**Filina A. A.** (Scientific research center of supercomputers and neurocomputers, Taganrog), **Nikitina A. V.** (Don State Technical University, Rostov-on-Don; Southern Federal University, Taganrog). **Research the numerical solution accuracy of the diffusion equation in water ecology problem based on the stochastic approach**

The method for problem solution has been developed to simulate the phytoplankton populations' dynamics in shallow water with its oil pollution taking into account the effects of natural and technogenic factors, global climate changes [1]. It's based on the use of difference schemes of high (fourth) order of accuracy to solve the problem presented by the diffusion equation of the form $u'_t = ku''_{xx} + f$, $0 < x < l$, $t > 0$ with the initial $u(x,0) = u_0(x)$ and boundary $u(0,t) = 0$, $u(l,t) = 0$, $t > 0$ conditions. In this case, various fluctuating quantities are considered as random functions.

**Theorem.** Under the conditions of existence of the diffusion equation solution, presenten as a series $u(x,t) = \sum_{m=1}^{N-1} C_m^u(t)\sin(\omega m x)$ and a source function $f(x,t) = \sum_{m=1}^{N-1} C_m^f(t)\sin(\omega m x)$ at model discretization on the basis of the developed finite-difference schemes of high order of accuracy, the rates of diffusion exchanges $k$ differ by the amount $\alpha = 1 - (15 - 16\cos(\omega m h) + \cos(2\omega m h))/6(\omega n h)^2$ or less than the real values for each harmonic of the solution function.

## REFERENCES

1. *Sukhinov, A. I., Chistyakov, A. E., Litvinov, V. N., Nikitina, A. V., Belova, Yu. V., Filina, A. A.* Computational aspects of mathematical modeling of the shallow water hydrobiological processes // Numerical Methods and Programming. – 2020. – Vol. 21. – p. 452–469. DOI:10.26089/NumMet.v21r436.

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