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Re-cycling Hénon

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Ergodic averages, entropies and characteristic invariant measures of chaotic systems can in principle be computed via limit distributions of saddle-type periodic orbits embedded in the chaotic set. This has been proven to be rigorous for hyperbolic systems. However hyperbolicity does not cover large families of dynamical systems, e.g. the Hénon family as one of the most prominent examples. In fact, from the point of view of concrete physical systems, hyperbolicity seems to be a rather rare property. The periodic orbit technique, which has been claimed for a wide range of nonhyperbolic systems, can indeed be extended rigorously to *some* systems that present a weak type of (nonuniform) hyperbolicity.

We study in detail how far quantities such as pressure, entropies, and escape rates can approximately be obtained by numerical computations; our model case includes the Hénon family. As a general result, for many parameter values we find a reasonable convergence. However, there exist specific parameters where convergence is very poor, which is usually caused by orbits with exceptionally small Lyapunov exponents. Moreover, the periodic orbit technique alone can be very misleading, if chaotic saddles and attractors coexist.