United States Environmental Protection Agency

Office of Air Quality Planning and Standards

BP Oil Spill Response Air Monitoring

US EPA – OAR – OAQPS

National Air Toxics Workshop

April 5, 2011

Topics

- EPA Report
  - Results of Air Monitoring
  - Additional Monitoring and Data Analysis
- Monitoring Challenges

Air Quality During the BP Deepwater Horizon Oil Spill

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711
March 2011

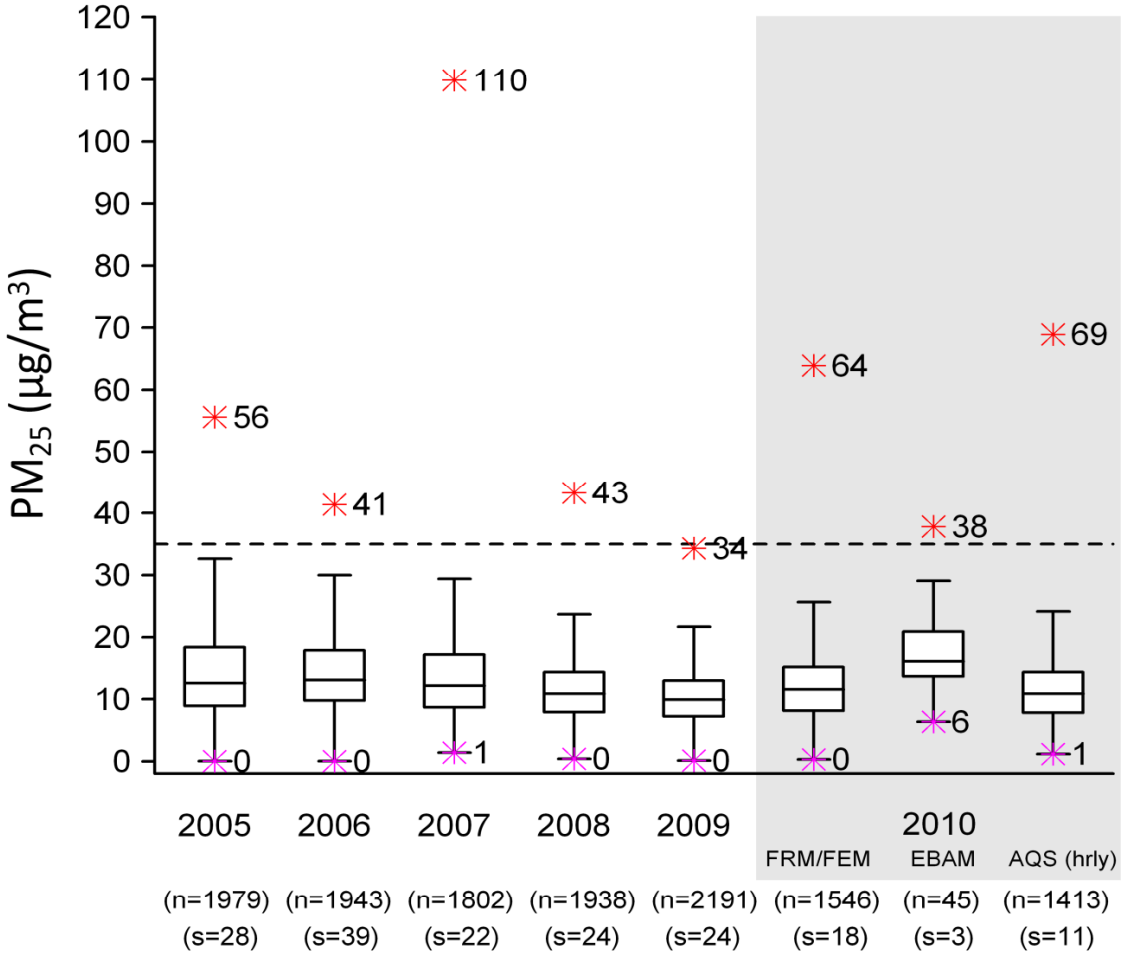
Air Monitoring

What we monitored for:

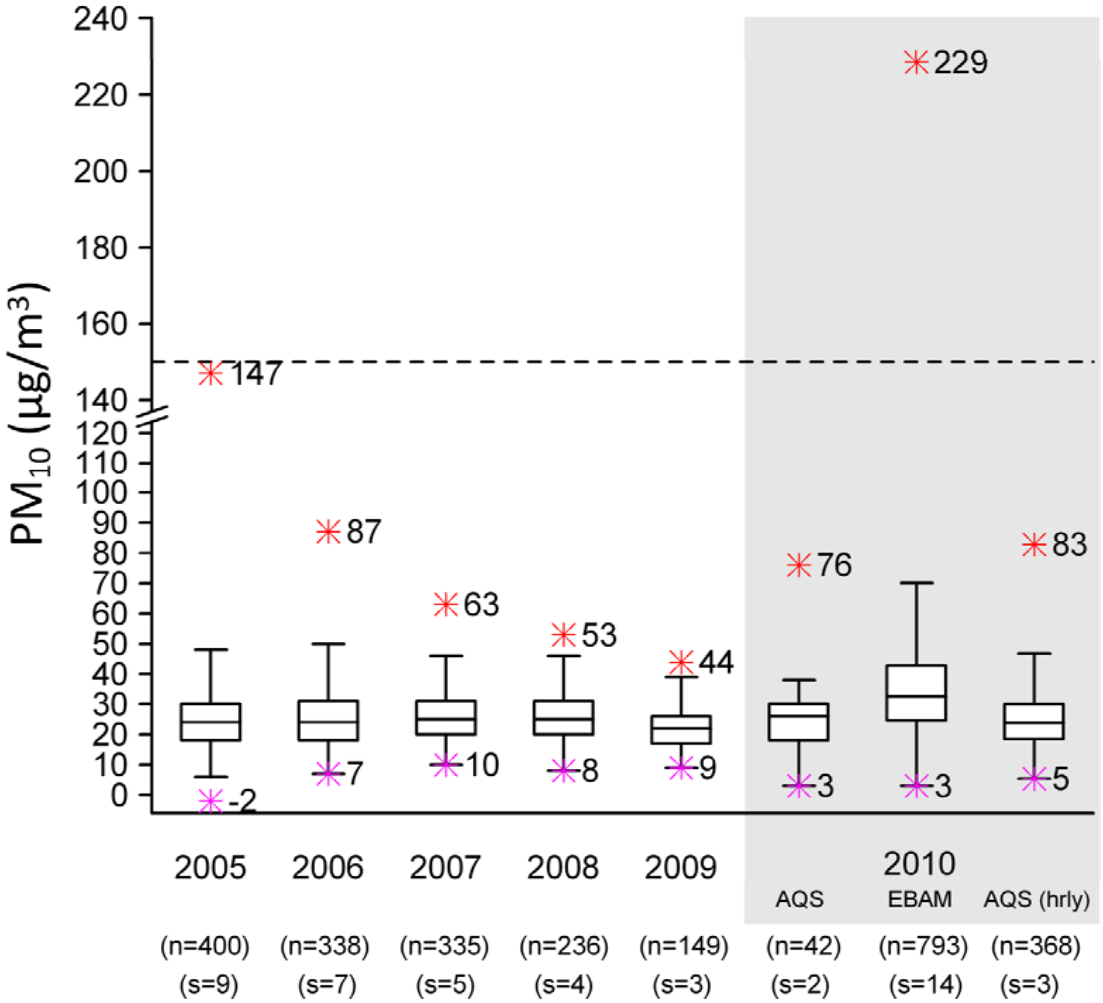
Pollutant	Instrument Type/ Analytical Method	Purpose
VOCs, BTEX compounds	Air samples collected in canisters; laboratory analysis using method TO-15 (GC/MS analysis)	Health risk consideration and characterization of air quality
VOCs	Air samples collected in canisters; laboratory analysis using SNMOC/TO-14 (GC/FID analysis)	Event analysis
H_2S	On-site sampling and laboratory analysis (Teledyne API 101E)	Hourly high sensitivity H_2S measurements for evaluation of portable H_2S measurements
H_2S, total VOC	Portable emergency response units (AreaRAE, MultiRAE, MiniRAE)	Odor response
PAHs	Air samples collected with PUF/XAD-2 units; laboratory analyses using TO-13A (GC/MS analysis)	Health risk consideration and characterization of air quality
PM_{10}, $PM_{2.5}$	Airborne particle collection and on-site measurement (E-BAM)	Health risk consideration and characterization of air quality
PM_{10}	Portable detector unit (DataRam)	Early response
24 hr Integrated $PM_{2.5}$	Airborne fine particle collection using BGI PQ 200; laboratory gravimetric analysis	Health risk consideration and characterization of air quality
$PM_{2.5}$, Ozone	Airborne particle collection and ozone measurements using FEM instruments	Health risk consideration, characterization of air quality and calculate AQI
BTEX compounds and dispersant chemicals	TAGA - mobile lab; Triple quadrapole mass spectroscopy	Real time mobile monitoring for Health risk and characterization of air quality, and oil dispersant monitoring

- Existing monitoring sites (data in AQS)
- Temporary sites installed for the response to the spill.

Results: PM2.5 (24hr)



Results: PM10 (24hr)

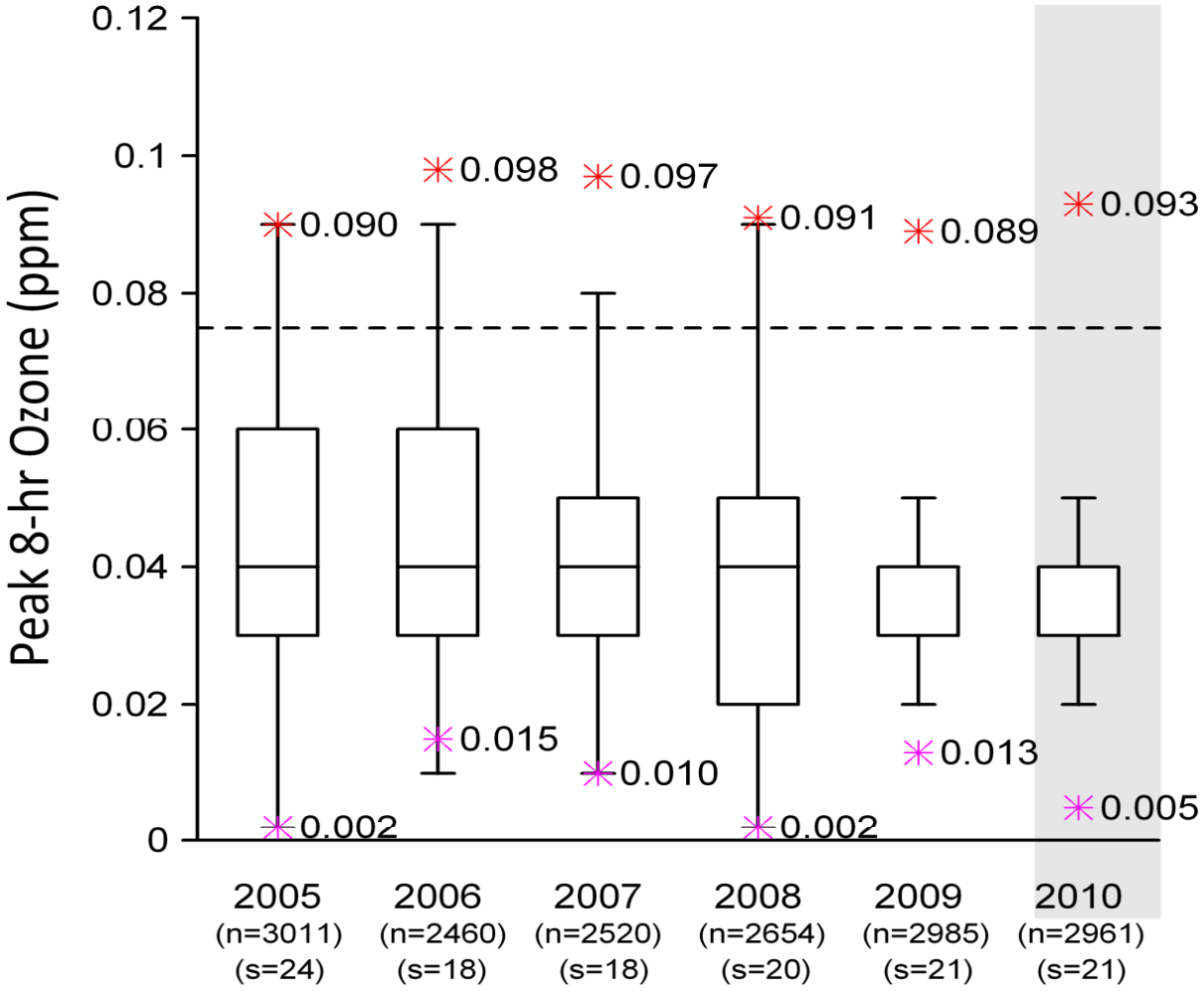


Grand Island Air Monitoring Site

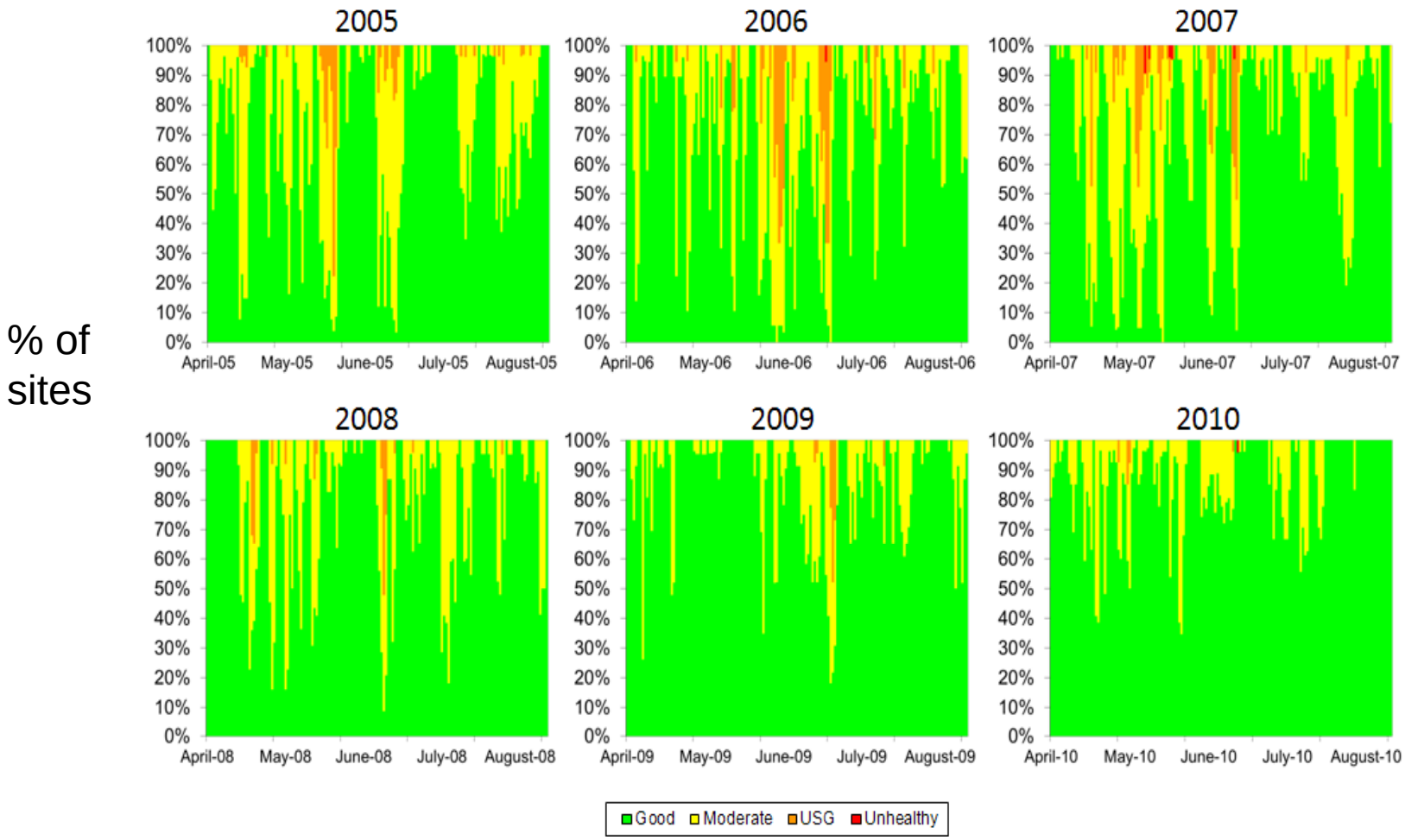
Beach Zamboni's

- Diesel exhaust
- Resulted in High PM10
- Affected 24 hr values

Results: Ozone (daily)



Results: AQI category



Results: BTEX

Pollutant	Number of Records	Screening Level (µg/m³)	Number of Records Above Screening Level	Number of Detects	Average Conc. (µg/m³)[a]	Max Conc. (µg/m³)	Min Conc. (µg/m³)
Benzene	2016	20	1	840	0.67	23.0	0.13
Ethylbenzene	2016	3000	0	662	0.33	11.0	0.044
m-&p-Xylenes	2015	3000	0	777	0.91	59.0	0.070
o-Xylene	2015	3000	0	671	0.33	15.0	0.040
Toluene	2016	5000	0	1013	1.6	42	0.14

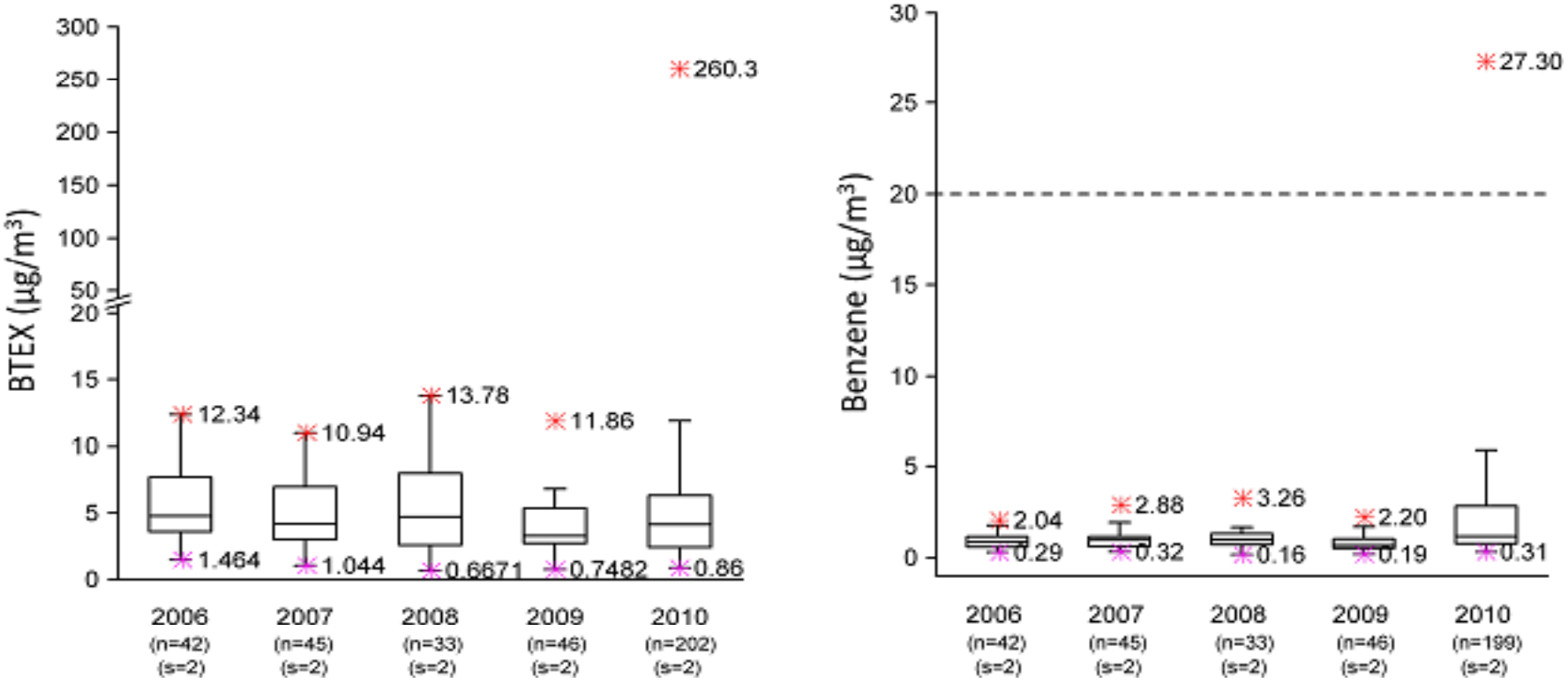
Table 3-3. 24-hour TO-15 BTEX measurements taken onshore at sites in the Gulf region (excluding Chalmette and Kenner sites) between April 28 and September 18, 2010.

Results: BTEX from LDEQ

Pollutant	Number of Records	Number of Records Above Screening	Screening Level (µg/m^3)	Number of Detects	Average Conc. (µg/m^3)[a]	Max Conc. (µg/m^3)	Min Conc. (µg/m^3)
Benzene	206	2	20	199	2.61	27.3	0.32
Ethylbenzene	206	0	3000	36	0.77	5.6	0.43
m-&p-Xylenes	206	0	3000	163	1.81	92.5	0.43
o-Xylene	206	0	3000	72	1.32	18.2	0.43
Toluene	206	0	5000	198	1.97	130	0.38

Table 3-4. 24-hour TO-15 BTEX measurements (not in AQS) taken at Chalmette and Kenner sites between April 28 and Sep.13, 2010 (µg/m^3) (LDEQ data).

Figure 3-3. 24-hour BTEX and benzene concentrations in the Gulf region between April 28 and September 18 for 2006-2010 of LDEQ sites (Chalmette and Kenner).



Results: PAHs

Pollutant	Number of Records	Screening Level (ng/m^3)	Number of Records Above Screening Level	Number of Detects	Average Conc. (ng/m^3)[a]	Max Conc. (ng/m^3)	Min Conc. (ng/m^3)
Benzo[a]anthracene	938	6400	0	494	0.08	0.95	0.012
Benzo[a]pyrene	939	640	0	499	0.11	1.60	0.022
Benzo[b]fluoranthene	939	6400	0	507	0.07	1.25	0.011
Benzo[k]fluoranthene	940	6400	0	496	0.07	0.70	0.0066
Chrysene	938	64,000	0	581	0.13	1.36	0.021
Dibenzo(a,h)anthracene	937	580	0	492	0.08	0.26	0.011
Indeno[1,2,3-cd]pyrene	936	6400	0	505	0.05	0.18	0.0052
Naphthalene	939	30,000	0	838	44.2	460	1.7

Table 3-5. 24-hour TO-13 PAH measurements taken onshore in the Gulf region between April 28 and September 18, 2010.

Monitoring Challenges

- TAGA – real time measurements
- H2S collocation
- In-Situ Burns
- Dispersants
- Odors

Additional Measurements

- Research Flights
  - NOAA P3 flights

Trace Atmospheric Gas Analyzer - TAGA

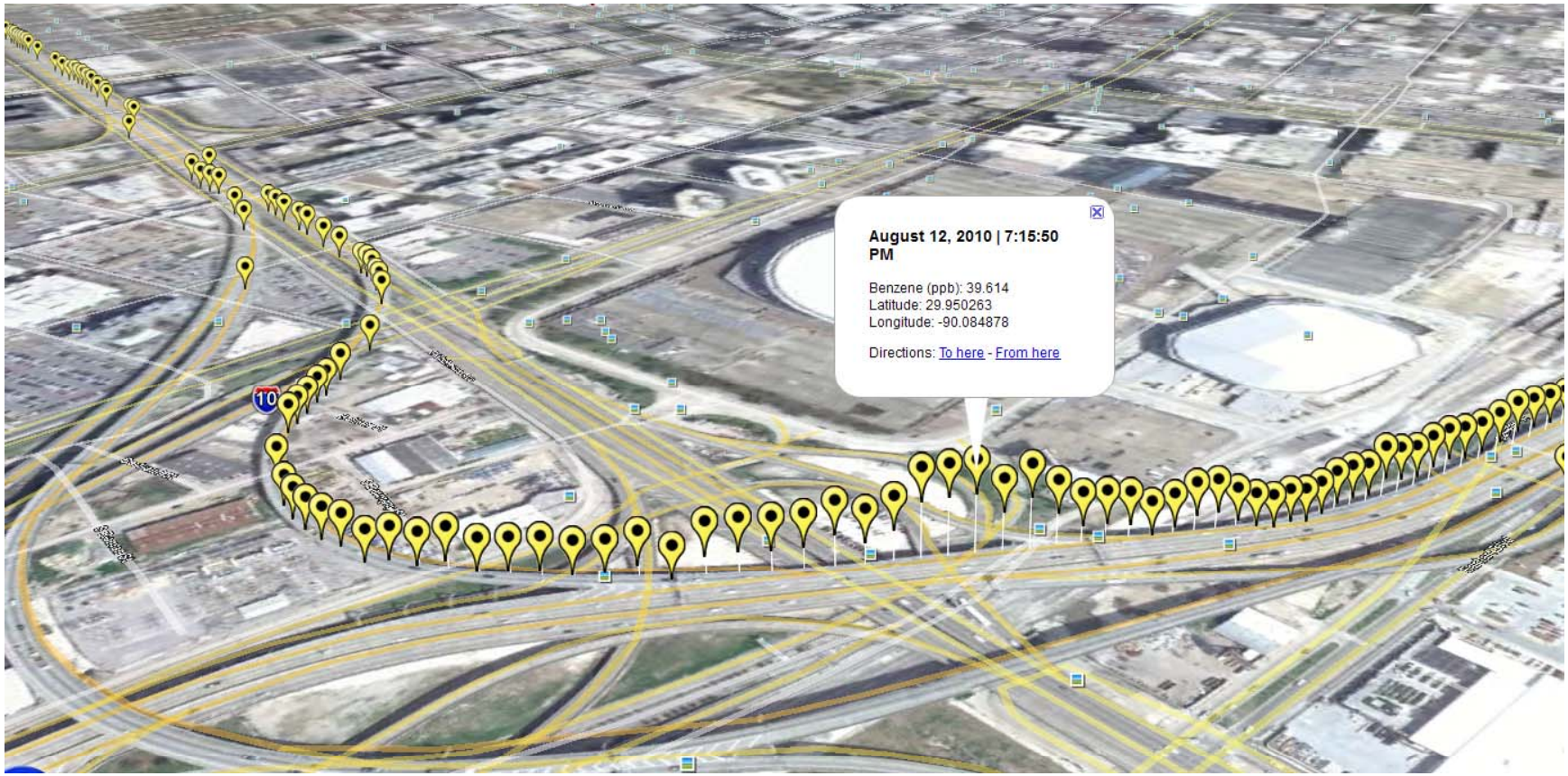
TAGA Bus

Air Precon. GC/MSD

Weathered oil on-shore

Real time MS/MS

TAGA Route


August 12, 2010 | 7:15:50 PM
Benzene (ppb): 39.614
Latitude: 29.950263
Longitude: -90.084878
Directions: To here - From here
10

H2S

MDL =100ppb

MDL = 0.4ppb

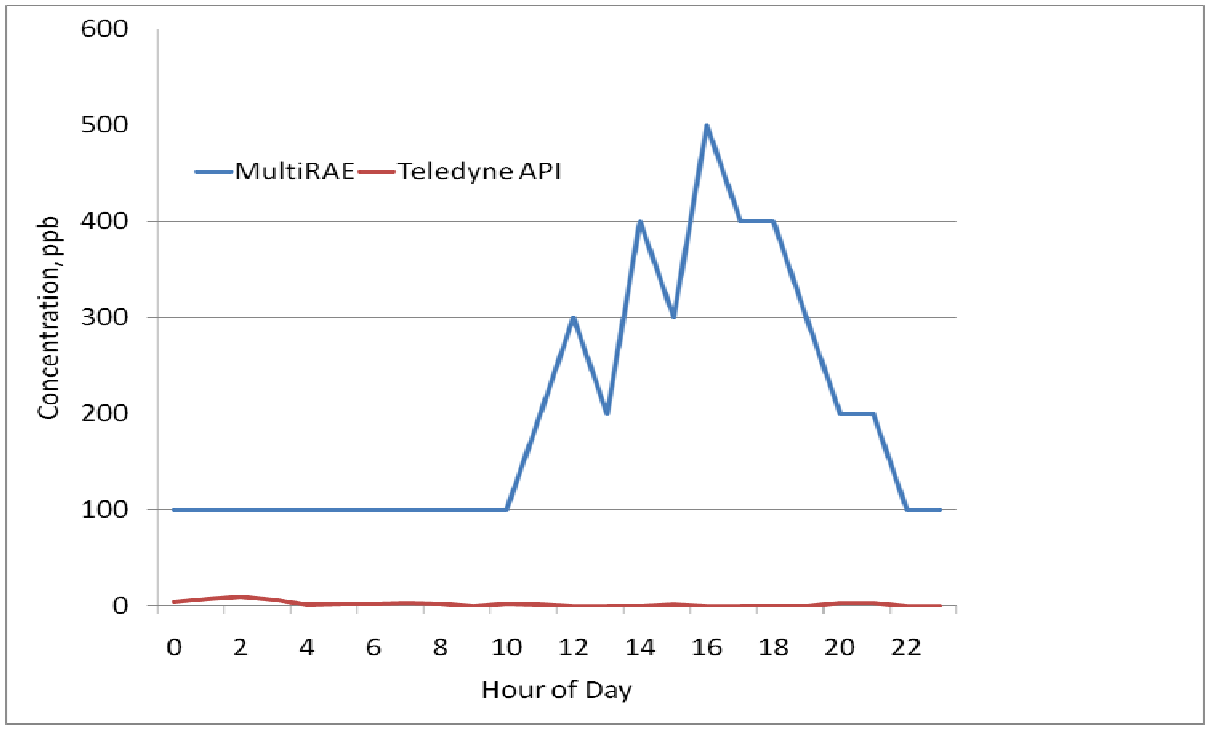


Figure 3-7. Hourly H_2S measurements taken at Venice, Louisiana (V03) using MultiRae emergency response and Teledyne API high sensitivity monitors on July 30, 2010

In-Situ Burns

- approx 350 burns
- duration – mins. to hrs.

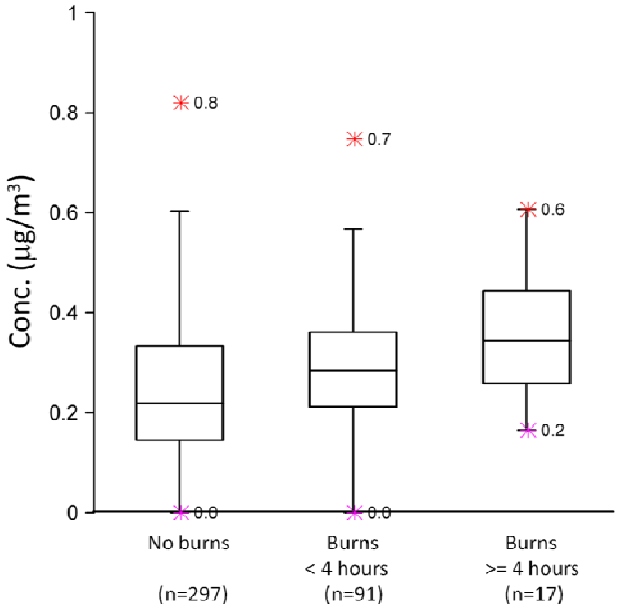


Figure 4-6. Range of BC concentrations at eight sites in Mississippi, Alabama, and western Florida for burn periods. The number (n) below each box plot refers to the number of observations for each grouping.

In-Situ Burns - Dioxins

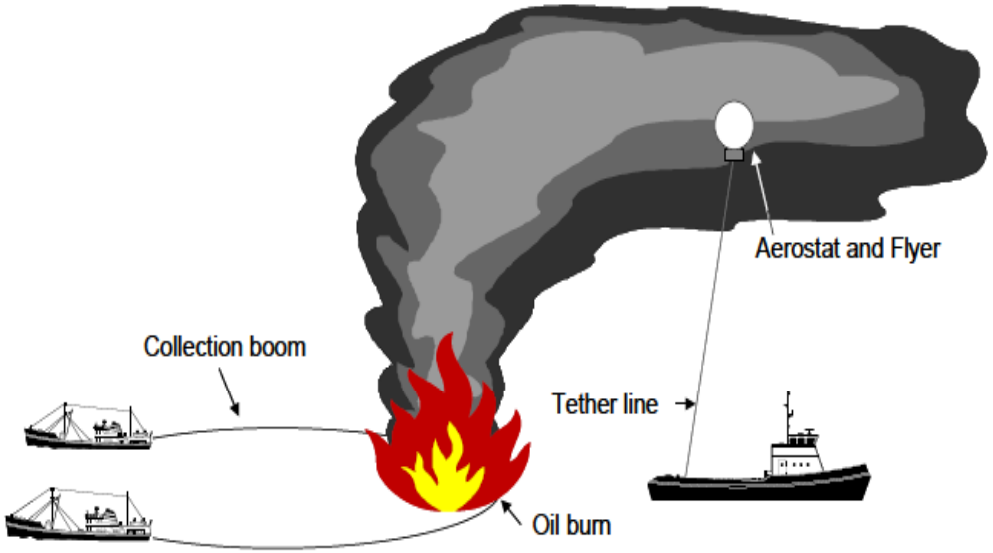


Figure 1. Schematic illustration of the in situ burn operations and plume sampling.

- EPA ORD
- 4 days of sampling in plumes
- XAD/PUF cartridges
- GC/MSD
- very low levels of congeners found

http://www.epa.gov/research/dioxin/docs/Gulfinsituburnemissionsampling.pdf

Dispersants

- 2-butoxyethanol
- dipropylene glycol monobutyl ether

- Canister samples initially
- TAGA

Odors/VOCs

- Largest challenge – we weren't setup to do odor response, we did "back-door" analysis of VOC and SVOC samples
- Full Scan GC/MS (8260) would have been helpful, for VOCs used FID analysis of Reg 4 samples
- TAGA – we needed to survey atmosphere first, then choose compounds to monitor
- Get TAGA in odor complaint areas
- Handheld GC/MSD could have been useful

SVOCs

- TO-13A (16 PAH)
- XAD/PUF
- Lab analyzed in GC/MSD SIM Mode
- 8270 Full Scan mode would have provided more detailed semi-vol. profile; branched PAH, higher MW alkanes

Research Flights

- NOAA flew their WP-3D two days in June
- Results found hydrocarbons similar to the source oil
- Downwind oxygenated VOC produced by photochemical reactions
- SOA being created from Oxy. VOCs

http://www.noaanews.noaa.gov/stories2010/PDFs/NOAA_P3_Gulf%20Mission%20Report_final.pdf

- EPA's ASPECT plane - open path & photos of oil spill

Questions