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Zhang, and EMC HWRF team

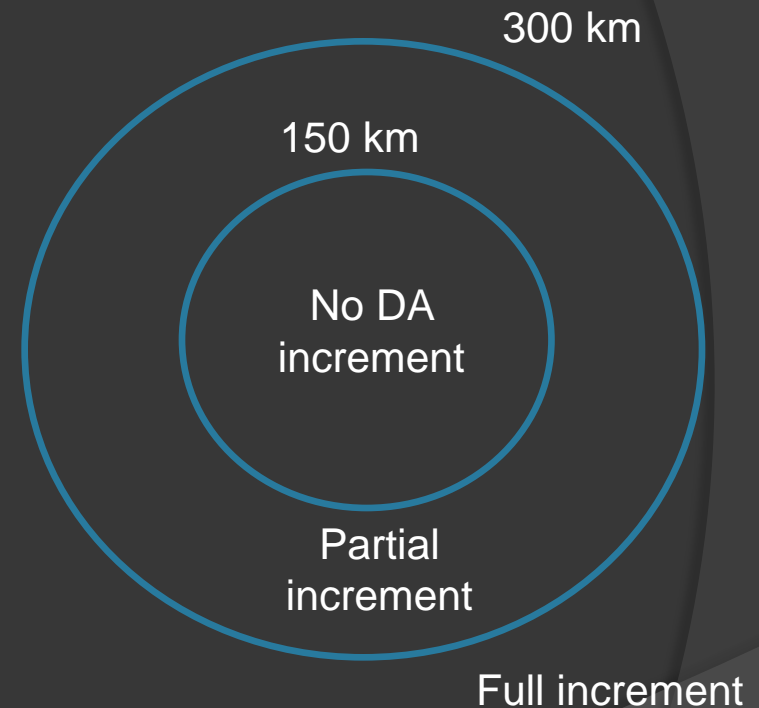
2016-2017 HWRF DA TESTING & PLANS

Outline

- Background & system upgrades
- Preliminary 2017 results
- Planned testing
- Long-term route

Background: Blending

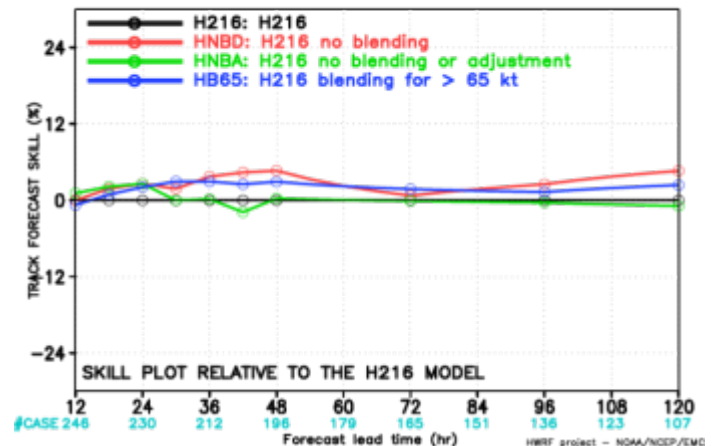
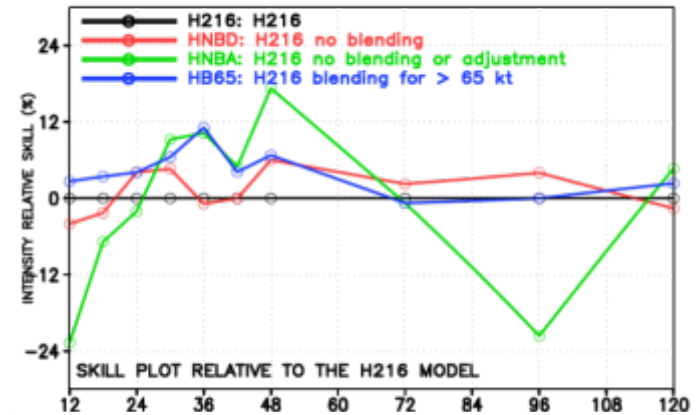
- Spindown can occur with GSI increments in strong storms
- Vortex init (first guess) gives less spindown
- Blending zero's GSI increments near center for $V_{max} > 50$ kt (H216)



“Blending” initialization
below 600 hPa

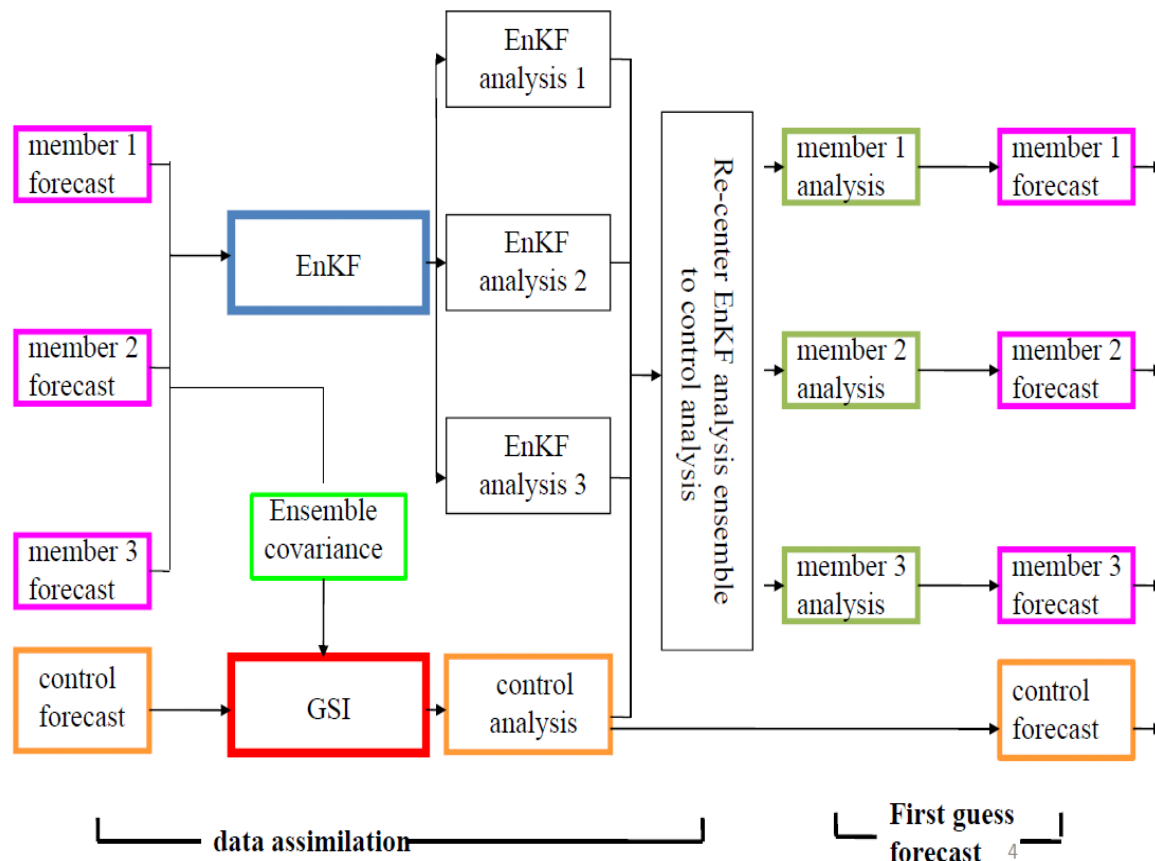
Upgrades: Blending & Vortex Init

- Vortex adjustment still necessary for track and intensity
- Blending is a double-edged sword
- Increasing blending threshold from 50 (H216) to 64 kt improves AL intensity & EP track



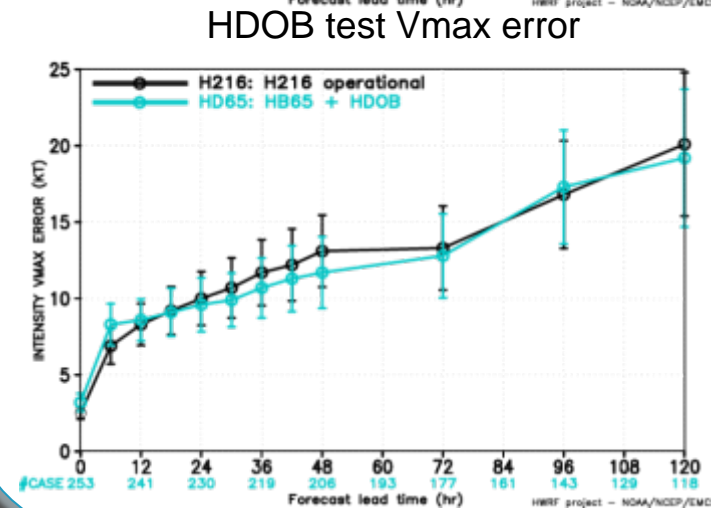
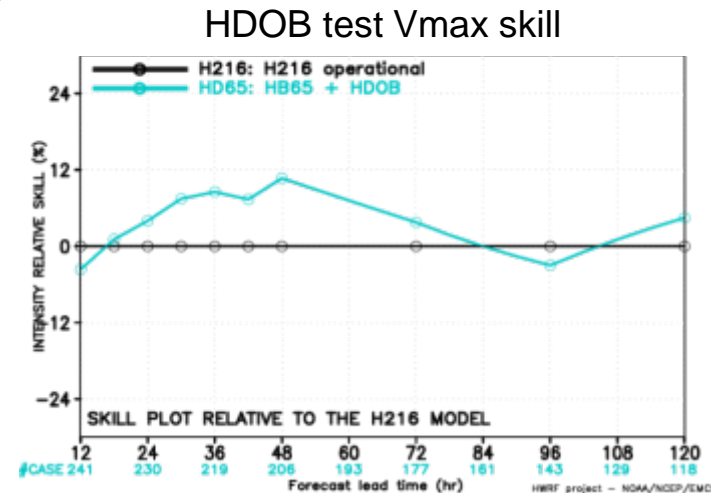
Upgrades: New DA System

Hybrid EnKF-GSI DA system: 2 way coupling



Upgrades: New data

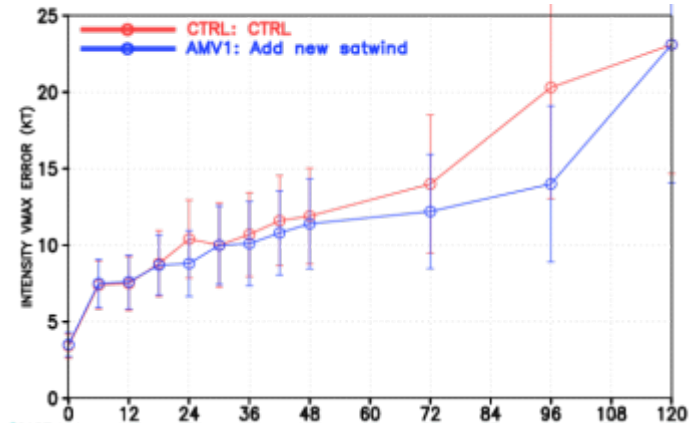
- Testing done for FL u,v,t,q, no SFMR
- Adding FL data significantly improves intensity
- No impact on track
- Tentatively included in H217



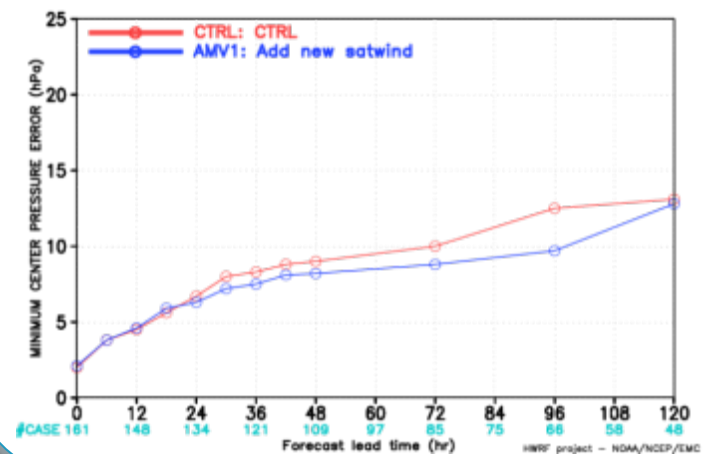
Upgrades: New data

- Initial tests by CIMSS of new AMVs: SWIR, VIS, CAWV
- Initial results are **very good** for intensity
- Little impact on track
- Tentatively included in H217

AMV test Vmax error



AMV test SLP error

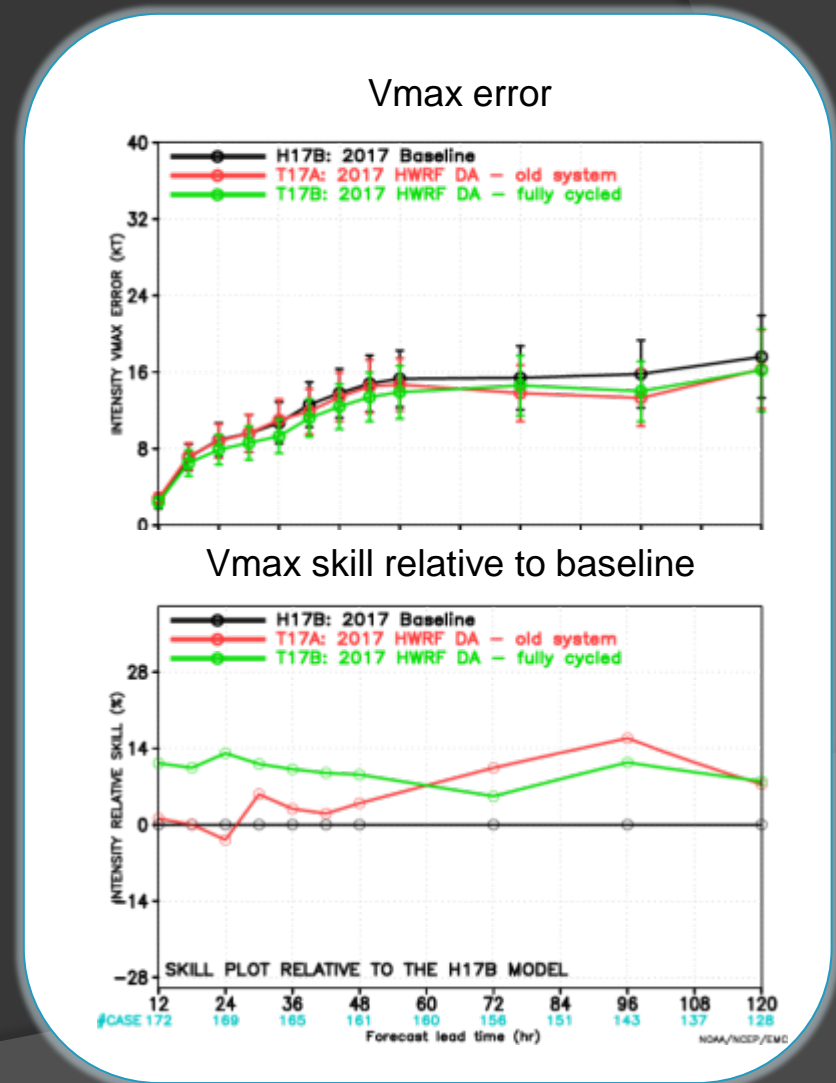


Outline

- ⦿ Background & system upgrades
- ⦿ Preliminary 2017 results
- ⦿ Planned testing
- ⦿ Long-term route

Preliminary 2017 results

- Increasing blending threshold + adding data (red) decreases long-term error
- DA system upgrade (green) decreases short-term errors
- Little/no track impact

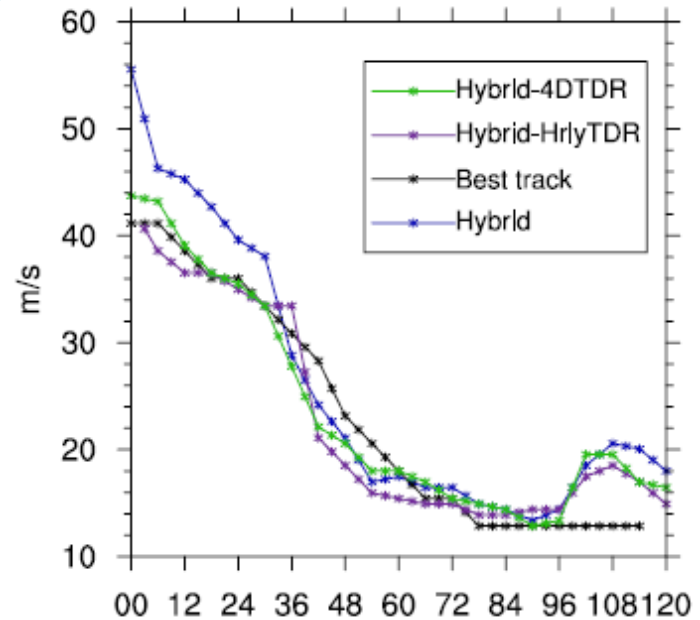


Outline

- ⦿ Background & System upgrades
- ⦿ New data
- ⦿ **Planned testing**
- ⦿ Long-term route

Planned tests: Hourly cycling

- Results from OU system show hourly cycling helps with inner core balance
- Current priority is to develop/test this for operational HWRF
- This should appeal to researchers as well

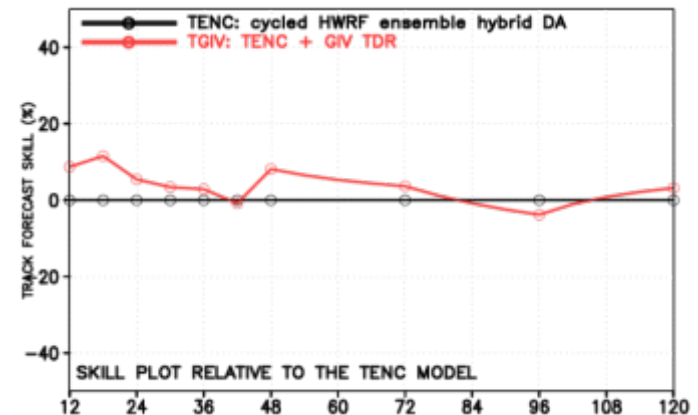


Vmax from the 12Z17 cycle of Edouard in the OU hybrid 3DVar and 4DVar systems. Courtesy Xuguang Wang, HFIP partner.

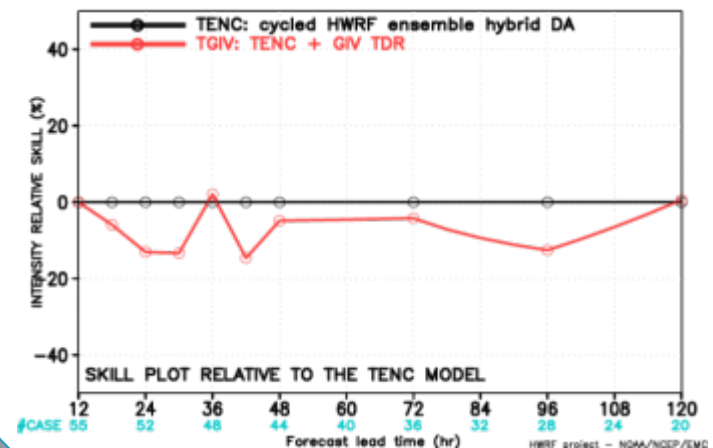
Planned tests: G-IV TDR

- Initial testing being performed
- Initial results are mixed (slightly better track; worse intensity)
- More testing needed (EMC/HRD coordination)

G-IV TDR test track skill



G-IV TDR test Vmax skill



Outline

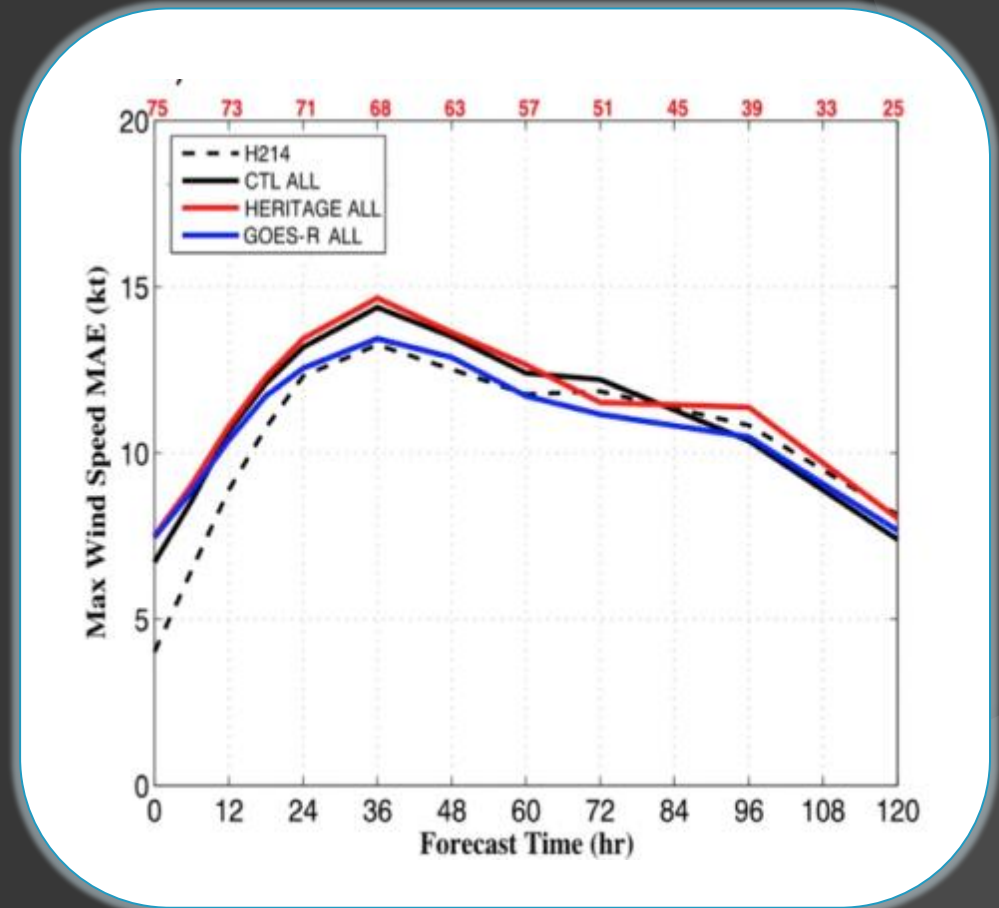
- ⦿ Background & System upgrades
- ⦿ New data
- ⦿ Planned testing
- ⦿ Long-term route

Long-term route

- ⦿ Continue developing hybrid system > 4D-Hybrid w/ IAU
- ⦿ Replace vortex initialization with self-consistent DA of something derived from TC Vitals
- ⦿ Update condensate (and w?) with each cycle
- ⦿ Assimilation of new data like GOES-R AMVs, cloudy radiances, inner-core dropsondes, etc
- ⦿ Coupled atmosphere-ocean DA

Long-term route

- Velden et al assimilated GOES-R-like AMVs in HWRF (H214)
- Positive impact on intensity and bias
- For track benefits, data needs to be in upstream model (GFS)



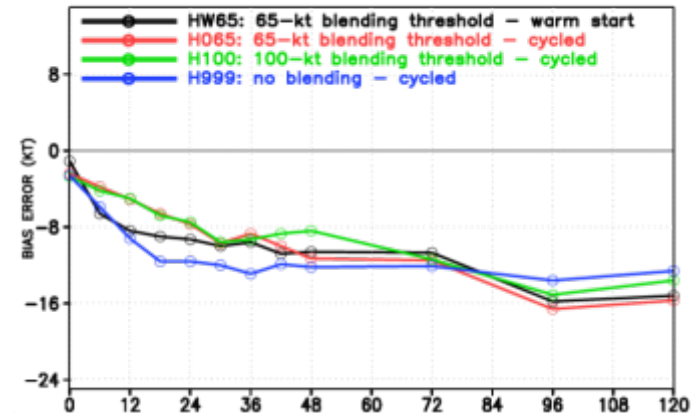
Conclusions

- ⦿ HWRF DA is undergoing dramatic advancements
- ⦿ We will be using more of the available data
- ⦿ Both of the above factors should contribute to intensity improvement in particular
- ⦿ Long term plans address ongoing issues (e.g., spindown, bias) and allow for greater data usage

Upgrades: New DA System

- Without blending, even new DA system suffers spindown
- With blending, new system outperforms old system
- Appropriate blending threshold for new system being tested

Matthew Vmax bias



Gonzalo Vmax bias

