KINEMATICS OF NUCLEI OF Sc GALAXIES

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For a sample of 21 Sc galaxies with a wide range of luminosities, of radii, and of masses, W. K. Ford and I have obtained spectra and determined rotation curves. By their kinematical behavior in their central regions, the Sc's can be separated into two groups. Some galaxies, generally small and of low luminosity, have shallow central velocity gradients, reflecting their low central masses and densities. Other galaxies, most often large ones of high luminosity, have steep central velocity gradients. One reason this separation by central velocity gradients is of interest is because these galaxies exhibit other significant spectral differences which go hand-in-hand with the kinematical differences.

The small, low luminosity galaxies show emission lines of Hα and [NII], with nuclear Hα sharp and stronger than [NII], and little or no stellar nuclear continuum, just as conventional HII regions. In contrast, the high luminosity galaxies show broad nuclear emission, with [NII] stronger than Hα. These galaxies have a strong red stellar continuum, arising from a red stellar population. The cause of the Hα/[NII] intensity reversal in the nuclei of some galaxies remains unknown. However, the strong [NII] emission in generally high luminosity galaxies with massive nuclei, nuclei which show strong red continua, suggests that [NII] intensity correlates with nuclear luminosity, and in turn with the density and velocity properties of the nuclear populations. We would expect high velocity dispersions and high bulge luminosities for galaxies with strong nuclear [NII] and steep central velocity gradients.

The central velocity gradient also correlates with 13-cm flux, for the nine Sc galaxies in our sample which were also observed by Dressel and Condon in their Arecibo survey. The three galaxies which they did not detect above the 3σ level all have shallow nuclear velocity gradients; the remaining six, all detected above the 3σ level, have steep velocity gradients. Hence the central velocity gradient is a good measure of both nuclear mass and density, and nuclear energetic activity.

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