Weak ergodicity breaking in a nonlinear dynamical system

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Abstract

Anomalous transport in systems where the average waiting time in a micro-state of the system is infinite also exhibit weak ergodicity breaking. Examples of such systems are blinking quantum dots which exhibits a stochastic behavior similar to the ballistic Lévy walk model, and beads diffusing in an actin network which exhibit a sub-diffusive CTRW behavior. In such systems time averages are not equal to ensemble averages. Hence the basic question addressed in this talk, is what statistical mechanical theory replaces the standard ergodic Boltzmann–Gibbs theory for systems whose dynamics is governed with long tailed power law waiting times distributions. Using several examples, from chaotic dynamics, blinking dots, CTRW model, and the fractional Fokker-Planck equation, we find that the theory of weak ergodicity breaking describes the non-ergodic properties of such systems.