15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: LIF276

Chaos, bifurcations and strange attractors in environmental radioactivity dynamics of some geosystems

Eugeny Ternovsky, Alexander V. Glushkov, Olga Khetselius, Alexander Belodonov

Abstract: We develop the theoretical foundations of new universal complex chaos-dynamical approach to description of the deterministic chaos, bifurcations and strange attractors in dynamics of the environmental radioactivity systems. In particular, the atmospheric radon 222Rn concentration temporal dynamics is studied and computed. The nonlinear analysis methods include advanced versions of the correlation integral and multifractal analysis, algorithms of average mutual information, false nearest neighbors, surrogate data, Lyapunov's exponents and Kolmogorov's energy analysis, non-linear prediction schemes, predicted trajectories algorithms, spectral methods etc (in versions [1,2]). The chaos-dynamical approach is applied to quantitative analysis, modeling and forecasting temporal and spatial evolution of the atmospheric radon 222Rn concentration. The detailed data of measurements of the radon concentrations at Environmental Measurements Laboratory (US Department of Energy, and Goddard Institute of Space Studies Chester, New Jersey, USA (1978-2001; c.g.[3]) are used. The perspectives of computing chaos, bifurcations and strange attractors characteristics in other geo- and bio-systems are analyzed. References: [1] Glushkov A.V.: Methods of a Chaos Theory. Odessa: Astroprint, 2012. [2] Glushkov A.V., Khetselius O.Yu., Svinarenko A.A., Buyadzhi V.V.: Methods of computational mathematics and mathematical physics, P.1. Odessa: TEC, 2015. [3] Jacob D., Prather M.: Tellus. 42b, 118 (1990).

[1)] Eugeny Ternovsky, M.Sc. (Ph.D. student): Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), ternovskyev@gmail.com.

[2)] Alexander V. Glushkov, Professor: Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), glushkovav@gmail.com.

[3)] Olga Khetselius, Professor: Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), okhetsel@gmail.com.

[4)] Alexander Belodonov, B.A. (M.Sc. student): Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), belodonovas17@gmail.com.