

Almost sure behaviour of extremes in dynamical systems

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Suppose (f, \mathcal{X}, ν) is a measure preserving dynamical system and $\phi : \mathcal{X} \rightarrow \mathbb{R}$ is an observable with some degree of regularity. We consider the maxima process $M_n := \max\{X_1, \dots, X_n\}$, where $X_i = \phi \circ f^i$ is a time series of observations on the system. When $M_n \rightarrow \infty$ almost surely, we establish results on the almost sure growth rate, namely the existence (or otherwise) of a sequence $u_n \rightarrow \infty$ such that $M_n/u_n \rightarrow 1$ almost surely. We establish such results for a wide class of non-uniformly hyperbolic dynamical systems, under mild assumptions on the rate of mixing, and on regularity of the invariant measure. Applications of our results include non-uniformly expanding systems (such as intermittency-type maps), and non-uniformly hyperbolic systems which include dispersing billiard maps, Lozi type maps, Hénon-like diffeomorphisms and Lorenz-like maps. [Joint with M. Nicol, A. Torok].