



# Connecticut Department of Energy and Environmental Protection



# Using Satellite Data to Forecast Air Quality in Connecticut

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September 2018



Connecticut Department of Energy and Environmental Protection

# 2016 Fort McMurray Wildfire Review

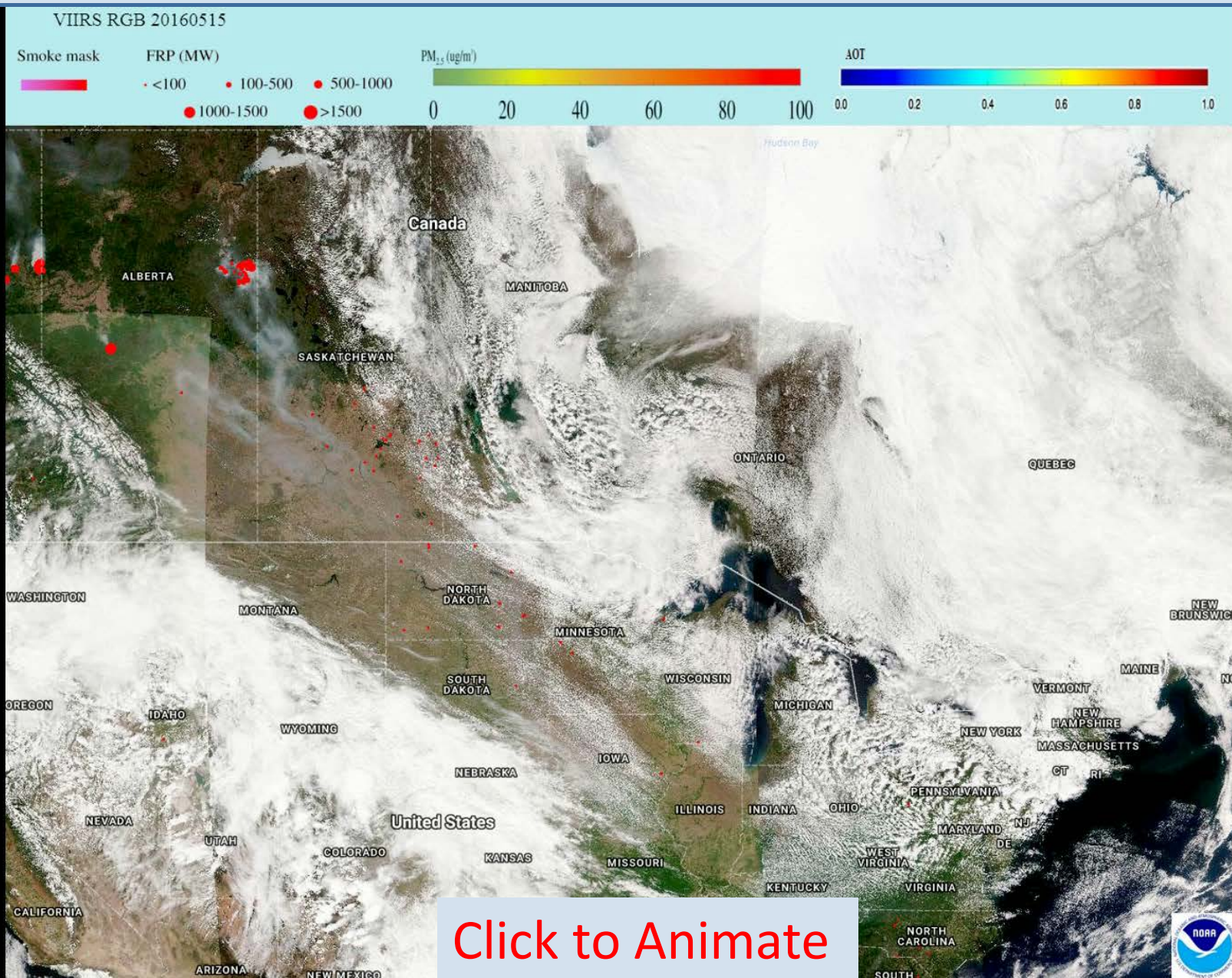
- Successfully used satellite images to prove that the 2016 Fort McMurray wildfire affected ozone levels in Connecticut.



*On May 1, 2016, a wildfire began southwest of Fort McMurray, Alberta, Canada. On May 3, it swept through the community, destroying approximately 2,400 homes and buildings and forcing the largest wildfire evacuation in Albertan history.*

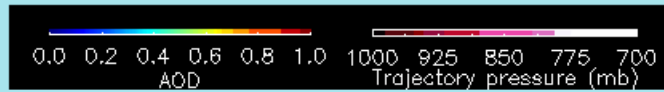


# Video of Wildfire Evolution May 15-26, 2016

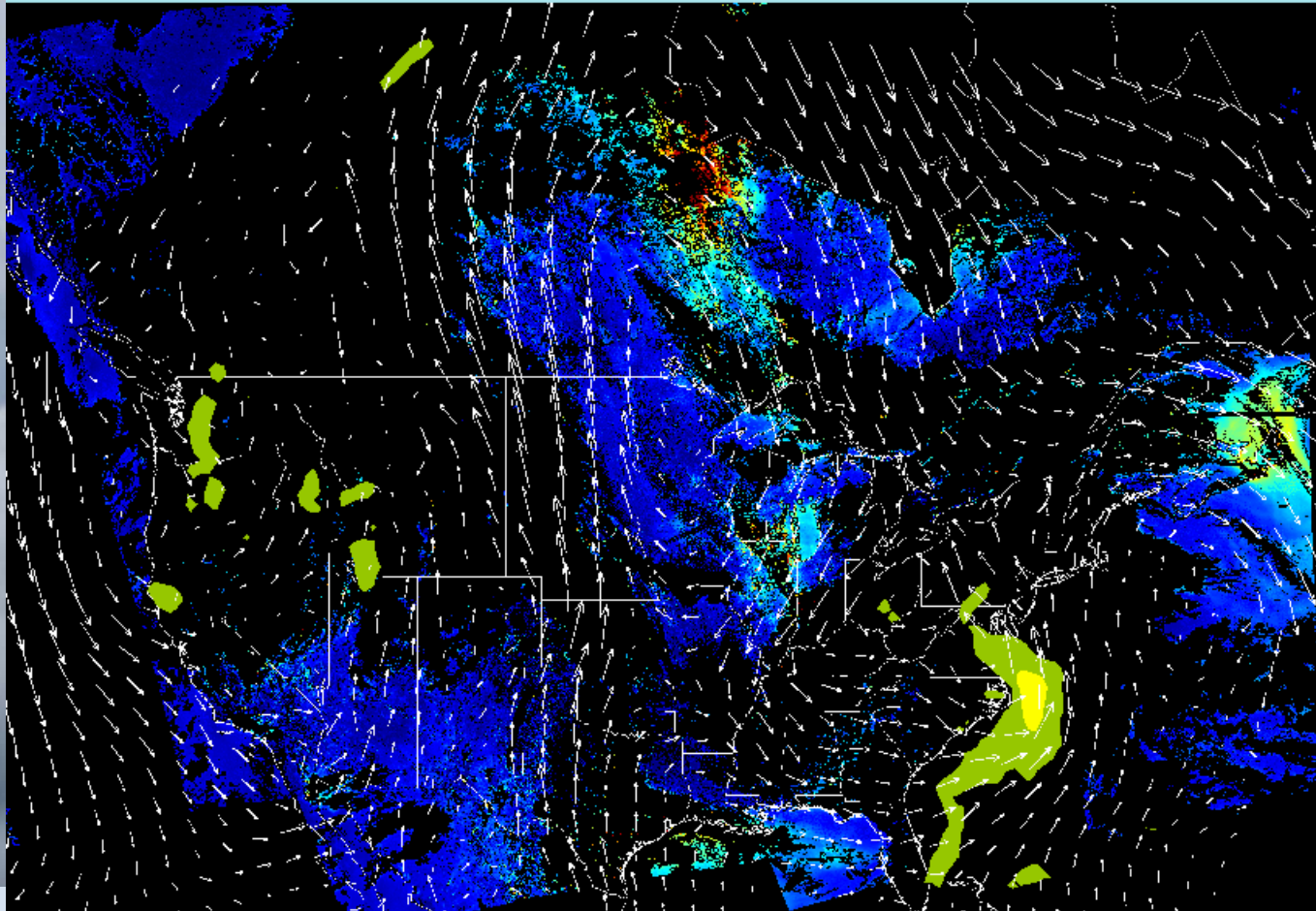


# VIIRS Modeled Trajectories, May 21-23, 2016

VIIRS 48-hour trajectories (initialized at 12Z 20160521, with 3-hour increment)



2016052115



- Trajectory forecast showed aerosols moving south into the Midwest, where they were later trapped under high pressure.

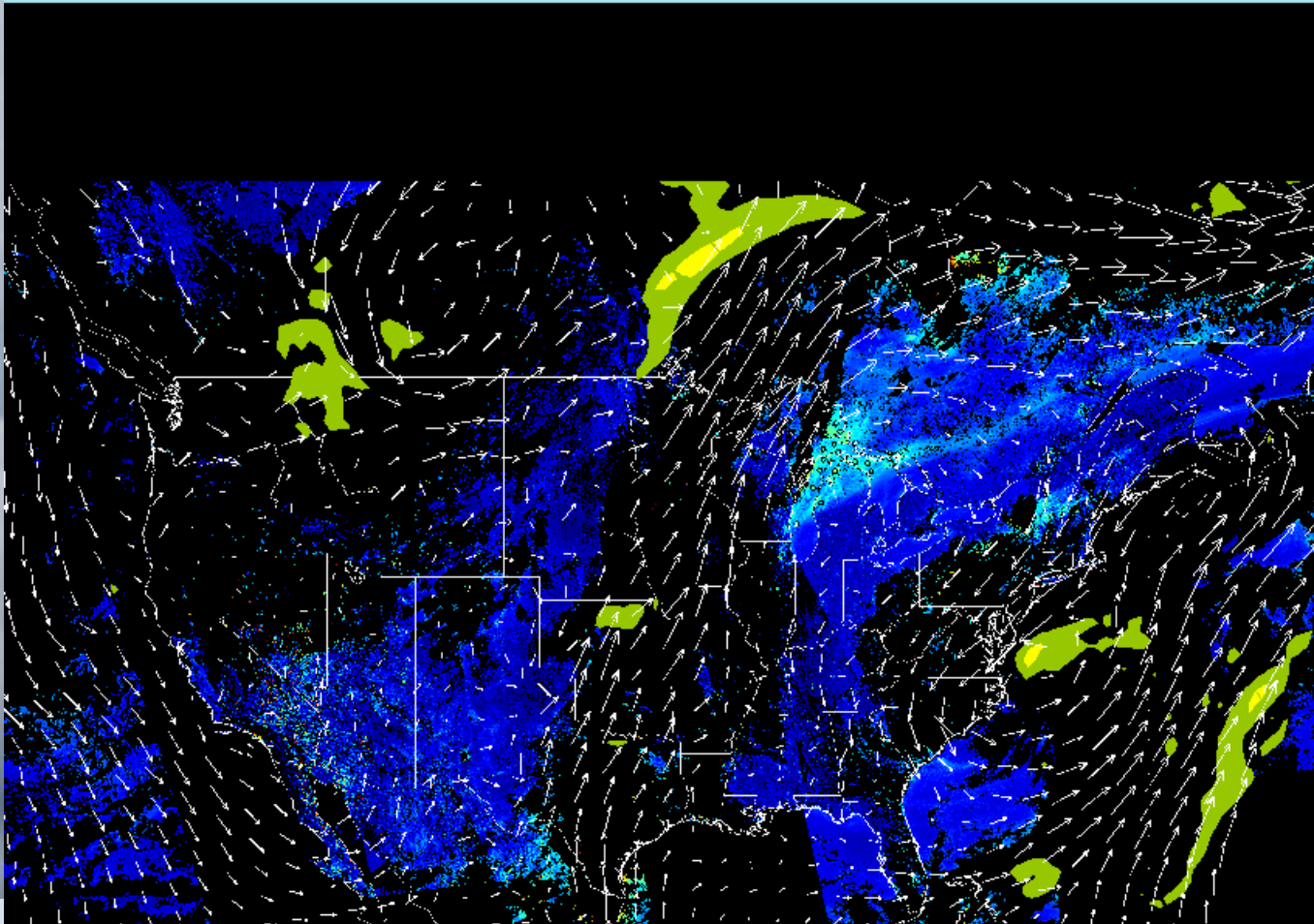


# VIIRS Modeled Trajectories, May 23-25, 2016

VIIRS 48-hour trajectories (initialized at 12Z 20160523, with 3-hour increment)

0.0 0.2 0.4 0.6 0.8 1.0 1000 925 850 775 700  
AOD Trajectory pressure (mb)

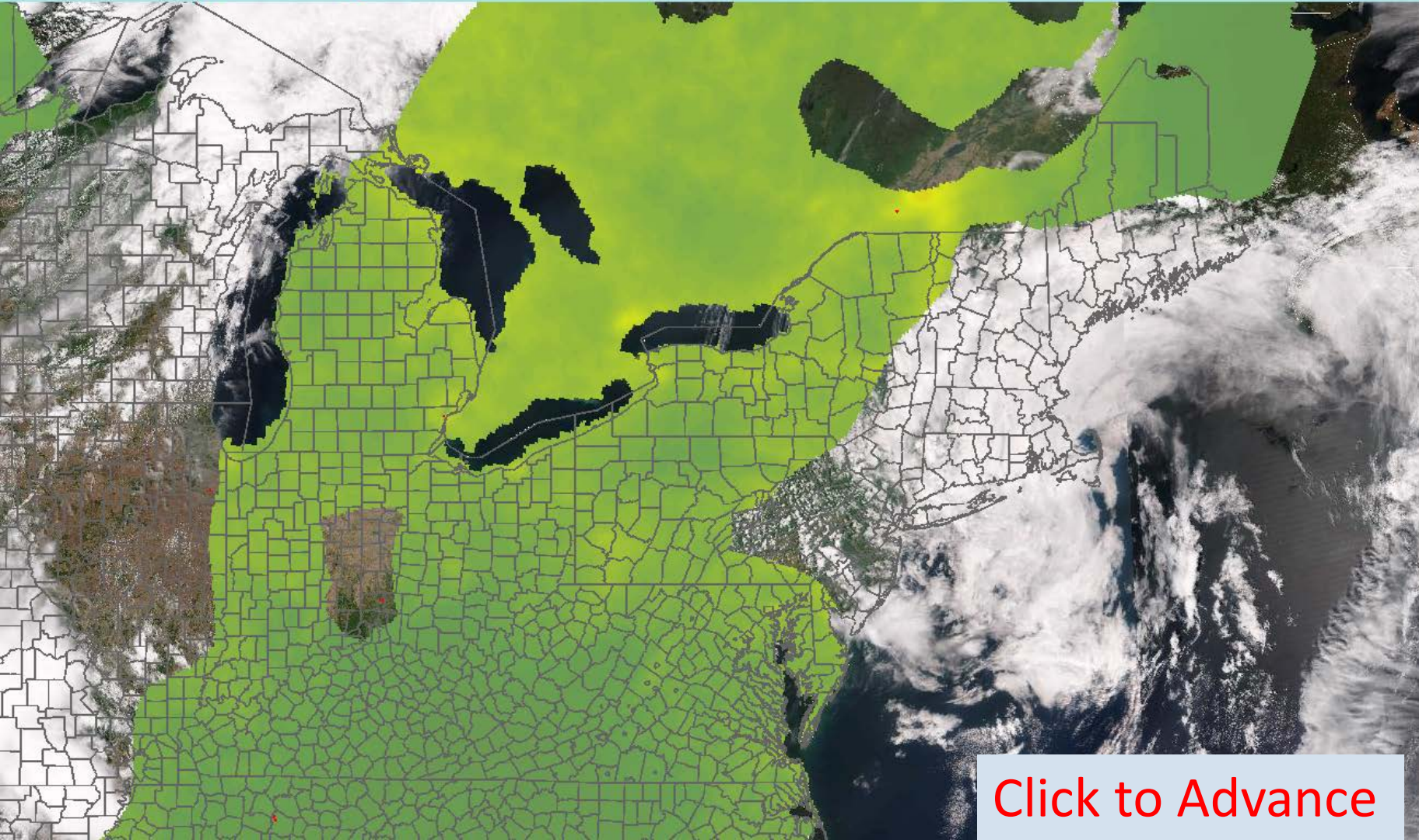
2016052315



- Aerosol plume was then transported to the east, after forming elevated levels of ozone.

# May 24, 2016 Smoke, AOT and PM2.5

VIIRS RGB and Derived PM2.5 20160524

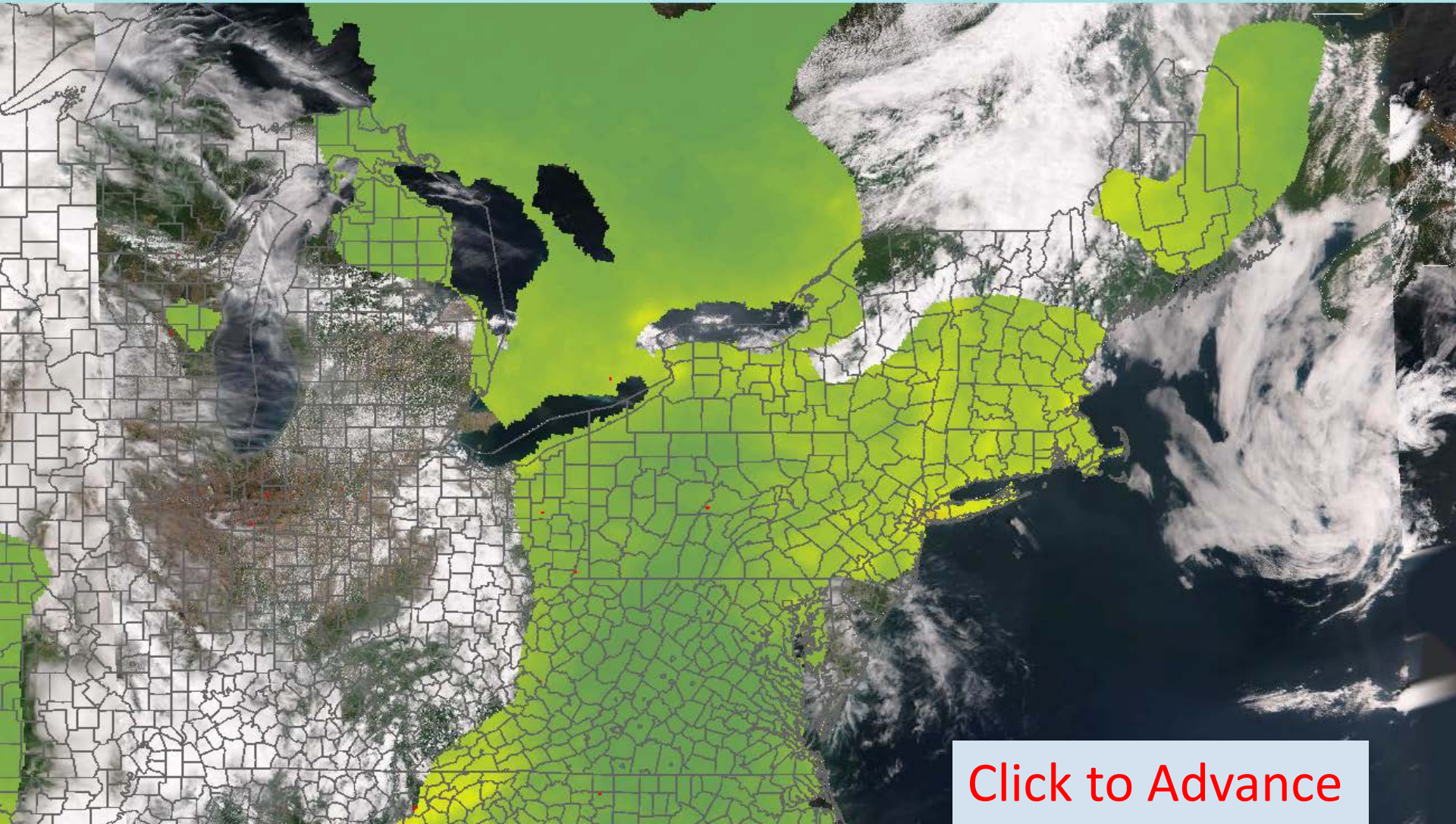


[Click to Advance](#)



# May 25, 2016 Smoke, AOT and PM2.5

VIIRS RGB and Derived PM2.5 20160525



[Click to Advance](#)

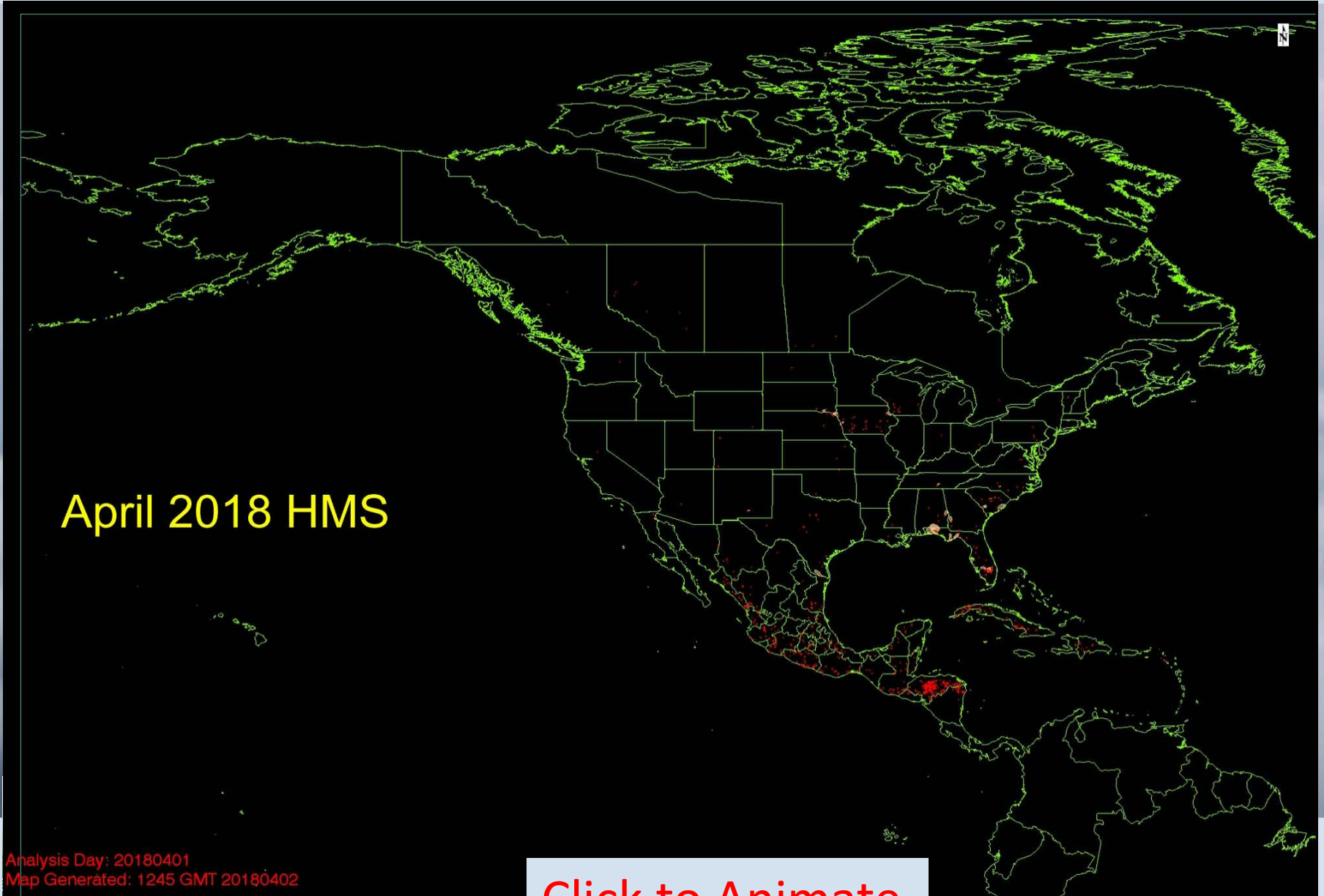


# Tracking Fires in 2018

- 2018 starts off with the usual spring agricultural burning in Mexico and the southeast States and Mississippi Valley;
- Major fires break out in the U.S. mountain west and Canada during May and June that bring plumes to the east coast.
- Extreme fires begin in July in the western States and British Columbia that last until September. These produce thick plumes and extreme PM2.5 levels near the fires.



# Tracking Fires in 2018- HMS Animation



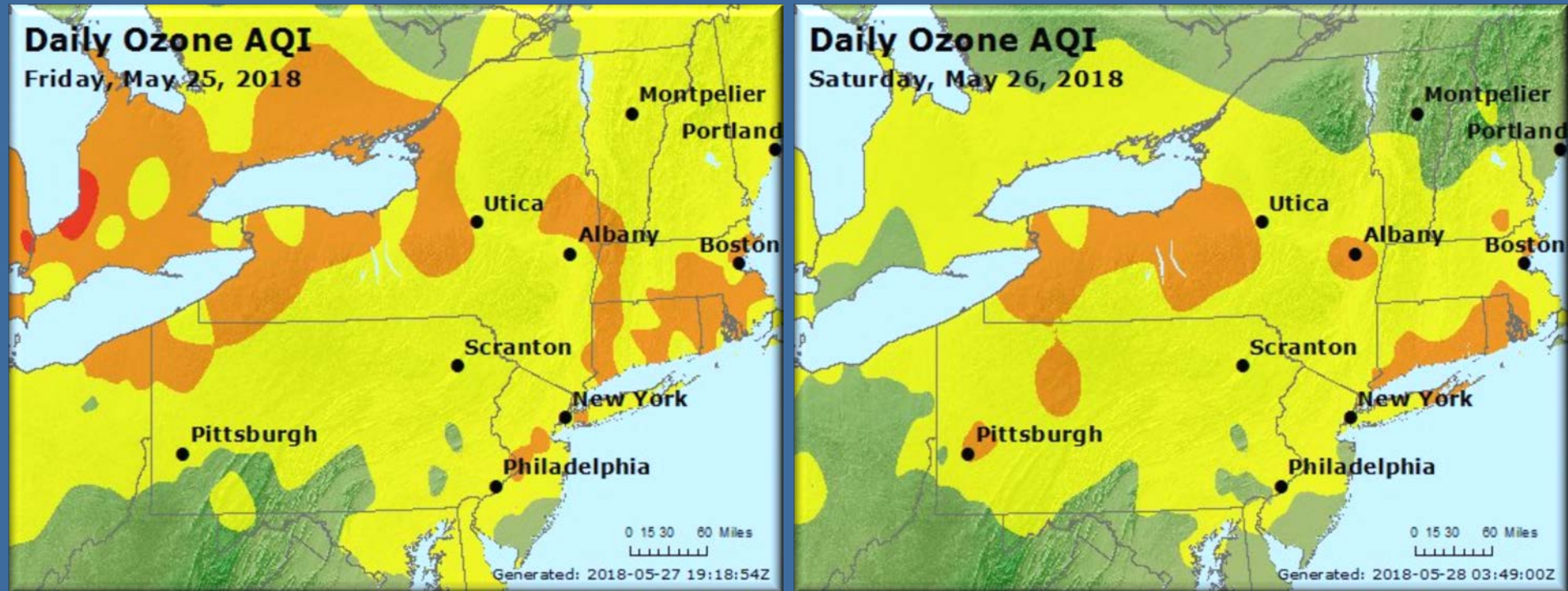
April 2018 HMS

Analysis Day: 20180401  
Map Generated: 1245 GMT 20180402

[Click to Animate](#)



# May 25-26 Ozone Event



There was a wide-spread area of elevated ozone from the Great Lakes into New England. This type of occurrence is usually associated with enhancement from smoke transported from wild fires or agricultural burning.



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# May 24-25, 2018 GOES-16 Animation

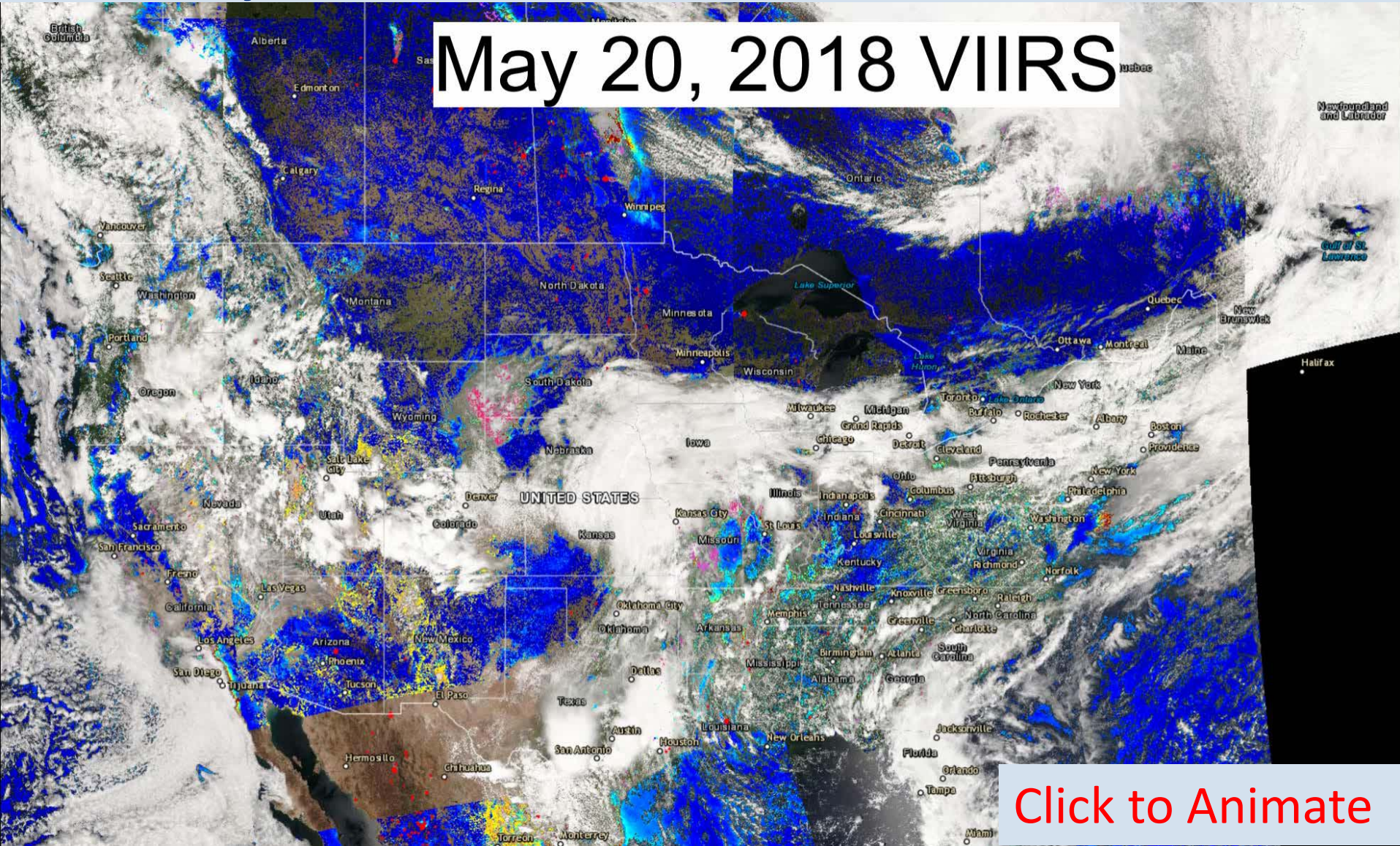


May 24, 2018 GOES-16  
Visible Animation

- Possible zone enhancement from smoke? [Click to Animate](#)



# May 20-27, 2018 VIIRS Animation

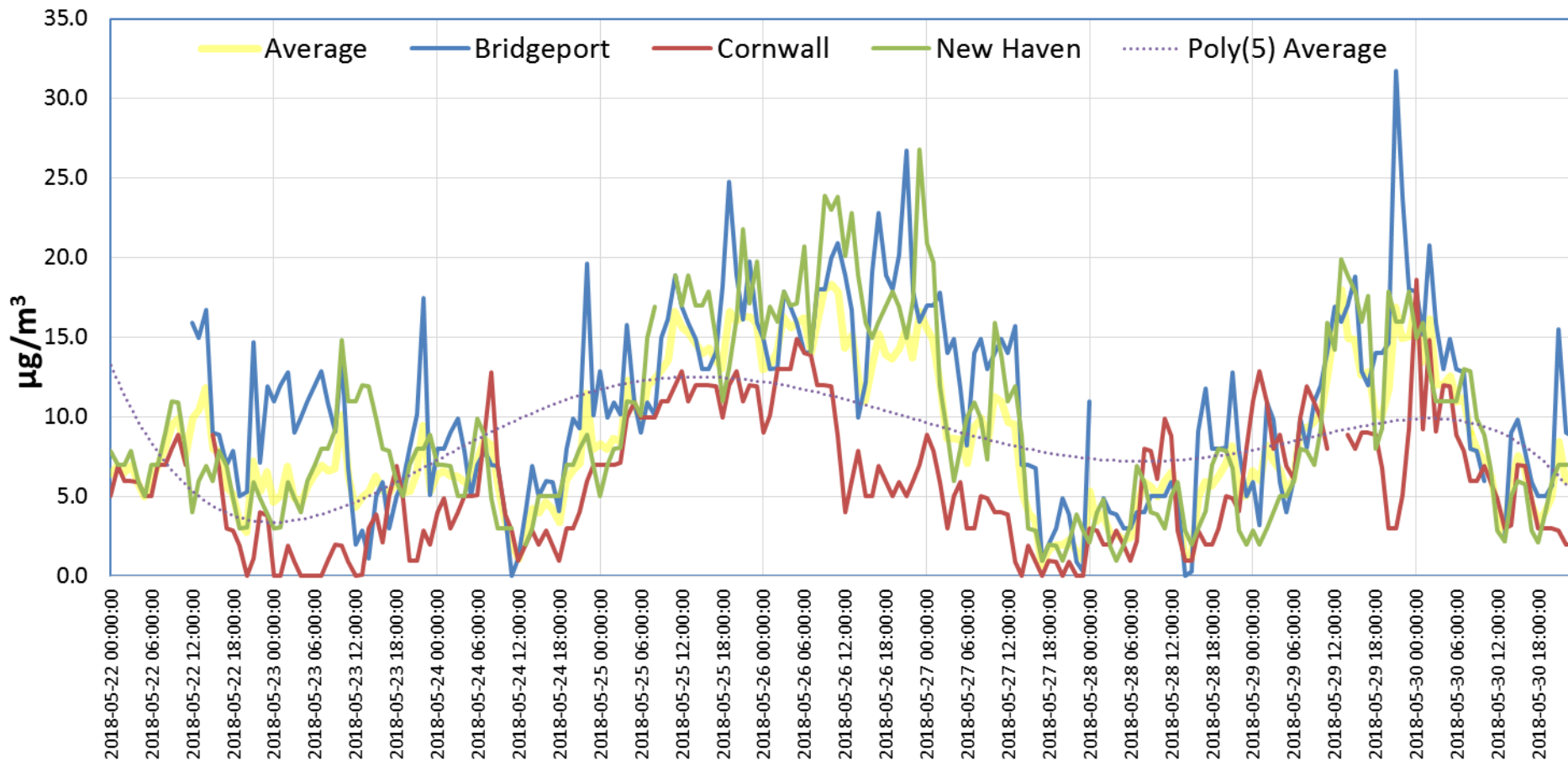


VIIRS AOD and smoke screen clearly depicted the Canadian smoke plume moving southeast over new England.



# May 22-30, Hourly PM2.5

## May 22-30, 2018 Hourly PM2.5

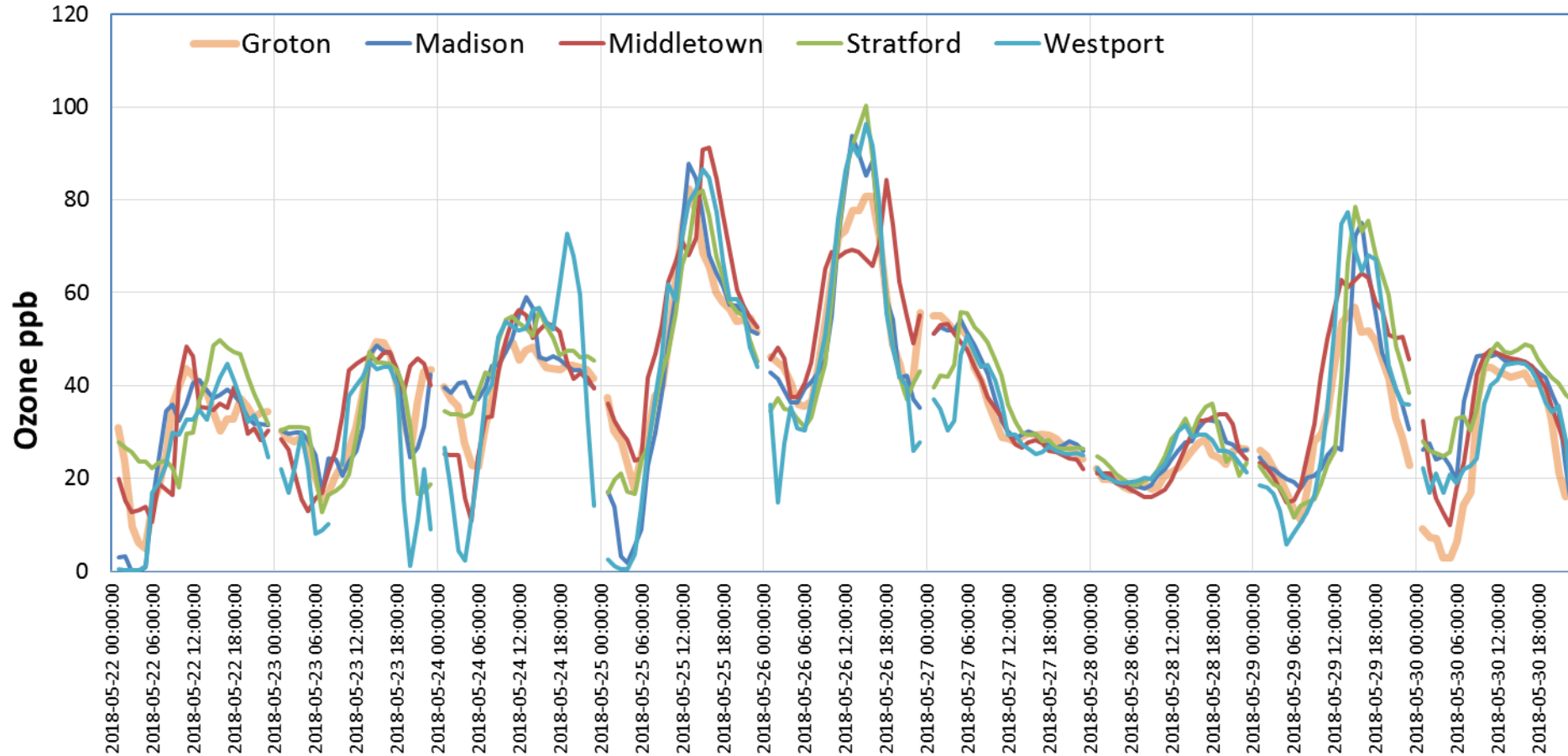


- Note the elevated PM2.5 during May 25-26 and on May 29<sup>th</sup>.



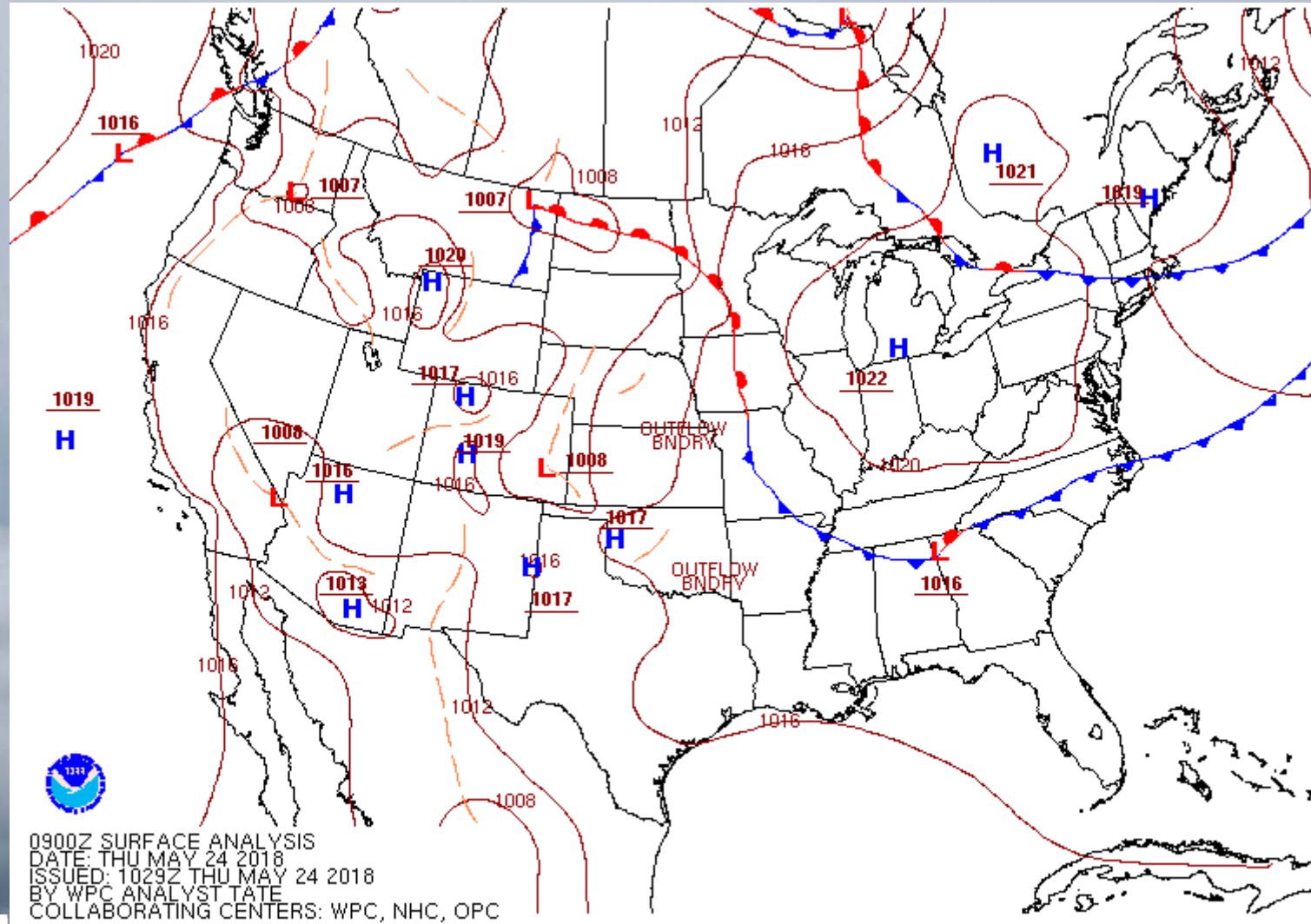
# May 22-30, Hourly Ozone

## May 22-30, 2018 Hourly Ozone



- Note the similar elevated ozone during May 25-26 and on May 29th

# May 24-26 Surface Analysis



0900Z SURFACE ANALYSIS  
DATE: THU MAY 24 2018  
ISSUED: 1029Z THU MAY 24 2018  
BY WPC ANALYST TATE  
COLLABORATING CENTERS: WPC, NHC, OPC



Note the area of high pressure over the Great Lakes that trapped the smoke plume and recirculated the pollutants towards New England.

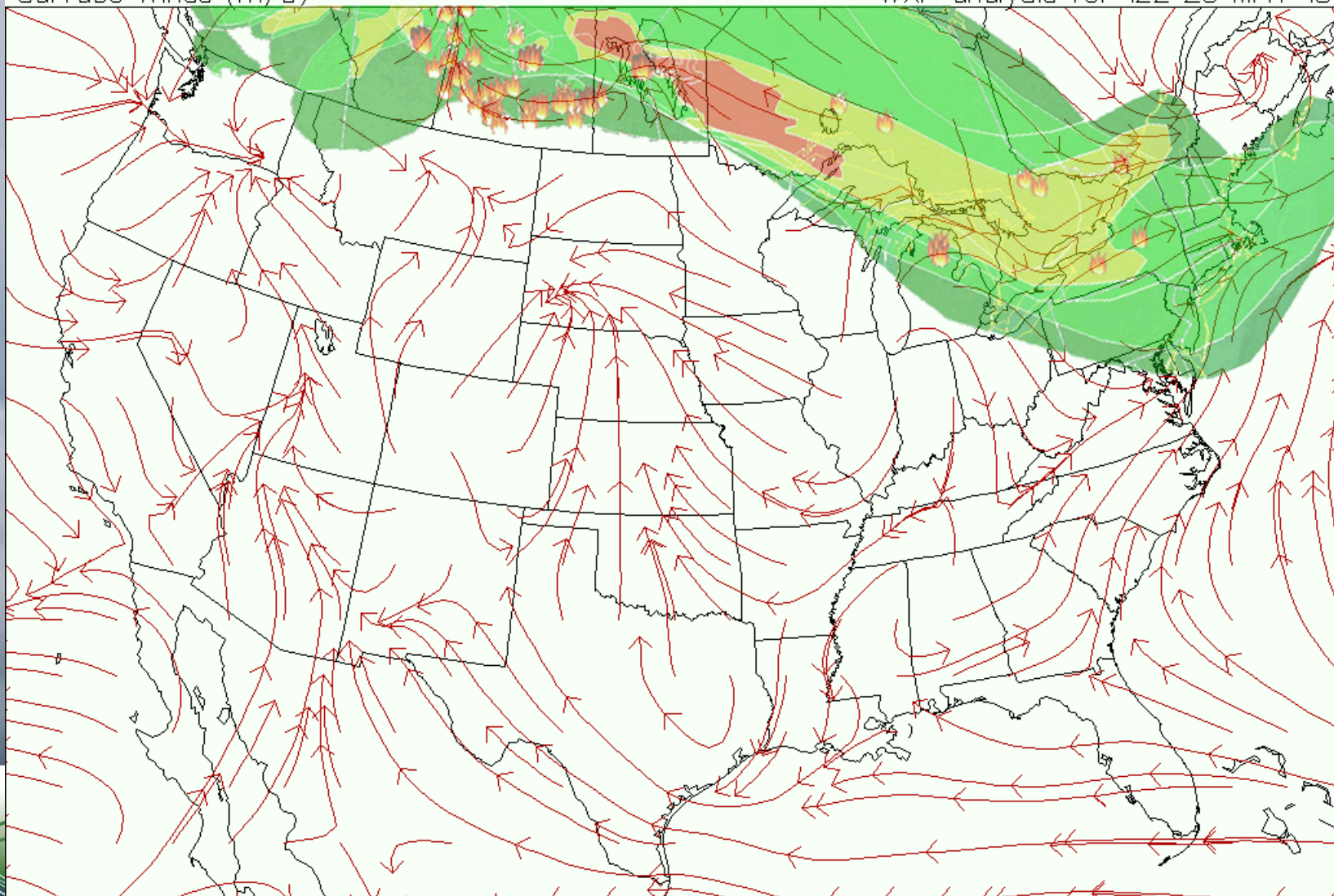


# Streamlines

▼ Plymouth State Weather Center ▼

Surface Winds (m/s)

WXP analysis for 12Z 23 MAY 18



MAX: 7.66



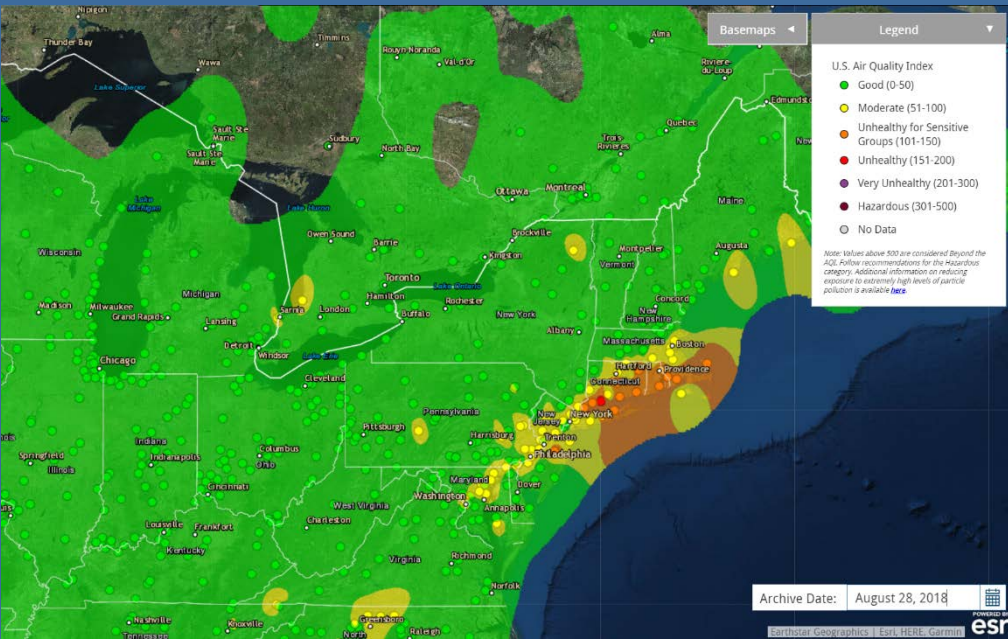
# Observations

- May 24-26 weather pattern suggests that smoke mixed southward into the Midwest and was trapped by high pressure.
- This allowed elevated ozone to form and move eastward into Connecticut, which likely enhanced the ozone levels.

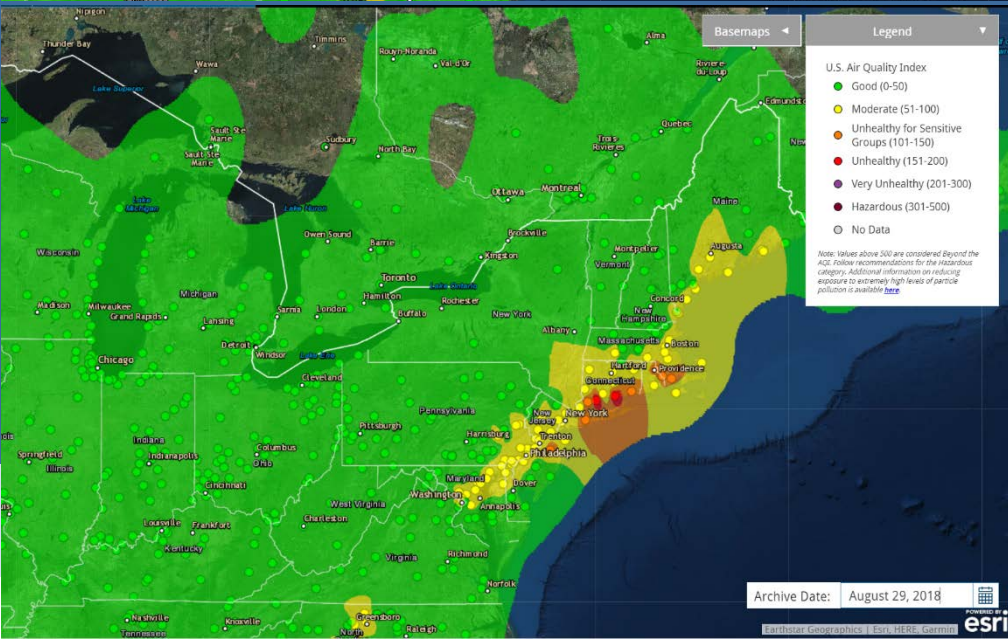




# August 28-29, 2018 Ozone Event



This was a classic I-95 corridor event in the northeast States. Although there were aerosols present from the smoke plume, they were not trapped under high pressure.



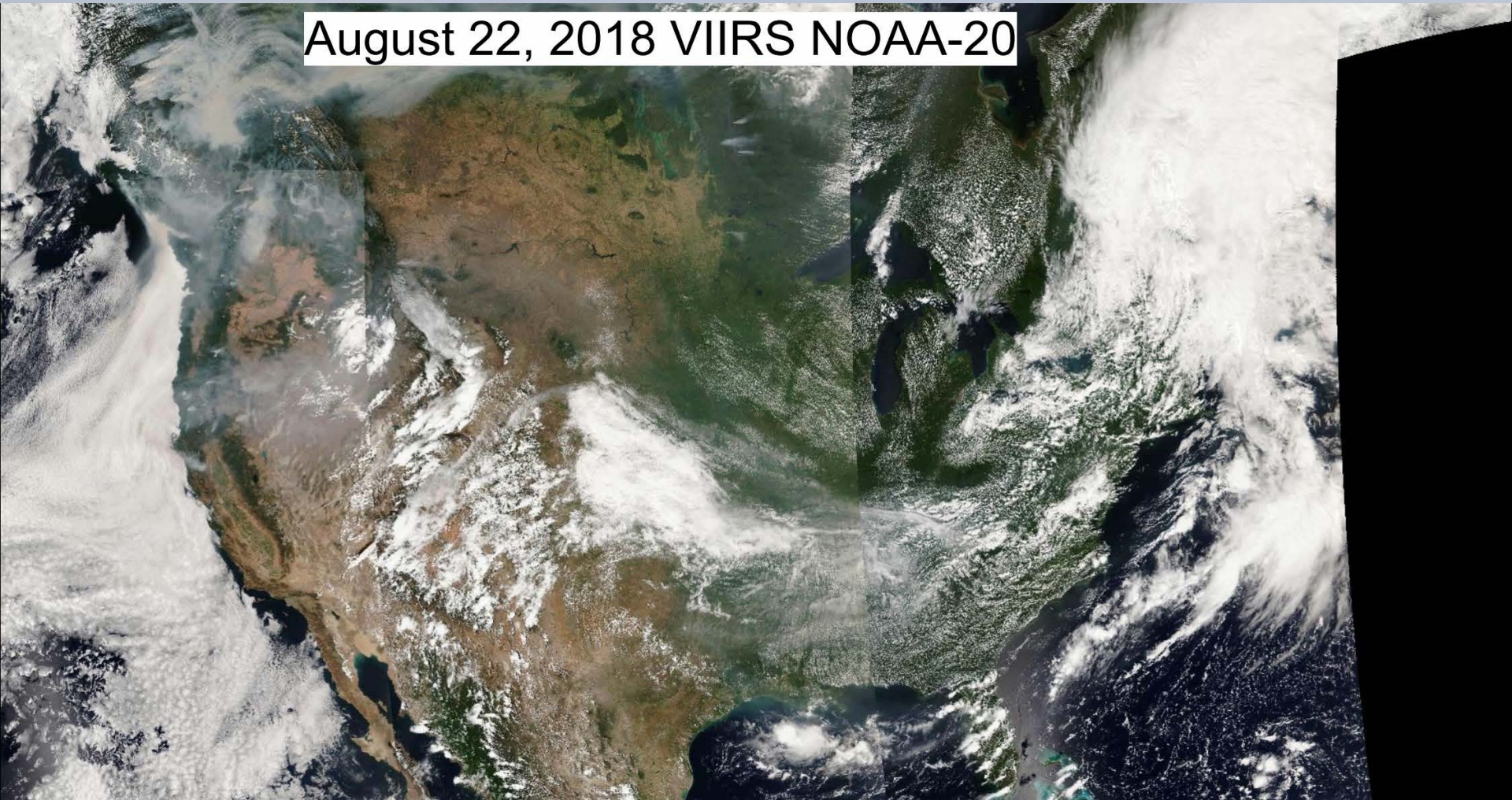
and Environmental Protection



# VIIRS August 22-28, 2018

This compares the VIIRS NOAA-20 products with the VIIRS SNNP smoke/AOD

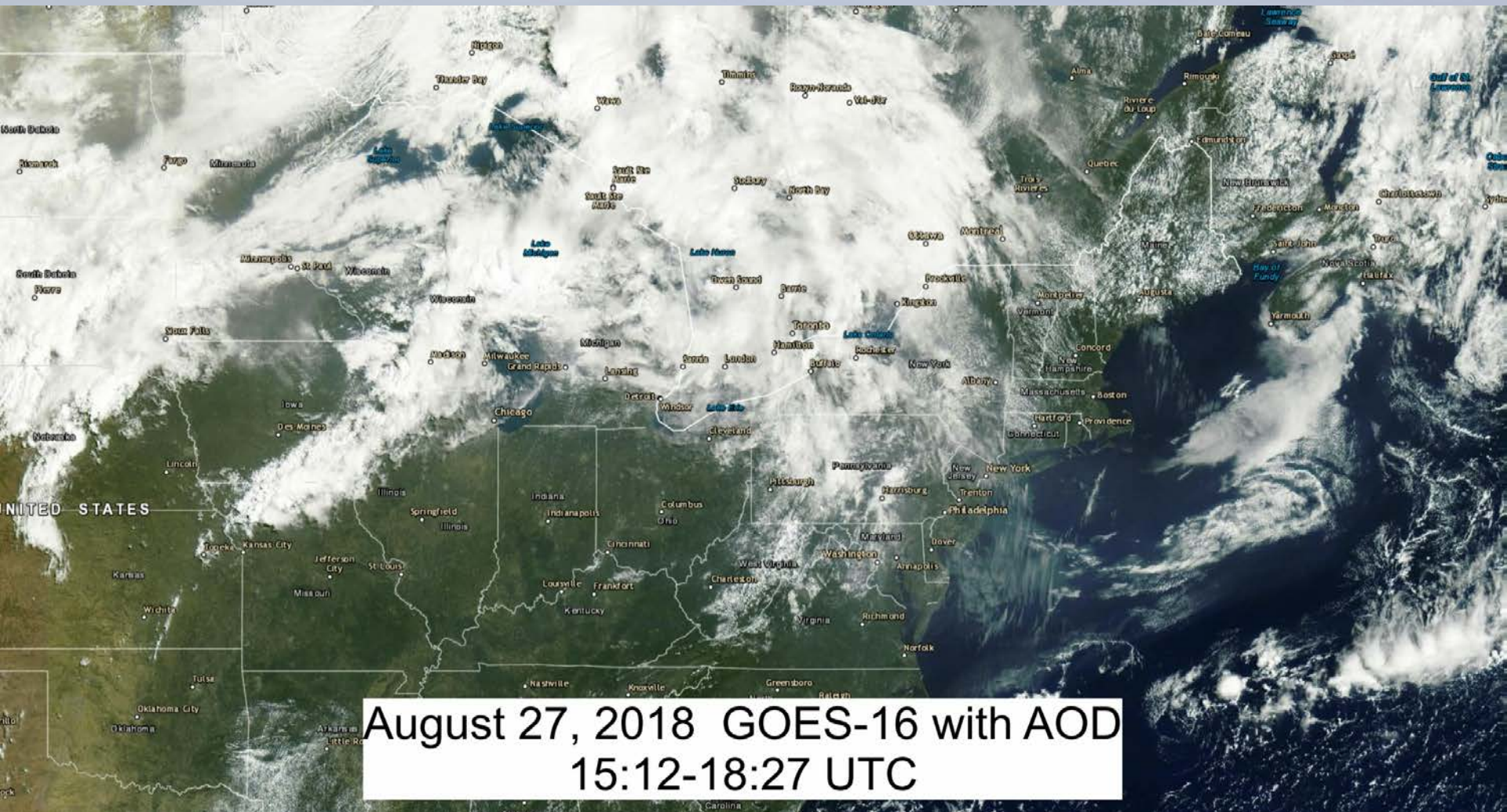
August 22, 2018 VIIRS NOAA-20



[Click to Animate](#)



# August 27, 2018 GOES-16



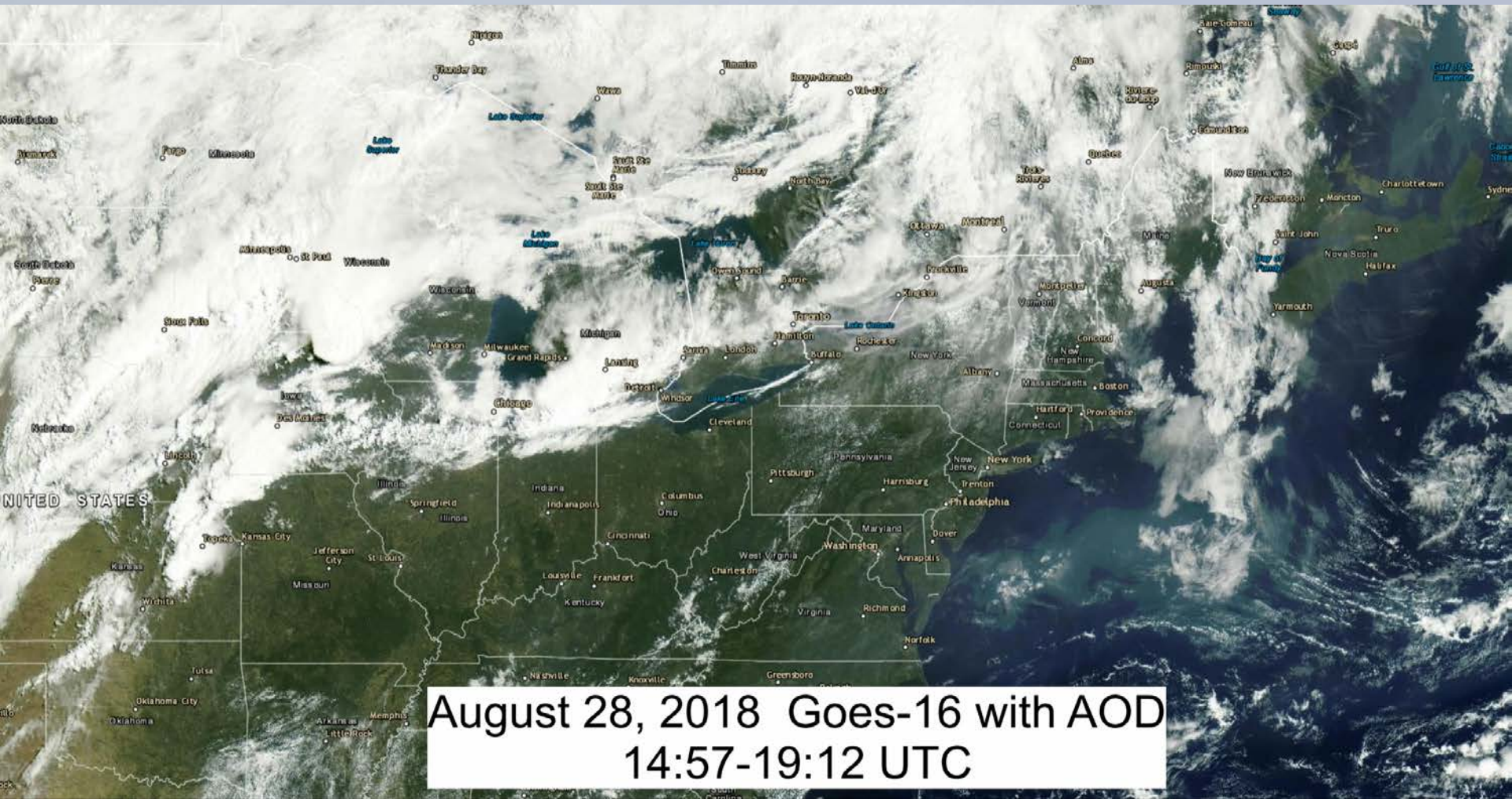
August 27, 2018 GOES-16 with AOD  
15:12-18:27 UTC



[Click to Animate](#)



# August 28, 2018 GOES-16



August 28, 2018 Goes-16 with AOD  
14:57-19:12 UTC



[Click to Animate](#)



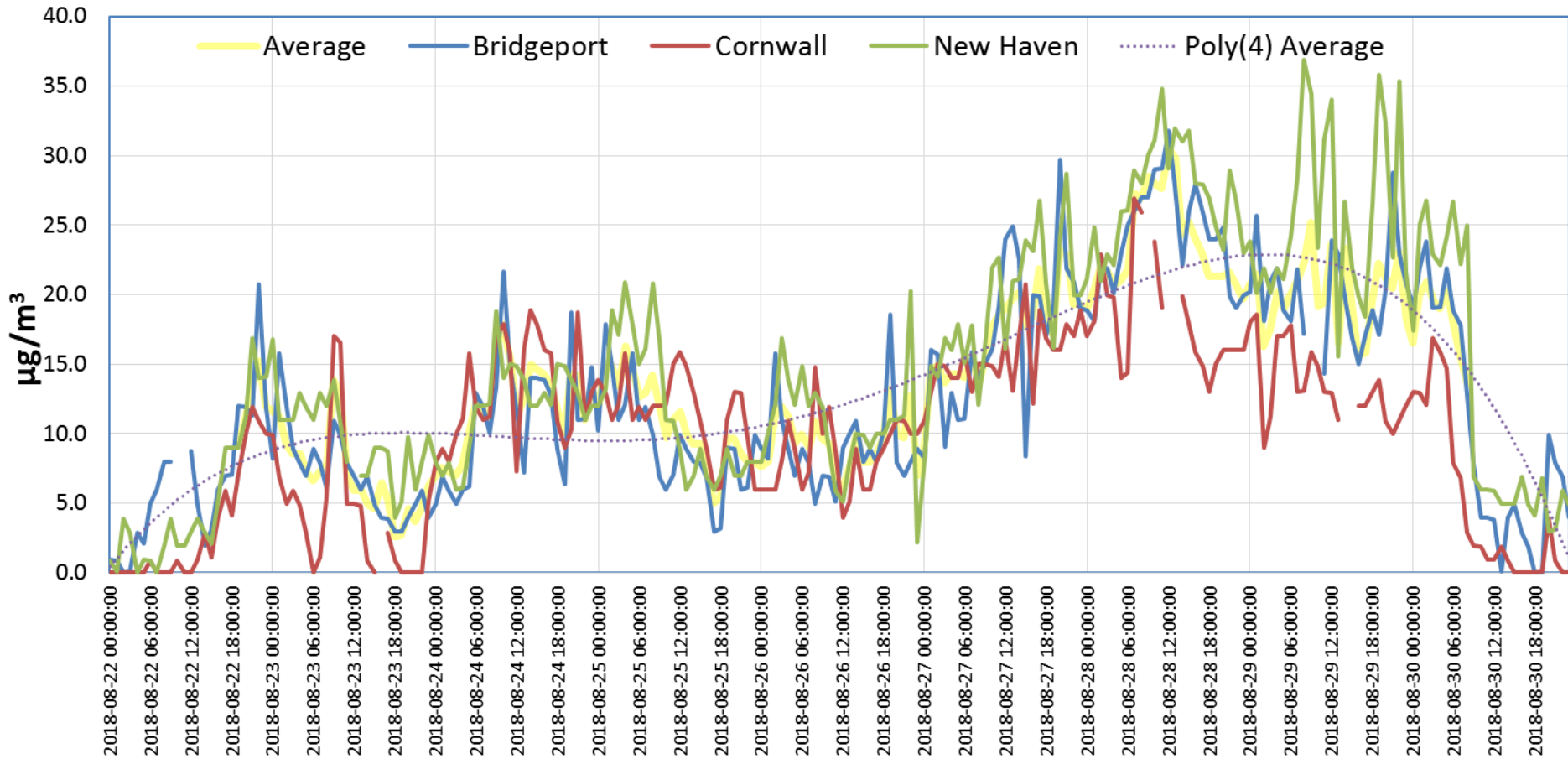
# August 29, 2018 GOES-16



[Click to Animate](#)

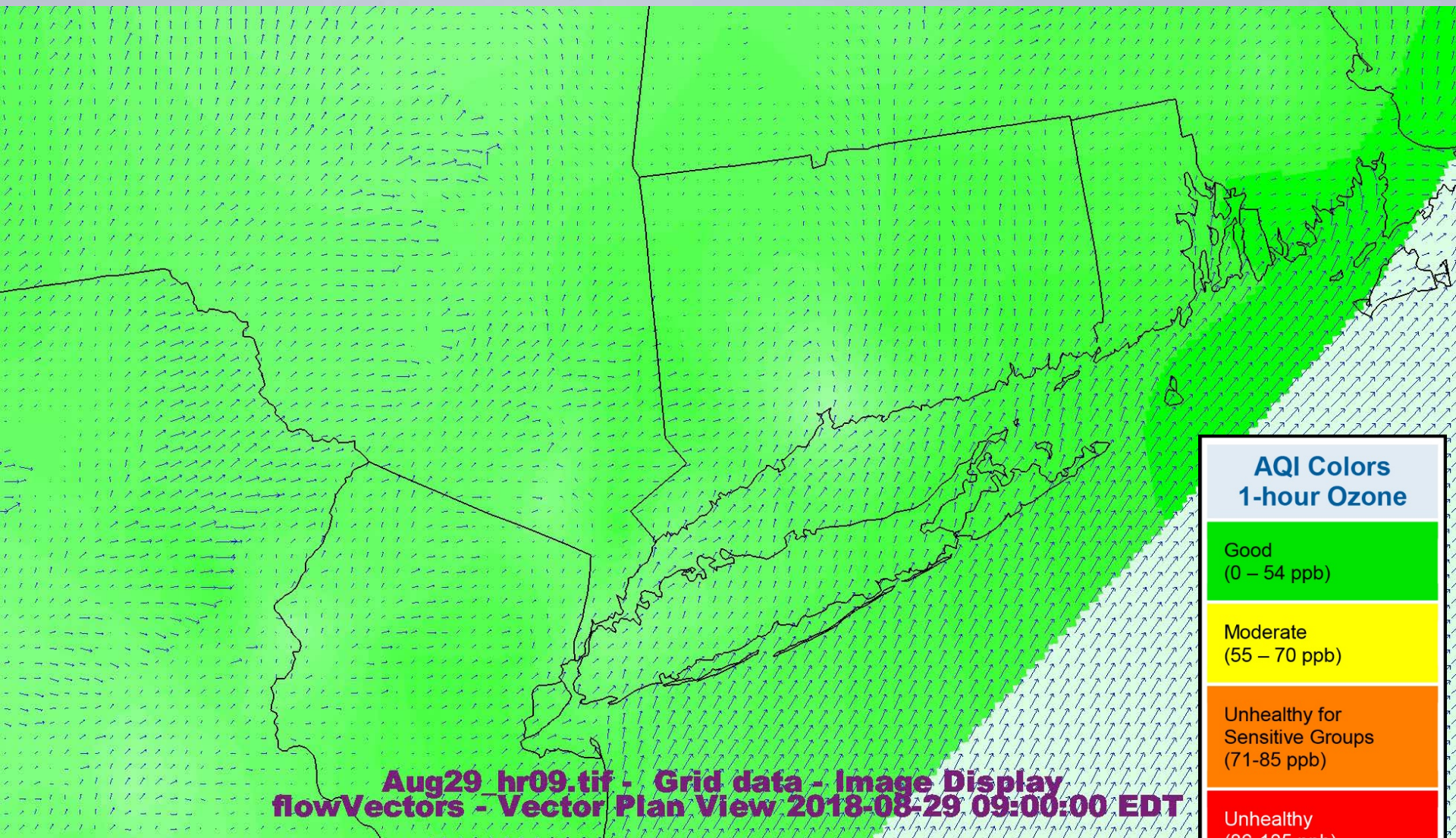
# August 22-30 Hourly PM2.5

## August 22-30, 2018 Hourly PM2.5





# August 29, 2018 Ozone Animation



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[Click to Animate](#)



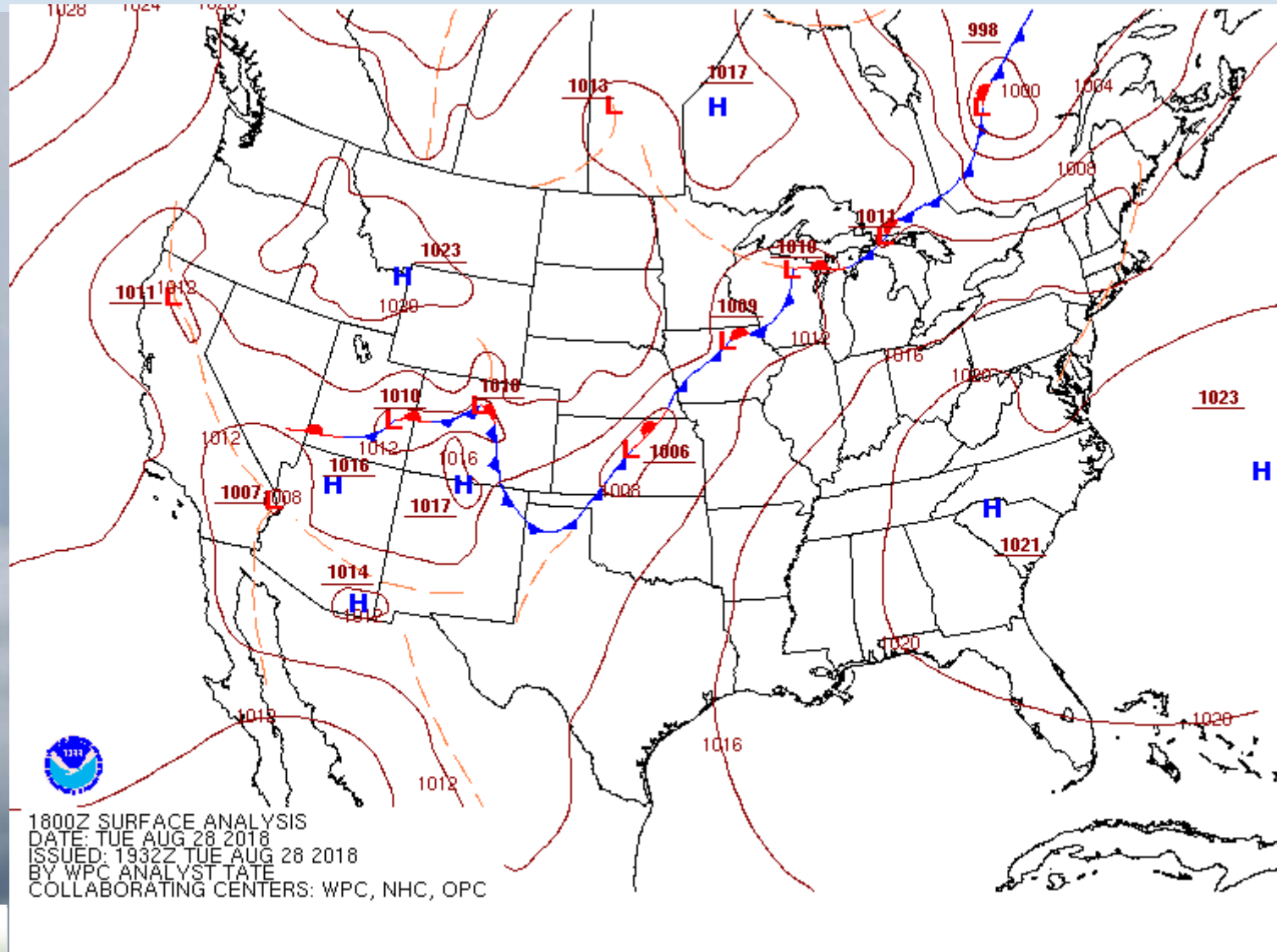
# August 22-30, 2018 Hazecam

August 22, 2018 View to Hartford, CT





# August 28, 2018 Surface Analysis



This weather pattern was more indicative of a Bermuda High ozone event. Unlike the May 25-26 event, the smoke plume was not trapped near the surface.

# Conclusions

- The May 25-26, 2018 ozone event was likely enhanced by the smoke plume, but not to the level of an exceptional event.
- Satellite images from VIIRS and GOES16 accurately tracked the aerosol plumes created from wildfires.
- AOD and smoke masks have improved since MODIS and are more discernible in thicker plumes.

