Vorticity effect on the onset of breaking waves in shallow water

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Two-dimensional nonlinear gravity waves travelling in shallow water on a vertically sheared current of constant vorticity are considered. Using Euler equations, in the shallow water approximation, hyperbolic equations for the surface elevation and the horizontal velocity are derived. Using Riemann invariants of these equations that are obtained analytically, a closed-form nonlinear evolution equation for the surface elevation is derived. A dispersive term is added to this equation using the exact linear dispersion relation. Within the framework of this new model and Whitham equations a study of the effect of vorticity on the onset of breaking wave is carried out.