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PNSWSH

Service Change Notice 22-131  
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:        Geoff Manikin  
              NWS Office of Science and Technology Integration  
              Meteorological Development Laboratory

Subject: Upgrade of National Blend of Models Guidance: Effective January 17, 2023

On or about Tuesday, January 17, 2023, beginning with the 1200 Coordinated Universal Time (UTC) model run, the NWS Meteorological Development Laboratory (MDL) will implement an update to the National Blend of Models (NBM) guidance over the Contiguous United States (CONUS) and OCONUS (Alaska (AK), Hawaii (HI), Puerto Rico (PR), Guam (GU) and Oceanic (OC)) National Digital Forecast Database (NDFD) domains. Additionally, a new upper air global product will be implemented.

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

#### 1. Background

Comments/feedback on this upgrade were previously solicited publicly from January 18 through April 8, 2022:

[https://www.weather.gov/media/notification/pdf2/pns22-01\\_nbm\\_v4.1.pdf](https://www.weather.gov/media/notification/pdf2/pns22-01_nbm_v4.1.pdf)

NBM Version 4.1 will continue to fill existing product gaps requested by the Aviation, Water Resources, Marine, Winter and Tropical NWS Service Programs. A listing of the new NBM v4.1 weather elements can be found here:

[NEW NBM v4.1 Weather Elements](#)

It is anticipated that these upgrades will benefit the NWS in its goal toward providing better Impact-Based Decision Support Services (IDSS).

## 2. NBM Model Modifications

### New NBM Model Inputs:

- Australian Community Climate and Earth-System Simulator Global Ensemble (ACCESSGE) (Mean) (0000- and 1200-UTC cycles) (0.3 x 0.45 degree).
- Canadian Global Ensemble Wave Prediction System (GEWPS) Wave Model (20 members) (0000- and 1200-UTC cycles) (0.25 degree).
- Canadian Regional Ensemble Wave Prediction System (REWPS) (20 member mean) (0000- and 1200-UTC cycles) (0.022 x 0.031 degree).
- NCEP's Short-Range Ensemble Forecast System (SREF) (10 members) (0300-, 0900-, 1500- and 2100-UTC cycles) (16km CONUS and 32 km Alaska).
- NCEP's Global Real-Time Ocean Forecast System (Global RTOFS) (0000-UTC) (0.3 degree).
- Canada's Regional Ice Ocean Prediction System (RIOPS) (5km).

NBM input model horizontal resolution changes with this implementation are limited to the GEFS grids increasing from approximately 50km to approximately 25km.

For this v4.1 upgrade, the NBM will be configured to leverage additional hourly forecast projections from the HiResW FV3 model through 60 hours. (CONUS: 0000- and 1200-UTC cycles and Alaska 0600- and 1800-UTC cycles).

### New and improved techniques for various NBM weather elements include:

- Improved calibration of probabilistic and deterministic NBM winter weather guidance for snow, ice, freezing rain and unconditional precipitation type through the increase in membership (18 to 100 members) and leveraging direct model precipitation type guidance.
- Substituting the Unrestricted Mesoscale Analysis (URMA) observation value with its respective METAR value for Bias correction in the quantile mapping process of 24-hour maximum probabilistic peak wind speed and wind gust guidance and daily probabilistic maximum (MaxT) and minimum temperature (MinT). This replacement allows all available input models for these weather elements to be calibrated to METAR observations rather than the URMA analysis.
- For the Alaska domain, substituting NBM v4.0 ceiling height and visibility guidance with the Localized Aviation MOS Program (LAMP) guidance for NBM projections of 1-36 hours. For projections 37-84, the NBM will leverage probabilistic Global Forecast System-based MOS (GFS-MOS) and North American Model based MOS (NAM-MOS) ceiling height and visibility guidance as inputs to generate both deterministic and calibrated probabilistic gridded ceiling height and visibility guidance.
- Usage of high-quality Quantitative Precipitation Estimates (QPE) observational and long sampled climatological data sets (e.g., the Multi Radar/Multi Sensor System (MRMS) and Multi-Source Weighted-Ensemble Precipitation (MSWEP) for calibrating probabilistic quantitative precipitation forecasts (PQPF) in the CONUS, Alaska, Hawaii, Puerto Rico and Oceanic domains.
- Leveraging the Rapid Refresh (RAP) analysis for calibrating Mixing Heights and Transport Winds in the CONUS, Alaska, Hawaii, and Puerto Rico domains.

- Excluding METAR/RAWS sites that were flagged/blacklisted for URMA. The site is removed if it was flagged for any of the following: temperature, wind speed or moisture. An excluded site will match the gridpoint to URMA rather than the observation. The station blacklist is a "living" operational file and updated periodically by NCEP Central Operations (NCO)/Senior Duty Meteorologist (SDM). When the status of a site is changed, it may take a few weeks or potentially months to see NBM forecasts improve, depending on the extent of the error and how quickly it was addressed.

### 3. NBM Text Product Changes

A comprehensive list of stations for which deterministic-based Hourly (NBH), Short-term (NBS), Extended (NBE), Super Extended (NBX) and probabilistic Extended (NBP) station text bulletin guidance can be found at: <https://vlab.noaa.gov/web/mdl/nbm-stations-v4.1>.

A description of all NBM text file products can be found here:

<https://vlab.noaa.gov/web/mdl/nbm-textcard-v4.1>

Extended-Range Text Messages:

With the NBM v4.1 continuing to move more towards probabilistic guidance, we have added several new probabilistic station-based text weather elements (NBP) for the same set of stations noted above. Two new notable weather elements added at 0100-, 0700-, 1300- and 1900-UTC include CONUS percentiles for 24-hour maximum wind speed and wind gust and along with percentiles for CONUS and probabilistic daily maximum and minimum temperatures for the Alaska domain. For the 1300 UTC NBM v4.1 run, we have added 24-hour probability of precipitation (PoP24) to the NBMX text bulletin for all domains. Details can be found in the NBM text file link noted above.

CONUS NBM domain:

W24P1 - Maximum 24-hour wind speed (0600-0600 UTC) (10th Percentile)  
W24P2 - Maximum 24-hour wind speed (0600-0600 UTC) (25th Percentile)  
W24P5 - Maximum 24-hour wind speed (0600-0600 UTC) (50th Percentile)  
W24P7 - Maximum 24-hour wind speed (0600-0600 UTC) (75th Percentile)  
W24P9 - Maximum 24-hour wind speed (0600-0600 UTC) (90th Percentile)  
G24P1 - Maximum 24-hour wind gust (0600-0600 UTC) (10th Percentile)  
G24P2 - Maximum 24-hour wind gust (0600-0600 UTC) (25th Percentile)  
G24P5 - Maximum 24-hour wind gust (0600-0600 UTC) (50th Percentile)  
G24P7 - Maximum 24-hour wind gust (0600-0600 UTC) (75th Percentile)  
G24P9 - Maximum 24-hour wind gust (0600-0600 UTC) (90th Percentile)

Alaska NBM domain:

TXNP1 - Daily Maximum and Minimum temperature (10th Percentile)  
TXNP2 - Daily Maximum and Minimum temperature (25th Percentile)  
TXNP5 - Daily Maximum and Minimum temperature (50th Percentile)  
TXNP7 - Daily Maximum and Minimum temperature (75th Percentile)  
TXNP9 - Daily Maximum and Minimum temperature (90th Percentile)

The filenames of the five types of NBM text messages are:

1. blend\_nbhtx.t[hh]z [where hh = 00, 01, 02, ..., 23]
2. blend\_nbstx.t[hh]z [where hh = 00, 01, 02, ..., 23]
3. blend\_nbetx.t[hh]z [where hh = 00, 01, 02, ..., 23]
4. blend\_nbxtx.t[hh]z [where hh = 00, 01, 02, ..., 23]
5. blend\_nbptx.t[hh]z [where hh = 00, 01, 02, ..., 23]

#### 4. NBM Runtime Changes

Upon implementation of v4.1, several timing and cycle changes should be noted. All runtime changes noted below apply to all NBM cycle times and domains except where indicated.

- All Deterministic products (such as QPF06) will be disseminated on average 20 minutes earlier.
- All QMD Percentile forecasts will be disseminated approximately 20-25 minutes later.
- Most cycles of the NBH, NBS, NBE, and NBX text messages will be disseminated on average 30 minutes earlier with the following exceptions: 0100-, 0700-, 1300- 1900 UTC cycles will be disseminated on average 30 minutes later.
- Most cycles of the NBP text messages will be disseminated on average 30 minutes earlier with the following exceptions: 0100 UTC and 1300 UTC cycles will be disseminated on average one hour later. 0700 UTC and 1900 UTC cycles will be disseminated on average 20 minutes later.

#### 5. Changes to Satellite Broadcast Network (SBN)/NOAAPort Dissemination

While the NBM runs hourly and produces output to 264 hours for each cycle, as with NBM v4.0 only a subset will be sent across the SBN and NOAAPort due to bandwidth limitations. To further reduce the NBM's SBN and NOAAPort data footprint, most products currently being disseminated through 264 hours and any newly introduced products in v4.1 will only be sent through 192 hours. NBM v4.1 data will be disseminated in gridded binary version two (GRIB2) format and will contain grouped World Meteorological Organization (WMO) headers, as is done in NBM v4.0.

With the implementation of NBM v4.1, the notable SBN/NOAAPort dissemination time changes can be summarized as follows:

- Daily mean maximum and minimum temperature from 0000 UTC and 1200 UTC to 0100 UTC and 1300 UTC, respectively.
- Mixing height, transport wind speed and direction, and Haines Index moved from 0000 UTC and 1200 UTC to 0100 UTC and 1300 UTC, respectively.
- Solar radiation from 0000 UTC and 1200 UTC to 0100 UTC and 1300 UTC, respectively (CONUS).
- Significant wave heights from 0000-, 0700-, 1200-, and 1900 UTC to 0500-, 1100-, 1700-, and 2300 UTC, respectively.
- Freezing spray removed from 0000 UTC and 1200 UTC.

A detailed listing of NBM v4.1 weather elements to be disseminated on the SBN/NOAAPort as a function of cycle time and domains can be found in the following hyperlink:

<https://vlab.noaa.gov/web/mdl/nbm-data-availability-v4.1>

Unique originating center IDs have been assigned to each geographic region. Please note that with the implementation of NBM v4.1, the originating center ID of KWER has been added to identify the new Global domain.

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

Geographic Region	Originating Center (CCCC)
CONUS and Oceanic	KWEA, KWEB, KWEI, KWEO
Alaska	KWEC, KWED, KWEJ, KWEP
Hawaii	KWEE, KWEF, KWEK
Puerto Rico	KWEG, KWEH, KWEL
Guam	KWEM, KWEN, KWEQ
Global	KWER

The NBM text bulletin WMO header information for each of the five bulletins to be disseminated every hour on the SBN are listed below.

WMO header information for NBM text products:

WMO Header	NBM Text Bulletin Description
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)
FEUS18 KWNO	Probabilistic extended bulletin (12-192 hours)

NBM v4.1 SBN/NOAAPort Header Additions and Removals:

A detailed listing of NBM WMO headers (by NBM domain) to be added over the SBN/NOAAPort can be found below:

CONUS Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_co.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_co.pdf)

Alaska Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_ak.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_ak.pdf)

Hawaii Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_hi.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_hi.pdf)

Puerto Rico Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_pr.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_pr.pdf)

Guam Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_gu.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_gu.pdf)

Oceanic Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_oc.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_oc.pdf)

Global Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_added\\_global.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_added_global.pdf)

A detailed listing of NBM WMO headers (by NBM domain) to be removed from the SBN/NOAAPort can be found below:

CONUS Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_removed\\_co.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_removed_co.pdf)

Alaska Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_removed\\_ak.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_removed_ak.pdf)

Hawaii Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_removed\\_hi.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_removed_hi.pdf)

Puerto Rico Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_removed\\_pr.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_removed_pr.pdf)

Guam Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_removed\\_gu.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_removed_gu.pdf)

Oceanic Domain:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/headers\\_removed\\_oc.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/headers_removed_oc.pdf)

A. GRIB2 SBN/NOAAPort output additions and removals:

[NBM v4.1 SBN Product Additions and Removals.pdf](#)

NBM v4.1 GRIB2 header identifiers delineated by weather element and domain can be found here:

[NBM v4.1 Header Scheme](#)

B. Text Bulletins on SBN/NOAAPort:

NBH, NBS, NBE, NBX and NBP will continue to be hosted on the SBN/NOAAPort as in v4.1. This station-based guidance covers 12-hour periods for projections 24-192 hours and has a very similar format to the NBM v4.0 deterministic NBM extended American Standard Code for Information Interchange (ASCII) text bulletins.

Header information for the probabilistic and deterministic text bulletin files are identical to that of NBM v4.0. For reference, that header information can be found here:

[Probabilistic Text Message Header Information](#)

## 6. NCEP Web Services (NOAA Operational Model Archive and Distribution System (NOMADS)/FTPFRD) Dissemination

On implementation day, all GRIB2 master (Core and QMD) files, index files, and NBM text messages will continue to be hosted on NCEP web services. Please follow any one of the three subsequent hyperlinks to access this data:

<https://nomads.ncep.noaa.gov/pub/data/nccf/com/blend/prod/>  
<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/blend/prod/>  
<ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/blend/prod/>

Please note that the naming convention and directory structure for the Master GRIB2 files remain unchanged and delineate between the core NBM products and those derived from the QMD process.

### File Naming Convention:

core/blend.tCCz.core.fHHH.rg.grib2 and qmd/blend.tCCz.qmd.fHHH.rg.grib2, where CC = NBM cycle time, HHH = forecast projection, and rg = NBM domain that includes: co, ak, hi, pr, oc, gu (core only).

### A. Changes to existing files on NOMADS/FTPFRD

These links detail the elements added to or removed from output that is hosted on NOMADS/FTPFRD:

[https://www.weather.gov/media/mdl/nbm/docs\\_v41/NBM\\_v4.1\\_NOMADS\\_Changes\\_Text.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/NBM_v4.1_NOMADS_Changes_Text.pdf)  
[https://www.weather.gov/media/mdl/nbm/docs\\_v41/NBM\\_v4.1\\_NOMADS\\_Changes\\_Core.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/NBM_v4.1_NOMADS_Changes_Core.pdf)  
[https://www.weather.gov/media/mdl/nbm/docs\\_v41/NBM\\_v4.1\\_NOMADS\\_Changes\\_QMD.pdf](https://www.weather.gov/media/mdl/nbm/docs_v41/NBM_v4.1_NOMADS_Changes_QMD.pdf)

### B. New Hawaii domain QMD files on NOMADS/FTPFRD

#### File Naming Convention:

qmd/blend.tCCz.qmd.fHHH.hi.grib2, where CC = NBM cycle time, HHH = forecast projection.

Prior to implementation, users may find parallel NBM data for download here:

<https://nomads.ncep.noaa.gov/pub/data/nccf/com/blend/para/>  
<https://para.nomads.ncep.noaa.gov/pub/data/nccf/naoport/blend/>  
<https://vlab.noaa.gov/web/mdl/nbm-text-products>

NCEP encourages users to ensure their decoders are flexible and are able to adequately handle changes in content order, changes in the scaling factor component within the product definition section (PDS) of the GRIB files, and any volume changes that may be forthcoming. These elements may change with future NCEP model implementations. NCEP will make every attempt to alert users to these changes prior to any implementations.

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 or data available on Amazon Web Services, please contact:

David Rudack  
MDL/Silver Spring, MD  
[david.rudack@noaa.gov](mailto:david.rudack@noaa.gov)

or

Geoff Manikin  
Acting SMD Chief  
MDL/Silver Spring, MD  
[geoffrey.manikin@noaa.gov](mailto:geoffrey.manikin@noaa.gov)

For questions regarding the data flow for NWS/NCEP services, please contact:

Anne Myckow  
NCEP Central Operations Dataflow Team Lead  
[ncep.pmb.dataflow@noaa.gov](mailto:ncep.pmb.dataflow@noaa.gov)

A webpage describing the NBM can be found at:

<https://vlab.noaa.gov/web/mdl/nbm>

National Service Change Notices are online at:

<http://www.weather.gov/notification>

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