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PNSWSH

Technical Implementation Notice 16-18 Amended
National Weather Service Headquarters Washington DC
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 NWS Office of Science and Technology Integration

Subject: Amended: Hurricane Weather and Research Forecast (HWRF) Model
Changes: Effective July 12, 2016

Amended to include a variable change for brightness temperature.

Effective on or about Tuesday, July 12, 2016, 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 and technical enhancements include the following:

- Upgrade dynamic core from WRF3.6a to WRF3.7.1a (with bug fixes) and reduce time step (dt=30 s vs. 38 4/7 s) for improved track and intensity forecasts in all global basins, especially for Atlantic and Eastern-Pacific (EPAC).
- Increase nested domain size, d02 from (12x12 deg) to (25x25 deg), and d03 from (6.5x7.0 deg) to (8.3x8.3 deg) and upgrade to new scale-aware SAS convection scheme for all domains. This allows the new system to better handle large storms and provide improved storm structure forecasts with detailed smaller scale storm features.
- Upgrade Gridpoint Statistical Interpolation (GSI), assimilating more satellite observation data in GSI (CrIS, SSMI/S, METOP-B changes) and turn on Data Assimilation (DA) for all storms in East Pacific Basin. The upgraded DA system provides well-balanced initial conditions, eliminating initial shocks (spin up and spin down) noted in previous version.
- Physics upgrades include: a) implementation of new GFS PBL (2015 version); b) updated momentum and enthalpy exchange coefficients (Cd/Ch); and c) improved vertical wind profile in the surface and boundary layer. These upgrades provide more realistic vertical wind profiles compared to the observations.
- Use Real Time Ocean Forecast System (ROTFS) data to initialize POM model for EPAC storms to have more realistic oceanic Initial Conditions (IC) and improved Rapid Intensification (RI) forecasts this coming season.
- Extend Ocean coupling for all Northern Hemisphere basins including Central North Pacific (CPAC), Western North Pacific (WPAC) and North Indian Ocean (NIO) for enhanced tropical cyclone track and intensity forecast skill.

-Add one-way coupling to wave model (Hurricane Wave Model) for North Atlantic and East Pacific storms which would allow us to replace Hurricane Wave model in FY17.

The 2016 HWRP model configuration has been extensively tested individually and with a combination of all the upgrades listed above for a 3-year period (2013-2015). The results showed further improvements in tropical cyclone track and intensity forecasts in all global oceanic basins compared to the current operational HWRP.

Product Changes:

- Changes to output products include filename changes, domain increases for some output grids, resolution changes for some output grids, and the removal of some obsolete products. Details are provided below.

The file naming convention in the 2015 version of HWRP is changed to include domain and resolution information in the file name.

| 2015 HWRP | 2016 HWRP | Change |
|----------------------|-------------------------|---|
| ----- | ----- | ----- |
| parent domain: | | |
| *hwrpXX.d1.0p20* | *hwrpXX.synoptic.0p125* | resolution increase from .2 to 0.125 degrees |
| global domain: | | |
| *hwrpXX.d123.0p25* | *hwrpXX.global.0p25* | filename change |
| outer-nested domain: | | |
| *hwrpXX.d2.0p06* | *hwrpXX.storm.0p02* | domain increase to 25x25, resolution increase to 0.02 degrees |
| inner-nested domain: | | |
| *hwrpXX.d3.0p02* | *hwrpXX.core.0p02* | domain increase to 8.3x8.3 |

The following grids are being removed due to resolution increases or the information being duplicative of the products listed above:

| | |
|---------------------|-----------------------------------|
| *hwrpXX.d123.0p06* | global domain at lower resolution |
| *hwrpfrs.d123.0p06* | combination of 18/6/2 km grids |
| *hwrpfsat.d12.0p06* | combination of 18/6/2 km grids |
| *hwrpXX.d23.0p02* | combination of 6/2 km grids |

In the above examples, hwrpXX is either hwrpfrs (pressure level output of atmospheric variables including surface variables) or hwrpfsat (synthetic satellite brightness temperatures).

Additional products and their contents:

Additional simulated synthetic imagery from different satellite sensors will be included in *hwrpfsat* output files in order to provide global coverage for all oceanic basins, including:

GOES-13 for North Atlantic; GOES-15 for East, Central Pacific; SEVERI for South, East Atlantic, and Indian Ocean; HIMIWARI (MTSAT-2 in 2015 version) for West, Central Pacific; DMSP/F17 SSMI/S for All basins; InSat-

3D/Kalpana for Indian Ocean.

The variables in the non-satellite output files (*hwrfrprs*) will remain the same as 2015 HWRF.

To be compliant with international standards, the following variable will change to reference table 4.2-0-5:

Brightness Temperature on hybrid (BRTMP) -> Brightness Temperature (BRTEMP)

The HWRF GRIB2 products are disseminated via the NWS and NCEP FTP servers and NOMADS and are not available on NOAAPort or AWIPS.

More details about the HWRF-MPIPOM are available at:

www.emc.ncep.noaa.gov/index.php?branch=HWRF

NCEP Central Operations has supplied a set of sample output for a recent storm so that users can examine the new filenames and output formats. Data is available at:

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

in the directories hwrf.YYYYMMDDCC, where YYYYMMDDCC is the year, month, day and cycle.

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:

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

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

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