NUMERICAL METHOD OF FINDING SOLITARY WAVE SOLUTIONS OF THE KDF EQUATION

Savenkova N.P., Ilutko V.P., Kutsaeva E.A.

Moscow State University named by Lomonosov M.V., the Department of Computational Mathematics and Cybernetics, Computational Methods Subdepartment,
75 flat, 2 building, 10/15 Yunih Lenintsev street, Moscow, 109390, RUSSIA,
phone: 8(905)178-11-15, 8-926-145-76-31,
E-mail: benedikta.merlin@gmail.com

Let's consider the KDF equation:

$$\frac{\partial u}{\partial t} = \frac{\partial^3 u}{\partial^3 x} + 3\frac{\partial (u^2)}{\partial x}, t > 0, -\infty < x < +\infty$$

$$u(\pm\infty, t) = 0, \frac{\partial u}{\partial x}(\pm\infty, t) = 0, t \geq 0$$

$$u(x,0) = u_0(x), -\infty < x < +\infty,$$

which describes dynamics of the solitary wave on shoal.

It could be analytically shown, that soliton type solution of the KDF equation presents by the formula:

$u_1(x,t) = \frac{c}{2} sch^2(\frac{\sqrt{c}}{2}(x - ct + \delta))$, where $c = k^2, k \in N, \delta$ – integration constant.

Usually when finding different nature soliton solutions unique, constructed especially for considered mathematical object setting difference schemes and solution finding methods are used.

This study describes two numerical methods, which can be used for finding the solitons, which are solutions of the different type non-linear differential equations, so these methods are universal in this regard. Accounts results comparison is reduced, which results are obtained using these methods to research KDF equation.

References:

1. *Miva T., Jimbo M., Date E.* Solitons: Differential Equations, Symmetries and Infinite Dimensional Algebras. - Moscow: MCCME, 2005.

2. *Torohova T.V., Savenkova N.P., Trofimov V.A.* Numerical modeling of the soliton solutions in the problem of the femotsecundal pulse spread in the cube nonlinearity environment// *Applied mathematics and informatics, collected articles of the CMC department,* №2, 1999. Pp. 63-68.