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PNSWSH

Service Change Notice 18-YY
National Weather Service Headquarters Silver Spring MD
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To: Subscribers
 -NOAA Weather Wire Service
 -Emergency Managers Weather Information Network
 -NOAAPORT
 Other NWS Partners, Users and Employees

From: Jeffrey Craven
 NWS Office of Science and Technology Integration
 Meteorological Development Laboratory

Subject: Upgrade of experimental National Blend of Models
 guidance effective July 5, 2018, and request for
 comments

On or about Tuesday, July 5, 2018, beginning with the 1200 Universal Time Coordinated (UTC) model run, the NWS Meteorological Development Laboratory (MDL) will implement an update to the experimental National Blend of Models (NBM) guidance over the CONUS, OCONUS (Alaska, Hawaii, Puerto Rico), and Oceanic National Digital Forecast Database (NDFD) domains.

In the event that the implementation date is declared a Critical Weather Day (CWD), or significant weather is occurring or is anticipated to occur, implementation of this change will occur at 1200 UTC on the next weekday not declared a CWD and when no significant weather is occurring.

1. Background

This upgrade will incorporate additional global and mesoscale models over the CONUS, OCONUS and Oceanic domains. The upgrade will enable the NBM to fill gaps in several key weather elements for service areas such as aviation, fire weather, and marine. The location and cycle availability of all NBM products is outlined in Sections 6-8 below.

2. New NBM Elements for the CONUS and OCONUS

A list of new weather elements that will be available at hourly time steps through 36 hours unless otherwise noted is provided below:

1. 1-hour Quantitative Precipitation Amount (OCONUS)
2. 1-hour Precipitation Potential Index (OCONUS)
3. 6-hour Calibrated Quantitative Precipitation Amount (CONUS) (6-hourly)
4. 6-hour Calibrated Quantitative Precipitation Amount (10th Percentile) (CONUS) (6-hourly)
5. 6-hour Calibrated Quantitative Precipitation Amount (50th Percentile) (CONUS) (6-hourly)
6. 6-hour Calibrated Quantitative Precipitation Amount (90th Percentile) (CONUS) (6-hourly)
7. 6-hour Calibrated Probability of Precipitation (CONUS) (6-hourly)
8. Simulated Maximum Hourly Reflectivity (CONUS and OCONUS)
9. Echo Tops (CONUS and OCONUS)
10. Vertically Integrated Liquid (CONUS and OCONUS)
11. Maximum Low Level Wind Shear Speed (CONUS and OCONUS)
12. Maximum Low Level Wind Shear Wind Direction (CONUS and OCONUS)
13. Maximum Low Level Wind Shear Height (CONUS and OCONUS)
14. Transport Wind Speed (CONUS and OCONUS)
15. Transport Wind Direction (CONUS and OCONUS)
16. Transport Mixing Height (CONUS and OCONUS)
17. Ventilation Rate (CONUS and OCONUS)
18. 6-hour maximum Haines Index (CONUS and OCONUS) (6-hourly)
19. 6-hour Maximum Fosberg Index (CONUS and OCONUS) (6-hourly)
20. Maximum wet-bulb temperature aloft (Alaska)
21. Bourgouin positive area/energy (Alaska)
22. Bourgouin negative area/energy (Alaska)
23. Probability of cloud ice present (Alaska)
24. Conditional probability of rain (Alaska)
25. Conditional probability of snow (Alaska)
26. Conditional probability of freezing rain (Alaska)
27. Conditional probability of sleet (Alaska)
28. Conditional probability of refreeze sleet (Alaska)
29. Snow-liquid ratio (Alaska)
30. Snow level (Alaska and Hawaii)
31. 1-hour Snow Accumulation (CONUS and Alaska)
32. 1-hour Ice Accumulation (CONUS and Alaska)
33. 6-hour Snow Accumulation (CONUS and Alaska) (6-hourly)
34. 6-hour Ice Accumulation (CONUS and Alaska) (6-hourly)
35. 1-hour Probability of Thunder (CONUS)

36. 3-hour Probability of Thunder (CONUS)(3-hourly)
37. 3-hour Probability of Dry Thunder (CONUS)(3-hourly)
38. 12-hour Probability of Thunder (CONUS) (6-hourly)
39. Predominant Weather (CONUS and Alaska)
40. Significant Wave Height (CONUS and OCONUS)(3-hourly)

The following new NBM weather elements will be available over the CONUS and OCONUS domains at 3-hour time steps between 39-192 hours and every 6 hours thereafter through 264 hours unless otherwise noted:

1. 6-hour Calibrated Quantitative Precipitation Amount (10th Percentile) (CONUS) (Every 6 hours through 240 hours)
2. 6-hour Calibrated Quantitative Precipitation Amount (50th Percentile) (CONUS) (6-hourly)
3. 6-hour Calibrated Quantitative Precipitation Amount (90th Percentile) (CONUS) (Every 6 hours through 240 hours)
4. 6-hour Calibrated Probability of Precipitation (CONUS) (Every 6 hours through 240 hours)
5. Transport Wind Speed (CONUS and OCONUS)
6. Transport Wind Direction (CONUS and OCONUS)
7. Transport Mixing Height(CONUS and OCONUS)
8. Ventilation Rate (CONUS and OCONUS)
9. 6-hour Maximum Haines Index (CONUS and OCONUS) (Every 6 hours through 234 hours)
10. 6-hour Maximum Fosberg Index (CONUS and OCONUS) (Every 6 hours through 264 hours)
11. Maximum wet-bulb temperature aloft (Alaska)
12. Bourgouin positive area/energy (Alaska)
13. Bourgouin negative area/energy (Alaska)
14. Probability of cloud ice present (Alaska)
15. Conditional probability of rain (Alaska)
16. Conditional probability of snow (Alaska)
17. Conditional probability of freezing rain (Alaska)
18. Conditional probability of sleet (Alaska)
19. Conditional probability of refreeze sleet (Alaska)
20. Snow-liquid ratio (Alaska)
21. Snow level (Alaska and Hawaii)
22. 6-hour Snow Accumulation (CONUS and Alaska)
23. 6-hour Ice Accumulation (CONUS and Alaska)
24. 12-hour Probability of Thunder (CONUS)(Every 6 hours (though 192 hours)
25. Predominant Weather (CONUS and Alaska)
26. Significant Wave Heights (CONUS and OCONUS)(every 3 hours through 192 hours)

3. New NBM Oceanic Products

With this implementation, NBM guidance for the Oceanic domain will now incorporate the deterministic and all ensemble members from Navy Global Environmental Model Global Ensemble Model (NAVGEMD and NAVGEME) and the deterministic Global Canadian Meteorological Centre (CMC) Model (GDPS). This upgrade will include the following nine new oceanic weather elements:

1. 10-m Wind Gust (50th Percentile)
2. 80-m Wind Speed (50th Percentile)
3. 30-m Wind Speed (50th Percentile)
4. 2-m Air Temperature (50th Percentile)
5. Visibility (50th Percentile)
6. Mean Sea Level Pressure (10th Percentile)
7. Mean Sea Level Pressure (50th Percentile)
8. Mean Sea Level Pressure (90th Percentile)
9. Significant Wave Height

These new Oceanic products will continue to be produced on the current 10-km oceanic Mercator grid. With this implementation, all oceanic products will be disseminated six times daily rather than the twice, as is currently being done. Please see Section 7 for further details.

4. National Blend of Models Text Product

For those customers who make use of MOS-station text bulletins, we have added a very similar product in this NBM upgrade. The data in these bulletins are the NBM's nearest grid point forecast to the corresponding station. Because these messages are not directly tuned to METAR and marine sites, we are generating text messages for several additional sites not presently found in the GFS MOS bulletins. It is important to note that while NBM forecasts are not tuned to stations, some of the input models are tuned to METARs, such as the Localized Aviation MOS Product (LAMP), Global Forecast System Model Output Statistics (GFS MOS), and Ensemble Kernel Density Model Output Statistics (EKDMOS).

We will be generating four individual NBM text bulletin products every hour, each covering different forecast horizons. They are as follows:

- a. NBH (Hourly resolution to 24 hours, similar to LAMP)
- b. NBS (3 hourly resolution to 66 hours, similar format to NAM MOS and GFS MOS short range MET and MAV)

- c. NBE (12 hour resolution to 192 hours, similar format to GFS Extended range MEX)
- d. NBX (same as NBE, but for Days 9-11)

Again, while the format of these four text messages is similar to the current MOS bulletins, the content and the notation in which it is conveyed are different in some instances. For a detailed explanation of these messages please follow the hyperlink provided below.

https://www.weather.gov/mdl/nbm_textcard

5. This upgrade will incorporate additional global and mesoscale models and statistically post-processed guidance over the CONUS, OCONUS, and Oceanic domains:

Current inputs:

1. NAM (North American Mesoscale Forecast System)
2. NAMNest (NAM high resolution nest)
3. GFS (Global Forecast System)
4. GEFS (Global Ensemble Forecast System)
5. GDPS (CMCD - Environment Canada Global Deterministic - PoP12/QPF06 only)
6. GEPS (CMCE - Environment Canada Global Ensemble)
7. EKDMOS (Ensemble Kernel Density Model Output Statistics)
8. Gridded GFS MOS (GMOS or MOSGuide)
9. HRRR (High Resolution Rapid Refresh) (CONUS only)
10. RAP (Rapid Refresh)
11. Gridded LAMP (GLMP Localized Aviation MOS Product)
12. HiResWindow ARW NCEP (High-Resolution Window Forecast System (HIRESW))
13. HiResWindow NMMB NCEP (High-Resolution Window Forecast System (HIRESW))
14. SREF (Short Range Ensemble Forecast)
15. NAVGEME (Navy FNMOC Global Ensemble)

New inputs:

1. ECMWFD (European Centre for Medium-Range Weather Forecasts, deterministic - 0.25 degree)(CONUS, OCONUS) (0000, 1200 UTC runs)
2. ECMWFE (European Centre for Medium-Range Weather Forecasts, Ensemble - 1.0 degree)(CONUS, OCONUS) (0000, 1200 UTC runs)
3. NAVGEMD (Navy FNMOC Global deterministic - 0.50 degree) (CONUS, OCONUS, and Oceanic domain) (0000, 0600, 1200,

- 1800 UTC runs)
4. GDPS (CMCD Environment Canada Global deterministic model (25km) for weather elements other than PoP12/QPF06)
 5. RDPS (Canadian Regional deterministic model - 10km) (CONUS and Alaska) (0000, 0600, 1200, 1800 UTC runs)
 6. REPS (Canadian Regional ensemble model - 15km) (CONUS) (0000 and 1200 UTC runs) (Precipitation products only)
 8. HRRR Alaska (High Resolution Rapid Refresh - 3km)
 - a. 1-18 hours (0300, 0900, 1500, 2100 UTC runs)
 - b. 1-36 hours (0000, 0600, 1200, 1800 UTC runs)
 9. HiResWindow ARW Mem2(3-km High-Resolution Window Forecast System (configured like NSSL WRF) (CONUS and OCONUS)
 10. WW3 (0.5 degree WaveWatchIII global deterministic model)
 11. WW3 (0.5 degree WaveWatchIII global ensemble model)
 12. WW3 (0.16 and 0.06 degree WaveWatchIII high resolution regional models) (CONUS and OCONUS)
 13. GLW (2.5km Great Lakes Wave model)

Model Resolution Changes:

1. GFS to 0.117 degree (was 0.25 degree)
2. GDPS (CMCD) to 0.25 degree (was 0.50)
3. GEPS (CMCE) to 0.50 degree (was 1.00)
4. GDAS to 0.117 degree (was 0.25 deg) (*like URMA for tuning/bias correction but only used for Oceanic Domain*)

Model Expansion Changes:

The grid specifications for both the GMOS and EKDMOS covering the CONUS and Alaska domains will now exactly match that of the National Blend of Models.

Model Projection Changes:

1. HRRR CONUS: 1-36 hours
(0000, 0600, 1200, 1800 UTC)
2. RAP CONUS and OCONUS: 1-39 hours
(0300, 0900, 1500, 2100 UTC)
3. NAM CONUS and Alaska: 1-36 hours, 3-hourly to 84
(0000, 0600, 1200, 1800 UTC)
4. NAMNest CONUS and OCONUS: 1-60 hours
(0000, 0600, 1200, 1800 UTC)

The CONUS NBM products will be disseminated on a 2.5-km Lambert Conformal grid with dimensions NX=2345 and NY=1597.

NBM products for Alaska will be produced on a 3-km Polar Stereographic grid with dimensions NX=1649 and NY=1105. The Hawaii NBM products will be produced on a 2.5-km Mercator grid

with dimensions NX=625 and NY=561. Products for Puerto Rico will be produced on a 1.25-km Mercator grid with dimensions NX=353 and NY=257.

6. SBN/NOAAPORT Dissemination

While the NBM will run every hour and produce output to 264 hours with each run, only a subset will be sent across the Satellite Broadcast Network (SBN) and NOAAPORT due to bandwidth limitations. Products will be disseminated in GRIB2 format and will contain individual WMO headers. The schedule for SBN/NOAAPORT dissemination is as follows:

NBM Window -----	Disseminated Cycles (UTC) -----
Short-term: 1-18h	0100, 0200, 0400, 0800, 1000, 1100, 1300, 1400, 1600, 2000, 2200, 2300
Short-term: 1-36h	0300, 0600, 0900, 1500, 1800, 2100
Short-term and medium-range: 1-187h	0500, 1700
Short-term and extended-range: 1-204h	1900
Short-term and extended-range: 1-264h	0000, 0700, 1200
Oceanic Products: Short-term and extended-range 3-264h	0000, 0500, 0700, 1200, 1700, 1900

SBN Additions:

(a) Adding several Fire Weather elements for CONUS, Alaska, Hawaii, and Puerto Rico through 204 hours: Mixing Height, Transport Wind Speed, Transport Wind Direction, Ventilation Rate, 6-hour maximum Haines Index, and 6-hour maximum Fosberg Fire Weather Index. Projections through 264 hours will be available on TGFTP/NDGD and FTPPRD/NOMADS.

(b) Adding several Aviation elements for CONUS, Alaska, Hawaii, and Puerto Rico through 36 hours: Low-level Wind Shear (LLWS) Speed, LLWS Direction, LLWS Height, Simulated Maximum Reflectivity, Vertically Integrated Liquid, and Echo Tops.

(c) Adding several elements for Oceanic domain through 204 hours: 10-m Wind Gust, 30-m Wind Speed, 80-m Wind Speed, Visibility, Air Temperature, 10th, 50th, 90th percentile Mean Sea Level Pressure. Projections through 264 hours will be available on TGFTP/NDGD and FTPPRD/NOMADS.

(d) Adding Significant Wave Height through 192 hours for CONUS, Alaska, Hawaii, Puerto Rico, and Oceanic domains.

(e) Adding NBM ASCII text bulletins for each NBM cycle containing approximately 3100 CONUS and OCONUS stations. These NBM bulletins will be available on the SBN and FTPPRD. Following are the four types of NBM text bulletins:

1. 1-hourly NBM guidance from 1-25 hours (NBH)
2. 3-hourly NBM guidance from 6-66 hours (NBS)
3. 12-hourly NBM guidance from 24-192 hours (NBE)
4. 12-hourly NBM guidance from 204-372 hours (Data currently to 264 hours) (NBX)

SBN Removals:

(a) At 1900 UTC, all existing elements beyond the 204 hour projection will no longer be sent on the SBN (but will still be available on TGFTP/NDGD and FTPPRD/NOMADS).

(b) Existing 6-h Probability of a Thunderstorm for CONUS will no longer be produced for any cycle (GMOS is only available input - already disseminated on SBN). CONUS Precipitation potential index (6-hourly) for projections 42 through 240 will no longer be disseminated on the SBN.

(c) The following existing elements for CONUS will no longer be sent on the SBN through 18 hours for 04z, 08z, 16z, and 20z cycles (but will still be available on FTPPRD/NOMADS): Max Wet-bulb Temperature Aloft, Positive Energy Aloft, Negative Energy Low-level, Probability Cloud Ice Present, Probability Refreeze Sleet, Conditional Probability Snow/Sleet/Rain/Freezing Rain, Snow-Liquid Ratio, and Snow Level.

(d) For the Oceanic domain, 10th and 25th percentile Wind Speed will no longer be sent on the SBN (but will still be available on TGFTP/NDGD and FTPPRD/NOMADS).

7. TGFTP/NDGD Dissemination

Output for the 0000, 0700, 1200, and 1900 UTC cycles will be placed in the experimental area of the National Digital Guidance Database (NDGD) in GRIB2 format at the following locations listed below. Alternatively, one may substitute "http" for "ftp" and obtain the data in that manner.

<ftp://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndgd/GT.blend/AR.conus/> (CONUS)

<ftp://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndgd/GT.blend/AR.alaska/> (Alaska)

<ftp://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndgd/GT.blend/AR.hawaii/> (Hawaii)

<ftp://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndgd/GT.blend/AR.puertori/> (Puerto Rico)

<ftp://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndgd/GT.blend/AR.oceanic/> (Oceanic)

Each domain directory will contain subdirectories for each valid period as follows:

VP.001/	Day 1
VP.002/	Day 2
VP.003/	Day 3
VP.004/	Day 4
VP.005-007/	Days 5-7
VP.008-450/	Days 8 and beyond

Each element-specific GRIB2 file will reside in the appropriate valid period subdirectory and contain individual WMO headers. A listing of GRIB2 file names for both new and updated existing NBM elements is provided in Tables 1 through 5 in the following document.

https://www.weather.gov/media/mdl/nbm/TGFTP_NDGD_Data_NBM2018.pdf

8. NCEP Web Dissemination

On implementation day, the NBM output for all cycles, elements, and projections will now be made available on NCEP web services sites:

<http://nomads.ncep.noaa.gov/pub/data/nccf/com/blend/prod/>

<http://ftp.ncep.noaa.gov/data/nccf/com/blend/prod/>

ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/blend/prod

9. WMO Headers

A document outlining the WMO header scheme for NBM GRIB2 products can be found here:

https://www.weather.gov/media/mdl/nbm/NBM_V3_1_Header_Scheme.pdf

Unique originating center IDs have been assigned to each geographic region. A listing of the originating center IDs is provided in Table 6.

Table 6: List of originating center IDs (CCCC) for NBM products

Three IDs are assigned to each geographic region to accommodate all weather elements.

Geographic Region	Originating Center (CCCC)
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CONUS and Oceanic	KWEA, KWEB, KWEI
Alaska	KWEC, KWED, KWEJ
Hawaii	KWEE, KWEF, KWEK
Puerto Rico	KWEG, KWEH, KWEL

A detailed list of WMO headers for new NBM products to be disseminated over the SBN/NOAAPORT and placed on TGFTP/NDGD can be found in Table 7 here:

https://www.weather.gov/media/mdl/nbm/FTPFRD_NOMADS_NBM2018.pdf

NBM text bulletin WMO header information for each of the four bulletins to be disseminated every hour on the SBN and FTPFRD can be found in Table 8 below:

Table 8: WMO header information for NBM text products.

WMO Header	NBM Text Bulletin Description
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FOUS15 KWNO	Hourly bulletin (1-24 hours)
FOUS16 KWNO	Short-range bulletin (6-66 hours)
FEUS16 KWNO	Extended bulletin (12-192 hours)
FEUS17 KWNO	Extra-extended bulletin (204-264 hours)

For those existing NBM weather elements that will no longer be disseminated with header information please see the bottom of the following supplemental document:

https://www.weather.gov/media/mdl/nbm/WMO_Headers_Remove_2018.pdf

Users may find parallel NBM data for download:

<http://para.nomads.ncep.noaa.gov/pub/data/nccf/noaaport/blend/>
<http://para.nomads.ncep.noaa.gov/pub/data/nccf/com/blend/para/>
https://www.weather.gov/mdl/nbm_text

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 implementation of NBM guidance please contact:

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For questions regarding the data flow, please contact:

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A web page describing the NBM can be found at:

http://w2.weather.gov/mdl/nbm_home

NWS National Service Change Notices are online at:

<http://www.weather.gov/os/notif.htm>

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