

Nonlinear dynamical systems: Does strong chaos exclude q-statistics?

Constantino Tsallis

Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro, Brazil
tsallis@cbpf.br

There is a common belief concerning classical Hamiltonian systems, namely that strong chaos necessarily leads to Boltzmann-Gibbs stationary states. The full scenario might be more subtle than that when the relevant phase space is not fully occupied.

Indeed, for the d -dimensional long-range XY and Fermi-Pasta-Ulam models (and possibly the long-range Heisenberg model as well), a region appears to exist where strong chaos is exhibited and nevertheless the system shows one-body q -statistical distributions ($q > 1$) for both velocities and energies, which excludes Boltzmann-Gibbs statistics. This apparent paradox might be related to the nature of the occupancy of phase-space, as recently suggested by numerical studies on the standard and web maps [U. Tirnakli and E.P. Borges, *Scientific Reports/Nature* 6, 23644 (2016); G. Ruiz, U. Tirnakli, E.P. Borges and C. Tsallis, *J. Stat. Mech.* 063403 (2017); G. Ruiz, U. Tirnakli, E.P. Borges and C. Tsallis, *Phys. Rev. E* 96, 042158 (2017)].

A full Bibliography is available at <http://tsallis.cat.cbpf.br/biblio.htm>