1. Introduction

The Cyclone Global Navigation Satellite System (CYGNSS) is a multi-satellite constellation that launched 15 December 2016. The primary objective of CYGNSS is to use bistatic Global Positioning System (GPS) reflectometry to accurately measure near-surface wind speeds within the heavily raining inner core of tropical cyclones.

CYGNSS also features rapid revisit times over a given region in the tropics - ranging from several minutes to a few hours, depending on the constellation geometry at that time. Despite the focus on tropical cyclones, the ability of CYGNSS to provide rapid updates of winds, unbiased by the presence of precipitation, has many other potential applications related to general tropical convection.

2. Data and Methodology

MJO Simulations
- MJO event period: October, November, December 2011
- 7-km resolution, 30-minute updates
- Simulates tropical convection but not MJO
- Apply CYGNSS End-To-End Simulator (E2ES)

CYGNSS OSSE
- Single-nest
- MJO tropical storm

CYGNSS Data Assimilation
- Enhanced surface winds in WWR associated with convectively driven downsheals

3. Simulated CYGNSS Views of Convection

October 2011

Example from October 2016 MJO event
CYGNSS E2ES observed simulated WWRW in WWRW southeast of India

November 2011

Enhanced surface winds in WWRW associated with convectively driven downsheals

4. CYGNSS OSSE of MJO Convection

10-m Wind Speed at 0500 UTC 2011-11-27

Variable Wind Speed CTWY (Knots) DA
2.4 (Knots)

SLP and wind vector at 18 UTC 2011-11-28

Forecast: Temperature Anomaly at 18 UTC 2011-11-28

Forecast: Water Vapor Mixing Ratio at 18 UTC 2011-11-28

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This was a tropical storm during an MJO onset that did not develop further. CYGNSS Data Assimilation helped the model to resist the tendency of the Control Run to further strengthen the storm. In addition, storm track position was significantly improved over the Control.

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CYGNSS should detect mesoscale wind features such as WWRW Bursts and gust fronts, even in the presence of heavy precipitation. CYGNSS likely will provide benefits to future tropical oceanic field campaigns that should be considered during their planning processes.

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