

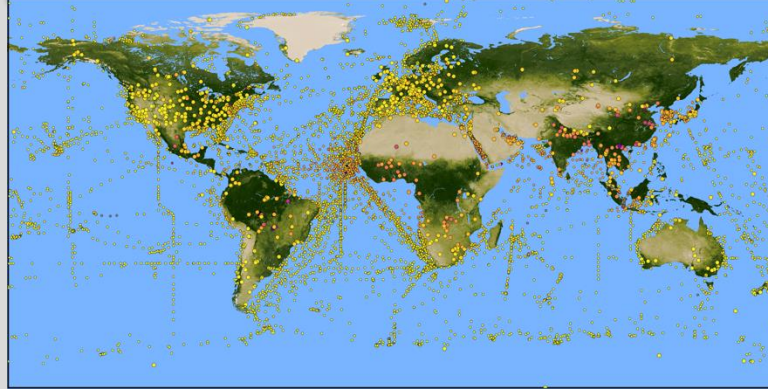
# **Air Quality Data & Application Development – AI/ML Approach**

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**HAQAST3, May 13-14, 2026, Madison**

# An Hybrid Approach to Monitor and Forecast Air Quality

## Ground Measurements



- AERONET
- AirNow/OpenAQ
- Purple Air/Clarity

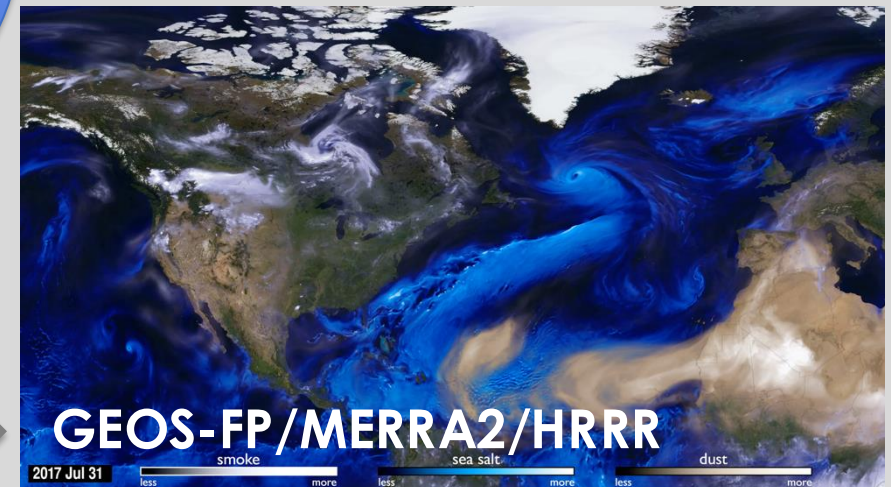
## Space Observations



## Integrating into AI/ML Model

- Historical
- Near Real Time
- Forecasting

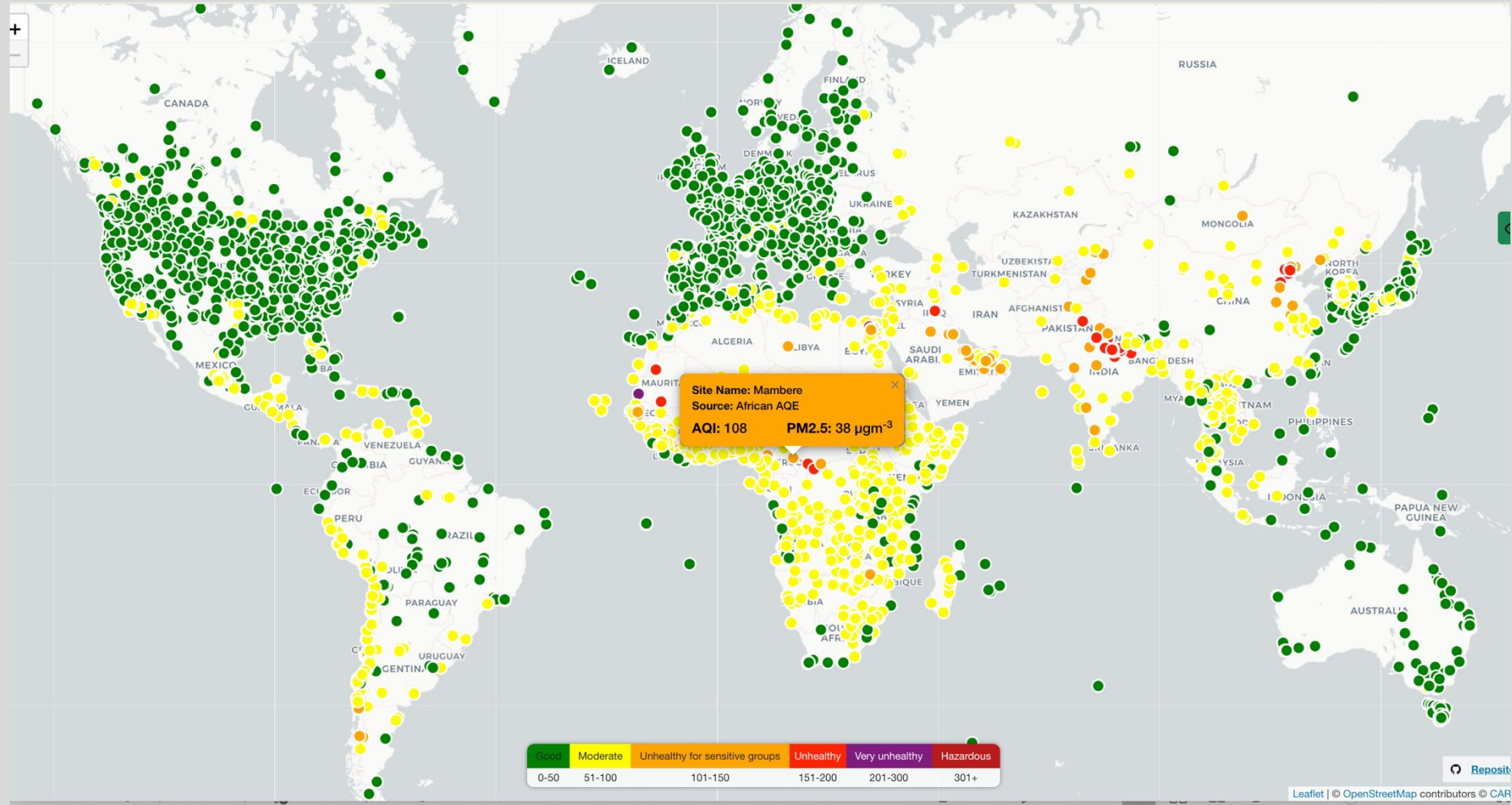
## Models



# Air Quality Forecasting

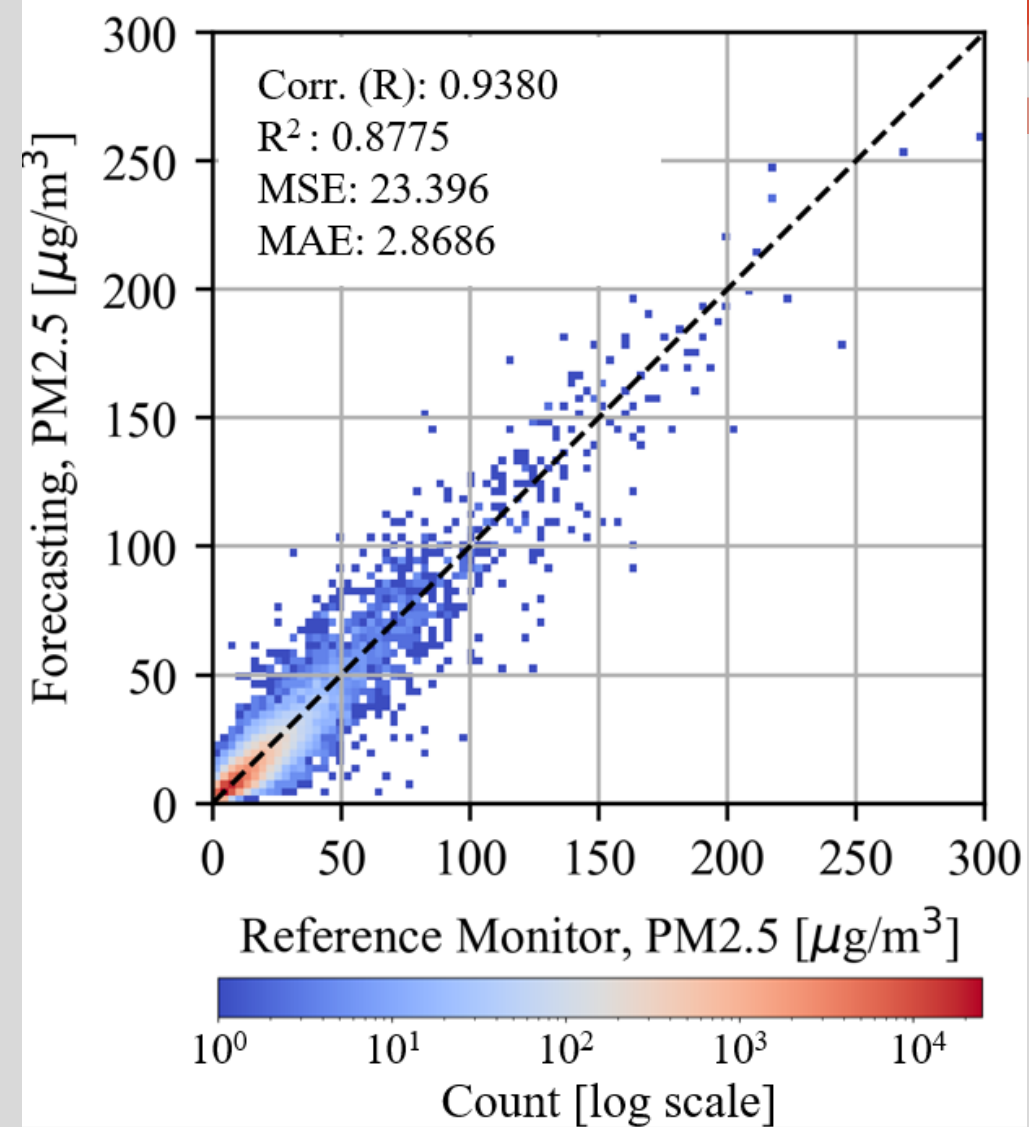
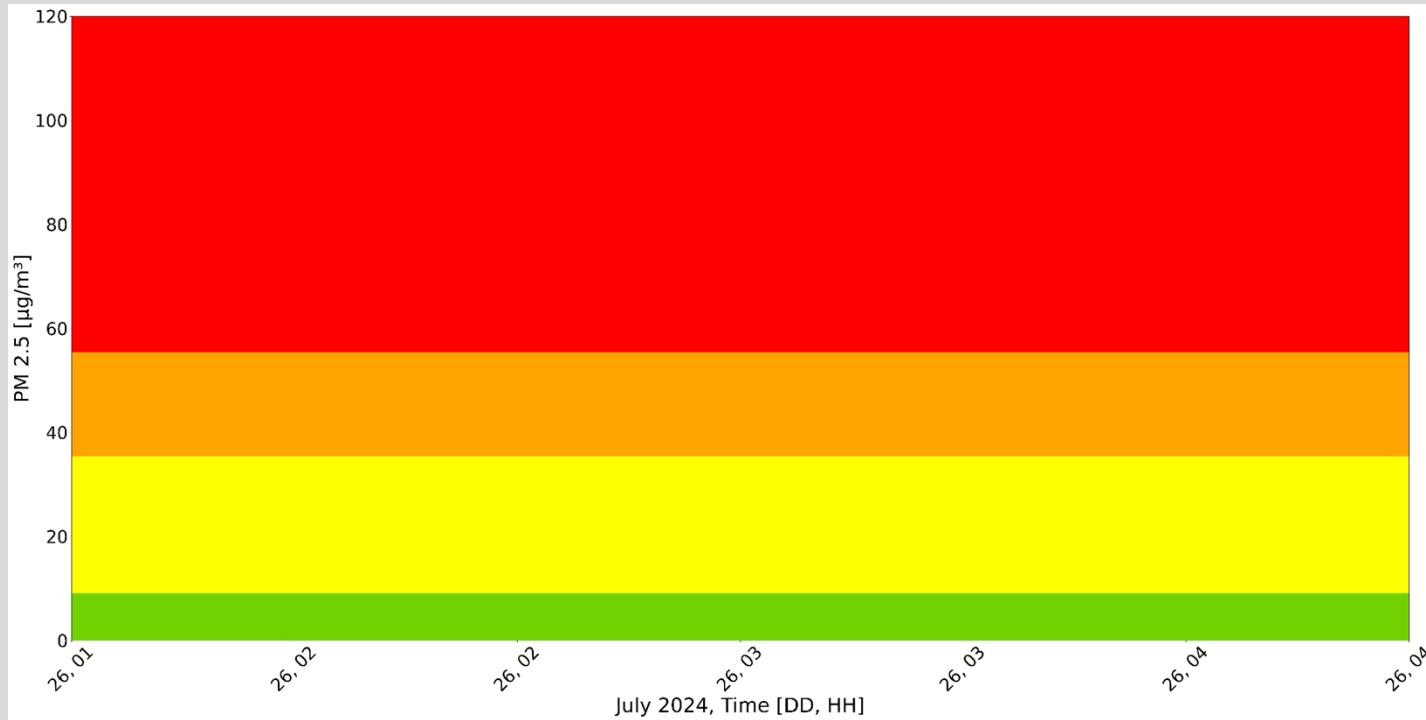
[https://aeronet.gsfc.nasa.gov/new\\_web/aqforecast](https://aeronet.gsfc.nasa.gov/new_web/aqforecast)

3-day  
PM2.5  
forecasts  
for 10k+  
locations



Seo, et al., 2025, <https://doi.org/10.1029/2025EA004210>  
Seo & Gupta 2026 (accepted)

# Continuous Evaluation



Rely on OpenAQ, Embassies, Local Partners

Seo, J., Sayeed, A., Park, S., Kerekes, J. P., Christel, S. M., Tran, M. T., & Gupta, P. (2025). PM2.5 forecasting at U.S. embassies and consulates worldwide using NASA model powered by machine learning. *Earth and Space Science*, 12(6), e2025EA004210.

<https://doi.org/10.1029/2025EA004210>

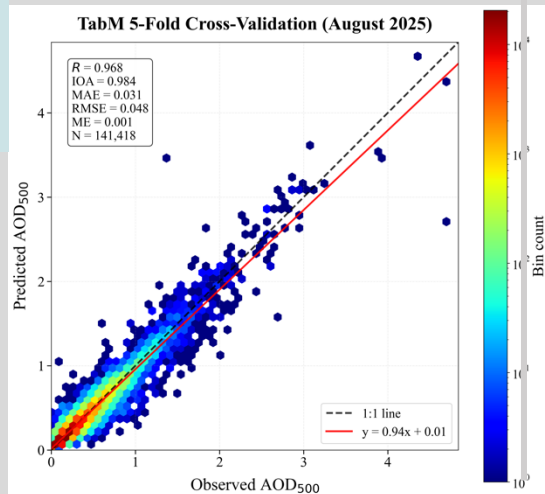
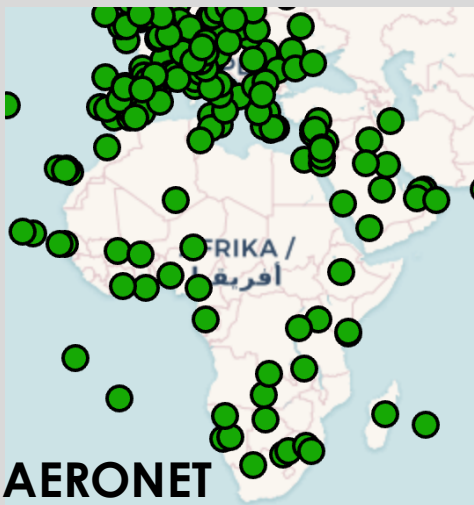
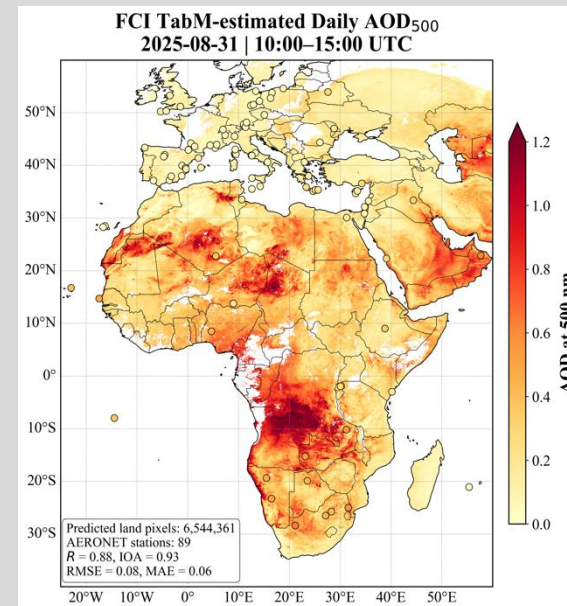
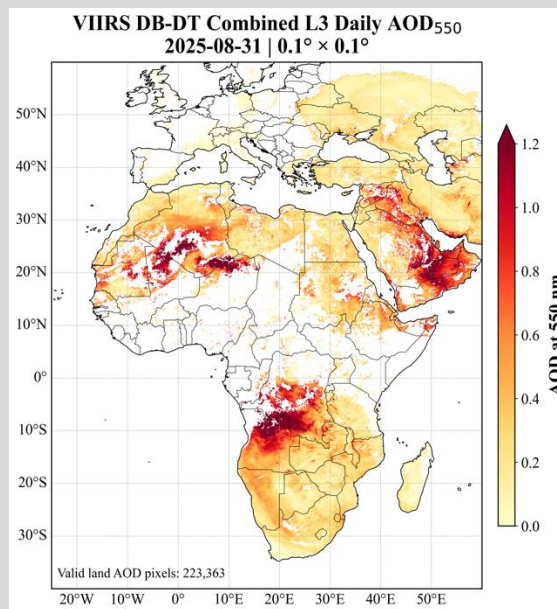
Seo, J., & Gupta, P. (2026). Adaptive expert-guided deep imbalanced regression for global PM2.5 forecasting with temporal convolutional networks and GEOS-FP inputs. *npj Climate and Atmospheric Science*. Accepted.

# MTG- FCI-Derived AOD<sub>500</sub>: Initial Results and Pathway to PM<sub>2.5</sub>

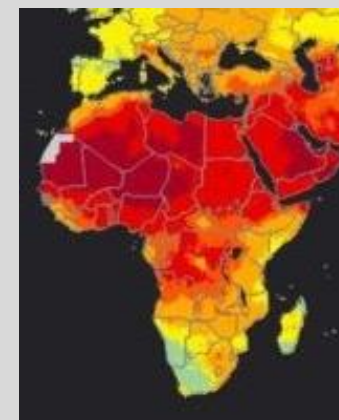
### GEORing (10 Minute Global Coverage)



## Spatial AOD Mapping and VIIRS



Hourly PM<sub>2.5</sub> Maps



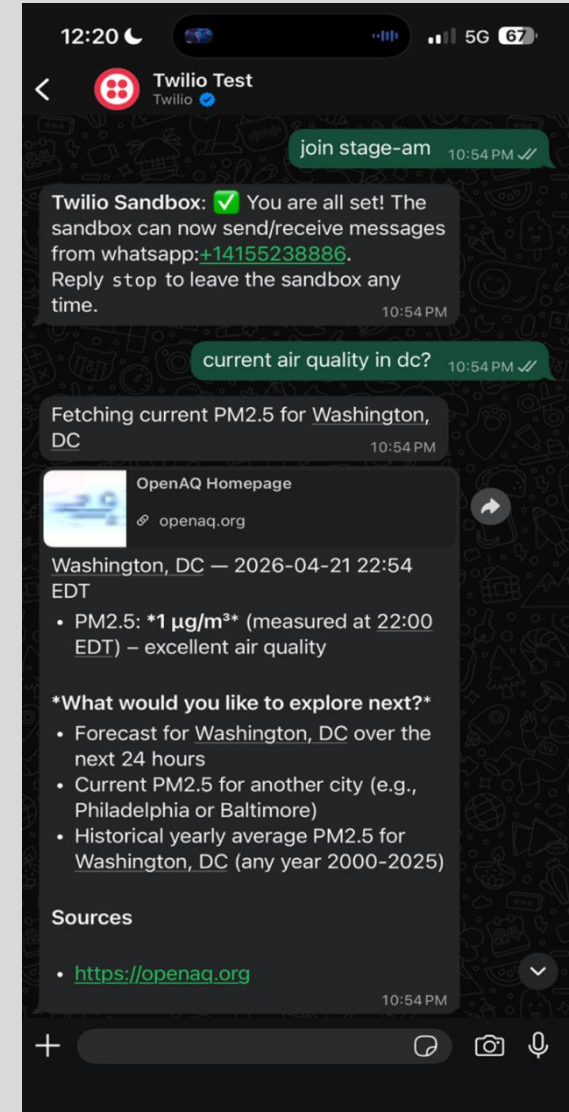
# VAYU – An Agentic Air Quality Assistant

- An agentic assistant that responds to dynamic user queries on air quality conditions worldwide, serving the public, scientists, and policymakers alike.



Provides latest, historical (MERRA2-CNN), forecasts, (GEOS-FP+ML >10K+) and measurements (AirNow/OpenAQ/AERONET)

## WhatsApp



# Integration - African Air Quality Explorer

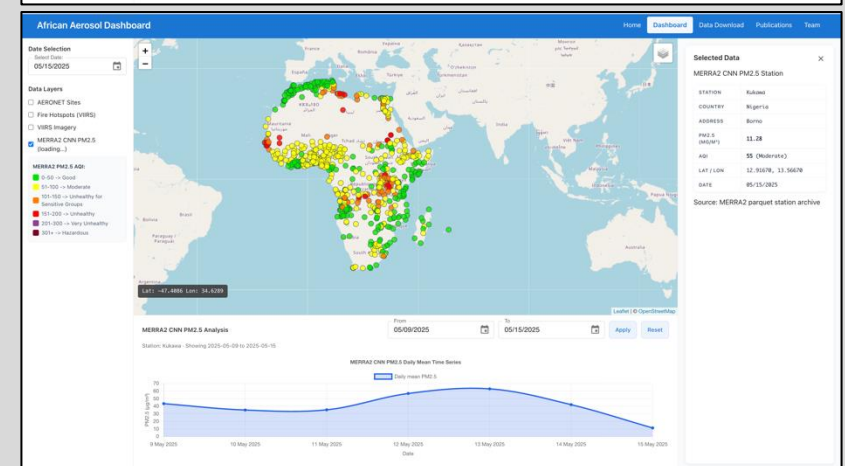
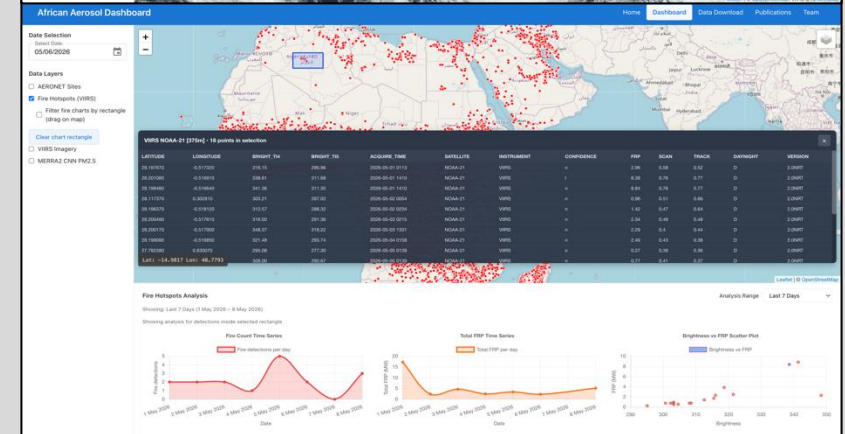
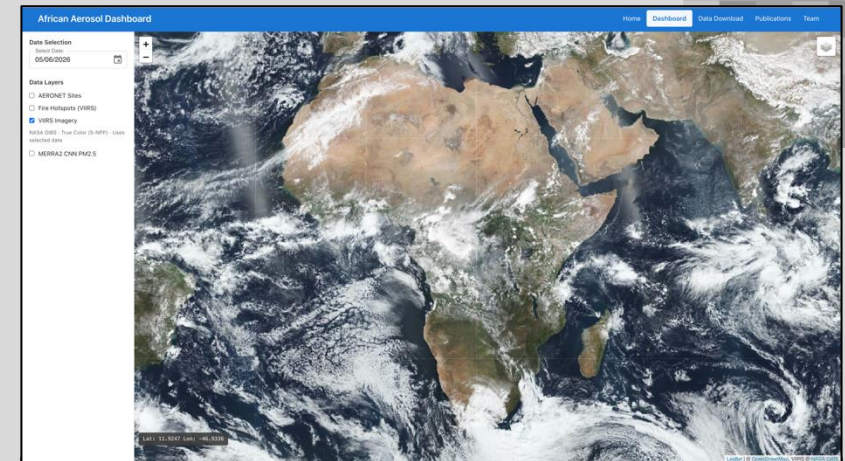
- **Why We're Doing This?**

- Not enough tools to measure serious air pollution in many African Countries/Cities
- Existing tools are limited
- Clear, trusted data is needed for better health and policy decisions
- Partnership with DoS/Embassies to provide timely air quality information

- **Vision for AAQE**

- **An Easy-to-use online tool** powered by NASA data that brings together:

- Historical air pollution trends
- Near real-time satellite imagery & data
- Air quality forecasts
- Tools to analyze data



# Acknowledgement

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