# Impact of usage of multiple-satellite sensors on accuracy of daily-mean sea surface wind data

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Most satellites observing sea surface winds have sun-synchronous orbits and provide observation data at the same place two times per a day. We can expect that daily-mean values estimated from these data have some errors when diurnal changes in wind field cannot be neglected. For this problem, use of multiple satellites is helpful. Since the number of sensors used to construct daily-mean data is different among the years, it is expected that the accuracy of a daily-mean value changes from year to year.

The purpose of this study is to describe time variation of accuracy in daily-mean wind data in the Japanese Ocean Flux Data Sets with Use of Remote Sensing Observation (J-OFURO)-3 and to investigate its causes by comparing with in-situ measurement data by moored buoys and calculating three statistical values.

Results reveal that the statistical values are improved with year. To examine the relationship between the yearly statistics and the yearly number of satellite sensors, we plotted a scatter diagram between the number of satellites and three statistical values in each year. We found that the correlations between them are very high. We also focused on a time interval of the satellite wind observation, namely maximum missing time within a day. The result showed that the correlation between three statistical values and maximum missing time intervals is high. Since the relation between these two factors is not independent, we analyzed by considering both factors together. First, we chose five buoys with various standard deviations for a daily-mean value. Next, we picked up data from buoy's hourly data using random numbers, and calculated the daily mean value using the random data, and then determined the number of observations and the maximum missing time interval each day. Assuming the daily mean value calculated from 24 hourly data as a true value, the RMSE between this true value and the daily mean created from random data was calculated. From the result of this analysis, it was found that the value of Root Mean Square Error(RMSE) depends on the maximum missing time interval rather than the number of observations. Furthermore, when RMSE was normalized by standard deviation, the same figures were obtained for all buoys. This result implies that the RMSE of the daily mean value of the buoy station can be estimated if the magnitude of diurnal variation is known by giving the number of satellites used for observation and the maximum missing time interval, Moreover, by applying this result, we think that it is possible to show the optimal number of sensors and observation time for target accuracy. This result gives very breakthrough information to the design of the satellite observation system for sea surface wind.

Keywords: Multiple-satellite sensors, Sea surface wind