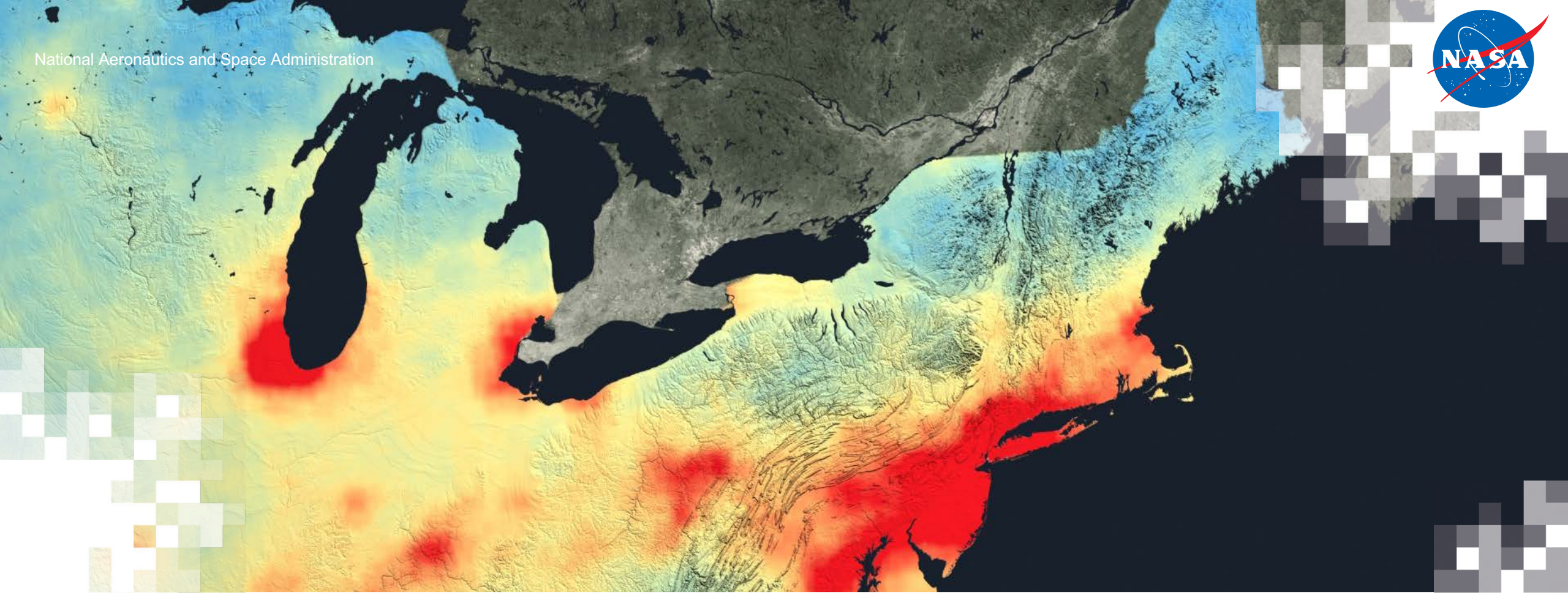


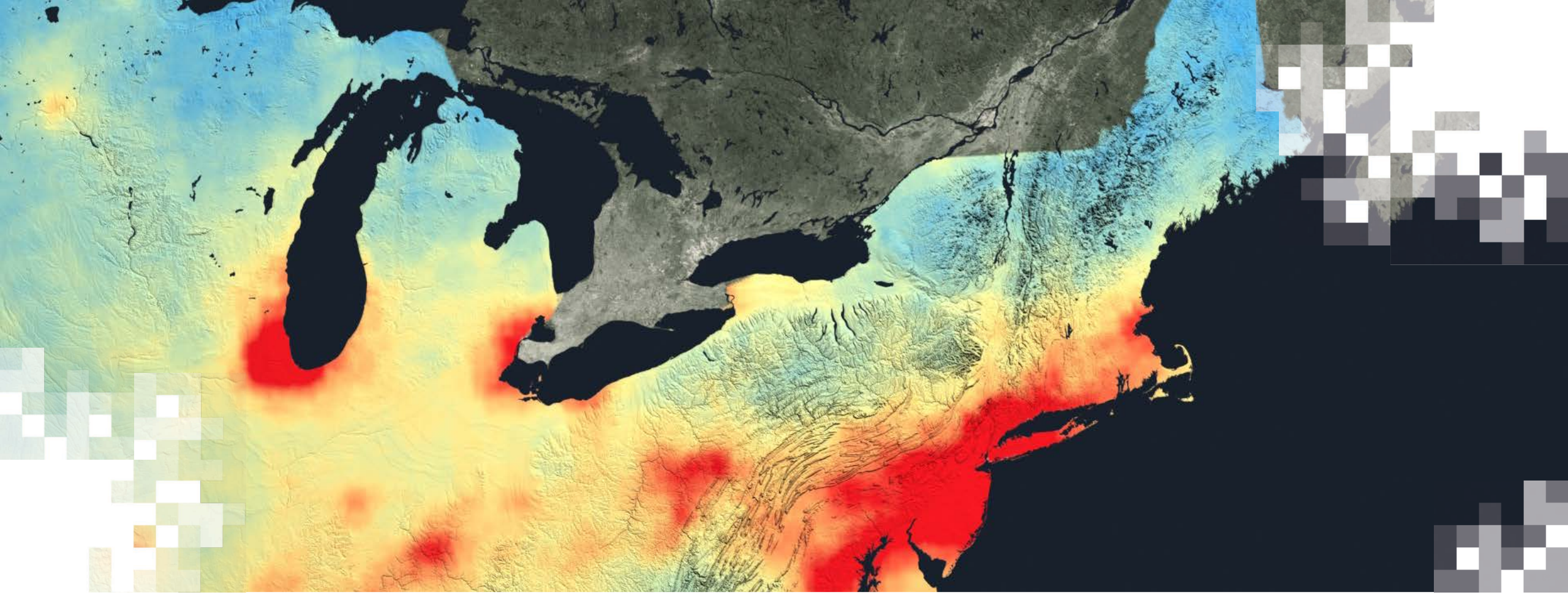
Exploring Air Quality from Geostationary Satellites Using NOAA Aerosol Watch

Carl Malings, Melanie Follette-Cook, Pawan Gupta, Sarah Strode

NASA Air Quality Remote Sensing Training, US EPA, Raleigh, NC, March 21-23, 2023

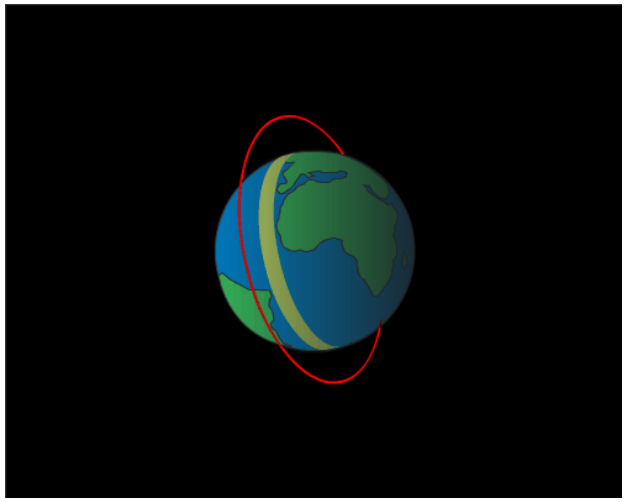
Objectives

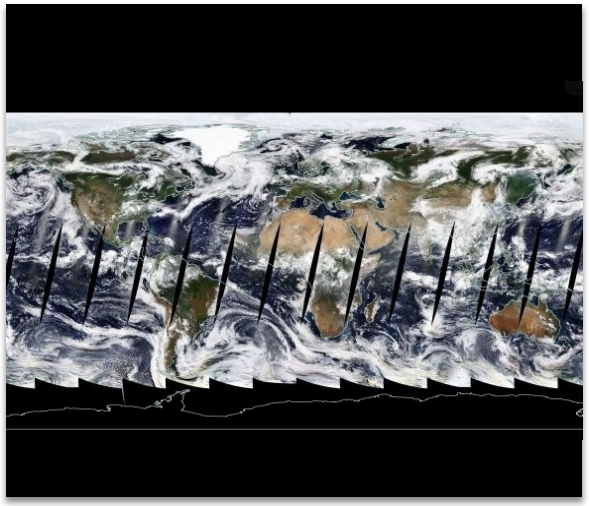
1. Learn the basics of geostationary satellites & sensors
2. Gain knowledge of and ability to visualize available products from geostationary sensors using NOAA Aerosol Watch



Introduction to Geostationary Satellites

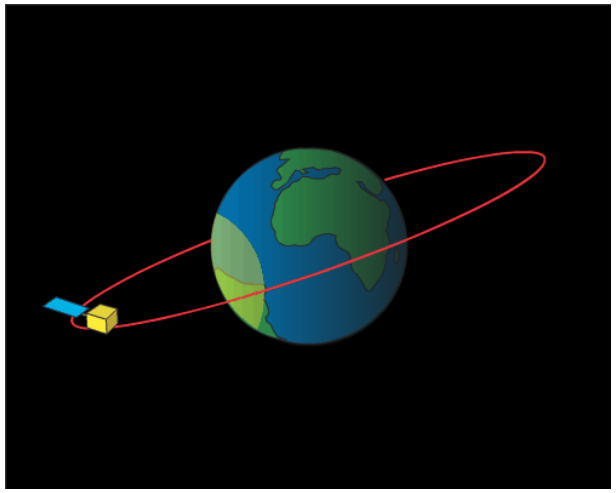
Common Orbit Types

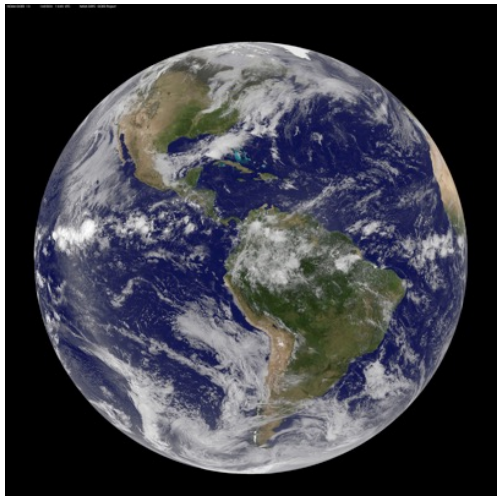




Polar Orbit (LEO)

- Fixed, circular orbit above Earth
- Sun synchronous orbit ~600-1,000 km above Earth with orbital passes at about the same **local solar time** each day





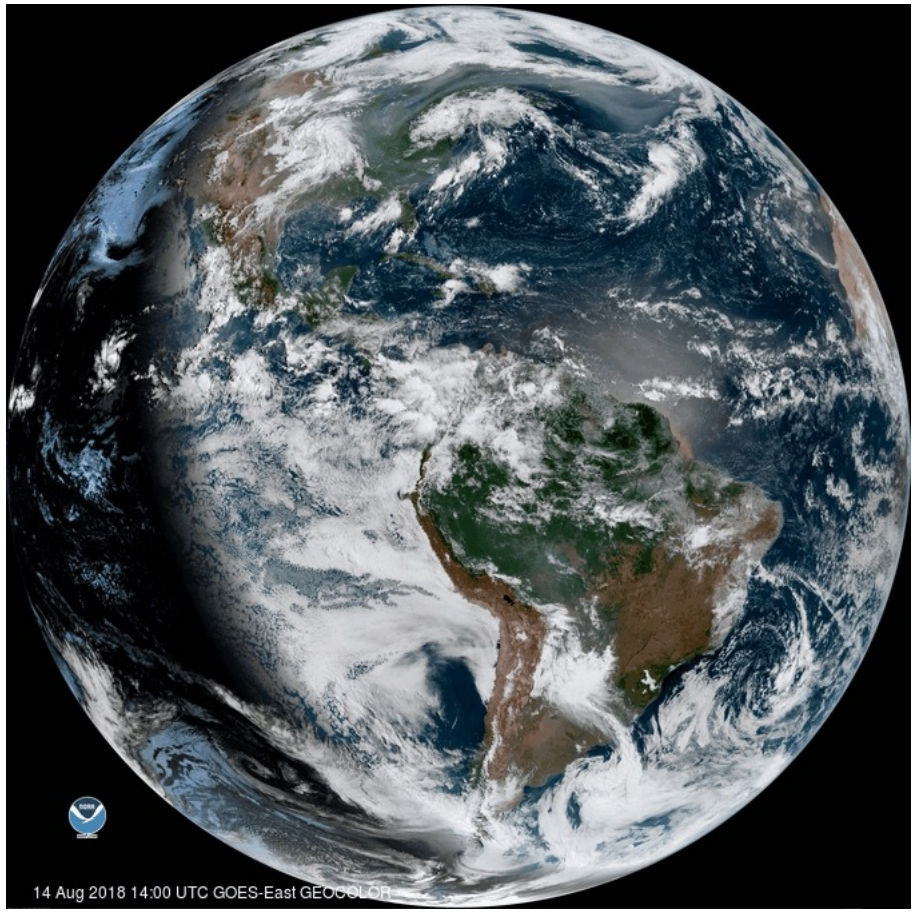
Geostationary Orbit (GEO)

- Has the same rotational period as Earth
- Appears 'fixed' above Earth
- Orbits ~36,000 km above the Equator

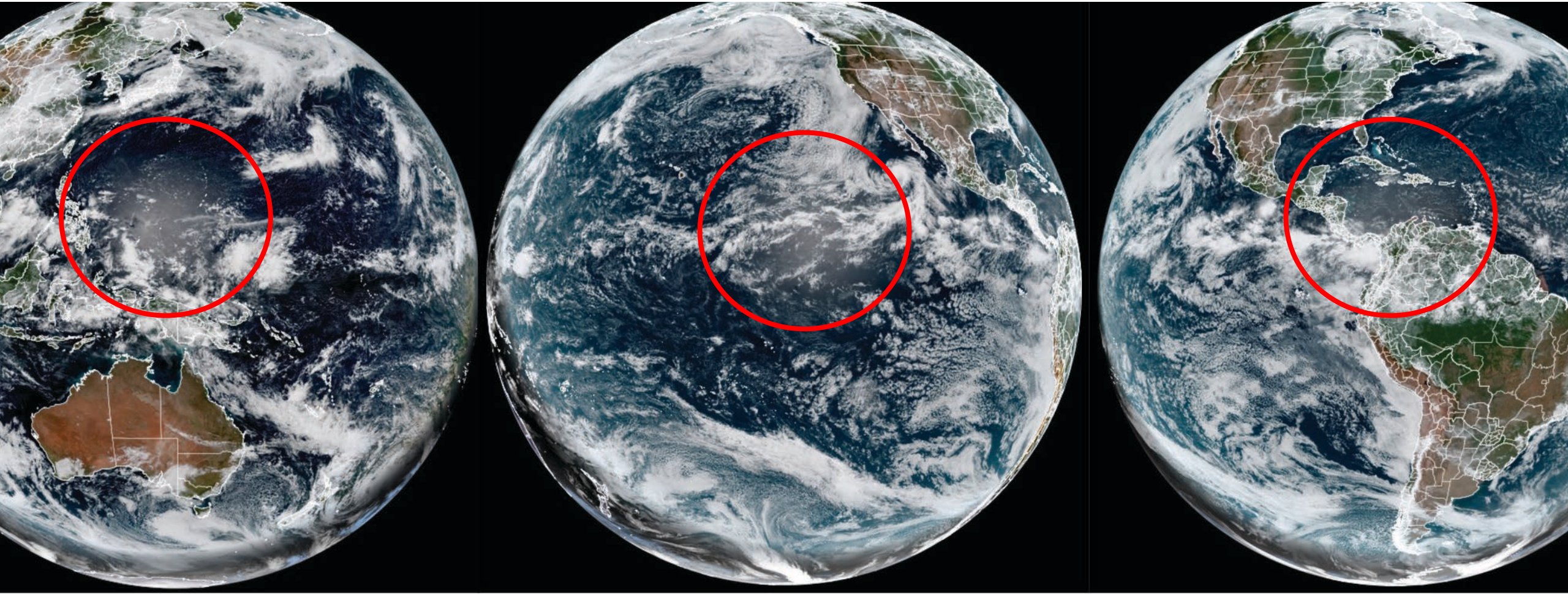
Low Earth Orbit (LEO) & Geostationary (GEO) Satellites

LEO Orbit

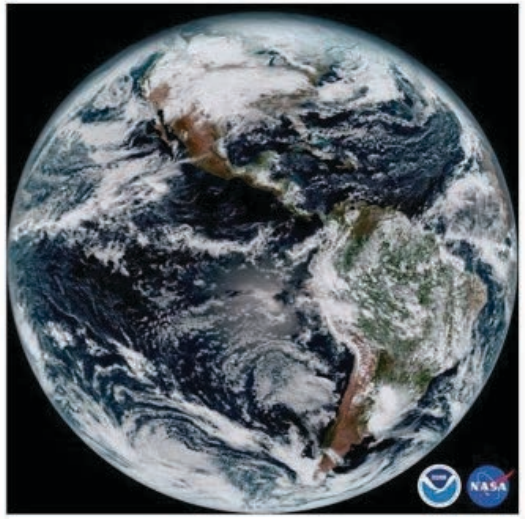
GEO Orbit



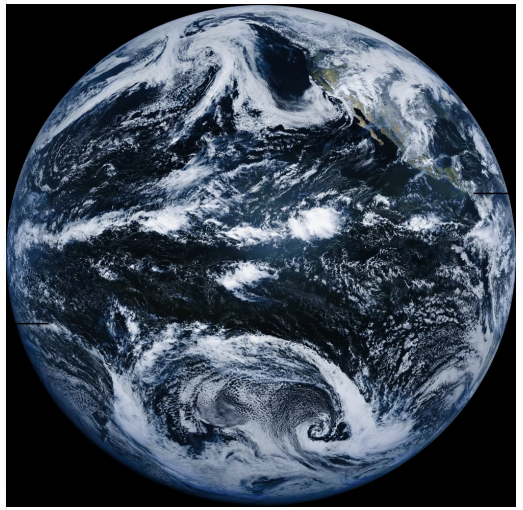
Glint



Satellite Coverage - GEO

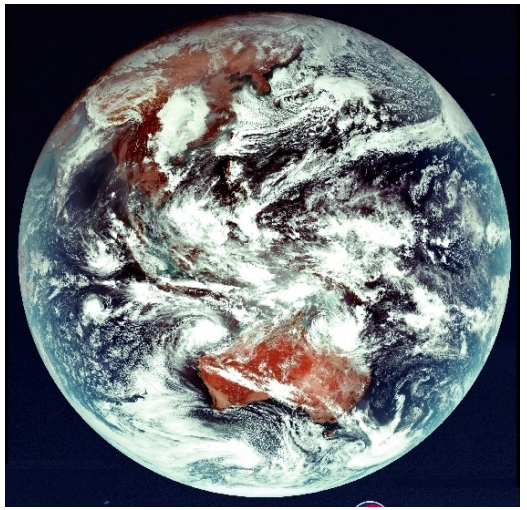


GOES-R/16/East

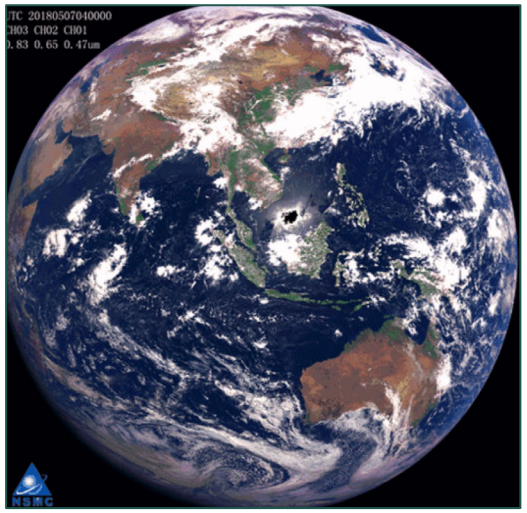


GOES-S/17/West
GOES-T/18/West

Himawari -8/9

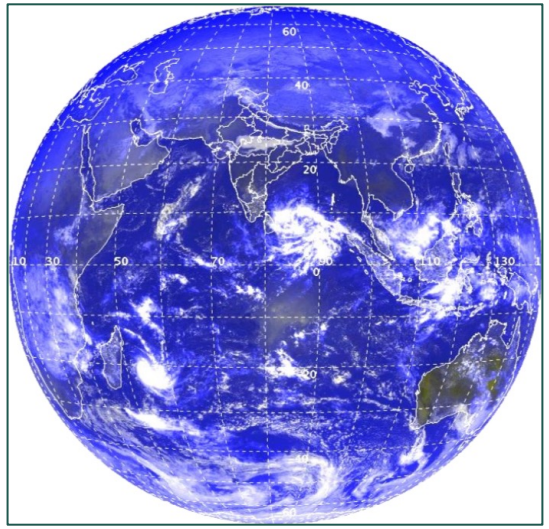


GK-2A (AMI)



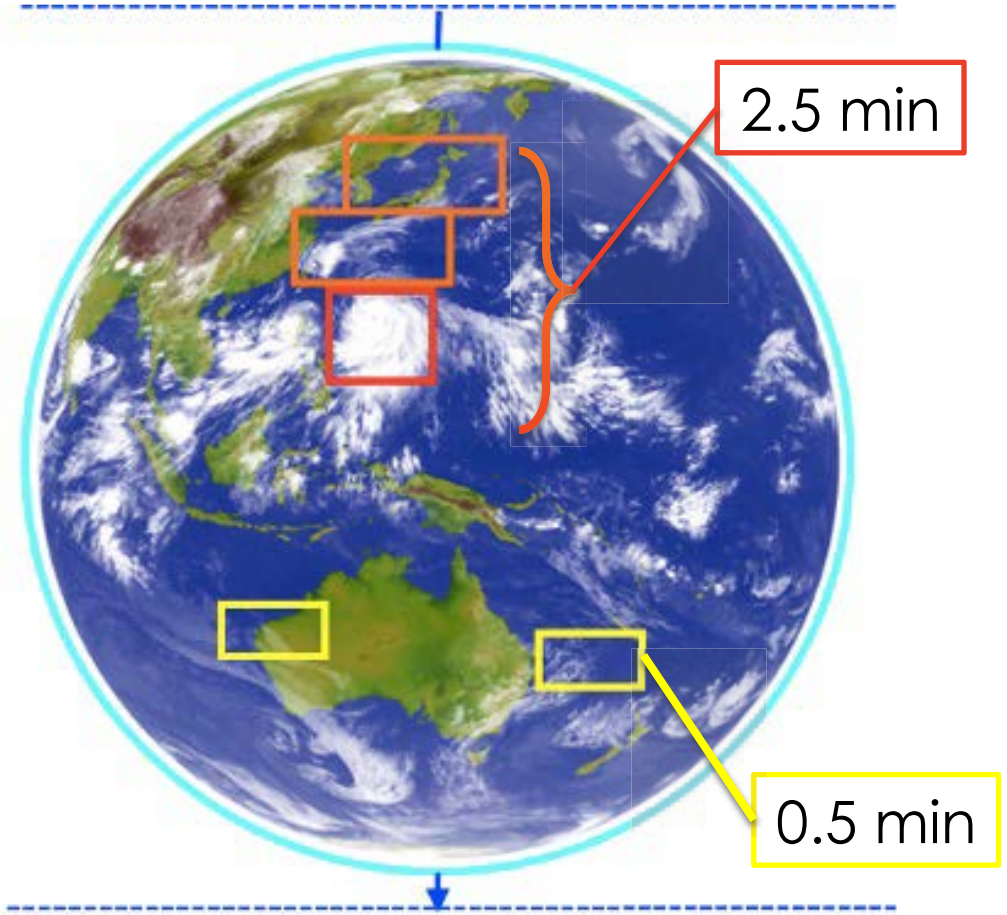
Fengyun-4

Meteosat (FCI)

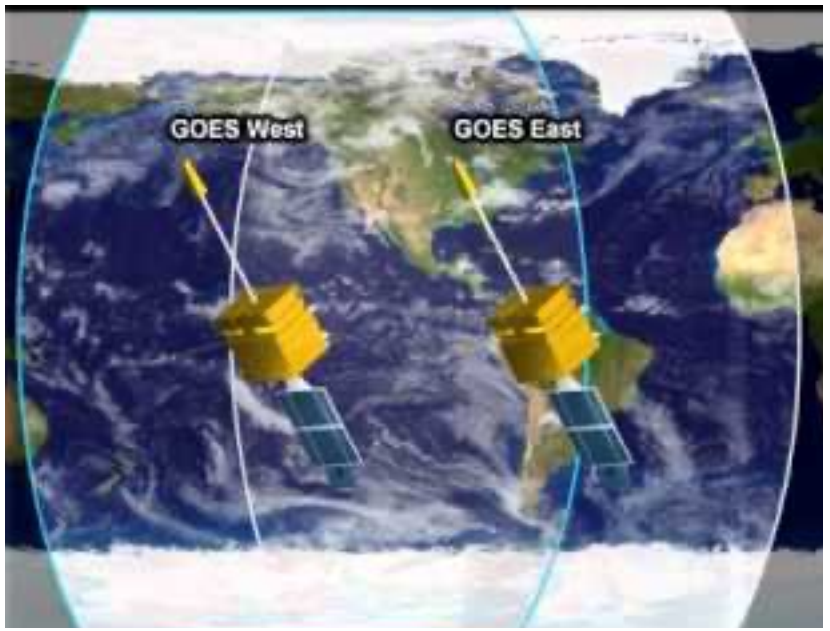


INSAT/GSAT

Advanced Himawari Imager (AHI) & Advanced Baseline Imager (ABI): Spatial Coverage and Temporal Resolution



Full Disk: Every 10 min



Full Disk: Every 10 min
CONUS: Every 5 min
Mesoscale: Every 0.5 min

GOES-16: Smoke Transport over the Northwest

Fast changing air quality due to smoke transport can be captured by GEO sensors.

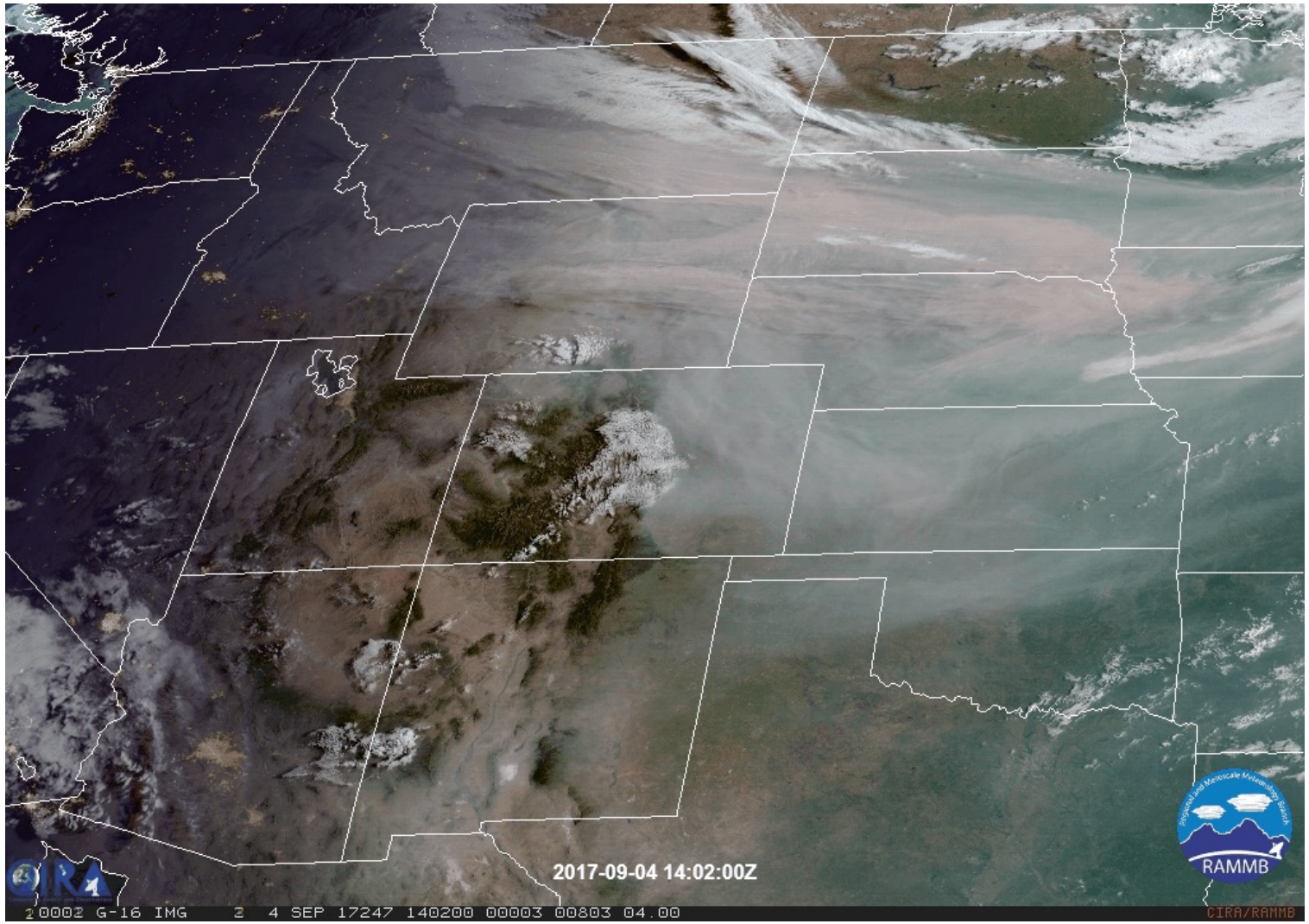


Image: RMMB

GOES-16 Loop: Dust

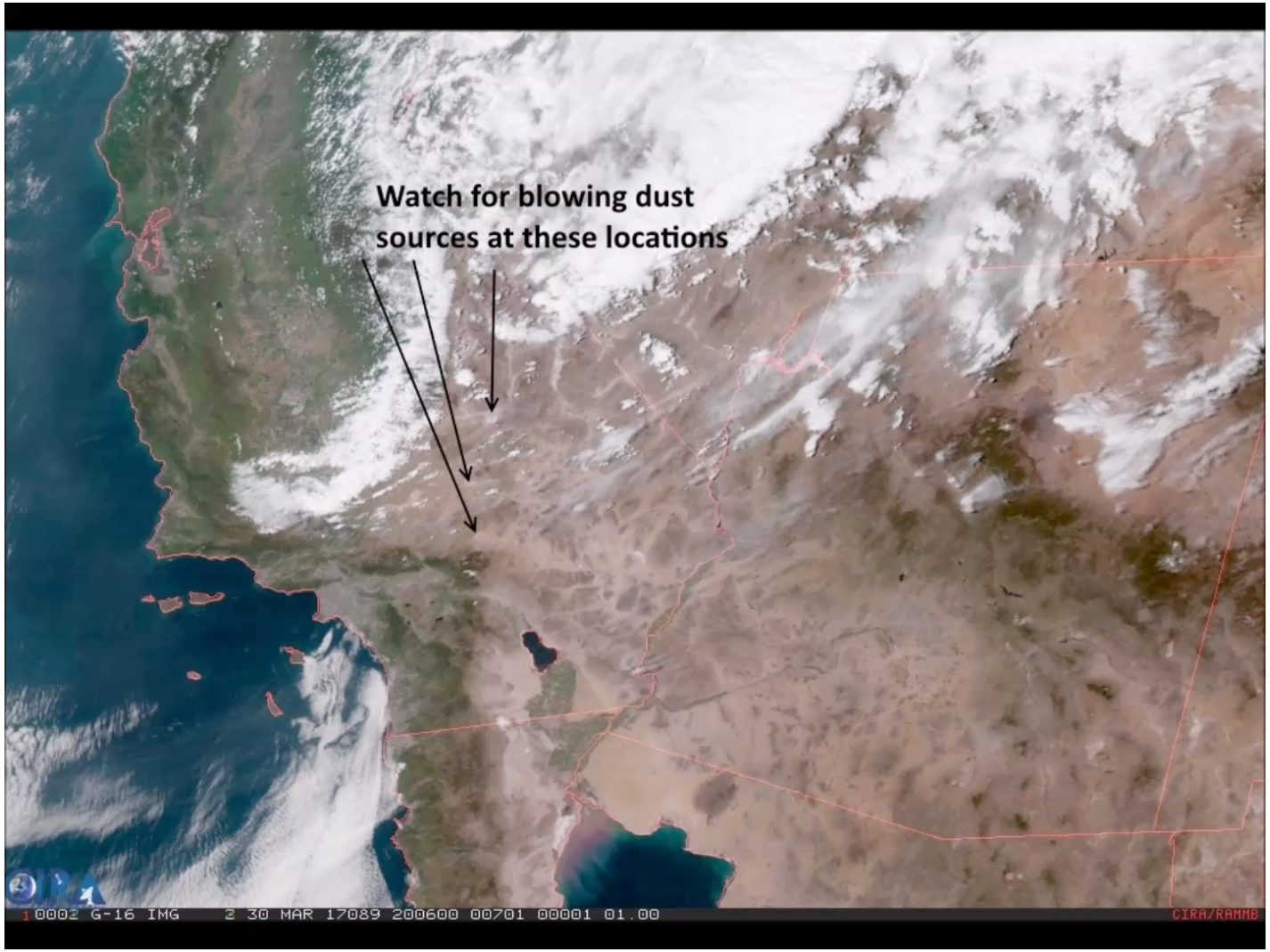


Image: RMMB

GOES-16 Loop: Smoke Over the Southeast U.S.

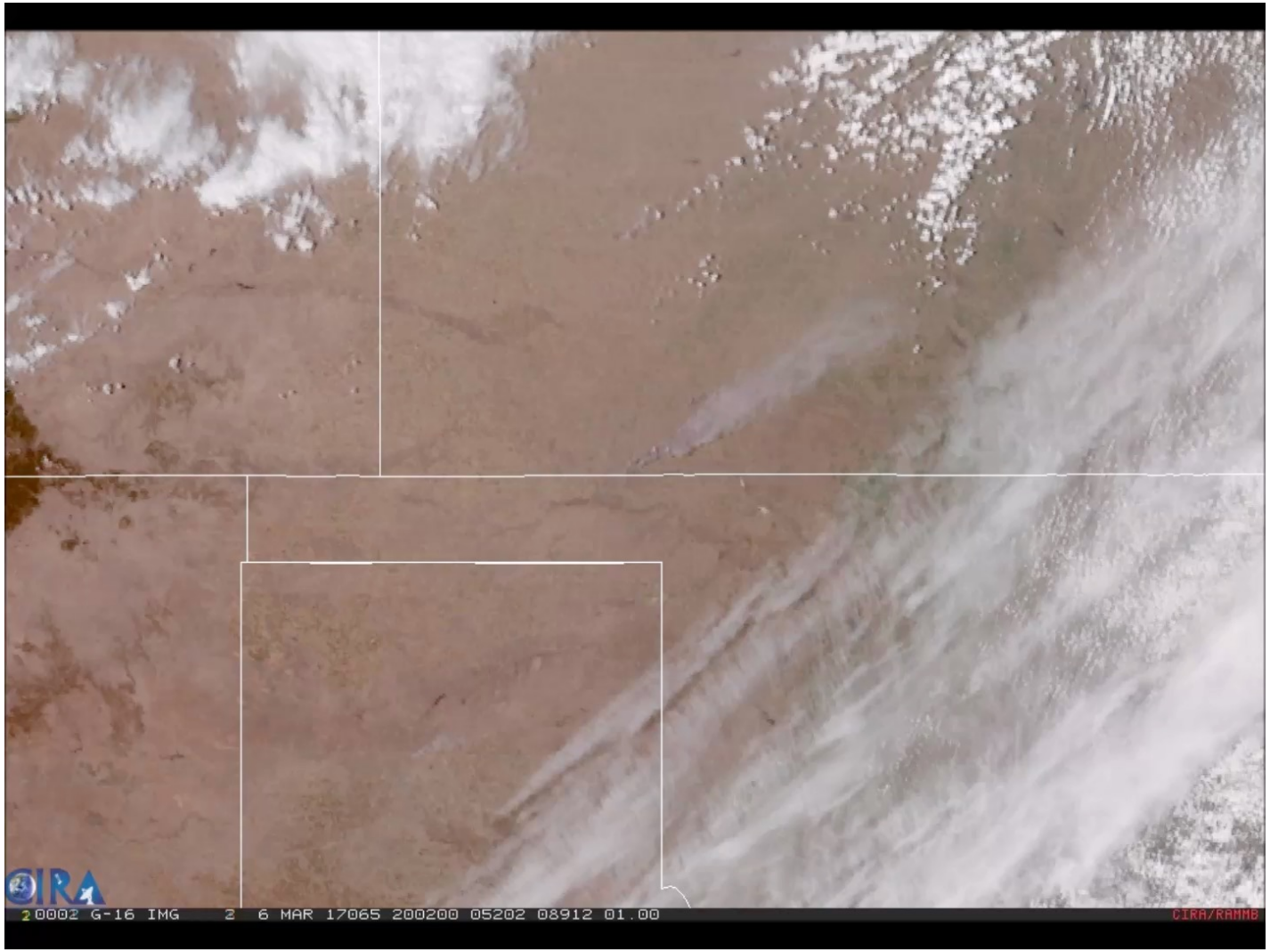
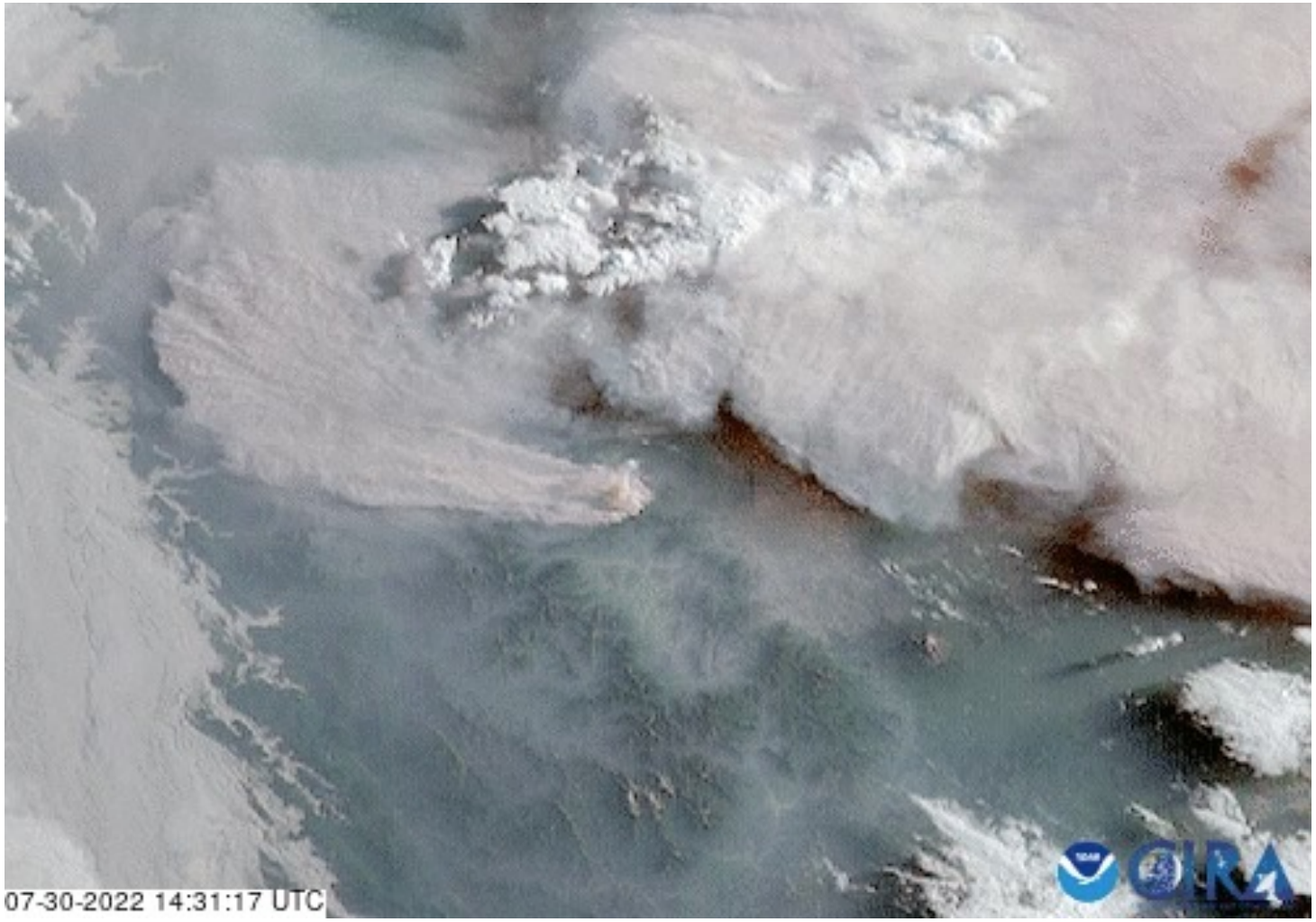


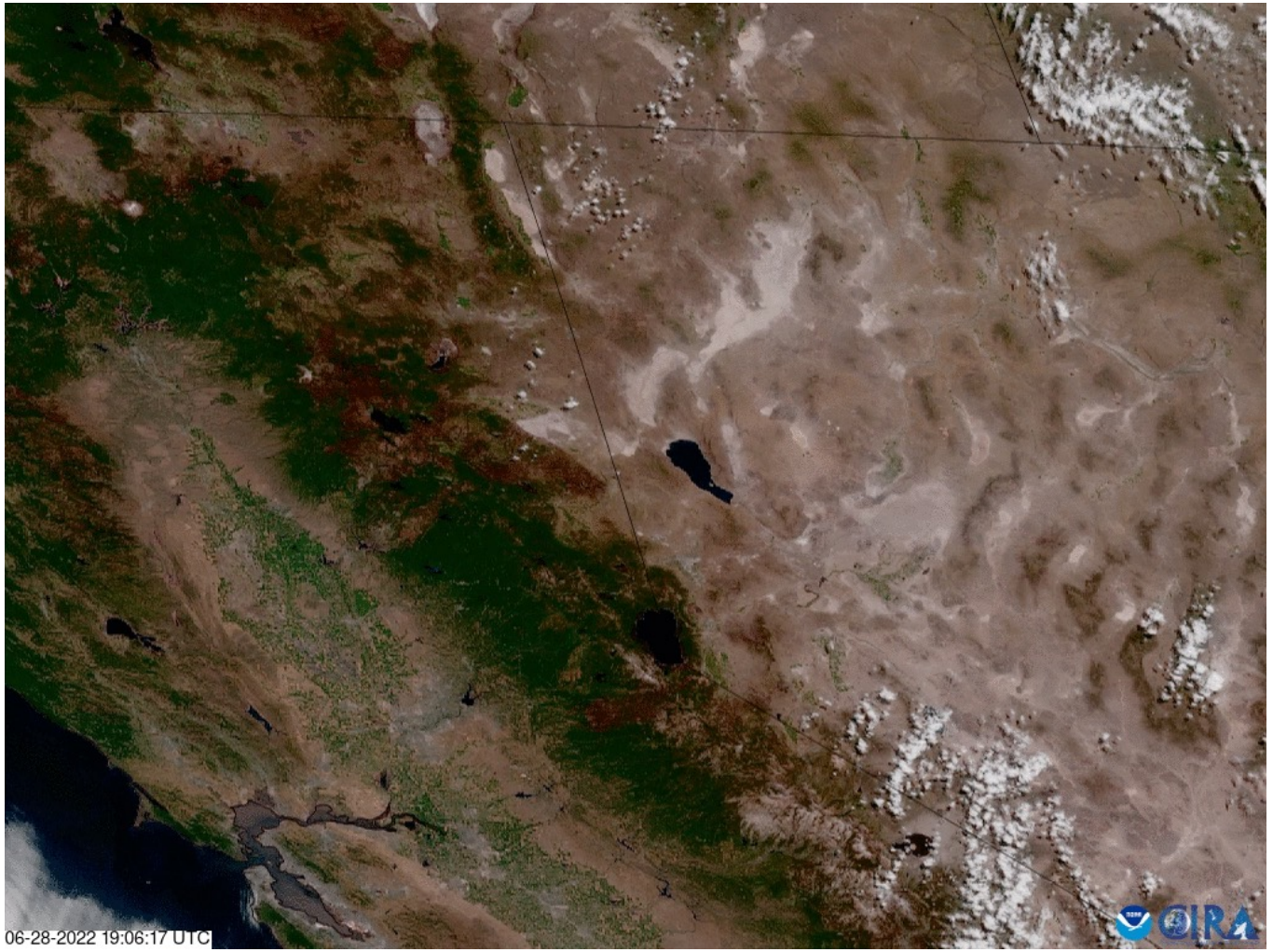
Image: RMMB

GOES-17 (GeoColor): McKinney Fire (US)



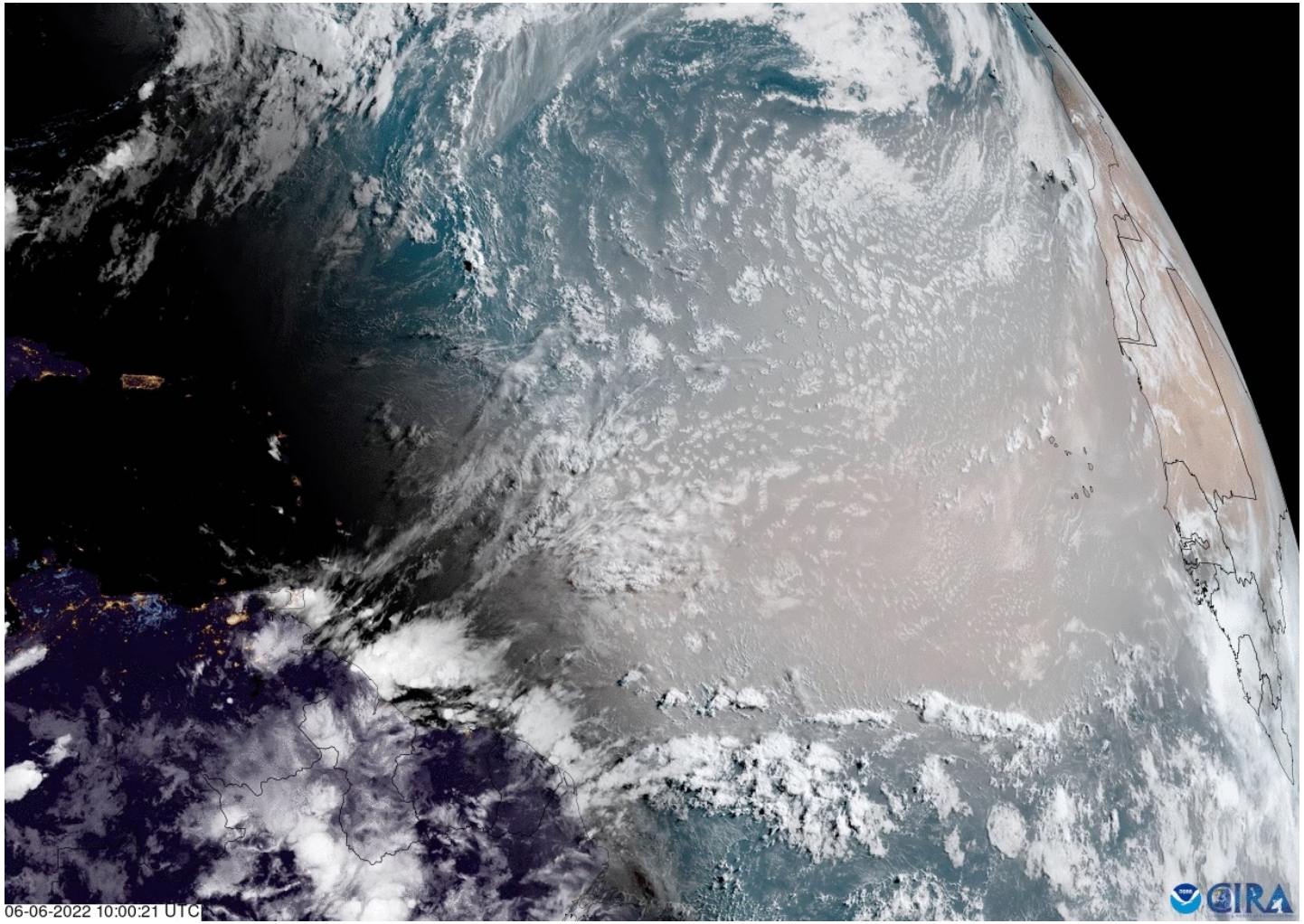
https://rammb.cira.colostate.edu/ramsdis/online/loop_of_the_day/

GOES-17 (GeoColor): Rices Fire (US)



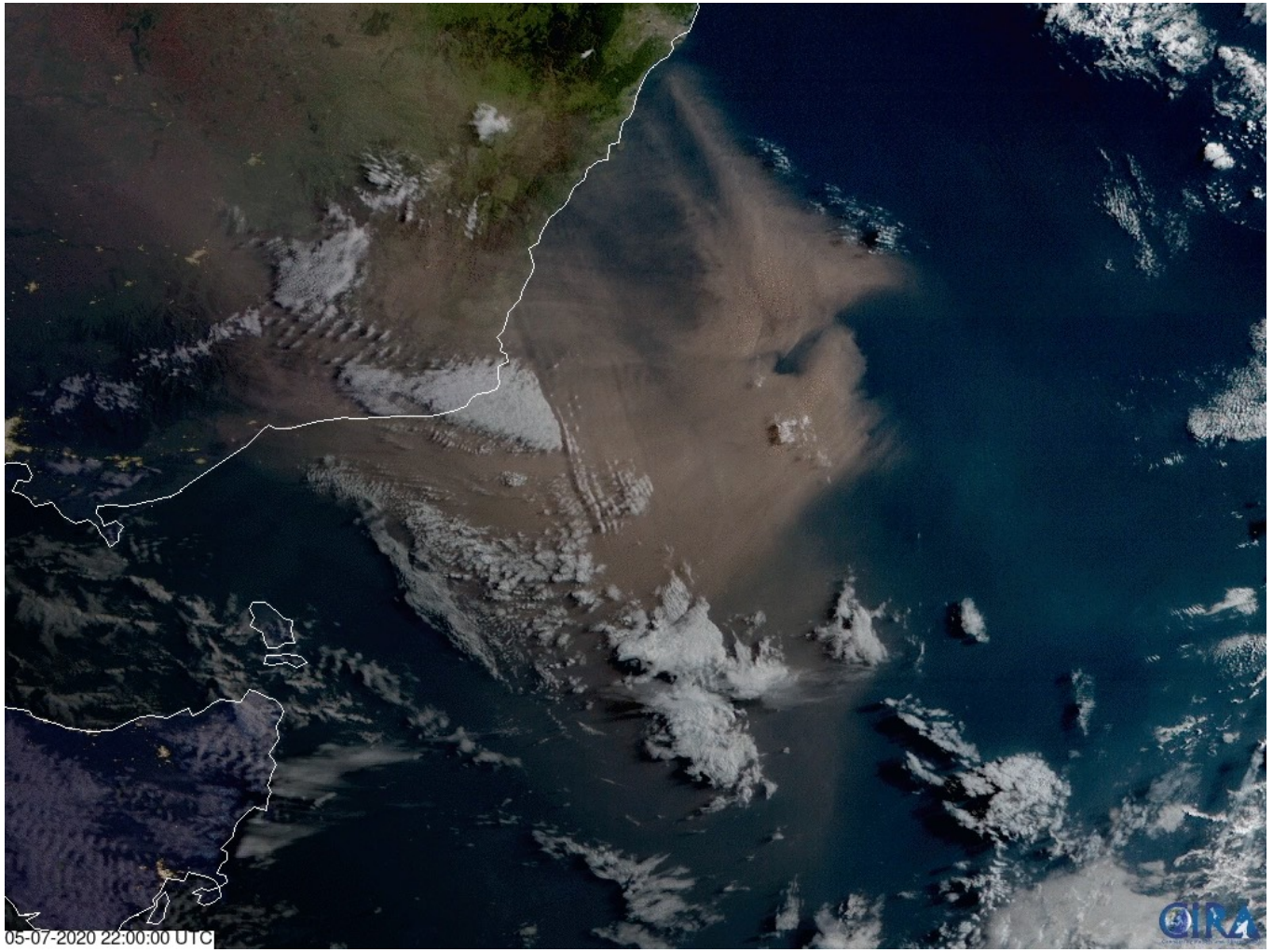
https://rammb.cira.colostate.edu/ramsdis/online/loop_of_the_day/

GOES-East: Dust over the Atlantic



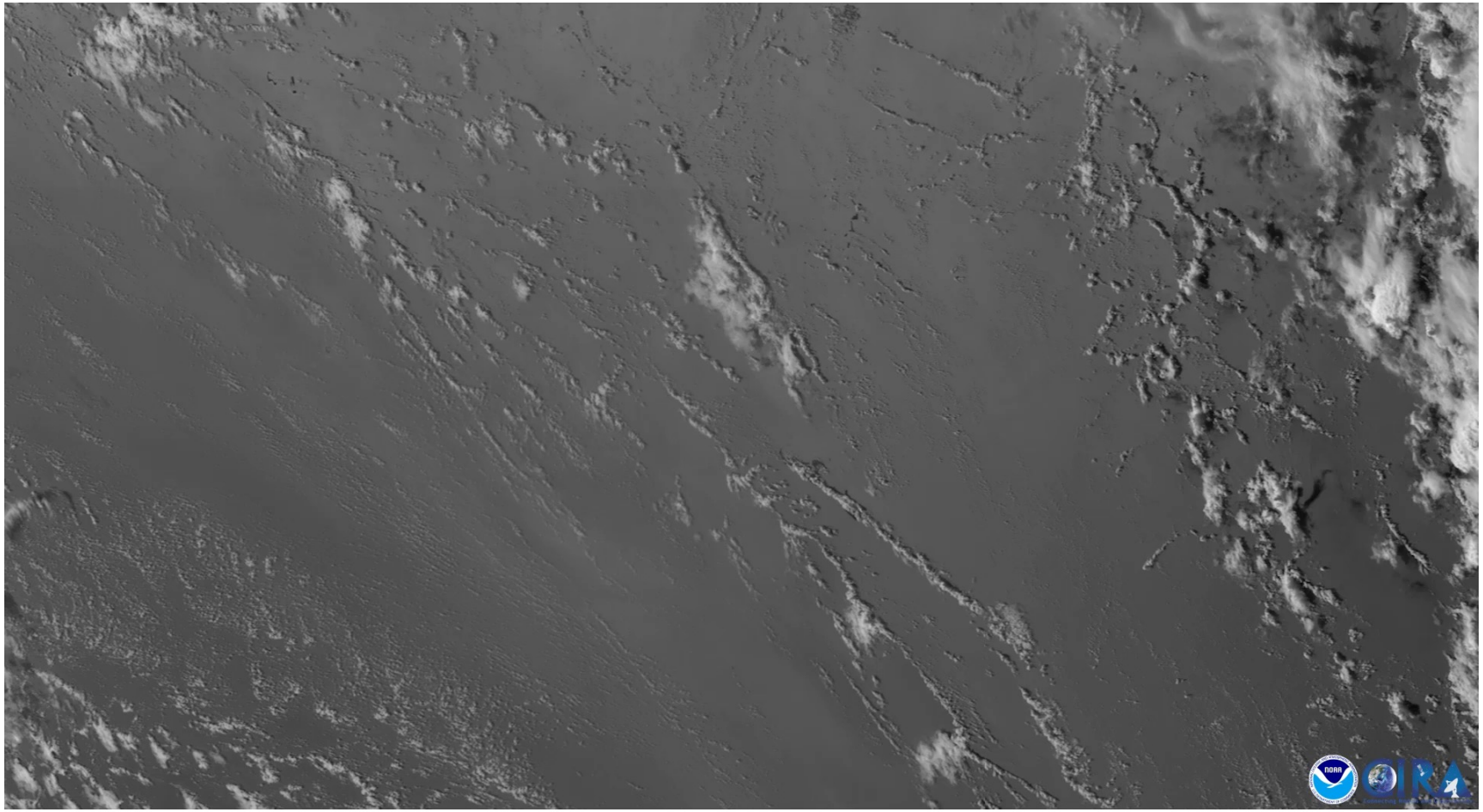
https://rammb.cira.colostate.edu/ramsdis/online/loop_of_the_day/

Himawari-08 (AHI): Dust over Australia (May 8th, 2020)

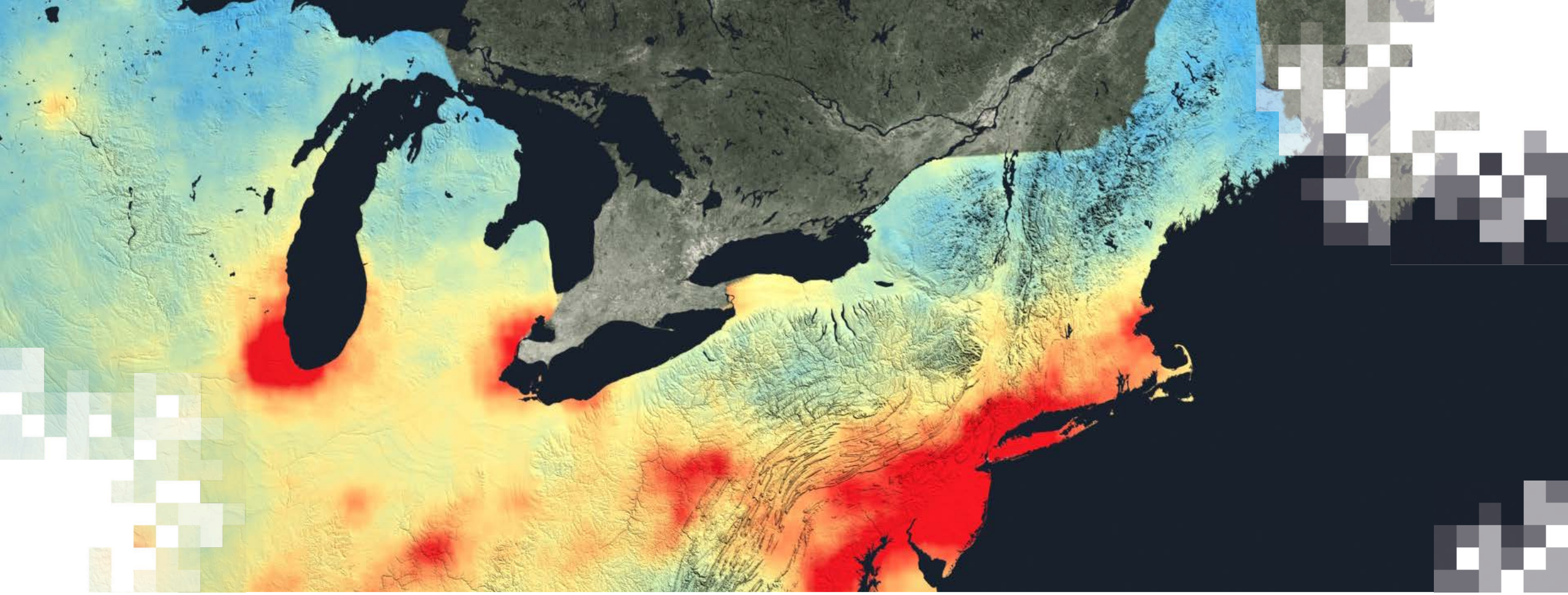


GOES-17: Hunga Tonga-Hunga Ha'apai's Eruption

January 15th, 2022, in the South Pacific



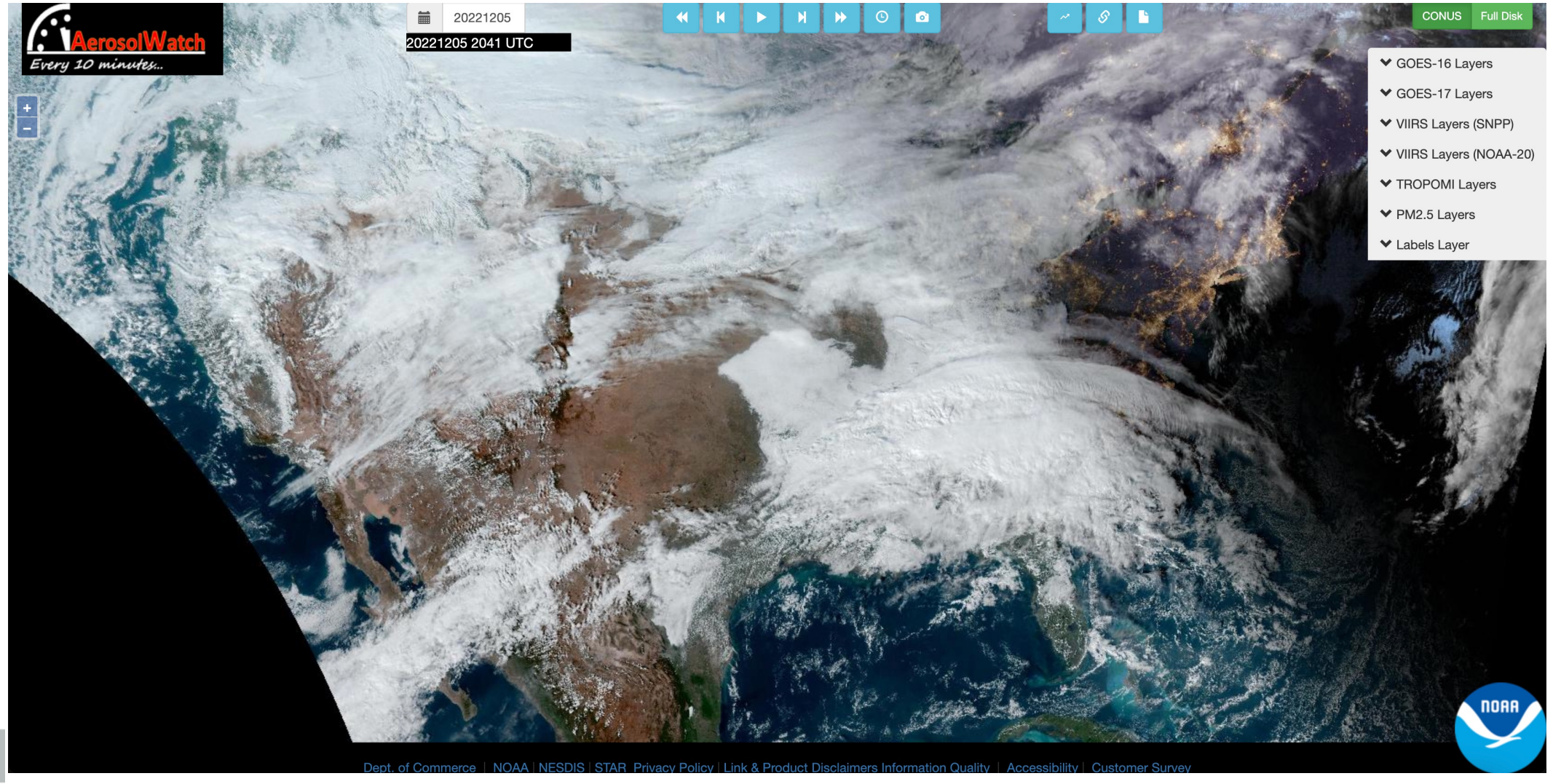
01-15-2022 | 03:10:32 UTC | GOES-17 | Visible (Band 2)



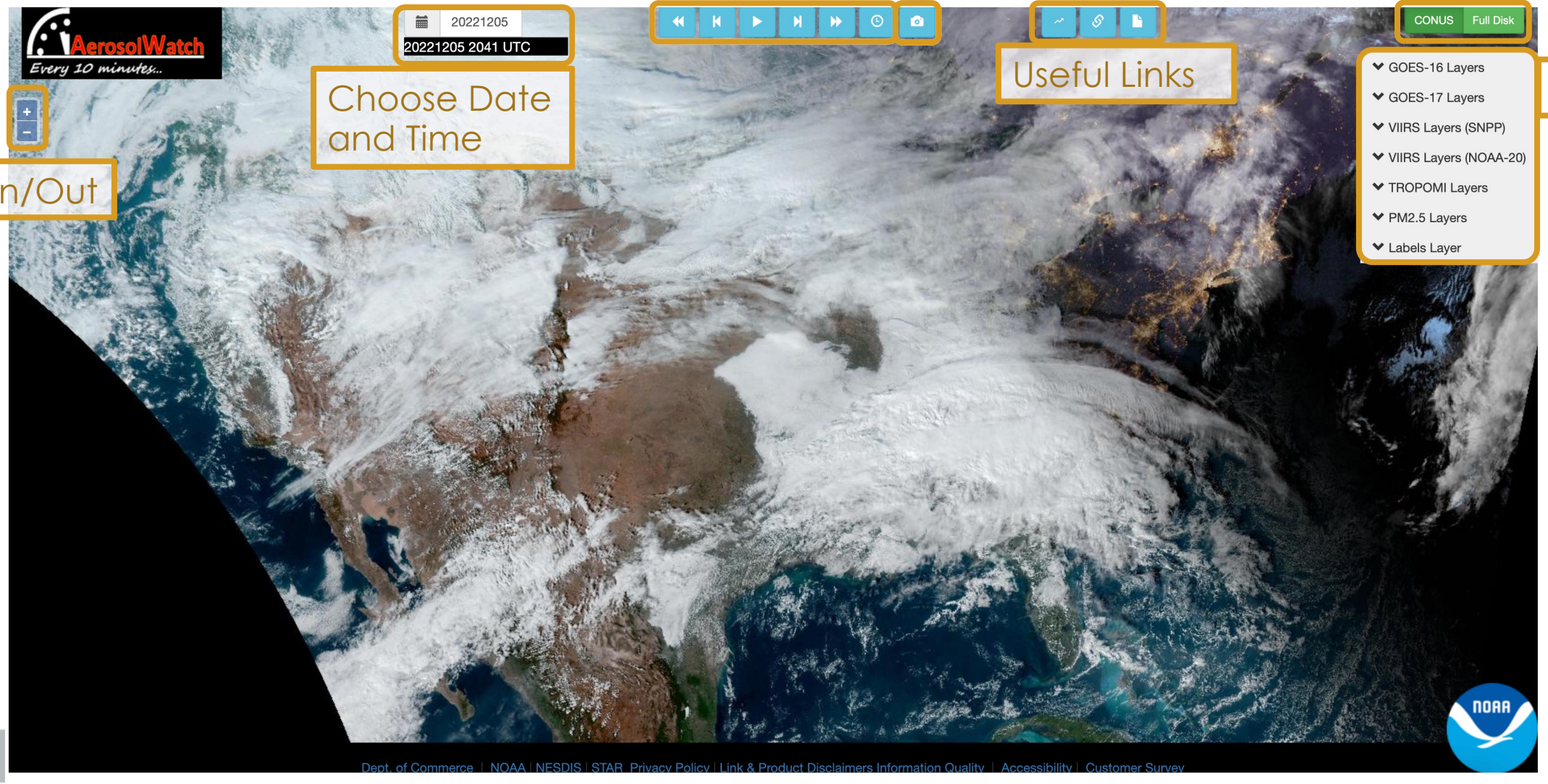
NOAA Aerosol Watch

NOAA Aerosol Watch

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/

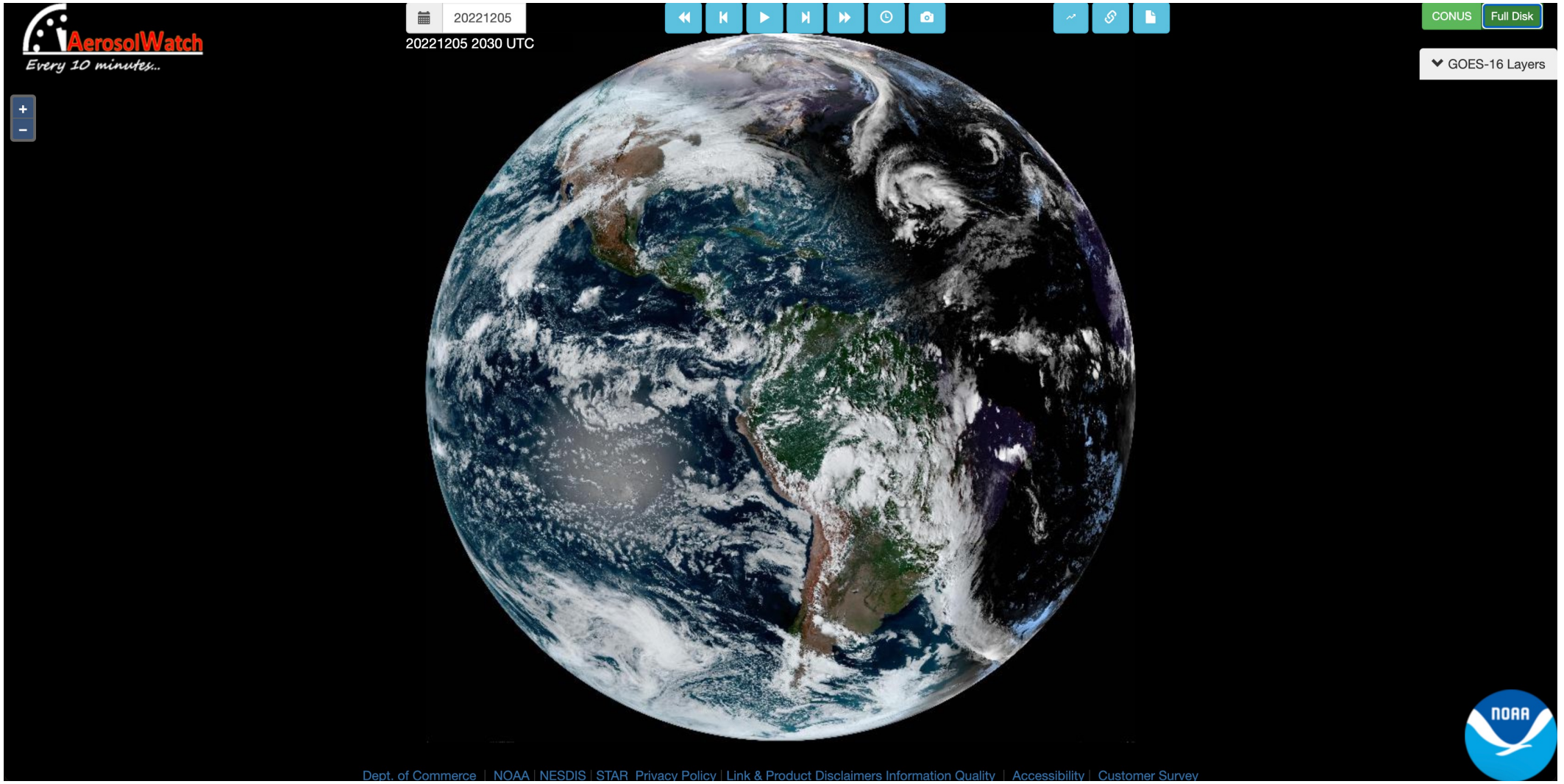


NOAA Aerosol Watch



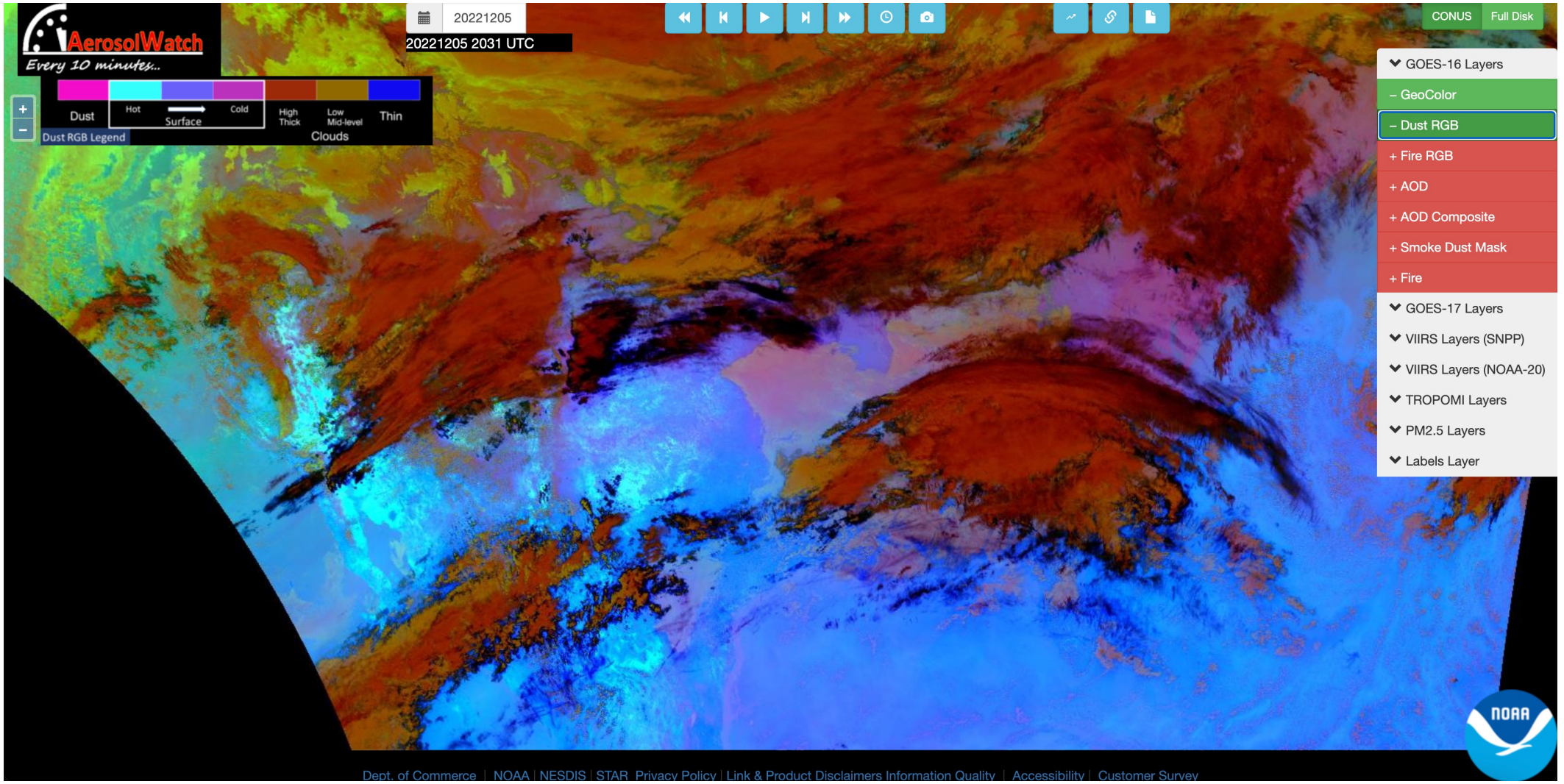
Full Disk Image

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



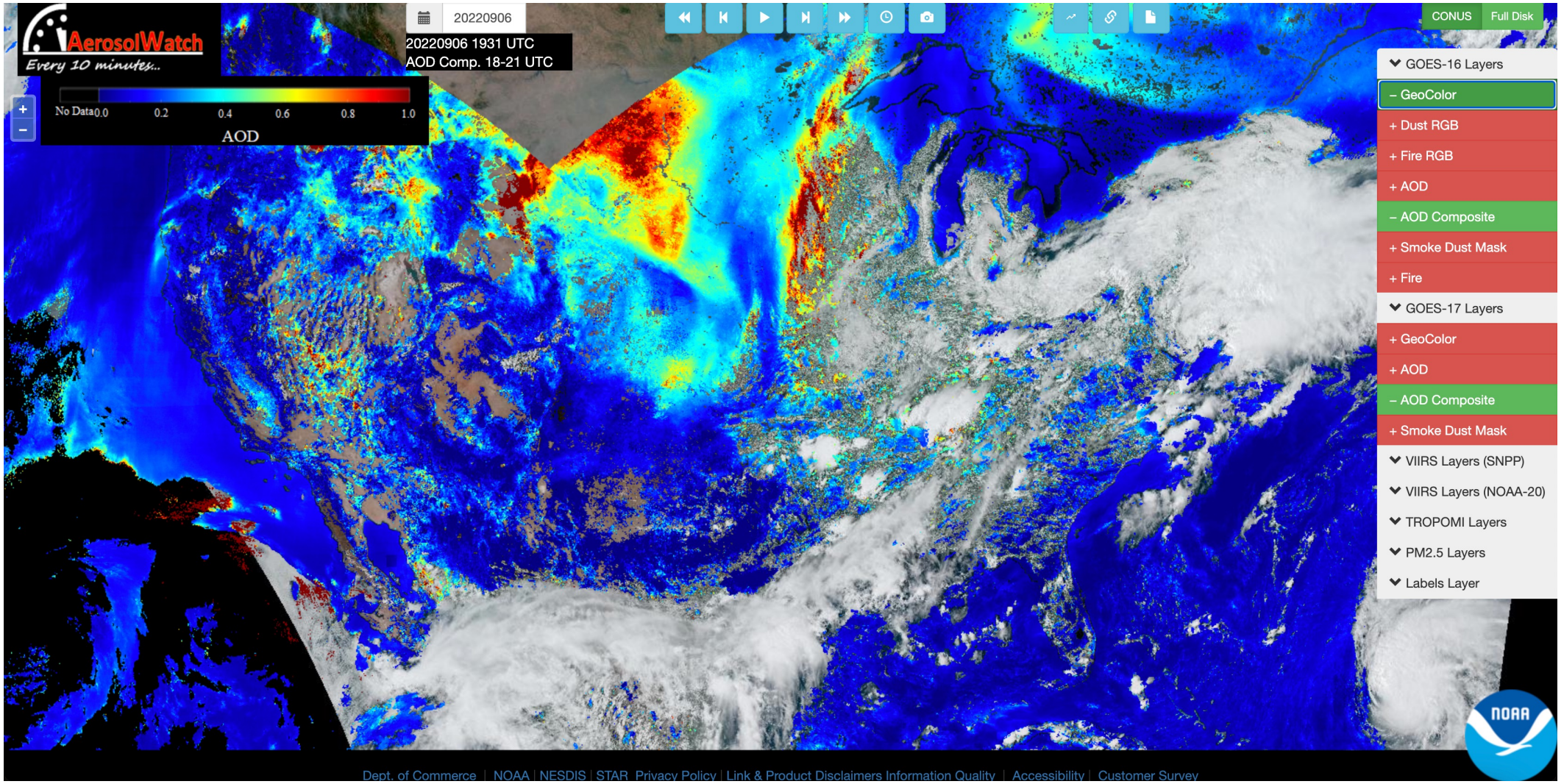
Dust Layer

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



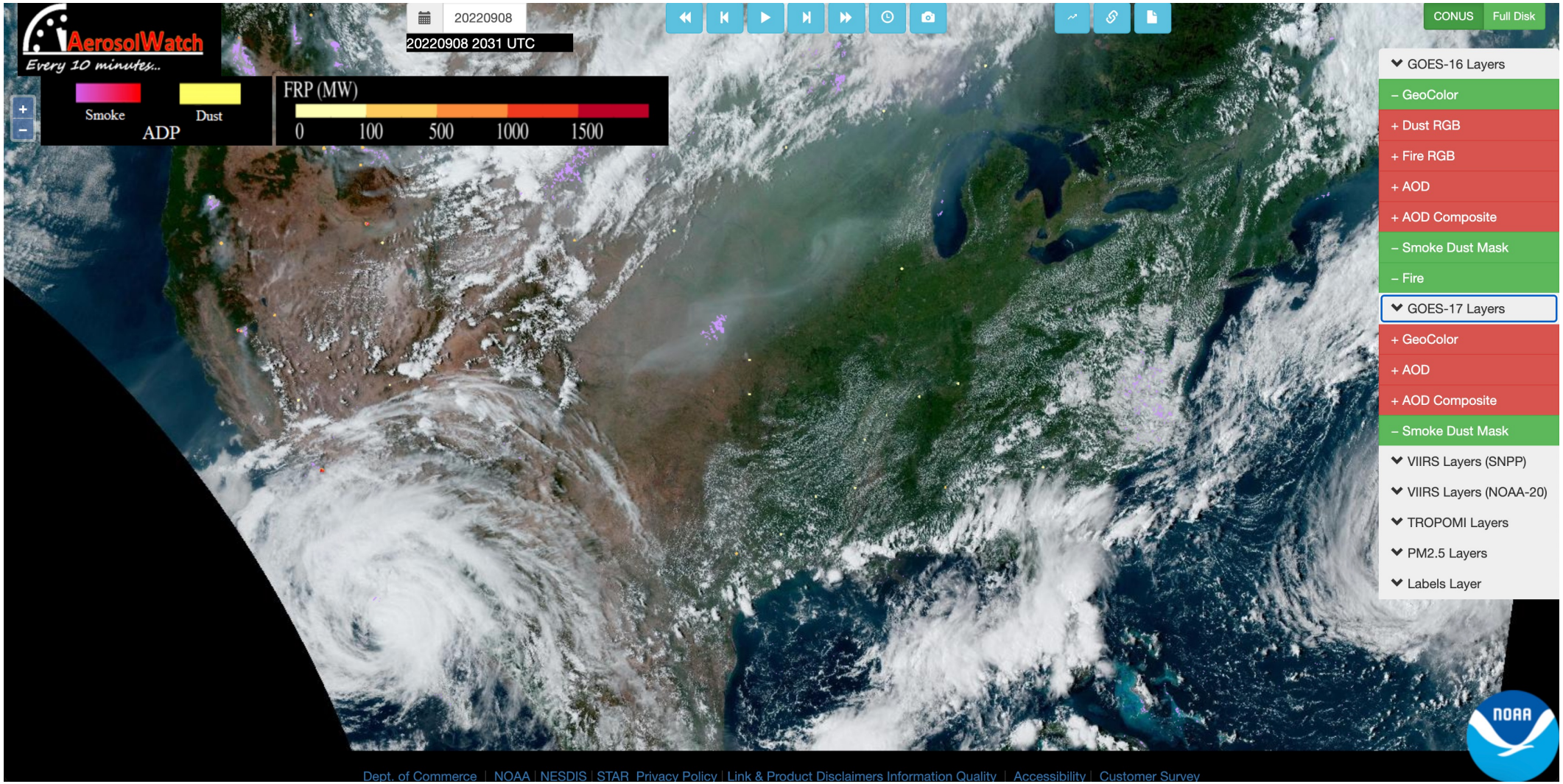
Geostationary AOD & Composite (3-hr-Average) AOD

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



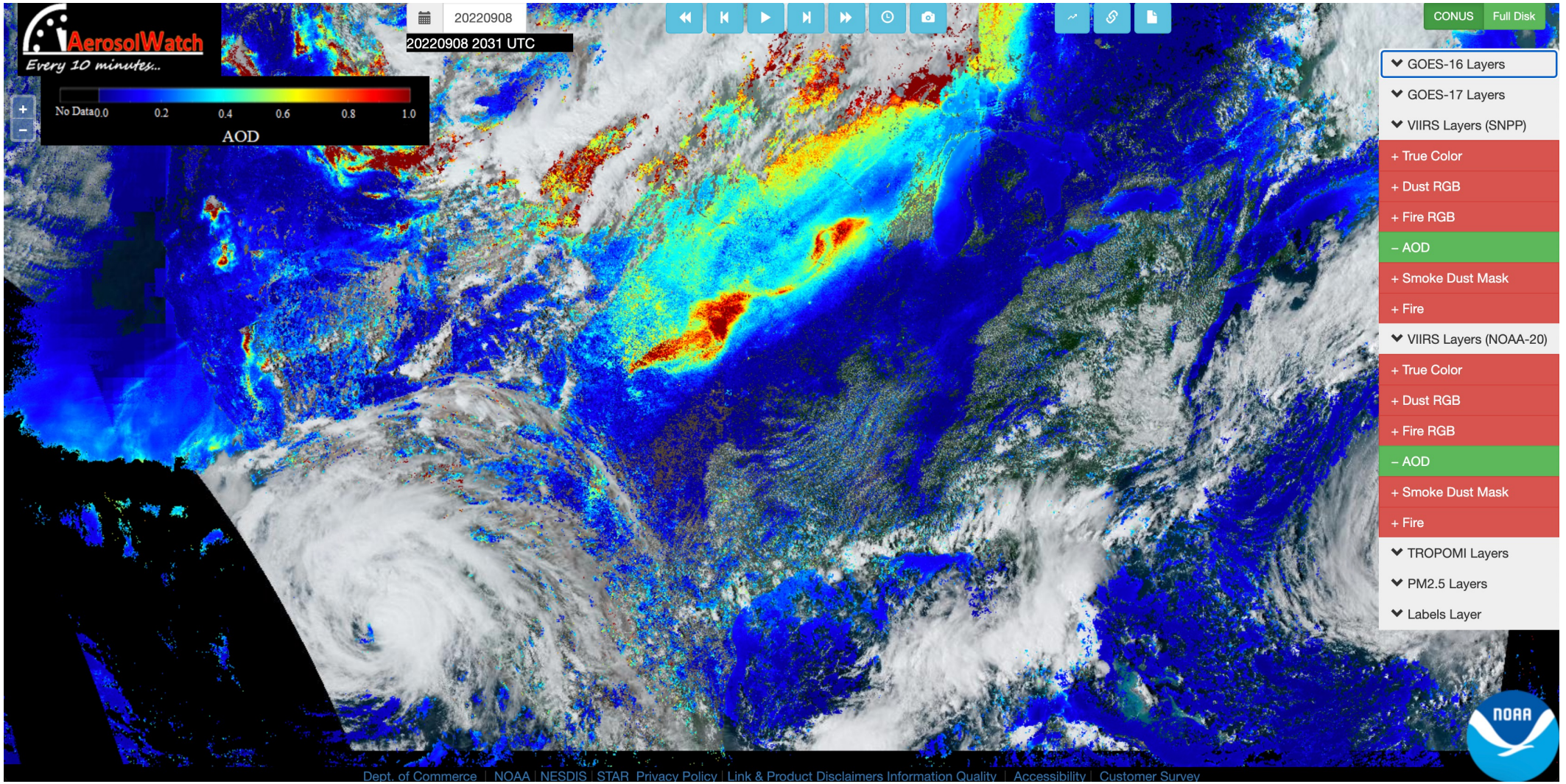
Fires, Smoke & Dust Mask

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



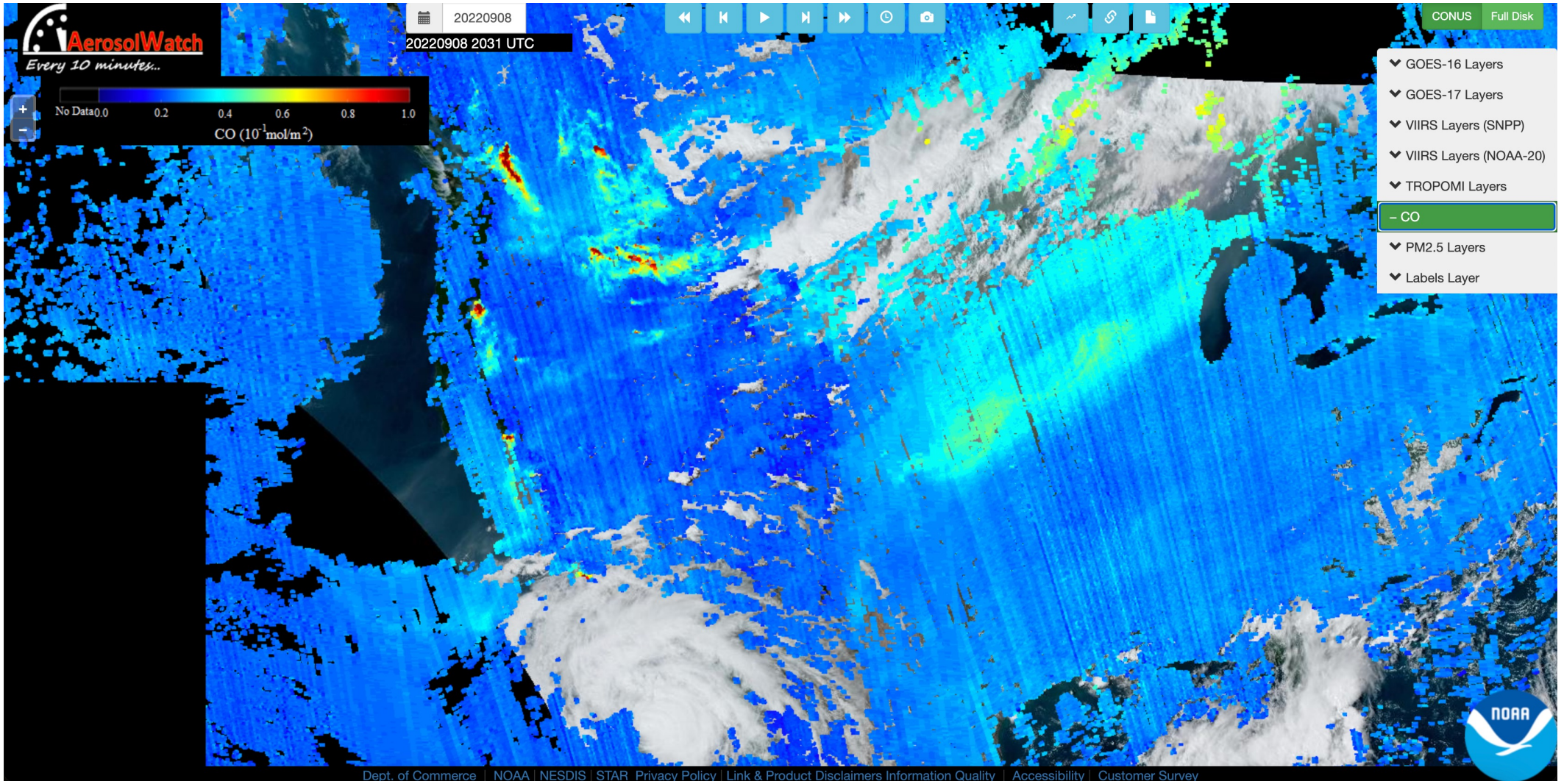
VIIRS Polar Orbit AOD

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



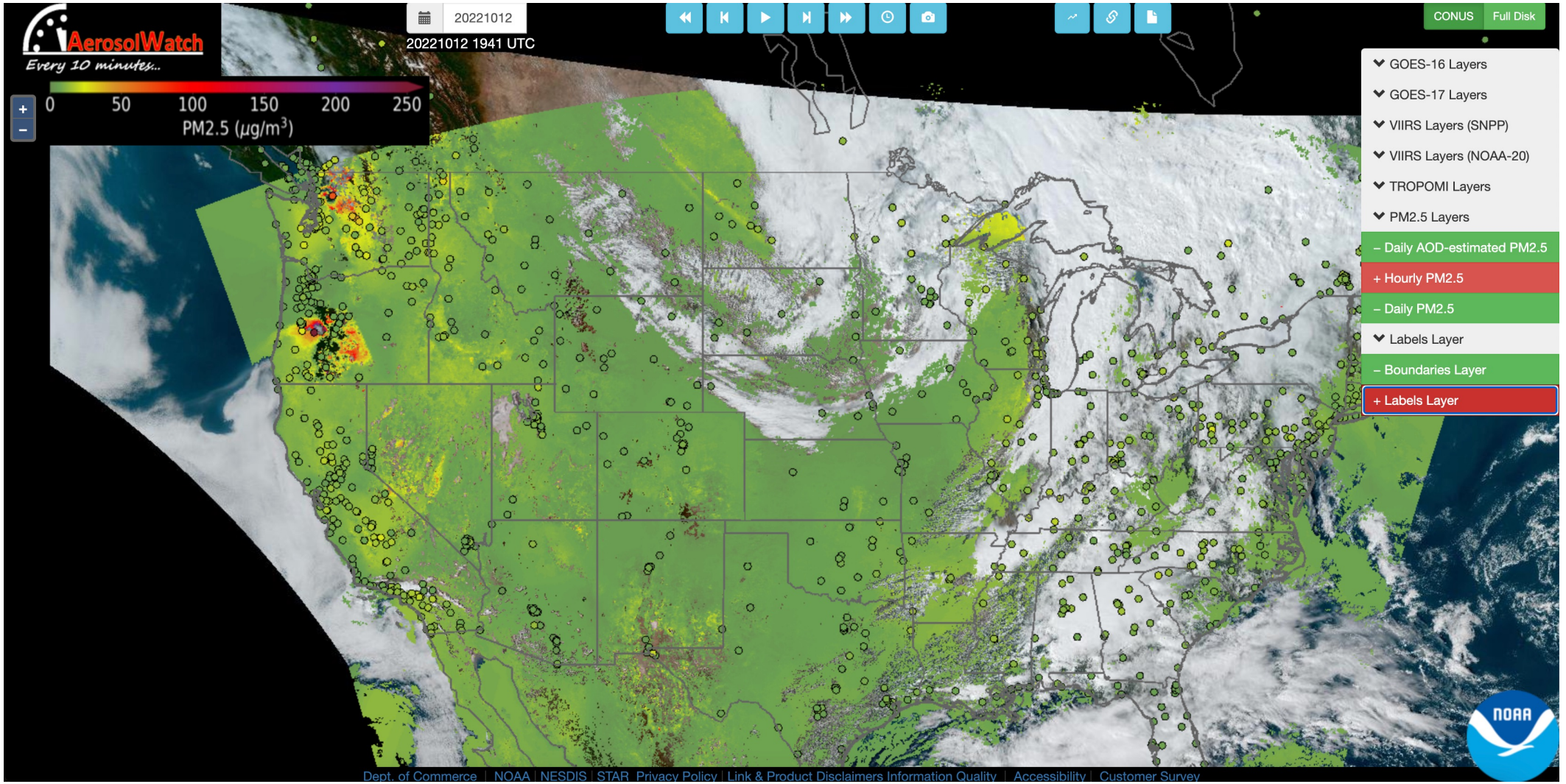
TROPOMI CO

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



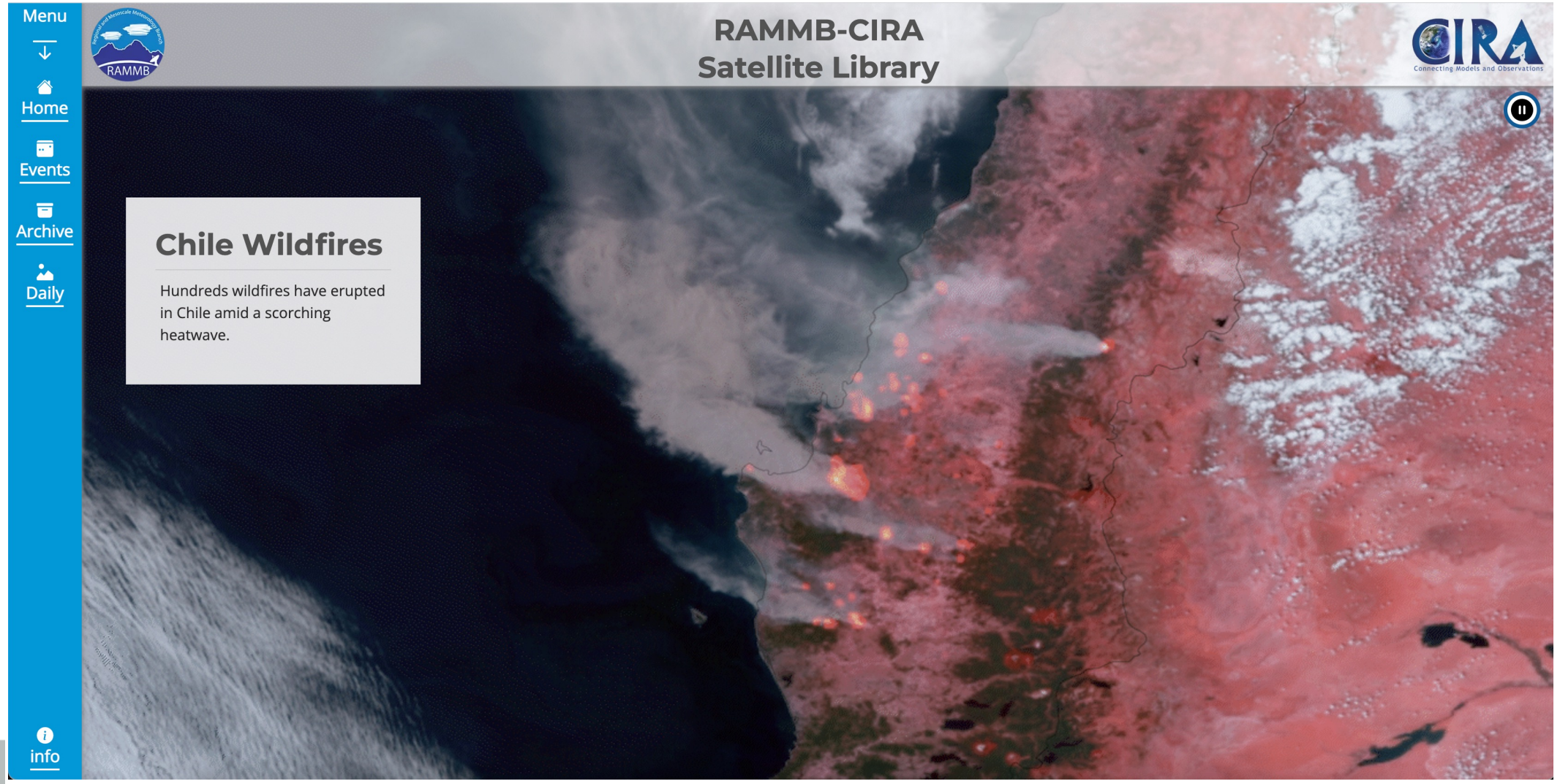
Surface $PM_{2.5}$ (Including Estimate from AOD)

https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/



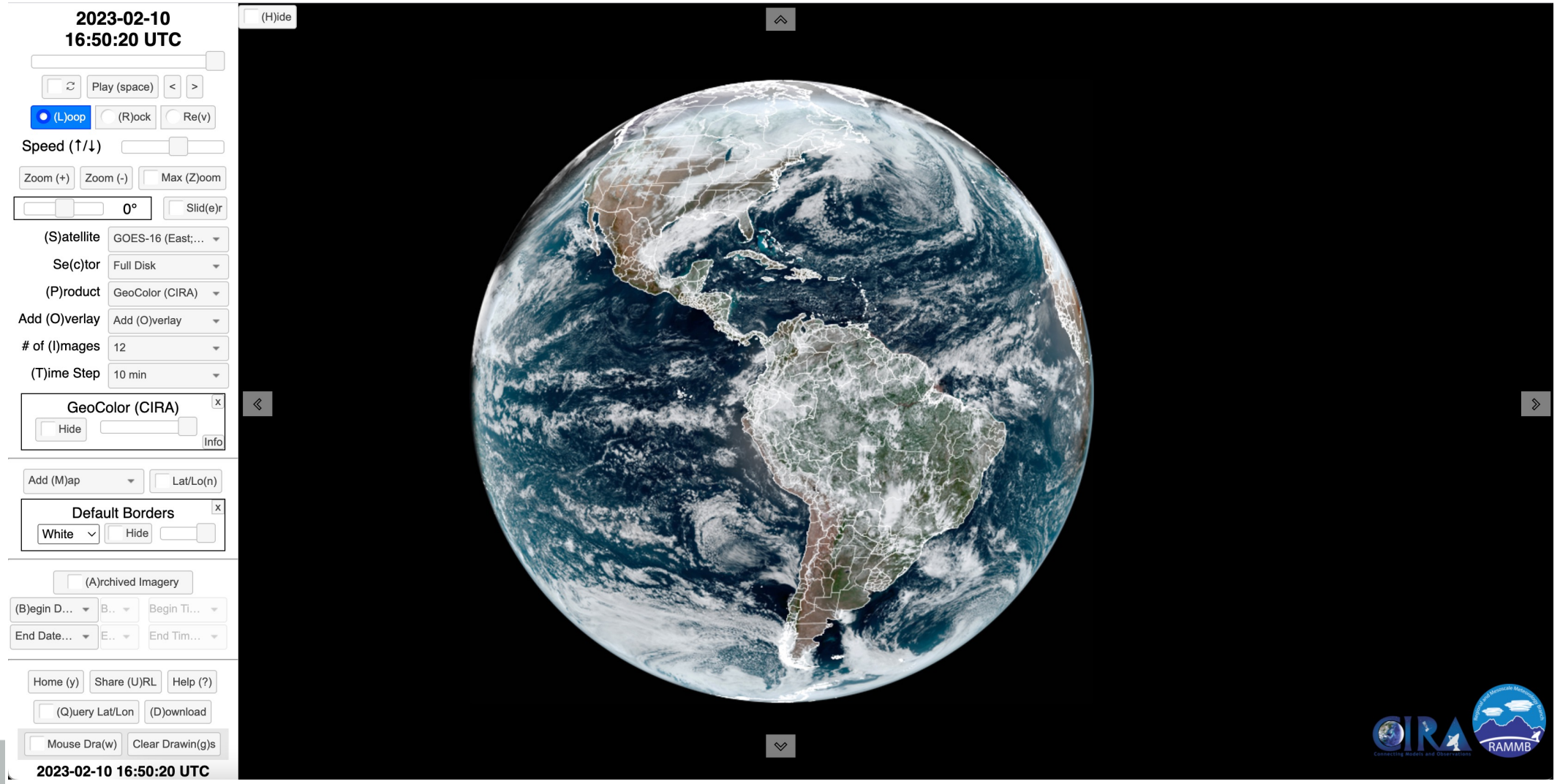
Additional Resources

RAMMB-CIRA Satellite Library - https://satlib.cira.colostate.edu/



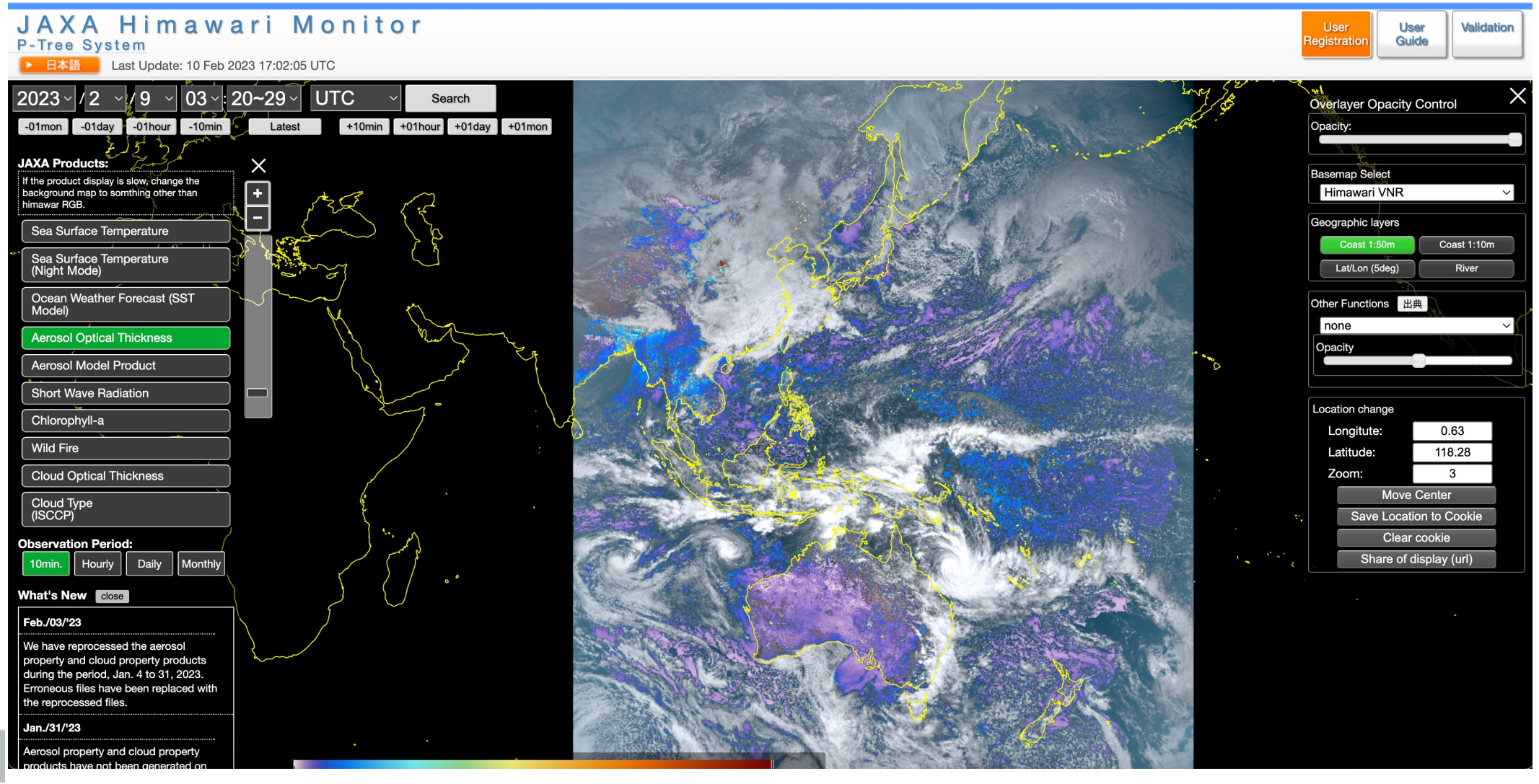
Additional Resources

RAMMB-CIRA Slider - https://rammb-slider.cira.colostate.edu/



Additional Resources

JAXA Himawari Monitor - https://www.eorc.jaxa.jp/ptree/



Additional Resources

NASA Worldview Geostationary Layers - https://worldview.earthdata.nasa.gov/