Chaos and Entropy in Galactic Models

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Untill 10 years ago, people used to modelate elliptical galaxies as collisionless equilibrium systems, ignoring the possibility of systematic dynamical changes. Complex equilibria, specially cuspy and/or nonaxisymetric potentials, may not exist or maybe very hard for a real galaxy to find; specially in high density environments external irregularities may be significantly more important in triggering systematic changes in the bulk of the structure of a galaxy1. This fact is reflected in the evidences that elliptical galaxies, even very isolated galaxies, are the results of several non-dissipative mergers. Thus, chaotic orbits are an important ingredient to maintain the triaxiality of elliptical galaxies as well as the orbital structure of dark halo-disk-bulge systems. The presence of massive black holes leads the galactic center into a chaotic system and therefore towards a possible morphological evolution. We use a Monte Carlo integration method to sample the most important families of chaotic orbits which build a galaxy chaotic, and calculate the Kolmogorov-Sinai entropy2 along the Hubble sequence as a measure of global stochasticity.

References

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