

The third nest development in HWRF-NMM V3.2

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HWRF-NMM v3.2

- The code obtained from DTC (Shaowu) on April 28 w/o .svn then May 4th w/ .svn directory
- Compiler: PGI
- 256 processors on njet
- Initial test:
 - HWRF physics options: stopped at 97.5 hrs
 - HWRFx physics options: 126 hrs integration, 3 hrs and 20 mins wall-clock

HWRFX Configuration

```
&domains
time_step          = 18,
time_step_fract_num      = 0,
time_step_fract_den     = 1,
max_dom            = 2,
s_we               = 1,    1,
e_we               = 476,  146,
s_sn               = 1,    1,
e_sn               = 926,  290,
s_vert             = 1,    1,
e_vert             = 43,   43,
num_metgrid_levels   = 22,
dx                 = .06,  .02,
dy                 = .06,  .02,
```

```
&physics
mp_physics         = 5,    5,
ra_lw_physics      = 1,    1,
ra_sw_physics      = 1,    1,
sf_sfclay_physics = 3,    3,
sf_surface_physics = 2,    2,
bl_pbl_physics     = 3,    3,
cu_physics         = 4,    0,
mommix             = 0.0,  0.0,
co2tf              = 1,
nrads              = 100,  30,
nradl              = 100,  30,
nphs               = 2,    6,
ncnvc              = 2,    6,
```

Implementation	Status
Registry	Final adjustment
Moving Algorithm	Done
Nest move Infrastructure	Done
Vortex search	Testing
HWRFx physics options	Testing
DIAPOST	Testing
ATCF	Testing
Real-time auto run	Testing
DA interface	Not testing yet
HWRF physics options	Not testing yet

Issues

- Large netCDF file size: resolved
- HWRF physics options: who responsible to do further test and bug-fix?

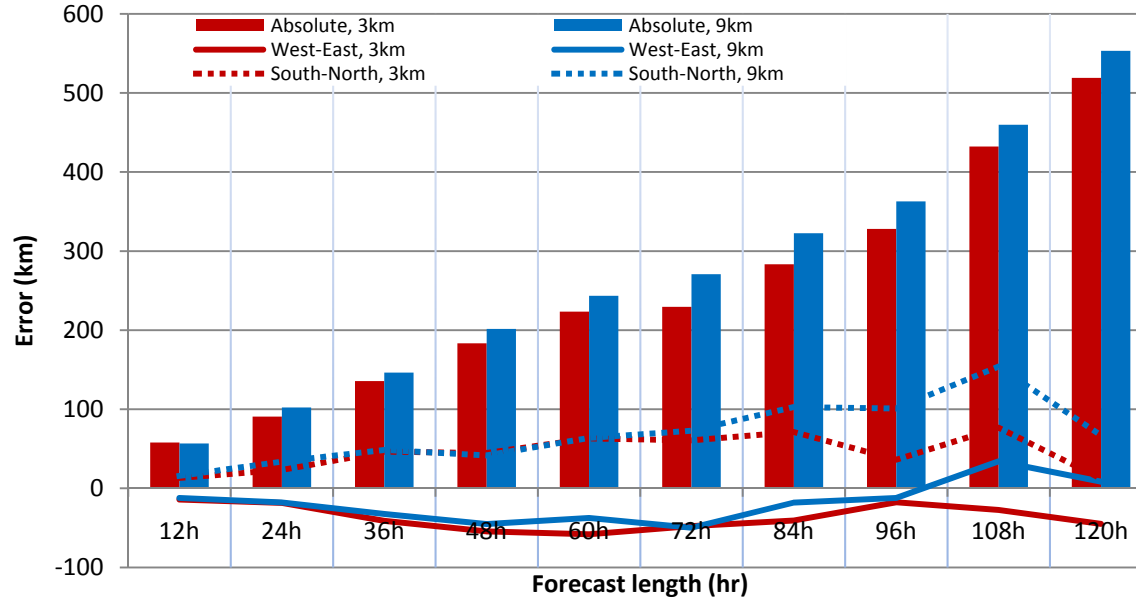
Future work

- Schedule: June 1 (keep the schedule but may upgrade in the future)
- Complete testing and transfer code to EMC
- Increase to operational domain sizes
- Create a DA interface for HEDAS
- Prepare for 2010 demo run
- Configure 27/9/3 km test
- Re-run 69 cases and 2009 season cases

Some results from HWRFx

- Papers submitted recently
 - Gopalakrishnan, S. G., F. D. Marks, X. Zhang, J.-W. Bao, K.-S. Yeh, and R. Atlas, 2010: The Experimental HWRF System: A Study on the Influence of Horizontal Resolution on the Structure and Intensity Changes in Tropical Cyclones using an Idealized Framework. Submitted to *Mon. Wea. Rev.*
 - Yeh, K.-S., X. Zhang, S. G. Gopalakrishnan, S. Aberson, R. Rogers, F. D. Marks, and R. Atlas, 2010: Performance of the experimental HWRF in the 2008 hurricane season. Submitted to *Natural Hazards*.
 - Zhang, X., T. S. Quirino, K.-S. Yeh, S. G. Gopalakrishnan, F. D. Marks, Jr., S. B. Goldenberg, and S. Aberson, 2010: Toward Improving Hurricane Forecast with High-Resolution Modeling. Submitted to *Computing in Science and Engineering*.

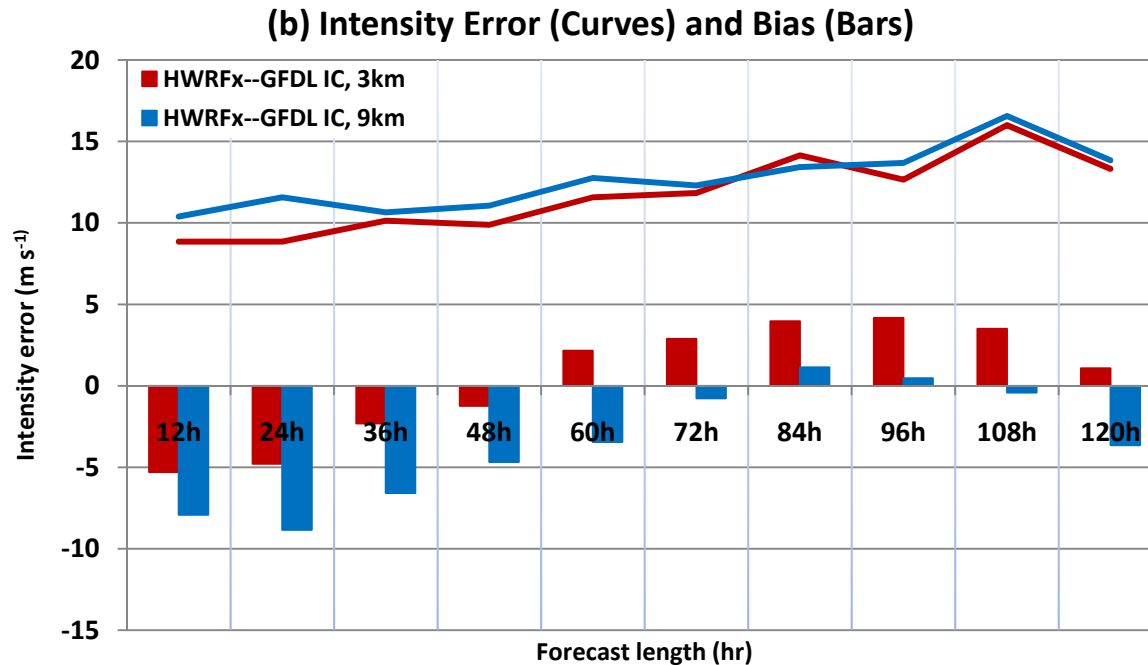
(a) Track Error



Frequency of Superior Performance and Confidence Level(%)

Resolution	12h	24h	36h	48h	60h	72h	84h	96h	108h	120h
HWRFx-3km	47.0	65.1	57.3	58.8	47.2	58.3	51.2	46.2	46.9	44.0
HWRFx-9km	53.0	34.9	42.7	41.2	52.8	41.7	48.8	53.8	53.1	56.0
#CASES	66	63	62	57	53	48	43	39	32	25
Confidence	66.6	99.6	93.2	92.2	89	95.9	89.1	78.9	64.5	61
# Adj. CASES	60.5	58	57	52.5	48.5	43.5	39	35.8	30.2	24

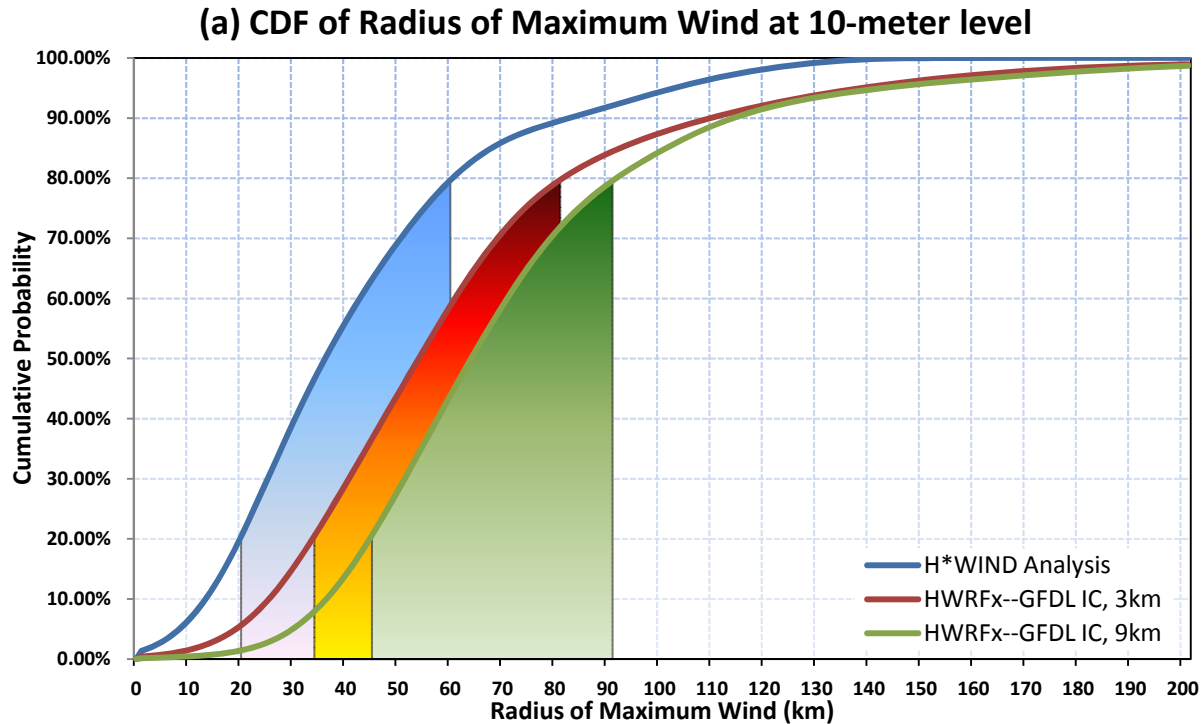
Track homogeneous verifications of HRH test for the HWRFx forecasts. (a) Absolute track errors (km) are shown with color bars, and the west-east and south-north track biases (km) are shown with the curves. The frequency of superior performance (FSP) (%) compares the forecasts with different resolutions based on the absolute errors. The confidence level is based on the sample size adjusted for 24 hrs serial correlation time (Aberson & DeMaria, 1994).



Frequency of Superior Performance and Confidence Level (%)

Resolution	12h	24h	36h	48h	60h	72h	84h	96h	108h	120h
HWRFX-3km	62.1	69.8	53.2	65.8	46.2	45.8	46.5	55.1	54.7	60.0
HWRFX-9km	37.9	30.2	46.8	34.2	53.8	54.2	53.5	44.9	45.3	40.0
#CASES	66	63	62	57	53	48	43	39	32	25
Confidence	99.1	100	72.4	89.6	82.6	64.5	69.2	72.3	61	57.8
# Adj. CASES	60.5	58	57	52.5	48.5	43.5	39	35.8	30.2	24

Intensity homogeneous verifications of HRH test for the HWRFX forecasts. (b) Absolute intensity errors (m s^{-1}) are shown with the curves, and the biases (m s^{-1}) are shown with color bars. The frequency of superior performance (FSP) (%) compares the forecasts with different resolutions based on the absolute errors. The confidence level is based on the sample size adjusted for 24 hrs serial correlation time (Aberson & DeMaria, 1994).



(a). Cumulative Distribution Function (CDF) of the radius of maximum wind at 10 meters above the ground for the HWRFx forecasts, compared with the H*WIND analysis. The CDFs are shaded for 20-80% of probability for the significance. According to the H*WIND analysis, 60% (from the 20th to 80th percentile) of the observed RMW is distributed over 19-60 km. For the high- and low-resolution models, 60% of the simulated RMW is distributed over 32-81 km and over 42-91 km, respectively. The average RMW is about 41 km for the H*WIND analysis, 58 km and 66 km for the high- and low-resolution HWRFx forecasts, respectively.