Uncertainties of Ocean Wave Parameter Estimated from HF Radar Sea-Echo in Typhoon Conditions

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Abstract

In order to monitor the dynamics of ocean surface under the passage of typhoons and monsoon fronts, a collaborative project of HF radar system is on-going to Taiwan. The system is scheduled to install 24 MHz HF radars that equipped with 32 antenna arrays at the NCU Coastal Observatory located in the northwestern of Taiwan in 2018. In this study, the existing methods for estimating wave parameters. i.e. significant wave height, mean period, wave direction and directional spreading parameter, are implemented to evaluate the output uncertainties for typhoon conditions. First, the Doppler-Range spectra are given as the target for the estimators is simulated by a self-developed numerical test-bed. Based on the theory of Barrick, the Doppler-Range spectra is generated by using the typhoon directional wave spectra, which is obtained from the 3rd generation wave model driven by the supper-fine grid of the typhoon wind fields. Thus, the directional wave spectra exhibit complexities such as extreme spatial heterogeneity, bimodal type and varying directional spreading under typhoon conditions. Then, the estimators were tested on the Doppler spectra simulated from different location designs of multi-virtual HF radar stations with respect to the trajectory of typhoons. The results demonstrated the advantages and limitations of using HF radar network for monitoring typhoon waves.

Key word: High Frequency Radar, Doppler-Range spectra, Typhoon Wave Parameters.