Characteristics of the nonlinear shallow water wave: shape, steepness and spectrum

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The process of the nonlinear deformation of the shallow water wave in a basin of constant depth is studied. Initial and boundary problems are solved and compared. Characteristics of the first breaking are analyzed in details. The Fourier spectrum and steepness of the nonlinear wave are calculated. Spectral amplitudes of such wave can be found analytically in case of weak but finite amplitudes and they are compared with calculated spectrum for all amplitudes. It is shown that spectral amplitudes can be expressed through the wave front steepness that is useful for practical estimations.