

SEMINAR ON STOCHASTIC PROCESSES, 2000

ANOMALOUSLY SLOW DIFFUSION AND HOMOGENISATION ON INFINITELY MANY SCALES

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It is now well known that natural Brownian motions on various fractal structures are anomalously slow. In this joint work with Houman Owhadi (EPFL) we try to understand the basic mechanisms of anomalously slow diffusion. These mechanisms are well understood for very regular strictly self-similar fractals. The archetypical specific example of a deep problem being the one solved by Barlow and Bass on the Sierpinski Carpet (which is infinitely ramified, a codeword for hard to understand rigorously). It appears that the main feature is the existence of an infinite number of scales of obstacles (with proper size) for the diffusion.

We show that this last feature is the key for the possibility of anomalous diffusion, in a general context (without any local symetries as those of the Sierpinski Carpet), using the tools of homogenisation.