POTENTIAL OF EARLY-TYPE BARRED GALAXIES AND ORBITAL STRUCTURE OF NGC 936

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Traditionally, the potential used for the study of the orbital structure of a bar is derived from a more or less realistic analytical mass distribution. Since the light distribution of real barred galaxies does not look like the mass distribution of the models (see [1]), we have directly computed the potential from CCD frames. We have applied our method on a sample of 17 early-type barred galaxies and, for one of them, we have computed orbits in its calculated potential.

To compute the potential from images, we use the following procedure: since the local mass-to-light ratio may be assumed to be constant for the inner parts of early-type galaxies, the surface brightness, measured from CCD frames deprojected to face-on, gives us the mass surface density. This density is decomposed on a basis of orthonormal potential-density pairs. The potential series is thus deduced from the mass one using the relations between the two bases. The coefficients of the Fourier series of the potential are computed for the 17 galaxies as well as for some models of ellipsoids (Ferrer, de Zeeuw-Pfenniger,...). The comparison definitively shows that these models are a coarse approximation of the computed potential.

For NGC 936, we compute orbits and look for families of periodic ones in the 3 following cases: (1) only the axisymetric part of the potential is used, (2) we add the m=2 coefficient to create a perturbation and (3) we add the m=4 component. The characteristic diagrams show a global behaviour predicted by models since we found the principal families (Lagrangian orbits, X1...), but there are many new features that do not appear in models. For instance, the X1 orbits develop loops along the major-axis of the bar but they are unstable at all energies. The 3/1 family has stable parts alternating with unstable ones. A family of long period orbits without loops is continuous in the m=2 case but is broken as we add the m=4 component; two parts remain stable, the rest loose their stability. To complete the present study, we have computed surfaces of section for different values of the Jacobi constant which show the importance of the ergodicity in this potential.

Reference:
[1] Athanassoula E., Morin S., Wozniak H., Puy D., Pierce M.J., Lombard J. and Bosma A.: 1990, *Mon. Not. R. Astr. Soc.*, in press.

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