PROBING THE HALO OF CENTAURUS A: A MERGER DYNAMICAL MODEL FOR THE PN POPULATION

A. MATHIEU AND H. DEJONGHE
Sterrenkundig Observatorium, Krijgslaan 281, Gent, Belgium

AND

X. HUI
Astronomy Department, Boston University, Boston, MA 02215

We use planetary nebulae observations (Hui *et al.* 1995) to build dynamical models of the dust-lane elliptical galaxy NGC 5128 (Centaurus A). The PN photometric and kinematical data extend out to 20 kpc ($\sim 4r_e$) along the major axis and 10 kpc along the minor axis. Our models are built using a Quadratic Programming technique (Dejonghe 1989). The method produces fits to the data set, which consists of the photometry field (E2, well fitted by a $r^{1/4}$-law) together with the major- and minor- axis rotation curves and velocity dispersion profiles. Assuming the merger hypothesis for Cen A, we describe its kinematics in a spherical potential by two sub-systems, one rotating about the intrinsic short axis and the other about the intrinsic long axis of the galaxy.

We show that no self-consistent model can match both photometry and kinematics of Cen A; the model fails to reproduce the high values of the major axis velocity dispersion at large radii, clearly indicating the presence of a dark halo. On the other hand, models including a dark halo can produce satisfactory fits to the complete data set. Our best fit model consists of 50% of dark matter for a total mass of $4 \times 10^{11} M_\odot$. The mass-to-light ratio increases from 5 at 5 kpc to 12 at 50 kpc. Different dark matter halos are compatible with our data set and the corresponding total masses interior to 50 kpc range from $3 \times 10^{11} M_\odot$ to $6 \times 10^{11} M_\odot$. For our QP best fit model, 75% of stars are rotating about the short axis and 25% about the long axis.

References

Dejonghe, H. 1989, ApJ, 343, 113
Hui, X., Ford, H.C., Freeman, K.C. & Dopita, M.A. 1995, ApJ in press