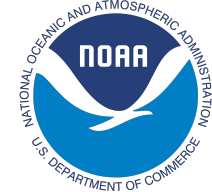




Overview of Regional Modeling Challenges

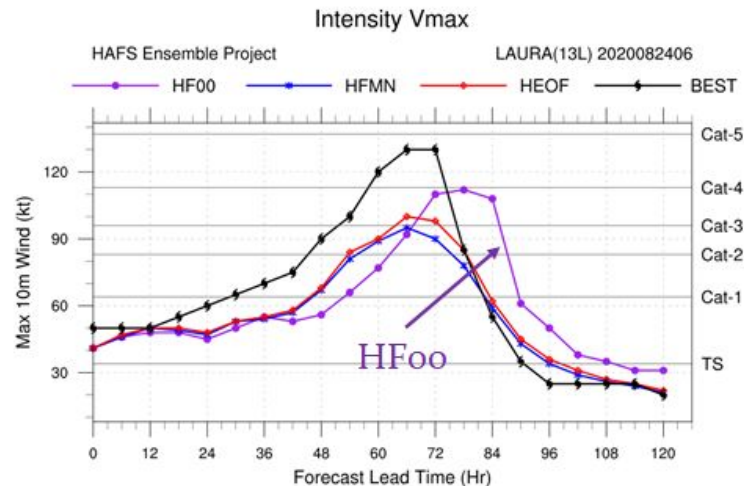
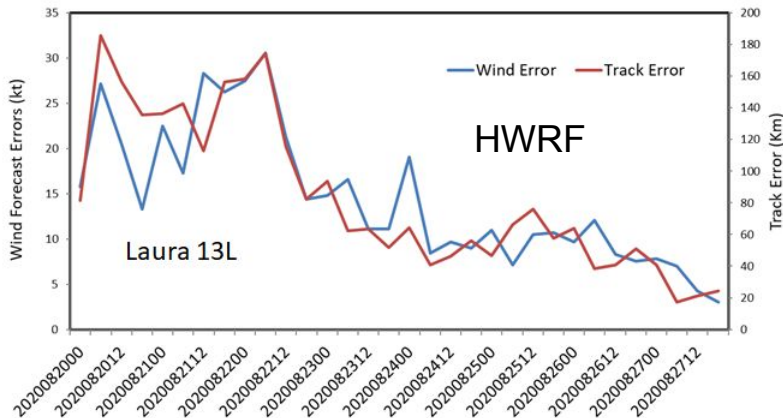
Issues Identified by Modelers

Zhan Zhang & Ghassan J. Alaka, Jr.
2020 HFIP Annual Meeting
18 November 2020

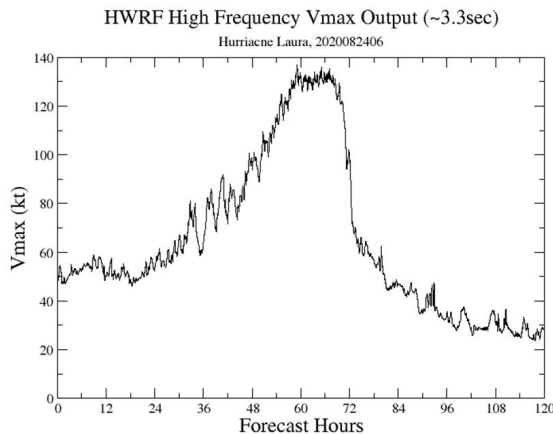


Track/Intensity Cycle-to-Cycle Variability

Cycle-to-cycle variations of track/intensity forecast errors



high-frequency temporal fluctuations in Vmax

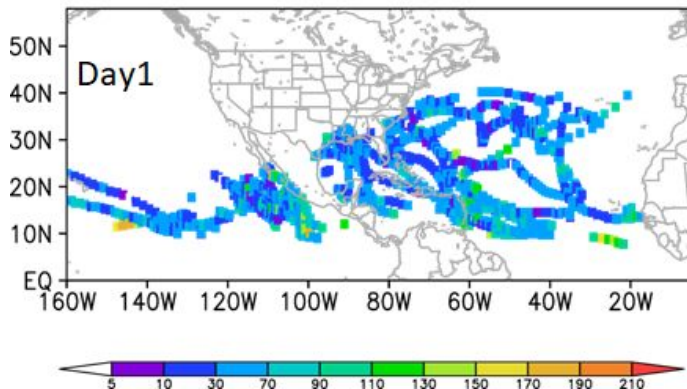


Deterministic forecast happened to be an outlier.
EPS may help to reduce cycle-to-cycle variability

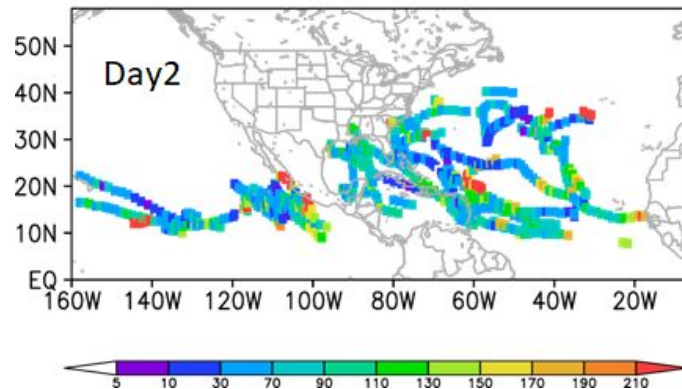


Spatial Distribution of HWRF Track Forecast Errors

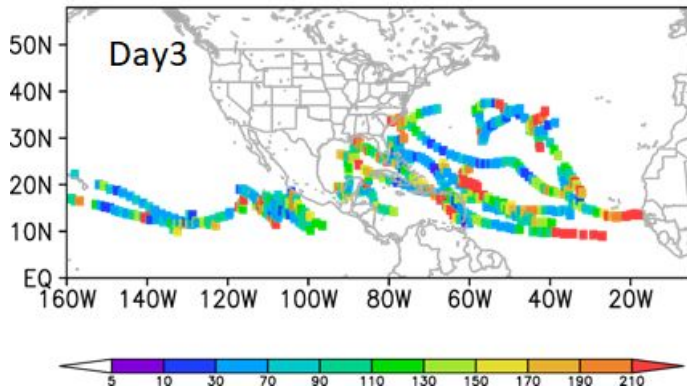
H221 24-h track error distribution
for 2018–2020 Atlantic & East Pacific



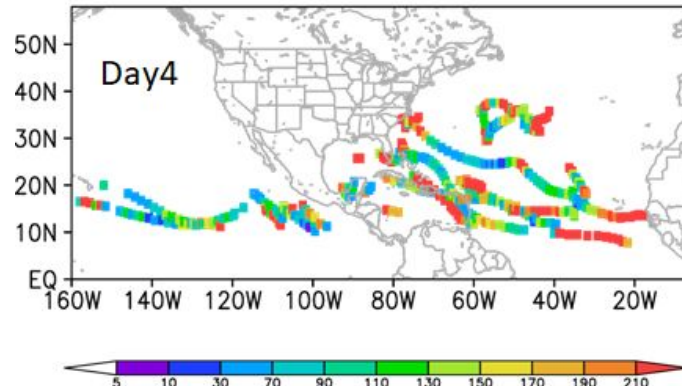
H221 48-h track error distribution
for 2018–2020 Atlantic & East Pacific



H221 72-h track error distribution
for 2018–2020 Atlantic & East Pacific



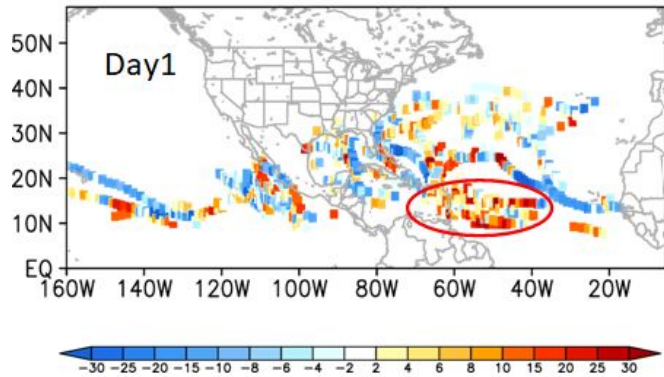
H221 96-h track error distribution
for 2018–2020 Atlantic & East Pacific



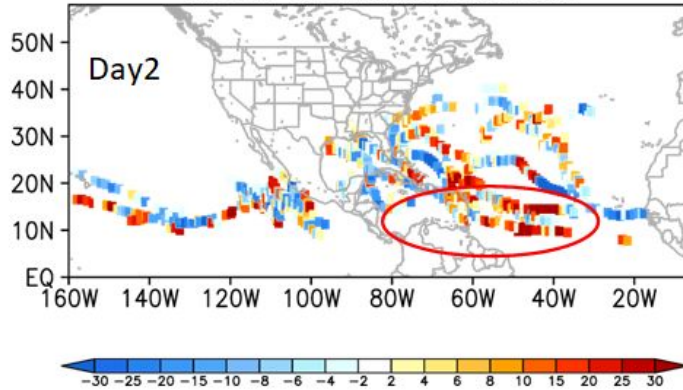
Plotted by Lin Zhu

Spatial Distribution of HWRF Vmax Forecast Errors

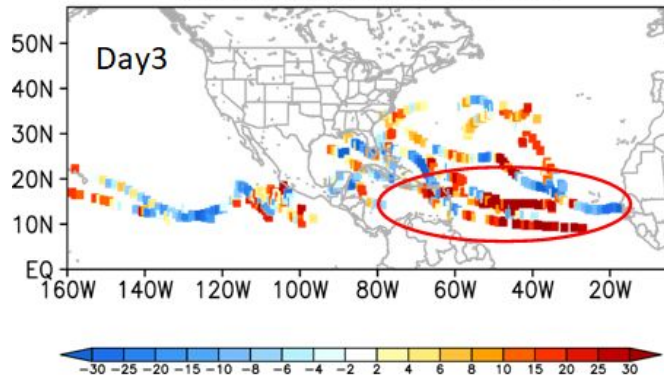
H221 24-h intensity error distribution
for 2018-2020 Atlantic & East Pacific



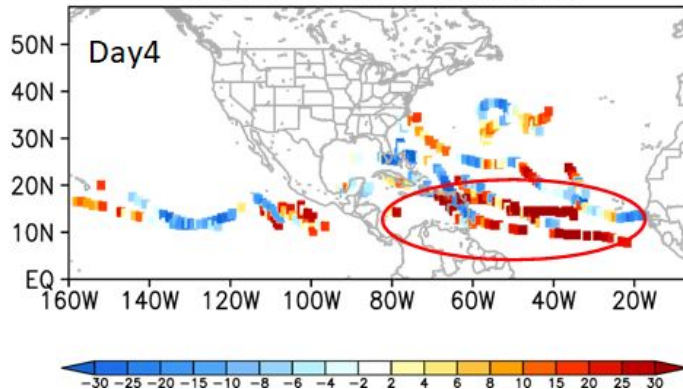
H221 48-h intensity error distribution
for 2018-2020 Atlantic & East Pacific



H221 72-h intensity error distribution
for 2018-2020 Atlantic & East Pacific



H221 96-h intensity error distribution
for 2018-2020 Atlantic & East Pacific



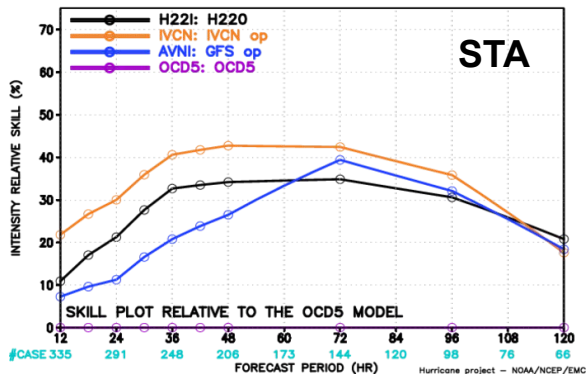
HWRF has large
Vmax errors:

1. MDR
2. TCs initialized
after landfall

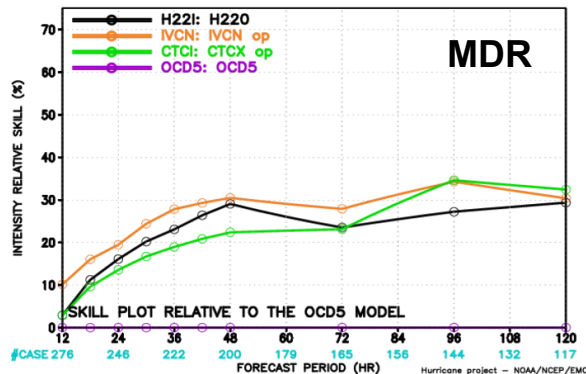
Plotted by Lin Zhu

Spatial Variability of HWRF Intensity Forecast Errors

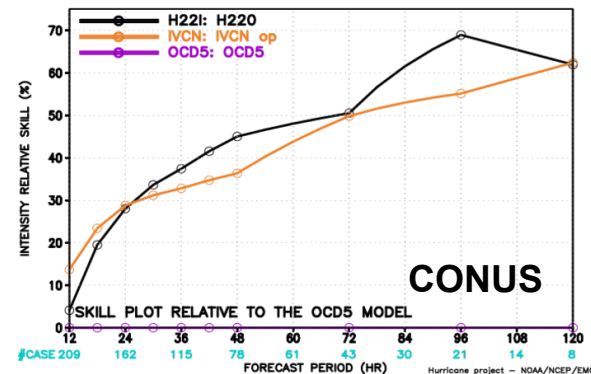
MODEL FORECAST — INTENSITY RELATIVE SKILL (%)
H220 eval



MODEL FORECAST — INTENSITY RELATIVE SKILL (%)
H220 eval



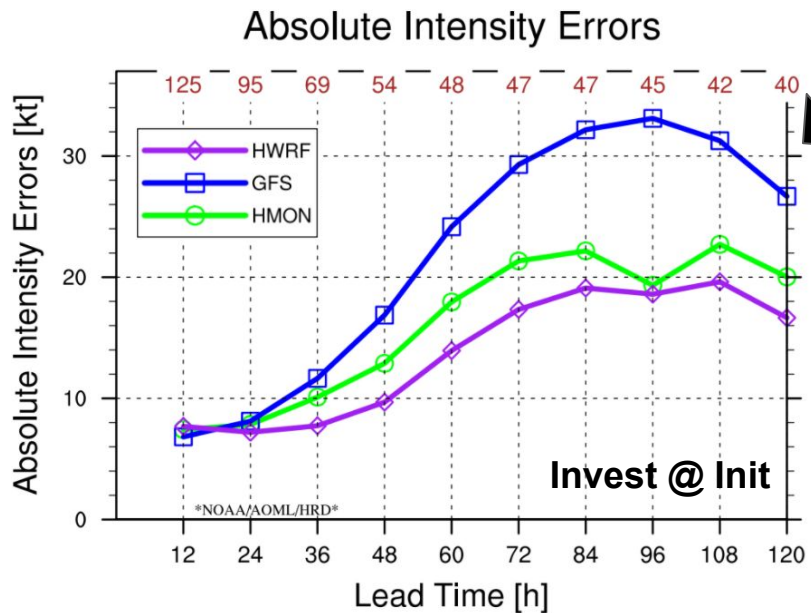
MODEL FORECAST — INTENSITY RELATIVE SKILL (%)
H220 eval



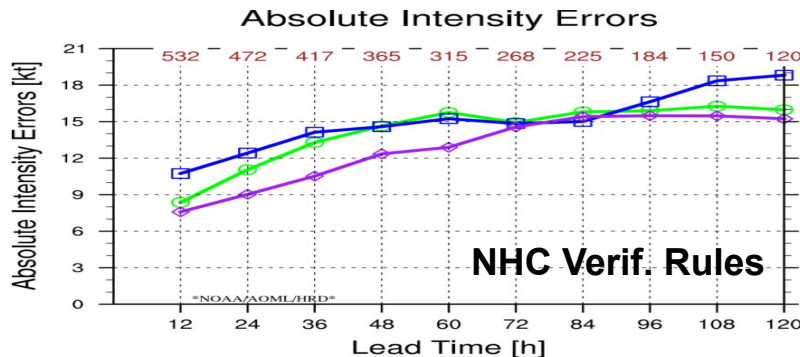
- HWRF (**black**) seems to show different error statistics in different regions
 - HWRF better than IVCN near CONUS (land points removed)
 - Weaker performance in STA & MDR → IVCN better than HWRF

(courtesy of Jason Sippel)

Operational Model Invest Forecasts



Includes genesis and non-genesis events
Invest forecasts are a proxy for genesis



HWRf errors were comparable for invests and the full sample (1-2 kt degradation)

GFS & HMON showed more degradation for invest forecasts



HWRF Invest Intensity Forecast Errors

With so many RI events, HWRF tended to underpredict intensity for invests.

Especially for:

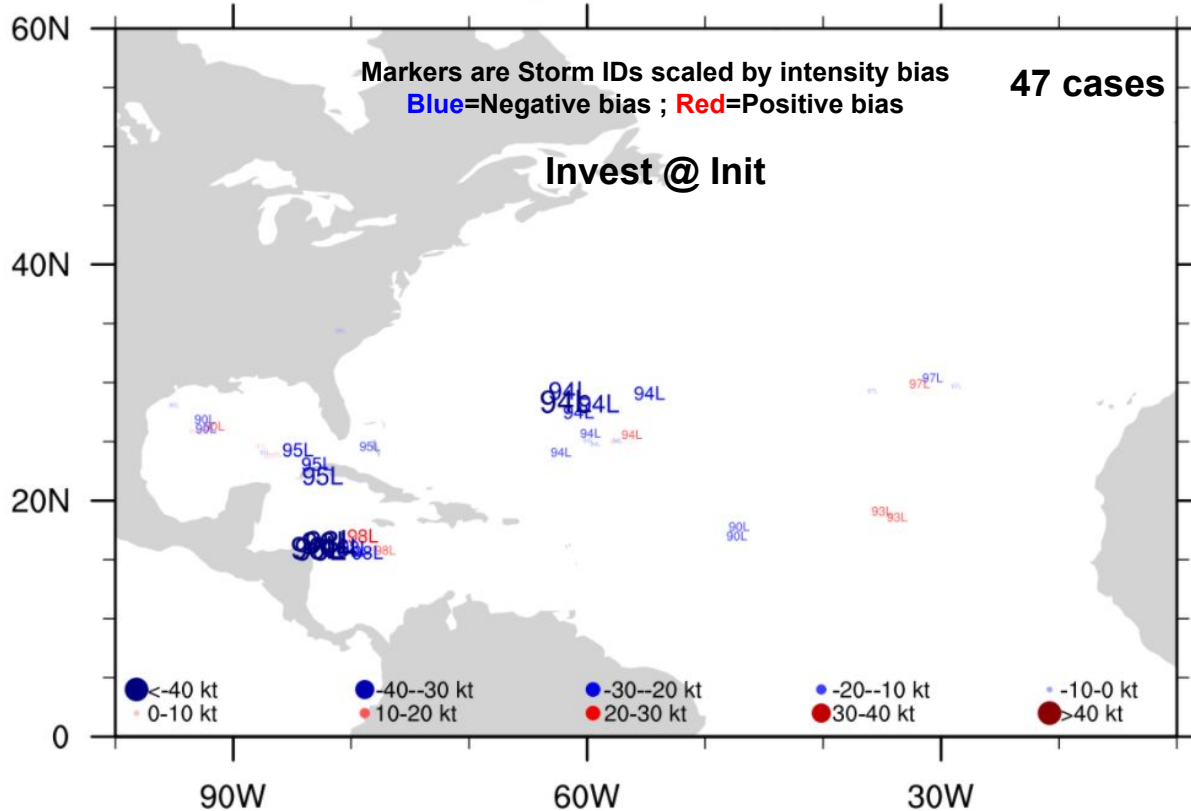
94L: Pre-Epsilon

95L: Pre-Zeta

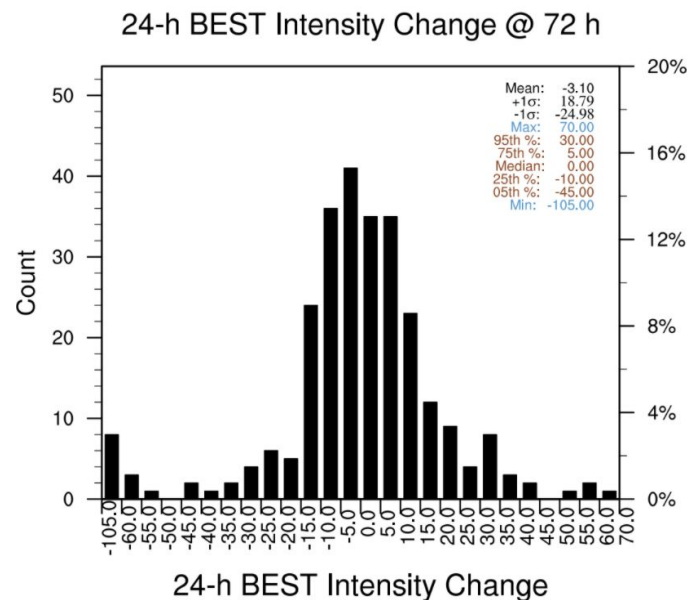
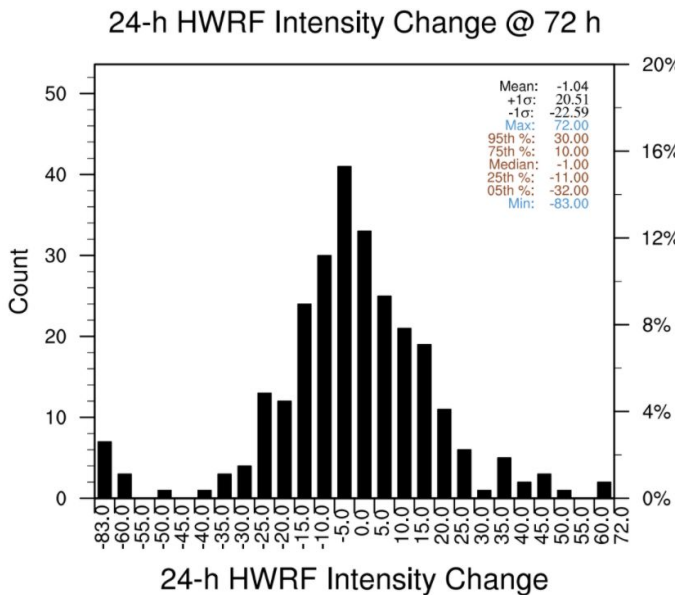
98L: Pre-Iota

(+ intensity bias at early lead times)

Intensity Errors @ 72 hrs



HWRF 24-h Intensity Change



- HWRF was well-calibrated for RI, with the 95th percentile of 30 kt / 24 h
- 24-h intensity change is broader for HWRF (left) than for the Best Track (right)
 - HWRF IQR = 21 kt ; Best Track IQR = 15 kt



Issues Identified by Forecasters

- Model genesis forecast challenges, especially in the Gulf of Mexico and Caribbean. In particular, the ECMWF seemed to have trouble detecting genesis this year in several cases.
- Inconsistent depiction of RI in regional hurricane models, which may be due to differences in alternating model cycles when TDR data are available for HWRF. This lack of consistency makes it difficult for forecasters to gain confidence to make more aggressive intensity forecasts.
- Related to the above, providing guidance to forecasters on when HWRF intensity forecasts should be most reliable. For example, they seem less reliable in situations with no recon/TDR data, especially for weaker systems
- Poor track forecasts from HWRF affecting intensity forecasts in the western part of the basin (land interaction, landfall timing, etc.).
- Noted left bias in Laura from ECMWF and especially ECMWF ensembles for some cycles leading up to landfall along the Gulf Coast.
- The targeting guidance that Ryan Torn was providing based on the ECMWF ensembles was helpful in drawing G-IV flight tracks, etc., during the season. It would be great to see what the impact of this perhaps "smarter" targeting was on the models this year at NCEP, ECMWF, UKMO, Navy, etc.



Issues Identified by Forecasters

- What is the optimal observation sampling strategy for the regional models - from TDR, to dropsondes to assimilation of HDOBS, etc? I think we have some idea of what works best for HWRF, but less for other regional models.
- Increasing accuracy and run-to-run consistency of track and intensity forecasts for developing TCs (particularly when intensity is below the tropical storm threshold)
- Improving model initialization and forecasts for non-classical TC genesis cases (particularly for multi-vortex disturbances such as monsoon depressions and Central America Gyres)