NOUS41 KWBC 031250
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Service Change Notice 17-10
National Weather Service Headquarters Silver Spring MD
850 AM EST Fri Feb 3 2017

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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 NEMS GFS Aerosol Component Version 2 system (NGACv2).

NGAC is a global inline atmospheric-aerosol module within the NOAA Environmental Modeling System (NEMS) Global Forecast System (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 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 5 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: 00Z and a new 12Z 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 files names are as follows:

Where: HHH=00 to 120 in 3hr 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_11p1um -> ngac.tCCz.aod_11p1um.grib2

The output files will now include these new fields:

(1) ngac.tCCz.a2dfHHH.grib2, where HHH=00,03,...,120 &
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)

(2) ngac.tCCz.a3dfHHH.grib2, where HHH=00,03,...,120 & 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)

(3) ngac.tCCz.aod_$NM.grib2, where NM=11p1um, 1p63um, 340nm, 440nm, 550nm, 660nm, 860nm & 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 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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NWS Service Change Notices are online at:

    http://www.nws.noaa.gov/os/notif.htm

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