Performance of the HWRF Analog Ensemble during the HFIP 2018 Real-Time Demonstration

William E. Lewis[*], Christopher Rozoff[†], Stefano Alessandrini[†], Luca delle Monache[††]

[*]Space Science and Engineering Center / University of Wisconsin-Madison
[†]Research Applications Laboratory / National Center for Atmospheric Research
[††] CW3E/ Scripps Institute of Oceanography

Thanks to Ryan Torn for providing the HWMN e-deck files.

The HWRF AnEn Rapid Intensification Model

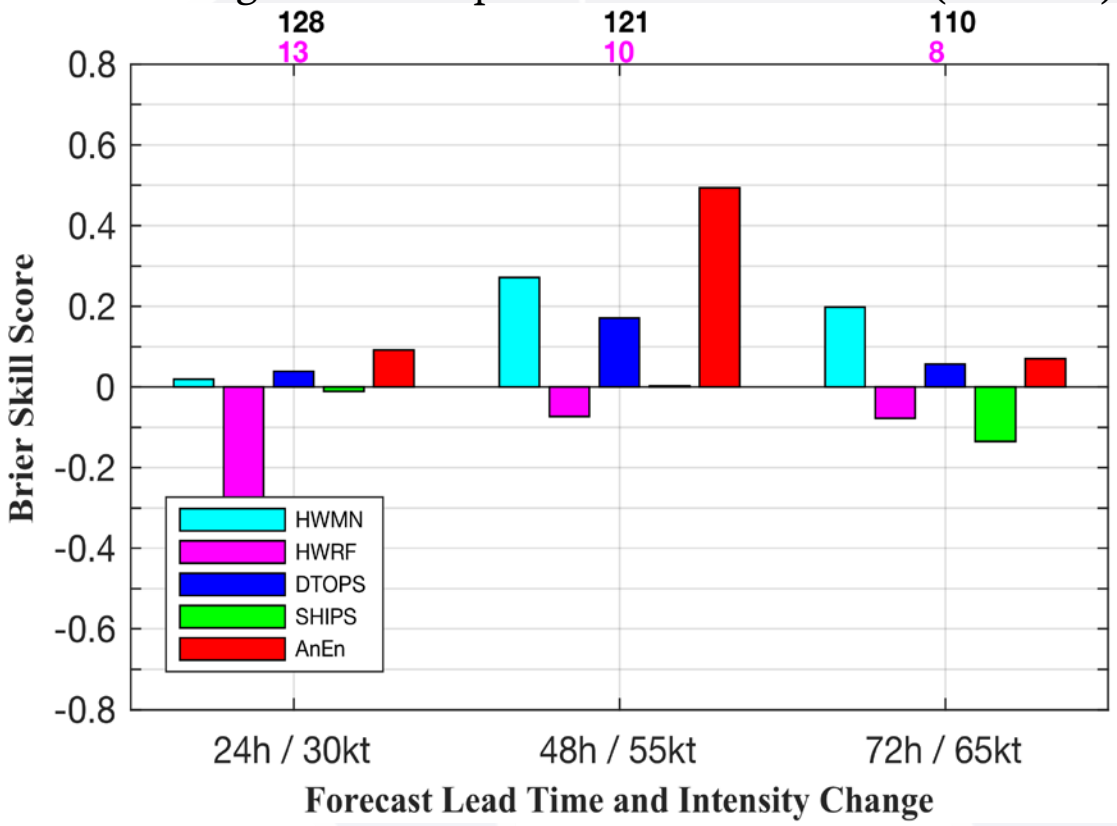
Developed with **H218** (1146 and 1372 reforecasts from the HWRF pre-implementation test for the Atlantic and Eastern Pacific, respectively)

H218 Analog Ensemble RI model Optimal Predictors

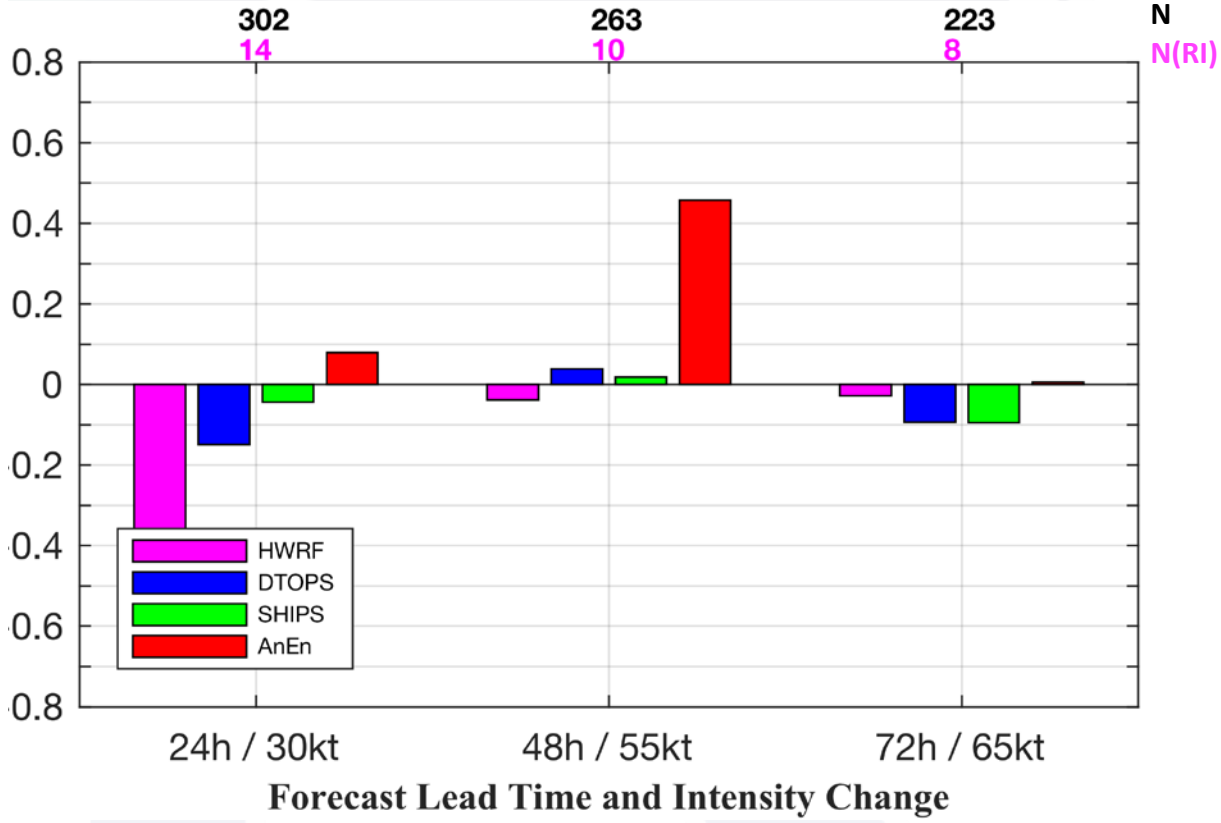
	Atlantic	Eastern Pacific
0-24 hr	Δv_{max} (HWRF), 500-250 hPa *relative humidity*, Inner core *sensible HFLX* (r = 0 – 50km), 850 – 200 hPa *vertical shear* magnitude	Δv_{max} (HWRF), Inner core *sensible HFLX* (r = 0 – 50km), 500-250 hPa *relative humidity*, 850 – 200 hPa *vertical shear* magnitude
0-48 hr	Δv_{max} (HWRF), MPI, *Inertial stability* (r = 0 – 100 km), 500-250 hPa *relative humidity*	Δv_{max} (HWRF), MPI, 850 – 200 hPa *vertical shear* magnitude
0-72 hr	Δv_{max} (HWRF), *Inertial Stability / Vertical Motion* Coupling Symmetry (r = 100 – 250 km)	Δv_{max} (HWRF), MPI, Inner core average *vertical motion* (r = 0 – 50 km), *Inertial stability* (r = 0 – 100 km), HWRF V_{max} (t=0)

Atlantic Basin Skill Assessment (27 JUL – 31 OCT)

Homogeneous Sample w/ HWRF ensemble (HWMN)

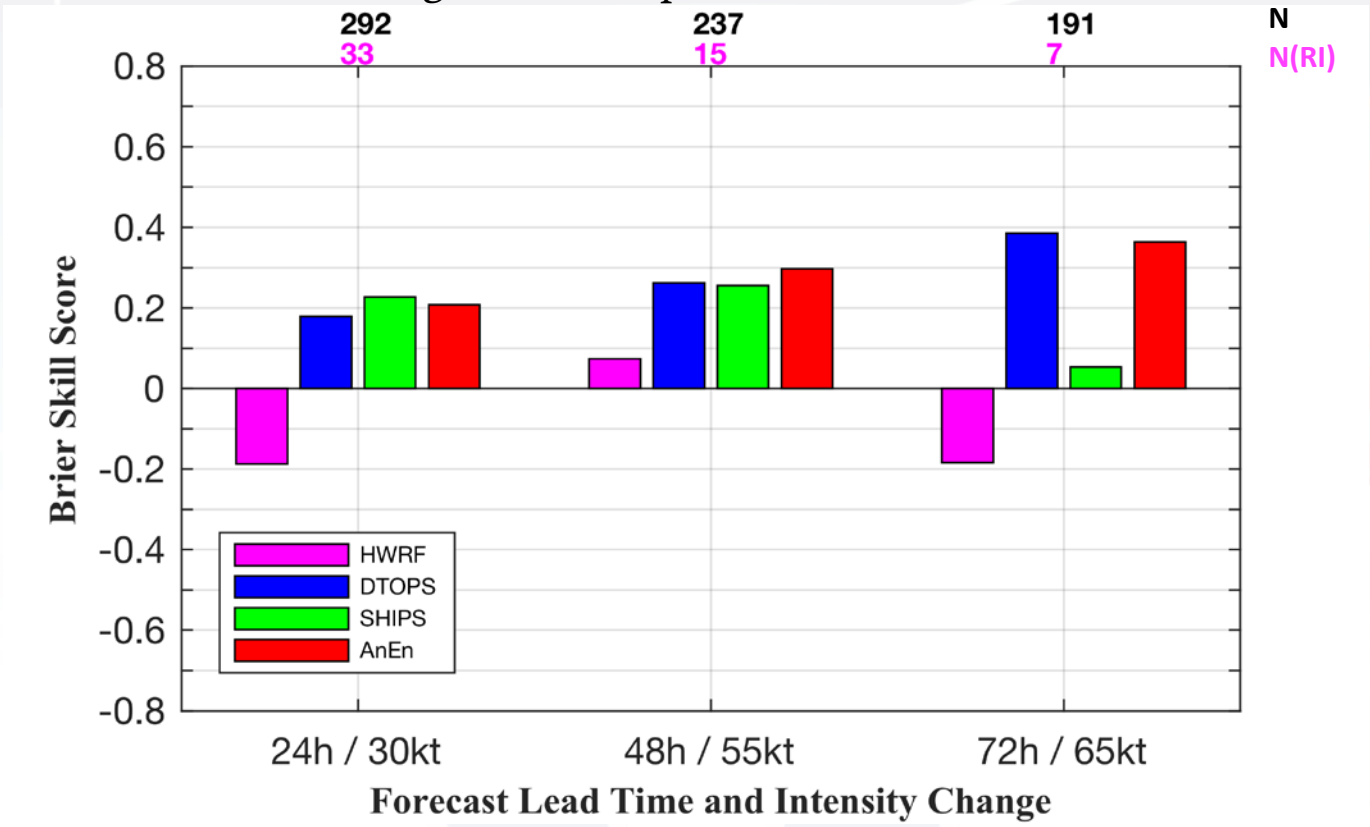


Homogeneous Sample w/o HWRF ensemble

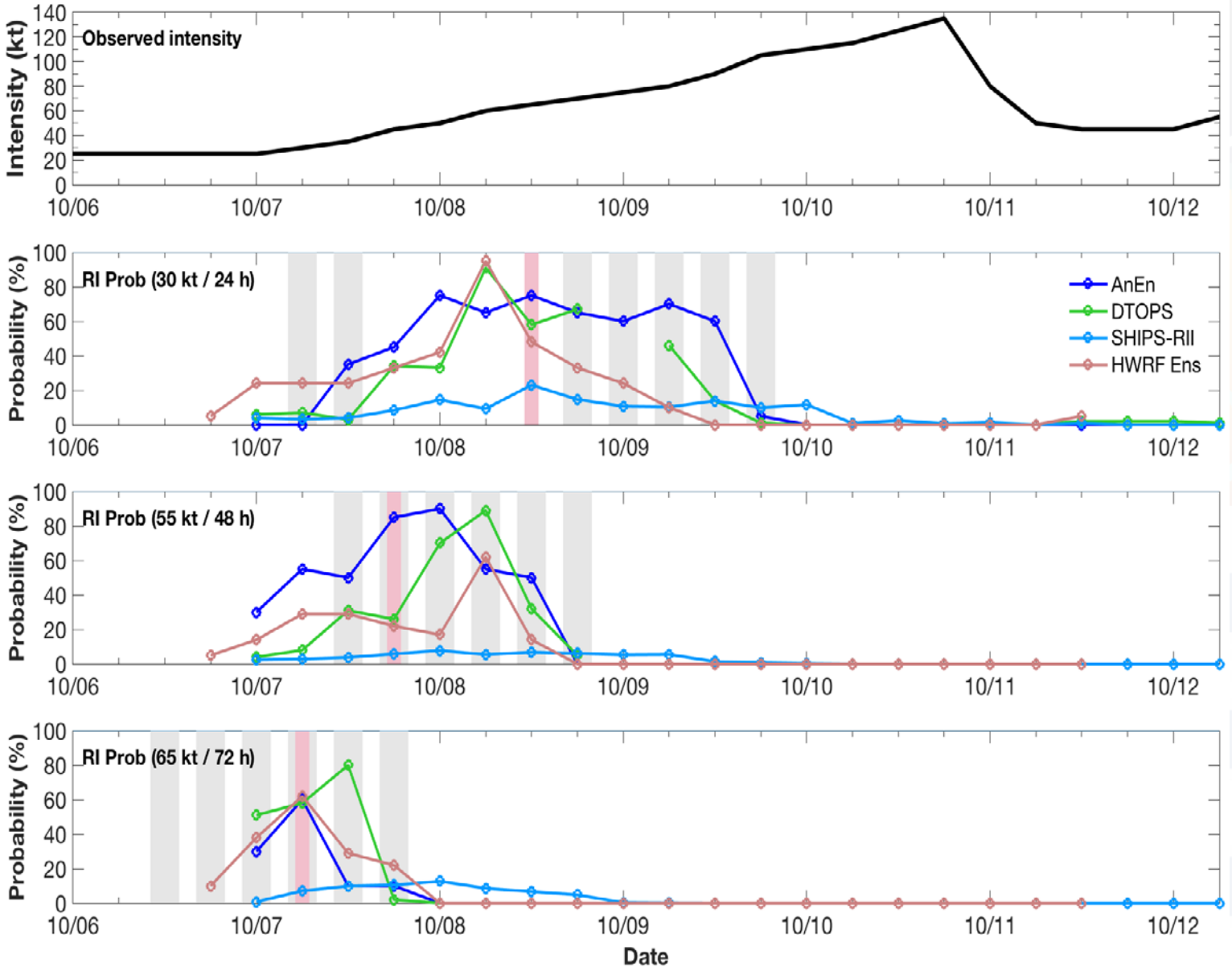


Eastern Pacific Basin Skill Assessment (27 JUL – 31 OCT)

Homogeneous Sample w/o HWRF ensemble



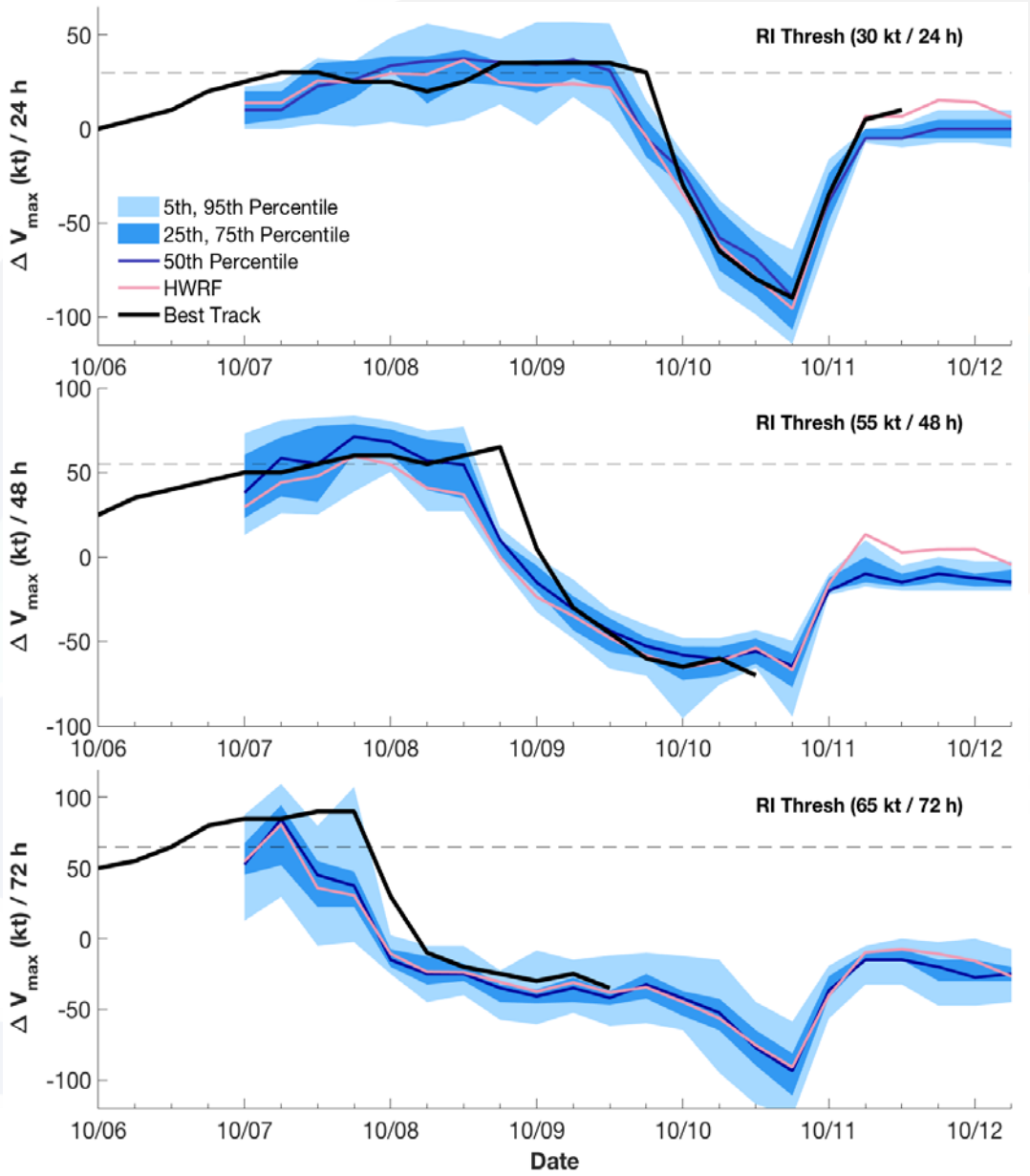
Hurricane Michael (6 OCT – 12 OCT)



DTOPS, **AnEn** and the **HWRF ensemble** forecast significant probabilities of RI during the 90-h period preceding Michael's landfall.

KEY:
SHADING = RI OBSERVED
SHADING = HWRF FORECAST RI

Hurricane Michael (6 OCT – 12 OCT)



The **AnEn** envelope of uncertainty captures the 24- and 48-h $\Delta \mathbf{V_{max}}$ and RI thresholds quite well.

The period from 6Z 7 OCT thru 18Z 9 OCT, a 60-h period containing 7 (nearly 11) 24-h RI events, is remarkable.

2018 HWRF AnEn RI Performance Summary

- The HWRF AnEn demonstrates skill relative to the climatological baseline at all lead times in the AL and EP.
- Improves upon the skill of the parent HWRF model at all lead times, thereby increasing benefit/cost for a single deterministic run (the computational cost of running AnEn is very low: ~ 10 min on a single Jet node).
- Methods to incorporate multiple HWRF model versions (and potentially multiple models) into the AnEn training set are currently being developed.