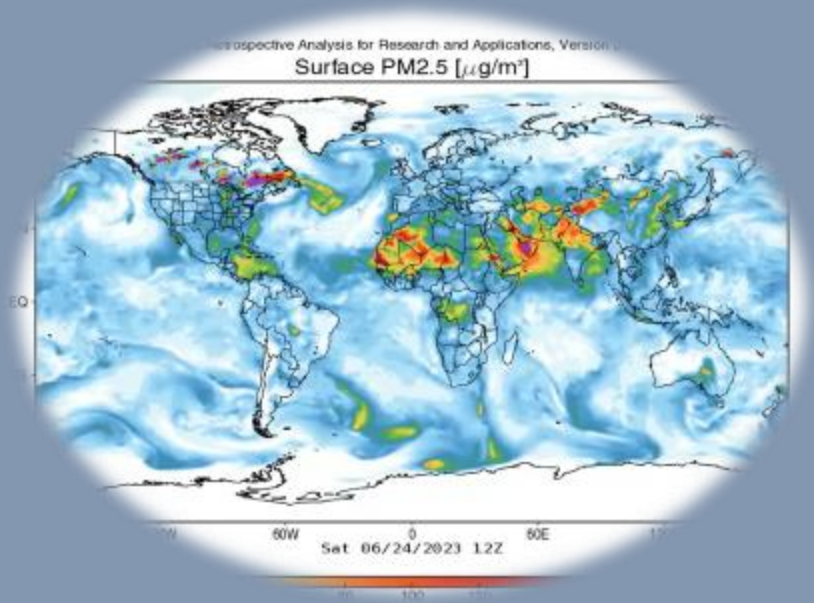
National Aeronautics and Space Administration



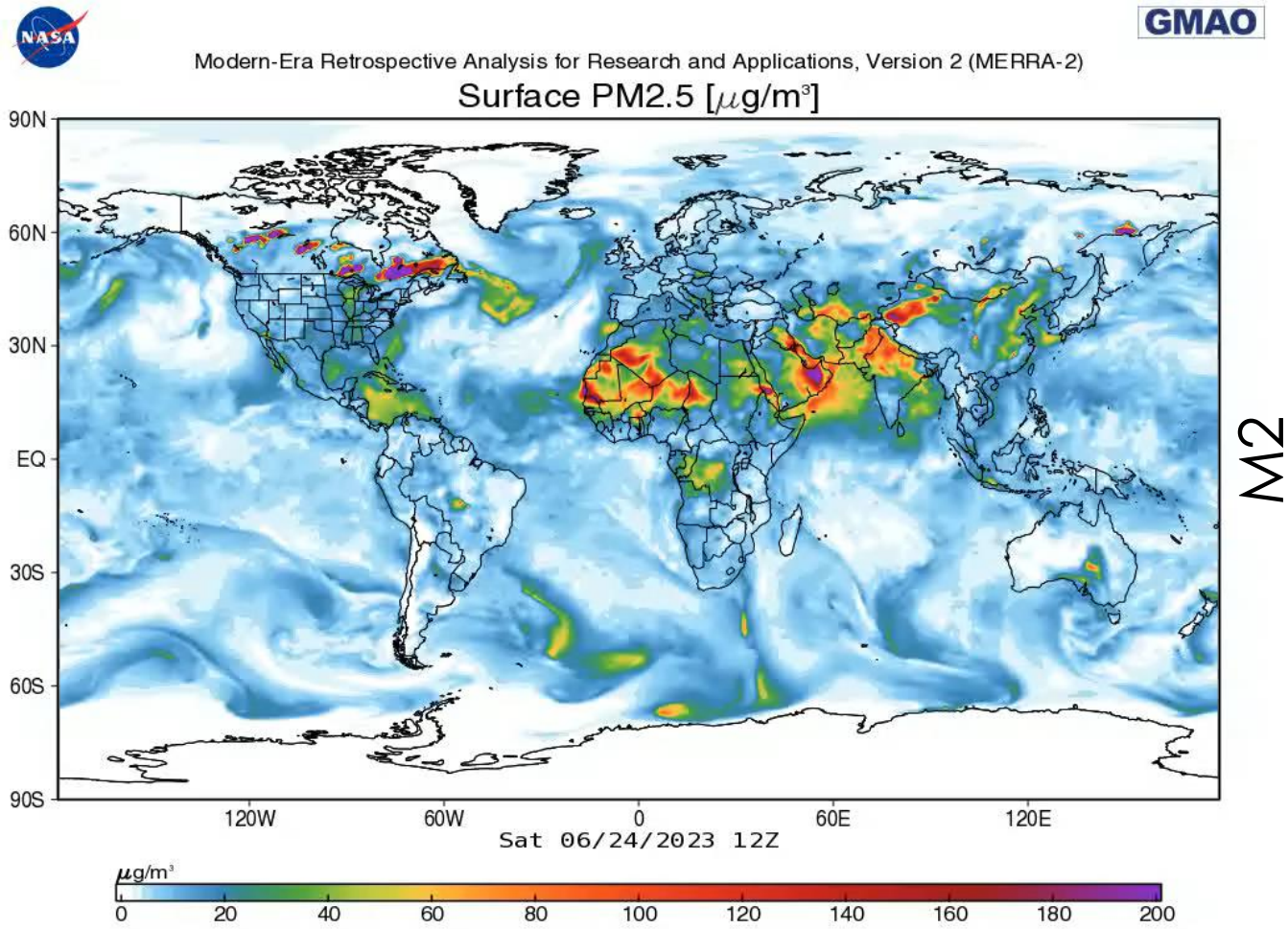
Reanalysis, Satellites, Machine Learning and New Opportunities

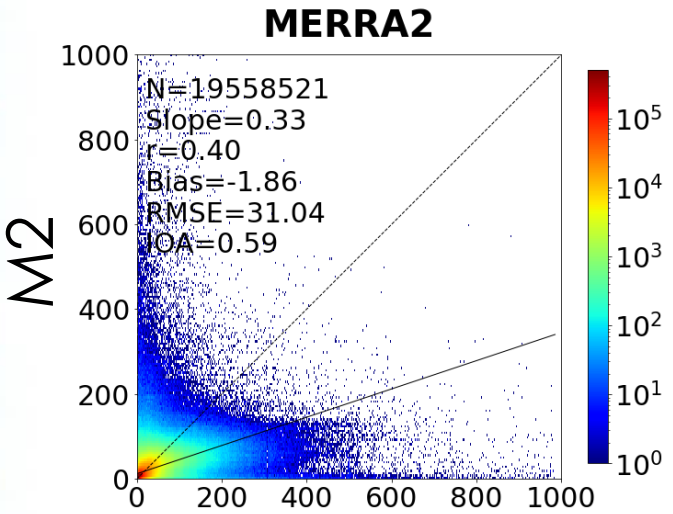
Pawan Gupta (NASA GSFC) - pawan.gupta@nasa.gov

HAQAST, Salt Lake City, Utah, October 18-19, 2023

Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA2) – 1980 – Current

long-term global reanalysis to assimilate space-based observations of aerosols and represent their interactions with other physical processes in the climate system

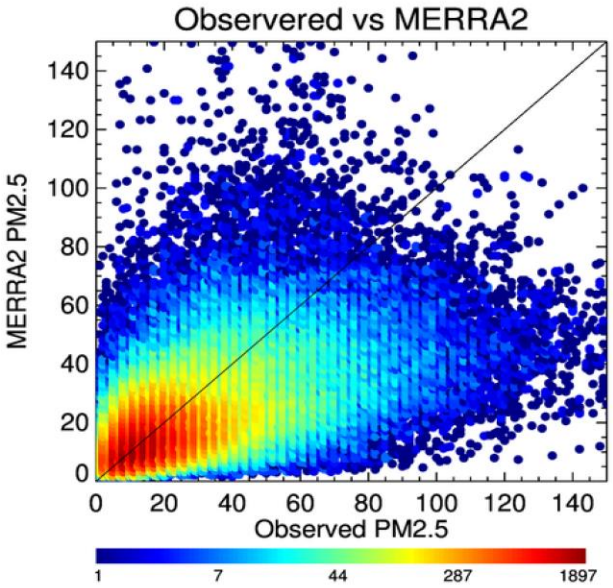


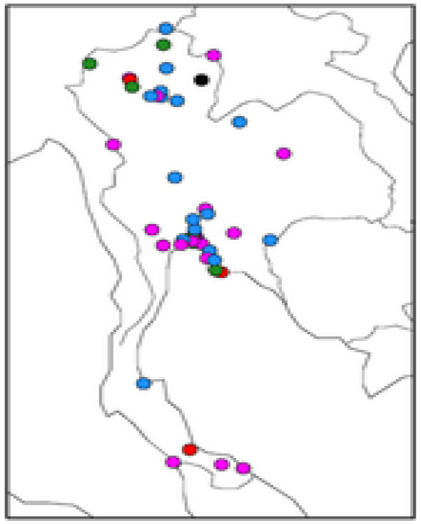


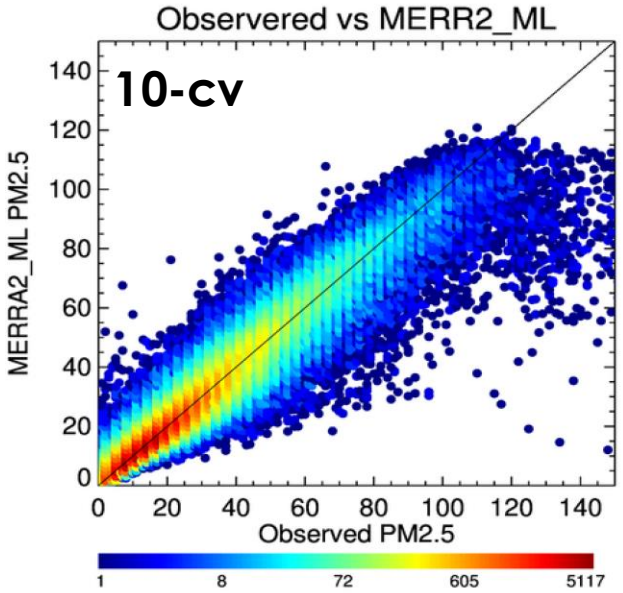
Obs.

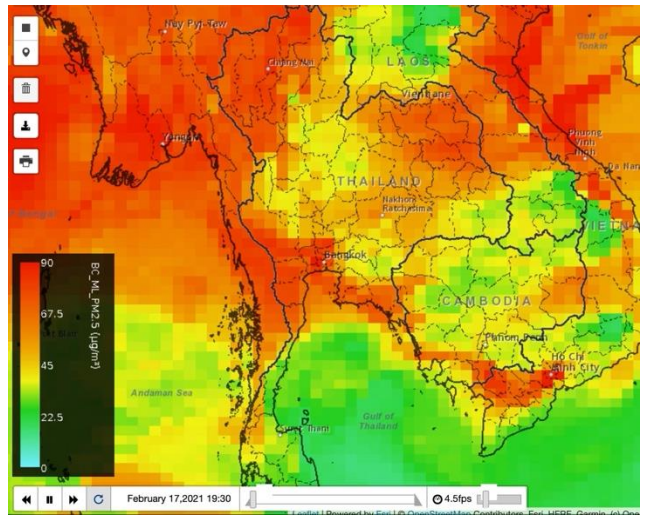
Regional Success Story – Hourly & Daily Data

MERRA2 /GEOS (Aerosol + Met.) + Surface PM2.5 + MLA/DLA → Historical PM2.5, Forecasted PM2.5









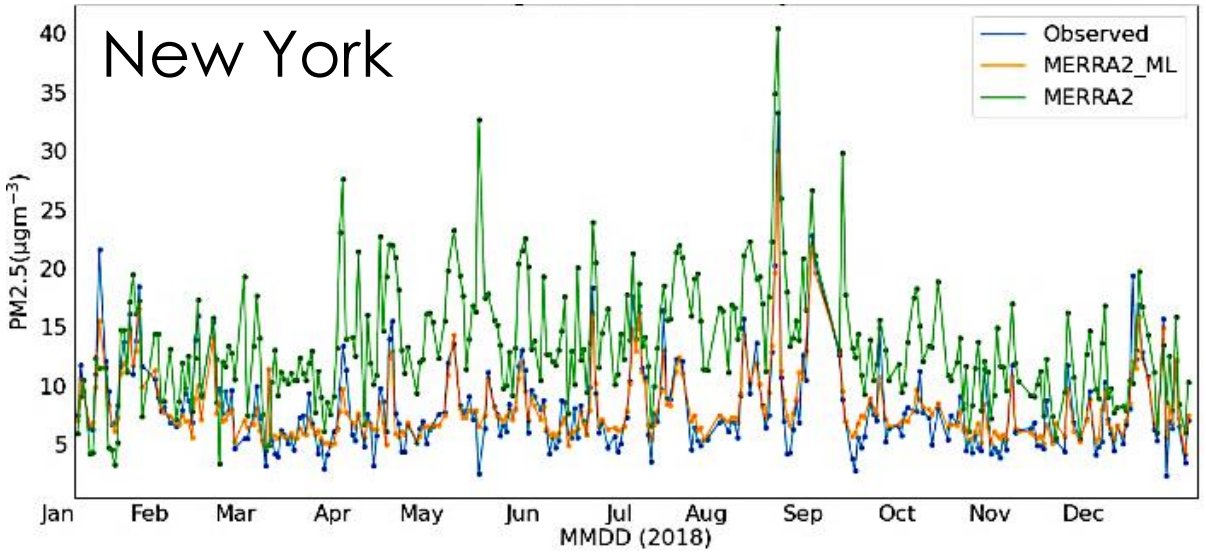
https://aqatmekong-servir.adpc.net/en/

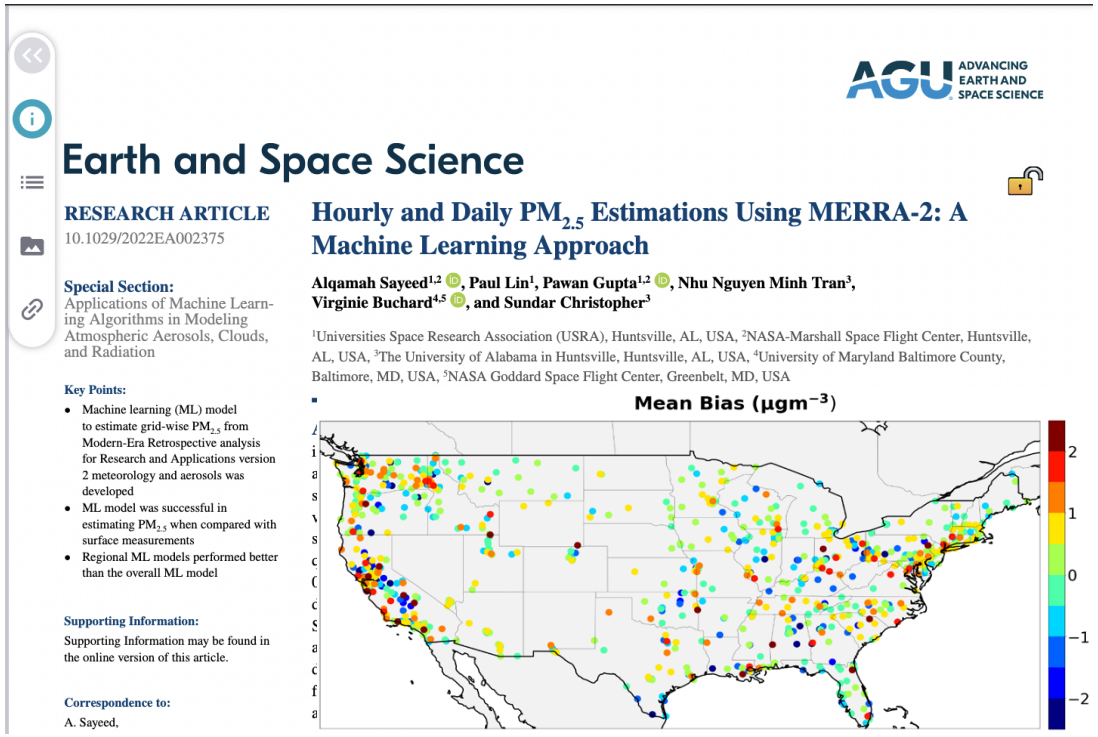
Partnership between NASA-SERVIR and TPCD

Gupta et al., 2021, https://aaqr.org/articles/aaqr-21-05-oa-0105

Hourly Data for US

MERRA2 (Aerosol + Met.) + Surface PM2.5 + MLA/DLA





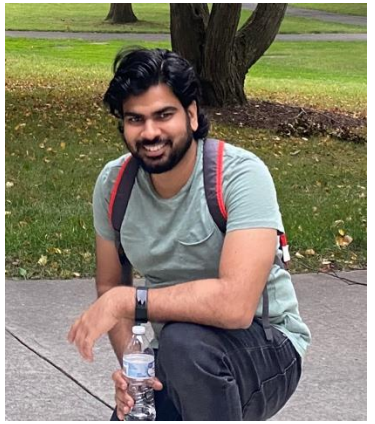
Data will be available through NASA GES-DISC – An HAQAST Partnership

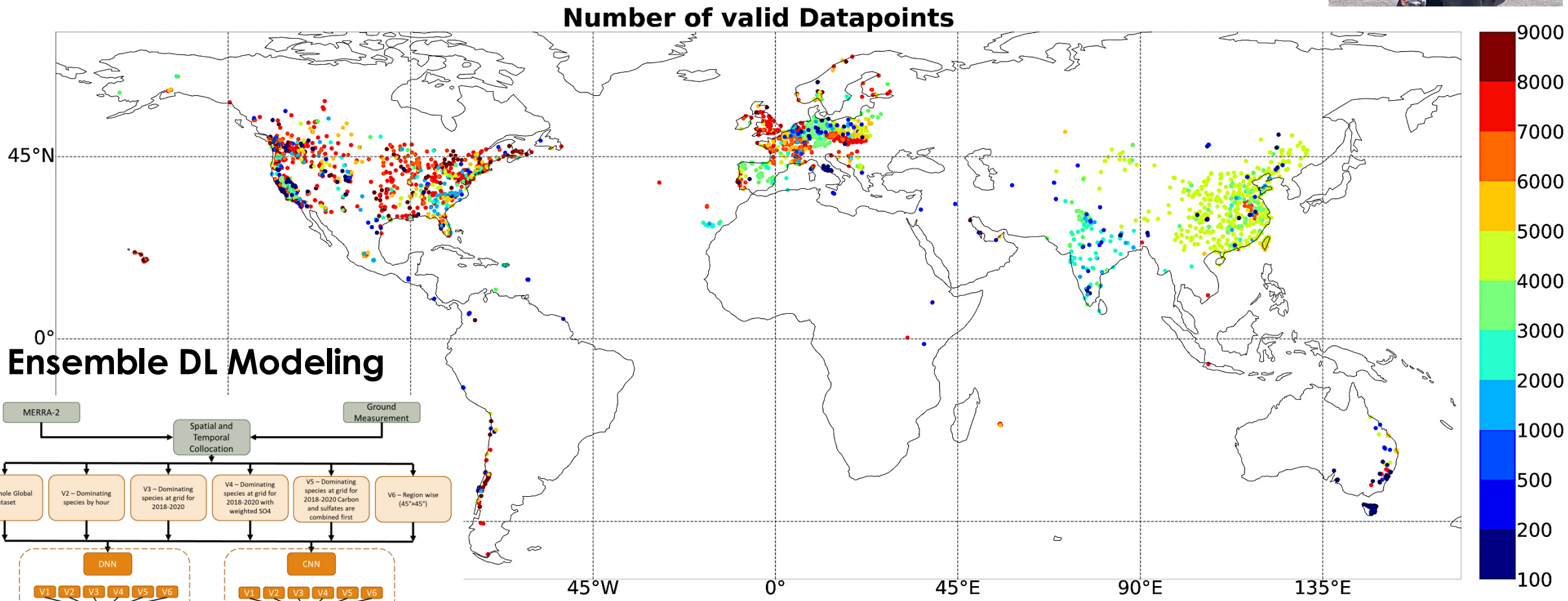
Sayeed et al., 2022

https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2022EA002375

Going Global – Available Ground Network

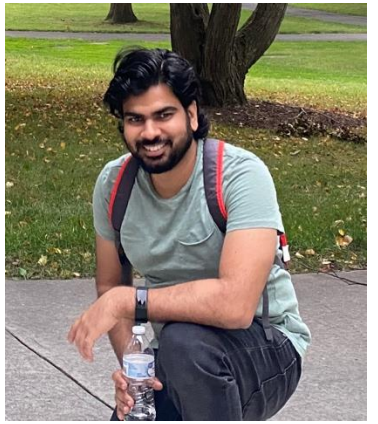
- ML Training and Testing - 2018 -2019
- Independent Data Evaluation – 2020-2022
- Deep Neural Network (DNN) & Convolutional Neural Network (CNN)



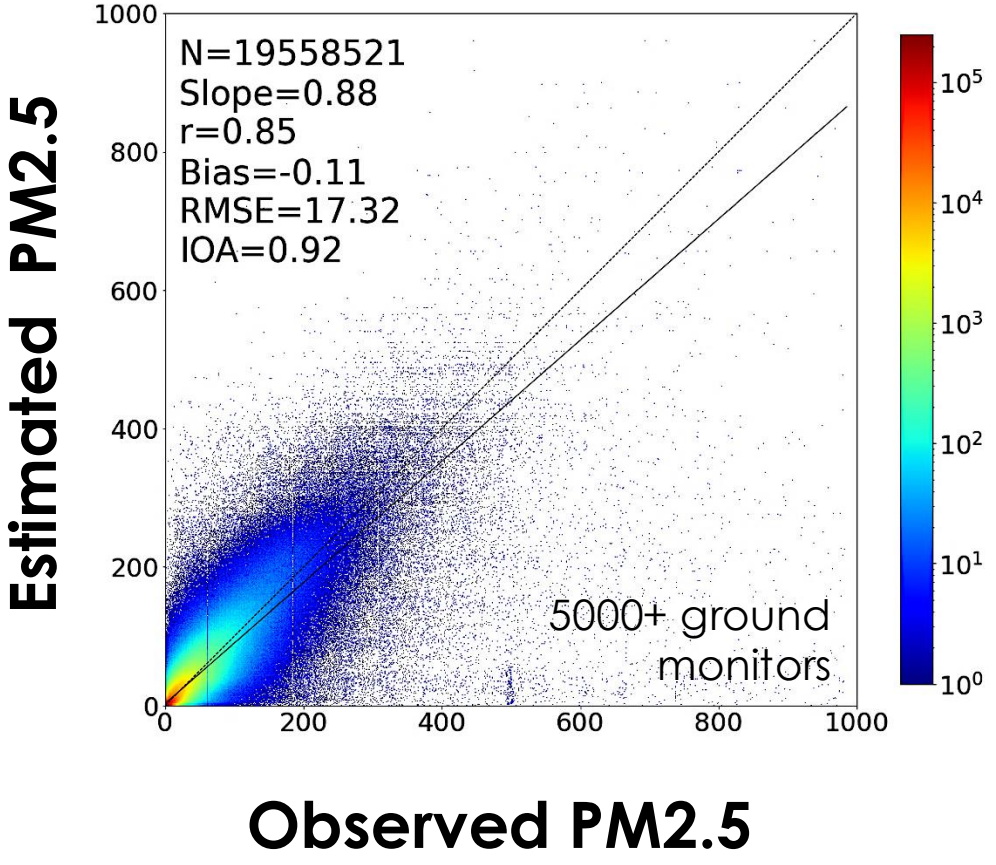


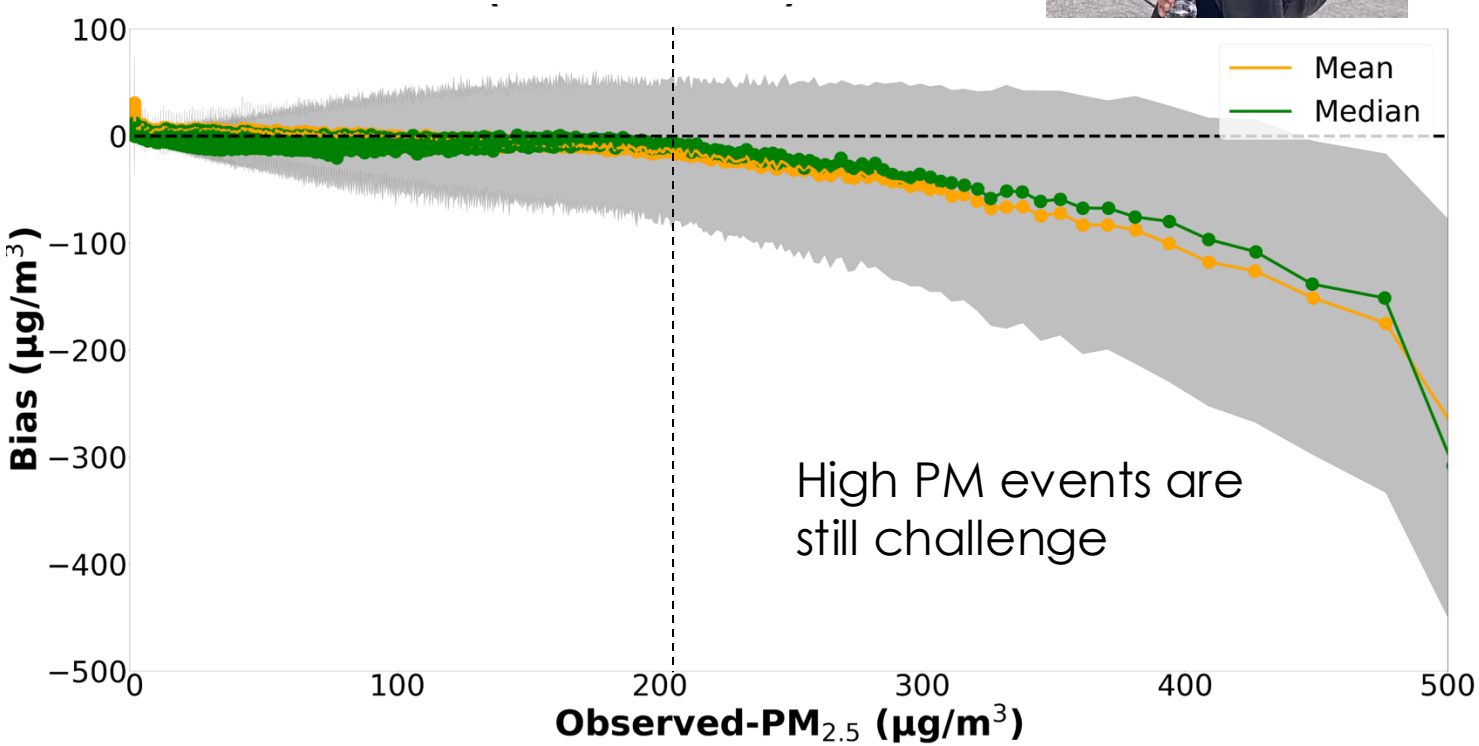
Ensemble DL Modeling

Global Estimates – Validation of Hourly Data



10-fold CV

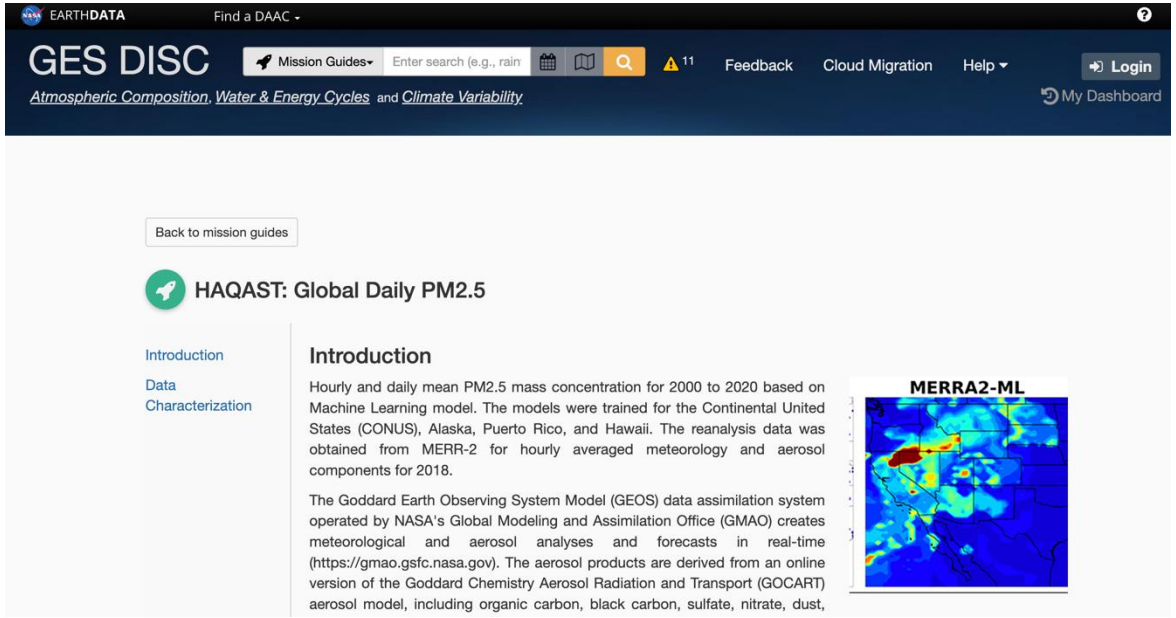




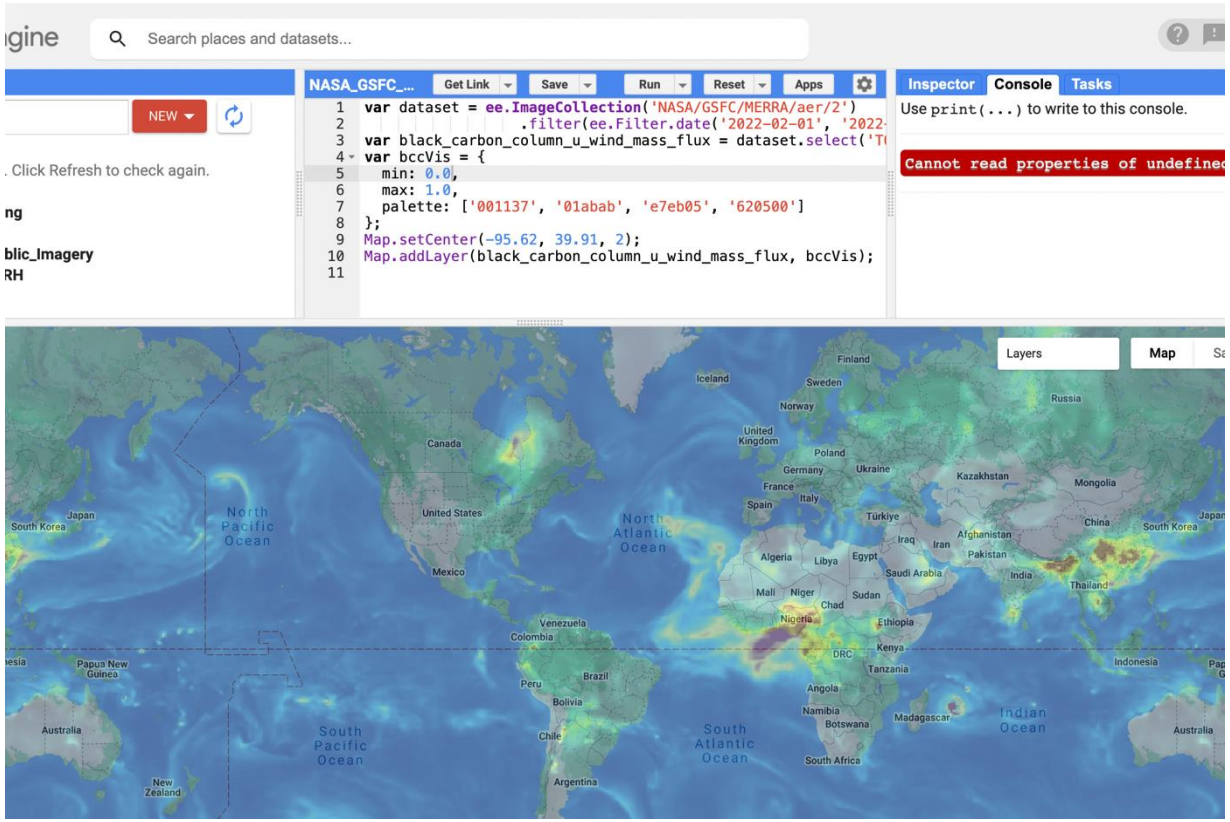
Sayeed et al., 2023, in prep

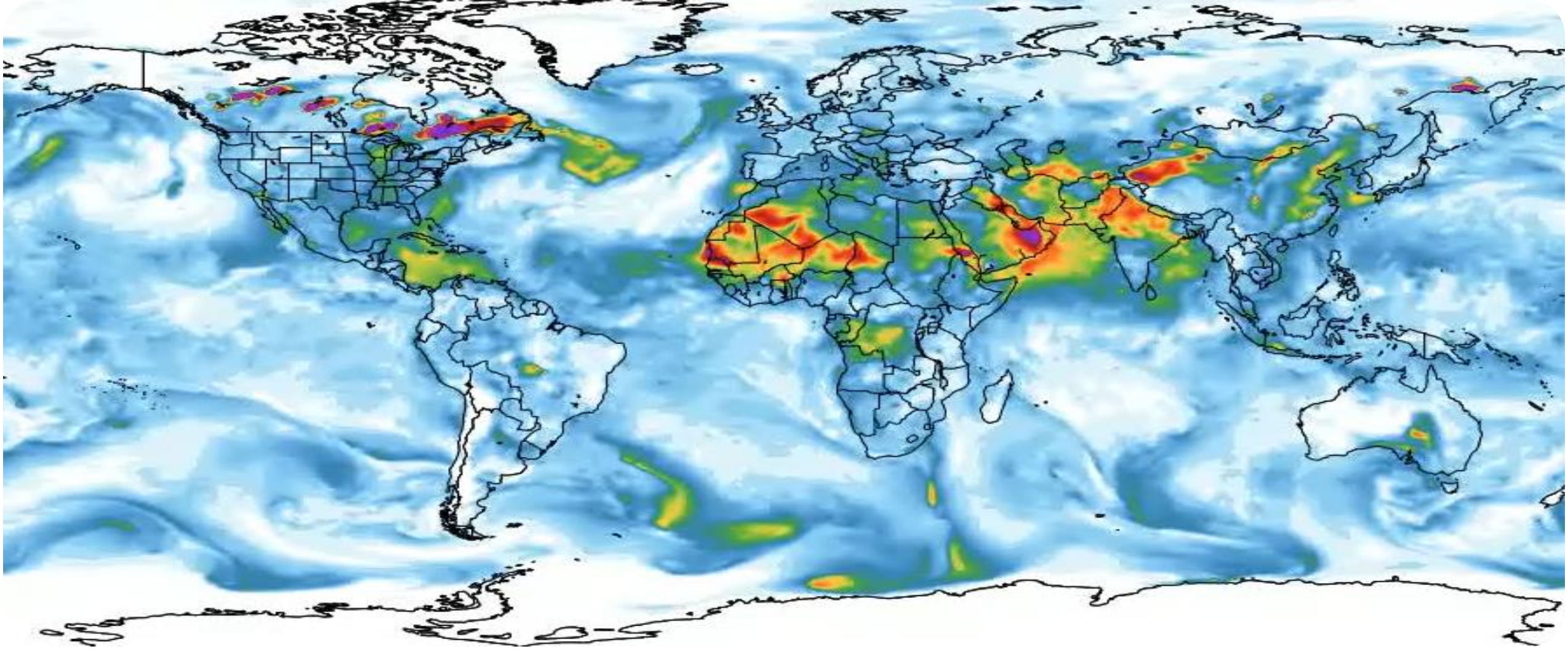
Data Availability

NASA Data Center



Google Earth Engine



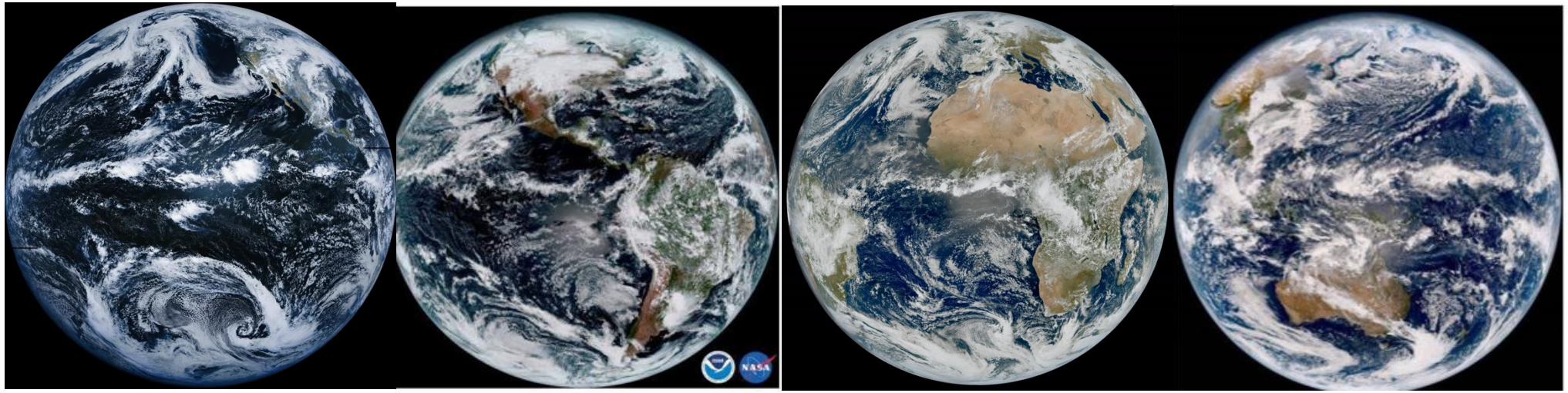


Upcoming Opportunities

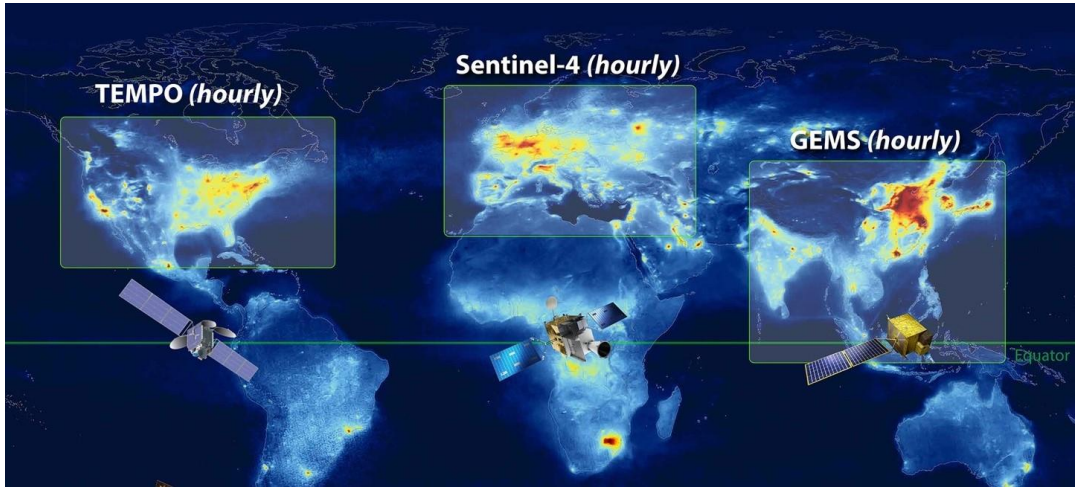
Geostationary Constellations

Visible-IR Sensors

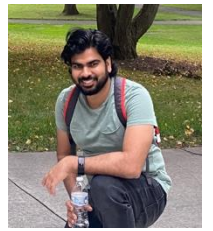
Every 10 minutes Aerosol Observations



UV-VIS Sensors – Hourly Trace Gases



GOES-R Data in AirNow



Partnership in Improving

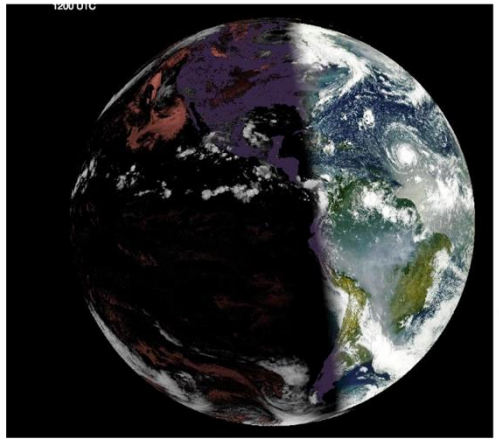
Air Quality Satellite Data Access

NOAA

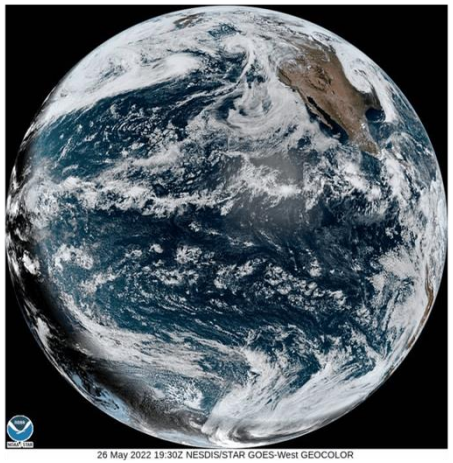
EPA

HAQAST

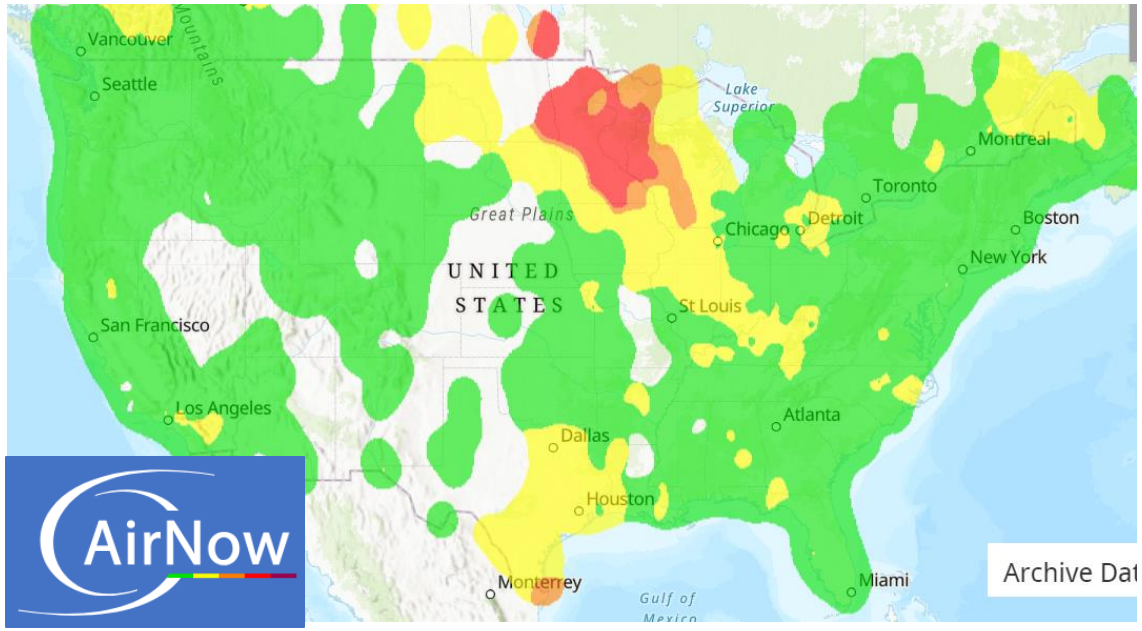
GOES-East



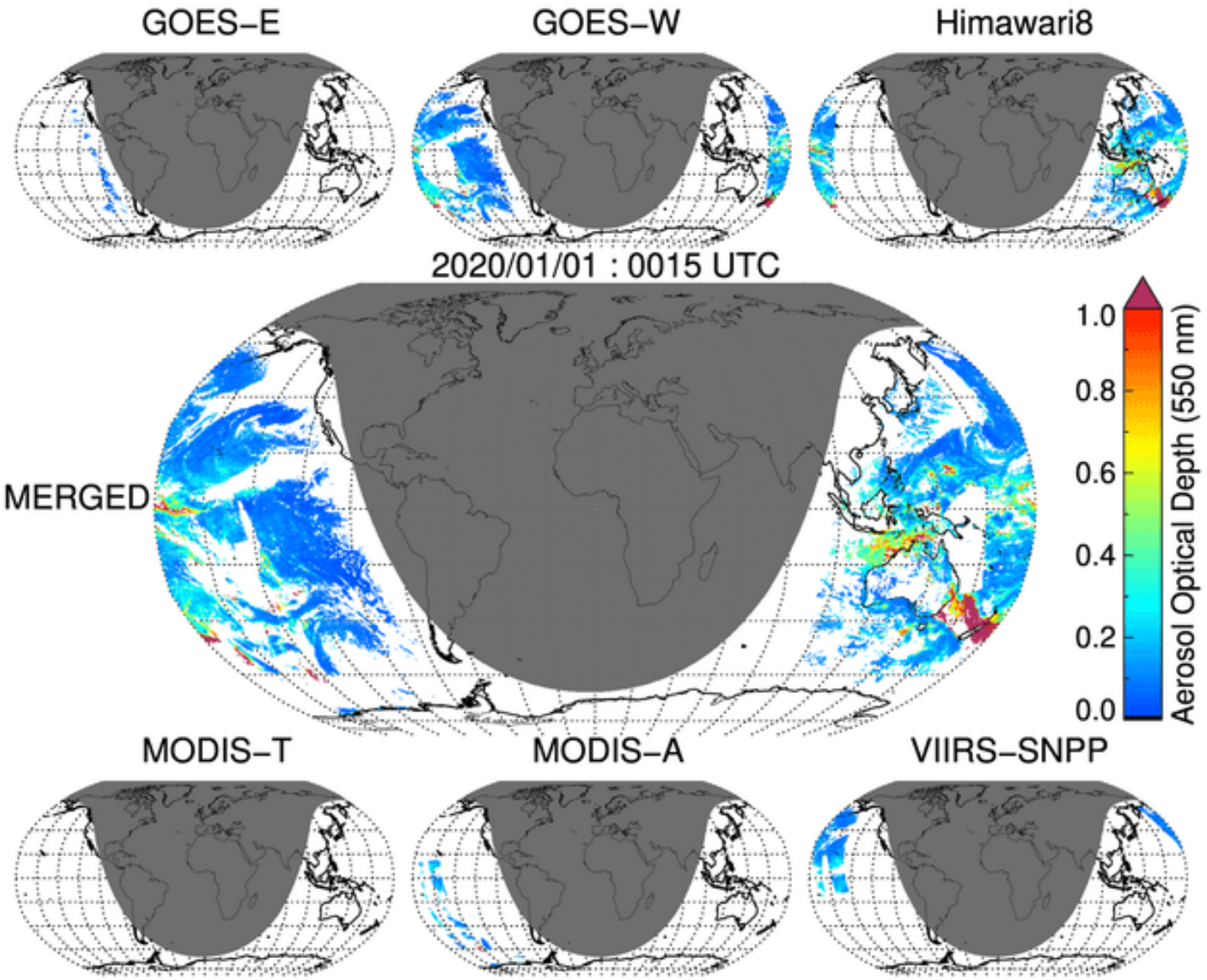
GOES-West



HAQAST Tiger Team – 2020/21



Looking into the future: Synergy of LEO & GEO



30 minutes loop Jan 1 to Jan 5, 2020