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Wind waves modeling under hurricane Irma wind conditions

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Tropical cyclones and hurricane phenomena directly affect the lives of people in coastal areas and can cause destruction. Good weather and sea state forecasts will make it possible to secure the population and minimize losses from such natural phenomena. Nowadays wave forecasts are made mainly with the help of numerical wave models, e.g. WAVEWATCH III [1]. The model solves numerically the Hasselmann equation in presence of many physical effects such as wind input, dissipation, nonlinear interactions and many others. The CFSR reanalysis wind field from the real-case condition of the Irma hurricane that took place in the 31/08/2017 - 13/09/2018 was used as the wind forcing for WAVEWATCH III model. Wave parameters under Irma hurricane were calculated. The model reproduces the rotating and motion of the hurricane. The asymmetry of distribution of the surface wave field is obtained. The calculated significant wave height of surface waves induced by the hurricane is compared with the NDBC buoys data.
Using the calculations of the wind and wave field, we estimated the parameter of exchange between the atmosphere and ocean, the surface drag coefficient, and estimated the effects associated with the sea spray production. In the estimates, we used the effect which was recently identified as the dominant spray production mechanism at high winds, the "bag-breakup" fragmentation (see [2 - 4]). The reduction of the surface drag coefficient in the area of the strong winds is obtained. The asymmetry of the surface drag distribution with respect to the direction of motion of the storm center reflects the asymmetry of distribution of the surface wind and wave field.
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