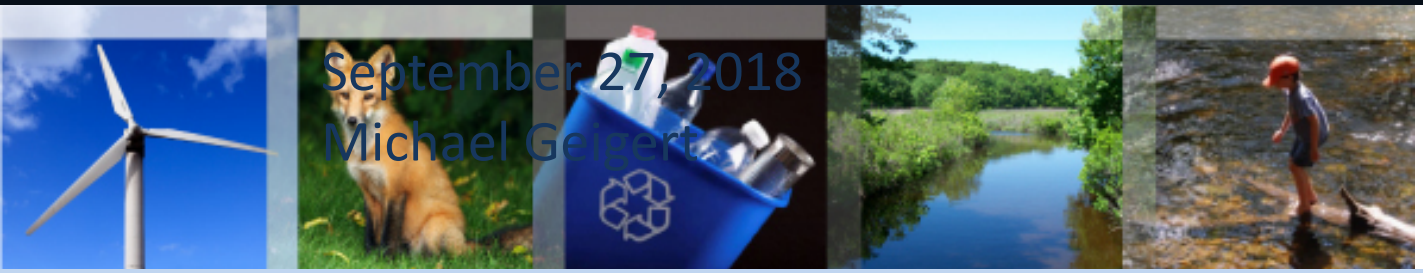
Connecticut Department of Energy and Environmental Protection



September 27, 2018
Michael Geigert

Connecticut Department of
ENERGY & ENVIRONMENTAL PROTECTION

2018 Ozone Season

23 Exceedance Days

Last Year: 20 Days

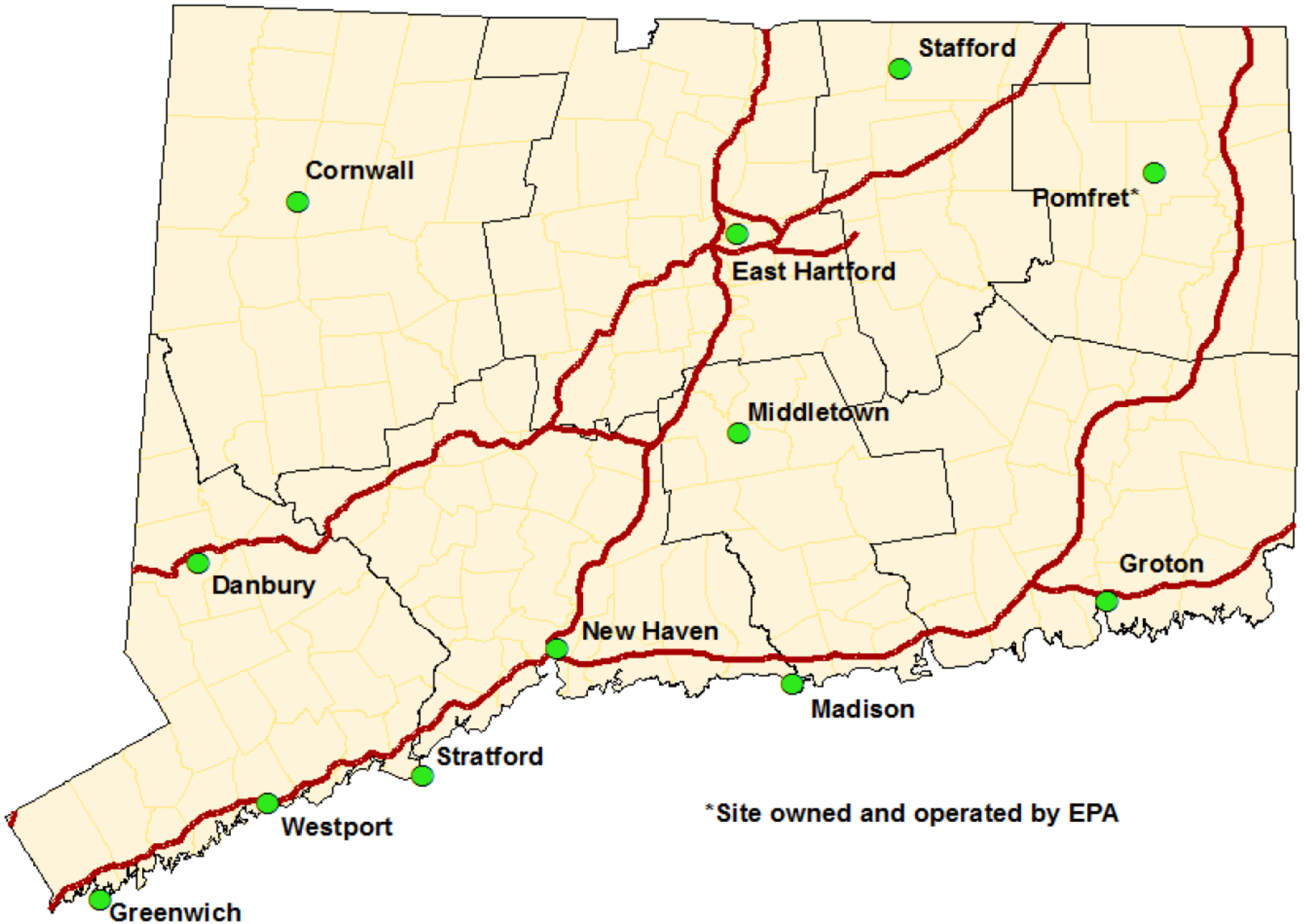
32 Days 90°+ (BDL) This Season

(4 in May & 4 in Sept)

October 11, 2018

Sam Sampieri & Michael Geigert

CT Ozone Monitors



2018 Design Values

	Site Name	To Date: Prelim 2018 DV	2018 Compliance Status x = Violating NAAQS: 2015 NAAQS	2008 NAAQS	1997 NAAQS	We squeaked by-- How close were we? # Needed to Next NAAQS in Violation (key monitors in each NA are highlighted in RED)				
SWCT Portion of NYC Area	Danbury	76	X	X		4	more days >	101	ppb day(s) violate the	1997 NAAQS
	Greenwich	79	X	X		4	more days >	101	ppb day(s) violate the	1997 NAAQS
	Madison	81	X	X		4	more days >	88	ppb day(s) violate the	1997 NAAQS
	Middletown	78	X	X		4	more days >	95	ppb day(s) violate the	1997 NAAQS
	New Haven	74	X			1	more days >	77	ppb day(s) violate the	2008 NAAQS
	Stratford	82	X	X		3	more days >	90	ppb day(s) violate the	1997 NAAQS
	Westport	82	X	X		3	more days >	92	ppb day(s) violate the	1997 NAAQS
Greater CT	Cornwall	70				1	more days >	71	ppb day(s) violate the	2015 NAAQS
	East Hartford	69				2	more days >	69	ppb day(s) violate the	2015 NAAQS
	Groton	75	X			1	more days >	74	ppb day(s) violate the	2008 NAAQS
	Stafford	71	X			4	more days >	85	ppb day(s) violate the	2008 NAAQS
	Abington	71	X			4	more days >	85	ppb day(s) violate the	2008 NAAQS
Number of Exceedance Days to Date			23							

The 1997 standard was repealed with the 2008 Implementation rule. Effective April 6, 2015

Ozone in Connecticut 2018

- 23 exceedance days in 2018

2018 Exceedances	May				June			July								August							Sept	Count
Site	2	3	25	26	17	18	30	1	2	9	10	13	14	16	28	6	7	8	16	27	28	29	6	
Abington	79	76	M	M	62	68	54	50	55	59	72	55	38	64	48	50	60	51	45	48	71	69	50	4
Cornwall	72	58	71	68	60	70	61	65	80	58	64	62	61	75	45	57	58	49	49	48	53	59	48	4
Danbury	75	66	72	68	62	82	74	48	92	65	70	62	69	81	57	51	72	57	52	49	56	58	53	7
East Hartford	66	62	67	62	59	83	59	53	59	65	60	59	57	67	54	54	70	67	30	44	63	57	47	1
Greenwich	71	68	67	77	60	74	60	57	72	86	95	72	77	81	79	86	64	84	61	73	83	69	69	14
Groton	75	61	68	74	69	53	61	69	81	61	82	46	30	69	49	61	52	53	55	56	74	74	62	6
Madison	71	64	71	80	72	59	64	77	71	75	86	49	57	73	52	70	52	64	71	61	77	87	74	13
Middletown	78	76	77	70	64	74	56	55	58	73	77	58	57	73	52	58	67	66	47	55	77	66	61	8
New Haven	65	59	59	82	54	45	58	59	67	63	88	61	66	85	59	63	60	72	50	47	68	58	66	4
Stafford	73	63	71	65	58	82	61	51	54	59	66	52	42	61	48	51	71	58	41	43	56	53	44	4
Stratford	70	67	70	83	58	63	64	75	72	77	99	65	72	80	68	74	61	78	71	71	87	90	78	14
Westport	71	70	75	84	59	66	60	62	64	80	94	64	77	77	70	77	67	84	57	64	84	77	72	12
# days > Federal Standard	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	

How Did We Do This Year?

Actual Exceedences Days = 23
Forecast Exceedences Days = 18

Month	Actual Dates	Forecast Dates
May	2, 3, 25, 26	2, 26
June	17, 18, 30	17, 18, 30
July	1, 2, 9, 10, 13, 14 16, 28	1, 2, 3*, 10, 16
August	6, 7, 16, 17, 27, 28, 29	6, 7, 16, 17, 27, 28, 29
September	6	6
Total	23	18

Ct's Forecasted Unhealthy Ozone Days

https://www.ct.gov/deep/cwp/view.asp?a=2684&Q=321760&deepNav_GID=1619

DEEP: Air Quality and Health

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ENERGY ENVIRONMENTAL QUALITY NATURAL RESOURCES OUTDOOR RECREATION PURA

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- Air Quality and Health Effects
- Air Quality Planning
- Air Regulations
- Compliance Assurance
- Emissions Inventory
- Mobile Sources
- Working Together for Clean Air
- Environmental Protection Begins With You
- Air Main Page
- Main Menu

Report an ENVIRONMENTAL Concern/Problem

Calendar of Events

Laws and Regulations

Maps and GIS Data

What's IN? What's OUT? Learn about the new, universal list for recycling.

No Child Left Inside

THE OFFICIAL CT STATE PARKS & FORESTS OUTDOORS GUIDE DOWNLOAD OUR FREE GPS MOBILE APP Pocket Ranger®

Air Quality and Health

Local air quality affects how we live and breathe. Like the weather, it can change from day to day or even hour to hour. A key tool in understanding the health effects associated with outdoor air quality is the Air Quality Index, or AQI. When AQI values are above 100, air quality is considered to be unhealthy. The CT DEEP issues the AQI daily, to provide the citizens of Connecticut simple information on local air quality. More information on the AQI and health effects can be found on these following links:

Connecticut Daily Air Quality Index (AQI)
View the daily predicted air quality index values for various towns throughout the State.

National Air Quality (EPA Airnow)
View the national air quality predictions and measurements, as well as those for Connecticut, on the national EPA Airnow web site.

Historical Ozone Data
View tables of daily maximum 8-hour ozone averages as well as peak 1-hour values dating back to 1998 for Connecticut monitors.

Air Pollutant Descriptions
The six "criteria" pollutants are listed and explained.

Air Quality Index (AQI) Health Effects
Learn what the AQI levels mean about possible health effects.

National Ambient Air Quality Standards (NAAQS)
The National Ambient Air Quality Standards for the six "criteria" pollutants are listed.

Air Quality Index – A Guide to Air Quality and your Health
(EPA Airnow, PDF)

Indoor Air Quality
The Deparment of Public Health's Indoor Environmental Quality Unit provides information and services related to indoor air quality, among other indoor [illegible]

Air Quality Guide for Particle Pollution (PDF)
Harmful particle pollution is one of our nation's most common air pollutants. Use the chart on the guide to help reduce your exposure and protect your health.

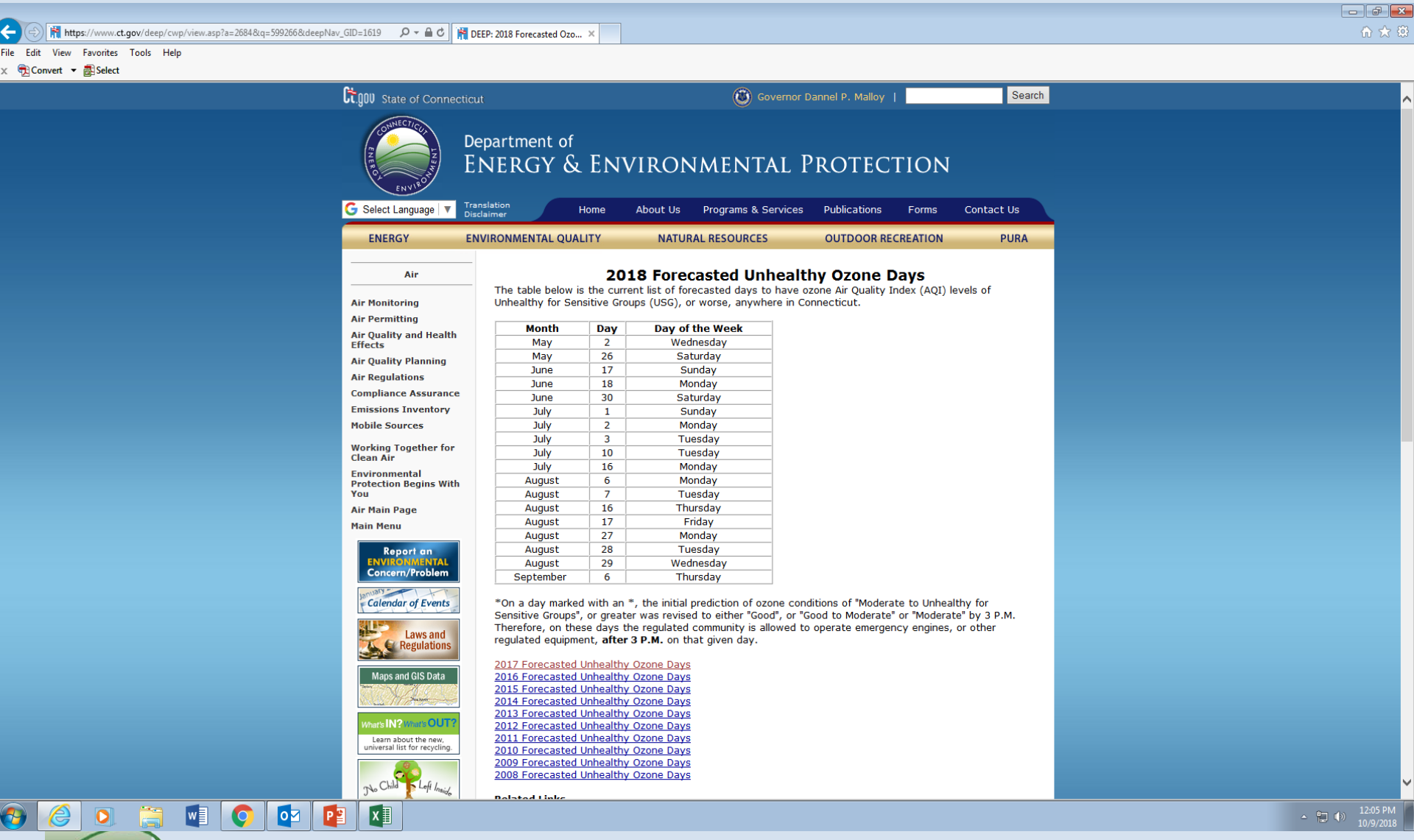
Connecticut's Forecasted Unhealthy Ozone Days
View the list of the days forecasted to be unhealthy. Tracking and documenting these days is important [illegible] their activities on forecasted unhealthy ozone days.

Subscribe to the Air Quality Information and Ozone Forecast Listservs

- Subscribe to the Air Quality Information listserv to receive a daily ozone forecast between May 1 through September 30, and a daily PM2.5 forecast year round.
- Subscribe to the Ozone Forecast listserv to receive a daily 8-hour ozone forecast that is

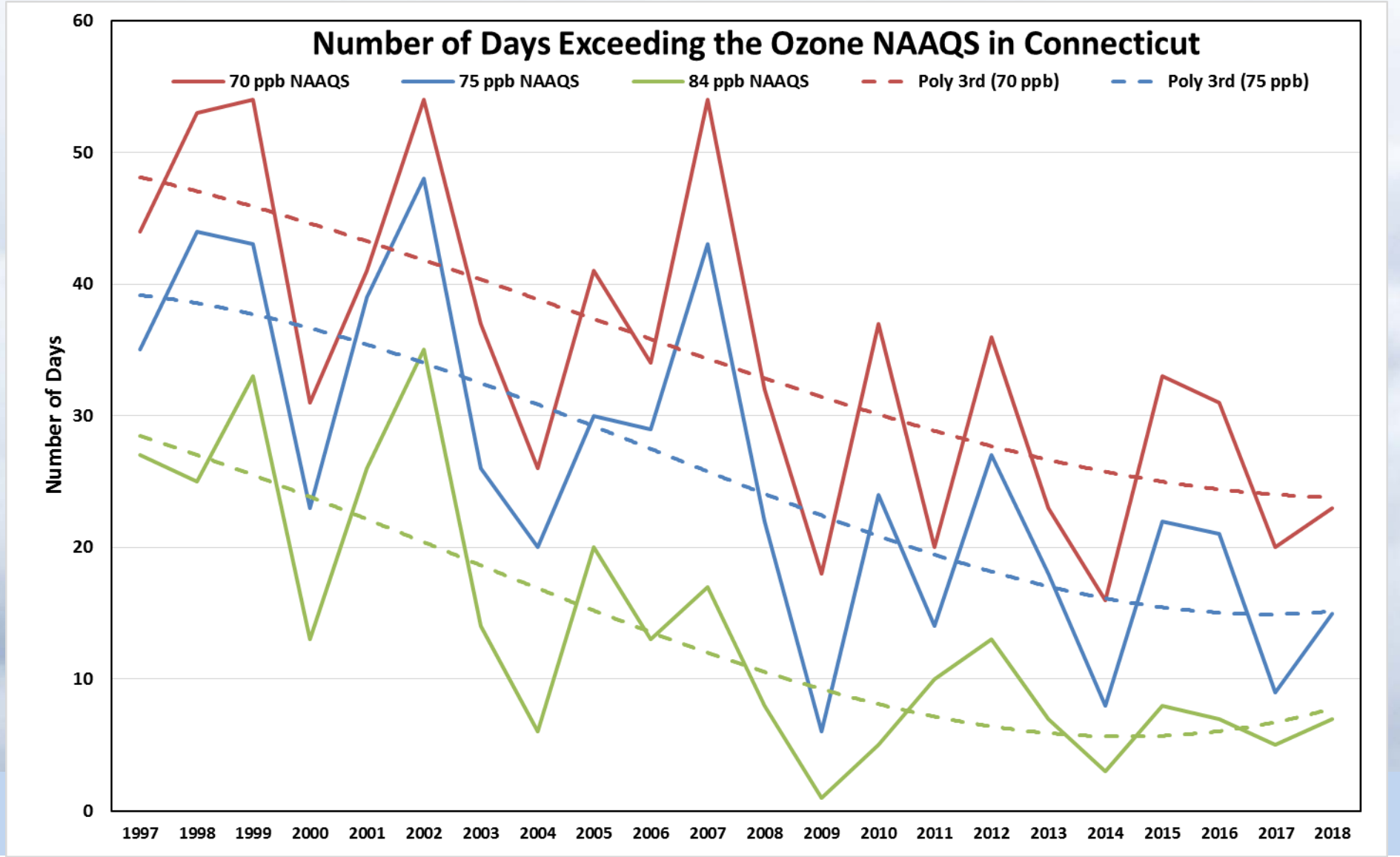
12:33 PM 10/9/2018

Ct's Forecasted Unhealthy Ozone



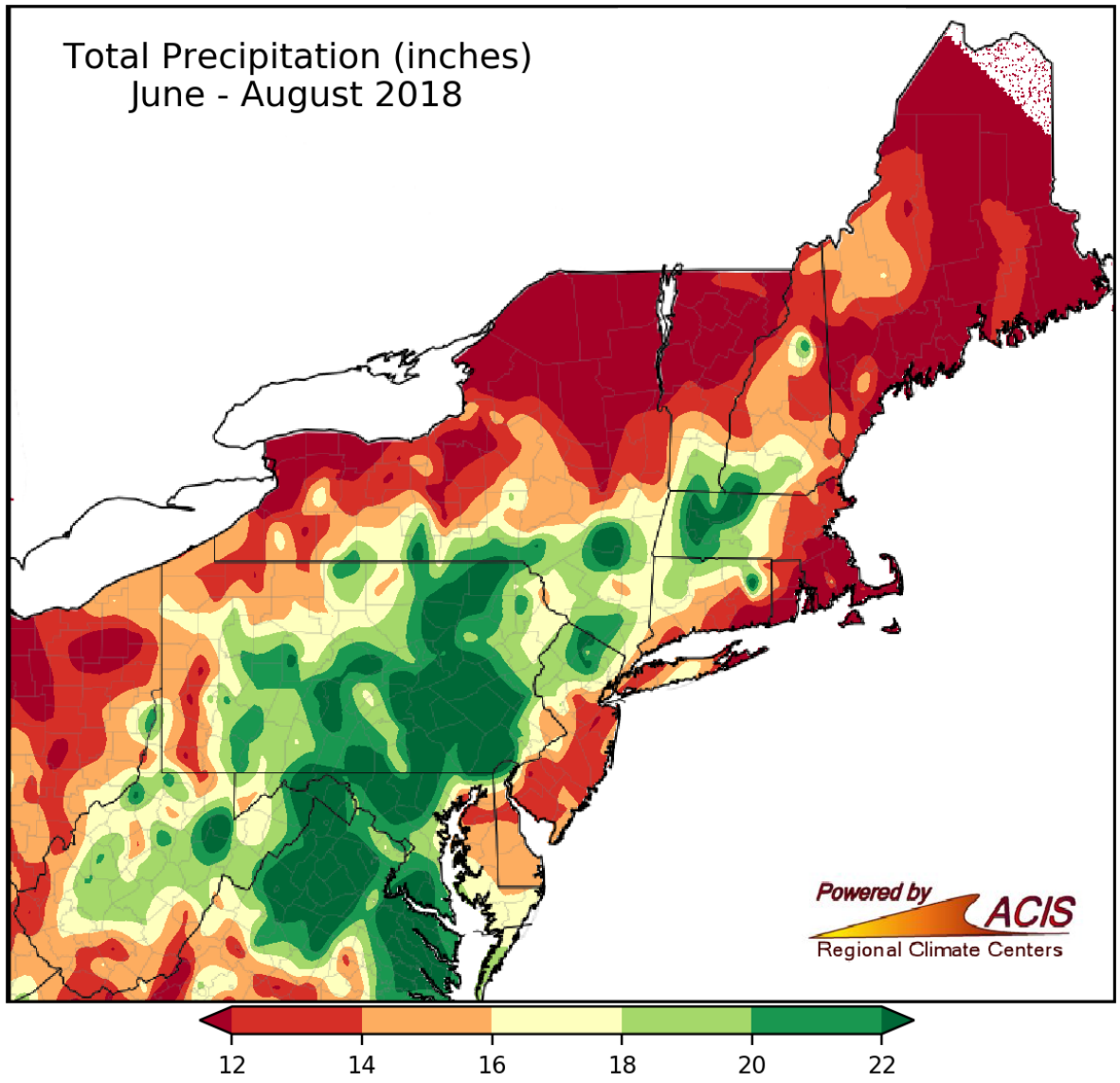
Connecticut Department of Energy and Environmental Protection

Trend Graph- Exceedance Days



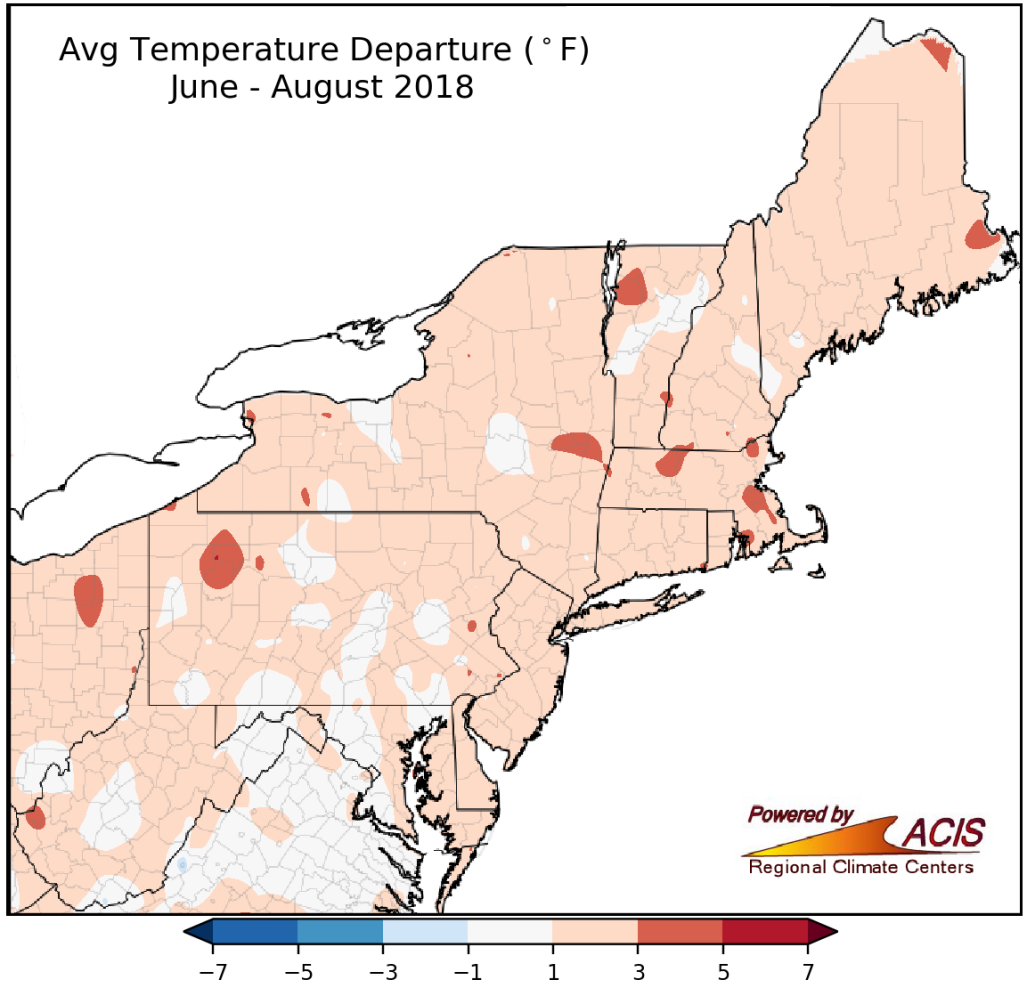
2018 Summer Precipitation Summary

- Overall, a wetter summer for the Northeast.

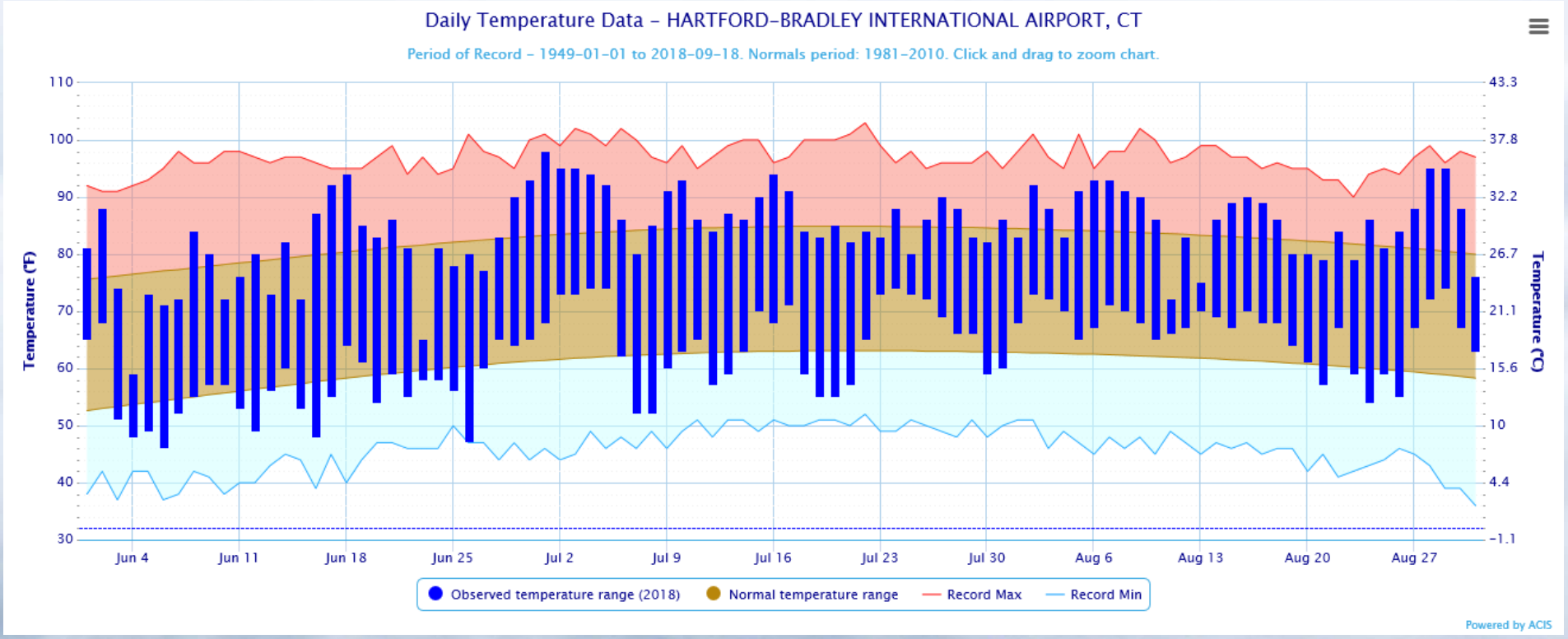


Summer Temperature summary

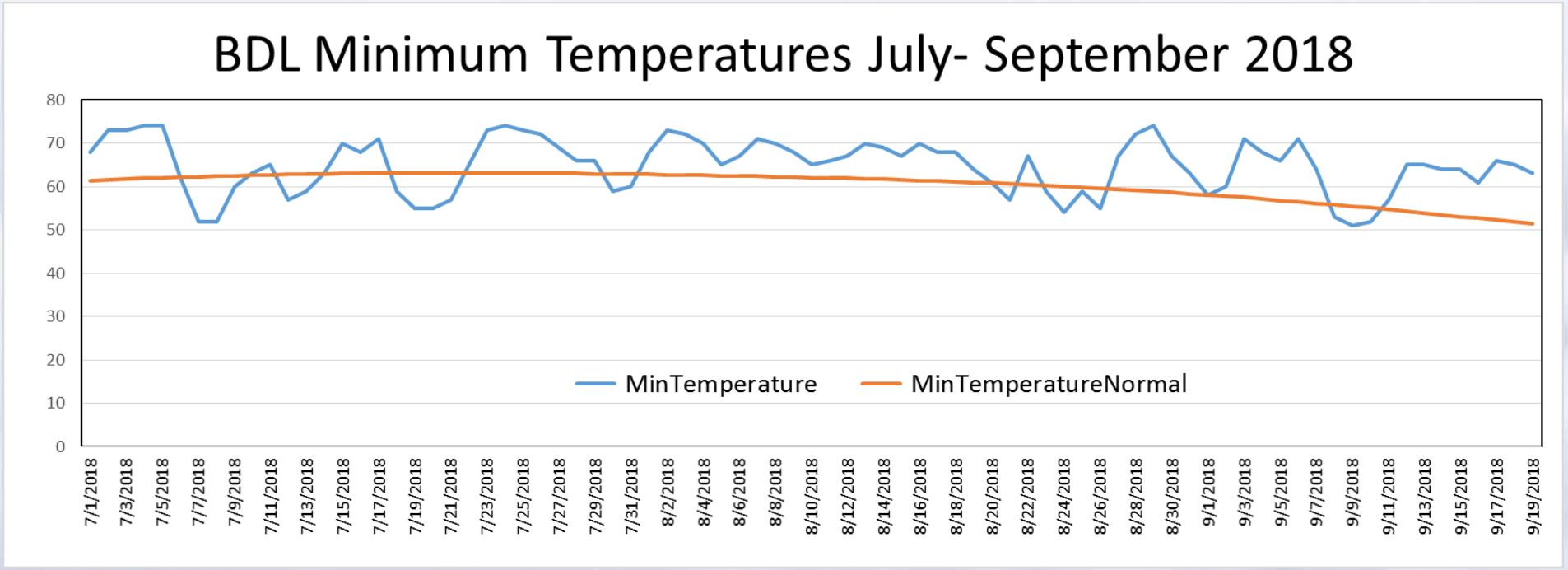
- Generally, above normal temperatures over the Northeast.



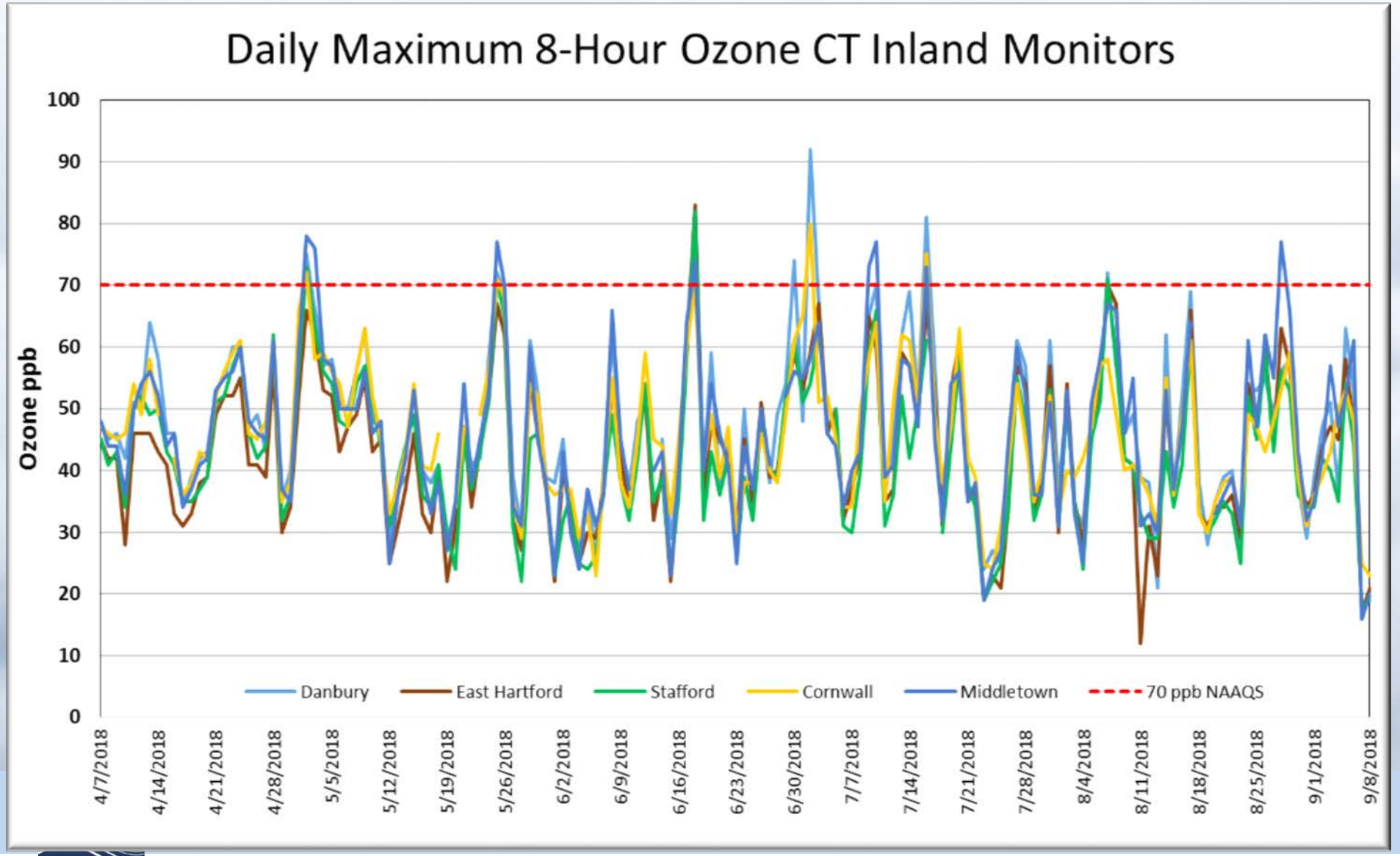
32 Days of 90° + May-September



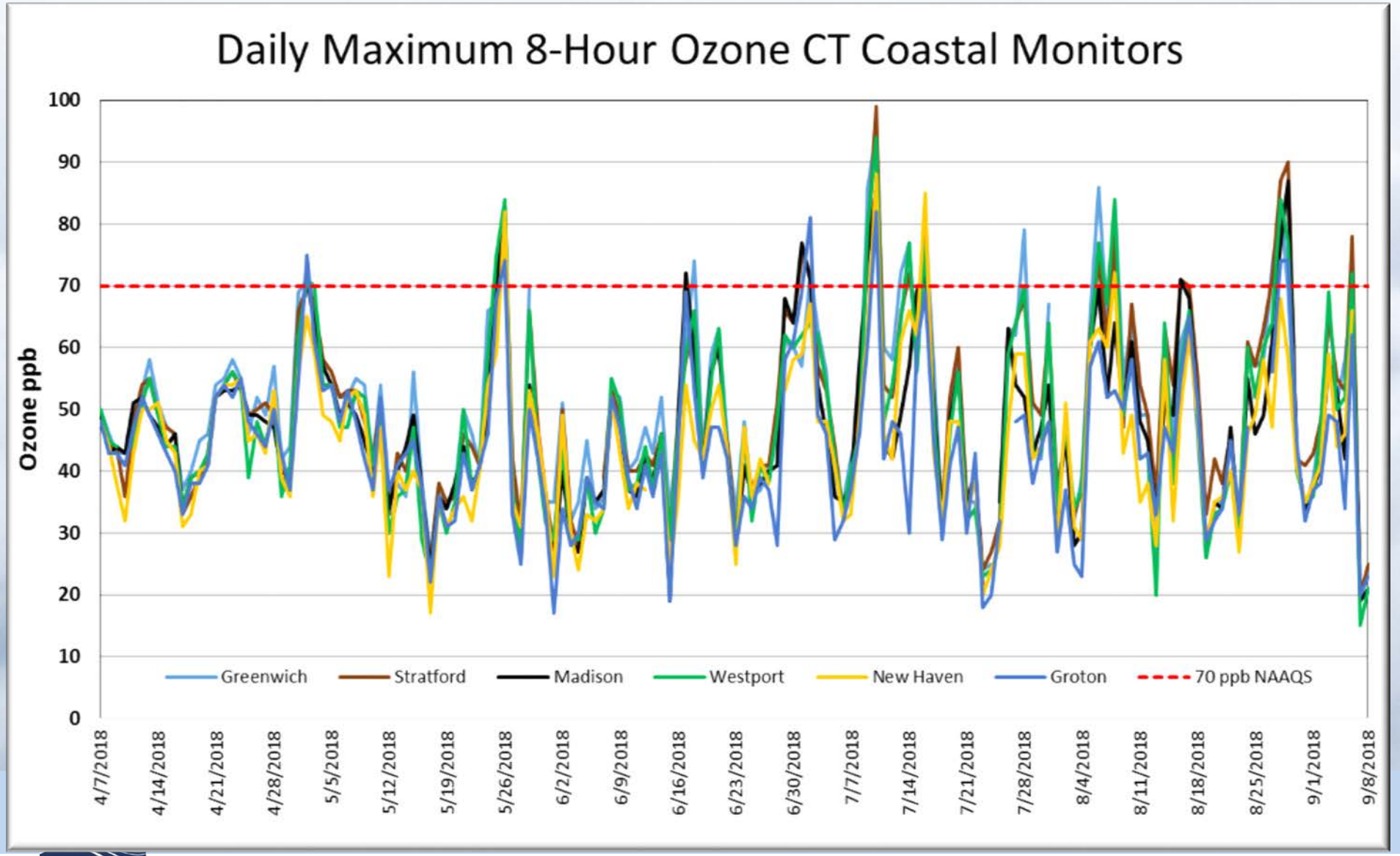
Higher Dew Points Reflected in Minimum Temperatures



Inland Monitors

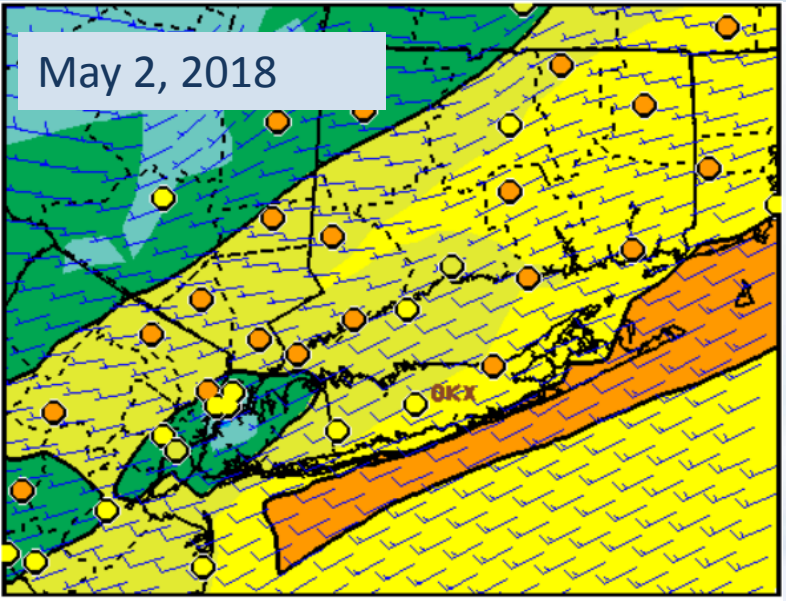


Coastal Monitors



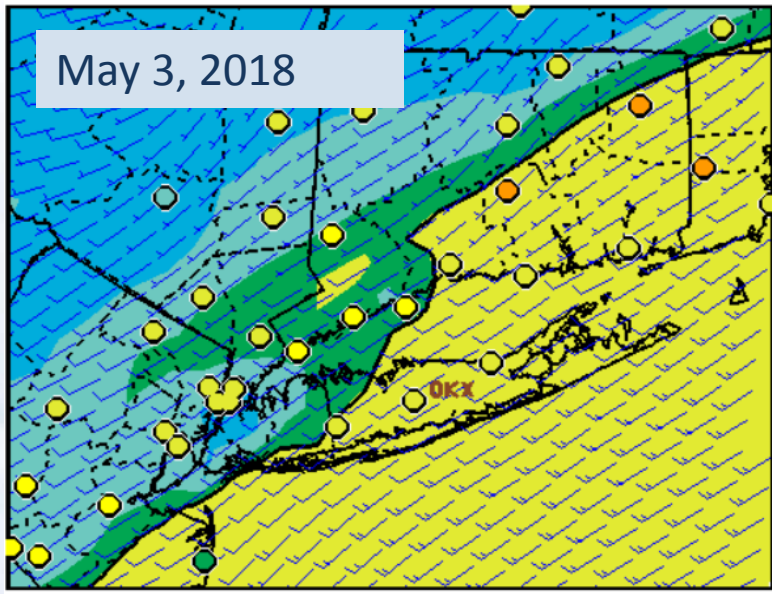
May 2018 Events

May 2, 2018



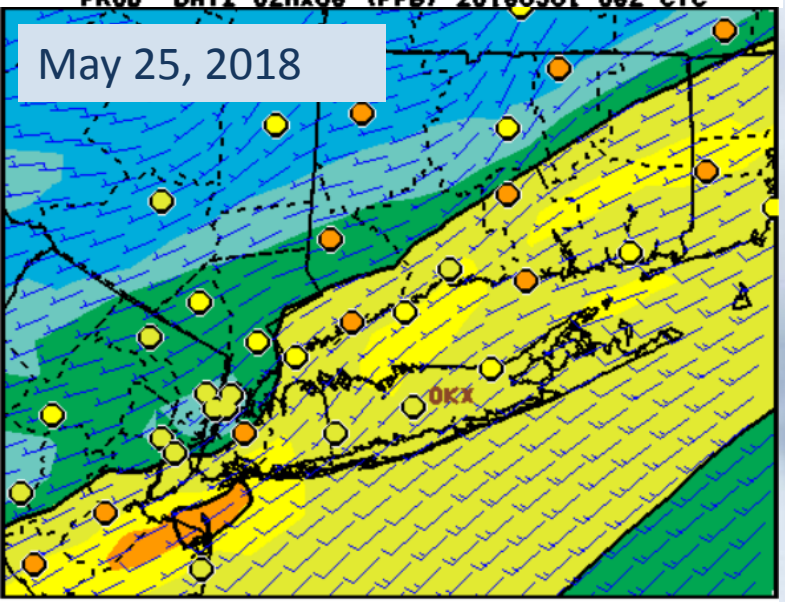
PROD DAY2 OZMXO8 (PPB) 20180501 06Z CYC

May 3, 2018



PROD DAY2 OZMXO8 (PPB) 20180502 06Z CYC

May 25, 2018



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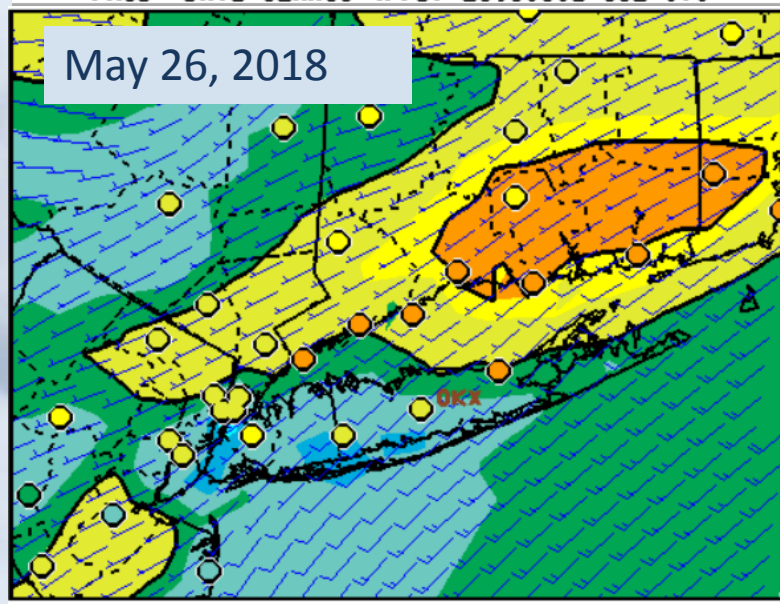
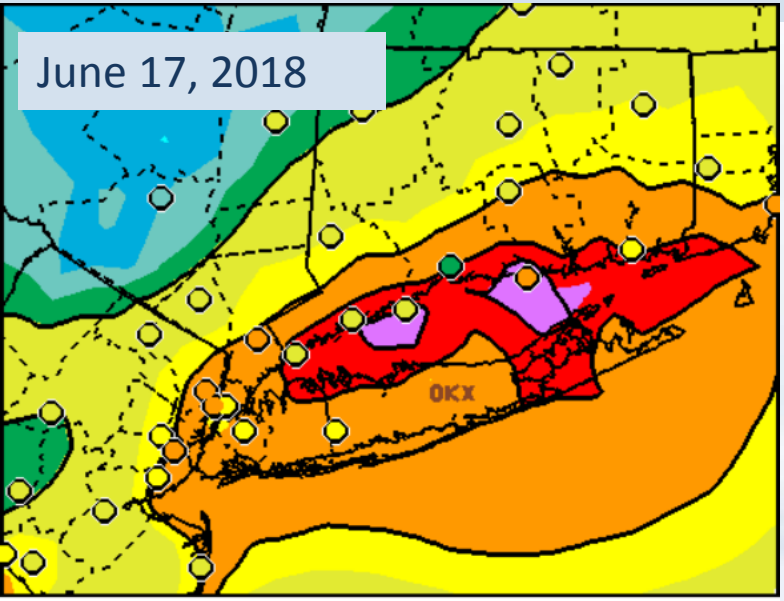
May 26, 2018



PROD DAY2 OZMXO8 (PPB) 20180525 06Z CYC

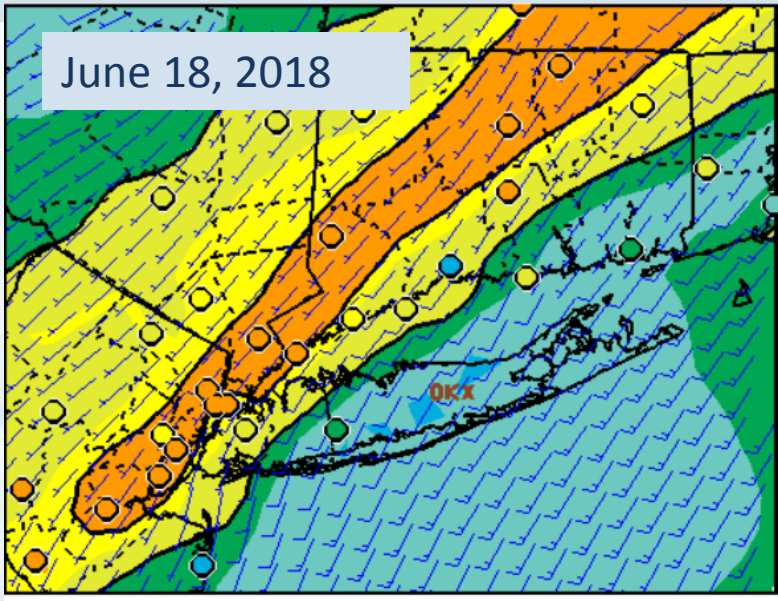
June 2018 Events

June 17, 2018



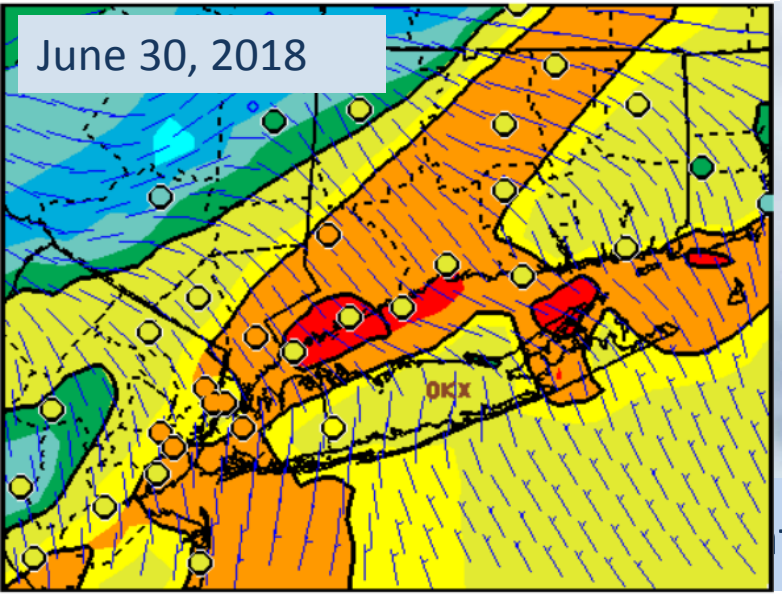
PROD DAY2 OZMX08 (PPB) 20180616 12Z CYC

June 18, 2018



PROD DAY2 OZMX08 (PPB) 20180617 06Z CYC

June 30, 2018



PROD DAY2 OZMX08 (PPB) 20180629 06Z CYC

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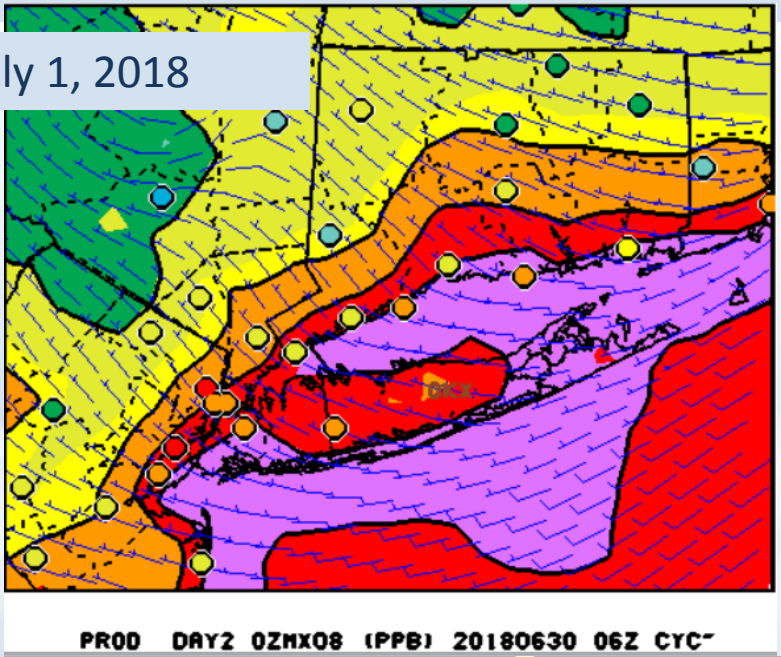
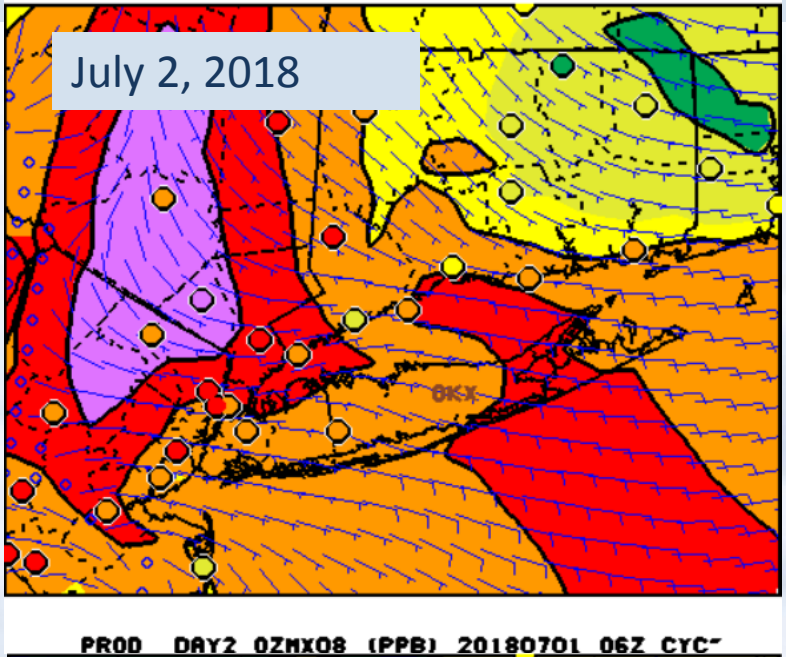
July 2018 Events

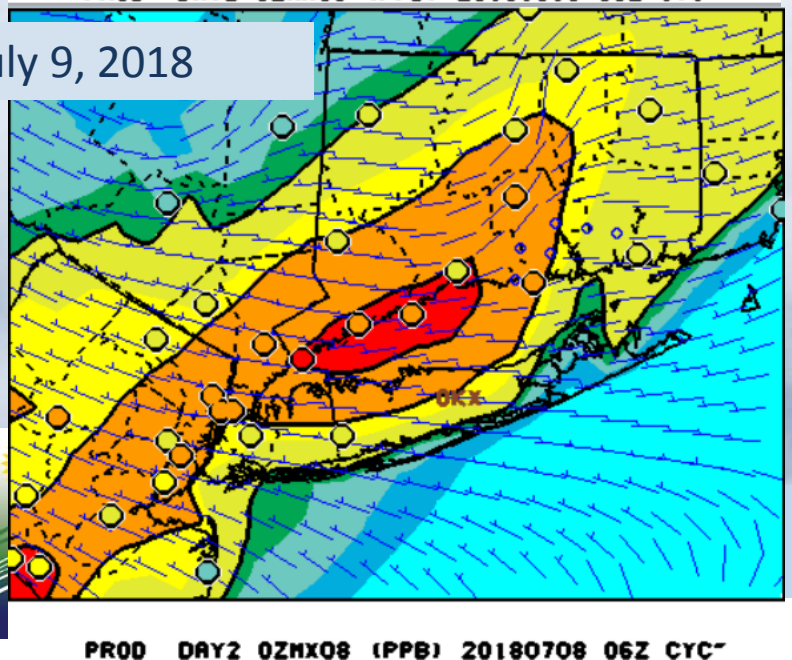
July 1, 2018



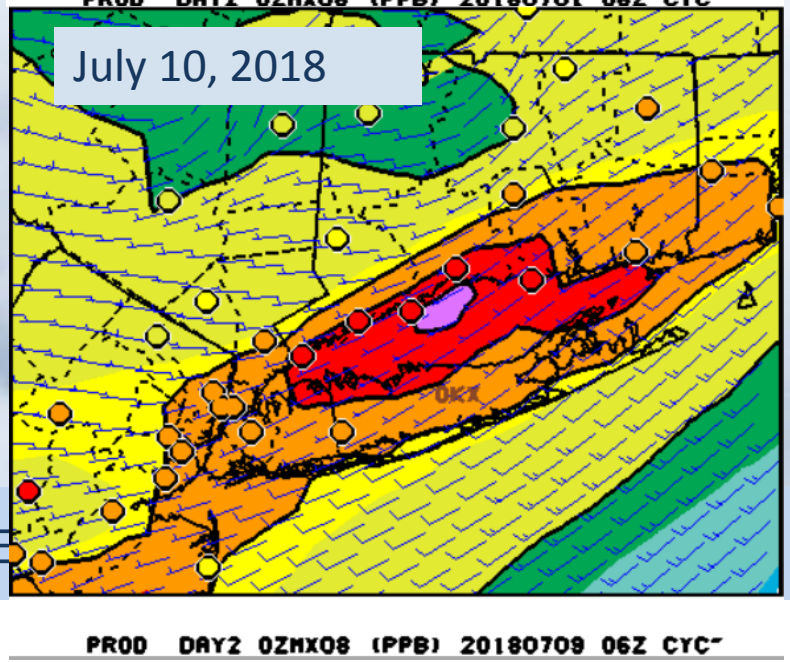
July 2, 2018



July 9, 2018



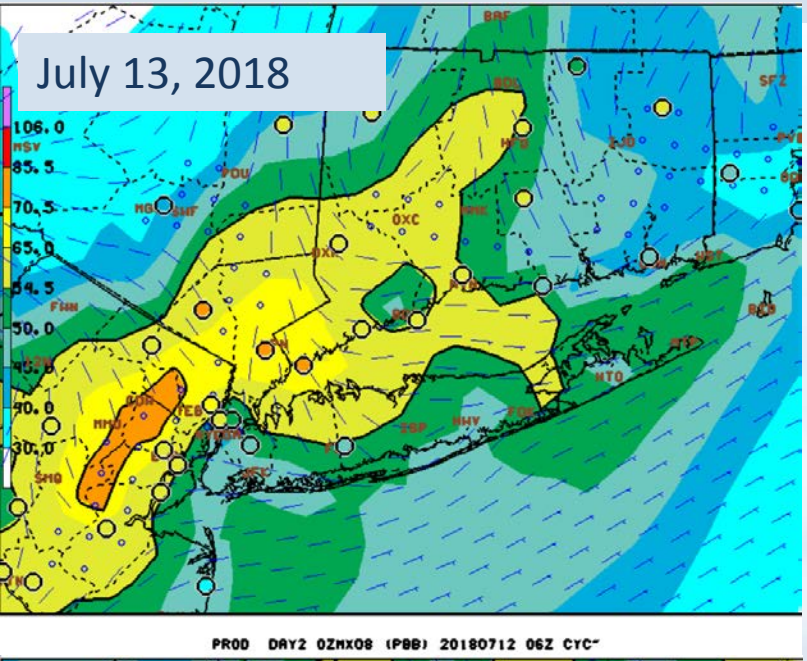
July 10, 2018



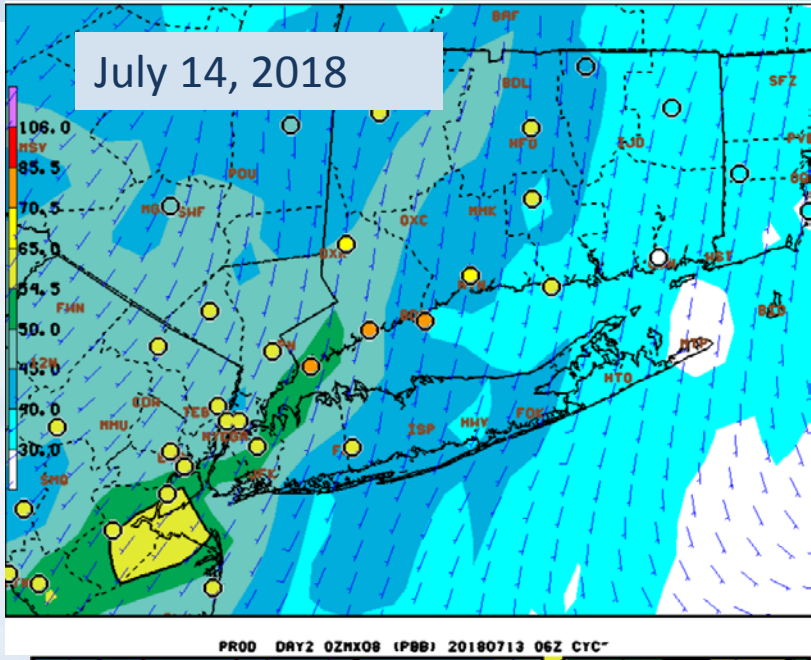
Energy and E

July 2018 Events

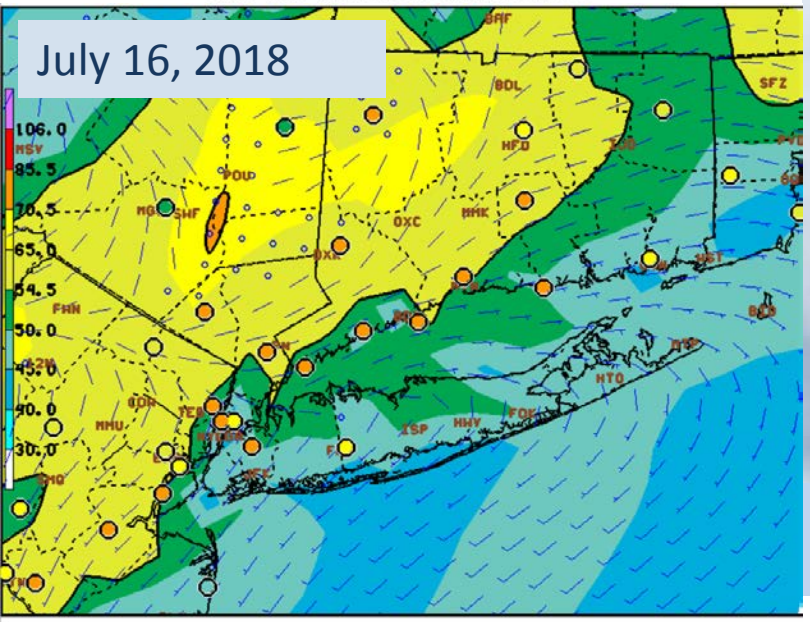
July 13, 2018



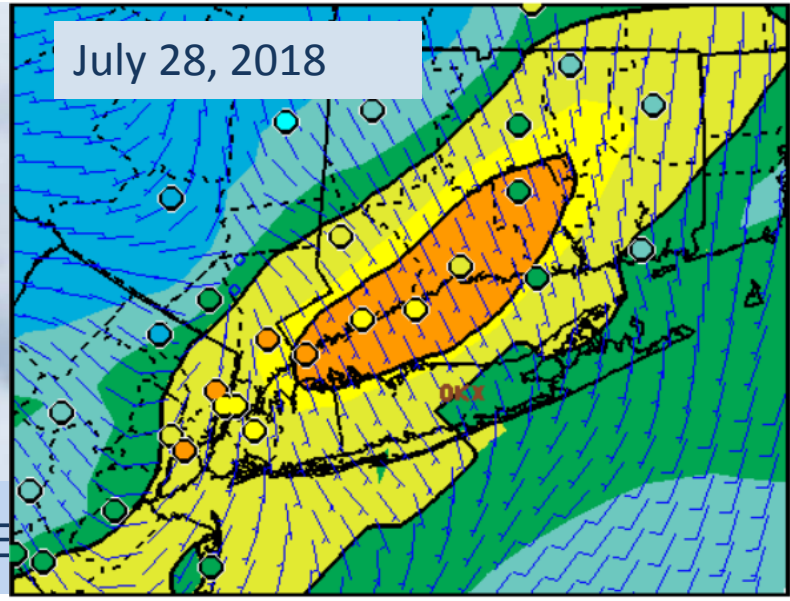
July 14, 2018



July 16, 2018



July 28, 2018



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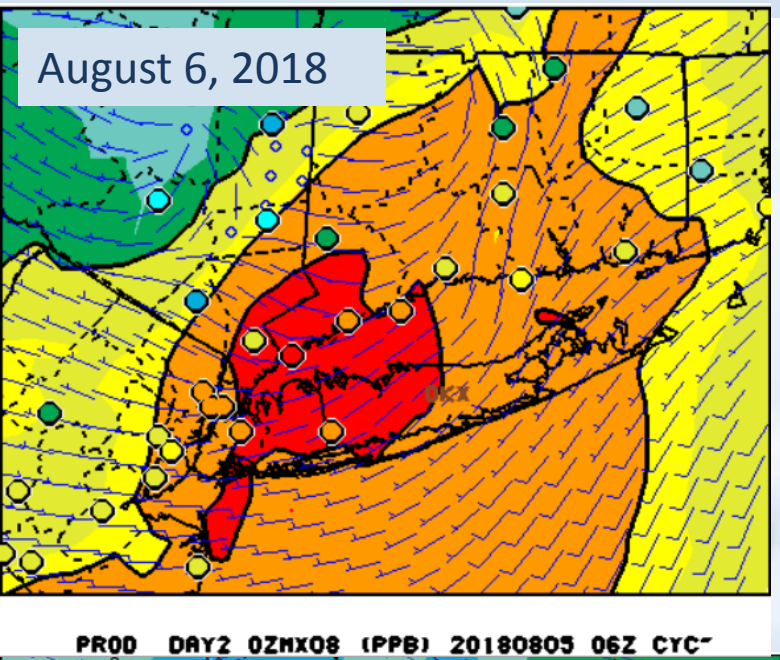
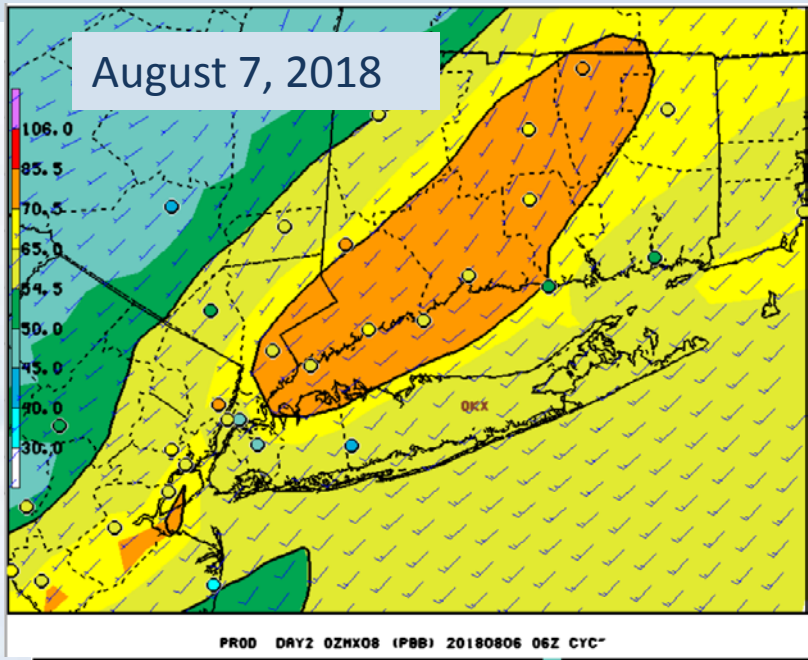
August 2018 Events

August 6, 2018



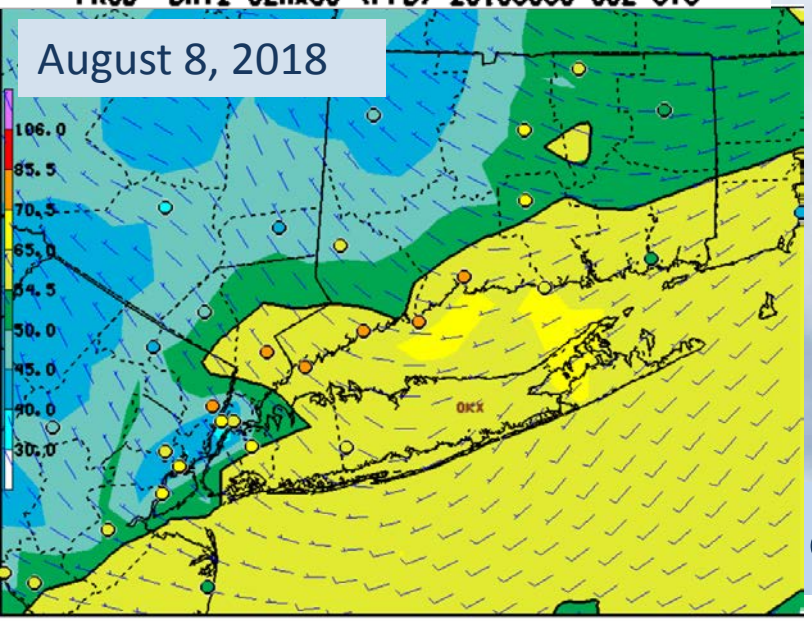
PROD DAY2 OZMX08 (PBB) 20180805 06Z CYC

August 7, 2018



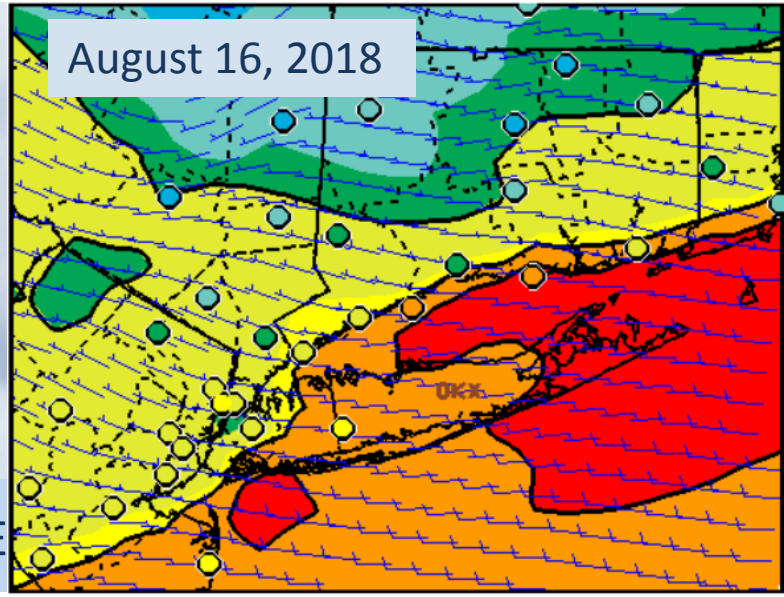
PROD DAY2 OZMX08 (PBB) 20180806 06Z CYC

August 8, 2018



PROD DAY2 OZMX08 (PBB) 20180807 06Z CYC

August 16, 2018



PROD DAY2 OZMX08 (PBB) 20180815 06Z CYC

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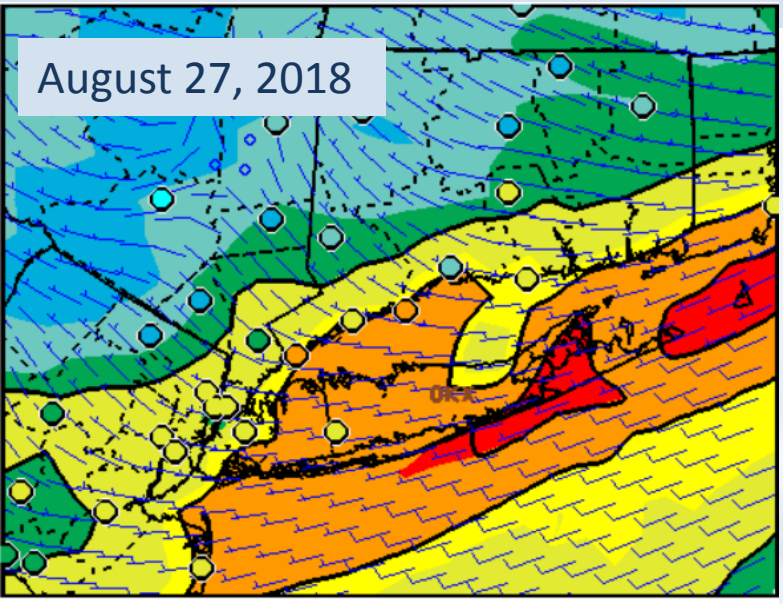
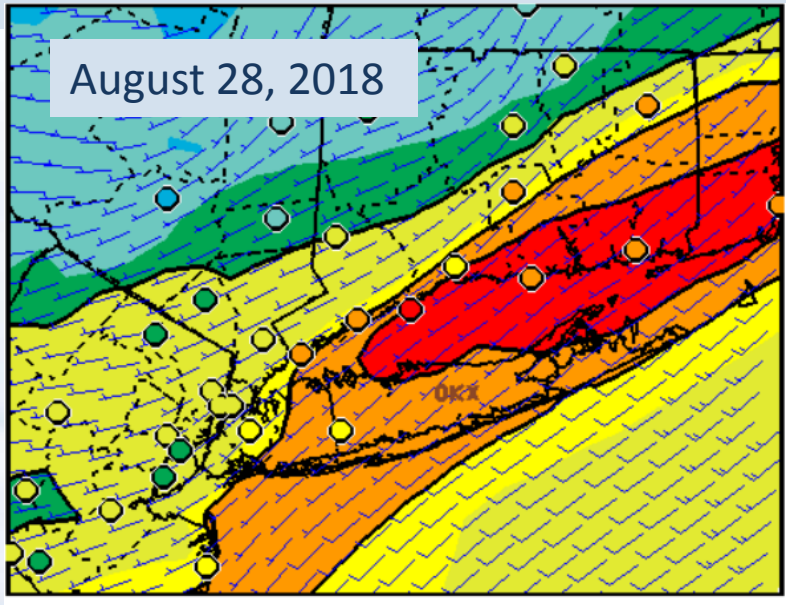
August-September 2018 Events

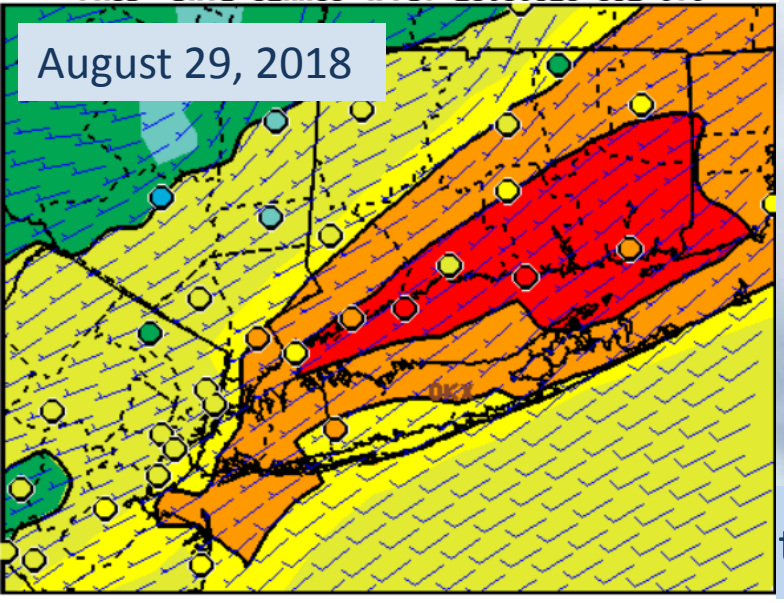
August 27, 2018



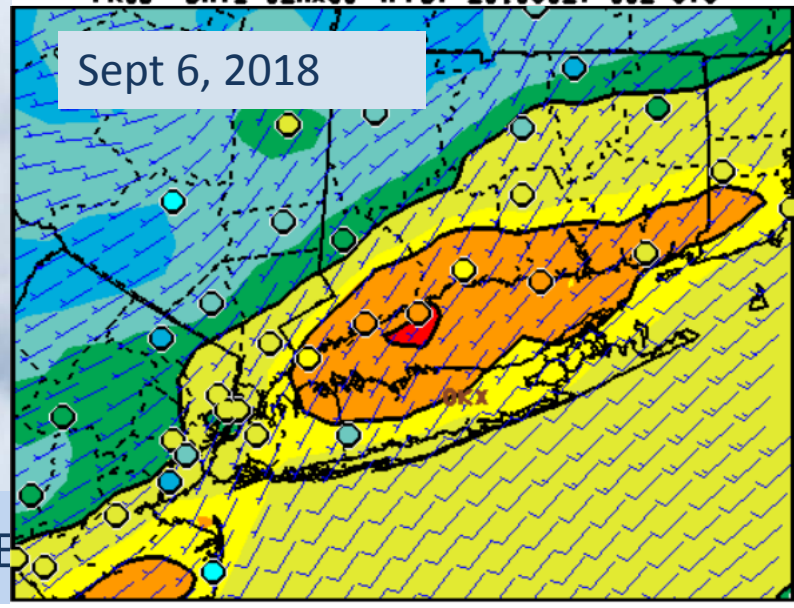
August 28, 2018



August 29, 2018



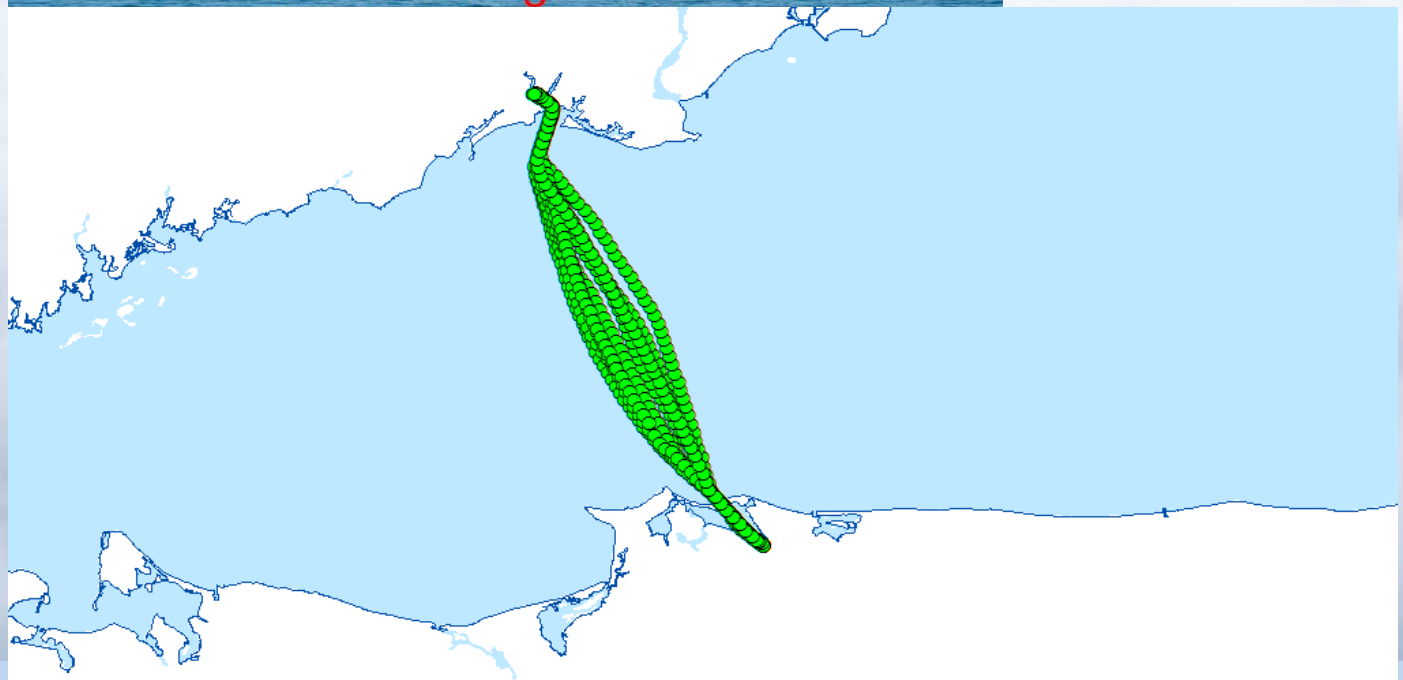
Sept 6, 2018



t of Energy and E

LIS Minute Ferry Data

Starting monitoring in late May, 2018, but ferry broke down in late August, so we missed the August 27-29 event.

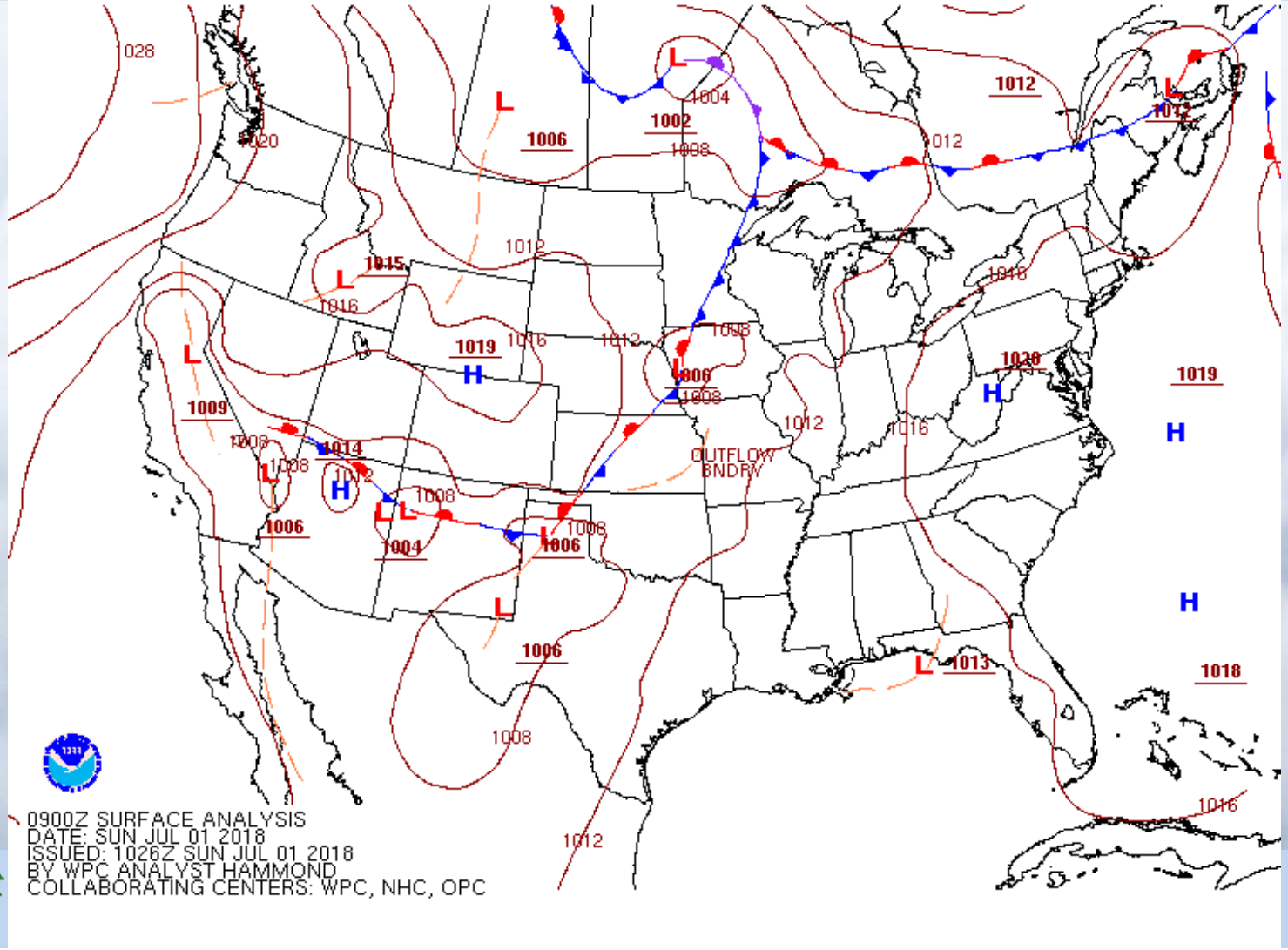


Typical transit path for the Park City Ferry

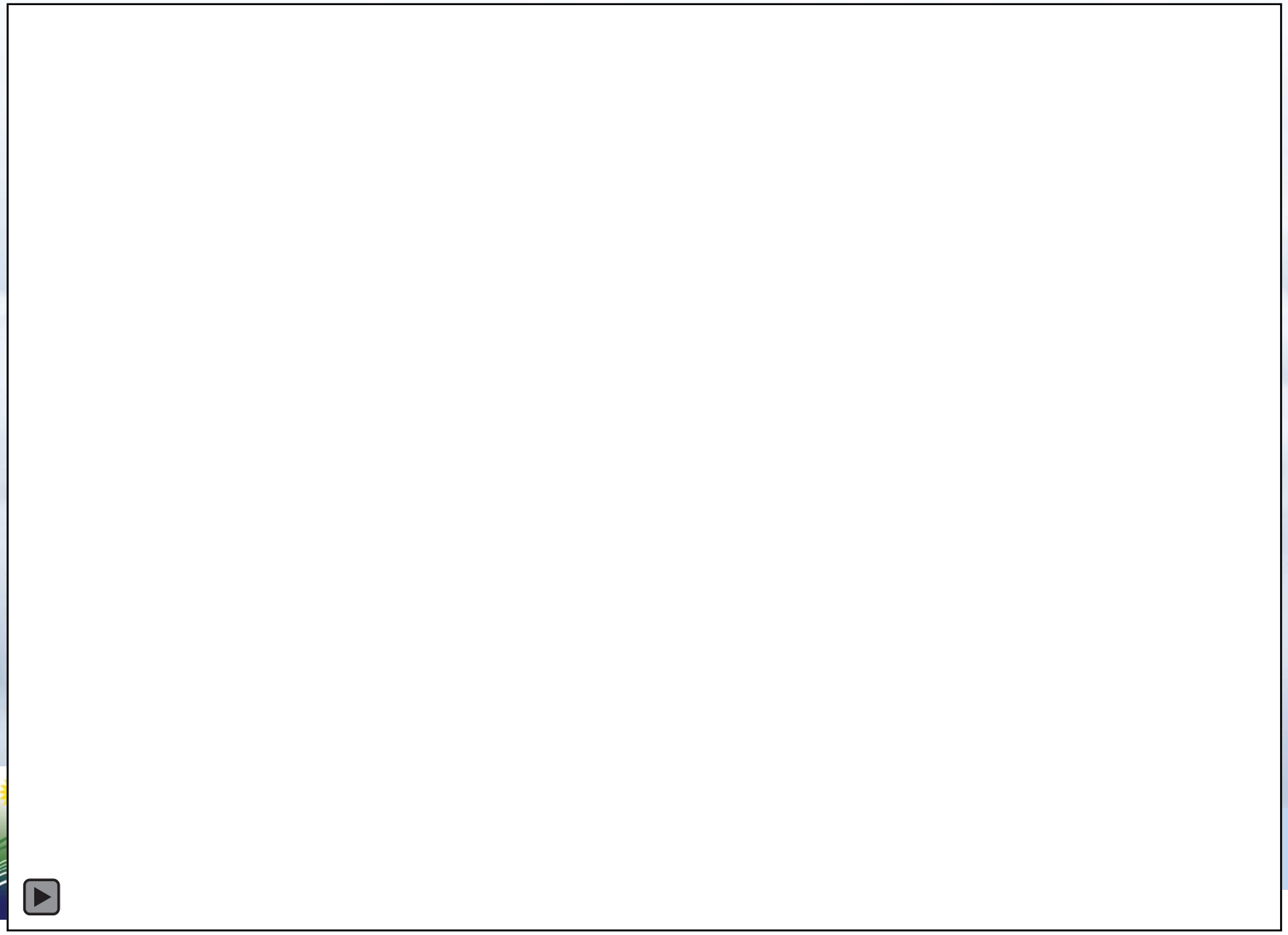
June 18, 2018 LIS Ferry Video

July 1 , 2018 Surface Analysis Animation

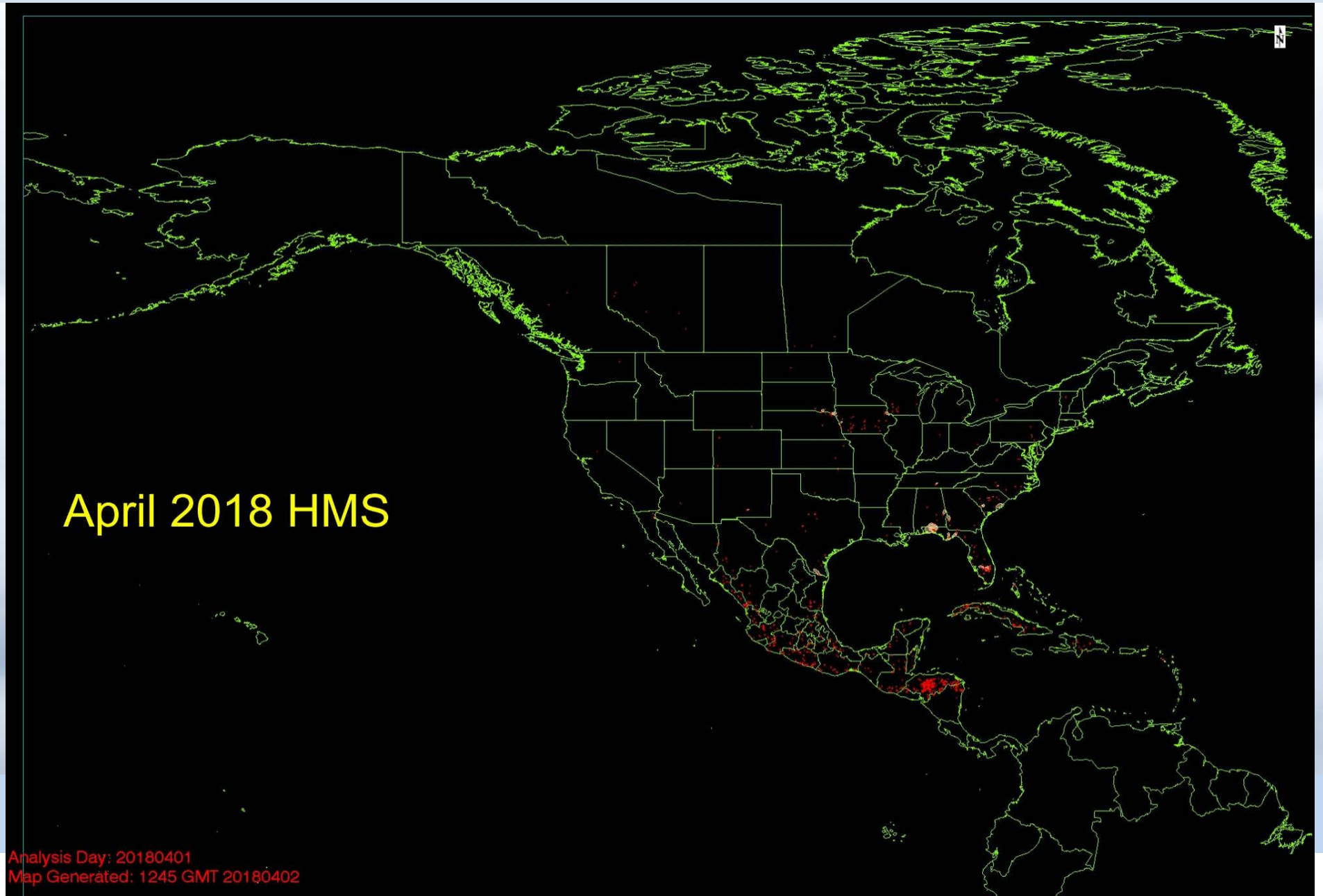
- Weak High pressure was anchored over the east coast, with a meso-low that tracked across Connecticut



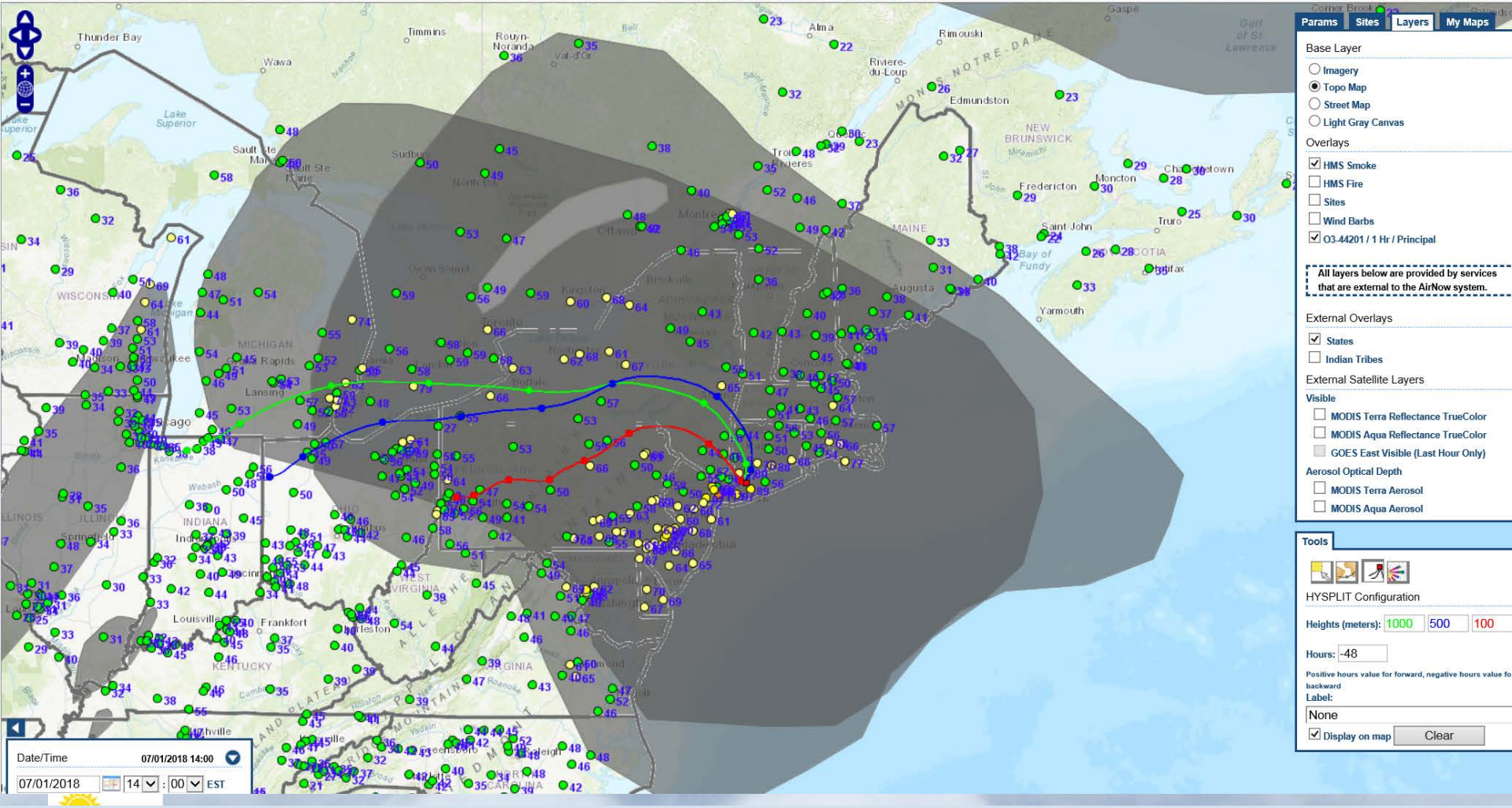
July 1, 2018 Satellite



Lots of smoke from western wild fires in 2018!



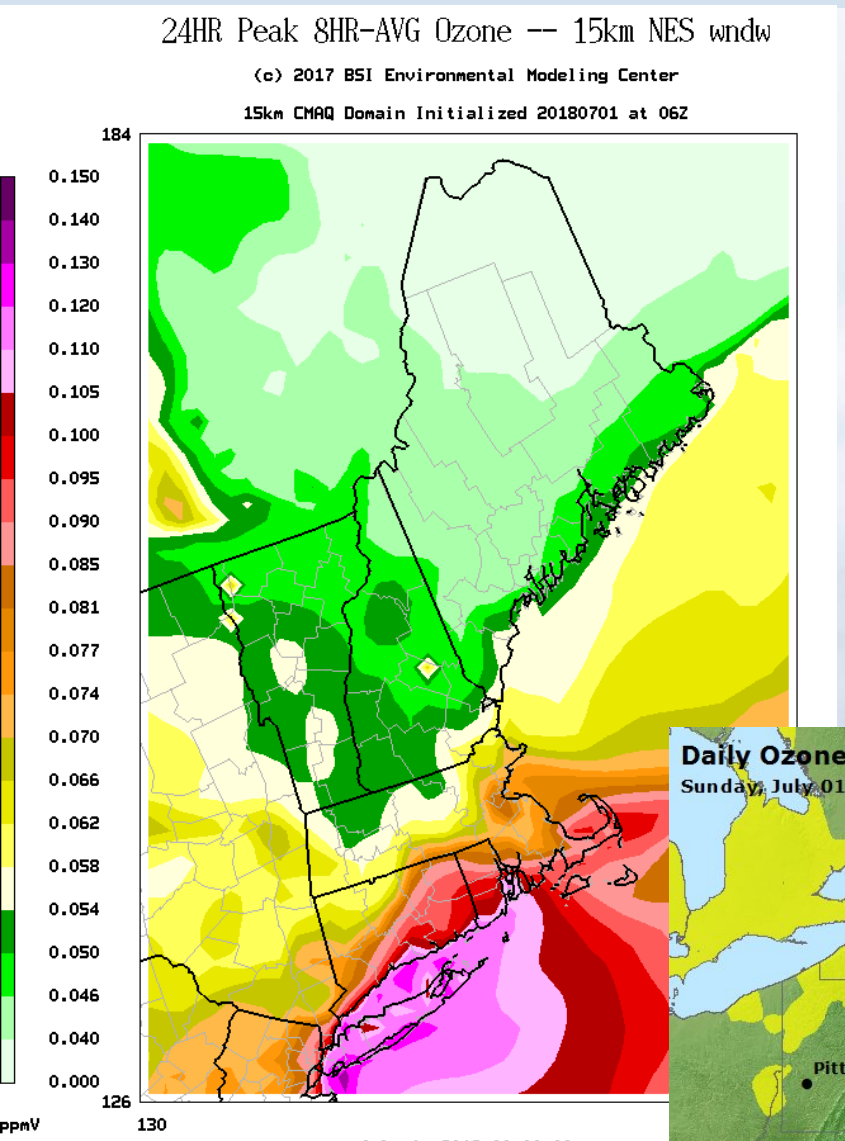
July 1, 2018 Smoke

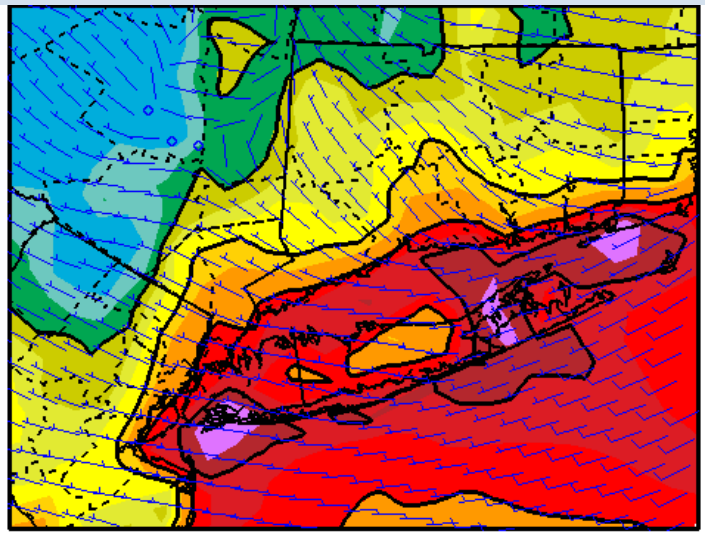


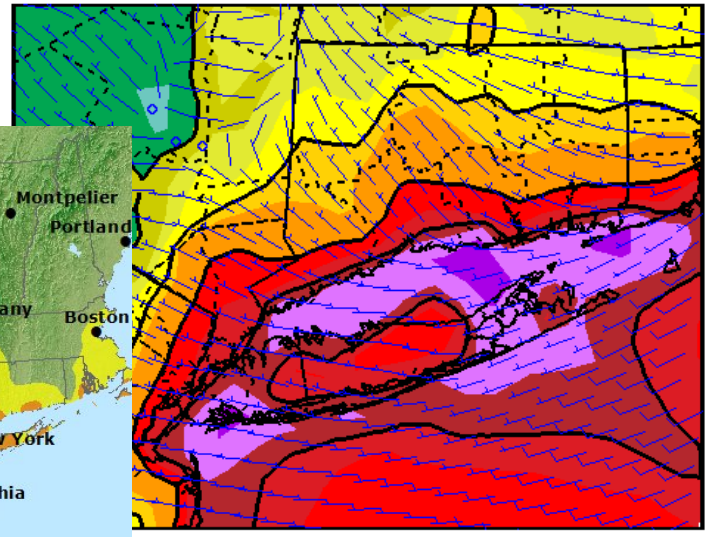
We need more studies as to how smoke plumes affect both monitored and modeled ozone data.

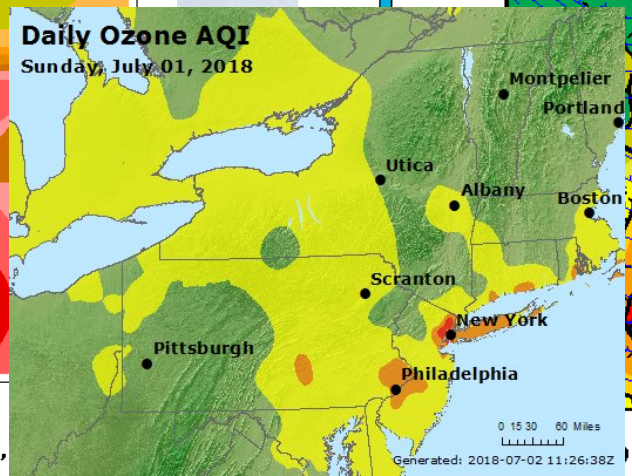
July 1, 2018 Model Performance

- All models showed an over prediction around LIS, with the NOAA bias correction closer to reality;



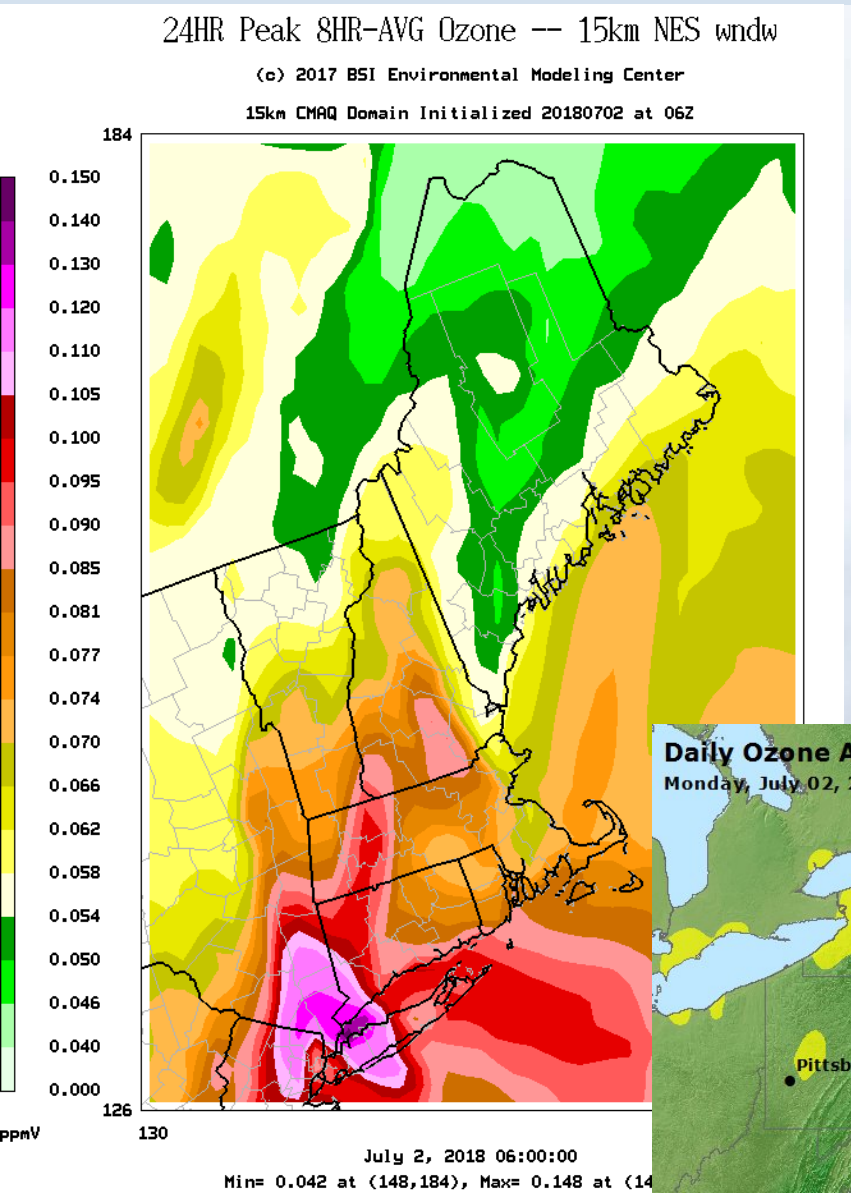


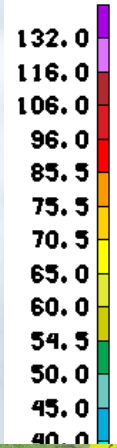


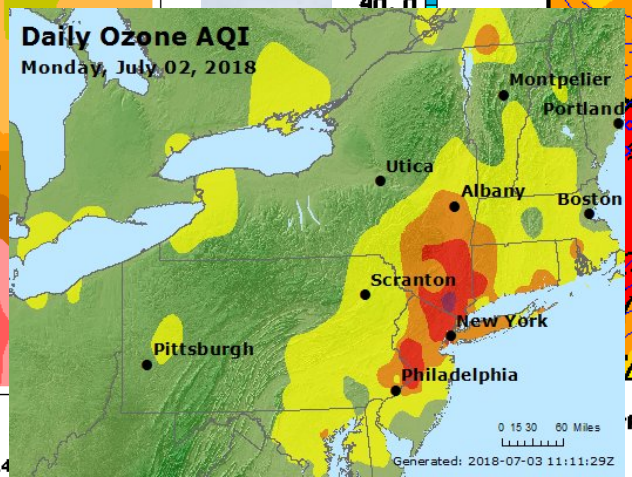


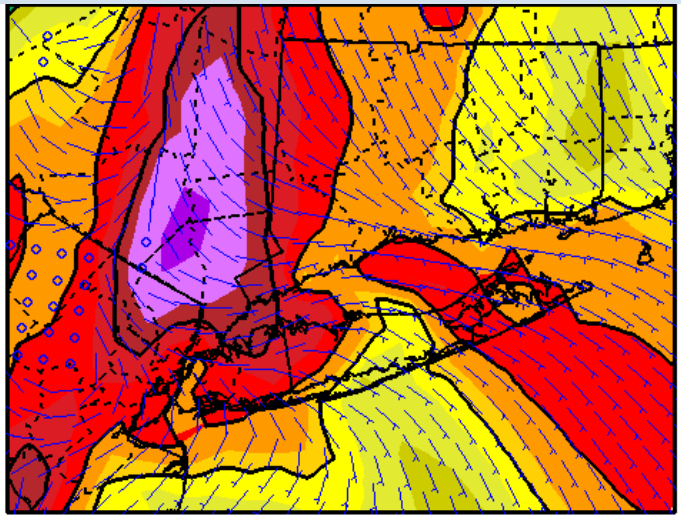
July 2, 2018 Model Performance

- The Barons CMAQ model showed an extreme over prediction, while the NOAA models were still over predicting, but much closer to actual values.

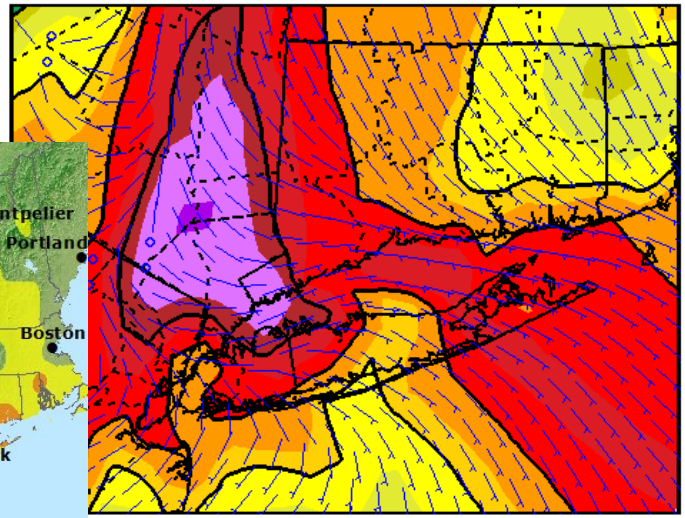








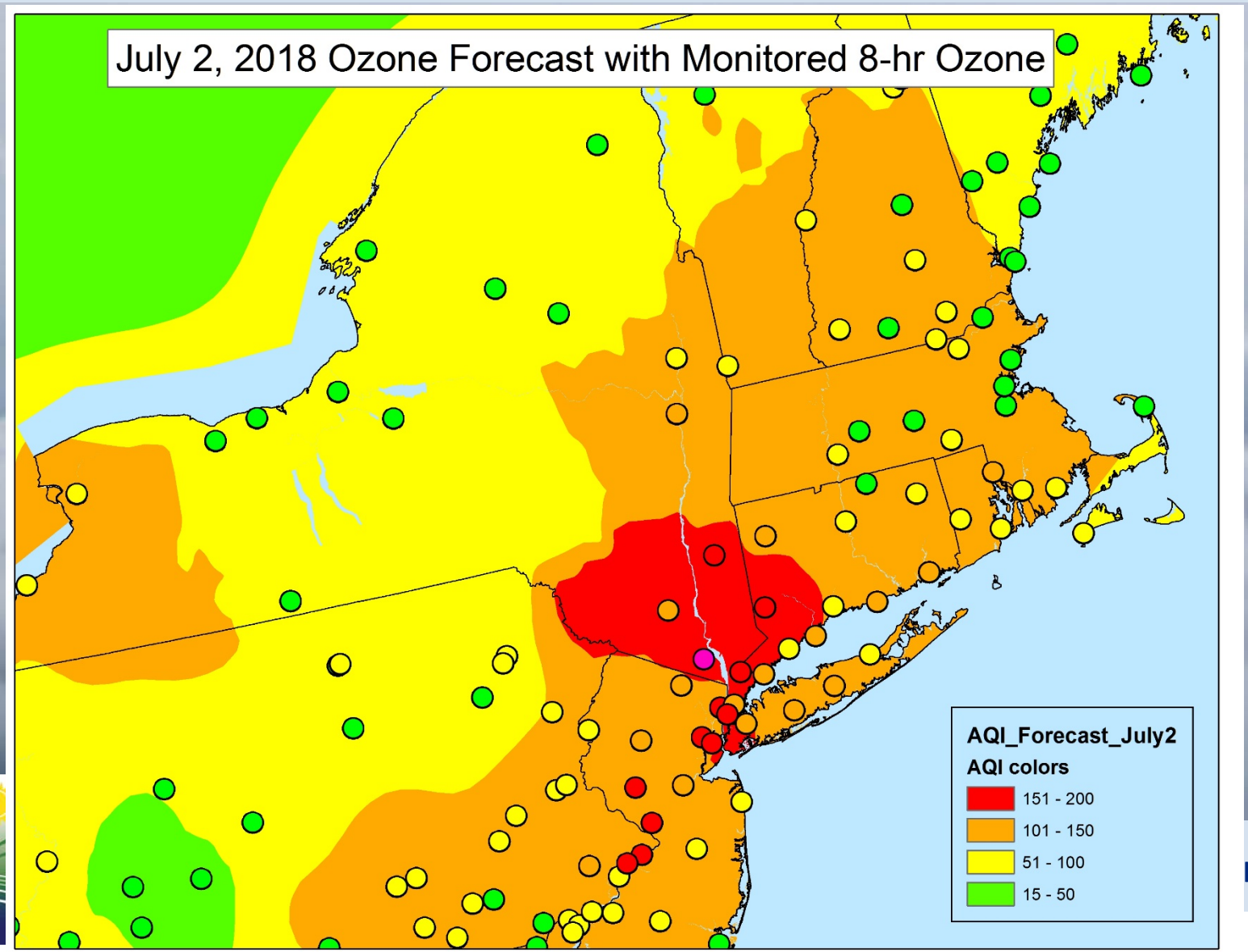
PARABCV8 BIAS COR V8 DAY1 OZMX08 (PPB) 20180702 06Z CYC



ROD DAY1 OZMX08 (PPB) 20180702 06Z CYC

July 2, 2018 AQI Forecast

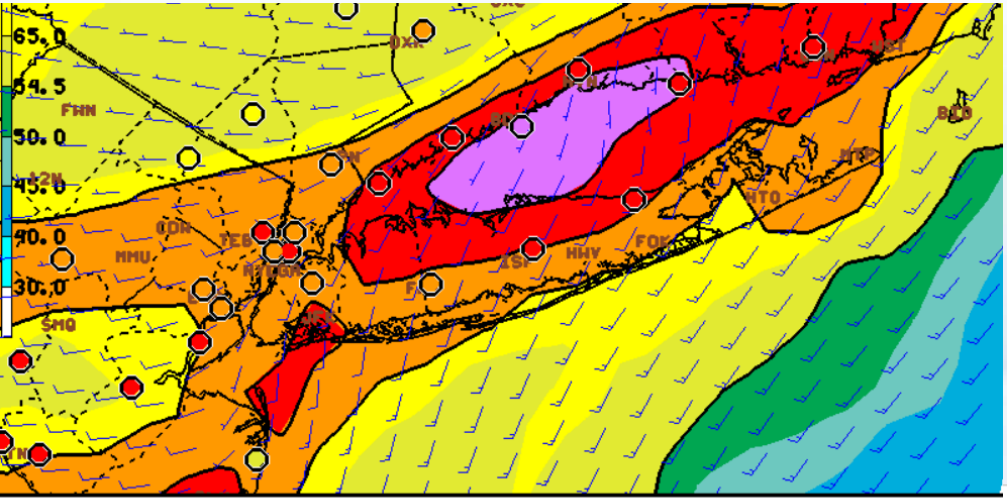
- Because of the Barons CMAQ over prediction, the area AQ forecasters also over predicted the ozone event.



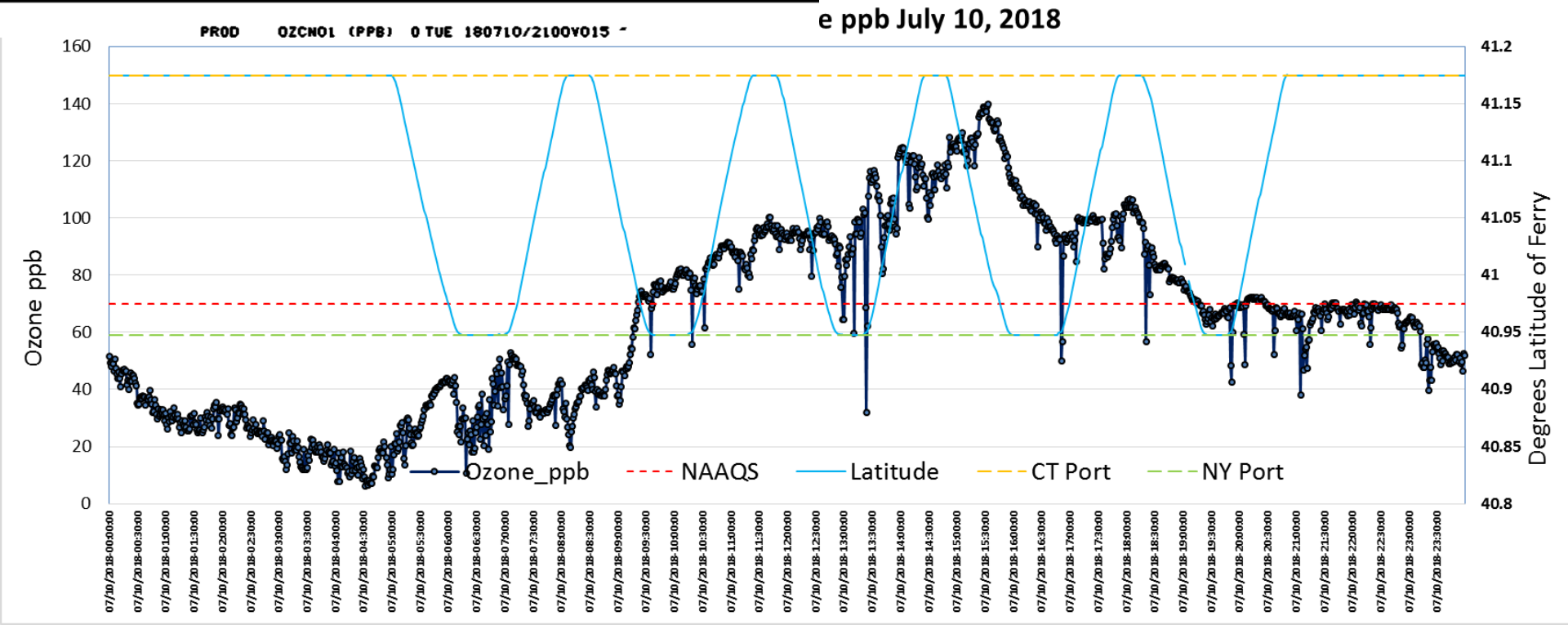
Conclusion

- This was a major ozone event for the area closest to NYC.
- A stagnant weather pattern with winds becoming east caused the ozone production over NYC to be concentrated to the west of NYC.
- A smoke plume was present on satellite images, as well as elevated PM2.5, which may have enhanced the ozone levels.

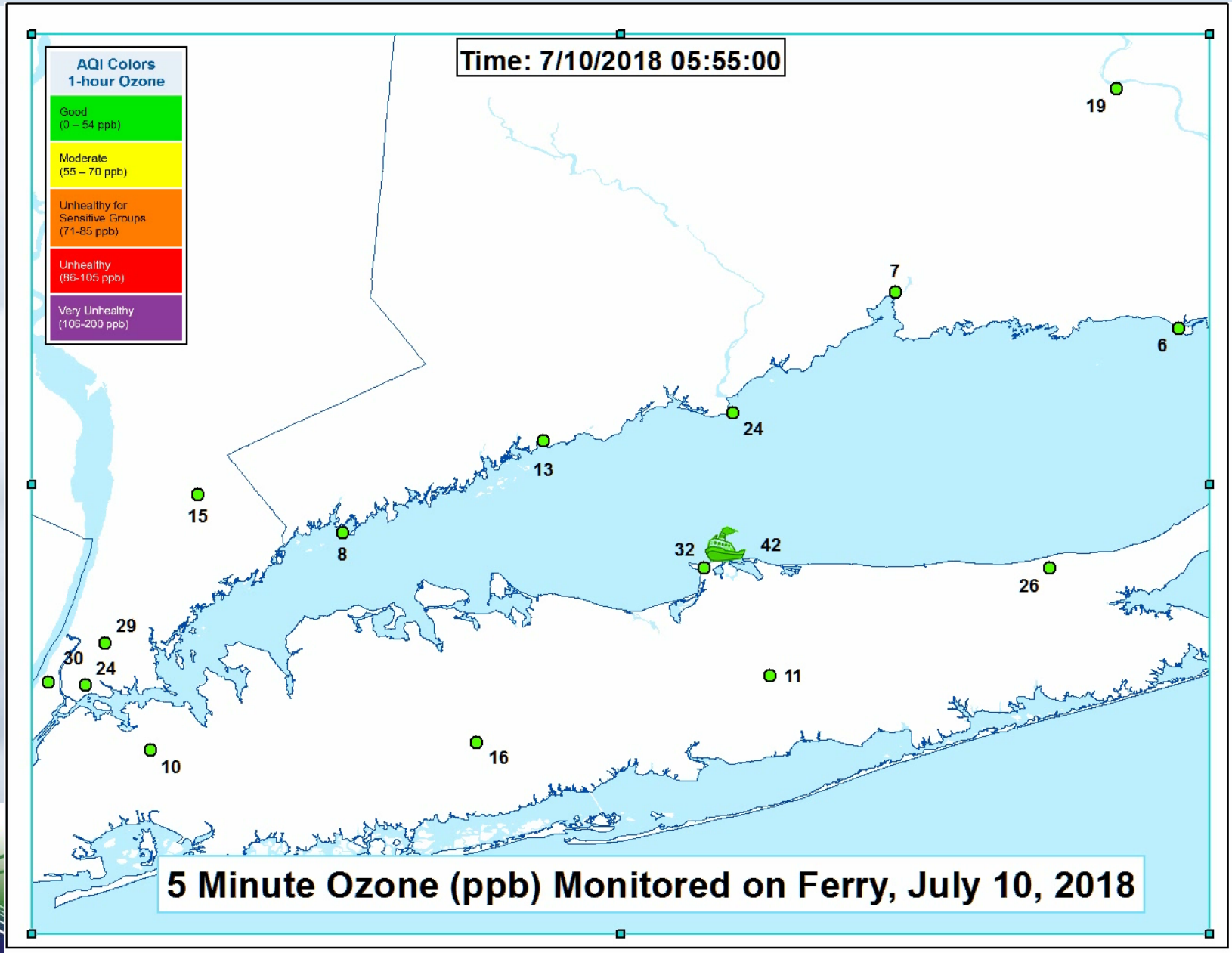
July 10, 2018 LIS Ozone



The minute ferry data does reach 140 ppb, so the model output at 2100z is fairly realistic on this day!

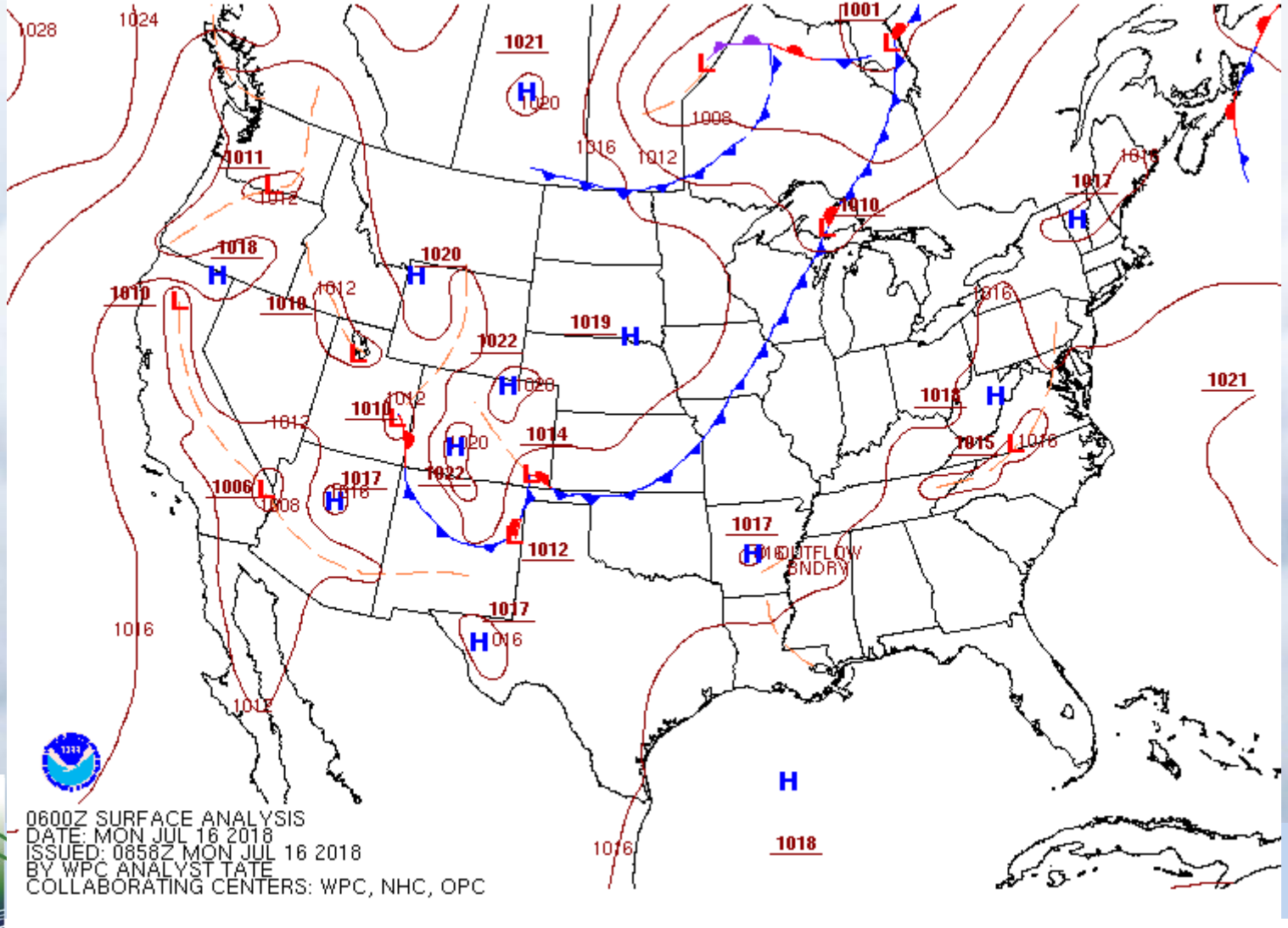


July 10, 2018 LIS Ozone



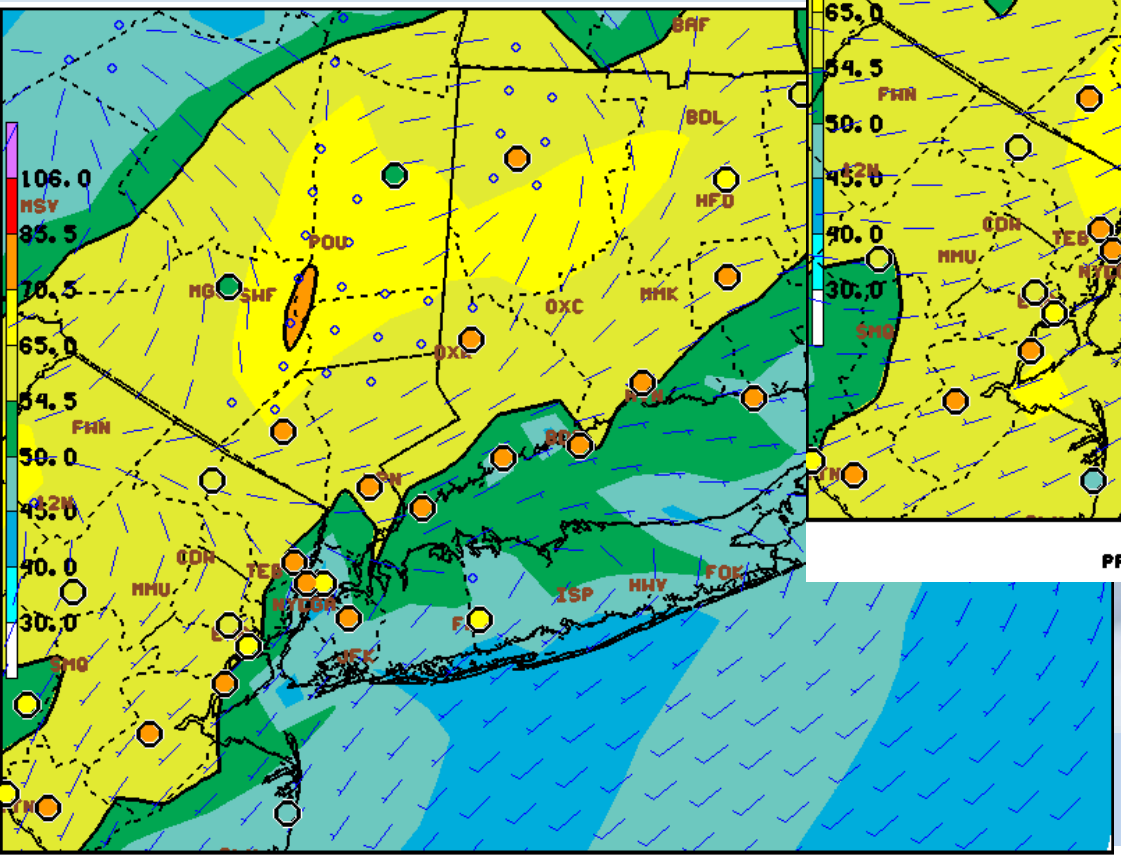
July 16, 2018 Surface Analysis Animation

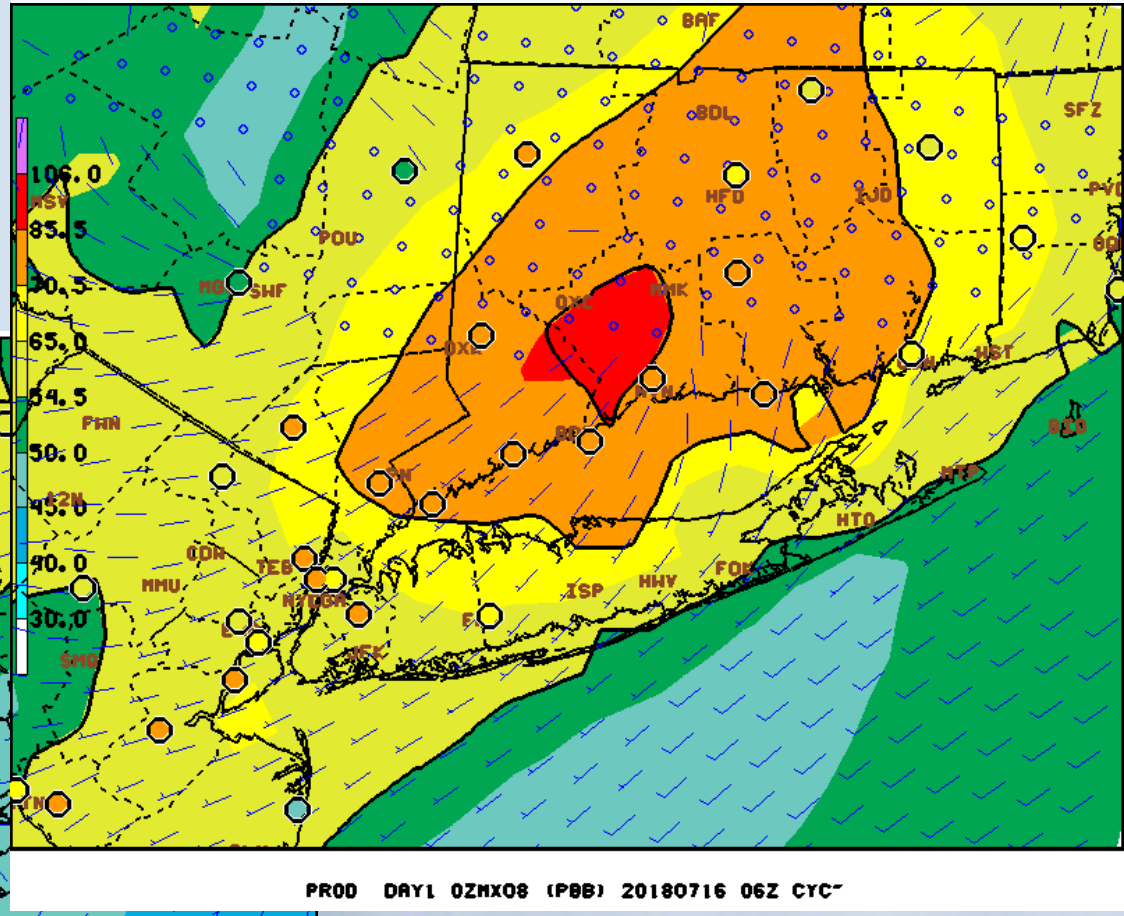
- A wave of low pressure passes over northern CT with scattered thunderstorms, but skies remained sunny to the south.



7/16/18 NOAA Model Performance

- Day before NOAA had wrong wind pattern and under predicted ozone for Connecticut.
- Same day NOAA model has SW wind pattern with much better agreement with CT ozone levels.

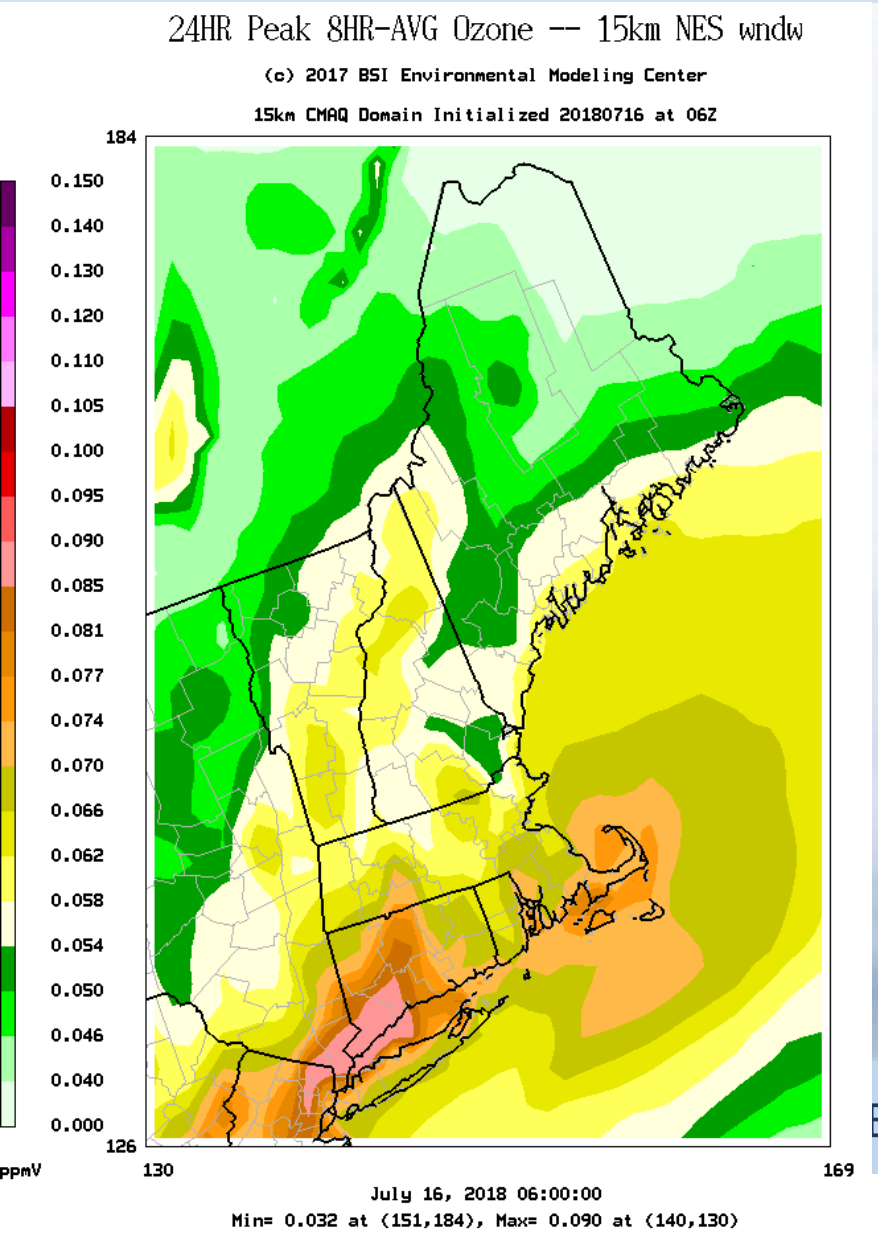


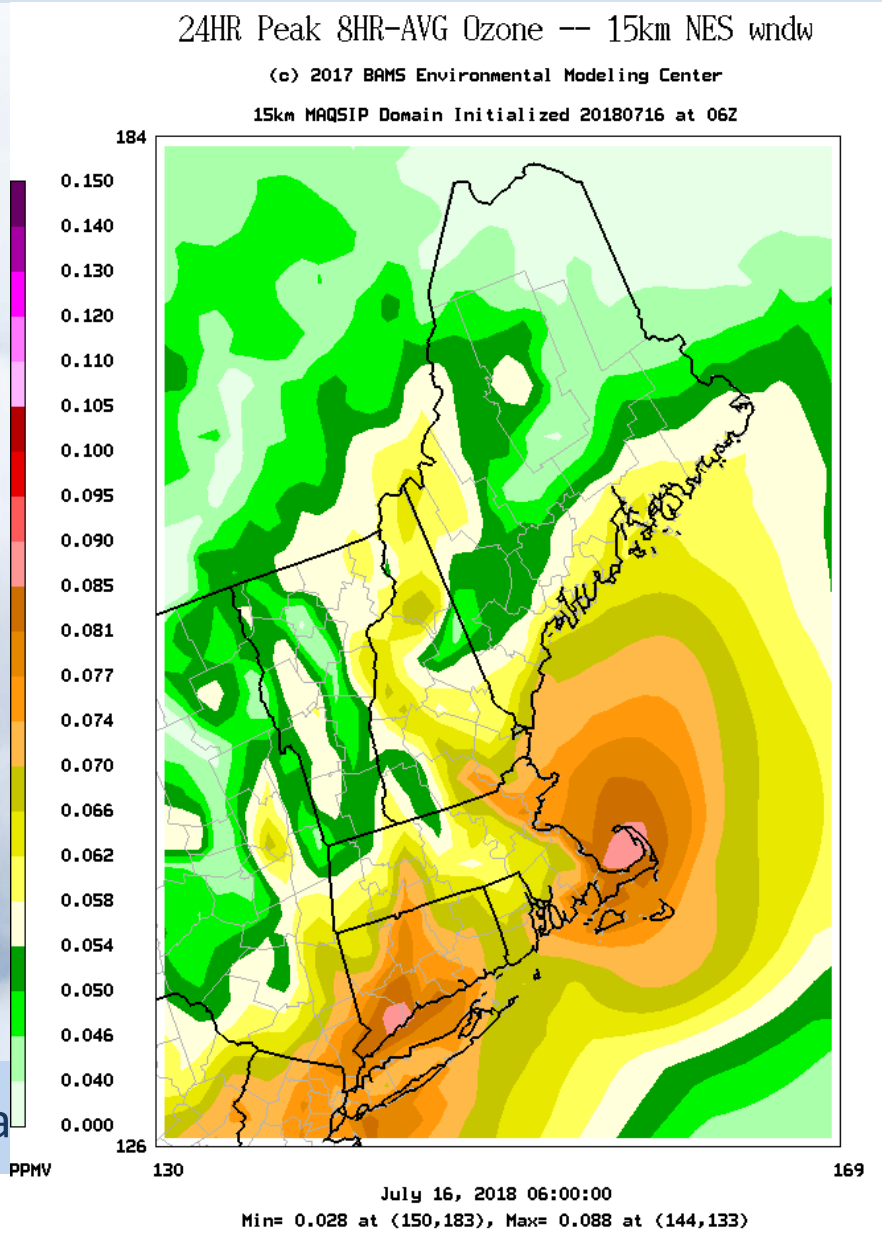


Environmental Protection

7/16/18 BARONS Model Performance

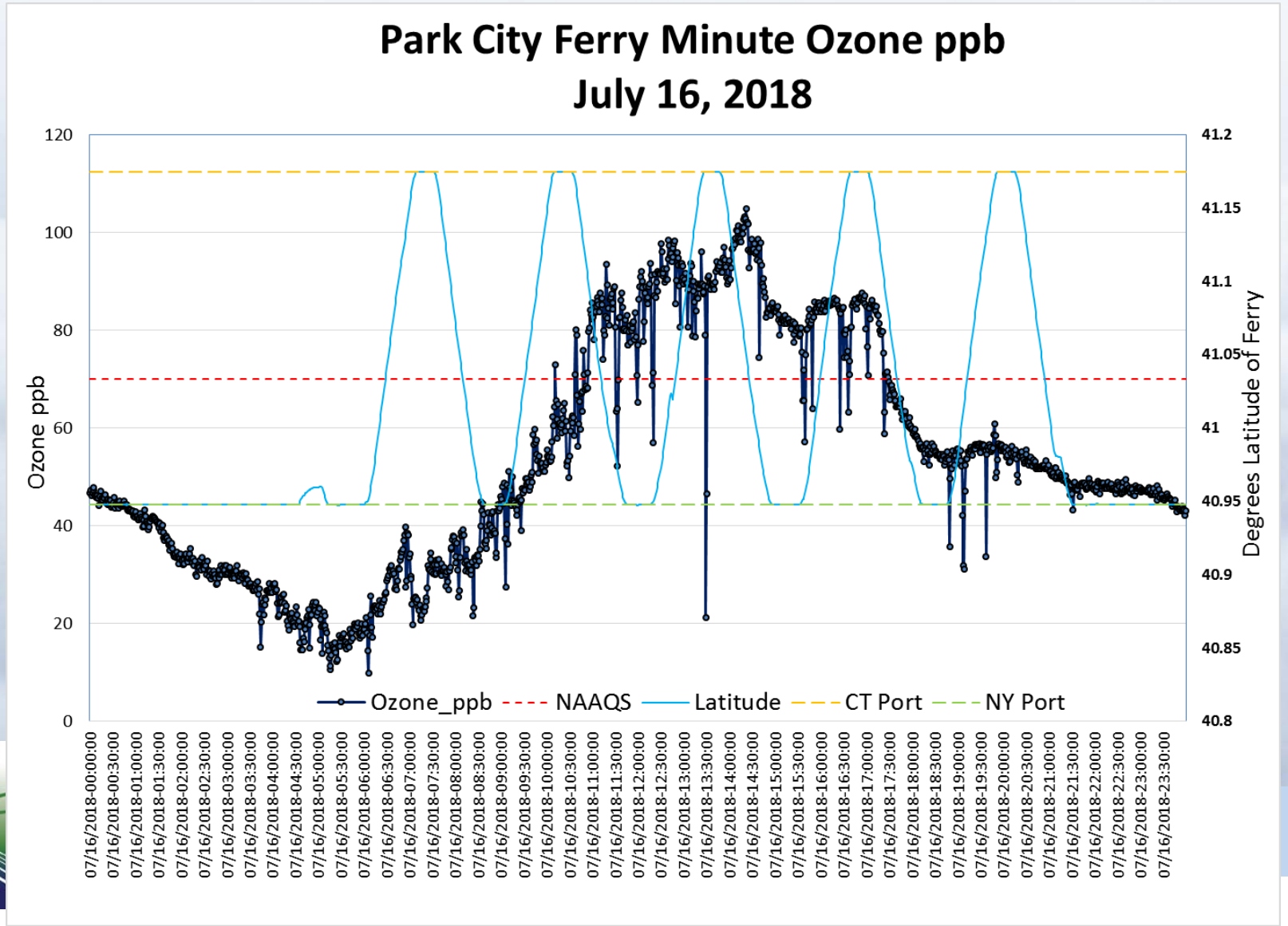
- Same day model predictions generally over predicted magnitude and extent of the exceedances



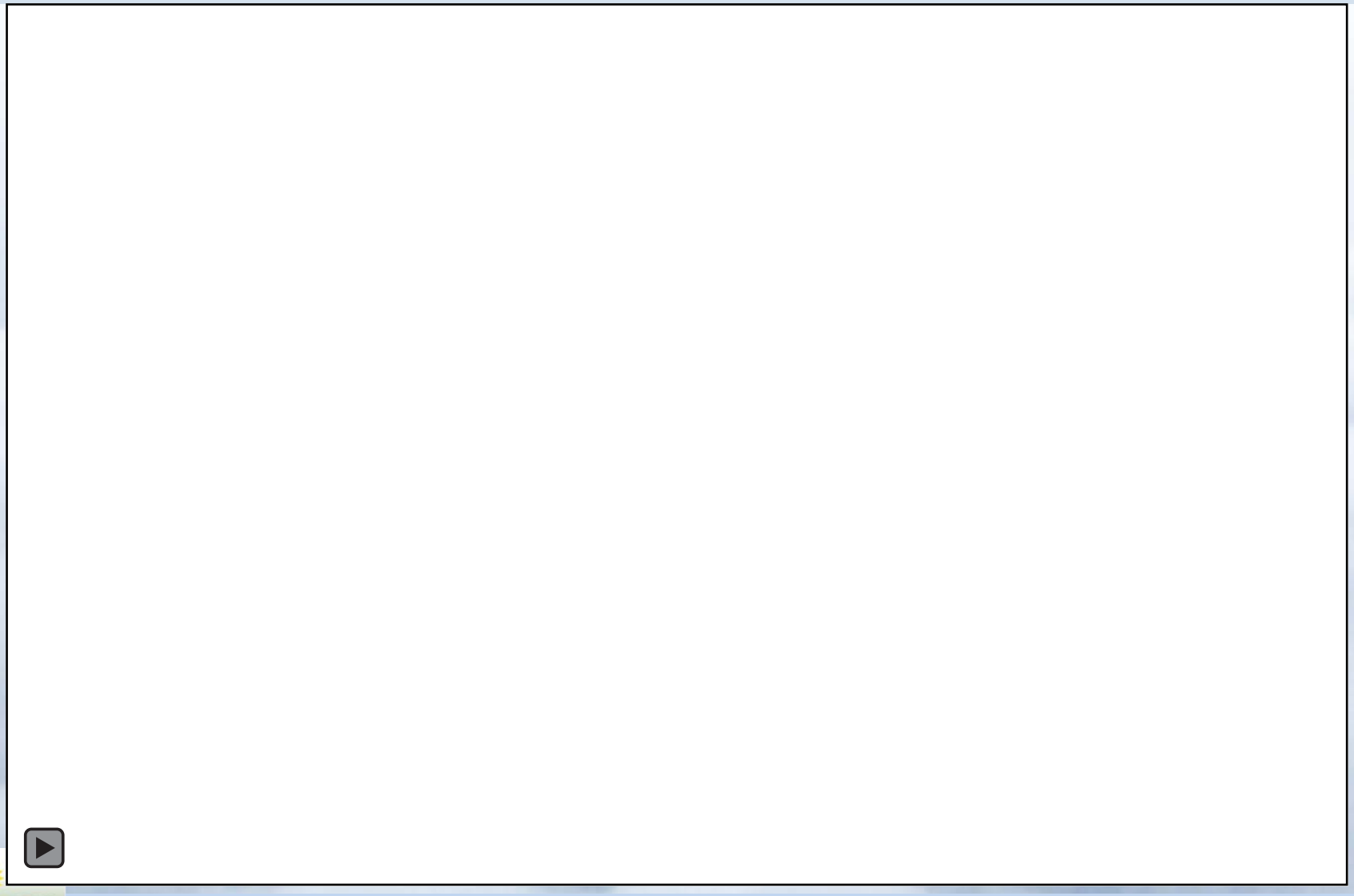


July 16, 2018 Park City Ferry Minute Data

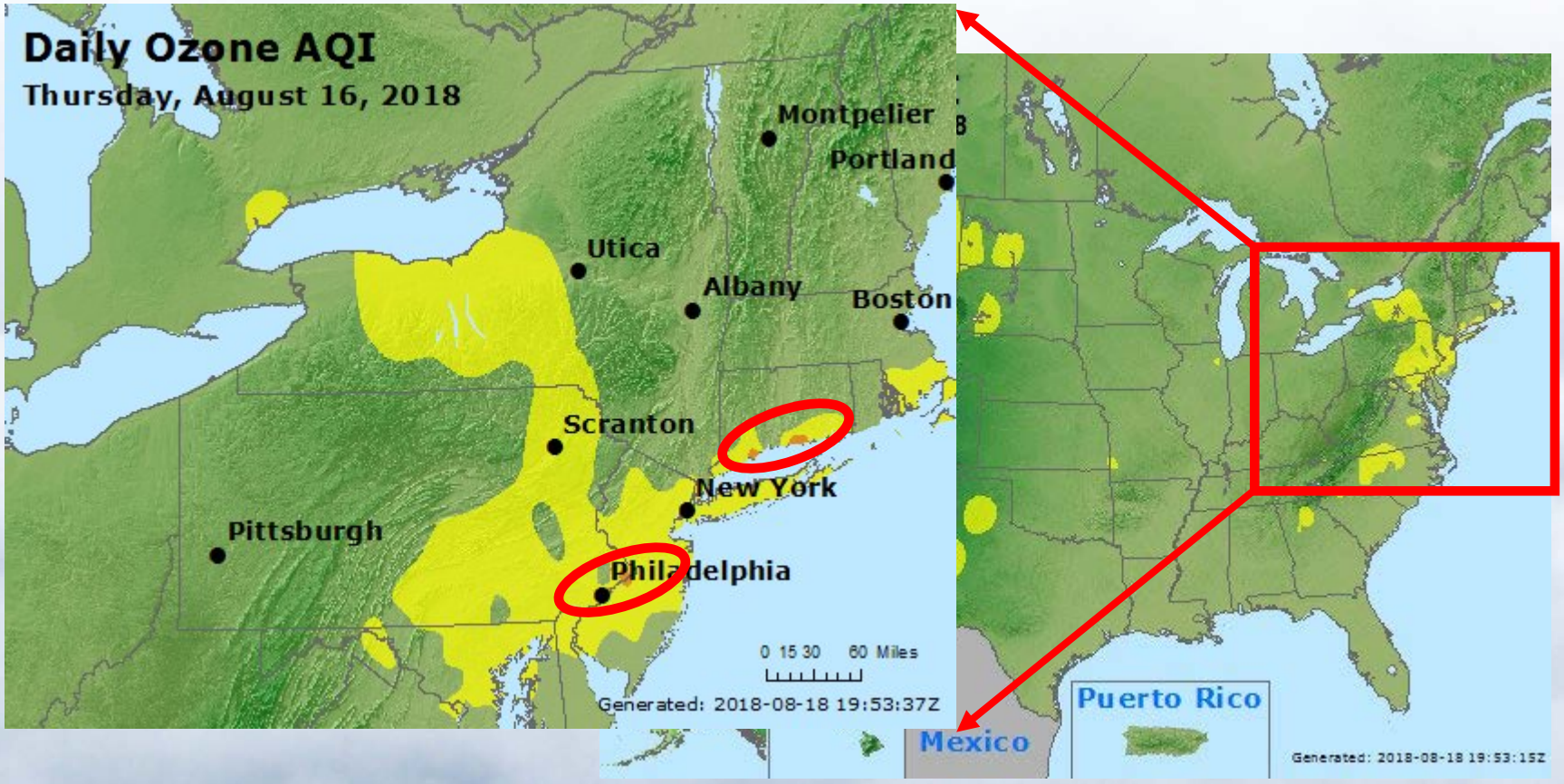
- Ferry ozone peaked at 105 ppb at 14:22 EST



July 16, 2018 Park City Ferry Animation

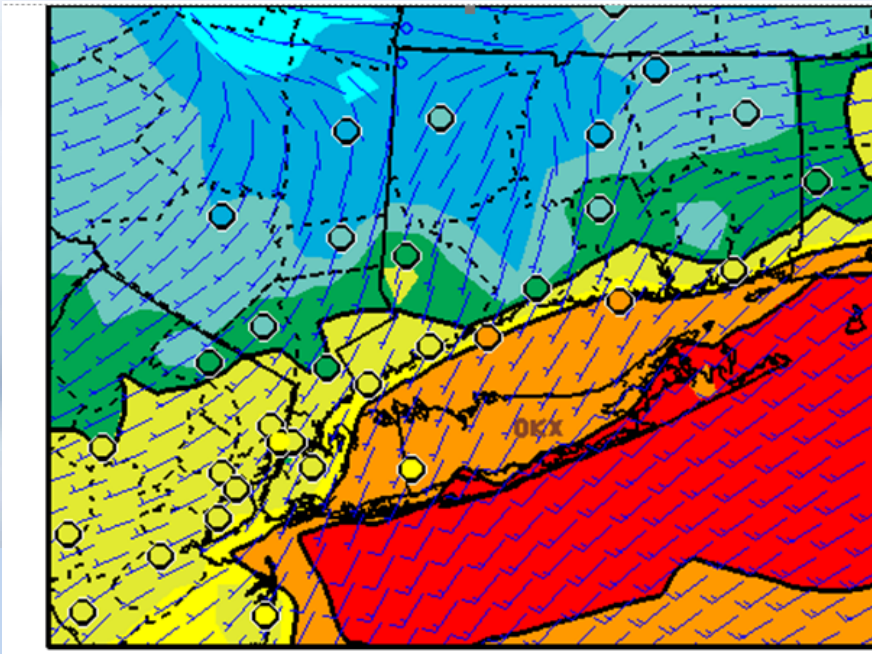


Regional AQI Maps



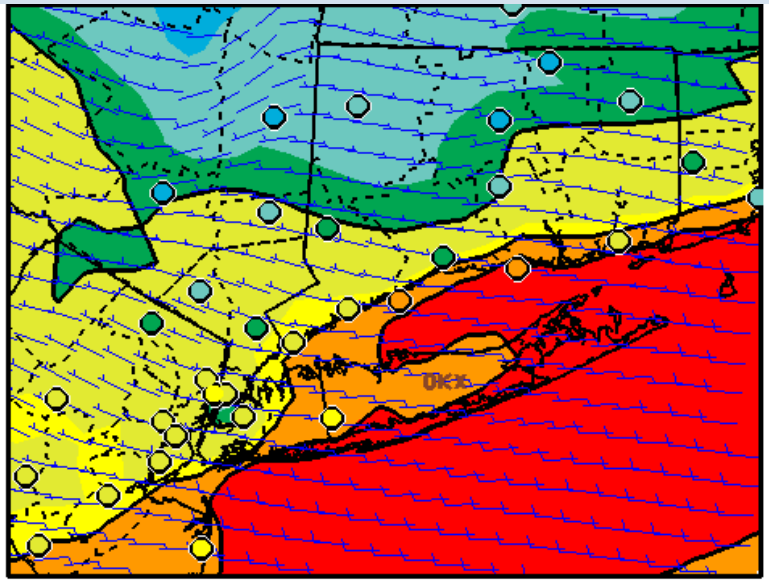
8/16/18 NOAA Model Performance

- NOAA model has 3 configurations:
- PROD (operational); NEI 2014 emissions; Bias Correction.
- All 3 overestimated ozone plume over Long Island and the Atlantic;
- Bias corrected forecasted the best for Connecticut.

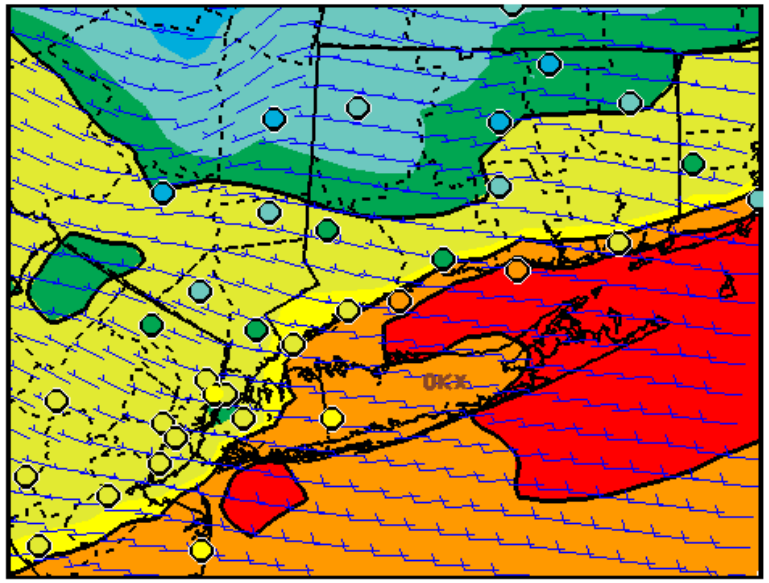


PROD BIAS COR V8 DAY2 OZMX08 (PPB) 20180815 12Z

106.0
85.5
70.5
65.0
54.5
50.0
45.0
40.0
30.0



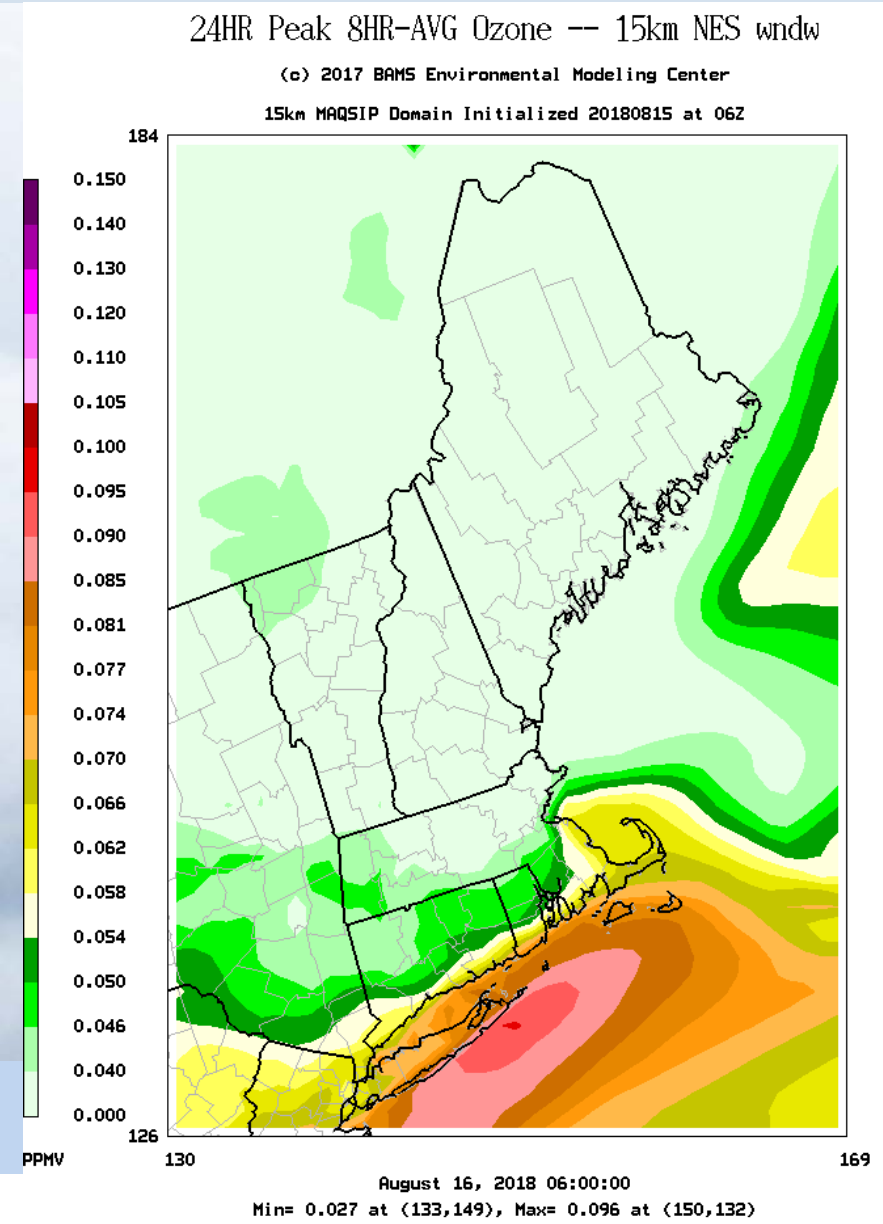
NAM V502 NEI2014 PARA5 DAY2 OZMX08 (PPB) 20180815 06Z CYC

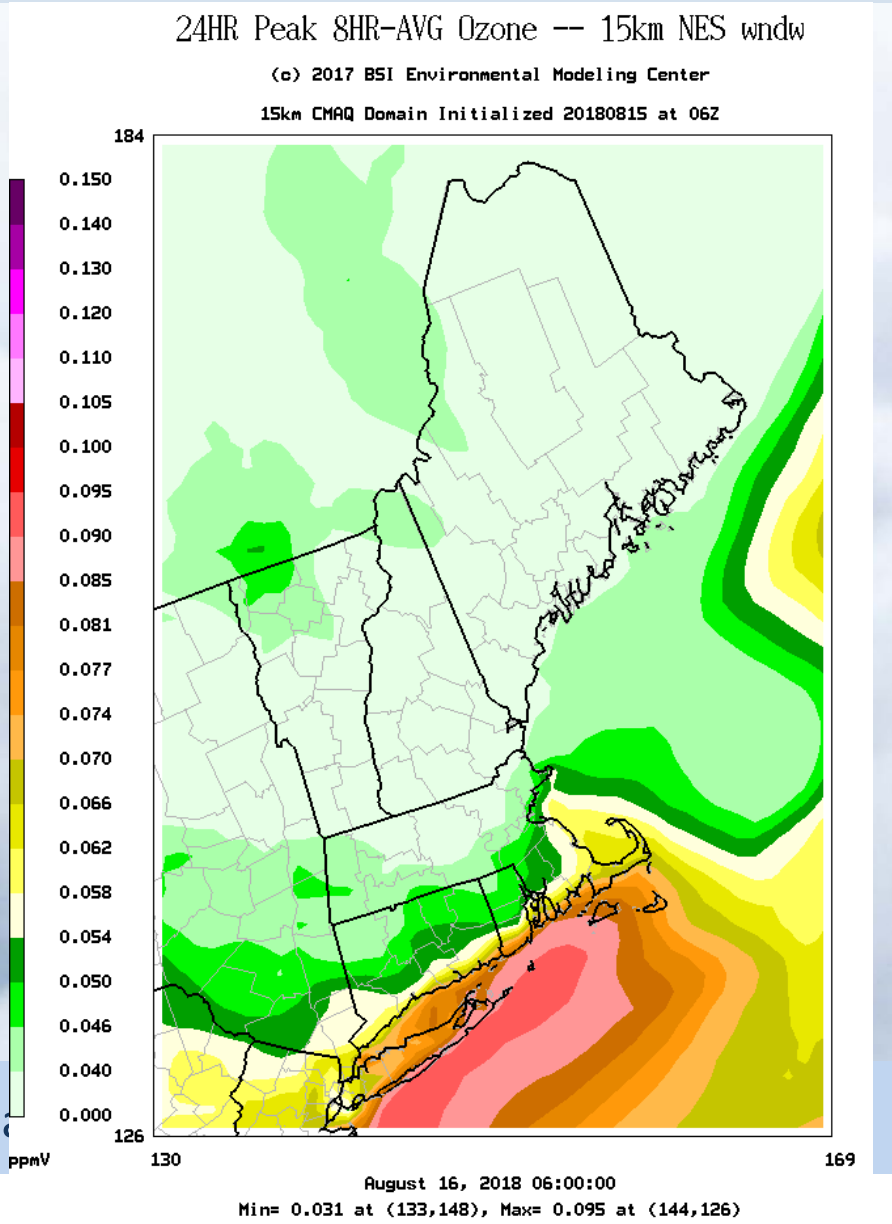


PROD DAY2 OZMX08 (PPB) 20180815 06Z CYC

08/16/18 BARONS Model Performance

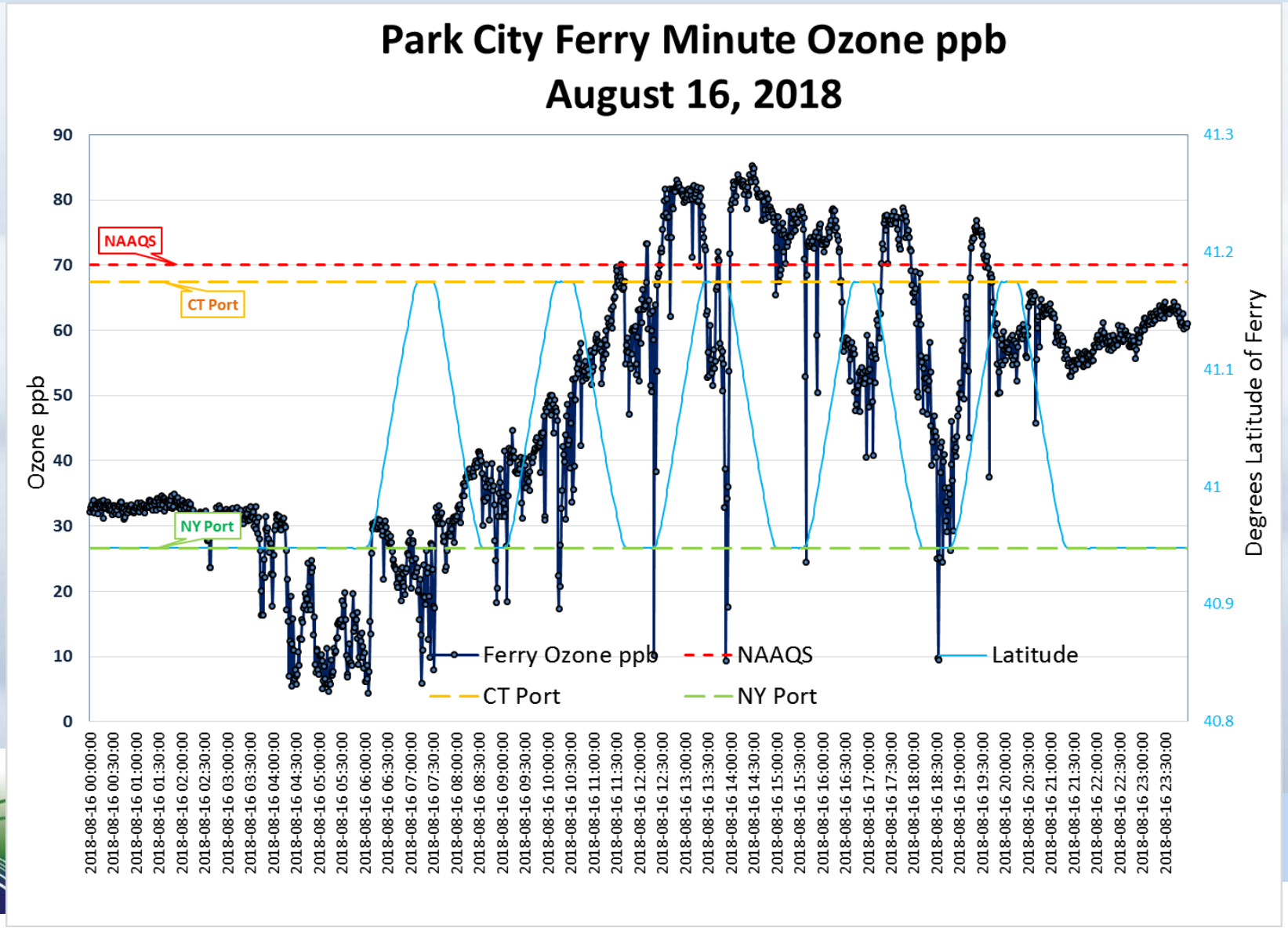
- Day 2 model predictions over predicted ozone over Long island, but did well for CT.





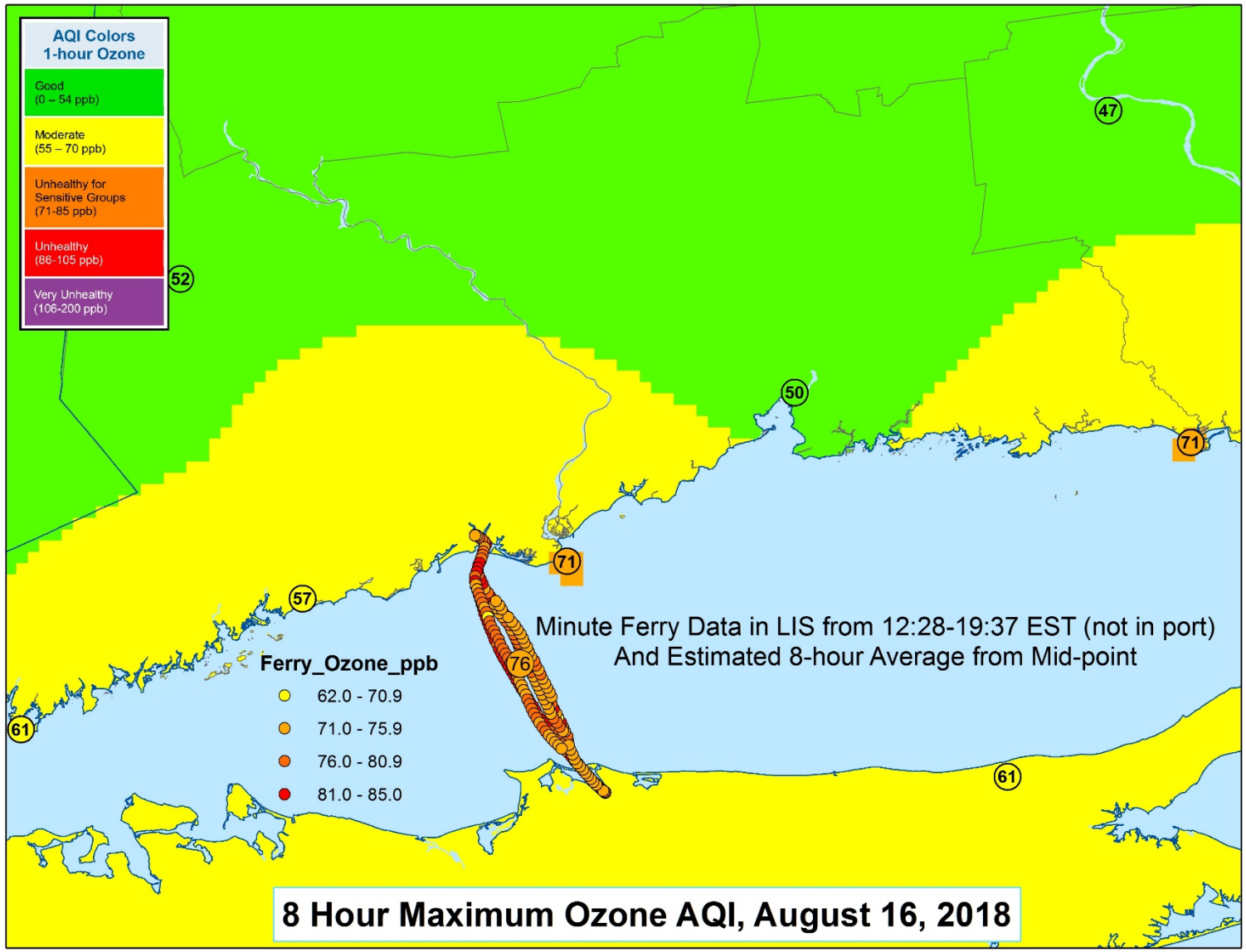
August 16, 2018 Park City Ferry Minute Data

- Ferry ozone peaked at 85 ppb at 14:30 EST

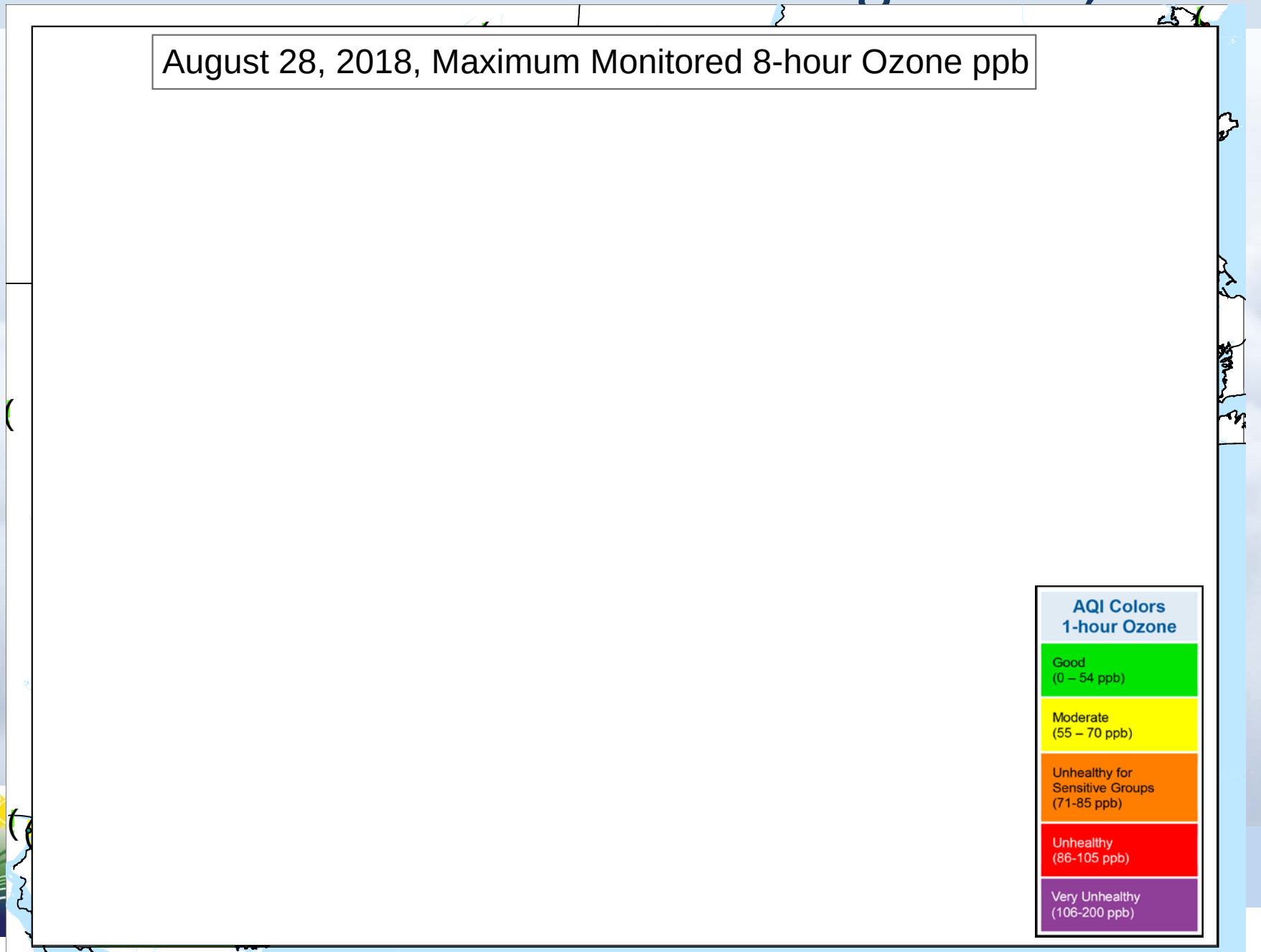


August 16, 2018 Park City Ferry Minute Data

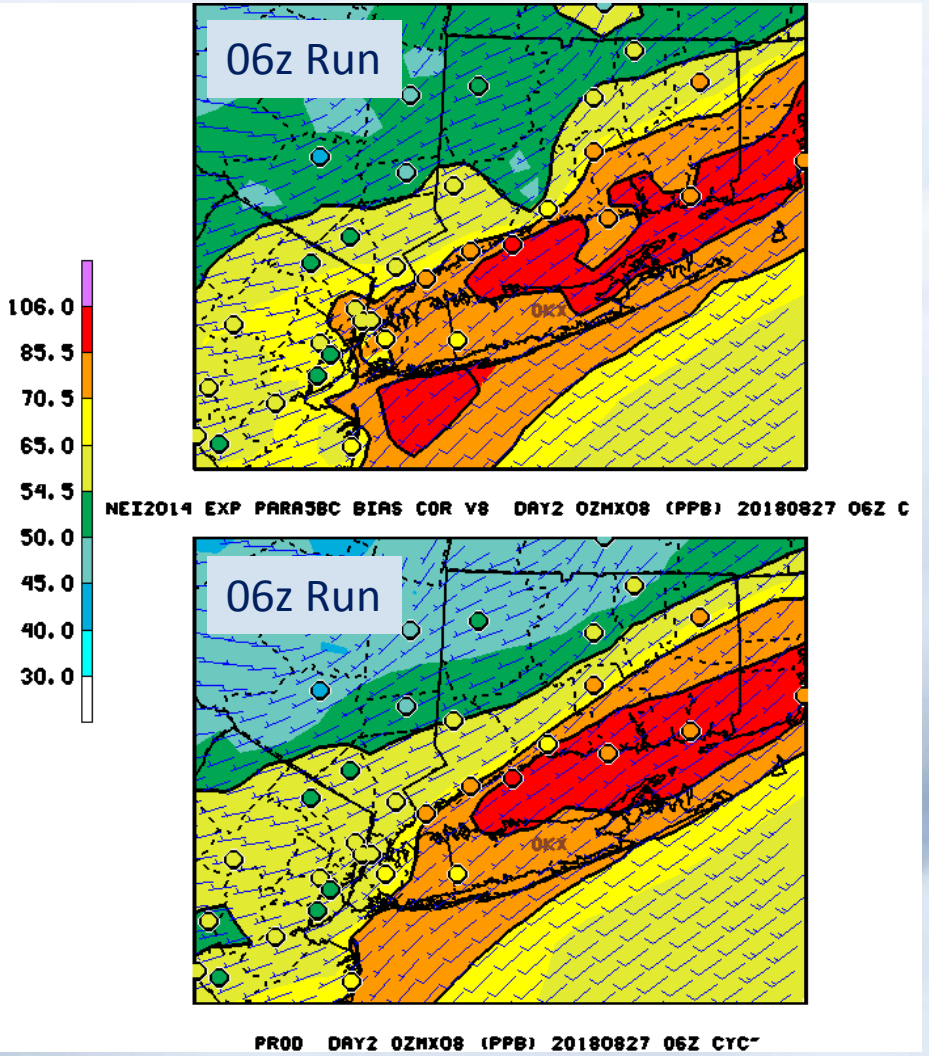
- Estimated 8-hour ferry ozone at mid-point in LIS was 76 ppb.

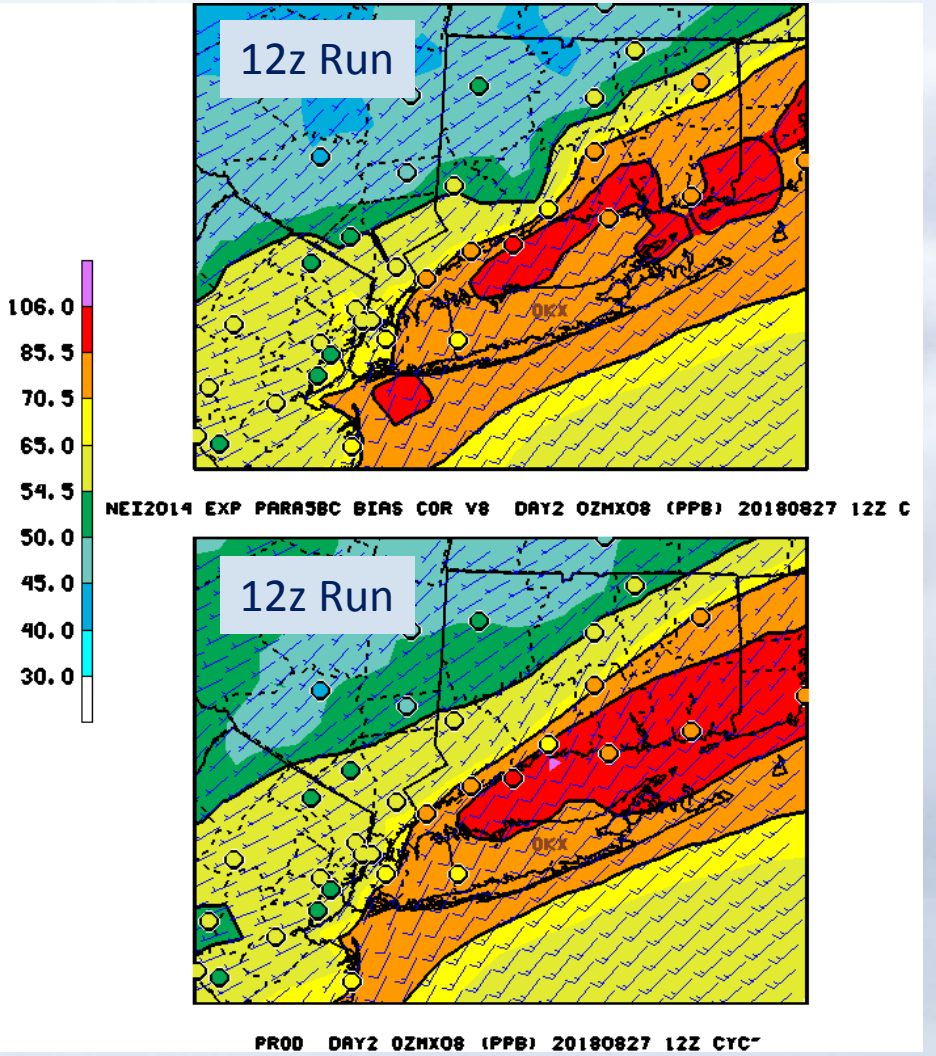


Connecticut Ozone Event August 28, 2018

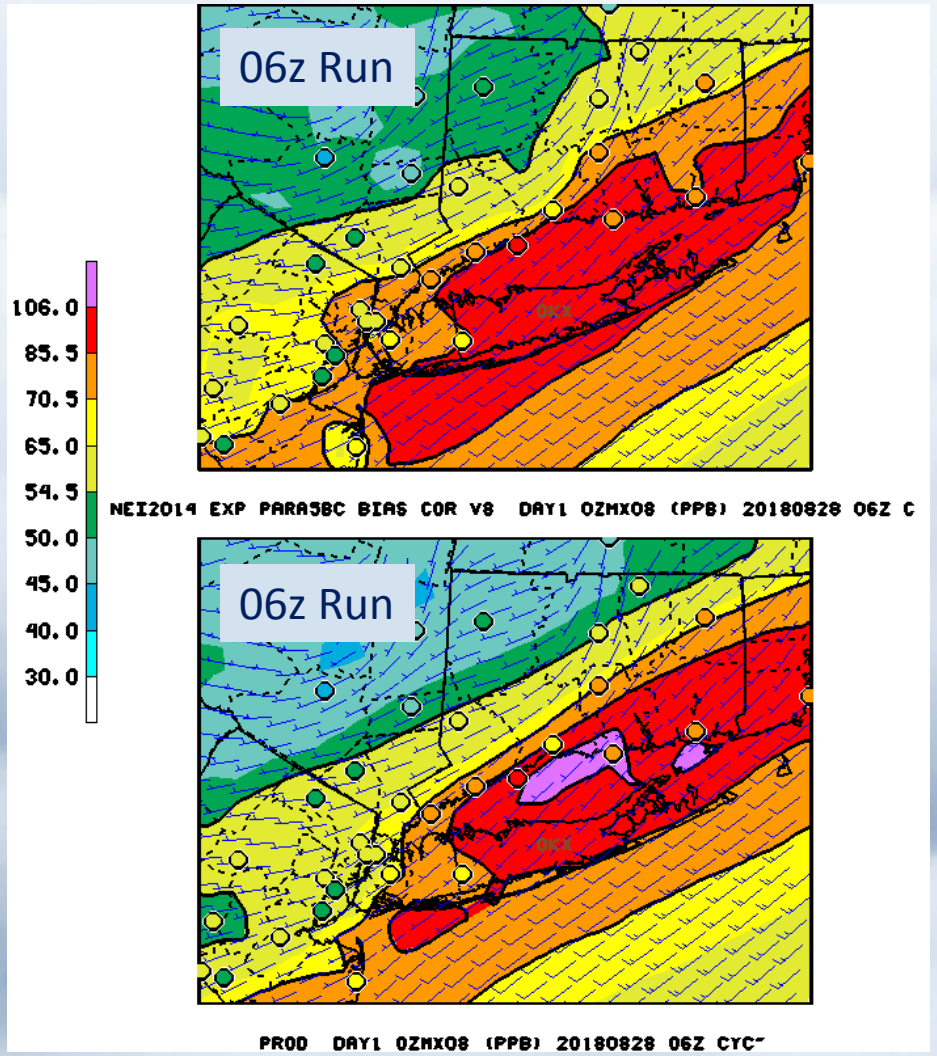


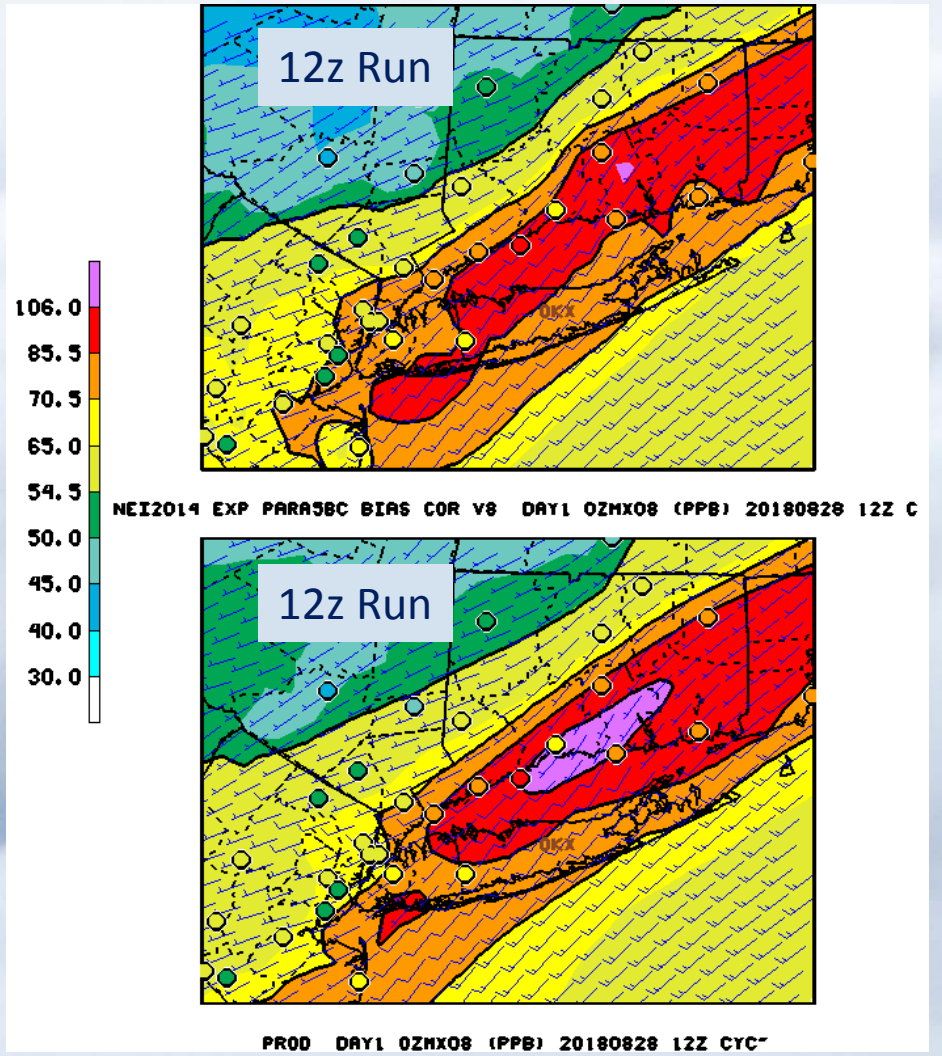
NOAA Model August 27, 2018 Day 2 for August 28th



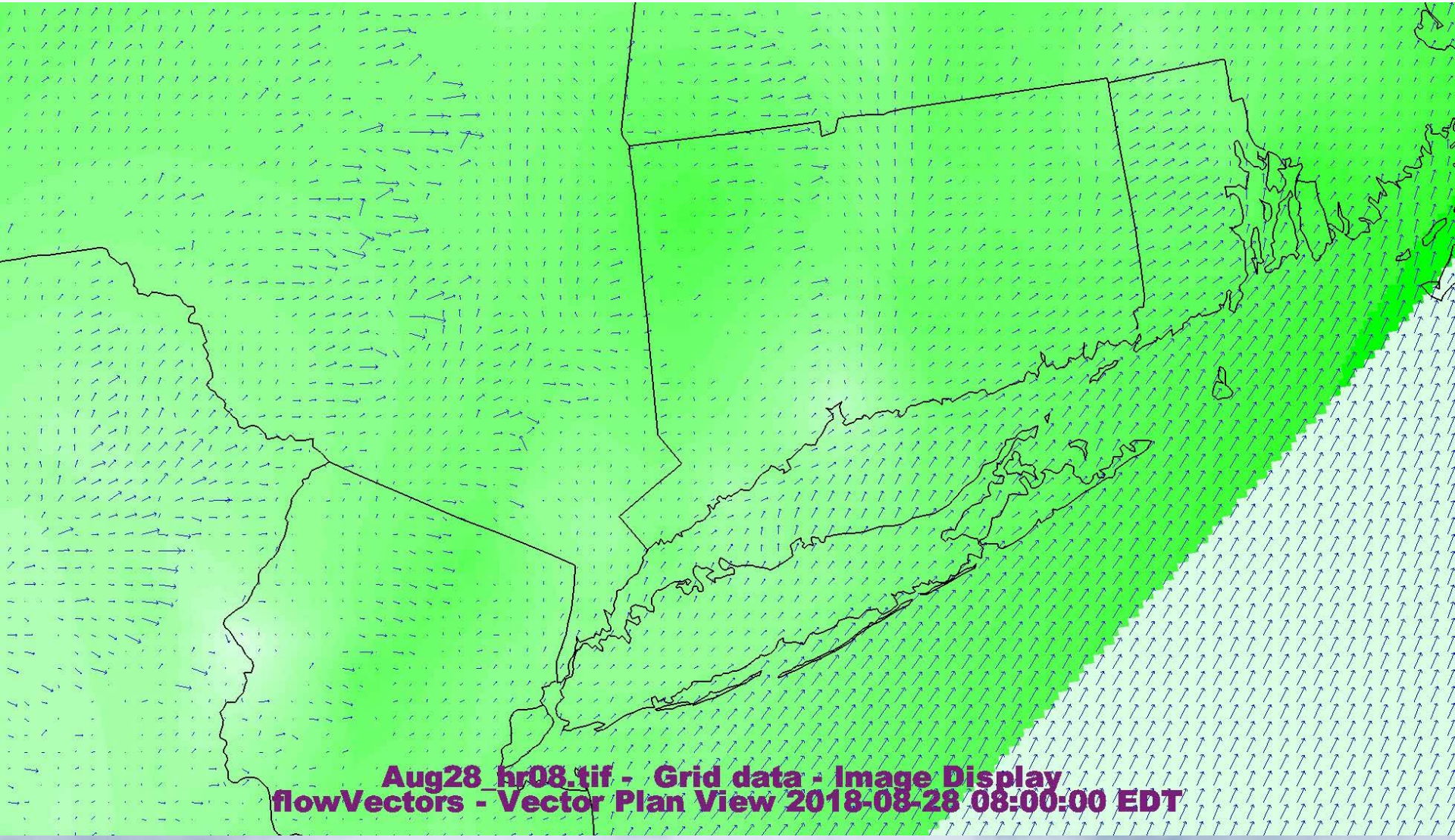


NOAA Model August 28, 2018 Day 1

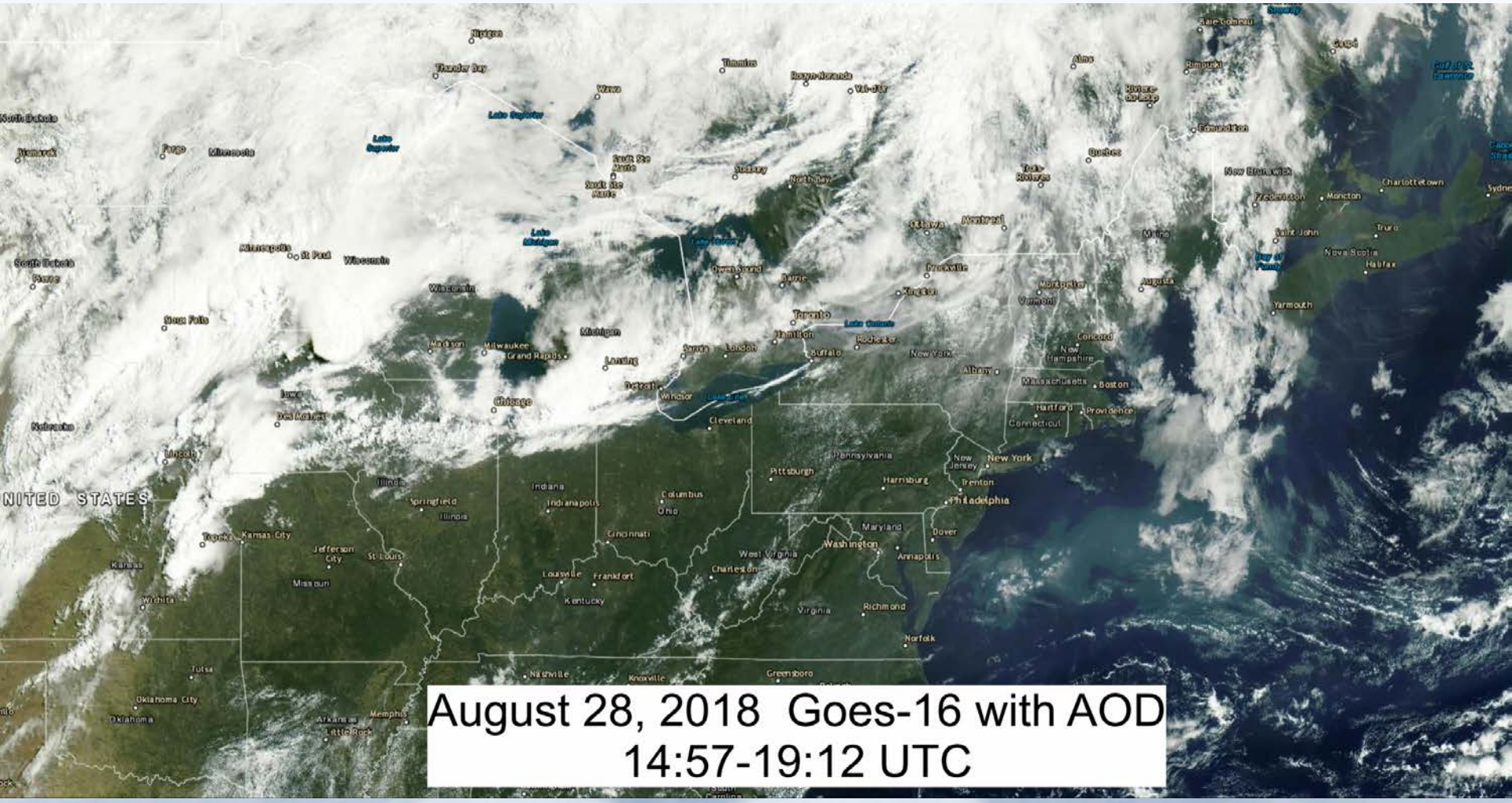




Connecticut Ozone Event August 28, 2018



Connecticut Ozone Event August 28, 2018



Conclusions

- 23 exceedance days in 2018, compared with 20 in 2017;

- Tropical weather pattern set up in July – August, which tended to push highest ozone further west, and allowed more mixing from the marine boundary layer, therefore;
  - this humid pattern actually limited the number of exceedance days to 23 considering the very hot & humid summer;

- The NOAA & Barons models generally under predicted in May;

- Over predictions began in June and continued into late August, however there were several days of under predictions thrown in.

Conclusions

- When we know that NOAA/BARONS models are over predicting, we generally lower the ozone levels by as much as 10-20 ppb;
- Smoke was present for several events during the summer, which may have hindered the model performance due to solar attenuation;
- On-going Long Island Sound Ozone Study (LISTOS) providing insight and more tools to Forecasters for increasing the forecast skill in future.