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ABSTRACTS

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New generalization for the intermittency theory for type I, II and III.

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The concept of intermittency has been introduced by Pomeau and Maneville in the context of the Lorenz system and are usually classified in three classes called I, II, and III. Intermittency is a specific route to the deterministic chaos when spontaneous transitions between laminar and chaotic dynamics occur. The main attribute of intermittency is a *global reinjection mechanism* described by the corresponding reinjection probability density (RPD), that maps trajectories of the system from the chaotic region back into the *local* laminar phase. We generalize the classical analytical expressions for the RPD in systems showing Type-I, II, or III intermittency. As a consequence, the classical intermittency theory is a particular case of the new one. we present an analytical approach to the noise reinjection probability density. It is also important to note that from the RPD, obtained from noisy data, we have a complete description of the noiseless system. Pathological cases of intermittency described in the literature are known by their significant deviation of the main characteristics from those predicted by the classical theory. In this work we have shown that the use of generalized RPD provides faithful description of anomalous and standard intermittencies in the unified framework.

Spatio-temporal dynamics of p53 and nonlinear reaction-diffusion equations

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In a protein spatio-temporal dynamics in a single cell one can easily arrive to coupled non-linear reaction-diffusion systems defined for the nuclear and cytoplasmic concentrations of species involved in the protein signaling network (for example, by using Michaelis-Menten and Hill kinetics to describe reactions between the species), connected with the so-called Kedem-Katchalsky boundary conditions on the nuclear membrane simulating transport of the species between the compartments. We are particularly interested in spatio-temporal signaling of the p53 protein in response to DNA damage. Among other things, we show that oscillatory patterns (and instabilities) in p53 concentration can be driven by spatial and compartmental representation of processes occurring in a cell, and by a membrane permeability property that can impose physiological delays into protein responses. The semi-implicit Rothe method is used to (constructively) prove existence and uniqueness of non-negative solutions of such reaction-diffusion systems.

Kinetic theory of two-species coagulation

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We will outline our study on the stochastic process of two-species coagulation. This process consists in the aggregation dynamics taking place in a ring. Particles and clusters of particles are set in this ring and they can move either clockwise or counterclockwise. They have a probability to aggregate forming larger clusters when they collide with another particle or cluster. We study the stochastic process by means of Boltzmann equations that do not conserve momentum and therefore give rise to an interesting dynamics. We determine the long time behavior of such a model, making emphasis in one special case in which it displays self-similar solutions. In particular these calculations answer the question of how the system gets ordered, with all particles and clusters moving in the same direction, in the long time.

Effect of the Central Bank on the Stability of a Bank Network System

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In the China interbank market, the transaction behaviors of banks are similar and the interbank borrowing is short of regulation, which may result in a big problem. In this case, when the bank system faces liquidity shocks, it is difficult for the bank system to resolve the crisis only with the help of the interbank market. Therefore, how to develop monetary policies by the central bank to ease the system risk is a big issue. Considering the issue of system risk, the present paper constructs a dynamical bank network model based on agents' behavior with the method of the agent-based computational finance, and then studies the effects of the central bank on the stability of the bank system. The results show that the central bank can eliminate financial panic and achieve stability and security of the bank system with a range of appropriate monetary policy tools. Furthermore, when the bank system becomes unstable due to the short of regulation, it is difficult for the central bank to improve the stability of the bank system by adjusting the money policy of the deposit reserve rate.