Wave boundary layer model in SWAN revisited

In this study we extend the work presented in Du et al. (2017) to make the WBLM applicable for real cases by improving the wind input and white-capping dissipation source functions. Improvement via the new source terms includes three aspects. First, the WBLM wind-input source function is developed by considering the impact of wave-induced wind profile variation on the estimation of wave growth rate. Second, the white-capping dissipation source function is revised to be not explicitly dependent on wind speed for real wave simulations. Third, several improvements are made to the numerical WBLM algorithm, which increase the model's numerical stability and computational efficiency. The improved WBLM wind-input and white-capping dissipation source functions are calibrated through idealized fetch-limited and depth-limited studies, and validated in real wave simulations during two North Sea storms. The new WBLM source terms show better performance in the simulation of significant wave height and mean wave period than the original source terms.