Sombrero Galaxy (M104) Rotation curve

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1. Introduction (Nicolas)

HI observations are an useful tool to study galaxy rotation curves, observing the shift in the wavelength of the 21cm line we can deduce that the part of the galaxy moving toward us would present a blueshift while the part moving away us would present a redshift. Observations at different distances from the galactic center will let construct the rotation curve of the galaxy. For our line of sight M104 is edge-on this simplify our calculations due to the fact that we do not have to make inclination corrections. In this project we construct the rotation curve of the Sombrero Galaxy (M104) from HI observations provided by Jacqueline van Gorkom.

2. Methods

2.1. P/V diagram (Wesley)

In the CASA Viewer, it is quite simple to obtain a Position/Velocity (P/V) diagram. By selecting the P/V tool in the menu bar, one can highlight a region and generate the diagram. The P/V diagram depends greatly on the individual parameters of the galaxy, such as inclination or gas distribution. Thankfully, CASA takes care of all of this and outputs the radial velocity as a function of offset in arcseconds. This diagram is shown in Figure 1.

2.2. Rotation Curve (Wesley)

The rotation curve extracted from the P/V diagram is shown in Figure 2. In order to display the rotation curve as a function of physical units, kiloparsecs, we used the small angle approximation:

$$kpc = D(0{,}000004848)\theta \tag{1}$$

where D is the distance in kiloparsecs and θ is the angular size of the object. We simply used the distance given by the *NASA/IPAC Extragalactic Database* (NED), 10.35 Mpc. The

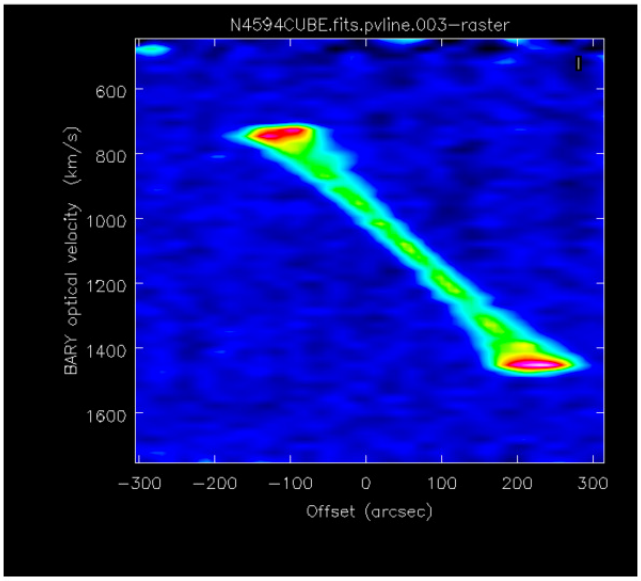

Figura 1: P/V Diagram of M104.

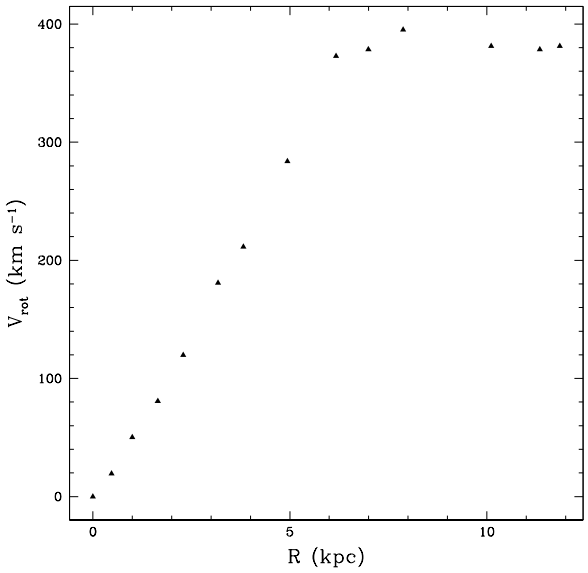

Figura 2: Rotation Curve of the Sombrero Galaxy (M104)

proper method of determining the rotation curve is to fit contours to the P/V diagram and fitting it, although here just reading off by eye was adequate enough.

The rotation curve of M104 exhibits a very fast rise, common of bulge dominated galaxies. The rotation curve also flattens out around 380 km/s at $\sim$ 6 kpc from the center.

3. Discussion

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3.1. Morphology of M104

3.2. Mass (Nicolas)

In order to obtain the mass of the galaxy we assume that the system is in equilibrium i.e:

$$2T = U \tag{2}$$

This let us compute the velocity terms of the mass of the galaxy, and the radii.

$$mv^2 = \frac{GMm}{r} \tag{3}$$

$$v = \sqrt{\frac{GM}{r}} \tag{4}$$