Chaotic diffusion in a triaxial galactic model: an example of global stable chaos

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In this work we focus on the chaotic diffusion in the phase space of a triaxial potential resembling an elliptical galaxy. The transport process is studied in two different action-like starting spaces in order to cope with circulating and non-circulating orbits. Estimates of the diffusion rate obtained by means of the variance approach are discussed in detail and their limitations are exposed. After revisiting the Shannon-entropy-based method from a conceptual point of view in the framework of simple arguments taken from the information theory, we apply it to measure changes in the unperturbed actions or integrals of motion of the system for different sets of small ensembles of random initial conditions. For such sets of ensembles, estimates of the Lyapunov times are also provided. The results show that, within the chaotic component of the phase space, the Lyapunov times are shorter than any physical time-scale as the Hubble time, but the diffusion times are much larger than the latter. Thus we conclude that stable chaos dominates the dynamics of realistic galactic models.

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