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Second-order theory for long nonlinear continental shelf waves on a beach with a general depth distribution

A. Kurkin (1), **O. Poloukhina** (1,2)

(1) Nizhny Novgorod State Technical University, Nizhny Novgorod, Russia; (2) Institute of Applied Physics of Russian Academy of Sciences, Nizhny Novgorod, Russia (poloukhin@hydro.appl.sci-nnov.ru)

Continental shelf waves are studied in the long wave limit. The effects of weak topographic dispersion along with the nonlinear effects are calculated up to the second order of asymptotic theory. The second - order Korteweg - de Vries equation is derived to describe the behavior of the wave amplitude. Some particular cases of depth distribution are analyzed in detail. For these cases the coefficients of the nonlinear evolution equation are calculated numerically or analytically, and their signs are determined. Correspondingly, the possible shelf waveforms are discussed. The waveforms leading to the focusing of nonlinear shelf waves are described.