

HFIP Annual Meeting Notes
Day 2: Wednesday Nov 18, 2020
12 noon - 5 pm ET

Notetakers: Sikchya Upadhayay and Karen Keith

12:00 noon - 1:00 pm: Updates on Current Operational Model

12:00 noon Current Operational Regional Model Advances and plans (Avichal Mehra)

- Using available consistent GFS forcings
- FY20 HWRF upgrades - DA improvements, air-sea coupling (HYCOM new version, switch to RTOFS data), PP, physics
- Comparison HWRF in NATL and EPAC (slide 8)
- HMON FY2020 upgrades - infrastructure, physics, coupling
- Significant improvements in NATL in both track and intensity with HMON model
- FY2020 HWRF/HMON 2020 config (slide 13)
- Operational performance for HWRF/HMON: NATL HWRF best intensity and HMON best track at all lead times, outstanding in Gulf
- HWRF captures storm structure well for Laura
- FY21 upgrades: inputs from GFS and RTOFS
- GFS 16 impact on hurricane models
- Future implementations

Q. How HWRF/HMON do with RI?

A. Performance was better than 2019, in both retrospective and real time.

Q. GFS v16 is more cyclogenetic than GFS v15. Does that affect HWRF/HMON?

A. Yes

12:20 pm Global Model advances and plans (Vijay Tallapragada)

- Major upgrade for UFS subseasonal and medium range
- Added new obs to GFS since last year
- Different version of GFS transitioned
- GEFS - increased the layers to 64, one way coupled to waves
- Comparing GEFS prod and GEFS Fv3, the intensity errors has improved
- GEFS outperforms the other models in weeks 1-2 and CFS in weeks 3-4.
- Concern of TC right-of-track bias
- Next major upgrade is GFSv16 - increase vertical res, advanced physics, improve DA, and include more observations
- Major upgrades to GDAS - more dropsonde data will be used.
- TC genesis concern with large false alarm rate
- GFS planned for FY21
- Future coupled UFS application (26)
- For NATL, right of the track biases is a concern.

12:40 pm RDHPCS Computing (Vijay Tallapragada)

- WCOSS status and structure details
- Cray dev allocation 350 nodes
- WCOSS access limited for community
- FY21 Feb moratorium lasting for a year
- New WCOSS2 coming online, distributing facilities
- Orion: 6th most powerful system
- RDHPCS usage: Jet used for RT, Orion follows
- Hera utilization upto 90%
- Orion usage by hurricane team 698%!
- Jet usage, could not utilized fully
- Realtime exp. 7 projects, 85 reservations, 12 M allocated
- Jet Issues: file system, rocoto, IB switch, slow performance, bad nodes, data transfer

Action Item 4: Address the Jet Upgrade/Refresh Issue

1:00 pm - 3:40 pm: HFIP Real-time reservation Experiment

1:00 pm Results from HAFS v0.1A (Bin Liu)

- HAFS (A) config: coupled with HYCOM, layers to 91, larger domain size, GWD turned off,
- HAFS-A better track and intensity performance than HWRF in NATL and EPAC at most lead times
- HAFS 1S experiment (Slide 10): impact of domain location convection scheme
- HAFS-1H exp: impacts of atm pressure forcing, pptn and river discharge for HYCOM coupling
- Encouraging results with the convection scheme
- Switch from direct ESMF/NUOPC coupling to ESMF/CMEPS
- Develop DA and vortex initialization
- Explore using other physics schemes

1:20 pm Results from HAFS v0.1B (Andy Hazelton)

- HAFS-B - 3km, L75, Two way feedback between the global and the nest, EDMF-TKE schemes
- 400 cases in 2020!
- Windradii 34 bias reduced in HAFS-B
- RMW better than HWRF/HMON
- Intensity has high bias at longer leads, probably lack of ocean coupling, needs more evaluation
- RI evaluation by 24 hr intensity change vs. obs.
- Laura evaluation: captured the peak but was a bit early
- Track skill good compared to other
- Some issue with long-range intensity
- RI skill well calibrated
- Laura had a right bias
- Delta initial RI/RW missed; asymmetric shear
- Planned Upgrades: multiple static nests, forecast on other basins, moving nest addition, improve res, ocean coupling is needed, model physics dev and eval, obs to eval upgrades

Action Item 5: Revisit ways to calculate Model 34kt radii wind speed in HAFS.

1:40 pm Results from HAFS v0.1J (Jili Dong)

- HAFS-J exp with ESG grid, increased layer to 75, not much difference for Dorian
- Original GFDL grid vs. ESG grid: larger domain and reduced the computing expenses
- NATL track and intensity forecast, track error improved compared to HWRF, HMON, GFS
- HAFS-J better performance for strong storms
- EPAC better than GFS but behind HWRF
- Seven day forecast comparison with GFS, HAFS-J performance better
- HAFS-LAM t&e with ESG grids
- NA: HAFS-J performed well in track before D2 but degraded; intensity comparable to GFS and HMON before D3

Morris: vertical levels improve the performance

Action item 6: Configuration for the next HAFS version

2:00 pm Results from HAFS v0.1E (Zhan Zhang)

- HAFS-E config based on HAFS-A with no ocean coupling
- Wall clock time for one run 5 hrs?
- 20 member ensemble, 4 times a day
- HAFS-E better performance than HWRF (slide 6)
- HAFS-E has larger RI POD with larger FAR as well
- Track-intensity clustering to find the cluster of the largest ensemble member
- HAFS-E more skill full than it's deterministic version
- Ensemble track speed is comparable with HWRF EPS

Q. What would be the recommendation for HAFS DA?

Q. HAFS model showed large positive bias in the 34kt wind radii? How do you address that? Physics might be the reason. Currently using diffusive.

Q. Is it running with multiple storms? It is basin centric not the storm.

2:20 pm Basin Scale HWRF-B (Gus Alaka)

- HWRF-B is the baseline for HAFS
- 884 forecasts for NATL and EPAC
- Delivered ATCF files to NHC
- Delivered 30M graphics!
- B-HWRF tested for potential implementation
- Large track errors HB20 at 72+ lead times
- Track errors were cut in half when 3+ storms were active
- Rainfall prediction for ETA was predicted 2 days in advance
- HWRF-B caught up with HWRF repository - not run in real time
- HWRF-B shows value for hi-res nests in the sam outer domain
- HWRF-B performance was degraded at higher lat
- Benefits of sel-cycled ensemble DA alone are unclear due to small sample sizes
- Rainfall predictions for Eta were excellent; priority to continue to develop rainfall products

Q. For northern boundary area, how can we compare with the global system?

Suggestion to look beyond 30 degrees north.

3:00 pm GFS CAM Physics (Georg Grell)

- Using larger part of RRFs physics, also Thompson microphysics
- GF Convective parameterization
- 300 hpa and 500 hpa temp error relative to GFS
- Thompson scheme has aerosols increase over time.

3:20 pm FHLO and HWRF CNN (Jonathan Vigh)

FHLO

- Forecasts of Hurricane using large-ensemble output (FHLO) running with 1000 member synthetic ensemble
- GEFS has bias at 64R
- Trying to develop a mean-state nudging term

CNN RI

- ML approaches to predicting intensity and RI
- Training data from HWRF runs in 2020
- ML models - CNN to predict discrete prob. Dist. of 24 hr change in intensity
- RI reliability verification (slide ?)
- Time difference fields provide performance improvement
- Discrete probability distribution enables RI prediction
- Tested with hailstorm too.

3:40 pm -5:00 pm : Special session on Operational Modeling Challenges in 2020 (eg. ensembles; DA; RI)

3:40 pm Overview of Modeling challenges

Issues identified by the forecasters (NHC/JTWC -Mike Brennan/Matt Kucas) (5 mins)

- Increasing accuracy and run-to-run consistency
- Improving model initialization and forecasts
- Poor genesis forecast
- Inconsistent depiction of RI
- Guidance on when HWRF intensity forecast is reliable

Issues identified by Modelers (EMC/HRD - Zhan Zhang/Gus Alaka) (5 mins)

- Run-to-run inconsistency
- Vmax has large temporal variation
- Deterministic forecast happened to be an outlier
- HWRF track errors is evenly distributed spatially

- The spatial distribution of intensity has large errors
- HWRF errors were comparable for invests
- HWRF RI events under predictions

3:50 pm Panel Presentation (Panelist: Jim Doyle, Julian Heming, Linus Magnusson, Vijay Tallapragada)

Recent Progress and Challenges in Tropical Cyclone Intensity Prediction Using COAMPS-TC (Jim Doyle)

- CTCX has good track performance in 2020
- COAMPS-TC RI performance has good improvements
- COAMPS-TC much improved track and intensity in 19-20
- Gaps: need obs during RI onset; improved DA; uncertainties in PBL and microphysics; more emphasis on hi-res ensembles

Met Office Perspectives on 2020 Atlantic Hurricane Season (Julian Heming)

- Track errors good at sort lead times but large at longer lead times
- ETA ensembles issues at Met office, some runs completely missed
- Genesis (Hanna) missed event, little indication
- Cyclogenesis (Paulette) good forecast 7 days ahead
- RI for Laura was well captured
- RI for Delta not captured
- Second peak in Delta was well handled
- Moving towards atmos-ocean coupled MOGM - planned 2021

ECMWF Progress in Tropical Cyclone Forecasts (Linus Magnusson)

- Last year more difficult; persistent slow propagation bias; intensity steadily improves
- Genesis probabilities were picked up by fraction of ensemble within 300 km for Paulette
- Improved wind-pressure relationships
- Propagation speed still an issue
- TC Laura challenging
- Increased vertical resolution for ensemble planned for 2021

Global Modeling Challenges for Tropical Cyclones (Vijay Tallapragada)

- GFSv16: identifies TC threats at longer lead times; improved TC intensity forecasts in NA; improved QPF associated with TCs making landfall; Concerns: increased right of track bias at longer lead times in NA; TCs moving to N typically move faster; strengthen all TCs that develop in both basins
 - MEG has done 2 evaluations
- Windshield and trombone effect!!
- GEFSv12: increased spread in TC tracks; captures threats from TCs at longer lead times; improved location of QPF maximum
- No operational implementation until FY24??
-

4:30 pm Panel/Audience Q&A.

J and L: Issues on cyclogenesis

FM: What are you looking at that might bring a change in future

JH: wind-pressure relationship, convection, new model development ongoing in Metoffice with new dynamic core, 4-5 yrs down the line.

LM: Frozen global model in 2022, is Covid effecting?

VT: not noticeable impact, satellite data for DA

JD: global model impacted due to aircraft data, cyclogenesis is a very difficult, clouds and microphysics interaction with radiation, how genesis occurs, ice microphysics does have an impact, increasing vertical res. Next year, national multimodel ensemble for future.

FM: What to focus on in future?

- multi-model ensemble, cycle to cycle run: HAFS will be an ensemble model
- Coupled systems in the tropics and extratropics
- Collection of storms from forecasters to developers for study
- Make better use of data
- Aerosol impacts in physics is still not ready
- Coastal regions and land impacts
- Pregenesis initialization
- More data.

5:00 pm Adjourn