Identifying Spatial Gradients Using Personal Ozone Monitor (POM) With In-situ Mobile Units and

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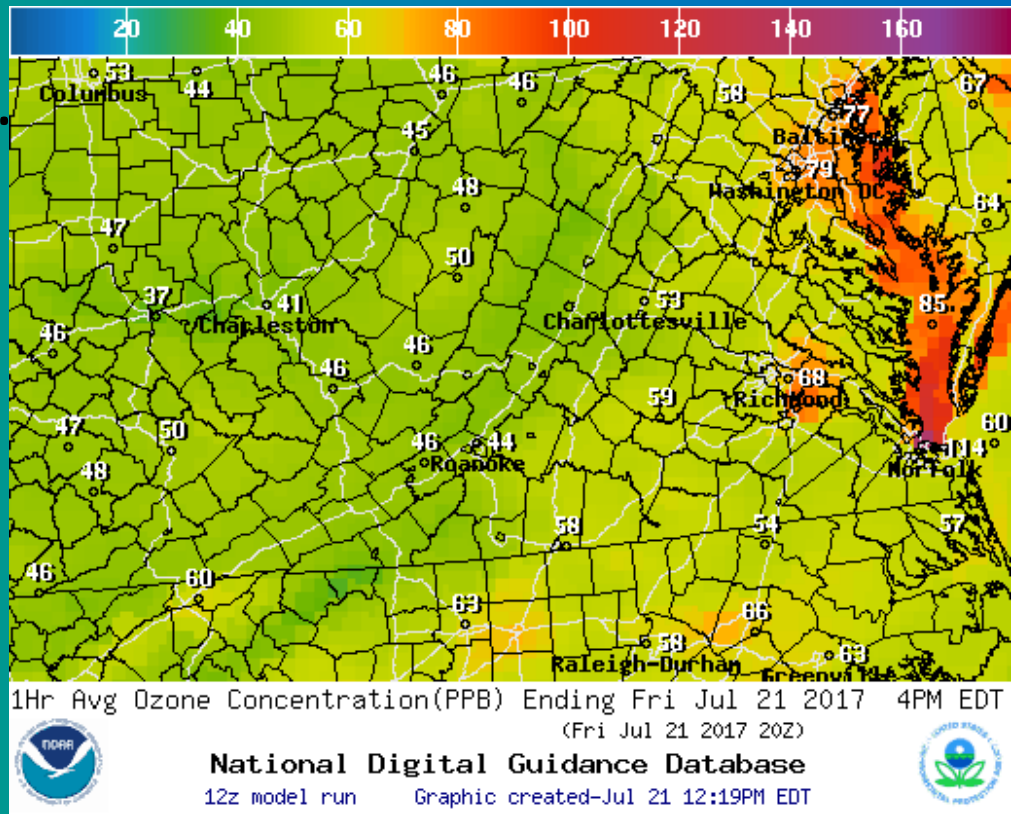
Outline

- Descriptions
  - 202 & POM
  - Calibrations
  - Mobile In-situ Config.
  - UAS Config.
- Further Research
  - Visualization
  - Model Comparison



Sensors

Mobile

- 2B Technologies Personal Ozone Monitor (POM)
  - 5.0 x 3.0 x 1.5 in (12.7 x 7.6 x 3.8 cm)
  - 1.0 lb (0.45 kg)
  - 0 ppb to 10 ppm
  - Accuracy and Precision: Greater of 1.5 ppb or 2% of reading
  - Data Storage: 8,192 lines
  - 10 sec avg.
  - NIST Traceable Calibration

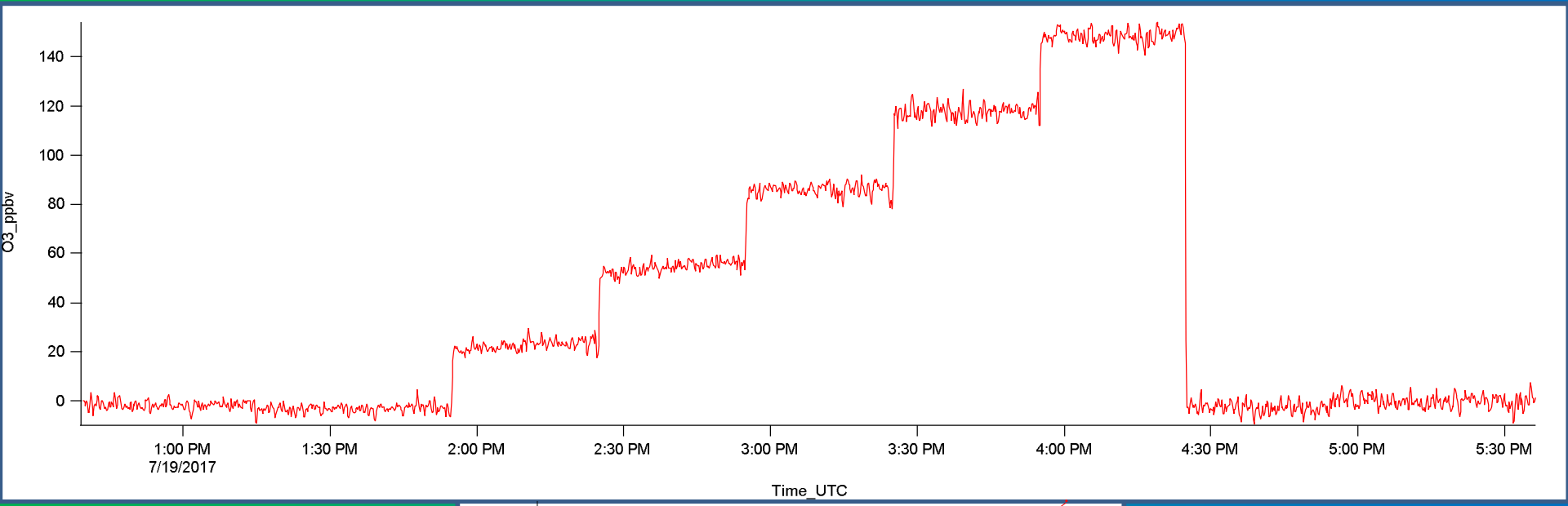
Stationary

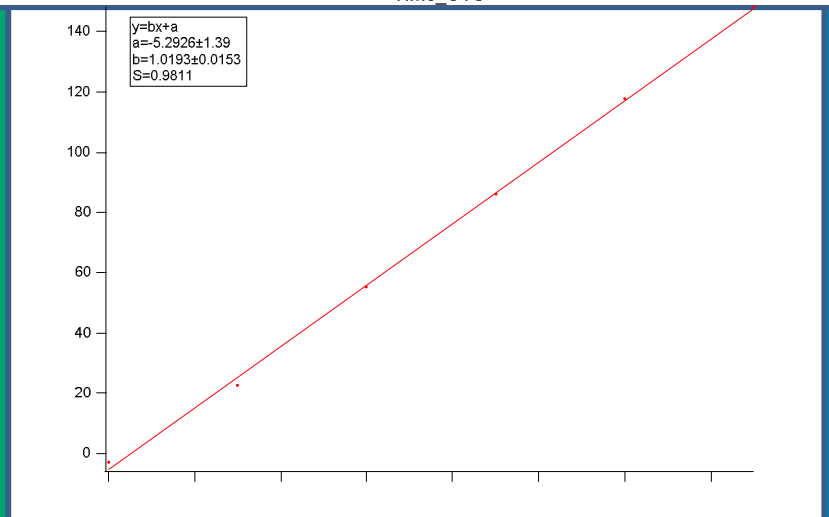
- 2B Technologies Model 202
  - 3.5 x 8.5 x 11 inches (9 x 21 x 29 cm)
  - 5.5 lb (2.5 kg)
  - 0 to 250 ppm
  - Accuracy and Precision: Greater of 1.5 ppb or 2% of reading
  - Data Storage: 16,383 lines
  - 1 min avg.
  - NIST Traceable Calibration

Calibrations

- Model 306 Ozone Calib. Source
  - Ozone Production: UV Photolysis of O_2 at 185 nm
  - Precision and Accuracy: Greater of 2 ppbv or 2% of ozone concentration
  - 6 Calibration Steps:
    - 0, 30, 60, 90, 120, 150 ppbv
  - 30 min intervals
  - Average 100 data points after initial 5 min
- POM and 202 set to 10 sec avg.

Calibration Product



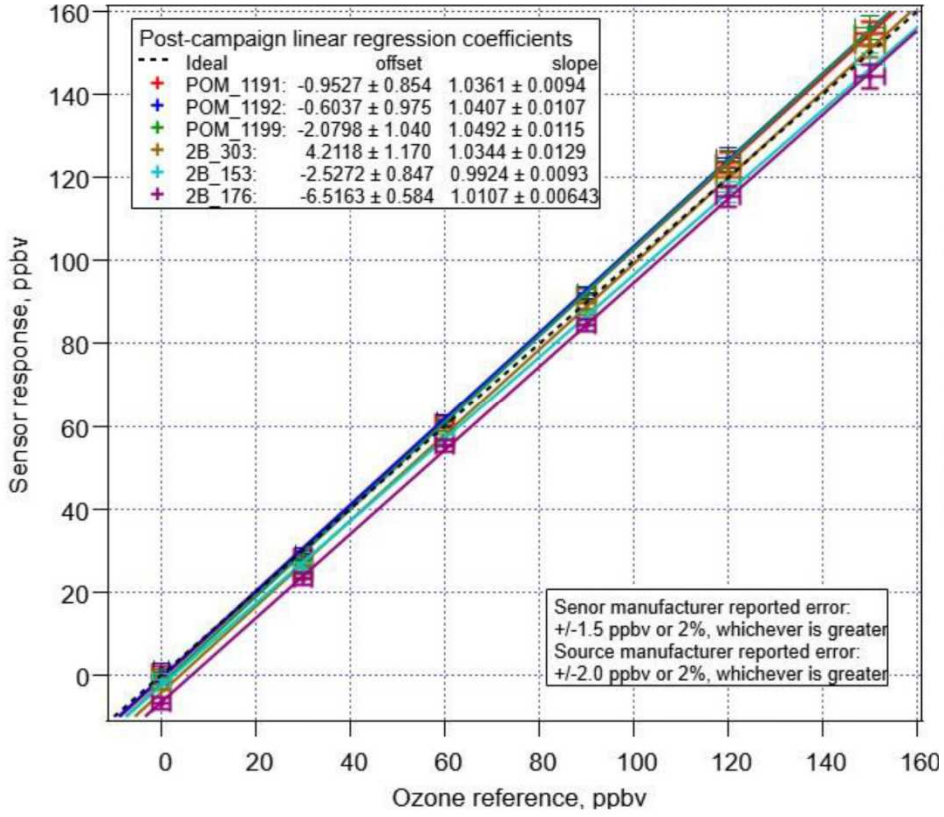


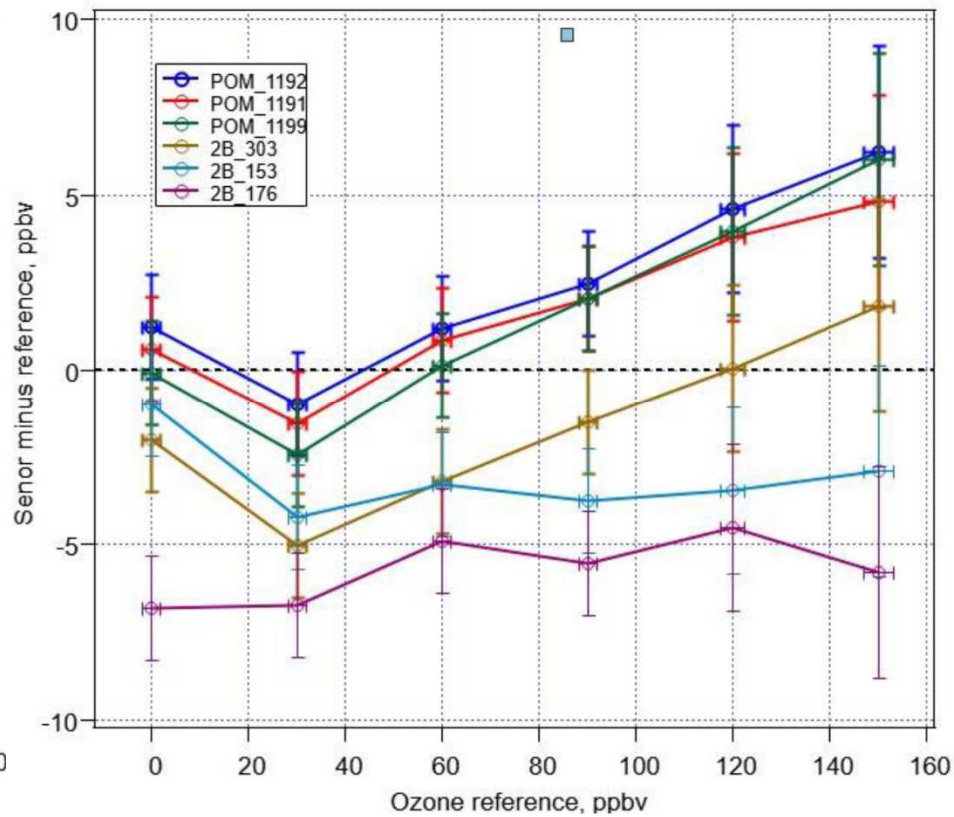
Calibration Before

- 2B Calibration
  - ????????

Calibration After

- Model 306 Calibration



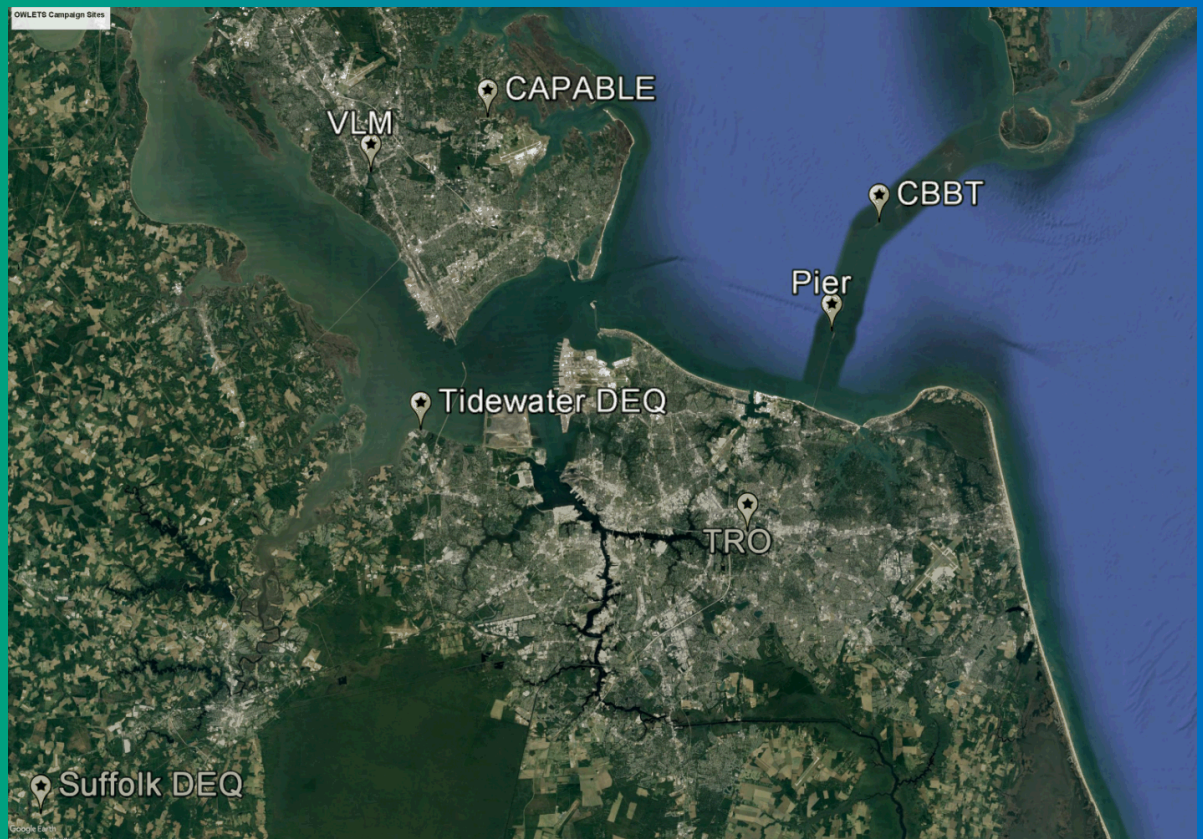


Sensor Placement

Mobile POM Serial Number (SN)					Stationary 202 SN		
	Mobile Unit 1	Mobile Unit 2	UAS-LaRC	UAS-CBBT		VLM	TRO
07/07/2017		1199			06/29/2017	303	176
07/08/2017	1199	1192			07/21/2017	303	153
07/12/2017	1191	1192					
07/13/2017	1191	1192					
07/17/2017	1191	1192		1199			
07/18/2017		1192	1199				
07/19/2017	1191	1192	1199				
07/20/2017	1191	1192					
07/21/2017	1191	1192		1199			
07/26/2017		1192		1199			
07/31/2017			1199				
08/01/2017	1191	1192		1199			
08/02/2017	1191	1192					

POM Purpose

- Collect horizontal spatial ozone data
- Refine spatial resolution between stationary monitors
- Verify field sensors with collocated intercomparison
- Measure predicted land to water ozone gradients



Mobile Config.

Mobile Deployment

- Two Mobile Units (MU)
  - MU1: Hampton/Newport News
  - MU2: Norfolk/VA Beach
- Routes with co-located stationary monitor
  - CAPABLE, VLM, TRO, CBBT
- Off-road locations
- 40-45 mph max speed

Mobile Visualization

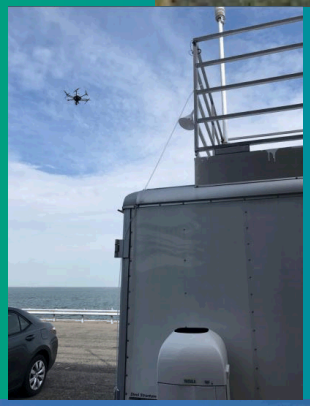
- Google Earth KML
  - Provides spatiotemporal access to data set

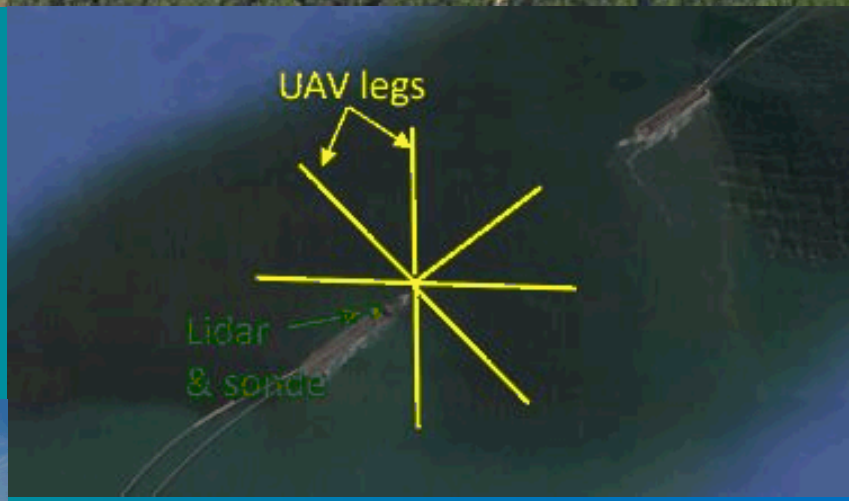
UAS Config.

- NASA LaRC Autonomy Incubator (AI)
- HIVE and MATRICE
  - Payload: POM
  - 3D printed mount
    - Vibration-resistant
  - 20-25 min flight time
  - 5 min battery swap/data collection

UAS Deployment

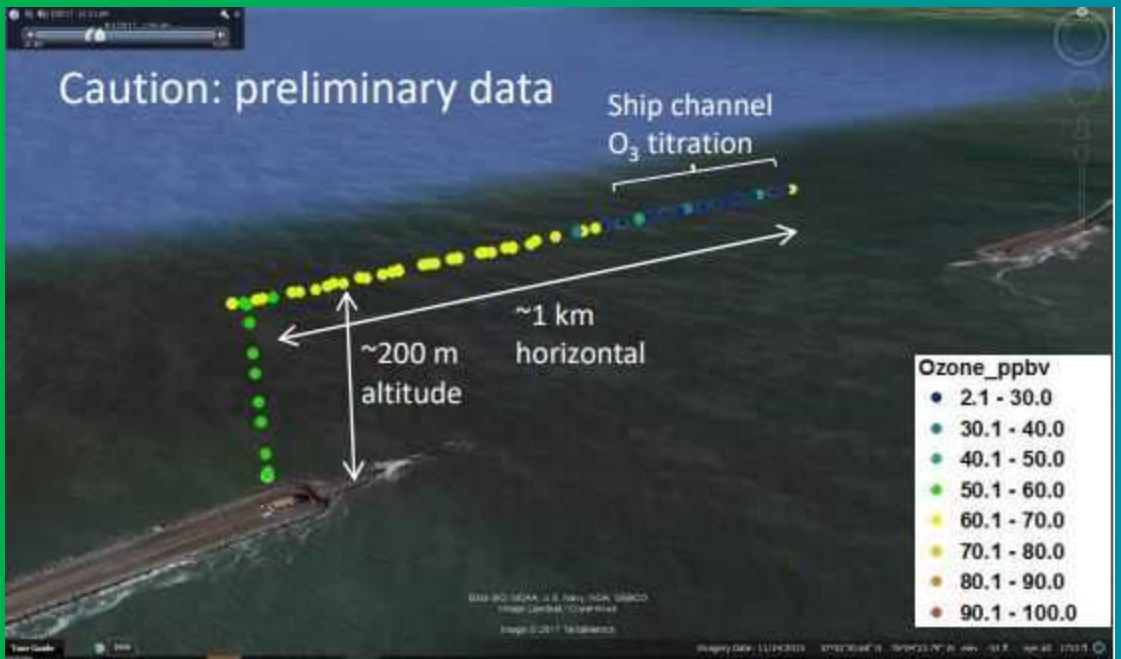
- Flight Height
  - LaRC: 500’ (150m)
  - CBBT: 700’ (200m)
- Flight Direction
  - Vertical
    - Lidar-Surface Comparison
    - Refine Near Range Resolution
  - Horizontal
    - Near Range Variability
    - Point Source Influences





UAS Visualization

- TBD



Results/Future Plans

- Data successfully collected on OWLETS measurement days
  - Mobile: 12 days
  - UAS: 7 days
- Quicklook reports are on the OWLETS website
- Provisional data to be uploaded to archive in ~ 1 month

- Complete absolute error and precision characterization of sensors
- Analyze co-located data with other platforms
  - CBBT, DEQ/CAPABLE sites, NASA static sites (TRO, VLM, CBBT)
  - Comparison with SERC research vessel at CBBT and GEO-TASO flights at LaRC /CBBT
- Ship titration event (see Guillaume's lidar talk!)
- Additional visualization enhancements
  - Include all platforms
  - Flag/screen data for local source influences (ie. O3 titration when in stopped traffic)
  - Comparisons to models

Thank You
Questions?