



Sea surface wind speed observations with SENTINEL-1 in coastal waters

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On the sea surface wind speed retrieval in coastal waters, this is a comparative study of accuracies with a new satellite and a decommissioned satellite. Over the past few decades, a considerable number of studies have been conducted on sea surface wind speed retrieval with satellite-borne C-band Synthetic Aperture Radars (SARs) and microwave scatterometers. According to previous studies, retrieved wind speeds at 10 m height above the sea surface have accuracies of 1.5 to 2.5 m/s root mean square error (RMSE). In this study, the accuracy with a new satellite, SENTINEL-1 is clarified and the accuracy is compared with those of the decommissioned satellite, ENVISAT/ASAR in Japanese coastal waters, Hiratsuka and Shirahama. Normalized radar cross sections (NRCSs) are calculated from 69 SAR images, and then the wind speed is retrieved from the NRCS with a wind direction, an incidence angle and a satellite heading angle in a geophysical model function, CMOD5.N.

The results show that RMSEs of the retrieved wind speed are 2.71 m/s (39.4 %) for Hiratsuka and 1.87 m/s (31.1 %) for Shirahama. These RMSE are higher than the previous study, which reported that RMSEs are 2.03 m/s for Hiratsuka and 1.73 m/s for Shirahama with ASAR. It is also shown biases are 1.79 m/s (25.9 %) for Hiratsuka and 1.46 m/s (25.1 %) for Shirahama. These biases are positive though those with the previous study are negative. It has been recognized that the SAR-retrieved wind speed has a negative bias in coastal waters because of an effect of land especially when winds blow from land to sea. Further research on other sea areas would clarify the reason of these differences.