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PNSWSH

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To:      Subscribers:
         -NOAA Weather Wire Service
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Subject: Upgrade to High Resolution Ensemble Forecast (HREF) and High-Resolution Window (HIRESW): Effective November 1, 2017

Effective on or about November 1, 2017, beginning with the 1200 Coordinated Universal Time (UTC) run, the National Centers for Environmental Prediction (NCEP) will upgrade the HREF and HIRESW systems to makes changes to:

- HREF model membership.
- HIRESW model runs, including changes to initialization and earlier product availability.
- Output products in HREF and HIRESW, including NOAAPort.

Changes to the HREF model membership For the CONUS domain:

- Adds a second Weather Research and Forecasting (WRF) Advanced Research WRF (ARW) member (current cycle run plus the 12-hour old run).
- Reduces the number of North American Mesoscale (NAM) 3km contiguous U.S. (CONUS) nest members in HREF from five to two (previously included the current cycle plus 6-, 12-, 18- and 24-hour old runs; now uses just the current cycle plus the six-hour old run).
- Reduces the number of Nonhydrostatic Multiscale Model on B-grid (NMMB) members from HIRESW from three to two (previously included the current cycle plus the 12- and 24-hour old runs; now uses just the current cycle plus the 12-hour old run).
- Reduces the number of HIRESW WRF-ARW members from three to two (previously included the current cycle plus the 12- and 24-hour old runs; now uses just the current cycle plus the 12-hour old run).

For the Alaska, Hawaii, and Puerto Rico domains:

- Generates new HREF products from a six-member ensemble (two cycles each of HIRESW NMMB, HIRESW ARW, and HIRESW ARW mem2).

Changes to HIRESW model runs:

- Unifies the horizontal grid spacing at 3km for both the ARW and NMMB models (3.2km for both over CONUS).

- Changes horizontal grid spacing (new km/old km) For the WRF-ARW runs over the five domains:

- CONUS (3.2/4.2)
- Alaska (3.0/3.5)
- Hawaii (3.0/3.8)
- Guam (3.0/3.8)
- Puerto Rico (3.0/3.8)

- For the NMMB run, over one domain only:
- CONUS (3.6 to 3.2)

- Adds a second ARW member for all domains, except for Guam, that is initialized from the NAM.  This second member also uses the Mellor Yamada Janjic (MYJ) planetary boundary layer (PBL) and MYJ surface layer physics, so differs from primary HIRESW ARW member in terms of the physics used in addition to having a different source of initial and lateral boundary conditions.  It also has just 40 vertical levels, while the primary ARW member has 50 vertical levels.

The NMMB run increases the call frequency for PBL/surface physics and microphysics from every fourth model time-step to every other time-step.

- Changes the vertical level structure within the primary 50 level ARW runs for all domains except Alaska.  Counting from the surface upward, layers 7-18 (roughly 970 to 760 hPa for a surface pressure of 1010 hPa) are made somewhat thicker, and layers 19-30 (roughly 690 to 330 hPa for a surface pressure of 1010 hPa) are made somewhat thinner.  This change was made for Alaska only in a previous fix to improve numerical stability, and is extended to all domains with this upgrade.

- Runs considerably earlier within production suite by using 6-hour old GFS (or NAM for the second ARW member) files to generate lateral boundary conditions.  Runs that use the GFS for initial conditions now utilize a 6-hour forecast from the 6-hour old GFS for initialization.

- Changes from 0.5 degree to 0.25 degree GFS data for use in producing initial and lateral boundary conditions.

- Initializes the Puerto Rico domain runs from the RAP (previously initialized from the GFS); the new second ARW member for Puerto Rico is NAM initialized.

Changes to Output:

The following changes are on the NCEP Web Services:
http://nomads.ncep.noaa.gov/pub/data/nccf/com
http://www.ftp.ncep.noaa.gov/data/nccf/com
ftp://ftp.ncep.noaa.gov/pub/data/nccf/com

Where the HIRESW is available under: hiresw/prod/hiresw.YYYYMMDD
Where the HREF is available under: hiresw/prod/href.YYYYMMDD
Where YYYYMMDD is year, month and day HREF Product Changes:
The HREF directory will be changing to include subdirectory

hiresw/prod/href.YYYYMMDD/file -> hiresw/prod/href.YYYYMMDD/ensprod/file
Where file is the href gridded binary version two (GRIB2) output.

HREF includes two new output file types: probability matched mean (pmmn),
and an "avrg" type which averages the conventional mean and probability
matched mean.

The HREF file naming structure is changed due to introduction of non-CONUS
output:

href.tCCz.TYPE.fFF.grib2 > href.tCCz.GRID.TYPE.fFF.grib2
Where CC is cycle, GRID is domain (conus, ak, pr or hi), TYPE is either
mean, sprd, prob, pmmn or avrg; and FF is forecast hour from 00-36.

All HREF Output frequency changed from three hourly to hourly, still
extending to 36-hours from the initialization time.

Cycle output for the "conus" domain is generated at 00/06/12/18 UTC.  For
the Alaska (ak) and Puerto Rico (pr) domains, output is produced at 06/18
UTC.  For Hawaii (hi), output is generated at 00/12 UTC.

Add neighborhood probability output for more localized fields; which
fields are neighborhood probabilities is specified later in this
subsection in descriptions of "prob" file type changes.

Adding new NOMADS Grib Filter functionality:
HREF Conus - filter_hrefconus.pl
HREF Alaska - filter_hrefak.pl
HREF Hawaii - filer_hrefhi.pl
HREF Puerto Rico - filter_hrefpr.pl

Eliminated fields for HREF "mean" and "sprd" file types:

500 hPa absolute vorticity (ABSV)

Added the following fields for HREF "sprd" and "mean" file types:

Convective Available Potential Energy (CAPE): 90-0 hPa AGL mixed layer,
180-0 hPa AGL most unstable and surface based.
Convective Inhibition (CIN): 90-0 hPa AGL mixed layer, 180-0 hPa AGL most
unstable and surface based 3000-0 m AGL helicity.
Geopotential Height: 250, 700 and 925 hPa
Soil temperature in 0-10 cm layer
Soil moisture in 0-10 cm layer
Wind component: 250, 500, 700 and 925 hPa.
Wind component: 250, 500, 700 and 925 hPa.
Temperature: 250, 500, 700, and 925 hPa
Dewpoint temperature: 500, 700, 850 and 925 hPa Wind speed at 250 and 925
hPa
Cloud base height
Low, middle, high and total cloud fraction
2 m above ground level (AGL) temperature and dewpoint
10 and 80 m AGL wind speed
Precipitation type (as rain, freezing rain, ice pellets, and snow)

1-hour precipitation accumulation 700-500 hPa mean vertical velocity
Haines Index
Wind shear over 0-6000 m layer
1-hour accumulated snowfall liquid equivalent
3-hour accumulated snowfall liquid equivalent [only for forecast hours dividing evenly into three]

Added fields for HREF "sprd" file type:

1000 m AGL simulated reflectivity
1000 m AGL hourly maximum simulated reflectivity
Composite simulated reflectivity
Echo top height
Updraft helicity over 5000-2000 m AGL layer
Hourly maximum updraft helicity over 5000-2000 m AGL layer
Surface height (topography)

This upgrade also corrects the derived forecast type labeling for "sprd" GRIB2 output to label it as the spread of all members rather than the weighted mean of all members.  In wgrib2 inventory form:

xx hour fcst:wt mean all members ---> xx hour fcst:spread all members

Eliminated fields for HREF "prob" file type:

Hourly maximum updraft velocity over 400-1000 hPa layer (> 5 m/s)
Hourly maximum downdraft velocity over 400-1000 hPa layer (> 1 m/s, > 5 m/s, > 10 m/s)
U and V components of hourly maximum 10 m AGL wind (> 15.4 m/s) Echo Top height (> 1000 m, > 3000 m, > 5000 m, > 7600 m, > 10000m)
3-hour accumulated precipitation (> 0.24 mm, > 6.34 mm, > 12.4 mm, > 25.1 mm, > 50 mm, > 75 mm)
Wind speed at 500 and 250 hPa (> 10.3 m/s, > 20.6 m/s, > 30.9 m/s, > 41.2 m/s, > 51.5 m/s)
Low-level (sfc) wind shear > 20 kts

Added fields for "prob" file type:

** = a neighborhood probability computed field

**1000 m AGL simulated reflectivity (> 30 dBZ, > 50 dBZ)
**1000 m AGL hourly maximum simulated reflectivity (> 50 dBZ)
**Echo Top height (> 6096 m, > 9144 m, > 10668 m, > 12192 m, > 15240 m)
**Updraft Helicity (> 25 m^2/s^2, >100 m^2/s^2)

**Hourly maximum updraft helicity (> 100 m^2/s^2)
**Hourly maximum updraft velocity over 400-1000 hPa layer (> 20 m/s)
90-0 m AGL mixed layer CAPE (> 500 J/kg, > 1000 J/kg, > 1500 J/kg, > 2000 J/kg, > 3000 J/kg)
90-0 m AGL mixed layer CIN (< 0 J/kg, < -50 J/kg, < -100 J/kg, < -400 J/kg)
3000-0 m AGL helicity (> 100 m^2/s^2, > 200 m^2/s^2, > 400 m^2/s^2)
2 m temperature (< 273.15 K)
2 m dewpoint temperature (> 283.15 K, > 285.93 K, > 288.71 K, > 291.48 K,

> 294.26 K)
Wind shear over 0-6000 m AGL layer (> 10.3 m/s, > 15.4 m/s , > 20.6 m/s, >
25.7 m/s)
Low-level (sfc) wind shear > 10.3 m/s

**1-hour accumulated precipitation (> 0.25 mm, > 6.35 mm, > 12.7 mm, >
25.4 mm, > 50.8 mm, > 76.2 mm)
**3-hour accumulated precipitation (> 0.25 mm, > 6.35 mm, > 12.7 mm, >
25.4 mm, > 50.8 mm, > 76.2 mm) [only for forecast hours dividing evenly
into three]
** 6-hour accumulated precipitation (> 0.25 mm, > 6.35 mm, > 12.7 mm, >
25.4 mm, > 50.8 mm, > 76.2 mm) [for forecast hours >=6 that divide evenly
into three]
** 12-hour accumulated precipitation (> 2.54 mm, > 6.35 mm, > 12.7 mm, >
25.4 mm > 50.8 mm, > 76.2 mm, > 127.0 mm) [for forecast hours >= 12 that
divide evenly into three]
** 24-hour accumulated precipitation (> 2.54 mm, > 6.35 mm, > 12.7 mm, >
25.4 mm > 50.8 mm, > 76.2 mm, > 127.0 mm) [for forecast hours >= 24 that
divide evenly into three]

**1-hour snowfall liquid equivalent (> 2.54 mm, > 7.62 mm)
**3-hour snowfall liquid equivalent (> 2.54 mm, > 7.62 mm, > 15.24 mm)
[only for forecast hours dividing evenly into three]
**6-hour snowfall liquid equivalent (> 2.54 mm, > 7.62 mm, > 15.24 mm, >
30.48 mm) [for forecast hours >=6 that divide evenly into three].

The labeling for the probability of the mean wind over the 850-300 mb
layer has been corrected.  It previously was labeled as an isobaric layer
relative to ground surface, but now is labeled purely as an isobaric
layer.  In wgrib2 inventory form: WIND:850-300 mb above ground:xx hour
fcst:prob <5 ---> WIND:850-300 mb:xx hour fcst:prob <5

The new probability matched (PM) mean "pmmn" file type and the new "avrg"
file type, which contains an average of the PM mean and conventional
arithmetic mean, both contain:

1000 m AGL simulated reflectivity
1000 m AGL hourly maximum simulated reflectivity
Composite simulated reflectivity
Echo top height
Updraft helicity over 5000-2000 m AGL layer
Hourly maximum updraft helicity over 5000-2000 m AGL layer
Surface height (topography)
1-hour accumulated precipitation
3-hour accumulated precipitation [only for forecast hours dividing evenly
into three].

Changes HIRESW products:

For the HIRESW *_5km.*.grib2 and *subset.grib2 output grids, these new
products are added:

2000-5000 m AGL hourly minimum updraft helicity
0-3000 m AGL hourly maximum updraft helicity

0-3000 m AGL hourly minimum updraft helicity
100-1000 hPa hourly maximum updraft velocity (replaces a 400-1000 hPa
hourly maximum updraft velocity field)
100-1000 hPa hourly maximum downdraft velocity (replaces a 400-1000 hPa
hourly maximum downdraft velocity field).

-For the HIRESW *_5km.*.grib2 (non-subset) output grids, these new
products are added:

VUCSH Vertical U-Component Shear [1/s]:0-6000 m above ground
VVCSH Vertical V-Component Shear [1/s]:0-6000 m above ground

-For the HIRESW *_5km.*.grib2 Conus only (non-subset) output grids, these
new products are added:

CPOFP Percent frozen precipitation
APCP Total Precipitation [kg/m^2]:surface:3-6 hour accumulation forecast
WEASD Water Equivalent of Accumulated Snow Depth
[kg/m^2]:surface:3-6 hour accumulation forecast.

For the HIRESW *_2p5km*.grib2 and *_3km*.grib2 (non-subset) grids, two new
products are added:

HGT Cloud ceiling
HGT Cloud base
100-1000 hPa hourly maximum updraft velocity (replaces a 400-1000 hPa
hourly maximum updraft velocity field)
100-1000 hPa hourly maximum downdraft velocity (replaces a 400-1000 hPa
hourly maximum downdraft velocity field).

For the HIRESW *_2p5km*conus.grib2 (non-subset) grids, following product
is removed:

MAXDVV Hourly Maximum of Downward Vertical Velocity

The CONUS "subset" grid with a reduced number of products now is output on
a 1799 x 1059 point 3km grid (the same grid utilized for HRRR and NAM
CONUS nest output).

The file name structure for the CONUS subset grid is changed to reflect
the change in output grid spacing:
hiresw.tCCz.*_5km.fFF.conus.subset.grib2 -->
hiresw.tCCz.*_3km.fFF.conus.subset.grib2

A new member will be available for the CONUS domain
hiresw.tCCz.*_3km.fFF.conusmem2.subset.grib2

HIRESW Time labeling for time-averaged surface fluxes (sensible and latent
heat) in NMMB model output have been corrected for forecast hours not
divisible by three.  As an example, a wgrib2 inventory of a 20-hour
forecast of time-averaged latent heat flux would change in this way:
LHTFL:surface: ---> LHTFL:surface:18-20 hour average forecast:

Some Binary Universal Form for the Representation of Meteorological Data
(BUFR) output points have been eliminated or redefined:

- All eliminated points are fictitious stations over the ocean previously
added to fill in around the limited stations on land for Hawaii (HI),
Puerto Rico (PR), and Guam.  Details are available at:

http://www.emc.ncep.noaa.gov/mmb/mpyle/hiresw/bufr_changes/hireswv7.txt

And, while not documented, all domains that had a change in resolution
(all ARW domains and the CONUS NMMB) will have some slight changes in the
exact location of individual BUFR output stations.  Changes to the grid
resolution modifies the grid dimensions and grid point locations, and
because the BUFR output is taken from values at the nearest model grid
point it may be shifted by up to a few kilometers.

- The HIRESW 5km data will be discontinued from the NWS web services, and
can instead be found on the NCEP web services.  Please see below for what
is being removed, and the exact replacement file name on NCEP web
services.  Users are encouraged to migrate over to the NCEP web files at
any time.

http://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.hires_MR.arw_CY.CC/
ftp://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.hires_MR.arw_CY.CC/
http://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.hires_MR.nmm_CY.CC/
ftp://tgftp.nws.noaa.gov/SL.us008001/ST.opnl/MT.hires_MR.nmm_CY.CC/

Subdirectories RD.YYYYMMDD/PT.grid_DF.gr2_AR.conus05/
RD.YYYYMMDD/PT.grid_DF.gr2_AR.alaska05/
RD.YYYYMMDD/PT.grid_DF.gr2_AR.hi05/
RD.YYYYMMDD/PT.grid_DF.gr2_AR.pr05/
Where CC is cycle and YYYYMMDD is year, month and day.

PT.grid_DF.gr2_AR.conus05 fh.00FF_tl.press_gr.awpreg ->
hiresw.tCCz.arw_5km.fFF.conus.grib2 hiresw.tCCz.nmmb_5km.fFF.conus.grib2

PT.grid_DF.gr2_AR.alaska05 fh.00FF_tl.press_gr.awpreg ->
hiresw.tCCz.arw_5km.fFF.ak.grib2 hiresw.tCCz.nmmb_5km.fFF.ak.grib2

PT.grid_DF.gr2_AR.hi05 fh.00FF_tl.press_gr.awpreg ->
hiresw.tCCz.arw_5km.fFF.hi.grib2 hiresw.tCCz.nmmb_5km.fFF.hi.grib2

PT.grid_DF.gr2_AR.pr05 fh.00FF_tl.press_gr.awpreg ->
hiresw.tCCz.arw_5km.fFF.pr.grib2 hiresw.tCCz.nmmb_5km.fFF.pr.grib2
Where FF is forecast hour.

NOAAPort/Satellite Broadcast Network (SBN) Additions:

With this upgrade, the HREF will become available over NOAAPort/SBN across
the CONUS, Alaska, Hawaii and Puerto Rico domains.  The total volume
increase with be 8.6GB/day.  Please see this document below for the
description of product World Meteorological Organization (WMO) headers:

http://www.nco.ncep.noaa.gov/pmb/changes/docs/HREF_WMO_description.pdf

Please see this document for every WMO header available:

http://www.emc.ncep.noaa.gov/mmb/mpyle/hiresw/wmo/wmo_headers.txt

Data Availability and Schedule Changes:

With the change in initialization procedures described earlier, HIRESW
output will be made available much earlier:

~115 minutes earlier for CONUS domain
~115 minutes earlier for Alaska domain
~95 minutes earlier for Hawaii domain
~110 minutes earlier for Puerto Rico domain
~110 minutes earlier for Guam domain.

CONUS HREF output will be available about 110 minutes earlier than in
current operations.

New HREF domain output will be available approximately this long after the
nominal cycle (CC) time:

Alaska: CC + 02:55
Hawaii: CC + 02:45
Puerto Rico: CC + 02:45

A consistent parallel feed of data is currently available on the NCEP HTTP
server at the following URLs:

http://para.nomads.ncep.noaa.gov/pub/data/nccf/com/hiresw/para/
http://para.nomads.ncep.noaa.gov/pub/data/nccf/noaaport/

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 these changes, please contact:

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National Service Change Notices are online at:

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

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