Geophysical Research Abstracts
Vol. 18, EGU2016-2459, 2016
EGU General Assembly 2016

Estimation of the Wavewatch III Model Performance for Pacific Ocean Wave: In the Perspective of Partitioned Wave Components and Wave-induced Transport

Fan Bi (1,2,3) and Jinbao Song (4)

(1) Institute of Oceanology, Chinese Academy of Sciences (IOCAS), Qingdao, China, (2) Key Laboratory of Ocean Circulation and Waves (KLOCAW), IOCAS, Qingdao, China, (3) Laboratory for Ocean Dynamics and Climate, Qingdao National Laboratory for Marine Science and Technology, Qingdao, China, (4) Ocean College, Zhejiang University, Hangzhou, China

Wave climate analysis and wave-current interaction research for the Pacific Ocean require a reliable wave hindcast. Five source and sink term packages in the Wavewatch III model (v3.14 and v4.18) are compared and assessed in this study through comprehensive observations, including altimeter significant wave height, advanced synthetic aperture radar swell, and buoy wave parameters and spectrum. In addition to the evaluation of typically used integral parameters, the spectra partitioning method contributes to the wave system and wave maturity validation, i.e. both wind sea and swell components are considered in detail. Two indexes are introduced in the evaluation: the modified performance evaluation method (PS) based on combination of weighted wave parameters and an indicator called HH (indicating the two authors) to avoid possible misleading results in the root mean square error-based validations. The comparison of PS and HH guarantee the consistency of the results. These methods effectively reduce attribute numbers and facilitates the overall assessment, and can be efficiently used in model validations.

The widely used Tolman and Chalikov (TC) package is still generally efficient in determining the integral properties of wave spectra but is physically deficient in explaining the dissipation processes. The ST4 package performs well in overall wave parameters and significantly improves the accuracy of wave systems in the open ocean. Meanwhile, the newly published ST6 package is slightly better in determining swell energy variations. The two packages (ACC350 and BJA) obtained from Wavewatch III v3.14 exhibit large scatters at different sea states. The three most ideal packages are further examined in terms of reproducing wave-induced momentum flux from the perspective of transport. Stokes transport analysis indicates that ST4 is the closest to the NDBC-buoy-spectrum-based transport values, and TC and ST6 tend to overestimate and underestimate the transport magnitude, respectively, in swell mixed areas. This difference must be considered, particularly in air–wave–current coupling research and upper ocean analysis. The assessment results provide guidance for the selection of ST4 for use in a background Pacific Ocean hindcast for high wave climate research and China Sea swell type analysis.