OWLETS-2

Direct Observations of Pollution Gradients Within the Chesapeake Bay

John T. Sullivan, *Timothy Berkoff, Joel Dreessen, Ruben Delgado, Xinrong Ren, Russell Dickerson, Adrian Flores & OWLETS-2 Teams*

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2021 Virtual A&WMA-Baltimore/DC Chapter Meeting - Th 25 Mar 2021 5:00 PM

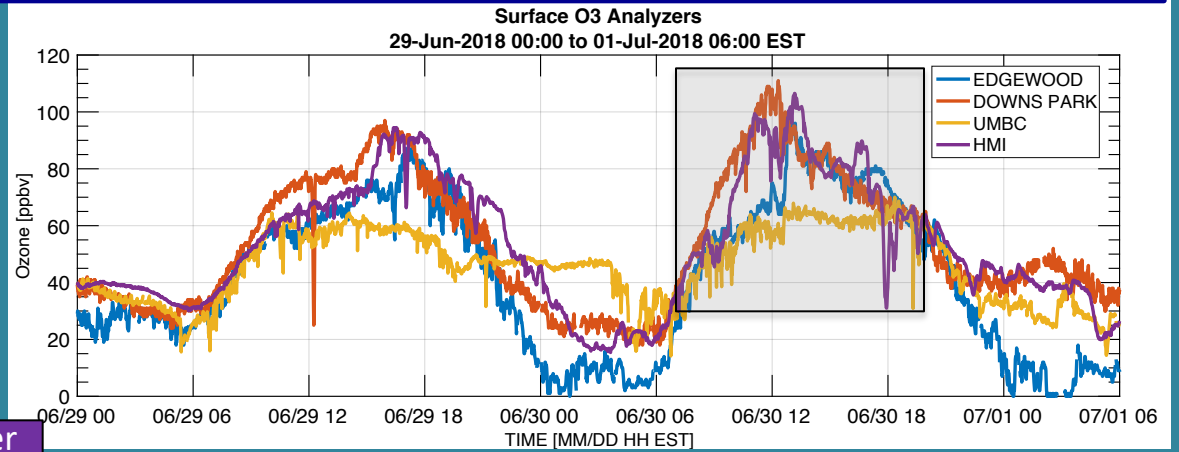
Complexity of Coastal AQ

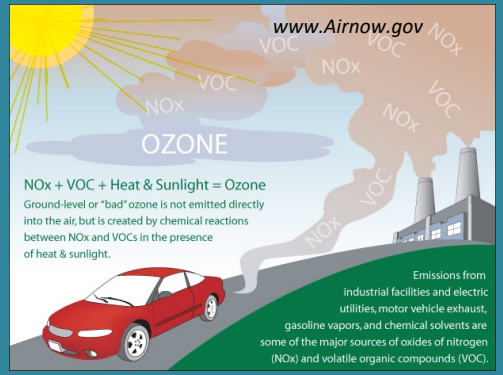
Ozone **W**ater-**L**and
Environmental **T**ransition **S**tudy

Sat. 6/30 ~15:30 LT
Courtesy: L. Judd NASA LaRC

High Ozone Episode

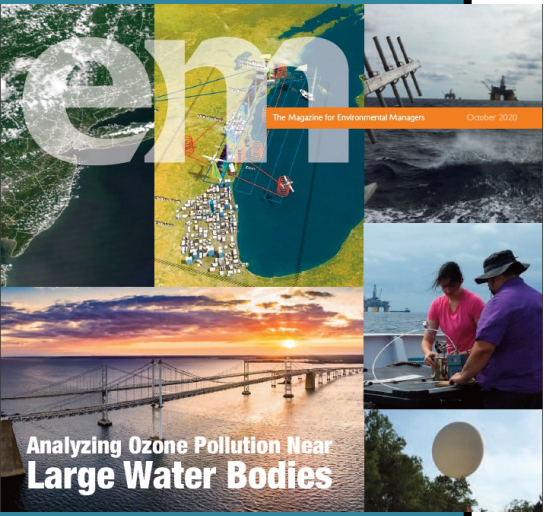
Ozone **W**ater-**L**and
Environmental **T**ransition **S**tudy

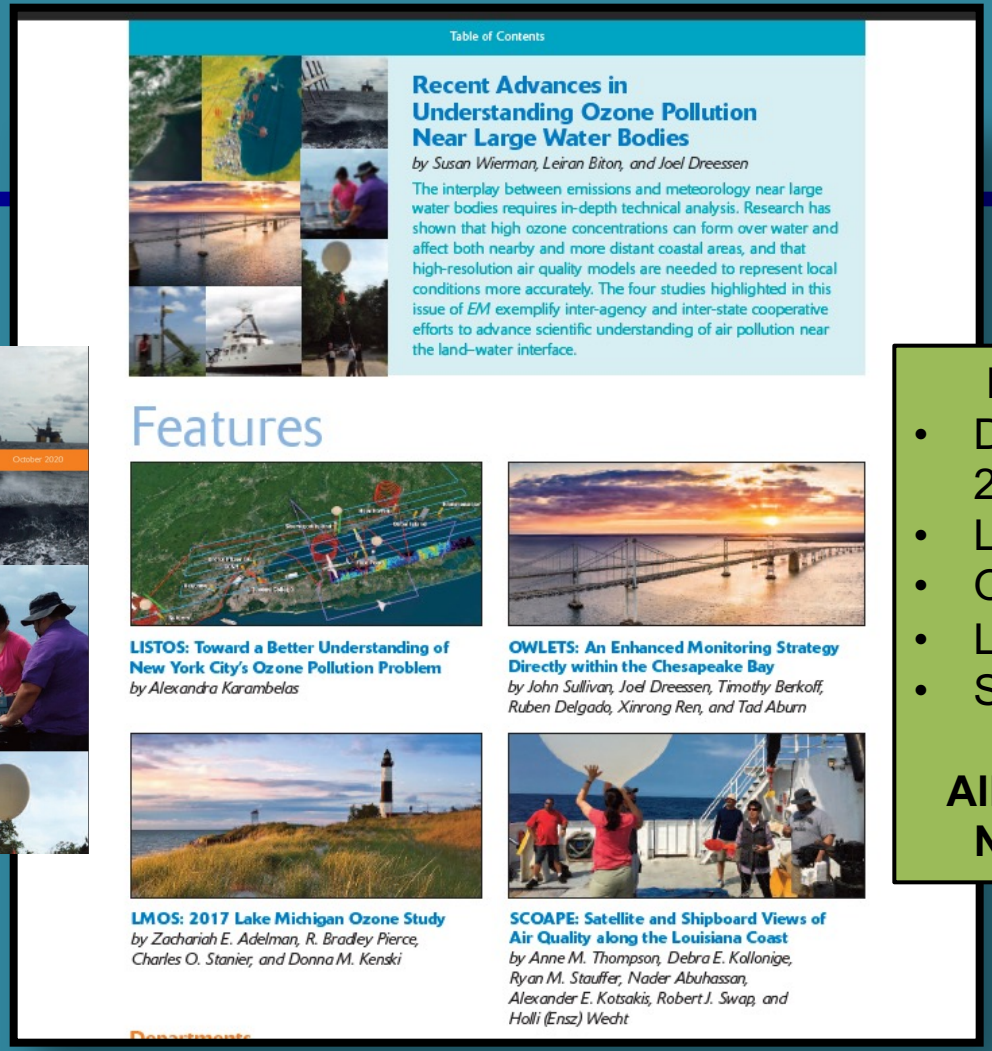




What the regulatory community needs:

4D (space, time) chemical and dynamical information during high ozone episodes





Ozone **W**ater-**L**and **E**nvironmental **T**ransition **S**tudy

Recent Field Studies

- DISCOVER-AQ, 2011; 2013, 2014
- LMOS, 2017
- OWLETS-1, 2017
- LISTOS, 2018, 2019
- SCOAPE 2019

All with an eye towards NASA TEMPO (2022)

OWLETS-2 Strategy

Ozone **W**ater-**L**and **E**nvironmental **T**ransition **S**tudy

June 6th to July 6th, 2018

NASA B-200

UMD Cessna

R/V

Mobile O_3 and Winds

UMBC

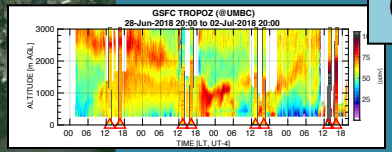
HMI

Howard U. Beltsville

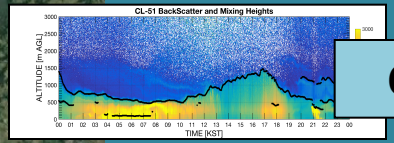
UAS

Maryland Department of the Environment

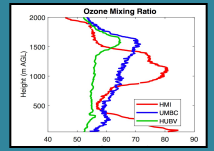
12 B/W MDE Sites



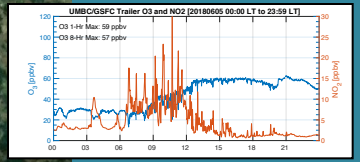
Ozone Lidar



Ceilometer & Winds



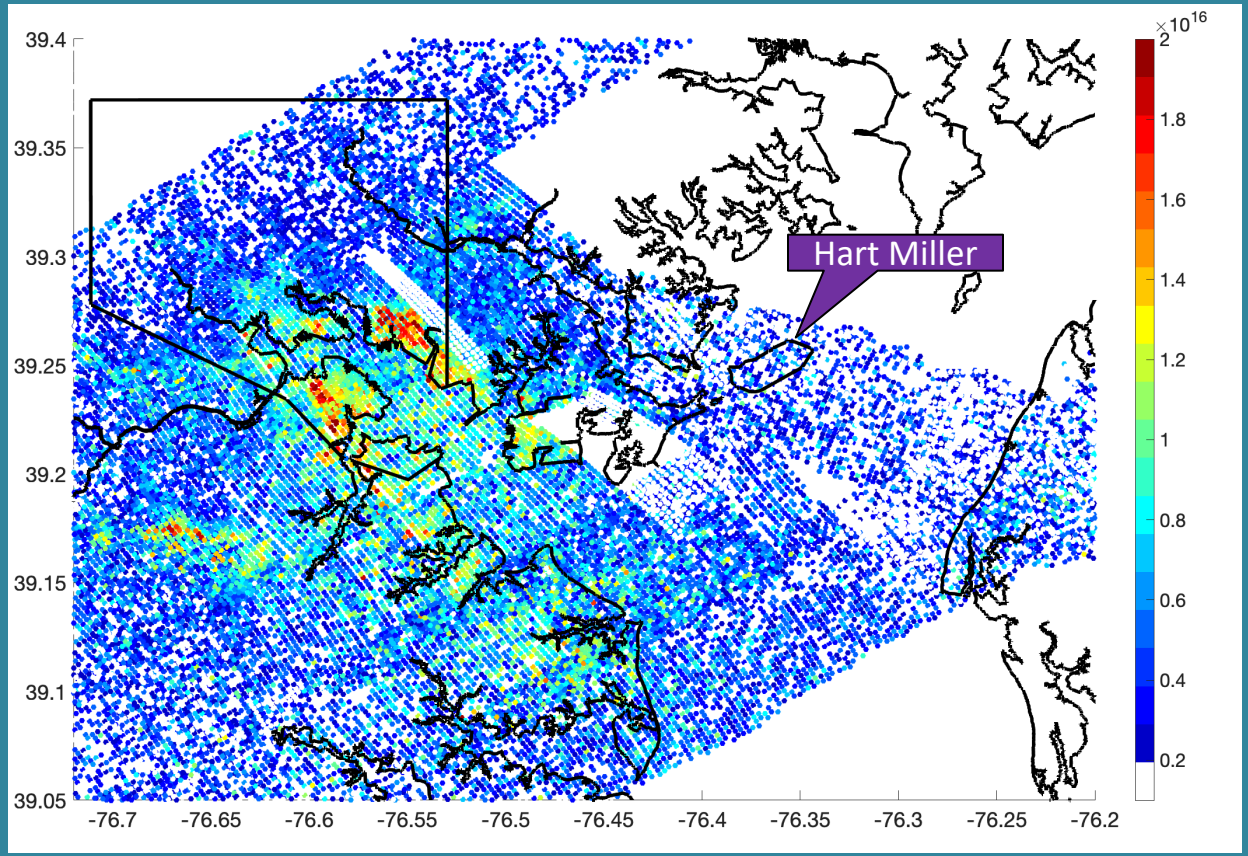
Ozonesondes



In-Situ Chem/Met
Pandora/AERONet

Mapping Morning NO_2 Emissions

OWLETS
Ozone Water-Land Environmental Transition Study

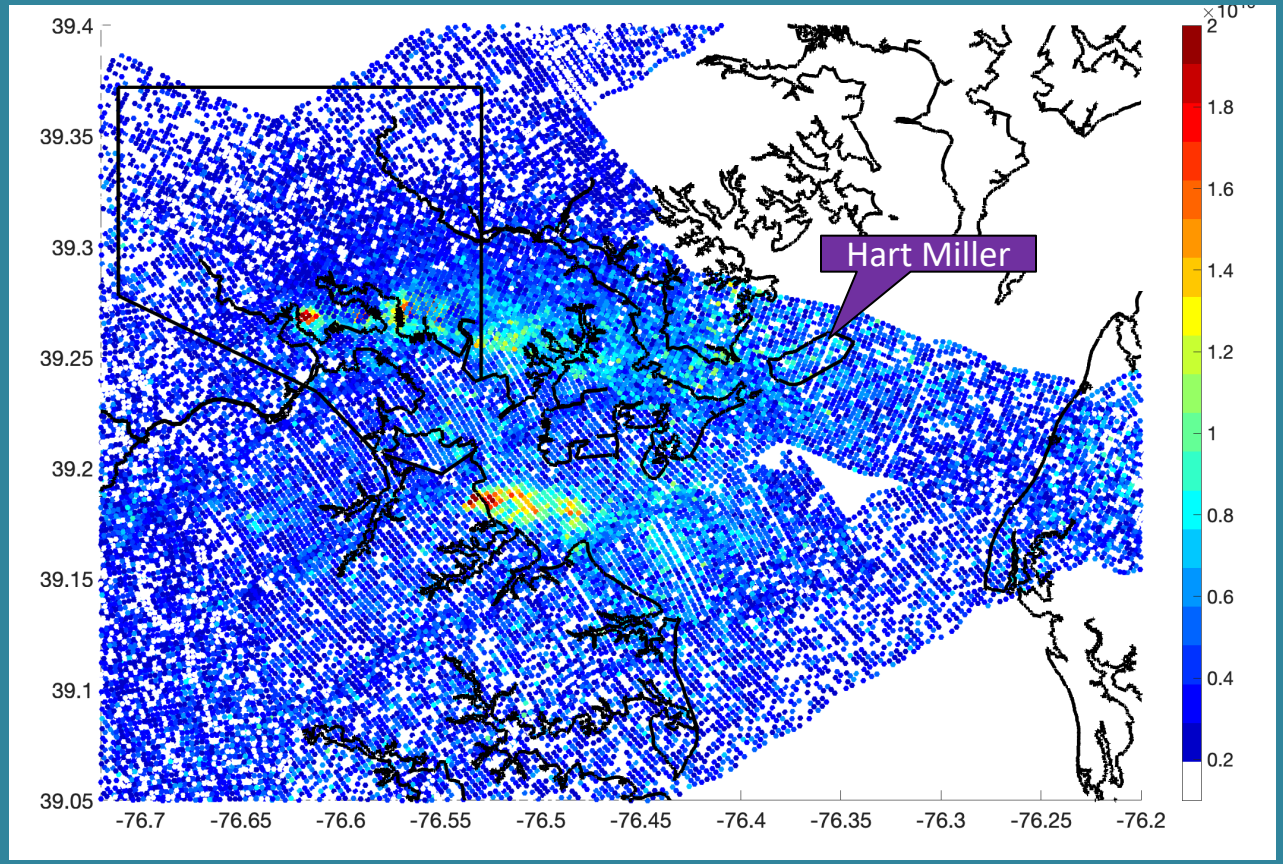


Sat. 6/30 ~08:30 LT
Courtesy: L. Judd NASA LaRC

- Tropospheric column NO_2 values from the NASA GeoTASO instrument
- To understand the downwind/late day ozone episode its critical to understand direct emissions

Mapping Afternoon NO_2 Emissions

OWLETS
Ozone Water-Land Environmental Transition Study



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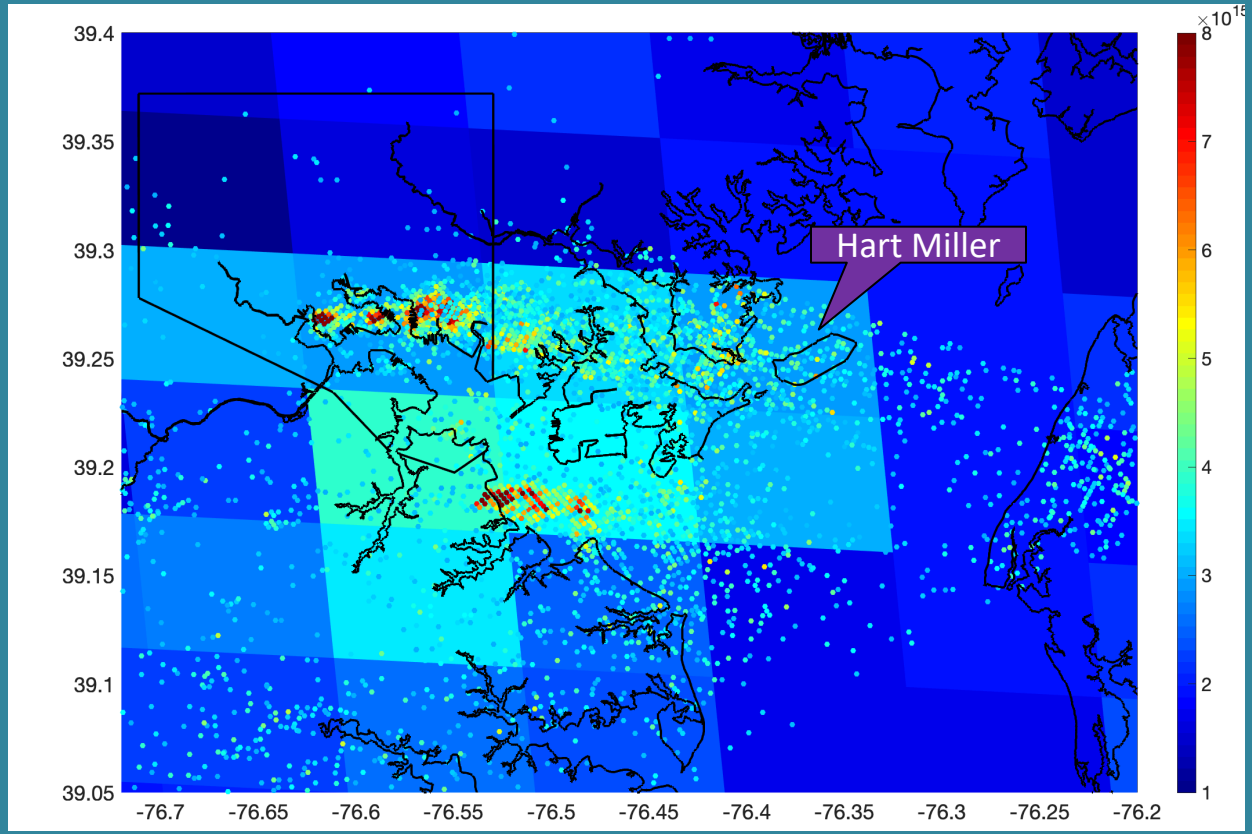
Mapping Afternoon NO_2

Ozone **W**ater-**L**and **E**nvironmental **T**ransition **S**tudy

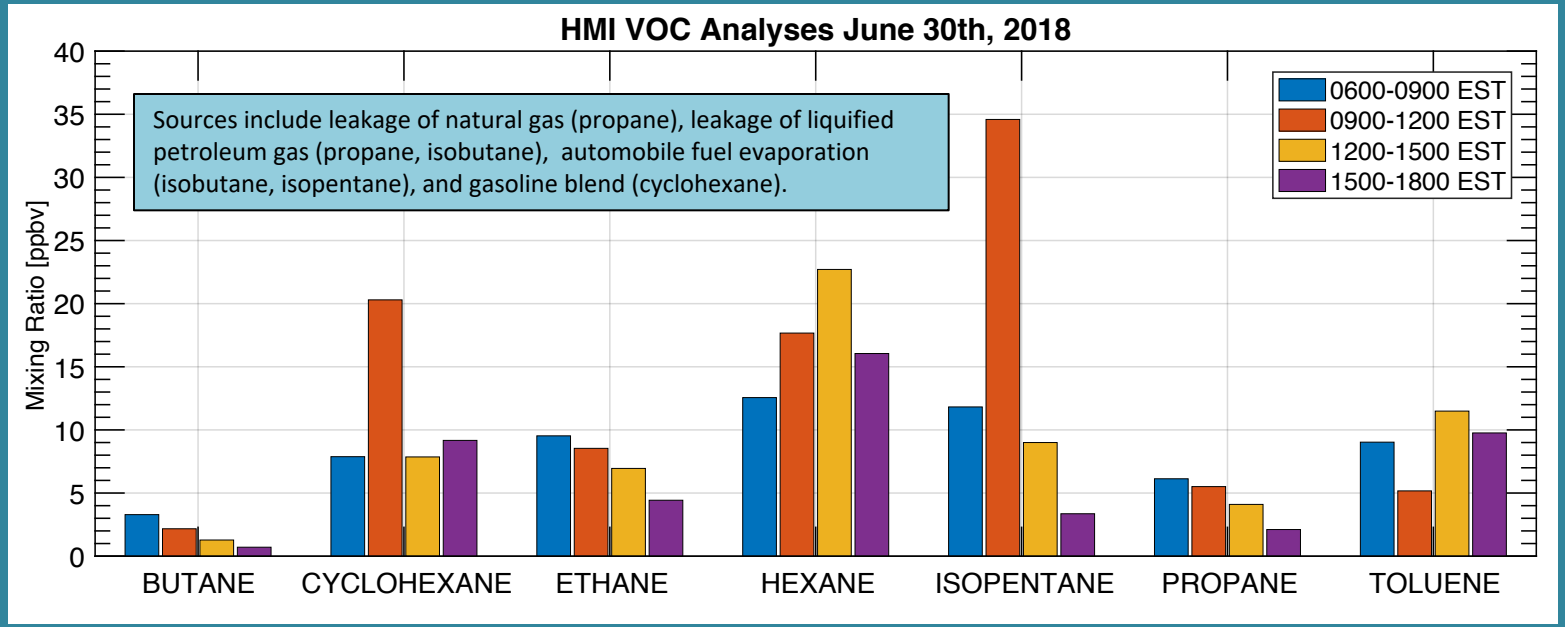


Sat. 6/30 ~15:30 LT
Courtesy: L. Judd NASA LaRC

- Nearly coincident trop. column NO_2 values from the NASA GeoTASO overlaid on the S5P TROPOMI instrument
- Future work: Upscale GeoTASO observations as source of evaluation and provide lessons learned to regulatory community

Air Mass Content at HMI

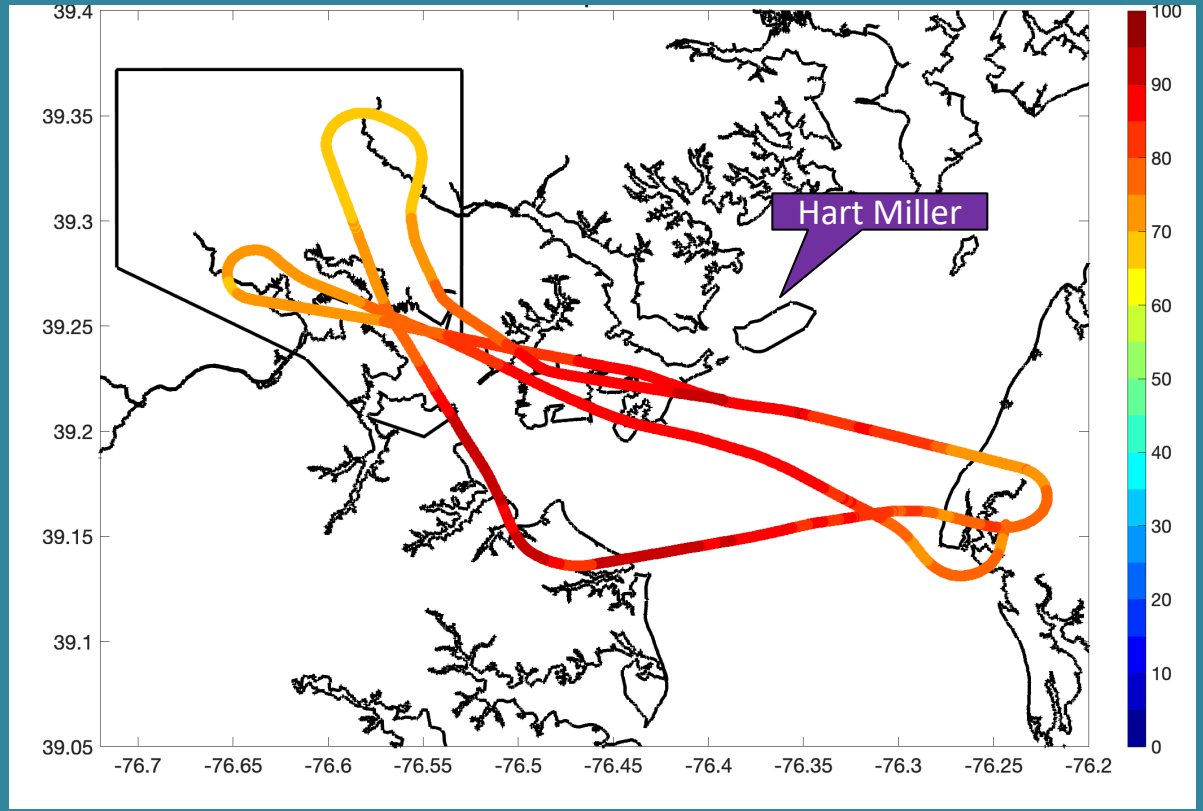
Ozone Water-Land Environmental Transition Study



- Daytime evolution of VOCs will be used to infer air mass origin. Future work will be to understand how VOCs can impact ozone production.

Mapping Afternoon O_3

OWLETS
Ozone Water-Land Environmental Transition Study

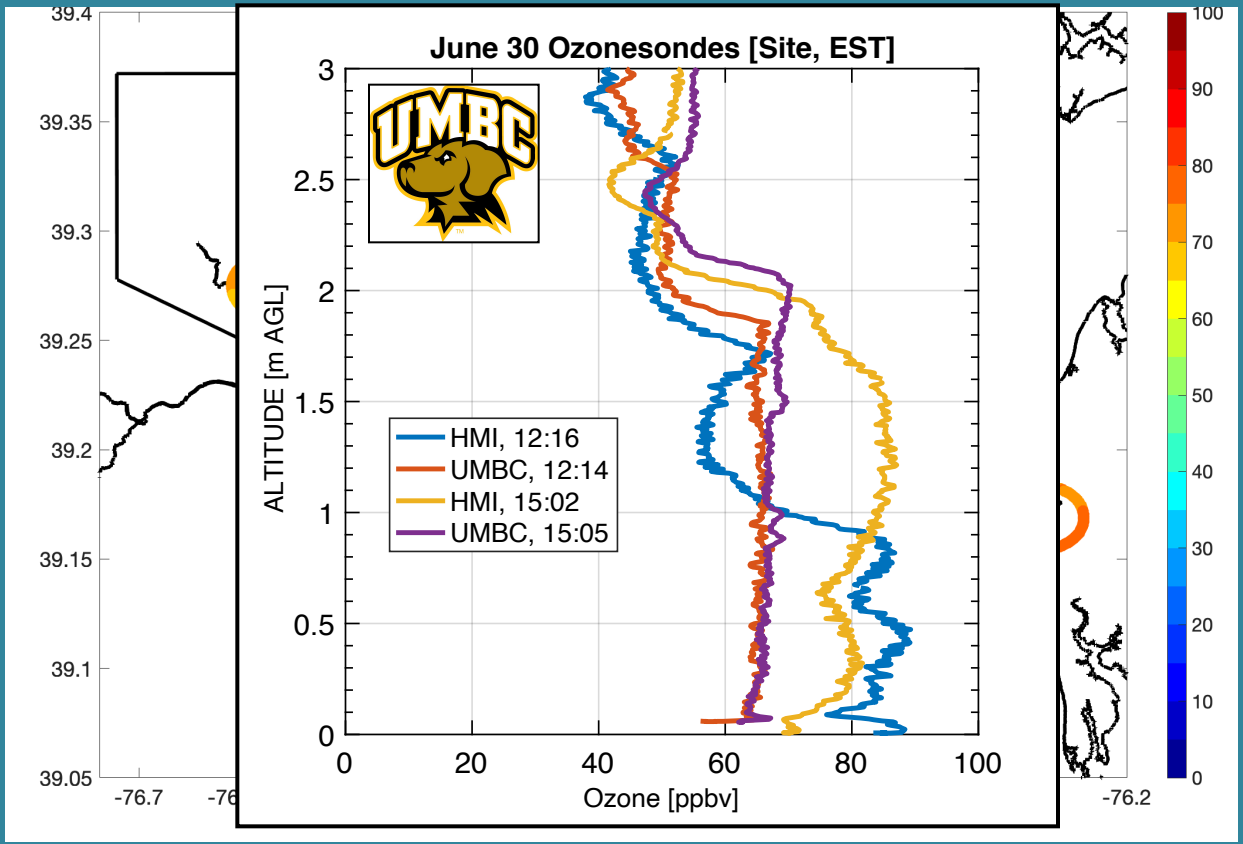


Sat. 6/30 ~15:30 LT
Courtesy: X. Ren UMD/NOAA

- 300m-500m sortie from UMD Cessna covering
- Dirtier (**80-100 ppbv**) over the bay adjacent sites, compared to the cleaner (**60-70 ppbv**) conditions observed over the continental sites

Mapping Afternoon O_3

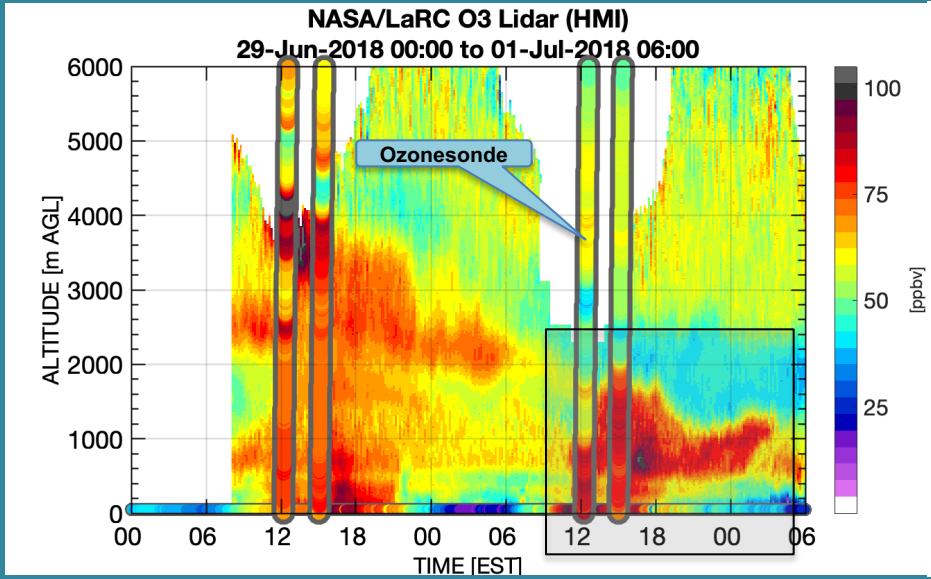
OWLETS
Ozone Water-Land Environmental Transition Study



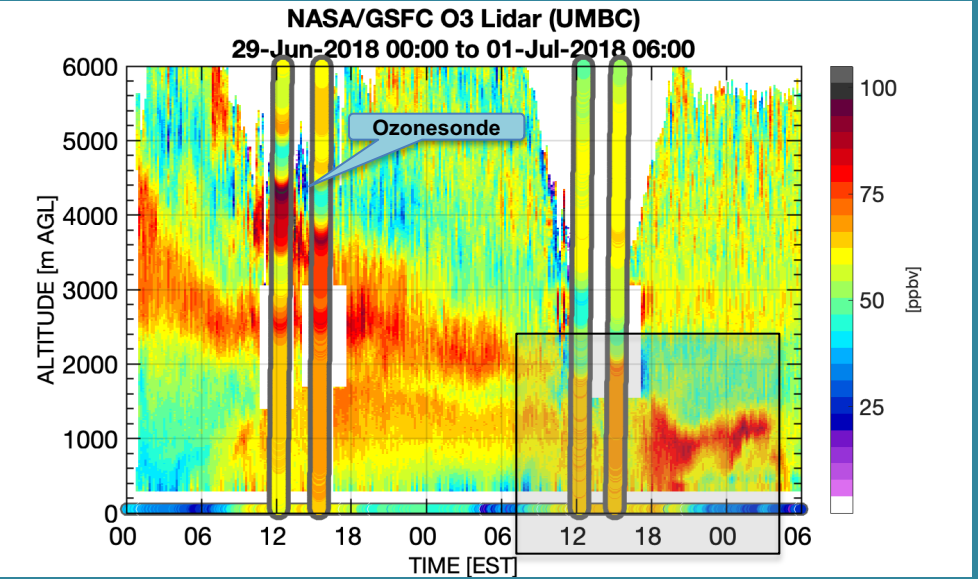
Mapping Multi-Day O_3

Ozone Water-Land Environmental Transition Study

Over Water - Hart Miller Island



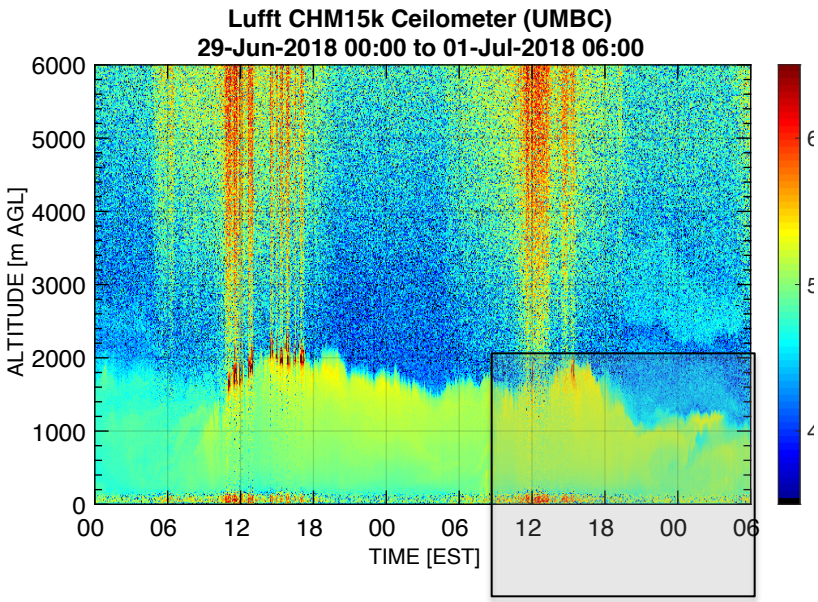
Over Land - UMBC

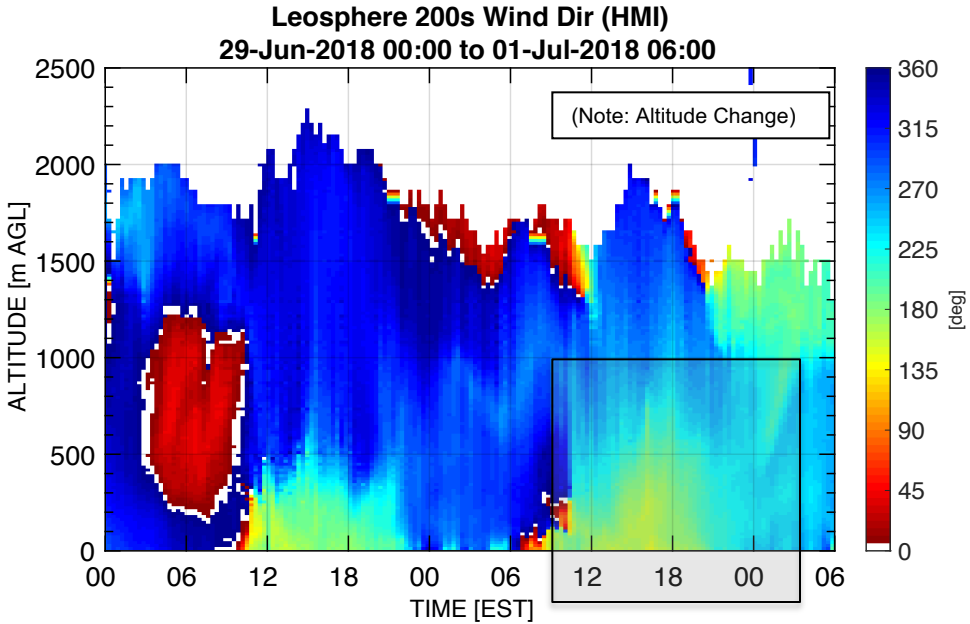


- Quantifying the return flow height and extent with continuous ozone lidar profiles from the Tropospheric Ozone Lidar Network (TOLNet)

Additional Lidar Profiles

Ozone Water-Land Environmental Transition Study

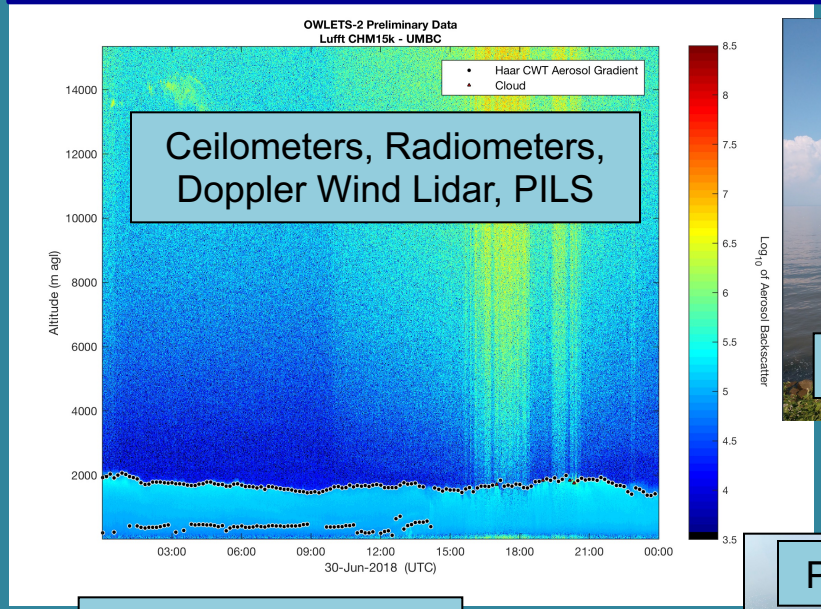


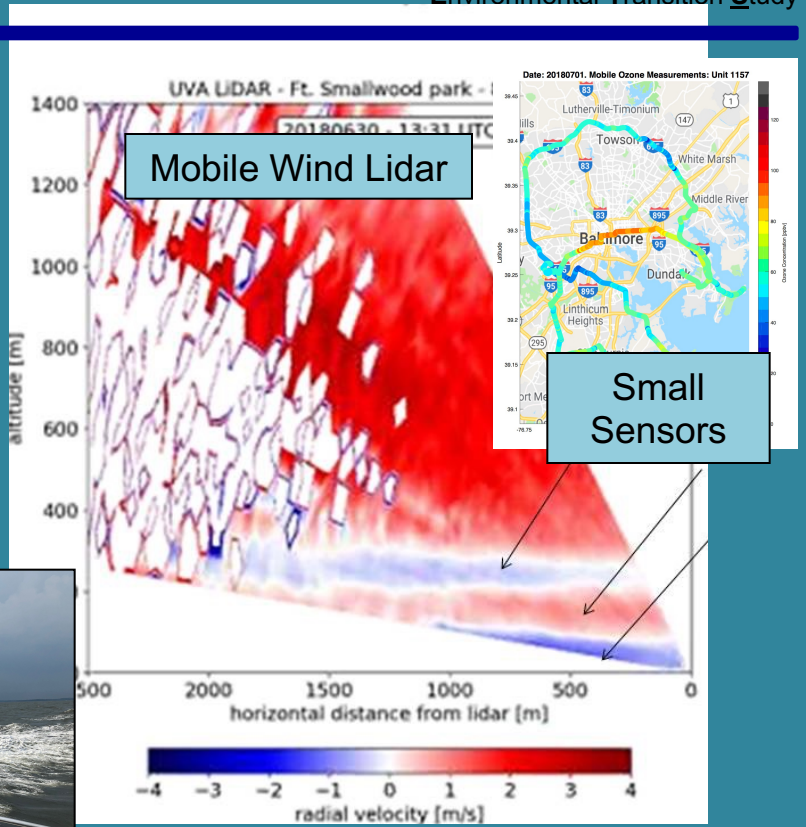


- Quantifying the return flow height and extent with continuous ceilometer and wind lidar profiles from UMBC and Hart Miller Island

Additional Platforms

Ozone **W**ater-**L**and
Environmental **T**ransition **S**tudy



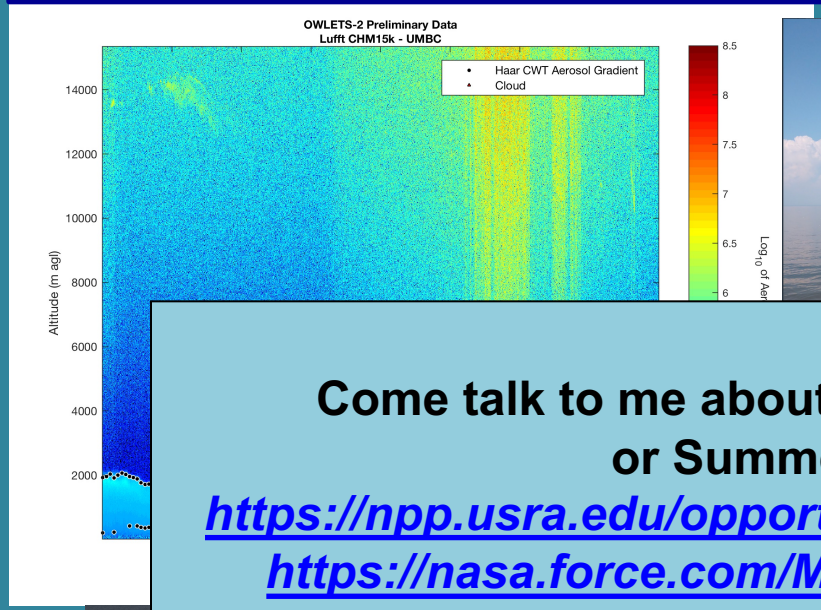


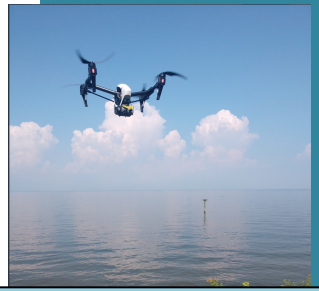
Research Vessel

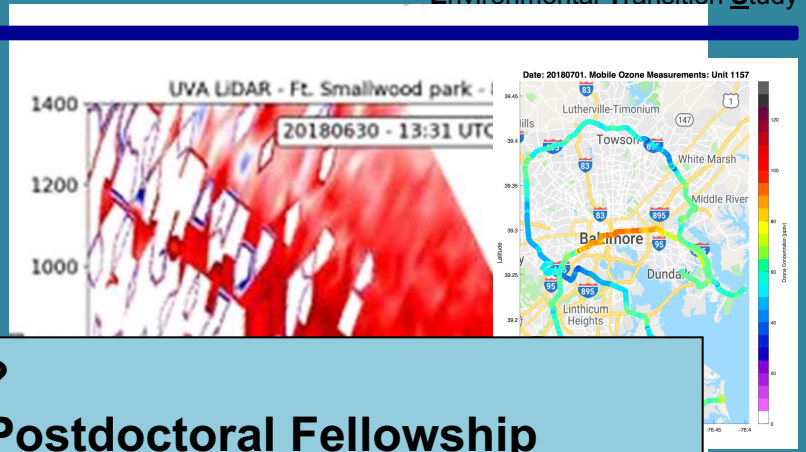
Pandora

Additional Platforms

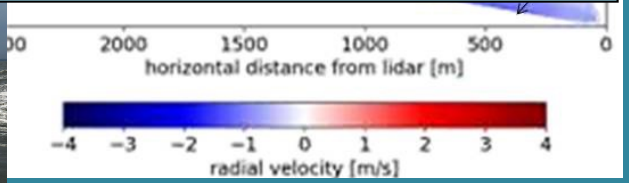
Ozone **W**ater-**L**and
Environmental **T**ransition **S**tudy





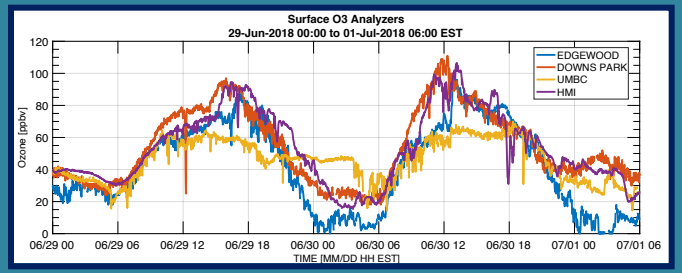


Interested?
Come talk to me about the NASA Postdoctoral Fellowship or Summer Internship Program!
https://npp.usra.edu/opportunities/details/?ro=17768 ***Mar 1 / July 1***
https://nasa.force.com/Mentors/s/my-projects?isdtp=p1 ***Mar 1***

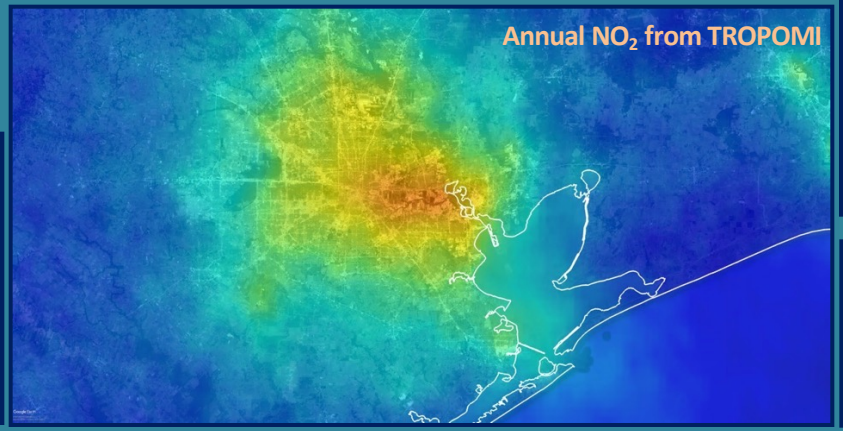


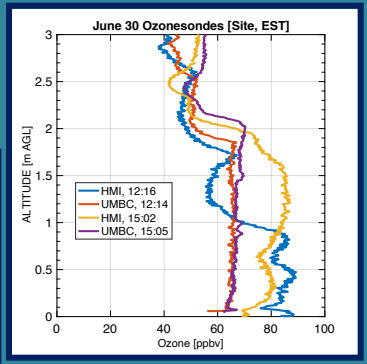
Next: 2021 TRACER-AQ In Houston, TX

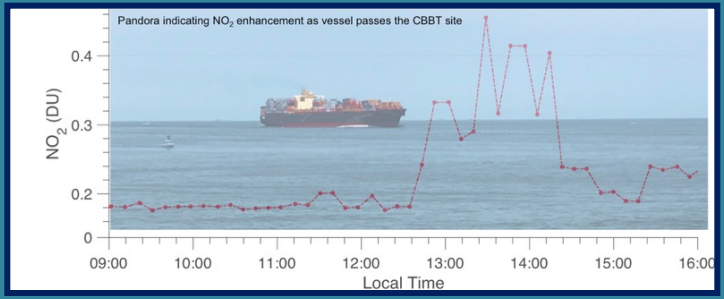
Ozone **W**ater-**L**and
Environmental **T**ransition **S**tudy



Pandora, TOLNet, Ozonesondes, surface samplers, and mobiles labs at key super sites in Houston, TX







- **Deploy key assets to ground sites to better characterize pollution episodes, chemical transport, and coastal gradients, and socio-economic relationships to pollution**
  - **Collaborate and expand relationships with TCEQ and the backdrop of extensive local regulatory observations**
  - **Connect surface observations to those mapped via aircraft and from satellite platforms**

Thanks!

Ozone Water-Land Environmental Transition Study

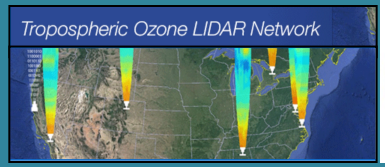
Special thanks to NASA HQ/Tropospheric Composition Program
For website quick look reports and archive:
www-air.larc.nasa.gov/missions/owlets/

OWLETS Science Team Meeting Fall 2017

@OWLETS

Research Teams

OWLETS
Ozone Water-Land Environmental Transition Study



2017 & 2018

2017: T. Berkoff, PI
2018: J. Sullivan, PI

2017

2018