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THE ISOLATED INTERACTING GALAXY PAIR NGC 5426/27 (ARP 271)

I. Fuentes–Carrera,[1] M. Rosado,[1] P. Amram,[2] D. Dultzin-Hacyan,[1] A. Bernal,[1] H. Salo,[3] E. Laurikainen,[3] I. Cruz-González[1] and E. Le Coarer[4]

RESUMEN

El par aislado de galaxias interactuantes NGC 5426/27 (Arp 271) fue observado utilizando el interferómetro Fabry–Pérot de barrido, PUMA. Se derivaron para cada galaxia su campo de velocidades, varios parámetros cinemáticos y la curva de rotación. Se encontró una pequeña barra en NGC 5426 y un campo de velocidades muy distorsionado para NGC 5427. Se calcularon además posibles intervalos de masa para cada galaxia.

ABSTRACT

The isolated interacting galaxy pair NGC 5426/27 (Arp 271) was observed using the scanning Fabry–Perot interferometer PUMA. The velocity field, various kinematical parameters and rotation curve for each galaxy were derived. We found a small bar–like structure in NGC 5426 and a severely distorted velocity field for NGC 5427. A range of possible masses was computed for each galaxy.

Key Words: **GALAXIES: INDIVIDUAL (NGC 5426, NGC 5427) — GALAXIES: INTERACTIONS — GALAXIES: ISM — GALAXIES: KINEMATICS AND DYNAMICS — GALAXIES: SPIRAL**

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1. INTRODUCTION

Twenty years ago, interactions between galaxies were viewed as unusual and rare; nowadays, they seem to be a segment in the life of many galaxies We present the observations and analysis of the interacting galaxy pair NGC 5426/27 (Arp 271). Using a scanning Fabry–Perot interferometer, we obtained the velocity field of each galaxy, its rotation curve and a range of masses. Various kinematical parameters were derived.

2. OBSERVATIONS

Observations of NGC 5426/27 were done in May 1997 with the 2.1 m telescope at the Observatorio Astronómico Nacional in San Pedro Mártir, using the scanning Fabry–Perot interferometer PUMA (Rosado et al. 1995). PUMA allowed us to get the continuum image and the H_α emission map of both galaxies. In its scanning mode, a cube with both spatial and spectral information was obtained.

3. NGC 5426/57 (ARP 271)

Arp 241 is an interacting pair consisting of two spiral galaxies of aproximately the same size. NGC 5426 is of type SA(s)c pec (De Vaucouleurs et al. 1991) and luminosity class II (Blackman 1982); its heliocentric systemic velocity is 2584 km/s (Schweizer 1987). NGC 5427 is a SA(s)c pec, Seyfert 2 galaxy with luminosity class I (De Vaucouleurs et al. 1991). From secondary indicators, it is situated at 26.7 Mpc (De Vaucouleurs et al. 1991) with a systemic heliocentric velocity of (2730 ± 4) km/s (Keel 1996).

[1]Instituto de Astronomía, Universidad Nacional Autónoma de México.
[2]IGRAP, Observatoire de Marseille.
[3]Dep. of Physical Sc., Div. f Astronomy, University of Oulu.
[4]Observatoire de Grenoble.

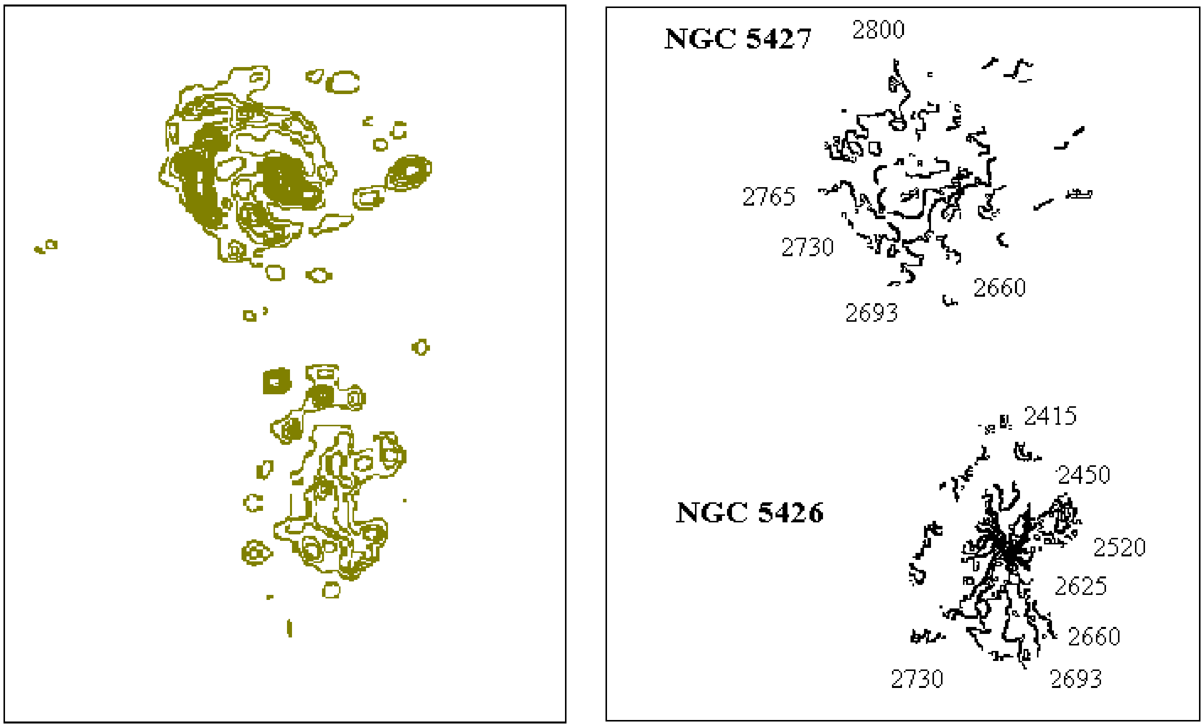

Fig. 1. *Left:* Monochromatic H_α image of NGC 5426/27. Outtermost isophote represents 174 counts per pixel, innermost 1494 counts per pixel. *Right:* Isovelocity contours for NGC 5426 and NGC 5427. *North is up, east to the left.*

4. MONOCHROMATIC IMAGE

From the monochromatic image (Figure 1), we can notice several H II regions in both galaxies. For NGC 5426, these are found on the nearest side to the companion NGC 5427. For the latter, we see several of these regions along the western arm and on the tip of the eastern one. We can also notice that the lower arm of NGC 5427 (closest to NGC 5426) is almost straight, instead of displaying the typical logarithmical spiral pattern.

5. VELOCITY FIELDS

The velocity field of each galaxy (Figure 1) was obtained from the data cube using the ADHOC program designed for the analysis of 3D Fabry–Pérot interferometry data (Boulesteix 1993).

For NGC 5426, the velocity field shows little distortion and can be considered as the typical velocity field of an isolated galaxy (Amram 1991). Nevertheless we can see that the isovelocity contours outline what seems to be a small bar–like feature at the center of the field. The velocity field of NGC 5427 is much more distorted than the one for NGC 5426. From the analysis of the kinematical parameters (such as position angle and ellipticity) and the rotation curve, we find that much of the emission on the northwestern side of the galaxy is not being detected.

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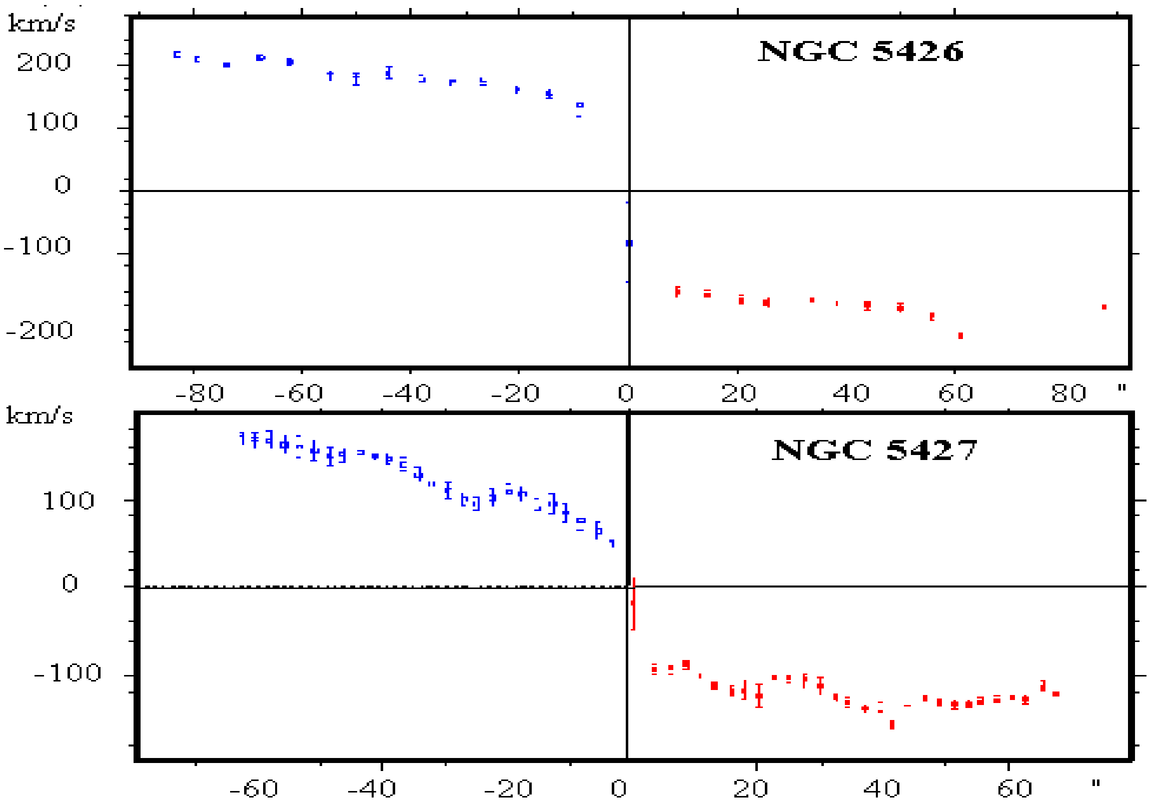

Fig. 2. Rotation curve for NGC 5426 *(top)* and rotation curve for NGC 5427 *(bottom)*.

6. ROTATION CURVES AND MASSES

The kinematical parameters derived from the computation of the rotation curves are listed in Table 1.

For NGC 5426 the effect of the small bar is not visible. The curve reaches its maximum at 60 arcsec with a rotation velocity of (207 ± 5) km/s (Fig. 2). This velocity is close to that found by Bottinelli et al. (1984) with observations at 21 cm. Our observations go as far as 100 arcsec and up to this point the curve is rather symmetric and resembles that of an isolated galaxy (Rubin, Fordk & Thonnard 1978). From the values at the curve's maximum, we infer a range of possible masses using the method by Lequeux (1983), finding $M_{NGC5426}$ is between $5.83 \times 10^{10} M_{\odot}$ and $9.72 \times 10^{10} M_{\odot}$.

For NGC 5427, the rotation curve shows strong oscillations (Fig.2). We can also see a bifurcation between both sides of the galaxy at 34 arcsec from the center. From this point, the northern side shows larger rotation velocities reaching its maximum at 55 arcsec with a rotation velocity of 160 km/s. The velocities on the southern side decrease to 110 km/s. From the values of the curve on the northern side, we find $M_{NGC5427}$ between $2.0 \times 10^{10} M_{\odot}$ and $3.4 \times 10^{10} M_{\odot}$.

7. DISCUSSION AND CONCLUSIONS

Several features found in Arp 271 seem to indicate the effects of the interacting process in each of its members, such as the small bar–like feature in NGC 5426, the distorted spiral pattern of NGC 5427, and its severely distorted velocity field. The fact that NGC 5427 seems to be more affected by the interaction could be due to the fact that it is less massive than its companion. It is also important to point out the fact that the systemic velocities differ by almost 150 km/s. The fact that the galaxies appear to be connected by a bridge

TABLE 1

KINEMATICAL PARAMETERS FOR NGC 5426 AND NGC 5427

Galaxy	α_{1950}	δ_{1950}	Syst.vel. (km/s)	Inclination (°)	P.A. (°)
NGC 5426	$14h00m47s$	$-05°49'52''$	2575 ± 3	59 ± 3	182.5 ± 2
NGC 5427	$14h00m49s$	$-05°47'26''$	2722.5 ± 1	34 ± 2.5	53.2 ± 3

of material suggests that we are actually measuring an important component of the peculiar velocities between these two galaxies.

REFERENCES

Amram, P. 1991, Ph.D. thesis Etude cinématique du gaz ionisé dans les galaxies spirales. Importance de l'environement: galaxies binaires et galaxies d'amas, Université de Provence, Marseille

Blackman, C. P. 1982, MNRAS, 200, 407

Bottinelli, L., Gouguenheim, L., Paturel, G. & De Vaucouleurs, G. 1984, A&AS, 56, 381

Boulesteix, J. 1993, ADHOC: Manuel d'utilisation, Observatoire de Marseille

De Vaucouleurs, G., De Vaucouleurs, A., Corwin, J. R., Buta, R. J., Paturel, G. & Fouque, P. 1991, Third Reference Catalogue of Bright Galaxies, (New York: Springer-Verlag)

Keel, W. C. 1996, AJ, 111 (2), 696

Lequeux, J. 1983, A&A, 125, 394

Rosado, M., Langarica, R., Bernal, A., Cobos, F., Garfias, F., Gutierrez, L., Tejada, C. & Tinoco, S. 1995, RMAA (Serie de Conferencias), 03, 263

Rubin, V., Fordk, W. K. & Thonnard, N. 1978, ApJ, 225, L1107

Schweizer, L.Y. 1987, ApJS, 64, 411

A. Bernal, I. Cruz-González, D. Dultzin-Hacyan, I. Fuentes–Carrera, M. Rosado, : Instituto de Astronomía, UNAM, Apdo. Postal 70-264, 04510 México D.F., México. (abel, irene, deborah, iqui, margarit@astroscu.unam.mx).

P. Amram: 2 Place Le Verrier, 13248 MARSEILLE Cedex 4, France (Philippe.Amram@observatoire.cnrs-mrs.fr).

E. Laurikainen, H. Salo: Dep. of Astronomy, University of Oulu, PL 333 90571, Oulu, Finland (eija@koivu.oulu.fi, hsalo@sun3.oulu.fi).

E. Le Coarer: Observatoire de Grenoble, B.P. 53X F-38041, Grenoble, Cedex 9 France (lecoarer@obs.ujf-grenoble.fr).