The use of a wave boundary layer model in SWAN

A Wave Boundary Layer Model (WBLM) is implemented in the third-generation ocean wave model SWAN to improve the wind-input source function under idealized, fetch-limited condition. Accordingly, the white capping dissipation parameters are re-calibrated to fit the new wind-input source function to parametric growth curves. The performance of the new pair of wind-input and dissipation source functions is validated by numerical simulations of fetch-limited evolution of wind-driven waves. As a result, fetch-limited growth curves of significant wave height and peak frequency show close agreement with benchmark studies at all wind speeds (5 ∼ 60 ms⁻¹) and fetches (1 ∼ 3000 km). The WBLM wind-input source function explicitly calculates the drag coefficient based on the momentum and kinetic energy conservation. The modeled drag coefficient using WBLM wind-input source function is in rather good agreement with field measurements. Thus, the new pair of wind-input and dissipation source functions not only improve the wave simulation but also have the potential of improving air-sea coupling systems by providing reliable momentum flux estimation at the air-sea interface. This article is protected by copyright. All rights reserved.