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Real-Time Phase-Resolved Ocean Wave Forecast with Data Assimilation[1] GUANGYAO WANG, YULIN PAN, University of Michigan, Ann Arbor — The phase-resolved prediction of ocean waves is crucial for the safety of offshore operations. With the ocean surface obtained from radar measurements as the initial condition, nonlinear wave models such as the high-order spectral (HOS) method can be applied to predict the evolution of the ocean waves. However, due to the error in the initial condition (associated with the radar measurements and reconstruction algorithm) and the chaotic nature of the nonlinear wave equations, the prediction by HOS can deviate quickly from the true surface evolution. To address these issues, the capability to regularly incorporate measured data into the HOS simulation through data assimilation is desirable. In this work, we develop the data assimilation capability for nonlinear wave models, through the coupling of an ensemble Kalman filter (EnKF) with HOS. We also propose a strategy of modifying the Kalman gain to address the problem of the shrinking of the predictable zone. The validity of the developed scheme is benchmarked using both the synthetic data and radar measurements. We show that the EnKF-HOS coupled scheme achieves much higher accuracy in the long-term simulation of nonlinear waves compared to the HOS-only method.

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