQ GOES-13 Visible 5/20/2011 7:38 a.m. CDT



Individual Smoke Plumes

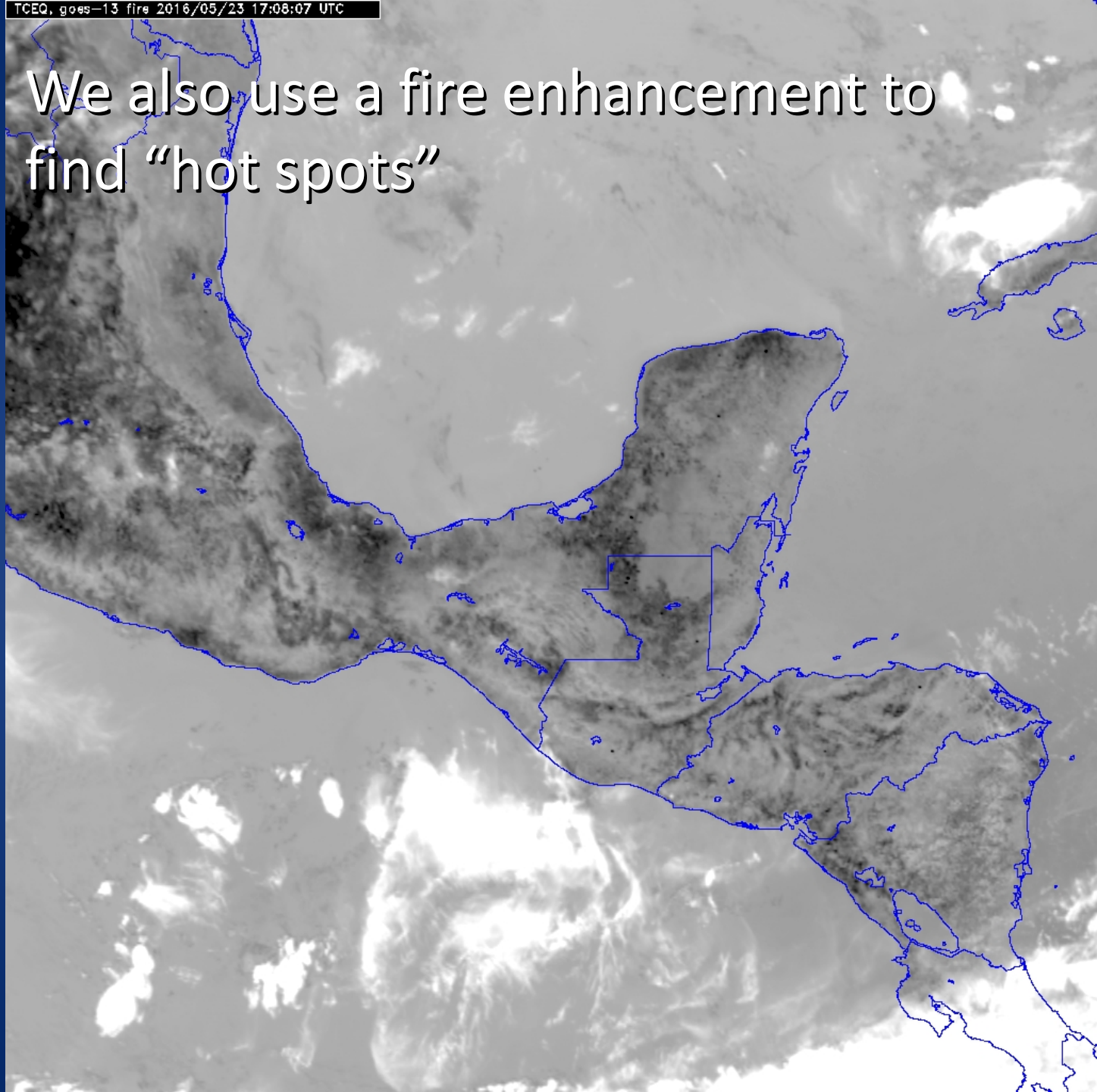
Primary Smoke Corridor

In addition to visible imaging...





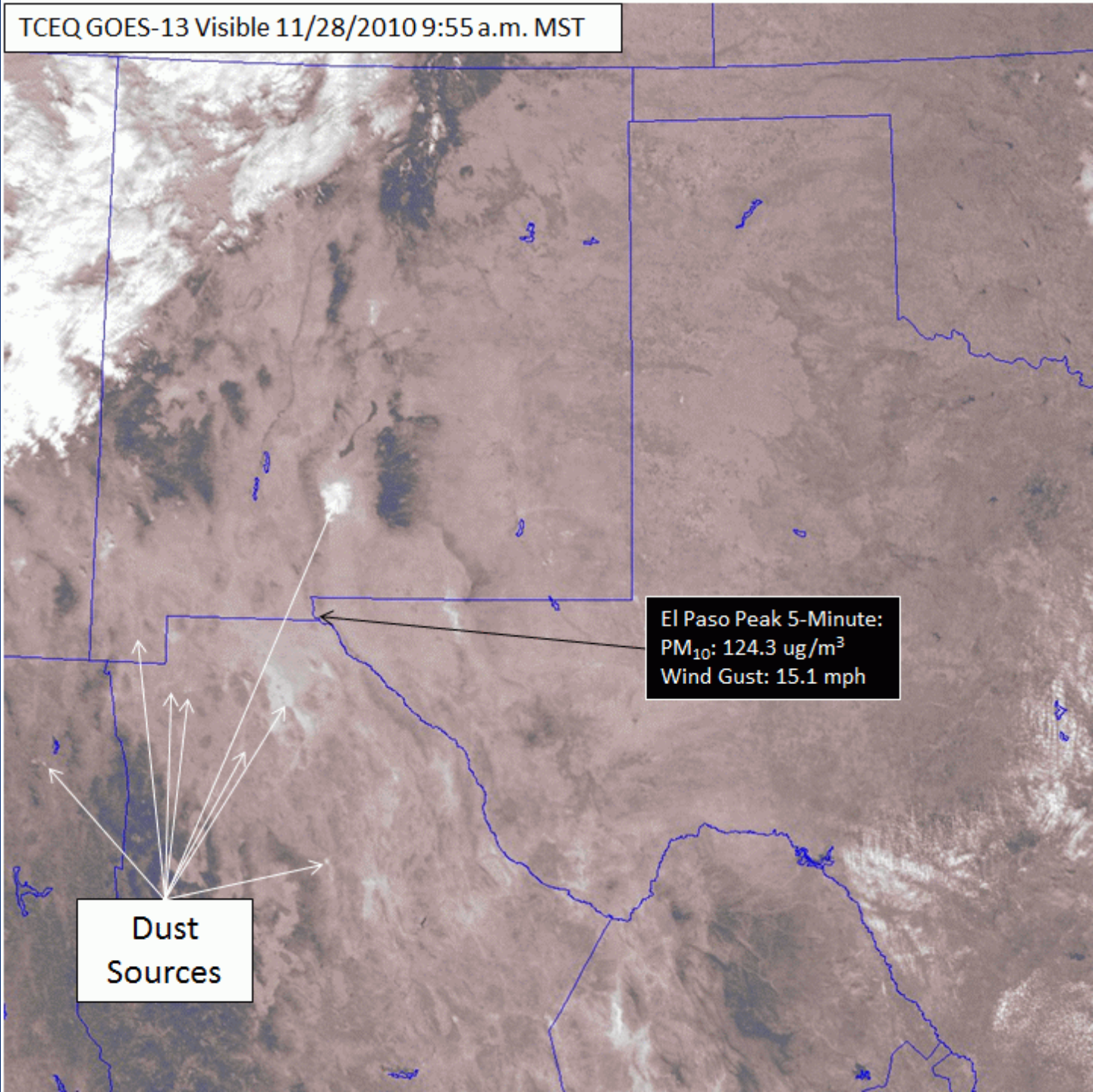
We also use a fire enhancement to find “hot spots”





Typically seen in El Paso and the Panhandle

DUST STORMS



Dust Sources

El Paso Peak 5-Minute:
PM₁₀: 124.3 ug/m³
Wind Gust: 15.1 mph



overlooking El Paso (shakiness is due to high winds)

TCEQ WEB CAM ANIMATIONS

11/28/2010

11/28/2010 06:02 AM



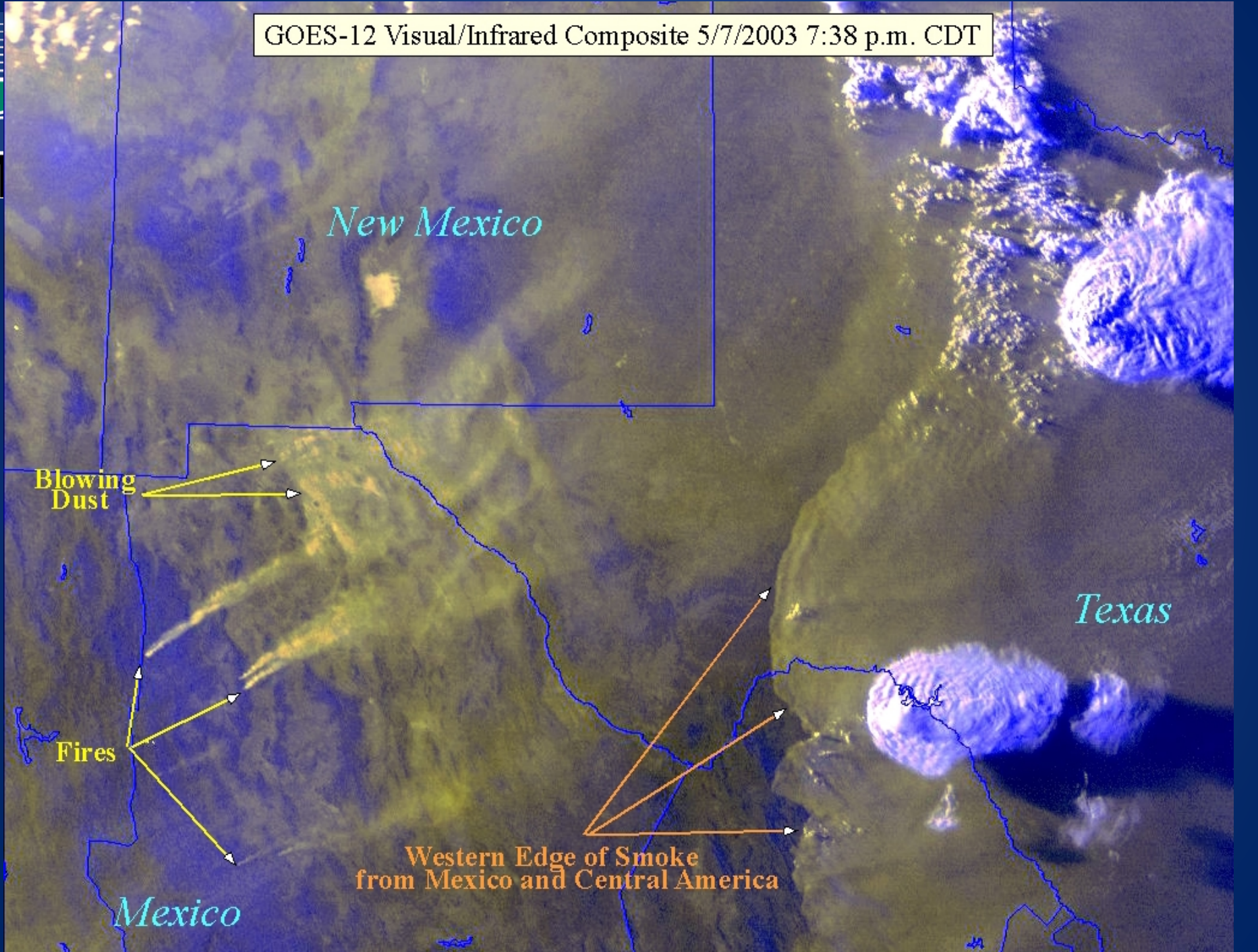
11/28/2010 06:01 AM





And, occasionally...

ALL AT THE SAME TIME



New Mexico

**Blowing
Dust**

Fires

Texas

Mexico

**Western Edge of Smoke
from Mexico and Central America**

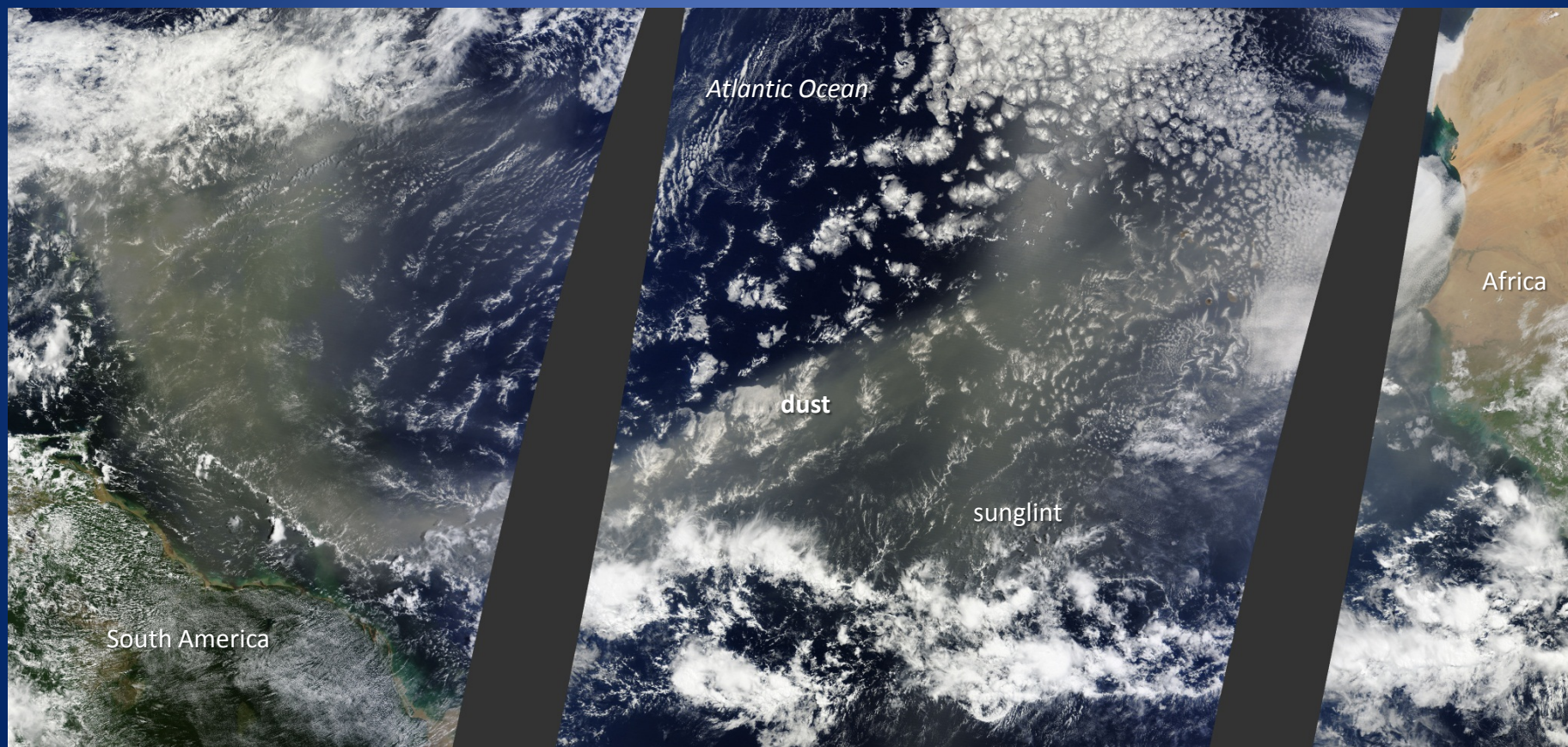


Travels across the Atlantic from June through August

AFRICAN DUST



African Dust Event Across the Atlantic





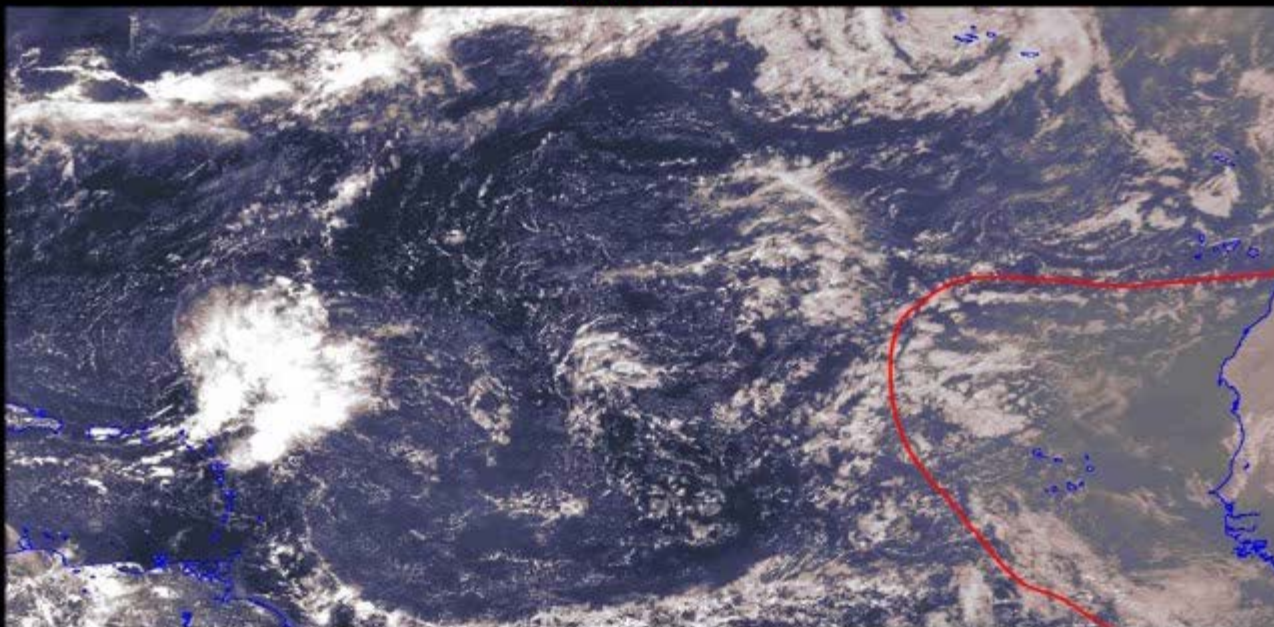
Dust Clouds Moving Over the Atlantic Ocean

- The video on the next slide shows the satellite view of three separate dust clouds moving over the Atlantic Ocean from Africa to the Texas Gulf Coast.
- The boundaries of the dust clouds have been circled with red, orange, and yellow in order to improve identification.
- As each of the dust clouds moves into the Texas Gulf Coast region, the corresponding changes in the Air Quality Index (AQI) are illustrated by changing the colors of the circles that represent measurements from the major metropolitan areas in Texas.
- The maximum 24-hour average concentration is included within the circle.



Dust Clouds Moving Over the Atlantic Ocean, July 2010

6/26/2010





Houston webcam comparison: July 4 and July 13

July 4

July 13





Regression model

- TCEQ forecasters have developed a regression-type statistical air quality forecast model
- Two main inputs
 - GFSX MOS forecasts
 - Naval Research Laboratory NAAPS Aerosol Model data
 - AOD, plus surface concentrations of sulfates, dust, and smoke
 - Satellite-derived



Regression model

8/30/2016 Dallas-Fort Worth region model forecast

30					GFSX												NRL Aerosol Model				Adj				
Date	NOAA O3 AQI	NOAA O3	Adj O3	MxMdl	TMP	DPT	WND	P12	AOD	Sulfate	Dust	Smoke	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx						
Tue 8/30	93	68	65		88	67	7	7	0.10	3.0	0.0	4.5	79	50	13.0	#VALUE!	79	50	14.4						
Wed 8/31	140	82	78		88	68	7	7	0.10	3.0	0.0	5.0	79	50	13.1	#VALUE!	79	50	14.5						
Thu 9/1		54	53		86	68	7	12	0.10	1.5	0.0	3.0	57	36	10.6	#VALUE!	57	36	12.0						
Fri 9/2		45	43	0	83	66	9	39					47	31	9.3	#VALUE!	47	31	10.7						
Sat 9/3		52	51	0	88	64	9	14					55	36	10.1	#VALUE!	55	36	11.5						
Sun 9/4		49	47		91	64	12	16					52	35	9.5	#VALUE!	52	35	10.9						
Mon 9/5		47	45		88	66	13	19					49	33	8.5	#VALUE!	49	33	9.9						
Tue 9/6		49	47		87	64	11	17					52	35	9.1	#VALUE!	52	35	10.5						
12Z Forecast					GFSX												NRL Aerosol Model				Adj				
Date	NOAA O3 AQI	NOAA O3	Adj O3	MxMdl	TMP	DPT	WND	P12	AOD	Sulfate	Dust	Smoke	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx						
Wed 8/31	143	83	74	72	89	68	7	13	0.10	3.0	0.0	5.0	78	50	13.7	#VALUE!	78	50	15.1						
Thu 9/1		51	47		85	68	7	15	0.10	1.5	0.0	0.5	52	32	9.6	#VALUE!	52	32	11.0						
Fri 9/2		50	46		82	65	8	28					51	33	9.3	#VALUE!	51	33	10.7						
Sat 9/3		60	55		86	60	7	9					61	40	10.5	#VALUE!	61	40	11.9						
Sun 9/4		52	48		89	62	12	12					53	37	9.1	#VALUE!	53	37	10.5						
Mon 9/5		53	49		90	67	11	9					54	35	9.7	#VALUE!	54	35	11.1						
Tue 9/6		50	46		88	64	12	18					51	35	8.9	#VALUE!	51	35	10.3						
21					GFSX												NRL Aerosol Model				Adj				
Date	NOAA O3 AQI	NOAA O3	O3	O3bg	PM2.5	PM10	ln(O3)	ln(O3bg)	ln(PM2.5)	ln(PM10)	TMP	DPT	WND	P12	AOD	Sulfate	Dust	Smoke	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx
8/29/2016	84	65	47	30	11.2		3.8501476	3.4011974	2.4159138	#NUM!	88	67	10	17	0.05	2.0	0.0	1.5	57	36	9.9	#VALUE!	57	36	11.3
8/28/2016	87	66	50	37	9.8		3.912023	3.6109179	2.2823824	#NUM!	86	67	9	19	0.15	1.5	0.0	1.0	52	34	9.4	#VALUE!	52	34	10.8
8/27/2016	74	62	59	39	10.8		4.0775374	3.6635616	2.3795461	#NUM!	86	69	7	26	0.05	1.5	0.0	0.0	49	29	9.9	#VALUE!	49	29	11.3
8/26/2016	80	64	46	32	11.0		3.8286414	3.4657359	2.3978953	#NUM!	86	68	8	52	0.05	1.5	0.0	1.0	44	28	10.5	#VALUE!	44	28	11.9
8/25/2016	49	53	51	25	10.5		3.9318256	3.2188758	2.3513753	#NUM!	90	67	8	7	0.00	0.5	0.0	2.0	50	31	10.1	#VALUE!	50	31	11.5
8/24/2016	49	53	43	25	12.2		3.7612001	3.2188758	2.501436	#NUM!	91	67	13	3	0.00	0.5	0.0	0.0	45	30	7.9	#VALUE!	45	30	9.3
8/23/2016	49	53	34	24	12.6		3.5263605	3.1780538	2.5386968	#NUM!	91	69	16	7	0.00	1.0	0.0	0.0	45	31	7.4	#VALUE!	45	31	8.8
8/22/2016	49	53	33	19	10.1		3.4965076	2.944439	2.3125354	#NUM!	83	71	9	70	0.05	2.5	0.0	0.0	42	26	10.0	#VALUE!	42	26	11.4
8/21/2016	74	62	54	33	9.6		3.988984	3.4965076	2.2617631	#NUM!	85	58	9	8	0.05	1.0	0.0	0.0	53	35	8.4	#VALUE!	53	35	9.8
8/20/2016	43	46	43	31	9.6		3.7612001	3.4339872	2.2617631	#NUM!	79	72	8	79	0.10	2.0	0.0	0.0	36	23	9.2	#VALUE!	36	23	10.6
8/19/2016	40	43	27	18	7.8		3.2958369	2.8903718	2.0541237	#NUM!	79	72	9	76	0.10	1.5	0.0	0.0	33	21	8.5	#VALUE!	33	21	9.9
8/18/2016	41	44	29	20	8.0		3.3672958	2.9957323	2.0794415	#NUM!	81	72	10	71	0.05	1.5	0.0	0.0	34	21	8.4	#VALUE!	34	21	9.8
8/17/2016	40	43	32	17	7.7		3.4657359	2.8332133	2.0412203	#NUM!	77	71	10	87	0.05	1.5	0.0	0.0	31	19	7.9	#VALUE!	31	19	9.3
8/16/2016	71	61	46	23	8.0		3.8286414	3.1354942	2.0794415	#NUM!	81	68	8	31	0.10	2.5	0.0	0.0	52	32	9.0	#VALUE!	52	32	10.4
8/15/2016	47	51	42	25	6.6		3.7376696	3.2188758	1.8870696	#NUM!	77	62	7	32	0.10	2.0	0.0	0.0	50	31	8.2	#VALUE!	50	31	9.6
8/14/2016	71	61	52	34	7.2		3.9512437	3.5263605	1.974081	#NUM!	84	66	11	18	0.15	1.5	0.0	0.5	49	33	8.1	#VALUE!	49	33	9.5
8/13/2016	71	61	61	45	8.8		4.1108739	3.8066625	2.1747517	#NUM!	90	68	14	30	0.15	2.5	0.0	2.0	57	41	9.8	#VALUE!	57	41	11.2
8/12/2016	100	70	59	39	14.9		4.0775374	3.6635616	2.7013612	#NUM!	98	68	8	12	0.00	1.0	0.0	2.0	58	36	13.2	#VALUE!	58	36	14.6
8/11/2016	80	64	58	33	11.7		4.060443	3.4965076	2.4595888	#NUM!	99	64	9	1	0.05	1.0	0.0	1.0	63	41	12.5	#VALUE!	63	41	13.9
8/10/2016	87	66	68	37	9.9		4.2195077	3.6109179	2.2925348	#NUM!	99	65	9	5	0.00	1.0	0.0	2.0	62	40	12.9	#VALUE!	62	40	14.3
8/9/2016	90	67	58	38	10.3		4.060443	3.6375862	2.3321439	#NUM!	96	65	8	8	0.00	1.0	0.0	2.0	60	38	12.4	#VALUE!	60	38	13.8
8/8/2016	50	54	52	31	12.6		3.9512437	3.4339872	2.5386968	#NUM!	102	60	12	1	0.00	0.5	0.0	0.0	59	40	11.3	#VALUE!	59	40	12.7
8/7/2016	71	61	62	34	12.5		4.1271344	3.5263605	2.5257286	#NUM!	101	60	13	3	0.00	0.5	0.0	0.0	57	39	10.6	#VALUE!	57	39	12.0
8/6/2016	67	60	58	36	14.2		4.060443	3.5835189	2.653242	#NUM!	101	63	14	2	0.00	0.5	0.0	0.5	54	38	10.3	#VALUE!	54	38	11.7
8/5/2016	58	57	57	35	11.7		4.0430513	3.5553481	2.4595888	#NUM!	99	66	12	4	0.05	0.5	0.0	0.5	53	36	10.6	#VALUE!	53	36	12.0
8/4/2016	106	72	78	53	15.8		4.3567088	3.9702919	2.7600099	#NUM!	95	60	10	7	0.15	1.5	0.0	1.0	66	47	11.5	#VALUE!	66	47	12.9



Regression model

8/30/2016 Dallas-Fort Worth model forecast w/o aerosol component

										GFSX								Adj						
1	30									TMP	DPT	WND	P12	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx				
2	Date	NOAA O3 AQI	NOAA O3	Adj O3	MxMdl									88	67	7	7	59	37	11.0	#VALUE!	60	38	11.4
3	Tue 8/30	93	68	65										88	68	7	7	58	36	10.9	#VALUE!	59	37	11.3
4	Wed 8/31	140	82	73										86	68	7	12	56	35	10.5	#VALUE!	57	36	10.9
5	Thu 9/1		72	68										83	66	9	39	47	31	9.3	#VALUE!	48	32	9.7
6	Fri 9/2		60	58	0									88	64	9	14	55	36	10.1	#VALUE!	56	37	10.5
7	Sat 9/3		71	67	0									91	64	12	16	52	35	9.5	#VALUE!	53	36	9.9
8	Sun 9/4		67	64										88	66	13	19	49	33	8.5	#VALUE!	50	34	8.9
9	Mon 9/5		63	61										87	64	11	17	52	35	9.1	#VALUE!	53	36	9.5
10	Tue 9/6		67	64																				
11																								
12	12Z Forecast																							
13	Date	NOAA O3 AQI	NOAA O3	Adj O3	MxMdl									TMP	DPT	WND	P12	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx
14	Wed 8/31	143	83	74	72									89	68	7	13	57	35	11.3	#VALUE!	58	36	11.7
15	Thu 9/1		74	67										85	68	7	15	55	35	10.3	#VALUE!	56	36	10.7
16	Fri 9/2		68	62										82	65	8	28	51	33	9.3	#VALUE!	52	34	9.7
17	Sat 9/3		82	74										86	60	7	9	61	40	10.5	#VALUE!	62	41	10.9
18	Sun 9/4		71	65										89	62	12	12	53	37	9.1	#VALUE!	54	38	9.5
19	Mon 9/5		72	66										90	67	11	9	54	35	9.7	#VALUE!	55	36	10.1
20	Tue 9/6		68	62										88	64	12	18	51	35	8.9	#VALUE!	52	36	9.3
21																								
22																								
23	Date	NOAA O3 AQI	NOAA O3	O3	O3bg	PM2.5	PM10	ln(O3)	ln(O3bg)	ln(PM2.5)	ln(PM10)	TMP	DPT	WND	P12	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx		
24	8/29/2016	84	65	47	30	11.2		3.8501476	3.4011974	2.4159138	#NUM!	88	67	10	17	52	34	9.7	#VALUE!	53	35	10.1		
25	8/28/2016	87	66	50	37	9.8		3.912023	3.6109179	2.2823824	#NUM!	86	67	9	19	52	34	9.7	#VALUE!	53	35	10.1		
26	8/27/2016	74	62	59	39	10.8		4.0775374	3.6635616	2.3795461	#NUM!	86	69	7	26	52	32	10.7	#VALUE!	53	33	11.1		
27	8/26/2016	80	64	46	32	11.0		3.8286414	3.4657359	2.3978953	#NUM!	86	68	8	52	45	29	10.5	#VALUE!	46	30	10.9		
28	8/25/2016	49	53	51	25	10.5		3.9318256	3.2188758	2.3513753	#NUM!	90	67	8	7	58	37	11.0	#VALUE!	59	38	11.4		
29	8/24/2016	49	53	43	25	12.2		3.7612001	3.2188758	2.501436	#NUM!	91	67	13	3	53	36	9.0	#VALUE!	54	37	9.4		
30	8/23/2016	49	53	34	24	12.6		3.5263605	3.1780538	2.5336968	#NUM!	91	69	16	7	48	33	7.9	#VALUE!	49	34	8.3		
31	8/22/2016	49	53	33	19	10.1		3.4965076	2.944439	2.3125354	#NUM!	83	71	9	70	39	25	9.6	#VALUE!	40	26	10.0		
32	8/21/2016	74	62	54	33	9.6		3.988984	3.4965076	2.2617631	#NUM!	85	58	9	8	59	40	9.4	#VALUE!	60	41	9.8		
33	8/20/2016	43	46	43	31	9.6		3.7612001	3.4339872	2.2617631	#NUM!	79	72	8	79	37	23	9.2	#VALUE!	38	24	9.6		
34	8/19/2016	40	43	27	18	7.8		3.2958369	2.8903718	2.0541237	#NUM!	79	72	9	76	37	23	8.8	#VALUE!	38	24	9.2		
35	8/18/2016	41	44	29	20	8.0		3.3672958	2.9957323	2.0794415	#NUM!	81	72	10	71	37	24	8.8	#VALUE!	38	25	9.2		
36	8/17/2016	40	43	32	17	7.7		3.4657359	2.8332133	2.0412203	#NUM!	77	71	10	87	34	22	8.1	#VALUE!	35	23	8.5		
37	8/16/2016	71	61	46	23	8.0		3.8286414	3.1354942	2.0794415	#NUM!	81	68	8	31	49	31	9.2	#VALUE!	50	32	9.6		
38	8/15/2016	47	51	42	25	6.6		3.7376696	3.2188758	1.8870696	#NUM!	77	62	7	32	51	34	8.7	#VALUE!	52	35	9.1		
39	8/14/2016	71	61	52	34	7.2		3.9512437	3.5263605	1.974081	#NUM!	84	66	11	18	50	34	8.5	#VALUE!	51	35	8.9		
40	8/13/2016	71	61	61	45	8.8		4.1108739	3.8066625	2.1747517	#NUM!	90	68	14	30	45	31	8.7	#VALUE!	46	32	9.1		
41	8/12/2016	100	70	59	39	14.9		4.0775374	3.6635616	2.7013612	#NUM!	98	68	8	12	58	36	13.3	#VALUE!	59	37	13.7		
42	8/11/2016	80	64	58	33	11.7		4.060443	3.4965076	2.4595888	#NUM!	99	64	9	1	62	40	12.8	#VALUE!	63	41	13.2		
43	8/10/2016	87	66	68	37	9.9		4.2195077	3.6109179	2.2925348	#NUM!	99	65	9	5	61	39	12.9	#VALUE!	62	40	13.3		
44	8/9/2016	90	67	58	38	10.3		4.060443	3.6375862	2.3321439	#NUM!	96	65	8	8	60	38	12.6	#VALUE!	61	39	13.0		
45	8/8/2015	50	54	52	31	12.6		3.9512437	3.4339872	2.5336968	#NUM!	102	60	12	1	61	41	12.1	#VALUE!	62	42	12.5		
46	8/7/2015	71	61	62	34	12.5		4.1271344	3.5263605	2.5257286	#NUM!	101	60	13	3	59	41	11.3	#VALUE!	60	42	11.7		
47	8/6/2015	67	60	58	36	14.2		4.060443	3.5835189	2.653242	#NUM!	101	63	14	2	56	39	10.8	#VALUE!	57	40	11.2		
48	8/5/2015	58	57	57	35	11.7		4.0430513	3.5553481	2.4595888	#NUM!	99	66	12	4	57	37	11.3	#VALUE!	58	38	11.7		
49	8/4/2015	106	72	78	53	15.8		4.3567088	3.9707919	2.7600098	#NUM!	95	60	10	7	60	40	11.3	#VALUE!	61	41	11.7		



Regression model

8/30/2016 Houston region model forecast

00Z Forecast										GFSX				NRL Aerosol Model				Adj							
Date	NOAA O3 AQI	NOAA O3	Adj O3	MxMdl	TMP	DPT	WND	P12	AOD	Sulfate	Dust	Smoke	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx						
Tue 8/30	90	67	64		86	74	10	35	0.05	1.5	0.0	0.5	45	24	9.3	#VALUE!	46	25	9.7						
Wed 8/31	126	78	77		88	74	7	12	0.05	2.0	0.0	3.0	54	28	11.5	#VALUE!	55	29	11.9						
Thu 9/1		89	89		89	72	6	12	0.10	2.5	0.0	2.0	61	33	12.3	#VALUE!	62	34	12.7						
Fri 9/2		73	72	0	86	72	6	25					50	26	10.9	#VALUE!	51	27	11.3						
Sat 9/3		75	74	0	86	70	6	31					51	27	10.7	#VALUE!	52	28	11.1						
Sun 9/4		64	60		84	75	12	22					44	23	9.6	#VALUE!	45	24	10.0						
Mon 9/5		63	59		84	73	12	38					43	24	8.9	#VALUE!	44	25	9.3						
Tue 9/6		67	64		86	73	10	33					46	24	9.6	#VALUE!	47	25	10.0						
12Z Forecast										GFSX				NRL Aerosol Model				Adj							
Date	NOAA O3 AQI	NOAA O3	Adj O3	MxMdl	TMP	DPT	WND	P12	AOD	Sulfate	Dust	Smoke	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx						
Wed 8/31	133	80	79	60	87	74	7	25	0.05	3.0	0.0	3.0	57	31	10.3	#VALUE!	58	32	10.7						
Thu 9/1		87	85		89	72	6	6	0.05	2.5	0.0	1.0	60	31	11.6	#VALUE!	61	32	12.0						
Fri 9/2		74	72		87	71	7	24					51	27	11.0	#VALUE!	52	28	11.4						
Sat 9/3		75	73		85	70	7	21					52	28	11.2	#VALUE!	53	29	11.6						
Sun 9/4		68	66		85	73	14	14					47	25	10.1	#VALUE!	48	26	10.5						
Mon 9/5		59	58		83	75	11	42					41	22	8.6	#VALUE!	42	23	9.0						
Tue 9/6		61	59		86	73	13	45					42	23	8.5	#VALUE!	43	24	8.9						
										GFSX				NRL Aerosol Model				Adj							
Date	NOAA O3 AQI	NOAA O3	O3	O3bg	PM2.5	PM10	ln(O3)	ln(O3bg)	ln(PM2.5)	ln(PM10)	TMP	DPT	WND	P12	AOD	Sulfate	Dust	Smoke	O3fx	O3bgfx	PM2.5fx	PM10fx	O3fx	O3bgfx	PM2.5fx
8/29/2016	40	43	41	22	5.8		3.7135721	3.0910425	1.7578579	#NUM!	80	75	14	67	0.05	1.5	0.0	0.0	36	21	7.1	#VALUE!	37	22	7.5
8/28/2016	54	56	44	27	5.6		3.7841896	3.2958369	1.7227666	#NUM!	80	76	12	68	0.10	2.5	0.0	1.5	41	26	7.8	#VALUE!	42	27	8.2
8/27/2016	74	62	56	36	7.1		4.0253517	3.5835189	1.9600948	#NUM!	77	74	10	51	0.15	3.0	0.0	0.5	46	30	9.3	#VALUE!	47	31	9.7
8/26/2016	77	63	60	38	6.6		4.0943446	3.6375862	1.8870696	#NUM!	80	74	6	58	0.10	3.0	0.0	2.0	45	26	8.5	#VALUE!	46	27	8.9
8/25/2016	77	63	46	20	9.1		3.8286414	2.9957323	2.2082744	#NUM!	84	76	7	37	0.00	1.0	0.0	2.0	38	18	8.7	#VALUE!	39	19	9.1
8/24/2016	54	56	43	17	9.5		3.7612001	2.8332133	2.2512918	#NUM!	84	76	9	24	0.00	1.0	0.0	0.0	39	19	9.1	#VALUE!	40	20	9.5
8/23/2016	64	59	41	16	9.6		3.7135721	2.7725887	2.2617631	#NUM!	83	78	10	23	0.00	1.0	0.0	0.0	38	18	9.1	#VALUE!	39	19	9.5
8/22/2016	49	53	25	14	7.3		3.2188758	2.6390573	1.9878743	#NUM!	83	76	8	54	0.00	1.0	0.0	0.0	34	17	7.4	#VALUE!	35	18	7.8
8/21/2016	45	49	33	22	7.0		3.4965076	3.0910425	1.9459101	#NUM!	79	72	5	54	0.10	1.0	0.0	0.0	35	19	8.8	#VALUE!	36	20	9.2
8/20/2016	54	56	29	17	12.1		3.3672958	2.8332133	2.4932055	#NUM!	83	76	8	20	0.05	1.0	0.0	0.0	40	20	10.2	#VALUE!	41	21	10.6
8/19/2016	47	51	32	14	10.6		3.4657359	2.6390573	2.360854	#NUM!	84	77	8	41	0.00	1.0	0.0	0.0	36	17	8.2	#VALUE!	37	18	8.6
8/18/2016	44	48	26	8	8.1		3.2580965	2.0794415	2.0918641	#NUM!	82	77	7	42	0.00	1.0	0.0	0.0	34	16	8.0	#VALUE!	35	17	8.4
8/17/2016	51	55	30	19	5.0		3.4011974	2.944439	1.6094379	#NUM!	79	76	6	83	0.05	1.5	0.0	0.0	30	16	6.5	#VALUE!	31	17	6.9
8/16/2016	51	55	30	19	6.3		3.4011974	2.944439	1.8405496	#NUM!	75	75	5	77	0.05	4.5	0.0	0.0	42	26	6.3	#VALUE!	43	27	6.7
8/15/2016	42	45	34	21	5.1		3.5263605	3.0445224	1.6292405	#NUM!	78	76	10	99	0.05	1.0	0.0	0.0	27	15	5.8	#VALUE!	28	16	6.2
8/14/2016	44	48	32	23	6.3		3.4657359	3.1354942	1.8405496	#NUM!	75	75	6	92	0.15	4.0	0.0	0.5	40	27	6.9	#VALUE!	41	28	7.3
8/13/2016	51	55	49	28	14.1		3.8918203	3.3322045	2.6461748	#NUM!	85	76	10	82	0.10	1.0	0.0	0.5	34	19	7.4	#VALUE!	35	20	7.8
8/12/2016	74	62	40	19	13.2		3.6888795	2.944439	2.5802168	#NUM!	92	74	10	4	0.05	1.0	0.0	2.0	54	27	12.3	#VALUE!	55	28	12.7
8/11/2016	61	58	40	22	10.8		3.6888795	3.0910425	2.3795461	#NUM!	91	76	8	26	0.05	1.0	0.0	1.0	46	22	10.4	#VALUE!	47	23	10.8
8/10/2016	74	62	47	23	10.8		3.8501476	3.1354942	2.3795461	#NUM!	92	75	7	24	0.05	1.0	0.0	4.0	49	23	11.2	#VALUE!	50	24	11.6
8/9/2016	108	73	64	27	10.3		4.1588831	3.2958369	2.3321439	#NUM!	92	73	8	12	0.00	1.0	0.0	2.0	51	24	10.7	#VALUE!	52	25	11.1
8/8/2015	51	55	45	22	20.4		3.8066625	3.0910425	3.0155349	#NUM!	96	70	12	2	0.00	1.0	10.0	0.5	57	31	17.2	#VALUE!	58	32	17.6
8/7/2015	58	57	53	23	13.2		3.9702919	3.1354942	2.5802168	#NUM!	94	72	13	1	0.00	0.5	0.0	2.0	55	27	11.7	#VALUE!	56	28	12.1
8/6/2015	49	53	42	21	15.6		3.7376696	3.0445224	2.7472709	#NUM!	94	72	13	2	0.00	1.0	0.0	0.5	57	28	11.2	#VALUE!	58	29	11.6
8/5/2015	45	49	42	19	12.9		3.7376696	2.944439	2.5572273	#NUM!	92	73	13	3	0.00	1.0	0.0	1.0	55	27	11.1	#VALUE!	56	28	11.5
8/4/2015	50	54	42	21	19.3		3.7376696	3.0445224	2.9601051	#NUM!	90	71	8	29	0.10	1.5	0.0	1.0	53	29	11.0	#VALUE!	54	30	11.4



Summary/Forecast verification

City	12Z NOAA model 8-hr ozone forecast for 8/31 (ppb)	12Z Regress. model 8-hr ozone forecast for 8/31 (ppb)	Monitored 8-hr ozone max conc. 8/31 (ppb)
Dallas-Fort Worth	83	78	
Houston	80	57	



Summary/Forecast verification

Region	12Z NOAA model 8-hr ozone forecast for 8/31 (ppb)	12Z Regress. model 8-hr ozone forecast for 8/31 (ppb)	Monitored 8-hr ozone max conc. 8/31 (ppb)
Dallas-Fort Worth	83	78	78
Houston	80	57	52



Thank you!

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