

Stochastic Arnold diffusion of deterministic systems

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Abstract:

In 1964 V. Arnold constructed an example of nearly integrable deterministic system exhibiting instabilities. In the 1970s physicist B. Chirikov coined the term for this phenomenon "Arnold diffusion", where diffusion refers to stochastic nature of instability. One of most famous example of stochastic instabilities for nearly integrable systems is dynamics of Asteroids in Kirkwood gaps in the Asteroid belt. They were discovered numerically by astronomer J. Wisdom.

During the talk we describe a class of nearly integrable deterministic systems, where we prove stochastic diffusive behavior. Namely, we show that distributions given by deterministic evolution of certain random initial conditions weakly converge to a diffusion process. This result is conceptually different from all known mathematical results, where existence of a "diffusing orbit" is shown. This work is based on three papers: one is joint with O. Castejon, another is joint with M. Guardia and J. Zhang, and the third one is joint with J. Zhang and K. Zhang.