



Bureau of Air Quality

2023 Ozone Year in Review

DEP Air Quality Technical Advisory Committee

January 11, 2024

Harrisburg, PA

Josh Shapiro, Governor

Jessica Shirley, Interim Acting Secretary

Agenda

Review of 2023 Weather and Ozone Concentrations

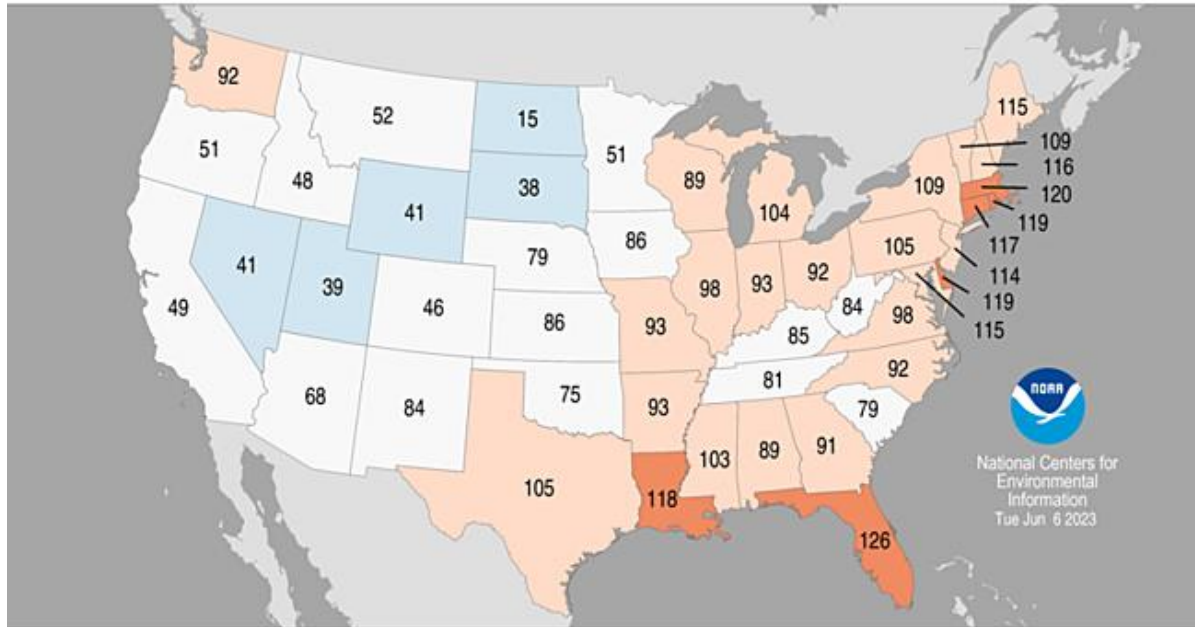
- Weather features include analysis of temperature and precipitation
- Ozone Concentration Data
 - Number of ozone exceedances
 - Current projected design values
- Ozone Episode Data
 - Dominated by smoke influenced events
 - Focus on June 1-2, June 29-30

Review of 2023 Weather and Ozone Concentrations

Meteorology – Spring 2023

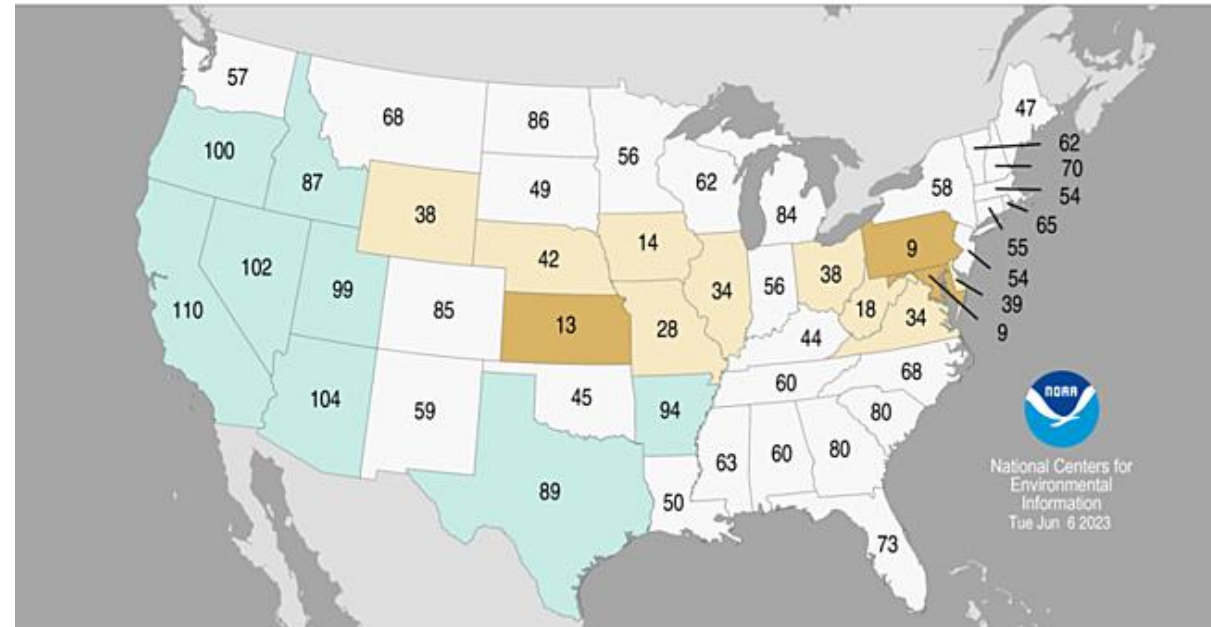
Temperature

Statewide Average Temperature Ranks
 March – May 2023
 Period: 1895–2023



Precipitation

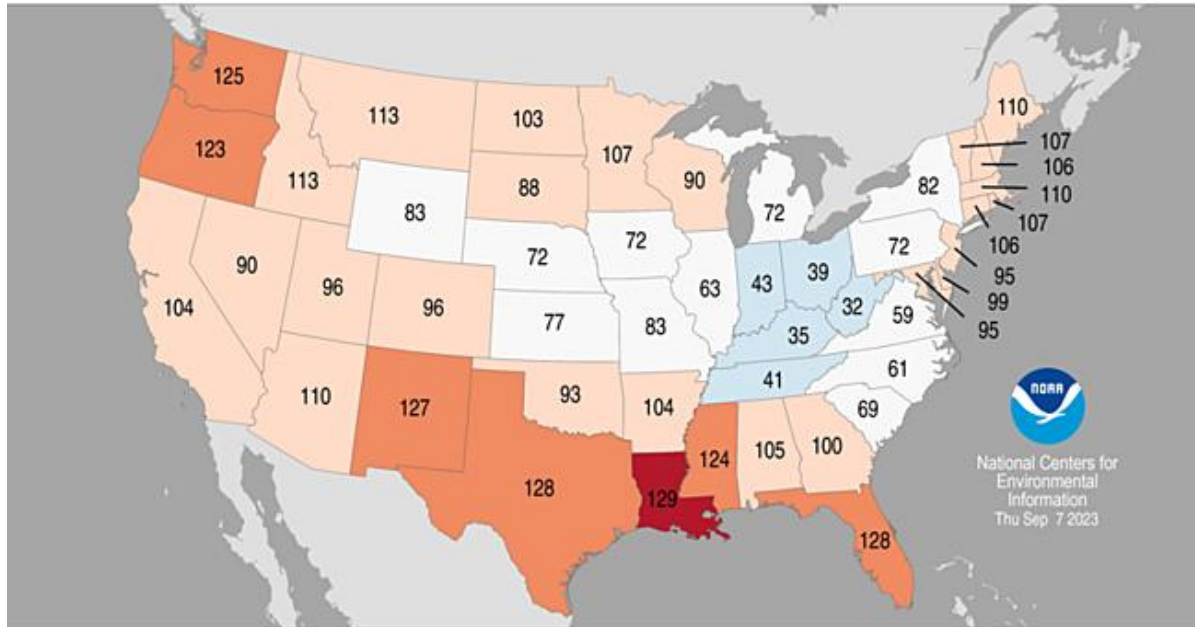
Statewide Precipitation Ranks
 March – May 2023
 Period: 1895–2023



Meteorology – Summer 2023

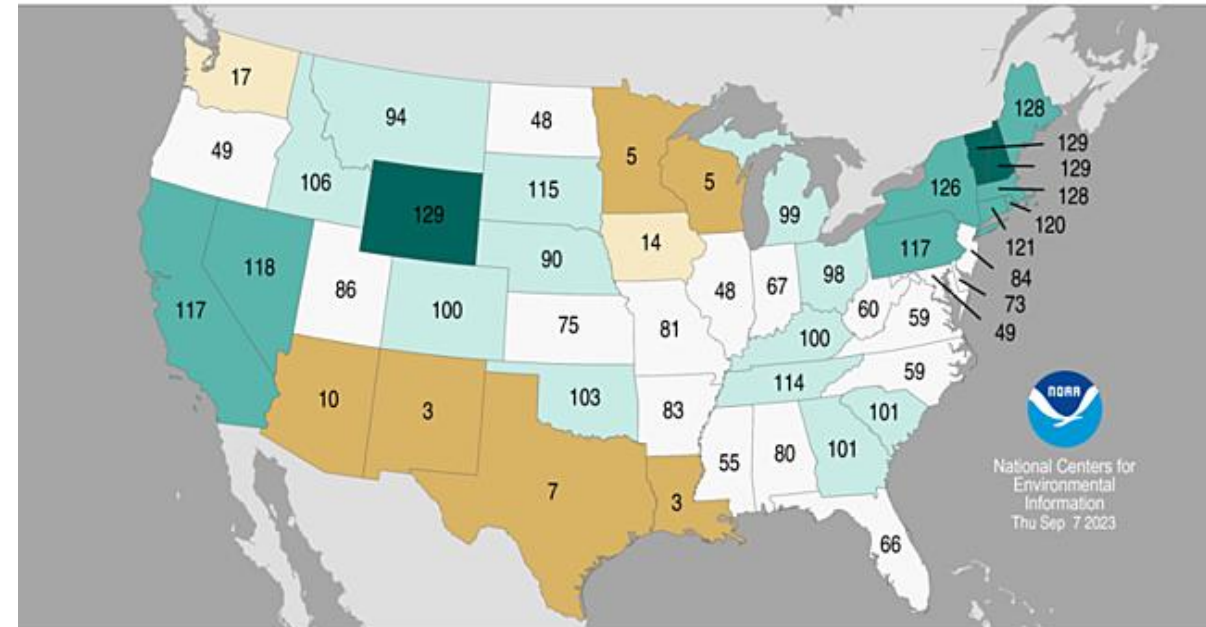
Temperature

Statewide Average Temperature Ranks
June – August 2023
Period: 1895–2023



Precipitation

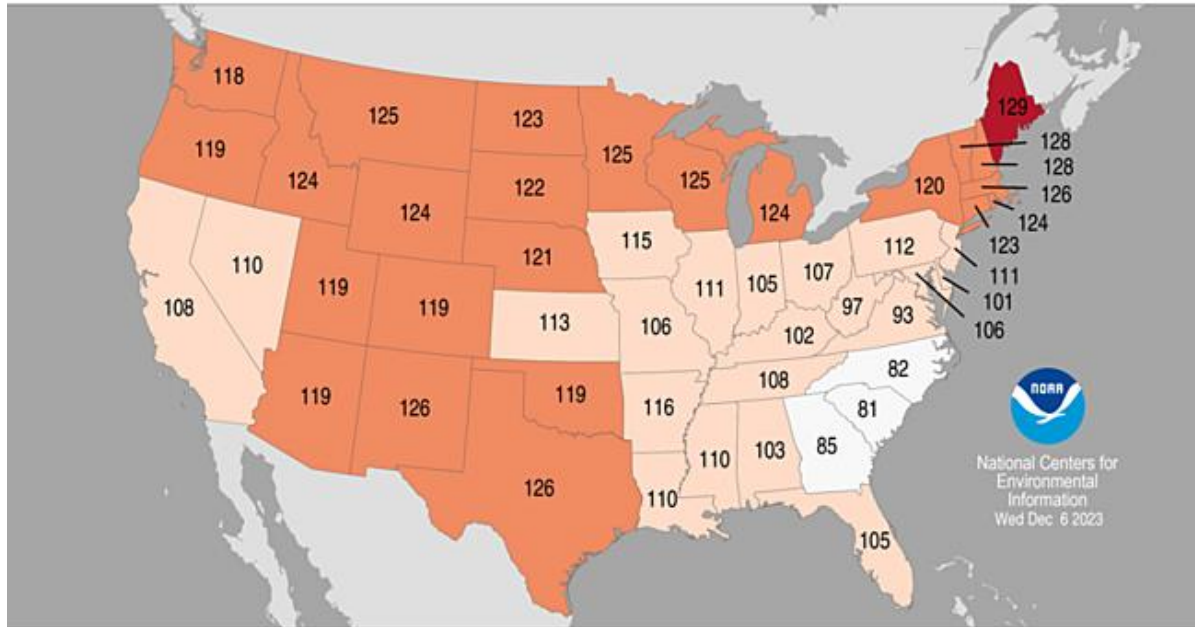
Statewide Precipitation Ranks
June – August 2023
Period: 1895–2023



Meteorology – Fall 2023

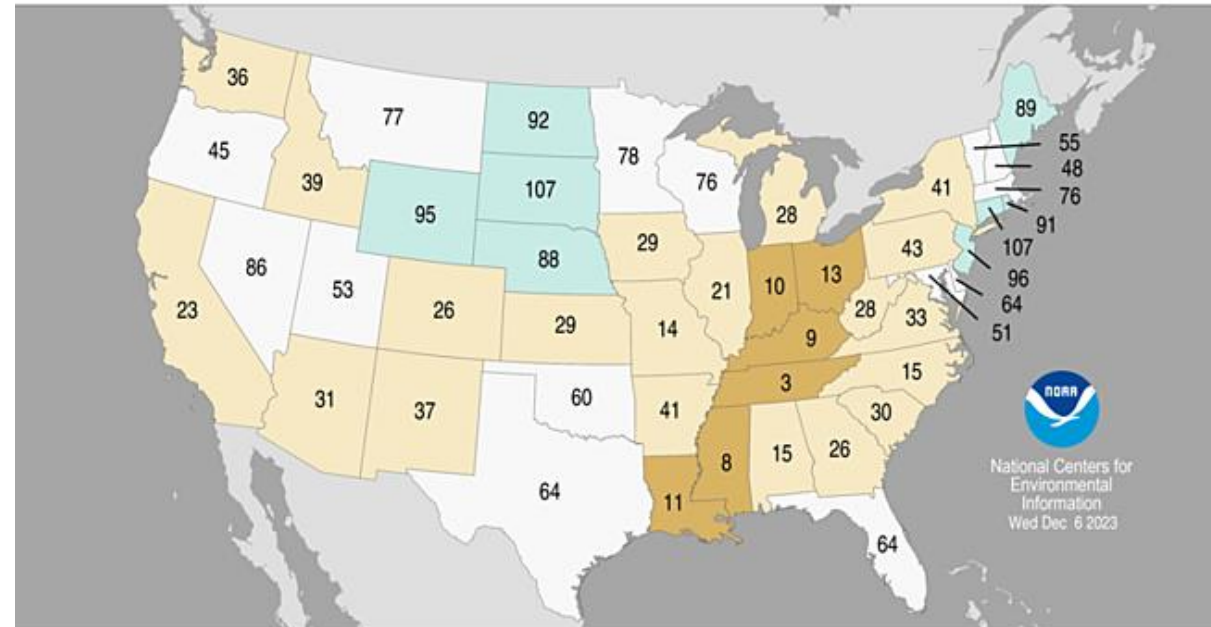
Temperature

Statewide Minimum Temperature Ranks
September – November 2023
Period: 1895–2023



Precipitation

Statewide Precipitation Ranks
September – November 2023
Period: 1895–2023



2023 Ozone Monitoring Summary

- Ozone monitoring season – March 1 to October 31
- Overview of the projected 2023 design values (DV)* for the 8-hour ozone national ambient air quality standard (NAAQS)
- 2023 DV calculation – 4th high from 2021, 2022, and 2023 averaged over a 3-year period

* 2023 ozone data has not been fully QA/QC'd.

Number of 8-hour Ozone Exceedances

- Number of 8-hour ozone exceedance days of 2015 ozone NAAQS (0.070 parts per million or 70 parts per billion) and total number of ozone exceedances per year within Pennsylvania.

(Includes 46 monitors from PA DEP (40), ACHD (3), and Philadelphia AMS(3))

- 2023: 18 days | 114 total exceedances*
- 2022: 5 days | 26 total exceedances
- 2021: 15 days | 46 total exceedances

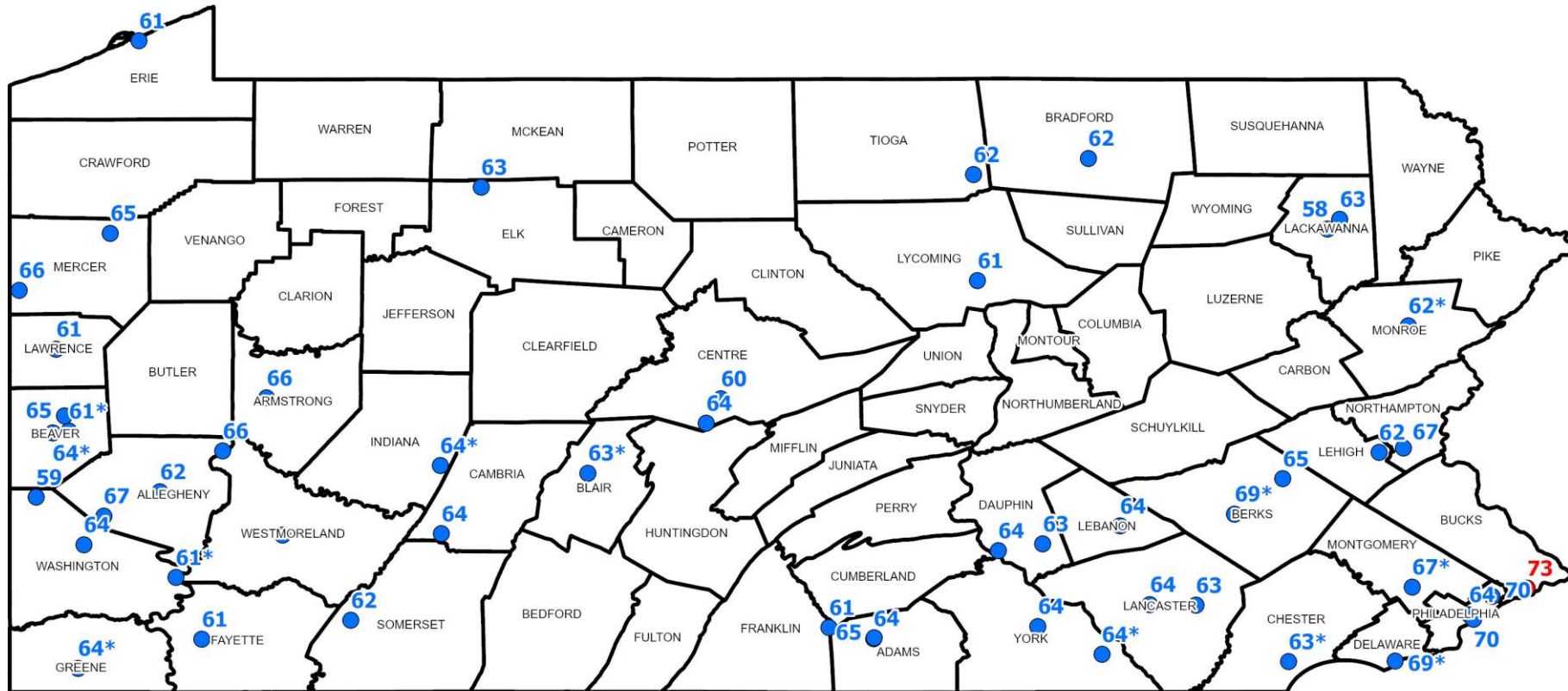
* 2023 ozone data has not been fully QA/QC'd.

2023 8-hour Ozone NAAQS Attainment Status

- In 2022, one sampler in the Commonwealth monitored nonattainment of the 2015 8-hour ozone NAAQS.
- In 2023*, one sampler in the Commonwealth is projected to be monitoring nonattainment of the 2015 8-hour ozone NAAQS.

* 2023 ozone data has not been fully QA/QC'd.

2023 8-Hour Ozone Design Values



Appearing in Red – 2023 8-hour ozone design value above 70 ppb (2015 Ozone Standard)

Appearing in Blue – 2023 8-hour ozone design value at or below 70 ppb (2015 Ozone Standard)

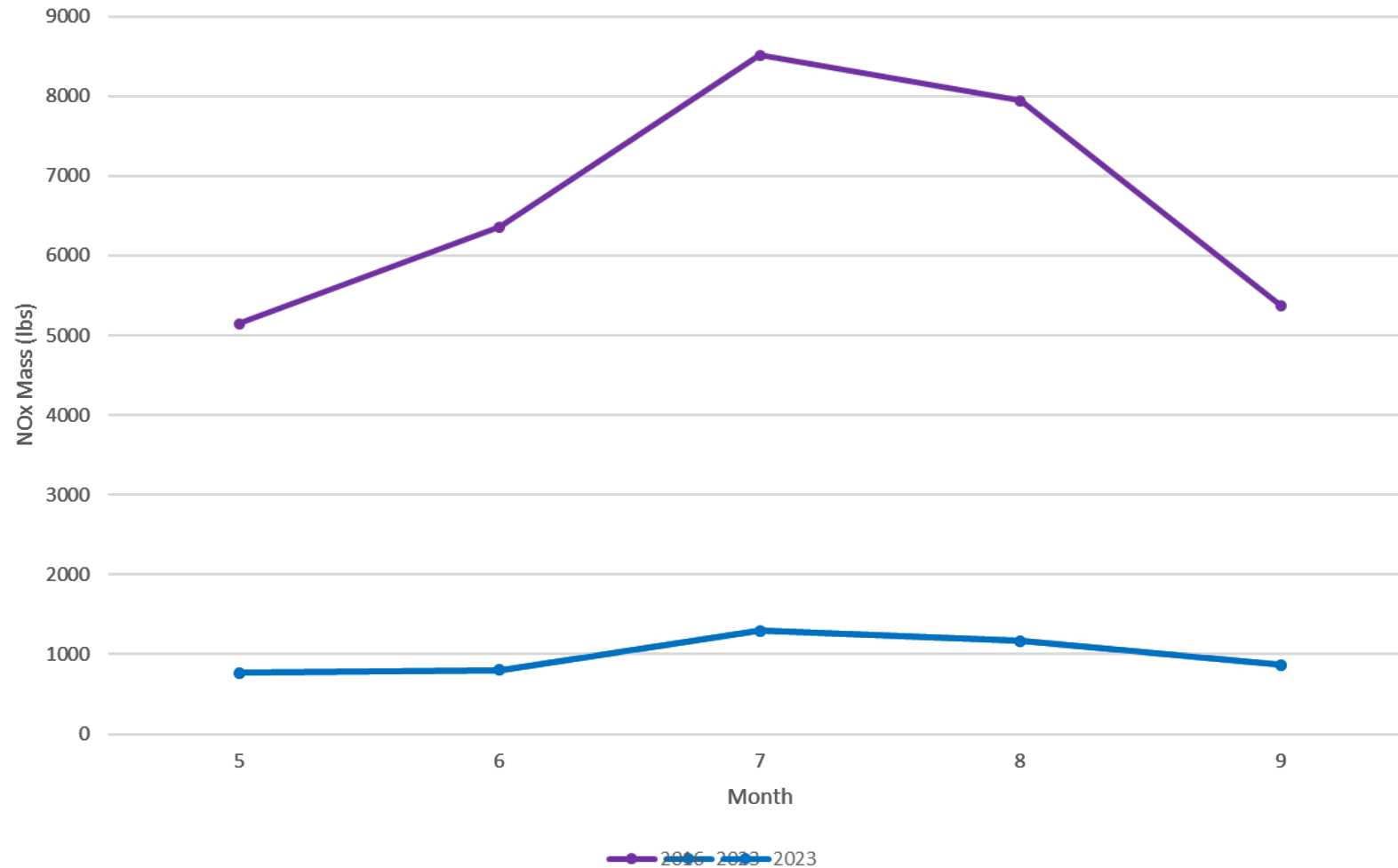
Asterisk (*) appearing behind the design value means the data is incomplete during 3-year period.

2023 Ozone Episode Data

- 2023 had the greatest number of ozone exceedances since 2016 (169 exceedances).
- 2023 saw a greater frequency of days impacted from smoke from associated wildfires in eastern Canada, western Canada and New Jersey.
- Two date periods are of interest for elevated ozone
 - June 1 – June 2
 - June 29 – June 30
- Preliminary analysis includes review of Aerosol Optical Depth imagery, surface satellite imagery and regional ozone concentrations.

EPA Clean Air Markets Division Data – 2016 v. 2023

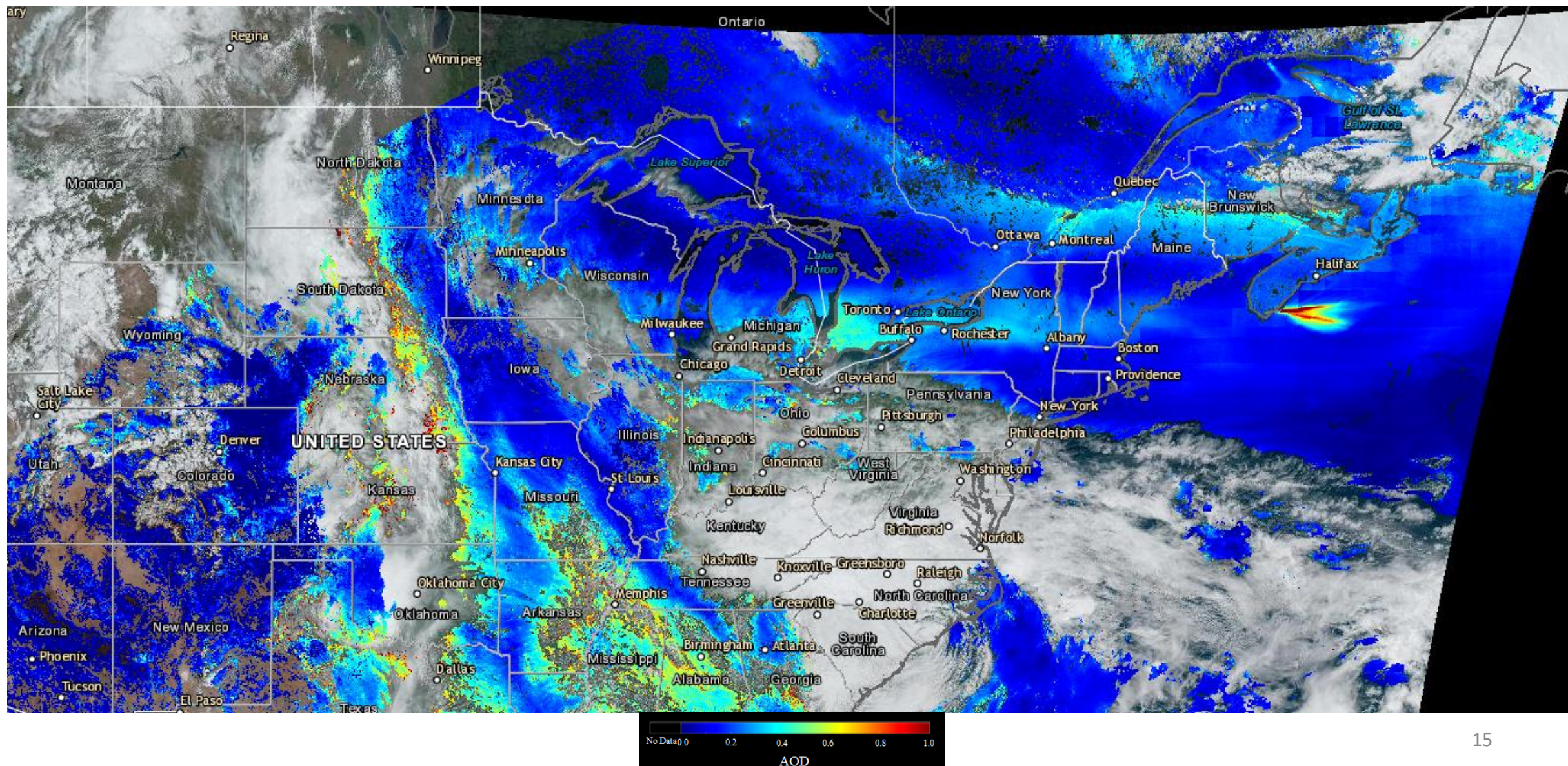
2016 vs. 2023 Trend in CAMD Monthly NOx Emissions



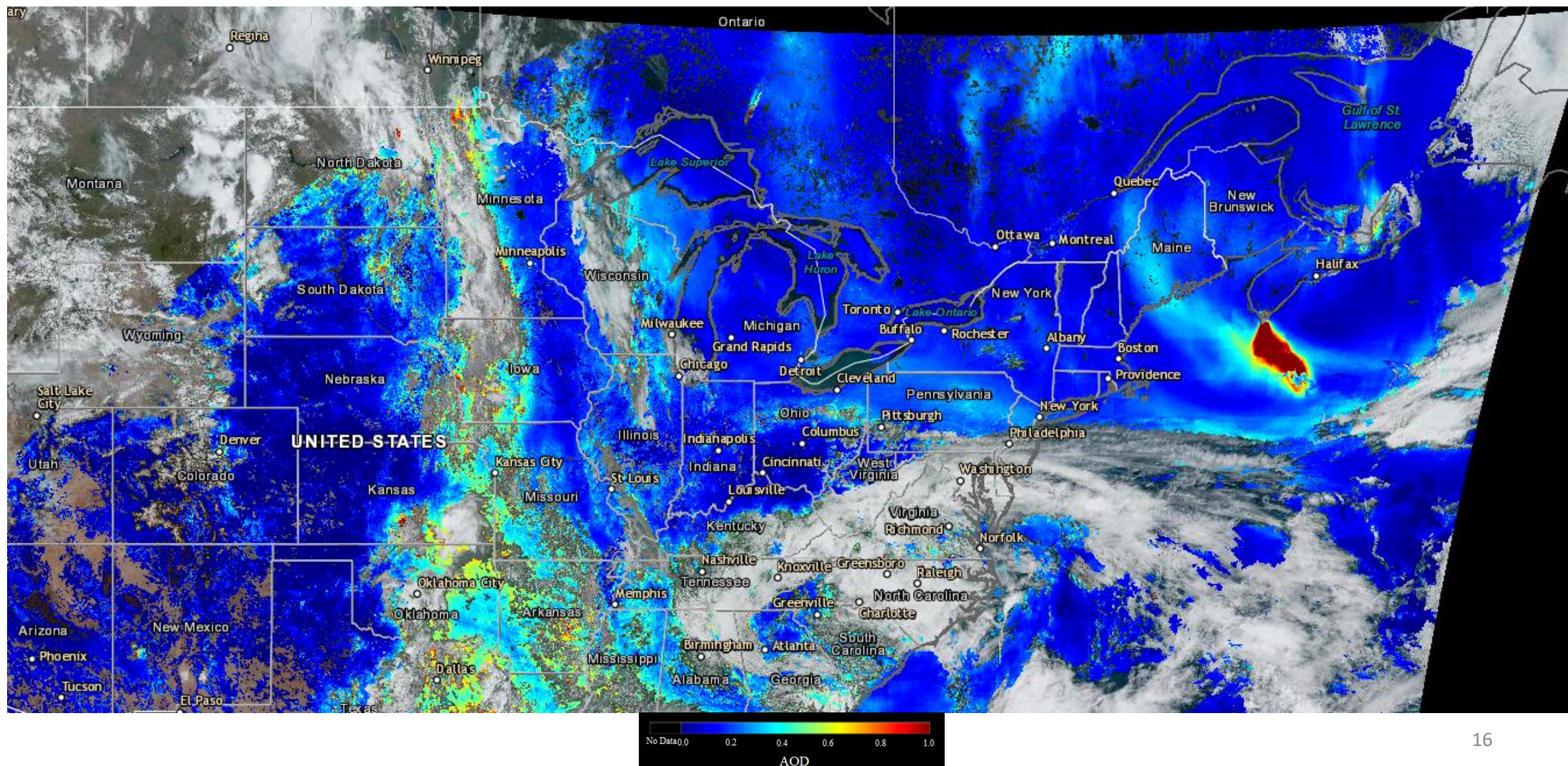
Evolution of an Ozone Episode

June 1-June 2, 2023

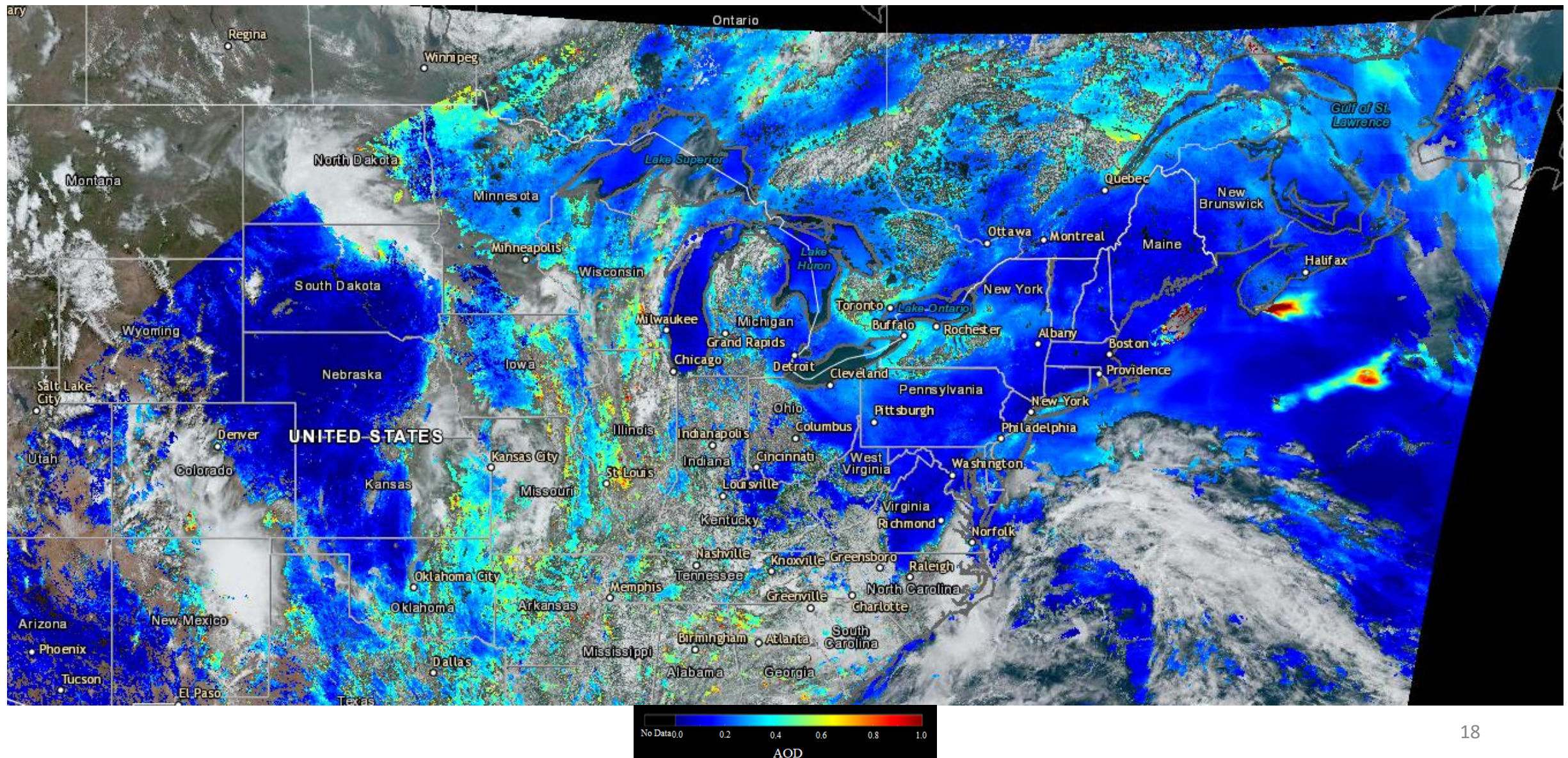
Aerosol Optical Depth – May 28, 2023



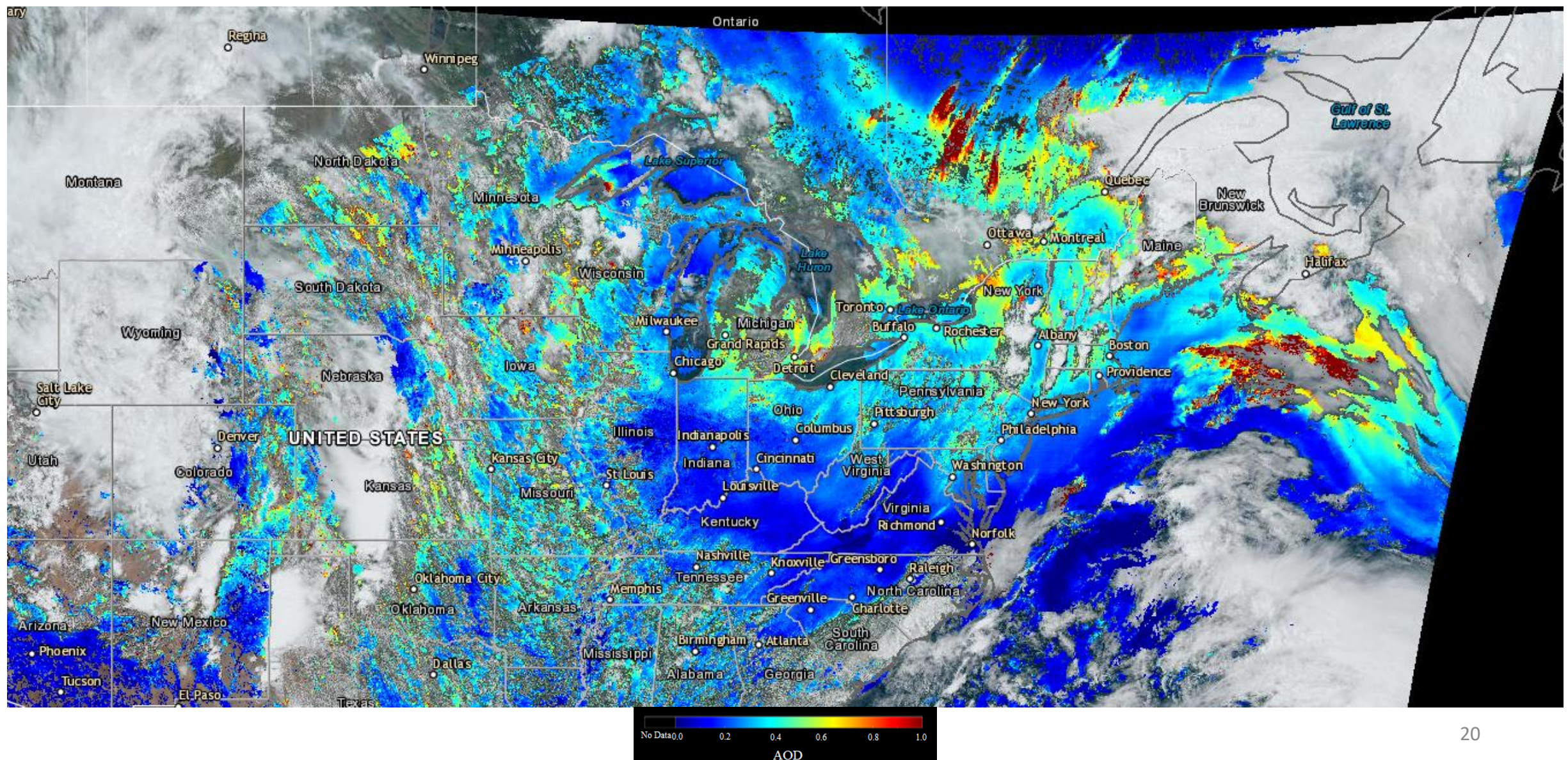
Aerosol Optical Depth – May 29, 2023



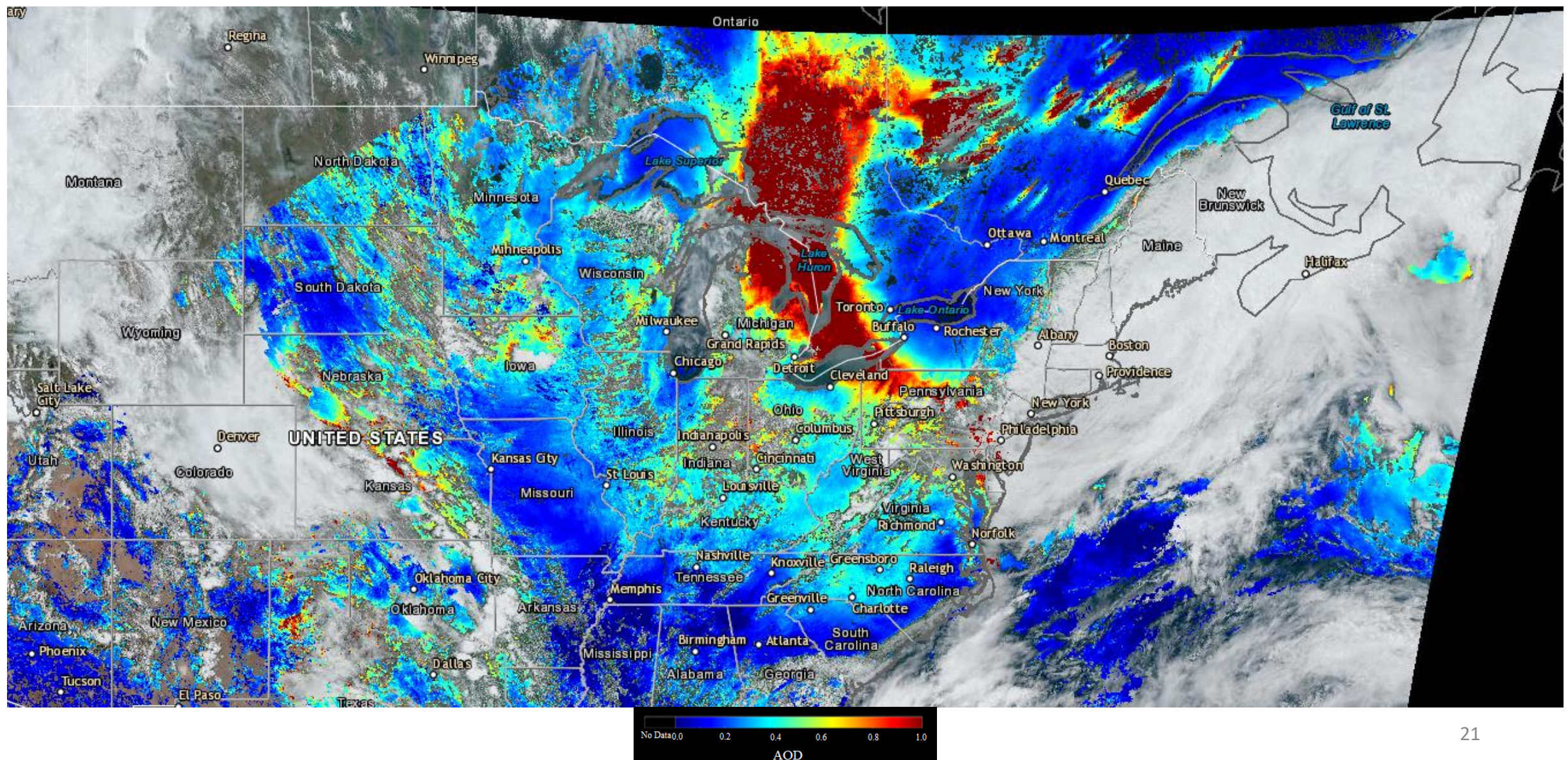
Aerosol Optical Depth – May 31, 2023



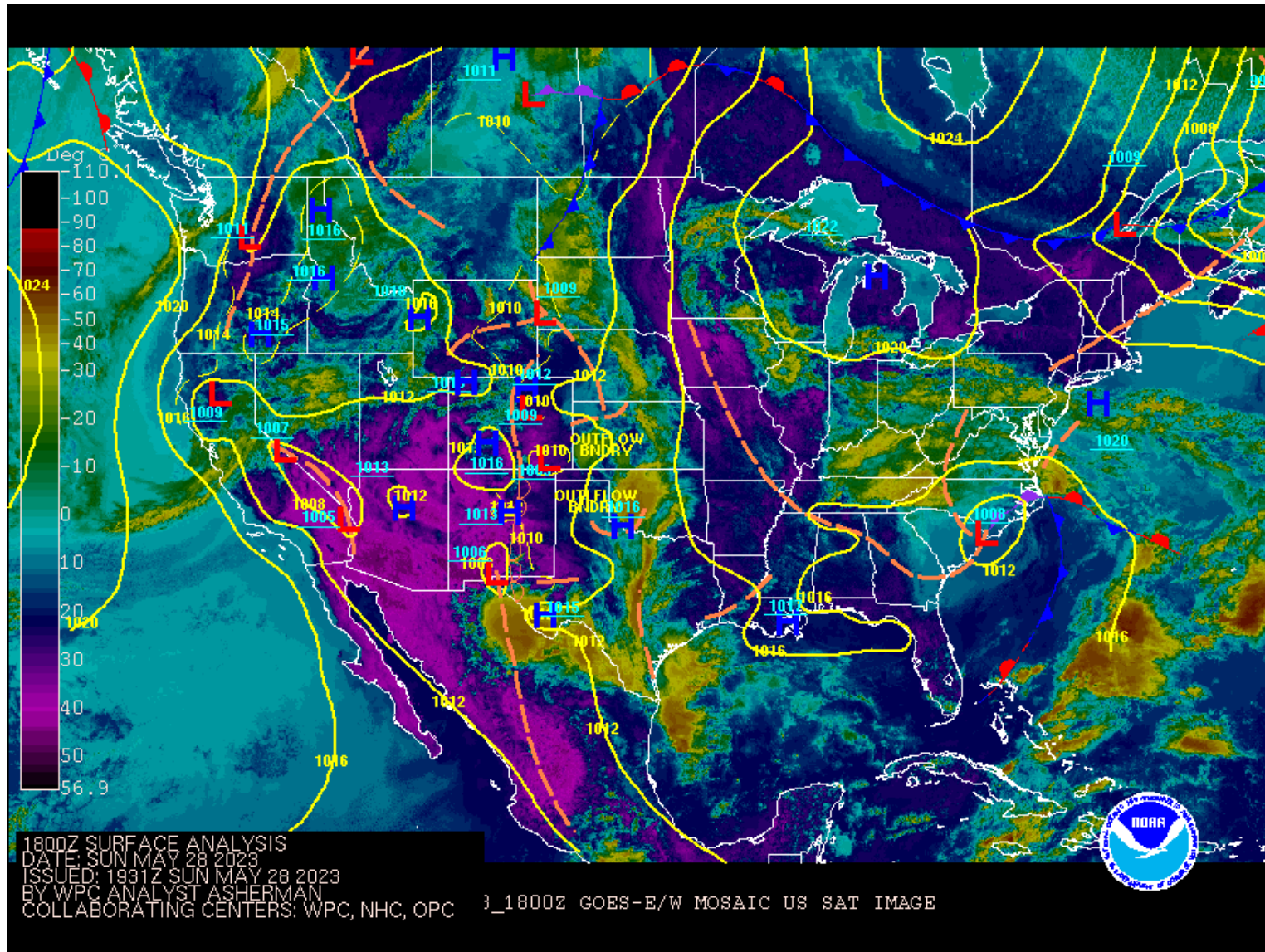
Aerosol Optical Depth – June 2, 2023



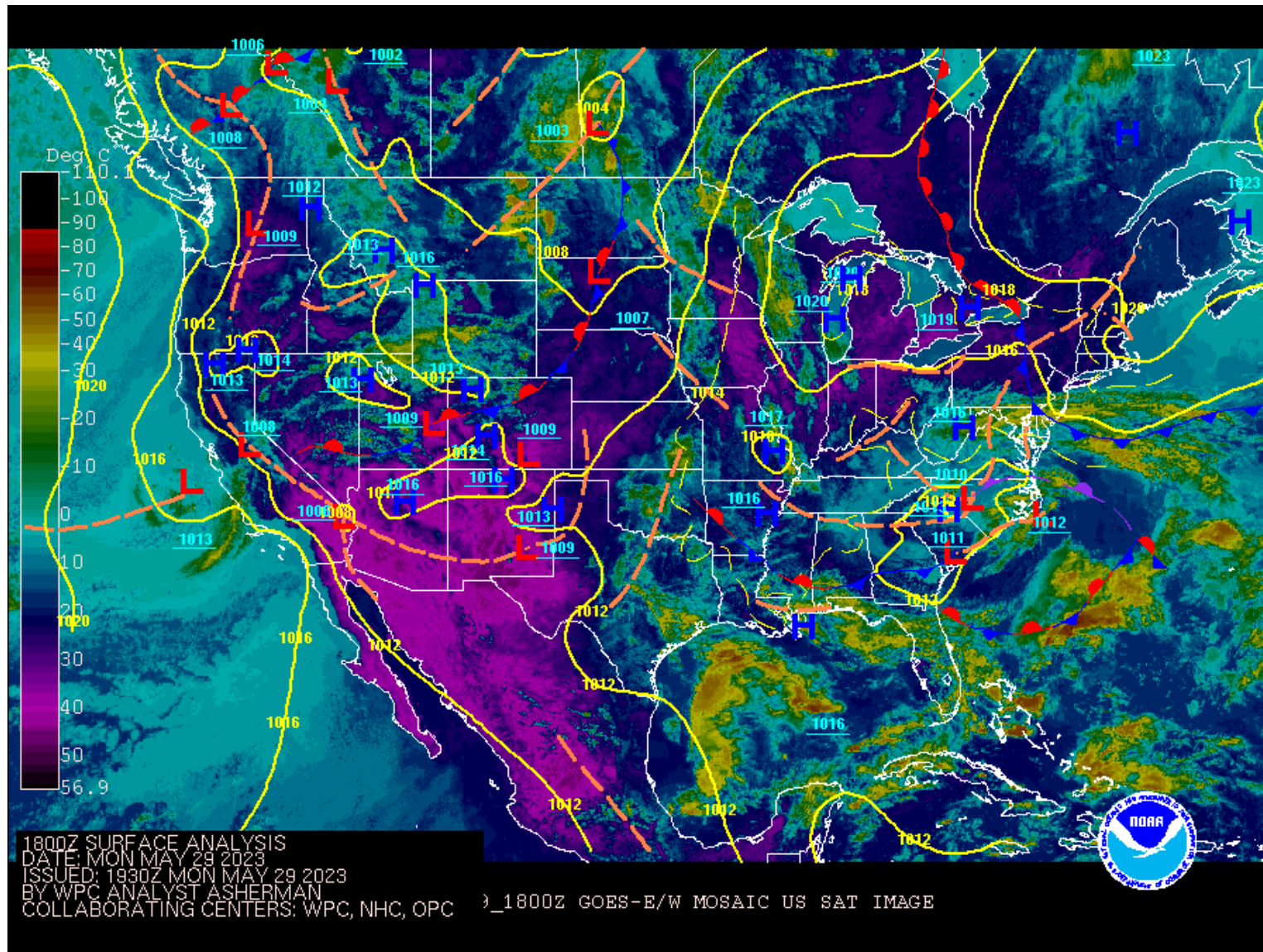
Aerosol Optical Depth – June 3, 2023



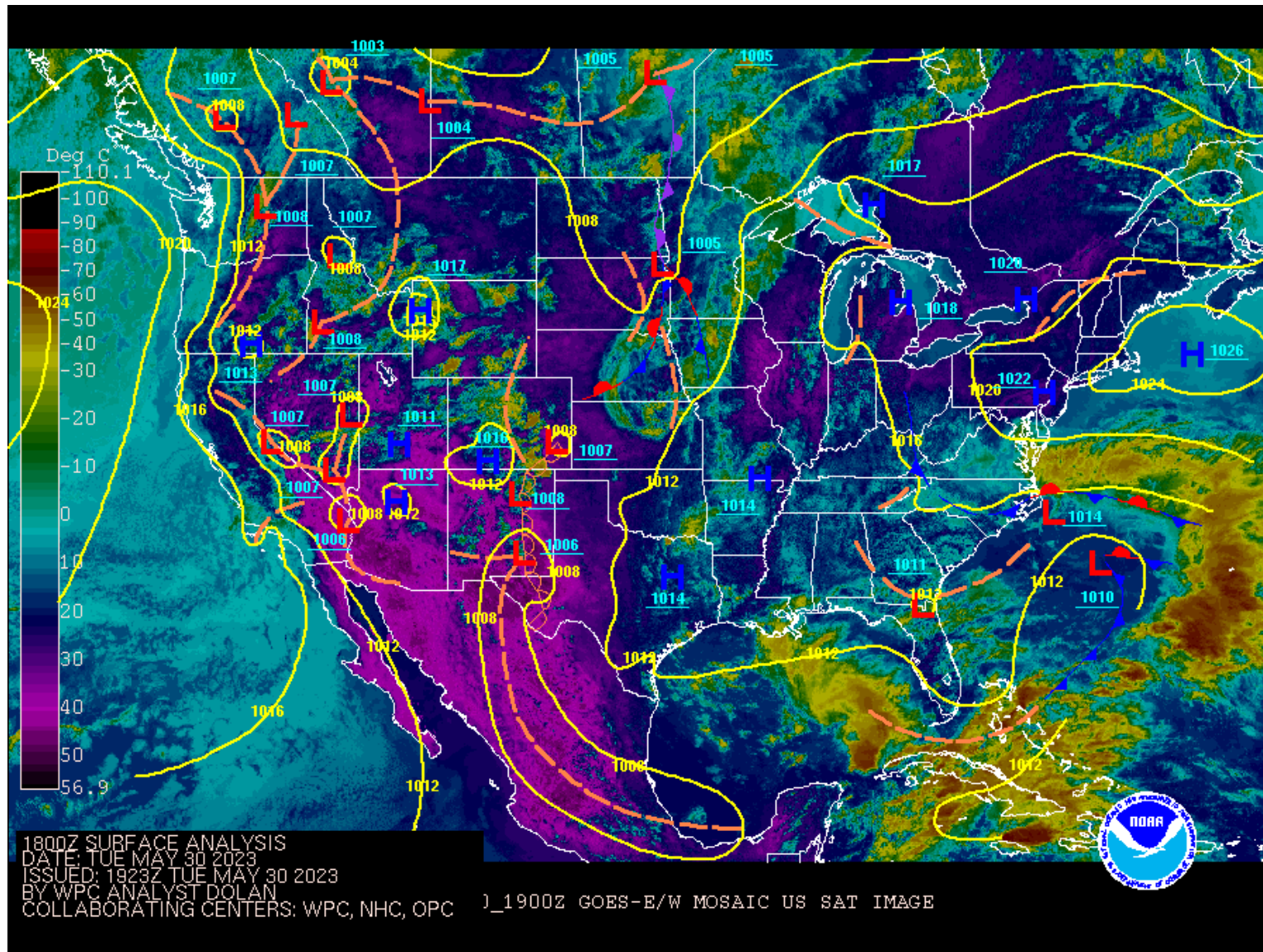
Surface Map – May 28, 2023



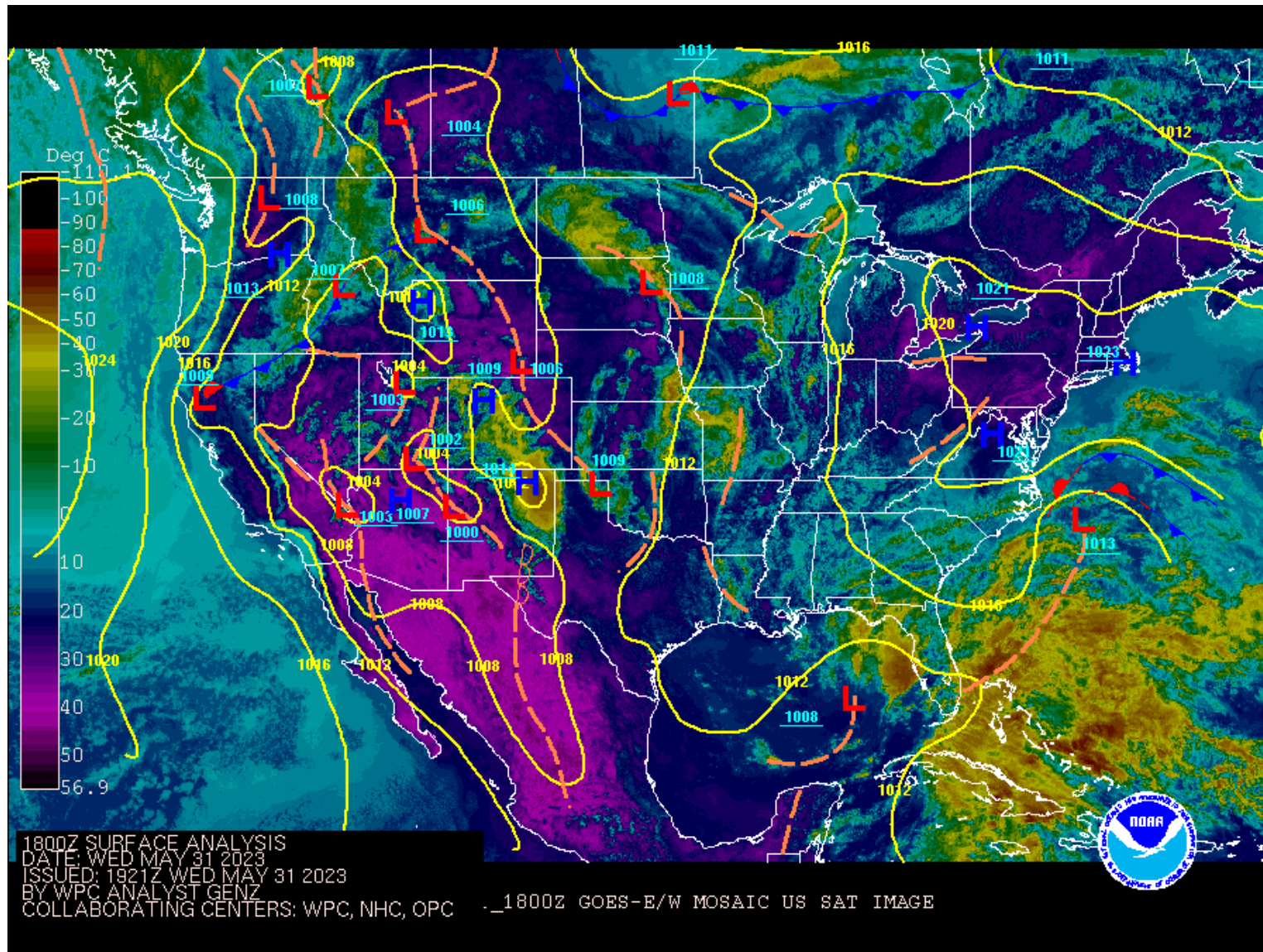
Surface Map – May 29, 2023



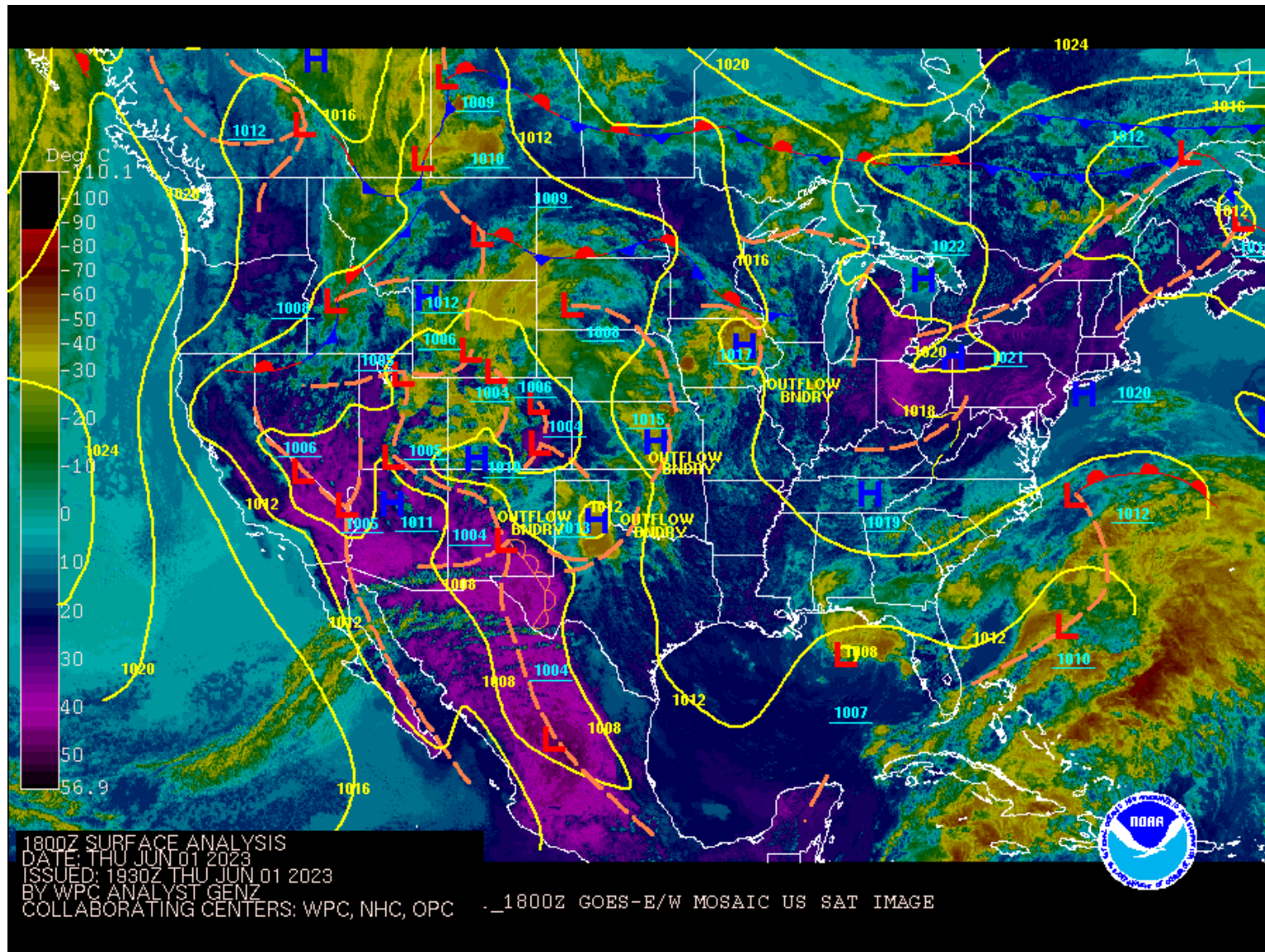
Surface Map – May 30, 2023



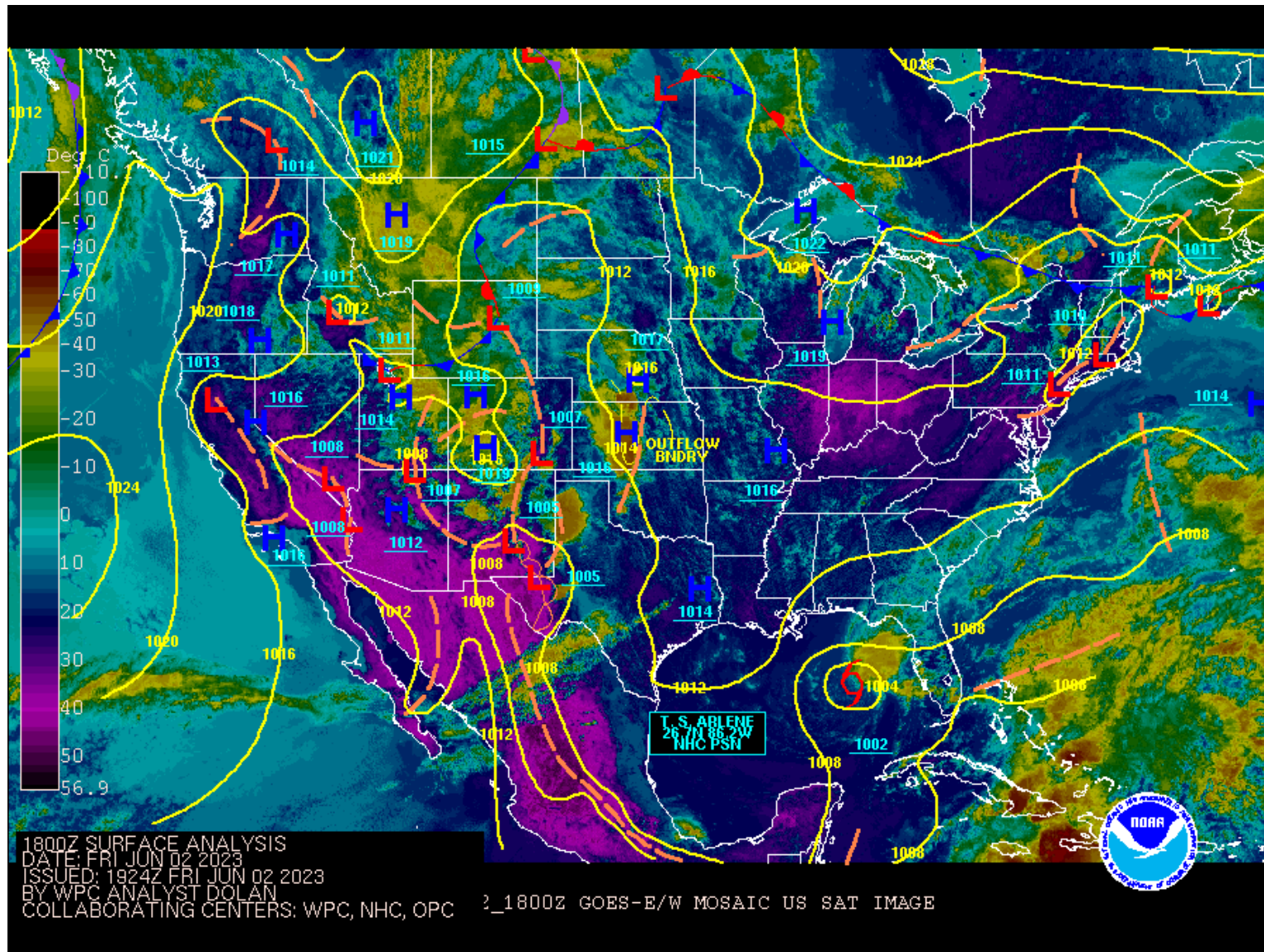
Surface Map – May 31, 2023



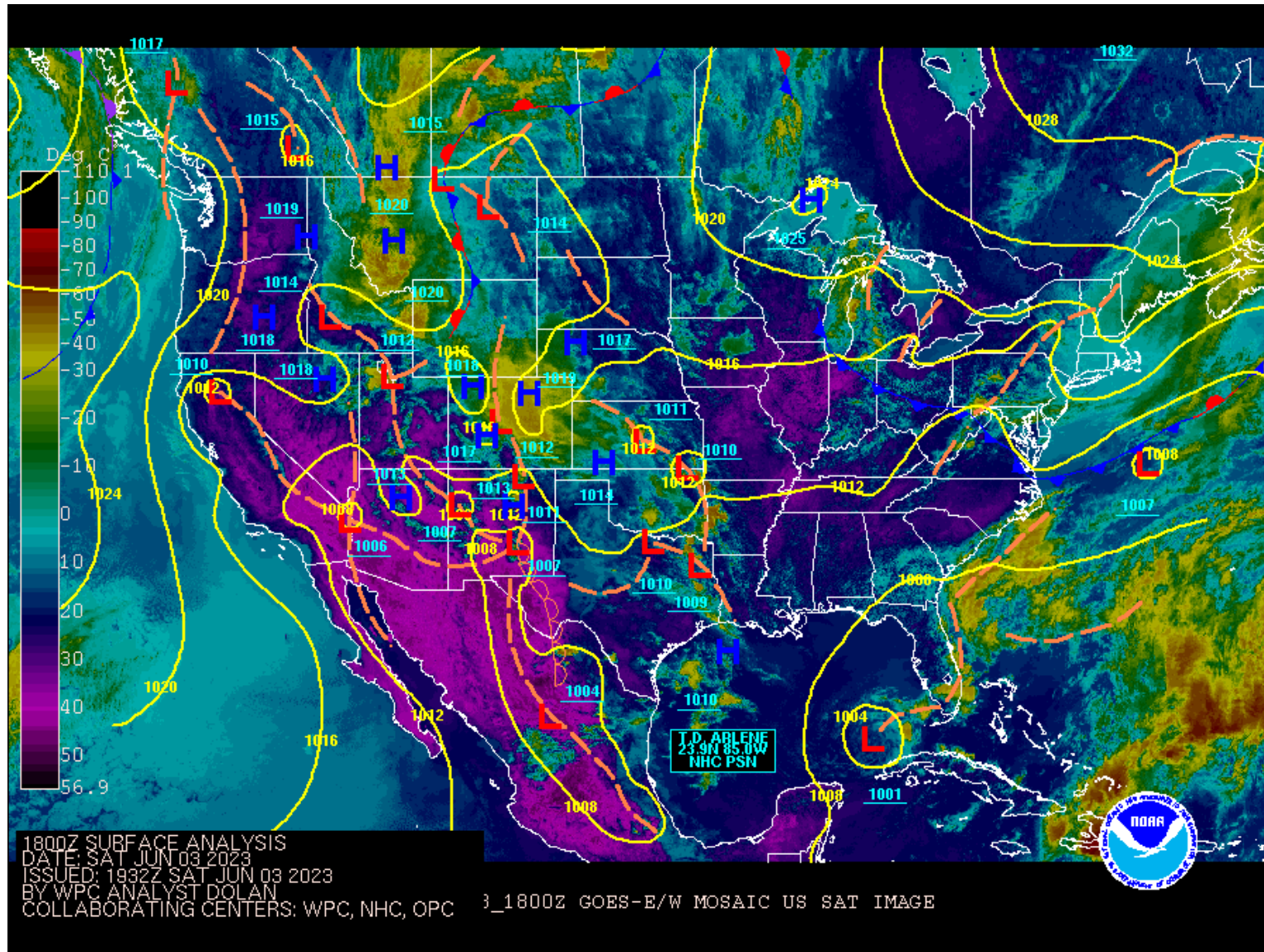
Surface Map – June 1, 2023



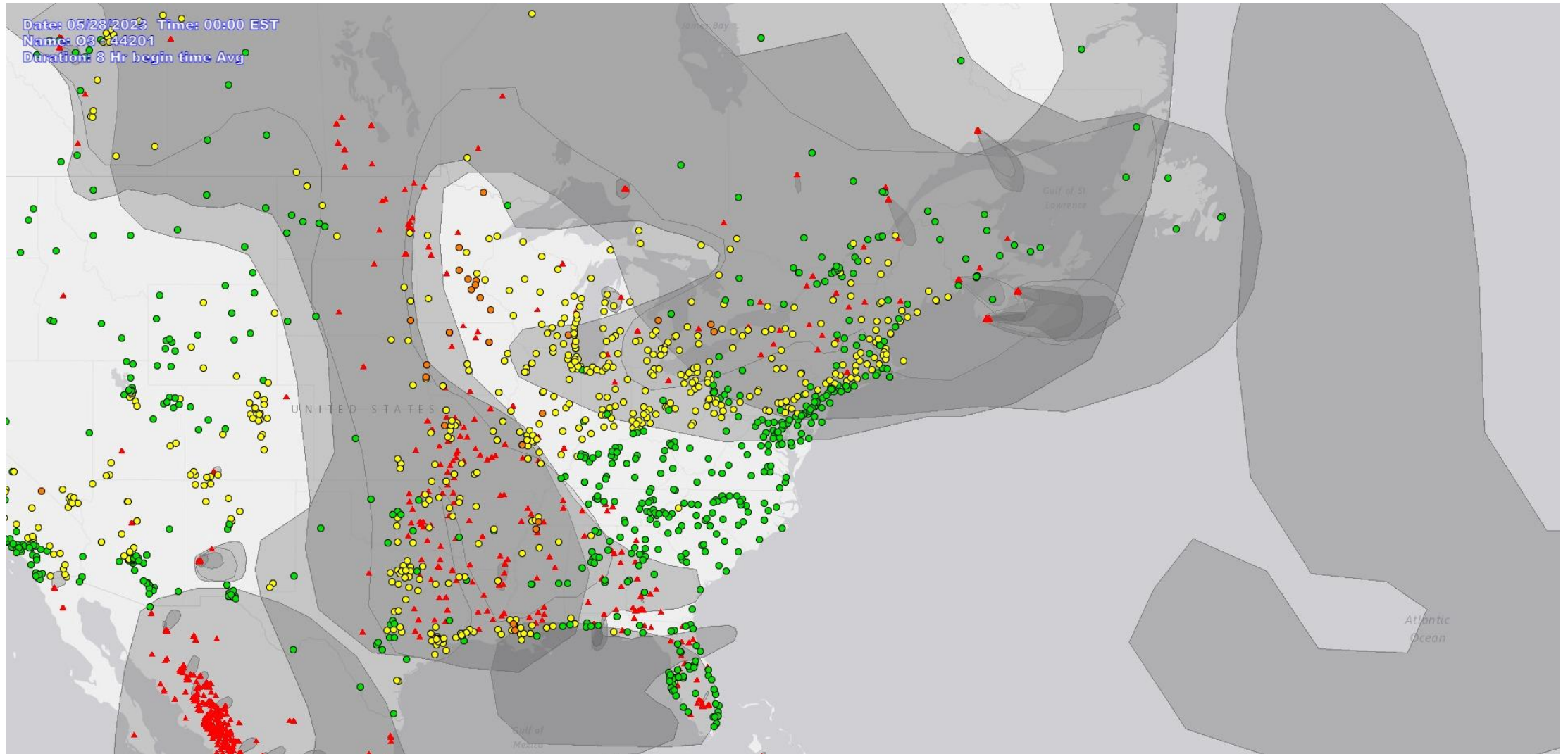
Surface Map – June 2, 2023



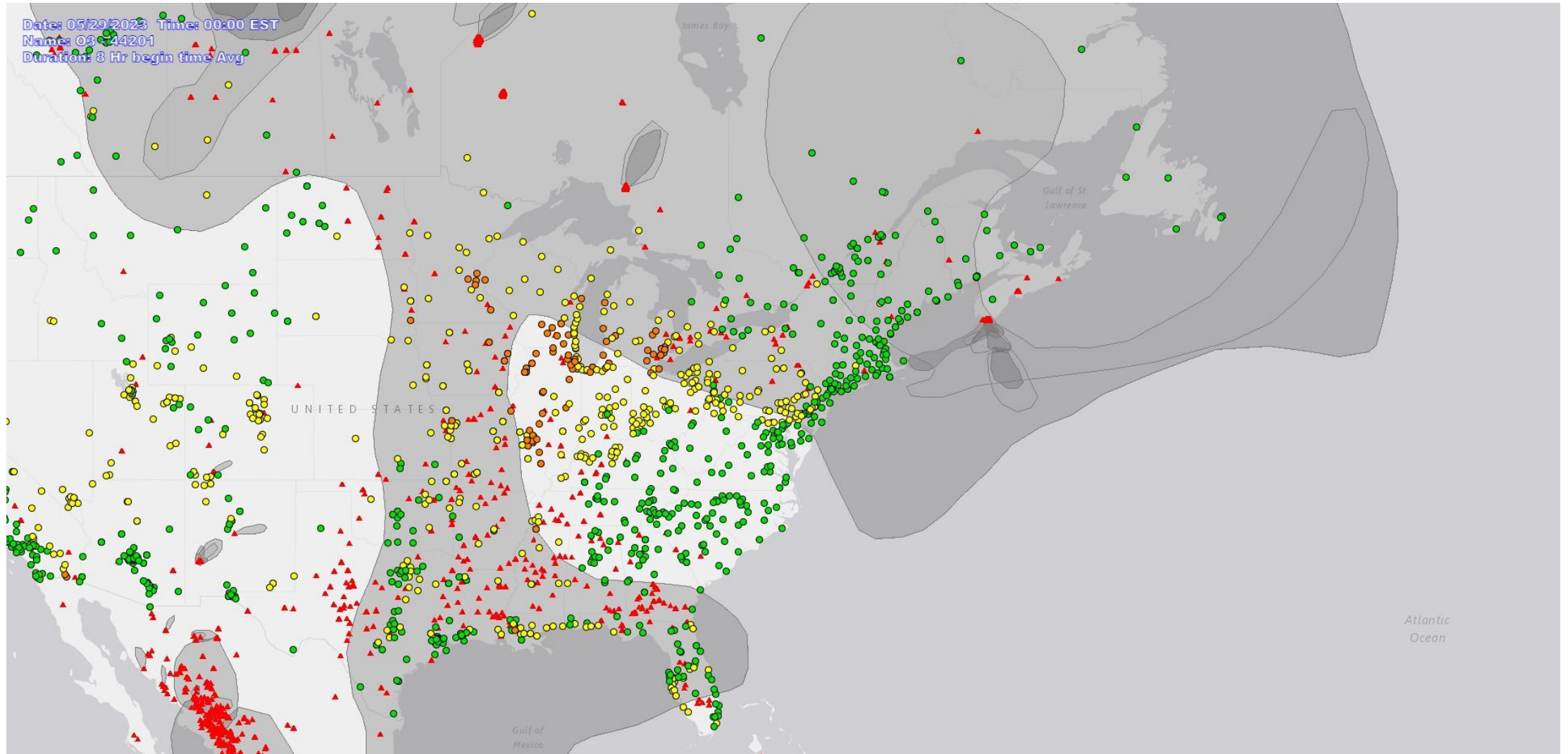
Surface Map – June 3, 2023



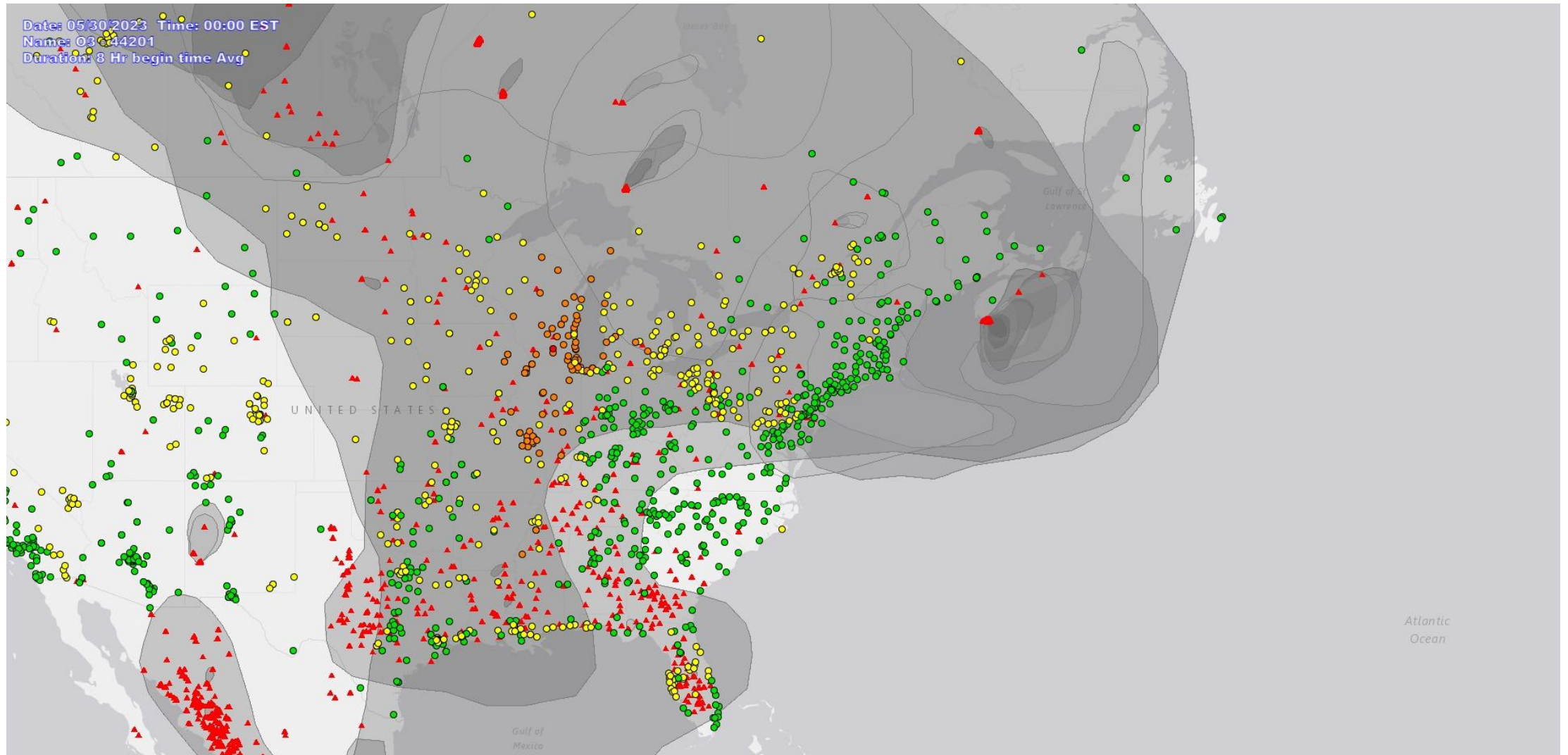
Ozone Concentrations – May 28, 2023



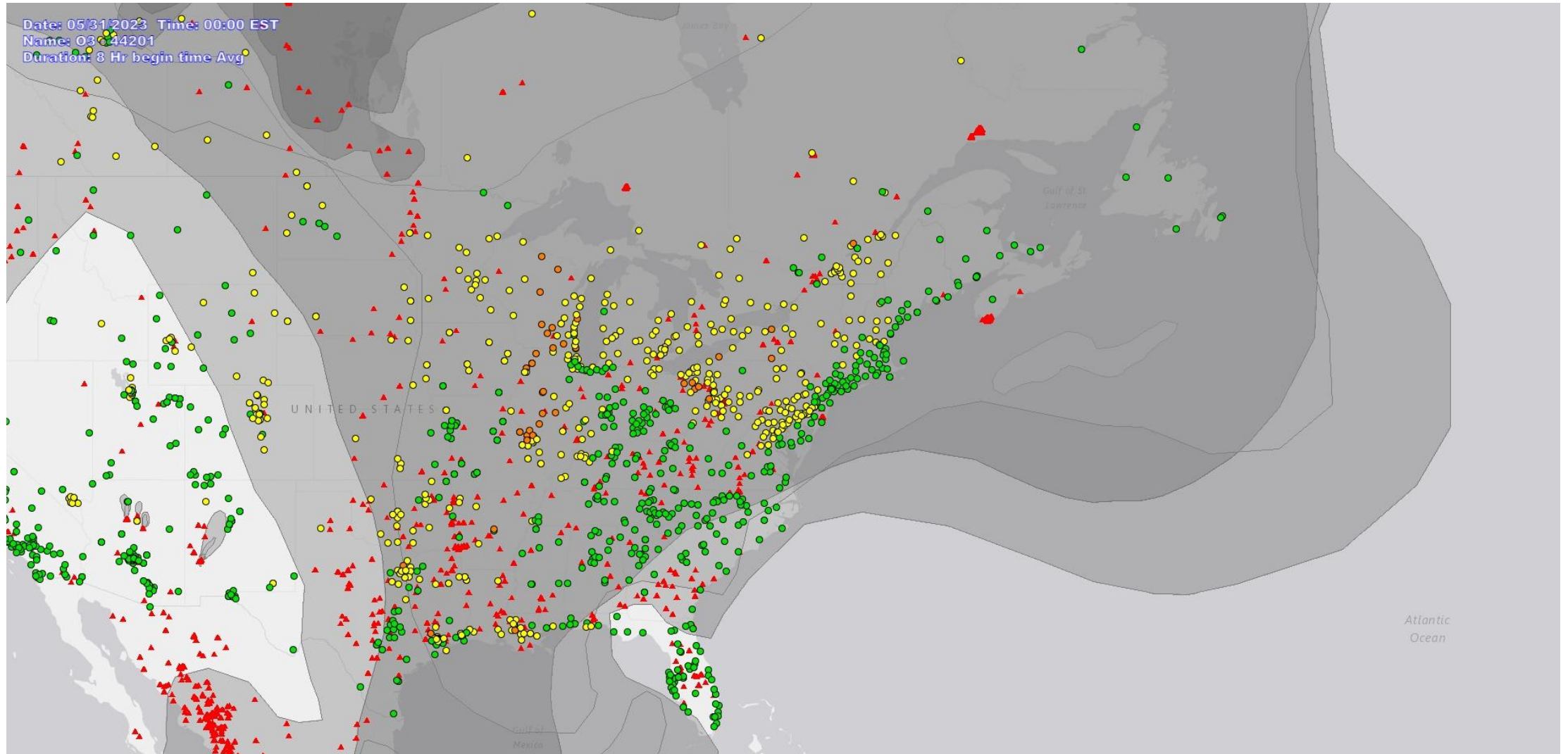
Ozone Concentrations – May 29, 2023



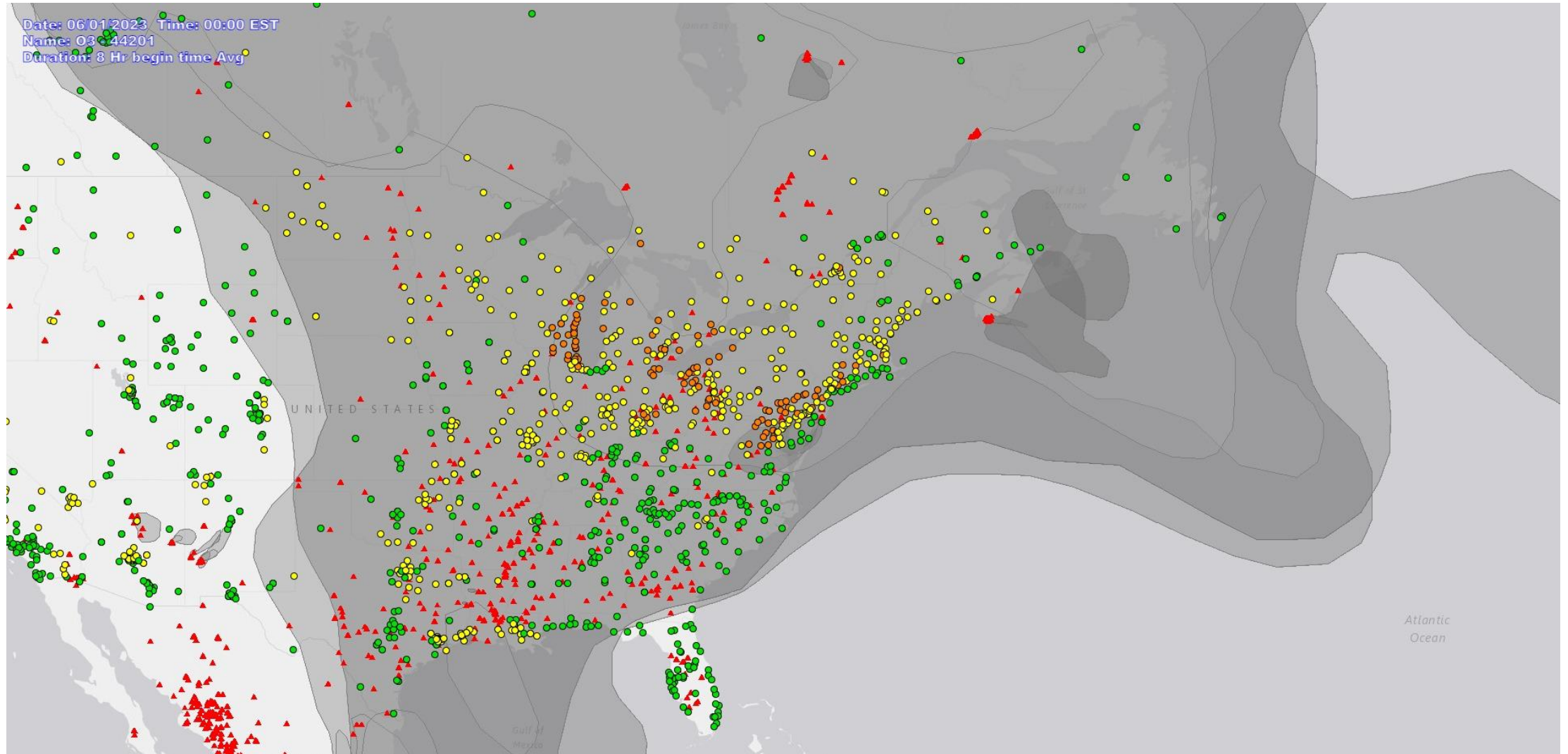
Ozone Concentrations – May 30, 2023



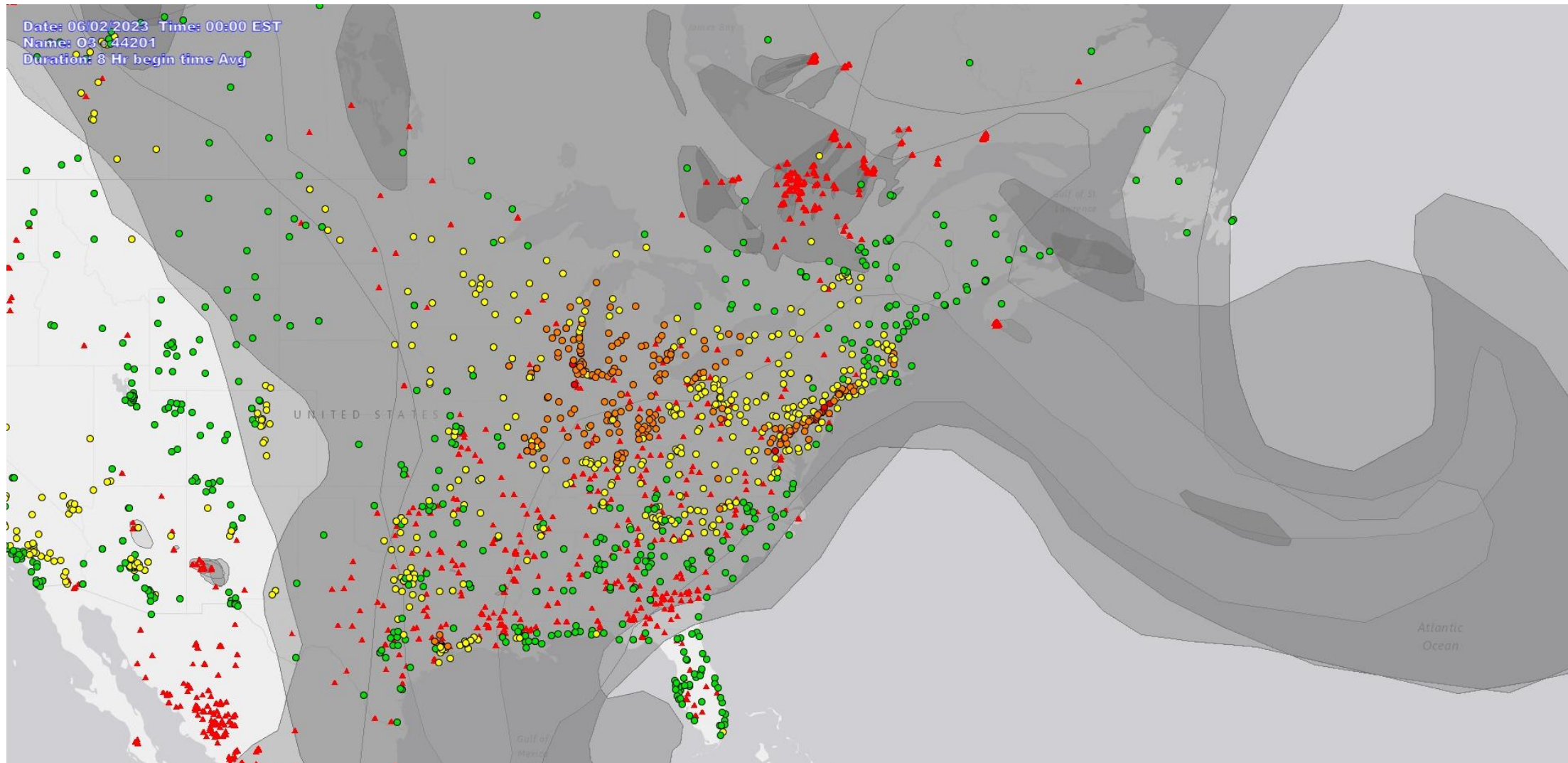
Ozone Concentrations – May 31, 2023



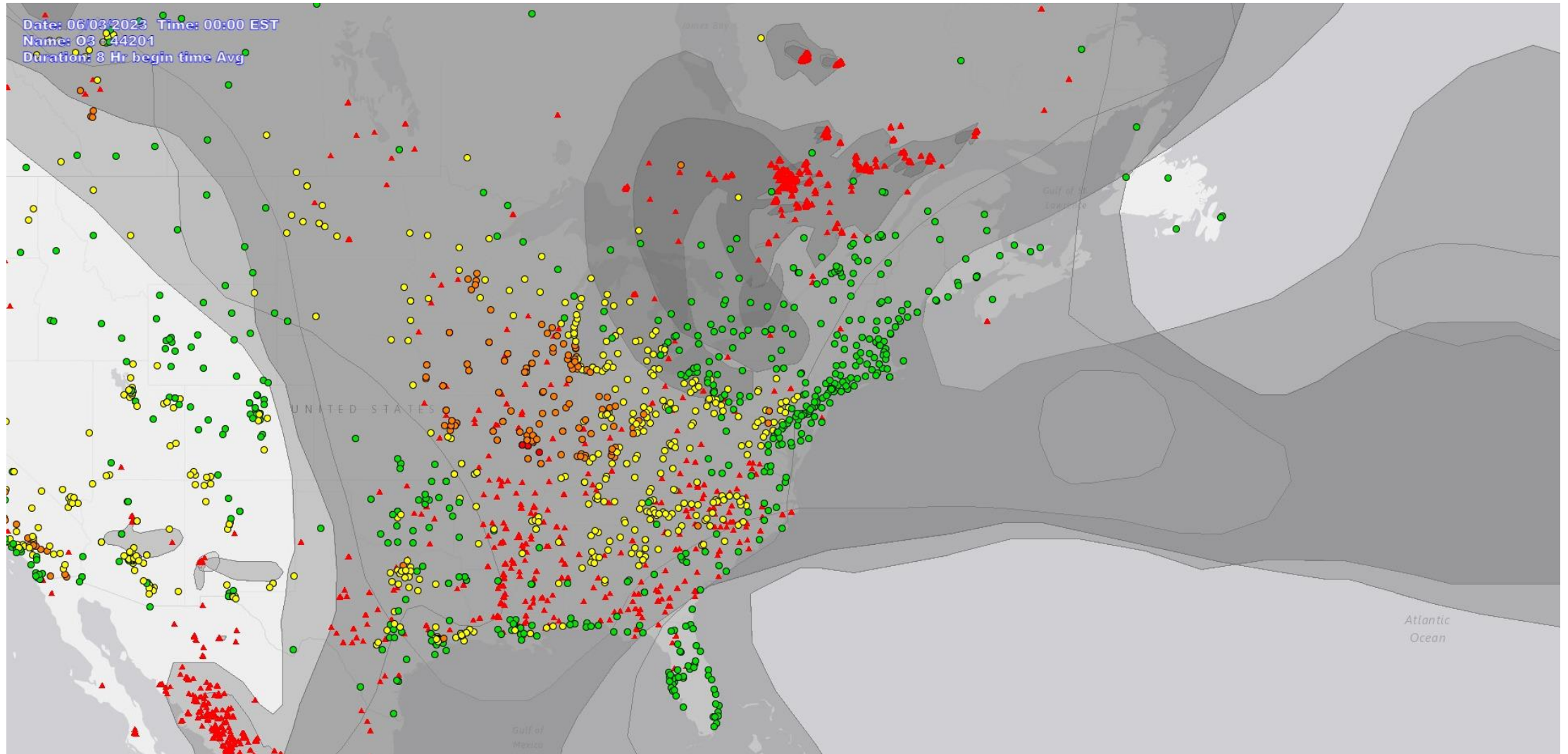
Ozone Concentrations – June 1, 2023



Ozone Concentrations – June 2, 2023



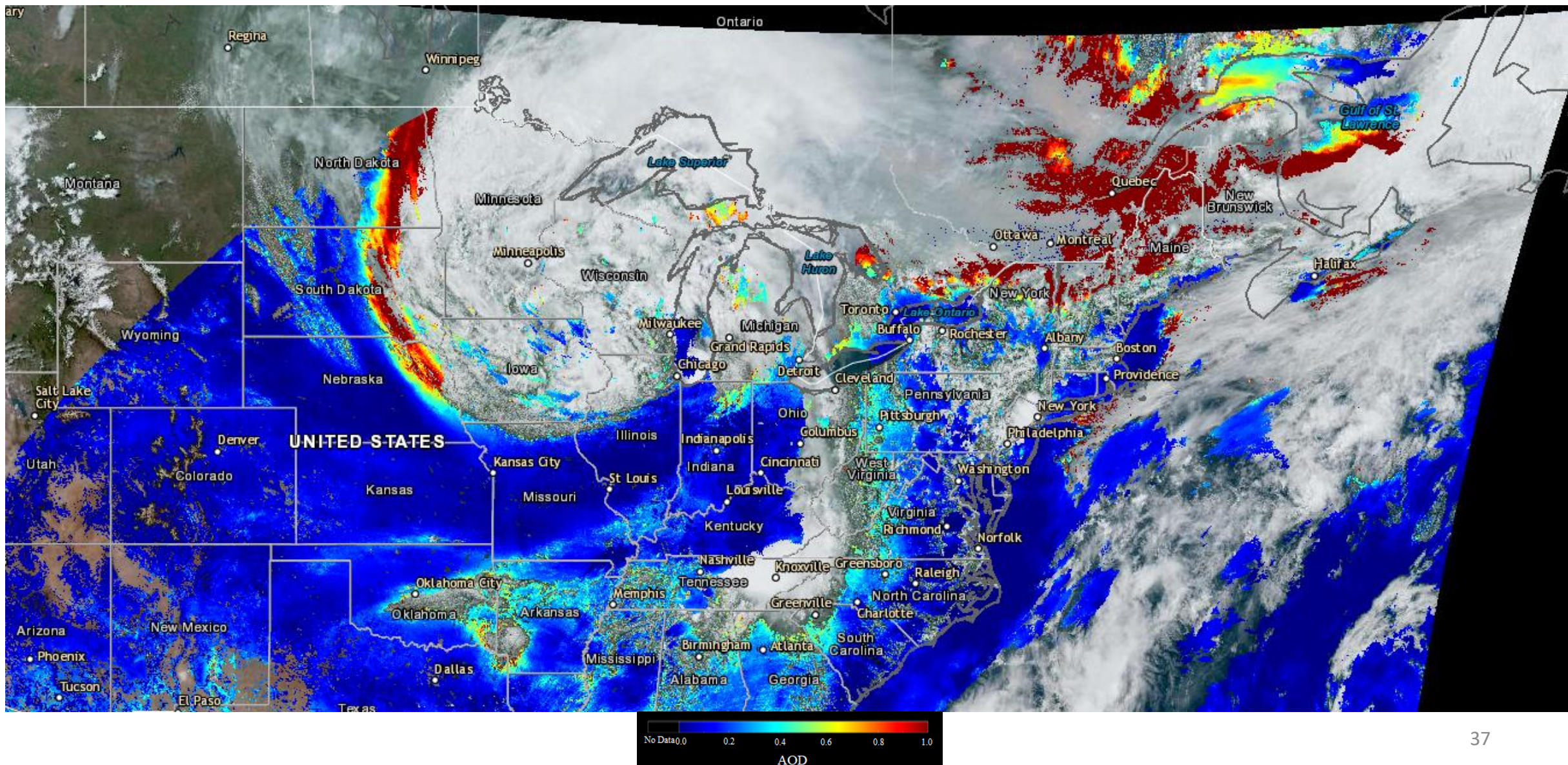
Ozone Concentrations – June 3, 2023



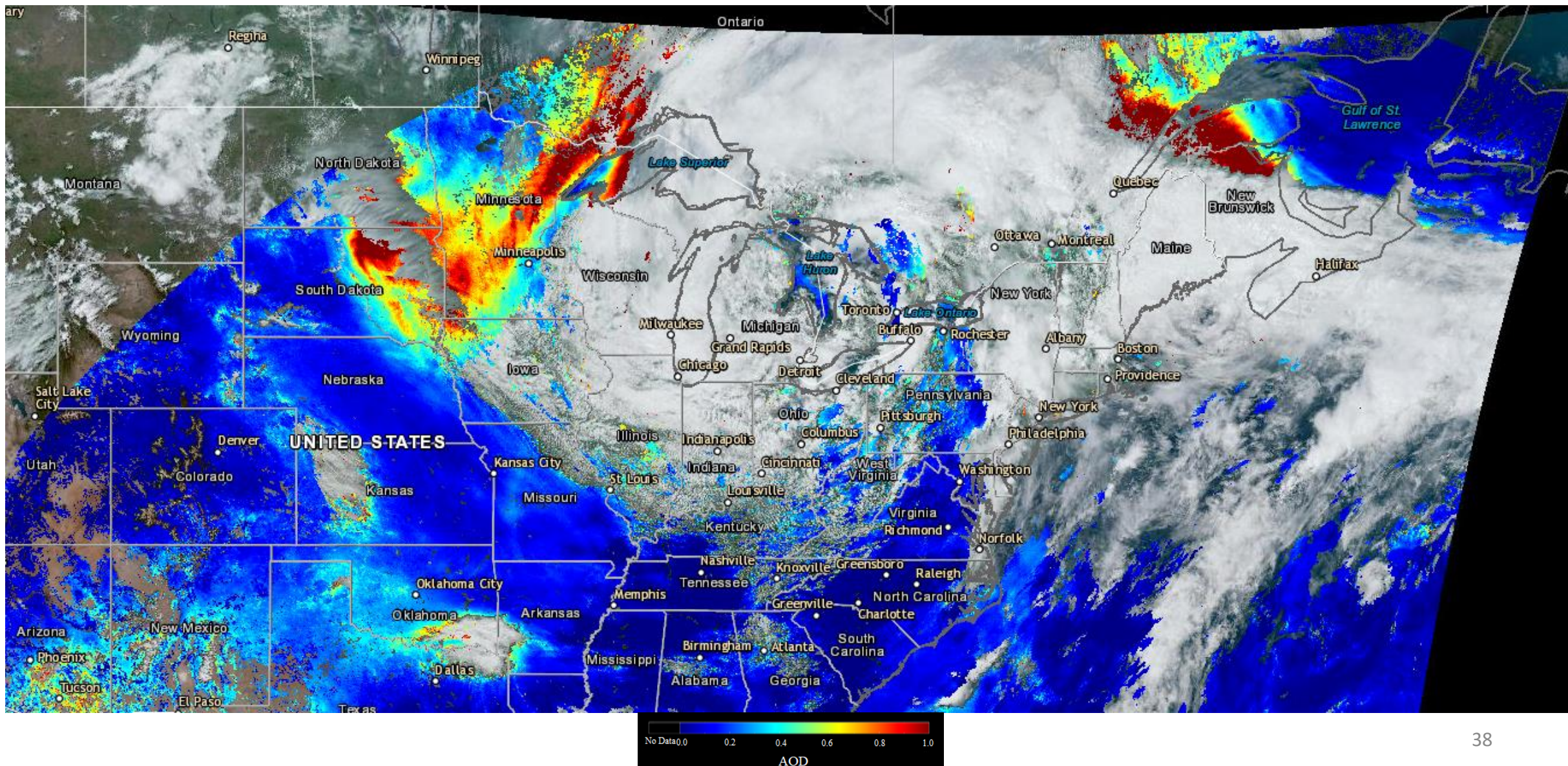
Evolution of an Ozone Episode

June 29-June 30, 2023

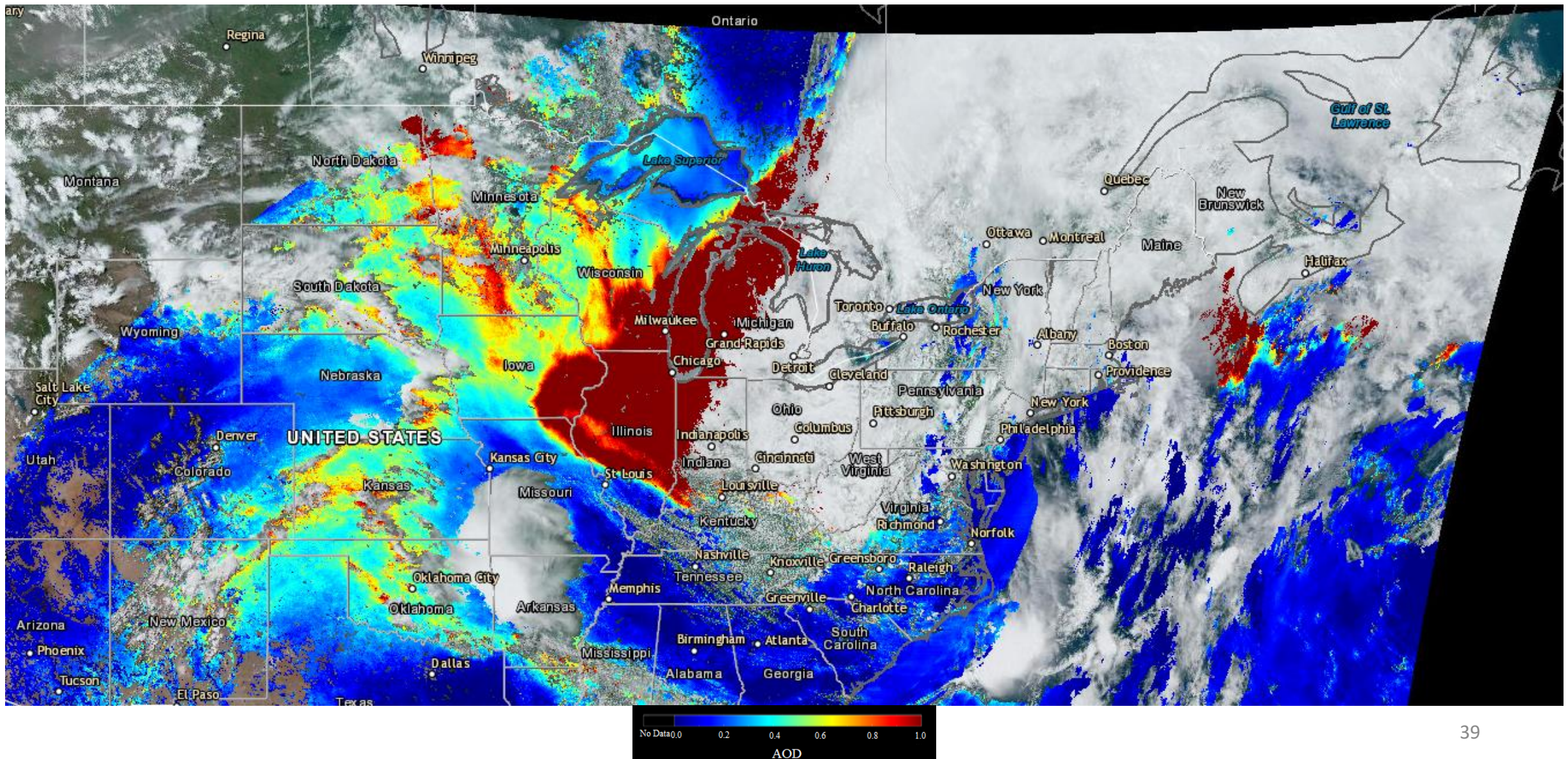
Aerosol Optical Depth – June 25, 2023



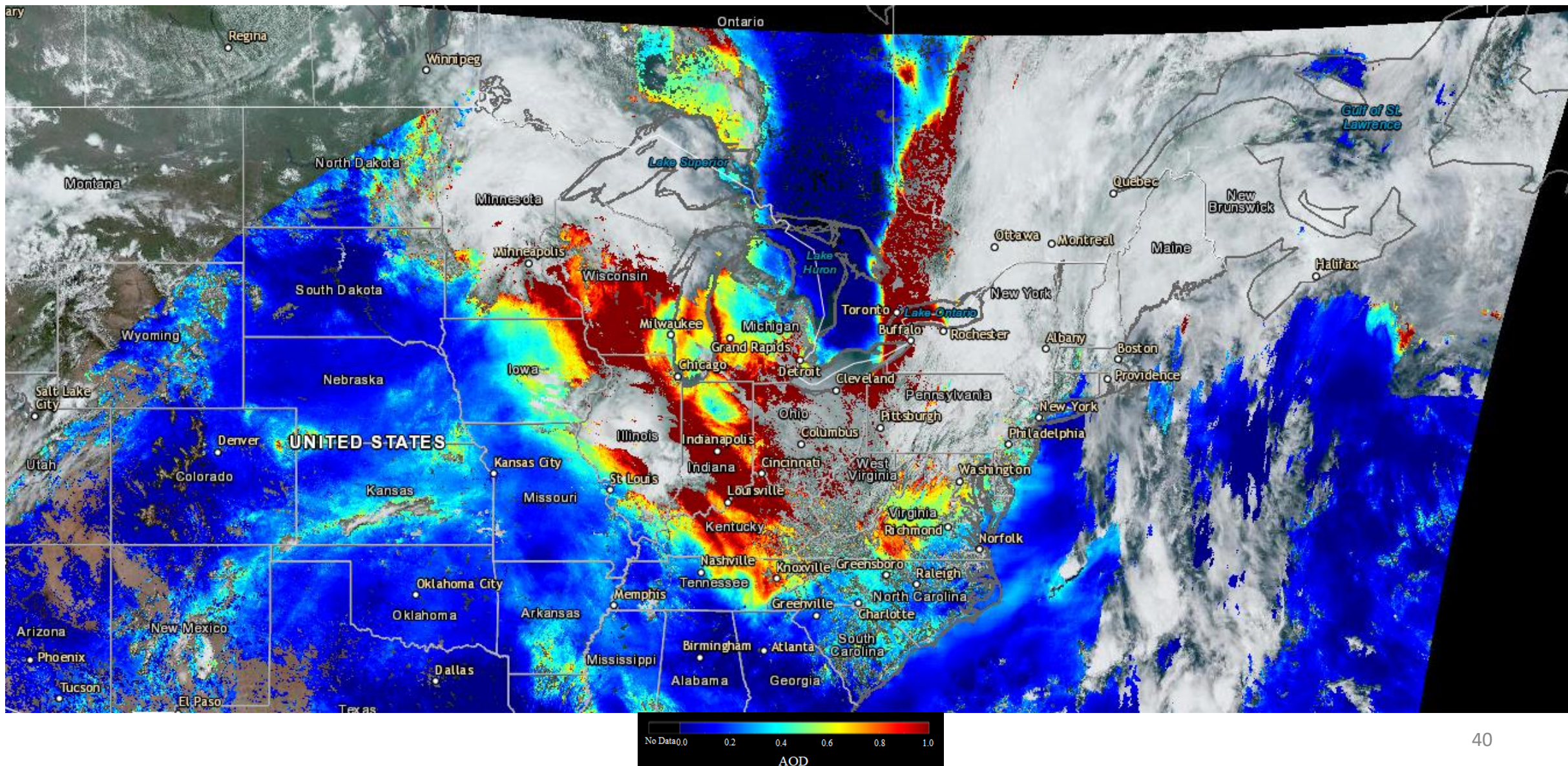
Aerosol Optical Depth – June 26, 2023



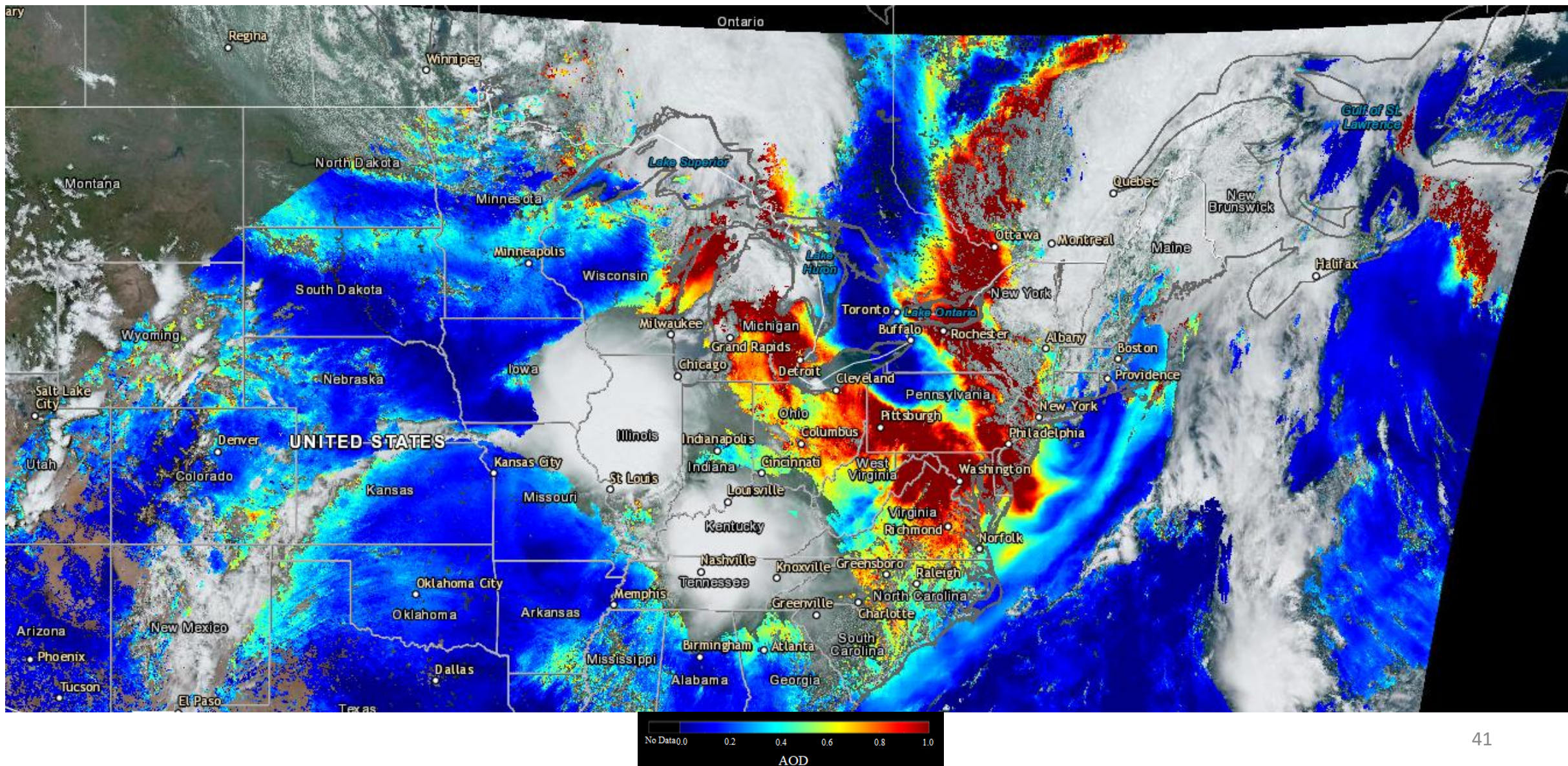
Aerosol Optical Depth – June 27, 2023



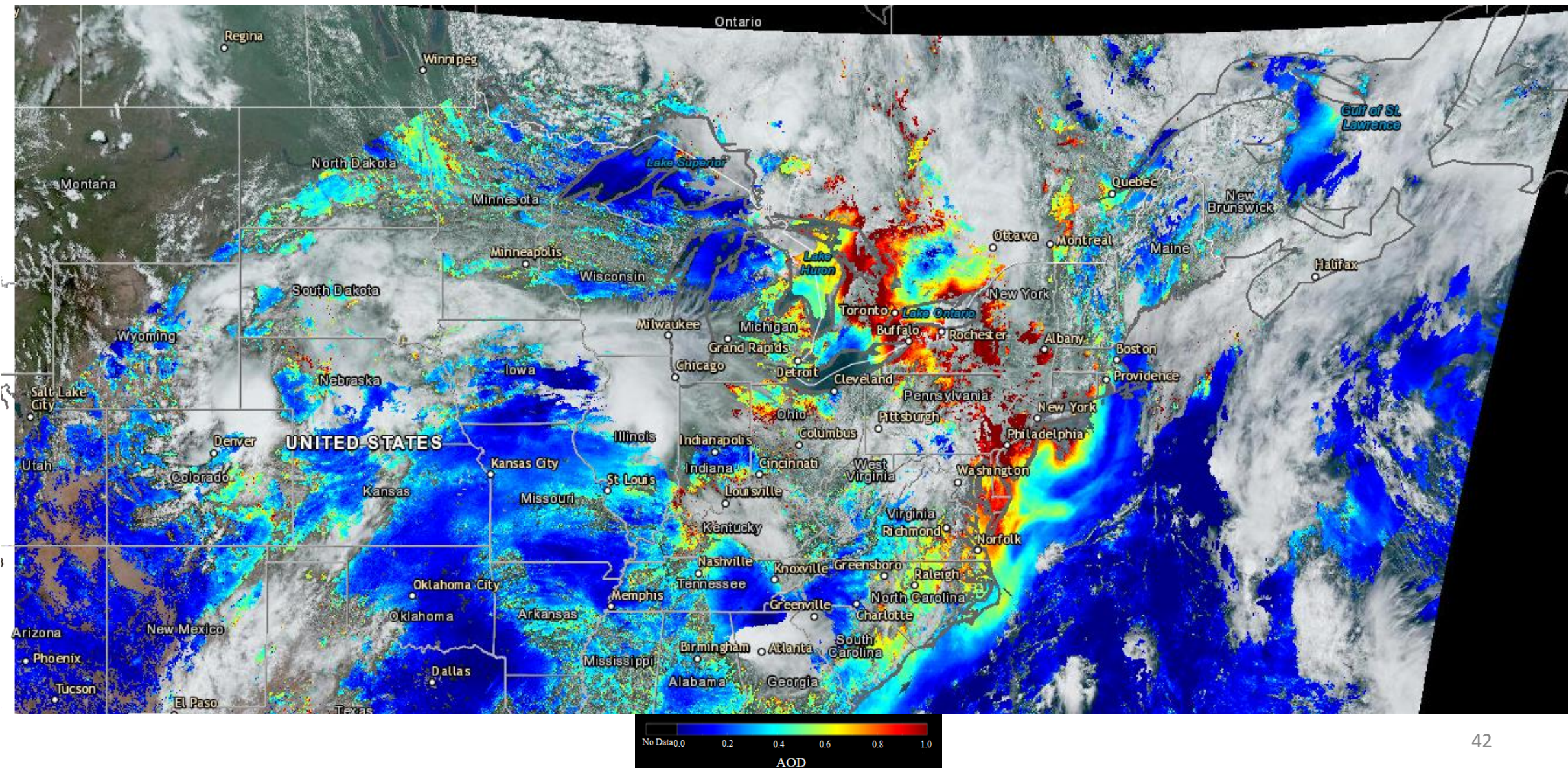
Aerosol Optical Depth – June 28, 2023



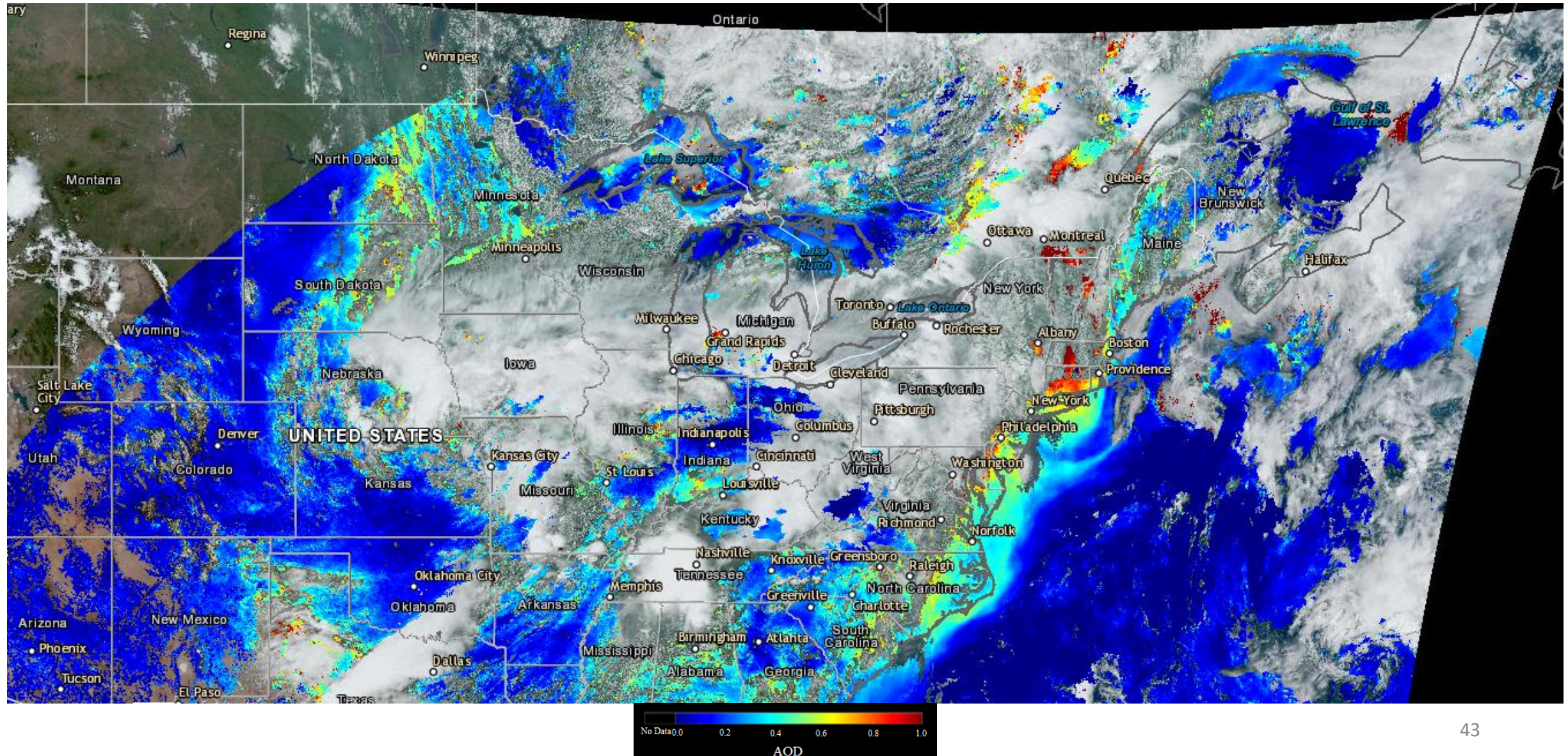
Aerosol Optical Depth – June 29, 2023



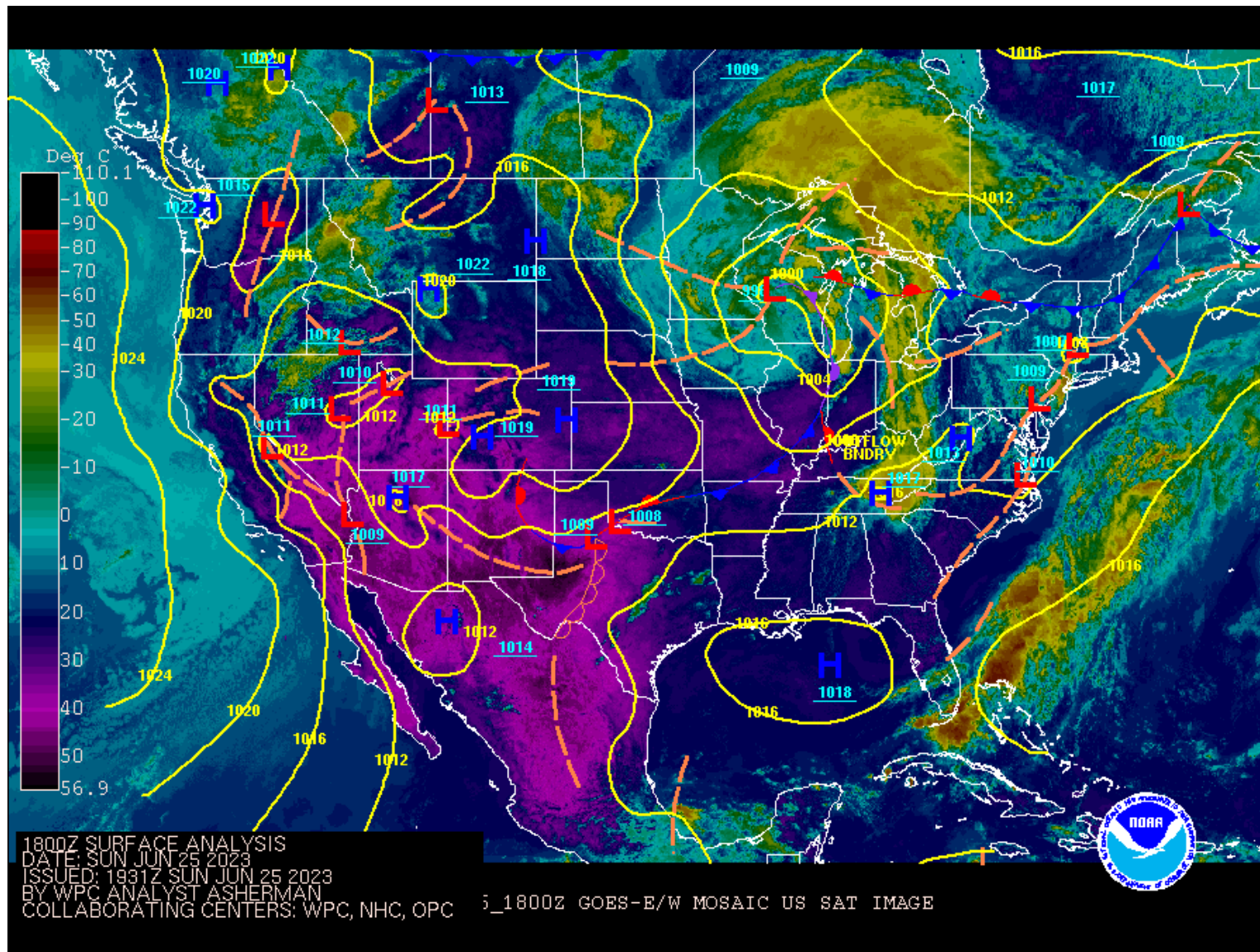
Aerosol Optical Depth – June 30, 2023



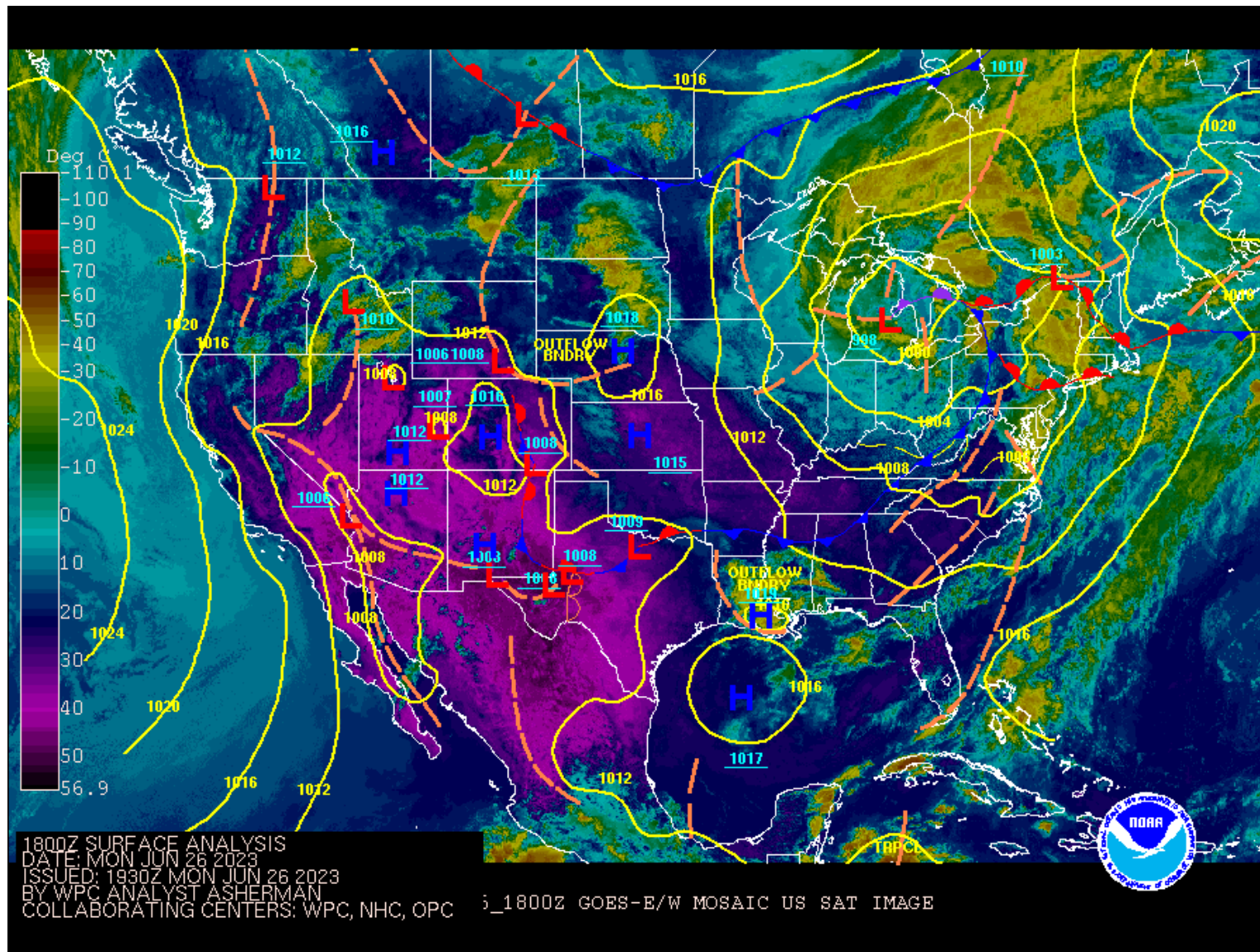
Aerosol Optical Depth – July 1, 2023



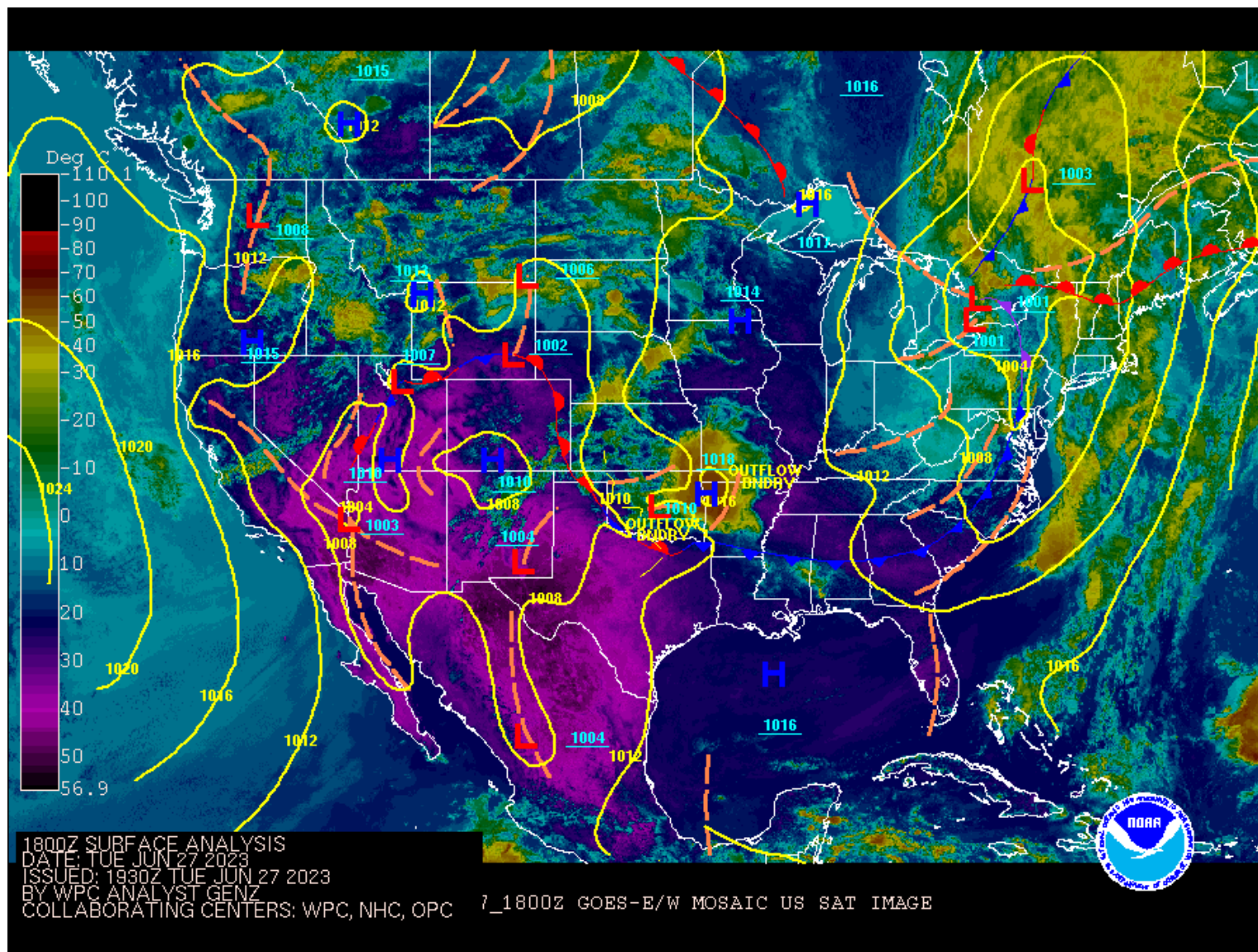
Surface Map – June 25, 2023



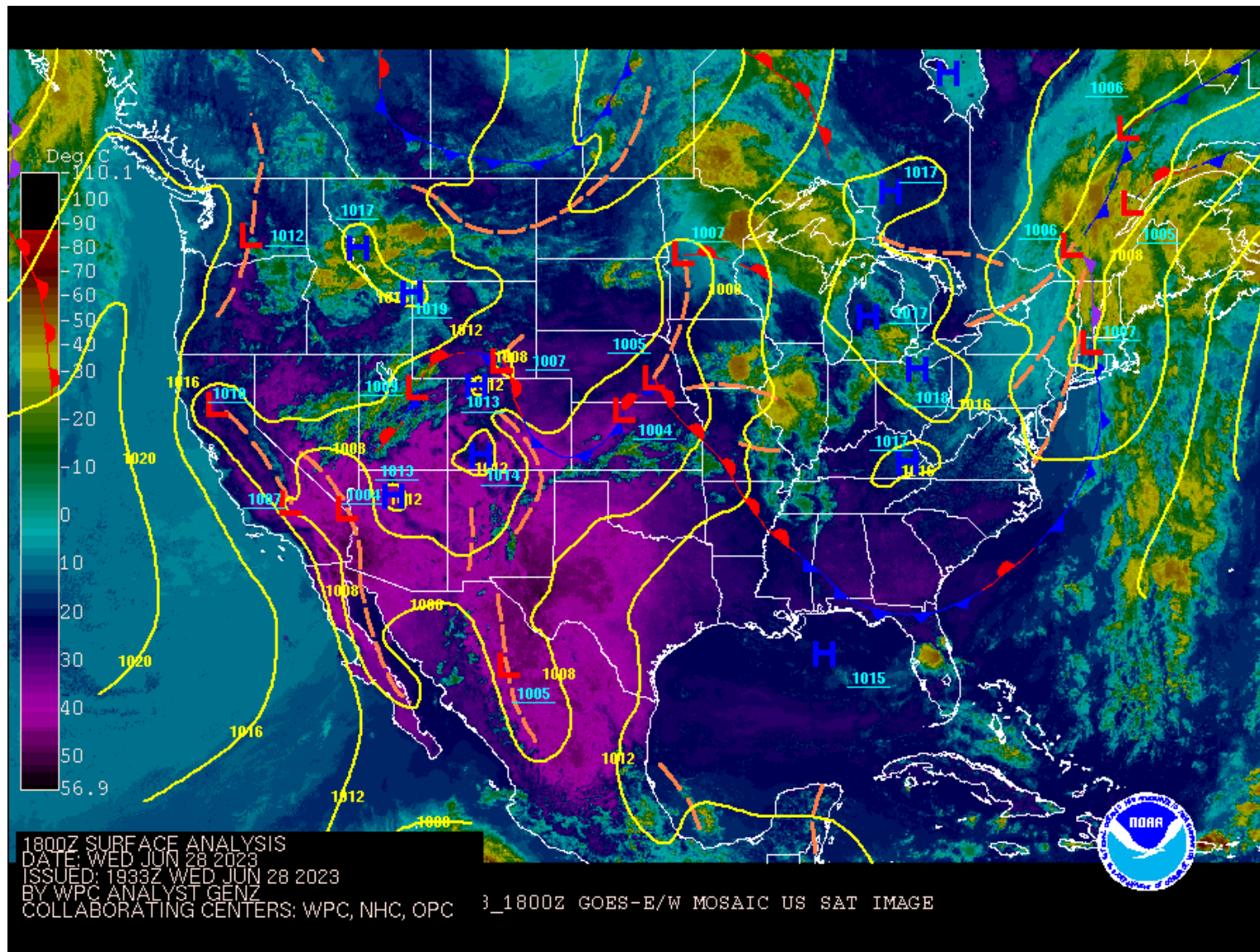
Surface Map – June 26, 2023



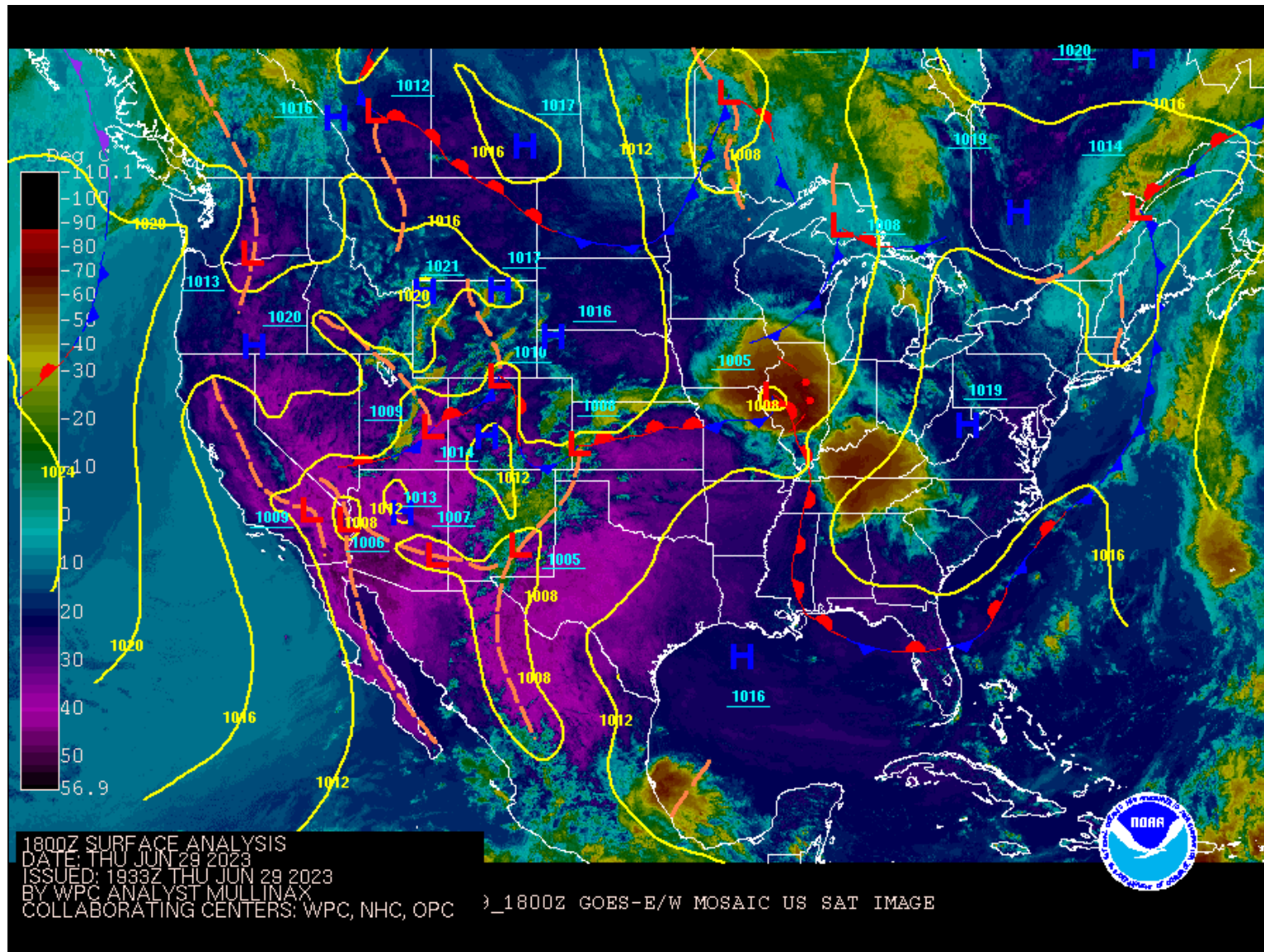
Surface Map – June 27, 2023



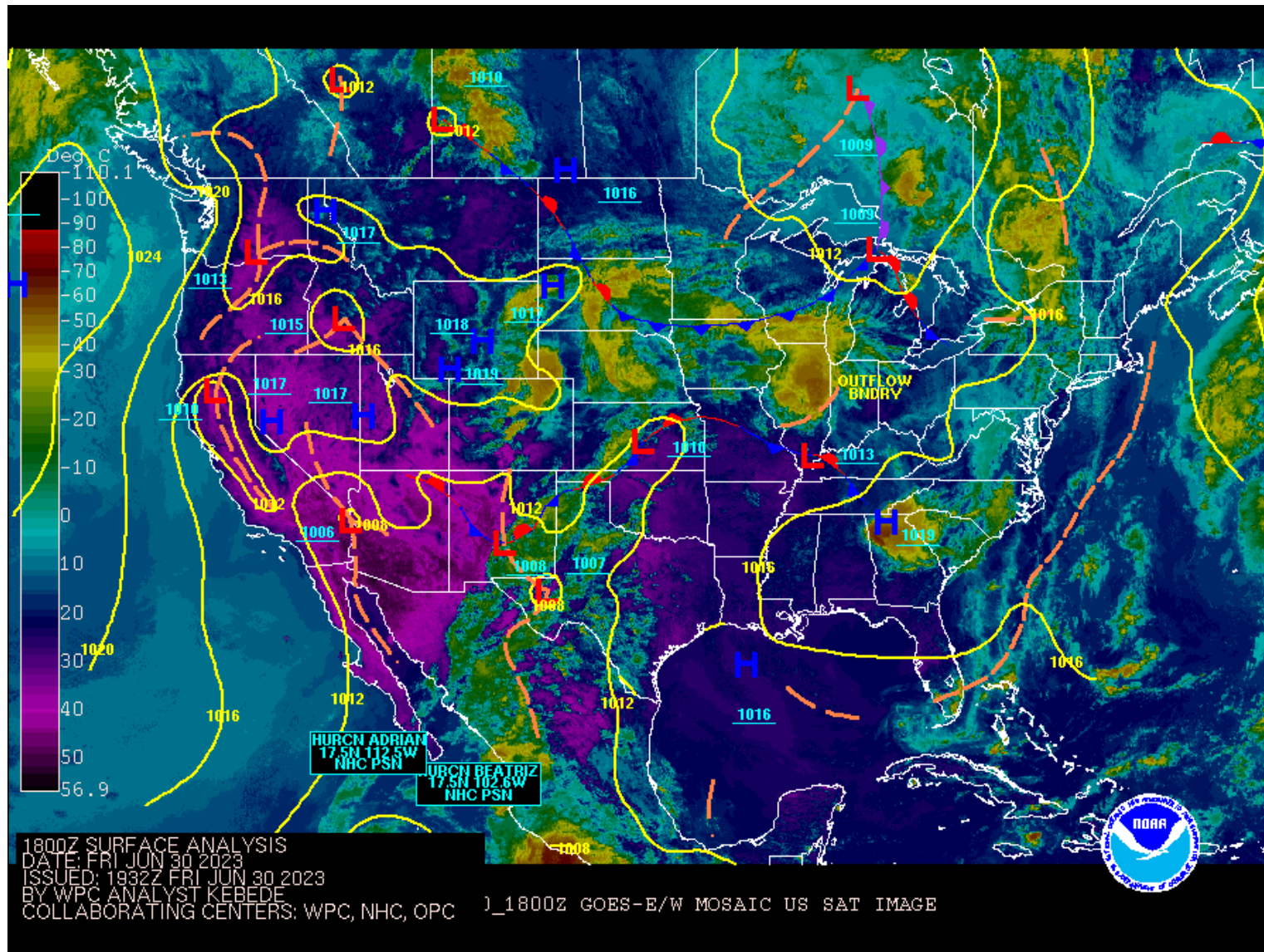
Surface Map – June 28, 2023



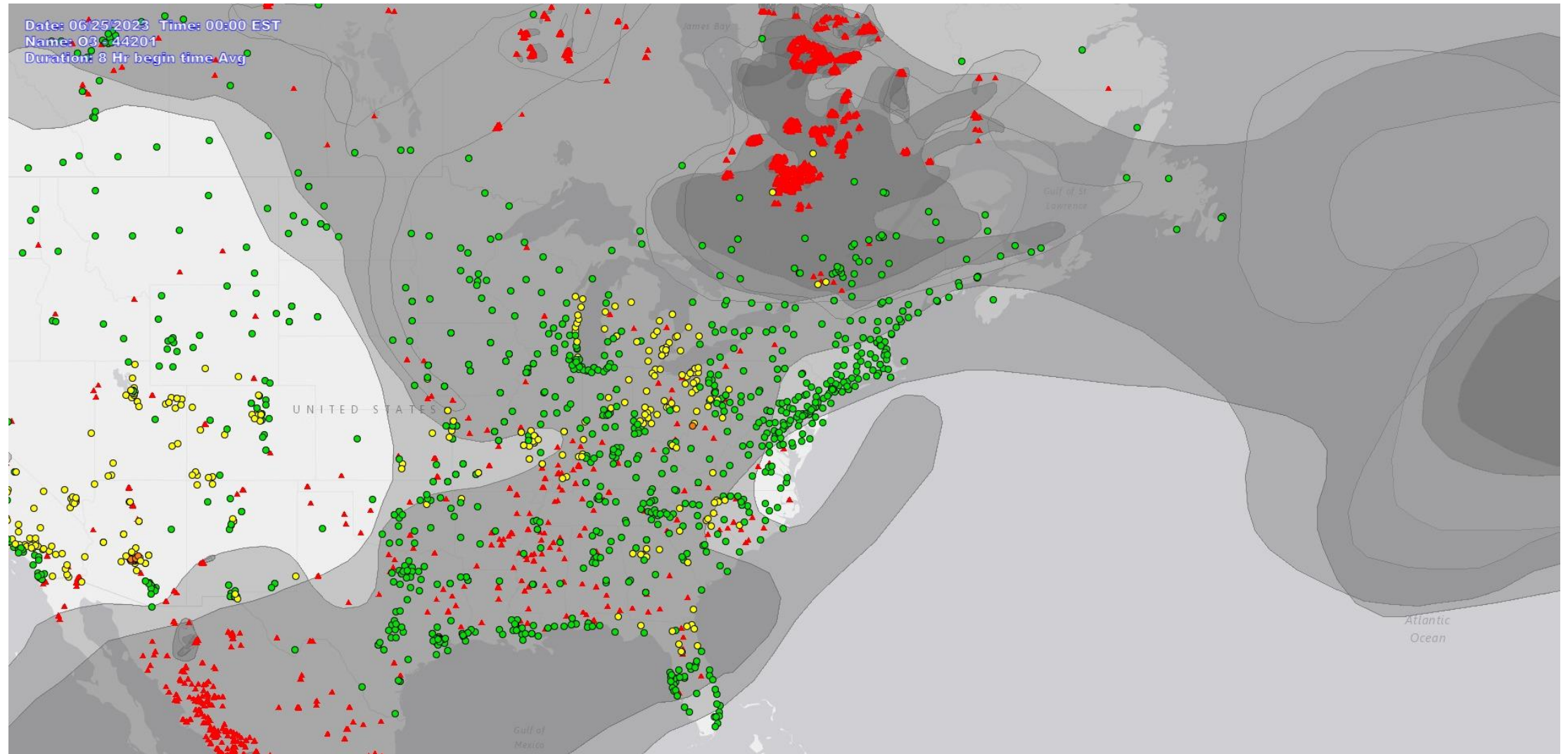
Surface Map – June 29, 2023



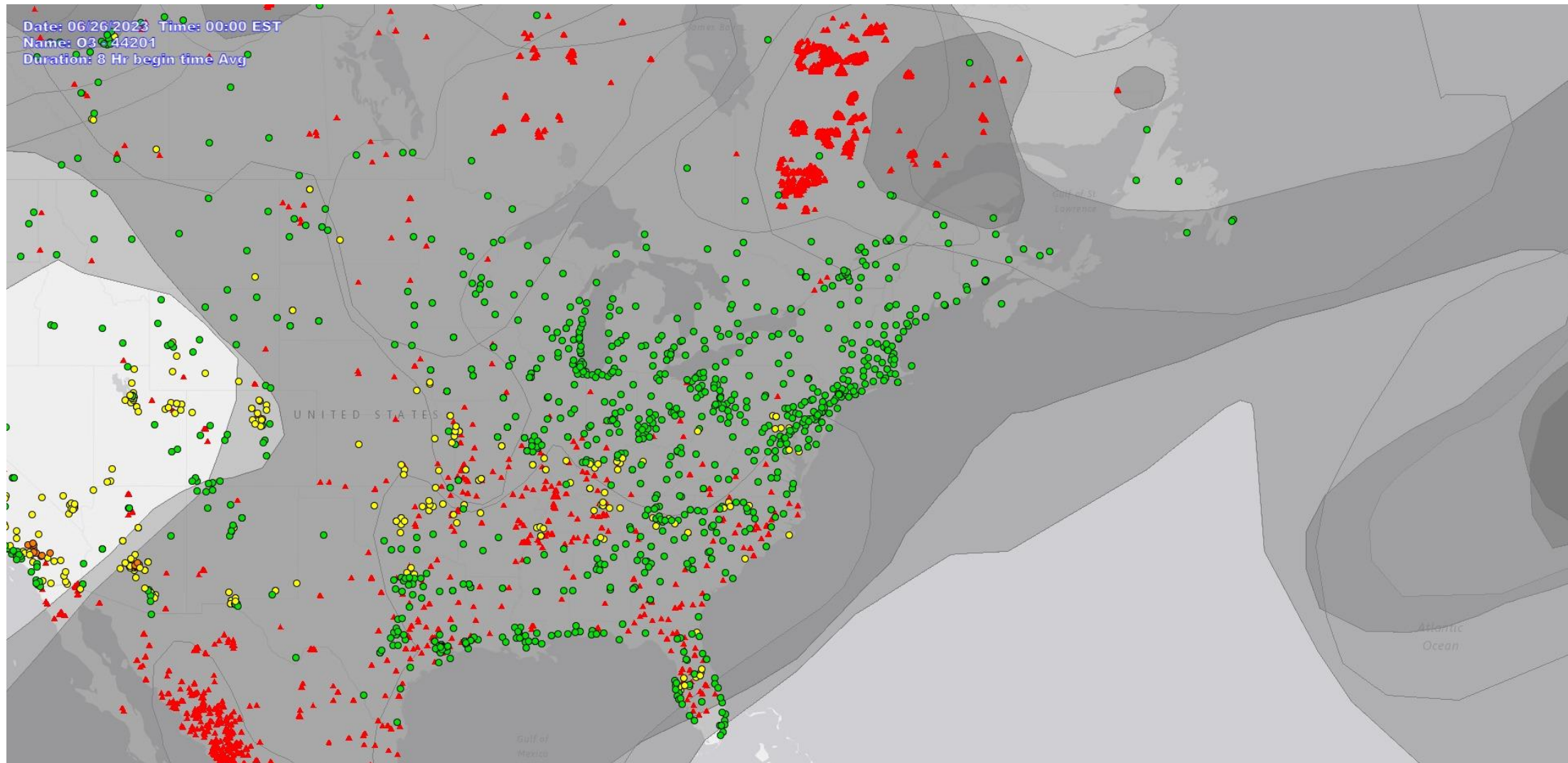
Surface Map – June 30, 2023



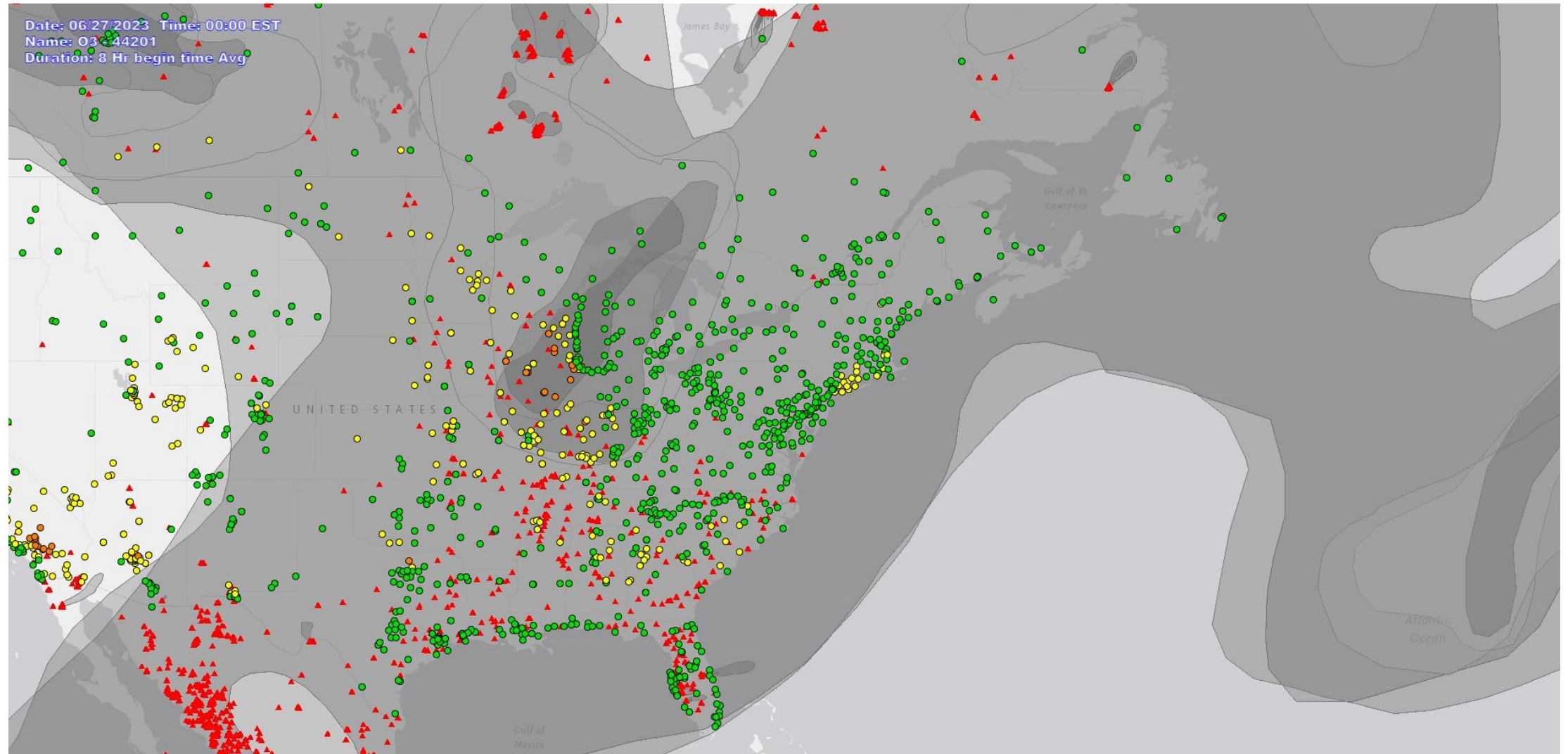
Ozone Concentrations – June 25, 2023



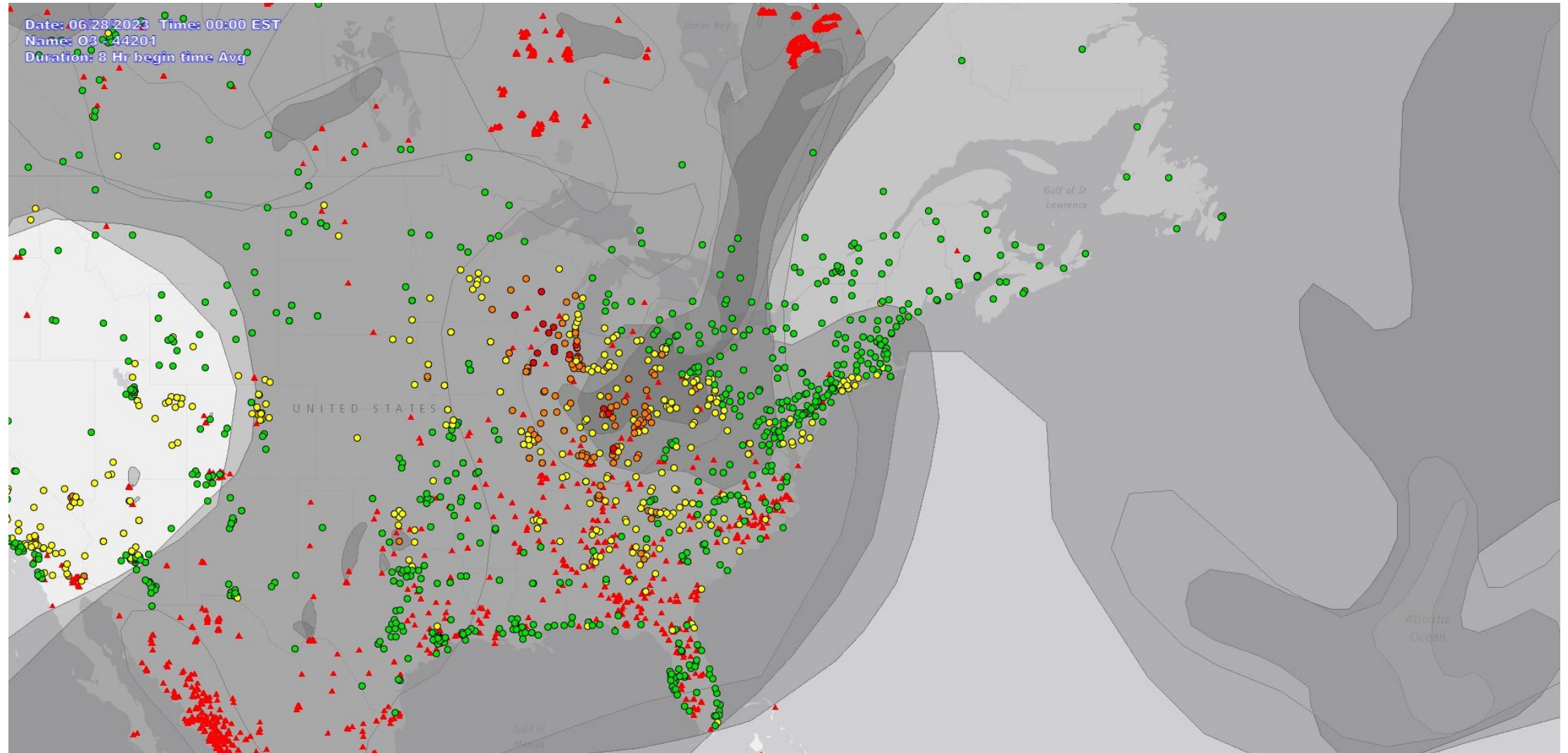
Ozone Concentrations – June 26, 2023



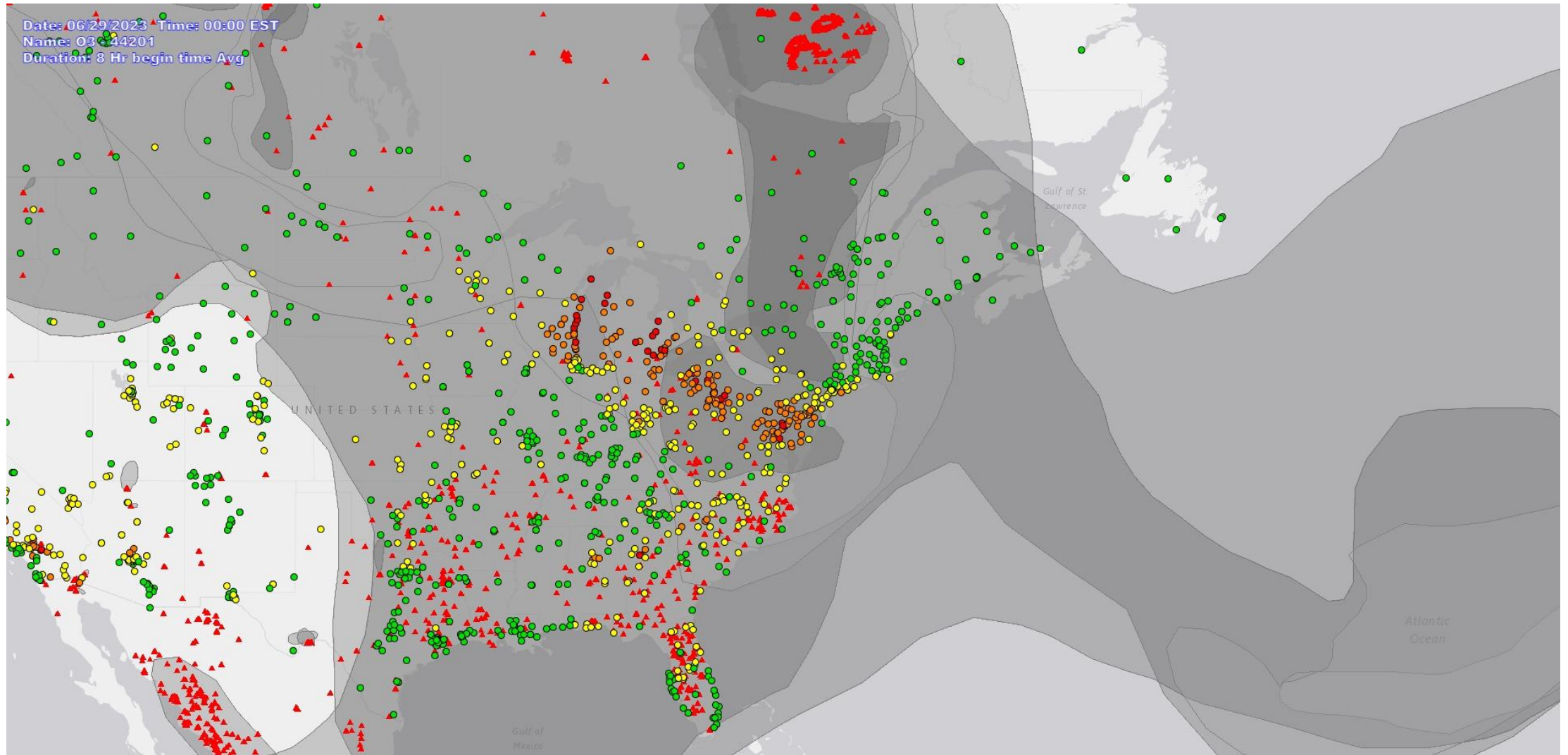
Ozone Concentrations – June 27, 2023



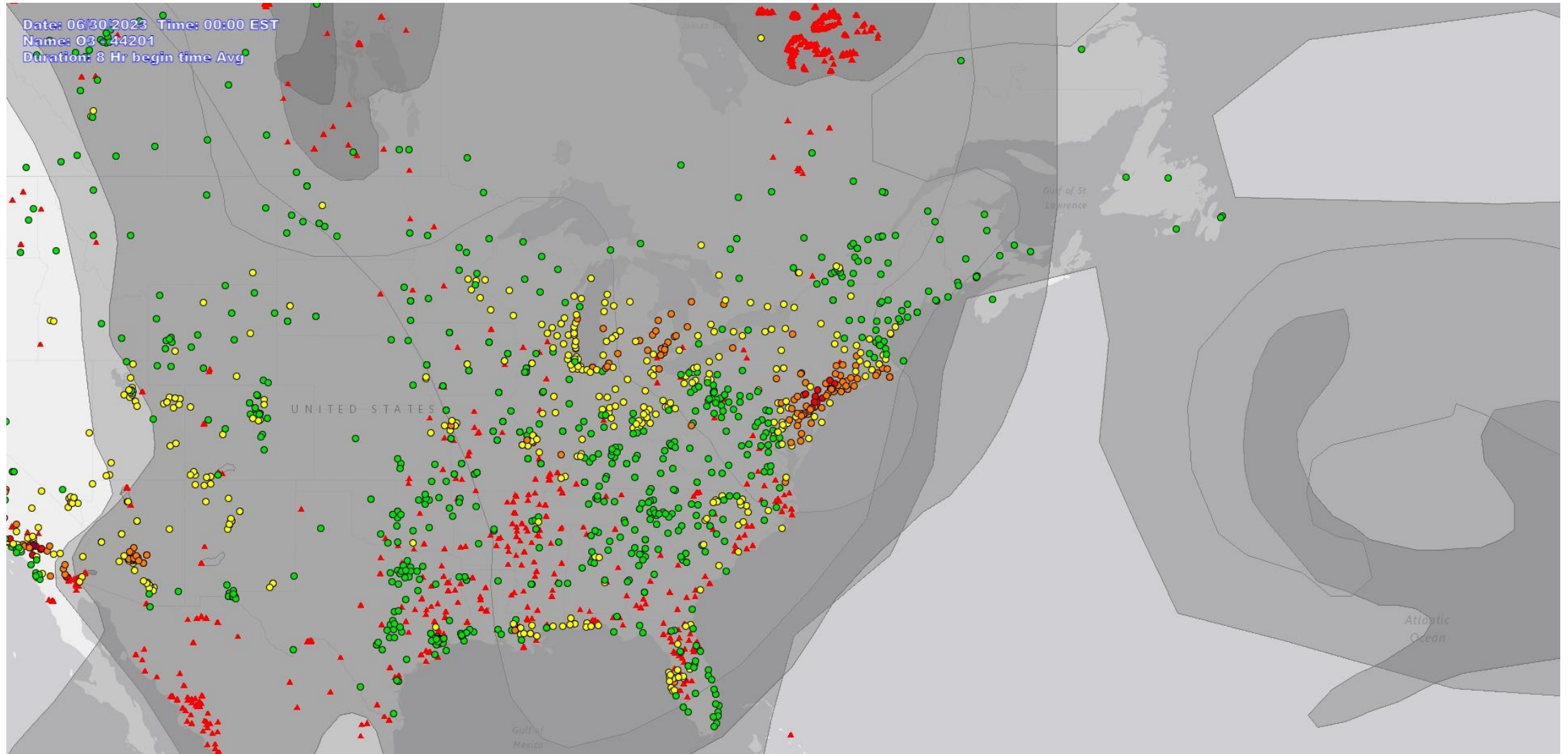
Ozone Concentrations – June 28, 2023



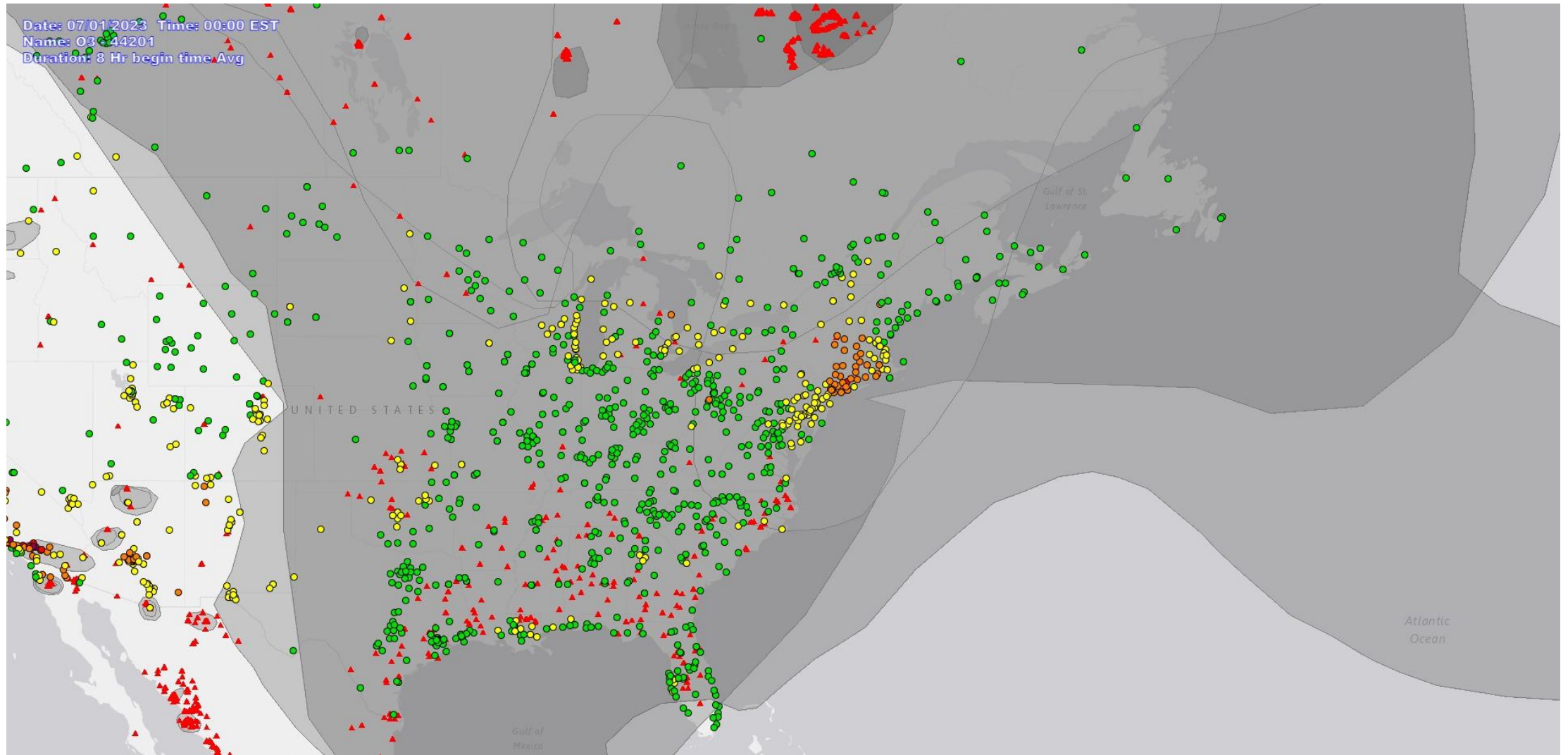
Ozone Concentrations – June 29, 2023



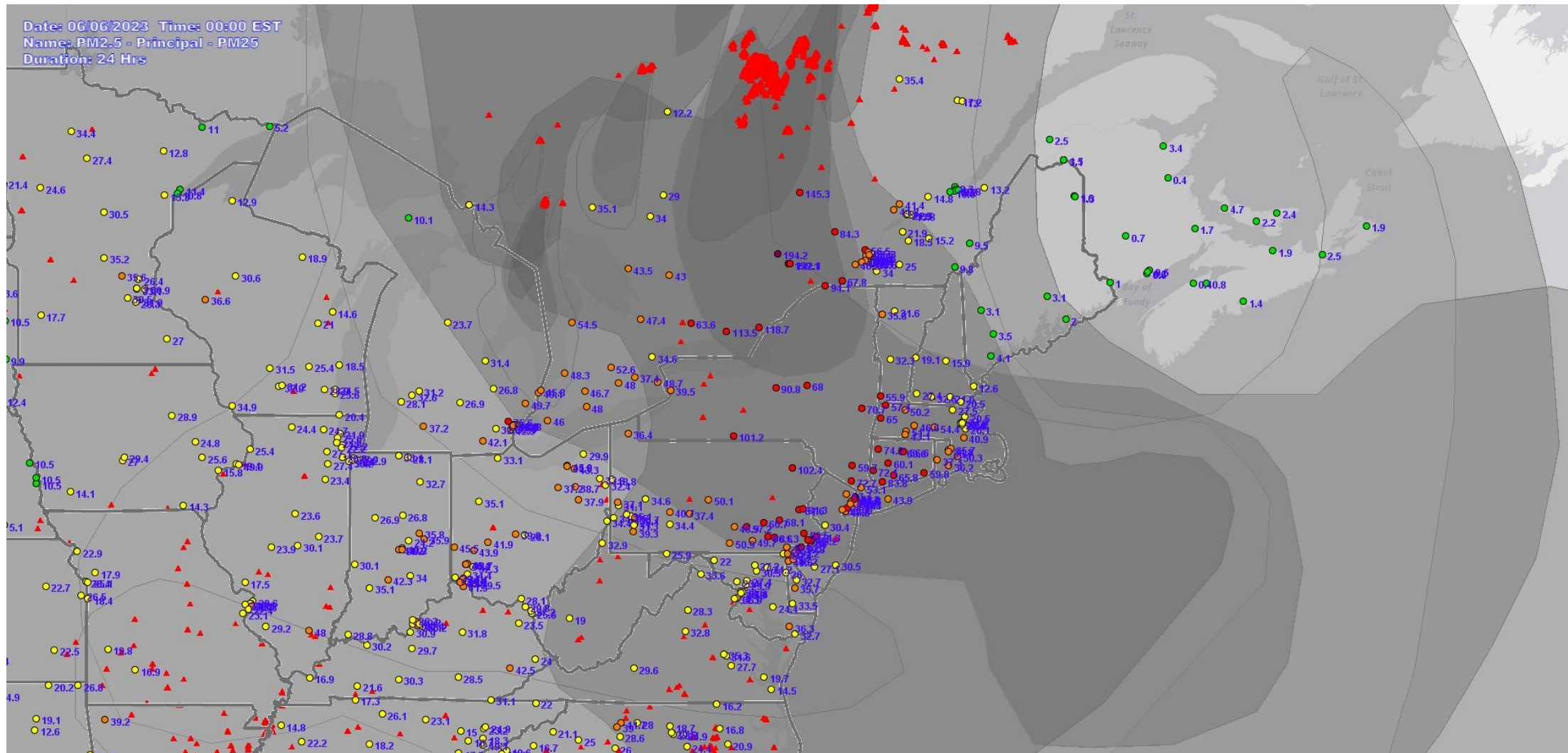
Ozone Concentrations – June 30, 2023



Ozone Concentrations – July 1, 2023



April AQTAC Meeting Teaser





Bureau of Air Quality

Daniel VanLenten, Air Quality Program Specialist

Air Quality Monitoring Division

717-783-9270

dvanlenten@pa.gov

Sean Nolan, Chief

Air Quality Monitoring Division

717-772-2303

senolan@pa.gov