# ANALYSIS OF STOCHASTIC ATTRACTORS AND NOISE-INDUCED TRANSITIONS IN 2D LOGISTIC-TYPE MODEL

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We consider the two-dimensional logistic model [1] under the influence of random perturbations

$$\begin{aligned} x_{t+1} &= (1-\mu)x_t + 4\mu y_t(1-y_t) + \varepsilon_1\xi_t \\ y_{t+1} &= (1-\mu)y_t + 4\mu x_t(1-x_t) + \varepsilon_2\eta_t \end{aligned}, \quad (1)$$

where $\xi_t$, $\eta_t$ are independent Gaussian random values with parameters $E\xi_t = 0$, $E\eta_t = 0$, $E\xi_t^2 = 1$, $E\eta_t^2 = 1$, and $\varepsilon_{1,2}$ are noise intensities.

In this work, we study dynamic regimes and bifurcations for the deterministic 2D logistic-type discrete model in zones of stable equilibria, closed invariant curves and discrete cycles. Here, a stability level of attractors is studied by Lyapunov exponents. Transformations of the closed invariant curve that appears as a result of Neimark-Sacker bifurcation, were analyzed via the rotation number and angular density.

Under the random disturbances, stochastic trajectories leaving deterministic attractors can form complex dynamic regimes that have no analogue in the deterministic case. We analyze an impact of the random noise on 2D logistic-type model in the bistability zones with coexisting attractors (equilibria, closed invariant curves, discrete cycles). For constructive probabilistic analysis of the random states distribution around such attractors, a stochastic sensitivity functions technique and method of confidence domains are used [2]. For the considered model, on the base of the suggested approach, a phenomenon of noise-induced transitions between attractors and the generation of chaos are analyzed.

The work was supported by Government of the Russian Federation (Act 211, contract № 02.A03.21.0006).

**References.**

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2. *Bashkirtseva I., Ryashko L.* Stochastic sensitivity analysis of the attractors for the randomly forced Ricker model with delay // Physics Letters A **Vol. 378**, Iss. 48, Year 2014. Pp. 3600-3606.