

State of Connecticut Implementation Plans for Ozone National Ambient Air Quality Standards

HAQAST Utah 2023

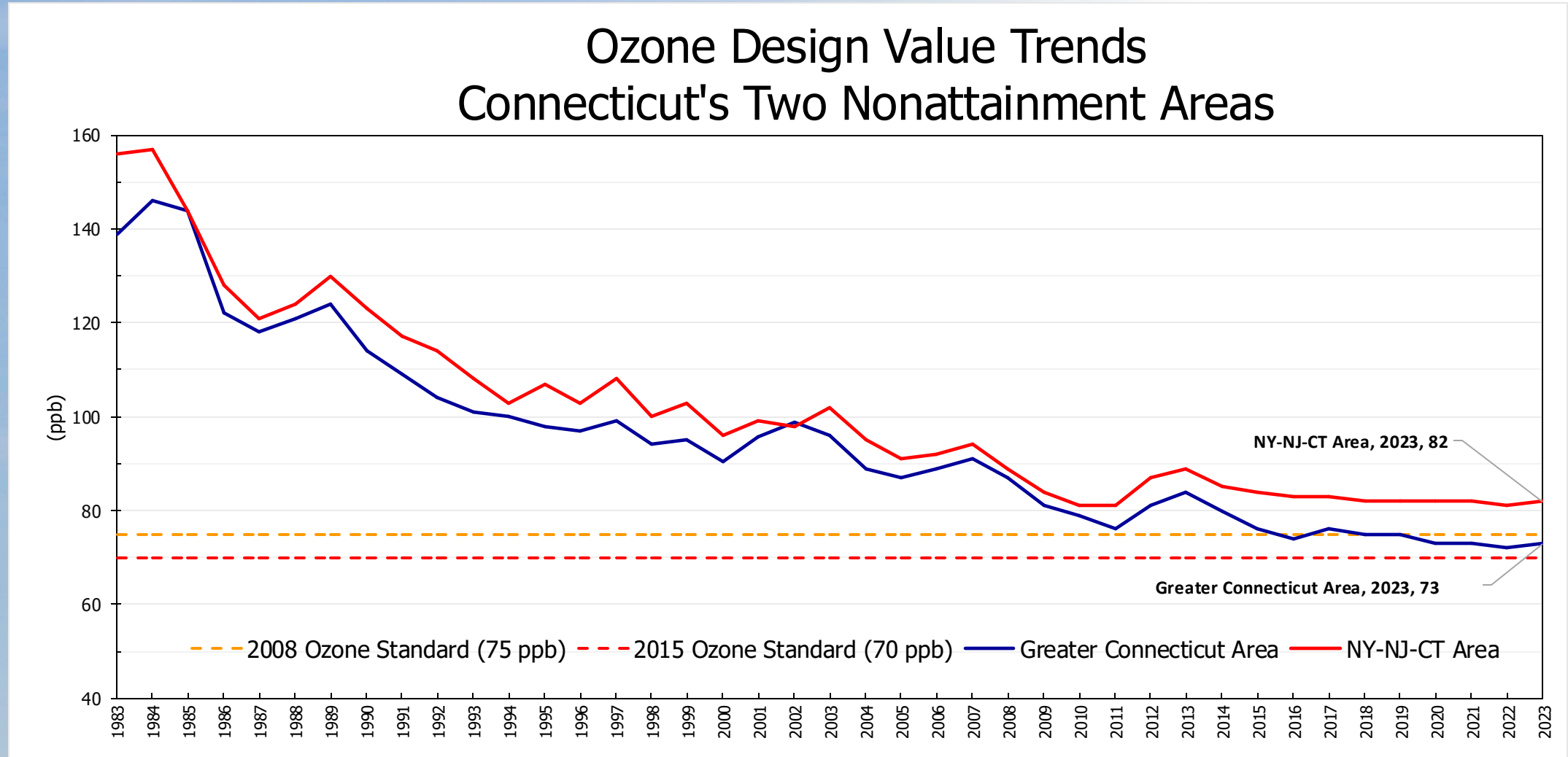


Connecticut
Department of Energy &
Environmental Protection

Michael Geigert
Bureau of Air Management



Connecticut's Ozone Design Value Trends



Connecticut, and many eastern States showed a 'bump up' in their ozone design values this year, due to wildfire smoke. Many of these increases will result in 'regulatory significance' and require exception event demonstrations.

Exception Event Regulatory Significance

The following events are being considered for regulatory significance:

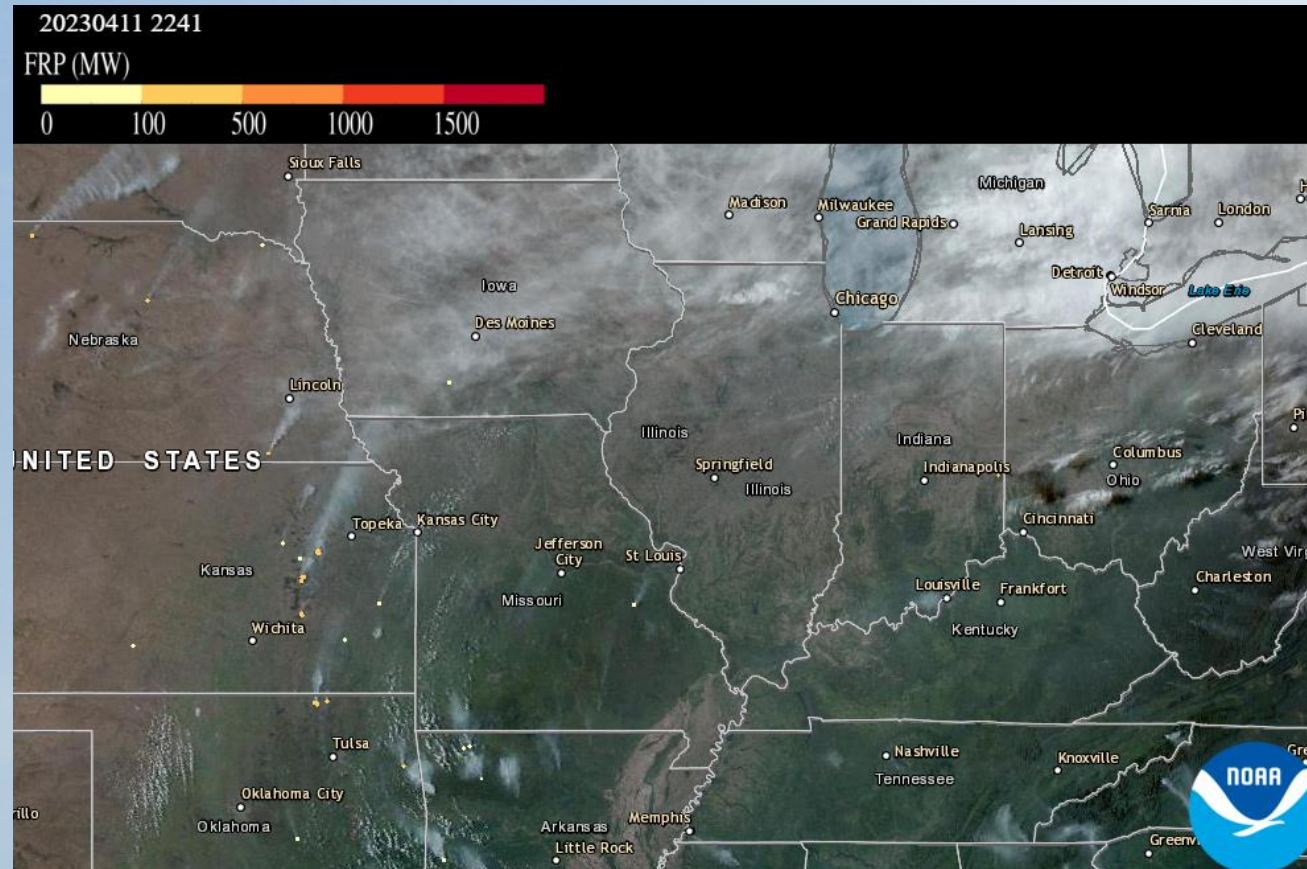
- April 13-14
- June 30-July 1
- July 12
- June 1-2

This would result in Greater CT attaining the 2015 ozone NAAQS and SW CT achieving a 4th high of 75 ppb at Greenwich.

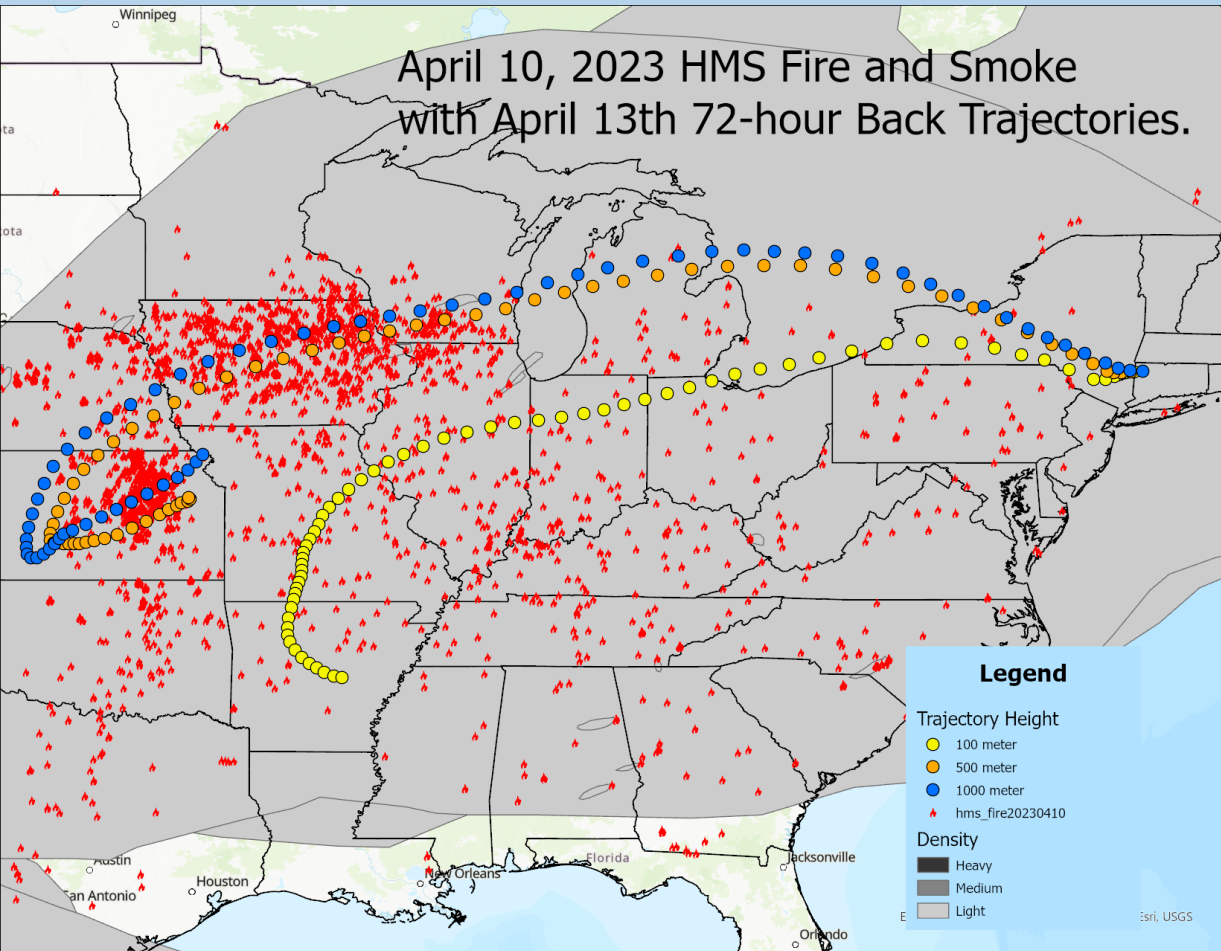
Site	Current 4th High	Current DV	April 13	April 14	June 30	July 1	July 12	June 1	June 2	Resulting 4th High	Resulting DV
Greater CT											
Abington	63	65	69	74	57	71	53	61	53	61	64
Cornwall	76	71	67	82	78	79	57	76	58	62	66
East Hartford	73	71	67	84	73	82	64	73	69	64	68
Groton	73	73	76	73	70	76	81	40	49	64	70
Stafford	70	68	71	88	68	76	61	65	51	62	65
Southwest CT											
Danbury	75	73	68	85	85	83	64	73	58	68	71
Greenwich	82	78	72	76	81	82	89	73	81	75	76
Madison	78	79	82	75	78	77	81	50	66	71	76
Middletown	75	75	75	82	69	80	70	68	68	65	72
New Haven	69	70	58	66	80	72	66	50	65	64	69
Stratford	81	82	77	72	81	86	89	57	75	74	80
Westport	79	82	79	78	79	82	89	72	80	74	80
Site Exceedances			7	11	8	12	5	5	3		

April 13-14, 2023

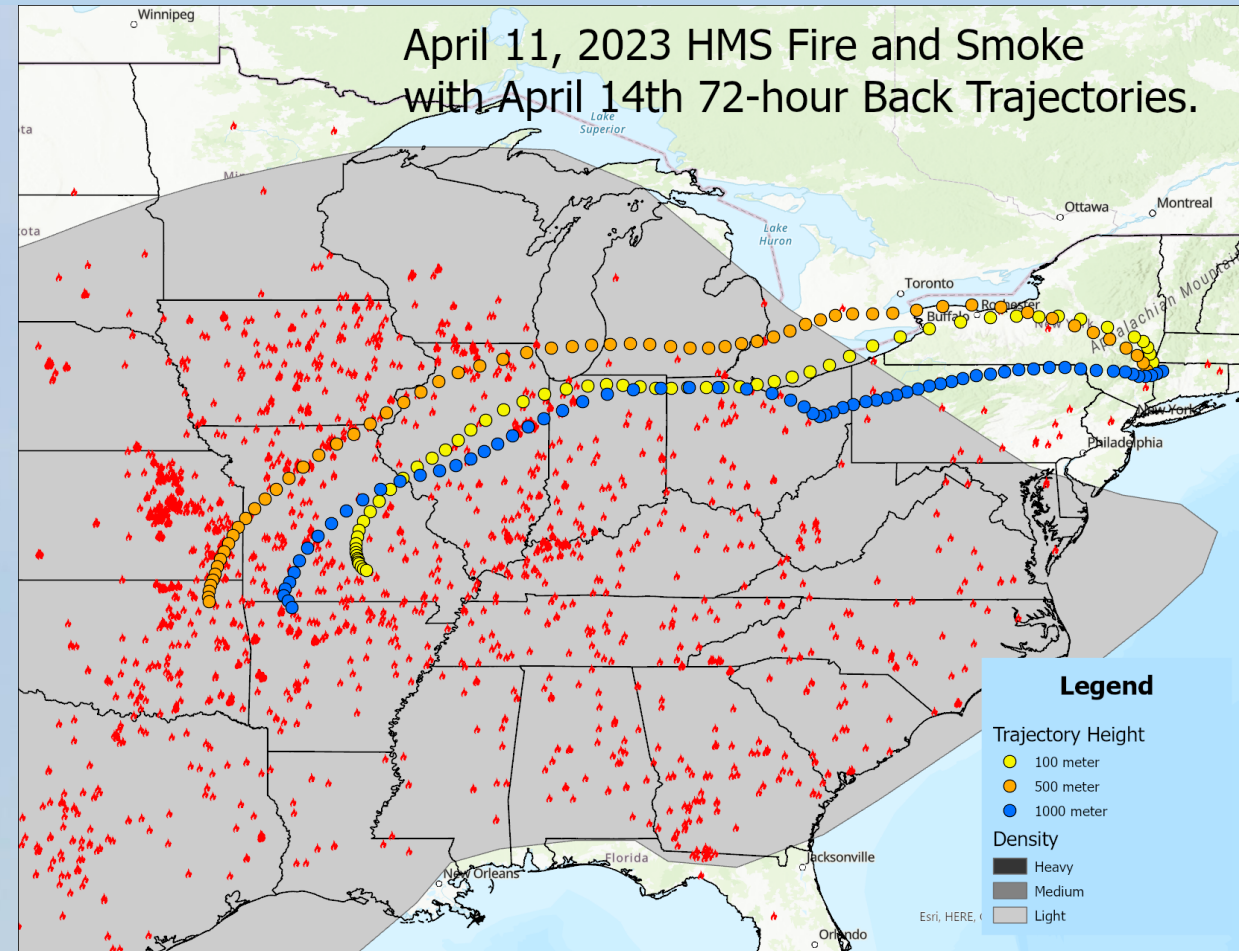
- During April 13-14, 2023, Connecticut experienced a rare ozone exceedance event in April, the first since 2016.
- Due to the widespread nature of this event, it is likely that smoke from fires upwind of Connecticut contributed to the unusually high ozone levels.



April 13-14, 2023 Back-Trajectories from Cornwall



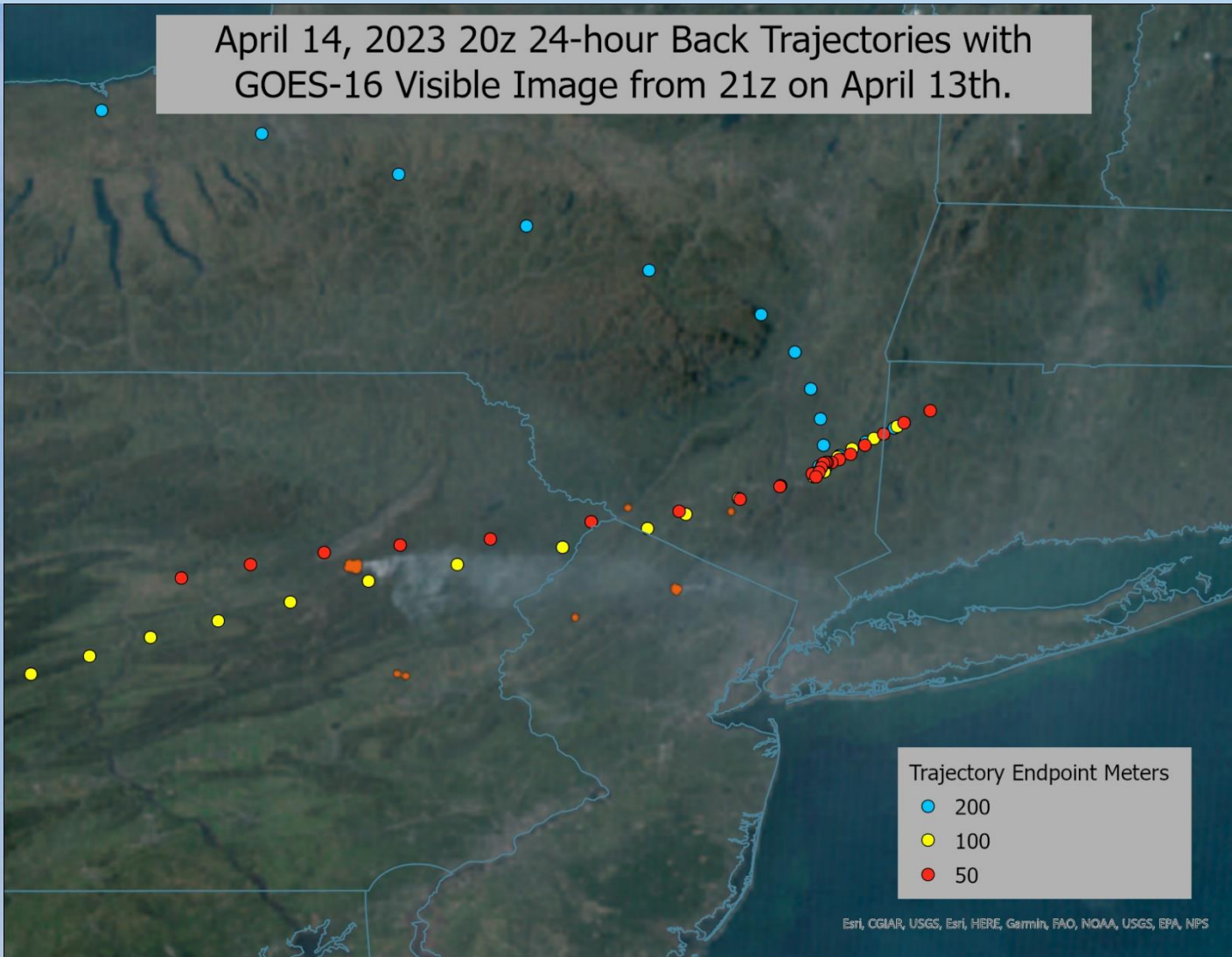
This map shows that 72 hour back-trajectories with the HMS smoke/fire analysis on April 10th. This is a more realistic depiction of the fires that would have contributed to the smoke near the beginning of the trajectory. Note the fires burning at the Flint Hills of eastern Kansas.



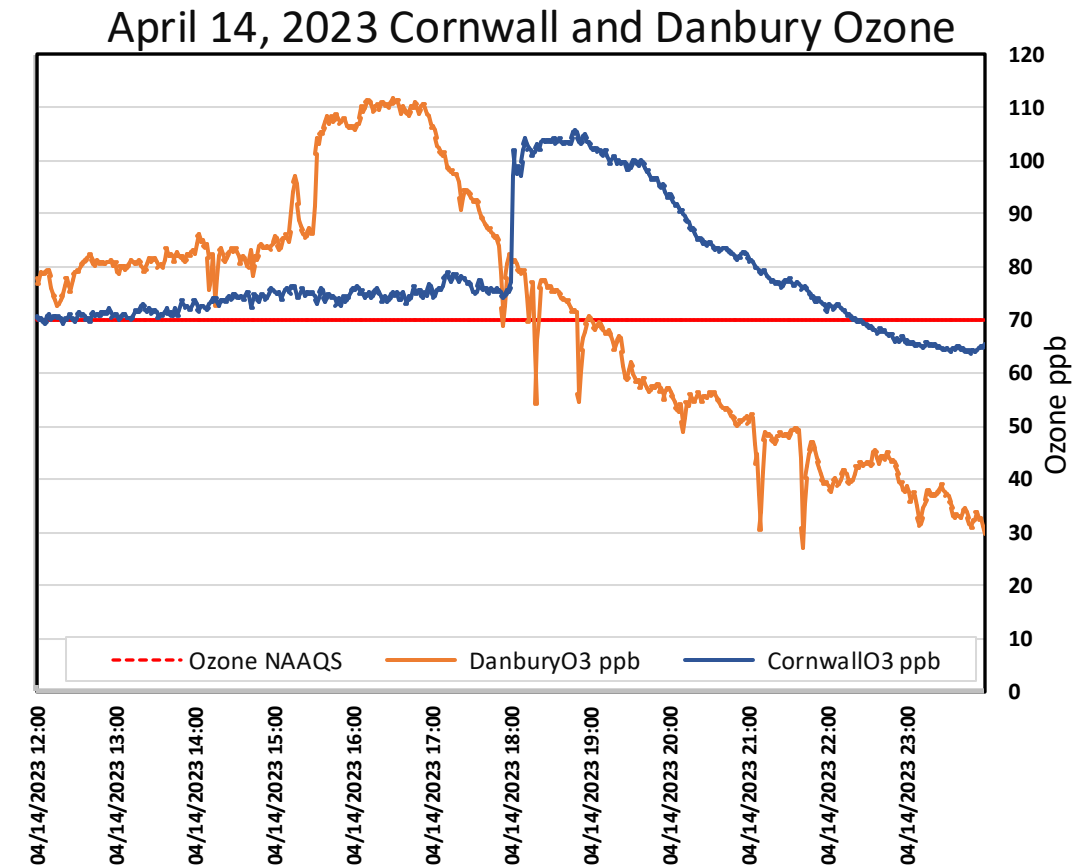
This map shows that 72 hour back-trajectories with the HMS smoke/fire analysis on April 11th. Note the numerous fires burning near the beginning of the trajectories, three days before the April 14th ozone exceedances.

Cornwall and Danbury Ozone Spike On April 14th

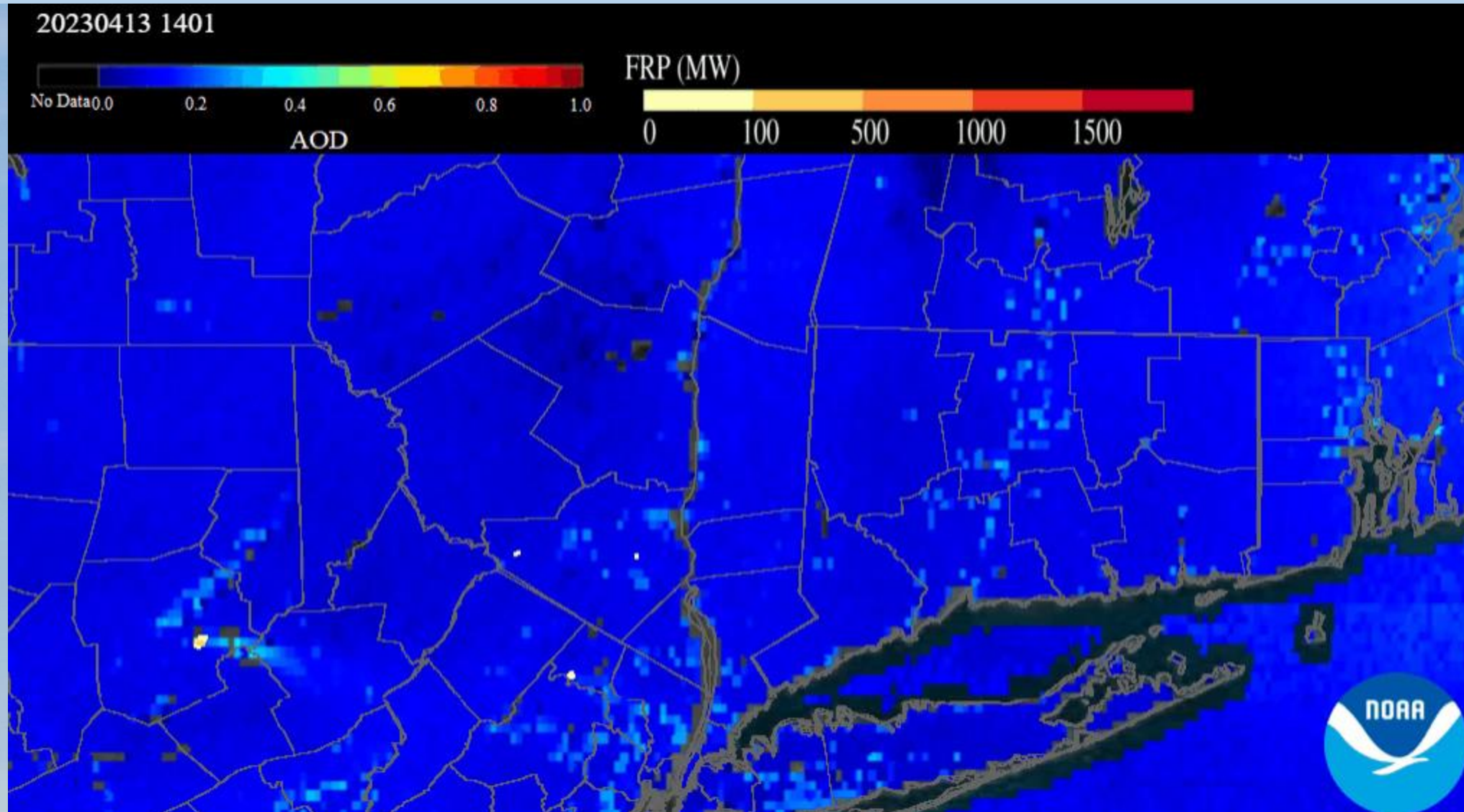
April 14, 2023 20z 24-hour Back Trajectories with
GOES-16 Visible Image from 21z on April 13th.



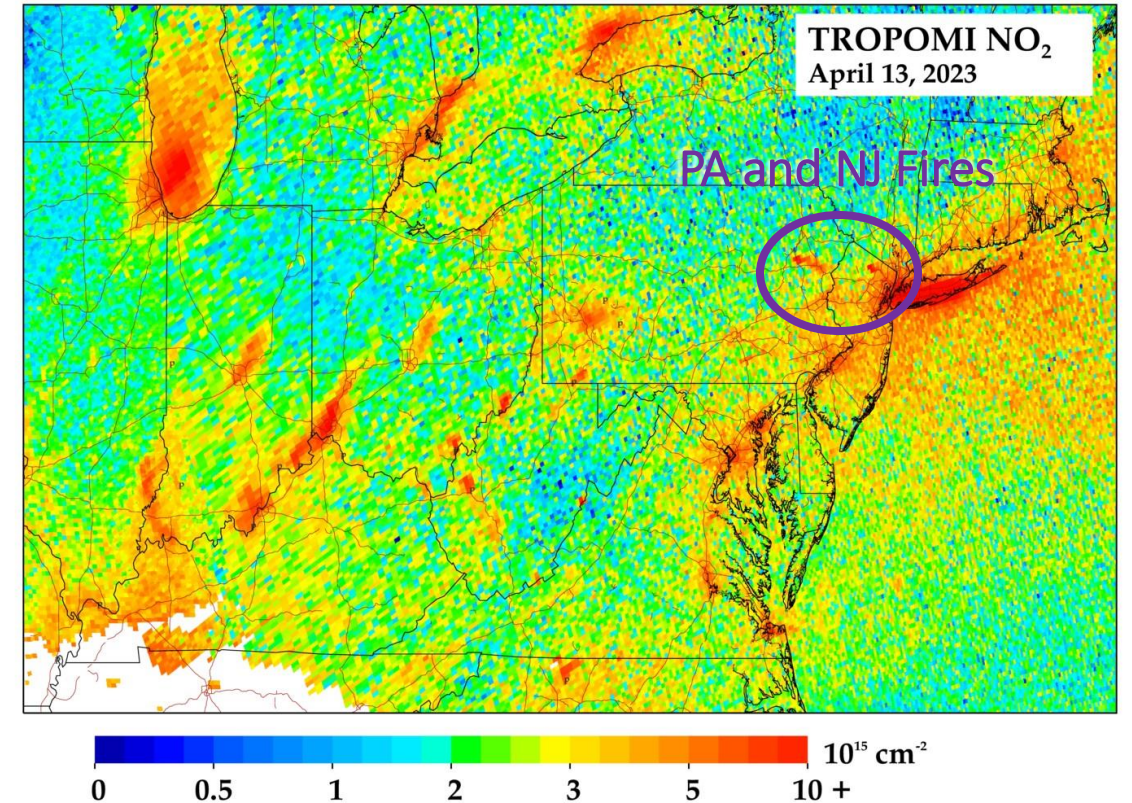
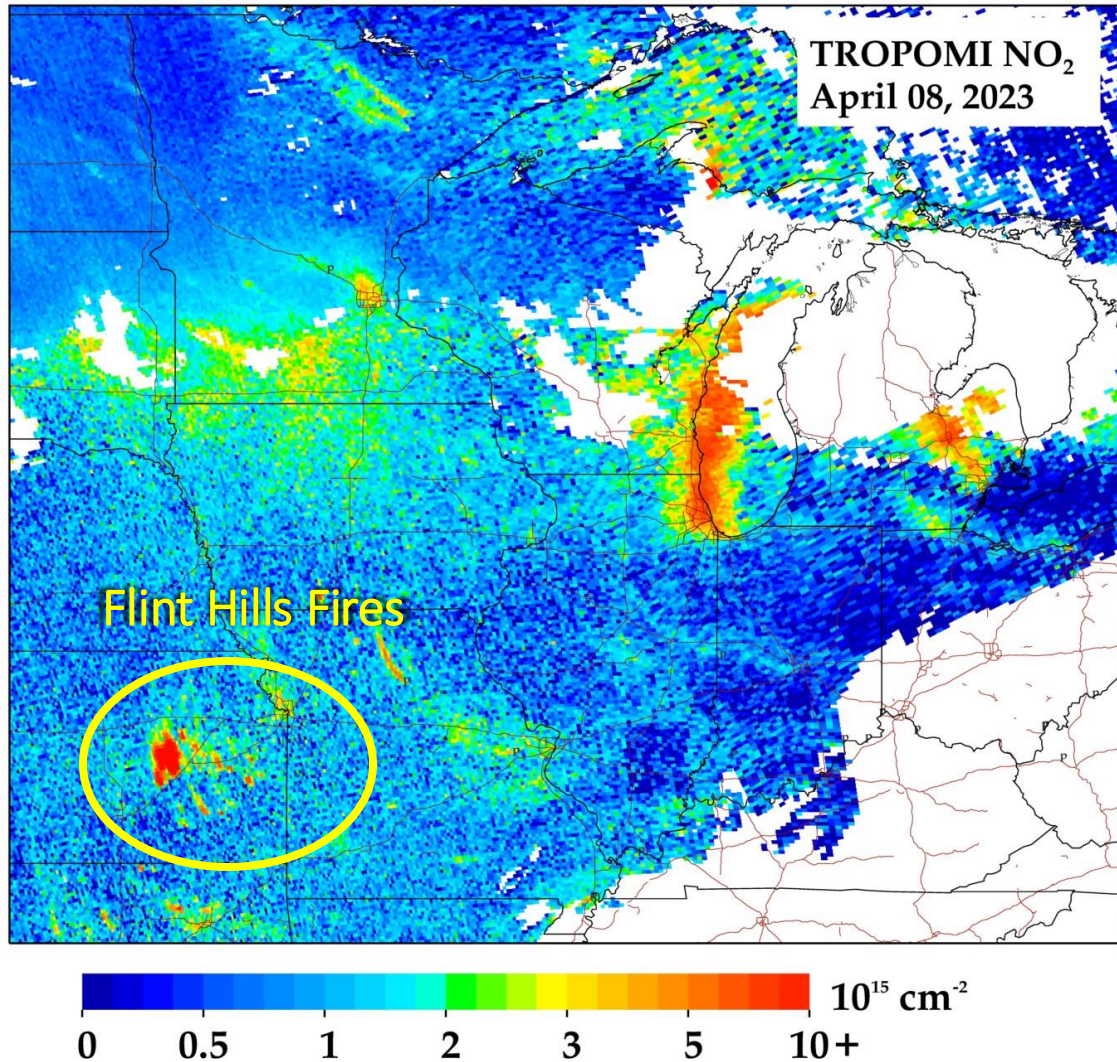
Note the ozone spike on April 14th at 1600 at Danbury and 1800 at Cornwall. This was likely due to the added smoke emissions from a large wildfire in eastern Pennsylvania from the day before.



AOD Satellite Animation April 13, 2023



TROPOMI NO₂ Images April 2023



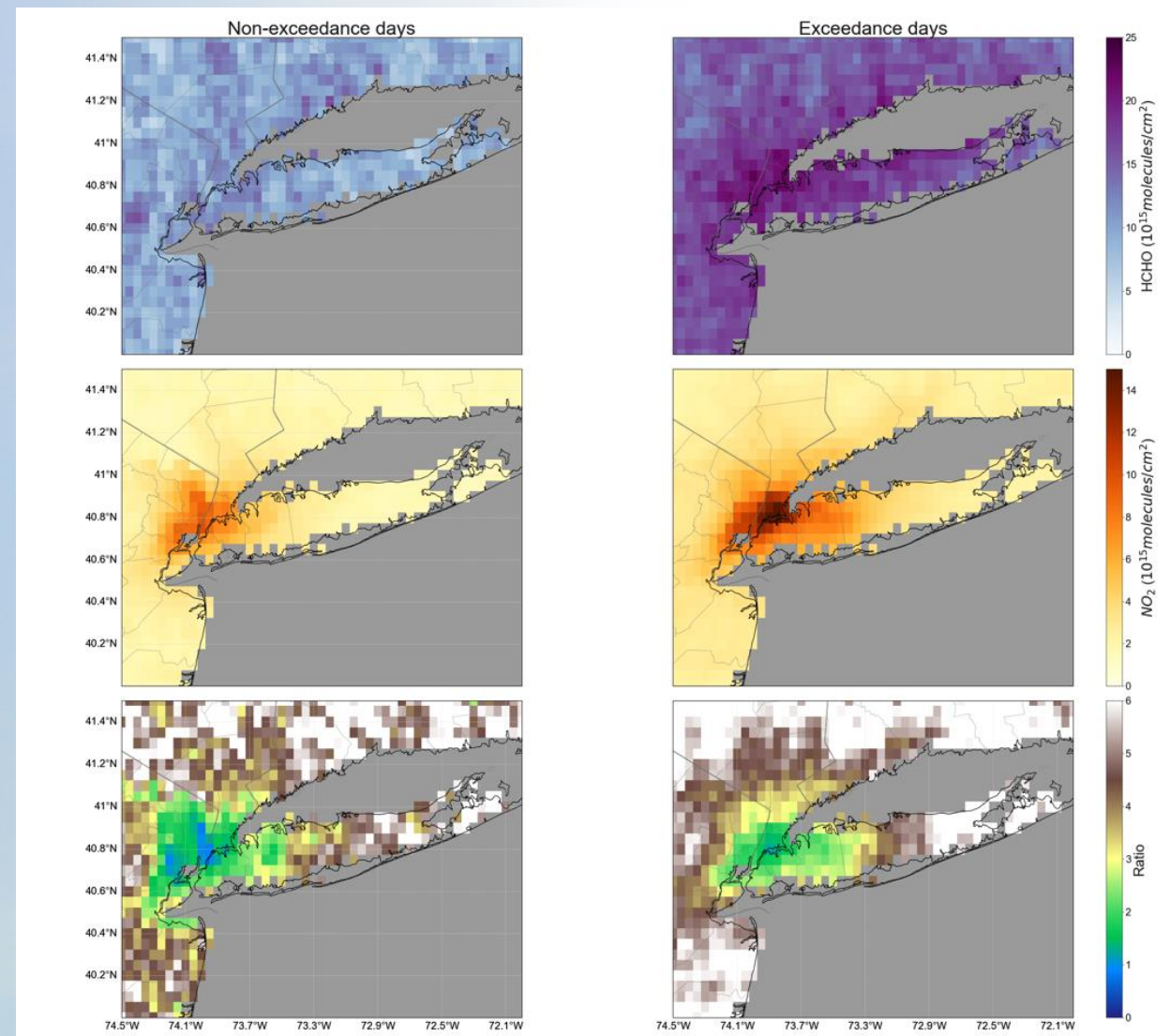
The tropomino2.us web site is maintained by the [Air Climate and Health Lab](#) at the Milken Institute School of Public Health at George Washington University, and is not directly affiliated with Tropomi Science Team. Data shown on the website are tropospheric vertical column amounts, are filtered to show measurements with a quality assurance flag exceeding 0.75, and are re-gridded using a methodology described in [Goldberg et al. 2021](#).

Satellite Data in Ozone SIPs

We make increasing use of satellite and remote sensing data in our ozone SIPs:

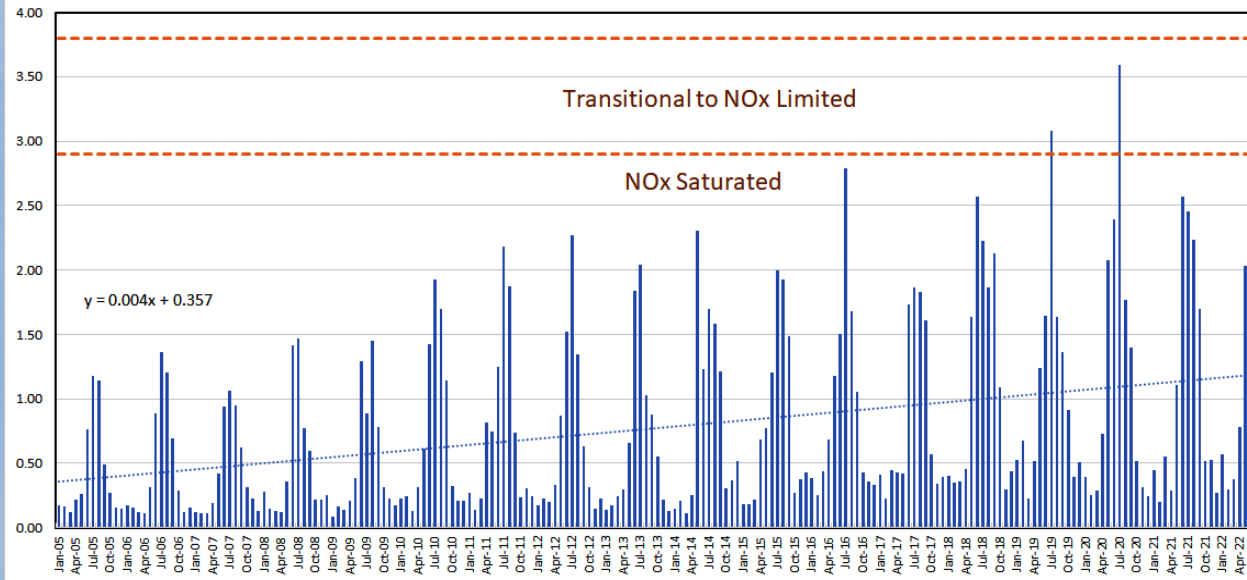
- On-going studies conducted by the Lamont-Doherty Earth Observatory at Columbia University make use of NASA data from air column NO_2 and formaldehyde (HCHO as a surrogate for VOC) as measured by ozone monitoring instruments (OMI) on satellites and correlated to ozone episodes in the Northeast. Figure 2-17 shows maps of HCHO, NO_2 and the resultant HCHO/ NO_2 ratios for 19 non-exceedance days versus 19 exceedance days in 2018 over NYC (as in Tao et al. 2022).

<https://pubs.acs.org/doi/10.1021/acs.est.2c02972> : Investigating Changes in Ozone Formation Chemistry during Summertime Pollution Events over the Northeastern United States.

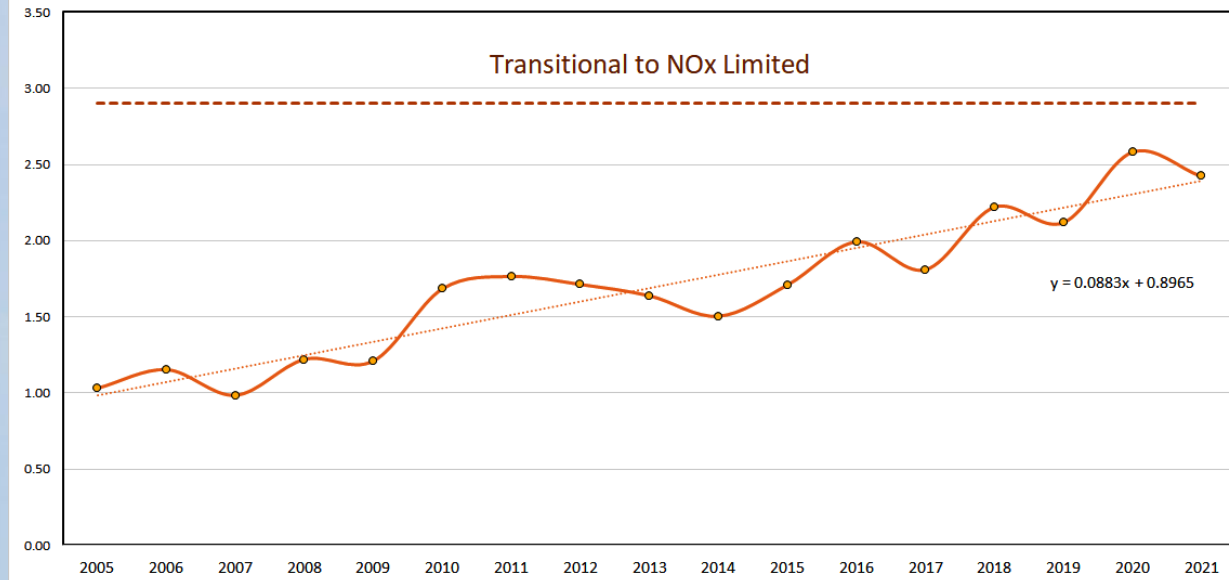


Satellite Data in Ozone SIPs

Monthly OMI HCHO/NO₂ Ratio for NYC

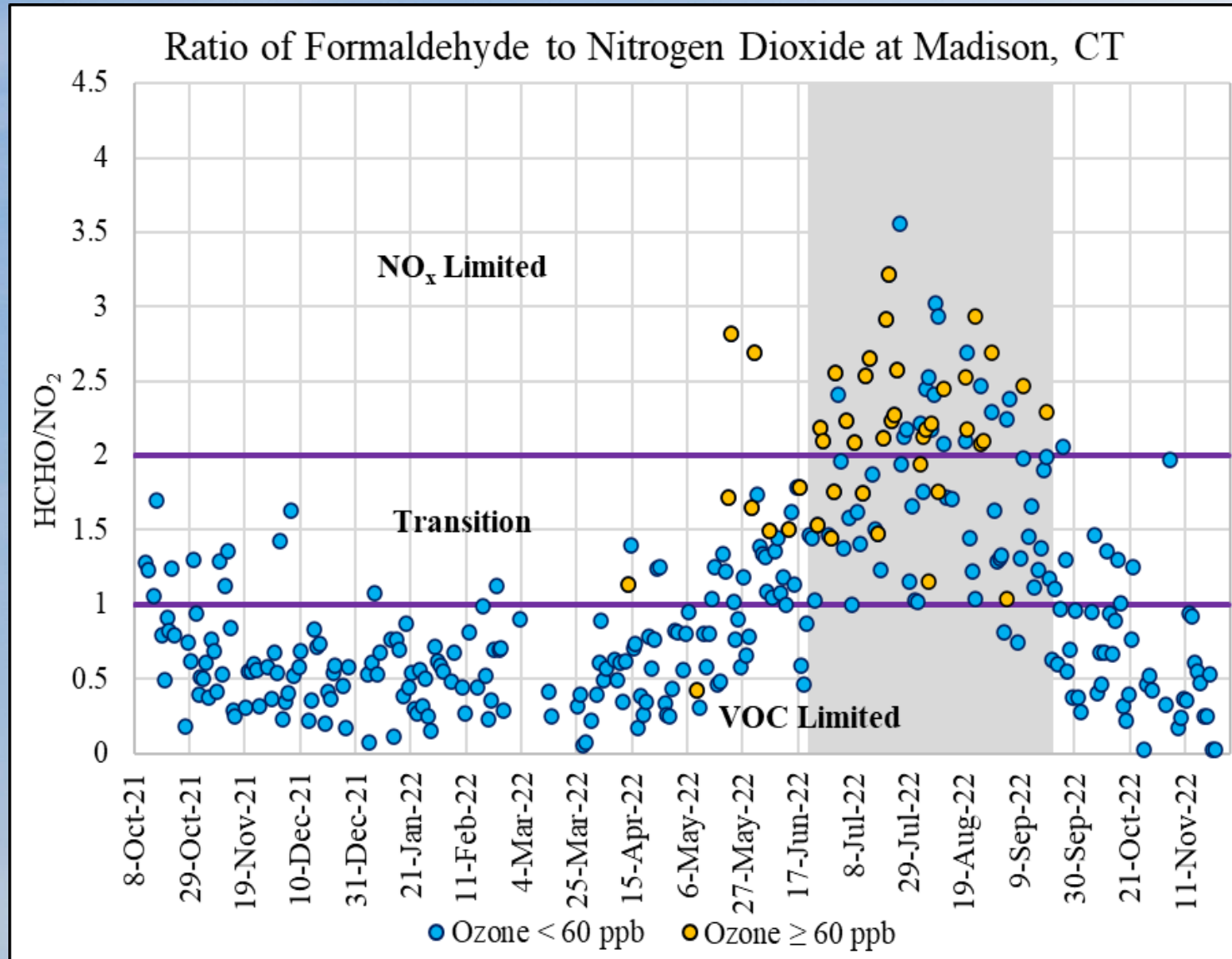


JJA Averaged OMI HCHO/NO₂ Ratio for NYC

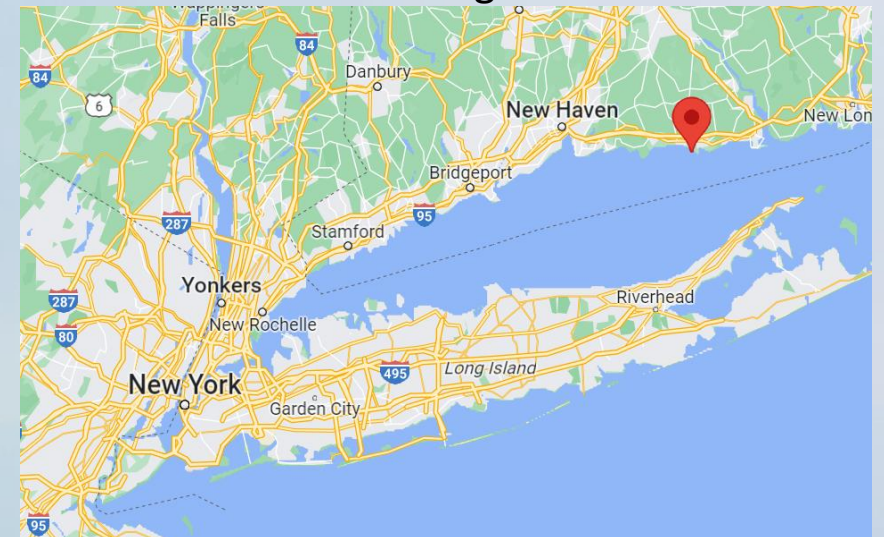


- Tao et al. produced updated time series of monthly average HCHO/NO₂ for gridded areas averaged over New York City on cloud-free days (QA>0.75) for all months (Figure 2-18) and only during the summer months of June, July and August (Figure 2-19). In both charts, the HCHO/NO₂ trends are increasing, especially for the summer months, where the transition to a NO_x limited regime may occur in several years over the NYC area.

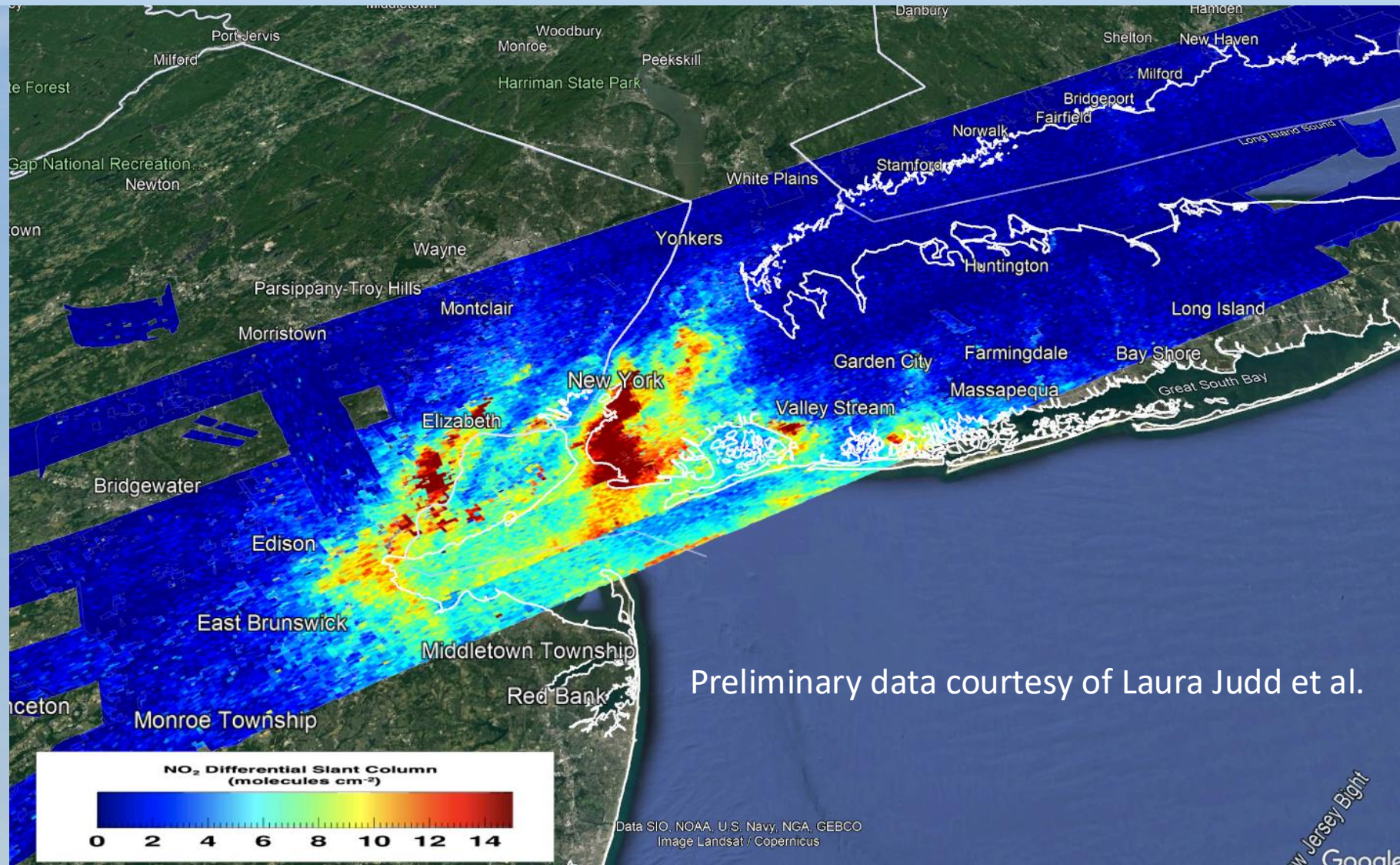
Pandora Data from Madison CT



- This approach, used in previous SIP submittals, does not rely on city specific data. In this approach, if the ratio of HCHO to NO₂ is less than one, it is a VOC limited regime. If the ratio is between one and two it is a transition regime. If the ratio is greater than two, it is a NO_x limited regime.
- For days with ozone values above 60 ppb, HCHO to NO₂ ratios are mostly near or above 1.5 indicating high ozone values tend to be NO_x limited at Madison. Control strategies implemented with a focus on a particular pollutant can have a more beneficial effect if ozone reactions in that air shed tend to be limited by that pollutant. Therefore, the Pandora data confirms it is appropriate to favor NO_x control strategies in Connecticut.

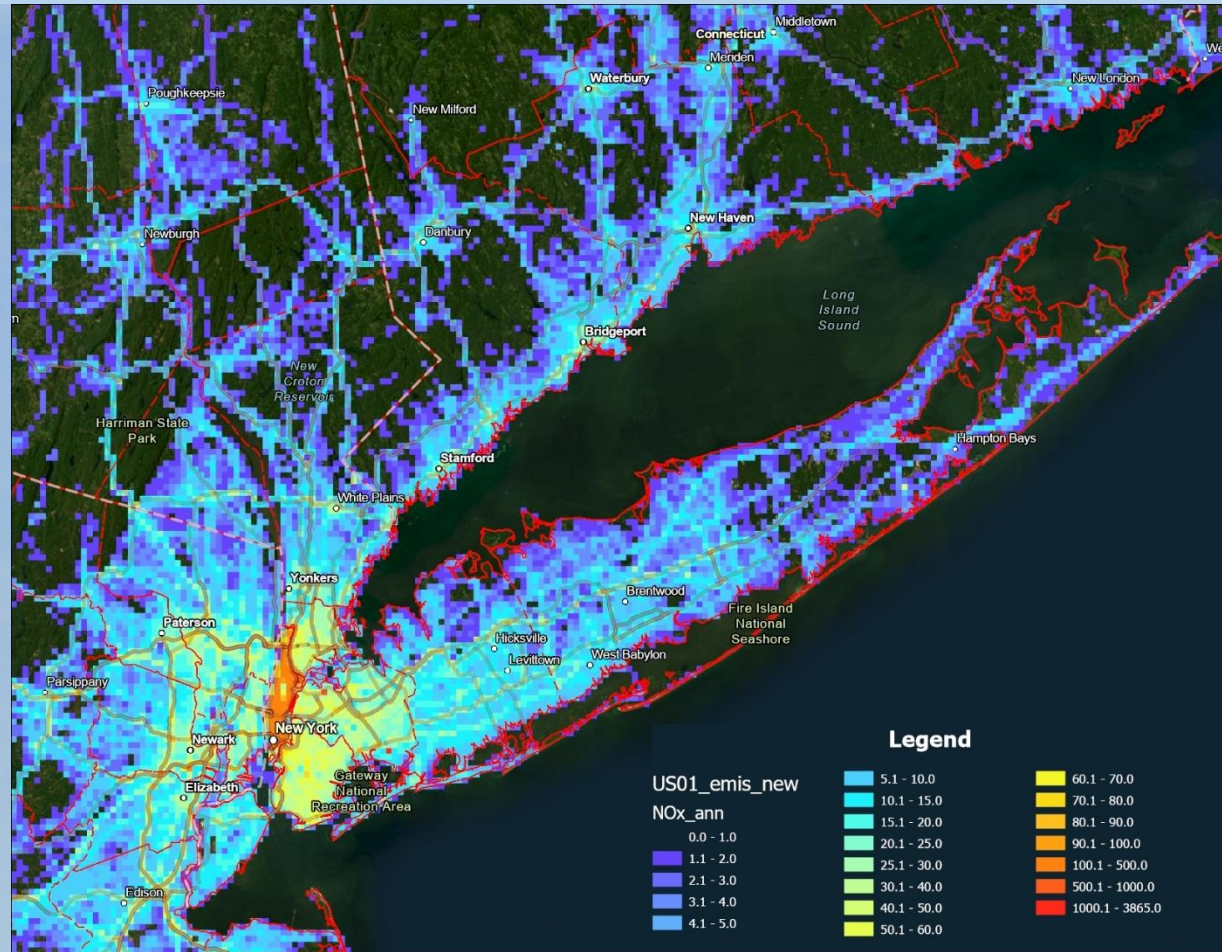


August 5, 2023 STAQS-GCAS NO2 Column



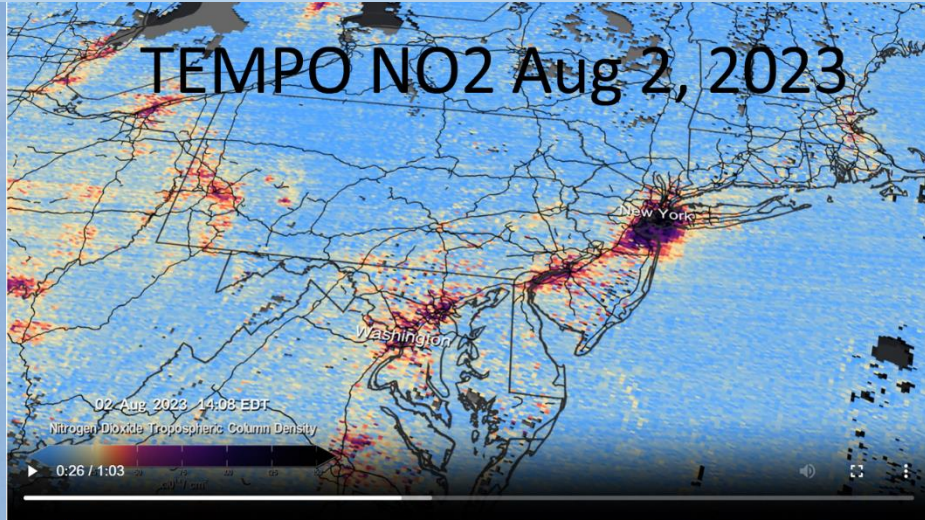
From the 2023 AGES+STAQS study over NYC. The NO2 plume continues to plague the Connecticut shoreline

High Resolution Regridded 1km 2017 NEI

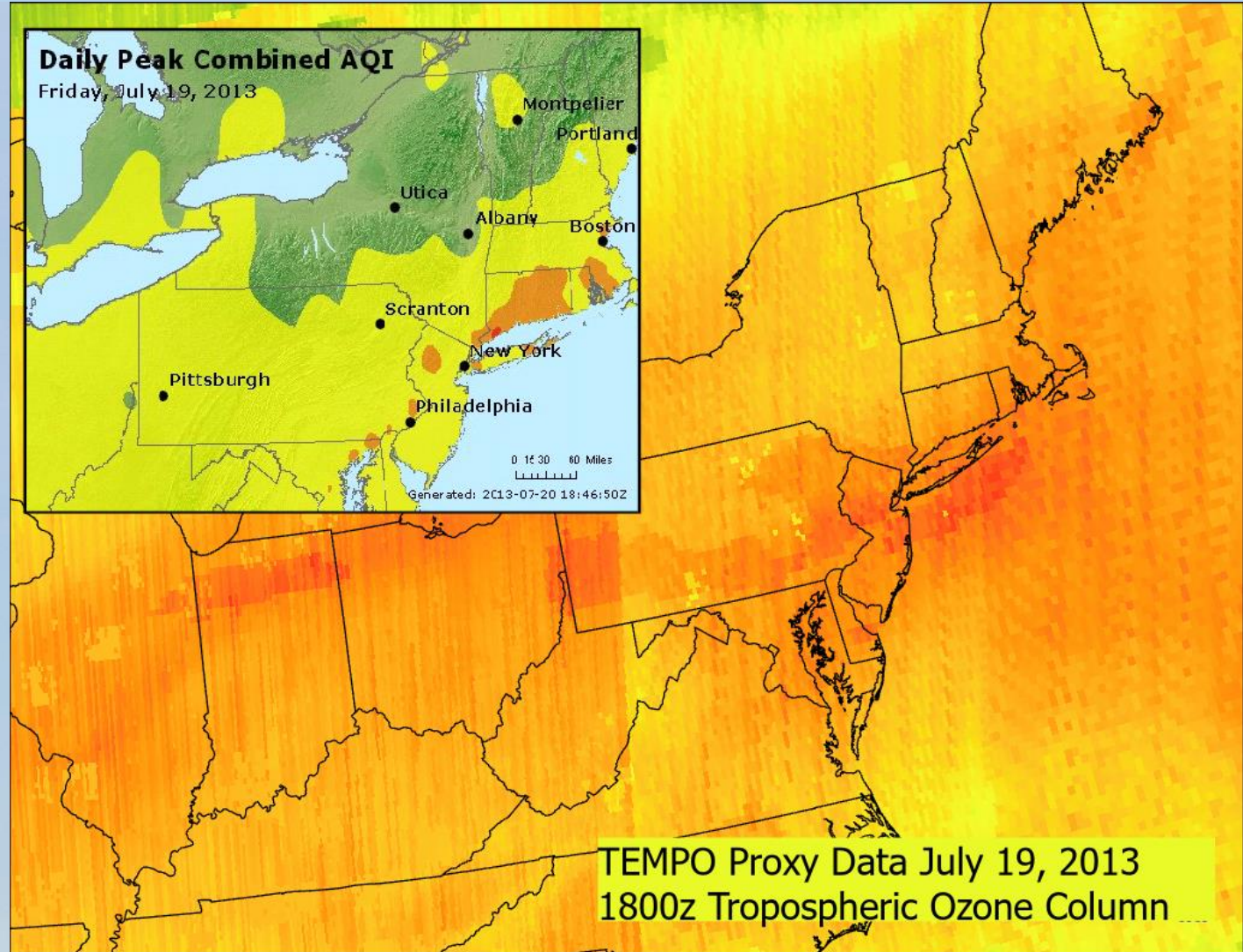
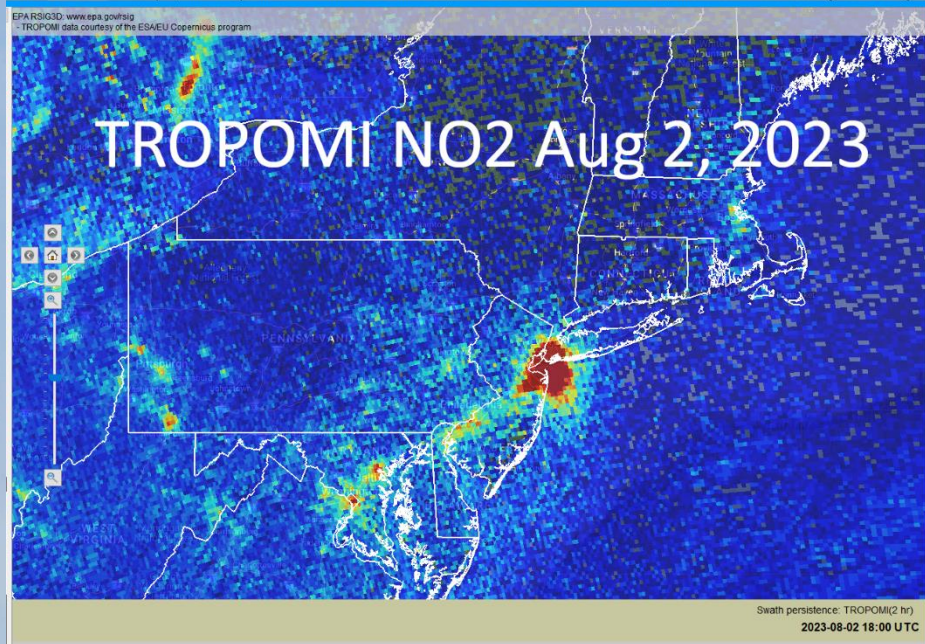


- **Figure 2-22.** 2017 NEI Modeled Non-point NO_x Regridded to a 1km Grid. Developed by Dr. Daniel Tong, George Mason University.

TEMPO First Light August 2, 2023



NASA's TEMPO instrument measured concentrations of nitrogen dioxide pollution over North America for the first time on August 2, 2023. The visualization shows six scans made hourly between 11:12 a.m. and 5:37 p.m., with closeups on the I-95 corridor in the US northeast, central and eastern Texas to New Orleans, and the southwest from Los Angeles to Las Vegas.



First ever tropospheric ozone column. Data will be GIS importable!

Conclusion

- Thank you HAQAST for all your support to your stakeholders!



NASA HEALTH AND AIR QUALITY APPLIED SCIENCES TEAM

Connecting NASA Data and Tools with Health and Air Quality Stakeholders