Effect of TMI SST Observations on the Simulation of Hurricane Sandy

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Summary

Our study investigates the effect of SST on the simulated intensity, track and rainfall of Hurricane Sandy (October 2012) using the Weather Research and Forecast (WRF) model. Observed SST data from TRMM Microwave Imager (TMI) and GHRSST level 4 datasets were used as ocean boundary condition. Comparing the WRF model simulated evolution of Hurricane Sandy with observed track, minimum sea level pressure from HURDAT data, and rainfall intensity and distribution from TRMM 3B42 data reveals the effect of SST input at various resolutions in the WRF model on the development of Hurricane Sandy.

Data

Meteorological Data :

Global Forecast System (GFS): 6-hourly 0.5 degree

Initial time: 2012/10/26 00Z

Duration:2012/10/26 00Z - 2012/10/31 00Z

SST Data :

1) CTL: control run using default SST data from WRF
2) TRMM Microwave Imager (TMI) (0.25^0)
   Daily data with 3-day composite
3) GHRSST Level 4 daily SST analysis (0.081^0)
   - TRMM Microwave Imager (TMI)
   - NASA Advanced Microwave Scanning Radiometer-EOS (AMSRE)
   - Aqua MODIS

WRF Setup

	WRF Scheme
Microphysis	WRF Single-Moment 6-class scheme
Longwave Radiation	RRTMG scheme
Shortwave Radiation	RRTMG shortwave
radt	10
Surface Layer	MM5 similarity
Land Surface	Noah Land Surface Model
Planetary Boundary layer	Yonsei University scheme
Cumulus Parameterization	Tiedtke scheme
ptop_requested	2000
Vertical layers	49
timestep	120 sec

Simulation Domain

D01: 90W-60W, 15N-45N, 30km (98 x 132)

D02: Moving-Nested, 10km (100 x 100)

Results

a. Hurricane Track (positions of lowest surface pressure)

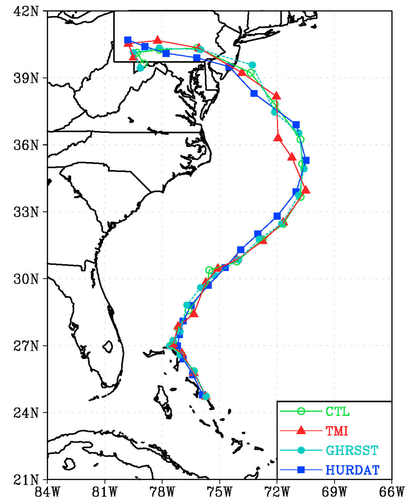

Figure 1. Simulated and observed tracks of Hurricane Sandy 00Z October 26 - 00Z October 31, 2012.

b. Minimum Sea Level Pressure

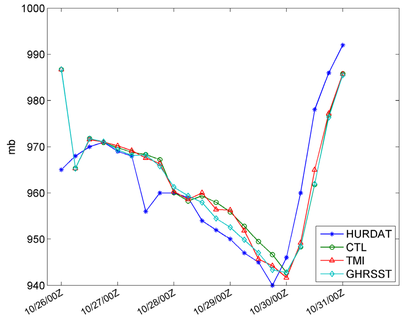

Figure 2. Simulated and HURDAT observed minimum sea level pressure of Hurricane Sandy.

c. Maximum Wind Speed:

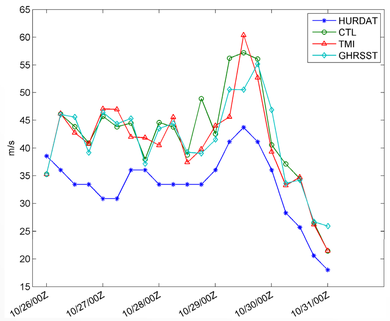

Figure 3. Simulated and HURDAT observed maximum wind speed of Hurricane Sandy.

d. Rainfall Intensity and Distribution

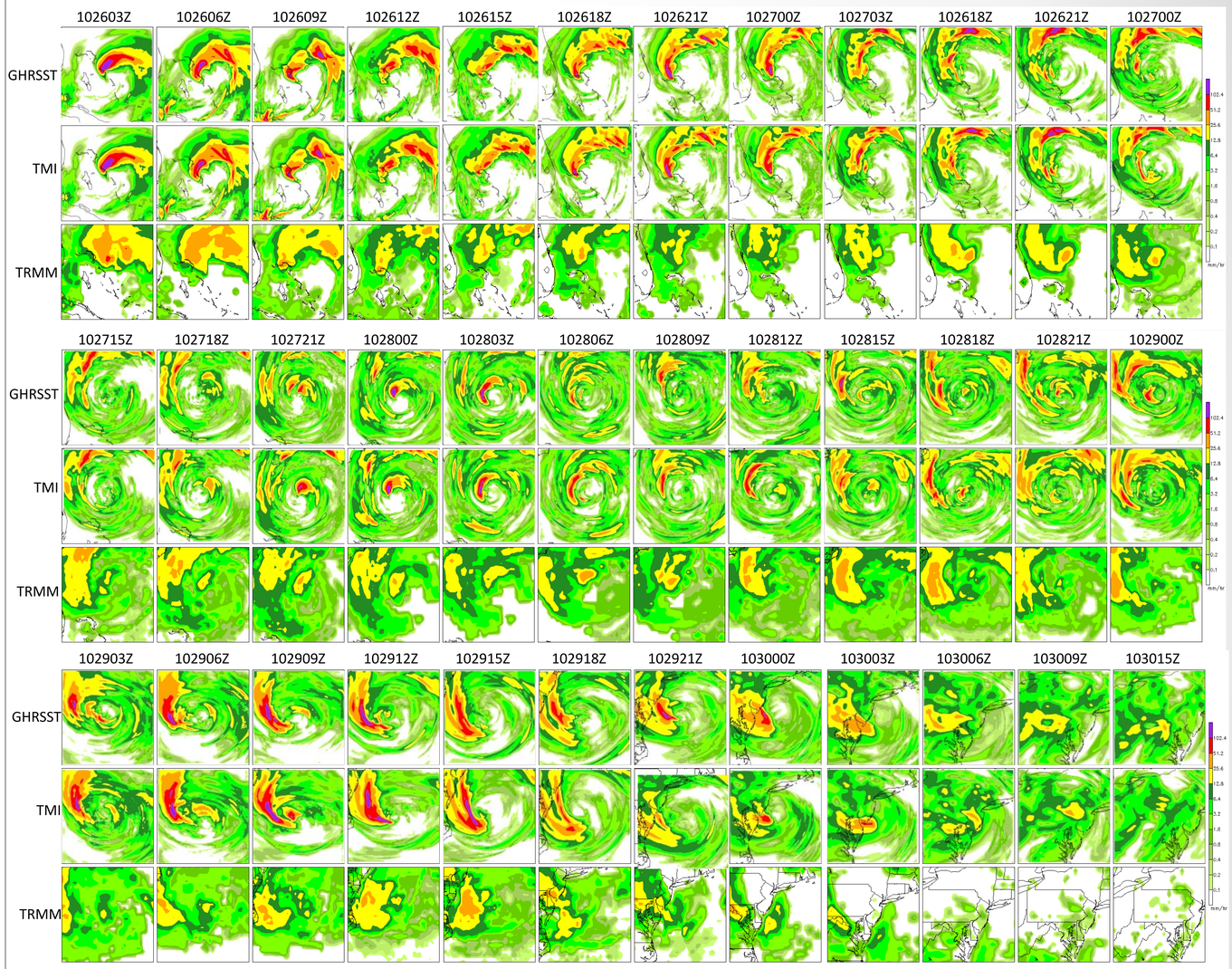

Figure 4. Simulated and TRMM observed rainfall intensity and distribution from 00Z October 26 to 12Z October 30, 2012

Conclusion

Use of the observed SST data from TMI and GHRSST as ocean boundary to initialize the WRF model is found to affect the simulation of Hurricane Sandy in October 2012. The effect of SST as initial condition on the simulated track and minimum sea surface pressure is marginal. Use of TMI and GHRSST data in the simulation tends to moderately overestimate the maximum wind speed and rainfall intensity. The simulated rainfall distribution is consistent with TRMM 3B42 observation. The numerical experiments suggest that increasing SST gradient has detectable effect on the prediction of intensity and track of Hurricane Sandy.

Acknowledgement

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