Updates to the Tropical Cyclone Logistic Guidance for Genesis (TCLOGG)

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Project Background

- TC genesis forecasting has been added as a key operational priority.

- Global NWP guidance has advanced in terms of resolution and physics. The biases in the raw NWP output can be exploited by developing calibrated TC genesis guidance products.

- This guidance applies logistic regression to key variables from global NWP outpu to produce well-calibrated probabilities for TC formation.

Project Background (Continued)

- The logistic regression approach is applied to GFS, UKMET, CMC, NAVGEM, and ECMWF real-time output, and has provided well-calibrated guidance for TC genesis at 48 h and 120 h for the eastern Pacific and north Atlantic basins to aid the NHC Tropical Weather Outlook (TWO) products:

 http://moe.met.fsu.edu/modelgen and http://moe.met.fsu.edu/modelgenec

- However, there has been considerable evolution in the raw global NWP guidance available over that past five years that, along with additional NHC goals and improved local techniques, have warranted further modifications to the TCLOGG guidance.

- This presentation provides an update TCLOGG, as funded by the NOAA JHT program over three cycles, and most recently the 2019-2022 cycle.

Major current project goals

- Provide 7-day TC genesis guidance.

- Create a most likely time of genesis forecast through comparison of the timing of TC genesis within the individual models.

- Apply this method to the GEFS Reforecast output to make use of ensemble data and the longer developmental dataset.

NAVGEM-based guidance and four-model consensus guidance were implemented in 2019. These were the only remaining tasks for the FY17-19 cycle.

Experimental 0-120 h TC genesis probability
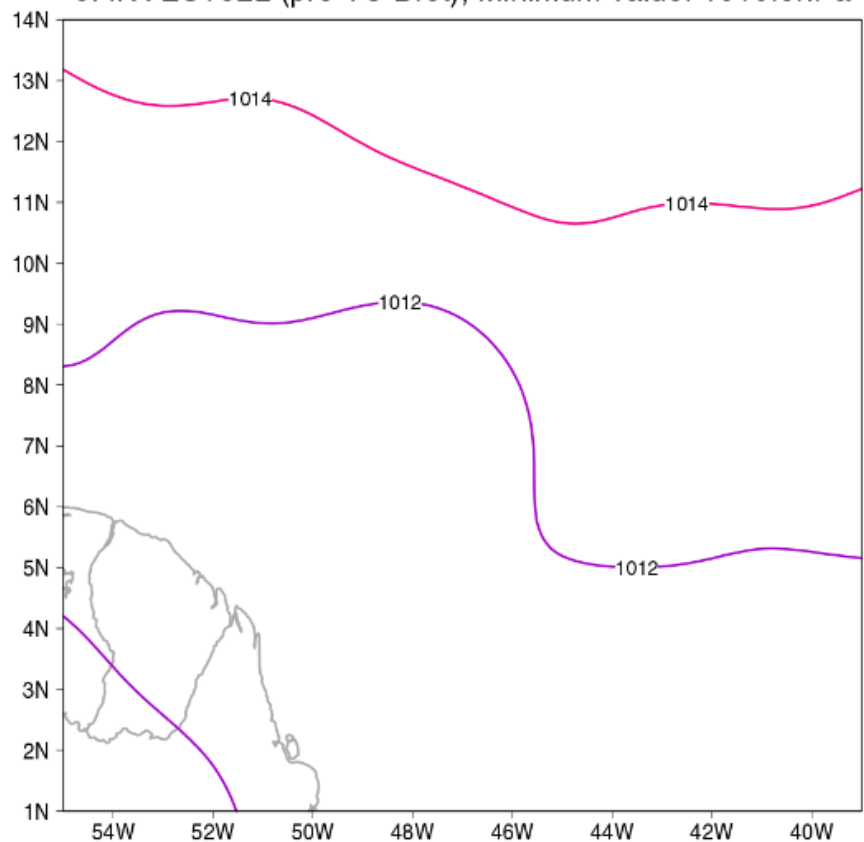2019-08-30 18Z consensus guidance
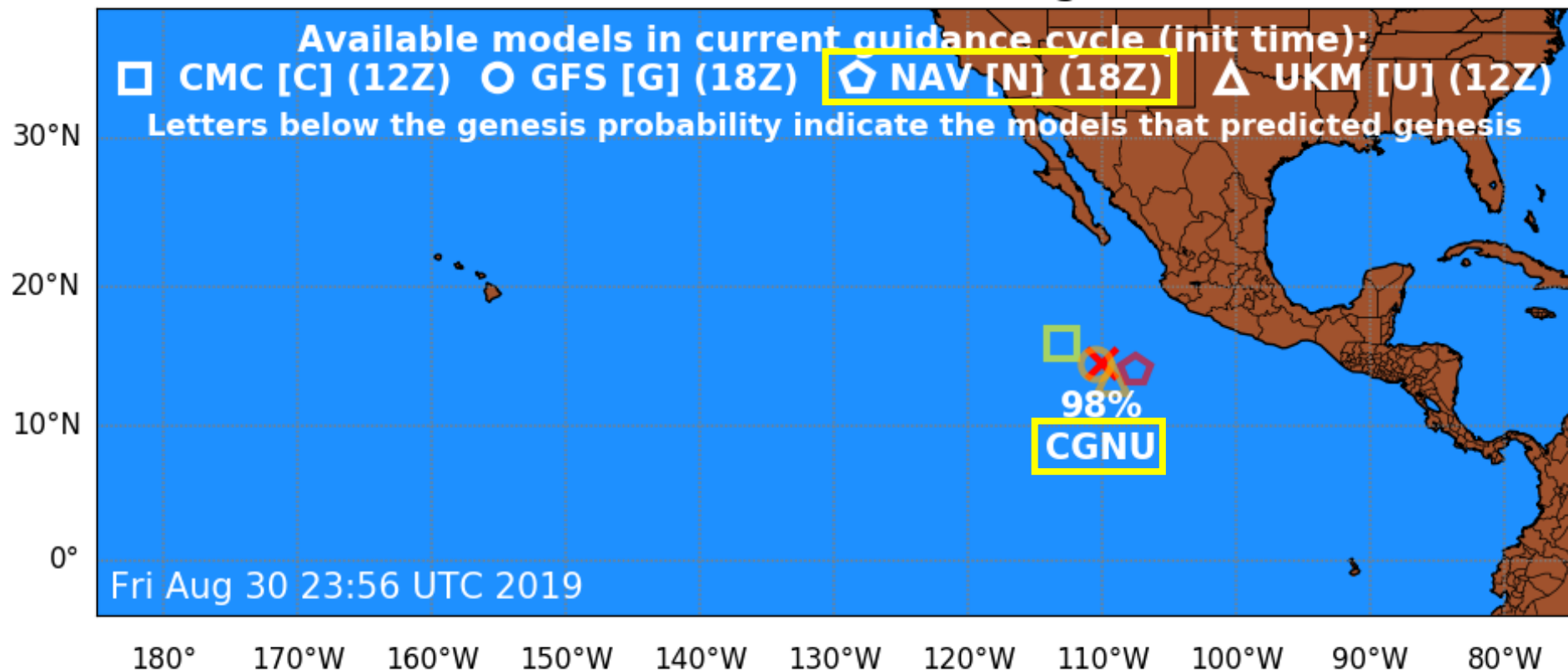
The GFS sea-level pressure variable used by TCLOGG was changed from PRMSL to MSLET. Expectedly, this has increased TC detection in the GFS.

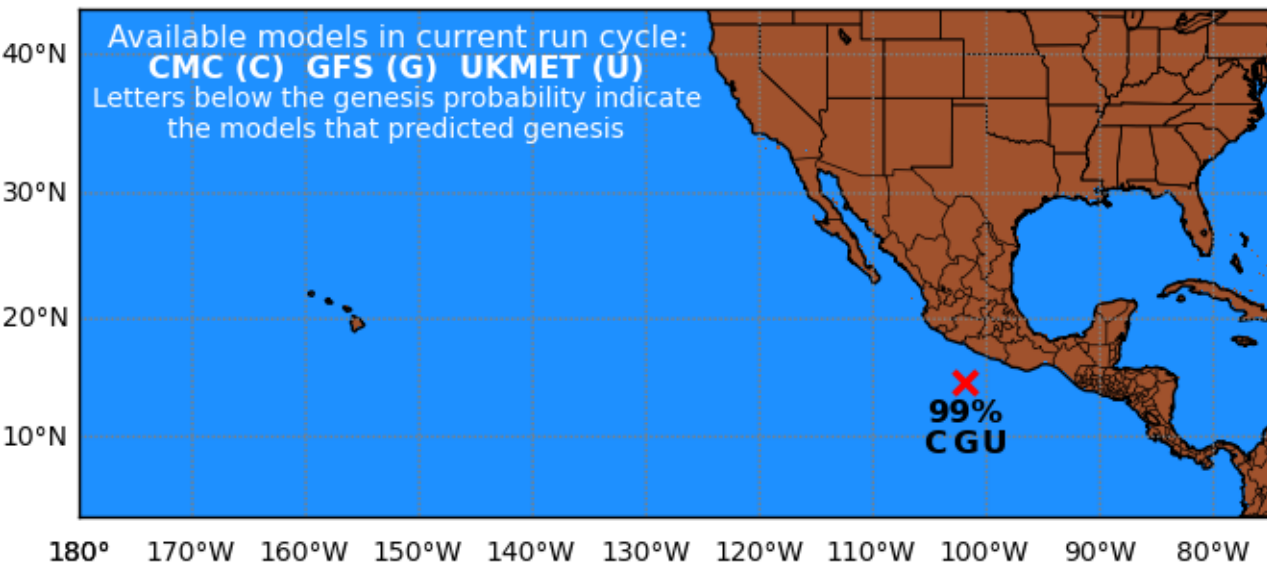1200UTC 18 June 2017 0.25° GFS Analysis SLP (PRMSL, hPa) of INVEST92L (pre-TC Bret); Minimum value: 1010.6hPa

1200UTC 18 June 2017 0.25° GFS Analysis SLP (MSLET, hPa) of INVEST92L (pre-TC Bret); Minimum value: 1005.8hPa
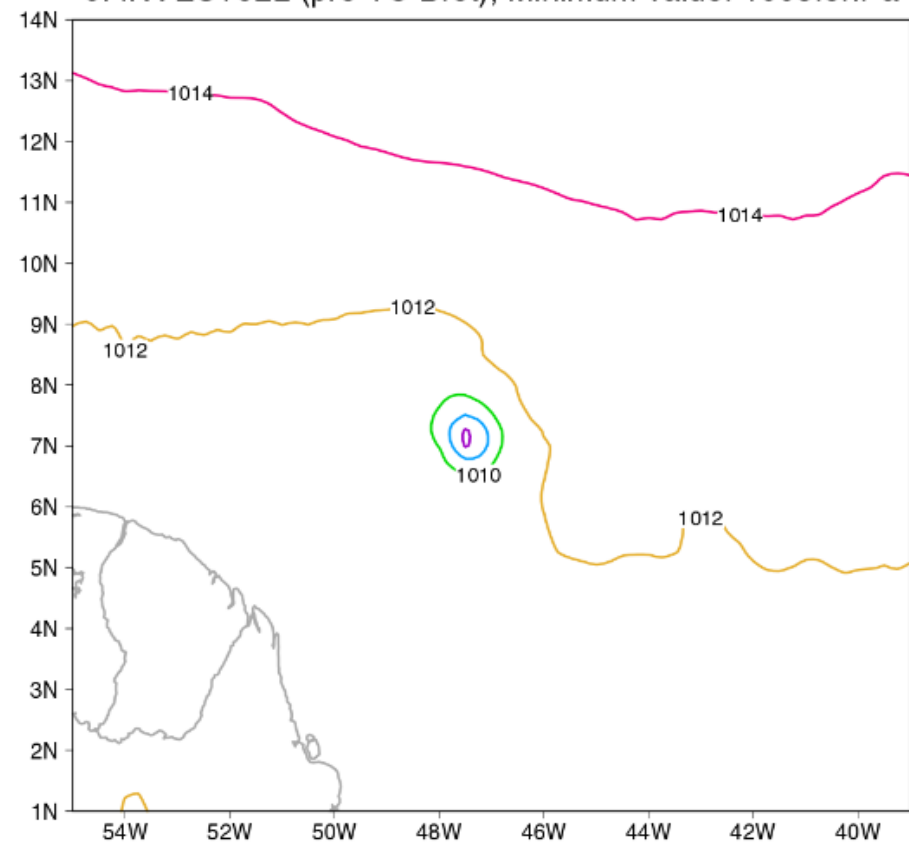
0-120 h regression equations were split into 0-48 h and 54-120 h equations, then nonlinearly combined to create a 0-120 h genesis probability.
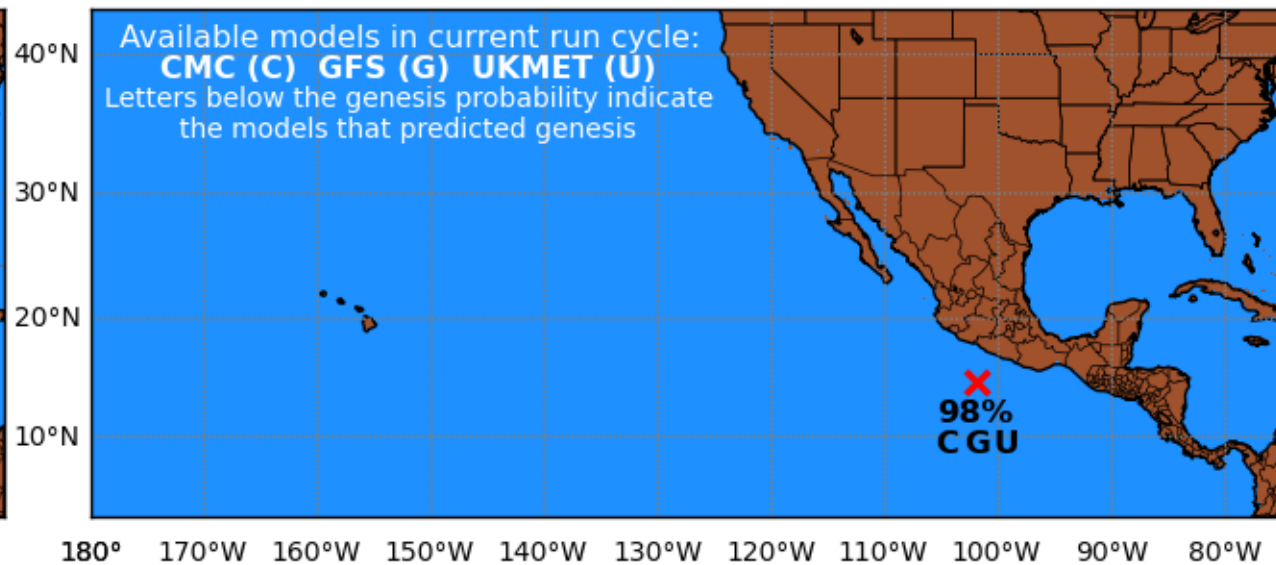
The goal is to avoid the following scenario where Pr(48) > Pr(120):

Experimental 0-48 h TC genesis probability
CON model output initialized 2017-06-24 12Z

Available models in current run cycle:
CMC (C)   GFS (G)   UKMET (U)
Letters below the genesis probability indicate
the models that predicted genesis

99%
C G U

http://moe.met.fsu.edu/modelgen

Experimental 0-120 h TC genesis probability
CON model output initialized 2017-06-24 12Z

Available models in current run cycle:
CMC (C)   GFS (G)   UKMET (U)
Letters below the genesis probability indicate
the models that predicted genesis

98%
C G U

http://moe.met.fsu.edu/modelgen

ECMWF-based guidance, five-model consensus guidance, and 7 day probabilities were implemented in 2019.

TCLOGG was run by the JHT facilitator on an NHC workstation in 2019.

Guidance products with ECMWF output included are not available to the public and can only be shared with NHC personnel per the licensing agreement. Guidance products without ECMWF output are available to the general public at **http://moe.met.fsu.edu/modelgen**
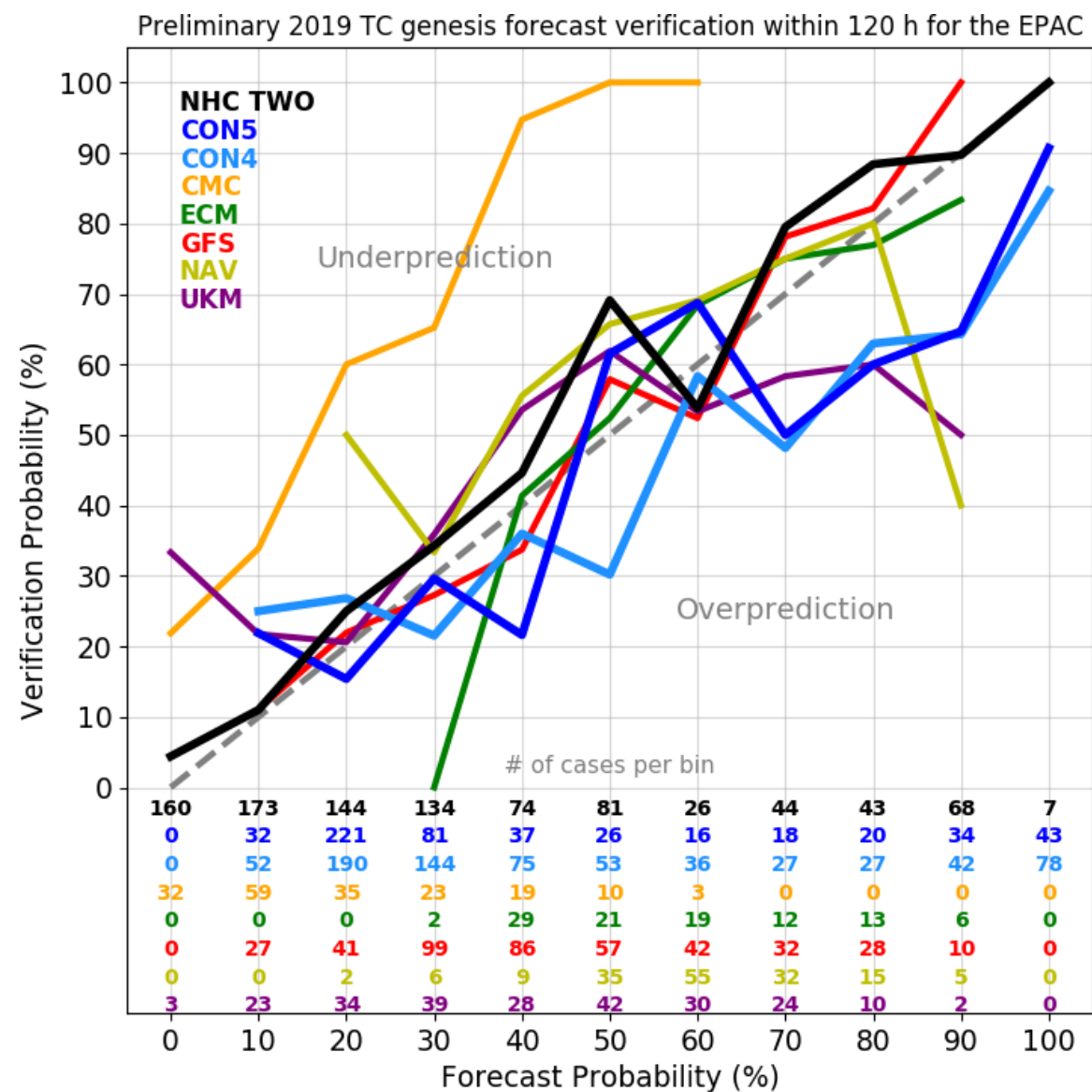
0-48 h consensus guidance generally had a low bias for the NATL and a high bias for the EPAC.

Preliminary 2019 TC genesis forecast verification within 48 h for the NATL

Preliminary 2019 TC genesis forecast verification within 48 h for the EPAC
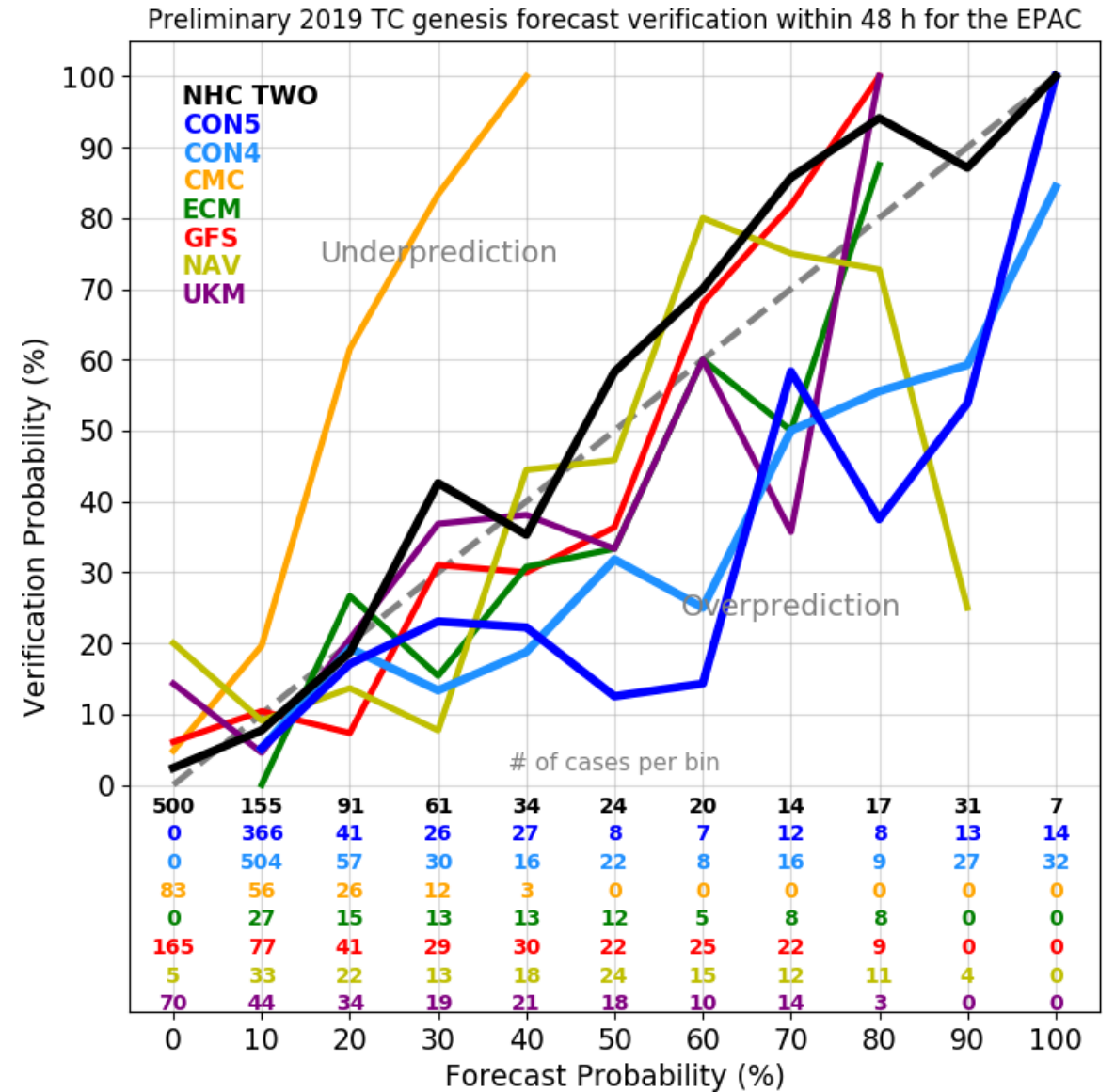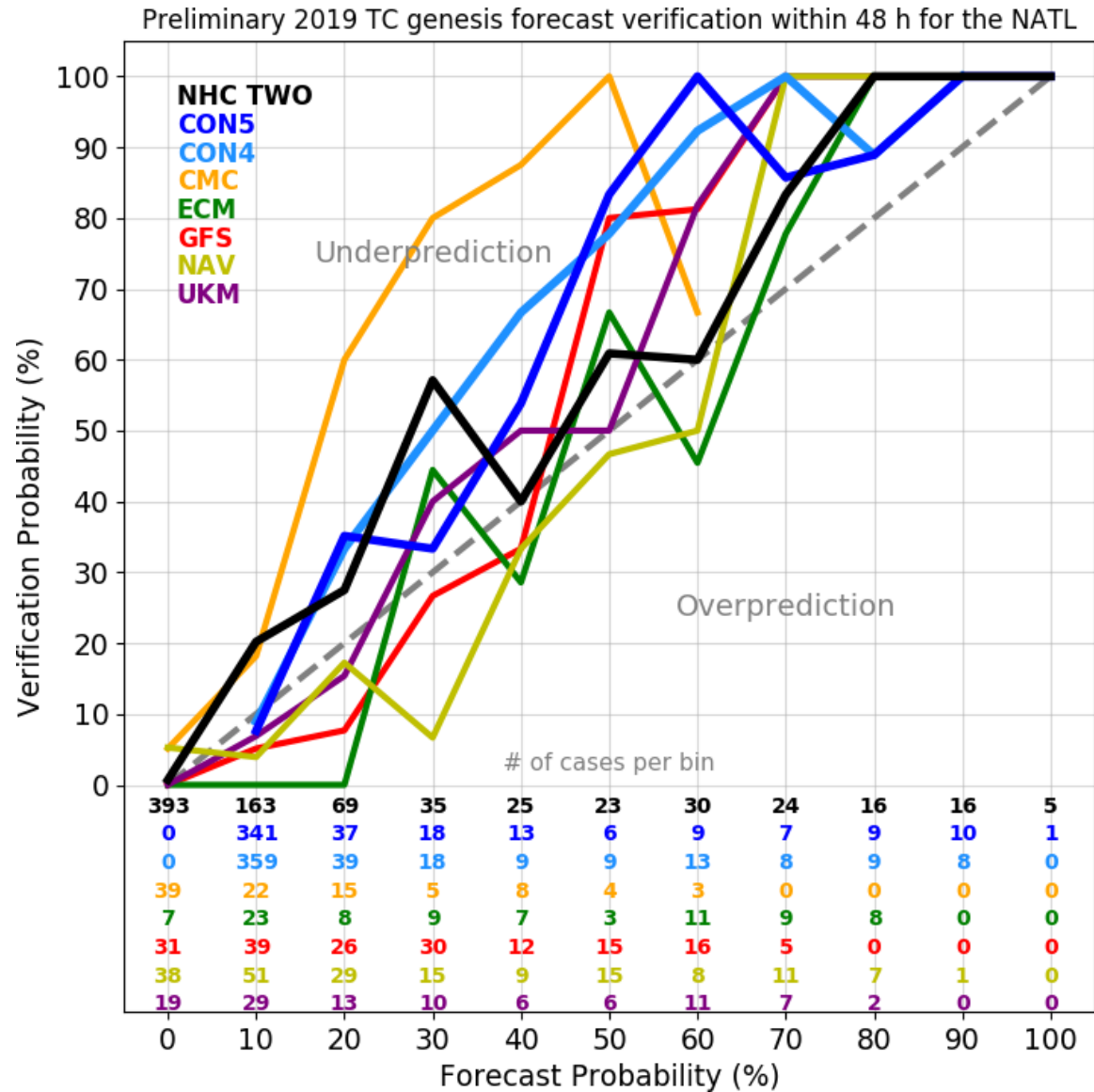
Despite the high bias in the consensus forecasts for the EPAC, some of the individual model probabilities were very well calibrated (e.g., GFS, ECMWF).

Preliminary 2019 TC genesis forecast verification within 120 h for the NATL

Preliminary 2019 TC genesis forecast verification within 120 h for the EPAC
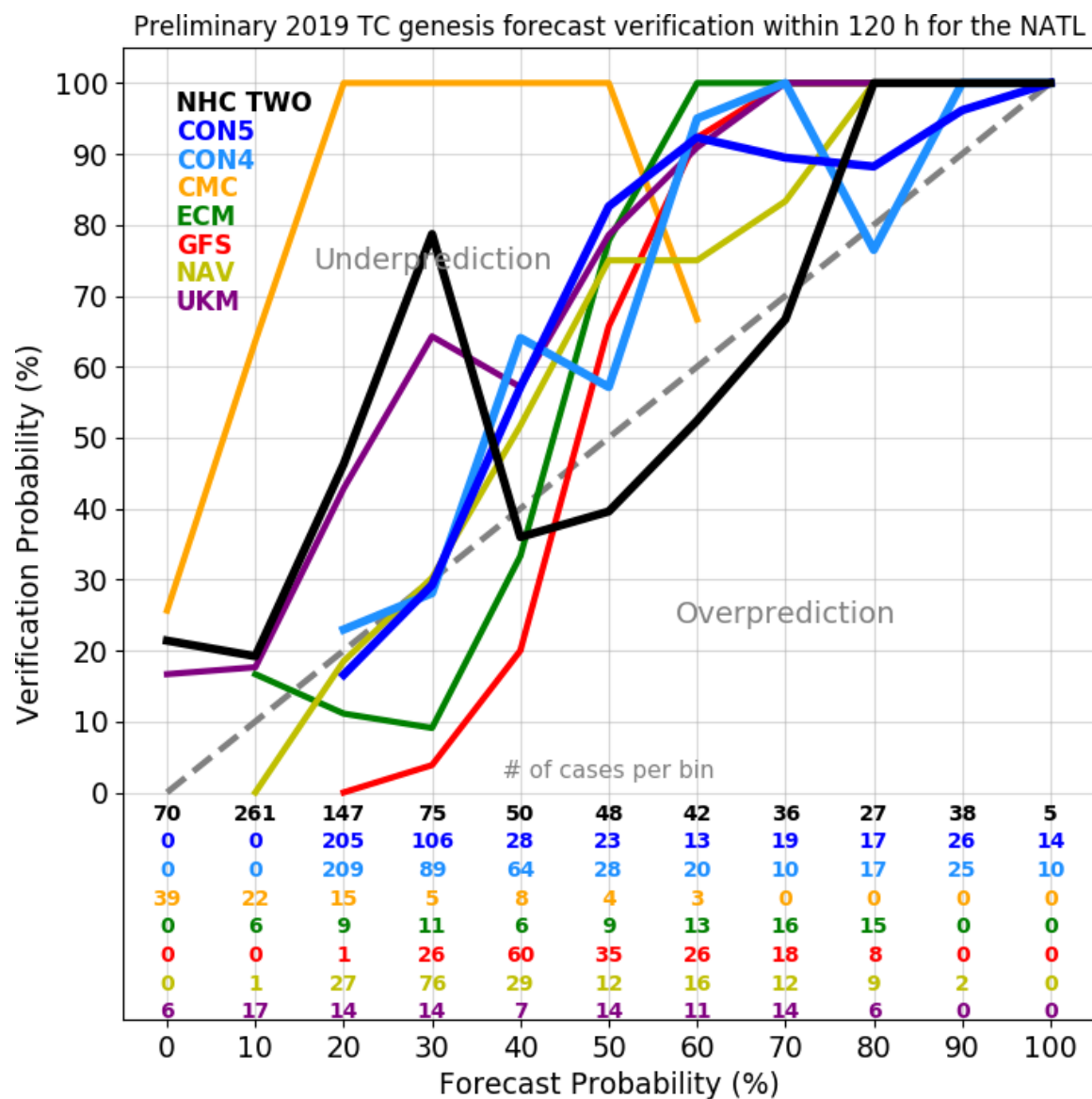
The impact of a model upgrade to the CMC is evident in the substantial low bias in CMC probabilities for all basins and forecast times.

Preliminary 2019 TC genesis forecast verification within 168 h for the NATL

Preliminary 2019 TC genesis forecast verification within 168 h for the EPAC
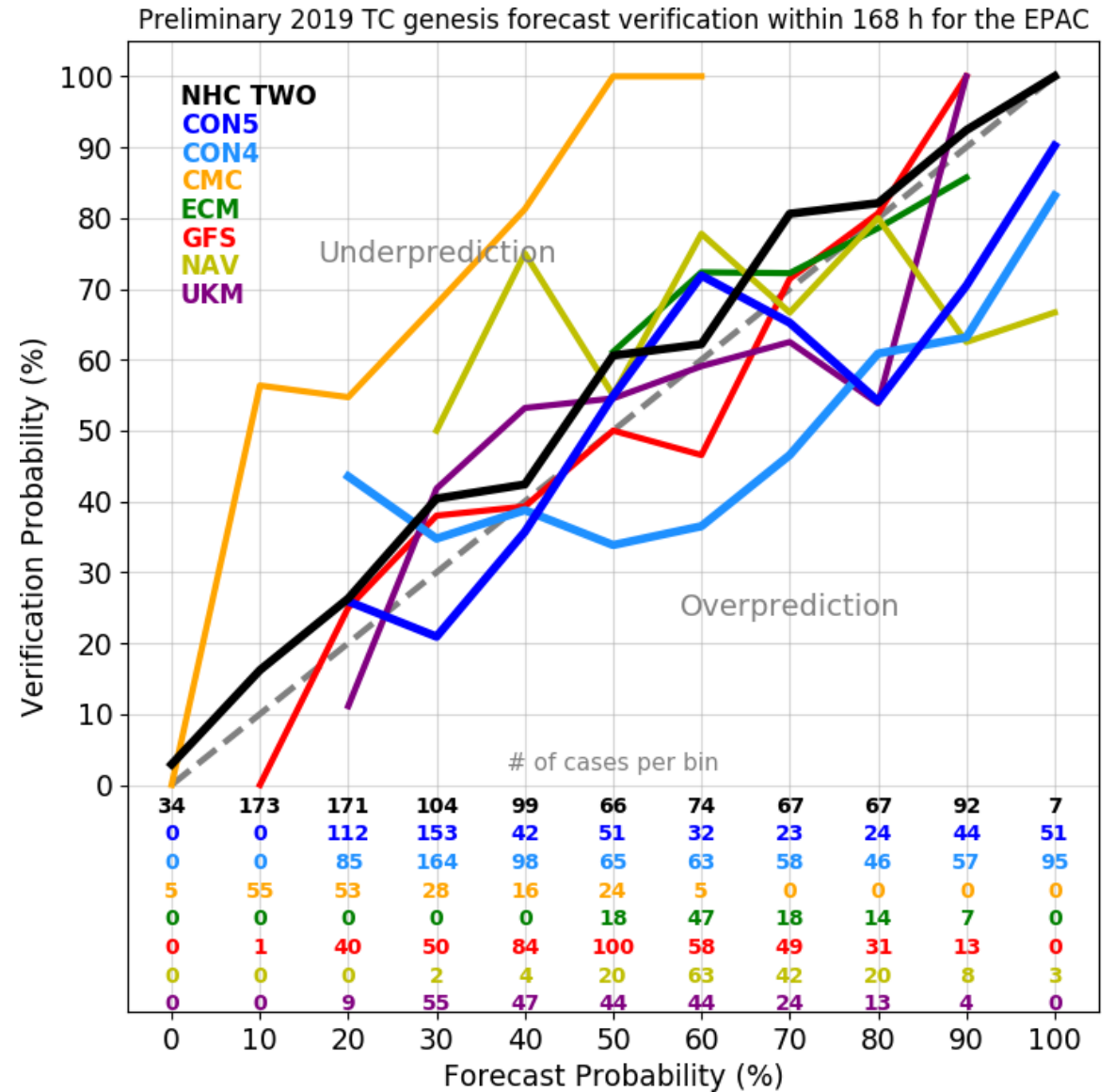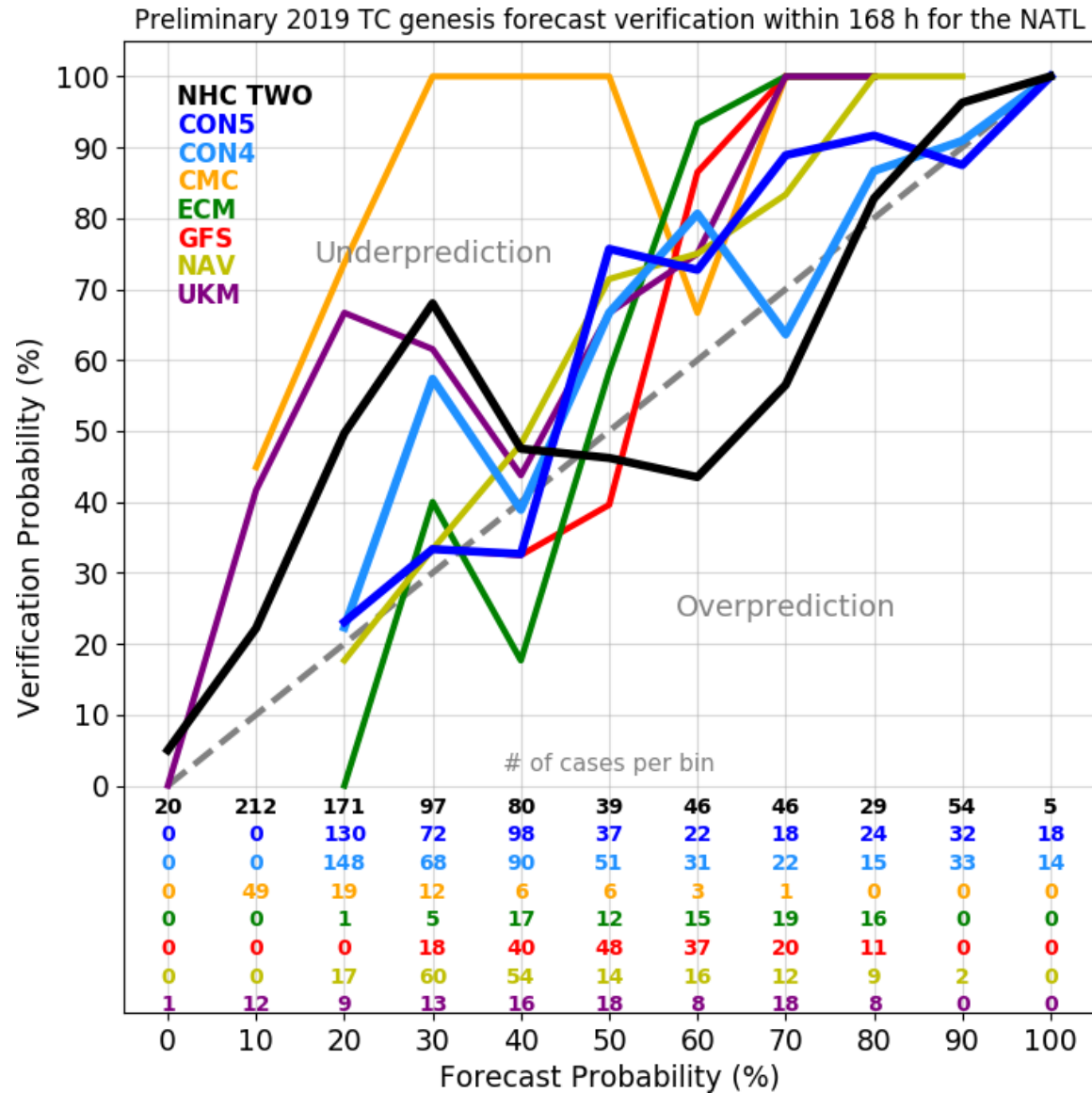
Updated Readiness Levels (RLs) in consultation with JHT POCs

Component	Project Start RL	Current RL	Status
Existing TCLOGG components	6	7/8	Implemented by Alan Brammer at NHC
GFS Switch PRMSL to MSLET	6	7/8	Implemented by Alan Brammer at NHC
Seven-day genesis guidance	6	7/8	Implemented by Alan Brammer at NHC
Separation of guidance into 0-48 and 54-120 h equations.	5	7	
Most likely time of genesis	3	3	Planned for Year 2 of project
Guidance based on GEFS	3	3	Planned for Year 3 of project

Plans for 2020

- Present a project update at the AMS Hurricanes and Tropical Meteorology Conference.

- Re-calibrate all regression equations.

- Test latitude-dependent thickness threshold for TC detection in the North Atlantic basin.

- Verify all forecasts from the 2020 hurricane season.