

# Using *In Situ* Measurements to Validate CYGNSS Wind Speed Observations

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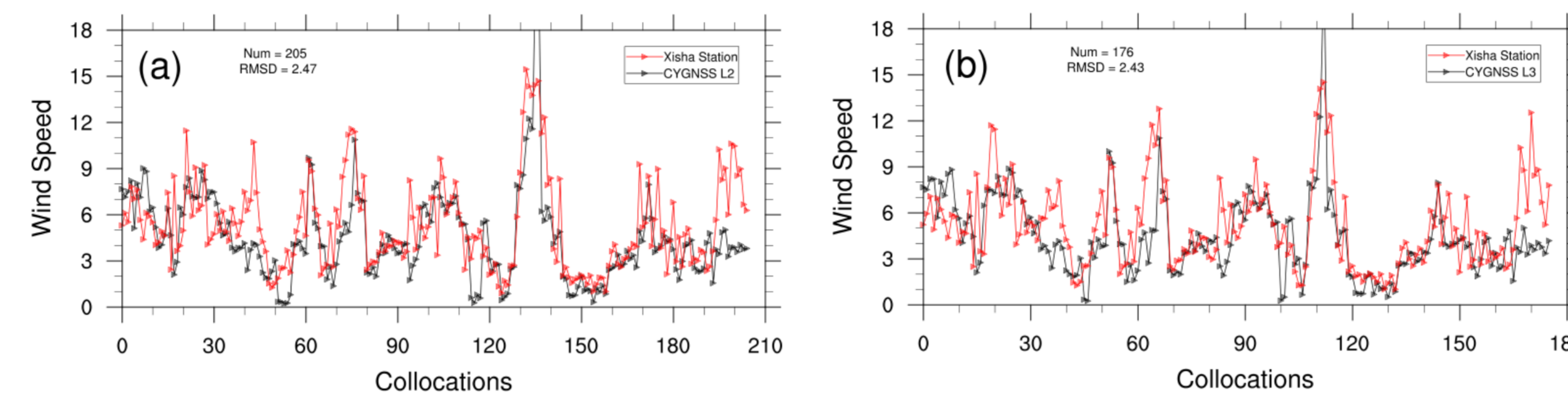
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## Introduction

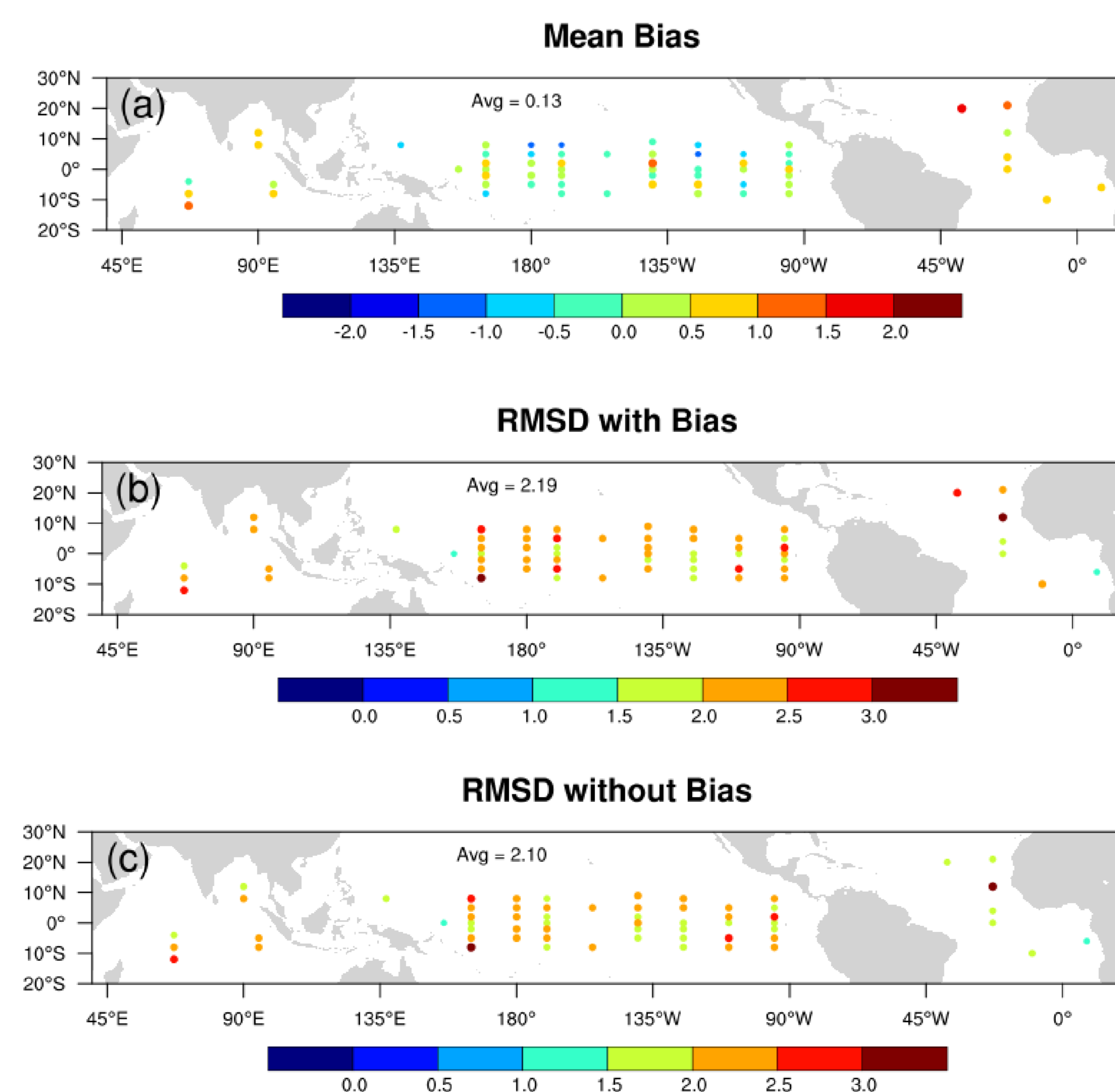
Sea surface winds from the Cyclone Global Navigation Satellite System (CYGNSS) mission between 35° N and 35° S are validated against *in situ* observations in order to evaluate the performance of CYGNSS mission. The *in situ* wind measurements are from the Xisha flux tower in South China Sea and from moored buoy data in the Global Tropical Moored Buoy Array. CYGNSS mission uses a constellation of eight small satellites and Global Positioning System reflectometry to measure wind speeds, even under rainy conditions. The CYGNSS constellation orbits inclinations of 35 degrees with respect to the equator, and each of the eight satellites are capable of measuring 4 simultaneous reflections, resulting in up to 32 wind measurements per second across the globe.

## Results

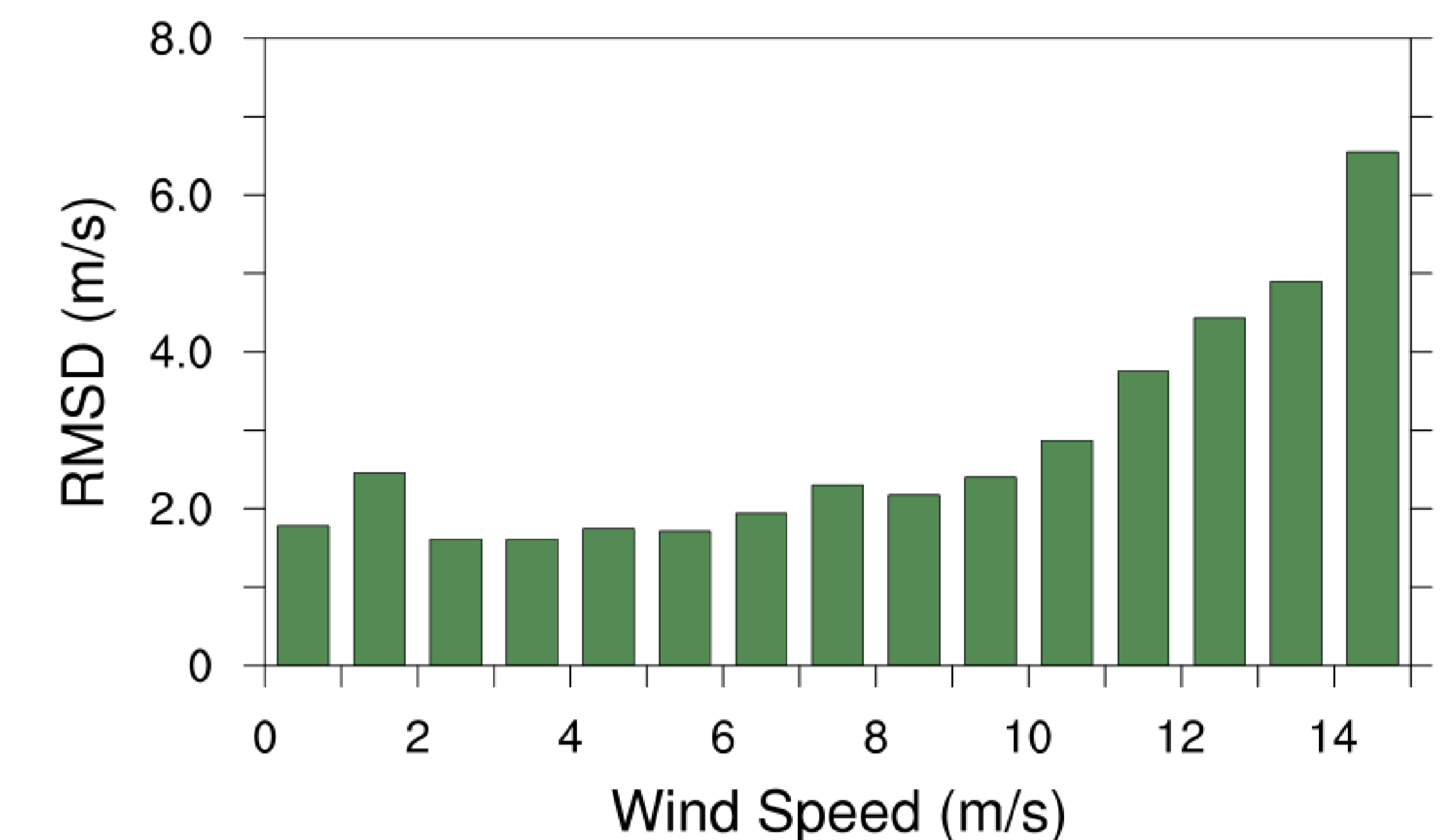
The results indicate that the mean bias of *in situ* and CYGNSS wind is 0.13 m/s. The mean root-mean-square-difference (RMSD) of *in situ* and CYGNSS wind is 2.19 m/s. When the wind speed is less than 10 m/s, the RMSD is generally less than 2 m/s and the RMSD increases when the wind speed is larger than 10 m/s. There is no difference in RMSD between *in situ* and CYGNSS measurement for rainy and non-rainy condition.



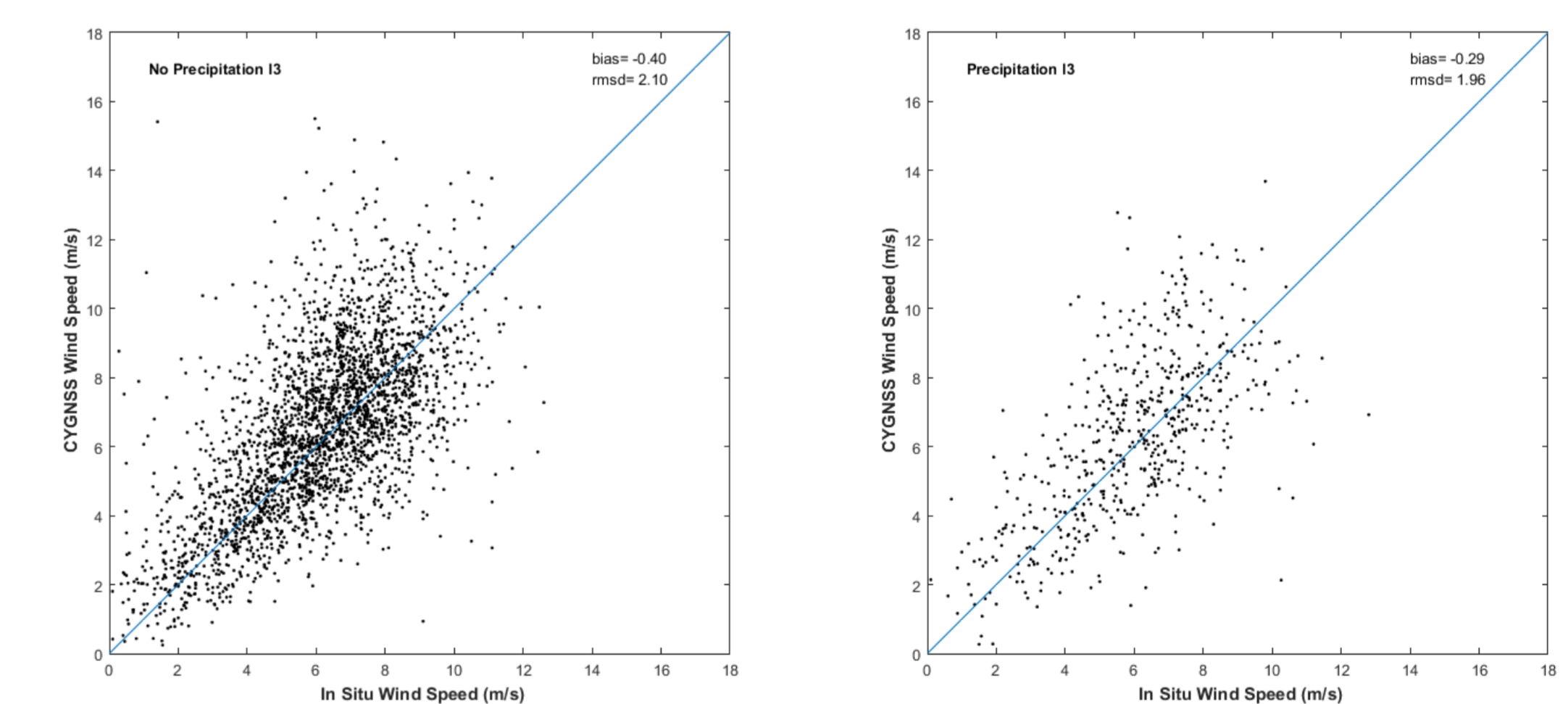
**Fig. 1** Comparison of wind speed between Xisha flux tower (16° 49'N, 112° 20'E) and collocated CYGNSS observation based on (a) L2 and (b) L3 observations from 1 August to 4 October 2017.



**Fig. 2** (a) Bias of CYGNSS wind speed observation and mooring wind observation, (b) root-mean-square-difference of CYGNSS and mooring wind speed observation with bias, (c) root-mean-square-difference of CYGNSS and mooring wind speed observation with bias removed.



**Fig. 3** Change of root-mean-square-difference of CYGNSS and mooring wind speed observations with wind speed.



**Fig. 4** Comparison of CYGNSS L3 wind speed product with *in situ* observation for non-rain (left) and rain condition (right). The rain condition is defined as precipitation rate from GPM data greater than 0.01mm/hour.

## Reference

Ruf C S, Atlas R, Chang P S, et al. New ocean winds satellite mission to probe hurricanes and tropical convection. Bulletin of the American Meteorological Society, 2012, 97:150626133330005

## Acknowledgment

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