The HWRF No Vortex Initialization (HNVI) realtime experiment

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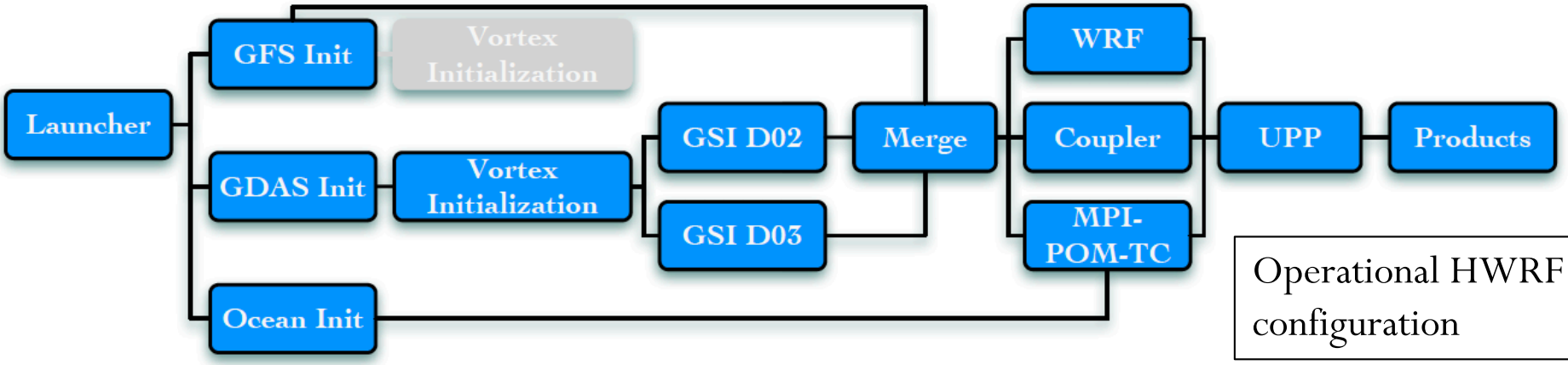
Realtime experiment goals

- Determine whether the operational HWRF vortex initialization scheme is needed for skillful tropical cyclone forecasts.
- Quantify whether data assimilation (DA) alone produces an initial vortex that matches the observed TC position/intensity.
- Provide guidance on whether HAFS needs vortex initialization.

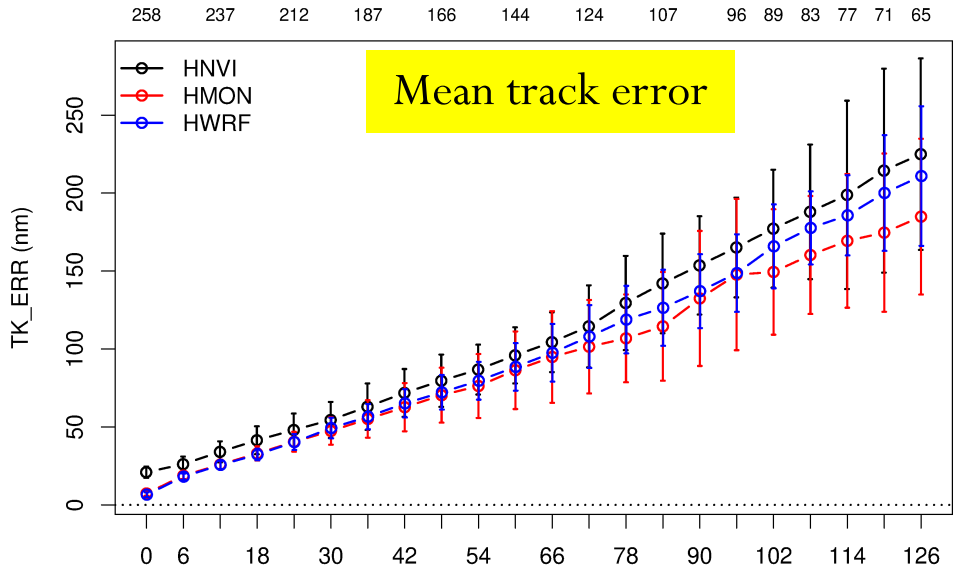


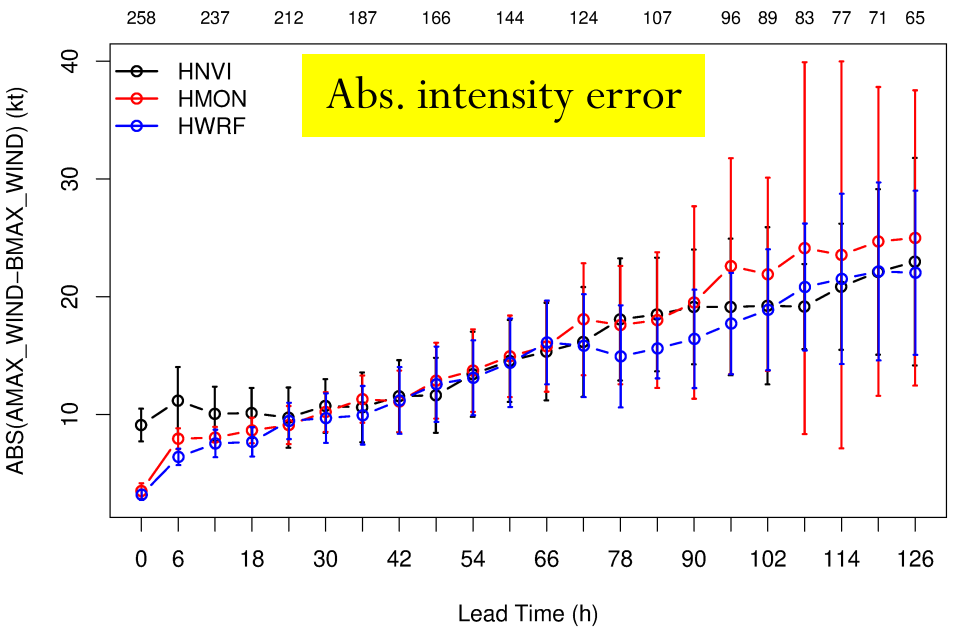
Operational HWRF configuration

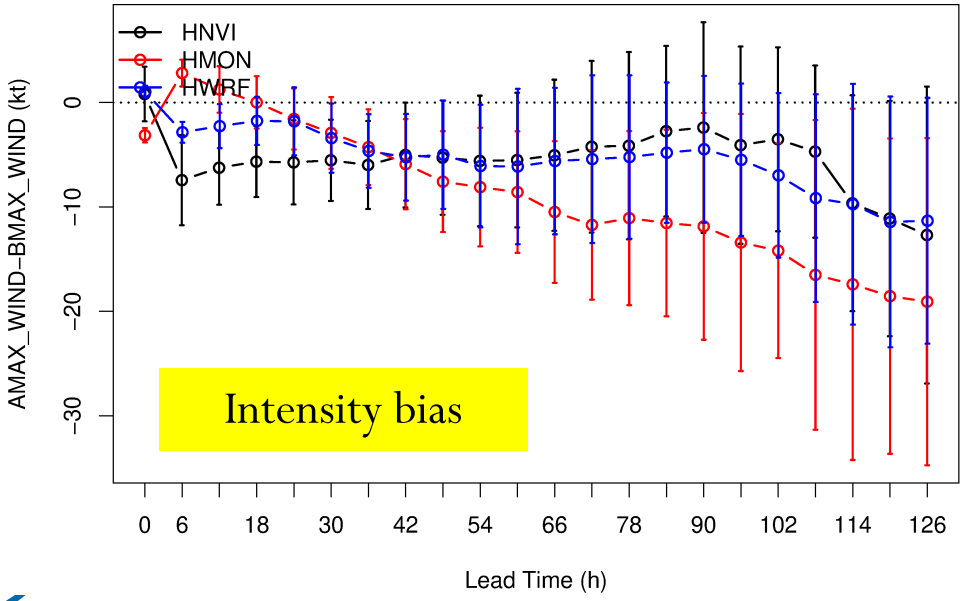
Experiment and verification methods

- HNVI and operational HWRF began cycling at the same time
  - HWRF cycles the vortex; HNVI cycles the nests
- 2019 FV3GFS input data used, except for EnKF files, which were from the 2017 (spectral) GFS implementation
- Verification follows NHC rules
  - SD, SS, TD, TS, and HU only at the initialization time
  - SD, SS, TD, TS, and HU only at a particular forecast lead time
- Error bars represent the 95% confidence interval on the mean

Atlantic verification: HNVI, HMON, HWRF



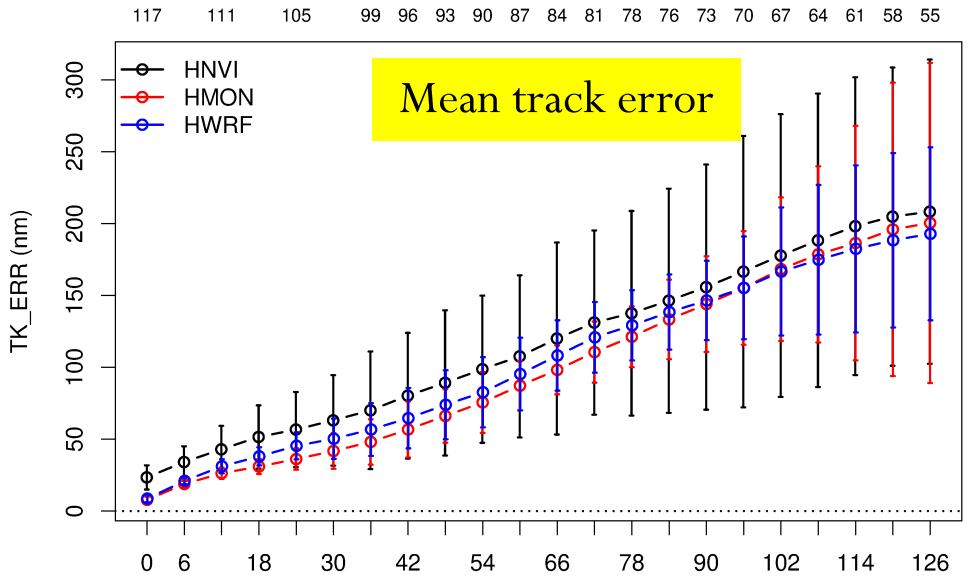


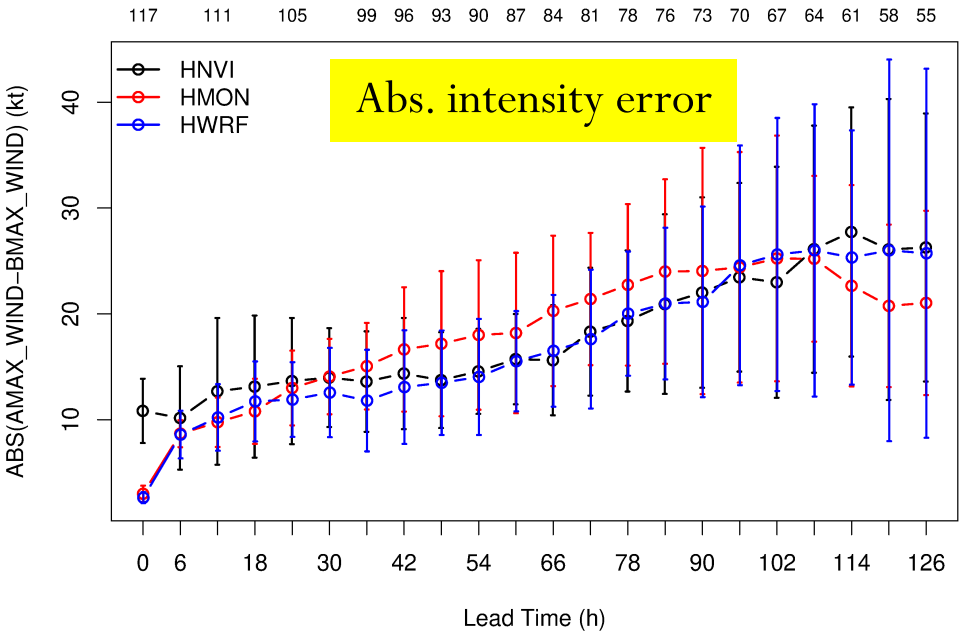


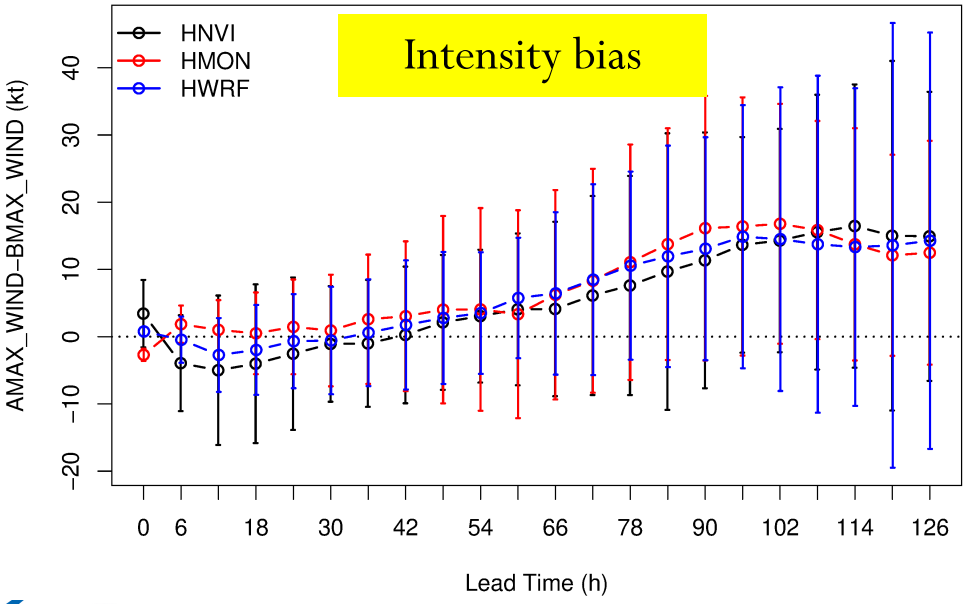
Key points

- HNVI track forecast slightly degraded
- HNVI intensity errors and bias comparable to HWRF after 1 day

Eastern Pacific verification: HNVI, HMON, HWRF



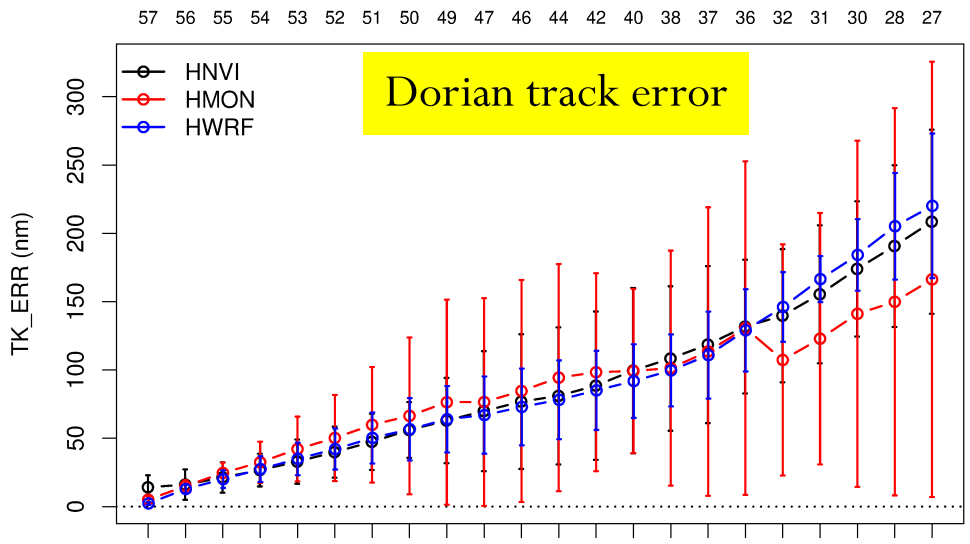


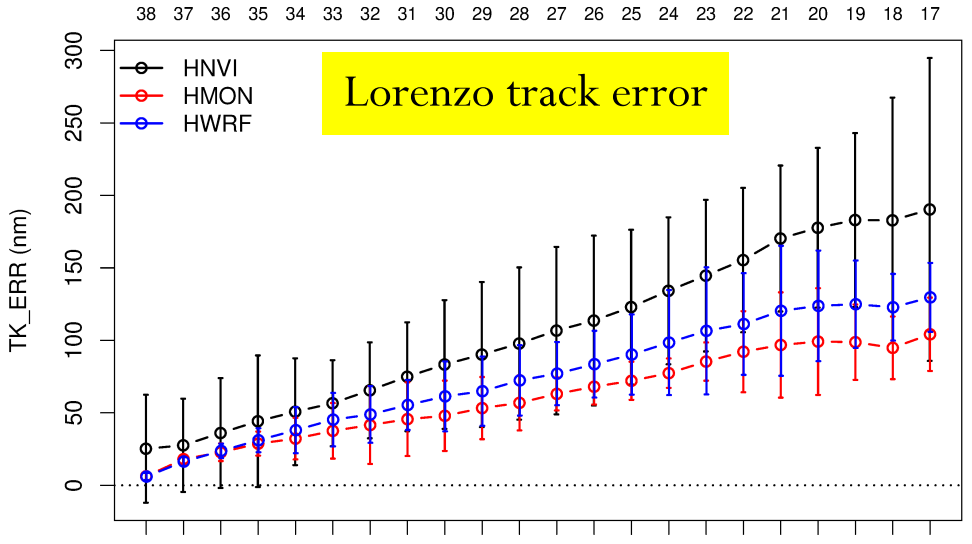


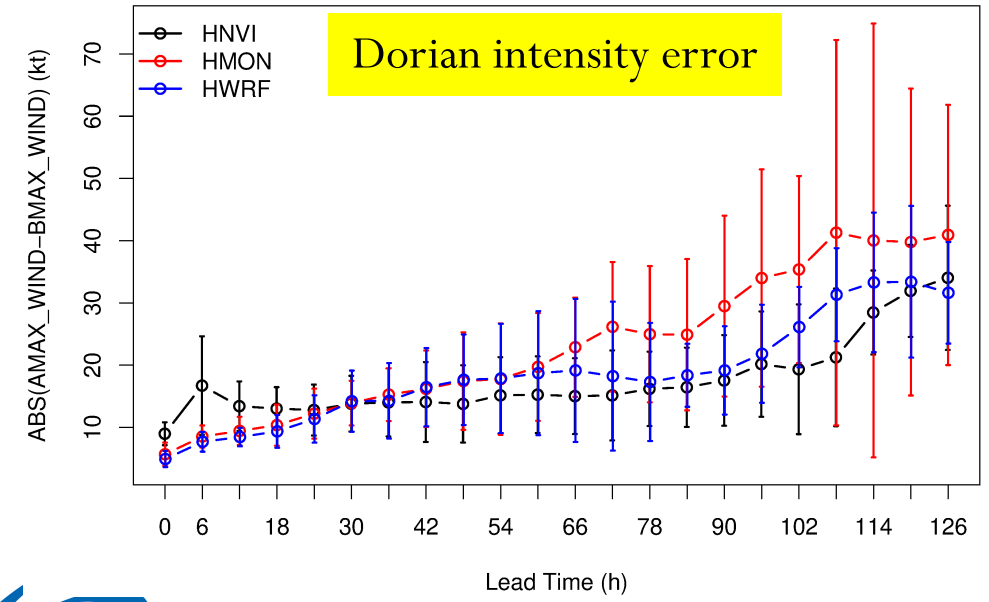
Key points

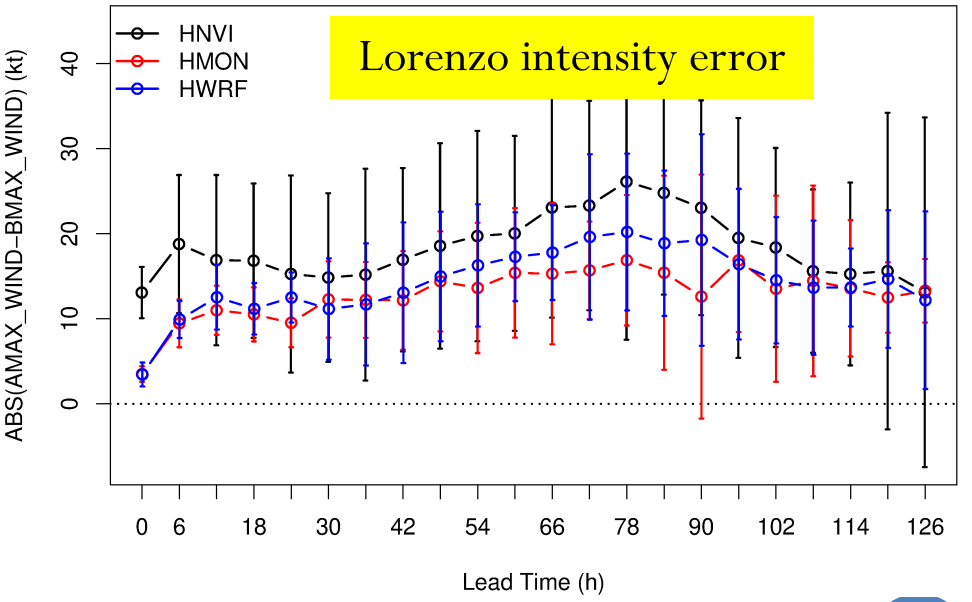
- HNVI track forecast slightly degraded
- HNVI intensity errors and bias similar to HWRF after ~6 hours

Two Category Fives, Two Very Different Results

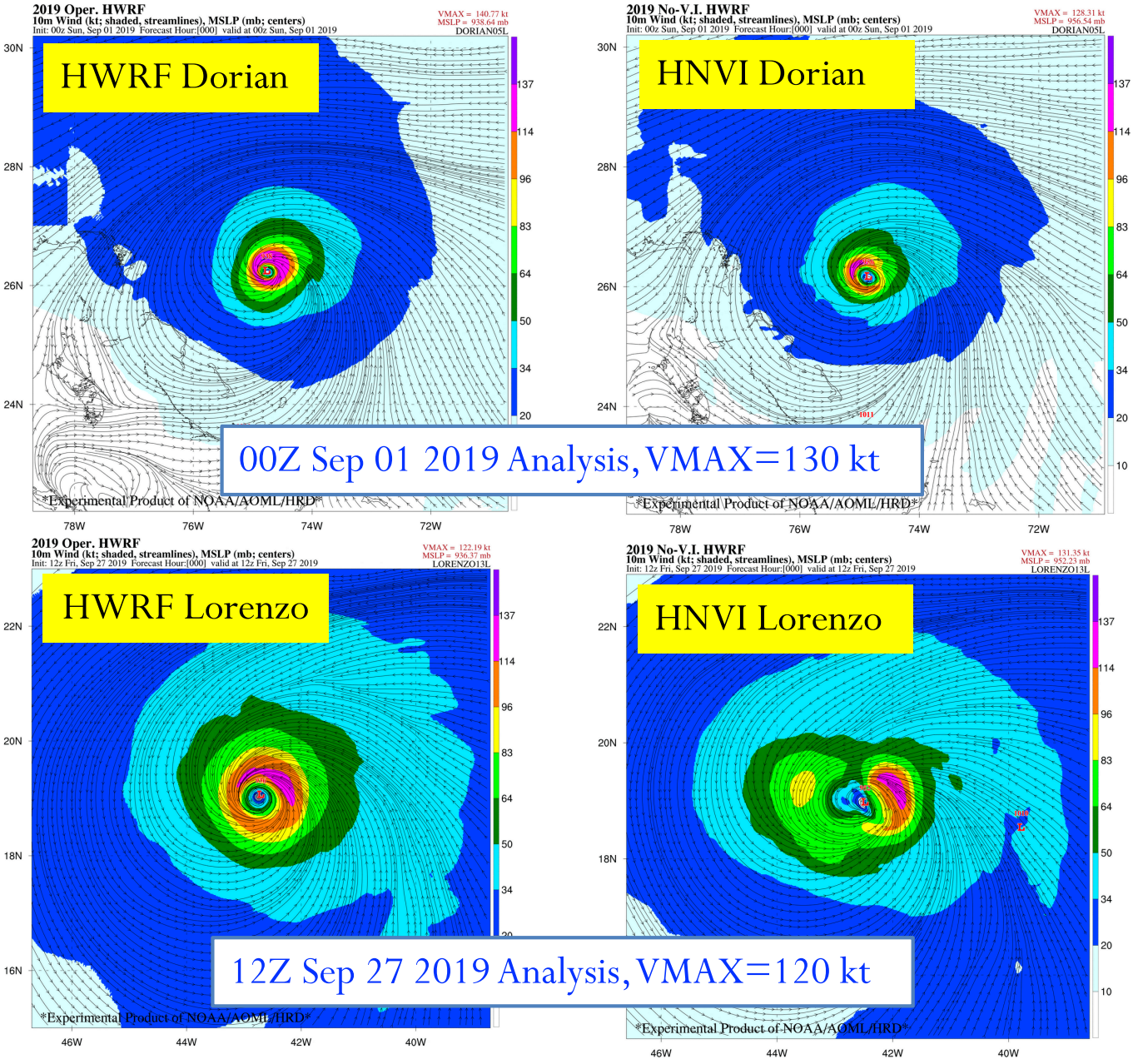








HNVI Analyses Benefit from Inner-core Data



Summary and Outlook

- Small increase in absolute mean track error across forecast lead times for HNVI.
- Short-term intensity forecast (t<24h) degraded in HNVI, but later lead times were comparable or better than HWRF.
- HNVI performed well in Dorian, but struggled in Lorenzo.
  - Hypothesis: Lack of Lorenzo inner-core data degraded the HNVI analyses. Data denial experiments in Dorian needed.
- HNVI likely would benefit from a GSI-based vortex relocation algorithm that draws data from a synthetic vortex. This would especially benefit HNVI when no inner-core data are present.