DYNAMICAL MODELS OF NGC 3115

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1. Jeans, Hunter & Qian, and Quadratic Programming

We present here axisymmetric two and three integral models of the S0 galaxy NGC 3115. The light and mass models are based on an application of the Multi-Gaussian Expansion (MGE) method on V band images of NGC 3115. The resulting model fits the photometry from the central HST pixel (0.045 arcsec) up to a radius of $\sim$ 500 arcsec (combining a wide field image kindly provided by Cecilia Scorza, an HRCAM/CFHT image, and the WFPC2/HST image). The deprojection is analytical if each component corresponds to a 3D Gaussian. Here, the model is assumed axisymmetric. The analytical expression of the luminosity density serves as the input for all the dynamical models.

We then gathered all available observed kinematics of NGC 3115 in order to properly sample the different scales. This resulted in a variety of data sets (including 2D TIGER kinematics) for which we must know the spatial and spectral PSFs, as well as the pixel size: all these parameters have been taken into account in the comparison between these data and the dynamical models.

We used simple Jeans models to obtain a first estimate of the mass to light ratio and the mass of a possible central dark object. Since available velocities and dispersions are usually measured from a pure gaussian fit, the observed true second order moment can only be derived with reasonable accuracy for data including higher order Gauss-Hermite moments (LOSVDs).

We then derived two integral distribution functions using the Hunter & Qian formalism coupled with the MGE technique, including different cusp slopes and a range of masses for the central dark object. The odd part of the

Y. Sofue (ed.), The Central Regions of the Galaxy and Galaxies, 393-394.

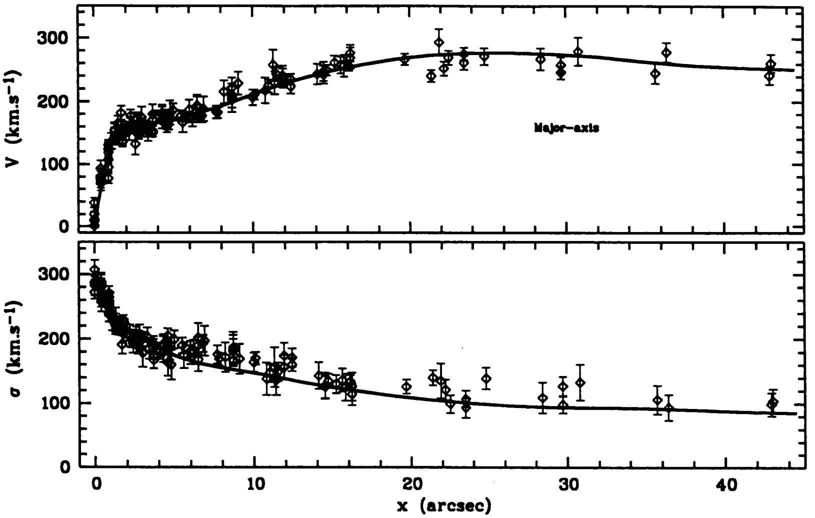

Figure 1. Kinematics (V and σ) along the major-axis of NGC 3115 from Kormendy & Richstone (1993) compared with the best fit 2I model.

distribution function was expressed as a function of the even part taking into account various different dynamics for the disc and bulge components.

We finally use the Quadratic Programming method developed by Dejonghe et al. to derive three integral distribution functions. The third integral was specified through the fitting of a Stäckel potential to this grid, and is thus an approximation. We finally used a softened $1/r$ singularity at the centre.

2. Conclusion

The main results of this study are:

- the central kinematics cannot be fitted without the addition of a central dark mass of $\sim 9 \times 10^8$ $M_\odot$.
- The high V/σ implies that the outer disc contains almost no counter-rotating stars.
- The outer flat rotation curve and dispersion profile along the major-axis require a dark halo, which represents $\sim$ 70% of the total mass of the galaxy inside a radius of 15 kpc.
- Two integral models seem to be able to reproduce the main kinematical features at the centre. This seems not to be the case for the outer disc. Higher order moments for $x > 40$ arcsec are required to confirm this trend.
- The detailed characteristics and specific treatment of the data (e.g. continuum subtraction, noise level) can have a strong influence on the derived kinematics.