Wave breaking in shallow water

James Salmon and Leo Holthuijsen

Most 3rd generation wave models represent the effects of depth-induced wave breaking with the Battjes-Janssen (1978) model which uses a bore analogy. Other models use versions of this model (Thornton and Guza, 1983 and Baldock et al., 1998). These models scale with a critical wave height (a fraction gamma of the local depth) or the fraction Qb of breaking waves. We have implemented in SWAN a dozen combinations of these models, including the correction of Janssen and Battjes (2010), and estimates of gamma (the constant value of 0.73 and 8 dependencies on bottom slope and normalised wave number) and Qb (van der Westhuysen, 2009, 2010 and Filipot et al., 2010) and we added a model based on Dally et al. (1985). We compare the computational results with observations of the significant wave height under a wide variety of laboratory and field conditions (~ 200 cases, including complex 2D bathymetries with wind and currents). We have been able to improve the results by combining suggested dependencies of gamma on bottom slope and normalised wave number and adding the effect of wave directionality.