Ozone Water-Land Environmental Transition Study (OWLETS)

2017 NASA Science Innovation Fund Award: PI - T. Berkoff/D. Allen (LaRC); T. McGee/J. Sullivan (GSFC)

Motivation/Background

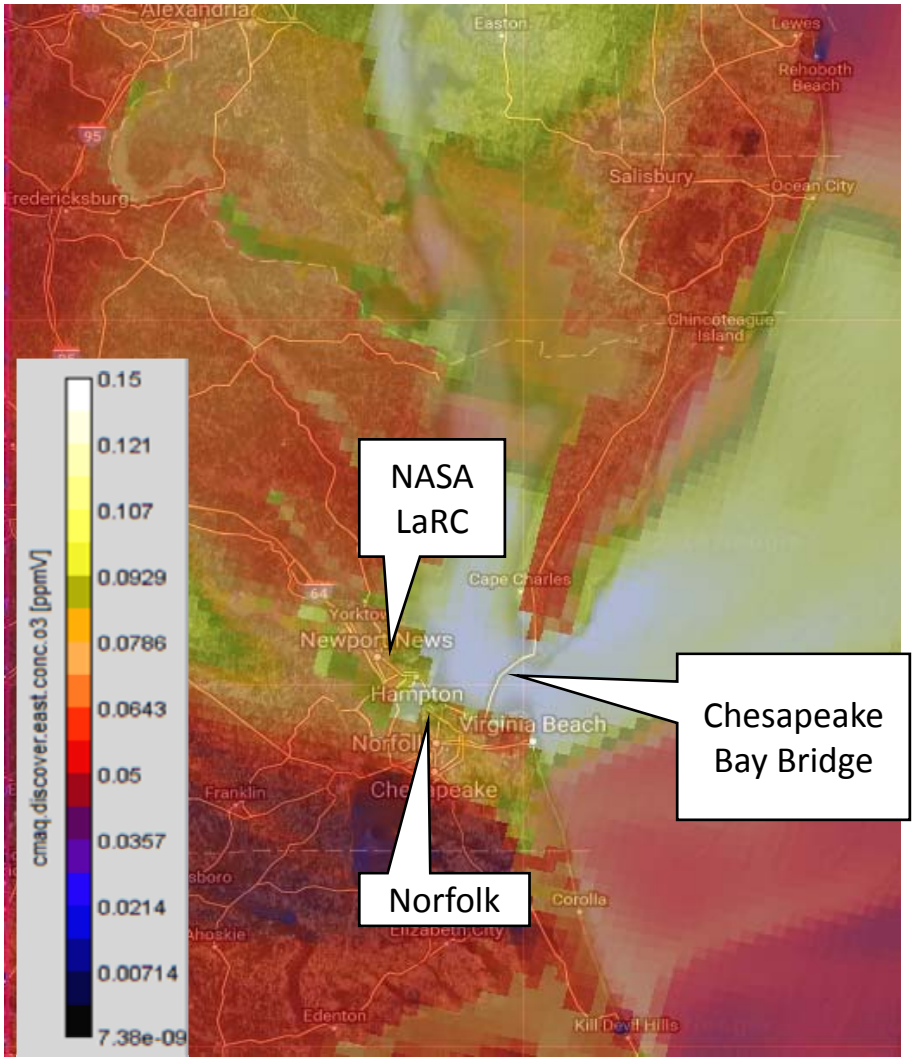
- Significant land-water gradients in coastal regions can occur due to differences in surface deposition, boundary layer height, and cloud coverage, example to right is an EPA/CMAQ surface ozone example case

- Studies have examined the Chesapeake air-shed with respect to ozone including: Martins et al. 2012 (Hampton Roads region), Goldberg et al. 2014, Loughner et al. 2014, Stauffer et al. 2015 (Baltimore-DC region)
    - O_3 measurements over water are scarce

- NASA Looking Forward: Vertical, horizontal, and temporal (4-D) measurements are needed to describe complex scenes to improve forecast models and air quality satellite retrievals
    - TEMPO/GEOCAPE

- Key goal: provide user community high resolution vertical O_3 profiles simultaneously over the land and water during various air quality events
    - Daytime, nighttime, sunset/sunrise, "poor" AQ days as well as "clean"

Chesapeake Bay Region
EPA/RSIG3D – July 29 2011 20:00 GMT (16:00 EDT)
CMAQ-DISCOVER-AQ, O_3 surface concentration



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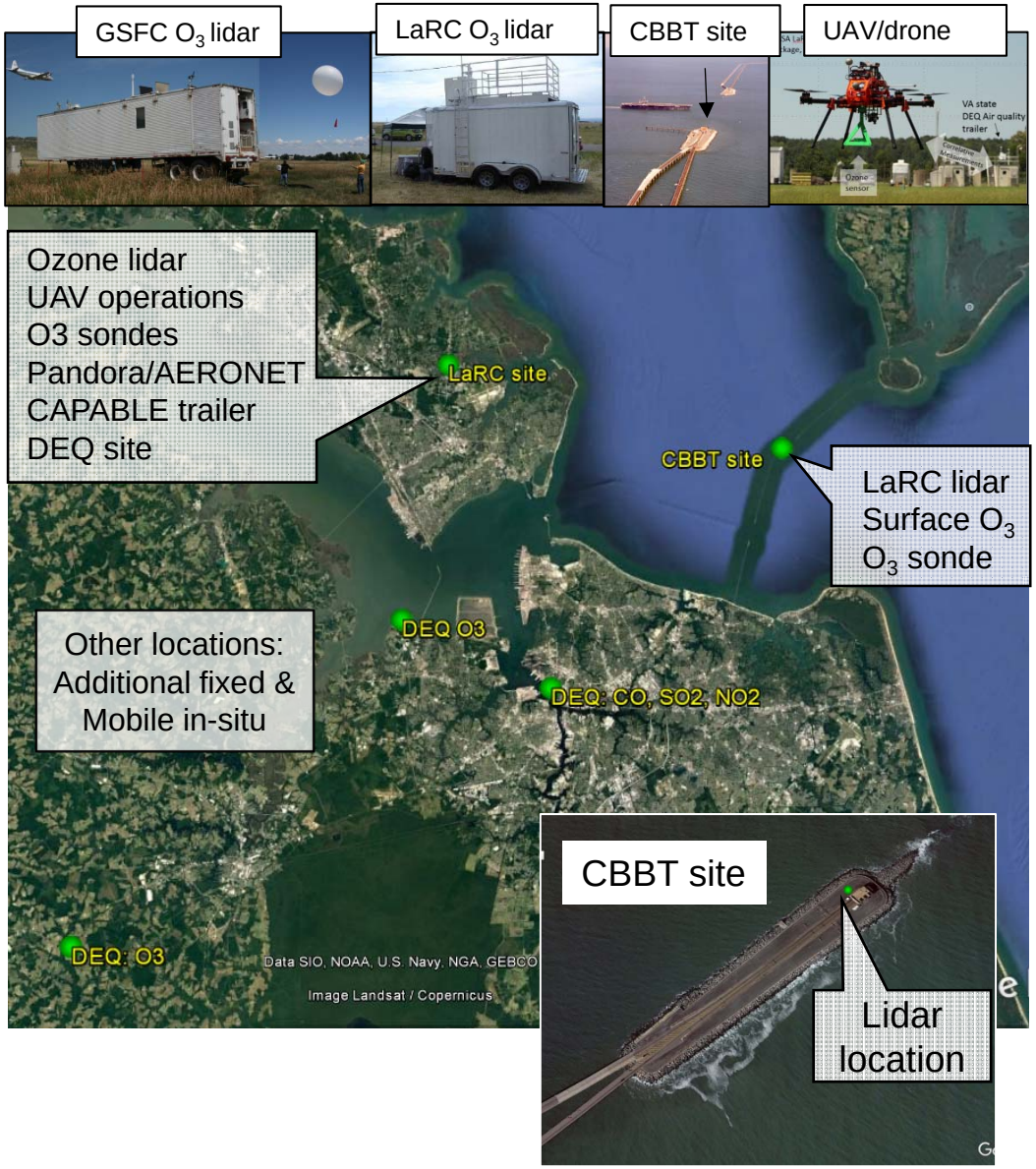
Measurement Strategy

- OWLETS will use a unique combination of two ozone lidars, UAV equipped with O_3 & surface sensors to characterize the water-land differences in O_3
- One of the lidars (GSFC lidar) will be located in-land, while a second lidar (LaRC) will be located on the Chesapeake Bay Bridge Tunnel, 6-7 miles off-shore to obtain simultaneous "over-water" data
- UAV/drone with a in-situ O_3 sensor will allow us to investigate near-range vertical and horizontal gradients
- O_3 sondes, fixed ground sensors, and mobile in-situ will also obtain measurements
- Science measurements will occur from mid-July to mid-August 2017 targeting days of special interest based on meteorological and air quality forecasts (~15 days of lidar/UAV measurements)



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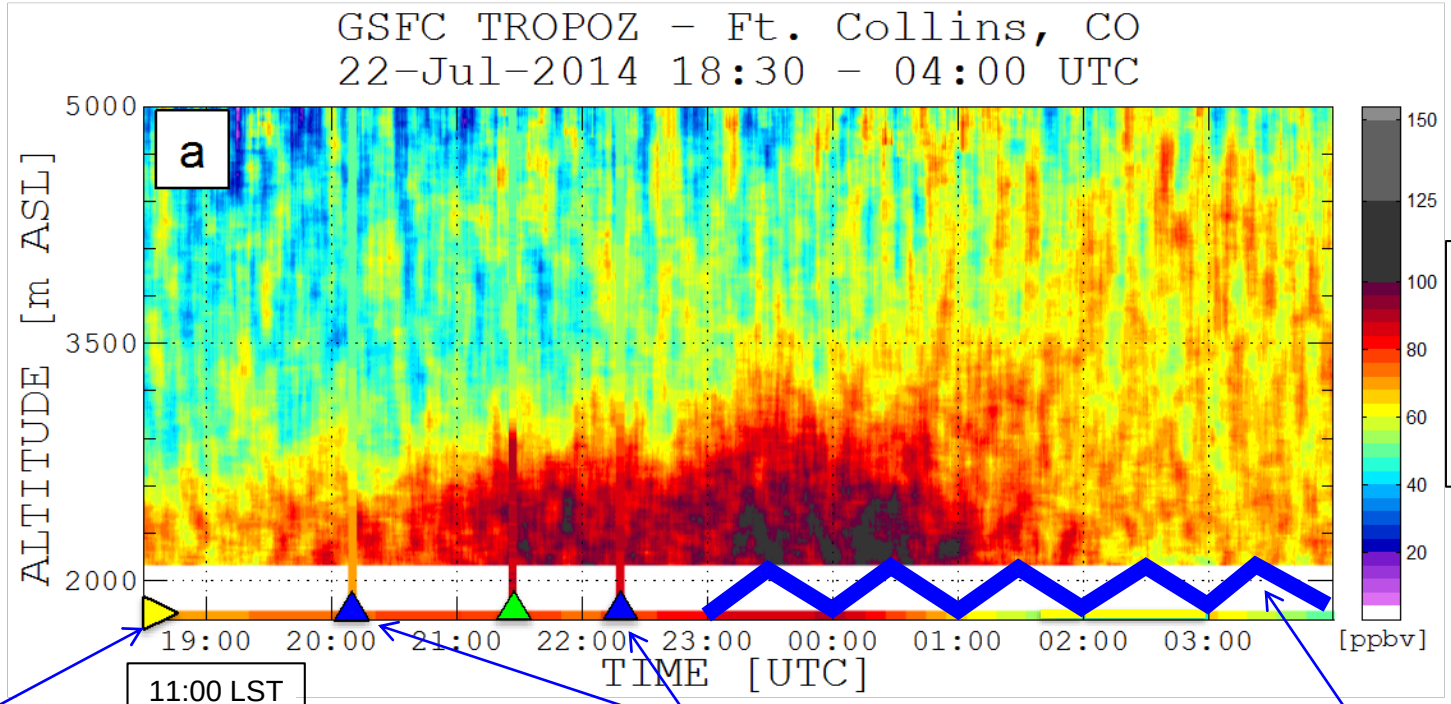

Suite of measurements at over water site and inland site!

Surface monitoring of O_3 and NO_2 will help assess photochemical vs. transport processes

O_3 sondes will supplement with meteorological information

UAV will fill in data gaps with O_3

Figure from Sullivan, John T., et al. "Quantifying the contribution of thermally driven recirculation to a high-ozone event along the Colorado Front Range using lidar." *Journal of Geophysical Research: Atmospheres* 121.17 (2016).