

2018 Ensemble Tiger Team Highlights

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(4) SSEC/University of Wisconsin

(5) CIRA

Purpose & Objectives

- **Charge:** Develop new ensemble-based products beyond the typical mean/standard deviation that could be used by NHC forecasters to improve forecasts
- First product was ensemble-based RI probabilities, which are compare to current statistical methods (SHIPS, DTOPS)
- Subsequently expanded to ensemble-based sensitivity for determining optimal supplemental observations

Major Milestones

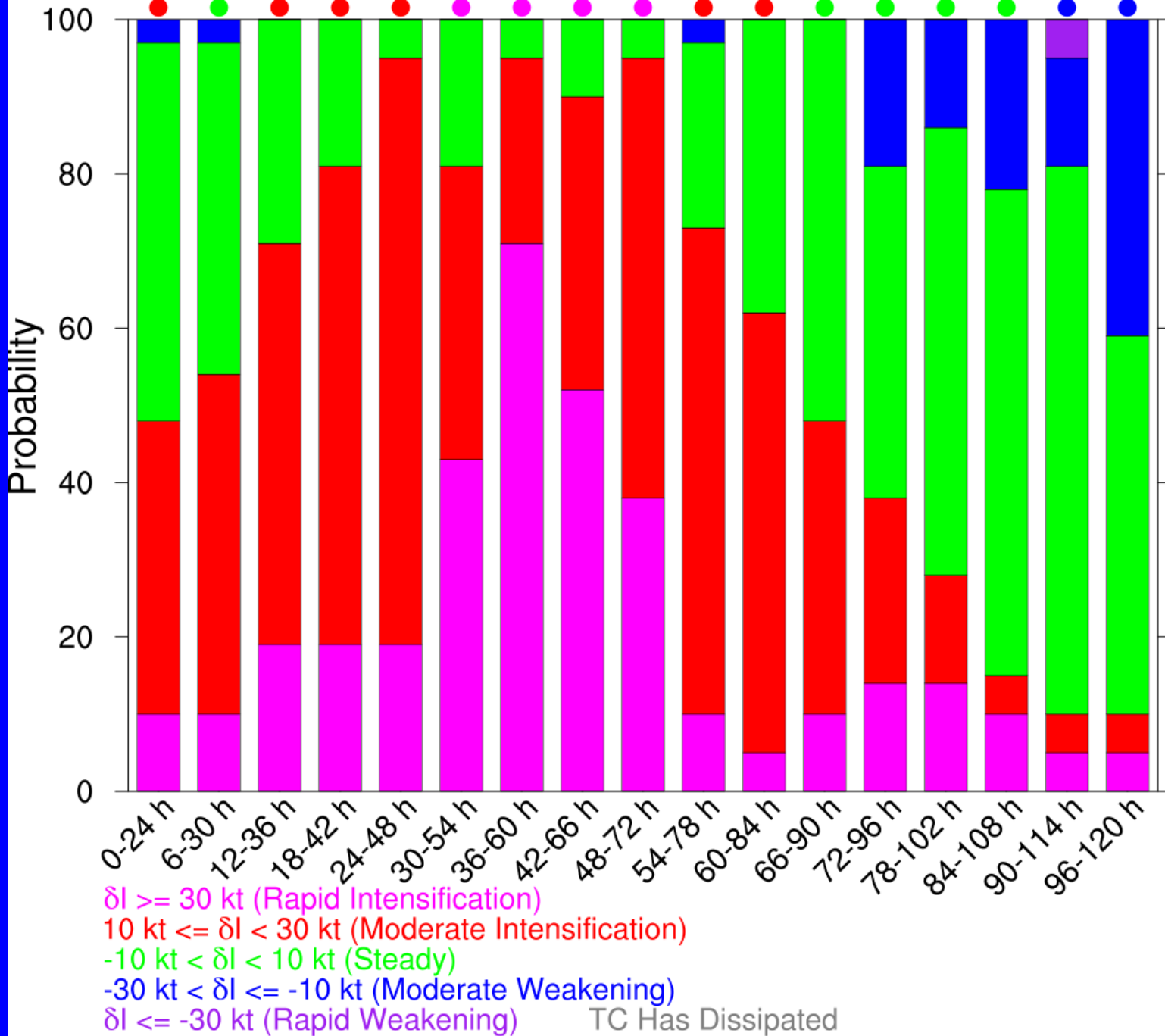
- Continued participation in the real-time intensity change probability product
- Multi-model products (HWRF+HMON)
- Integration of products into HFIP site
- Moskaitis-style intensity change probability added to HWRF & HMON ensembles
- Use of ECMWF ensemble guidance for aircraft flight plans and extra sondes
- Use of HWRF ensemble guidance for aircraft flight plans

Configuration

Model	Type	Real-Time Offset
HWRF (HWMN)	Dynamical (IC + Physics)	12 h
HMON (HMMN)	Dynamical (IC + Physics)	12 h
HWRF Analog (HWAN)	Statistical model applied to retrospective HWRF	6 h
DTOP (DTOP)	Statistical combination of dynamical forecasts	0 h
SHIPS (RIOD)	Statistical	0 h

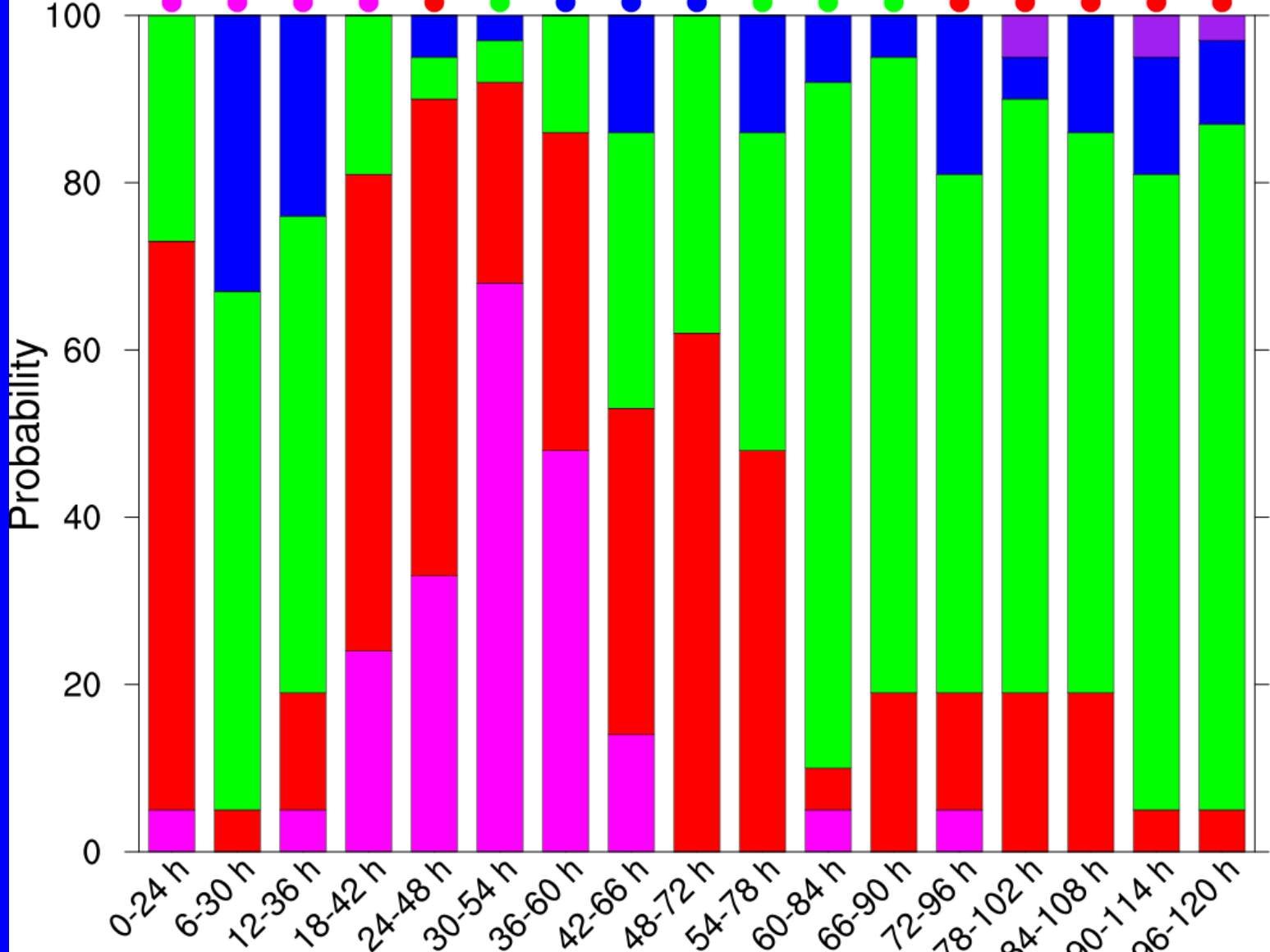
- Probabilities derived for first three models via counting number of members where intensity change criteria is satisfied

HWMN 2018090800 florence (06L)



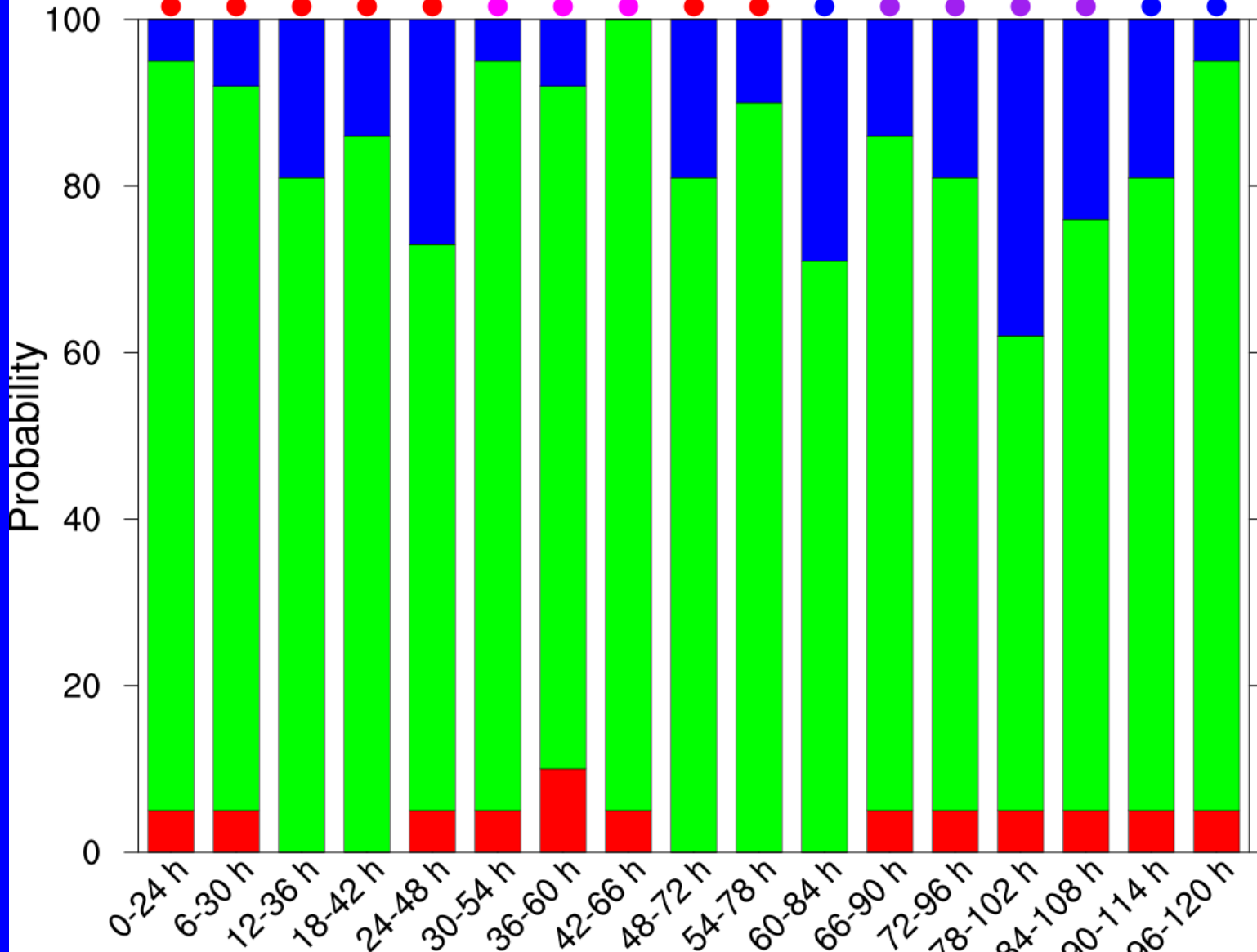
- $\delta I \geq 30$ kt (Rapid Intensification)
- $10 \text{ kt} \leq \delta I < 30 \text{ kt}$ (Moderate Intensification)
- $-10 \text{ kt} < \delta I < 10 \text{ kt}$ (Steady)
- $-30 \text{ kt} < \delta I \leq -10 \text{ kt}$ (Moderate Weakening)
- $\delta I \leq -30 \text{ kt}$ (Rapid Weakening)
- TC Has Dissipated

HWMN 2018081700 lane (14E)



- $\delta I \geq 30$ kt (Rapid Intensification)
- $10 \text{ kt} \leq \delta I < 30$ kt (Moderate Intensification)
- $-10 \text{ kt} < \delta I < 10$ kt (Steady)
- $-30 \text{ kt} < \delta I \leq -10$ kt (Moderate Weakening)
- $\delta I \leq -30$ kt (Rapid Weakening)
- TC Has Dissipated

HWMN 2018090300 florence (06L)



$\delta I \geq 30$ kt (Rapid Intensification)

$10 \text{ kt} \leq \delta I < 30 \text{ kt}$ (Moderate Intensification)

$-10 \text{ kt} < \delta I < 10 \text{ kt}$ (Steady)

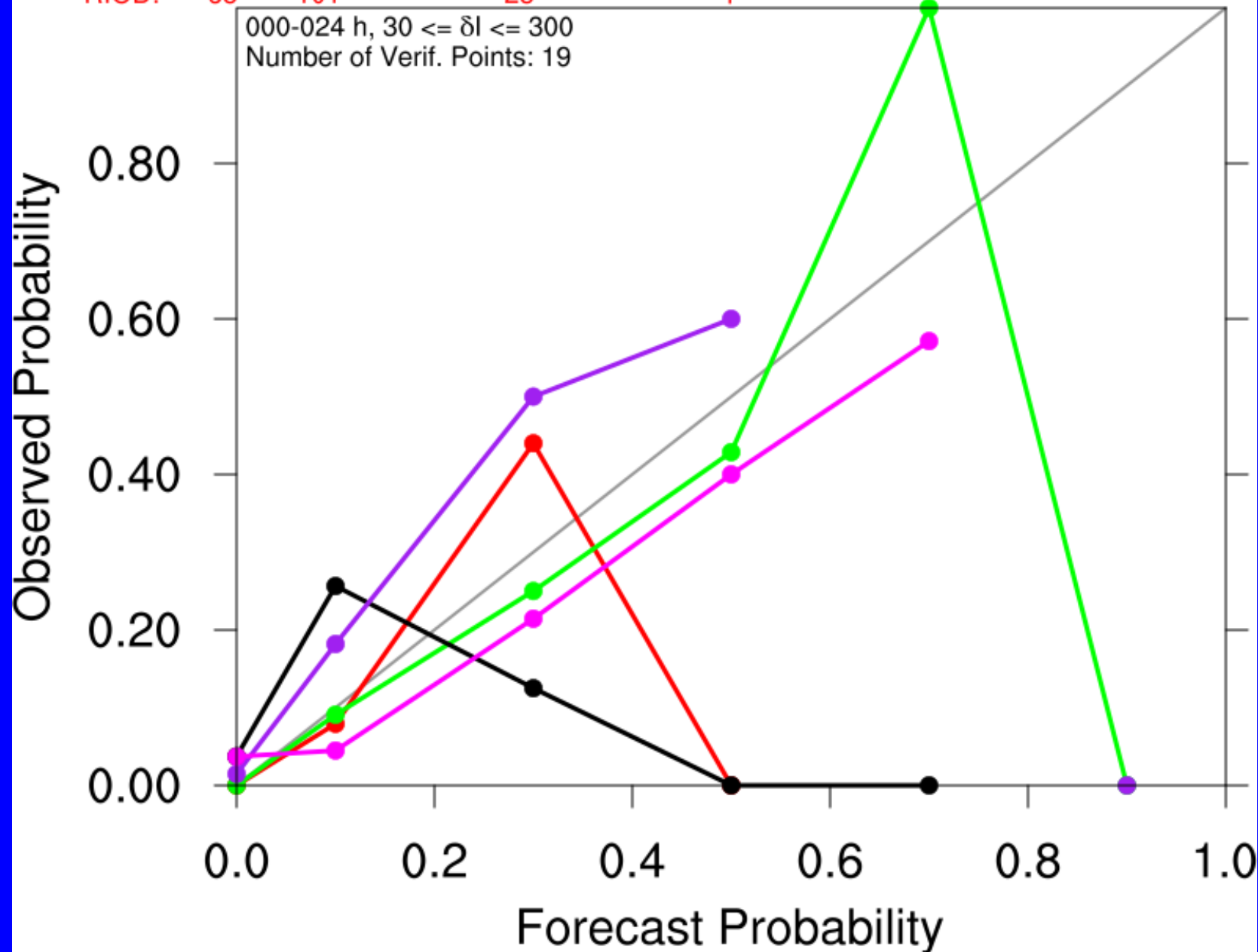
$-30 \text{ kt} < \delta I \leq -10 \text{ kt}$ (Moderate Weakening)

$\delta I \leq -30 \text{ kt}$ (Rapid Weakening)

TC Has Dissipated

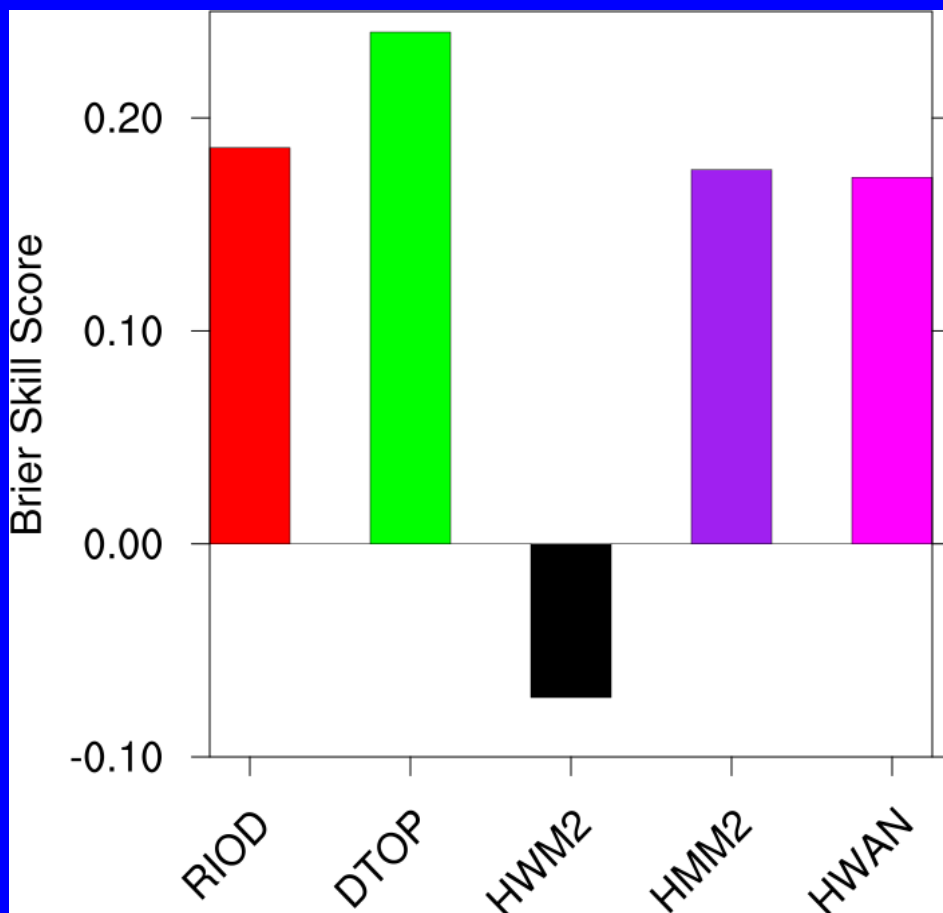
HWAN:	108	67	28	5	7	1
HMM2:	136	33	10	5	5	1
HWM2:	161	39	8	2	1	1
DTOP:	82	88	8	7	5	2
RIOD:	68	101	25	1	1	1

000-024 h, 30 <= δl <= 300
 Number of Verif. Points: 19

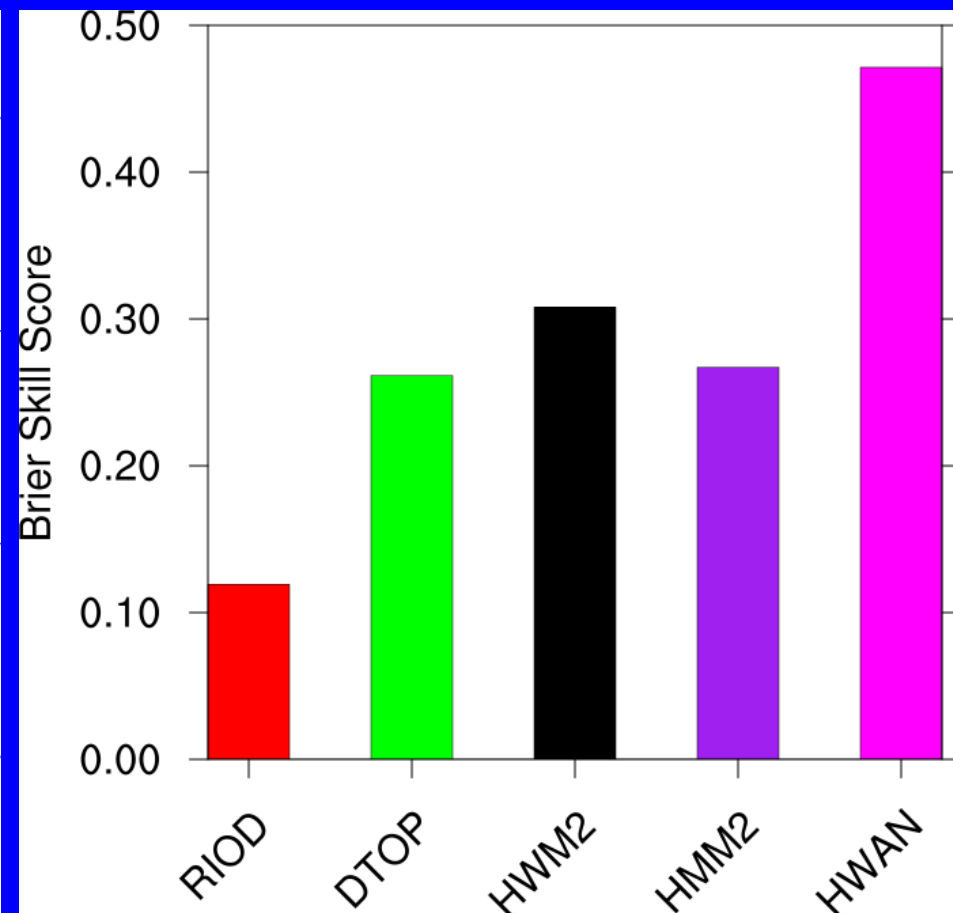


Brier Skill Score

0-24 h 30 knots

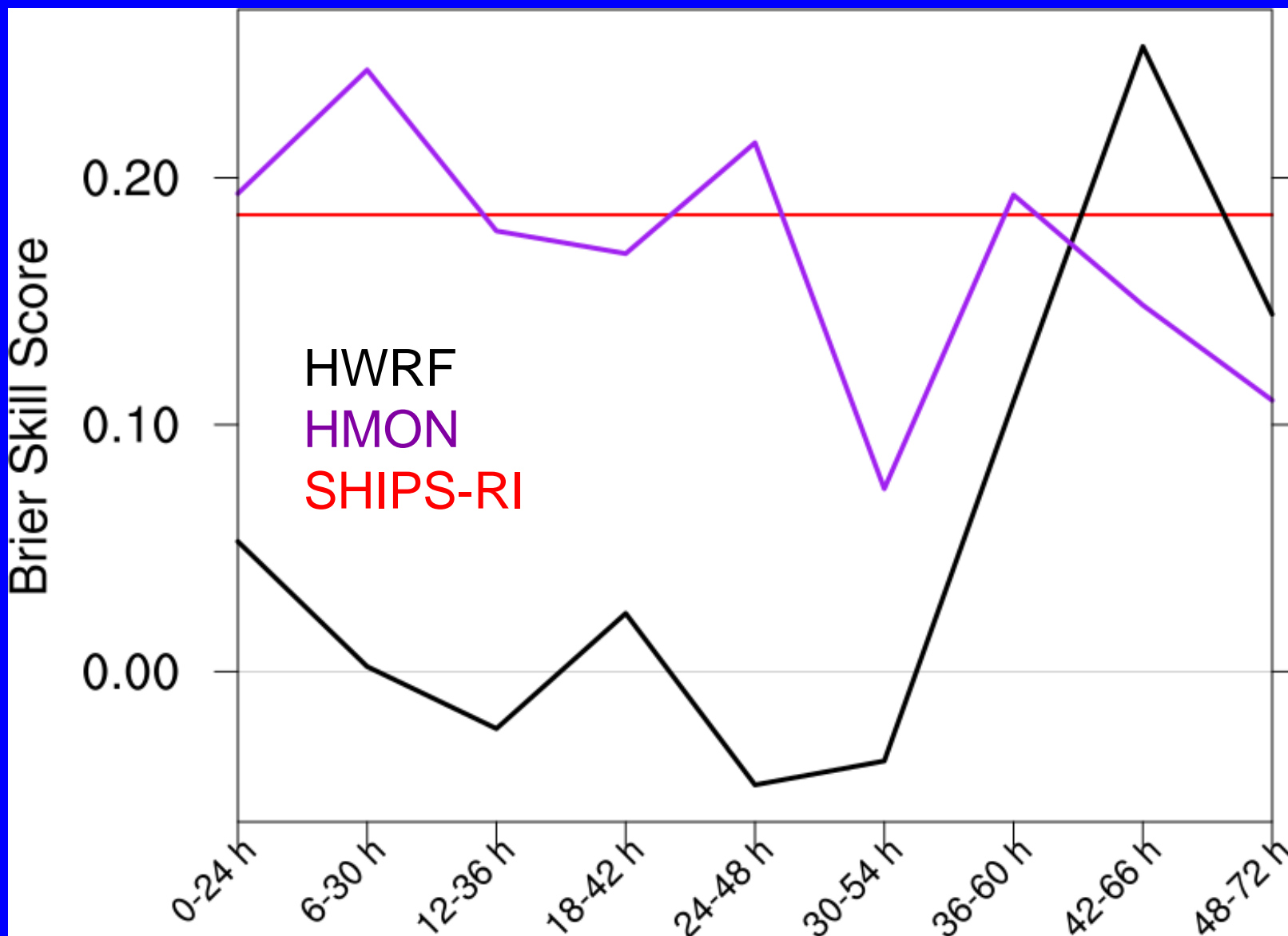


0-48 h 55 knots



AL + EP Combined, Homogeneous Comparison

Brier Skill Scores



Multi-Model Probabilities

- Can create multi-model probabilities by combining members of multiple ensembles into one large ensemble (i.e., HWRF and HMON ensembles)
- Bias toward HWRF since it has 21 members (11 for HMON)

HWHM: 314
HMMN: 400
HWMN: 362

171
78
110

31
25
29

6
8
15

2
7
5

6
3

000-072 h, 30 <= δl <= 300
Number of Verif. Points: 44

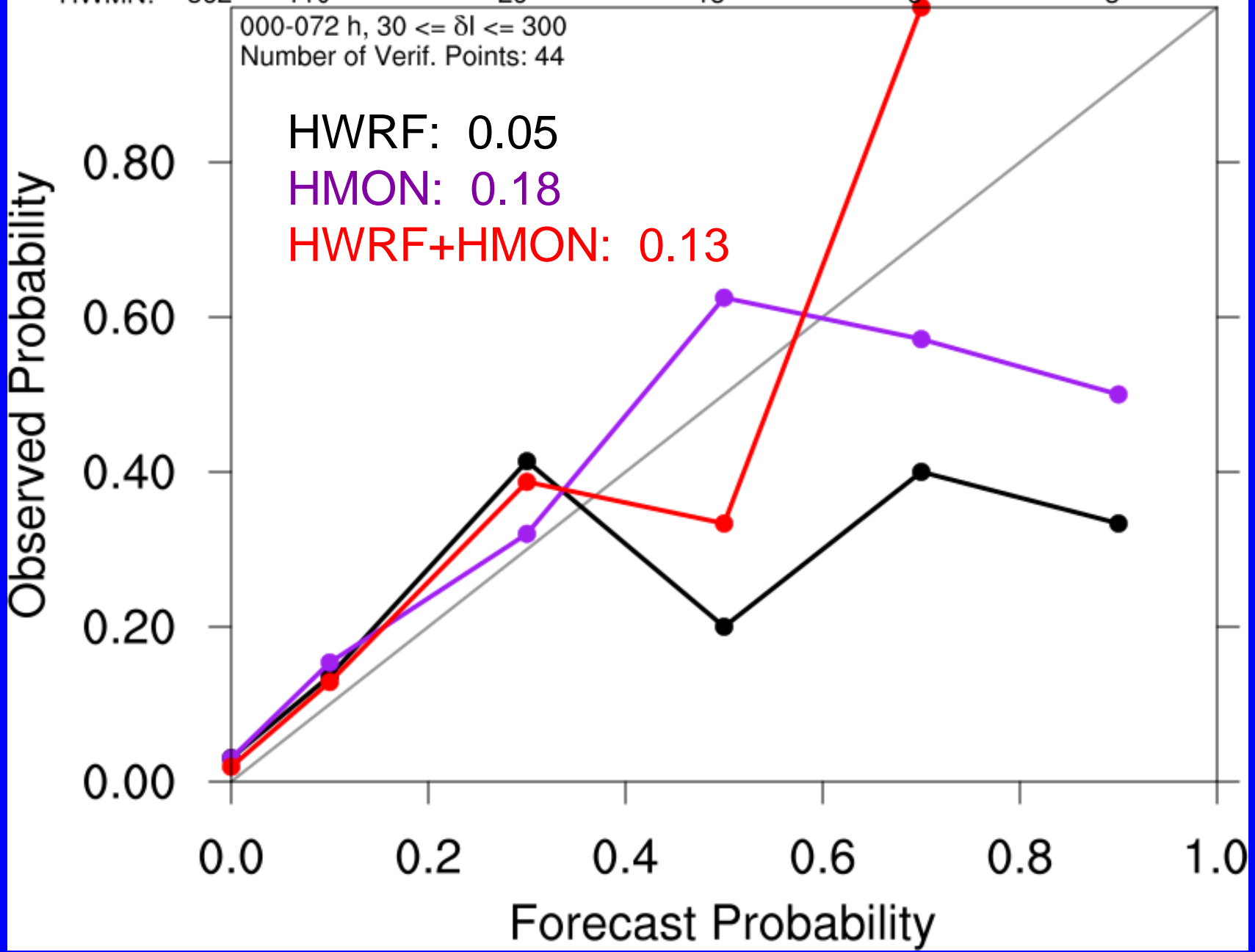
Observed Probability

HWRP: 0.05
HMON: 0.18
HWRP+HMON: 0.13

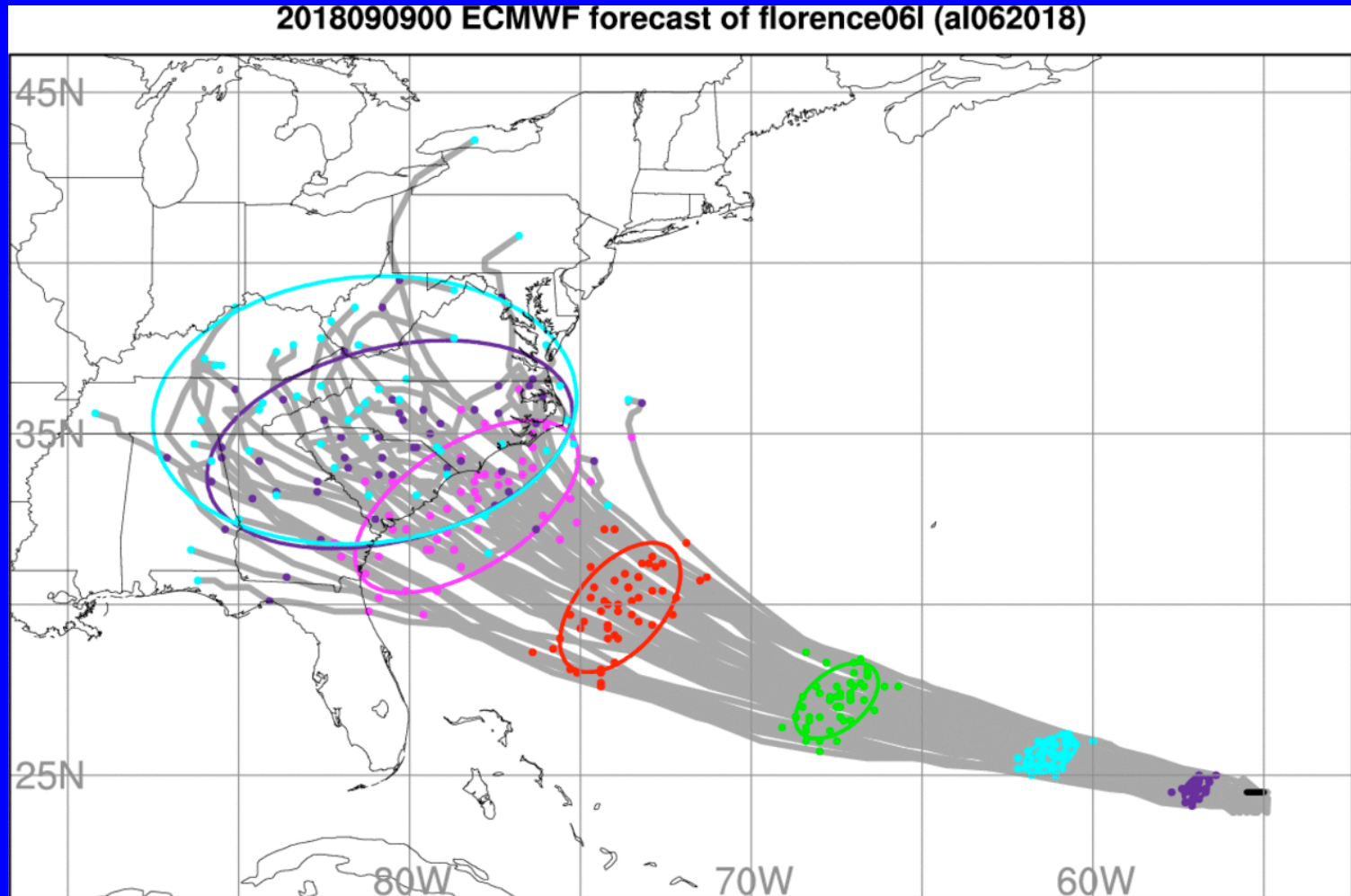
0.80
0.60
0.40
0.20
0.00

0.0 0.2 0.4 0.6 0.8 1.0

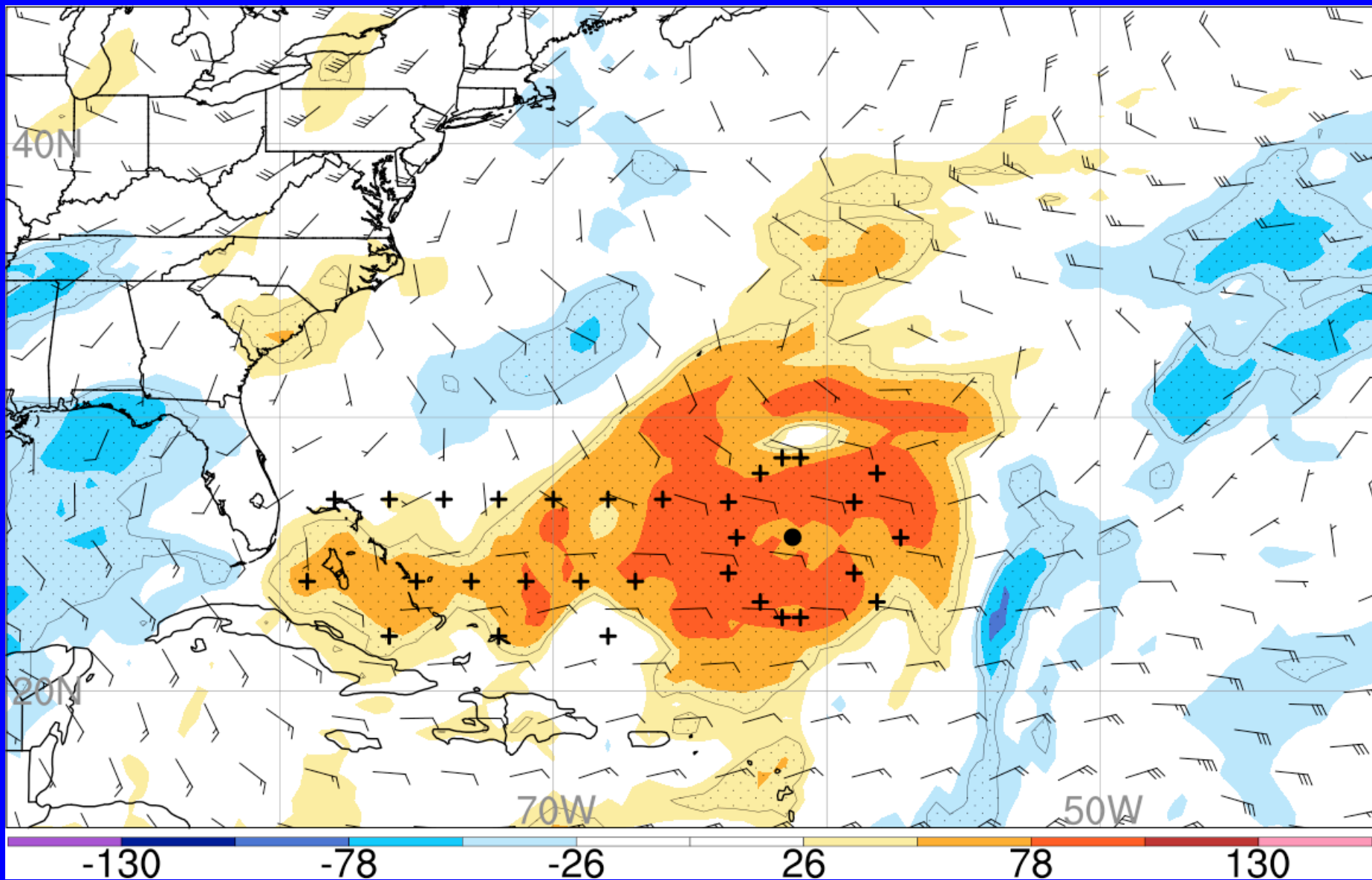
Forecast Probability



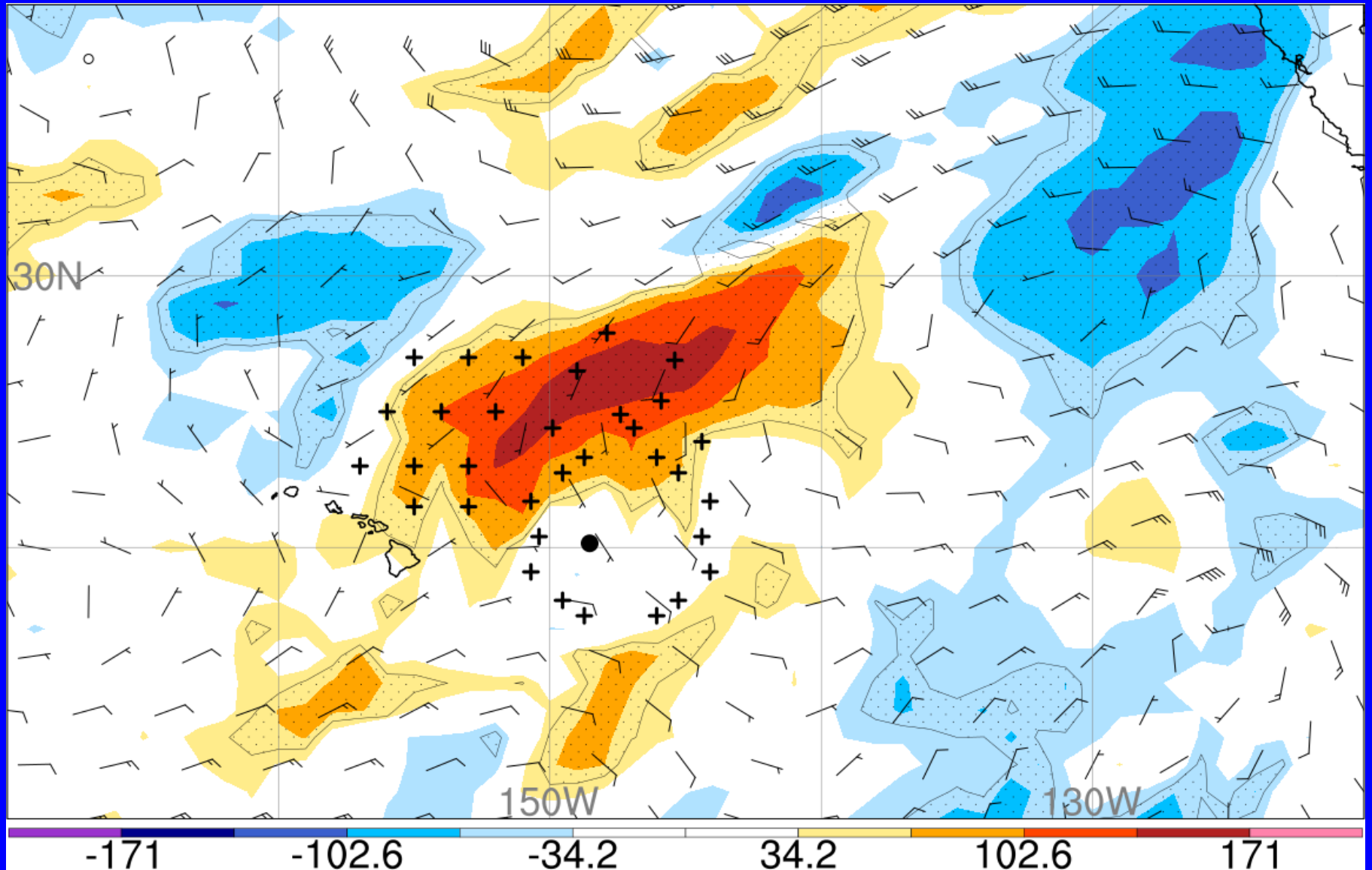
- On-demand ensemble-based track sensitivity for AL (Florence, Michael) and EP (Hector, Lane, Norman, Olivia)



00 UTC 11 Sept. Florence



00 UTC 6 Sept. Norman



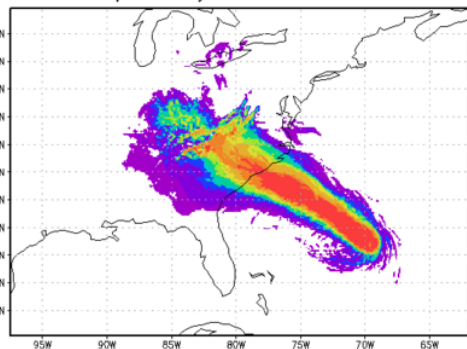
Summary

- HMON and HWRF analog provided skillful RI probabilities, not as much for HWRF ensemble
 - HWRF ensemble mis-timed RI on several occasions
- Combining probabilities from multiple models shows little additional value
- Real-time track sensitivities used by NHC for multiple cases in both basins. Will continue in future seasons

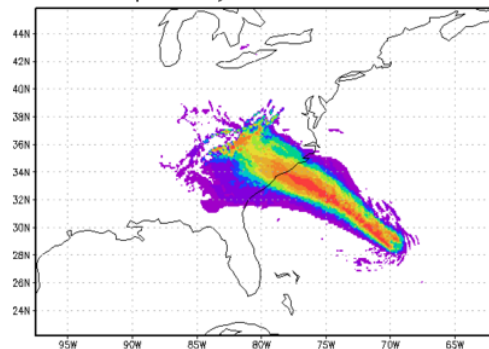
Future Plans/Priorities

- Further evaluation of multi-model probabilities (i.e., statistical & dynamical guidance)
- Generate and validate ensemble-based hazard probabilities (wind, rain)
- Expanded use of ensemble-based methods for observation targeting information
- Further use of ensembles for model diagnostics in individual cases

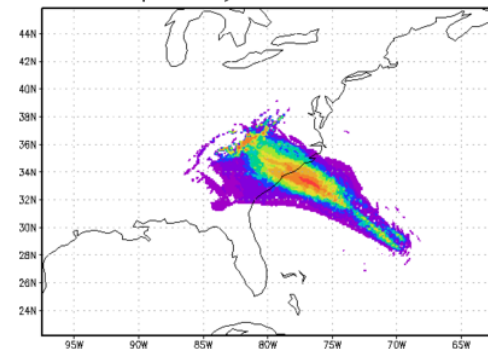
2018091206-06I
probability of arain > 5cm



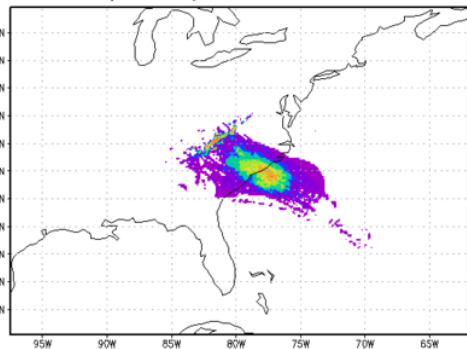
Rain_prob
2018091206-06I
probability of arain > 11cm



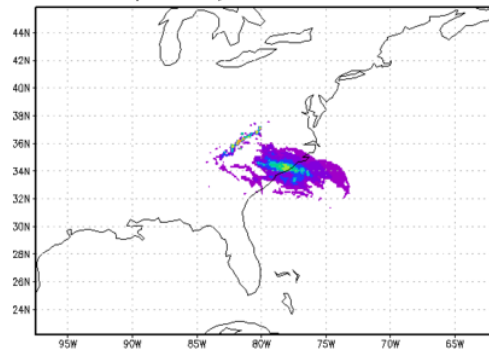
2018091206-06I
probability of arain > 15cm



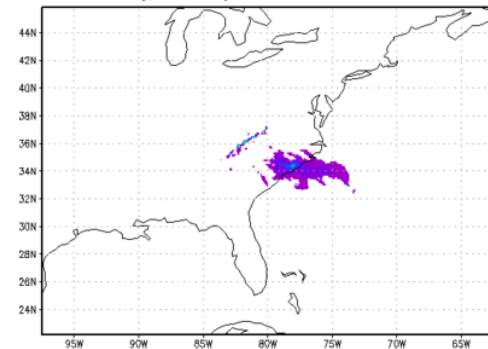
2018091206-06I
probability of arain > 25cm



2018091206-06I
probability of arain > 38cm

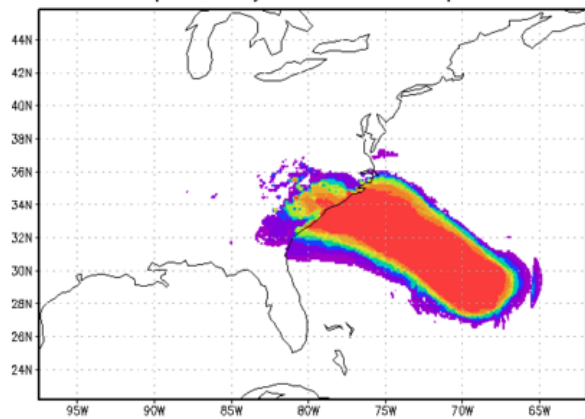


2018091206-06I
probability of arain > 51cm



Wind_prob

2018091206-06I
probability of wind > 17mps



2018091206-06I
probability of wind > 26mps

