Abstract Submitted
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Predicting the breaking onset and strength of gravity water waves in arbitrary depth[1] MORTEZA DERAKHTI, APL-UW, JIM KIRBY, UD, JIM THOMSON, APL-UW, STEPHAN GRILLI, URI, MIKE BANNER, UNSW — We introduce a robust and local parameterization to predict the breaking onset and breaking strength of 2-D and 3-D gravity water waves in arbitrary depth. We use a LES/VOF model to simulate nonlinear wave evolution, breaking onset and post-breaking behavior for representative cases of 2-D and 3-D focused wave packets, modulated wave trains, regular and irregular waves propagating over various bed topographies featuring deep water, intermediate depths, and the shallow surf zone. We also use a 2D potential flow solver using BEM to simulate nonlinear wave evolution, focusing on breaking onset behavior. The new parameterization relates the breaking strength to a breaking strength predictor Γ defined as the normalized rate of change of $B = U/C$ following the wave crest (with U the water velocity at the crest and C the crest celerity). We show that the breaking onset criterion proposed by Barthelemy et al. (2018) in deep water is also effective in shallow water (i.e., when B exceeds $B_{th} \sim 0.85$ then breaking is imminent). The new parameterization is local and can handle multiple breaking events in space and time. The implementation of the new parameterization is convenient and efficient in phase-resolving models such as Boussinesq and HOS models.

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