

PM_{2.5} Exceptional Event Update



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October 30, 2024

Louisiana section
Air and Waste Management Association

LSU COastal METeorology (COMET) Lab

PAUL MILLER BECOMES 4TH OCEANOGRAPHY & COASTAL SCIENCES PROFESSOR TO WIN NSF CAREER AWARD

February 01, 2023



Saharan air layer = SAL

JGR Atmospheres

Research Article | [Free Access](#)

The Saharan Air Layer as an Early Rainfall Season Suppressant in the Eastern Caribbean: The 2015 Puerto Rico Drought

Thomas L. Mote [✉](#) Craig A. Ramseyer, Paul W. Miller

First published: 12 October 2017 | <https://doi.org/10.1002/2017JD026911> | Citations: 29

Research Article | [Free Access](#)

Modeled Atmospheric Optical and Thermodynamic Responses to an Exceptional Trans-Atlantic Dust Outbreak

P. W. Miller [✉](#) M. Williams, T. Mote

First published: 10 February 2021 | <https://doi.org/10.1029/2020JD032909> | Citations: 7

Research Article | [Full Access](#)

The Relationship Between the Saharan Air Layer, Convective Environmental Conditions, and Precipitation in Puerto Rico

P. W. Miller [✉](#) C. Ramseyer

First published: 04 January 2024 | <https://doi.org/10.1029/2023JD039681>

What's the big deal with the SAL?

Xian et al. (2020)

- Effects on hurricane activity
- Global climate effects
- Caribbean drought
- Poor air quality



COMMENT · Volume 3, Issue 6, E242-E243, June 2019

Increasing trans-Atlantic concern?

Sateesh Sakhamuri^{a,b} · Safiya Cummings^{a,b}

African d
Part I: Imp
Peninsula

Carolina Ramírez-Romé^{a,b} · Jandro Jaramillo, María F. Córdoba, Graciela B. Raga, Javier Miranda, Harry Alvarez-Ospina, Daniel Rosas, Talib Amador, Jong Sung Kim, Jacqueline Yakobi-Hancock, Darrel Baumgardner, and Luis A. Ladino

Research article

Article Type: Research Article

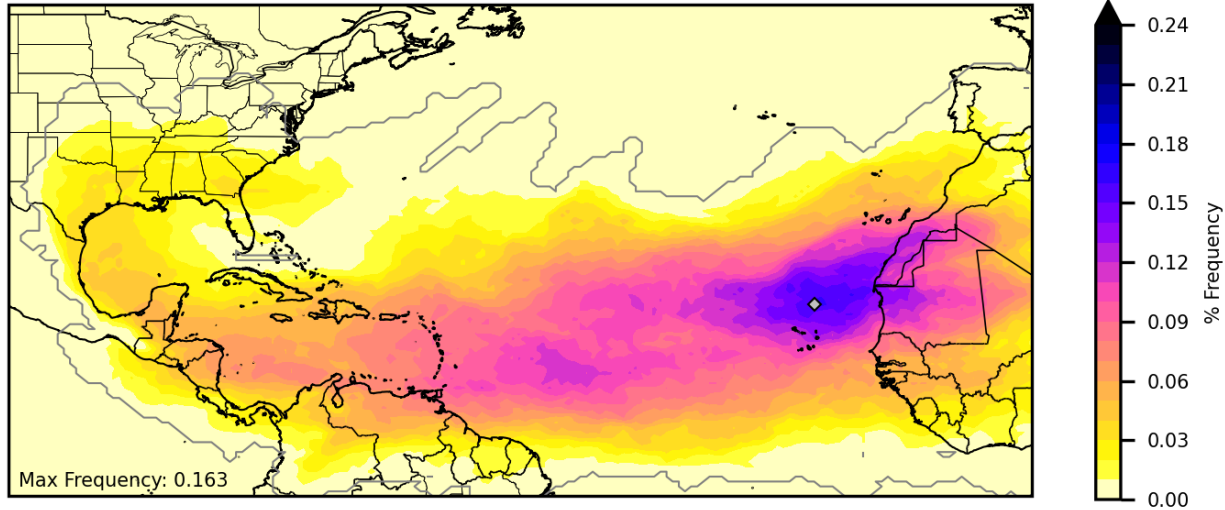
Who Is Affected by Saharan Dust in the Caribbean? A Spatial Analysis and Citizen's Perspective from Puerto Rico during the Godzilla Dust Event in June 2020

Maité Morales-Medina^{1b}, Ana P. Ortiz-Martínez, Cynthia M. Pérez-Cardona, Digna Rueda-Roa, Daniel Otis, Edgar Pérez-Matías, Frank Muller-Karger, Olga Mayol-Bracero, and Pablo Méndez-Lázaro

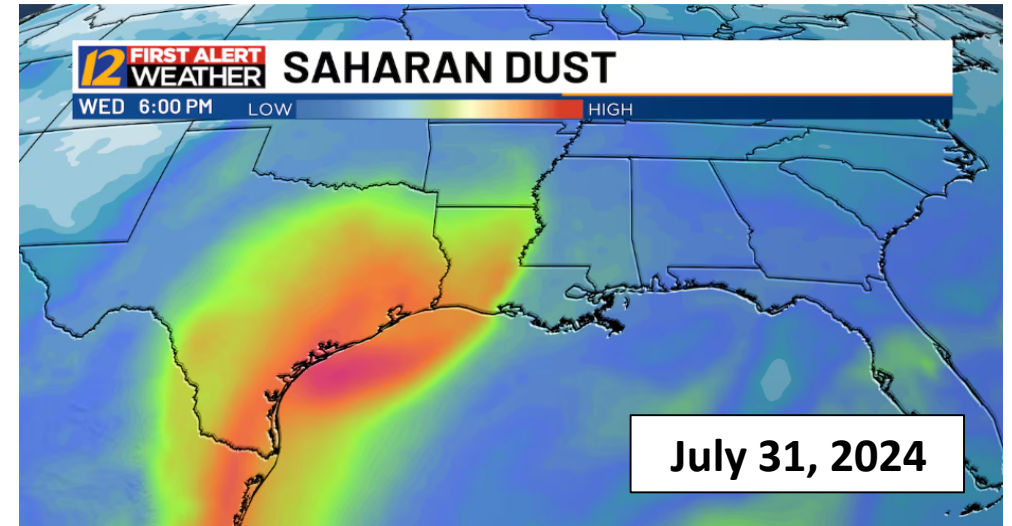
Online Publication: 05 Mar 2024
Print Publication: 01 Jan 2024

Recent SAL Encounters

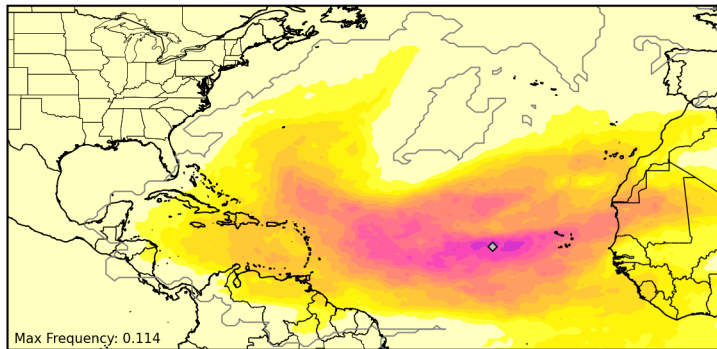
DERSAD SAL Plume Frequency for 2020



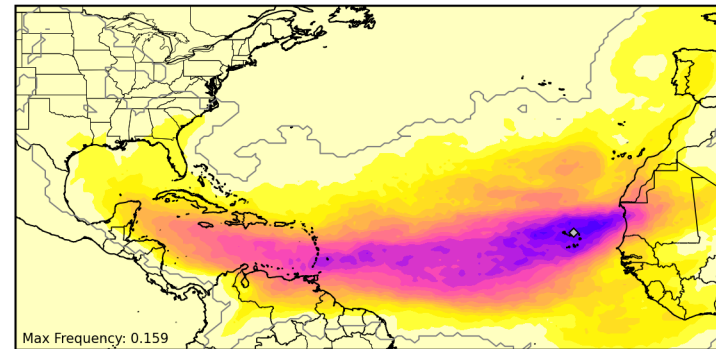
Air Quality Action Day issued for Shreveport due to Saharan dust



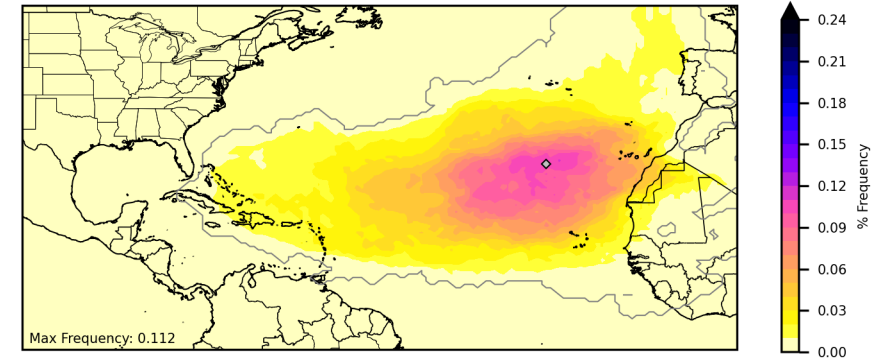
DERSAD SAL Plume Frequency for 2021



DERSAD SAL Plume Frequency for 2022

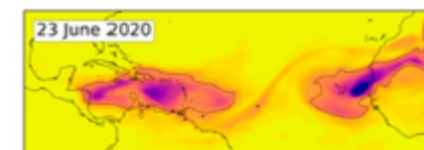
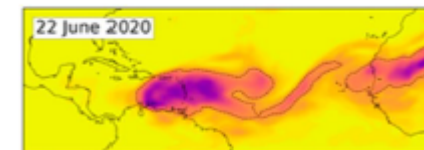
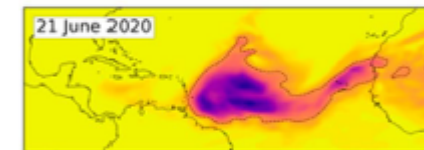
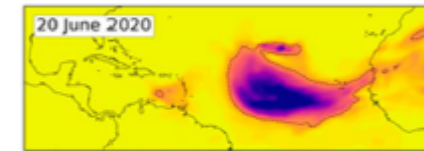
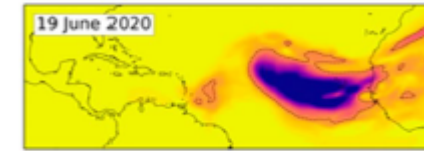
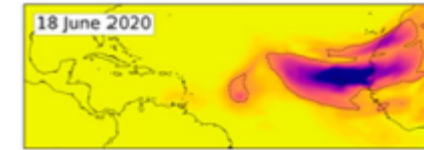
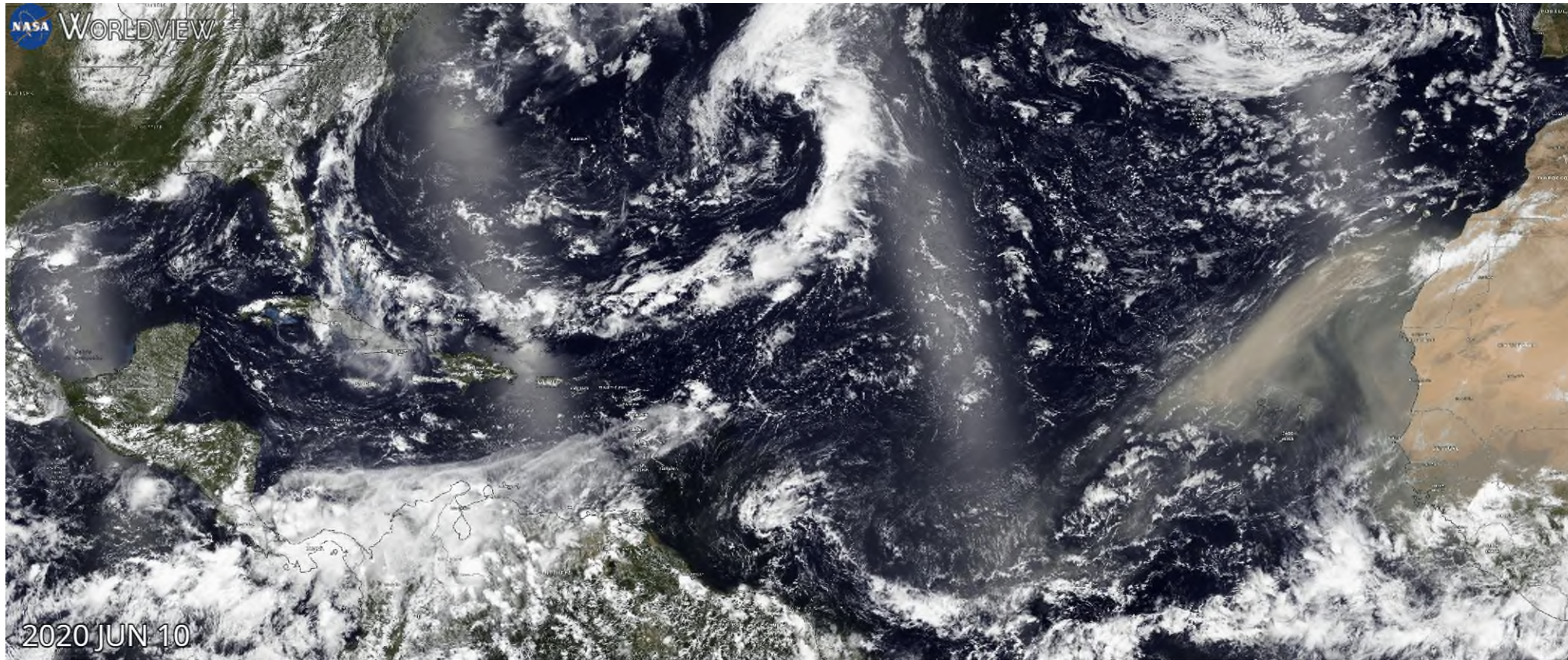


DERSAD SAL Plume Frequency for 2023



Dolce & Miller (In Preparation)

Recent Dust Encounters || June 2020



Miller & Ramseyer (2024)

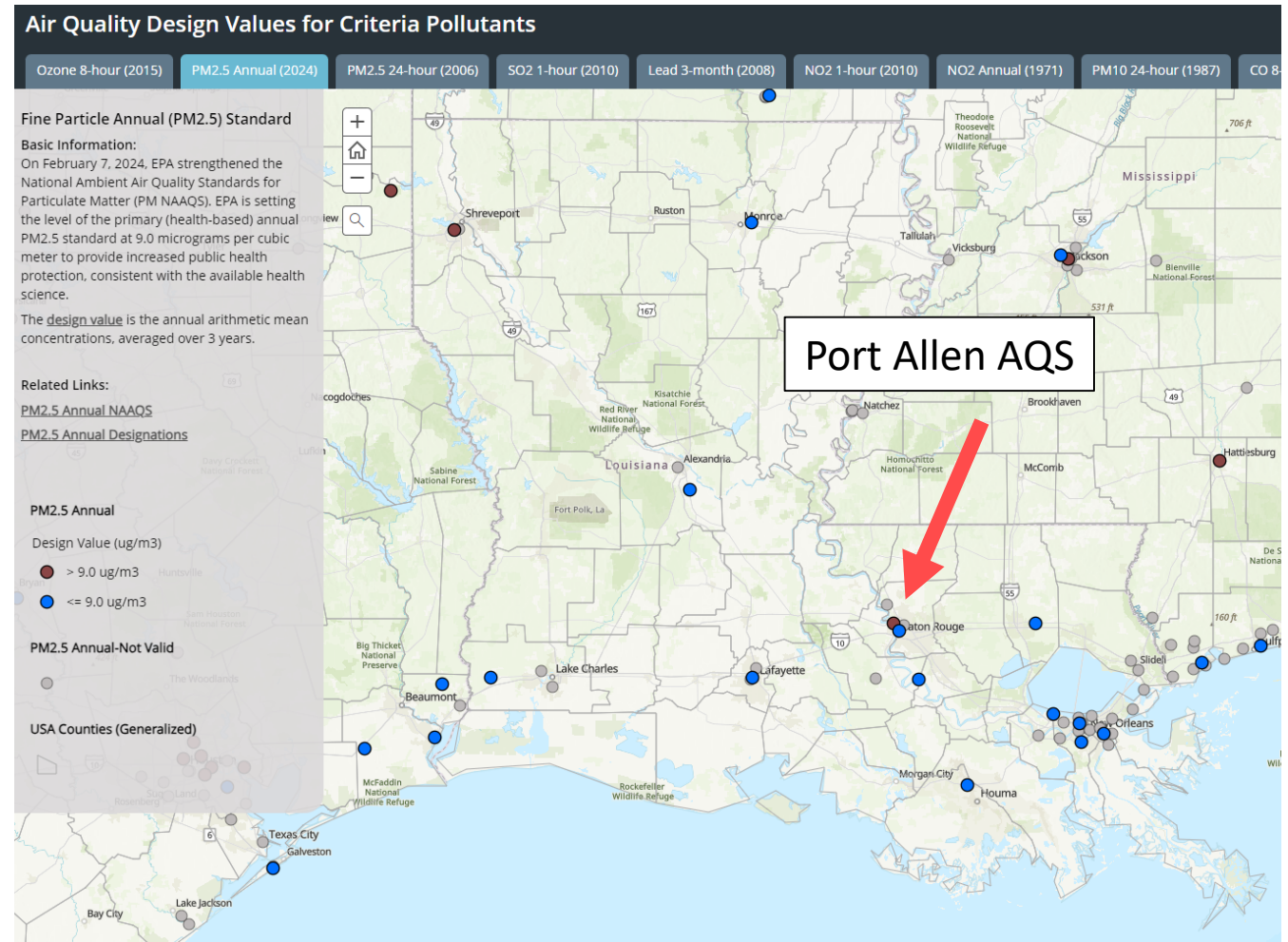
Joe Rogan Experience: Episode #2219

- **DT:** “But, in a way, the bigger one is even the air. It’s the currents. It’s an amazing thing. It’s been flowing that way a million years, so long before-”
- **JR:** “We share air with the whole world. Yeah, we get Saharan dust clouds over here.”
- **DT:** “Absolutely.”
- **JR:** “We get dust clouds in Austin from the Sahara desert.”

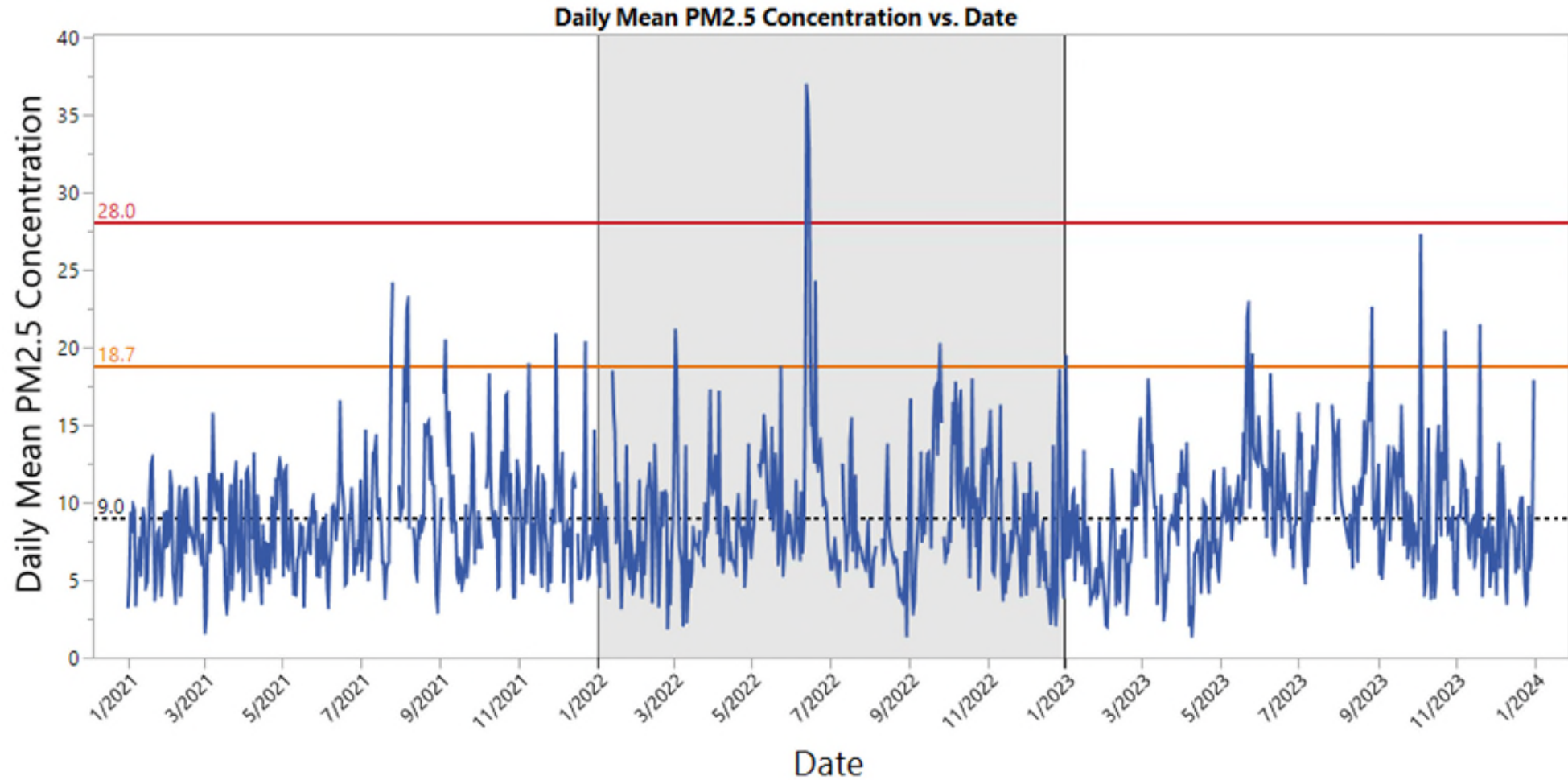


Port Allen AQS Site

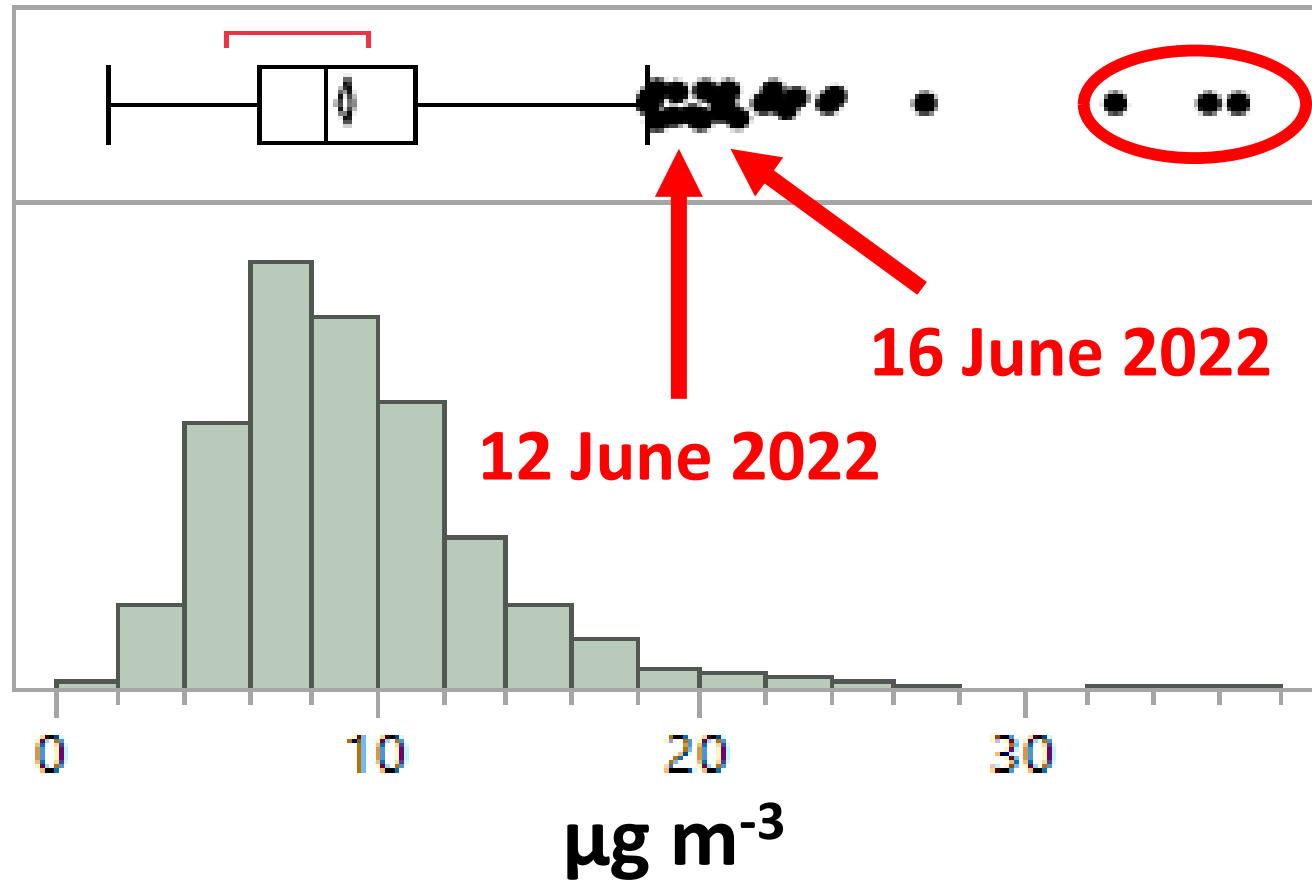
- AQS ID: 221210001
- Observations begin in 2018
- EPA 2023 Design Value:
 - $9.1 \mu\text{g m}^{-3}$



Port Allen AQS Site



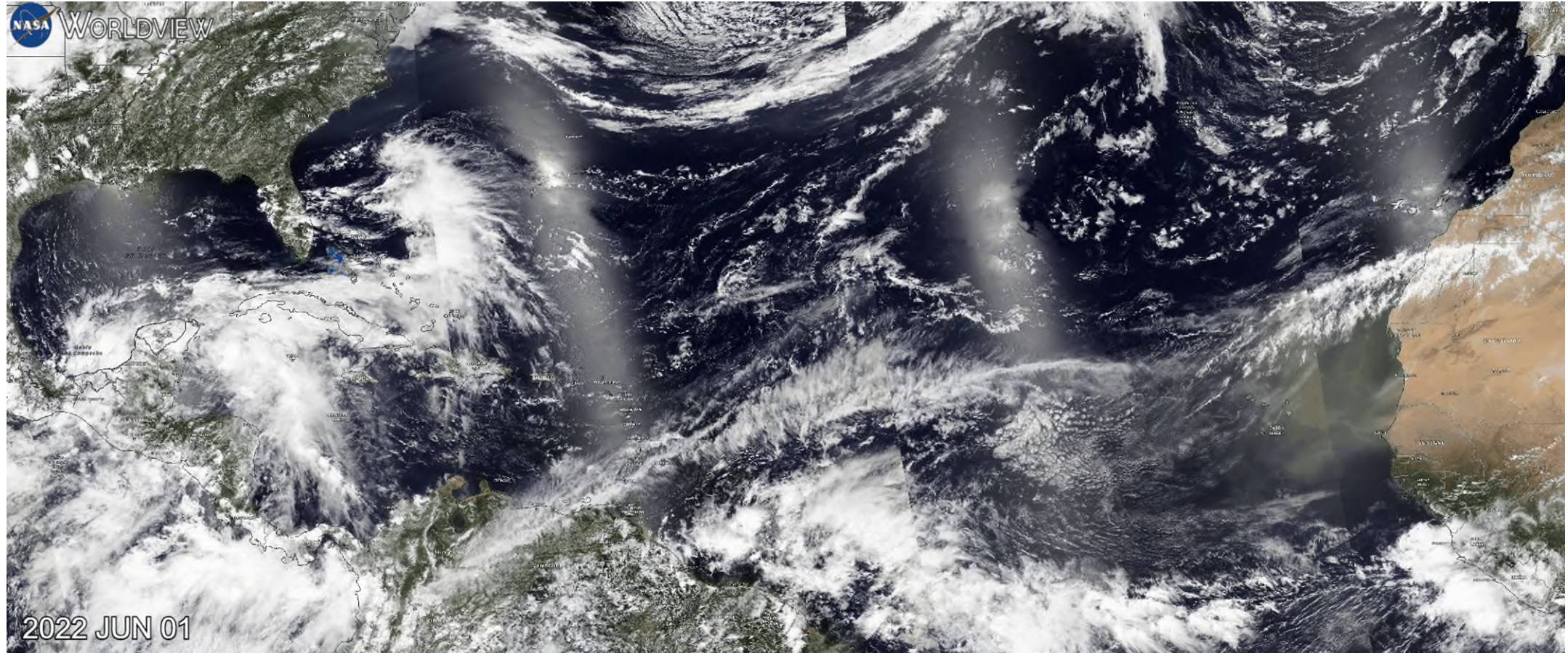
Identifying Anomalous Events



13-15 June 2022

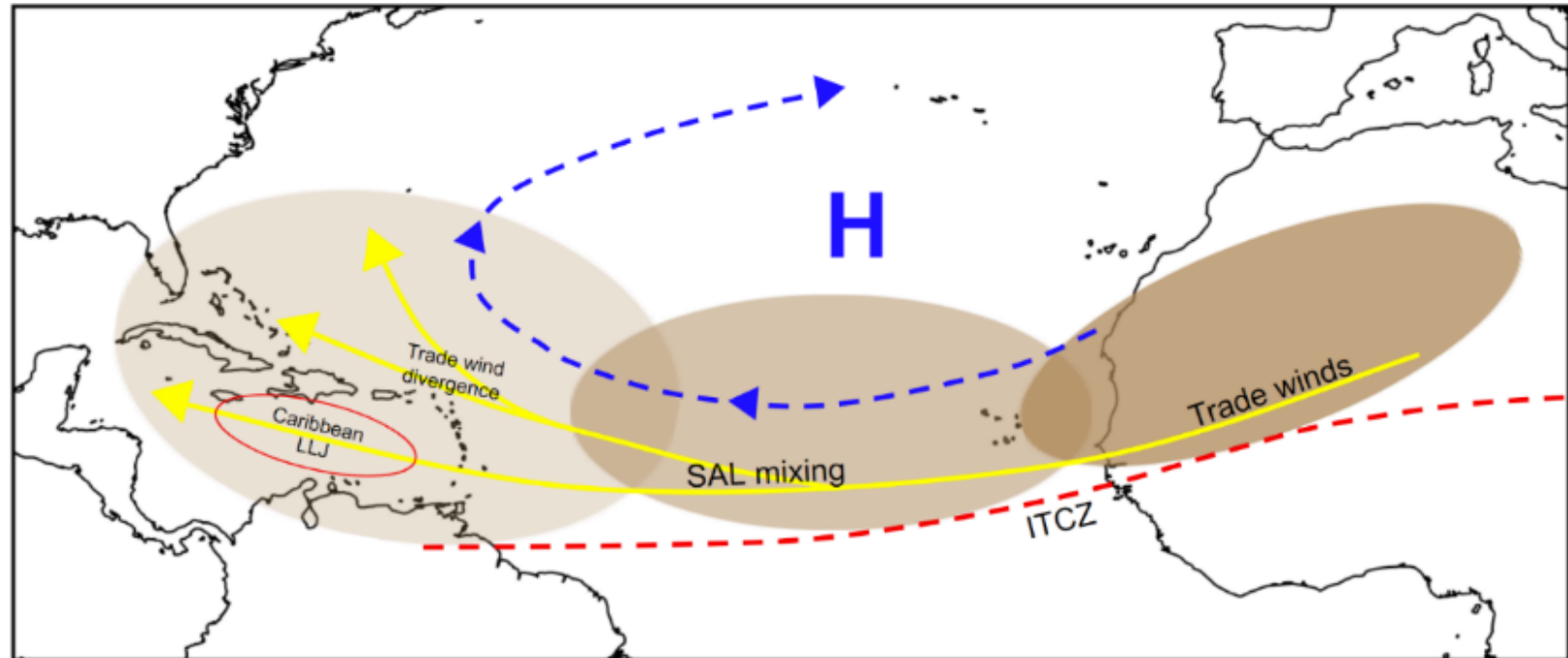
- Mean PM_{2.5} = 9.1 $\mu\text{g m}^{-3}$
- Mean PM_{2.5} declines to 8.98 $\mu\text{g m}^{-3}$ if 12-16 June 2022 are omitted

Exceptional Event || 12–16 June 2022



Conceptual Narrative

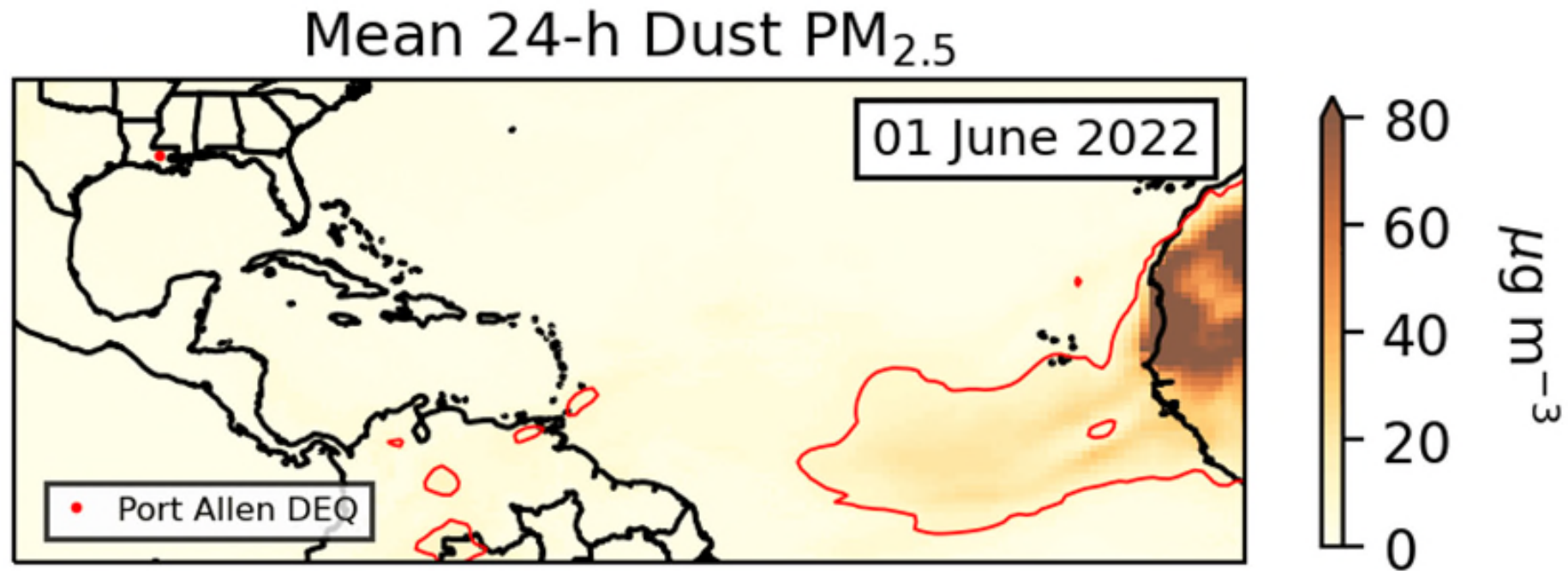
- Plume steered west by easterly trade winds in tropics
- Turns north as it reaches Caribbean
- Rounds base of Bermuda High



Dolce & Miller (In Preparation)

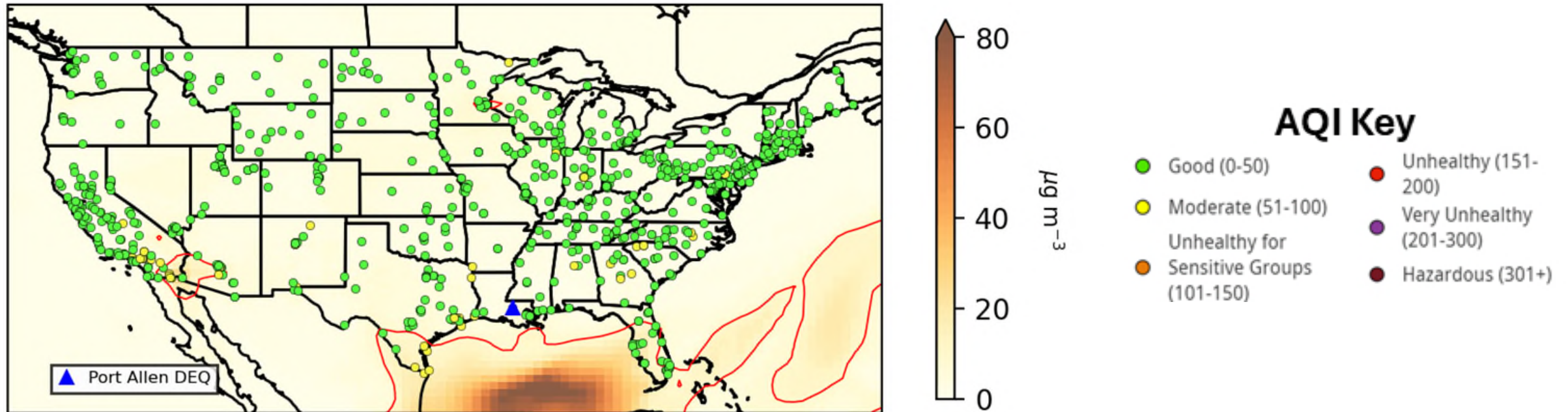
Exceptional Event || 12–16 June 2022

- Modern-Era Retrospective analysis for Research and Applications
- Speciates aerosols into five categories: dust, salt, sulfates, carbon (x2)

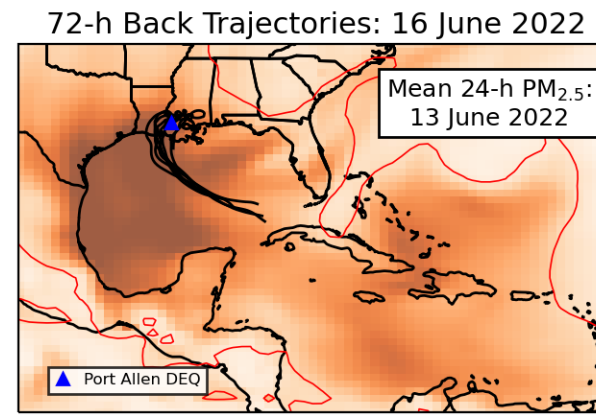
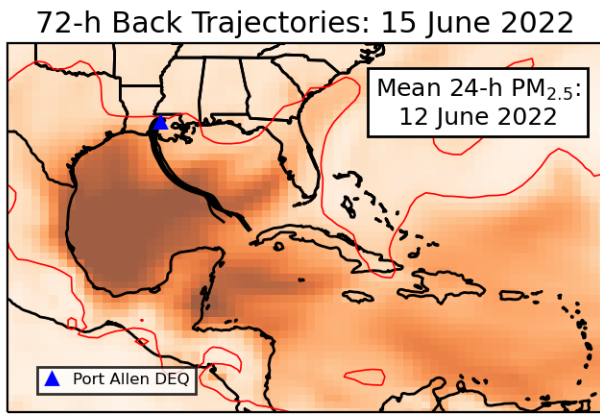
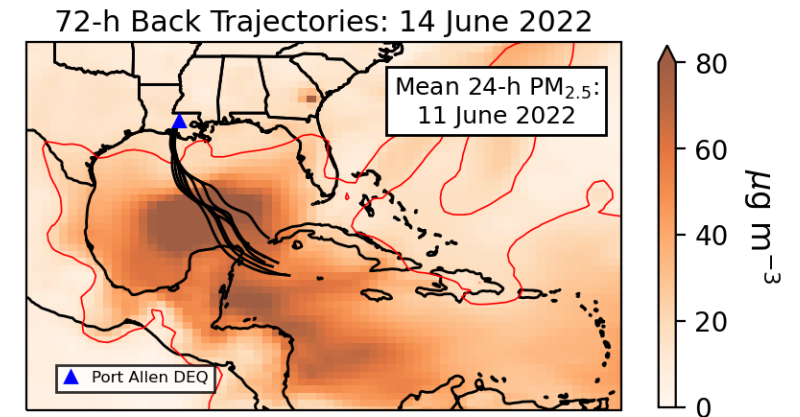
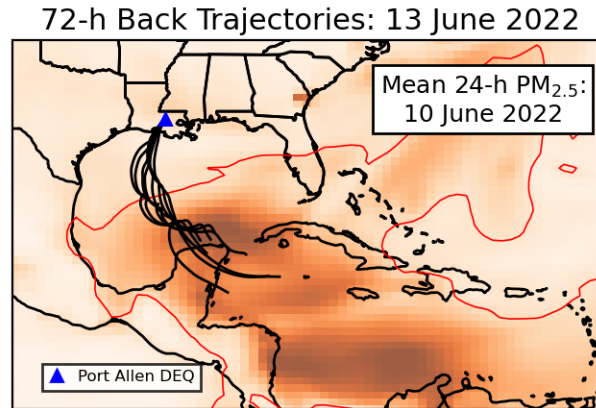
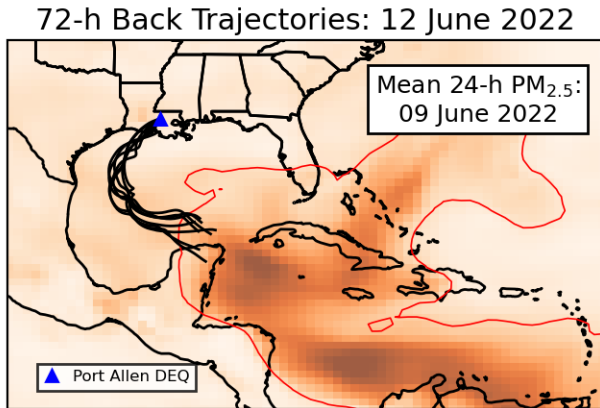


Exceptional Event || 12–16 June 2022

Mean 24-h Dust PM_{2.5} and AQI: 11 June 2022

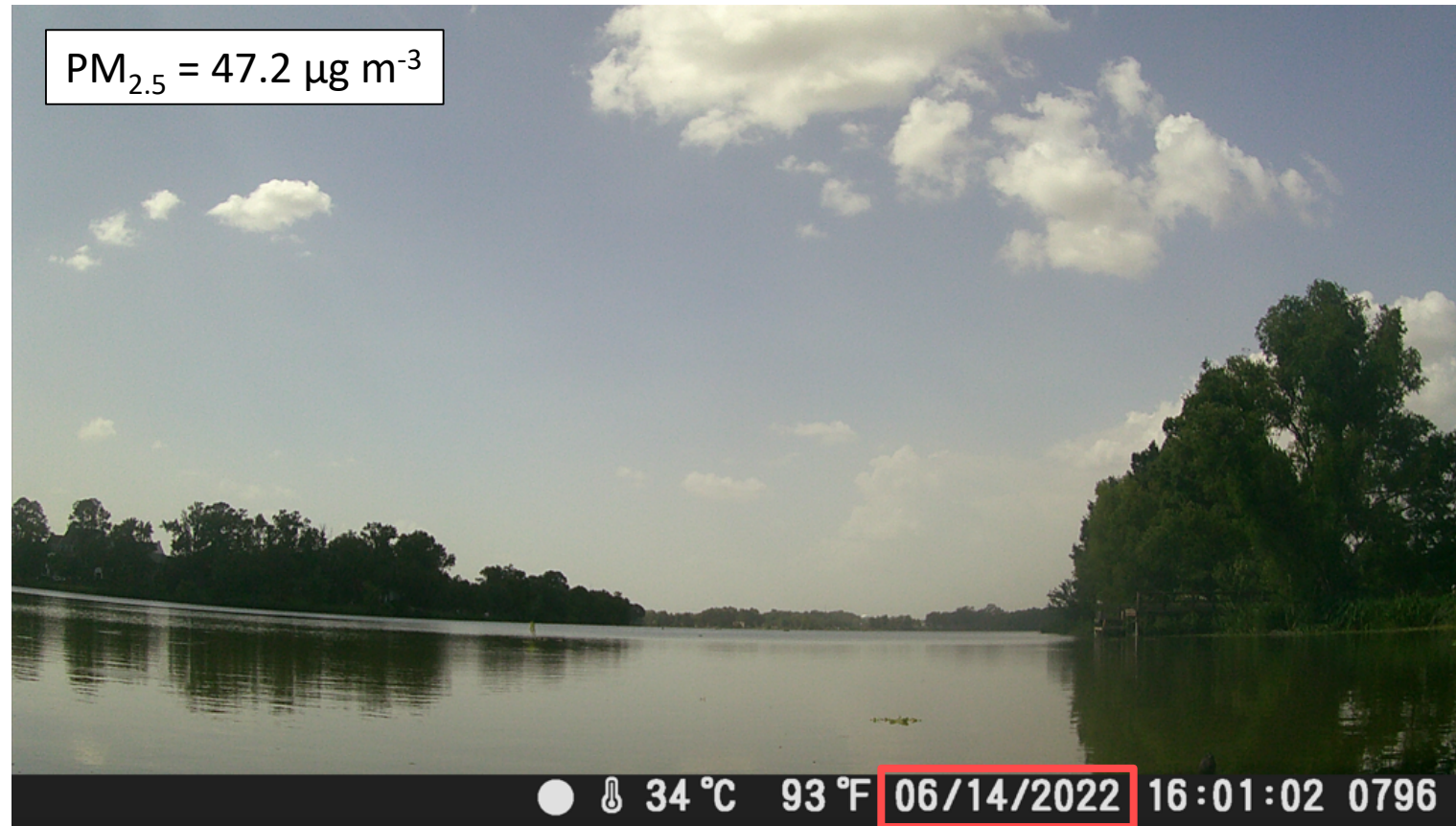
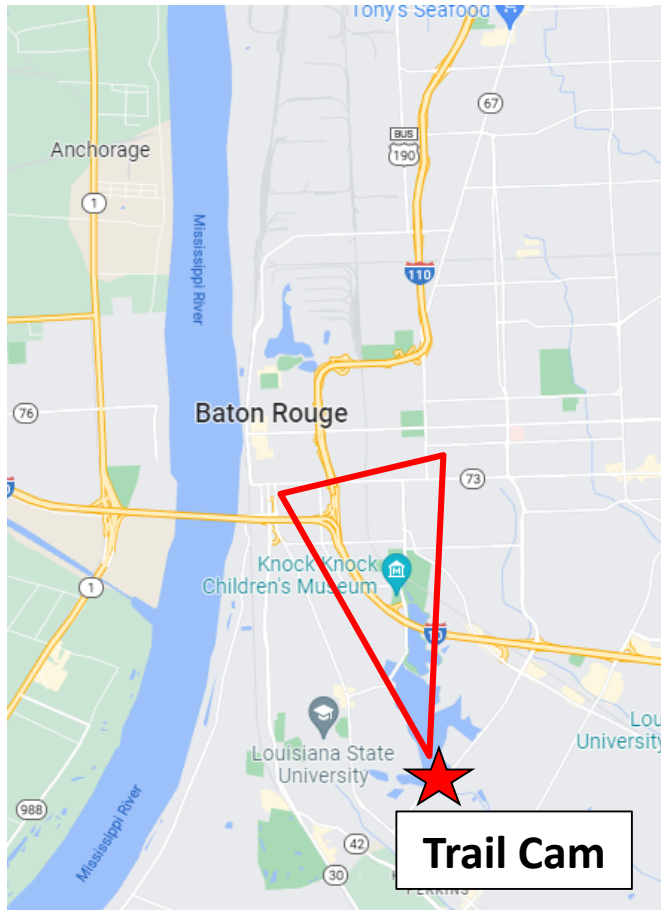


Exceptional Event || 12–16 June 2022



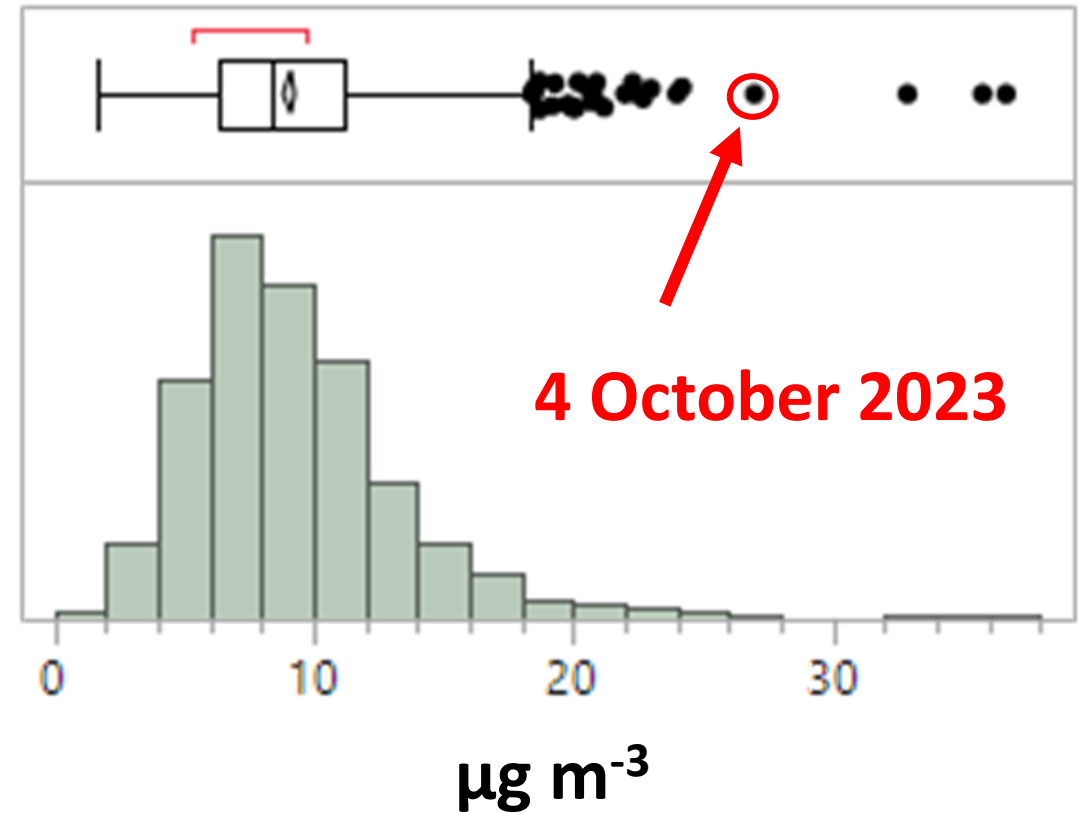
- 72-hr back trajectories
- Hybrid Single-Particle Lagrangian Integrated Trajectory model

Exceptional Event || 12–16 June 2022



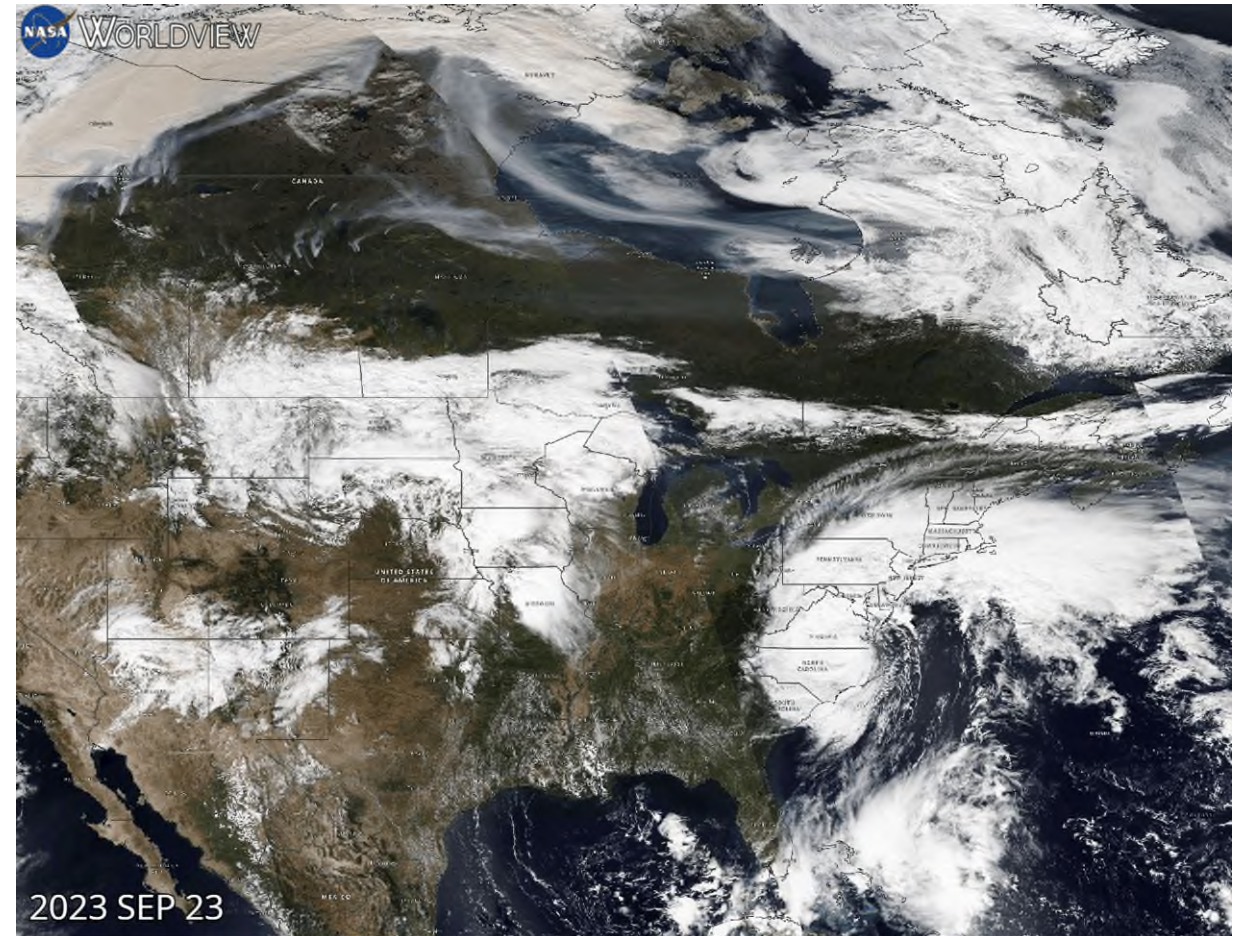
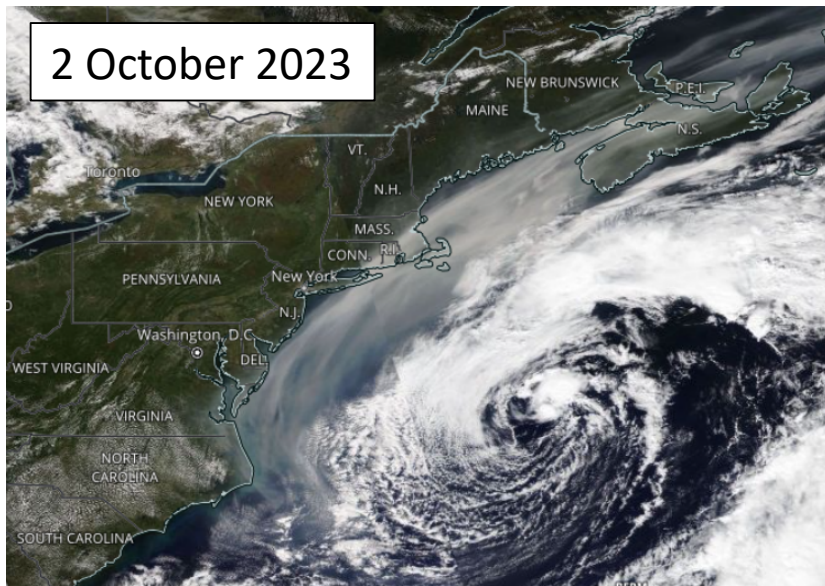
Exceptional Event || 4-5 October 2023

- Not as severe or long-lasting as the June 2022 SAL outbreak
- Daily values:
 - October 4: $27.0 \mu\text{g m}^{-3}$
 - October 5: $15.5 \mu\text{g m}^{-3}$
- If only 4-5 October 2023 are omitted, the design values $\text{PM}_{2.5}$ declines only to $9.05 \mu\text{g m}^{-3}$



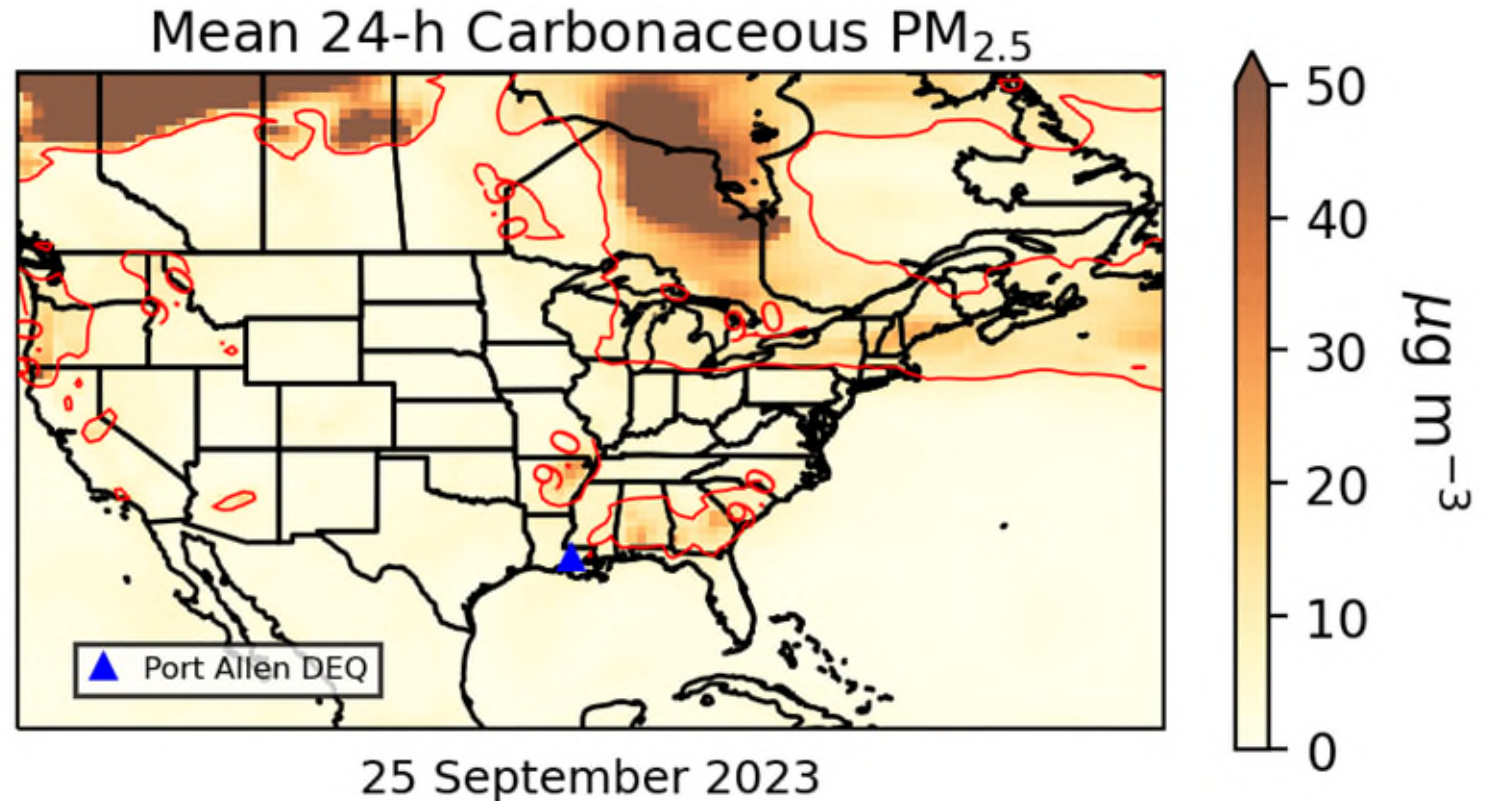
Exceptional Event || 4-5 October 2023

- Smoke from western Canada travels east
- Funneled south by storm



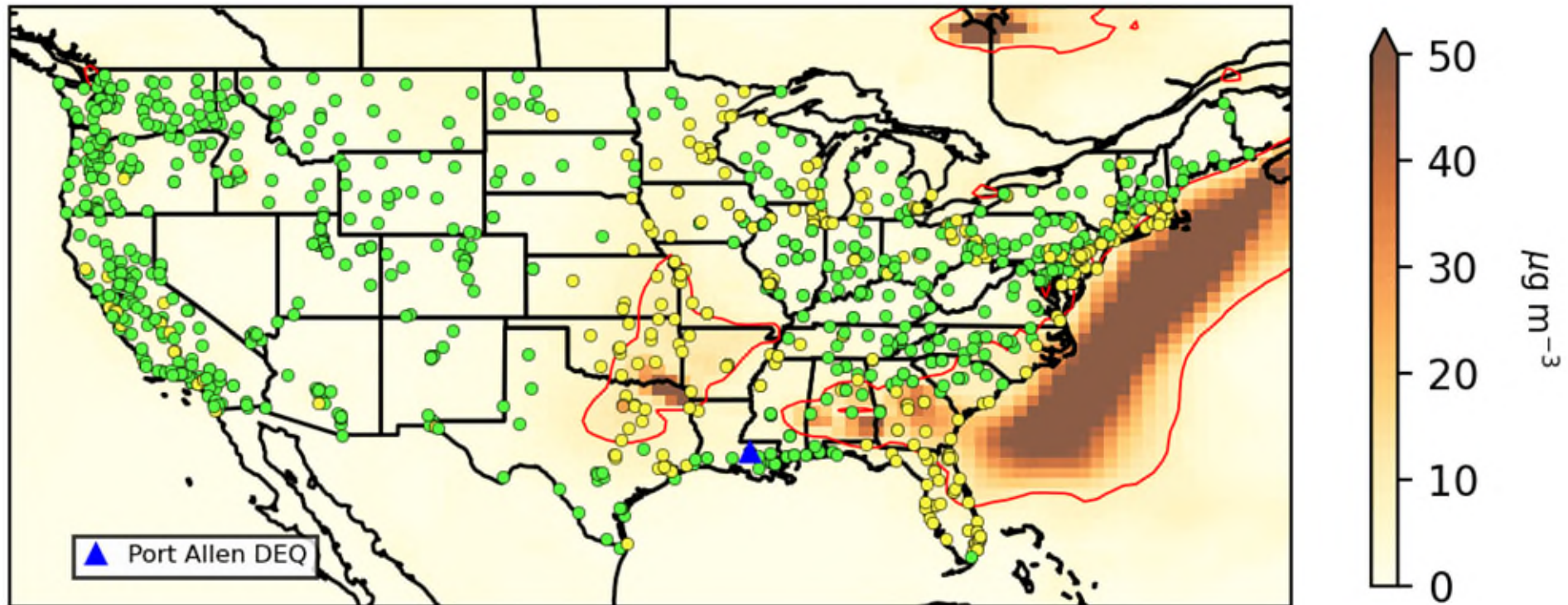
Exceptional Event || 4-5 October 2023

- Speciated MERRA-2 animation shows smoke-associated aerosols directed to Louisiana
- Dissipates by October 6, 2023



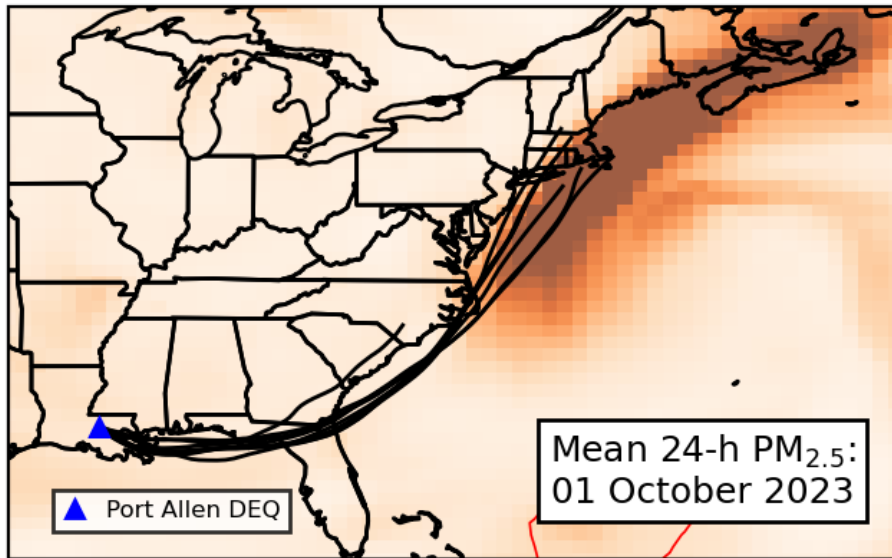
Exceptional Event || 4-5 October 2023

Mean 24-h Carbonaceous $PM_{2.5}$ and AQI: 02 October 2023

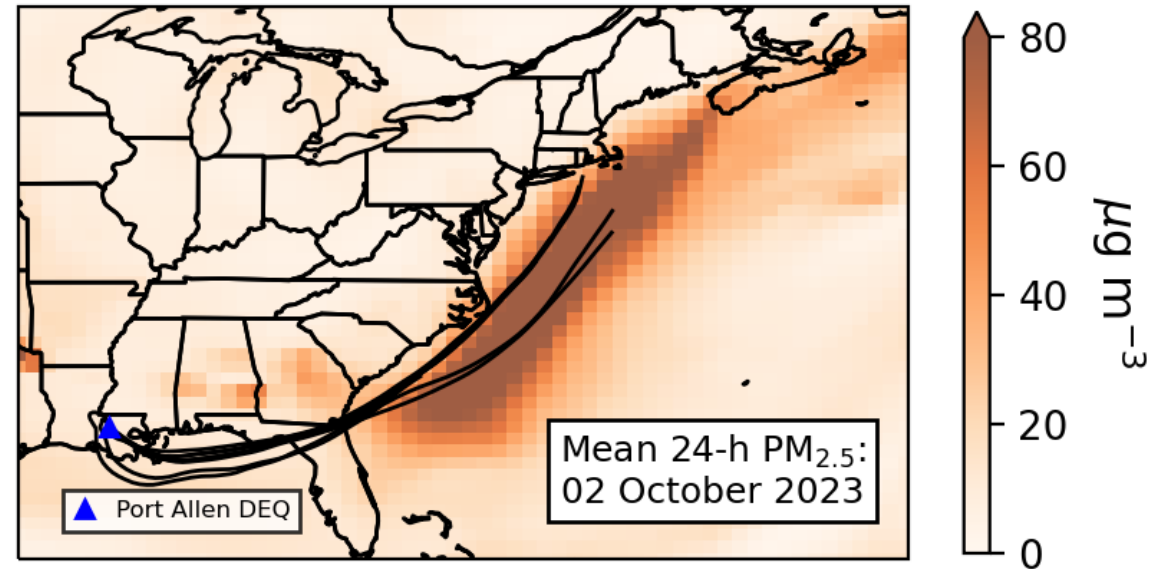


Exceptional Event || 4-5 October 2023

72-h Back Trajectories: 4 October 2023



72-h Back Trajectories: 5 October 2023



Questions?

pmiller1@lsu.edu

Saharan dust || 12–16 June 2022

<https://edms.deq.louisiana.gov/app/doc/view?doc=14512447>

Canadian smoke || 4–5 October 2023

<https://edms.deq.louisiana.gov/app/doc/view?doc=14512449>

Hurry! The public comment period ends on November 20th!