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Stationary solutions of the extended reduced Ostrovsky equation

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The extended Ostrovsky equation,

$$(u_t + cu_x + \alpha uu_x + \alpha_1 u^2 u_x + \beta u_{xxx})_x = \gamma u,$$

is used as a model of large-amplitude internal oceanic waves affected by Earth's rotation. It contains two types of dispersion, the Boussinesq dispersion ($\sim\beta$), which accounts for non-hydrostatic effects and Coriolis dispersion ($\sim\gamma$) which accounts for the Earth' rotation. In addition to that, the equation contains two nonlinear terms, quadratic ($\sim\alpha$) and cubic ($\sim\alpha_1$) ones. The reduced version of the equation, that does not contain the small-scale Boussinesq dispersion,

$$(u_t + cu_x + \alpha uu_x + \alpha_1 u^2 u_x)_x = \gamma u,$$

is relevant for the description of very long internal waves when the non-hydrostatic effects are negligible. Such equation may be also of interest for description nonlinear waves of other physical origin in nonlinear media. In this paper we present a systematic analysis and categorization of stationary solutions to this extended reduced Ostrovsky equation. Periodic and solitary solutions are constructed and their typical parameters are estimated for the natural oceanic conditions.