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Technical Implementation Notice 16-11 Amended
National Weather Service Headquarters Washington DC
950 AM EDT Thu Apr 21 2016

To: Subscribers:
 -NOAA Weather Wire Service
 -Emergency Managers Weather Information Network
 -NOAAPort
 Other NWS Partners, Users and Employees

From: Timothy McClung
 Chief Operating Officer
 NWS Office of Science and Technology Integration

Subject: Amended: Global Forecast Systems (GFS) Upgrade: Effective May 11, 2016

Amended to add the Pacific Region 20km grid to NOAAPort and the hourly 0.25 degree in the NOAA Operational Model Archive and Distribution System (NOMADS).

Effective on or about Wednesday May 11, 2016, beginning with the 1200 Coordinated Universal Time (UTC) run, the National Centers for Environmental Prediction (NCEP) will upgrade the GFS Analysis and Forecast System as follows:

- Changes to the data assimilation components
- Changes to the model components
- Addition of hourly gridded output through 120 hours
- Addition of five layers in the upper stratosphere in gridded output
- Addition of new product fields
- Product removals

Changes to the Global Data Assimilation System (GDAS):

Upgrade the three dimensional (3D) Hybrid Ensemble-Variational to four dimensional (4D) Hybrid Ensemble-Variational Data Assimilation System:

4D increments are constructed by figuring out the best combination of 4D ensemble perturbations. The weights for ensemble members are kept constant throughout the assimilation window. 4D-Hybrid uses 50 outer and 150 inner iterations with variational quality control turned on after 25 iterations.

Tangent Linear Normal Mode Constraint (TLNMC) and Digital Filter Initialization (DFI) are used in the ensembles while additive error inflation is removed.

Ozone cross covariances are in the 4D-Hybrid. Localization is reduced to 50% in the troposphere and the weights for static and ensemble are kept at 12.5% and 87.5% respectively.

Assimilate all sky Advanced Microwave Sounding Unit (AMSU-A) Radiances

Assimilate Advanced Very High Resolution Radiometer (AVHRR) winds and monitor Visible Infrared Imaging Radiometer Suite (VIIRS) winds.

Implement Geostationary Operational Environmental Satellites - R series (GOES-R) data read ability.

Update Community Radiative Transfer Model (CRTM) to v2.2.1 with bug fixes in wind direction, use of FAST Microwave Emissivity Models (FASTEM-6 and FASTEM-X) reflection correction for cloudy situations.

Improve bias correction for aircraft observations.

Modify relocation and storm tracking to allow hourly tropical cyclone relocation.

Modify thinning/weight in time for Atmospheric Motion Vectors (AMVs) and radiances.

Upgrade data assimilation monitoring package.

Model changes to the GFS Global Spectral Model and post-processing software:

Correct the land surface characteristics for grassland and cropland categories to reduce summertime warm and dry biases over Great Plains.

Upgrade convective gravity wave drag.

Upgrade tracer adjustment in the semi-Lagrangian dynamic core.

Upgrade the NCEP Unified Post Processing (UPP) software to version 7.0.

Implement Global Current Icing Potential analysis (G-CIP) products.

Output product changes:

All operational products below can be found on any of following NCEP or

NWS servers: <ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/gfs/prod>

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

<http://nomads.ncep.noaa.gov> <ftp://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/>

<http://weather.noaa.gov/pub/SL.us008001/ST.opnl/>

Add new Global Forecast Icing Severity (G-FIS) icing severity parameter (ICSEV Icing Severity):

gfs.tCCs.pgrb2.0p25.fFFF gfs.tCCs.pgrb2.0p50.fFFF gfs.tCCs.pgrb2.1p00.fFFF

Where CC is 00, 06, 12 and 18

Where FFF is 000 to 384.

Improve Global Forecast Icing Potential (ICIP) products:

WAFS_blended_YYYYMMDDCCfFF.grib2

Where FF is 06 to 36.

Include hourly forecasts out to 120 hours:
gfs.tCCz.pgrb2.0p25.fFFF gfs.tCCz.pgrb2b.0p25.fFFF
Where FFF is 000, 001, 002, 003, 004...120.

Add gridded binary (grib) filter and GDS/OpenDAP availability of the 0.25 deg hourly forecasts in NOMADS:
filter_gfs_0p25_1hr.pl (grib filter link)
gfs_0p25_1hr (OpenDAP-alt link)

At this time, data will not be available for testing until it goes into operations.

Add five more vertical levels (7, 5, 3, 2, and 1 hPa) for the variables geopotential height (HGT), temperature (TMP), relative humidity (RH), U- and V- components of wind (UGRD and VGRD) and ozone mixing ratio (O3MR):
gfs.tCCz.pgrb2.0p25.fFFF, gfs.tCCz.pgrb2b.0p25.fFFF
gfs.tCCz.pgrb2.0p50.fFFF, gfs.tCCz.pgrb2b.0p50.fFFF
gfs.tCCz.pgrb2.1p00.fFFF, gfs.tCCz.pgrb2b.1p00.fFFF
gfs.tCCz.pgrb2.2p50.fFFF
Where FFF is forecast hours from 000 to 384.

Replace 775 hPa state variables with 750 hPa in the GFS WAFS grids 37-44 for UGRD, VGRD, TMP, RH, HGT:
On NCEP Servers: wafsgfs_L_tCCz_intdskFFF.grib2
wafsgfs_P_tCCz_intdskFFF.grib2
On NWS Servers: fh.0FFF_tl.press_ar.octant(ijklmno) Where FFF is 000-120.

Addition of GDAS ABIAS air Binary Universal Form for the Representation of Meteorological Data (BUFR) file gdas1.tCCz.abias_air.

Modify the list of stations on NOAAPort and NCEP servers, for which BUFR data are generated for the GFS. The changes will also modify the lists of stations in the GFS BUFR sounding collectives disseminated on NOAAPort. For the full list, please reference this page:
http://www.nco.ncep.noaa.gov/pmb/changes/gfs_upgrade_2016.shtml

The following changes to NOAAPort are detailed below with the following World Meteorological Organization (WMO) headers for each grid:
http://www.nco.ncep.noaa.gov/pmb/changes/gfs_20kmAWIPS_grids.shtml

Alaska region grid 217 (20km) has been modified to expand latitude from 30N to 35N and longitude from 173W to 170W.

The Maximum and Minimum Temperatures (TMAX, TMIN) Product Definition Template 4.8 will correct a mistake in the second fixed surface from "255 0 2" to "255 0 0" for the following grids:
Alaska region 20km
Pacific region 20km
Puerto Rico 0.25deg
CONUS 20km

The Water Equivalent of Accumulated Snow Depth (WEASD) WMO headers were incorrectly labeled for forecast hours 186, 198, 210, 222 and 234. The following changes will be applied to each grid below:

CONUS 20km: LSRU98 -> ZSNZ98
Alaska 20km: LSRU98 -> ZSBZ98
Pacific Region 20km: LSRU98 -> ZSEZ98
Puerto Rico 0.25deg: LSRU98 -> ZSFZ98

The Alaska Region, grid 217 (20km), had some incorrectly labeled forecast hours in the grid identifier WMO header. This will be addressed so all Alaska WMO products have A1 = B.

Addition of GRIB2 20 km gridded product over Pacific Region (Mercator) to NOAAPort: Runs four times per day at 00, 06, 12 and 18 UTC. WMO headers will be as follows:

T1 = Y for forecast hours: 00, 06, 12, 15, 18, 24, 30, 36, 42, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, 168, 180, 192, 204, 216, 228, 240.
T1 = Z for forecast hours: 03, 09, 15, 21, 27, 33, 39, 45, 51, 54, 57, 63, 66, 69, 75, 78, 81, 90, 102, 114, 126, 138, 150, 162, 174, 186, 198, 210, 222, 234.

T2 specifies the parameters as follows:
T = Temperature, TMIN, TMAX; H = Height;
5-wave geopotential height; O = Vertical velocity; R = Relative humidity;
C = Absolute vorticity; U = u-component of wind; V = v-component of wind;
P = Pressure; Pressure reduce to Mean Sea level; B = Vertical speed shear;
E = Total precipitation; G = Convective precipitation; Q = Best Lifted Index; W = Convective Available Potential Energy; Y = Convective Inhibition; X = Surface Lifted Index; F = Precipitable Water; M = Precipitable Water; S = Water Equivalent of Accumulated Snow Depth; A1 = E* Grid 20 km, Pacific Region

*Was incorrectly labeled "F" in the previously advertised [Technical Implementation Notice \(TIN\) 14-54](#).

A2 specifies the forecast hours as follows:
A=00; B=06; C=12; D=18; E=24; F=30; G=36; H=42; I=48; J=60; K=72; L=84;
M=96; N=108; O=120; P=132; Q=144; R=156; S=168; T=180; U=192; V=204;
W=216; X=228; Y=240 (Note: T1 is Y)

B=03; E=09; H=15; K=21; L=27; O=33; P=39; Q=45; R=51; M=54; S=57; Z=63;
N=66; Z=69; Z=75; T=78; Z=81; U=90; V=102; W=114; Z=126; 138; 150; 162;
174; 186; 198; 210; 222;
234 (Note: T1 is Z)

ii specifies level as follows:
99=1000mb; 93=975 mb; 95=950 mb; 92=925 mb; 90=900mb; 91=875 mb; 85=850mb;
82=825 mb; 80=800 mb; 77=775 mb; 75=750mb; 72=725mb; 70=700mb; 67=675 mb;
65=650 mb; 62=625 mb; 60=600mb; 57=575 mb; 55=550mb; 52=525 mb; 50=500mb;
45=450mb; 40=400mb; 35=350mb; 30=300mb; 25=250mb; 20=200mb; 15=150mb;
10=100mb; 73=High, Mid, Low cloud bottom level; 86=Boundary Layer;
89=Reduced to Sea Level; 94=Level of the 0 deg. C isotherm; 96=Maximum

wind level; 97=Level of the Tropopause, potential vorticity surface;
98=Surface of Earth; 00=Entire Atmosphere

See the following link for a full list of WMO headers:

http://www.nco.ncep.noaa.gov/pmb/changes/gfs_pac_wmo.txt

Output product removals:

NCEP has been working to remove low-resolution legacy products and replace them with higher resolution grids. Last year, NCEP added new higher resolution grids to NOAAPort in preparation for removing the legacy grids. Due to the positive responses received from [Public Information Statement 16-04](#), Removal of Legacy Global Forecast System (GFS) Gridded Output, the following products will be removed with this upgrade:

Remove the GFS grid 212, 40km Regional CONUS from NOAAPort. WMO Headers:

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

To find the replacement products please reference this TIN:

https://www.weather.gov/media/notification/tins/tin14-54gfs_noaaport.pdf

Removal Vessel Sea Ice and Fog on grid 232, 1 degree Northern Hemisphere from NOAAPort:

WMO Headers:

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

Removal of 1.25 degree GRIB1 GFS WAFS products from the NWS http/ftp server:

weather.noaa.gov/pub/SL.us008001/ST.opnl/MT.gfs_CY.CYCLE/RD.YYYYMMDD/PT.grid_DF.gr1/fh.FFF_tl.press_ar.octant[ijklmnop]

ftp://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.gfs_CY.CYCLE/RD.YYYYMMDD/PT.grid_DF.gr1/fh.FFF_tl.press_ar.octant[ijklmnop]

where CYCLE is 00, 06, 12, 18

where YYYYMMDD is Year, Month, Day where FFF is forecast hour from 000-120

To find the replacement product, please reference this TIN:

https://www.weather.gov/media/notification/tins/tin14-54gfs_noaaport.pdf

Removal of 1.25 degree GRIB1 GFS WAFS products from the NCEP http/ftp server:

http://nomads.ncep.noaa.gov/pub/data/nccf/pcom/gfs/xtrn.wfsgfs*

ftp://ftp.ncep.noaa.gov/pub/data/nccf/pcom/gfs/xtrn.wfsgfs*

To find the replacement product, please reference this TIN:

https://www.weather.gov/media/notification/tins/tin14-54gfs_noaaport.pdf

Parallel data available:

Starting in April 1, 2016, all parallel data sets will be available on the following servers:

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

For more information on this GFS upgrade, please see EMC real-time and retrospective parallels and verification pages:
<http://www.emc.ncep.noaa.gov/gmb/noor/4dGFS/synergy%20announcementjan08.htm>

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. For questions regarding these changes, please contact:

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

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National Technical Implementation Notices are online at:

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

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