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Technical Implementation Notice 16-31 Amended
National Weather Service Headquarters Washington DC
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From: Tim McClung, Portfolio Manager
 Office of Science and Technology Integration

Subject: Amended: Changes to GFS-based Model Output Statistics (MOS)
Guidance: Effective on or About November 15, 2016

Amended to postpone the implementation date from Thursday, November 3, 2016, to Tuesday, November 15, 2016.

On or about Tuesday, November 15, 2016, beginning with the 1200 Coordinated Universal Time (UTC) model run, the NWS Meteorological Development Laboratory (MDL) will implement changes to the Global Forecast System (GFS)-based Model Output Statistics (MOS) station-based and gridded guidance. These changes will include:

1. Updated cool and warm season equations for certain elements contained in the short-range GFS MOS text (MAV) and BUFR messages for the 0000, 0600, 1200 and 1800 UTC cycles. These updates will include the following elements:

Daytime Maximum and Nighttime Minimum Temperature
2-meter Temperature
2-meter Dewpoint Temperature
Wind speed
Wind direction
6-/12-hour probability of precipitation
6-/12-hour categorical precipitation amount

2. Updated cool and warm season equations for certain elements contained in the medium-range GFS MOS text (MEX) and Binary Universal Form for the Representation of meteorological data (BUFR) messages for the 0000 and 1200 UTC cycles. These updates will include the following elements:

Daytime Maximum and Nighttime Minimum Temperature
2-meter Temperature
2-meter Dewpoint Temperature
Maximum sustained surface wind (12-hour)
12-/24-hour probability of precipitation
12-/24-hour categorical precipitation amount

3. Updated cool and warm season maximum and minimum temperature guidance for all cycles of the short-range and extended-range Cooperative Observer Program (COOP) maximum and minimum temperature messages, known by their Advanced Weather Interactive Processing System (AWIPS) IDs MCG and MCX, respectively.

4. Updated cool and warm season equations for all cycles of the marine MOS message, known by its AWIPS ID: MMG. These updates include the following elements:

Air temperature
Dewpoint
Temperature
Wind speed
Wind direction

For changes 1-4 above, current equations will be retained for a small number of stations that did not have a sufficient sample to develop new equations. There are no stations being dropped from the MAV, MEX, MMG, MCG or MCX messages at this time.

5. Adding 910 stations to the GFS-based short-range and extended-range COOP maximum and minimum temperature messages. A list of the stations being added can be found at:

http://www.mdl.nws.noaa.gov/~mos/mos/gfsmos_eval/changes/new_sites2016.php#coop

6. Updated cool and warm season mesonet guidance for the 0000 and 1200 UTC cycles. These updates will include the following elements:

Daytime Maximum and Nighttime Minimum Temperature
2-meter Temperature
2-meter Dewpoint
Temperature
Wind Speed
Wind Direction

Mesonet guidance is used in the GFS MOS River Forecast Center (RFC) Standard Hydrometeorological Exchange Format (SHEF) message (known by the AWIPS IDL: FTP) and also influences the Gridded MOS analysis for temperature and wind. No new sites are being added to the FTP message at this time. New mesonet sites will be added to the Gridded MOS analysis in a future upgrade.

7. Expansion of dissemination grid for 2.5-km contiguous U.S. (CONUS) Gridded MOS products. The output grid for 2.5-km CONUS Gridded MOS will be expanded northward by 220 grid lengths (~340 miles) to provide coverage for the full Northwest RFC domain. The dimensions of the output grid will change from 2145 X 1377 to 2145 X 1597. Other grid characteristics (grid projection and grid resolution) will be unchanged. This change will affect all 2.5 km CONUS Gridded MOS products disseminated over the Satellite Broadcast Network (SBN), NOAAPort, to the NCEP FTPPRD server and to TGFTP/National Digital Guidance Database (NDGD). Users can find

comparison graphics for parallel and operational 2.5-km CONUS Gridded MOS at the following link (This page is not operationally supported and guidance may not be current):

http://www.mdl.nws.noaa.gov/~mos/gmos/conus25_all/view_gmos_comp.php

8. Replacing high-resolution MOS (HRMOS) probability of precipitation (PoP) and quantitative precipitation amount (QPF) with the standard PoP/QPF in the CONUS Gridded MOS analysis. This change will provide coverage for the Northwest RFC domain and will incorporate the latest updates to the station-based PoP/QPF equations.

9. Adding new terrain and land-water mask to the Gridded MOS analysis for CONUS. This new mask and terrain set is the result of a coordinated effort between the Meteorological Development Laboratory (MDL), the Environmental Modeling Center (EMC) and the AWIPS program to generate a single terrain and land/water dataset for use in the Real Time Mesoscale Analysis/UnRestricted Mesoscale Analysis (RTMA/URMA), Gridded MOS, National Blend of Models (NBM), and AWIPS/Graphical Forecast Editor (GFE).

10. Expanding gridded MOS guidance coverage over Alaska. The forecast extent of Gridded MOS guidance over Alaska will be expanded eastward to cover the Yukon River Basin and will be expanded northward to include offshore Arctic marine zones. The coverage expansion will affect the following Alaska Gridded MOS elements:

Daytime Maximum and Nighttime Minimum Temperature
2-meter Temperature
2-meter Dewpoint Temperature
Wind speed
Wind direction
Wind gust
6-/12-hour Probability of Precipitation
6-/12-hour Quantitative Precipitation Amount
Relative humidity
Total sky cover

This expansion only affects the extent to which Gridded MOS forecasts are produced. Guidance will continue to be disseminated on the National Digital Forecast Database (NDFD) Alaska grid. Forecast coverage for elements not listed above is not being expanded at this time.

Users can find graphics for the expanded Alaska Gridded MOS at the following link (This page is not operationally supported and guidance may not be current.):

http://www.mdl.nws.noaa.gov/~mos/gmos/conus25_all/view_gmos_AK_para.php

GFS MOS text, gridded binary (GRIB) and BUFR products that currently reside on the NCEP FTPPRD server in the gfs.YYYYMMDDCC directory will be moved to a new directory named gfsmos.YYYYMMDD as follows: YYYYMMDD denotes run date, CC is the cycle):

Old FTPPRD directory:

<http://ftpprd.ncep.noaa.gov/data/nccf/com/gfs/prod/gfs.YYYYMMDDCC>

New FTPPRD directory:

<http://ftpprd.ncep.noaa.gov/data/nccf/com/gfs/prod/gfsmos.YYYYMMDD>

Moving GFS MOS text products that currently reside on TGFTP to the NCEP FTPPRD server as follows:

Old TGFTP paths for GFS MOS text products:

<http://tgftp.nws.noaa.gov/SL.us008001/DF.anf/DC.mos/DS.mav>

<http://tgftp.nws.noaa.gov/SL.us008001/DF.anf/DC.mos/DS.mavaf>

<http://tgftp.nws.noaa.gov/SL.us008001/DF.anf/DC.mos/DS.mcg>

<http://tgftp.nws.noaa.gov/SL.us008001/DF.anf/DC.mos/DS.mcx>

<http://tgftp.nws.noaa.gov/SL.us008001/DF.anf/DC.mos/DS.mex>

<http://tgftp.nws.noaa.gov/SL.us008001/DF.anf/DC.mos/DS.mexaf>

New path for GFS MOS text products (YYYYMMDD denotes run date):

<http://ftpprd.ncep.noaa.gov/data/nccf/com/gfs/prod/gfsmos.YYYYMMDD/>

New filenames for each GFS MOS text product that will reside in the gfsmos.YYYYMMDD directory on FTPPRD (CC denotes cycle):

mdl_gfsmav.tCCz	Short-range GFS MOS text product
mdl_gfsafmav.tCCz	Short-range GFS MOS Air Force text product
mdl_gfsmcg.tCCz	Short-range COOP text product
mdl_gfsmcx.tCCz	Medium-range COOP text product
mdl_gfsmex.tCCz	Medium-range GFS MOS text product
mdl_gfsafmex.tCCz	Medium-range GFS MOS Air Force text product

The expected benefits of changes 1-10 include:

- MOS station guidance will be better tuned to the new version of the GFS model.
- Northward expansion of 2.5 km CONUS Gridded MOS output grid will provide coverage for all of the Northwest RFC domain.
- Replacement of HRMOS PoP/QPF with standard PoP/QPF analysis in Gridded MOS will provide coverage for the Northwest RFC domain.
- Updated terrain and land-water masks give a better representation of topography and improve consistency with observational analysis datasets.
- Expansion of Alaska Gridded MOS will provide coverage over the Yukon River Basin and Arctic offshore waters.

Tables 1-5 below list the communication identifiers for the affected products.

Due to the migration to a new computing platform, there will be a slight change in dissemination times for GFS MOS products. Some products will be disseminated sooner, while most others will be delayed by no more than five minutes. The following Gridded MOS products for Alaska will be delayed by up to 10 minutes from their current dissemination time: extended-range precipitation potential index (PPI) and extended-range predominant weather. World Meteorological Organization (WMO) headers for the affected Alaska Gridded MOS products are listed in Table 6 below.

Beginning approximately one month prior to the implementation date, users may find parallel data for download on NOAA's Parallel Operational Model Archive and Distribution System (NOMADS) at the following link:

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

Table 1: Communication Identifiers for the GFS-based MOS Public Text Products Affected by the Updated Station Guidance: for Air Force MOS Messages: xx = 01...29

WMO Heading	AWIPS ID	WMO Heading	AWIPS ID
	(Short Range)		(Extended Range)
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FOCN20 KWNO	N/A	FECN21 KWNO	N/A
FOUS10 KWNO	MCGUSA	FEUS10 KWNO	MCXUSA
FOPA20 KWNO	MAVPA0	FEPA20 KWNO	MEXPA0
FOUS21 KWNO	MAVNE1	FEUS21 KWNO	MEXNE1
FOUS22 KWNO	MAVSE1	FEUS22 KWNO	MEXSE1
FOUS23 KWNO	MAVNC1	FEUS23 KWNO	MEXNC1
FOUS24 KWNO	MAVSC1	FEUS24 KWNO	MEXSC1
FOUS25 KWNO	MAVRM1	FEUS25 KWNO	MEXRM1
FOUS26 KWNO	MAVWC0	FEUS26 KWNO	MEXWC0
FOUS30 KWNO	MAVFxx	FEUS30 KWNO	MEXFxx
FOAK37 KWNO	MAVAJK	FEUS37 KWNO	MEXAJK
FOAK38 KWNO	MAVAFC	FEUS38 KWNO	MEXAFC
FOAK39 KWNO	MAVAFG	FEUS39 KWNO	MEXAFG
FQPA20 KWNO	MMGHI1	FQUS21 KWNO	MMGNE1
FQUS22 KWNO	MMGSE1	FQUS23 KWNO	MMGGL1
FQUS24 KWNO	MMGGF1	FQUS25 KWNO	MMGNW1
FQUS26 KWNO	MMGSW1	FQAK37 KWNO	MMGAK1

Table 2: Communication Identifiers for the GFS-based MOS BUFR Products Affected by the Updated Station Guidance

WMO Heading	WMO Heading	Region
(Short Range)	(Extended Range)	
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JSML30 KWNO	JSMT30 KWNO	PACIFIC REGION
JSML31 KWNO	JSMT31 KWNO	NORTHEAST CONUS
JSML32 KWNO	JSMT32 KWNO	SOUTHEAST CONUS
JSML33 KWNO	JSMT33 KWNO	NORTH CENTRAL CONUS
JSML34 KWNO	JSMT34 KWNO	SOUTH CENTRAL CONUS
JSML35 KWNO	JSMT35 KWNO	ROCKY MOUNTAIN CONUS
JSML36 KWNO	JSMT36 KWNO	WEST COAST CONUS
JSML37 KWNO	JSMT37 KWNO	ALASKA

Table 3: WMO Super Headers for each 2.5 km CONUS Gridded MOS Element Affected by the Output Grid Expansion

Listed below are representations of the super headers where ii=98 for short-range guidance (days 1-3) and ii=97 for medium-range guidance (days 4-7). Elements indicated by (**) include ii=96 for extra extended-range (days 8-11).

WMO Super Header	Element
-----	-----
MAUZii KWBQ	Conditional probability freezing precipitation
MBUZii KWBQ	Conditional probability frozen precipitation
MCUZii KWBQ	Conditional probability liquid precipitation
YAUZii KWBQ	Total sky cover
YBUZii KWBQ**	Wind direction
YCUZii KWBQ**	Wind speed
YDUZii KWBQ**	12-hour probability of precipitation
YEUZii KWBQ**	2-meter temperature
YFUZii KWBQ**	2-meter dew point temperature
YGUZii KWBQ**	Daytime maximum temperature
YHUZii KWBQ**	Nighttime minimum temperature
YIUZii KWBQ	6-hour quantitative precipitation
YJUZii KWBQ	6-hour probability of a thunderstorm
YLUZii KWBQ	Precipitation type best category
YMUZii KWBQ	Precipitation potential index
YNUZii KWBQ	Probability of precipitation occurrence
YRUZii KWBQ**	Relative humidity
YSUZii KWBQ	24-hour snowfall amount
YUUZii KWBQ	6-hour probability of precipitation
YVUZii KWBQ	12-hour quantitative precipitation
YWUZii KWBQ	Wind Gusts
YXUZii KWBQ	12-hour probability of a thunderstorm
YYUZii KWBQ	3-hour probability of a thunderstorm
YZUZii KWBQ	Predominant weather

Table 4: WMO Super Headers for each Alaska Gridded MOS Element Affected by the Coverage Expansion

Listed below are representations of the super headers where ii=98 for short-range guidance (days 1-3) and ii=97 for medium-range guidance (days 4-7). Elements indicated by (**) include ii=96 for extra extended-range (days 8-11).

WMO Super Header	Element
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LARZii KWBQ	Total sky cover
LBRZii KWBQ**	Wind direction
LCRZii KWBQ**	Wind speed
LDRZii KWBQ**	12-hour probability of precipitation
LERZii KWBQ**	2-meter temperature
LFRZii KWBQ**	2-meter dew point temperature
LGRZii KWBQ**	Daytime maximum temperature
LHRZii KWBQ**	Nighttime minimum temperature
LIRZii KWBQ	6-hour quantitative precipitation
LRRZii KWBQ**	Relative humidity
LURZii KWBQ	6-hour probability of precipitation
LVRZii KWBQ	12-hour quantitative precipitation
LWRZii KWBQ	Wind Gusts

Table 5: WMO Super Headers for CONUS Gridded MOS Elements Affected by the Replacement of HRMOS PoP/QPF with the Standard PoP/QPF Analysis

Listed below are representations of the super headers where ii=98 for short-range guidance (days 1-3) and ii=97 for medium-range guidance (days 4-7). Elements indicated by (**) include ii=96 for extra extended-range (days 8-11).

WMO Super Header	Element
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YDUZii KWBQ**	12-hour probability of precipitation
YIUZii KWBQ	6-hour quantitative precipitation
YUUZii KWBQ	6-hour probability of precipitation
YVUZii KWBQ	12-hour quantitative precipitation

Table 6: WMO Super Headers and Corresponding TGFTP Filenames for the Alaska Gridded MOS Products that will be delayed by up to 10 Minutes from their Current Dissemination Time

WMO Super Header	Element	TGFTP Filename
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LMRZ97 KWBQ	Precipitation Potential Index	ds.ppi.bin
LZRZ97 KWBQ	Predominant weather	ds.wx.bin

For questions regarding the changes to GFS-based MOS guidance, please contact:

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For questions regarding the dataflow, please contact:

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A webpage outlining the gridded MOS guidance can be found at:
<http://www.nws.noaa.gov/mdl/synop/gmos.php>

Links to MOS products and descriptions are online at:
<http://www.nws.noaa.gov/mdl/synop>

National Technical Implementation Notices are online at:
<https://www.weather.gov/notification/archive>

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