Maryland
Department of
the Environment

GeoXO ACX Instrument & Maryland Air Quality

May 9, 2024

GeoXO ACX Science Team Meeting

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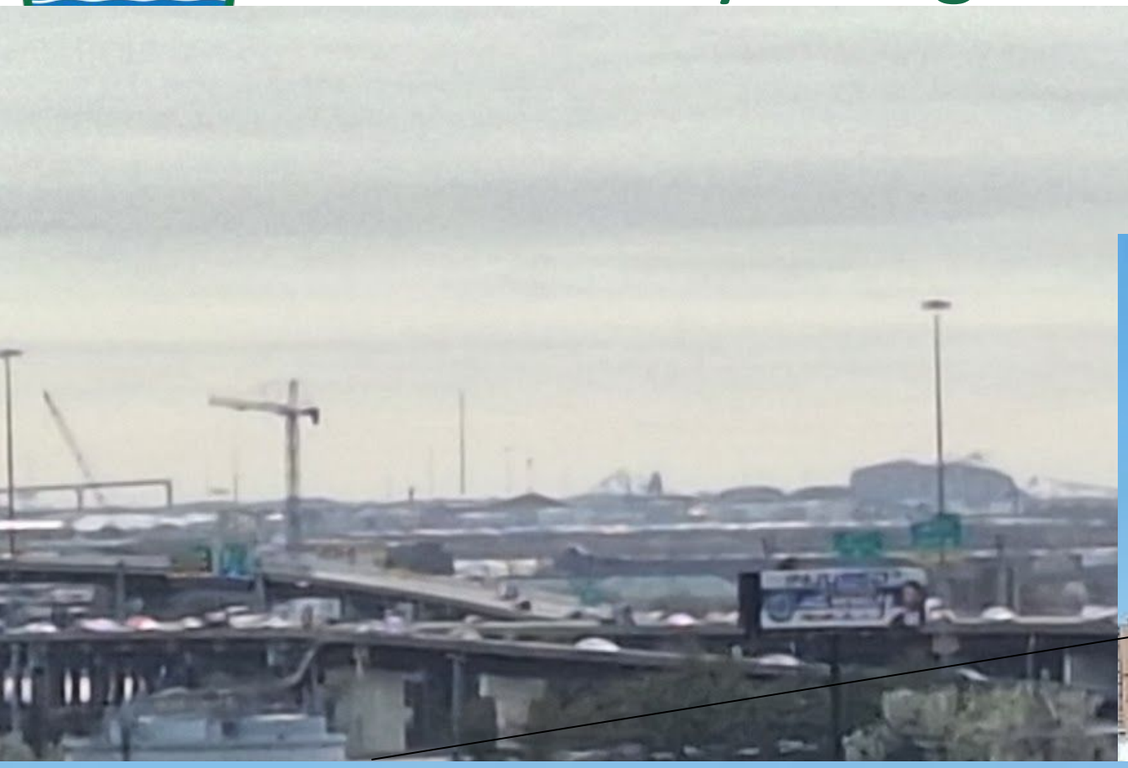
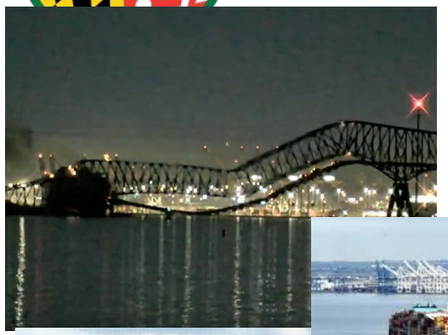
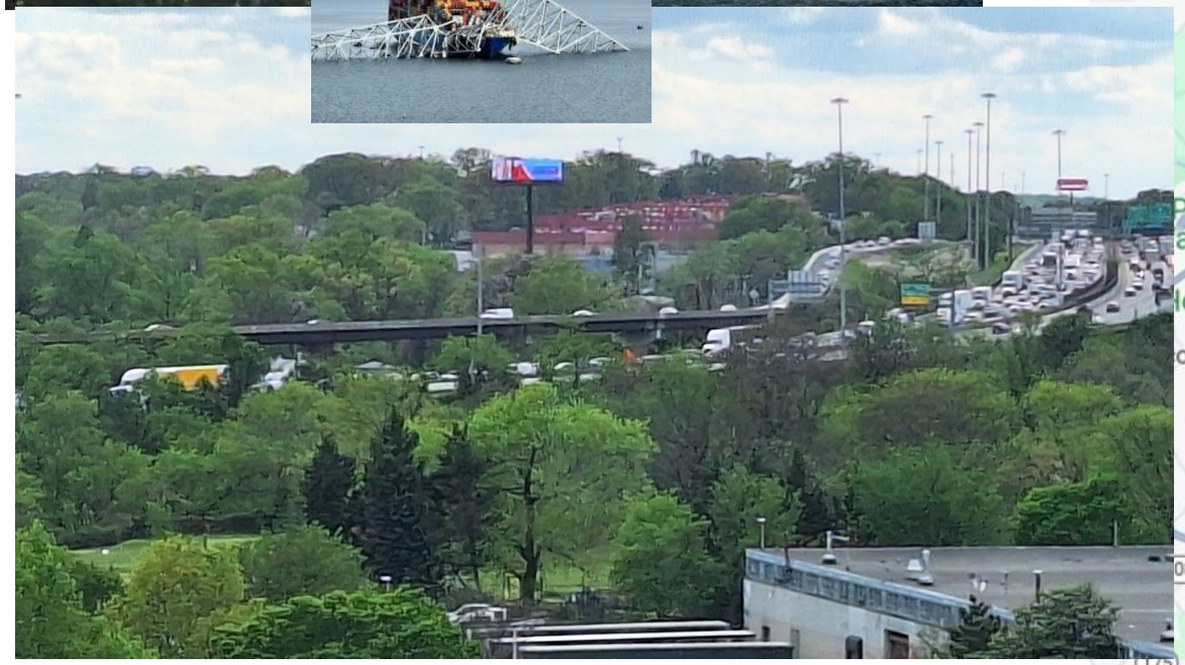
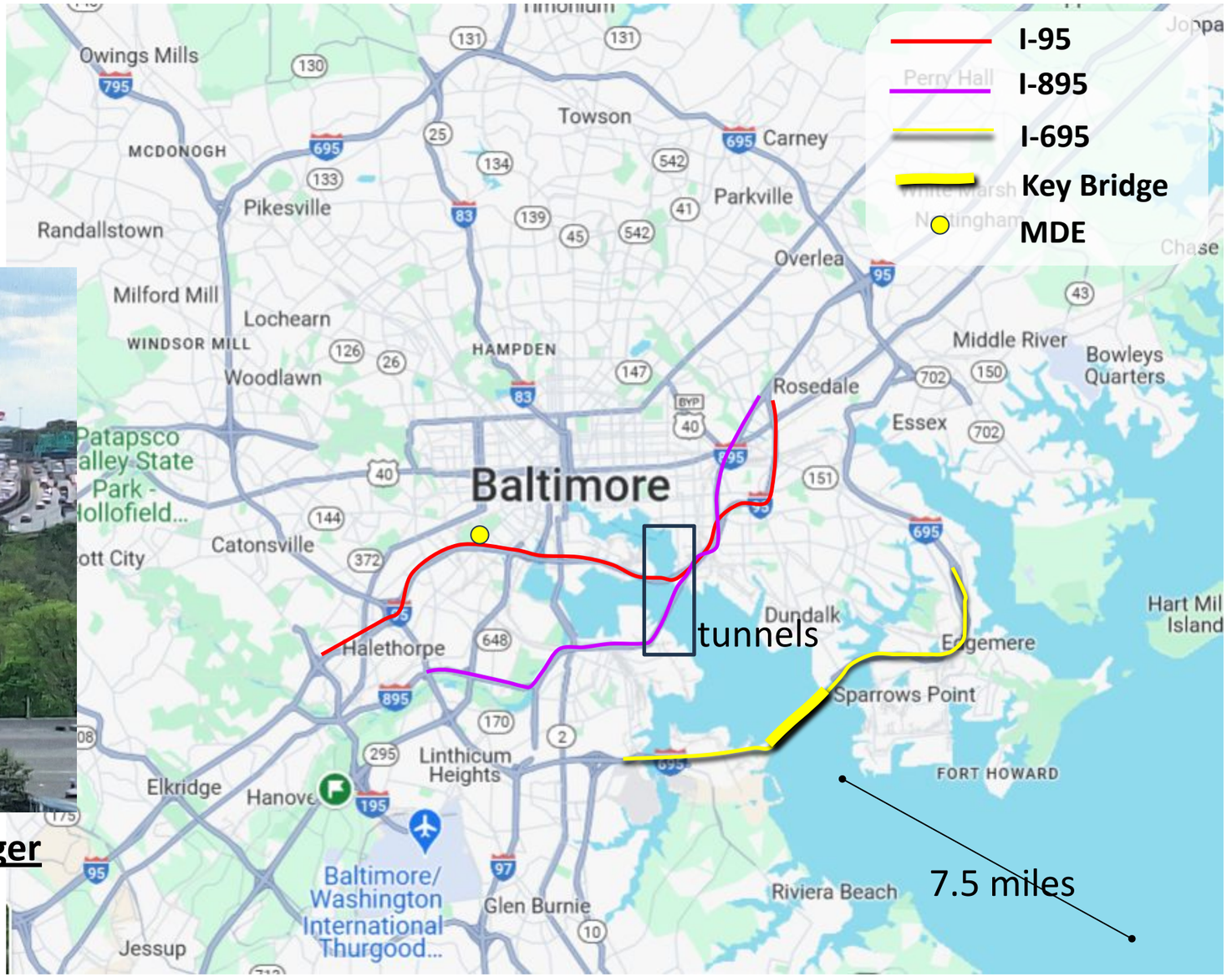
The Key Bridge and The Dali from MDE offices



Key Bridge Collapse







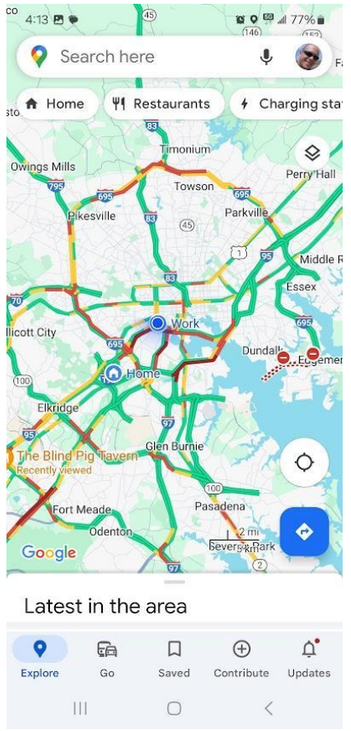
Traffic on I-95 is now backed up around **2-3 miles longer** than it was prior to the collapse on the WEST side

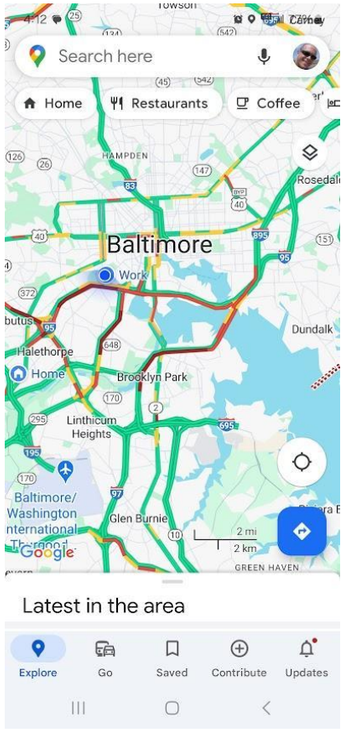
**I clocked a 3.7-mile backup just from my work exit

**Colleagues are sharing stories that 20–25-minute commutes are now closer to 1 hour

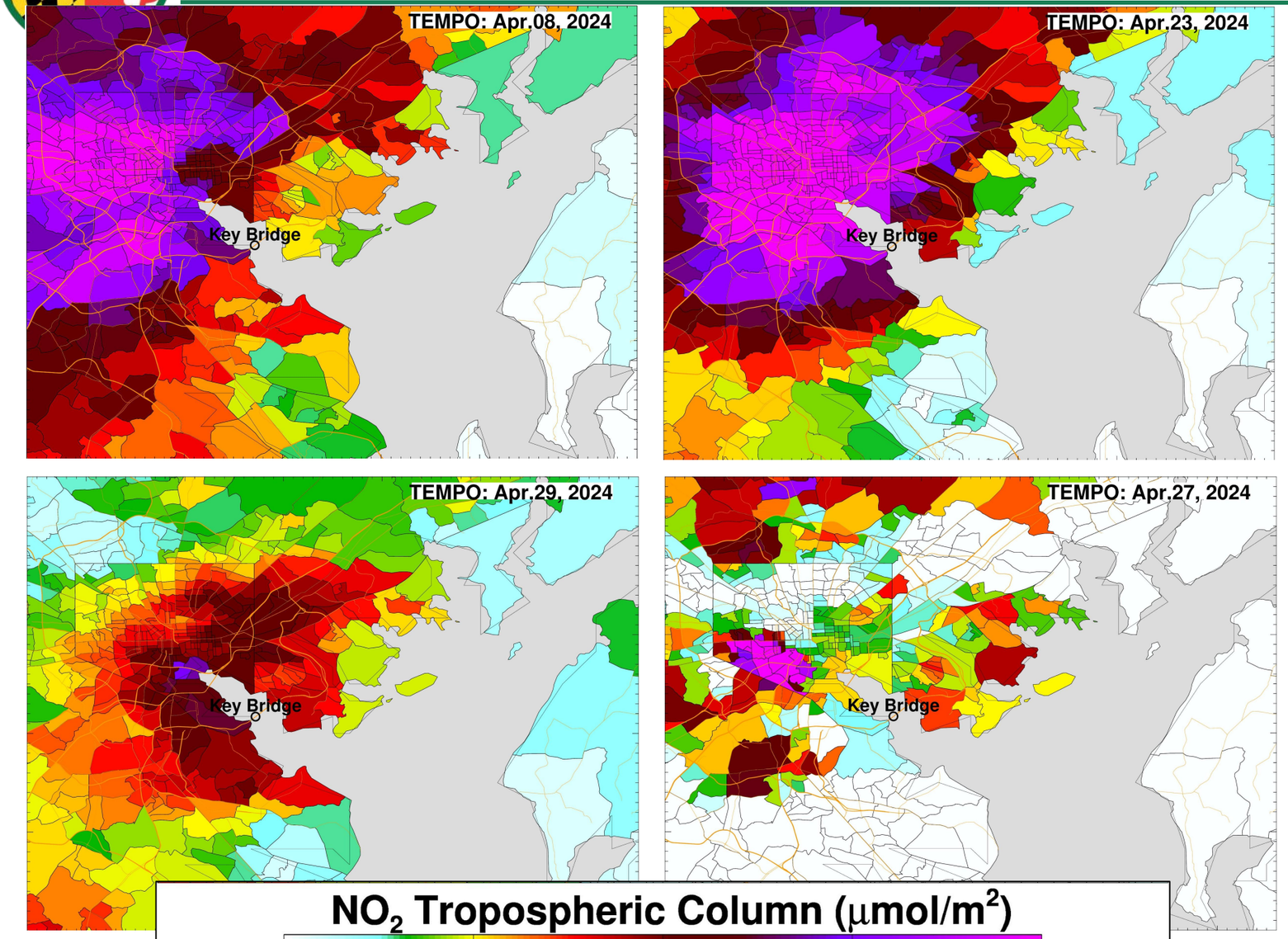
Traffic Change Summary

- Large fraction of rerouted traffic
  - Larger perturbations in trip times and speed resulting in altered mobile sector emissions profiles
  - A potential large fractional change with ‘vented’ tunnels, acting like a point source
  - Diesel reroutes probably most significant change to consider in the mobile sector
  - Heavy diesel through neighborhoods?
- Unknown impact from the Port Operations
  - Reduction in ship number
  - Reduction in drayage supporting vehicles??
  - Increase in salvage operations





TEMPO in Census Tracts Provided by Dr. Shobha Kondragunta



- Daily Average Retrievals
  - Before and After the Key Bridge Collapse
  - Allow community by community inspection for patterns
  - Address questions of Environmental Justice (EJ) as well as changing emission patterns for NAAQS questions
- Eventually hourly changes assessed
  - Apply to model framework

Not screened for solar zenith angle and cloud contamination

Unofficial TEMPO Data: Not for Public Release

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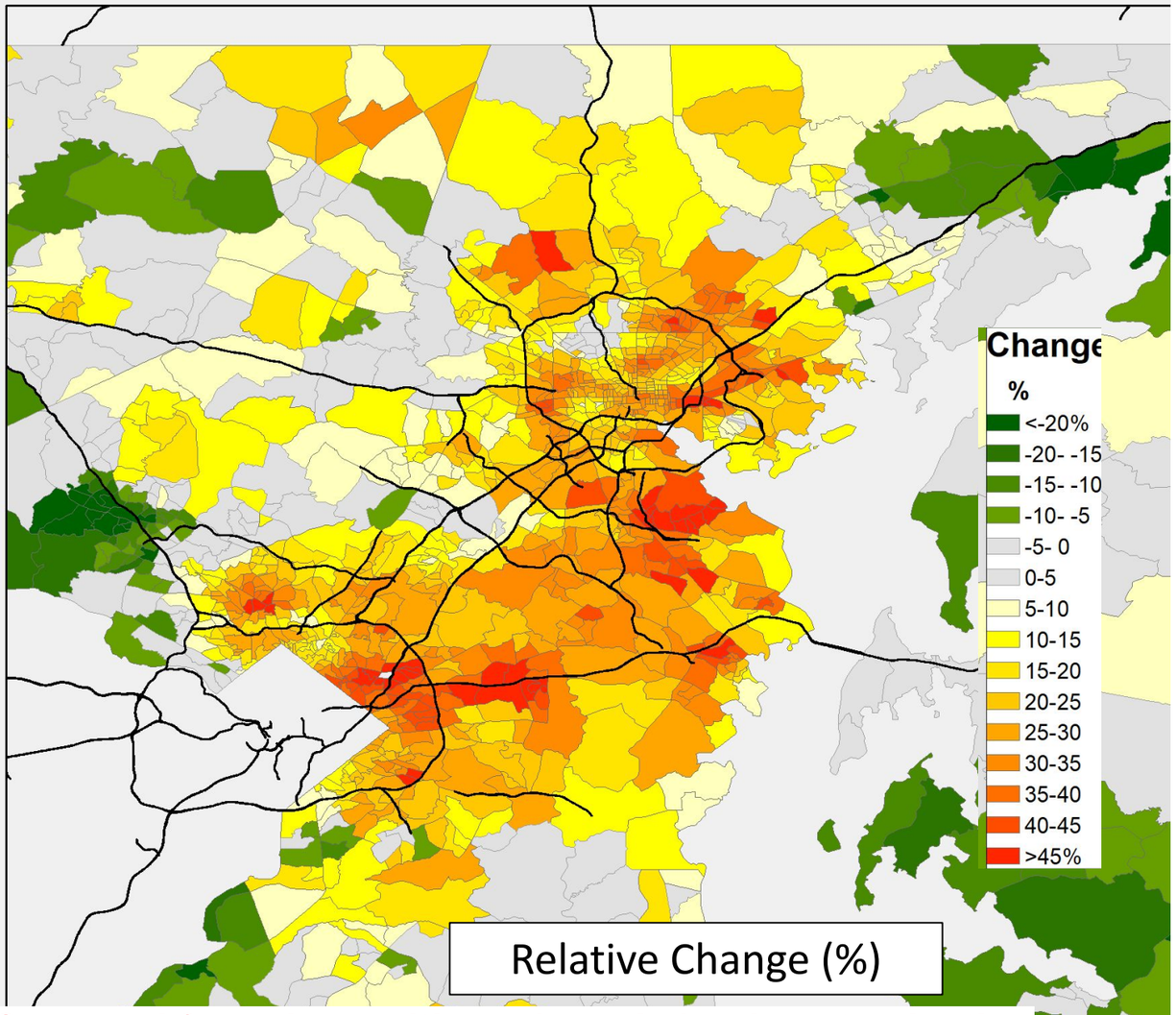
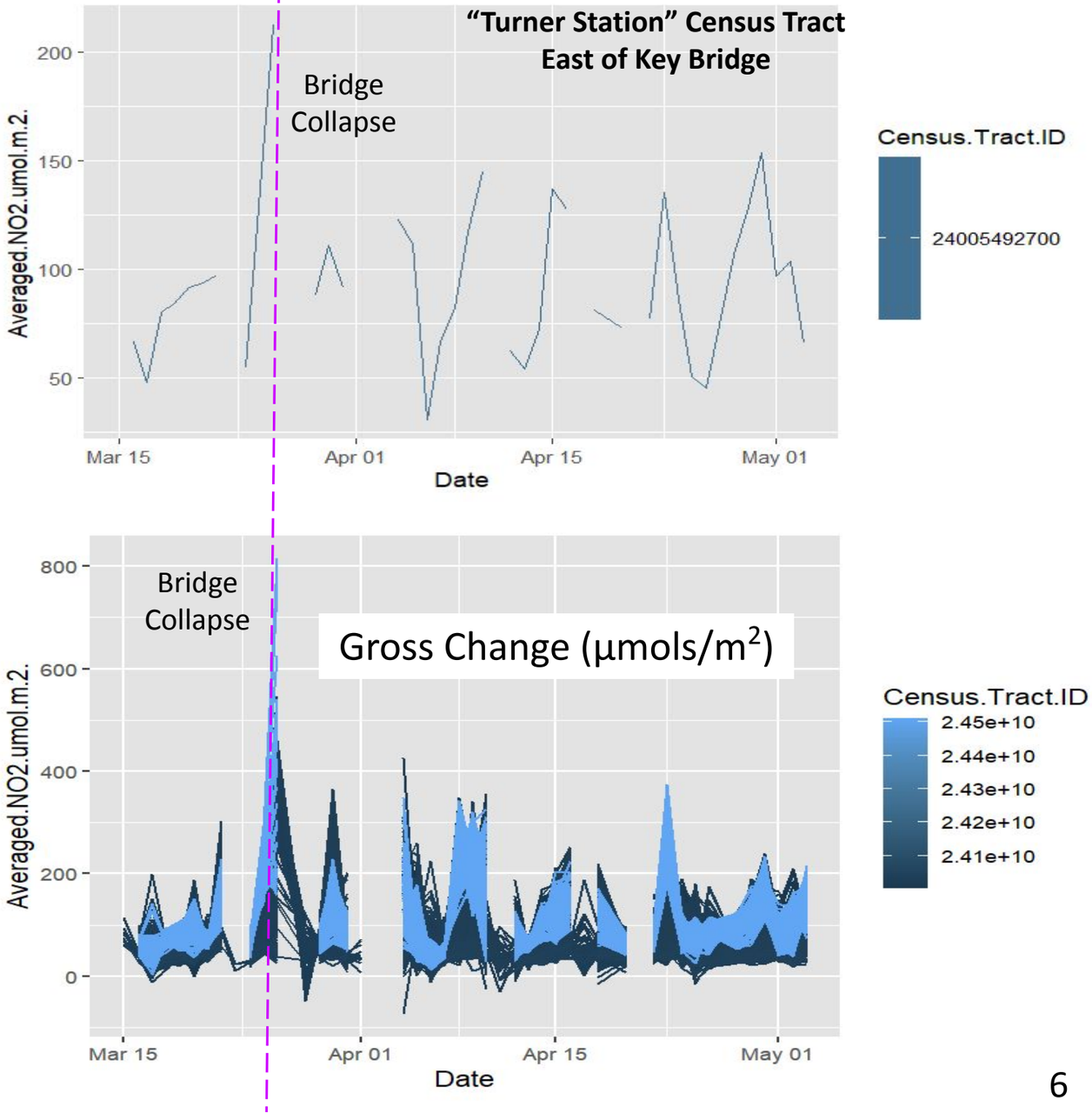


Relative Change (%)



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- NO2 changes do NOT account for intra-annual VMT trends!
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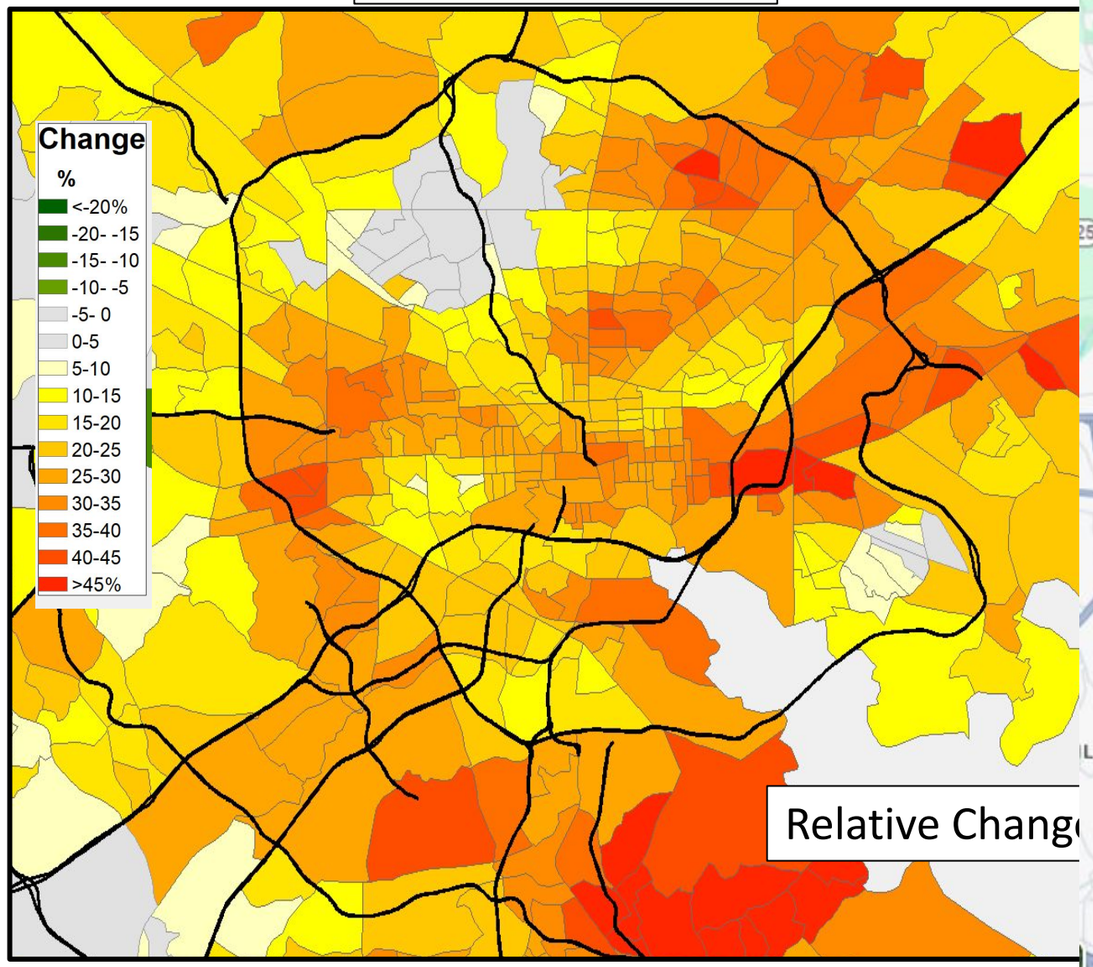
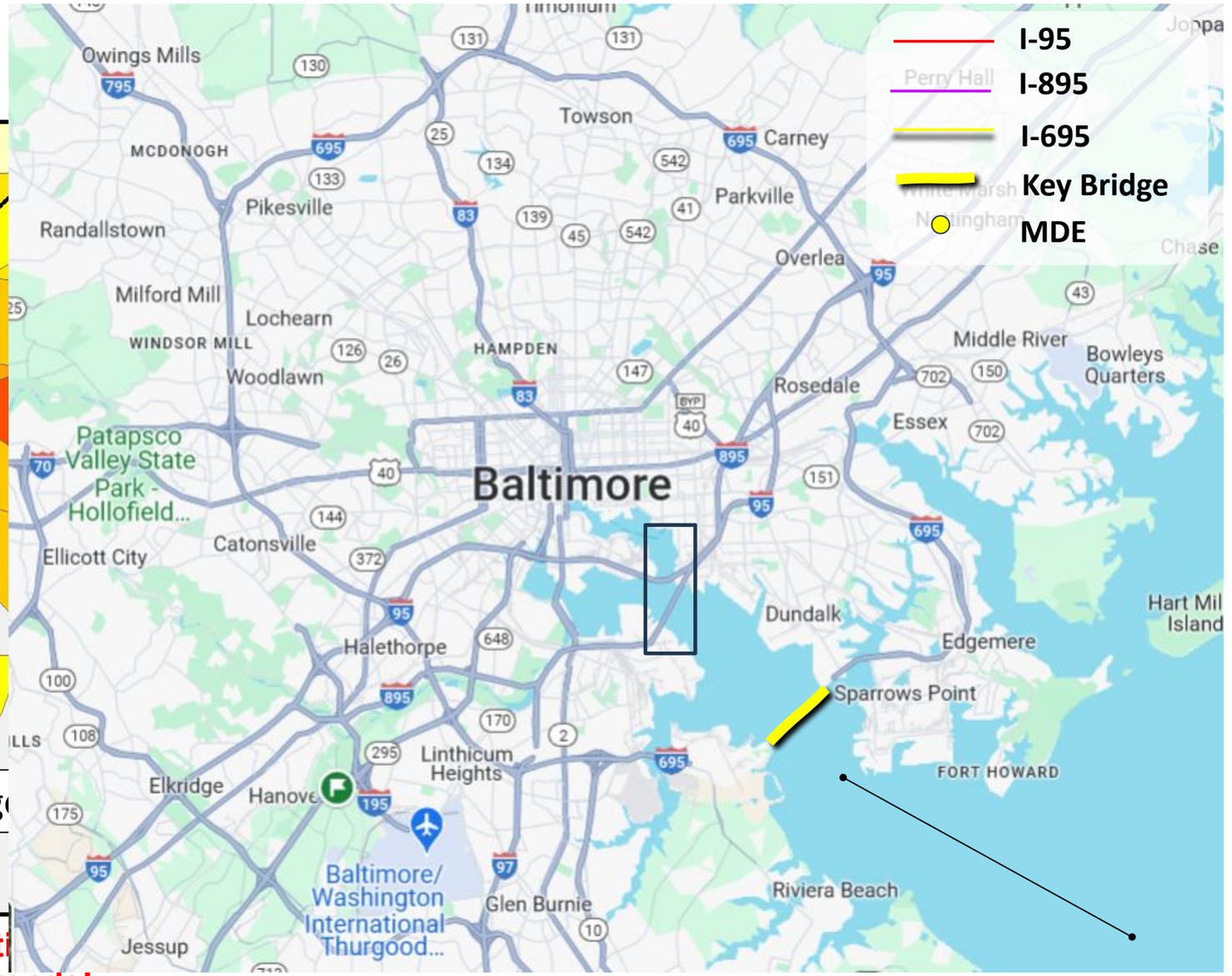
TEMPO in Census Tracts Provided by Dr. Shobha Kondragunta

Baltimore Zoom





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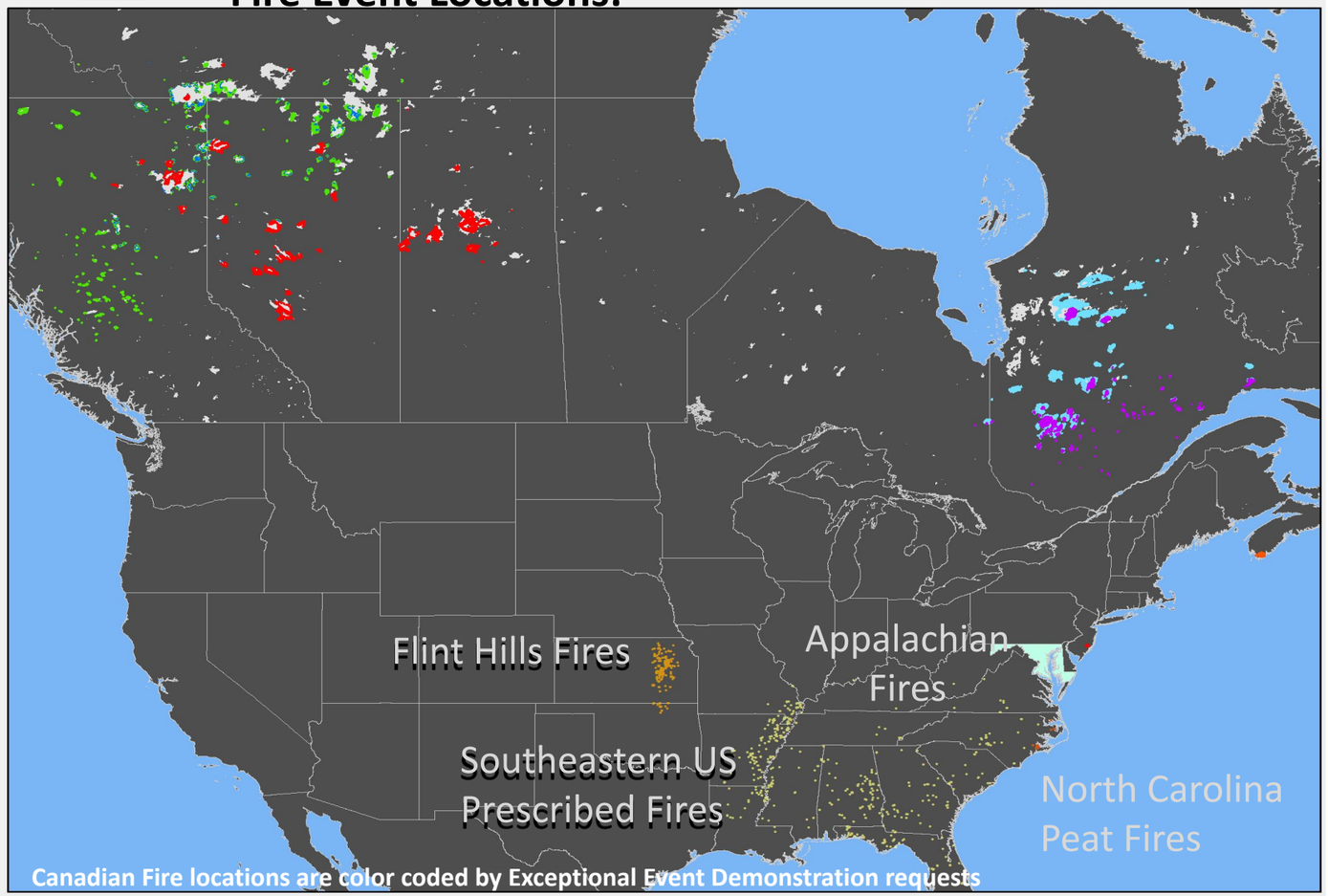
Wildfires: Maryland 2023 Smoke Event Impacts on Air Quality

Fire Event Locations:



Fire Events Affecting Maryland

Date	Fire Event/Source	Remarks; Color Peak AQI
March 27	NC Peat Fires	“Plastic Smell” in DC
April 4	MD, Soldiers Delight	Local Fire 321 Acres
April 13	Flint Hills, SE US	Ozone Ex
April 22	SE US, NC Peat Fires	Ozone/smells
May 12	Al. & Sk. Canada	Ozone
June 1 - 3	Al., Sk., N.S., & NJ US	Ozone
June 6-9	Quebec (Qc)	Ozone & PM
June 11	Qc & SE US (aged)	Ozone
June 15	Qc (aged)	Ozone
June 19	Qc (aged)	Ozone
June 29-30	Qc	Ozone & PM
July 11-13	Al. & Sk.	Ozone
July 17-18	Bc., Al., & Sk.	Ozone & PM (12-12 Ex)
July 26 & 28	Bc. & Al.	Ozone

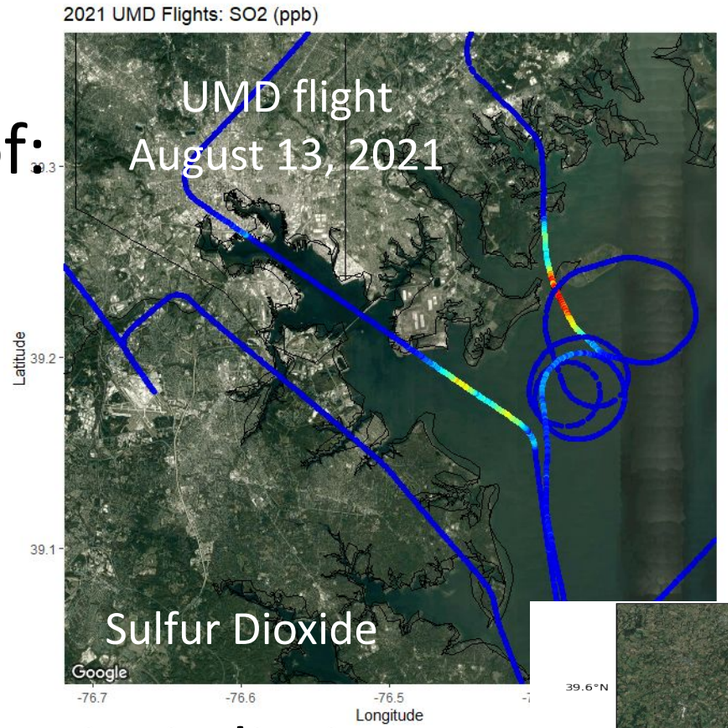
- **Over 18,400,000 hectares burned in Canada alone; An area greater than the size of the State of Missouri.**
- **Controlled burns happen regularly, but earlier warmth may cause increasing impacts on air quality**

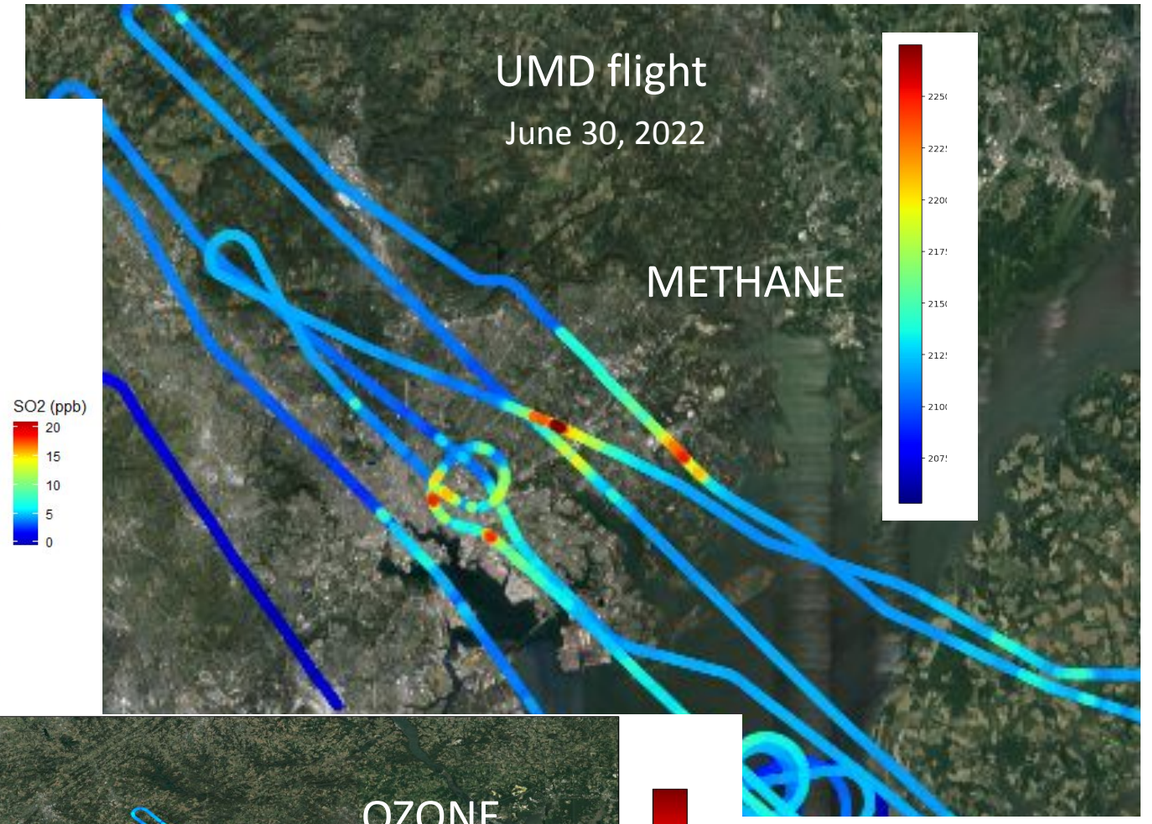
13 events impacted air quality on 23 days in 2023, resulting in 25* violations of Federal standards, or 96% of the violating days in 2023.

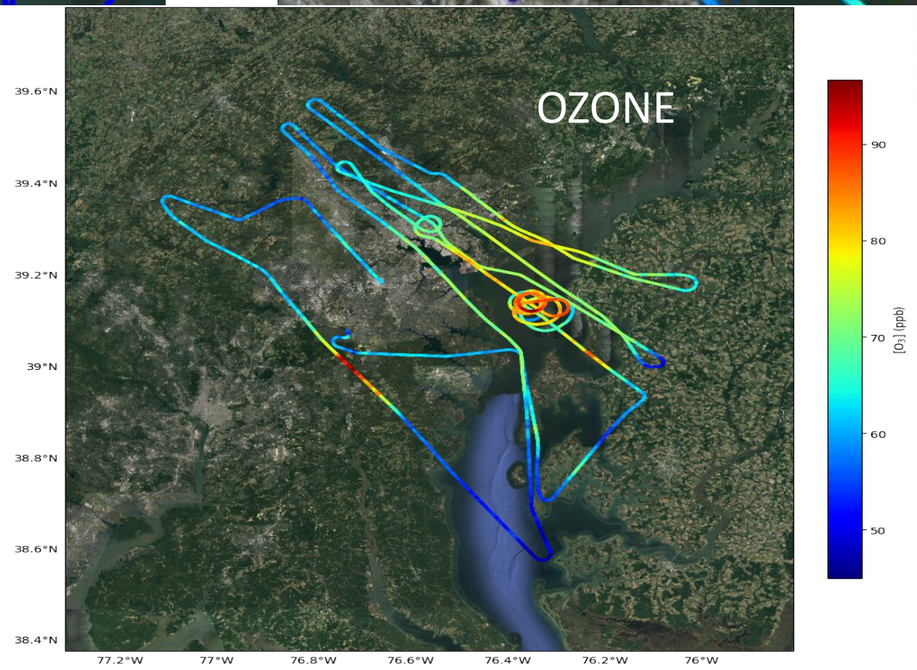
*19 ozone exceedances with evidence of smoke + 5 official midnight to midnight PM2.5 exceedances + 1 noon to noon PM2.5 ‘exceedance’

Plumes and Transport

- We see plumes of:
  - NO2
  - Methane
  - Ozone
  - Smoke
  - Etc.
- Transport between jurisdictions
  - Assess culpability & attribution
  - Modeling
  - Attainment
  - Environmental Justice



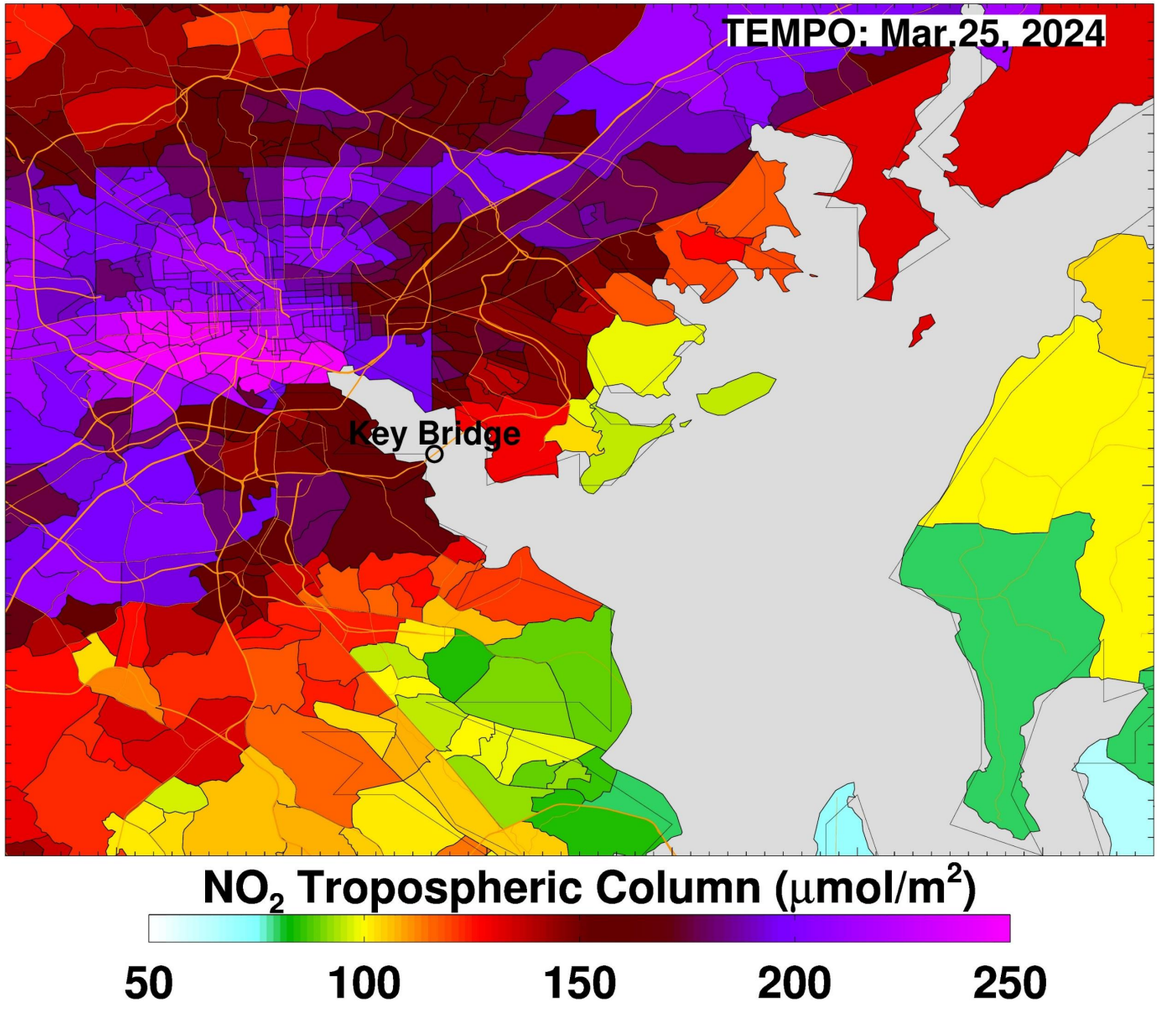




Summary of Needs and a Recommendation

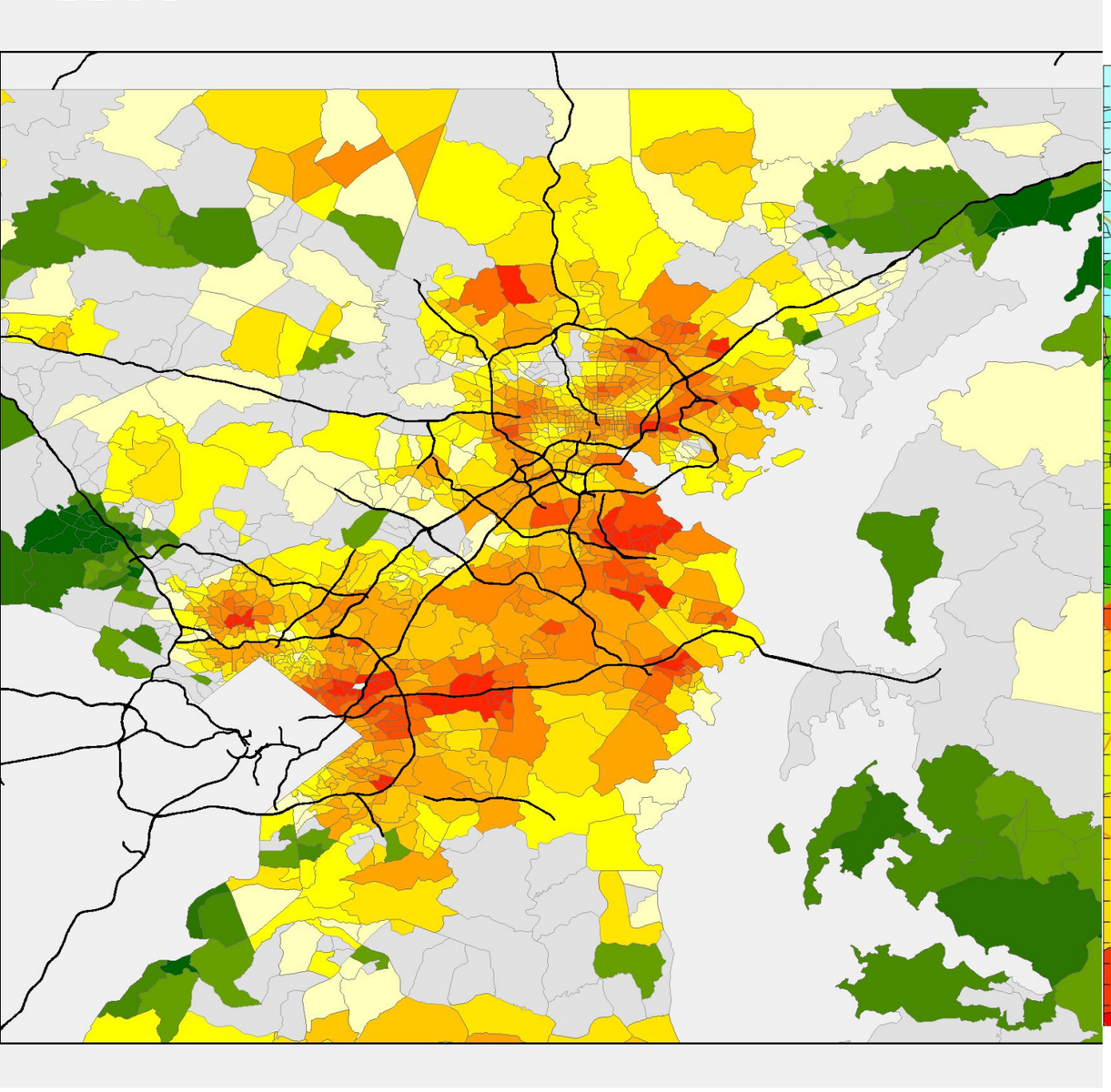
- High resolution data
  - Temporally
  - Spatially

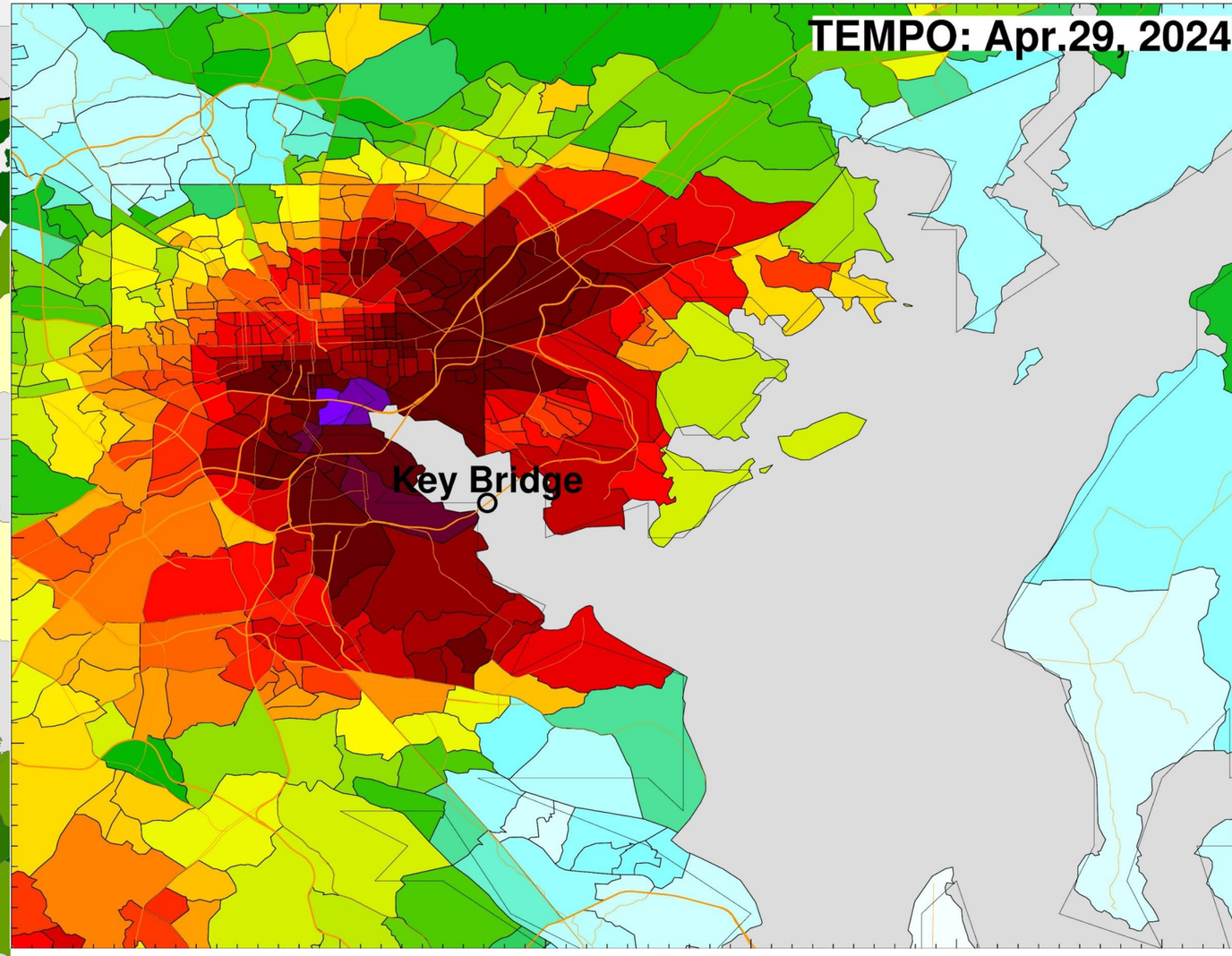
- … in support of:
  - Event Responses
  - Decision Making (forecasting, modeling experiments)
  - Forecasting/Warning/Communicating AQ
  - Modeling (perturb/correct emissions)
  - Attainment Demonstrations
  - Environmental Justice Initiatives
  - Community Concerns



- Idea/Recommendation:
  - Use IR channels for nocturnal ozone transport

THANK YOU





Goal: Modeling of the situation

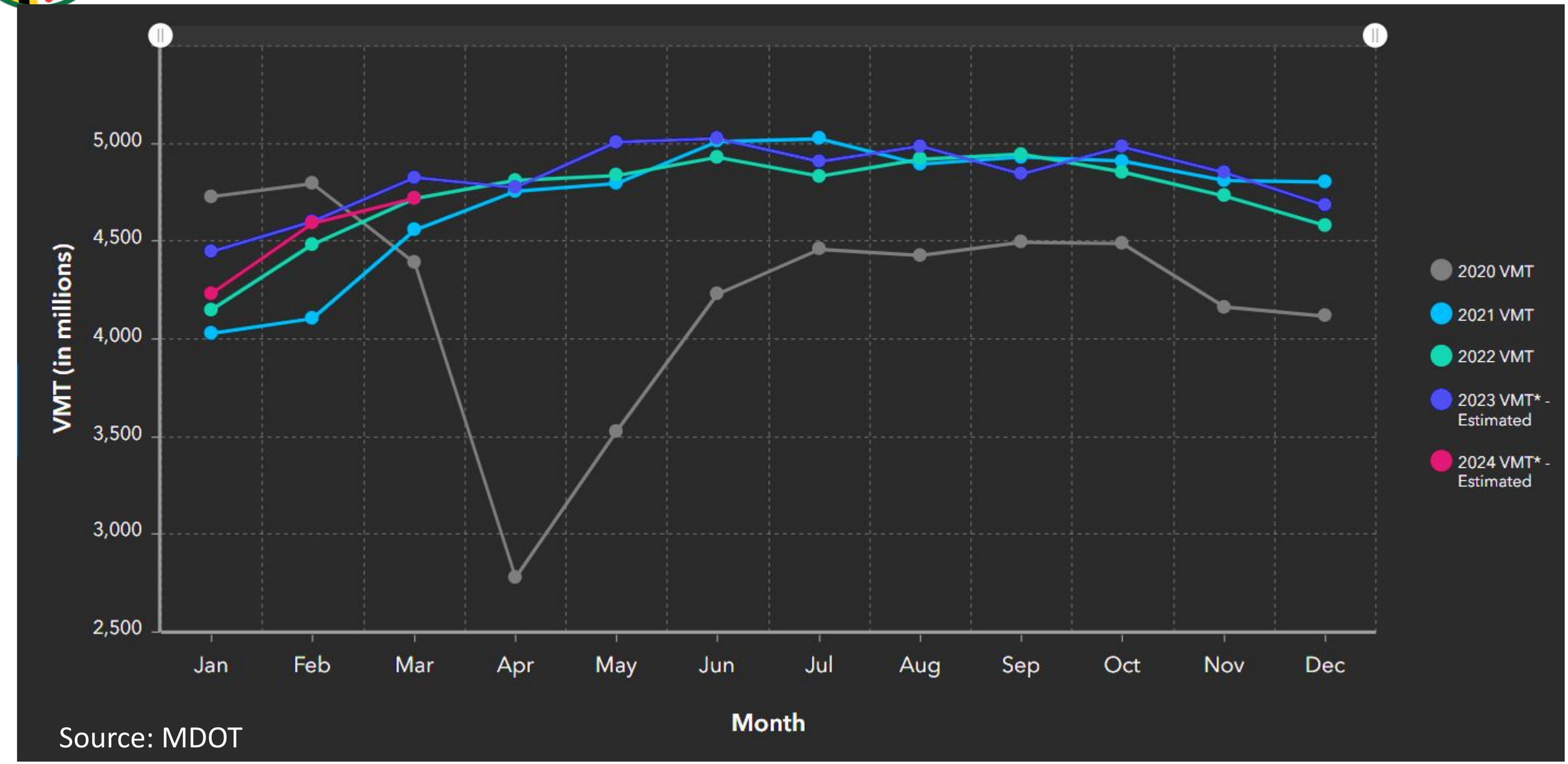
Key Modeling Scenarios:

- Air Quality with Business as usual
- Air Quality with Port Closed and Traffic Perturbed
- Air Quality with Port Open and Traffic Perturbed

June or July 2024 meteorology to drive 2 week to 1 month simulation

Where we need help: <u>Temporalizing NO2 and VOC profiles to mimic the traffic diversion patterns</u>

Total VMT



Source: MDOT

https://experience.arcgis.com/experience/b3dacc0b17b54902b2d6c05ced66c7cf?dlg=Window-VMT-Trends&org=maryland

Freight VMT

Source: MDOT

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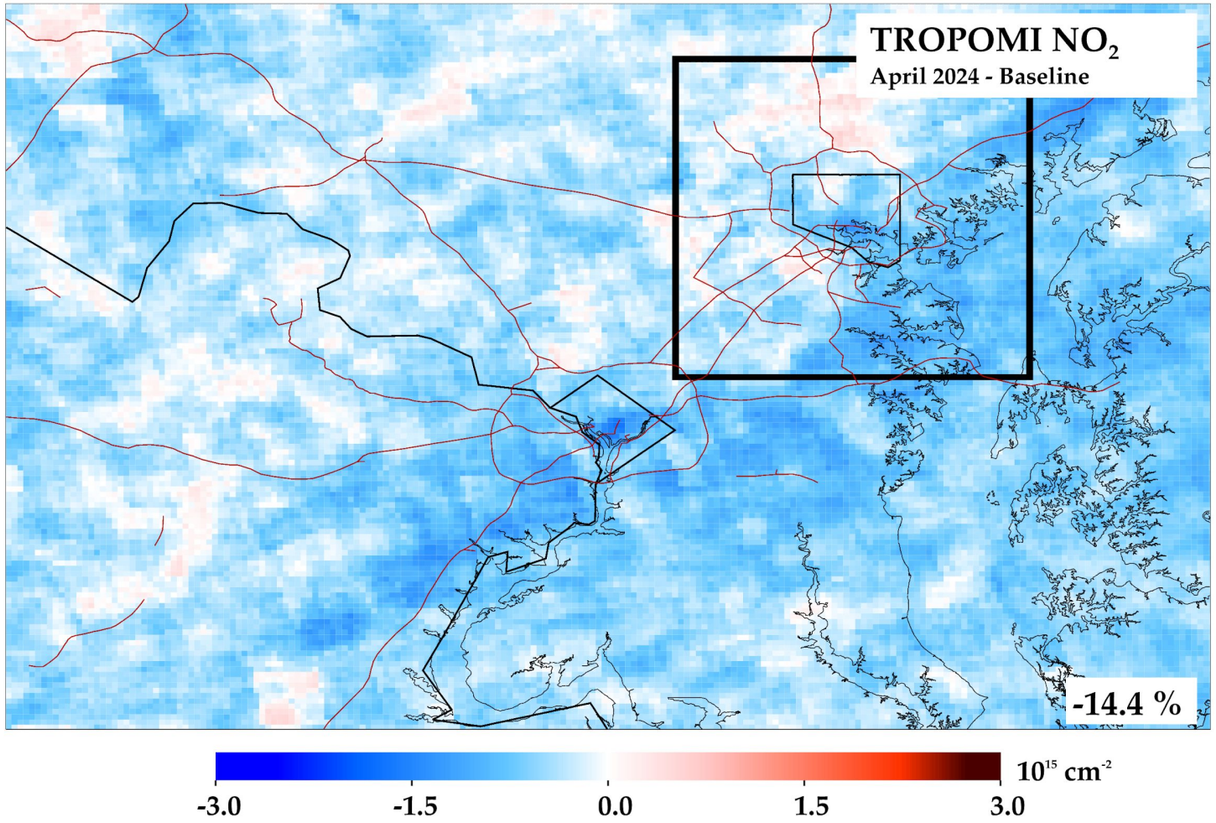
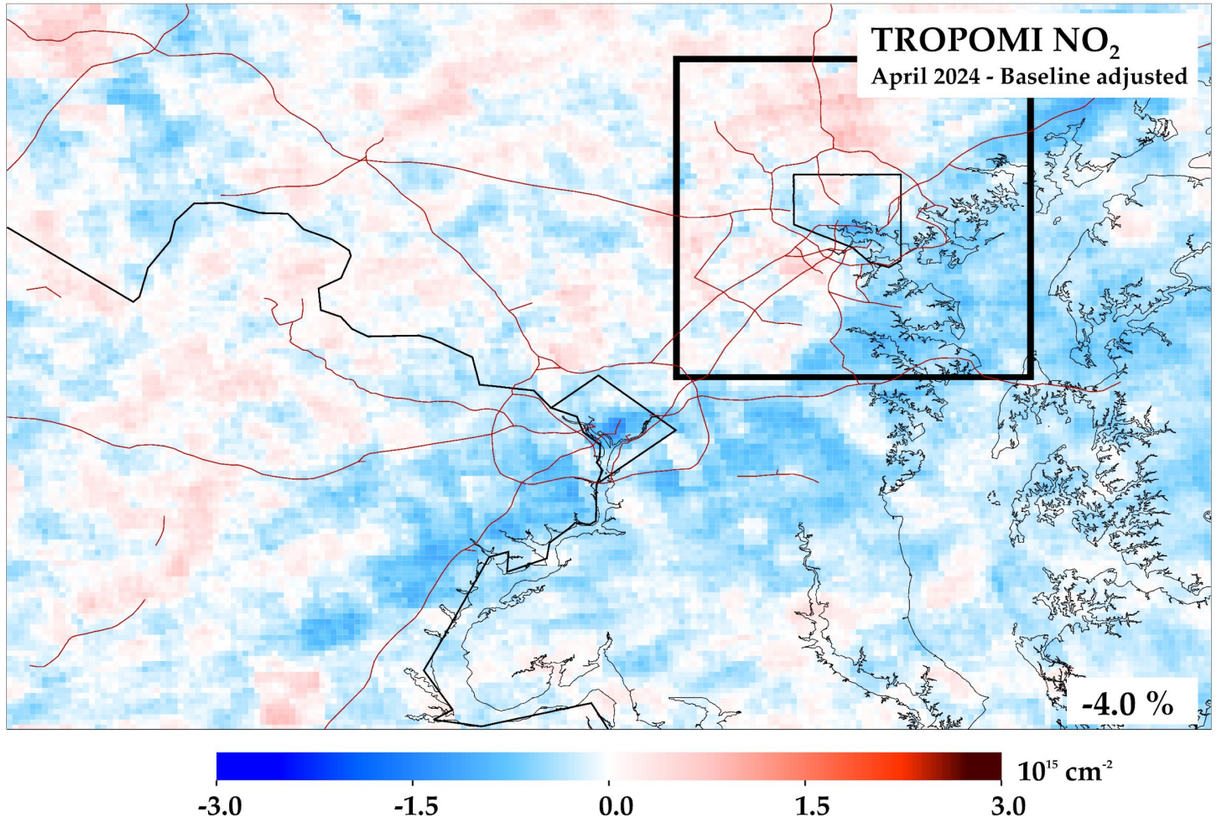
Dan Goldberg – TROPOMI review





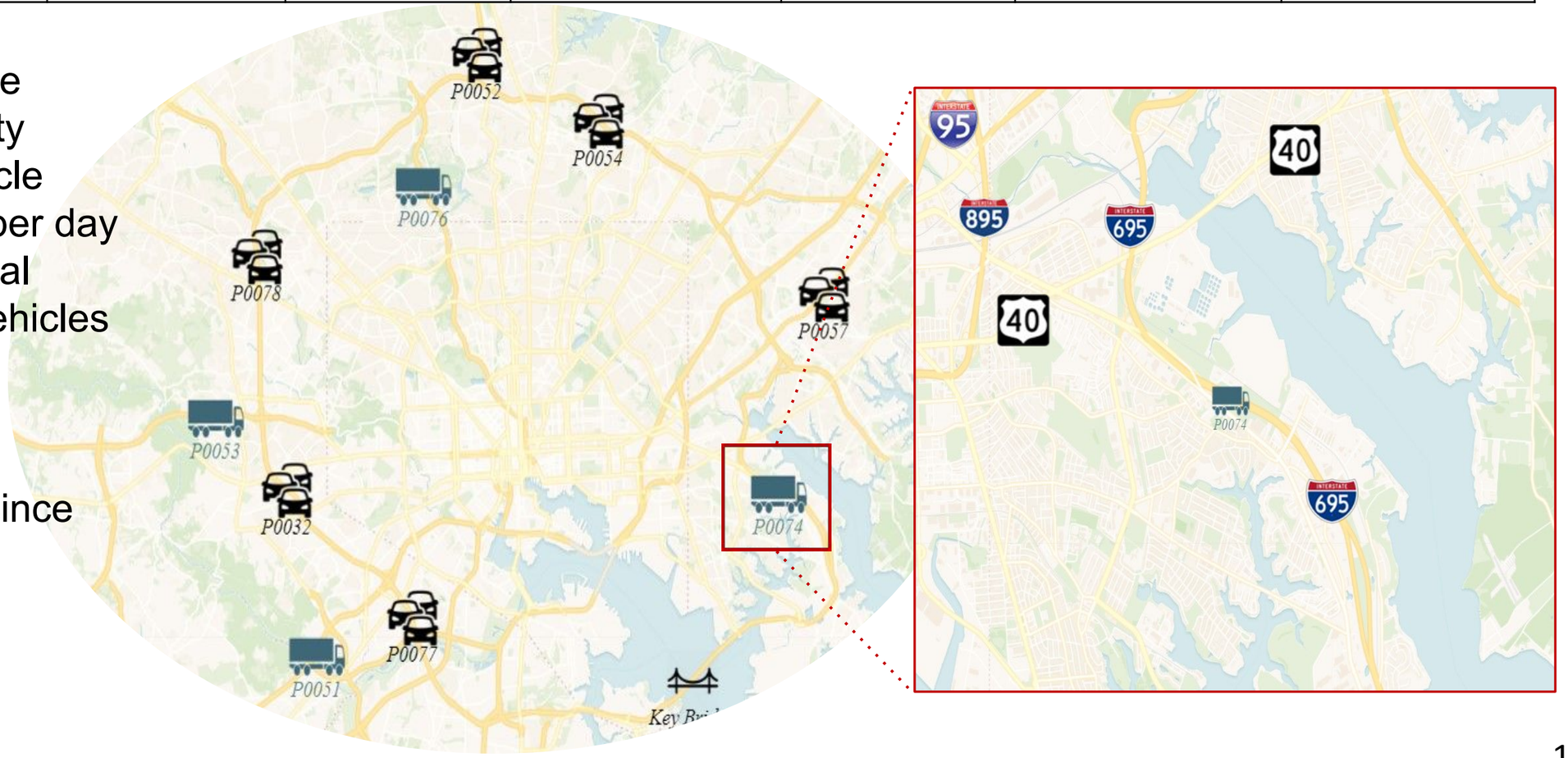
Adjusted so the inflow into the region in 2024 matches inflow into region of the previous years

Less NO2 in Port area, more NO2 around Baltimore Beltway and I895, but nothing statistically significant.

P0074 Volume Details

Location	Station ID	2023 AVG Vehicle Count	March 23 AVG Vehicle Count	April 23 AVG Vehicle Count	AVG Vehicle Count from 3/26/24	%deviation from 2023 mean	%deviation from March23 mean	%deviation from April23 mean
I-695 near Trappe Rd	P0074	35232	35875	34609	25061	-28.87	-30.14	-27.59

- Located on the Baltimore Beltway, southeast of city
- 2023 average total vehicle count: 35,232 vehicles per day
- March 2023 average total vehicle count: 35,875 vehicles per day
- April 2023 average total vehicle count: 34,609
- Average vehicle count since 3/26/24: 25,061



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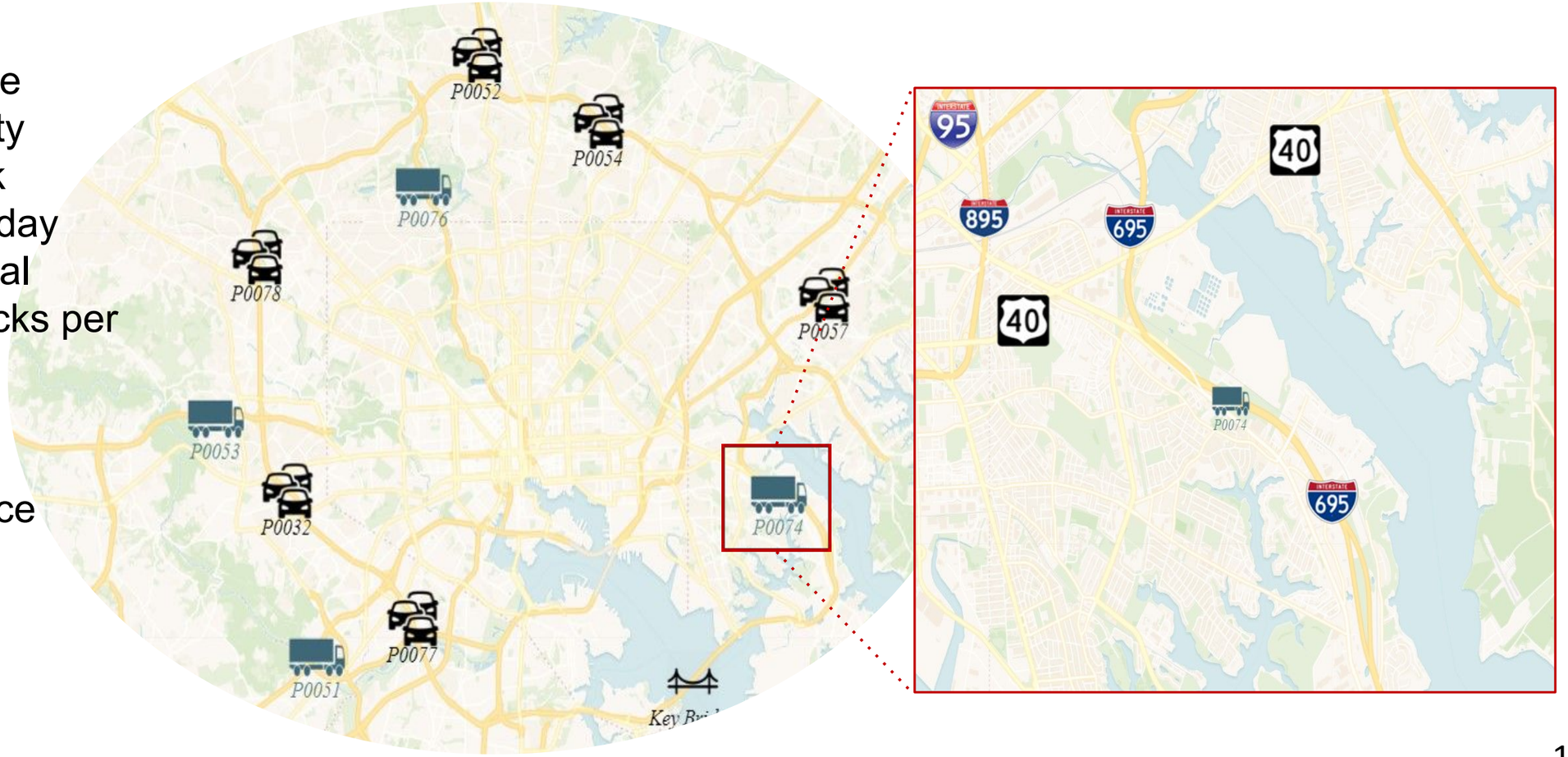
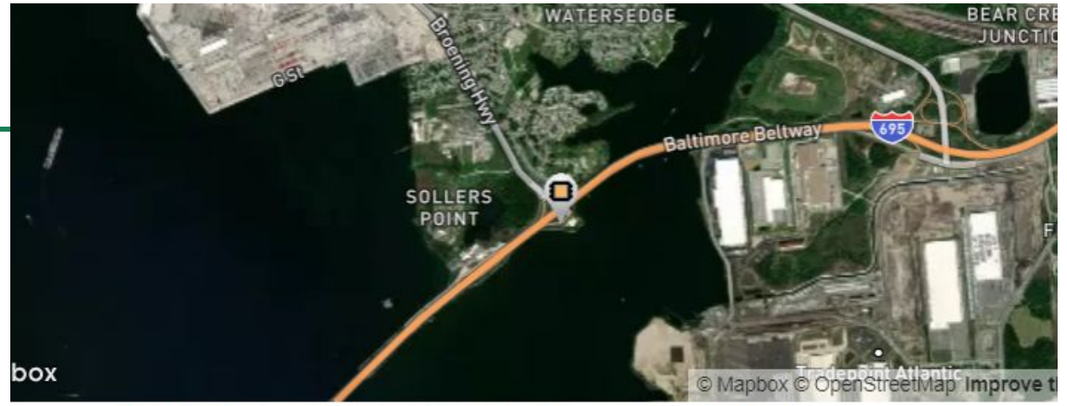
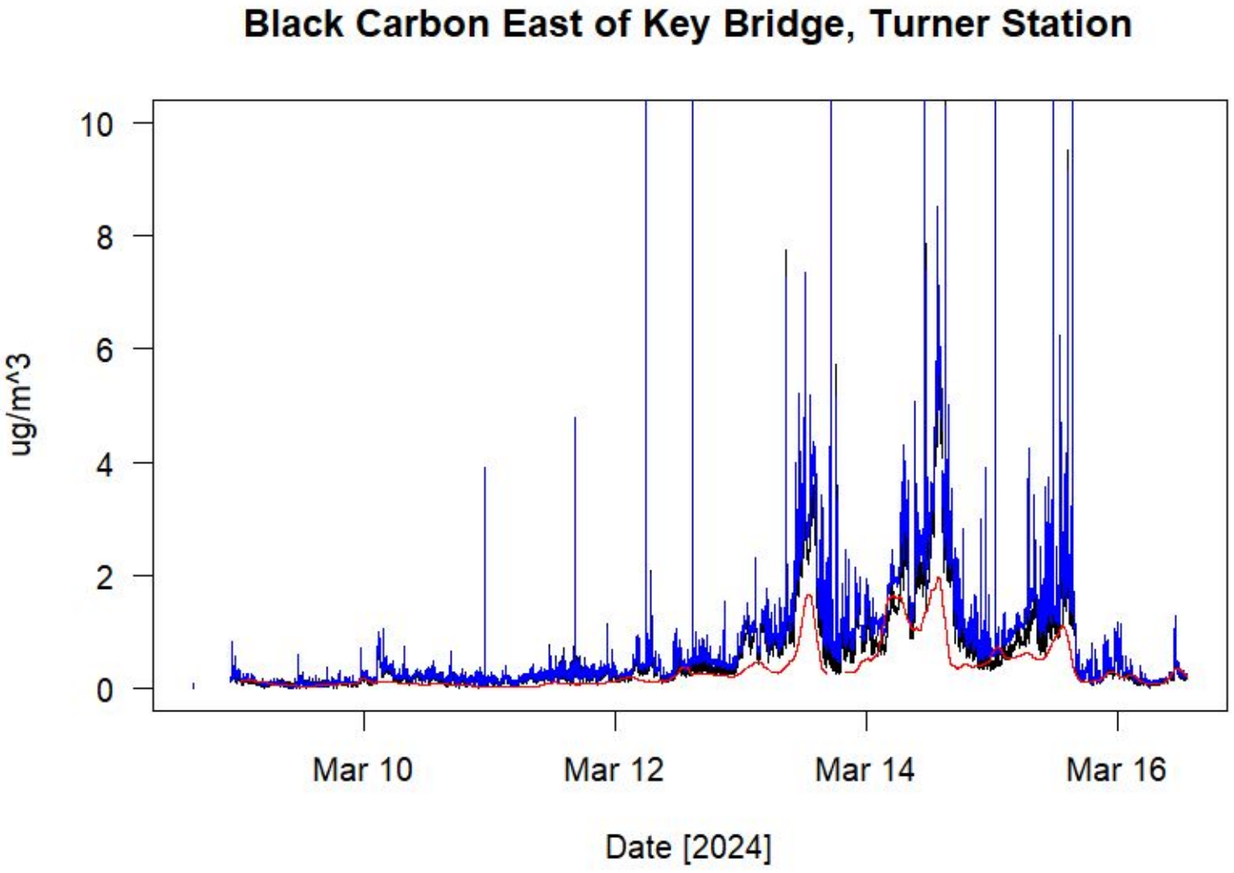
I-695 near Trappe Rd	P0074	2941	3091	2759	2990	1.65	-3.27	8.38

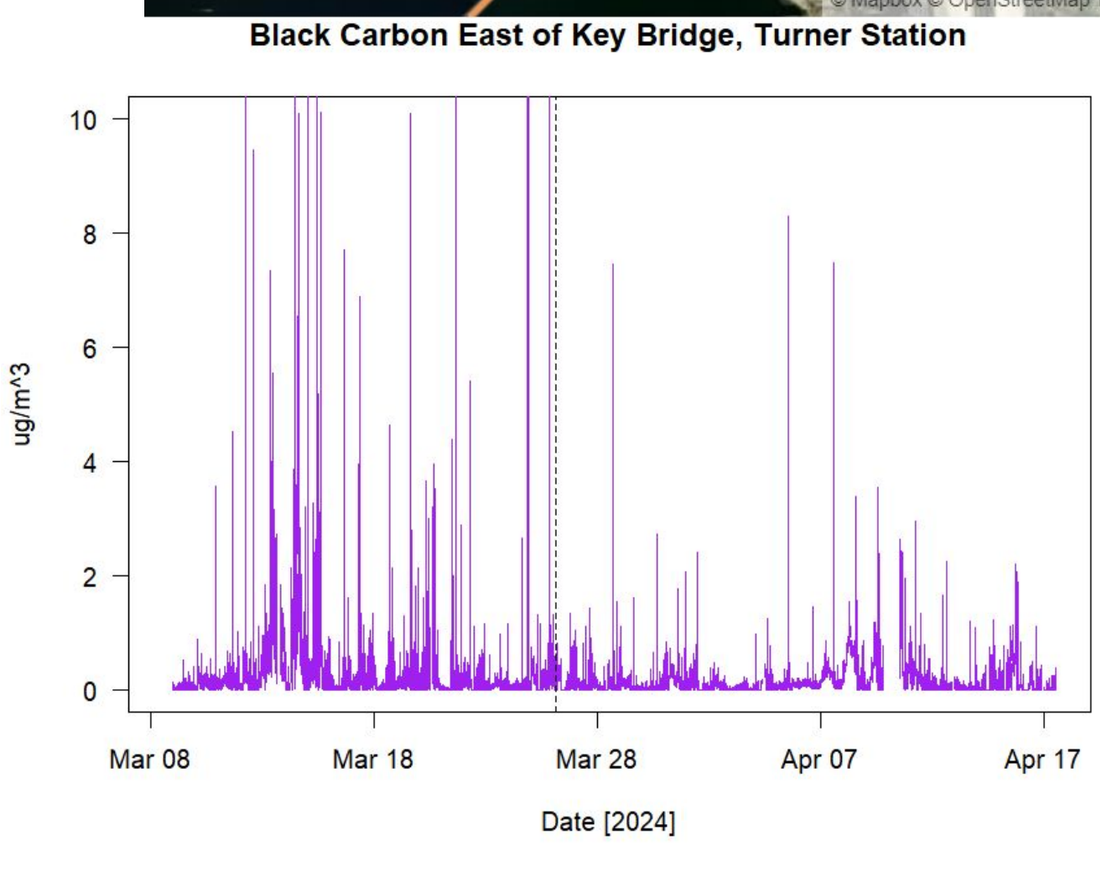
- Located on the Baltimore Beltway, southeast of city
- 2023 average total truck count: 2,941 trucks per day
- March 2023 average total vehicle count: 3,091 trucks per day
- April 2023 average total vehicle count: 2,759
- Average truck count since 3/26/24: 2,990



Black Carbon

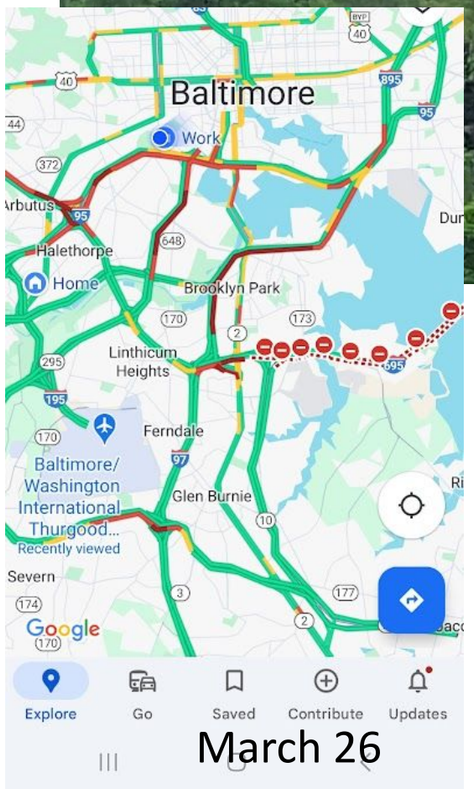






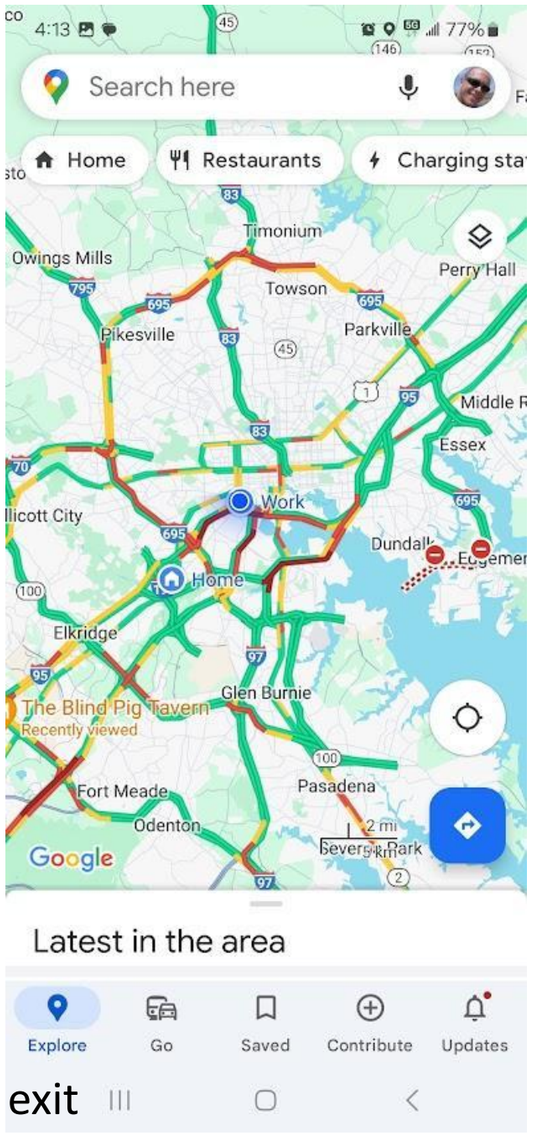
40-50% drop in Black Carbon concentrations

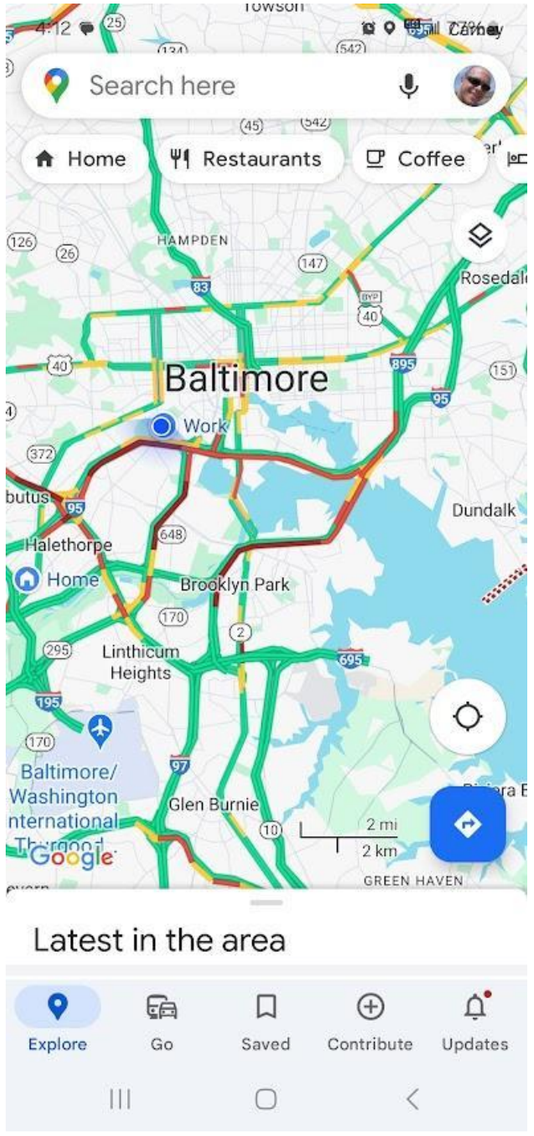
Traffic Impacts



March 26

Traffic on I-95 is now backed up around **2-3 miles longer** than it was prior to the collapse on the WEST side





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