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PNSWSH

Technical Implementation Notice 16-41 Updated
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To: Subscribers:
 -NOAA Weather Wire Service
 -Emergency Managers Weather Information Network
 -NOAAPort
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From: Dave Myrick
 NWS Office of Science and Technology Integration

Subject: Updated: Upgrade to the North American Mesoscale (NAM) Forecast System and Discontinuation of Downscaled GFS by NAM Extension (DGEX) Forecast System: Effective March 21, 2017

Updated to change the implementation date from March 15, 2017, to March 21, 2017 due to critical weather declaration.

Effective on or about March 21, 2017 beginning with the 1200 Coordinated Universal Time (UTC) run, the National Centers for Environmental Prediction (NCEP) is proposing to implement Version 4 of North American Mesoscale (NAM) and discontinue the Downscaled GFS by NAM Extension (DGEX) Forecast System:

- Discontinue all DGEX model output
- Remove legacy NAM products on NOAAPort and NCEP/NWS servers
- Make resolution changes for NAM nests
- Implement major changes to NAM Data Assimilation System (NDAS)
- Implement model changes: convection, microphysics, land-surface upgrades; frequency of physics calls increased.

FORECAST MODEL CHANGES:

- Resolution changes to the contiguous U.S. (CONUS) (from 4 to 3 km), Alaska (from 6 to 3 km), and CONUS fire weather (from 1.333 to 1.5 km) nests.
- More frequent calls of physics (now every 2nd time step for all domains); change frequency of radiation updates for the NAM 12 km parent domain from hourly to every 20 minutes.
- Advect specific humidity every dynamics time step.
- Changes to Betts-Miller-Janjic convective scheme to improve 12 km parent Quantitative Precipitation Forecast (QPF) bias, especially during the cool season.
- Updated Ferrier-Aligo microphysics to improve stratiform precipitation, better anvil reflectivity, reduce areas of light/noisy reflectivity over

oceans.

- Improved effect of frozen soil on transpiration and soil evaporation, leads to reduced cold/moist bias during cool season.
- Radiation/microphysics changes to reduce incoming surface shortwave radiation; reduced warm-season 2-m temperature bias.

DATA ASSIMILATION / ANALYSIS CHANGES:

- Replace 12-hour NAM Data Assimilation System (NDAS) with 3-hour analysis updates for the 12 km parent domain with a 6-hour data assimilation cycle with hourly analysis updates for the 12 km parent and the 3 km CONUS/Alaska nests. The Hawaii/Puerto Rico/Fire weather nests will be initialized from the 12-km first guess at the end of 6-hour assimilation cycle.
- Use of lightning data (from National Lightning Detection Network (NLDN) and Earth Networks Laboratory (ENL) networks) and radar reflectivity-derived temperature tendencies in the diabatic digital filter initialization.
- Add execution of the diabatic digital filter initialization prior to the NAM forecast (was only run during NDAS in current ops NAM version 3).
- Assimilate new observation types:
Aircraft data: Aeromexico, ADS-C, Air-Wisconsin
New satellite radiance data: NOAA NPP (ATMS, CRIS), METEOSAT-10 SEVIRI, DMSP-F17 SSMIS; METOP-B AMSUA, MHS, IASI New GPS Radio Occultation data: METOP-B 3 (subtype) New satellite winds: Himawari-B, METEOSAT-7, 10 Imager WV AMV, NOAA-15, 18, 19 AVHRR IR AMV, METOP-A, B AVHRR AMV.

OTHER SCIENCE CHANGES:

- Reinstate use of 557th Weather Wing (formerly Air Force Weather Agency (AFWA)) 23 km snow depth analysis using envelope adjustment.
- Use a new climatology of fresh water lake temperatures (FLAKE) for inland water bodies not resolved by the 1/12th degree RTG_SST_HR analysis in the CONUS, Alaska, and fire weather nests.
- Reduce terrain smoothing in all NAM nest domains.
- Use National Environmental Satellite, Data and Information Service (NESDIS) burned area data (30-day and 2-day average) in the fire weather nest; greenness fraction and albedo are adjusted based on the 30-day average, top-layer soil moisture based on the 2-day average.
- Perform tropical cyclone relocation for the 12 km parent domain at the start of the 6-h catchup cycle and for the NAM forecast first guess.

OUTPUT CHANGES TO WEB SERVICES:

- Files below can be found on the following NCEP services:

nomads.ncep.noaa.gov/pub/data/nccf/com/nam
www.ftp.ncep.noaa.gov/data/nccf/com/nam
<ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/nam>

- The output grid for nests will change:
CONUS nest: change from grid #227 to the same output grid as the High Resolution Rapid Refresh (HRRR) (see link below for difference):
<http://www.emc.ncep.noaa.gov/mmb/namgrids/conusoutgrid.jpg>

nam.tCCz.conusnest.hiresFFF.tm00.grib2
Where CC is cycle and FF is forecast hour 00-60
Alaska nest: change from the 6 km National Digital Forecast Database (NDFD) grid to the 3 km NDFD grid
nam.tCCz.alaskanest.hiresFFF.tm00.grib2

- All NAM nests grids will be output hourly from 0-60 hour; in the current ops NAMv3, they were output hourly from 0-36 hours and 3-hourly from 39-60 hours.

- Added 1-hour maximum precipitation rate (PRATE) and frozen precipitation rate (SRWEQ) to the following grids:

nam.tCCz.awip32FF.tm00.grib2
nam.tCCz.awip12FF.tm00.grib2
nam.tCCz.awak3dFF.tm00.grib2
nam.tCCz.##nest.hiresFFF.tm00.grib2

Where CC is cycle and FF is forecast hour and ## is either: alaska, conus, prico, hawaii, firewx.

- Add a new visibility field based on the Global Systems Division (GSD) algorithm to the following output grids (this field is labeled with vertical level=cloud top (VIS):

nam.tCCz.awip3dFF.tm00.grib2 nam.tCCz.awipakFF.tm00.grib2
nam.tCCz.awip12FF.tm00.grib2 nam.tCCz.awphysFF.tm00.grib2
nam.tCCz.awip32FF.tm00.grib2 nam.tCCz.awak3dFF.tm00.grib2
nam.tCCz.awiphiFF.tm00.grib2
nam.tCCz.(alaska|conus|prico|hawaii|firewx)nest.hiresFFF.tm00.grib2

Where CC is the cycle time and FF is the forecast hour.

- Ceiling height (HGT) in the NAMv4 is changed from height above ground level to height above mean sea level for all output files

- The NAM 12km CONUS grid #218 file will be renamed
nam.tCCz.awphysFF.grb2.tm00 -> nam.tCCz.awphysFF.tm00.grib2

- The 0.108 degree latitude (lat)/longitude (lon) Caribbean grid will be renamed
nam.tCCz.afwacaFF.grb2.tm00 -> nam.tCCz.afwacaFF.tm00.grib2

- The 0.108 degree lat/lon Hawaii grid will be renamed
nam.tCCz.afwahiFF.grb2.tm00 -> nam.tCCz.afwahiFF.tm00.grib2

- The current NAM 12km Alaska grid #242 file contains both surface and upper level data. In NAMv4, it is being renamed and will contain mostly

pressure level data:

nam.tCCz.awak3dFF.grb2.tm00 -> nam.tCCz.awak3dFF.tm00.grib2

- A second grid #242 file called is being added to the server; this contains mostly surface fields that will not be in the new awak3d file:
nam.tCCz.awp242FF.tm00.grib2

The gridded binary version two (GRIB2) labeling for 0-6 km integrated vertical u- and v- components of the wind shear is changing from "6000-0 m above ground" to "0-6000 m above ground"); this field is output in the following grids:

nam.tCCz.awak3dFF.tm00.grib2 nam.tCCz.awip3dFF.tm00.grib2
nam.tCCz.awipakFF.tm00.grib2 nam.tCCz.awphysFF.tm00.grib2
nam.tCCz.(alaska|conus|prico|hawaii|firewx
nest.hiresFF.tm00.grib2

- The GRIB2 sigma value label for 0.33-0.67 sigma RH and 0.67-1.00 sigma RH will change to 0.33-0.66 sigma RH and 0.66-1.00 sigma RH in the following grids:

nam.tCCz.awipakFF.tm00.grib2
nam.tCCz.grbgrdFF.tm00.grib2

- The GRIB2 sigma level label for 0.7848 sigma temperature and 0.8967 sigma temperature will change to 0.78483 sigma temperature and 0.89671 sigma temperature for the following grids:

nam.tCCz.awip32FF.tm00.grib2
nam.tCCz.awipakFF.tm00.grib2
nam.tCCz.grbgrdFF.tm00.grib2

- With the NAM Alaska nest horizontal grid resolution changing from 6 km to 3 km, it will no longer run with convective parameterization. Therefore, the following convective-type fields will no longer be output for the Alaska nest: Accumulated convective precipitation; Convective precipitation rate; Convective cloud top/bottom pressure; Deep convective cloud top/bottom pressure; Shallow convective cloud top/bottom pressure; Total convective cloud cover; Deep convective heating rate.

- The total snow water equivalent on the ground will be added to the file:
nam.tCCz.awip20FF.tm00.grib2

- The GRIB2 processing for the NAM nests has been streamlined so that all 6 NAM nests will output the same variables. Thus, the following fields that are now only available from the NAM CONUS nest will also be output from the Alaska, Hawaii, Puerto Rico, and Fire weather nests:

- 80 meter above ground pressure, specific humidity, temperature, and wind.

- 0-6 km integrated vertical u- and v-components of the wind shear.

- Vertically-integrated liquid water.

As part of the streamlining of the GRIB2 processing for the NAM nests, the following variables will be removed from the output grid for the NAM Fire Weather nest:

- Dew point temperature on pressure levels except for 300, 400, 500, 700, 850, 925, and 1000 millibars (mb).
 - Dew point temperature at the 1st and 2nd model levels above ground.
 - Absolute vorticity at 200 and 300 mb levels.
 - Vertical velocity, relative humidity, and specific humidity at 2, 5, 7, 70 mb levels.
 - Turbulent kinetic energy at 2, 5, 7, 10, 20 mb levels.
 - Cloud ice, cloud water, rain, and snow mixing ratio and rime factor at 2, 5, 10, 20, 70 mb levels, and on the 2nd model level above ground.
 - Grid-point latitude and longitude planetary boundary layer (PBL) Regime.
 - 1-hour average non-convective cloud cover.
 - Equivalent radar reflectivity factor for snow and rain 1-hour average total cloud cover.
 - Height, pressure, temperature, and reflectivity on the 2nd model level above ground.
- NAMv4 output files on the NCEP/NWS web servers will be written as GRIB2 format from the post-processing, instead of first being written out in GRIB1 format and converted to GRIB2. The GRIB2 compression type for each NAM domain will be as follows:

JPEG2000: Hawaii, Puerto Rico and Fire Weather nests Complex packing with 2nd order spatial differencing: CONUS nest, Alaska nest and all output from 12km NAM parent domain.

- Variables in those grids created with GRIB2 complex compression may occasionally contain invalid negative numbers.

Users may see some differences with the encoding and are encouraged to upgrade their software to handle this. Please see the links below for upgraded code:

<http://www.nco.ncep.noaa.gov/pmb/codes/GRIB2>
<http://www.cpc.ncep.noaa.gov/products/wesley/wgrib2>
<ftp://ftp.cpc.ncep.noaa.gov/wd51we/wgrib>

- The number of days archived on the NCEP web services will be changed from 28 days to 7 days.

Based on feedback from [Public Information Statement \(PNS\) 16-43](#), remove NAM-driven Great Lakes Wave (GLW) model. On this date, the following products will be removed from /com/wave/prod/glw.YYYYMMDD/:

glw.tCCz.spec_tar.gz
glw.grlc_2p5km.tCCz.grib2
glw.wstp.grlc_2p5km.tCCz.grib2

Several bulletins provided within glw.tCCz.bull_tar
Several bulletins provided within glw.tCCz.cbull_tar
Several bulletins provided within glw.tCCz.csbull_tar
Several bulletins provided within directory bulls.tCCz
Where CC is cycle at 00, 06, 12 and 18Z

PRODUCT REMOVALS FROM WEB SERVICES:

- NCEP solicited public feedback through [PNS 16-34](#) NAM Removals, after balancing user comments with the code management of the production suite the following changes will be made:

https://www.weather.gov/media/notification/pdfs/pns16-34nam_removalaaa.pdf

Files below can be found on the following NCEP servers via nomads.ncep.noaa.gov/pub/data/nccf/com/nam:

www.ftp.ncep.noaa.gov/data/nccf/com/nam

<ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/nam>

Or NWS servers via:

<http://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.nam.CY.CC>

<ftp://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.nam.CY.CC>

- NAM Products listed will be discontinued from all NCEP web services:

nam.tCCz.awip12FF.tm00.10m.uv.grib2

nam.tCCz.awp217FF.tm00_icwf.grib2

nam.tCCz.awipakFF.tm00_icwf.grib2

nam.tCCz.awip218tiles_fff.grib2.tar.gz

nam.tCCz.awip32tiles_fff.grib2.tar.gz tiles.tCCz directory

NOTE: Users who wish to obtain a subset of NAM grids can generate them directly using the grid sub setting option on the NCEP NOAA Operational Model Archive and Distribution System (NOMADS) server at <http://nomads.ncep.noaa.gov> (click on "grib filter" option)

nam.tCCz.grb5fmFF.tm00.grib2 nam.tCCz.grb_fmFF.tm00.grib2

NOTE: Users can replace these with the 90 km North American polar stereographic grid #104: nam.tCCz.grbgrdFF.tm00.grib2

nam.tCCz.smartconusFF.tm00.grib2 nam.tCCz.smartakFF.tm00.grib2

NOTE: Users should instead be using the higher resolution 2.5/3km NAM DNG products.

The following will be removed from the NWS servers and can instead be found on the NCEP servers:

fh.00FF_tl.press_gr.awp218

fh.00FF_pa.sw10m_tl.press_gr.awip12

fh.00FF_tl.press_gr.awip20

fh.00FF_tl.press_gr.awip3d

fh.00FF_tl.press_gr.awp211

fh.00FF_tl.press_gr.awip12

fh.00FF_tl.press_gr.awipak

fh.00FF_tl.press_gr.grbgrd

fh.00FF_tl.press_gr.icwf20 fh.00FF_tl.press_gr.icwf3d

NOTE: Users can access these exact data sets on the NCEP servers as direct grib output or by using NOMADS grib filter and are encouraged to transition to the NCEP servers at any time.

Please reference this page for file name changes:

<http://www.nco.ncep.noaa.gov/pmb/products/nam/>

- The "ndas.YYYYMMDD" directories on the NCEP servers will be discontinued. All grids and BUFR observation files from the NAMv4 6-hour assimilation cycle will be written into the "nam.YYYYMMDD" directory. Since the 12-hour NDAS will be replaced by a 6-hour data assimilation cycle with hourly analyses, the grid #212 files from the current NDAS, for example:

./ndas.YYYYMMDD/ndas.tCCz.awip3d(00|01|02|03).tm12|09|06|03.grib2

will be replaced by:

./nam.YYYYMMDD/nam.tCCz.awip3d(00|01).tm06|05|04|03|02|01.grib2

where YYYYMMDD is the cycle date, CC the cycle time.

- All Downscaled GFS with Eta Extension (DGEX) model output from the NCEP servers under dgex/prod/dgex.YYYYMMDD will be discontinued. The DGEX model will no longer be run within the NCEP model suite.

Where YYYYMMDD is year, month, day.

- Remove the GRIB1 NAM grid 215 products under directory "PT.grid_DF.bb/" on the NWS web servers.

NOAAPORT PRODUCT TERMINATIONS:

NCEP solicited public feedback through the [PNS 16-34](#) NAM Removals, after balancing user comments with the code management of the production suite the following changes will be made:

https://www.weather.gov/media/notification/pdfs/pns16-34nam_removalaaa.pdf

1) All 00z and 12z cycle NAM FAX charts will be removed:

Description	WMO Headers
00 Hour 200MB Isobar/Temperature	QHUA17 KWBC
00 Hour 500MB Isobar/Temperature	QHTA11 KWBC
00 Hour 700MB Isobar/Temperature	QHTA07 KWBC
00 Hour 850MB Isobar/Temperature	QHUA04 KWBC
Analysis 300MB Isobar	QHUA15 KWBC UPA PYMA[357]0 KWBC UPA PYMA[28]5 KWBC

This legacy code can no longer be supported on the next generation supercomputer. If users are interested in the code to create the charts, please contact the Environmental Modeling Center (EMC) below. NCEP will also investigate the possibility of the Model Analysis and Guidance (MAG) creating replica charts.

Please see the link below for the exact WMO headers for items 2-4:

http://www.nco.ncep.noaa.gov/pmb/changes/nam_TIN_AWIPS_grids.shtml

Removal of the lower resolution only for:

NAM NDFD 5km CONUS (grid 197) and 6km Alaska grids (grid 198)

Removal of grid 217, 22 km Alaska region Polar Stereographic

Removal of grid 215, 20km Regional CONUS

Removal of all DGEX products

PARALLEL DATA:

A consistent parallel feed of data is available on the NCEP server via the following URLs:

<http://para.nomads.ncep.noaa.gov/pub/data/nccf/com/nam/para>

<http://para.nomads.ncep.noaa.gov/pub/data/nccf/noaaport/nam>

For more general information about the NAM, please see:

<http://www.emc.ncep.noaa.gov/?branch=NAM>

NCEP urges all users to ensure their decoders can handle changes in content order, changes in the scaling factor component within the product definition section (PDS) of the GRIB files, and volume changes. These elements may change with future NCEP model implementations. NCEP will make every attempt to alert users to these changes before implementation.

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

For questions regarding the science aspects, please contact:

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For questions regarding the data flow aspects of these datasets, please contact:

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National Technical Implementation Notices are online at:

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

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