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Service Change Notice 20-54
National Weather Service Headquarters Silver Spring MD
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From: Brian Gross
 Acting Director
 National Centers for Environmental Prediction

Subject: Upgrade to Hurricane Weather and Research Forecast
 (HWRF) Effective July 14, 2020

Effective on or about Tuesday, July 14, 2020, with the 1200 Coordinated Universal Time (UTC) cycle, the National Centers for Environmental Prediction (NCEP) Central Operations (NCO) will upgrade the Hurricane Weather and Research Forecast (HWRF) model to Version 13.

The scientific and technical enhancements include the following:

- Upgrade the Hurricane Weather and Research Forecasting (HWRF) Non-hydrostatic Meso-scale Model (NMM) core to community version V4.0a and the latest HWRF trunk including the latest bug fixes
 - Use high-resolution land-sea masks for the moving nests
 - Obtain 3-hourly (instead of 6-hourly) lateral boundary conditions from GFS
 - Optimize and unify the domain sizes for the ghost domains for initialization and data assimilation (DA)
 - Adjust the horizontal mixing length scale parameter (coac) for D03
 - Use the exponential random cloud overlap method (cldovrlp=5) with a constant decorrelation length (idcor=0) in the RRTMG radiation scheme and include a recent shortwave radiation related bug fix from Atmospheric Environment Research (AER) through Developmental Testbed Center (DTC)
 - Sync the scale-aware SAS convection scheme with a recent GFS version, but keep using the HWRF's detrainment rate
 - Use the unified F-A microphysics scheme (consistent with the versions used in Hurricanes in a Multi-scale Ocean-coupled Non-hydrostatic, HMON, and North American Meso-scale, NAM) with bug fixes (collection efficiency calculation, calculation of the saturation mixing ratio with respect to water at 0 degC, limit the ice/rain fraction within 0 to 1, etc.)
 - Adopt new settings for the Data Assimilation and Grid-

point Statistical Interpolation, DA/GSI, increment blending

- Turn off smoothing in Vortex Initialization (VI) and turn off intensity correction when model mean sea level pressure is shallower than observed and wind speed is stronger than observed wind speed
- Skip the effects of VI but keep DA/GSI for weak storms/cycles with $v_{max} \leq 25$ kts, and fall back to use Global Forecast System (GFS) analysis as initial conditions (ICs) for weak storms/cycles with $v_{max} < 20$ kts
- Implement a new domain merging method and procedure to handle the transition from the HWRF analysis to GFS analysis
- Update and fix issues related to the preprocessing of the temperature dropsonde (TEMPDROP) data
- Use upgraded data assimilation system
- Assimilate some additional satellite observations used in GFS
- Unflag and turn off the thinning method for the Advanced Scatterometer (ASCAT) data
- Assimilate the Next Generation Weather Radar (NEXRAD) radial wind data from coastal radar sites together with Hurricane Research Division, and Oklahoma University, collaborators)
- Switch to use the Global Real-Time Ocean Forecast System. RTOFS data (instead of the Generalized Digital Environmental Model, GDEM climatology) to initialize the ocean model for the national basin (same as the east Pacific basin)
- Improve the regridding of initial data from RTOFS to Princeton Ocean Model (POM) grid especially over shallow layers to fix the cold spots of Sea Surface Temperature (SST) appeared in the previous forecasts
- Unify the POM related scripts to support both the current operational HWRF or basin-scale HWRF configurations
- Use a newer version HYbrid Coordinate Ocean Model (HYCOM) for ocean coupling for JTWC basins and update the ocean lateral boundary condition specification
- Use upgraded unified post-process
- Use the latest version of Geophysical Fluid Dynamics Laboratory (GFDL) tracker (from Tim Marchok, GFDL)

The 2020 HWRF system has been fully tested and compared with the forecast skill of 2019 operational HWRF v12.4.4. Overall, it has shown improved skill in track and intensity forecasts for both North Atlantic (NATL) and Eastern Pacific (EPAC) basins.

Product Timing Changes:

Users of public data on NOMADS will notice all forecast products will be up to 10 minutes later for Atlantic, Eastern and Central Pacific basins.

Sample HWRF products from 2020 HWRF are available at:

<https://para.nomads.ncep.noaa.gov/>

More details about the HWRP system are available at:

http://www.emc.ncep.noaa.gov/gc_wmb/vxt/HWRP/index.php

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 which 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 these model changes, please contact:

Dr. Avichal Mehra
Chief, Dynamics and Coupled Modeling Group
NOAA/NCEP/Environmental Modeling Center
National Centers for Weather and Climate Prediction
College Park, MD
301-683-3746
avichal.mehra@noaa.gov

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

Anne Myckow
NCEP/NCO Implementation and Data Services Branch
College Park, Maryland
301-683-0567
ncep.pmb.dataflow@noaa.gov

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

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