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Breaking solitary waves and swash flows

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Abstract

This talk consists of two parts. In the first part we will discuss numerical solutions describing the entire wave breaking process of a solitary waves on a slope. Numerical solutions are compared with detailed PIV measurements. Since both numerical solutions and experimental data are highly resolved, the dynamic processes for incident wave breaking and the hydraulic jump induced by down rush flows are discussed.

The second part of the talk focuses on the effects of bed friction on the swash flows near the moving shoreline. A theoretical approach, using the integral treatment, is introduced. The tip of the swash near the moving shoreline is treated as a region of uniform velocity, being acted on by the forces of friction, gravity, and the pressure force induced by the frictionless flow behind the swash tip. The bed shear stress is parameterized using the quadratic dependency on velocity. The theory is compared to data of the shoreline velocity and position in the swash of breaking solitary waves, and the friction coefficient is determined from direct measurements of bed shear stress. The theoretical predictions are in good agreement with the laboratory results in terms of the run-up as well as time history of the shoreline velocity and position.