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# Comment on gmd-2022-187

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Community comment on "Enhanced ocean wave modeling by including effect of breaking under both deep- and shallow-water conditions" by Yue Xu and Xiping Yu, Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-187-CC1, 2023

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Accurate simulation of typhoon waves has a crucial impact on the design of coastal structures and the disaster prevention of coastal cities. The key issue of typhoon wave simulation is the interaction between wind and waves and the description under high wind speed conditions. The WaveWatch III (WWIII) model, as a representative of the third-generation wave model, comprehensively considers the influence of various factors such as ocean currents and shallow water waves. But unfortunately, for wave simulation under extreme conditions, the wave energy will still be overestimated or underestimated when the optimal parameterization scheme is selected.

An important reason for the inaccurate simulation of the wave model is that the parameterization scheme of the source term inside the wave model is not perfect, especially since the consideration of various physical processes under extreme conditions is not careful enough. Due to extreme wind speed conditions and rapidly changing wind directions, ocean waves under typhoon conditions often correspond to generally lower wave ages and more severe breakage. Therefore, the simulation of typhoon waves requires a more accurate description of the wind momentum input in order to reasonably reflect the above characteristics. The shallowing process of offshore waves causes the air-sea coupling to become particularly complex in nearshore conditions.

In this study, based on the coupled AWBLM-WWIII model, the applicability of the air-sea momentum transfer description method under extreme conditions in the actual wind wave simulation is investigated, and the impact of the violent breaking scenario on the typhoon wave simulation is analyzed. Numerical simulations were carried out for the free growth process of ocean waves with limited wind time under uniform wind fields and the development process of typhoon waves under hurricane conditions, focusing on the simulation performance under different water depth conditions. The simulation results of the integral characteristics of the wave field, including the wave height, average period, and average wavelength, and the simulation results of the two-dimensional characteristics of the wave spectrum, including the distribution of frequency spectrum and direction spectrum, have been evaluated in detail.

In each wave simulation scenario, the wind momentum input and wave energy dissipation source item combination ST-XY proposed in this study has better performance in the characteristic wave parameter simulation than the WWIII built-in source item combination. The simulated wave spectrum parameters are in good agreement with the measured results. Many interesting results have been proposed and verified by the buoys in this study. These works provide a good idea for improving the accuracy of current wind wave simulation. This valuable work deserves to be published in Geoscientific Model Development, except that some figures should be re-edited, such as Figs.1, 5, and 10.