DYNAMICAL INTERACTION BETWEEN THE DIFFERENT COMPONENTS OF SO-Sd GALAXIES.

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Using both photometric and gas kinematic data of three galaxies of different type (NGC 7814 SO, NGC 2841 Sb, NGC 300 Sd), we estimate the density of the dark halo and visible components which gives the best fit with the observed rotation curves. We then compute the ratio of each component force to the total force as function of radius. Finally, we derive from the potential energy tensor the quantitative effect of each component on bulge, disk and halo dynamics.

1. MASS MODELS. Bulge and disk are oblate spheroid with spatial density inferred from the deprojected $r^{1/4}$ law and the exponential law, respectively. The dark halo is assumed spherical with a spatial density $\nu(r) = \nu_o(1+r/r_h)^{-3.05}$.

2. FITTING PROCEDURE. There are 4 free parameters to fit the observed rotation curves: the blue mass-to-light ratios of the bulge and the disk and the two parameters of the halo density. For NGC 7814 and NGC 2841 we use the stellar velocity rotation and dispersion for the computation of the bulge's mass-to-light ratio via the tensor virial formulae.

3. POTENTIAL ENERGY TENSOR. For each potential component U^i (i.e. bulge, disk and halo potential) we compute

$$(W_z)^i_j = \int \nu_j \, z \frac{\partial U^i}{\partial z} \, dV \quad \text{and} \quad (W_{\tilde{\omega}})^i_j = \int \nu_j \, \tilde{\omega} \, \frac{\partial U^i}{\partial \tilde{\omega}} \, dV$$

We define

$$(Q_z)^i_j = \frac{(W_z)^i_j}{\sum_i (W_z)^i_j} \quad \text{and} \quad (Q_{\tilde{\omega}})^i_j = \frac{(W_{\tilde{\omega}})^i_j}{\sum_i (W_{\tilde{\omega}})^i_j}$$

which measure the relative effect of the potential due to the i population on the j population.

4. CONCLUSION. These quantitative estimations of the dynamical interactions between dark halo, bulge and disc in three galaxies of types SO, Sb and Sd suggest:

1. Bulges of early-type spirals are probably self-gravitating.
2. SO-Sb disk dynamics are greatly affected by the bulge potential, whereas Sd disks are self-gravitating. The halo potential does not seem to play a key role in the stability of disk against bar-like perturbation.
3. Halos are very massive and almost self-gravitating.

J. Kormendy and G. R. Knapp (eds.), Dark Matter in the Universe, 134.