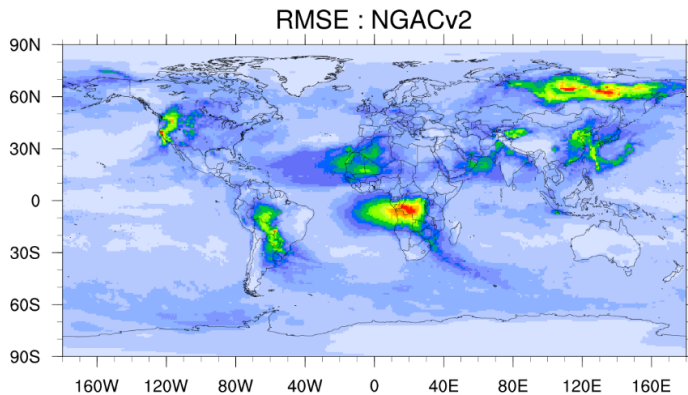
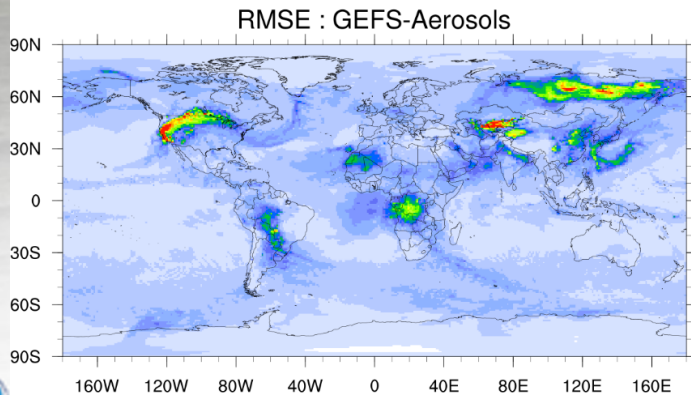


Overview of NOAA's Global Aerosol Model Progress (GEFS-Aerosol)

- Replaced operational NGACv2 on Sept. 23, 2020
- One member of Operational GEFS v12
- GEFS meteorology at C384 (~25 km), 64 levels, to 120 hrs, 4x/day
- Inline aerosol representation based on GOCART
- Sulfate, Organic Carbon, Black Carbon, Dust, Sea Salt
- Emissions: CEDS-2014 (SO₂, PSO₄, POC, PEC), GEOS- seasalt, DMS, ARL Dust
- GBBEPx biomass burning with 1-d cloud model to simulate tilt of plume. Fire Radiative Power is used to calculate convective heat flux, determine injection height

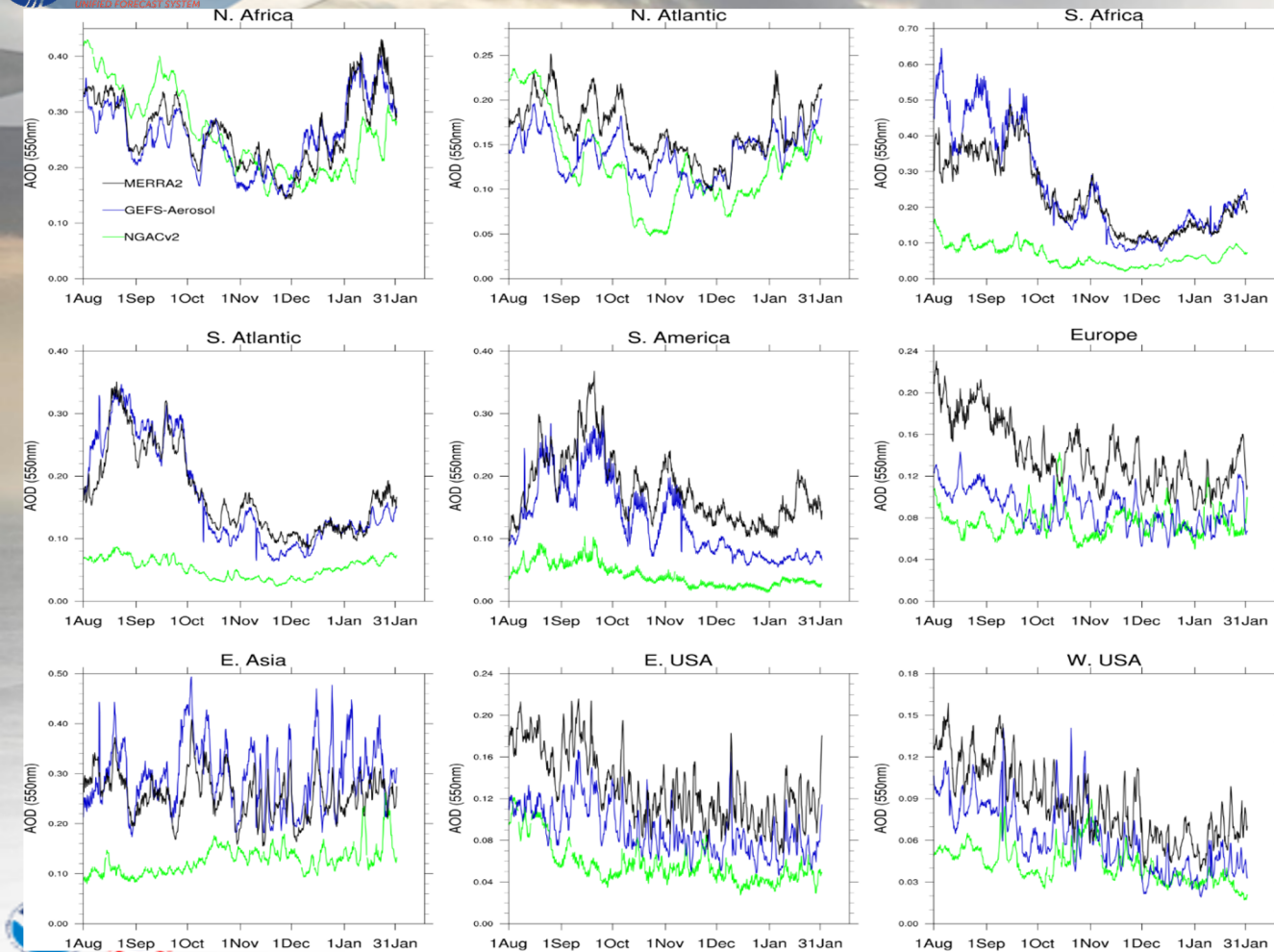
August, 2020 : Total AOD at 550nm



UFS Atmospheric Composition Modeling Goal 2024

Capability	Global GEFSv13 (~25 km?)	Regional CAM-Chem (3 km)	Hazards dispersion
Anthro Emissions	NEXUS/HEMCO	NEXUS/HEMCO	Inverse modeling
Biomass Burning Emissions	Improved GBBEPx w/ duration information	Improved GBBEPx esp. for Rx/ag fires/impr. speciat.	On-demand local fires
Data Assimilation	VIIRS AOD	AOD, TROPOMI NO2	Volcanic Ash
Atmospheric Composition module	Unified GOCART w/ nitrates	Online Optimized CMAQ: CB-VI, Aero7	N/A
Post-processing	Improved AOD calculations or inline	Machine learning for bias correction, chemistry	Ensemble products
Physical processes	Improved dust (albedo), Aerosol-Rad interactions	Improved dust, Aerosol-wx interactions	Trans. Coeff. Matrix src term calc.

Time series of Day 1 AOD forecasts compare to MERRA2 reanalysis



Black – MERRA2 reanalysis
 Green – NGACv2
 Blue – GEFSv12

Major global regions
 (from top left to bottom right)

- *N. Africa*
- *N. Atlantic*
- *S. Africa*
- *S. Atlantic*
- *S. America*
- *Europe*
- *E. Asia*
- *E. USA*
- *W. USA*

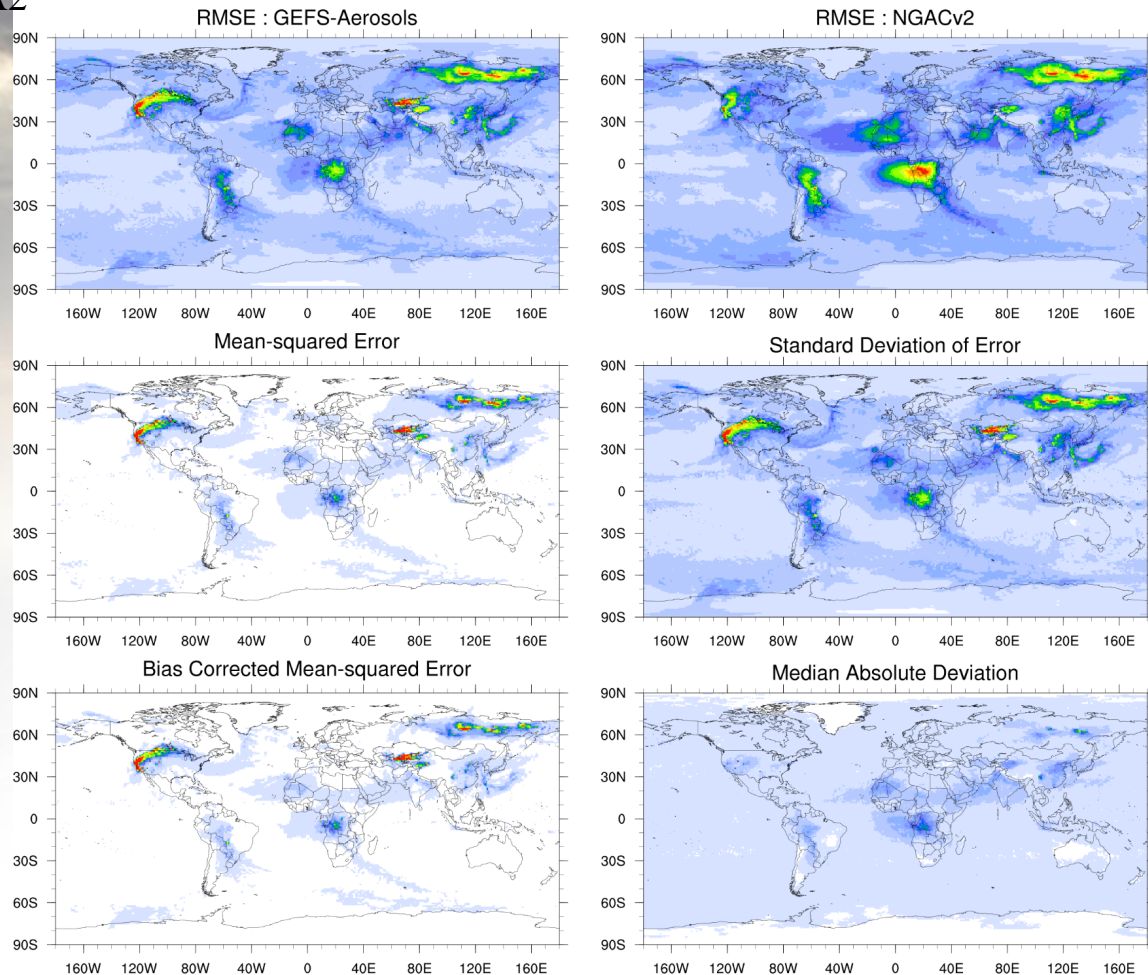
An improvement is over all major global regions. A significant improvement is for S. Africa, S Atlantic, S America and E. Asia.

Partha Bhattacharjee

Day 1 forecast evaluated against MERRA2

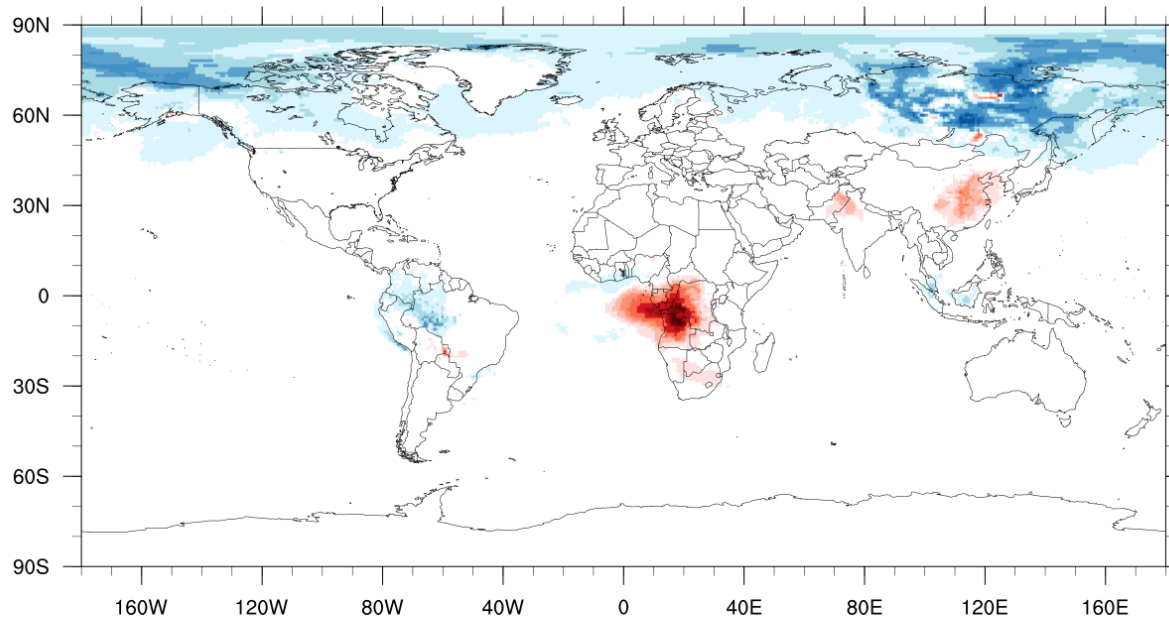
MET Series-stat used to accumulate statistics separately for each horizontal grid location over a series. This tool computes statistics for each individual grid point and can be used to quantify how model performance varies over the domain.

August, 2020 : Total AOD at 550nm



Day 1 forecast (1-31st August,2019) OC AOD at 550nm

Bias : GEFS-Aerosols(Retro) minus GEOS5



African BBA strongly overpredicted

- Fire sources: 1 day old
- Uncertainty with Plume Rise, scavenging...

GEFS-Aerosols provides 0.25, 0.5 and 1x1 degree forecast products in GRIB2 format 4 times per day

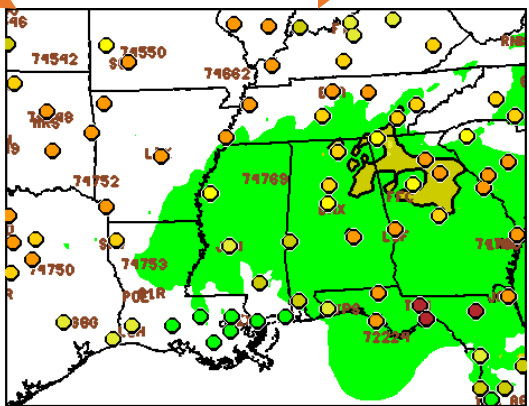
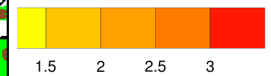
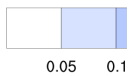
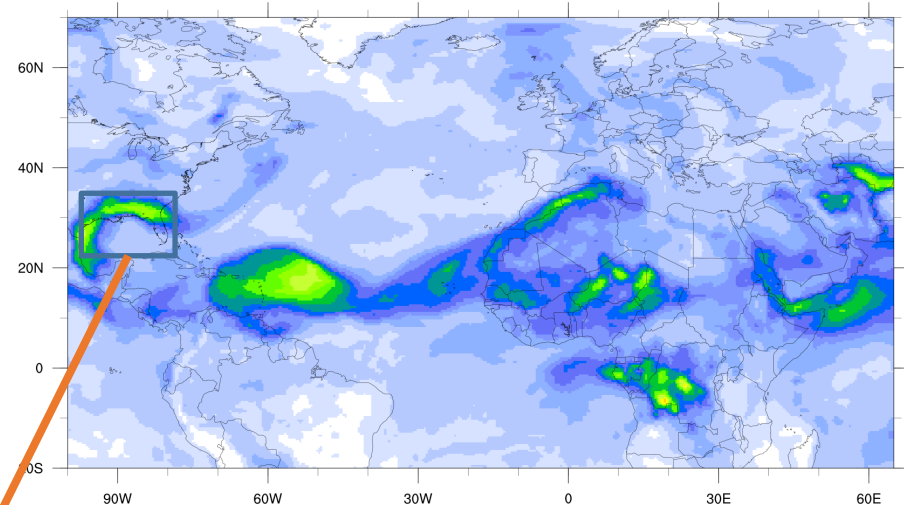
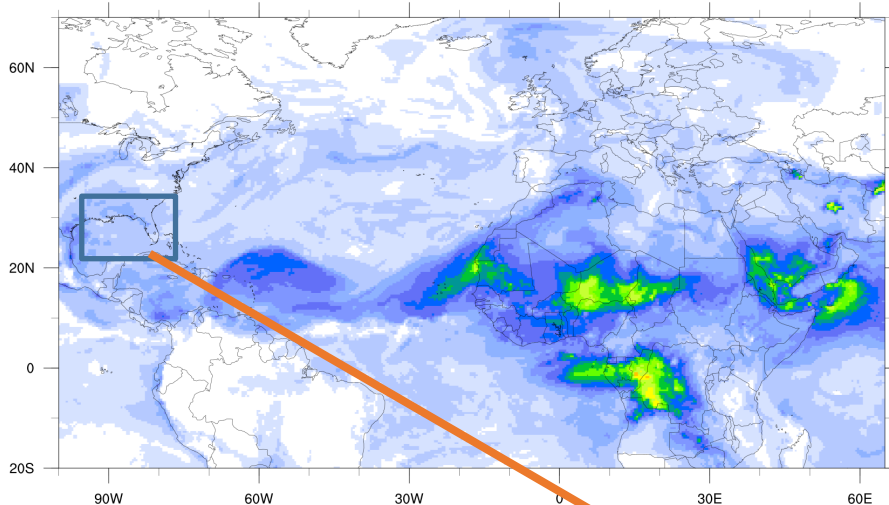
Product files and their contents include:

- 2d fields : Aerosol Optical Depth (AOD) at 340, 440, 550, 660, 860, 1063 and 1110nm from 0-120 hours
- PM10 and PM2.5 for 0-120 hours.
- Total AOD at 550nm contains fields from all 5 species (dust, sea-salt, carbonaceous aerosols, sulfate AOD) along with emission, sedimentation, dry deposition and wet deposition fluxes.
- Single scatter albedo and asymmetric factor for total aerosols at 340nm
- 3d fields : Aerosol mixing ration of species at model levels along with pressure, temperature and RH.

- ❖ **results from daily model forecasts between July – December, 2019**
- ❖ **AOD at 550nm used for verification with observation**

GEFS-Aerosol : 00fh

ICAP-MME : 00fh



Historic Sahara dust event

- Was Algerian source missed
- Were winds properly captured...