2019 Basin-scale HWRF (HWRF-B)  
An HFIP Real-Time Demonstration Project on WCOSS

PRELIMINARY RESULTS FOR  
HURRICANE DORIAN (AL052019)

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HWRF-B configuration is identical to HWRF, except for:

1. Large, static outermost domain that covers NATL, EPAC, and CPAC
2. Multiple sets of movable multi-level nests
3. RTOFS initialization for POM
4. No TDR-based hybrid data assimilation
Track and Intensity Verification for DORIAN (HWRF-B vs. HWRF)

- HWRF-B has lower track errors than HWRF at 24-96 h
- HWRF-B has lower absolute intensity errors at 48-120 h
- HWRF-B intensity bias is improved at 12-120 h
Track and Intensity Skill Verification for DORIAN (HWRF-B vs. HWRF)

- Ignore skills at 0-h
- HWRF-B track is more skillful than HWRF from 24-84 h
- HWRF-B intensity is more skillful than HWRF from 48-120 h
  - Degradation at earlier lead times may be related to the lack of hybrid DA in HWRF-B
Along-Track and Cross-Track Verification for DORIAN (HWRF-B vs. HWRF)

- Along-track errors are very similar for HWRF-B and HWRF.
- HWRF-B cross-track errors are lower than HWRF at most lead times.
Wind Radii Verification for DORIAN (HWRF-B vs HWRF)

- Radius of maximum wind and 34KT radius errors for HWRF-B are better than HWRF, especially at later lead times.
- 64KT radius errors are comparable for HWRF-B and HWRF
Lifetime Track Forecasts for DORIAN (HWRF-B vs. HWRF)

- HWRF-B was **better** than HWRF near the Greater Antilles
  - Fewer forecasts with Hispaniola landfall
  - Implications for intensity forecasts

- HWRF-B and HWRF both had a **left bias** near FL
  - Resulted in more FL landfall forecasts for both models
  - More forecasts were offshore for HWRF-B
HWRF-B was better than HWRF during the critical intensification period.

HWRF had more weaker systems due to interaction with the Greater Antilles.

Both HWRF-B and HWRF topped out near 125 kt.

- Both missed the maximum intensity.
HWRF-B intensity and 10m wind structure is **more realistic** than HWRF

- **BEST:** VMAX = 130 kt, PMIN = 941 mb
- **HWRF-B:** VMAX = 115 kt, PMIN = 947 mb
- **HWRF:** VMAX = 50 kt, PMIN = 999 mb
Deep-layer shear is 10-15 kt weaker associated with the ULL to the west of Dorian.

Dorian location differences may be associated with subtle steering flow differences as well.
HWRF-B is **more aligned up to 400 mb** than HWRF.

HWRF has a **more distinct tilt to the SE** up to 400 mb.
HWRF-B has an anticyclone over Dorian and overall weaker shear than HWRF.

HWRF is still contending with shear associated with the ULL to the west.
DORIAN Case Study: 2019082706
(Vortex Structure @ 96 h)

- HWRF-B is *vertically aligned*.
- HWRF still exhibits a *tilted* vortex structure.
Track and Intensity Skill Verification for 2019 NATL (HWRF-B vs. HWRF)

- HWRF-B track is **more skillful** than HWRF from 24-120 h
  - > 10% improvement on Days 4-5

- HWRF-B intensity is **more skillful** than HWRF from 48-120 h
  - > 10% improvement on Days 3-4
  - Degradation at earlier lead times may be related to the lack of hybrid DA in HWRF-B
HWRF-B track is *comparable* to HWRF at most lead times.

HWRF-B intensity is *less skillful* than HWRF from 0-48 h (< 10%).

HWRF-B intensity is *more skillful* than HWRF at 96 h and 120 h (> 10%).
Track and Intensity Verification for DORIAN (HWRF-B vs. HWRF)

- EGRG was the best track model over most lead times
- HWRF-B was the best intensity model over most lead times

**These results do not include HAFA or HAFB**
HWRF-B versus HWRF composite intensity

Tropical Cyclone DORIAN (2019)

Maximum Wind (Kt) vs Days

- OBSR
- HWRF-B

Tropical Cyclone DORIAN (2019)

Maximum Wind (Kt) vs Days

- OBSR
- HWRF