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Abstract

Drag coefficient is an important parameter in order to correctly estimate the air-sea momentum flux. However, the parametrization of the drag coefficient hasn't been established due to the variation in the field data. Instead, a number of drag coefficient model formulae have been proposed, even though almost all these models haven't discussed the extreme wind speed range. With regards to such models, it is unclear how the drag coefficient changes in the extreme wind speed range as the wind speed increased. In this study, we investigated the effect of the drag coefficient models concerning the air-sea momentum flux in the extreme wind range on a global scale, comparing the difference in the drag coefficient models between Charnock (1955) and Takagaki et al. (2012). Interestingly, the former model didn't discuss the extreme wind speed range while the latter one considered it. We have found that the difference of the models in the annual global air-sea momentum flux was small because the occurrence frequency of strong wind was approximately 1% with a wind speed of 20 m/s or more. However, we also discovered that the difference of the models was shown in the middle latitude where the annual mean air-sea momentum flux was large. In addition, the estimated data showed that the difference of the models in the drag coefficient was large in the extreme wind speed range and that the largest difference became 23% with a wind speed of 35 m/s or more. These results clearly show that the difference of the two models concerning the drag coefficient has a significant impact on the estimation of a regional air-sea momentum flux in an extreme wind speed range such as that seen in a tropical cyclone environment.