

Wind field measurements during LISTOS

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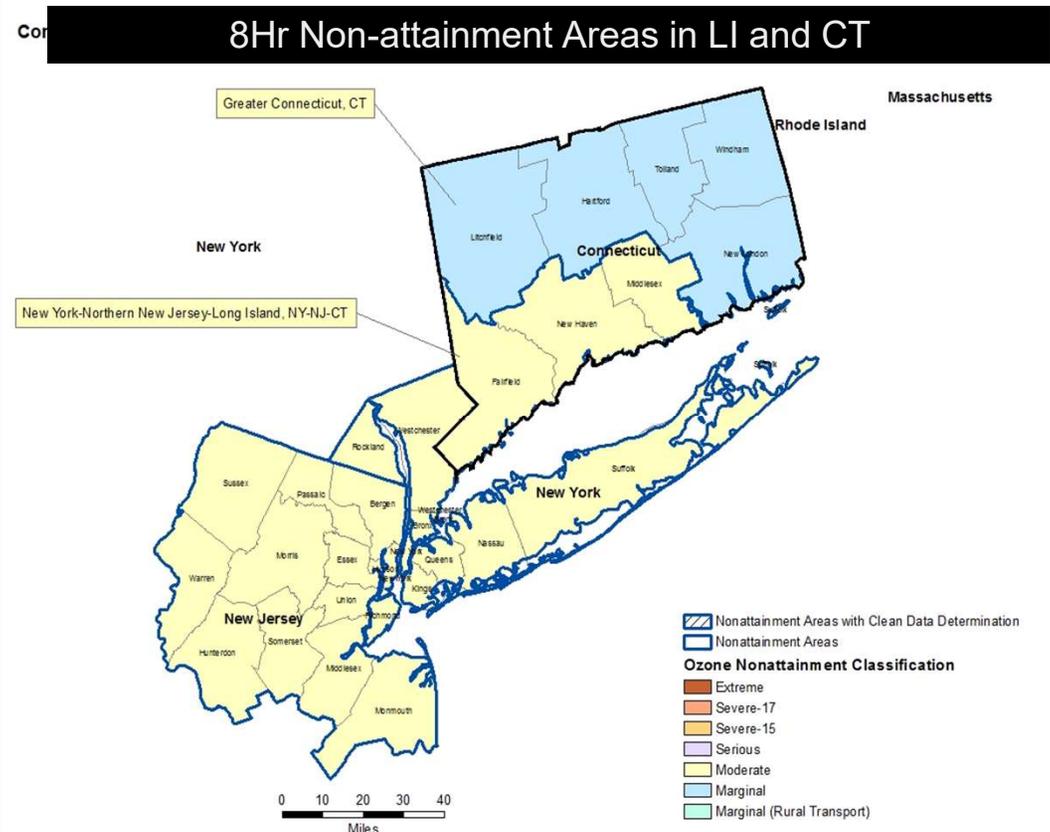
This project supported by



We thank NESCAUM for supporting this work!

Background and Motivation

- Surface ozone over LI, CT, and NY metro frequently exceed NAAQS levels for humans.
- Amplification of these plumes due to complex interplay of over-land and marine boundary layer dynamics is not well understood.



Relevant Research Questions to LISTOS

- How does the evolution of the PBL across Long Island, Long Island Sound, and Coastal CT impact the distribution of air pollutants and the generation of O₃?
- What is the impact of the coastal CT low level jet (first observed in LISTOS 2018) on pollutant transport from NYC to the CT coast?
- What is the chemical evolution of O₃ within this region?

LISTOS 2018

- During the Summer of 2018, we characterized the wind fields across Long Island, Long Island Sound, and coastal Connecticut in the western region (closer to NYC) and the eastern region during various weather patterns.
- Research aircraft fitted with Aventech AIMMS-20 (aircraft integrated meteorological measurement system) measures 3-D wind vector at 20 Hz, T at 1 Hz and RH at 0.5 Hz
- 14 research flights were made between June 15 and Jul 28 2018.
- We also flew during some high O₃ events and collected O₃ (2B technologies), CO₂ (Licor 6252) concentrations as well.



Six out of 14 research flights were during high ozone events in the region.

8-Hour Averages

Values (in red) below are maximum daily 8-hour ozone concentrations measured in parts per million, exceeding the 2015 Federal standard of .070 ppm.

Note: 4th Max. column indicates that the 4th highest 8-hr avg for all days to date, not just those listed

	ID	4th Max.	2-May	24-May	25-May	26-May	29-May	17-Jun	18-Jun	30-Jun	1-Jul	2-Jul	9-Jul	10-Jul	13-Jul	14-Jul	16-Jul	28-Jul	6-Aug
NYC METRO																			
Babylon	5150-02	0.074	0.069	0.067	0.063	0.064	0.046	0.069	0.052	0.07	0.081	0.083	0.063	0.082	0.046	0.060	0.066	N/A	0.074
Holtsville	5151-10	0.076	0.07	0.063	0.062	0.059	0.051	0.068	0.048	0.061	0.079	0.082	0.058	0.086	0.049	0.063	0.067	0.051	0.076
Riverhead	5155-01	0.072	0.072	0.062	0.068	0.075	0.061	0.068	0.058	0.058	0.069	0.061	0.068	0.086	0.055	0.067	0.074	0.048	0.070
Flax Pond	5151-12	0.074	N/A	N/A	N/A	N/A	N/A	0.064	0.06	0.058	0.057	0.074	0.072	0.094	0.059	0.073	0.074	0.045	0.065
CCNY	7093-25	0.077	0.066	0.062	0.061	0.062	0.068	0.071	0.078	0.074	0.082	0.086	0.072	0.077	0.055	0.058	0.071	0.068	0.074
Pfizer Lab	7094-10	0.077	0.067	0.063	0.065	0.064	0.064	0.073	0.07	0.079	0.069	0.085	0.074	0.081	0.059	0.063	0.072	0.068	0.077
IS 52	7094-07	0.071	0.066	0.062	0.063	0.065	0.06	0.07	0.071	0.078	0.071	0.074	0.07	0.081	0.054	0.062	0.068	0.066	0.071
Queens College 2	7096-15	0.073	0.071	0.068	0.073	0.067	0.054	0.07	0.054	0.072	0.08	0.076	0.063	0.082	0.047	0.063	0.071	0.066	0.071
Fresh Kills West	7097-17	0.077	0.065	0.061	0.064	0.057	0.074	0.067	0.078	0.065	0.077	0.081	0.067	0.078	0.060	0.057	0.071	N/A	0.062
White Plains	5902-04	0.078	0.072	0.062	0.07	0.065	0.074	0.072	0.08	0.072	0.064	0.093	0.073	0.072	0.071	0.064	0.080	0.078	0.065
Rockland County	4353-02	0.072	0.072	0.056	0.066	0.064	0.058	0.059	0.069	0.06	0.056	0.115	0.055	0.065	0.072	0.059	0.073	0.051	0.043

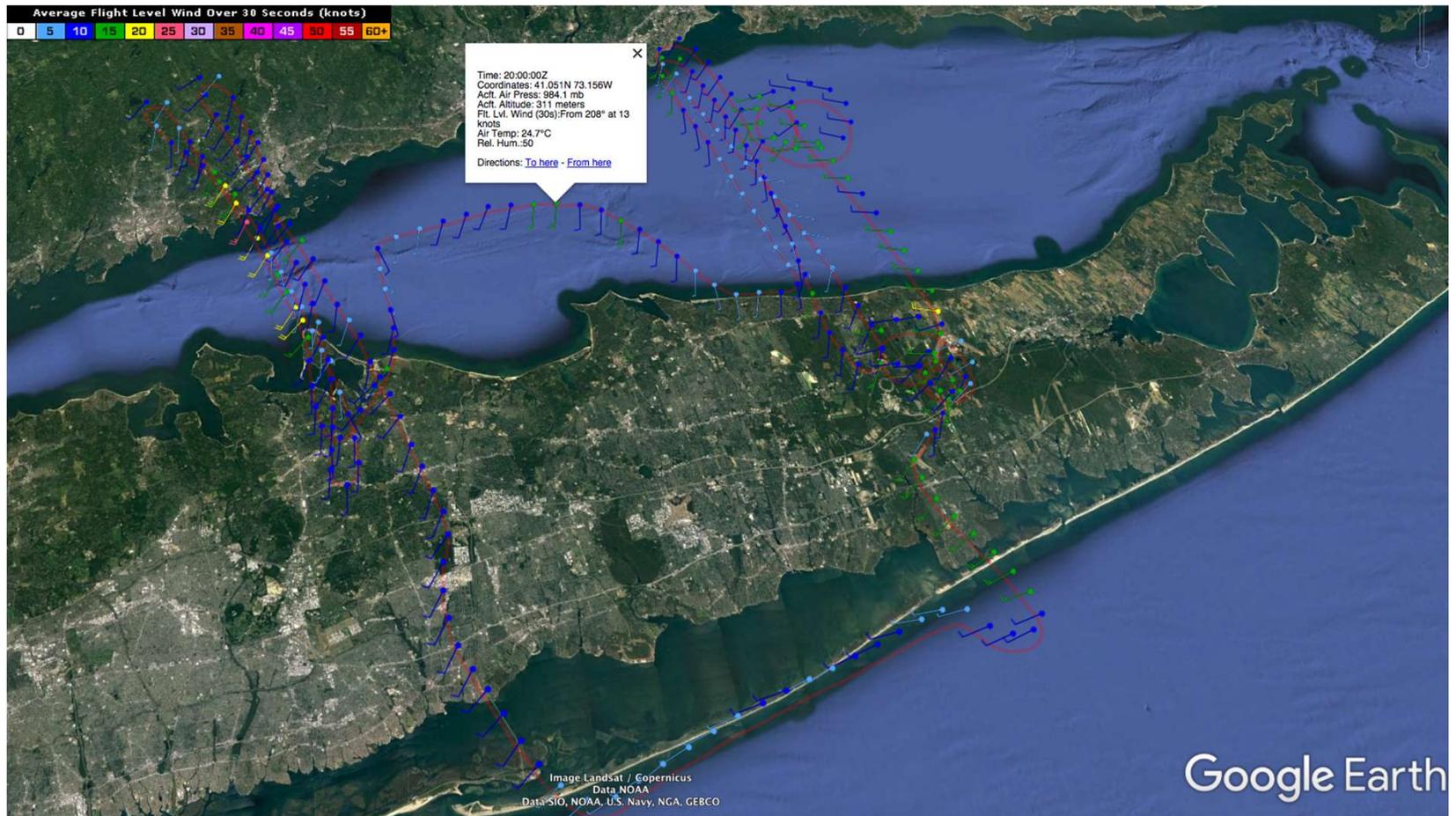


↑ = flight date

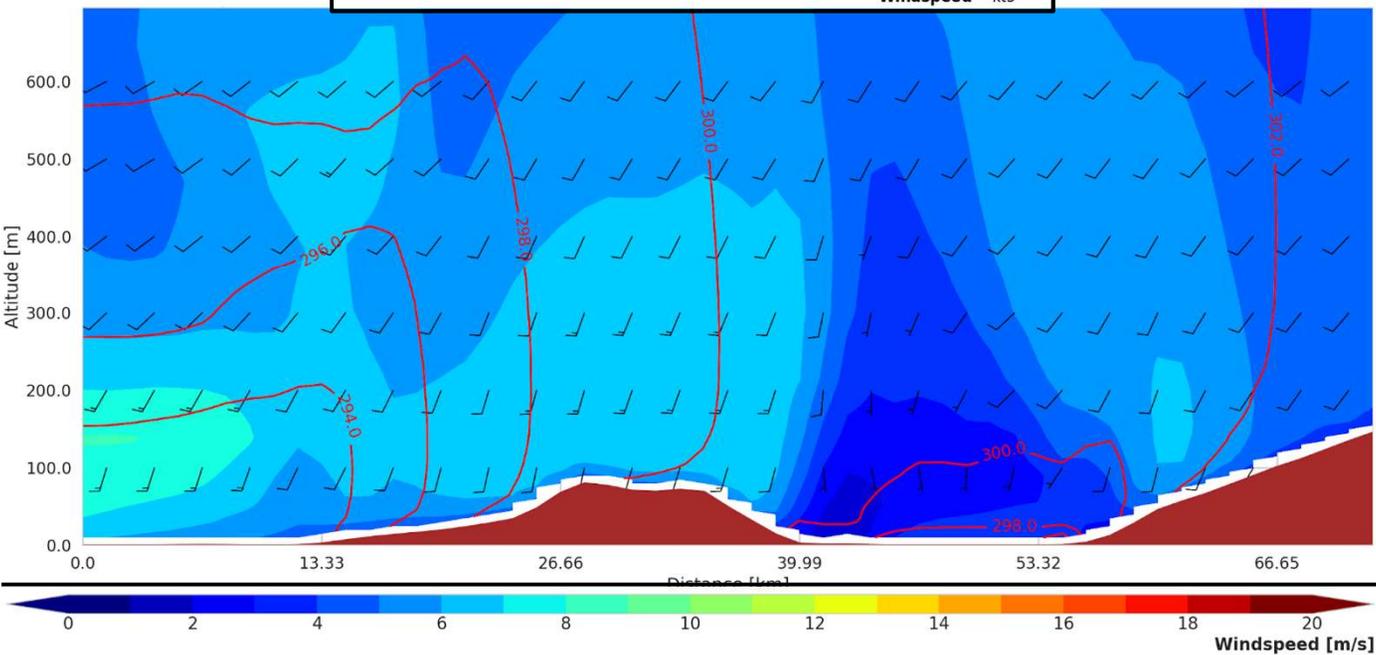
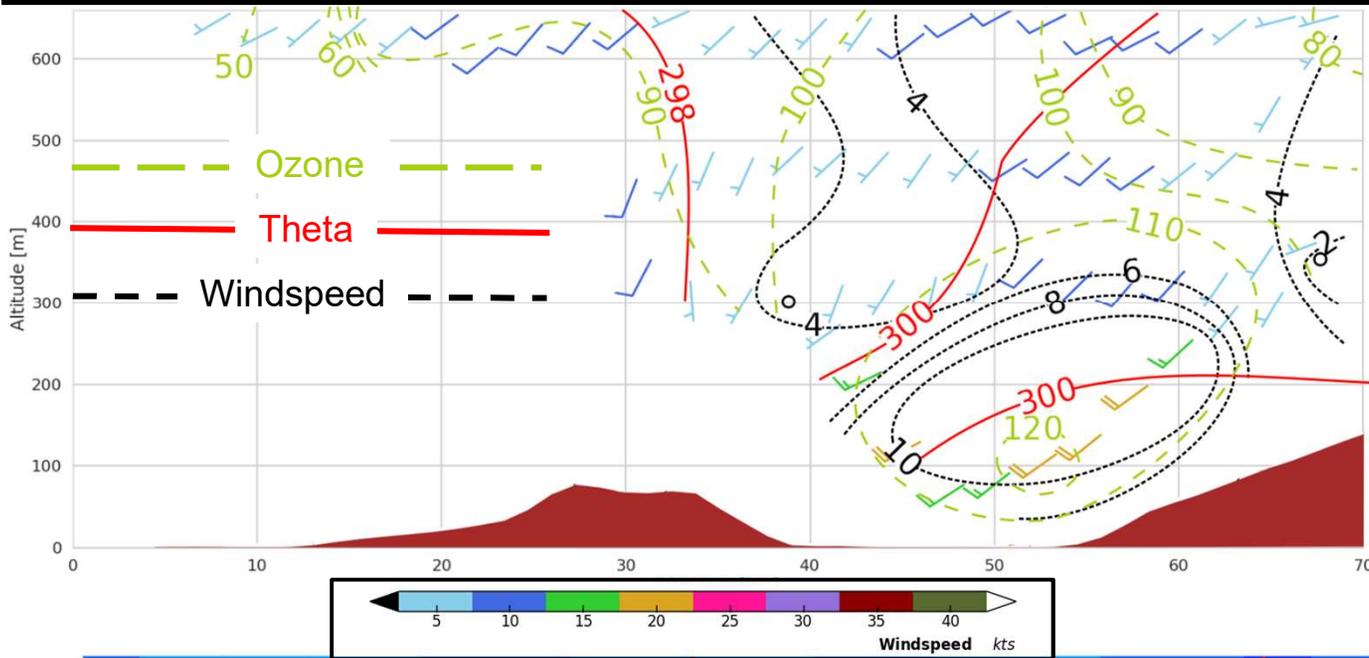
Source: NYSDEC (<https://www.dec.ny.gov/chemical/38377.html>)

LISTOS 2018 products

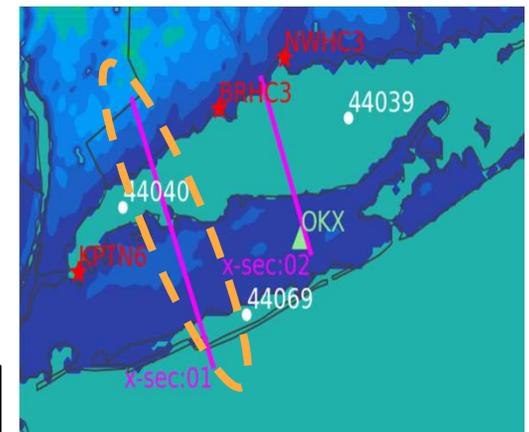
- Wind data from 14 flights have been uploaded to the NASA website. O3, RH, and CO2 are also available for most flights.
- All data are also available directly from me in different formats.
- Our WRF simulations output are available upon request.
- We have also generated kmz files for each flight with data summaries and flight tracks; available by request.



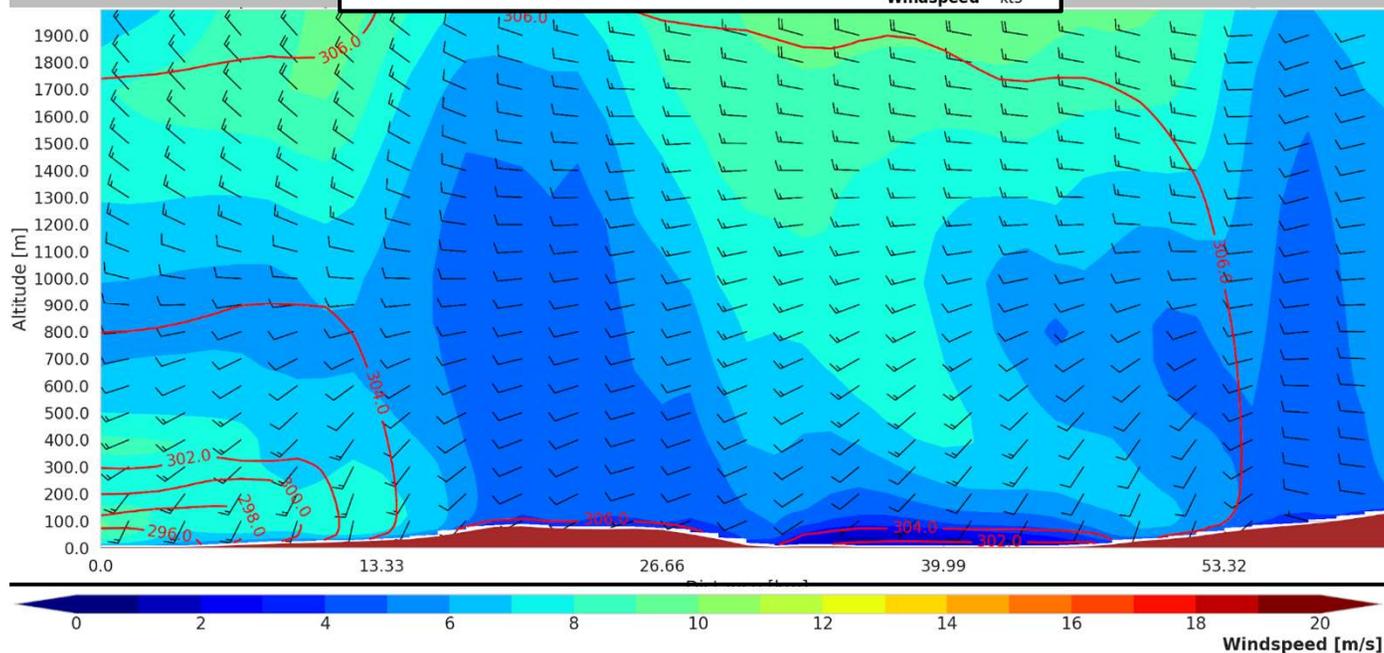
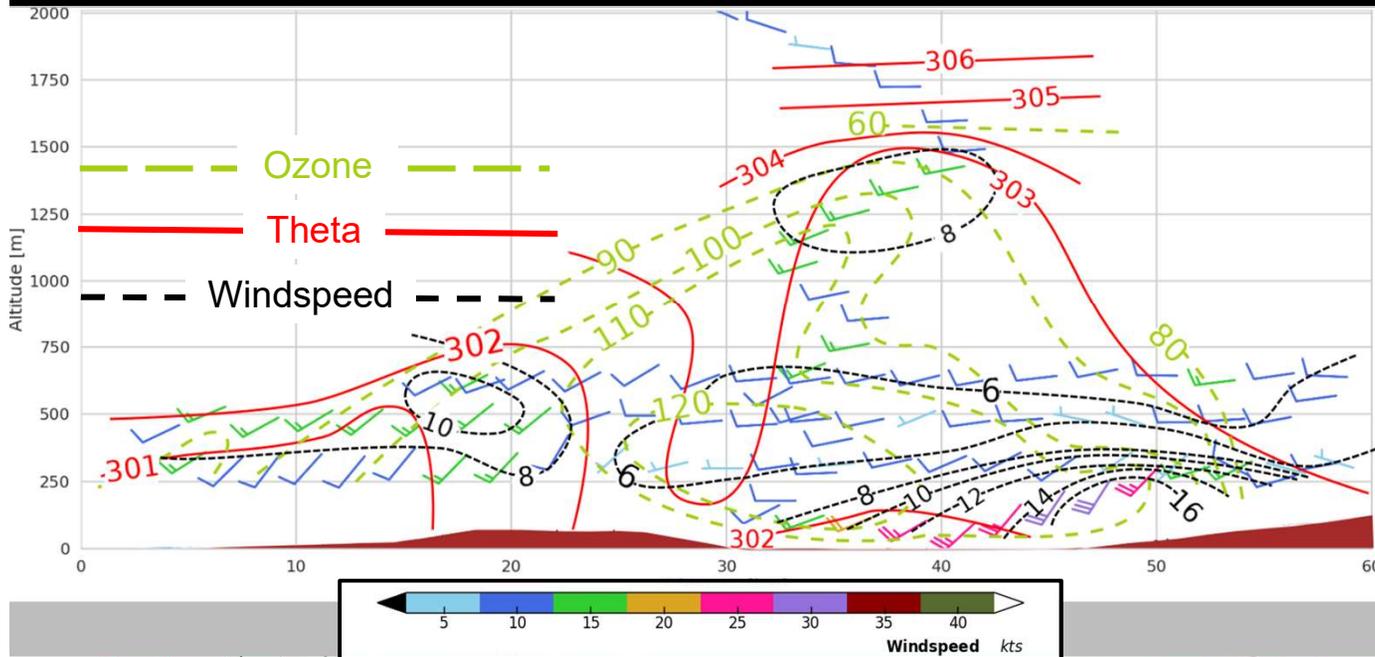
LISTOS 2018



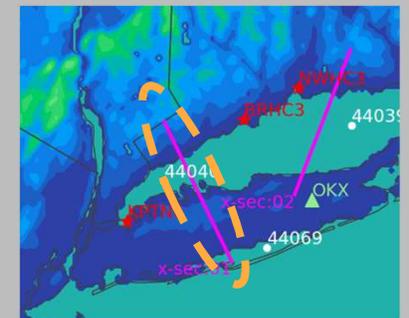
Novel observations include the existence of a low level jet off the coast of western CT during high ozone events. High ozone concentrations coincided with warmer air and maximum wind speeds.



LISTOS 2018



- On at least one occasion, max O_3 is observed within the lower region of the PBL over LIS; is this consistent with chemical models?



Future plans

The combination of relevant airborne observations and model simulations will be needed to answer these questions. Of course, these questions also tie in to various other important topics (e.g., O₃ precursors, atmospheric chemistry, etc.).

Observations should be carried out in consultation with chemical weather forecasters and synoptic meteorologists.

LISTOS 2019

- We will conduct research flights in conjunction with U Md (Dickerson and Ren) during 2019:
- UltraPure Air LLC's aircraft fitted with Aventech AIMMS-20 (aircraft integrated meteorological measurement system) measures 3-D wind vector at 20 Hz, T at 1 Hz and RH at 0.5 Hz
- Some *in situ* chemical observations will also be made (CO, CO₂, NO_x, O₃, H₂O, aerosol load, whole air samples).
- 2-D winds and chemical observations will also be made by U. Md (R. Dickerson, X. Ren).
- Flights will be planned in parallel.

