Wind waves modeling under hurricane 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. The model solves numerically the Hasselmann equation in presence of many physical effects such as wind input, dissipation, nonlinear interactions and many others. The trial simulation of the waves generated by hurricane is implemented within WAVEWATCH III on three nested domains with grid spacing of 50 km, 15 km and 5 km, respectively. The results of the calculation of the singnificant wave height Hs show the movement the waves under hurricane conditions and the azimuthal displacement of the waves distribution. Calculated spectra in the region of high values of Hs are analyzed when different wind wave interaction parameterizations are switched on.

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 spectra of surface waves created by the hurricane allowed the evaluating the function of generating sprays according to empirical formulas.