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Technical Implementation Notice 14-19  
National Weather Service Headquarters Washington DC  
1020 AM EDT Tue Apr 29 2014

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From: Timothy McClung  
Science Plans Branch Chief  
Office of Science and Technology

Subject: Hurricane Weather and Research Forecast  
(HWRf) Model Changes: Effective June 3, 2014

Effective on or about Tuesday, June 3, 2014, beginning with the 1200 Coordinated Universal Time (UTC) run, the National Centers for Environmental Prediction (NCEP) will upgrade the HWRf Princeton Ocean Model (POM) coupled system. The scientific enhancements include the following:

- Increase the vertical resolution of the HWRf atmospheric model from 43 to 61 levels and raise the model top from 50 hPa to 2 hPa, expand the size of the 9km domain by 20 percent (from 10 degrees x 10 degrees to 12 degrees x 12 degrees) and 3km domain by 10 percent (from 6.5 degrees x 6.5 degrees to 7.1 degrees x 7.1 degrees).
- Upgrade the nest movement algorithm to generate storm total rain and wind swath products directly from the model output.
- Upgrade WRF NMM core to WRF community version V3.5.1.
- Upgrade the ocean model (POM) to 1/12 degrees MPI POM with unified trans-Atlantic basin, and for the first time, 3D ocean for Eastern Pacific basin.
- Make further improvements to HWRf vortex initialization scheme including cycling the invests to prevent cold start for a named/numbered storm
- Improve HWRf Data Assimilation System through upgrade of one-way hybrid EnKF-3DVAR GSI to community version V3.3, data assimilation to include all conventional and satellite radiance data and aircraft Tail Doppler Radar (TDR)/Dropsonde data in the 9km domain; only conventional, TDR and Dropsonde data in the 3km domain.
- Add operational forecast products from HWRf to include tornado probability forecasts and new variables for downstream applications (hurricane wave model)

-Fix bugs and enhancements for the GFDL vortex tracker

The 2014 HWRF model configuration has been extensively tested with a combination of all the upgrades listed above for a 6-year sample of cases (2008-2013) and the results showed that for Atlantic basin track and intensity, the 2014 HWRF showed about 10 percent improvement compared to the current operational HWRF.

#### Product Changes:

- ASCII files of storm total wind and rain swath will have twice the resolution (0.05o) than the current operational products (0.1o).
- HWRF tracker output (ATCF) will now include hourly data for the first 9 hours and 3-hourly for rest of the forecast period.
- The auxiliary history files for wave model in binary format (out4wave\_d01, out4wave\_d02 and out4wave\_d03) will be replaced by new files in netCDF format (wrfdiag\_d01, wrfdiag\_d02 and wrfdiag\_d03).

#### Additional products and their contents:

- 3D fields in all GRIB2 files will now have 6 additional levels (30, 20, 10, 7, 5 and 2 hPa)
- The following fields will be added to the GRIB2 files:
  - CAPE
  - CIN (Convective Inhibition)
  - Storm Relative Helicity
  - 19GHz simulated brightness temperature from SSMI/S F17 (both vertical and horizontal polarizations)
  - Rime factor on pressure surface
- The auxiliary history files (wrfdiag\_d01, wrfdiag\_d02 and wrfdiag\_d03) will include the following additional fields:
  - Incoming/Outgoing Radiation
  - SST, fluxes for sensible heat, latent heat and momentum
  - Lowest model level temperature and height
  - Tornado genesis

More details about the HWRF-MPIPOM are available at:

[www.emc.ncep.noaa.gov/index.php?branch=HWRF](http://www.emc.ncep.noaa.gov/index.php?branch=HWRF)

The HWRF GRIB2 products are disseminated via the NCEP FTP server and are not available on NOAAPORT or AWIPS.

These changes will result in up to a 12-minute delay in product dissemination time. A change in delivery time was proposed in an NWS Public Information Statement issued March 25, 2014. Based on the responses received, NWS will move forward with this change in dissemination time of the HWRF 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 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.

For questions regarding these model changes, please contact:

Dr. Vijay Tallapragada  
NOAA/NCEP/Environmental Modeling Center  
College Park, Maryland, 20740.  
301-683-3672  
vijay.tallapragada@noaa.gov

NWS National Technical Implementation Notices are online at:

<http://www.nws.noaa.gov/os/notif.htm>

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