



GEORGIA
DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

Use of Satellite Data At Georgia EPD

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**Session 4B: Improving Emissions Inventories
with Satellite Data, HAQAST - St. Louis
November 6, 2025**



Use of Satellite Data in Exceedance Reports

- **Initial Exceedance Reports**

- Since 2016, Georgia EPD has written detailed reports for every exceedance of the NAAQS.
 - Each initial exceedance report must be completed within 2-3 business days after the exceedance.
- These reports include discussions on meteorology, emissions (e.g., satellite detected fires), smoke plume movements (e.g., GOES16 geo-color images), and air quality (e.g., TEMPO and TROPOMI NO₂ VCDs).
- A collection of Exceedance Reports will be the foundation of Georgia EPD's control strategy development for State Implementation Plans.

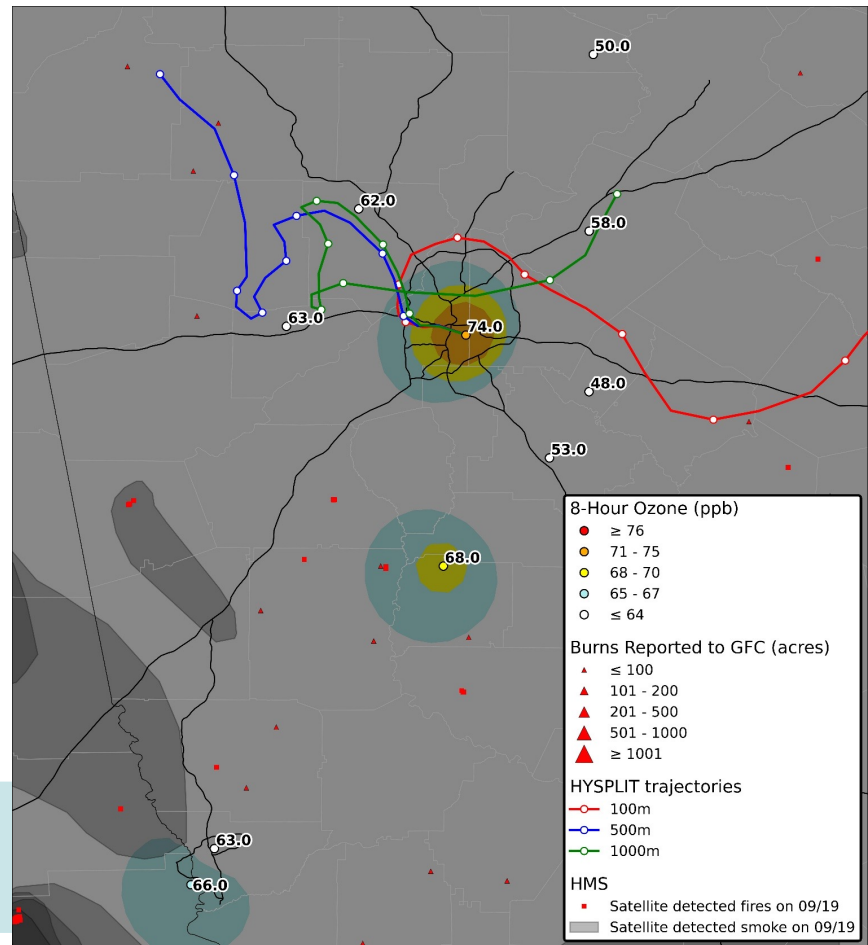
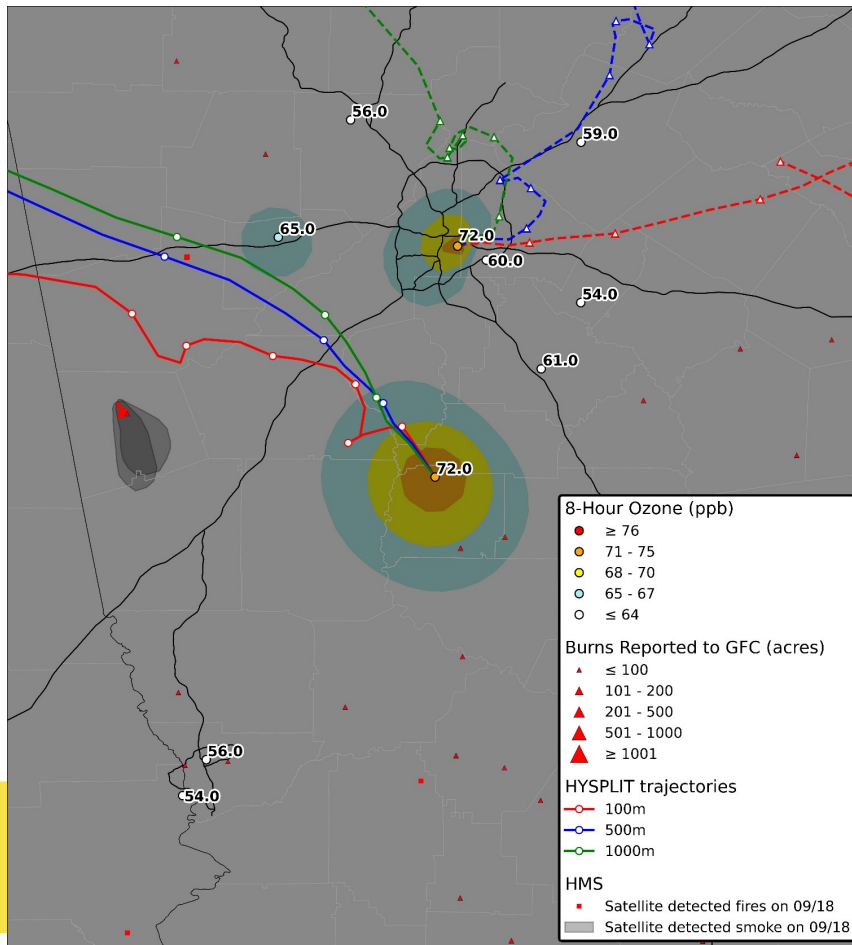
- **Final Exceedance Reports**

- Final exceedance reports are submitted after all relevant information has been collected.
 - In the past, satellite measured NO₂ values on exceedance days and the day before/after exceedance days were compared with using TROPOMI data. We plan to expand this comparison with TEMPO.

TEMPO data will be a crucial resource for Georgia EPD's efforts to improve and maintain air quality.

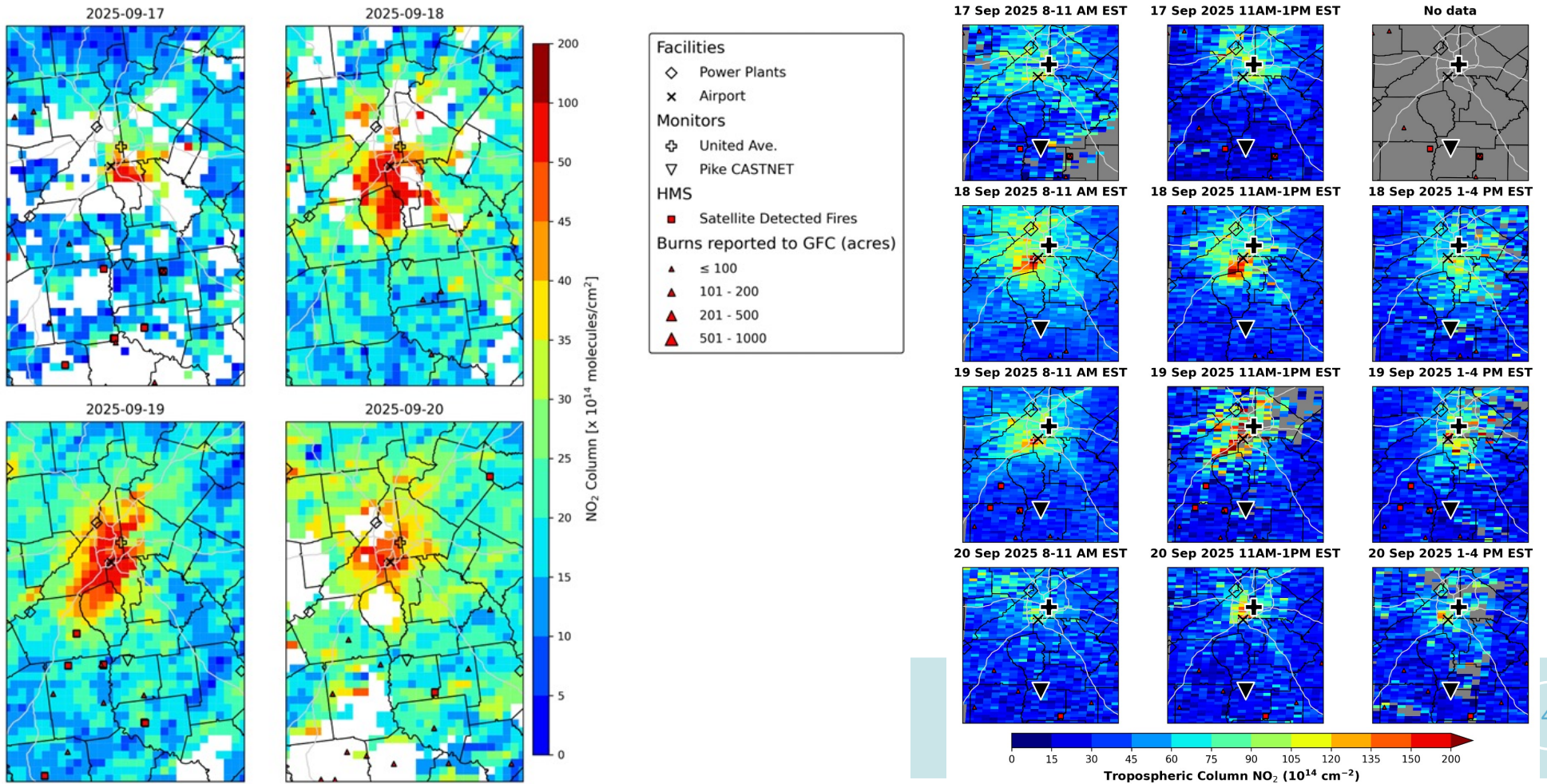


Integrated Plots for September 18 and 19, 2025



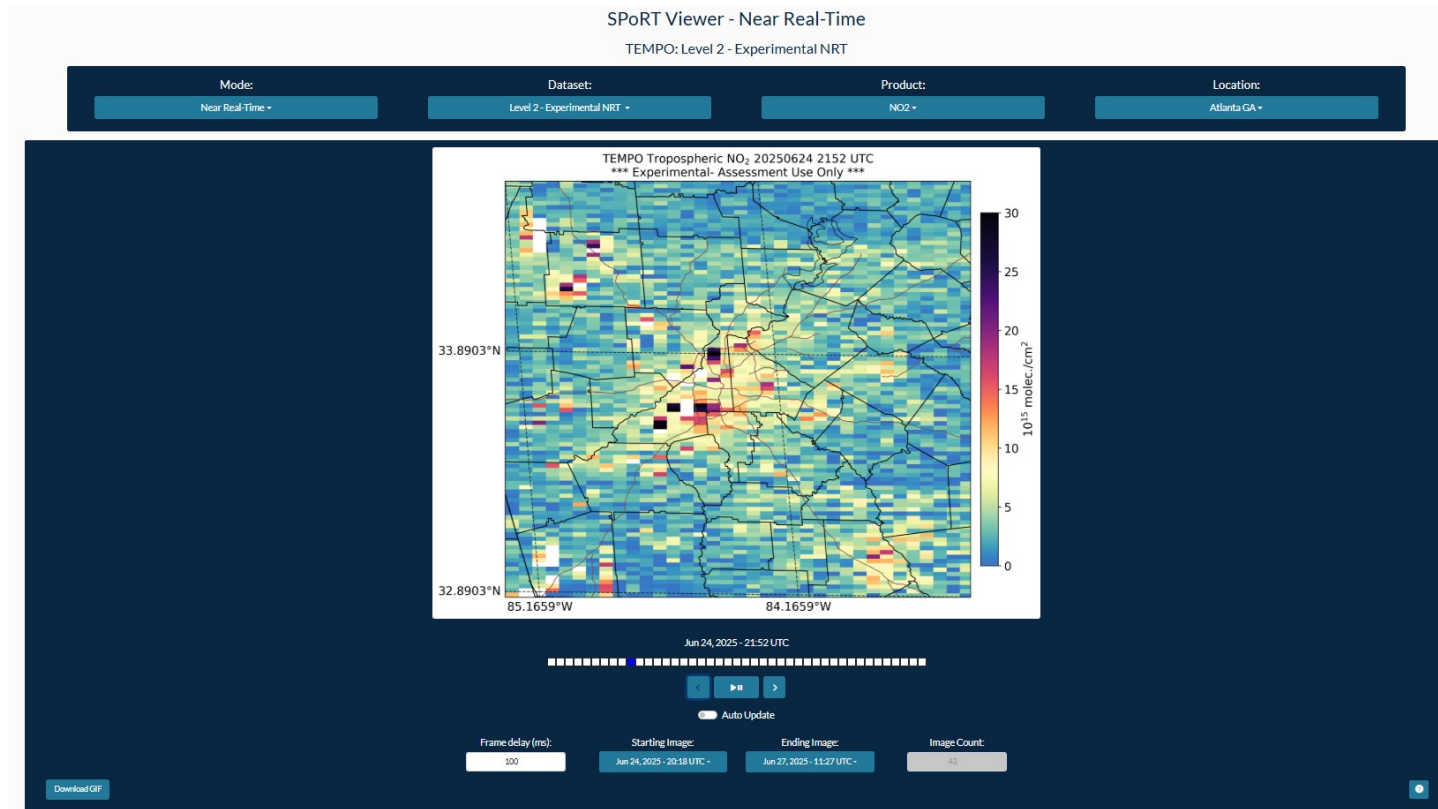


Use of TROPOMI and TEMPO Data at Georgia EPD





Use of TEMPO Data at Georgia EPD



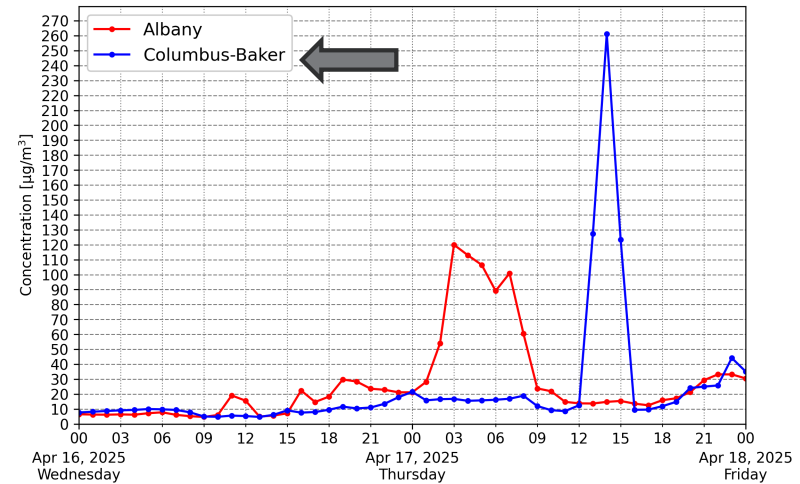
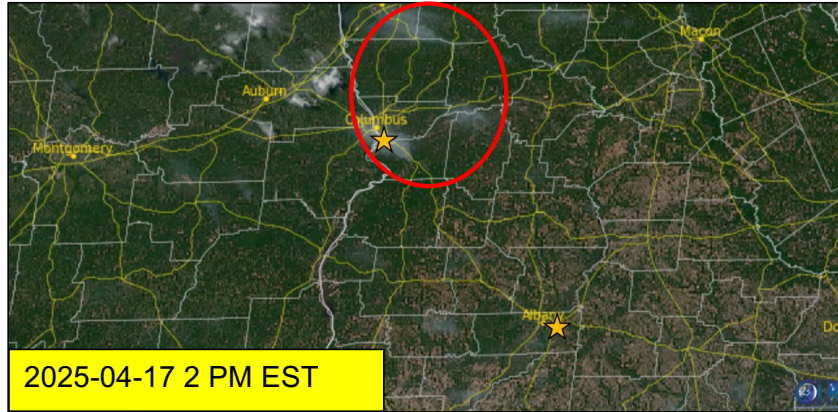
https://weather.ndc.nasa.gov/sport/viewer/?dataset=tempol2nrt&product=tempo_nrt_no2&location=atlanta_ga

Very useful for quick review on temporal evolution of NO₂ over a single day.

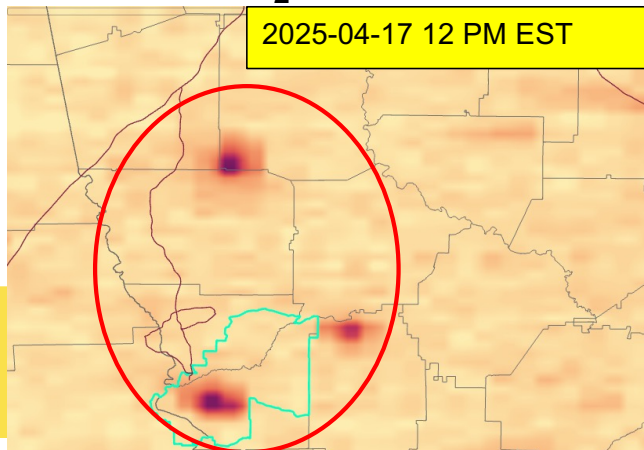


Use of TEMPO Data at Georgia EPD

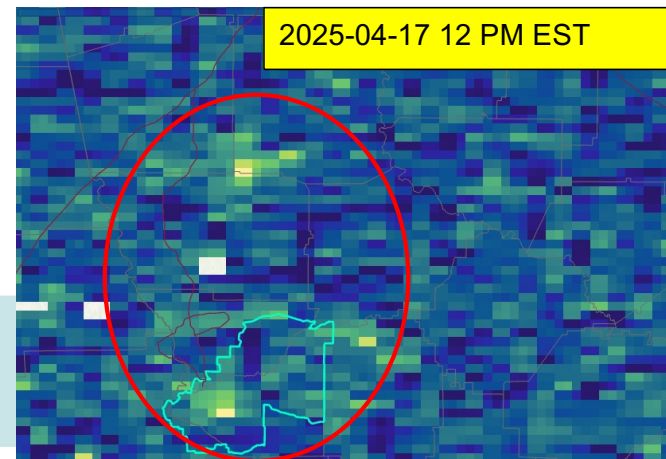
GOES19 via RAMMB-SLIDER



TEMPO NO₂ VCD via ArcGIS



TEMPO HCHO VCD via ArcGIS

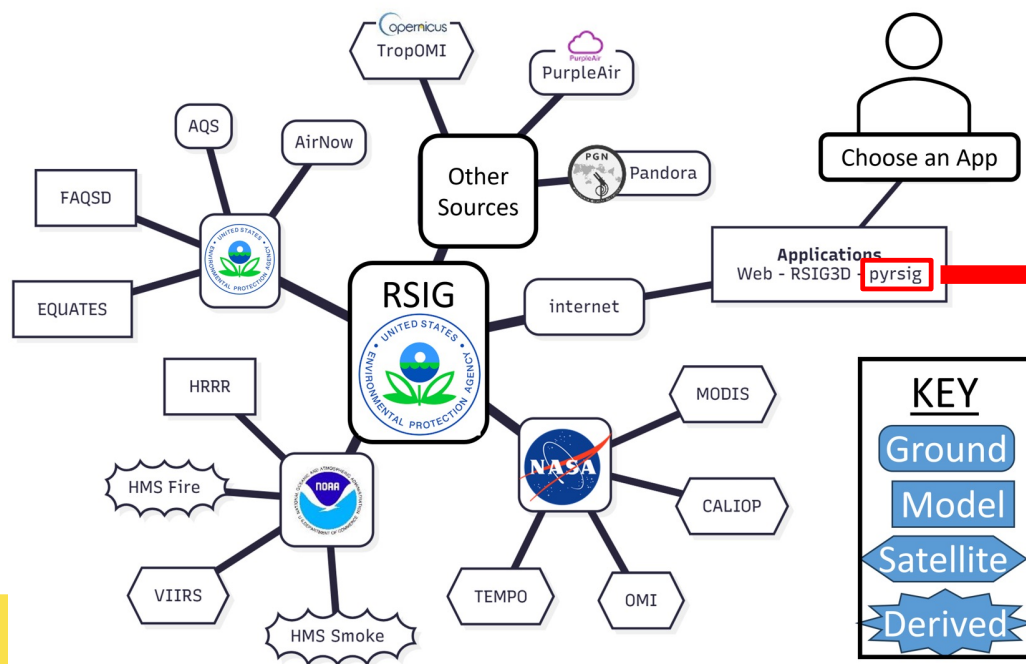




TEMPO Data via RSIG (with pyrsig)

ArcGIS and SPoRT are great for a quick initial analysis. However, we need more tools to do our own analyses routinely going forward. That's where pyrsig shines.

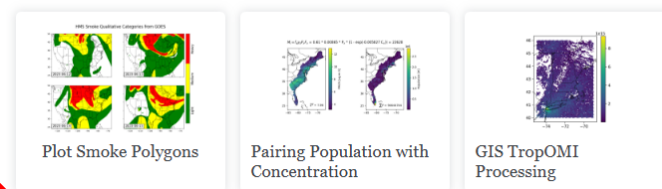
RSIG



pyRSIG

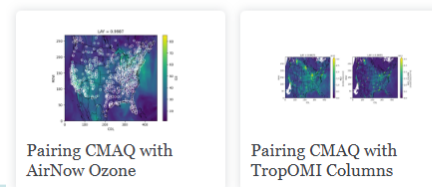
Maps examples

Examples showing how to make specific maps.



Comparison examples

Examples showing comparison of CMAQ to various datasets that illustrate the power of pyrsig.



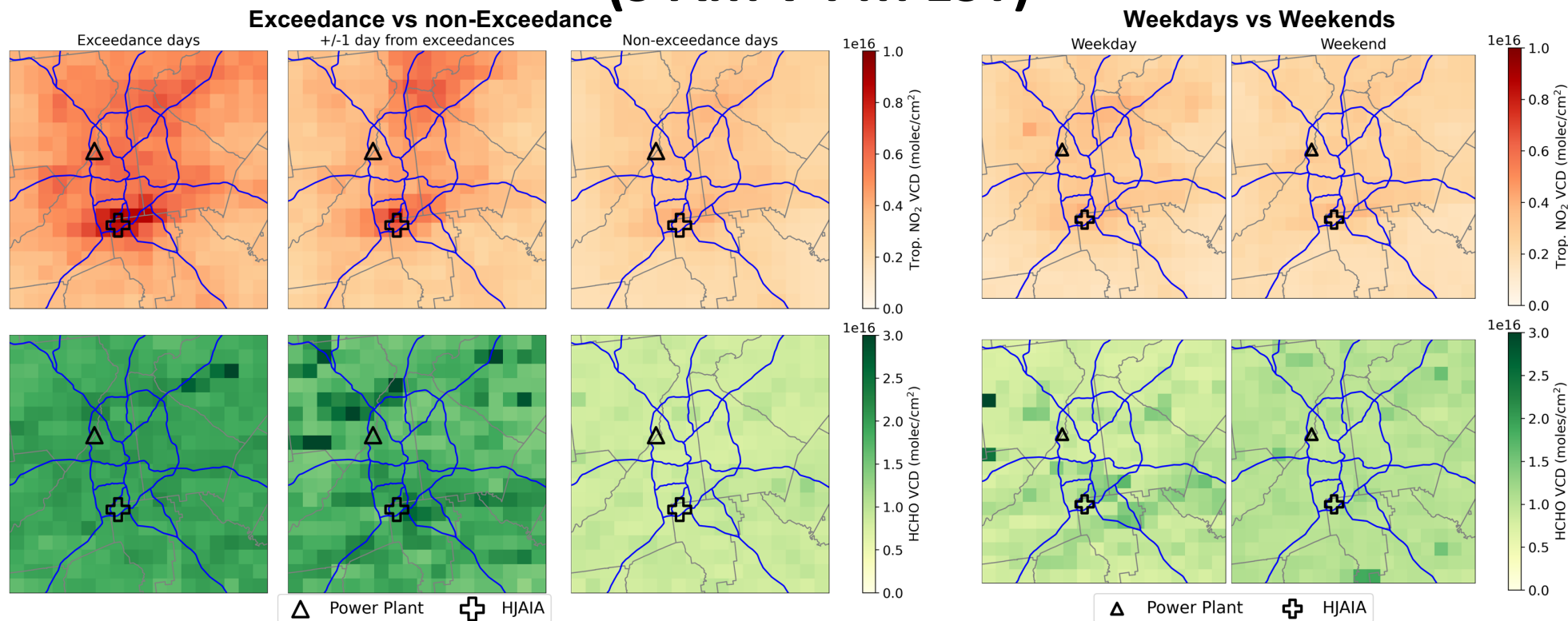
Kudos to Dr. Barron Henderson and EPA's RSIG team!

https://barronh.github.io/pyrsig/auto_examples/index.html





TEMPO NO₂ and HCHO VCDs: March-October 2024 (9 AM-7 PM EST)



With trainings and tools that the TEMPO Early Adopter program and U.S. EPA offered, Georgia EPD has developed its own tool to process and visualize TEMPO data. Special thanks to Dr. Aaron Naeger at NASA for the Early Adopter Program and Dr. Barron Henderson and the RSIG Team at U.S. EPA!

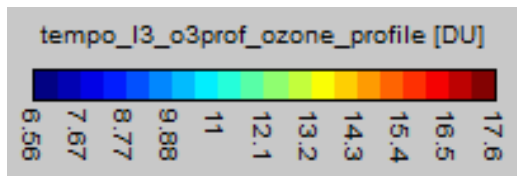
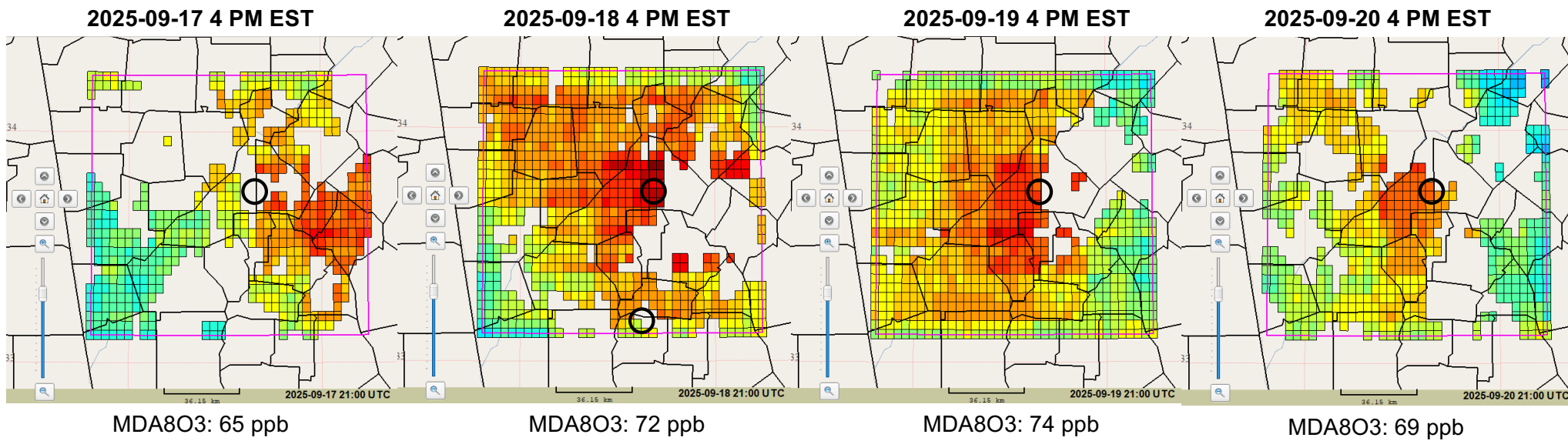


Future Projects with TEMPO Data

- **Understanding high ozone events**
 - Ground ozone concentrations inferred from TEMPO's "ozone profile" data
 - Ozone formation regime (i.e., NO_x vs VOC)
 - Identification of any missing precursor sources
- **Investigating causal-relationships between PM_{2.5} exceedances and fires (both prescribed fires and wildfires)**
- **Examining potential use of satellite derived products**
 - Regional haze (AOD vs visibility)
 - Source-oriented monitoring
 - Background Concentrations for PSD Permit Modeling
- **Developing Top-down Emissions Inventories**



1st Look at O₃ Profile Data

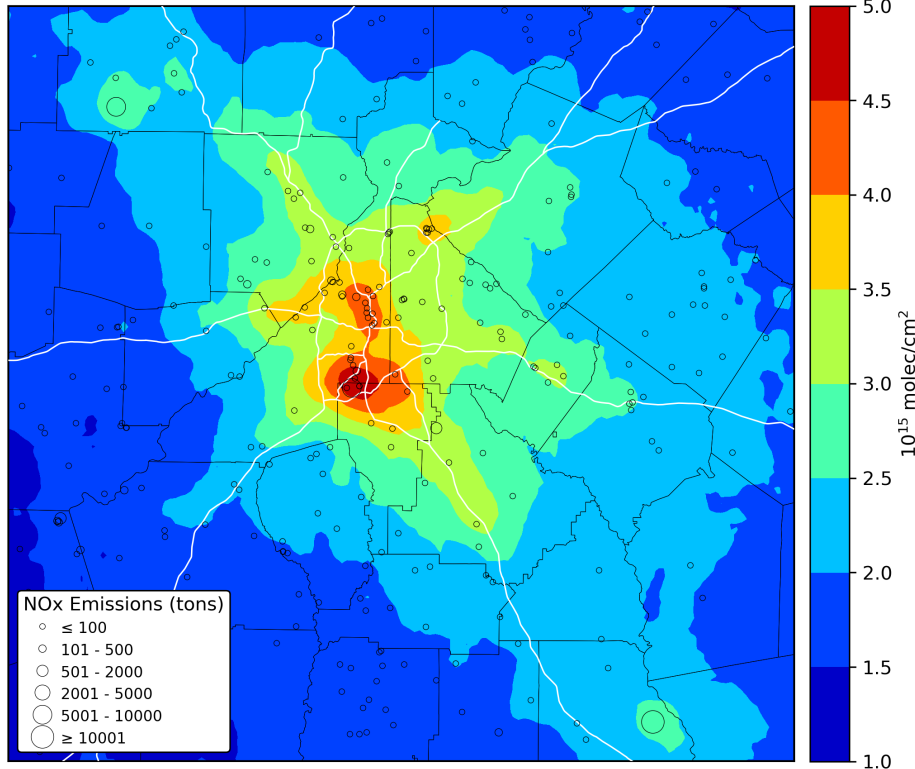


Thanks to EPA's RSIG team!

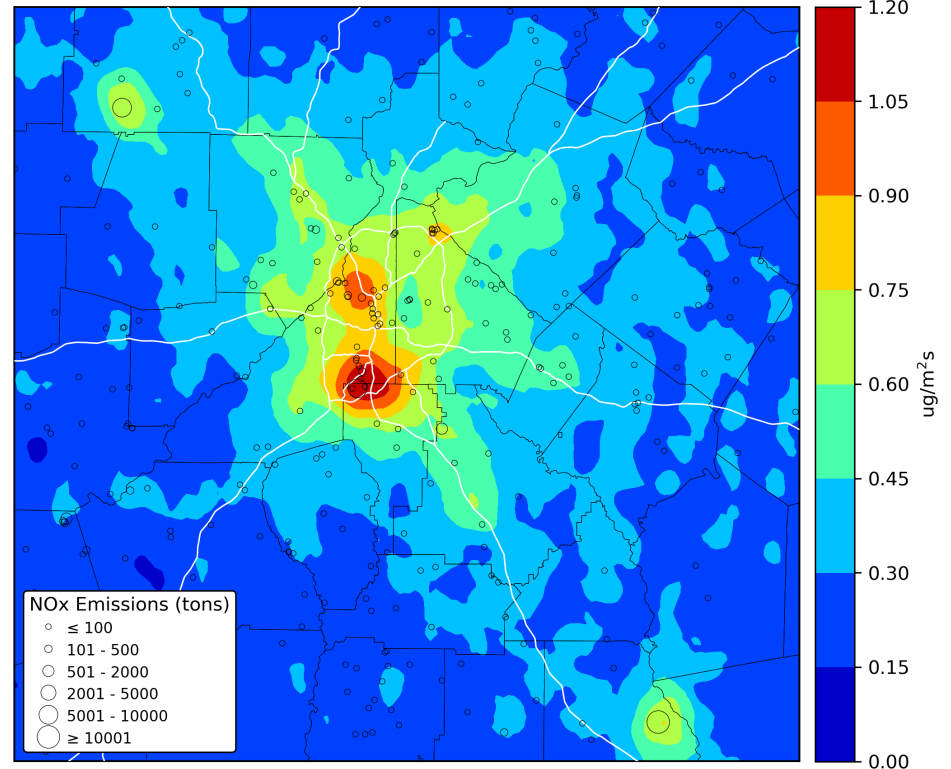


Top-Down NO_x Emissions Estimates

Mean of TROPOMI NO₂ VCD over Atlanta (10/2/2019-9/29/2021)



Mean of TROPOMI NO₂ Emission over Atlanta (10/2/2019-9/29/2021)



This example is from Dr. de Foy at Saint Louis University processing TROPOMI data with the flux divergence method and a Gaussian mixture model.

Georgia EPD plans to develop its own top-down emission datasets.



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Questions?

