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Service Change Notice 17-10
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From: Dave Myrick
 NWS Office of Science and Technology Integration

Subject: NGAC Aerosol Forecast System Upgrade: Effective March 7, 2017

Effective on or about March 7, 2017, starting with the 1200 Coordinated Universal Time (UTC) cycle, the National Centers for Environmental Prediction (NCEP) will begin to run and disseminate data from the NOAA Environmental Modeling System (NEMS) Global Forecast System (GFS) Aerosol Component Version 2 system (NGACv2).

NGAC is a global inline atmospheric-aerosol module within the NEMS GFS. The aerosol component of the NGAC is the Goddard Chemistry Aerosol Radiation and Transport Model (GOCART).

The scope of this upgrade includes:

- Extending aerosol species from dust only to multiple species including dust, sea salt, sulfate, organic carbon and black carbon aerosols; the extension will provide a more complete global aerosol forecast using the near real time Global Blended Biomass Burning Emissions Product (GBBEPx).
- Updating meteorological model physics including the Rapid Radiative Transfer Model (RRTM) with Monte Carlo Independent Column Approximation (McICA) radiation package, Eddy-Diffusivity Mass-Flux (EDMF) Planetary Boundary Layer (PBL) scheme and land surface updates on canopy height scheme, soil moisture nudge and roughness length.

Fixing bugs such as AOD computation, and error message in MPI quit
Emission sources/techniques used for new species are:

Source for sulfate: daily biomass burning emissions from the National Environmental Satellite, Data and Information Service (NESDIS) GBBEPx and biofuel and fossil fuel emissions from Aerosol Comparisons between observations and models (AeroCom) anthropogenic emissions. Dimethylsulfide (DMS) source is a climatology of oceanic DMS concentrations (Chin et al. J. Atmos. Sci., 2002).

Sources for carbonaceous aerosols: daily biomass burning emissions from NESDIS GBBEPx, biofuel and fossil fuel climatology from AeroCom anthropogenic emissions and climatology Emission Database for Global

Atmospheric Research (EDGAR) based ship emissions. Organic carbon also has Terpene emission.

Emission techniques for sea salt: NGACv2 has five size sea salt bins (dry radius range: 0.03-10micron); the emission is a function of particle size and surface wind speed (Gong S., Global Biogeochem. Cy. 2003).

Model will be run twice daily: 0000 UTC and a new 1200 UTC cycle.
File names will be standardized.
New fields will be added in all output files (listed below).

The changes will provide the following benefits/impacts:

- Guidance on long range aerosol transport impacting the United States.
- Dynamic aerosol lateral boundary conditions to regional air quality model.
- Multi-species aerosol forecasts to end users for applications such as sea surface temperature retrieval and UV index forecast.

The changes to the filenames are as follows:

Where: HHH=00 to 120 in 3-hour increments and CC=00, 12(new)

Old -> New

ngac.tCCz.a2dfHHH-> ngac.tCCz.a2dfHHH.grib2
ngac.tCCz.a3dfHHH-> ngac.tCCz.a3dfHHH.grib2
ngac.tCCz.aod_340nm -> ngac.tCCz.aod_340nm.grib2
ngac.tCCz.aod_440nm -> ngac.tCCz.aod_440nm.grib2
ngac.tCCz.aod_550nm -> ngac.tCCz.aod_550nm.grib2
ngac.tCCz.aod_660nm -> ngac.tCCz.aod_660nm.grib2
ngac.tCCz.aod_860nm -> ngac.tCCz.aod_860nm.grib2
ngac.tCCz.aod_1p63um -> ngac.tCCz.aod_1p63um.grib2
ngac.tCCz.aod_11plum -> ngac.tCCz.aod_11plum.grib2

The output files will now include these new fields:

ngac.tCCz.a2dfHHH.grib2, where HHH=00, 03,..., 120 and CC=00, 12:

New fields:

ASYSFK: Asymmetry Factor at 340 nm from total aerosols [Numeric]
SSALBK: Single Scattering Albedo at 340 nm from total aerosols [Numeric]
AOTK: Aerosol Optical Thickness at 550 nm from total aerosols [Numeric]
AOTK: Aerosol Optical Thickness at 550 nm from sea salt aerosol [Numeric]
AOTK: Aerosol Optical Thickness at 550 nm from black carbon dry aerosol [Numeric]
AOTK: Aerosol Optical Thickness at 550 nm from particulate organic carbon dry aerosol [Numeric]
AOTK: Aerosol Optical Thickness at 550 nm from sulphate dry aerosol [Numeric]
DUST_SCAVENGING_FLUX: dust wet Deposition by Convective Precipitation Flux fluxes (kg/m2/sec)
SEASALT_EMISSION_FLUX: sea salt emission mass flux (kg/m2/sec)
SEASALT_SEDIMENTATION_FLUX: sea salt sedimentation mass flux (kg/m2/sec)

SEASALT_DRY_DEPOSITION_FLUX: sea salt dry deposition mass flux (kg/m2/sec)
SEASALT_WET_DEPOSITION_FLUX: sea salt wet deposition by large-scale precipitation mass flux (kg/m2/sec)
SEASALT_SCAVENGING_FLUX: sea salt wet deposition by convective precipitation mass flux (kg/m2/sec)
BC_EMISSION_FLUX: black carbon emission mass flux (kg/m2/sec)
BC_SEDIMENTATION_FLUX: black carbon sedimentation mass flux (kg/m2/sec)
BC_DRY_DEPOSITION_FLUX: black carbon dry deposition mass flux (kg/m2/sec)
BC_WET_DEPOSITION_FLUX: black carbon wet deposition by large-scale precipitation mass flux (kg/m2/sec)
BC_SCAVENGING_FLUX: black carbon wet deposition by convective precipitation mass flux (kg/m2/sec)
OC_EMISSION_FLUX: particulate organic carbon emission mass flux (kg/m2/sec)
OC_SEDIMENTATION_FLUX: particulate organic carbon sedimentation mass flux (kg/m2/sec)
OC_DRY_DEPOSITION_FLUX: particulate organic carbon dry deposition mass flux (kg/m2/sec)
OC_WET_DEPOSITION_FLUX: particulate organic carbon wet deposition by large-scale precipitation mass flux (kg/m2/sec)
OC_SCAVENGING_FLUX: particulate organic carbon wet deposition by convective precipitation mass flux (kg/m2/sec)

ngac.tCCz.a3dfHHH.grib2, where HHH=00, 03,..., 120 and CC=00, 12:

New fields:

SEASALT1: sea salt bin1 (diameter: 0.06-0.2 micron) mixing ratio (kg/kg)
SEASALT2: sea salt bin2 (diameter: 0.2-1 micron) mixing ratio (kg/kg)
SEASALT3: sea salt bin3 (diameter: 1-3 micron) mixing ratio (kg/kg)
SEASALT4: sea salt bin4 (diameter: 3-10 micron) mixing ratio (kg/kg)
SEASALT5: sea salt bin5 (diameter: 10-20 micron) mixing ratio (kg/kg)
BC1: black carbon hydrophobic dry (median diameter: 0.0236 micron), mixing ratio (kg/kg)
BC2: black carbon hydrophilic dry (median diameter: 0.0236 micron), mixing ratio (kg/kg)
OC1: particulate organic carbon hydrophobic dry (median diameter: 0.0424 micron), mixing ratio (kg/kg)
OC2: particulate organic carbon hydrophilic dry (median diameter: 0.0424 micron), mixing ratio (kg/kg)
SO4: sulphate dry (median diameter: 0.139 micron), mixing ratio (kg/kg)

ngac.tCCz.aod_\$NM.grib2, where NM=11plum, 1p63um, 340nm, 440nm, 550nm, 660nm, 860nm and CC=00, 12:

Total aerosol optical depth at specified wavelengths (11.1, 1.63, 0.34, 0.44, 0.55, 0.66, and 0.86 micron)

Note: NGACv1 total aerosol optical depth is from dust only. NGACv2 total aerosol optical depth is from multiple species including dust, sea salt, sulphate, black carbon and particulate organic carbon.

New fields:

ngac.t00z.aod_550nm.grib2 file also contains aerosol optical depth at 550nm from each species: dust, sea salt, sulfate, organic carbon and black

carbon.

The NGAC output will continue to be disseminated via NCEP's ftp/http server at the following locations:

<http://www.nomads.ncep.noaa.gov/pub/data/nccf/com/ngac/prod>
<http://www.ftp.ncep.noaa.gov/data/nccf/com/ngac/prod>
<ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/ngac/prod>

Web graphics will remain available at:

<http://www.emc.ncep.noaa.gov/gmb/NGAC/html/realtime.ngac.html>

A consistent parallel feed of data will be available on the NCEP server via the following URL:

<http://para.nomads.ncep.noaa.gov>

NGAC products are encoded in gridded binary version two (GRIB2). The NCEP GRIB2 table is updated to include the definition of new aerosol types. Users should download the latest versions of wgrib2 and the other NCEP GRIB utilities to use the NGAC output products.

A website containing retrospective run results from NGACv2 for the period of Apr2015-Feb2016 is online at:

<http://www.emc.ncep.noaa.gov/gmb/NGAC/V2/>

Questions, comments or requests regarding this implementation should be directed to the contacts below. We will review feedback and decide whether to proceed.

For questions regarding the scientific content of the NGAC model, please contact:

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For questions regarding the dataflow aspects of these data sets, please contact:

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National Service Change Notices are online at:

<https://www.weather.gov/notification/archive>

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