Geophysical Research Abstracts
Vol. 17, EGU2015-6543, 2015
EGU General Assembly 2015

Evaluation and Validation of Simulated CYGNSS Winds over Large Range of Tropical Cyclones

Zorana Jelenak (1), Paul Chang (1), Seubson Soisuvarn (1), and Faozi Said (2)
(1) NOAA/NESDIS/STAR, (2) Global Science & Technology Inc.

The CYclone Global Navigation Satellite System (CYGNSS) mission is the first satellite constellation demonstration of ocean surface wind retrievals utilizing the GPS reflection technique [1]. While CYGNSS is targeting retrievals in and around the tropical cyclone environment, it will be retrieving wind speeds in all weather conditions. The End-to-End (E2E) simulator was developed by the CYGNSS project to help assess engineering design impacts, develop and evaluate wind retrieval algorithms, and to help identify and address system risk areas. The CYGNSS E2E simulator takes sensor-based inputs such as the GPS satellite locations, CYGNSS satellite locations, the transmitter and receiver positions and orientations, and the antenna pattern, together with large non-uniform wind fields and produces simulated DDMs. These DDMs are then used within retrieval algorithms to produce observed winds.

To assess the performance and error characteristics of CYGNSS wind measurements as well as to test different sensor configurations, measurements were simulated using E2E simulator and realistic, high-resolution wind fields from Hurricane Weather Research and Forecasting prediction model HWRF during 2010-2011 Atlantic and Pacific hurricane seasons. This resulted in simulated measurements for a total of 43 storms; 22 hurricanes, 17 tropical storms and 4 depressions. Wind speeds retrievals from simulated measurements were performed using retrieval algorithm developed at the University of Michigan [2].

To characterize algorithm performance and CYGNSS measurement capability CYGNSS wind retrievals were collocated in space and time with “truth” data. The “truth” data included HWRF, ASCAT and OSCAT scatterometer winds, and step frequency microwave radiometer (SFMR) aircraft measurements collected during hurricane reconnaissance flights. Wind speed retrieval error characteristics relative to wind speed ranges, measurement geometry, storm center position and NHC best track database were examined and validated against project science requirements document. The improved understanding of measurement and algorithm performances, derived from these analyses, led us to develop new quality flagging scheme with a goal of achieving a more robust wind product. The new flagging scheme has been proposed and implemented in final validation statistics.
A summary of the analyses of these simulated data and flagging algorithm will be presented and discussed.

References:

[1] Ruf, C.S.; Gleason, S.; Jelenak, Z.; Katzberg, S.; Ridley, A.; Rose, R.; Scherrer, J.; Zavorotny, V. : The CYGNSS nanosatellite constellation hurricane mission; IEEE International Geoscience and Remote Sensing Symposium Proceedings, pp 214-216; July 2012

[2] Clarizia, M.P.; Ruf, C.S.; Jales, P.; Gommenginger, C.; Spaceborne GNSS-R minimum variance wind speed estimator; IEEE Transactions on Geoscience and Remote Sensing, pp 6829-6843; February 2014