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Real-time Seasonal Prediction of Major Hurricane in 2017 using High-Resolution Global Coupled Model

Hiroyuki Murakami[1,2], Thomas Delworth[1], Rich Gudgel[1], and Xiaosong Yang[1,3]

[1]Geophysical Fluid Dynamics Laboratory (GFDL), [2]Princeton University, [3]UCAR

1. Introduction

In the 2017 summer North Atlantic hurricane season, there **were 6 major hurricanes** generated, and a few of them made landfall (e.g., Hurricanes Hervey, Irma, and Maria), leading to huge socioeconomic damage around coastal regions.

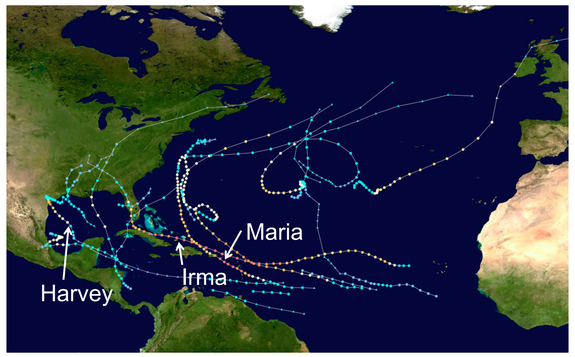

Fig 1. Hurricanes in 2017.

At Geophysical Fluid Dynamics Laboratory (GFDL), we utilize a high-resolution global coupled model (HiFLOR) for real-time seasonal prediction.
In this presentation, successful seasonal predictions of major Hurricanes in 2017 will be shown. Physical mechanism explained for the active major-hurricane season is also preliminarily examined.

2. Model and Retrospective Seasonal Forecasts

Table 1. *Resolution for coupled global models developed at GFDL.*

	Ocean	Atmos
CM2.1	100 Km	250 Km
FLOR	100 Km	50 Km
HiFLOR	100 Km	**25 Km**

Table 2. *Configuration for retrospective seasonal forecasts.*

Period	1980–2015, mainly focus on TC prediction for July–November
Initial	July (Leal Month=0–4), Ocean is initialized, but atmosphere is not initialized.
Ensemble	24 Ensemble Members

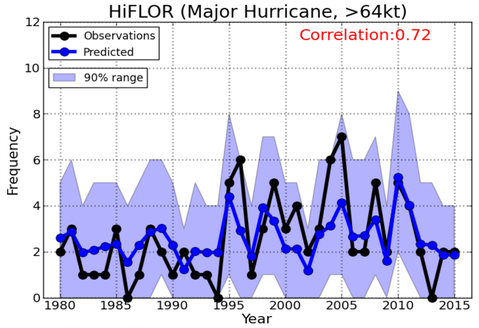

Fig 2. *Predicted (blue) and observed (black) major hurricane frequency in the North Atlantic.*

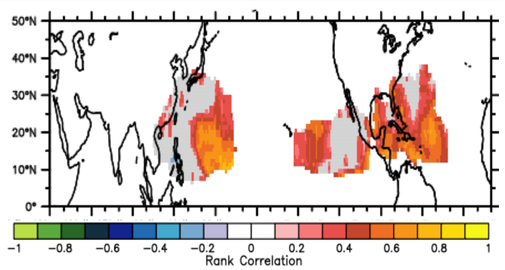

Fig 3. *Skillful prediction of major hurricane density.*

HiFLOR has skill in predicting major hurricanes at regional scale.

3. Real-time Seasonal Prediction for 2017 Hurricane Season

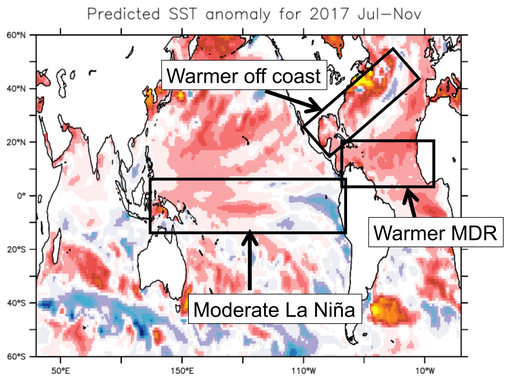

Fig 4. *Predicted SST anomaly relative to climatological mean of 1982-2012.*

Which region of SST anomaly contributed to active 2017 MH in the North Atlantic?

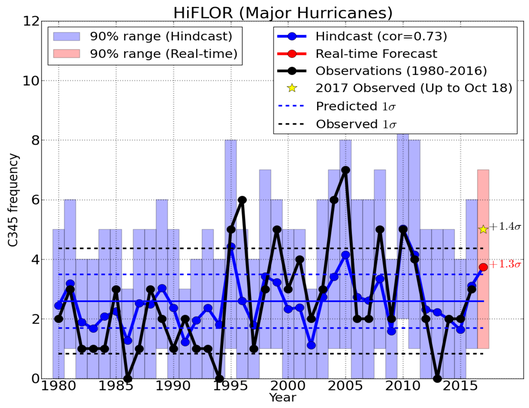

Fig 5. *Real-time seasonal forecast (red).*

HiFLOR predicted active 2017 major hurricanes a few months in advance.

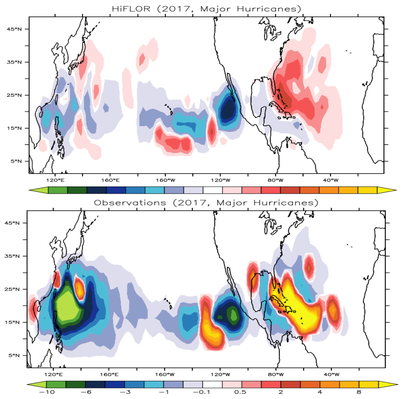

Fig 6. *Predicted (top) and observed (bottom) major hurricane density anomaly for 2017.*

HiFLOR predicted location of major hurricanes very well.

4. Idealized SST forced Reforecasts

In order to identify which of SST anomaly shown in Fig. 4 has a greater impact on major hurricane activity, idealized SST forced forecats were conducted.

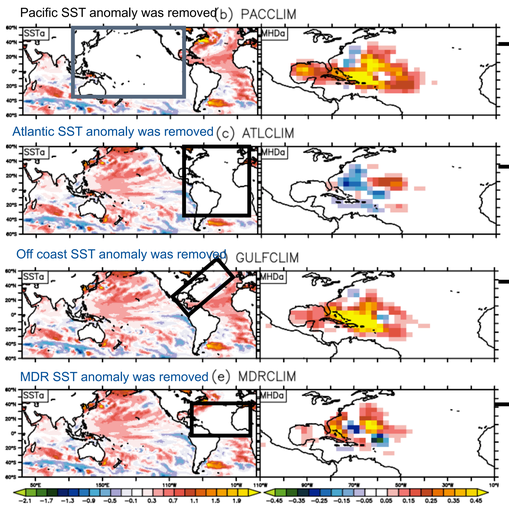

Fig 7. *Prescribed idealized SST anomaly (left) and predicted major hurricane density anomaly (right).*

Pacific SST anomaly in 2017 has less impact on major hurricane activity in the North Atlantic.

Atlantic SST anomaly has a big impact on major hurricanes.

Off-coast SST anomaly has less impact on major hurricanes.

MDR SST anomaly has a significant impact on major hurricanes.

MDR SST anomaly is a key factor for this active 2017 major hurricanes.

5. Summary

- As observed, HiFLOR could predict active major hurricanes in 2017 a few months in advance.
- HiFLOR could predict not only basin-total frequency of major hurricanes, but also locations of major hurricanes with accuracy.
- MDR SST anomaly may be a key factor for this active major hurricanes in 2017.
- In the future, impact of anthropogenic forcing on major hurricane activity in 2017 will be investigated.