Runup of nonlinear deformed waves on a beach

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The nonlinear theory of shallow-water is used to analyse the runup of long waves on the beach of constant slope. In most of previous studies (Carrier, Synolakis, Pelinovsky, Yeh, Tinti) the symmetrical or anti-symmetrical (N-shapes) initial wave shapes have been chosen. In the presented paper, the approaching of the nonlinear deformed waves to the coast is considered. Mathematically, the nonlinear deformed wave is the exact solution of the nonlinear shallow-water theory for the ocean of constant depth. It is shown that the runup height depends from the wave steepness (and, of course, the wave length and amplitude, and distance to the beach as for symmetrical disturbances) and may significantly exceed the runup height of symmetrical waves. The dynamics of the moving shoreline is studied in details, including characteristics of the "first breaking" on the coast.