Weak chaos, infinite ergodic theory, and anomalous diffusion

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My talk is about the relation between weak chaos and anomalous transport in simple one-dimensional maps [1]. I will first remind of fundamental chaos quantities and their relation to each other in the paradigmatic Bernoulli shift. By using the intermittent Pomeau-Manneville map I will then outline the problem of infinite ergodic theory, which defines a very recent mathematical field of research. On this basis I will discuss generalizations of ordinary chaos quantities for characterizing weak chaos. Considering a spatially extended version of the Pomeau-Manneville map [1,2] leads to the phenomenon of anomalous transport [3]. Here I will study the parameter dependence of subdiffusion by using stochastic continuous time random walk theory and deriving a fractional diffusion equation. I will conclude by indicating the importance of anomalous dynamics for biological cell migration.

[1] R.Klages, *From Deterministic Chaos to Anomalous Diffusion* (book chapter for Reviews of Nonlinear Dynamics and Complexity Vol. 3, H.G.Schuster (Ed.), Wiley-VCH, Weinheim, 2010).

[2] R.Klages, *Microscopic Chaos, Fractals and Transport in Nonequilibrium Statistical Mechanics* (World Scientific, Singapore, 2007).

[3] R. Klages, G.Radons, I.M.Sokolov (Eds.), *Anomalous transport* (Wiley-VCH, Weinheim, 2008).