RevMexAA (Serie de Conferencias), **17**, 184–184 (2003)

THE LINK BETWEEN ROTATION CURVE TYPE AND SPIRAL ARM STRUCTURE IN DISK GALAXIES

M. S. Seigar,[1] P. A. James,[2] I. Puerari[3] and D. L. Block[4]

A new classification scheme for spiral galaxies (Block & Puerari 1999) has been developed which classifies galaxies on the basis of their near-IR arm morphology. This 'dust-penetrated class' predicts a correlation between spiral arm pitch angle and rotation curve type (or shear rate A/ω, where A is the first Oort constant and ω is rotational velocity - Block et al. 1999; Fuchs 2000). If such a correlation exists, it would provide a physical basis for this classification scheme.

The Hubble classification breaks down in the near-IR, where it has been shown that neither pitch angle or K band bulge-to-disk ratio correlate well with Hubble type (Seigar & James 1998a, b; de Jong 1996). We have therefore investigated the properties of arm morphology in images of spiral galaxies (e.g. pitch angle) and dynamical properties from their rotation curves (e.g. shear rate) in order to determine if there is a physical basis for the dust-penetrated class.

We have observed 8 galaxies at UKIRT with the imaging camera, UFTI, in the K band to a depth of 21.5 magnitudes/arcsec^2, S/N=3 from August 1st – 4th, 2001. The sample was selected from Mathewson et al. (1992). They all have measured Hα rotation curves, major axis, $a < 1.5$ arcmin, ratio of major-to-minor axes, $a/b < 3.0$ and declination, $\delta > -25°$.

The galaxies were deprojected to a face-on orientation and pitch angles were measured using a FFT technique (Schröder et al. 1994). The shear rate is measured from the rotation curves using equation 1.

$$\frac{A}{\omega} = \frac{1}{2}\left(1 - \frac{R}{V}\frac{dV}{dR}\right) \qquad (1)$$

Figure 1 shows a correlation between rotation curve type and pitch angle. Figure 2 shows a correlation between shear rate and pitch angle. However, these correlations are only 94% significant and the errors are $\sim$20%. Nevertheless, these are extremely promising initial results, and we now have more data, going even deeper, which should enable us to strengthen our conclusions.

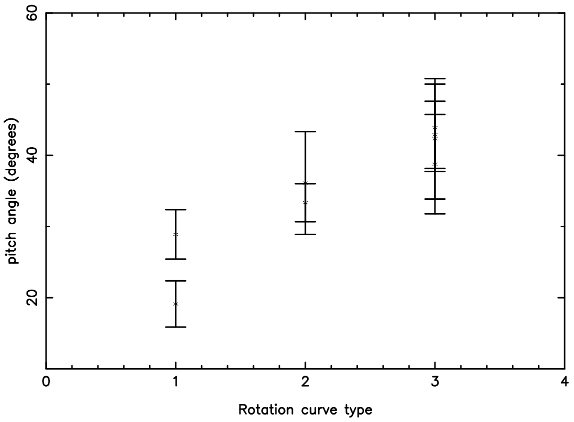

Fig. 1. Rotation curve type (1=declining, 2=flat, 3=increasing) versus spiral arm pitch angle.

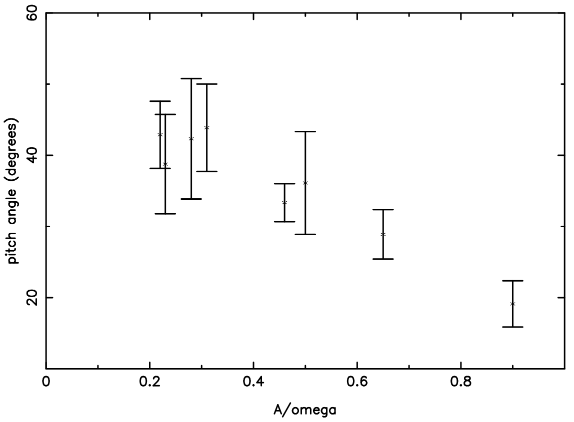

Fig. 2. Shear rate (A/ω) versus spiral arm pitch angle.

[1]Joint Astronomy Center, 660 N. A'ohoku Place, Hilo, HI 96720, USA.

[2]Astrophysics Research Institute, Liverpool John Moores University

[3]INAOE, Puebla, México.

[4]University of the Witwatersrand, Johannesburg, South Africa.

REFERENCES

Block, D. L., & Puerari, I. 1999, A&A, 342, 627
de Jong, R. S. 1996, A&A, 313, 45
Fuchs, B. 2000, in *Galaxy Dynamics*, eds. F. Combes, G. A. Mamon, ASP Conf. Ser. vol. 197, p 53
Mathewson, D. S., et al. 1992, ApJS, 81, 413
Schröder, M. F. S., et al. 1994, A&AS, 108, 41
Seigar, M. S., & James, P. A. 1998a, MNRAS, 299, 672
Seigar, M. S., & James, P. A. 1998b, MNRAS, 299, 685

Galaxy Evolution: Theory and Observations (Cozumel, Quintana Roo, México, 8-12 April 2002)
Editors: Vladimir Avila-Reese, Claudio Firmani, Carlos S. Frenk & Christine Allen