Evaluation of GfsFV$^3$ on Hurricane Prediction

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Evaluation of 2 versions of GfsFV³ run on the Jet Computer facility by GFDL group (*near real time*):

- **Global version**: 13 km Horizontal Resolution
- **Second version**: 3 km nest over Atlantic, two-way interaction with Global model
- **63 Vertical Levels**
- **Global model**: Older version of SAS and PBL
- **Nested model**: Scale-Aware SAS
- **GFDL 6-class Micro-Physics replacing Zhao-Carr**
- Both versions start from GFS initial fields (*cold start*)
- Evaluate Performance for 2017 seasons for Atlantic, East and West Pacific Basins and compare with operational guidance (*i.e.* GFS, HWRF, ECMWF, UKMET)
- Comparison with other GFS based guidance (*e.g.*, HRD Basin-Scale HWRF)
C768L63 (13-km) for all basins
Comparison with Operational Models

Intensity skill was as good as HWRF for Retrospective runs
Comparison of Performance of GFDL GfsFV³ with operational GFS, HWRF and ECMWF
2017 WPAC, EPAC, and ATLANTIC SEASONS

NUMBER OF CASES: (386, 345, 297, 260, 197, 147, 115)

- NWS GLOBAL GFS
- GFDL GLOBAL FV3
- HWRF
- ECMWF
7% reduced 6-7 day track errors for GfsFv^3 compared to current operational GFS.

ECMWF significantly better in 6-7 day lead times (9% GfsFV^3; 16% GFS)
2017 Atlantic Season

Comparison of GfsFV$^3$ with GFS Based Guidance

Comparison with other Global Model Guidance

2017 ATLANTIC SEASON
NUMBER OF CASES: (141, 134, 126, 112, 90, 78, 70)

2017 ATLANTIC SEASON
NUMBER OF CASES: (105, 95, 83, 75, 60, 49, 44)
Summary of Intensity Guidance

Intensity Errors (Knots)  Intensity Bias (Knots)

HRWF Intensity Guidance Far More Superior !!
GFDL GfsFV3 Has Reduced Intensity Errors & Bias Compared to operational GFS. BS HWRF had consistent positive bias
Summary
Hurricane Harvey Performance
Hurricane Harvey Track Errors

Comparison of GfsFV$^3$ with GFS Based Guidance

Comparison with other Global Model Guidance
Summary
Hurricane Irma Performance
Hurricane Irma Track Errors

Comparison of GfsFV³ with GFS Based Guidance

Comparison with other Global Model Guidance
Comparison of Track Guidance
Hurricane Irma

September 6th, 12z

September 7th, 12z
September 6th, 12z
SUMMARY

- GfsFV\(^3\) had modest improvements in track guidance compared to operational GFS particularly in longer day lead times (~8%).
- ECMWF track errors were superior in the Atlantic to any guidance. GfsFV\(^3\) had smallest track errors in WPAC.
- The HRD BS HWRF performed better then operational HWRF for track, particularly for Harvey.
- ECMWF and GfsFV\(^3\) track errors were comparable for Hurricane Harvey. ECMWF track errors are much smaller for Hurricane Irma than any other guidance.
- Operational HRWF Intensity Guidance was much superior compared to either version of GfsFV3 or HRD BS-HWRF with very little intensity bias.