



Dynamics of ship-induced solitary wave troughs in Venice Lagoon

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Based on experiments in the industrial channel of the Venice Lagoon, we demonstrate that ship-induced depressions (Bernoulli wakes) may propagate as long-living strongly nonlinear Riemann waves of depression into shallow water adjacent to navigation channels. Ships of moderate size (blocking coefficient 0.07–0.14) and sailing at low depth Froude numbers (0.37–0.5) produce depressions with a depth up to 2.5 m. The waves of depression decrease in height away from the channel before increasing in very shallow water. As the waves propagate into and through shallow water surrounding the navigation channel, they become strongly asymmetric with the rear of the depression wave becoming extremely steep, similar to a bore, and may be associated with very high water velocities.