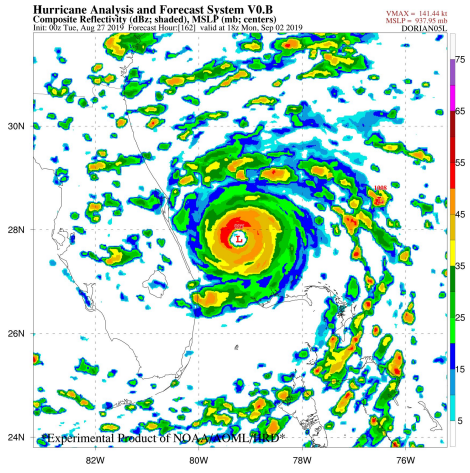
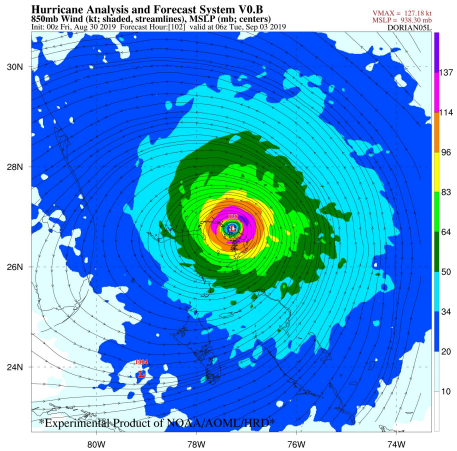
Global-Nested HAFS Results from Hurricane Dorian





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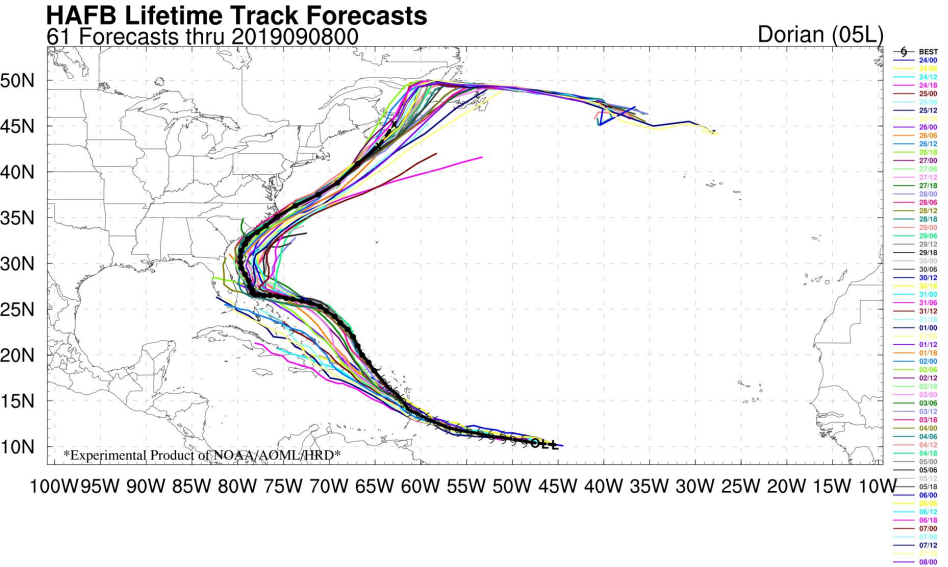
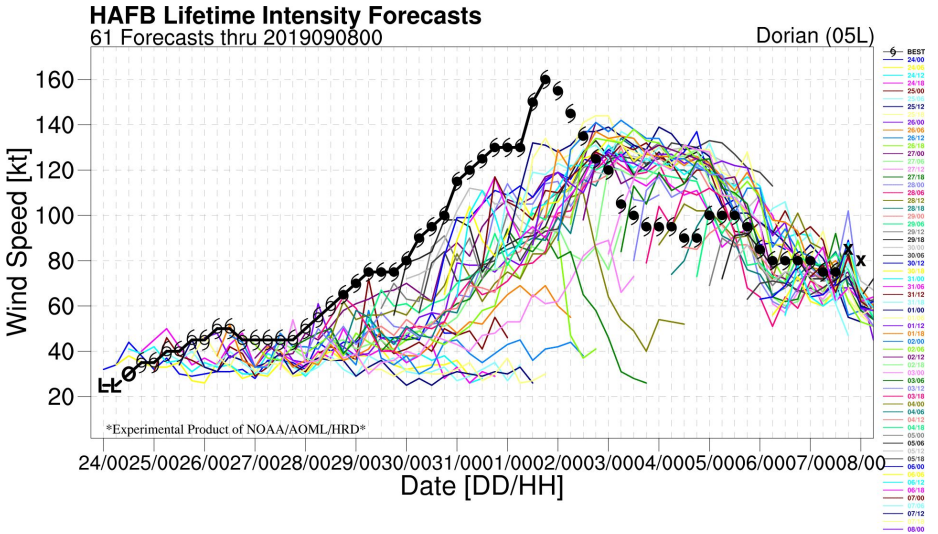
HAFS Configuration

- HAFS is the Hurricane Analysis and Forecast System based on Uniform Forecast System
- HAFA is based on stand-alone regional HAFS configuration
- HAFB is based on global-nested HAFS configuration
- Initial conditions are downscaled from the global GFS analysis
- No ocean model coupling in the current version of HAFS

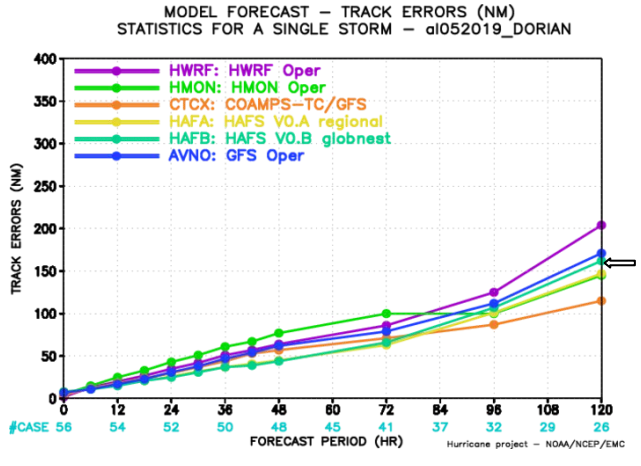
All HAFS-B Dorian Forecasts

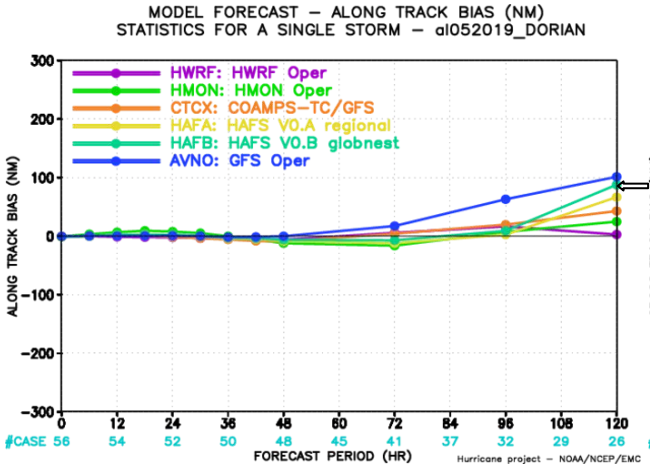


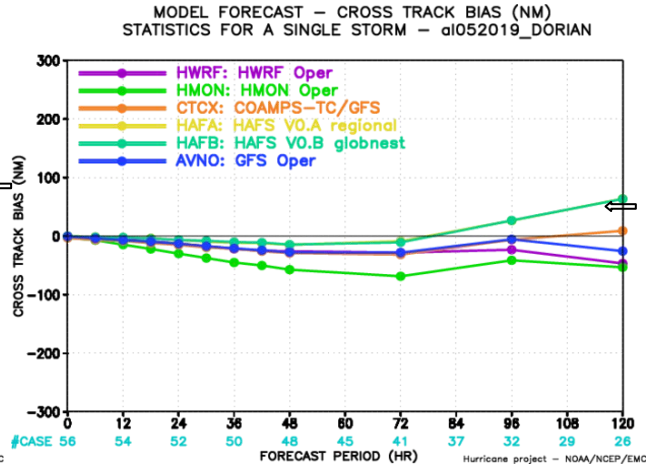


- Early tracks were almost all left-biased
- Tracks did avoid Florida correctly
- Intensity was too low during intensification (init?), but many captured Cat. 4-5
- High bias in the Bahamas (coupling?)

Basic Track Stats

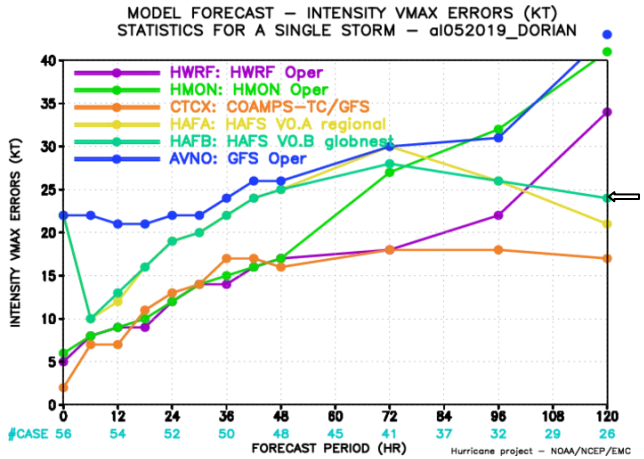


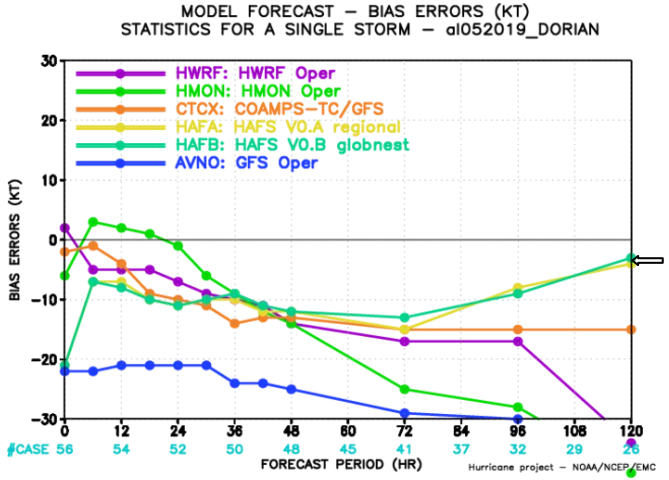




- Both HAFS configurations performed well for track
- HAFB was slightly better than both GFS and HWRF
- HAFB had a slight right bias at long range, where other GFS-based guidance was slightly left

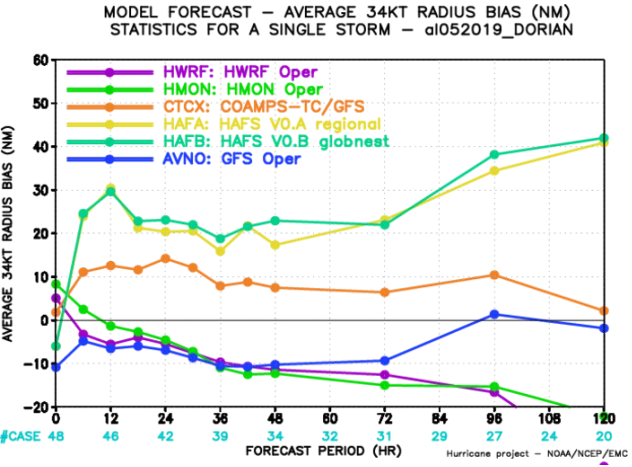
Basic Intensity Stats

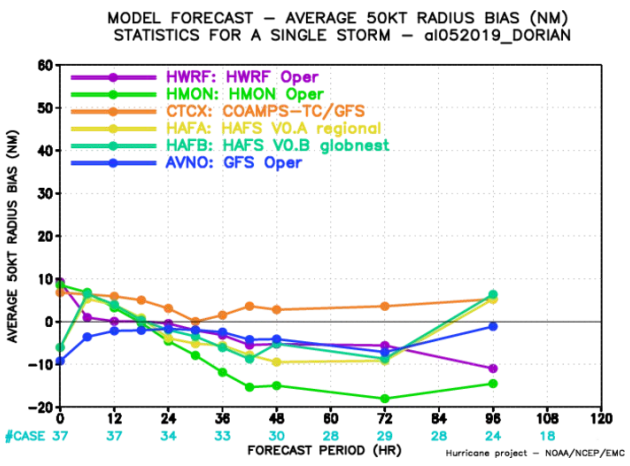


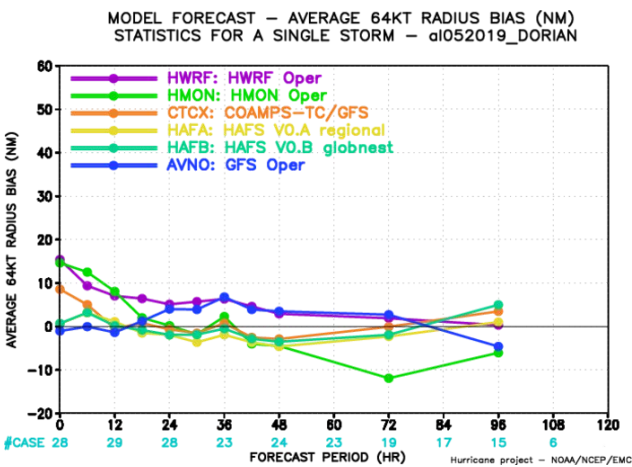


- Intensity forecasts were mixed
- HAFB outperformed GFS (demonstrating value of high-res nest)
- HAFS bias was overall lowest (a bit deceiving?)
- Low bias initially, RI somewhat captured (more later)
- High bias during decay in Bahamas (full ocean coupling needed)

Wind Radii Stats

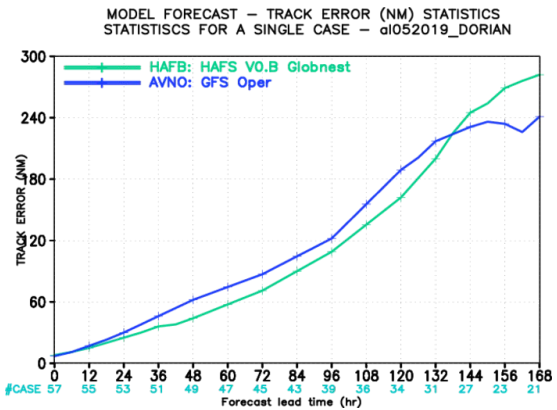


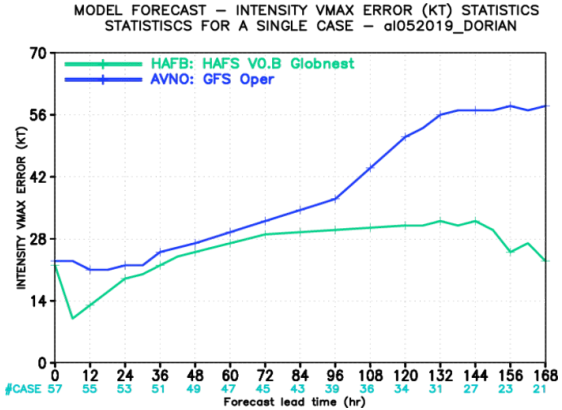


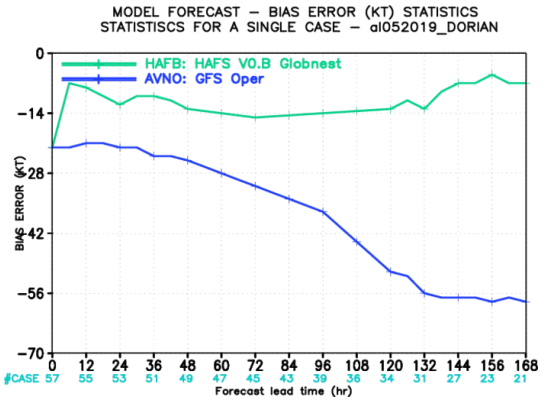


- R34 high bias that was present in Barry was present at all times after spinup
- Other wind radii (R50, R64) were much better
- PBL/drag possible culprit (but similar to HWRF, which had a low bias)
- More likely is the advection scheme (too diffusive)

7-day Stats



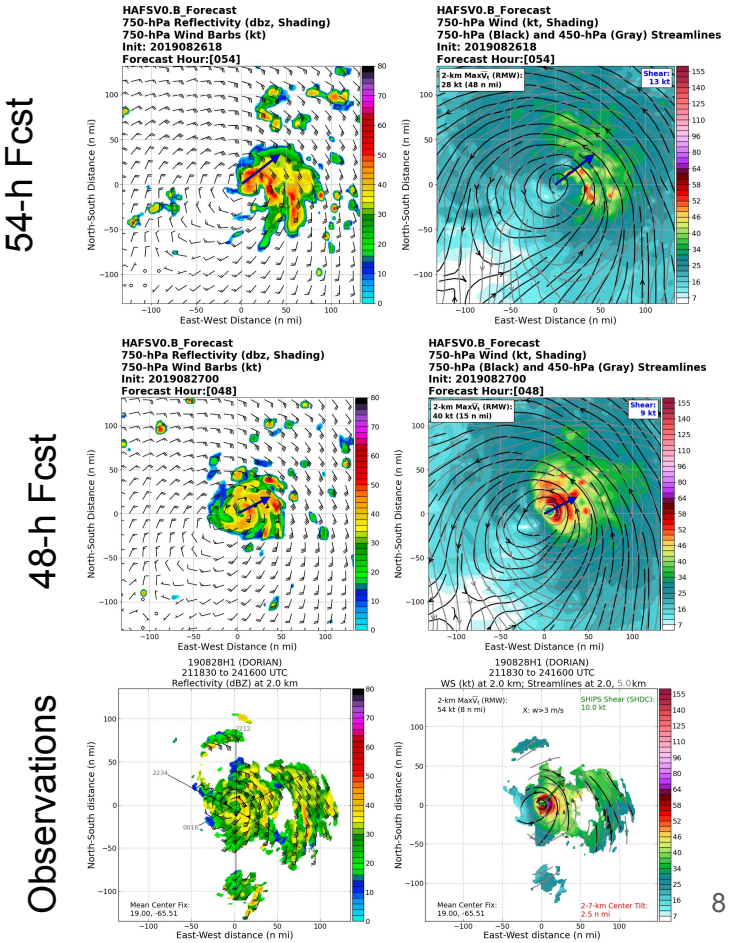




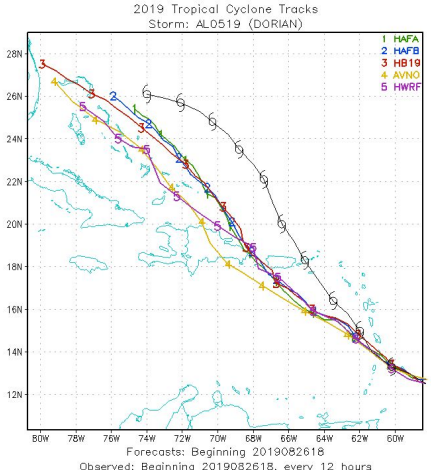
- HAFB better with track D1-5, GFS better D6-7
- HAFB intensity errors flatline around 72h, GFS errors grow
- HAFB intensity bias flat near ~10 kt after spin-up, GFS has growing negative bias (both are uncoupled)
- This case really illustrates the value of the high-resolution nest for TC intensity prediction

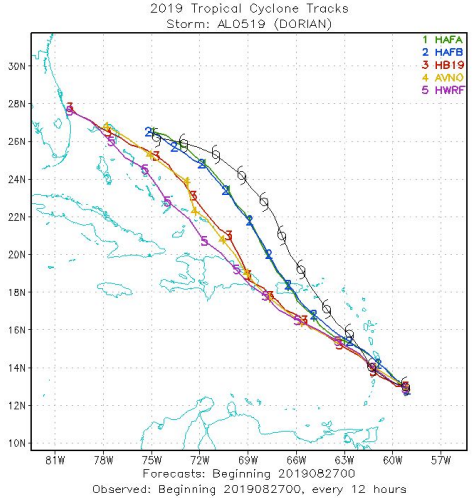
Structure Compared With Observations

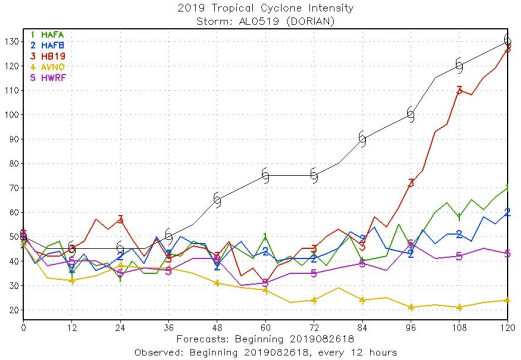
- Two forecasts initialized 6 hours apart
- Near the time of center relocation
- Very different wind structures
- Second one correctly predicted the small wind core that developed
- Track/intensity very different

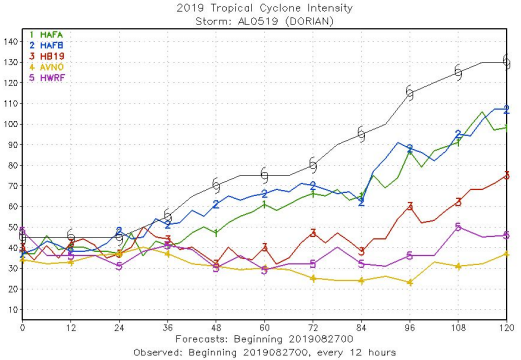


Structure Compared With Observations









- The run that correctly got the core development was much stronger and further NE
- Chicken/egg question: was earlier development a cause or result of track difference?
- Good case for ensembles

Conclusions

- Global-nested HAFS was quite successful in track forecasts for Dorian
- Intensity mostly good as well
- R34 continues to show a high bias, needs to be fixed
- Comparison to observations demonstrated the importance of inner-core structure for skillful prediction
- Relationship between track and structure (and feedback) a possible research topic