Penn State DISCOVER-AQ Activities & Products

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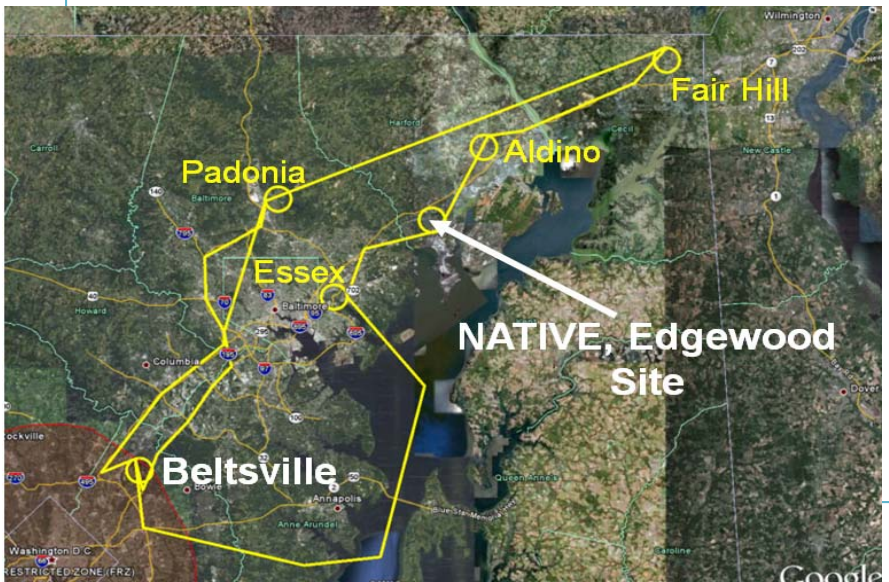
DISCOVER-AQ Science Team Mtg, 14-16 Feb 12

Newport News, VA

Overview (1)

- **Experimental Activity (AMT/DKM, 3 student Posters)**
  - PSU NATIVE Air Quality Trailer at Edgewood
  - Standard payload (below) with ancillary remote sensing, meteorological, chemical instruments
  - Co-located with MDE long-term trailer (ozone, $PM_{2.5}$); 2 km from Millersville Univ. (MU) tethered balloon, sodar



Overview (2)

- Analyses on NO_2 and Ozone. Latter include column comparisons with OMI, TTOR, P-3, surface data; sea-breeze impacts; compare Beltsville sonde climatology

- **Related Collaborations (EJ/JDF, 1 student Poster)**
  - AQAST (Air Quality Applied Science Team)
  - Statistical AQ forecasts issued from WFF to MDE daily (GG)
  - Tiger Team project: Monte Carlo oxidant formation calculations (DK)
  - PSU part of Howard U. BCCSO (VOCs, Tether balloon, tower)

- **Workshop Contributions: Discussions/Breakouts – Wed. Paper Titles and DISCOVER-AQ 2103 Plans – Thurs.**

Pennsylvania State University Gator Research Team

Dr. Anne Thompson - Professor, Dept. of Meteorology
Fulbright Scholar, South Africa (2010 – 2011); SHADOZ (1998 - present)

(2009) Dr. Doug Martins
CAPABLE (2009, 2010); DISCOVER-AQ (2011)

Dr. Debra Kollonige (2012)
NASA AQAST (2012)
Newest Gator! PhD Atmospheric Physics, UMBC 12/2011

(2008) Greg Garner
DISCOVER-AQ / NASA AQAST (2011); EPA STAR (2011)
Evaluation of Air Quality Model Performance during the 2011 DISCOVER-AQ Campaign

Ryan Stauffer (2010)
CAPABLE (2010); DISCOVER-AQ (2011)
Bay Breeze Impact on Surface Ozone at Edgewood, MD

(2010) Hannah Halliday
DISCOVER-AQ (2011)
VOC Species and Emission Types for Beltsville and Edgewood MD on Select Days in July 2011

Andra Reed (2011)
Comparison of Satellite and Ground-based Measurements of Total Column Ozone and Nitrogen Dioxide from Edgewood, MD in July 2011

Sonya Miller, Nikolai Balashov, Alaina MacFarlane

NATIVE @ Edgewood, MD 2011

Nittany **A**tmospheric **T**railer and **I**ntegrated **V**alidation **E**xperiment

"MetChem" Data

Instrument	% Valid Data
O_3	97.2
NO-NO_y	97.7
SO_2	87.9
CO	85.1
Temperature	NA
Relative Humidity	NA
Pressure	97.8
Wind Speed	97.8
Wind Direction	97.8
J-NO_2	96.5

Shadowband Radiometer

	UV Channel % Valid Data						
Channel	299 nm	304.6 nm	310.7 nm	316.8 nm	323.7 nm	331.7 nm	367.2 nm
Direct	9.5	39.6	58.6	58.6	37.0	58.6	58.6
Diffuse	12.7	53.7	58.6	58.6	58.6	58.6	58.6
Total	12.7	54.1	58.6	58.6	58.5	58.6	58.6

Daylight hours occurred ~58.6% of the time

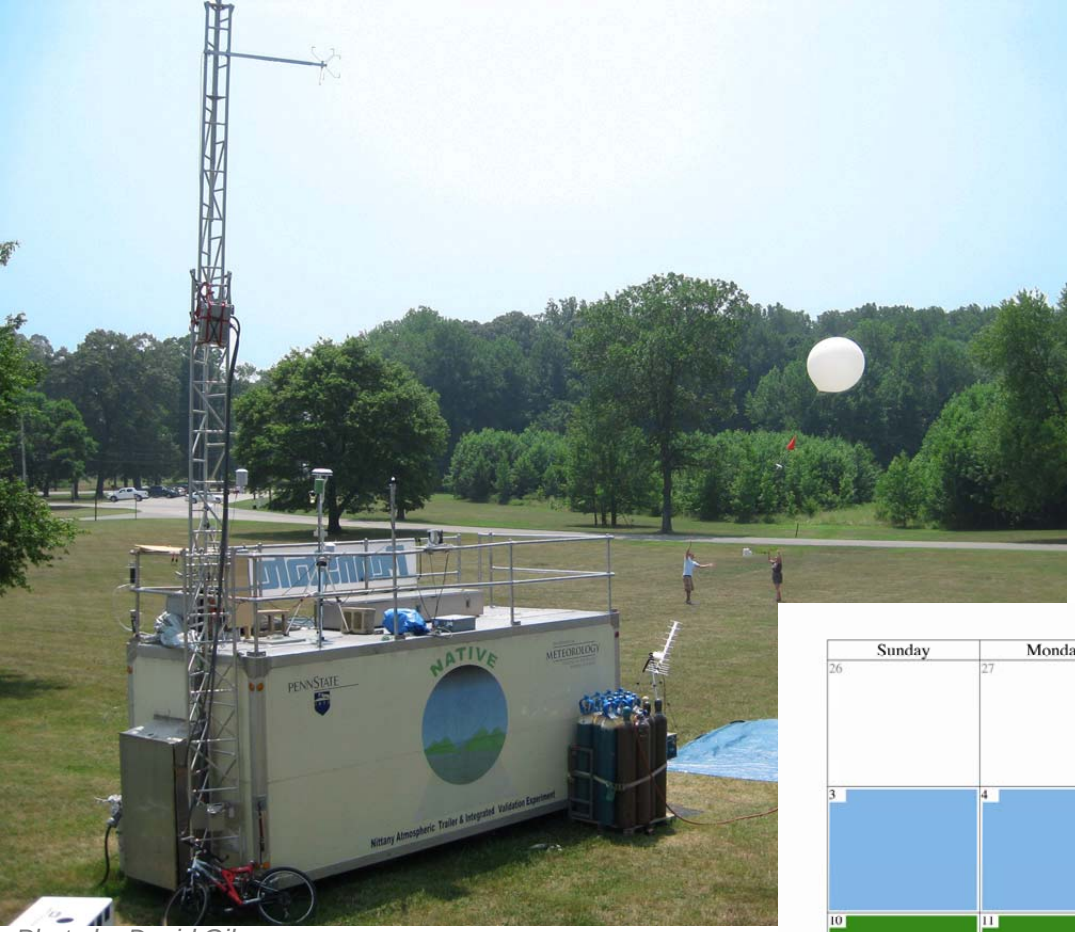
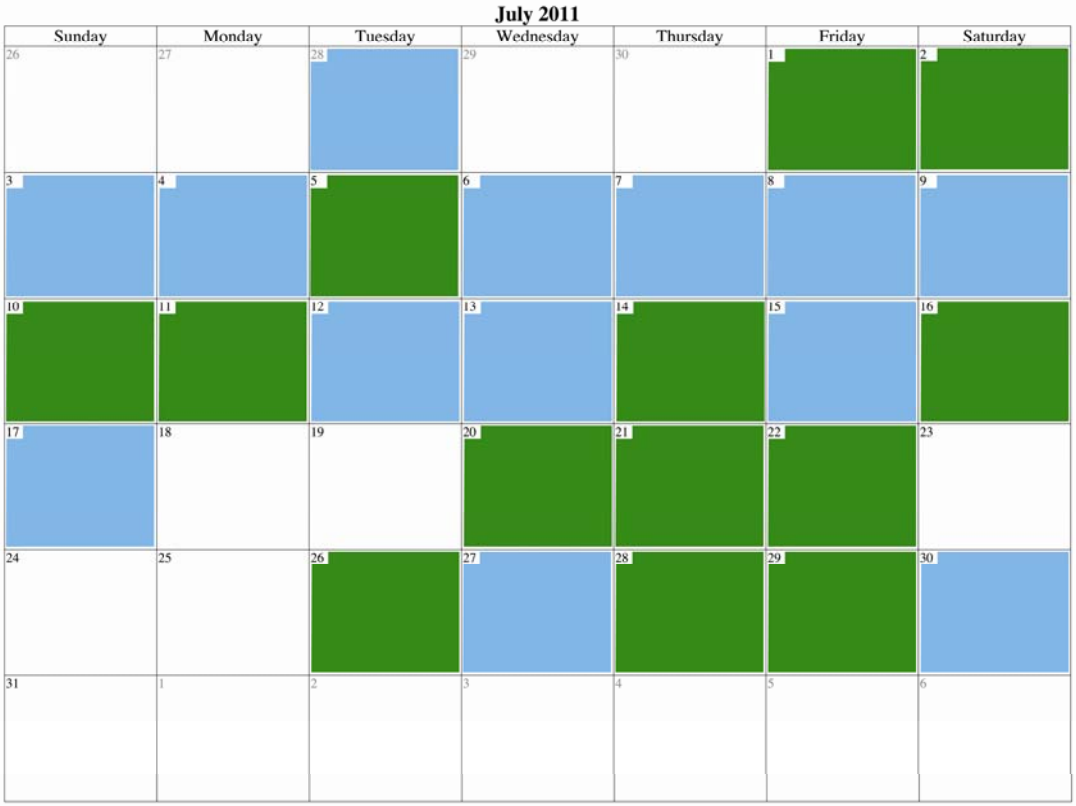


Photo by David Giles

Ozonesondes

- 39 launched at Edgewood
- Temporal resolution: 1 s
- Vertical resolution: ~5 m
- Range: Surface-35 km
- Measurements: ozone, pressure, temperature, dewpoint, wind speed/direction



1 Launch

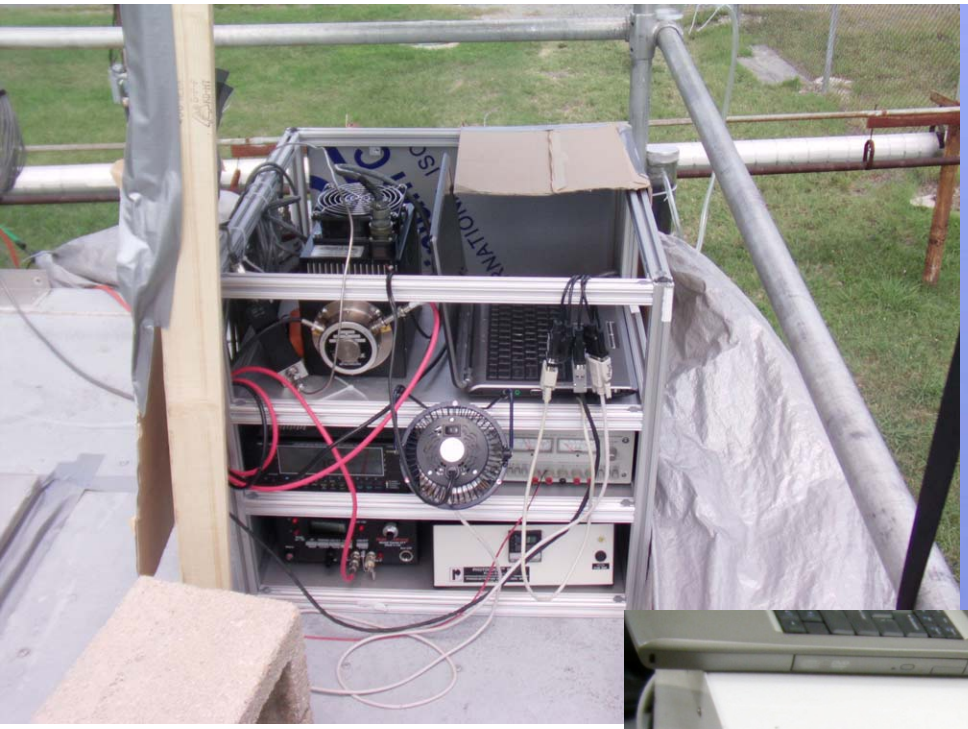
2 Launches

Hosted Instrumentation

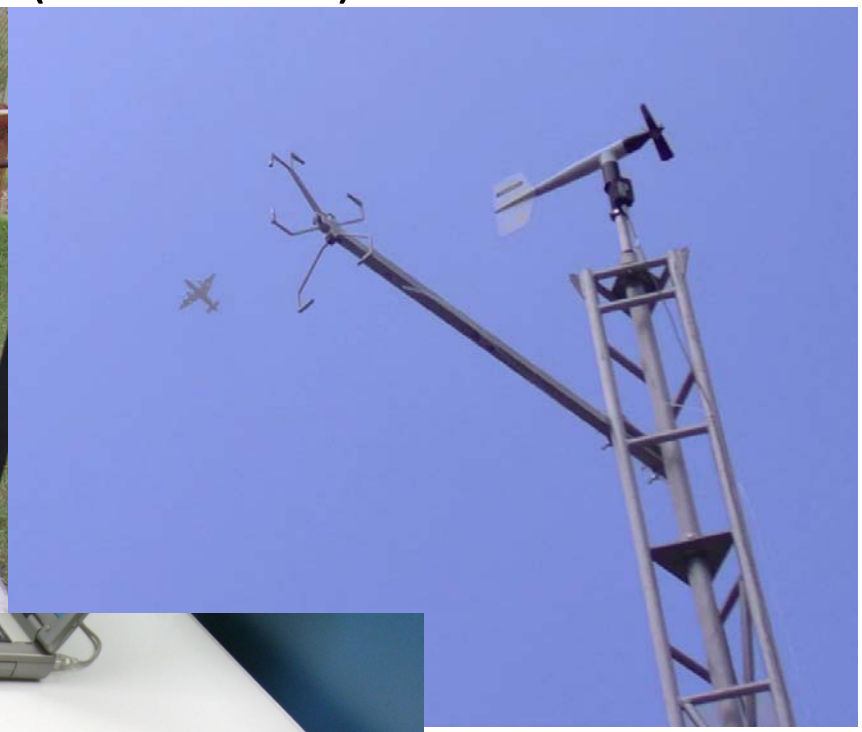
Instrument	Measurement	PI/Archiver
Leosphere Wind Cube	3-D vertically resolved Wind Speed/Direction	Knepp.Travis
Thermo Scientific TEOM	$PM_{2.5}$, PM_{coarse}	Szykman/Knepp.Travis
Teledyne API 200EU (Photolytic Converter)	$NO/NO_2/NO_x$	Szykman/Knepp.Travis
Mini Micro-Pulse Lidar (Sigma Space)	Aerosols	Berkoff.Tim

Other Measurements

Fast Ozone Sensor



3-D Wind Speed/Direction (Turbulence)



VOC Canister Sampling
23 Samples on 5 days

These measurements not part of data archive…yet (contact Hannah; hsh5031@psu.edu for data)

Data Processing and Flux Calculations still on-going

Edgewood, MD Ozone Summary – Measured by NATIVE

Edgewood, MD (NATIVE) DISCOVER-AQ 2011 Daily Maximum Ozone

Ryan Stauffer
The Pennsylvania State University

8 hr color codes based on EPA NAAQS

- **0-59 ppbv**
- **60-75 ppbv**
- **76-95 ppbv**
- **96-115 ppbv**

Date	8 hr Max (ppbv)	Previous Day Forecast (12z)	NAQFC (12z) - 8 Hour Observed Max	1 hr Max (ppbv)	1 hr Max Start (EST)	8 hr Max Start (EST)	
20110627	50.81	69.10	18.29	60.60	13.27	11.90	
20110628	54.17	70.20	16.03	62.22	14.97	11.00	
20110629	61.23	53.10	-8.13	65.80	15.63	10.95	
20110630	68.23	48.20	-20.03	78.04	15.12	11.85	
20110701	73.82	56.00	-17.82	83.23	16.02	11.42	
20110702	**96.45**	**89.70**	**-6.75**	**107.34**	**13.22**	**11.08**	**Breeze**
20110703	73.00	64.70	-8.30	82.79	13.08	10.90	
20110704	50.34	61.00	10.66	55.86	11.93	9.32	
20110705	**89.49**	**65.90**	**-23.59**	**105.06**	**17.28**	**12.70**	**Breeze**
20110706	75.00	78.90	3.90	99.25	15.42	11.28	
20110707	**86.80**	**96.50**	**9.70**	**96.73**	**14.95**	**10.40**	**Interrupted**
20110708	54.51	76.90	22.39	58.04	11.50	9.72	
20110709	61.49	55.00	-6.49	72.32	16.00	10.93	
20110710	68.86	61.00	-7.86	74.67	14.28	11.85	
20110711	64.47	81.50	17.03	75.38	13.92	9.80	
20110712	63.82	71.40	7.58	67.60	14.80	9.97	
20110713	52.55	59.60	7.05	57.91	11.67	8.95	
20110714	51.46	58.40	6.94	56.46	15.23	11.28	
20110715	65.76	83.30	17.54	79.35	13.67	10.65	
20110716	54.19	60.60	6.41	64.65	11.85	9.90	
20110717	52.95	64.90	11.95	60.88	11.25	9.93	
20110718	83.58	100.70	17.12	109.30	12.48	10.85	
20110719	**76.13**	**82.90**	**6.77**	**107.84**	**14.23**	**10.40**	**Interrupted**
20110720	75.64	104.60	28.96	78.87	10.33	10.27	
20110721	72.84	86.10	13.26	84.83	13.80	9.80	
20110722	**102.08**	**105.10**	**3.02**	**128.57**	**15.37**	**10.88**	**Interrupted**
20110723	**93.70**	**102.40**	**8.70**	**113.45**	**17.50**	**12.37**	**Breeze**
20110724	65.83	67.10	1.27	68.03	10.28	9.52	
20110725	60.23	60.80	0.57	72.57	11.92	7.65	
20110726	**73.65**	**67.10**	**-6.55**	**82.95**	**15.30**	**11.33**	**Breeze**
20110727	53.04	70.60	17.56	58.04	12.90	11.05	
20110728	70.60	63.70	-6.90	79.25	10.77	9.40	
20110729	**82.62**	**103.90**	**21.28**	**99.01**	**17.60**	**11.22**	**Breeze**
20110730	60.46	87.30	26.84	65.01	17.00	10.50	
20110731	**78.72**	**68.00**	**-10.72**	**101.09**	**12.63**	**10.27**	**Interrupted**
20110801	100.47	80.90	-19.57	118.65	13.72	8.32	