STRUCTURE AND DYNAMICS OF MAGELLANIC TYPE GALAXIES

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Morphology

In continuation of former work (Feitzinger 1980) the morphological structure of 68 SB(s)m systems, greater than 2!5 on ESO/SRC survey plates, was investigated. Three morphological features should be mentioned:

1. Stellar bars located asymmetrically with respect to the disk are found in 70% of the cases; the displacement relative to the disk diameter is Λ = 0.1 - 0.35.
2. The disk is populated in 45 % of the cases by chains of HII regions (spiral arm filaments).
3. Though not very frequent nearly 25 % of the SBm systems have a dominating HII region near the outer periphery and predominantly near one end of the bar.

Model Calculations

To obtain a first understanding of the structure of SBm systems and the above mentioned features gas dynamical calculations were performed to clear the gas-bar interaction (Feitzinger, Schmidt-Kaler, Weiss 1983). In the case of a symmetrical embedded prolate bar in an oblate disk two stable and two unstable Lagrange points exist apart from the center. If we shift the bar out of the center of the disk one of the stable points (N_4 or N_5) is lost (de Vaucouleurs, Freeman 1973). For an inertial observer the rotation curve of such a galaxy, measured perpendicular to the symmetry line of the bar, shows two disturbances (Fig. 1). The stable circulation around the N_4 point diminishes, if we shift the bar out of the disk center and the rotation curve becomes asymmetric.
Generally near the end of the bar a density increase develops and also short density enhancements (spiral arm filaments) are set up in the disk. The stability and life time of these structures depends mainly on the bar rotation. In the disturbed gas disk stochastic selfpropagating star formation processes have been run (Feitzinger et al. 1981). We see a preponderance of star formation in the denser parts of the disk. The ends of the bar are very active sites, and star formation is also going on in the density enhancements of the disk. Observationally such structures may be identified with the spiral arm filaments and the giant and supergiant HII regions at the ends of the bars of Magellanic type galaxies.

E. Athanassoula (ed.), Internal Kinematics and Dynamics of Galaxies, 241–242.

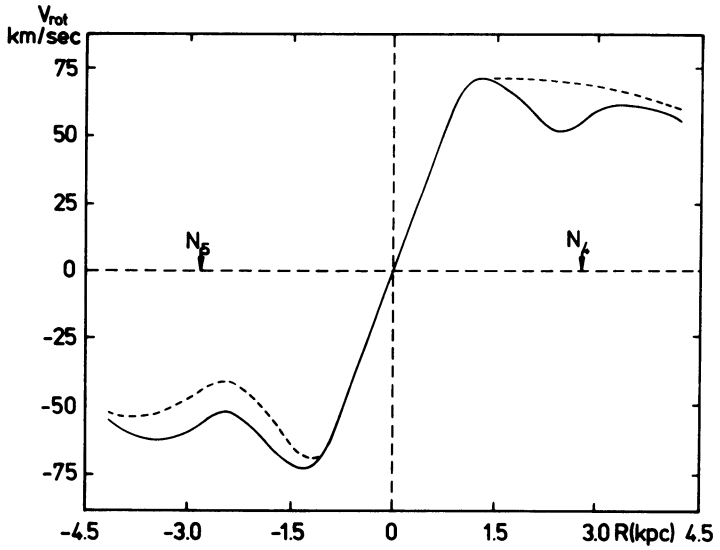

Fig. 1 Rotation curve, measured perpendicular to the bar. Large Magellanic Cloud parameters are used (compare also Christiansen and Jefferys 1976). Full line: Bar and disk center coincide. Broken line: Bar and disk center are shifted by 500 pc; the rotation curve becomes asymmetric.

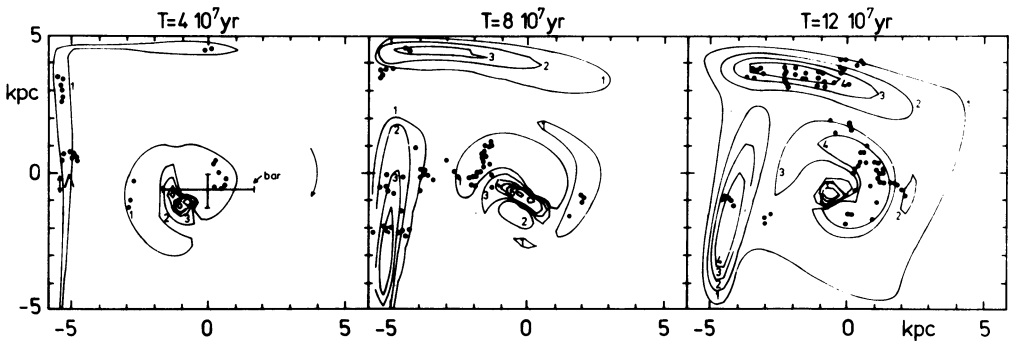

Fig. 2 Density distribution in percent of the undisturbed disk at three time steps with the same bar position. Dots indicate star forming regions. The time step of star formation is 10^7 yr and only the most recent sites are indicated; no aging is shown.

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