

What's New and What's Next

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National Hurricane Center

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Outline

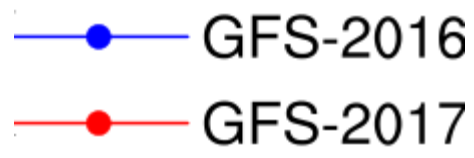
- * Model Changes
 - * GFS
 - * HWRF
 - * HMON replaces GFDL
- * Vortex Data Message
- * 6/7-day tropical cyclone forecasts

GFS 2017 Upgrades

- * Implementation planned for late June.
- * Mainly structural, rather than science changes. Even so, tropical cyclone forecasts were degraded.
- * NCEP/EMC found some errors in the vortex relocation algorithm; fixes appear to mitigate the degradations.
- * Overall now expect some modest improvements in model performance.
- * GFS will assimilate dropwindsonde data from the Global Hawk UAV
- * Last GFS upgrade until 2019, when the fundamental framework of the model will change.

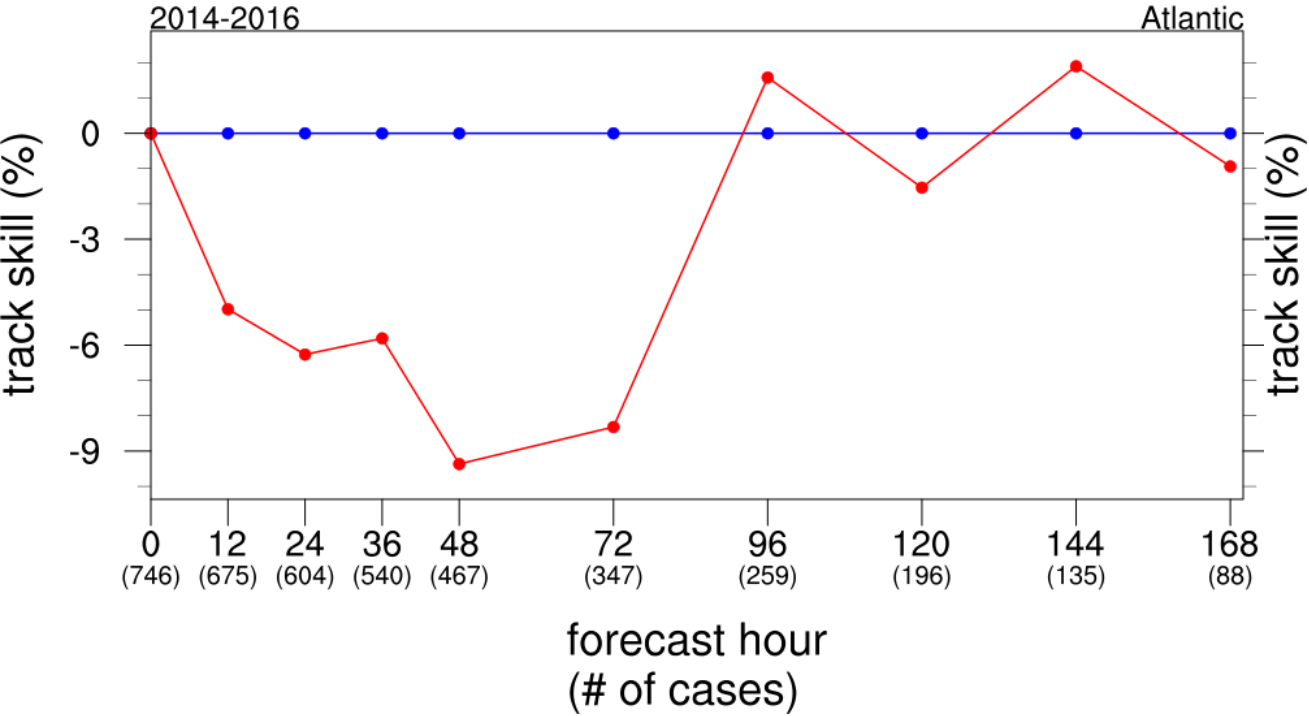
Track Skill 2014-2016

(Early Models)

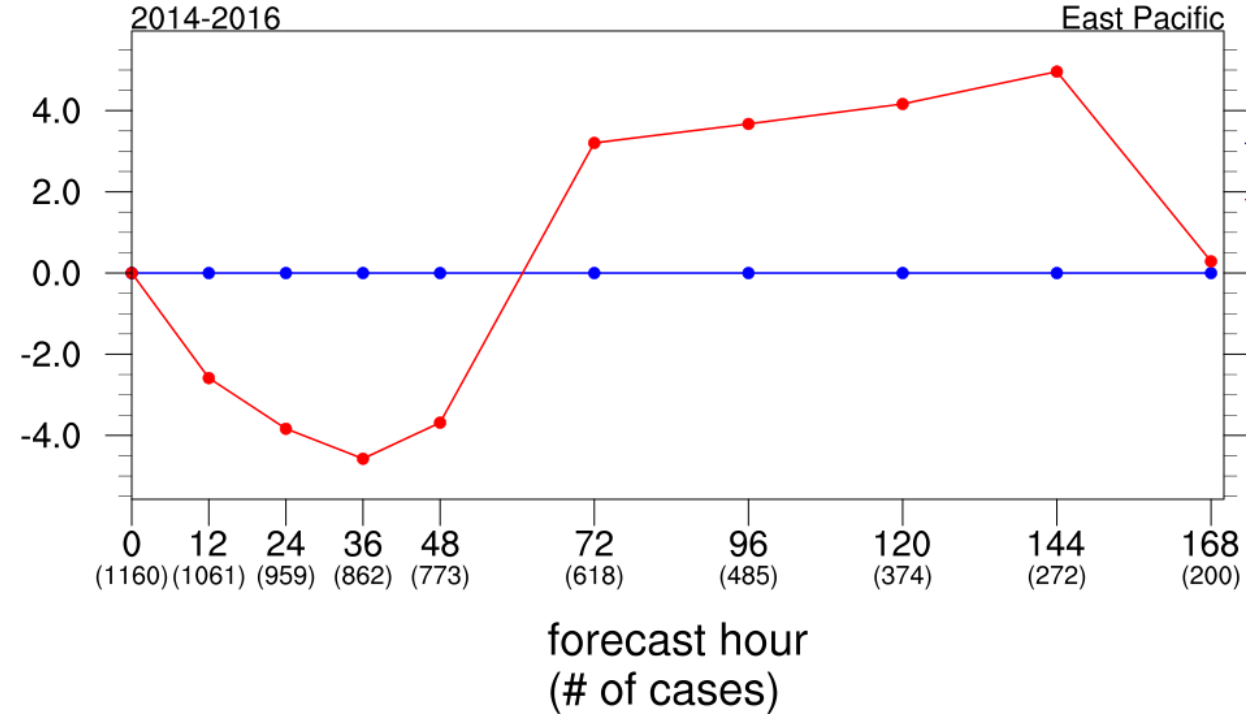


Skill relative to 2016 version of GFS

Atlantic



East Pacific

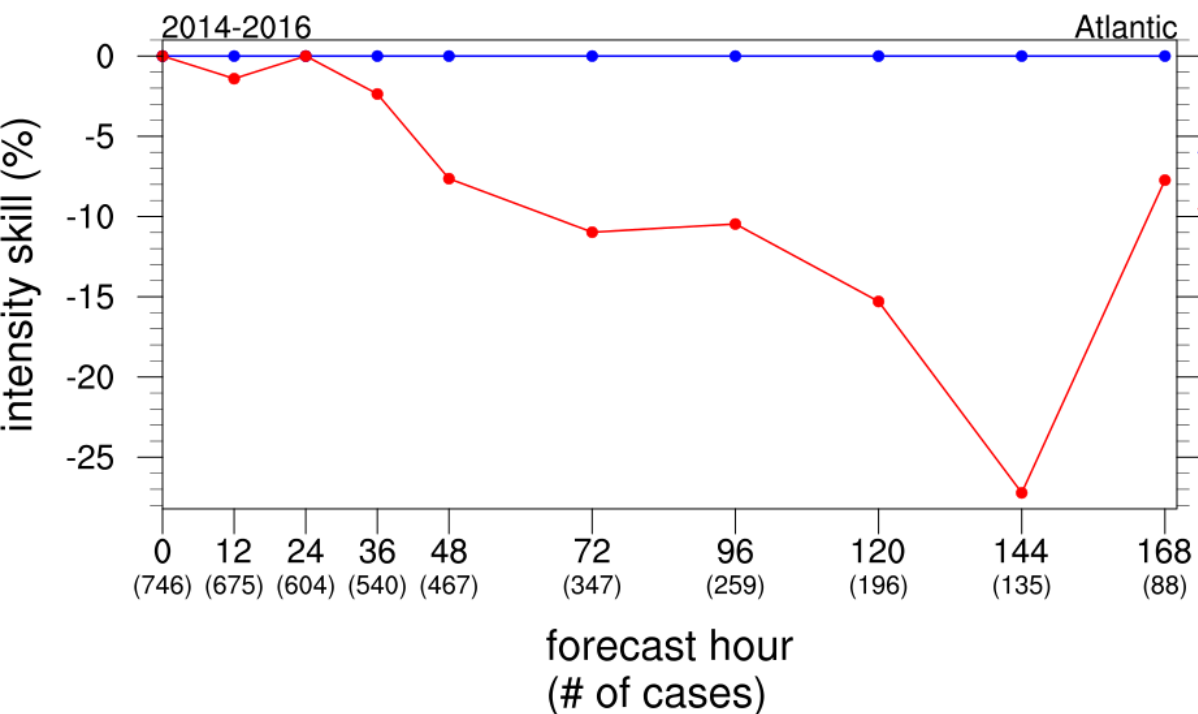


Intensity Skill 2014-2016 (Early Models)

—●— GFS-2016
—●— GFS-2017

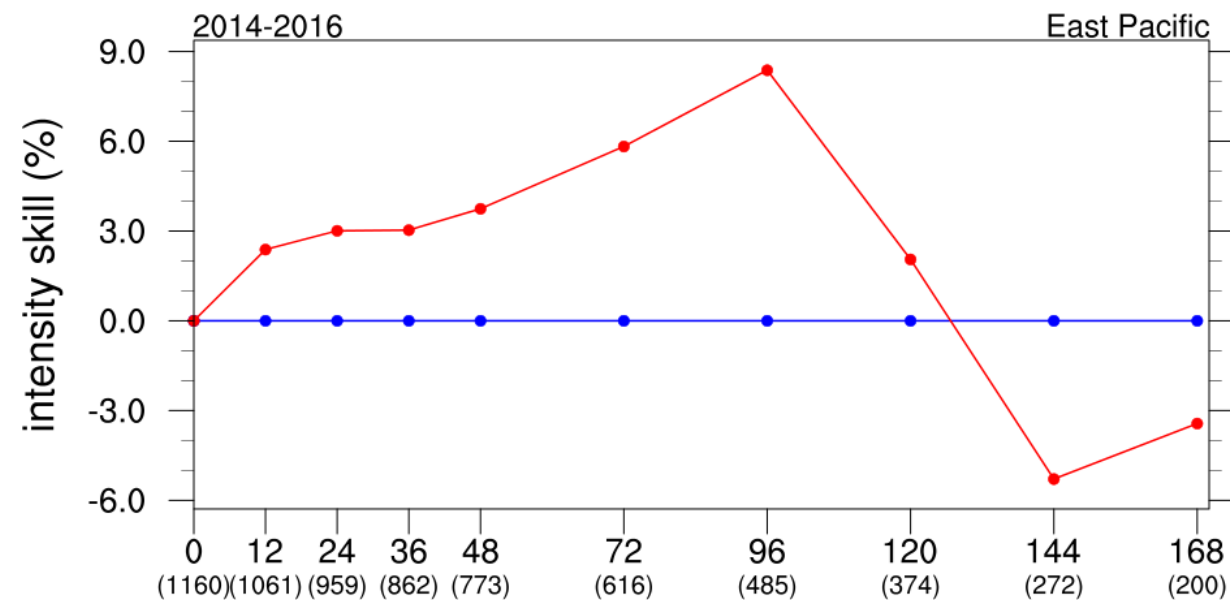
Skill relative to GFS-2016

Atlantic



forecast hour
(# of cases)

East Pacific

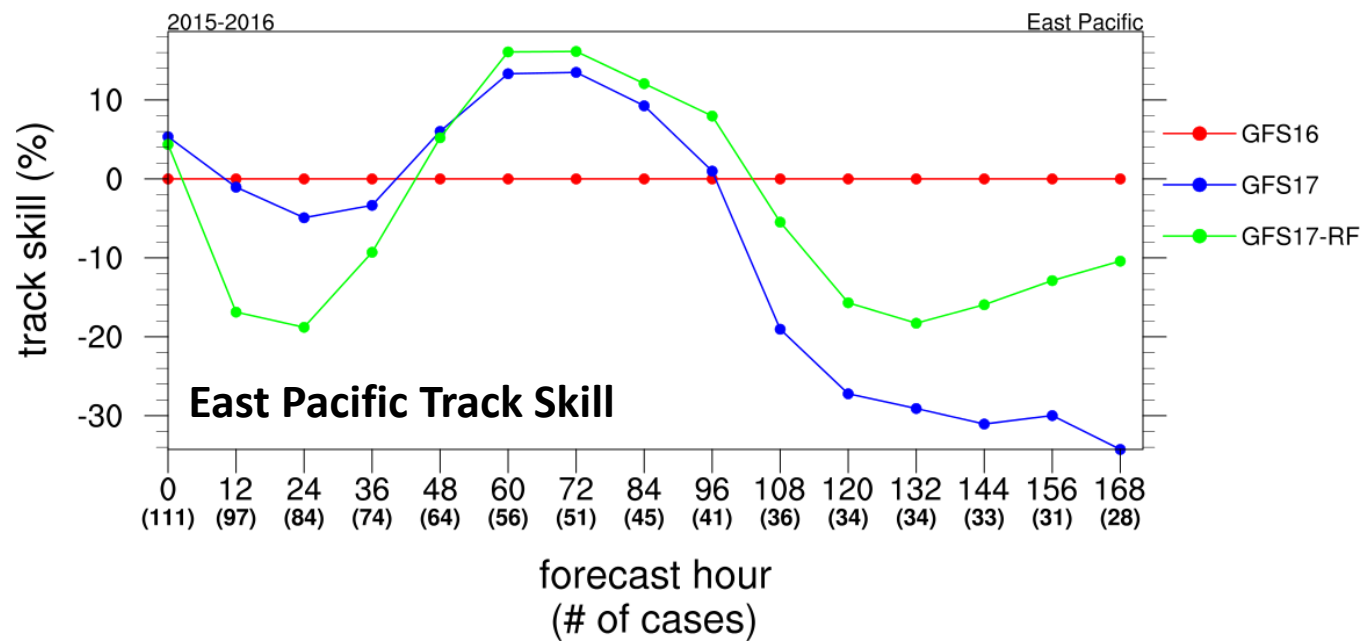
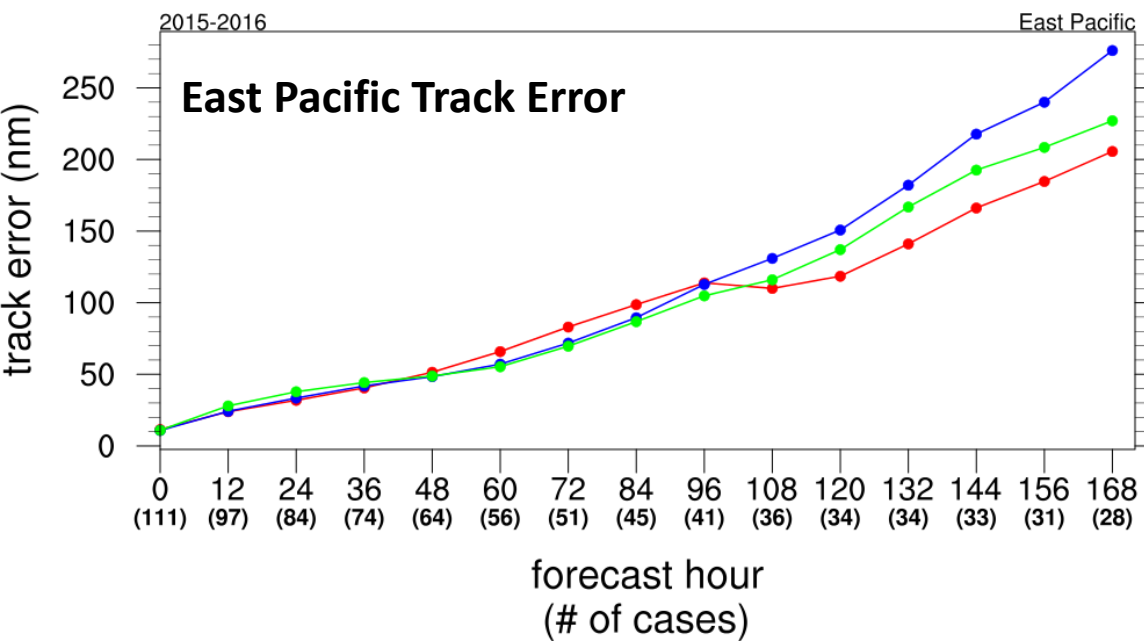
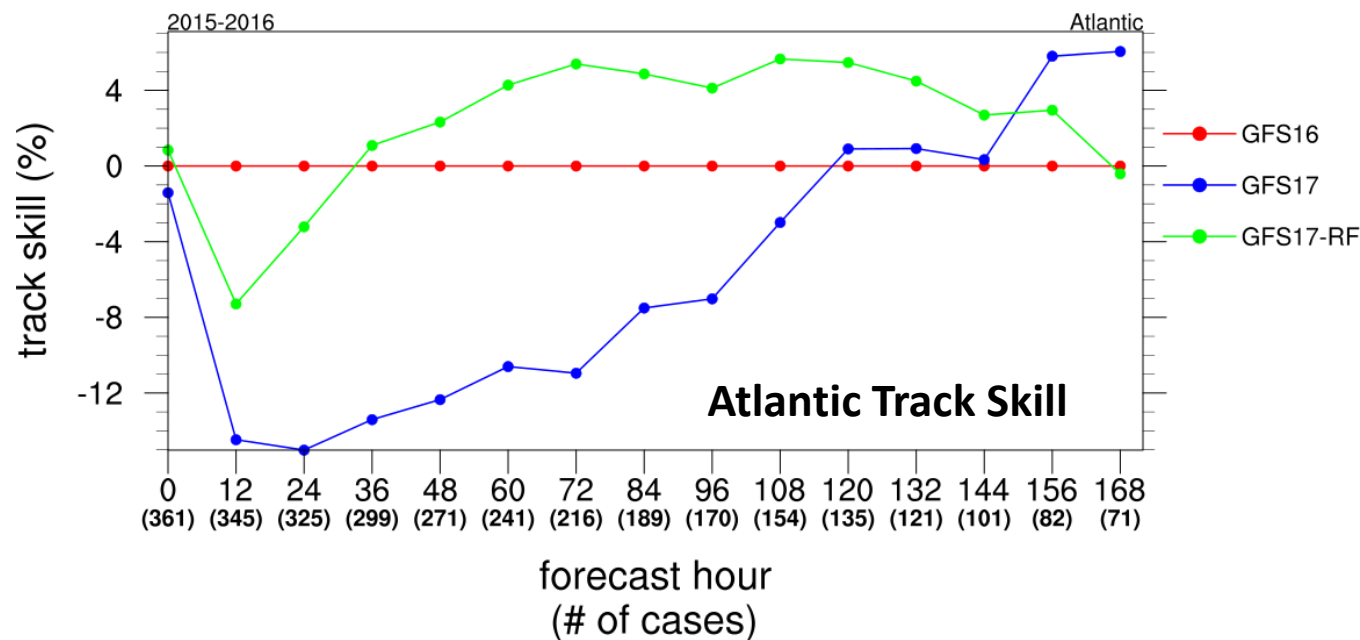
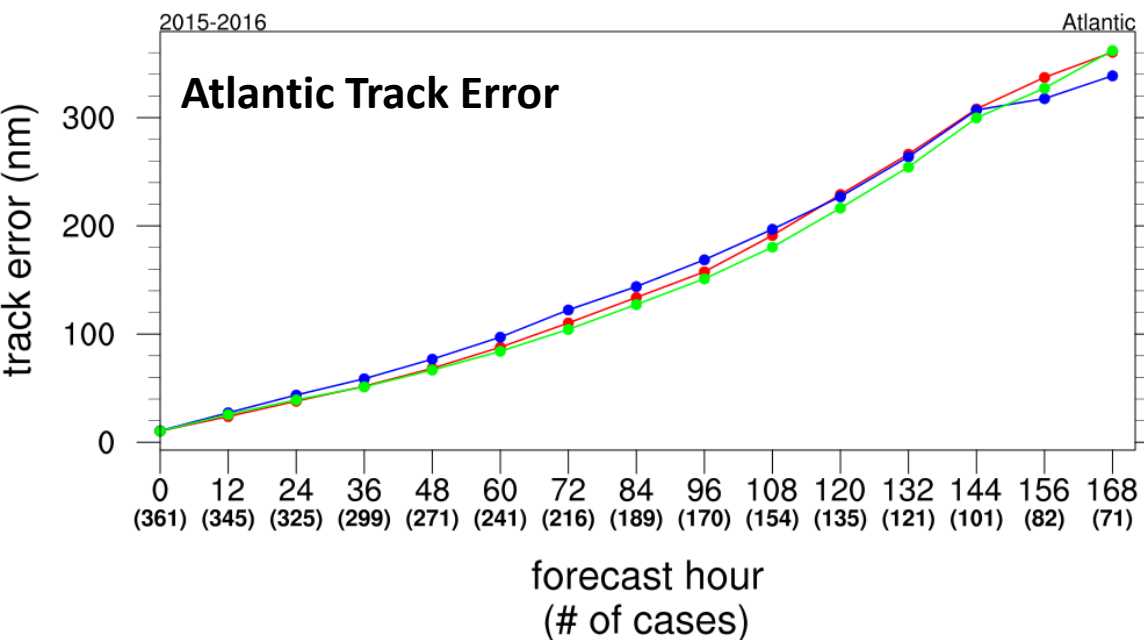


forecast hour
(# of cases)

Track

GFS16 – 2016 GFS :: **GFS17 – 2017 GFS** :: **GFS17-RF – 2017 GFS w/ vortex relocation fix**

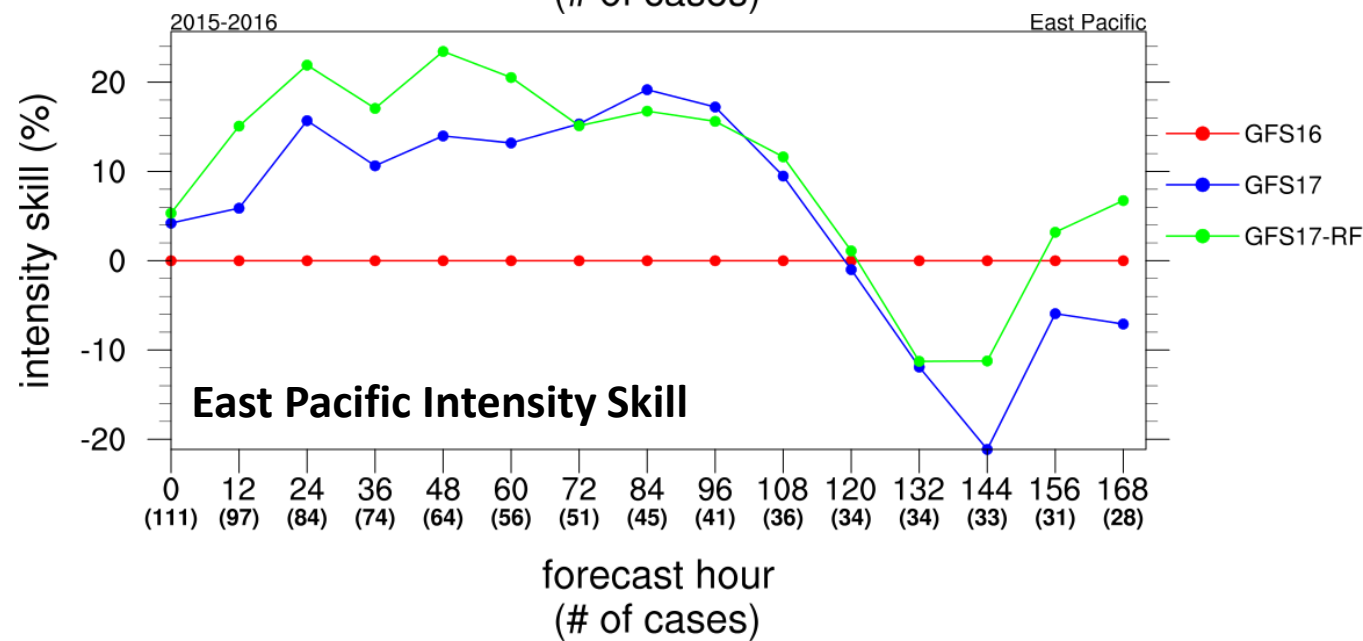
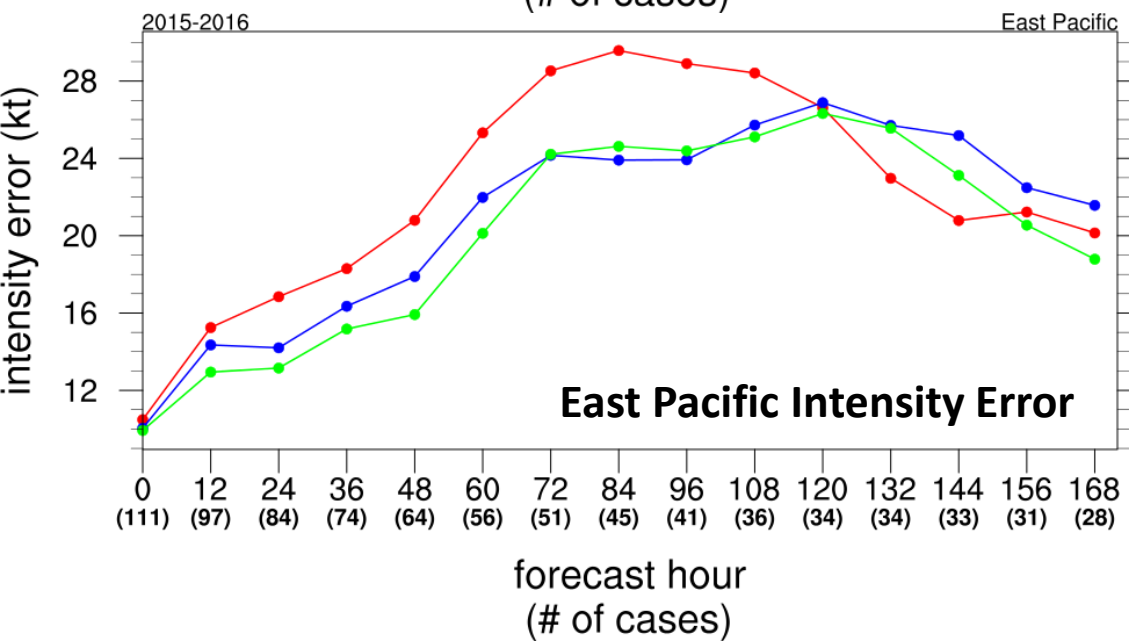
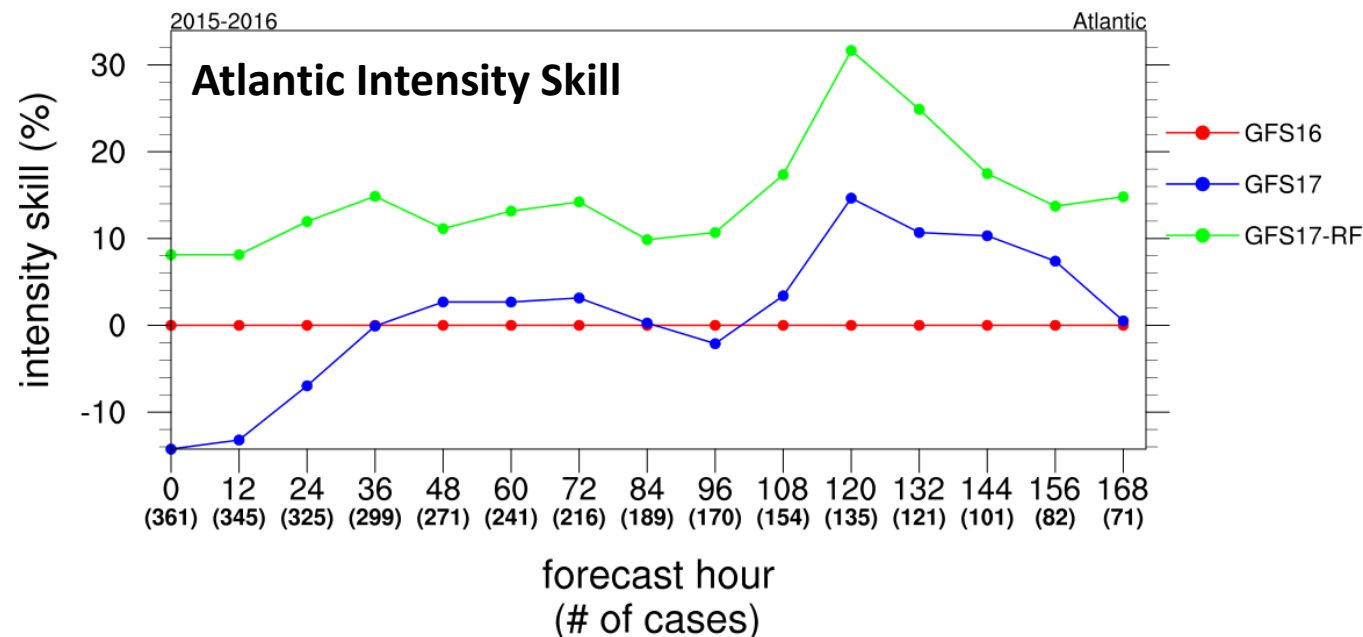
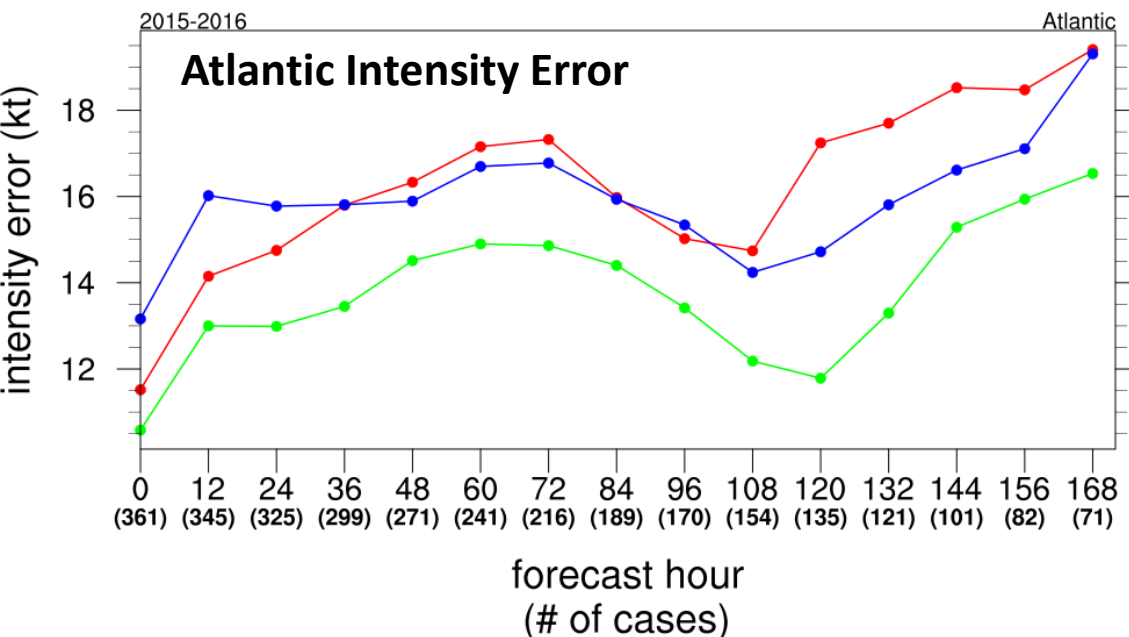
GFS 2015-2016



Intensity

GFS16 – 2016 GFS :: **GFS17 – 2017 GFS** :: **GFS17-RF – 2017 GFS w/ vortex relocation fix**

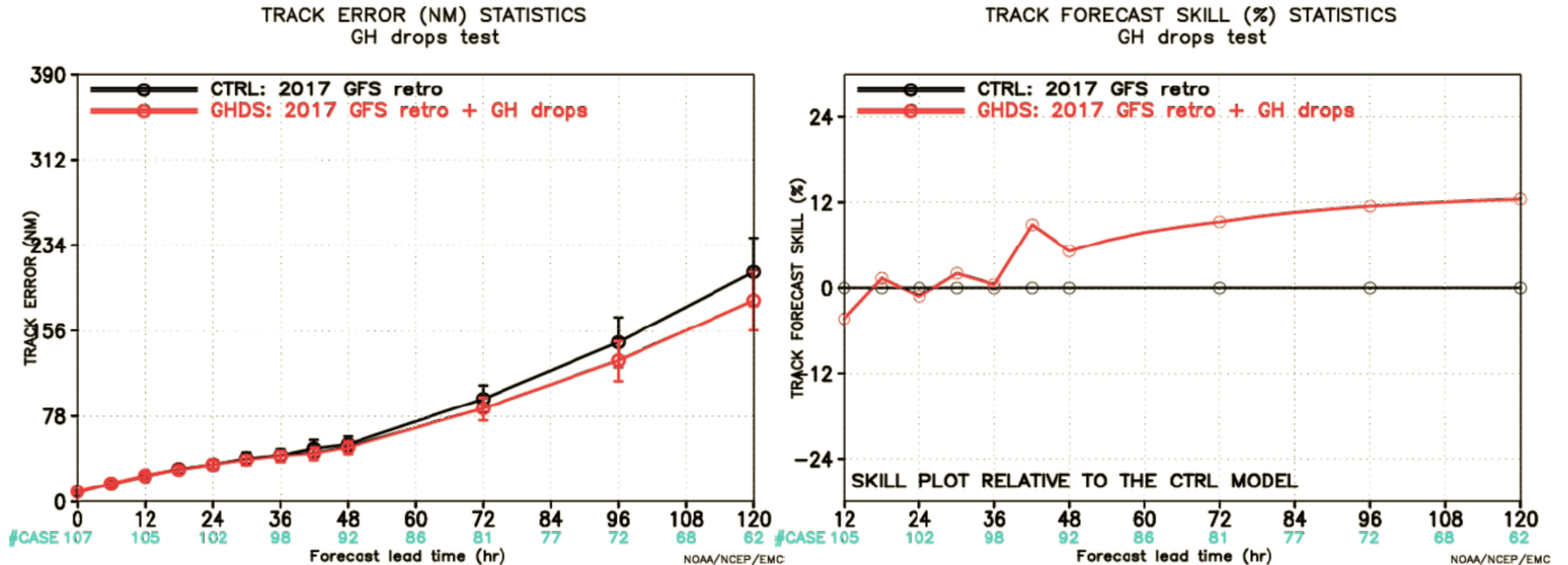
GFS 2015-2016



GFS: Positive impact of assimilating Global Hawk dropwindsondes

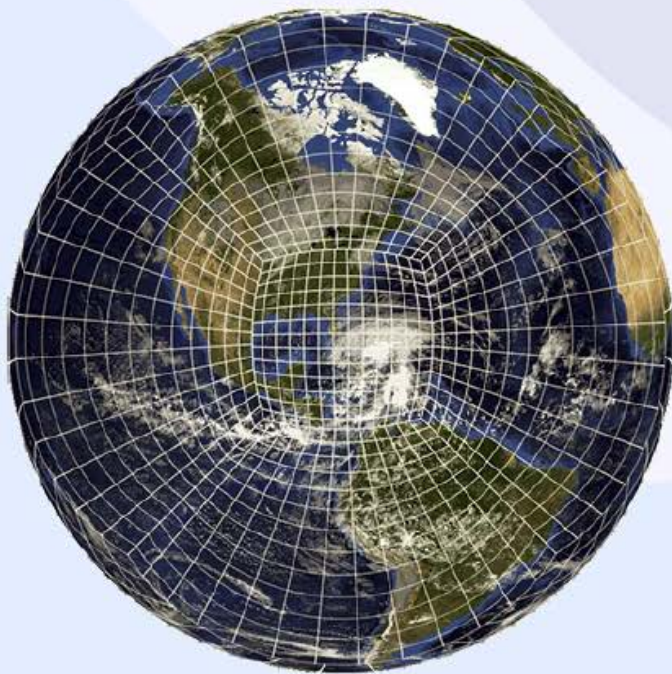
ATLANTIC

GH targeted storms: Gaston, Hermine, Karl, Matthew

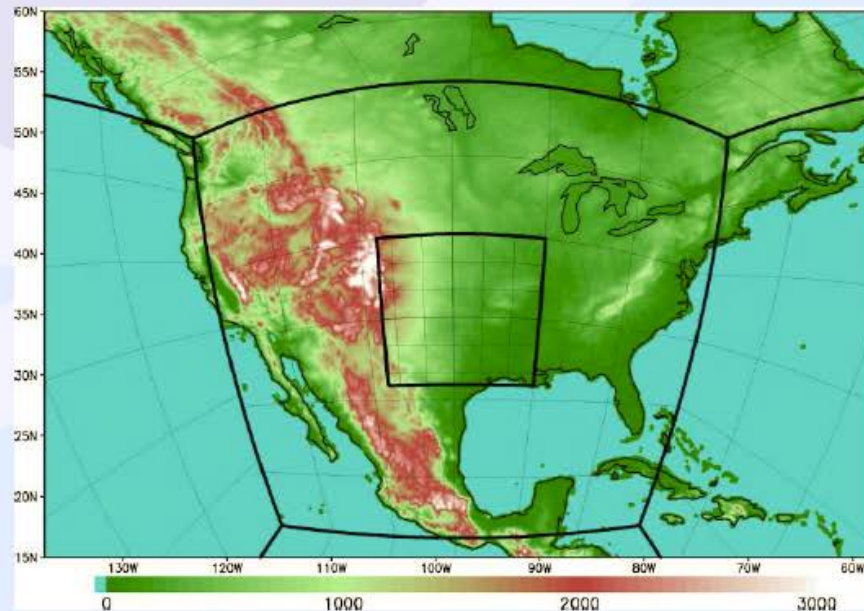


Grid refinement for higher-resolution (potential solution for hurricane forecasts)

FV³ supports both stretching and nesting for grid refinement
Development of two-way interactive moving nests for FV³ planned (AOML/GFDL/EMC Collaboration)



Grid stretching is simple and smooth



Grid nesting is efficient and flexible

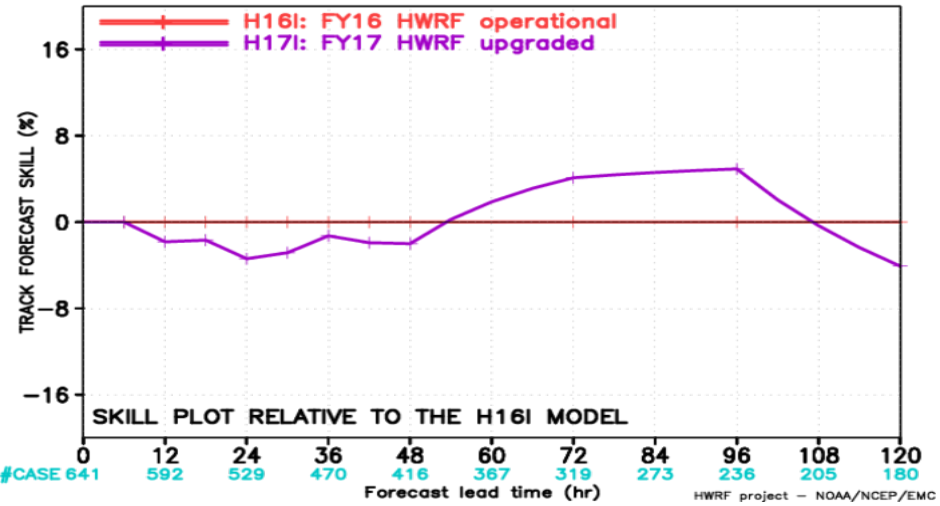
HWRF 2017 Upgrades

- * Implementation planned for early July.
- * Increases number of vertical levels from 61 to 75.
- * Upgrades to the models microphysics (representation of clouds/rain/snow).
- * Upgrade to the coupled ocean model.
- * Improved vortex initialization.
- * Assimilation of Global Hawk dropsondes, higher-frequency cloud and vapor motion vectors.

HWRF Track/Intensity Skill – Early Guidance

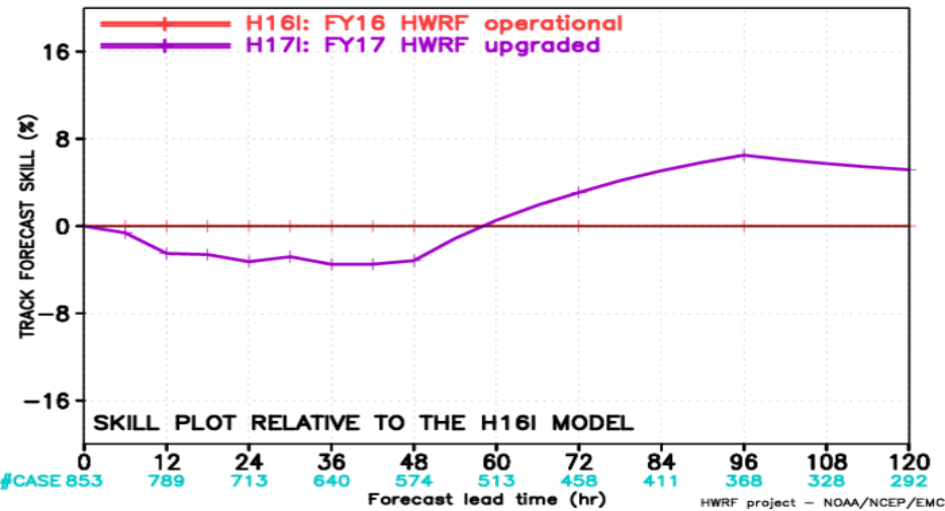
Track

HWRF FORECAST – TRACK FORECAST SKILL (%) STATISTICS
VERIFICATION FOR NATL BASIN 2014–2016



Atlantic

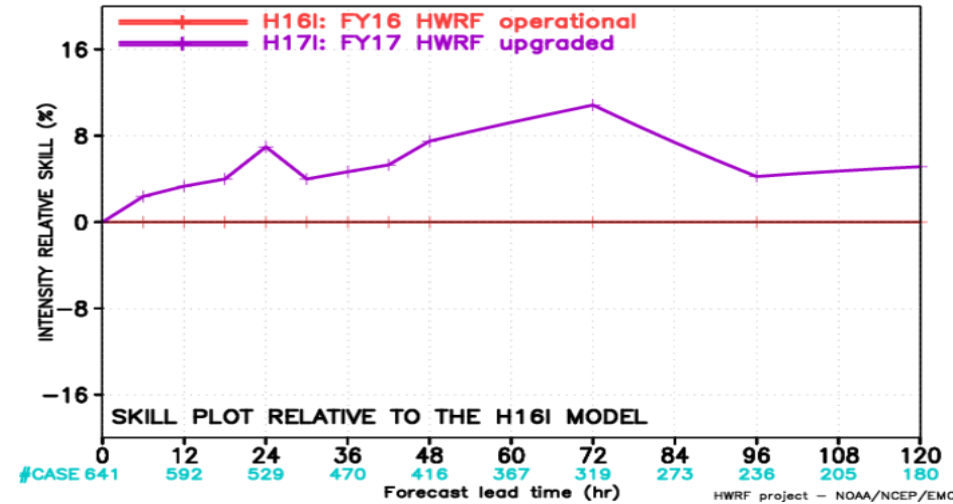
HWRF FORECAST – TRACK FORECAST SKILL (%) STATISTICS
VERIFICATION FOR EPAC BASIN 2014–2016



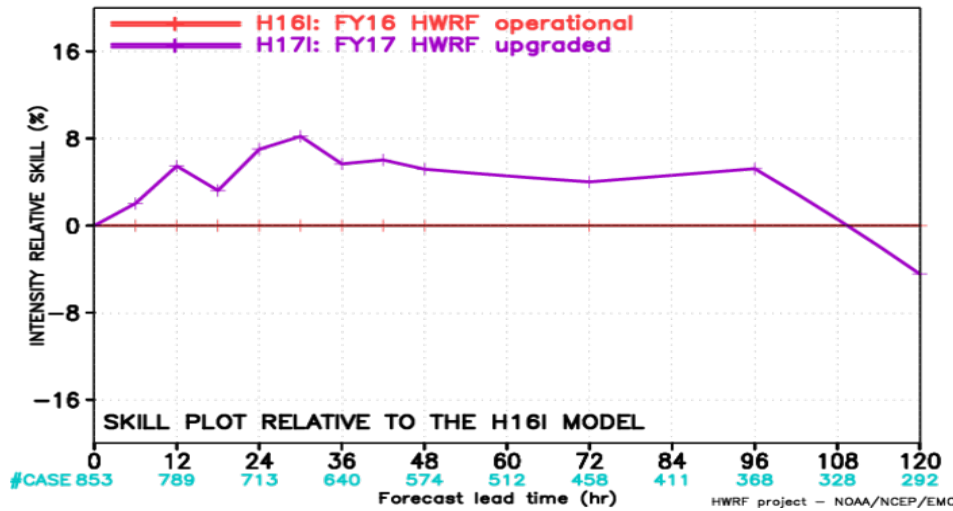
East
Pacific

Intensity

HWRF FORECAST – INTENSITY RELATIVE SKILL (%) STATISTICS
VERIFICATION FOR NATL BASIN 2014–2016



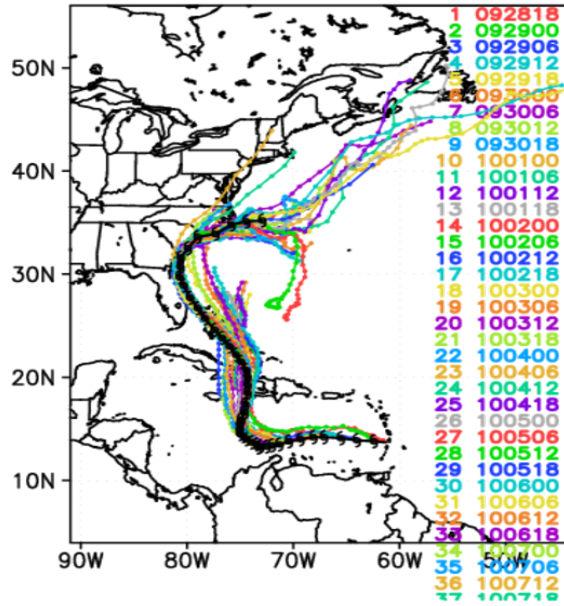
HWRF FORECAST – INTENSITY RELATIVE SKILL (%) STATISTICS
VERIFICATION FOR EPAC BASIN 2014–2016



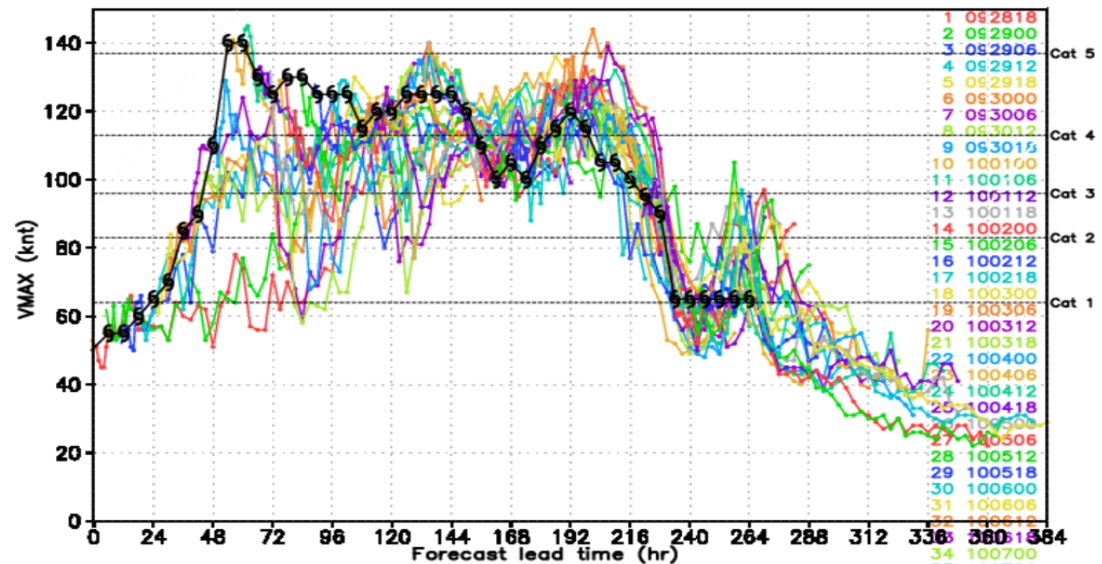
HWRF Matthew (2016) AL142016

H217

H217 forecast: MATTHEW (al142016)

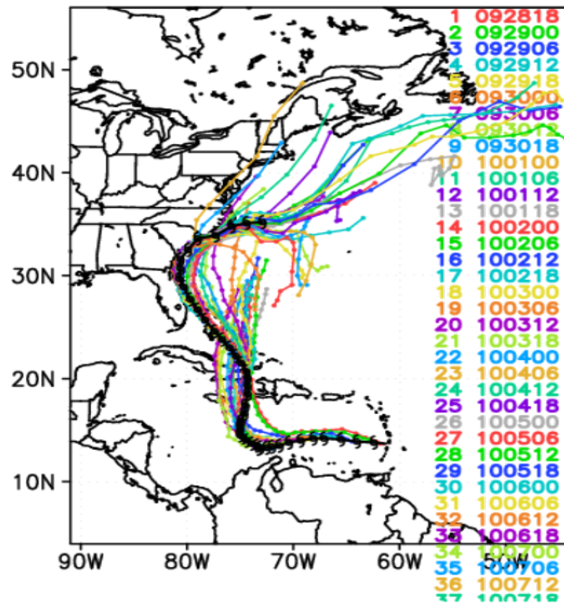


H217 forecast: MATTHEW (al142016)
Maximum 10-m wind time series

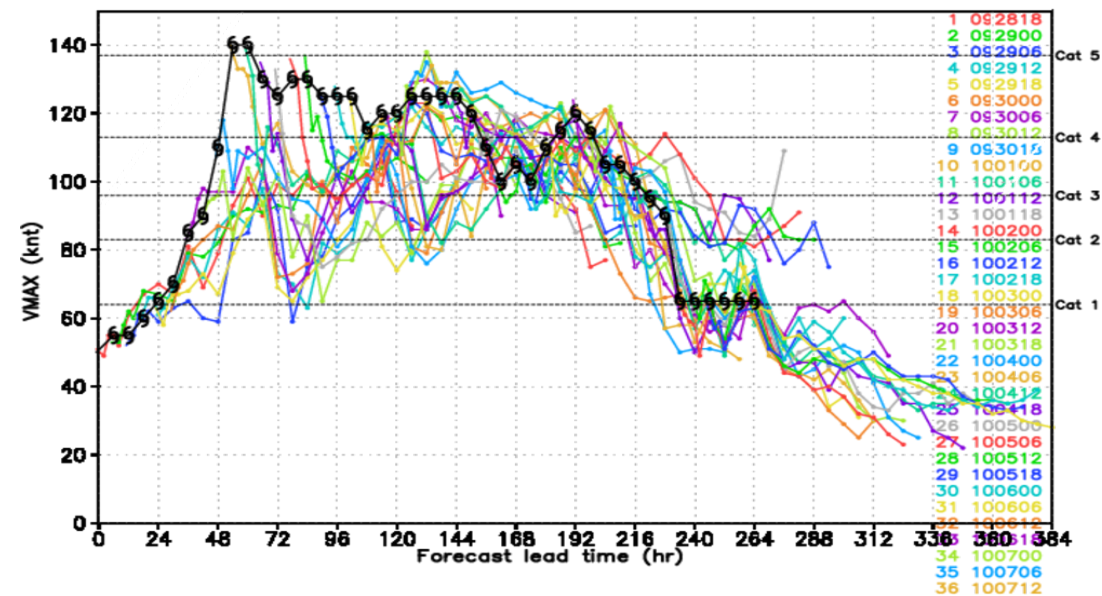


FY2016
HWRF

H216 forecast: MATTHEW (al142016)



H216 forecast: MATTHEW (al142016)
Maximum 10-m wind time series

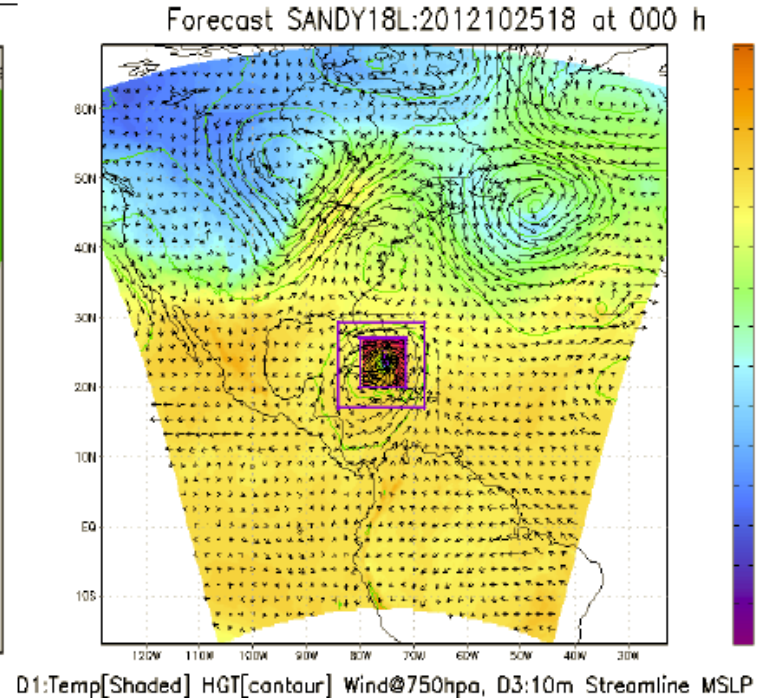
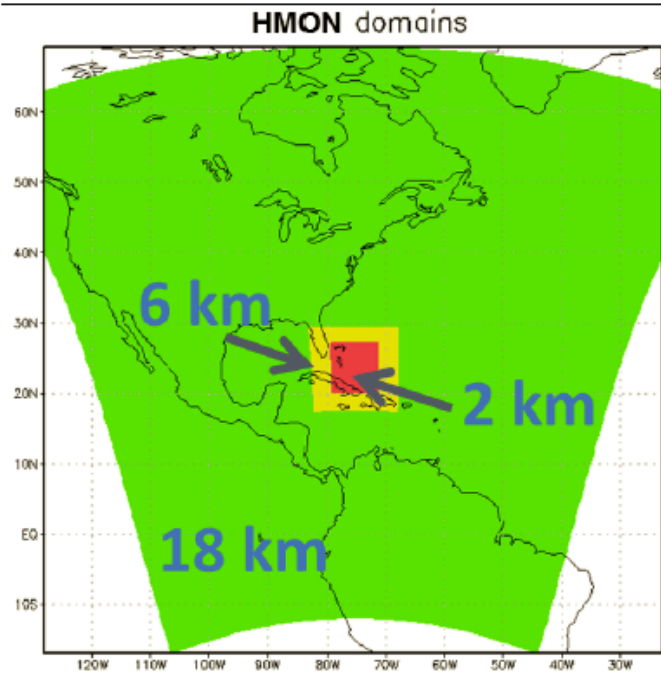


HMON

- * New regional model that replaces the GFDL model.
- * Scheduled for implementation with the GFS in late June.
- * Initial implementation will be un-coupled.
- * Shares a lot of physics with the HWRF.
- * NHC forecasters know next to nothing about how it's going to perform.



HMON: A New Operational Hurricane Model at NCEP replacing GFDL Hurricane Model



HMON: Hurricanes in a Multi-scale Ocean coupled Non-hydrostatic model

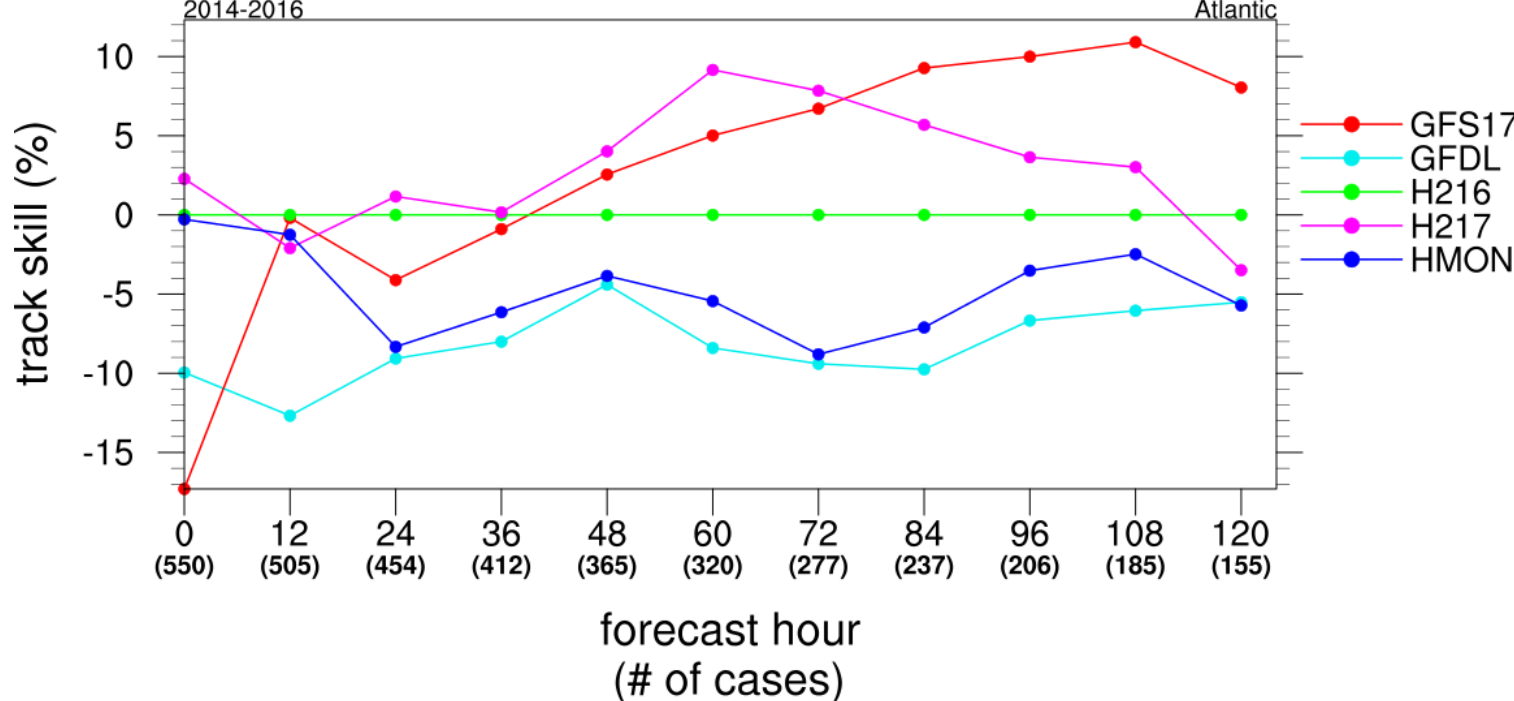
HMON: Implements a long-term strategy at NCEP/EMC for multiple static and moving nests globally, with one- and two-way interaction and coupled to other (ocean, wave, sea ice, surge, inundation, etc.) models using NEMS-NUOPC infrastructure.

HWRF/HMON

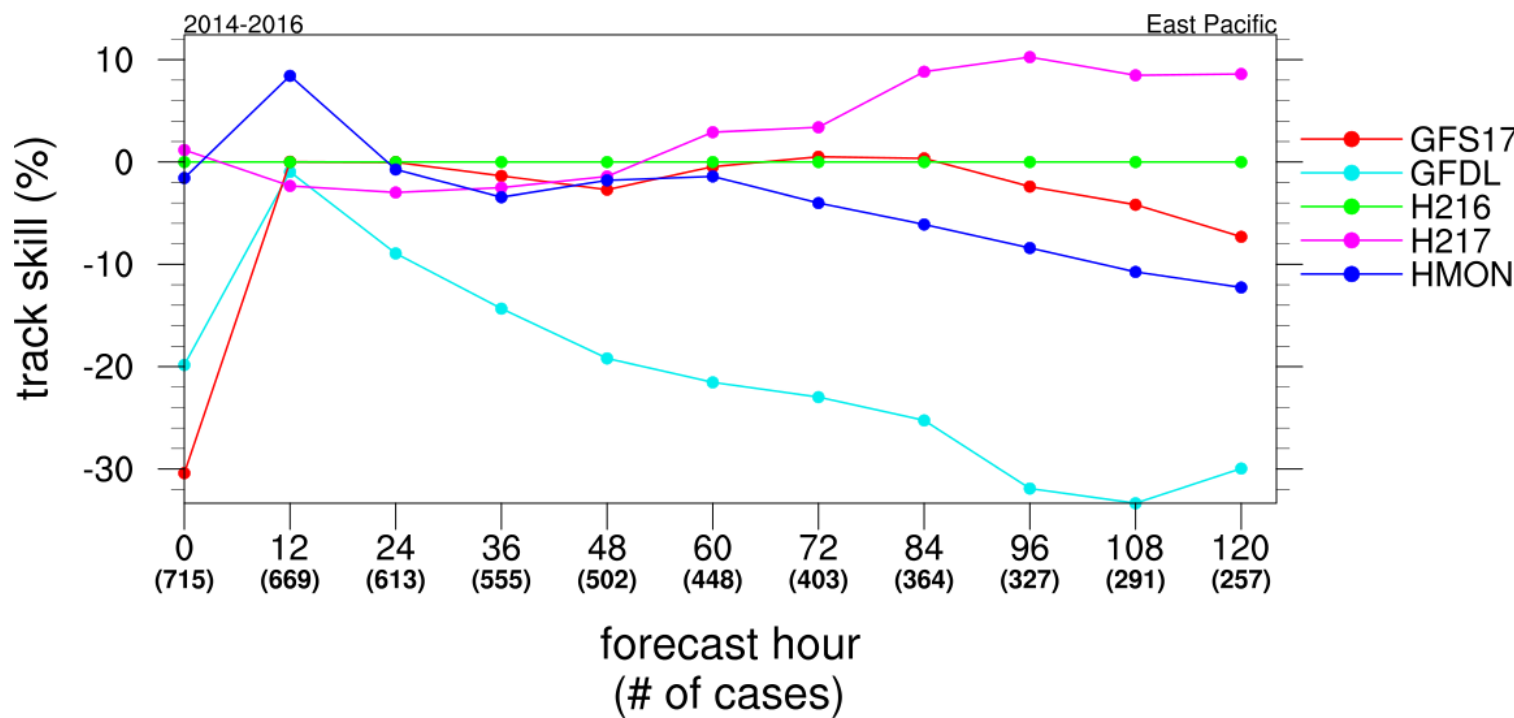
Track Skill



Atlantic



East Pacific

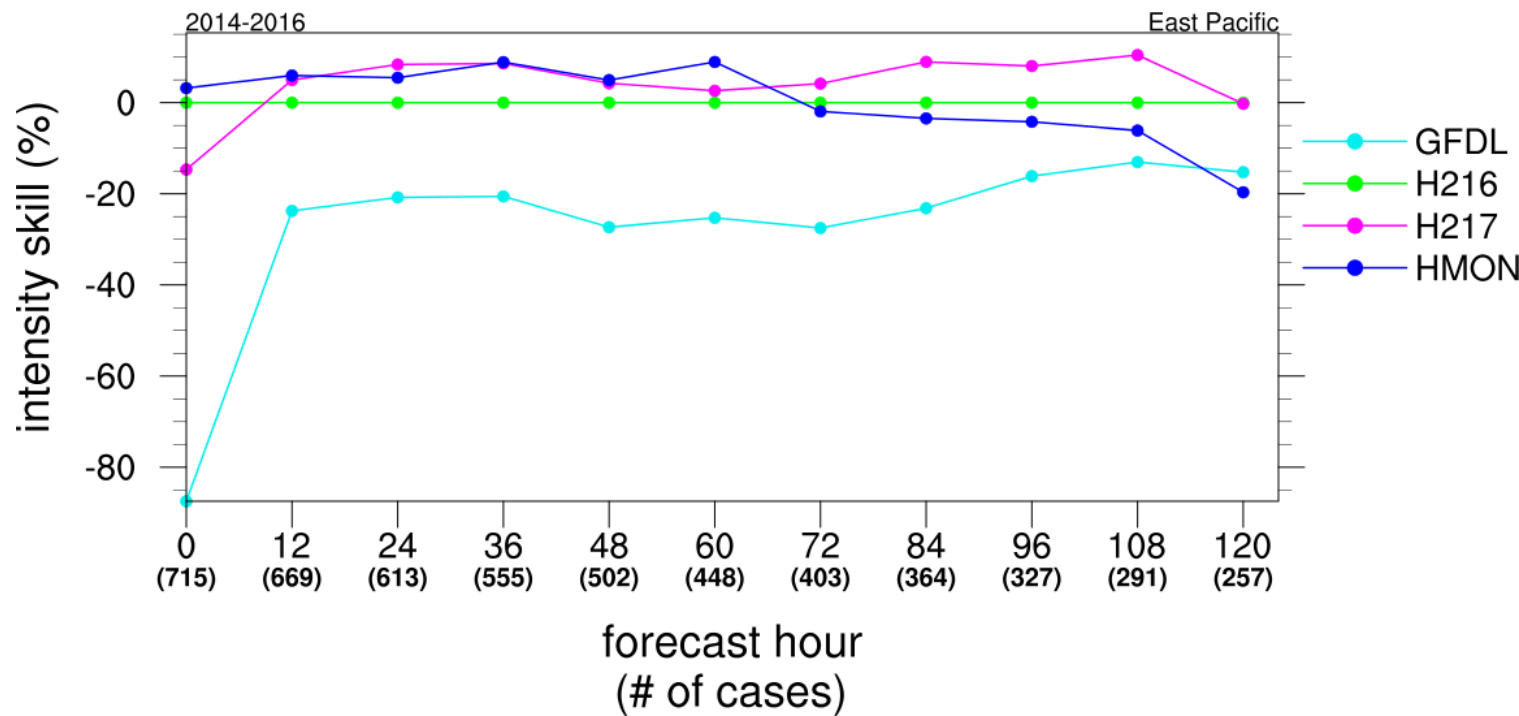
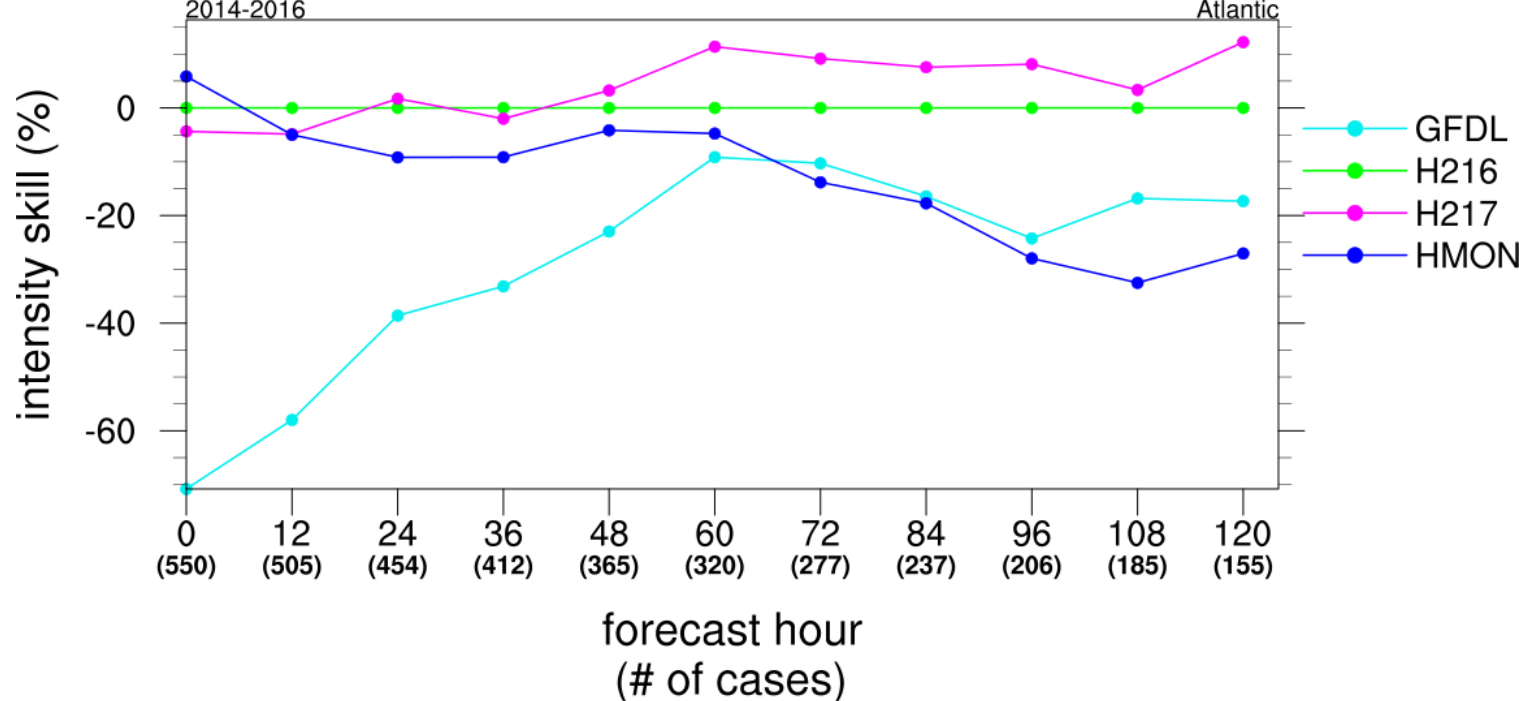


HWRF/HMON Intensity Skill

Atlantic



East Pacific



Proposed VDM for 2018

- * New format for the VDM tentatively approved at the 2017 Interdepartmental Hurricane Conference
- * NWS will solicit public comments for 30 days through a PNS likely issued next week.
- * Proposed format includes some parameters currently not included or only optionally included in the comments section, and improves the organization of the message.

Proposed VDM for 2018

URNT12 KNHC 241133
VORTEX DATA MESSAGE AL162016
A. 24/11:12:50Z
B. 10 deg 58 min N
082 deg 46 min W
C. 700 mb 2927 m
D. 90 kt
E. 144 deg 5 nm
F. 253 deg 78 kt
G. 158 deg 8 nm
H. 977 mb
I. 10 C / 3042 m
J. 18 C / 3045 m
K. NA / NA
L. CLOSED
M. C20
N. 12345 / 7
O. 0.02 / 1 nm
P. AF301 0616A OTTO OB 13
MAX OUTBOUND AND MAX FL WIND 108 KT 349 / 14 NM
11:17:00Z
CNTR DROPSONDE SFC WIND 210 / 11 KT

URNT12 KNHC 241133
VORTEX DATA MESSAGE AL162016
A. 24/11:12:50Z
B. 10.97 deg N 082.77 deg W
C. 700 mb 2927 m
D. 977 mb
E. 210 deg 11 kt
F. CLOSED
G. C20
H. 90 kt
I. 144 deg 5 nm 11:07:00Z
J. 253 deg 78 kt
K. 158 deg 8 nm 11:07:30Z
L. 95 kt
M. 314 deg 5 nm 11:17:00Z
N. 033 deg 108 kt
O. 349 deg 14 nm 11:17:30Z
P. 10 C / 3042 m
Q. 18 C / 3045 m
R. NA / NA
S. 12345 / 7
T. 0.02 / 1 nm
U. AF301 0616A OTTO OB 13
MAX FL WIND 108 KT 349 / 14 NM 11:17:00Z

Proposed VDM for 2018

B: Center fix location in decimal degrees.

```
URNT12 KNHC 241133
VORTEX DATA MESSAGE AL162016
A. 24/11:12:50Z
B. 10.97 deg N 082.77 deg W
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J. 253 deg 78 kt
K. 158 deg 8 nm 11:07:30Z
L. 95 kt
M. 314 deg 5 nm 11:17:00Z
N. 033 deg 108 kt
O. 349 deg 14 nm 11:17:30Z
P. 10 C / 3042 m
Q. 18 C / 3045 m
R. NA / NA
S. 12345 / 7
T. 0.02 / 1 nm
U. AF301 0616A OTTO OB 13
MAX FL WIND 108 KT 349 / 14 NM 11:17:00Z
```

L-O: New block for outbound wind maxima,
surface and flight level.

Proposed VDM for 2018

```
URNT12 KNHC 241133
VORTEX DATA MESSAGE AL162016
A. 24/11:12:50Z
B. 10.97 deg N 082.77 deg W
C. 700 mb 2927 m
D. 977 mb
E. 210 deg 11 kt
F. CLOSED
G. C20
H. 90 kt
I. 144 deg 5 nm 11:07:00Z
J. 253 deg 78 kt
K. 158 deg 8 nm 11:07:30Z
L. 95 kt
M. 314 deg 5 nm 11:17:00Z
N. 033 deg 108 kt
O. 349 deg 14 nm 11:17:30Z
P. 10 C / 3042 m
Q. 18 C / 3045 m
R. NA / NA
S. 12345 / 7
T. 0.02 / 1 nm
U. AF301 0616A OTTO OB 13
MAX FL WIND 108 KT 349 / 14 NM 11:17:00Z
```

H-K: Inbound wind maxima, surface and flight level. Time that the maxima were observed now included.

Proposed VDM for 2018

C-G: Tropical cyclone center data block.
Now includes the splash wind direction and speed from the center dropsonde.

```
URNT12 KNHC 241133
VORTEX DATA MESSAGE    AL162016
A. 24/11:12:50Z
B. 10.97 deg N 082.77 deg W
C. 700 mb 2927 m
D. 977 mb
E. 210 deg 11 kt
F. CLOSED
G. C20
H. 90 kt
I. 144 deg 5 nm 11:07:00Z
J. 253 deg 78 kt
K. 158 deg 8 nm 11:07:30Z
L. 95 kt
M. 314 deg 5 nm 11:17:00Z
N. 033 deg 108 kt
O. 349 deg 14 nm 11:17:30Z
P. 10 C / 3042 m
Q. 18 C / 3045 m
R. NA / NA
S. 12345 / 7
T. 0.02 / 1 nm
U. AF301 0616A OTTO OB 13
MAX FL WIND 108 KT 349 / 14 NM 11:17:00Z
```

6/7-day Tropical Cyclone Forecasts

- * Hurricane Specialists have been making 6/7-day TC forecasts since 2012, but that in-house experiment is being suspended for 2017.
- * Want to be able to focus on our public products, recognizing there are workload increases associated with
 - * The new storm-surge W/W and the new national TCV.
 - * Advisories/W/W for potential tropical cyclones.
- * Forecast accuracy of 6- and 7-day forecasts isn't where we think it needs to be to avoid jeopardizing the credibility of the official NHC forecast.
 - * 3 in 10 7-day track forecasts were off by >450 miles (Miami vs Charleston).
 - * 1 in 20 were off by >1000 miles (Miami vs NYC).
 - * 1 in 3 7-day intensity forecasts were off by two SSHWS categories.
 - * 1 in 5 were off by three SSHWS categories.
- * Forecasters have gotten all the practice we need, but the model guidance needs to get better.