KINEMATICS AND MORPHOLOGY OF IONIZED GAS IN HICKSON COMPACT GROUP 18

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ABSTRACT

We present new observations of Hα emission in the Hickson compact group 18 (HCG 18), obtained with a scanning Fabry-Perot interferometer. The velocity field does not show motions of individual group members but instead a complex common velocity field for the whole group. The gas distribution is very asymmetric, with clumps of maximum intensity coinciding with the optically brightest knots. Comparing Hα and Hβ data, we conclude that HCG 18 is not a compact group but instead a large irregular galaxy with several star-forming clumps.

Key words: galaxies: individual (UGC 2140) — galaxies: irregular — galaxies: ISM — galaxies: kinematics and dynamics — instrumentation: interferometers

1. INTRODUCTION

Compact groups of galaxies have been known for over 30 years (Vorontsov-Vel'yanov 1959; Arp 1966; Rose 1977; Hickson, Richstone, & Turner 1977; Hickson 1982). A spectroscopic survey confirmed that 92 of the 100 groups cataloged by Hickson (1982) have at least three accordant redshift members, with 69 groups having at least four (Hickson et al. 1992). With a median galaxy-galaxy separation of ~1 kpc and a low typical velocity dispersion (σ ~ 200 km s⁻¹; Hickson et al. 1992), compact groups are usually considered ideal laboratories for studying galaxy interactions. The most direct way to determine whether interactions have occurred among group galaxies is to measure their kinematics and check whether they are disturbed or normal. Study of the ionized gas kinematics for several of the Hickson group galaxies has shown that they are in different evolutionary stages (Mendes de Oliveira et al. 1998; Plana et al. 1998). HCG 18 (H18, Arp 258, or VV 143) was cataloged by Hickson (1982) as a group of three irregular galaxies (H18b, H18c, and H18d, with radial velocities between 4080 and 4163 km s⁻¹) plus one discordant-redshift S0 galaxy (H18a, with velocity 10,000 km s⁻¹; Hickson 1993). In this paper the H18 group refers to the triplet H18b, H18c, and H18d.

Verdes-Montenegro et al. (1998) determined the IRAS flux for H18d and upper limits on the flux for H18b and H18c. They also determined the H₂ mass for H18b and H18c from their CO observations. Allam et al. (1996) also give IRAS flux, but for H18b, H18c, and H18d together. We eventually use Allam’s values because H18 IRAS emission cannot be spatially resolved. H I data are also available for this group, besides the optical measures (Hickson 1993). From a study of the H I velocity field of the group, Williams and van Gorkom (1988, hereafter W&vG) concluded that the HI gas is concentrated in a single cloud with \( m_{HI} = 10^{10} \, M_\odot \) encompassing all the optical structures.

We observed the H18 group in the Hα emission line with a scanning Fabry-Perot instrument, and we obtained velocity and Hα integrated flux maps for the system. This observation is part of a larger program that has the goal of unveiling kinematic evidences of interactions in compact groups of galaxies to determine their evolutionary stages.

H18 appears to be one of the most complex groups of the Hickson sample. A key question raised by the H I study of W&vG was the nature of the three components, H18b, H18c, and H18d, namely, whether they are individual entities or form one single galaxy. Based on our observations and comparisons between our data and the H I results, we conclude that H18 is likely to be a single large irregular galaxy. The Hα maps presented in this study permit the determination of the Hα luminosity \( L(H_\alpha) \) and star formation rate (SFR) of the system, which can be compared with typical values for samples of irregular galaxies studied by Hunter et al. (1986, 1989; Hunter, Hawley, & Gallagher 1993). We also compare the total B luminosity \( L_B \) of the group and its far-infrared luminosity \( L_{FIR} \) with values given in the literature for typical irregular galaxies.

The paper is organized as follows: § 2 gives details about the reduction of the Fabry-Perot data. Section 3 describes the results. Section 4 has a comparison of our results with the H I observations. Section 5 presents a discussion about the nature of H18 in light of our new Hα observations, and § 6 contains our summary and final remarks.

2. OBSERVATIONS AND DATA REDUCTION

Observations were carried out in 1996 August with the multiobject spectrograph focal reducer in Fabry-Perot mode attached to the f/8 Cassegrain focus of the 3.6 m Canada-France-Hawaii Telescope (CFHT). The CCD was an STIS 2 detector, 2048 × 2048 pixels, with a readout noise of 9.3e⁻ and a pixel size on the sky of 0′.86 after 2 × 2 binning. Table 1 contains the journal of observations.
Reduction of the data cubes were performed using the CIGALE/ADHOC software (Boulesteix 1993). The data reduction procedure has been extensively described in Amram et al. (1996).

Wavelength calibration was obtained by scanning the narrow Ne 6599 Å line under the same conditions as the observations. Velocities measured relative to the systemic velocity (Table 2) are very accurate, with an error of a fraction of a channel width (< 3 km s⁻¹) over the whole field.

Subtraction of bias, flat-fielding of the data, and cosmic-ray removal have been performed for each image of the data cube. To minimize seeing variation, each scan image was smoothed with a Gaussian function of full width at half-maximum equal to the worst-seeing data of the data cube. Transparency and sky foreground fluctuations have also been corrected using field-star fluxes and galaxy-free windows.

The signal measured along the scanning sequence was separated into two parts: (1) an almost constant level produced by the continuum light in a 23 Å passband around Hα (continuum map) and (2) a varying part produced by the Hα line (Hα integrated flux map). To avoid channel noise effects, the continuum level was taken to be the mean of the three faintest channels. The Hα integrated flux map was obtained by integrating the monochromatic profile in each pixel. The velocity sampling was 11 km s⁻¹. The Hα integrated flux map had 1 pixel resolution in the positions of H18b, H18c, and H18d. Spectral profiles were binned in the outer parts to 5 × 5 pixels to increase the signal-to-noise ratio (S/N). Strong OH night-sky lines passing through the filters were subtracted by determining the level of emission away from the galaxies (Laval et al. 1987).

A rough flux calibration was attempted using the group HCG 100, observed during two runs (in 1995 at the ESO 3.6 m telescope and in 1996 at the CFHT). Monochromatic images of HCG 100 have been calibrated in flux using the Cartwheel galaxy, observed during the 1995 ESO run (see Amram et al. 1998 for details). We then determined the

### Table 1
**Observations on 1996 August 22:**

| Parameter                        | Value               |
|----------------------------------|---------------------|
| Telescope                        | CFHT 3.6 m          |
| Equipment                        | MOS/FP at Cassegrain focus |
| Seeing                           | < 1"                |
| Interference filter:             |                     |
| Central wavelength               | 6653 Å             |
| FWHM                             | 23 Å               |
| Transmission (maximum)           | 0.6                |
| Calibration of neon comparison light... | 6598.95 Å          |
| Perot-Fabry:                     |                     |
| Interference order               | 1162 at 6562.78 Å  |
| Free spectral range at Hα        | 265 km s⁻¹         |
| Finesse at Hα                    | 12                 |
| Spectral resolution at Hα        | 27344 at the sample step |
| Sampling:                        |                     |
| Number of scanning steps         | 24                 |
| Sampling step                    | 0.24 Å (11 km s⁻¹)  |
| Total field                      | 430" × 430" (500 × 500 pixels²) |
| Pixel size                       | 0".36              |
| Detector                         | STIS 2 CCD          |
| Total exposure                   | 2 hr                |
| Total exposure time per channel  | 300 s               |

### Table 2
**Physical Parameters**

| Parameter                        | HCG 18b | HCG 18c | HCG 18d |
|----------------------------------|---------|---------|---------|
| Other names                      | UGC 2140a, Arp 258, VV 143 | UGC 2140b, Arp 258, VV 143 | UGC 2140c, Arp 258, VV 143 |
| α (1950.0)                       | 02°36′18″5.5 | 02°36′18″2.2 | 02°36′17″0.0 |
| δ (1950.0)                       | 18°10′04″1   | 18°10′24″5   | 18°10′43″9   |
| Morphological type               | Im      | Im      | Im      |
| \(B_c\)                          | 14.90   | 15.61   | 15.10   |
| Systemic heliocentric velocity   | 4082 ± 40| 4163 ± 37| 4067 ± 58|
| Gas central velocity             | 4063 ± 20| 4108 ± 20| 4061 ± 20|
| Distance                         | 54      | 54      | 54      |
| Hα velocities                    | 4065    | 4085    | 4095    |
| FWHM of central profiles         | 65 ± 20 | 70 ± 20 | 80 ± 20 |

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* Hickson 1993.
* Williams & van Gorkom 1988.
HCG 18 galaxy fluxes relative to HCG 100. We have reasonable agreement with fluxes published by Iglesias-Parámo & Vilchez (1999) for H100a and H100b. We compared our H18 fluxes with those determined by Laurikainen & Moles (1989), and we found a value that was 4 times higher for the flux of H18d and around 5 times higher for H18b (they did not measure the flux of H18c). Differences by factors of 4 or 5 can be understood if we note that flux calibration with slit observations can significantly underestimate the true flux. Hz profiles for the H18 galaxies were measured to a minimum flux density of $1.1 \times 10^{-16}$ ergs s$^{-1}$ cm$^{-2}$ arcsec$^{-2}$ and a maximum of $9.3 \times 10^{-15}$ ergs s$^{-1}$ cm$^{-2}$ arcsec$^{-2}$ (corresponding to a S/N between 3 and 500).

3. RESULTS

We obtained Hz integrated flux map and velocity maps for H18b, H18c, and H18d. The systemic velocity of H18a was outside the range of the interference filter we used. Figure 1 shows continuum isophotes superposed on a DSS image.

3.1. Fabry-Perot Interferograms and Channel Maps

Figure 2 presents channel maps for H18 with a $1.8 \times 1.8$ field of view. The velocity amplitude is low, with the lowest velocity channel at 4003 km s$^{-1}$ and the highest velocity channel at 4177 km s$^{-1}$. The optical centers of H18b, H18c, and H18d are represented by crosses. Several emission-line regions appear, with velocities between 4003 and 4068 km s$^{-1}$ south of the principal optical continuum sources. We can clearly see from channels 4047 to 4090 km s$^{-1}$ that H18c and H18d have a common emission. North of the group there is another emission-line region, which appears between channels 4068 and 4177 km s$^{-1}$. There are optical counterparts for almost all emission-line regions except the ones between 4003 and 4068 km s$^{-1}$. The southern regions between 4003 and 4047 km s$^{-1}$ form a circular pattern. Looking carefully at optical images (Hickson 1993; Arp 1966) reveals faint optical counterparts to the southern sources. This circular structure does not show any evidence for expansion. Examination of H I channel maps (W&vG) reveals that the southern emitting regions coincide with H I emission in the range 4015–3994 km s$^{-1}$.

The extended Hz emission of H18 is not concentrated in a single cloud but instead shows substructures. As described in detail below, we do not detect rotation for individual group members. Except for the southern and northern

![Figure 1](image-url)
clumps, all the other emission-line regions are aligned along position angle $\sim 160^\circ$.

3.2. Velocity Field and Line-of-Sight Velocity Curves

Figure 3 presents the velocity field for the H18b, H18c, and H18d system. Hα intensity isophotes are superposed on the velocity field. The total extent of the velocity-mapped structure is $\sim 2.2$ by $30^\circ$. The radial velocity across the map varies from $4007$ km s$^{-1}$, in the southern region, to $4127$ km s$^{-1}$, in the northern and northeastern part of the group. This map shows that there is no circular motion for the group as a whole. Nevertheless, the southern region seems to have an independent kinematics from the rest of the group.

Line-of-sight (LOS) velocity curves (uncorrected for inclination) can be derived from the velocity field. Figure 4 shows LOS velocity curves along different position angles. Figure 4a presents the LOS velocity diagram for the southern region, with a cut along P.A. $\sim 80^\circ$ (see Fig. 1 for the exact location). Figure 4b presents the LOS velocity curve for the group as a whole, along P.A. $\sim 160^\circ$, the position angle that best describes the velocity field of the group.

The first plot (Fig. 4a) shows disklike rotation with a velocity amplitude of $70$ km s$^{-1}$ and an almost solid-body motion across a region of $20^\circ$. This plot includes all points within a cone of half-angle $20^\circ$. The emission is rather weak in comparison with the rest of the system. The measured profiles have S/N between 5 and 10. In this region there are no cataloged members noted by Hickson (1982). This clear velocity gradient may indicate an independent motion for the southern part of the system.

Figure 4b shows the velocity curve along P.A. $\sim 160^\circ$, which is our best estimate for the position angle of the major axis of the entire group. For this plot we show the average velocity values with error bars (calculated in a 2 pixel crown) inside a cone of $20^\circ$ half-angle. We note that although there is a large scatter in the velocities (with a dispersion of $\pm 20$ km s$^{-1}$), there is a clear velocity gradient from the northwest to the southeast of the group, of mean total amplitude $78$ km s$^{-1}$, over $90^\circ$. We marked on Figure 4b the positions of the three group members, H18b, H18c, and H18d.

3.3. Monochromatic Emission

Figure 5 shows isophotes of averaged Hα flux (superposed on the DSS image) obtained by integrating the emission above the continuum. The image was smoothed with a box of $5 \times 5$ pixels. The threshold is $10^{-16}$ and the step is $5 \times 10^{-16}$ ergs s$^{-1}$ cm$^{-2}$ arcsec$^{-2}$. The total Hα flux is $2.5 \times 10^{-12}$ ergs s$^{-1}$ cm$^{-2}$. Using the formula of Osterbrock (1974) and assuming an electronic density of $1000$ cm$^{-3}$, we obtain an upper limit for the ionized gas mass of $M_{HII} < 2 \times 10^6 M_\odot$. The five compact emitting regions seen in Figure 5 represent more than 50% of the
total emission from the source. As mentioned before, although the gas emission is clumpy, the profiles are continuous between H18c and H18d. We also note that regions 2 and 5 do not correspond to any cataloged group members (Hickson 1993), although we do detect counterparts for these emission regions in our continuum image.

3.4. Star Formation History of HCG18

The total Hα flux implies a luminosity \( L(\text{Hα}) = 2.2 \times 10^8 \, L_\odot \), adopting a distance of 54 Mpc for H18 (with \( H_0 = 75 \, \text{km s}^{-1} \, \text{Mpc}^{-1} \)). The visual \( B \) magnitude in Hickson (1993), yields \( B \) luminosity \( L(B) = 1.1 \times 10^{10} \, L_\odot \). From Allam et al. (1996) IRAS fluxes, we derive the total FIR luminosity \( L(\text{FIR}) = 2.42 \times 10^9 \, L_\odot \) for the whole group.

The multiwavelength luminosities (\( B \), Hα, FIR) can be used to determine the star formation rates (SFR) for different epochs in the galaxy history. Table 3 summarizes the different quantities derived for H18. A recent SFR can be estimated from the \( B \) luminosity and equation (7) in Gallagher, Hunter, & Tutukov (1984). This equation represents the average SFR over the lifetime of the stars that dominate the blue light \( [(0.4-6) \times 10^9 \, \text{yr}] \). We then estimate \( \text{SFR}(B) = 0.29 \times 10^{-10} \, L_B \, M_\odot \, \text{yr}^{-1} \) \( \) (where \( L_B \) represents the bolometric solar luminosities) and \( \text{SFR}(B) = 0.32 \times M_\odot \, \text{yr}^{-1} \). The current SFR can be deduced from both FIR \( [L(\text{FIR})] \) and Hα \( [L(\text{Hα})] \) luminosities. The current SFR is driven by the number of OB stars. Knowledge of the FIR luminosity may measure this (through the dust heated by OB stars). But our lack of understanding of the details of the radiation processes responsible for the FIR luminosity introduces uncertainties in the calculation of the recent SFR (Gallagher & Hunter 1987). The major assumption for the recent SFR determined using \( L(\text{FIR}) \) is that of the role played by the massive stars in heating the dust. Thronson & Telesco (1986) adopted the value \( \text{SFR(FIR)} = 6.5 \times 10^{-10} L(\text{FIR}) \, M_\odot \, \text{yr}^{-1} \) (with \( L(\text{FIR}) \) in \( L_\odot \)), yielding the current SFR over \( 2 \times 10^6 \, \text{yr} \). Under similar assumptions but using a different stellar luminosity law and different

**TABLE 3**

| Parameter       | Value                      |
|-----------------|----------------------------|
| \( F(\text{Hα}) \) | \( 2.5 \times 10^{-12} \, \text{ergs s}^{-1} \, \text{cm}^{-2} \) |
| \( L(\text{Hα}) \)  | \( 2.2 \times 10^8 \, L_\odot \) |
| \( L(B) \)           | \( 1.1 \times 10^{10} \, L_\odot \) |
| \( L(\text{FIR}) \)  | \( 2.4 \times 10^9 \, L_\odot \) |
| \( \text{SFR(\text{Hα})} \) | \( 6.1 \, M_\odot \, \text{yr}^{-1} \) |
| \( \text{SFR(\text{B})} \)  | \( 0.32 \, M_\odot \, \text{yr}^{-1} \) |
| \( \text{SFR(\text{FIR})} \) | \( 1.58 \, M_\odot \, \text{yr}^{-1} \) |
| \( M_\text{H}/M_\text{H}^\alpha \) | \( 3000 \) |
| \( \text{M}_\text{H}/L(B) \)  | \( 0.9 \, M_\odot/L_\odot \) |
upper mass limits, Gallagher & Hunter (1987) deduced another formula that gives rates that are half the values calculated by Thronson & Telesco (1986) for a given luminosity.

The Hα luminosity provides another way to estimate the current SFR (Hunter & Gallagher 1986; Gallagher & Hunter 1987), that of calculating the flux of Lyman continuum photons from hot young stars. In that case, a problem could arise from the effect of dust extinction and the model chosen to convert the observed $L$(Hα) to Lyman count luminosity (Gusten & Mezger 1982). Hunter & Gallagher (1986) adopted the value $SFR(Hα) = 7.02 \times 10^{-42} L$(Hα) $M_\odot$ yr$^{-1}$, with $L$(Hα) in ergs per second. We found $SFR(FIR) = 1.58 M_\odot$ yr$^{-1}$ and $SFR(Hα) = 6.1 M_\odot$ yr$^{-1}$ for H18. The factor of 4 difference between the measurements, however, is expected, given the assumptions made in the calculations.

4. COMPARISON WITH H I DATA

H I data (W&vG) represent important information for understanding the nature of H18. W&vG presented H I velocity field and integrated images for H18 and suggested that it is a single giant cloud not associated with another formula that gives rates that are half the values calculated by Thronson & Telesco (1986) for a given luminosity.

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Fig. 4.—Line-of-sight velocity curves of H18, indicating dispersion error bars and, in all plots, the average values of velocities (filled circles) in a 2 pixel crown. (a) Velocity curve of the southern region of the group, along an axis with P.A. = 80° (see Fig. 1 for the exact location of the axis). The plot shows all the points inside a cone with a half-angle at the summit of 20°. (b) Line-of-sight velocities along the major axis of H18 (P.A. = 160°). The positions of the three group members, H18b, H18c, and H18d, are marked. (c) Velocity curve across an axis with P.A. = 20°, using the velocity field presented in Fig. 6 (at the resolution of H I data). Overplotted are the data points taken from the velocity field of W&vG along the same position angle, 20°.
5. DISCUSSION: NATURE OF H18

The nature of H18 in light of H I observations was discussed by W&vG. They considered two possibilities for the nature of this system: (1) it is a knotty irregular galaxy (the irregular-galaxy scenario) or (2) it is an interacting group and the observed H I cloud is a remnant of an interpenetrating collision that stripped the gas from the colliding galaxies. Our data and analysis confirm the first scenario.

5.1. Arguments in Favor of the Irregular-Galaxy Scenario

The strongest argument in favor of H18 being an irregular galaxy comes from the kinematics of the H I and Hα gas. The velocity maps show velocity amplitudes of ±70 km s\(^{-1}\) and gradients of 15 km s\(^{-1}\) kpc\(^{-1}\) for the ionized gas and 10 km s\(^{-1}\) kpc\(^{-1}\) for the H I. These confirm that H18 is a slow rotator. The few detailed studies concerning the kinematics of irregular galaxies (Hunter 1982; Tomita et al. 1998) confirm that irregular galaxies are indeed slow rotators.

Hunter (1982) studied a sample of 15 irregular galaxies, five of which showed velocity gradients between 60 and 80 km s\(^{-1}\) kpc\(^{-1}\), consistent with results found for H18. Tomita et al. (1998) produced position-velocity diagrams for four dwarf galaxies along several slit orientations. They did not detect disklike rotation, but velocity gradients were clearly seen. They also found a velocity difference of 10 to 20 km s\(^{-1}\) between the H II regions and the H I gas disk. Saito et al. (1992) reported a kinematic study of the ionized gas in IC 10 and particularly a comparison between the ionized and H I gas kinematics for this galaxy, giving the same kind of velocity differences that we found for H18. Two other works have studied a few irregular galaxies with a Fabry Perot interferometer. Sasaki et al.\(^1\) reported observations of NGC 4449 and its Hα velocity field that show a kiloparsec-scale mosaic structure of blueshift and redshift components with a slow global rotation. They confirmed the counter rotation between ionized gas and the H I halo for this galaxy. Rosado et al. (1998) and Valdez & Rosado (1998) present an optical velocity field for NGC 4449 showing a decreasing gradient along the optical bar and an anti-correlation with respect to the H I velocity field.

The LOS velocity curve of the southern part (Fig. 4a) suggests an independent disk rotation. The velocity curve along the major axis of H18 (Fig 4b) shows that H18b and H18c lie on the curve, suggesting that they are gravitationally bound. The ratio \(L_\text{B}/L(\text{H}\alpha)\) of H18 is consistent with the irregular-galaxy hypothesis. Hunter et al. (1989) find a value for the ratio \(L_\text{B}/L(\text{H}\alpha)\sim 44\) for giant irregular galaxies while we find 50 for H18.

\(^1\) Seehttp://adsabs.harvard.edu/cgi-bin/nph-abs_connect for an abstract.
One last piece of evidence for the irregular-galaxy scenario comes from the H I data. The size of the large H I cloud around H18 measured by W&vG and the total H I mass they found \( M(H_I) \approx 10^{10} M_\odot \) are consistent with values found for H I clouds around irregular galaxies such as IC 10 (Shostak & Skillman 1989) and NGC 4449 (Hunter et al. 1998). Normalized by the total B luminosity, the H I total mass is also comparable to the typical values found for the Hunter et al. (1993) sample.

5.2. Differences between H18 and Irregular Galaxies

The main difference between H18 and irregular galaxies concerns the FIR properties and star formation rates. Hunter et al. (1989, 1993) present properties (in FIR, Hα, and broadband imaging) for a sample of 43 irregular galaxies of different types (dwarf, giants, distant, and amorphous). We used their sample of dwarf and giant irregular galaxies as a control sample for comparison with the properties of H18.

We measured ratios of \( L(FIR)/L_B = 0.22 \) and \( L(FIR)/L(Hz) = 11 \) for H18. The \( L(FIR)/L_B \) ratio is significantly lower than the mean values of 1.9 and 1.0 found for the sample of Hunter et al. (1989) consisting of giant and dwarf irregulars, respectively (the two other classes, amorphous and distant, show much larger ratios). The \( L(FIR)/L(Hz) \) ratio is also lower than the mean values of 90 and 71 for the giant and dwarf irregulars, respectively. However, within each subclass—giant, dwarf, amorphous or distant—there is significant scatter in the ratios. We also derived a dust temperature for H18 [from the S(100\(\mu\)) and S(60\(\mu\)) IRAS data] of \( T_d = 27 \) K, which is cooler than typical dust temperatures derived for other irregular galaxies.

The recent SFR \([SFR(B)]\) and the current SFR \([SFR(FIR) \text{ or } SFR(H\alpha)]\) are much higher (by 1 or 2 orders of magnitude) compared with values from the sample of Hunter et al. If, however, we calculate the SFR per unit area, using the SFR(Hα) and taking the area to be that enclosed within the ellipse of the major and minor axes defined by the Hα integrated flux map (Fig. 5), we find that the ratio of SFR to area is \( 5 \times 10^{-9} M_\odot \text{ yr}^{-1} \text{ pc}^{-2} \). Hunter & Gallagher (1986) have a similar average for SFR/area for the giant irregular galaxies of their sample. The other subclasses of irregular galaxies have average values for SFR/area that are slightly lower than that found for H18.

6. SUMMARY AND FINAL REMARKS

HCG 18 is a special case in the Hickson compact group catalog (Hickson 1982). It was originally thought to be a group composed of three members, H18b, H18c, H18d, and a discordant-redshift galaxy, H18a. The three members are...
not well separated and they are embedded in a diffuse halo. A key question raised by W&vG was about the nature of H18. Our Hα observations suggest that H18 is in fact a giant irregular galaxy, confirming previous H I results.

We find evidence in favor of the irregular-galaxy scenario here in that the blobs (previously called galaxies, when the system was classified as a group) are kinematically connected, and therefore they may form a single object. We find a velocity gradient similar to that found by W&vG from the H I data and consistent with values for irregular galaxies. A comparison between the Hα and the H I velocity fields shows a difference in their morphologies, but the velocity amplitudes and gradients are similar. Various authors also show differences between the H I and the optical kinematics for other irregular galaxies (see Section 5.1). The Hα emission shows that the ionized gas distribution is clumpy, which is rather common for irregular galaxies. The values for the total luminosities in B, Hα, and FIR are larger than those for the Hunter et al. (1989) sample of irregular galaxies, but if we normalize the L(Hα) by the total B luminosity or the L(FIR) by the total B luminosity, it appears that the ratios are close to those other authors find for giant irregular galaxies. The inferred star formation rate of H18 is higher than the average for irregular galaxies, although the values are comparable when they are normalized by the area of the galaxies.

Two other groups that may be classified as a single object, an irregular galaxy, are HCG 31 and HCG 54. HCG 54 is formed by three members classified as irregulars and one late spiral, and HCG 31 is formed by four members and seems to be a single object. Kinematical study is necessary to confirm whether it is an irregular galaxy like H18. If true, this would suggest that only a small fraction (∼3%) of cataloged compact groups may be misclassified single objects.

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