GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Stakeholder Needs: Georgia EPD's Perspective

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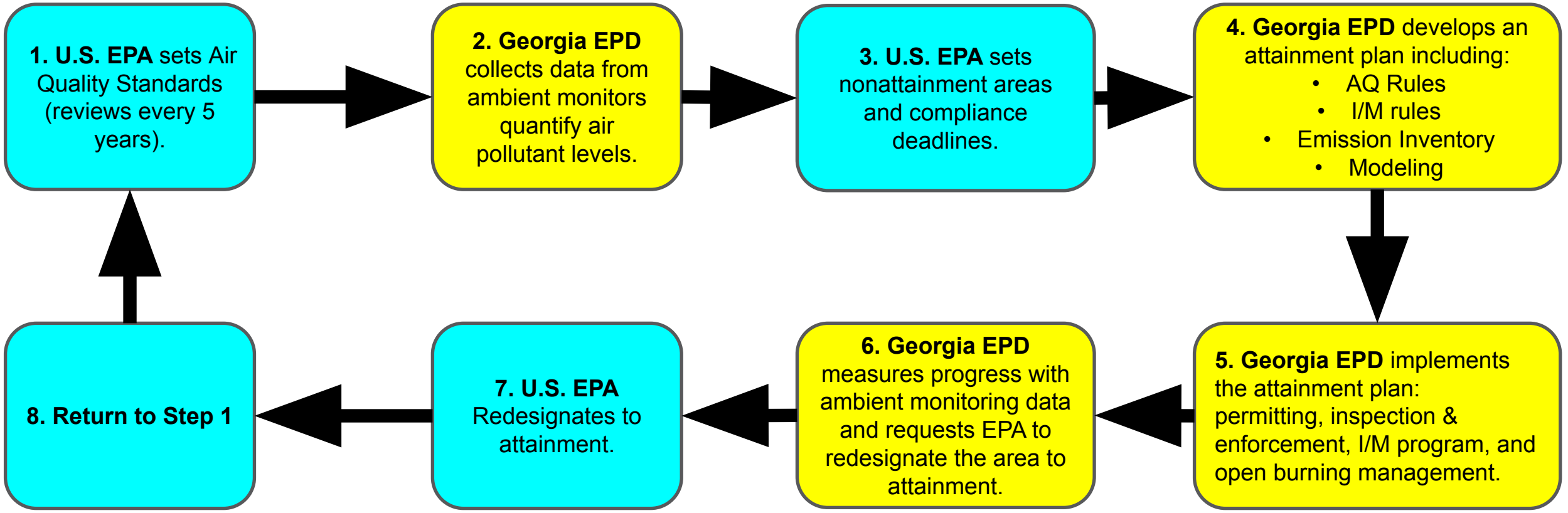
Planning and Support Program
Georgia EPD - Air Protection Branch

GeoXO ACX STM Meeting
May 9, 2024

Roles of U.S. EPA and Georgia EPD in Air Quality Management



U.S. EPA (Federal) and Georgia EPD (State) are tasked to improve air quality.
Satellite products will be very helpful for all Georgia EPD's roles!

Georgia EPD's missions benefited from Satellite Data

- **Planning**
  - State implementation plans for National Ambient Air Quality Standards (NAAQS) and Regional Haze
    - Comparing "design values" with standards
    - Exceptional event demonstration
  - Emission inventory
  - Control strategy development with regional scale photochemical modeling
- **Permitting**
  - Source impact assessment with dispersion modeling
    - Background concentrations for permit modeling
- **Compliance**
  - Inspection
    - Stack testing
- **Ambient Monitoring**
  - Measurement of NAAQS pollutants
  - Network planning including monitor siting

How are we using satellite data now?

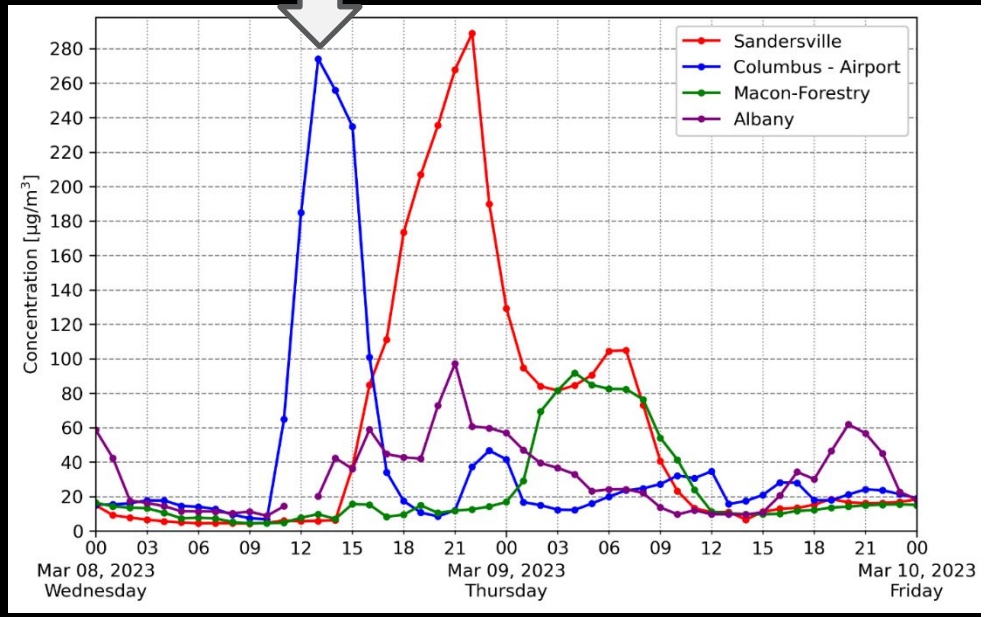
Georgia EPD's current projects using satellite data

- **Exceedance Reports**
  - Since 2016, Georgia EPD has written detailed reports for every exceedance of the NAAQS.
    - INITIAL REPORT: Must be completed within 2-3 business days after the exceedance.
    - FINAL REPORT: Submitted after all relevant information has been collected. This could be days, weeks, or months.
  - Reports include discussions on meteorology, emissions (e.g., satellite detected fires), smoke plume movements (e.g., GOES16 true color images), and air quality (e.g., TROPOMI NO_2 VCD).
- **Exceptional Event Demonstrations**
  - Exclusion of data for the purpose of calculating design values
    - Clear Causal Relationship
- **Data Screening for $PM_{2.5}$ "Background Concentration"**
  - NAAQS Analysis as part of PSD Permit Modeling
- **Network Assessment**

GOES16 ANIMATION - MARCH 8, 2023

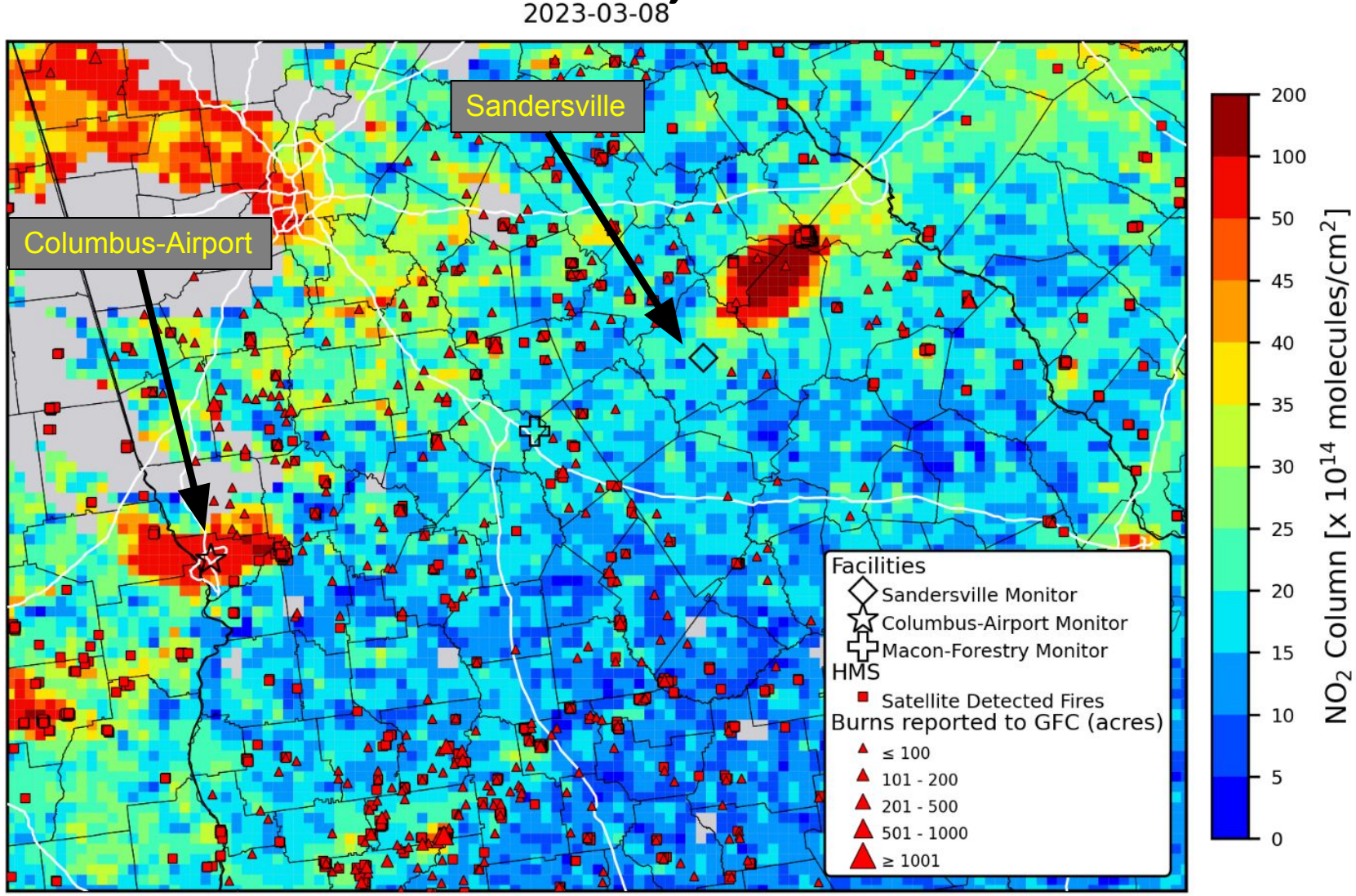
Columbus-Airport

1:00 PM EST



Images from SLIDER by RAMMB/CIRA@CSU (https://rammb-slider.cira.colostate.edu/)

Columbus-airport and Sandersville: March 8, 2023



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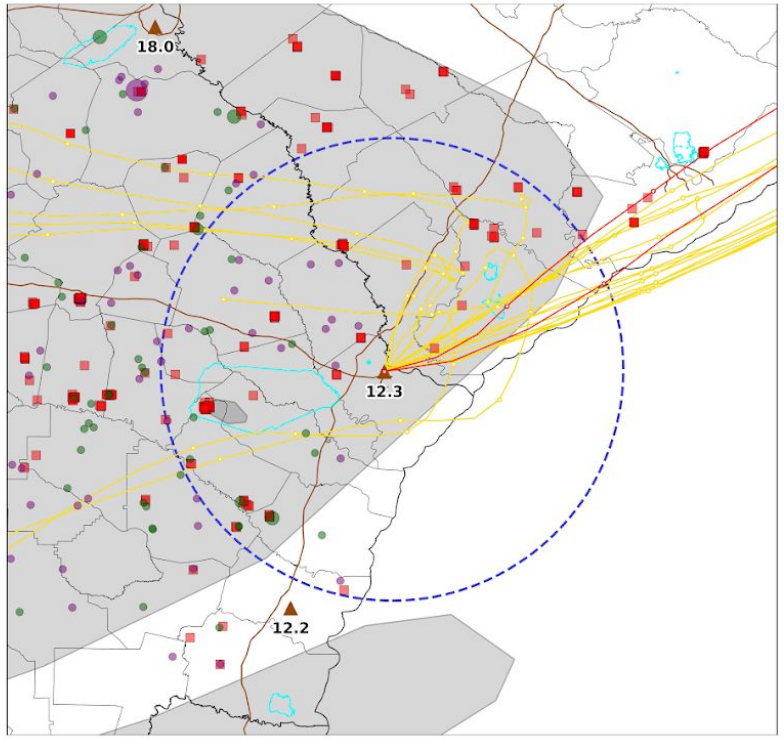
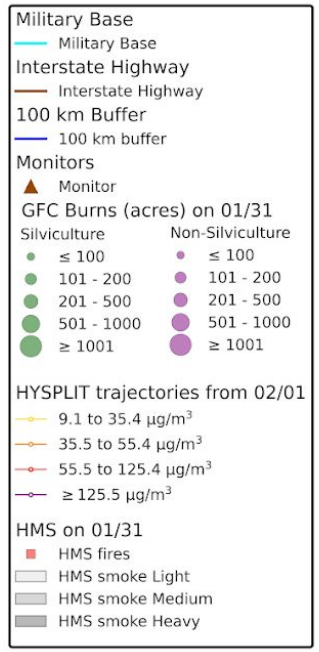
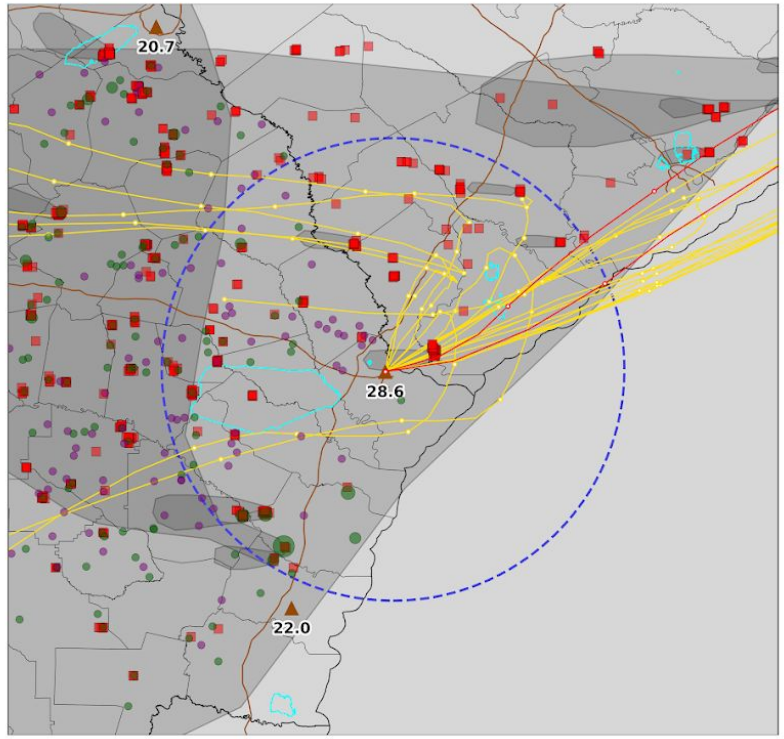
Georgia EPD developed a Python code to create these plots using EPA's RSIG3D data.

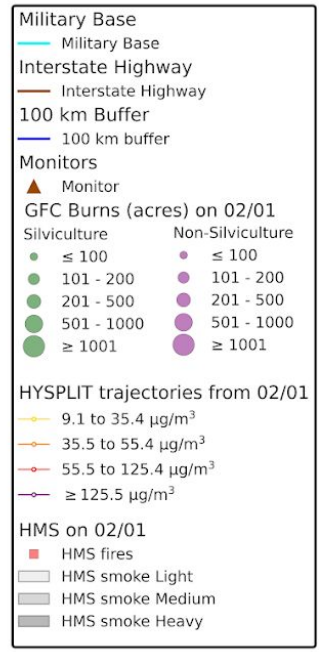
Data Screening Analysis Plot

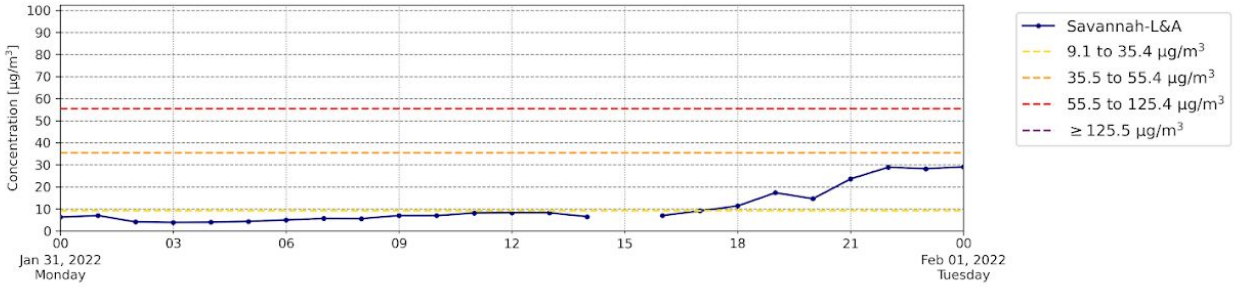
Savannah-L&A on 20220201

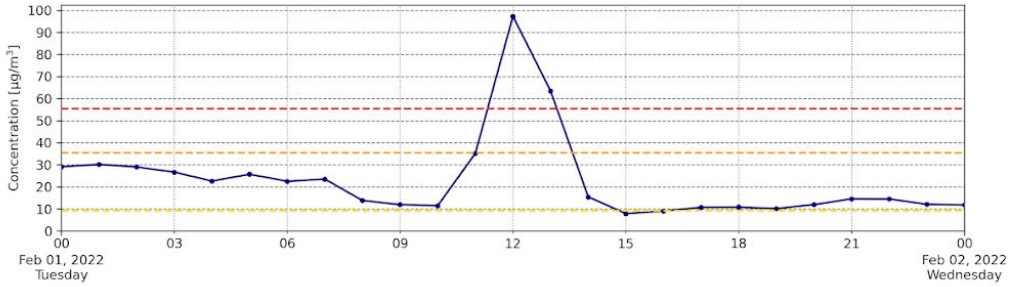












Georgia EPD developed a Python code to create these plots.

Long-term SO_2 changes: Ambient Monitoring Program's Annual Report

Statewide SO_2 Concentration Comparison from 2005 to 2020

- Figure 21 compares the concentrations of sulfur dioxide from 2005 and 2020 in Georgia on a scale of 0 to 5 in Dobson units (DU)[5].
- These maps were created by NASA using satellite data and depict averages of sulfur dioxide concentrations over the eastern United States.

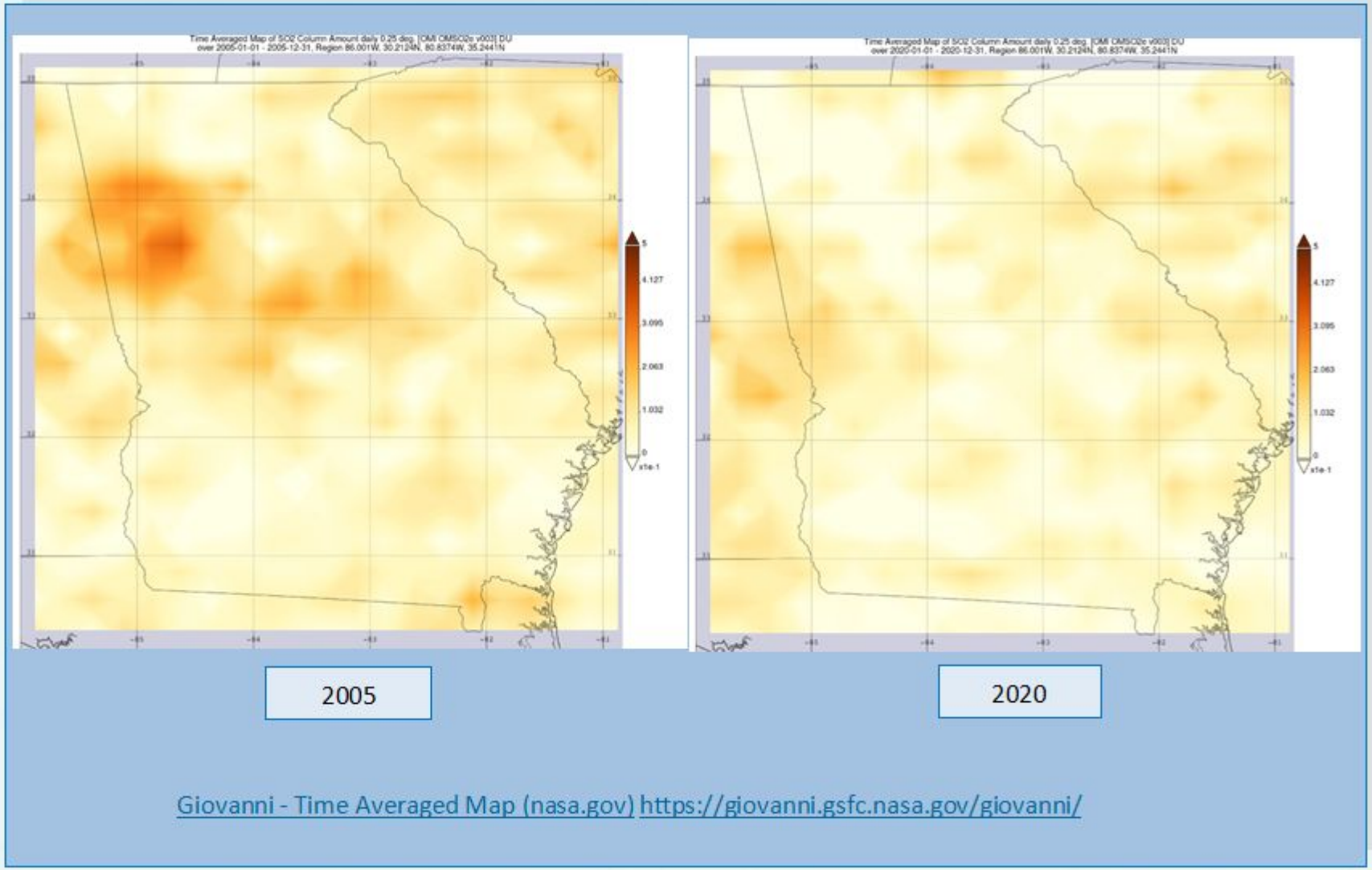
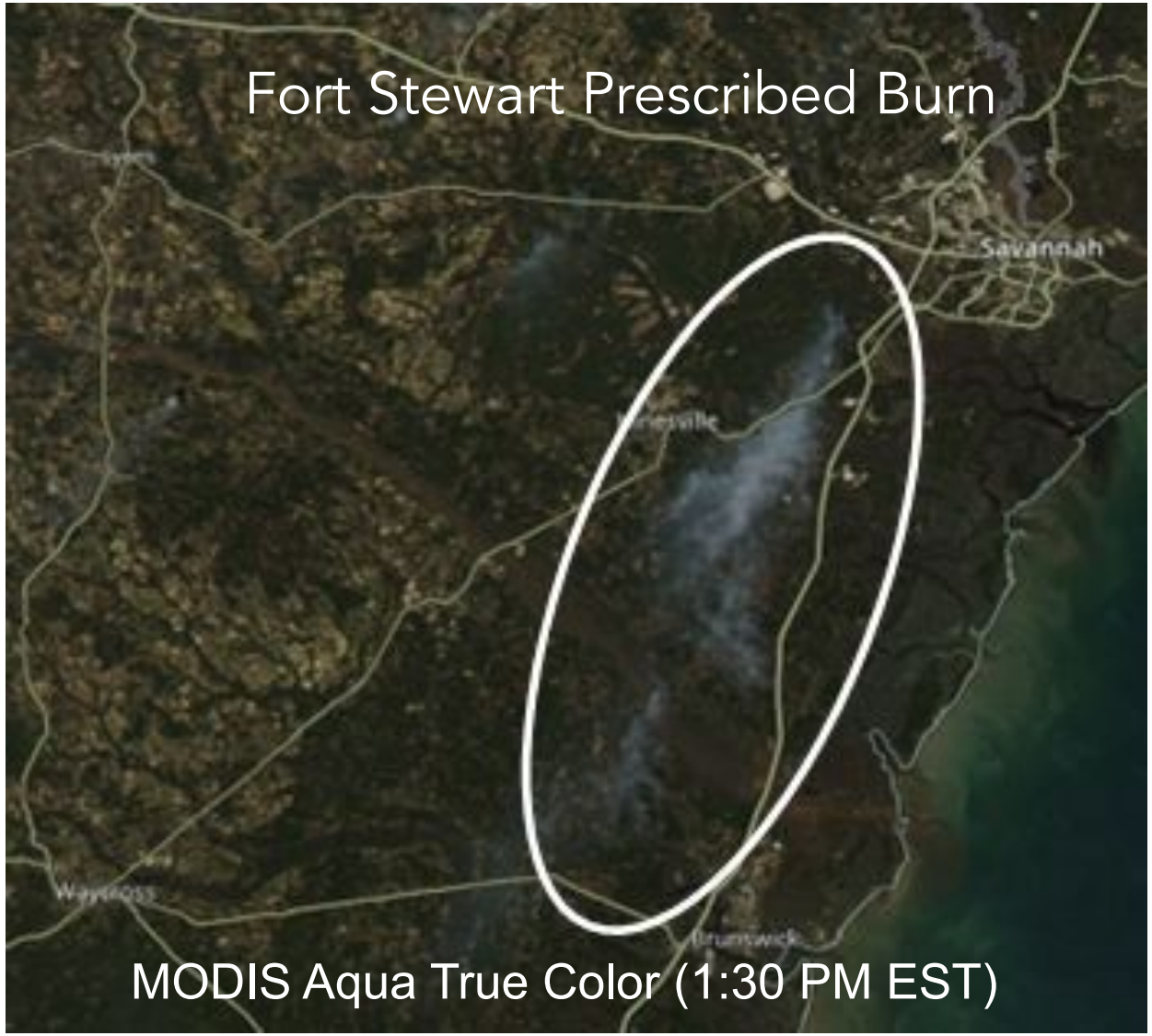
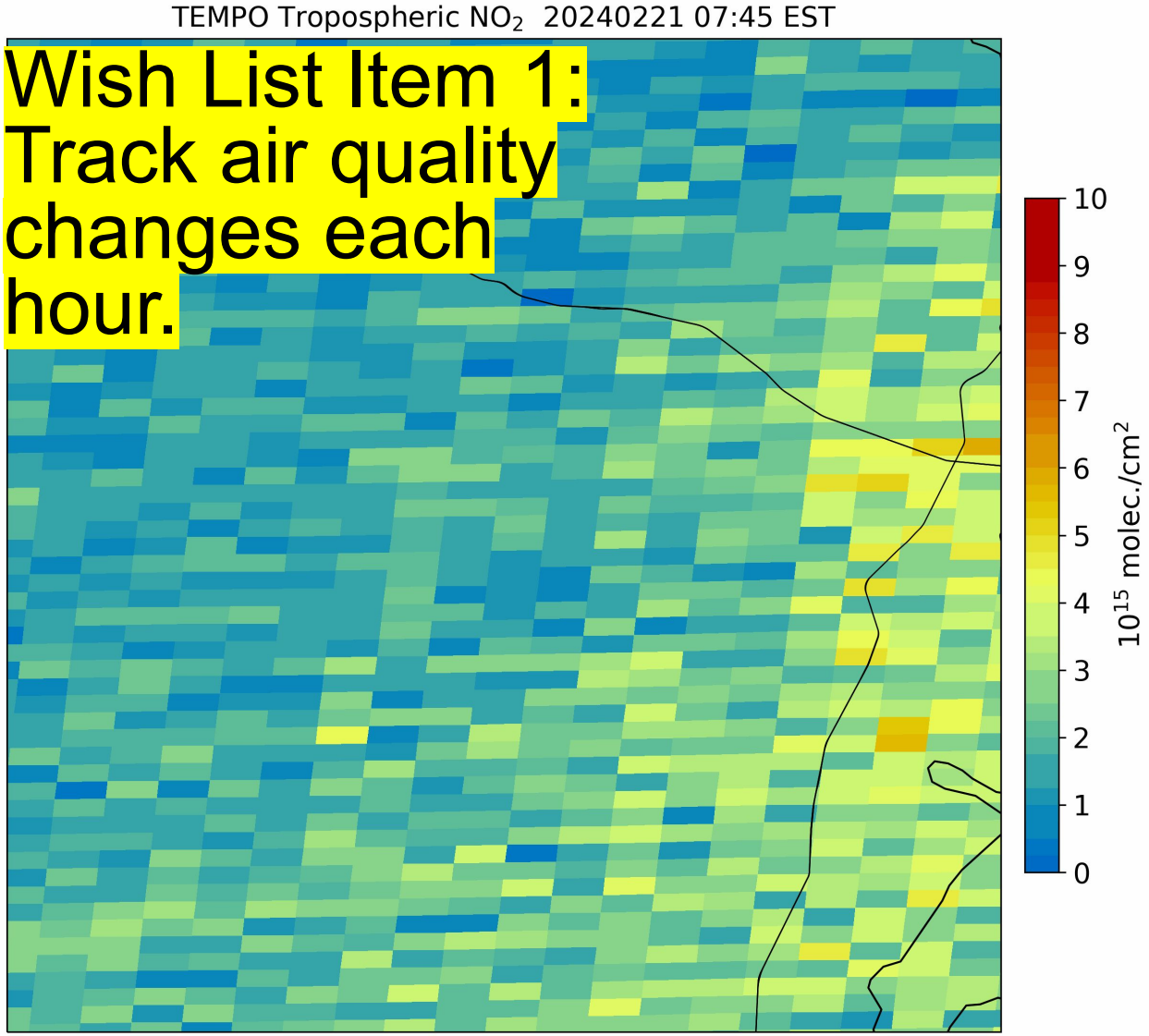


Figure 21. SO_2 Statewide Concentration Comparison from 2005 to 2020

Summary and "Wish list"

- **Satellite data products are very important for Georgia EPD's mission critical day-to-day tasks.**
- **Georgia EPD will continue to use satellite data products for its on-going work such as Exceptional Event Demonstration.**
- **Georgia EPD needs satellite data and/or derived products that provide:**
  - High resolution information – less than 10 km in horizontal resolution, vertically resolved, hourly (including nighttime), and speciated (ozone, formaldehyde, NOx, and all major $PM_{2.5}$ components),
  - High quality information comparable with what ground monitoring station can offer for concentrations at the ground, and
  - Easy-to-use tools with efficient access options, i.e., archived data with fast data retrieval options
- **Georgia EPD will closely follow up recent developments of satellite missions such as TEMPO by NASA and GeoXO by NOAA.**





Courtesy: Dr. Aaron Naeger, TEMPO Mission Applications Lead, NASA Marshall Space Flight Center

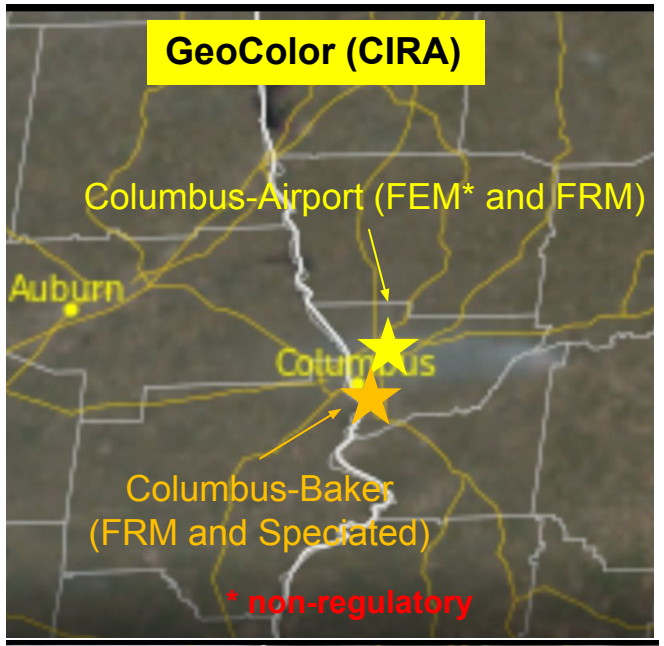
Unofficial Data: Not for Public Release

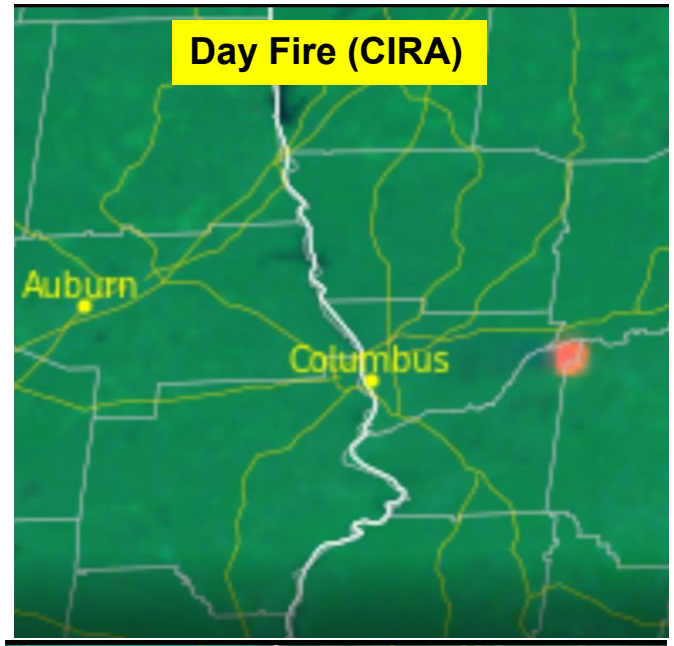
Columbus-Airport: March 8, 2023

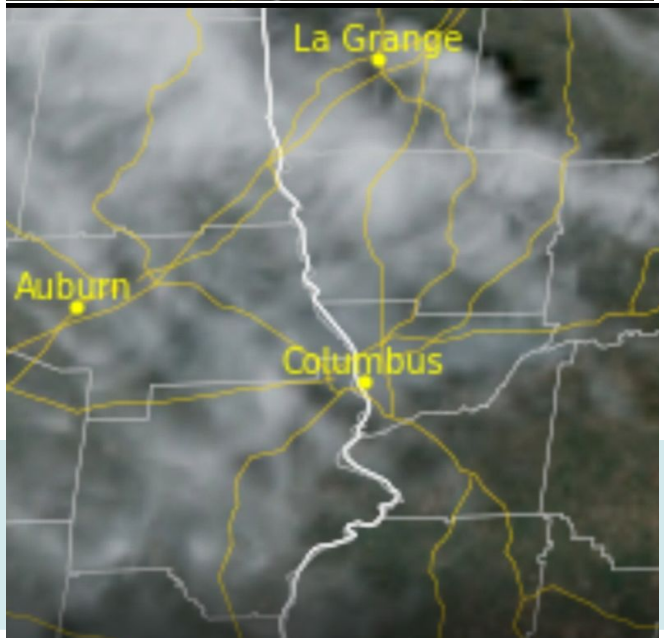
12:11:17 PM EST

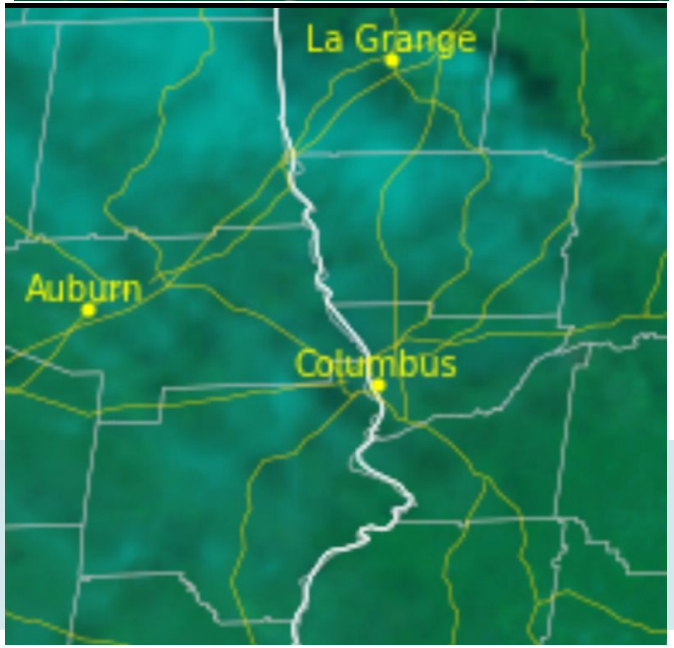
Wish List Item 2: Capture low level burns with satellite observations.

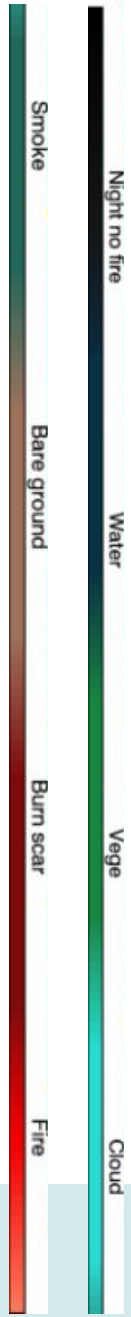
2:06:17 PM EST





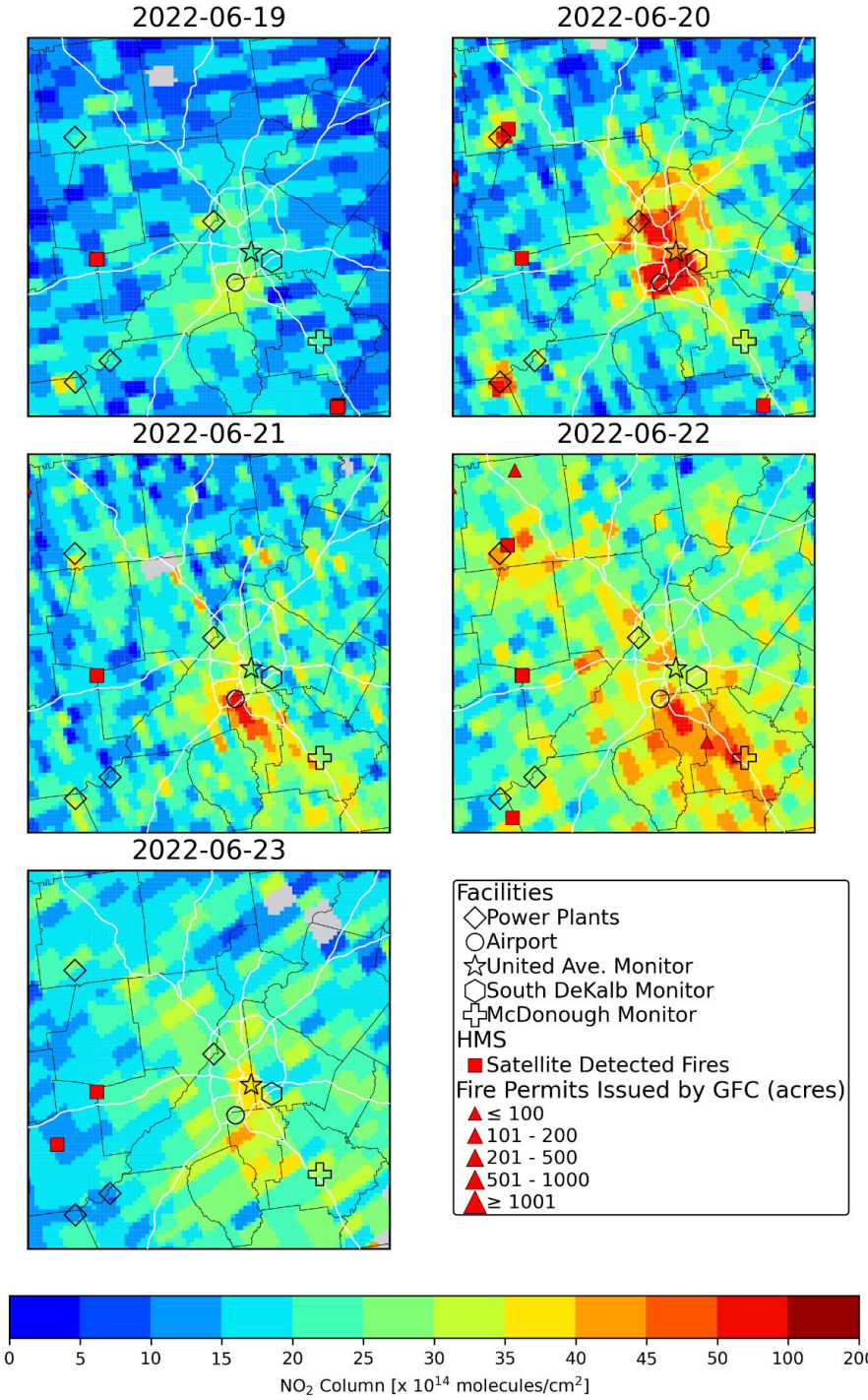


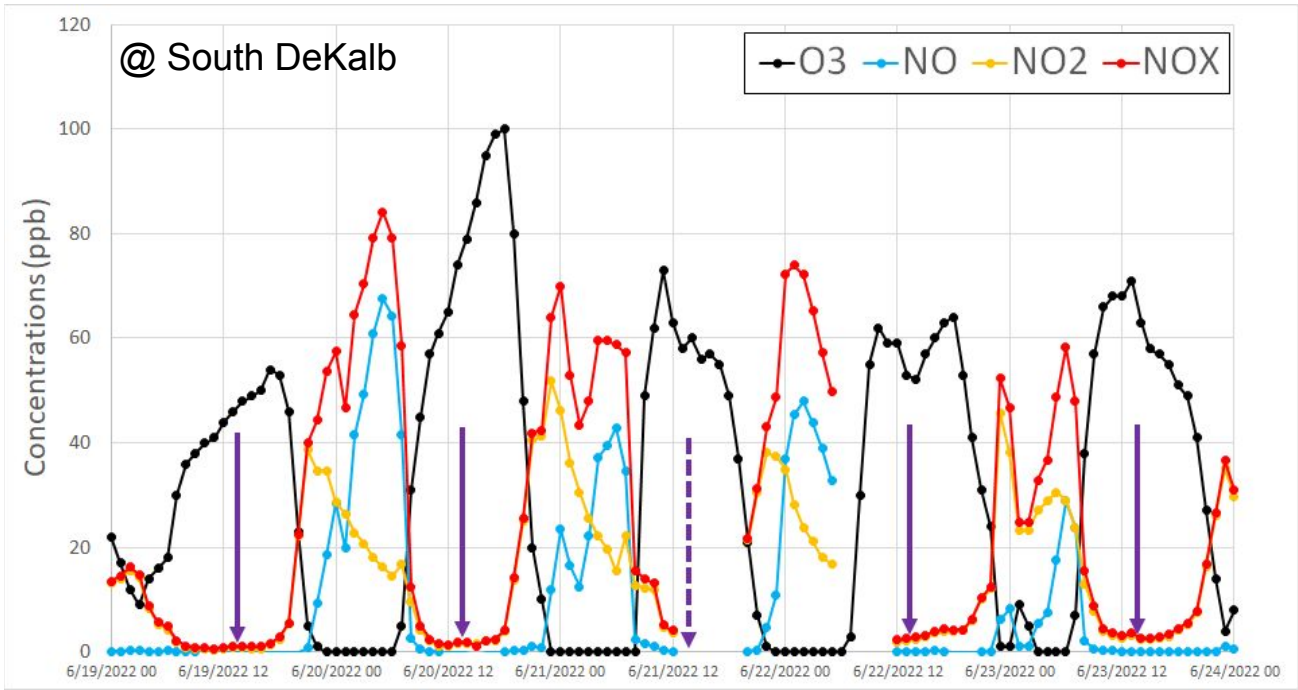




O_3 Exceedances on June 20-22

- Many exceedance days coincided with high NO_2 VCDs at the Hartsfield Jackson Atlanta International Airport and at power plants.
- **Wish List Item 3: Be able to correlate ground level NOx with NO_2 VCDs for major NOx source locations. This is also true for any pollutant such as O_3 and $PM_{2.5}$.**





Nighttime AOD

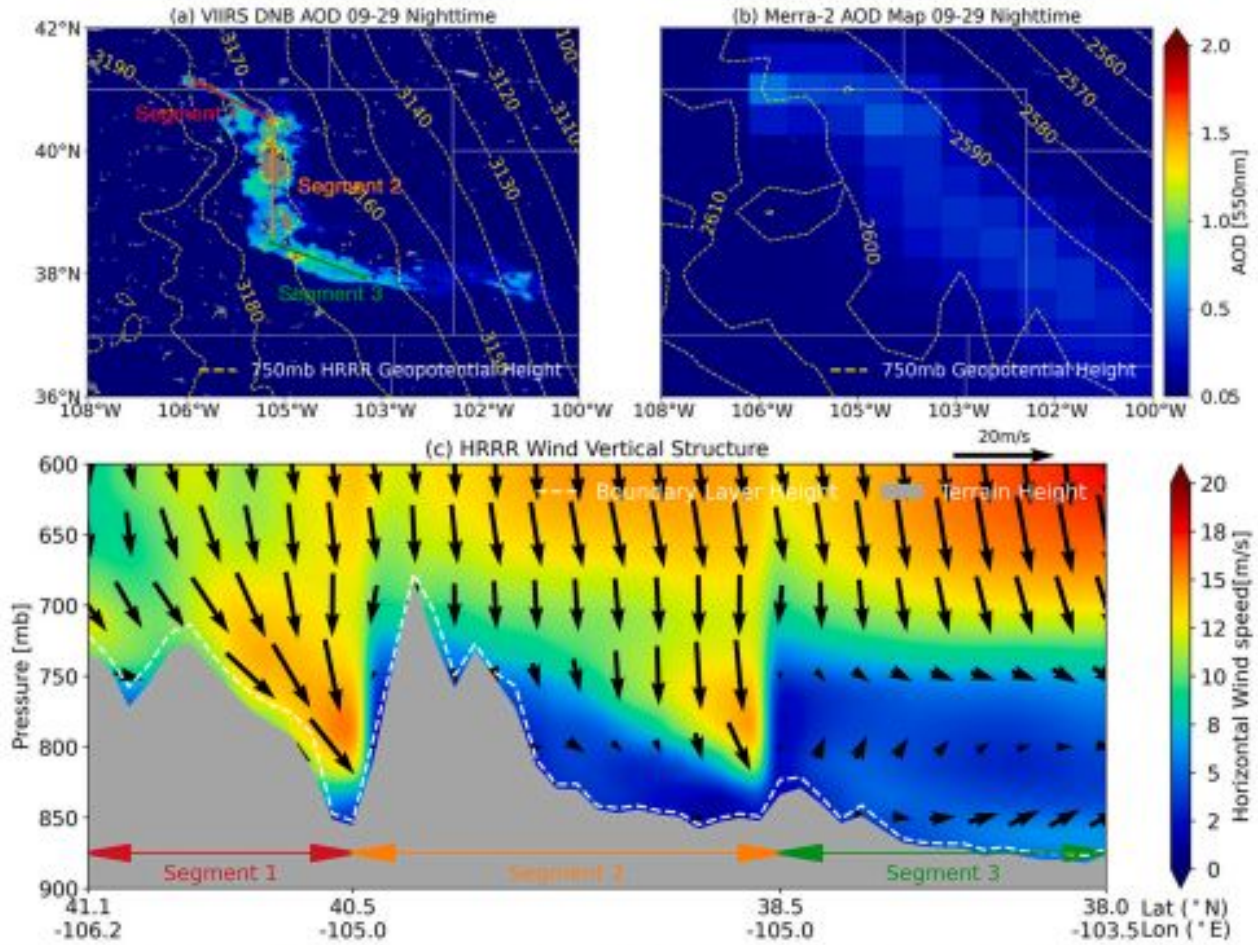


Fig. 10. Zoomed-in plot of the AOD map over the Colorado region (white boxes in Fig. 9). (a) DNB AOD map at midnight of Sept. 29th, 2020; (b) MERRA-2 AOD map at VIIRS overpass time; (c) HRRR wind profile at VIIRS overpass time. The yellow dashed line on the DNB AOD map is the 750 mb geopotential height (in unit of m) contour extracted from HRRR, while the yellow dashed line on the MERRA-2 map is the 750 mb geopotential height contour of MERRA-2. The L-shaped distribution of smoke layer in (a) is marked with three colored lines denoting three segments. Also shown is the horizonal wind vector in (c) at different pressure levels, with north pointing upward. Note that a small but eastward (pointing to the right-hand side) dominated wind was found in Segment 3 at and below the 750 mb pressure level, favoring the formation of the L shape of the AOD map. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Wish List Item 4: Observe smoke plumes traveling during nighttime.

Courtesy: Dr. Jun Wang at U. of Iowa

M. Zhou et al. (2021), https://arroma.uiowa.edu/docs/publication/paper_pdf/2021/1-s2.0-S0034425721004375-main.pdf

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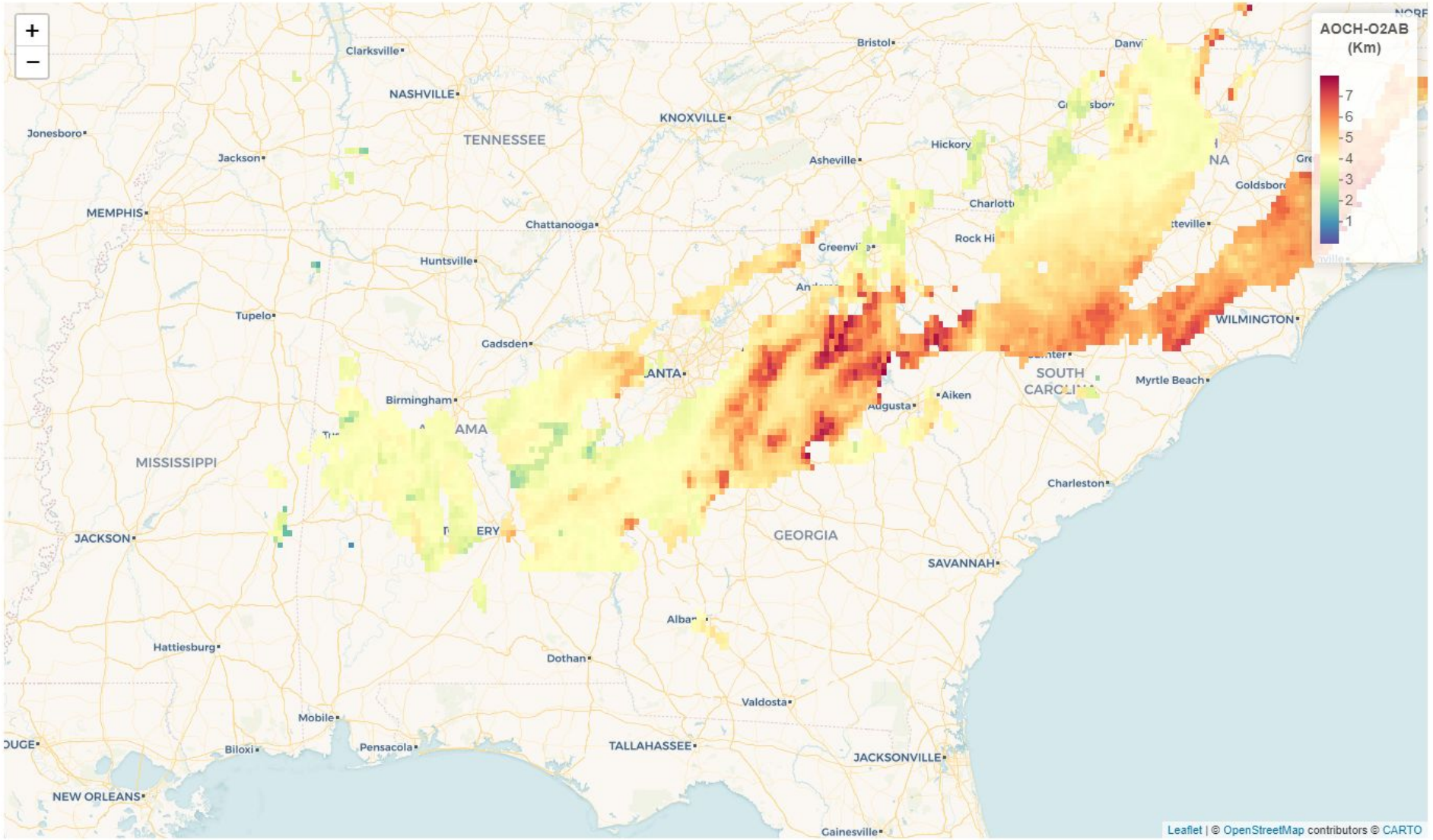
Absorbing Aerosol Optical Centroid Height (AOCH) retrieved from TROPOMI with UIowa's AOCH-O_2AB algorithm



Select date

2023-07-17

Variables:

- (•) Height
- ( ) AOD
- ( ) None

Background layers:

- [ ] VIIRS SNPP True-color Image

Note: rectangle over the map represents the retrieval domain

Wish List Item 5: Identify smoke plumes traveling aloft including nighttime travel.

http://esmc.uiowa.edu:3838/tropomi_aoch/

Courtesy: Dr. Jun Wang at U. of Iowa

Contact Information

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Questions?