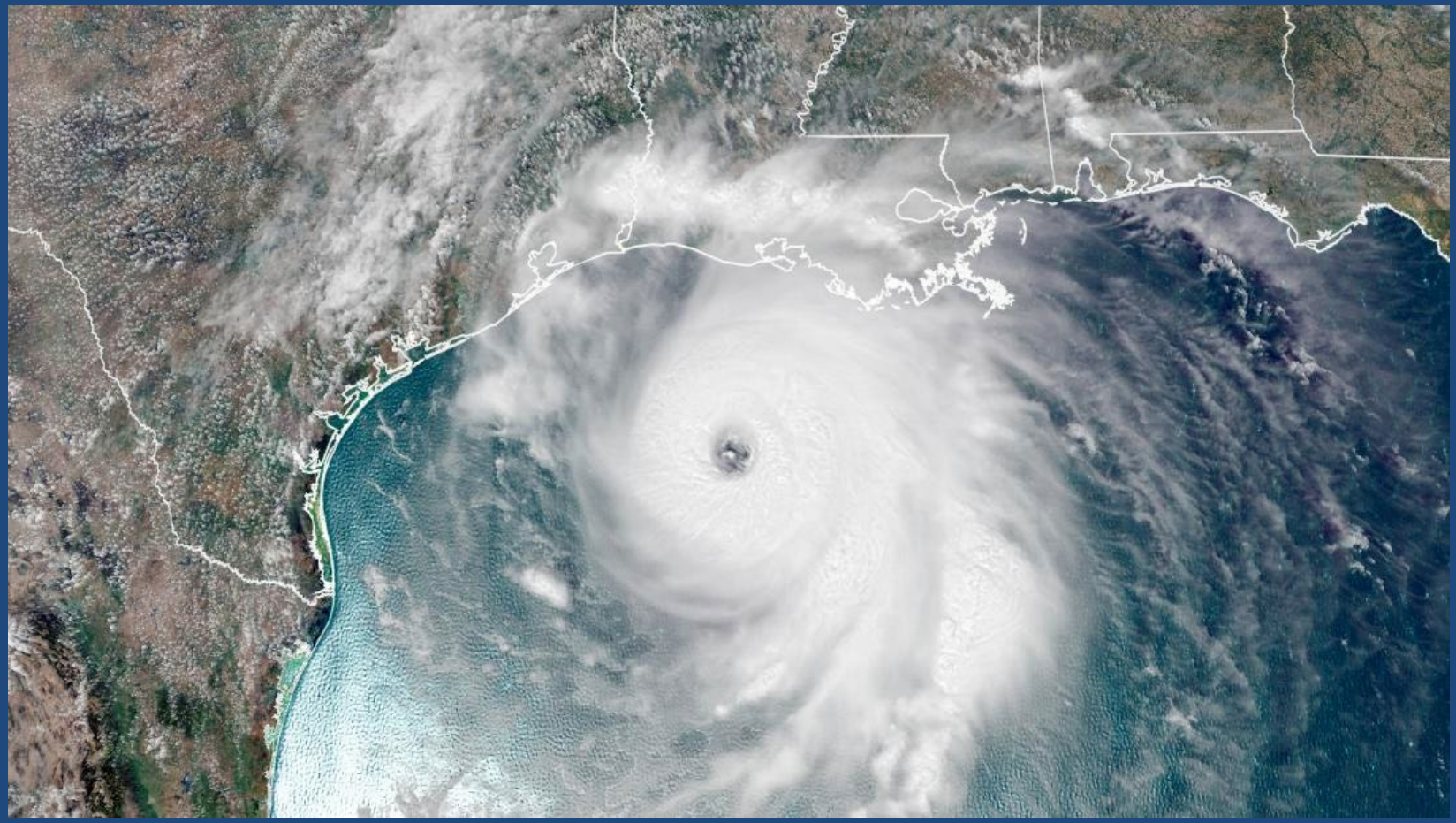
2020 GFDL T-SHiELD Near Real-Time System



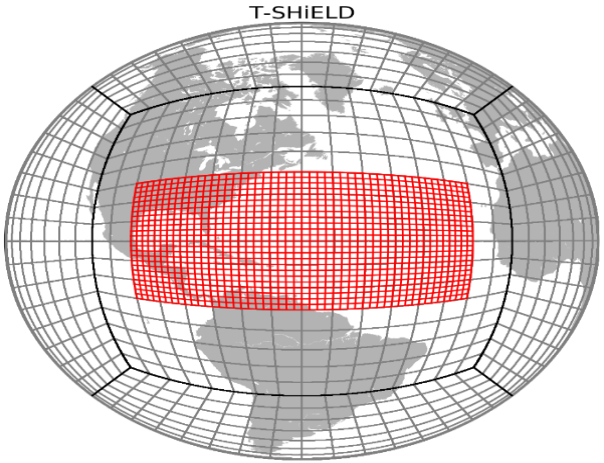
Morris Bender, Kun Gao, Matthew Morin, Timothy Marchok, Lucas Harris,

HFIP Annual Meeting

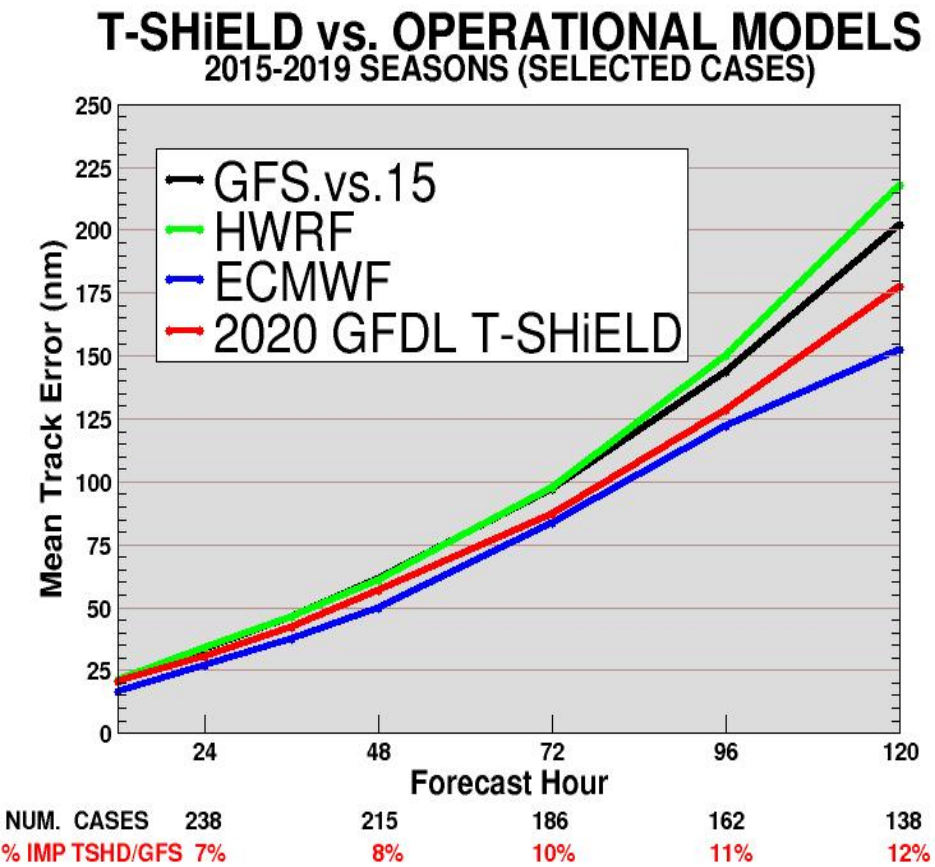
November 17-19th , 2020

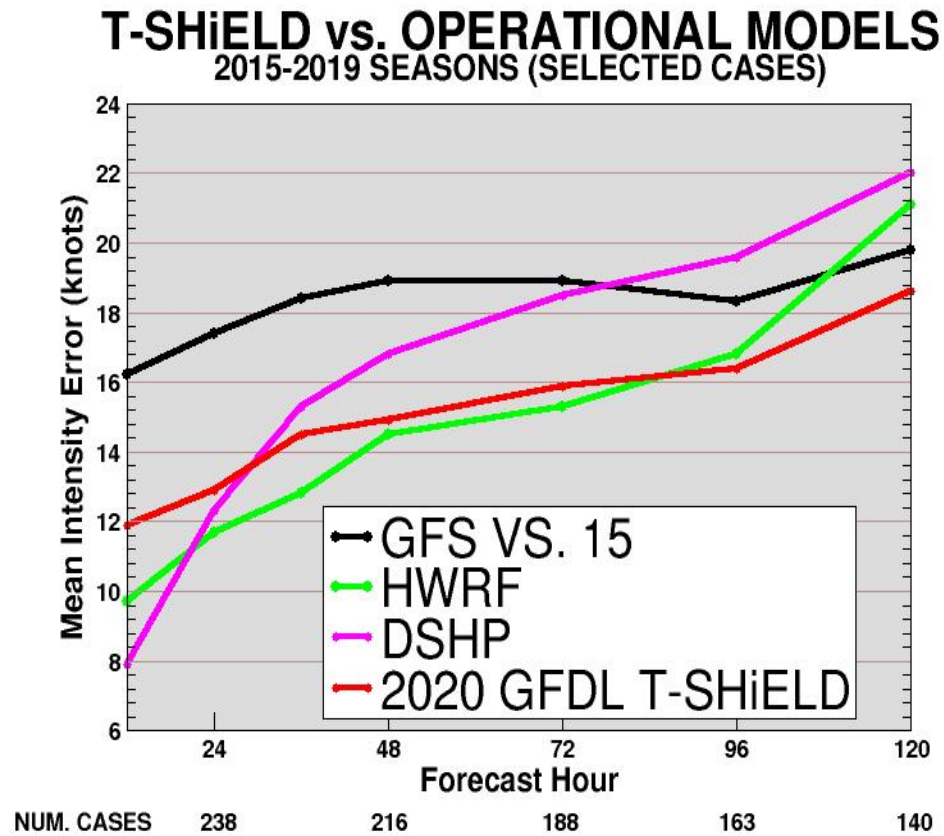
Key features of 2020 T-SHiELD

- Updated FV3 Dynamical Core
- Updated in-line GFDL Microphysics and cloud-radiation interaction schemes
- Refined nested domain for faster speed
- Reconfigured horizontal advection schemes (hord=6 for dynamical and positive-definite -5 scheme for tracers)
- Deep convection disabled and shallow convection retuned in the nest
- YSU PBL with GFDL stability/efficiency modifications
- Retuned 1-D mixed-layer ocean for simple ocean coupling
- New ocean surface drag scheme under high wind conditions



Retrospective Evaluation of 2020 T-SHiELD

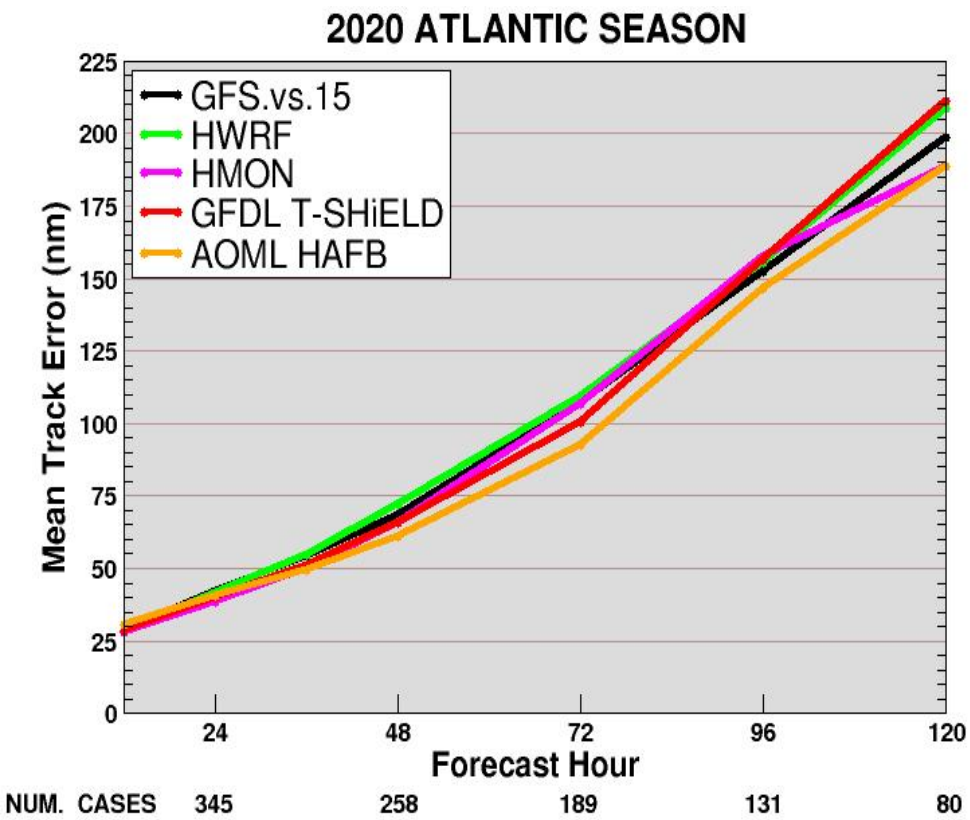




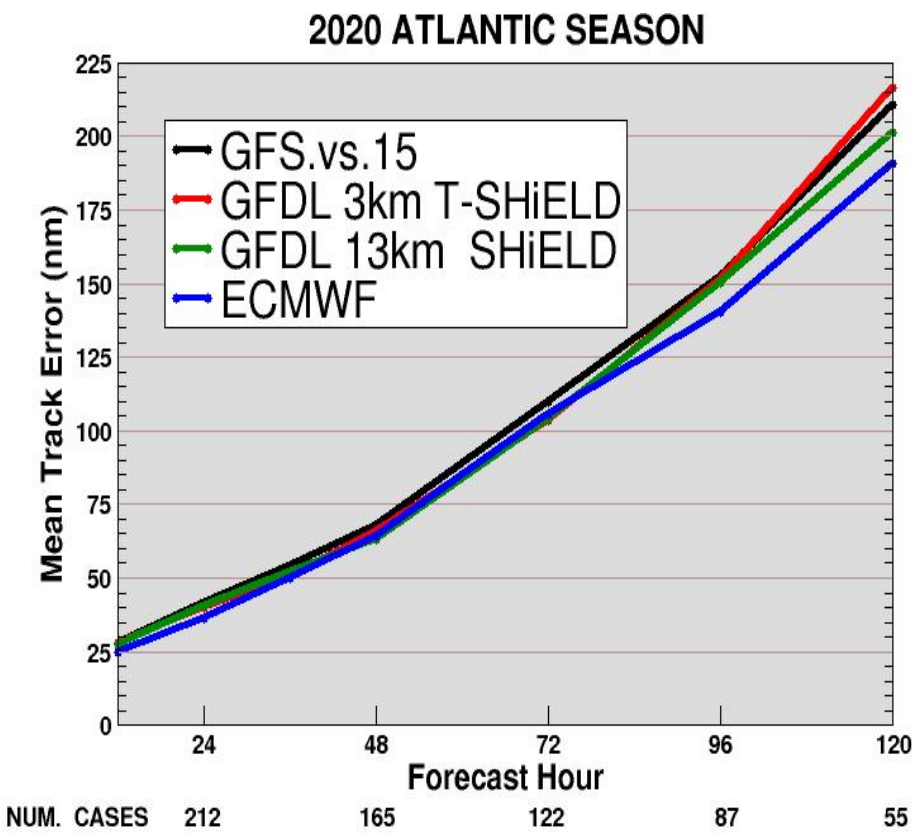
Retrospective testing of 2020 T-SHiELD demonstrated very encouraging track and intensity skill compared to operational models !!

Track Error for 2020 Atlantic Season
(Late model guidance)

Comparison of T-SHiELD to Regional Models & GFS

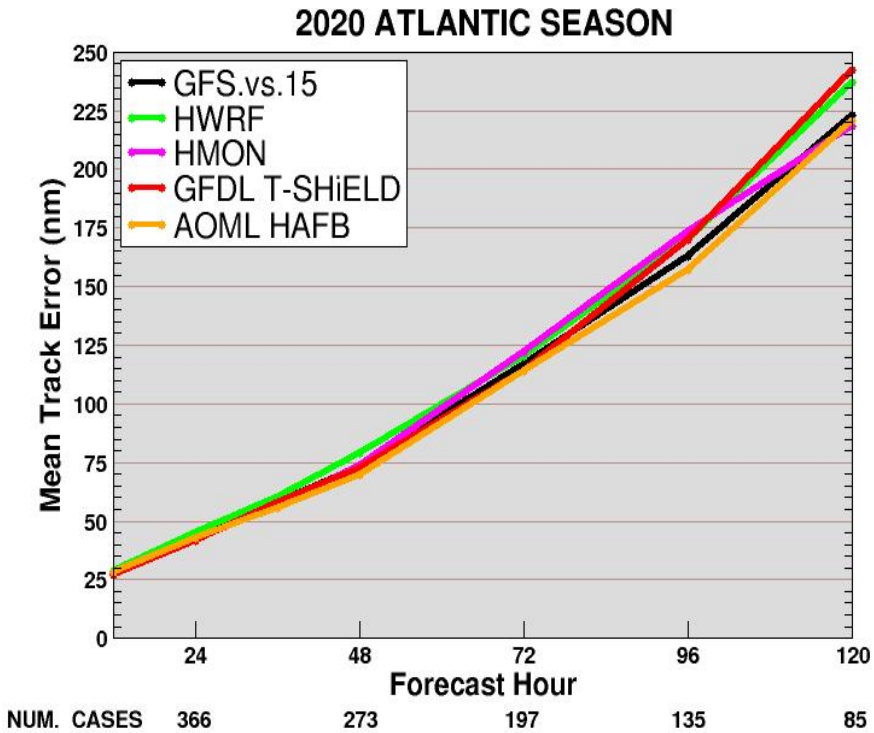


Comparison of T-SHiELD to Global Models

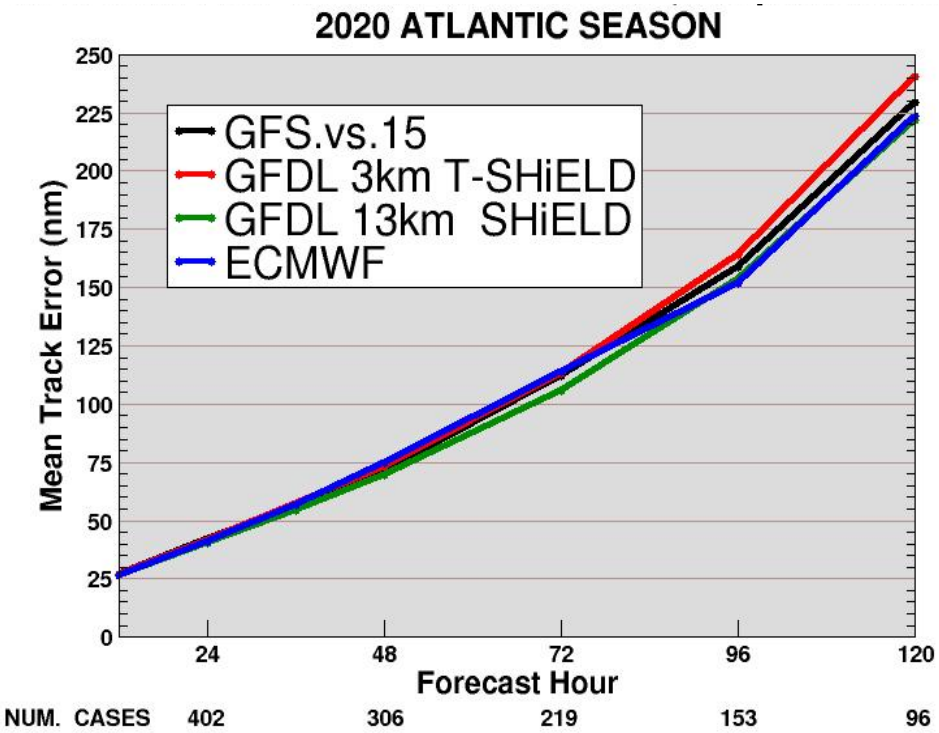


Track Error for 2020 Atlantic Season
(Interpolated Models)

Comparison of T-SHiELD to Regional Models & GFS

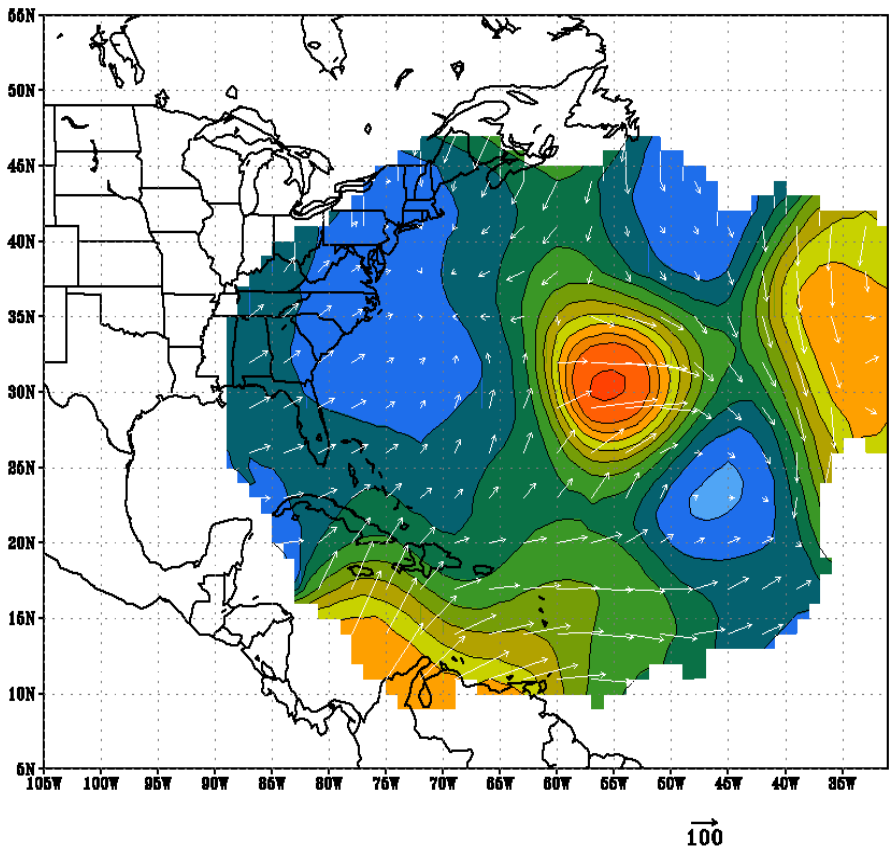


Comparison of T-SHiELD to Global Models

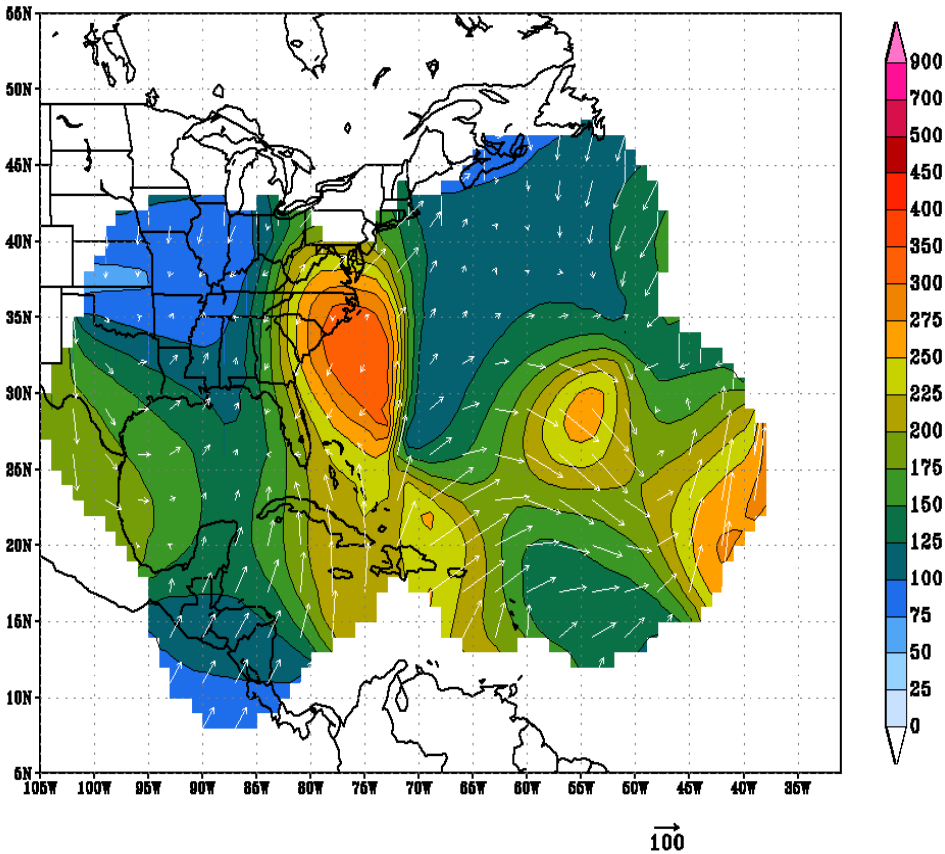


96h Spatial Errors and Error Bias

2015-2019 Seasons (Selected Cases)

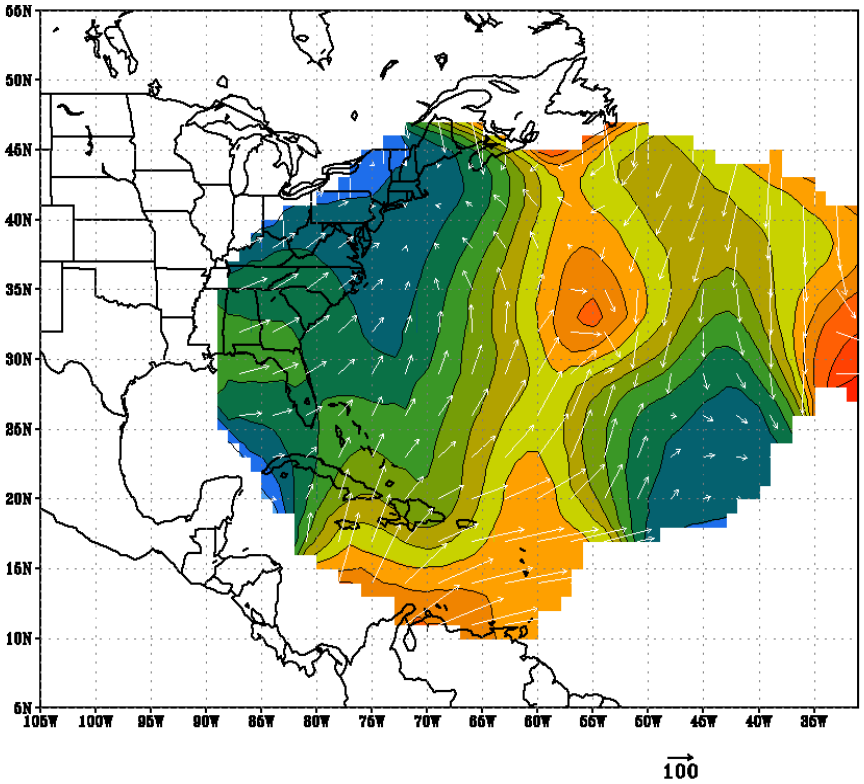


2020 Season

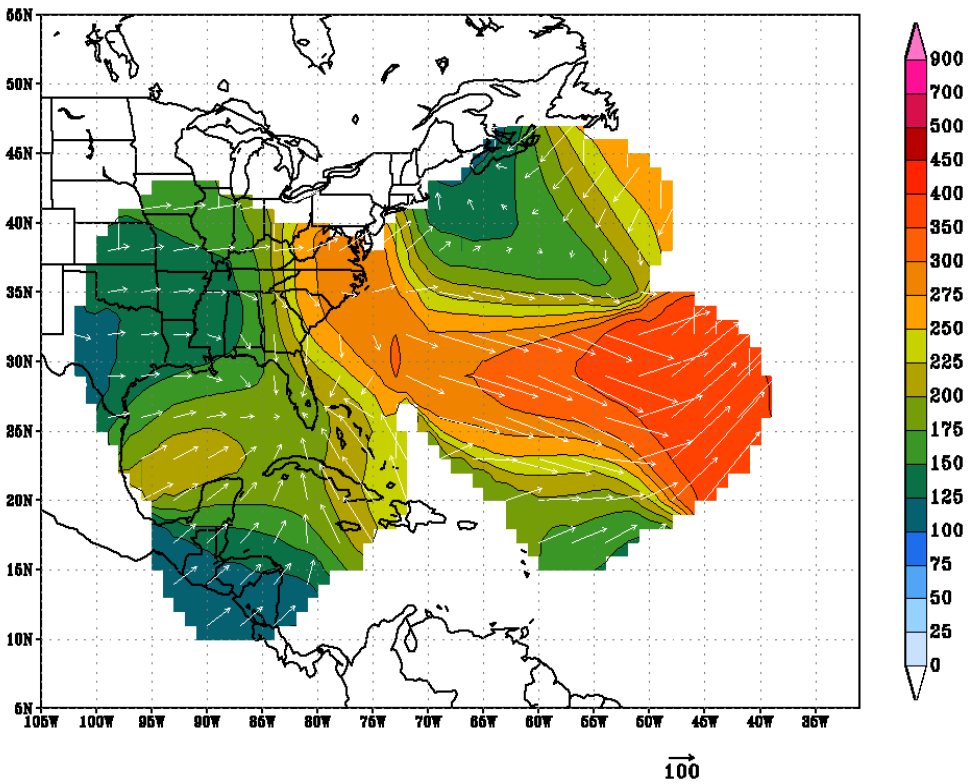


120h Spatial Errors and Error Bias

2015-2019 Seasons (Selected Cases)

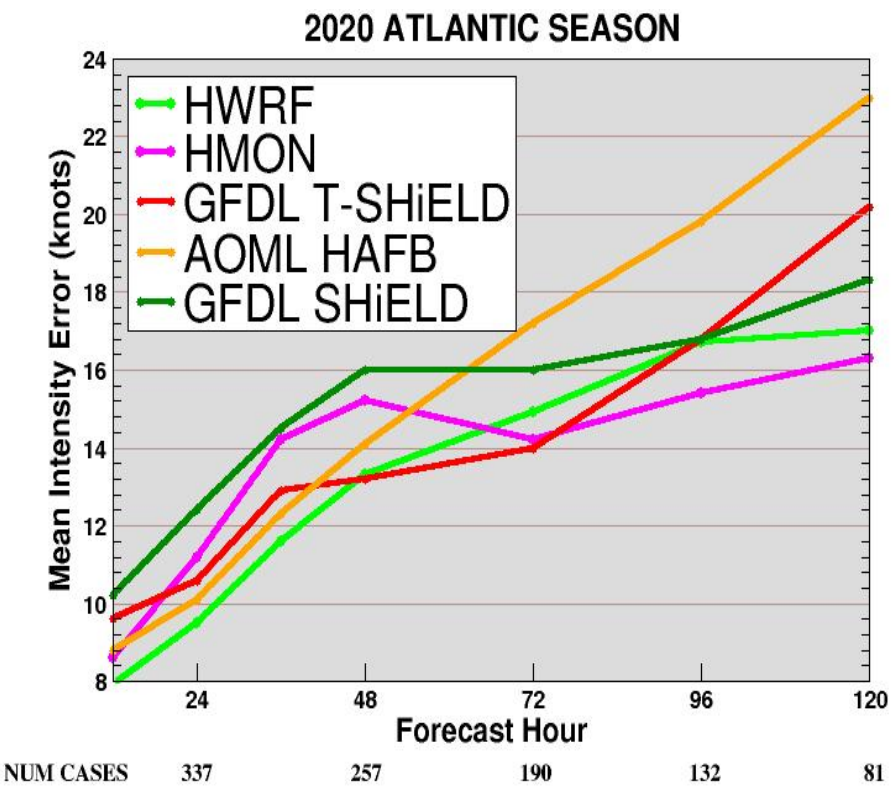


2020 Season

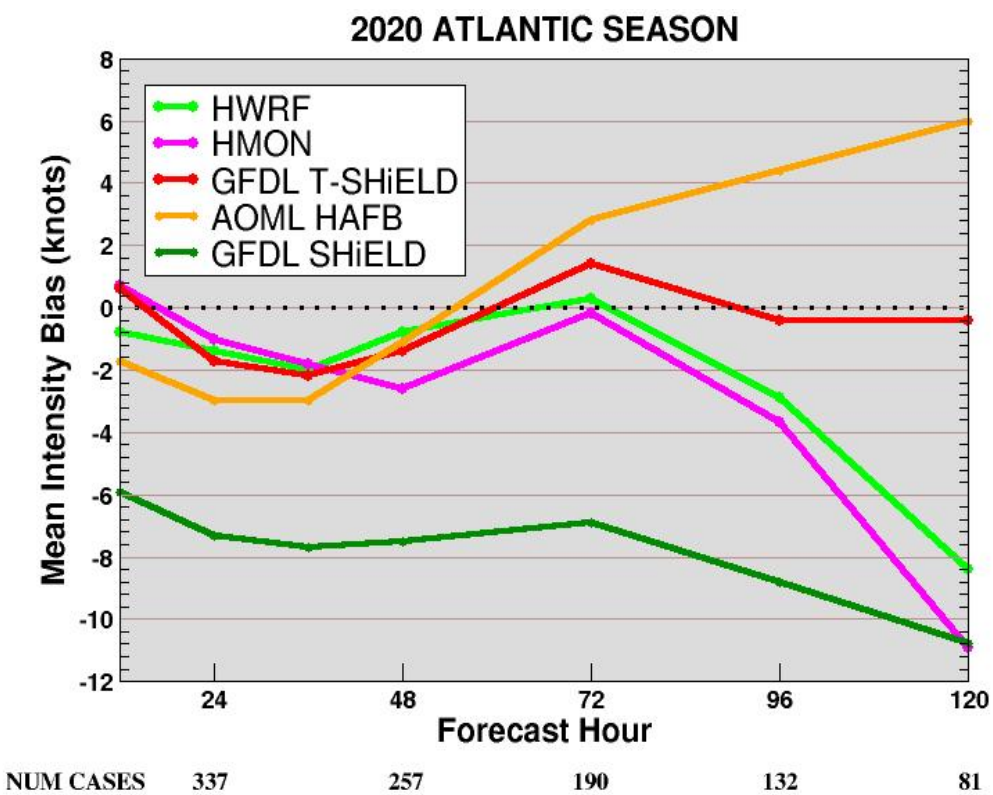


Intensity Errors and Bias

Intensity Error

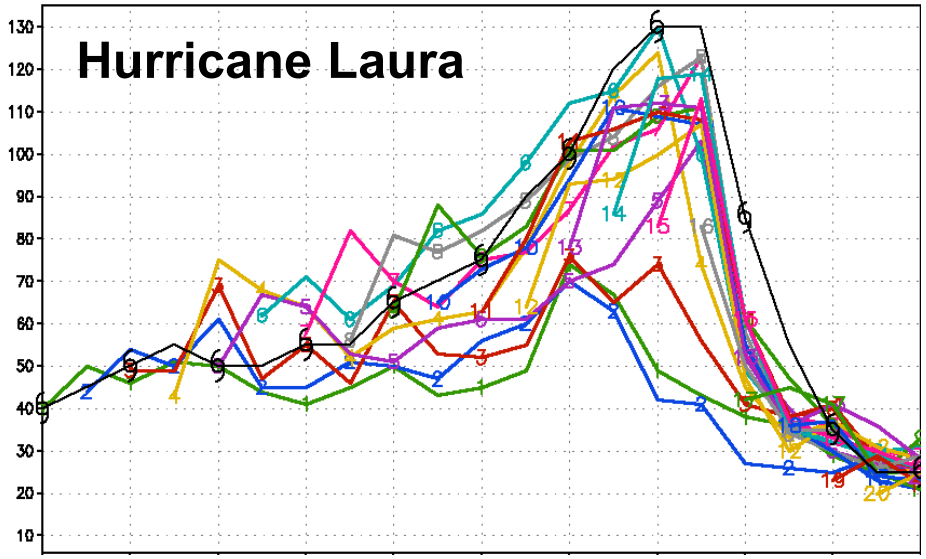


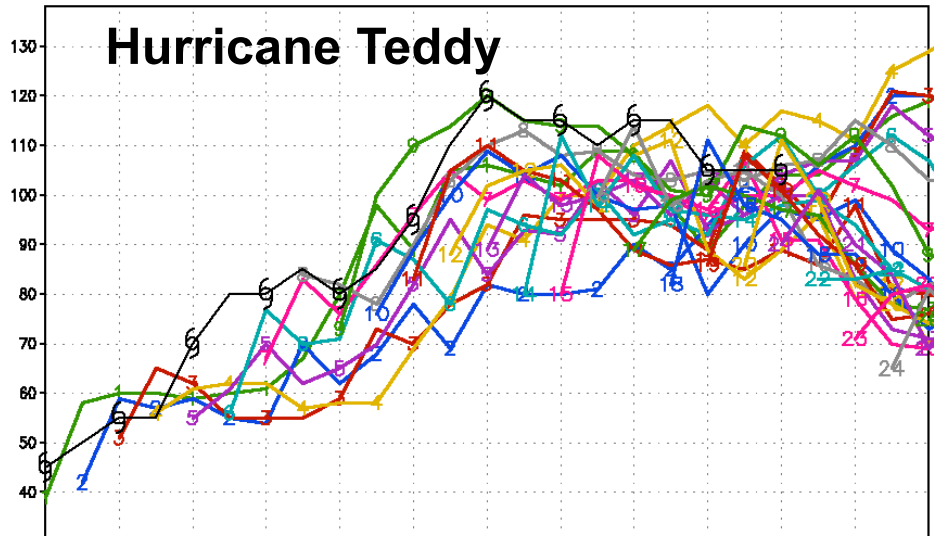
Intensity Bias

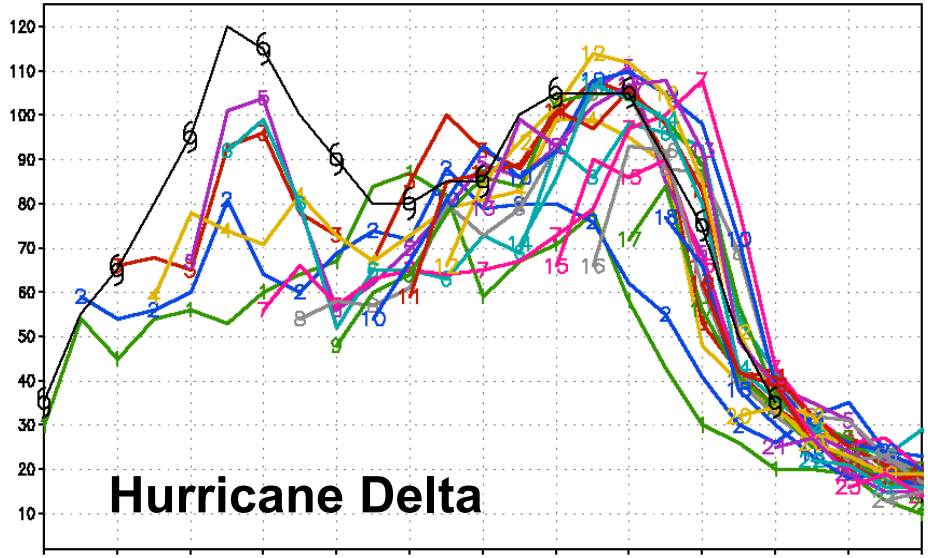


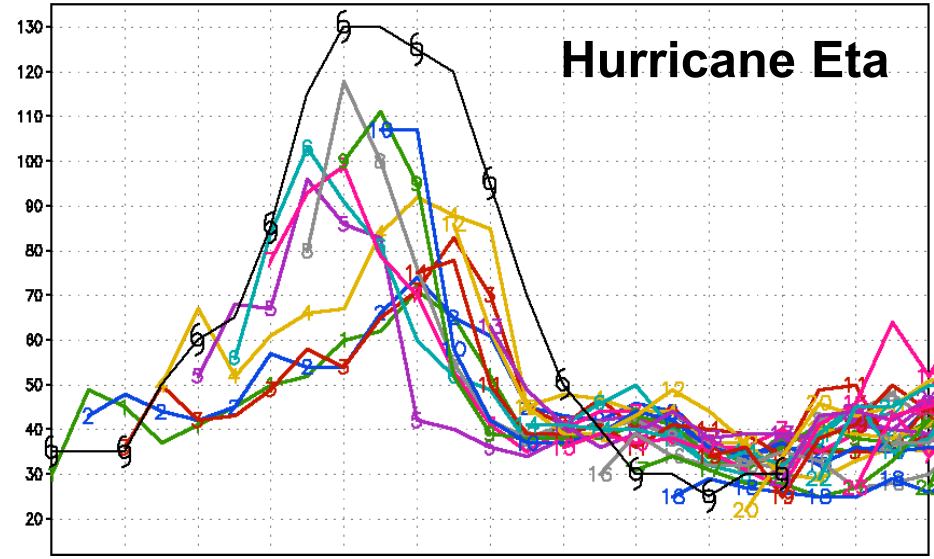
2020 T-SHiELD gave encouraging intensity prediction at early lead times & smallest bias compared to other model guidance.

Composite Intensity Forecasts



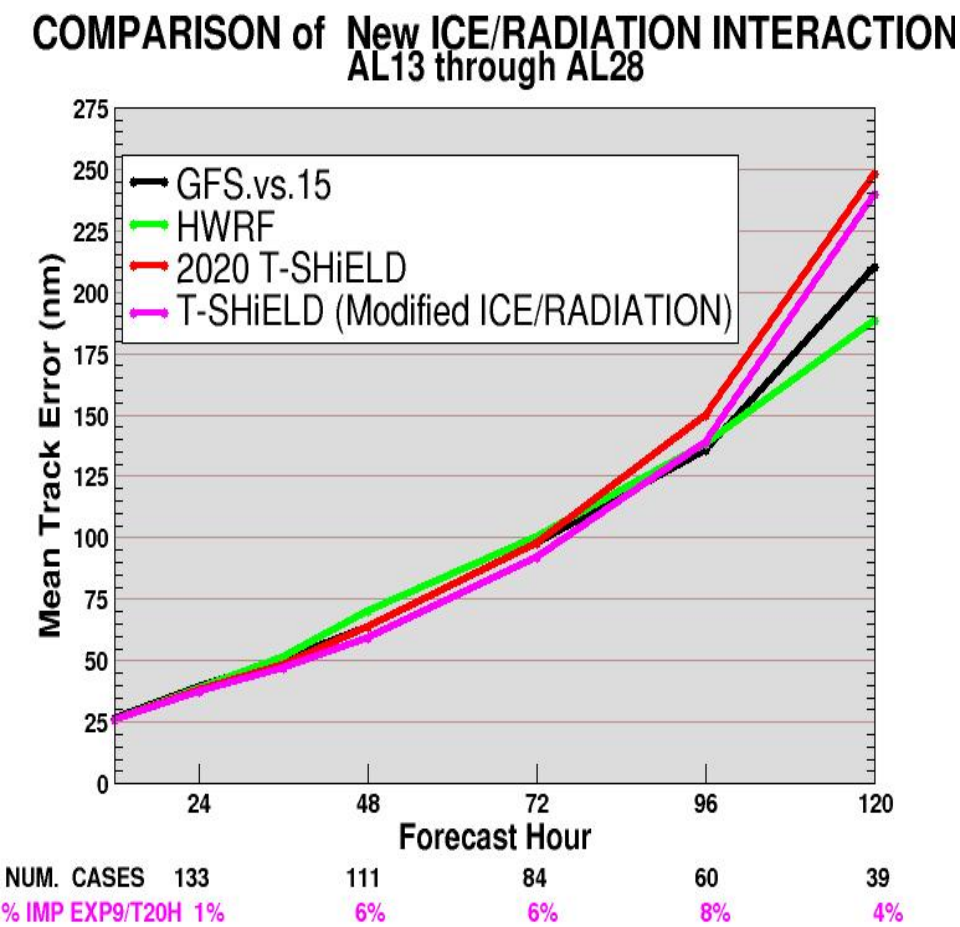


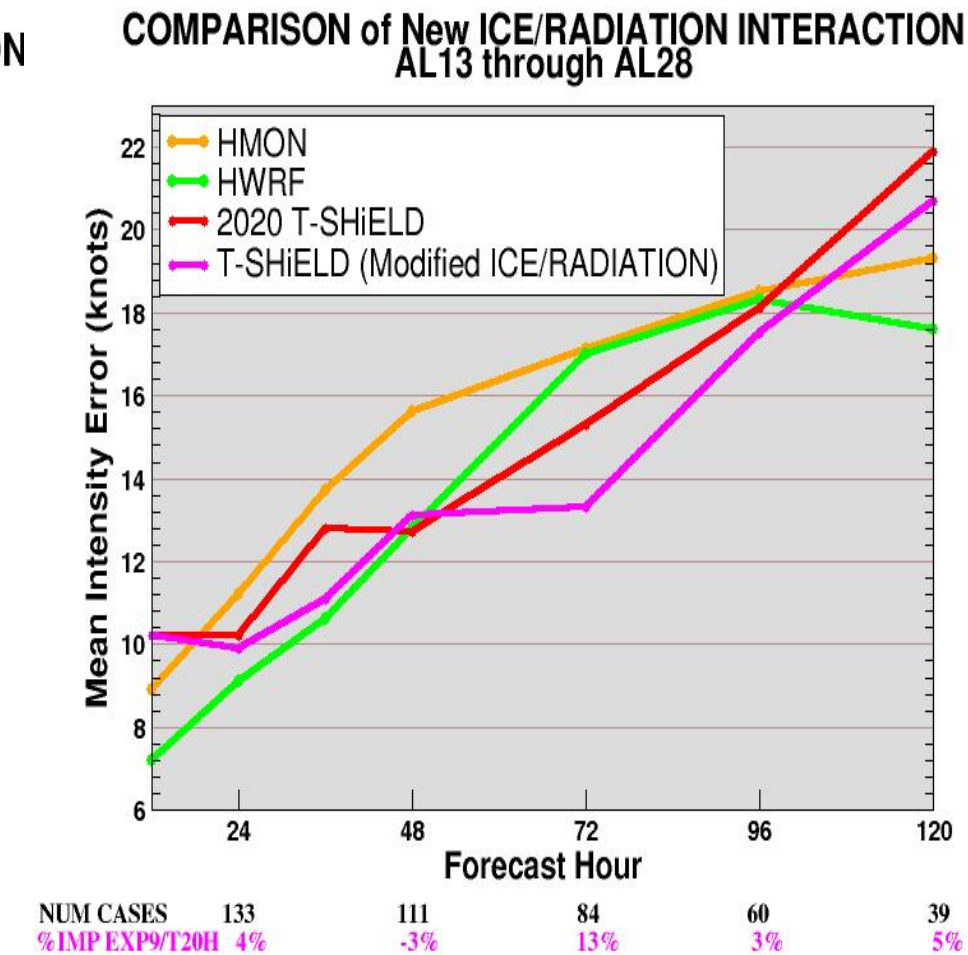




2020 T-SHiELD Continued to Demonstrate Encouraging Skill in Prediction of RI

2020 Atlantic Season for Selected Cases





Improved ice-radiation scheme gives modest track improved at 4-5 day forecast time & significantly improved intensity skill at 3-5 day forecast lead times.

Summary

- **Although the 2020 T-SHiELD showed much improved track skill compared to the GFS and other guidance in retrospective tests from earlier seasons, the Atlantic 2020 real-time demo did not perform as well as the GFS but was comparable to HWRF.**

- **Spatial Error Distributions of the 2020 T-SHiELD was markedly different than in the retrospective years (2015-2019).**

- **2020 T-SHiELD was top performer for intensity prediction at 2 and 3 day forecast lead times but had degraded performance at long lead times.**

- **2020 T-SHiELD intensity bias was small compared to high-resolution operational models (i.e. HWRF, HMON) and other HAFS real time models (i.e., AOML HAFS-B).**

- **2020 T-SHiELD shows promise in prediction of RI in most 2020 intense storms consistent with earlier retrospective tests.**

- **GFDL is currently evaluating model improvements for 2021 Demo.**