

ASYMPTOTIC SOLITON-LIKE SOLUTIONS OF THE BENJAMIN-BONA-MAHONY EQUATION WITH VARIABLE COEFFICIENTS

V. H. Samoilenko¹ and Yu. I. Samoilenko¹

¹ Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
valsamyul@gmail.com, yusam@univ.kiev.ua

The report deals with the singularly perturbed equation with variable coefficients

$$a(x, t, \varepsilon)u_t + b(x, t, \varepsilon)u_x + c(x, t, \varepsilon)uu_x - \varepsilon^n u_{xxt} = 0, \quad (1)$$

where $a(x, t, \varepsilon)$, $b(x, t, \varepsilon)$, $c(x, t, \varepsilon)$ are infinitely differentiable functions of variables (x, t, ε) , ε is a small parameter, n is natural.

Equation (1) is a generalization of Benjamin-Bona-Mahony (BBM) equation of the following form [1]

$$u_t + u_x + uu_x - u_{xxt} = 0 \quad (2)$$

proposed as alternative to the Korteweg-de Vries equation in 1966. Equation (2) describes the propagation of long waves in nonlinear dispersive media and it is called the regularized long wave equation. The BBM equation has soliton solutions, but it is not integrable one since it has only three conservation laws.

We present the algorithm for construction of asymptotic soliton-like solutions to equation (1). The algorithm is based on the nonlinear WKB technique developed for constructing quasi-periodic solutions to the singularly perturbed KdV equation with constant coefficient [2] in 1974. The main results are presented in [3].

1. Bona J.L., Pritchard W.G., Scott L.R. Solitary wave interaction. *Physics of Fluids*, 1980, V. 23, P. 438 – 441.
2. Miura R.M., Kruskal M. Application of non-linear WKB-method to the KdV equation. *SIAM J. Appl. Math.*, 1974, V. 26, P. 376 – 395.
3. Samoilenko V., Samoilenko Yu. Asymptotic soliton-like solutions to the Benjamin-Bona-Mahony equation. *J. Math. Physics*, 2019, V. 60, 011501; doi: 10.1063/1.5085291.