Fractional equations and fractals in Hamiltonian systems

Lydia Bouchara*[1], Ouerdia Meziani[2], Xavier Leoncini[3], Bachir Meziani[2,4], and Nawel Amatousse[2]

[1]Laboratoire de Physique théorique (UAMB) – Algeria
[2]Laboratoire de physique théorique (UAMB) – Algeria
[3]Centre de Physique Théorique (Marseille) – Centre National de la Recherche Scientifique - CNRS – France
[4]Laboratoire de physique théorique – Algeria

Abstract

The Hamiltonian systems Kinetics is complex, To study this kinetic, we have analyzed Focker Planck Kolmogorov equations (FPK) and fractional FPK equations (FFPK). This kinetic lead either to a Gaussian statistic, in strong disturbance case or else to Levy flight or Dirac peak in for average velocities distributions. Therefore, we identified phase velocities data and made statistical and stochastic averages over different times, which allowed us to calculate different moments, plot average velocities distributions and note their maximum for each time considered. Therefore, define characteristics exponents so as to deduce transport nature of these systems.

In this work, link between the fractal geometry which characterizes, at a given time and for well-chosen perturbations, our phase spaces and the fractional equations is investigated. It is obvious that type and structure of kinetic equation depend on the space considered and on the random process whether or not Markovian. Thereafter, we will be interested in link between a fractal or multifractal geometric description and a statistical description by using moments, let appear, under certain conditions, FFPK equation.

Keywords: Fractional equation, Hamiltonian transport, Chaos

*Speaker