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Global Calibration and Error Estimation of Altimeter, Scatterometer, and Radiometer Wind Speed Using Triple Collocation

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Abstract

The accuracy of wind speed measurements is important in many applications. In the present work, error standard deviations of wind speed measured by satellites and National Data Buoy Center (NDBC) buoys were estimated using triple collocation. The satellites included six altimeters, three scatterometers, and four radiometers. The six altimeters were TOPEX, ERS-2, JASON-1, ENVISAT, JASON-2, and CRYOSAT-2, whilst the three scatterometers were QUIKSCAT, METOP-A, and METOP-B and the four radiometers included SSMI-F15, AMSR-2, WINDSAT, and GMI. Hence, a total of 14 platform measurements, including NDBC buoy data, were used and the error standard deviations of each estimated. It was found that altimeters have the smallest error standard deviations for wind speed measurements followed by scatterometers and then radiometers. NDBC buoys have the largest error standard deviation. Since triple collocation can simultaneously perform error estimation as well as calibration for a given reference, this method enables us to perform intercalibration between platform measurements including NDBC buoy. In addition, the calibration relations obtained from triple

collocation were compared with the calibrations obtained from the widely used reduced major axis (RMA) regression approach. This method, to some extent, can accommodate measurements in which both platforms contain errors. The results showed that calibration relations obtained from RMA and triple collocation are very similar, as indicated by statistical parameters such as RMSE, correlation coefficient, scatter index, and bias.

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