Belova Y.V. (Rostov-on-Don, Russia), **Nikitina A.V., Filina A.A.** (Taganrog, Russia). **The statistical processing of field data for studying nutrient pollution of a shallow water by river flows when modeling its ecological state.**

Analytical probability curves for mathematical modeling of the influence of the biogenic substances concentration that enter the Sea of Azov with river flows can be obtained by statistical analysis of natural hydrological and hydrochemical information [1]. In this paper, water pollution is considered as a probabilistic process based on the assumption that the process of transport of nutrients is random. The model of biochemical transformation of biogenic substances:

$$\frac{\partial S_i}{\partial t} + div\left(\mathbf{U}, S_i\right) = div\left(\mathbf{k}_i grad S_i\right) + R_i, \mathbf{k}_i = \left\{\mu_i, \mu_i, \nu_i\right\}, \, i = \overline{1,10}, \tag{1}$$

where S_i - concentration of i-th component; $\mathbf{U}$={u,v,w} - water flow velocity vector, R_i - chemical and biological source, index i indicates type of substance: 1-3 indexes for the concentrations of green, blue-green and diatoms, respectively; 4 - phosphates (PO_4), 5 - suspended organic phosphorus (POP), 6 - dissolved organic phosphorus (DOP), 7 - nitrates (NO_3), 8 - nitrites (NO_2), 9 - ammonium (NH_4), 10 - dissolved inorganic silicon (Si); μ_i, ν_i - diffusion coefficients in horizontal and vertical directions [2]. Add the corresponding initial and boundary conditions to the system. The principle of the aggregate action of Mitscherlich external factors was used:

$$f_P(S_4) = \frac{S_4}{S_4 + K_4}, f_{Si}(S_{10}) = \frac{S_{10}}{S_{10} + K_{10}}, f_N(S_7, S_8, S_9) = f_N^{(1)}(S_7, S_8) + f_N^{(2)}(S_9),$$

$$f_N^{(1)}(S_7, S_8) = \frac{(S_7 + S_8)\exp(-K_{psi}S_9)}{K_7 + (S_7 + S_8)}, \; f_N^{(2)}(S_9) = \frac{S_9}{K_9 + S_9},$$

where K_4, K_7, K_9, K_{10} - constants of half-saturation of phosphates, nitrates, ammonium, silicon; K_{psi} - coefficient of ammonium inhibition.

During the statistical processing of field data, the following values were calculated: asymmetry coefficients C_s, kurtosis C_e, variance D and standard deviation σ, coefficient of variation C_ν, ratio C_s/C_ν, autocorrelation coefficient, and Neumann ratio. Due to the heterogeneity of the data of field observations in the samples, they were divided into seasons and months. Anderson's test was used for determine the significance of autocorrelation relationships. The significance of the autocorrelation coefficient for the nutrients under consideration was tested in relation to Neumann with a given level of significance.

REFERENCES

1. *Nikitina A.V., Sukhinov A.I., Ugolnitsky G.A., Usov A.B., Chistyakov A.E., Puchkin M.V., Semenov I.S.* Optimal control of sustainable development in the biological rehabilitation of the Azov Sea. Mathematical Models and Computer Simulations, 2017, 9 (1), pp. 101-107, DOI 10.1134/S2070048217010112.
2. *Sukhinov A.I., Belova Y.V.* Study of stationary solutions of the problem of phytoplankton dynamics with the transformation of phosphorus, nitrogen and silicon compounds. Vestnik of Don State Technical University, 2019, vol. 19, № 1, pp. 4-12.

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