A SURVEY AND FOLLOW-UP OBSERVATIONS OF STARBURST GALAXIES

H. Maehara
Tokyo Astronomical Observatory, Mitaka, Tokyo 181, Japan
B. Takase
Kohugakuin University, Shibuya, Tokyo 150, Japan
J. Heidmann
Paris Observatory, 92195 Meudon, France

1. SURVEY AND MORPHOLOGY

A survey of UV-excess galaxies (KUGs) has been made on UGR three image plates taken with the 105-cm Kiso Schmidt telescope (105/150/330) by Takase and Miyauchi-Isobe (1984, 1985a,b). Up to now, about 1 800 objects down to 17-17.5 mag have been catalogued in the surveyed areas of about 900 square degrees.

In the course of the survey, it has been found that there are a number of irregular and spiral galaxies as well as pairs of galaxies with interacting or detached components. Bright samples were classified into seven morphological types (Takase *et al.* 1983).

2. PHOTOMETRY AND SPECTROSCOPY

Photometric observations were done using the 2-m Pic-du-Midi telescope. It is shown that some irregular galaxies contain more than ten bright blue clumps scattered out to their peripheral regions. Sizes and brightnesses of these clumps are much larger than typical galactic H II regions (Maehara *et al.* 1986b, Bottinelli *et al.* 1987).

Low-resolution spectrograms were taken with the Cassegrain image-intensifier spectrograph attached to the 188-cm Okayama telescope. About 85% of the total have conspicuous emission lines similar to H II regions (Maehara *et al.* 1986a). Portions of strong emission lines in the spectra correspond to positions of bright blue clumps of the objects.

3. LUMINOSITIES AND EMISSION-LINES

Absolute magnitudes of KUGs were obtained on the basis of radial velocities derived from the spectra and apparent magnitudes referred to the CGCG catalogue by Zwicky *et al.* (1961-1968). It is indicated that there are irregular galaxies brighter than classical ones, and that no bright spirals ($M_B < -21$) are found among the representative samples.

KUGs having spectroscopic data are plotted on a diagram of emission-line ratios (Figure 1), which is efficiently used in classifying emission-line objects such as H II regions, planetary nebulae, Seyfert galaxies and liners (Maehara *et al.* 1986b). According to this figure, most KUGs are located in the H II region domain.

https://doi.org/10.1017/S0074180900096777 Published online by Cambridge University Press

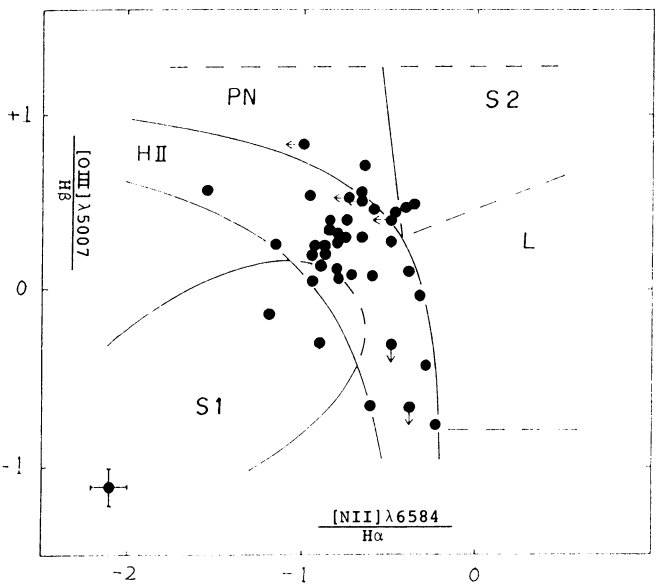

Fig. 1. Diagram of emission-line ratios, HII: H II regions, PN: planetary nebulae, S1: Type 1 Seyferts, S2: Type 2 Seyferts, L: liners.

4. DISCUSSION

Follow-up observations in the radio wavelength are in progress using the 45-m Nobeyama and the 300-m Nançay telescopes. In general, KUGs have stronger non-thermal radiation and stronger 21-cm lines than galaxies of normal types (Maehara *et al.* 1985, Bottinelli *et al.* 1987). The fact that about 20% of bright KUGs have been detected by the IRAS suggests that KUGs are generally intense emitters of FIR.

It is pointed out from the observational results described above that most KUGs have giant H II regions or conglomerates of H II regions in them. Therefore, they have much higher star forming activity than their normal correspondents. That is, they belong to the category of starburst galaxies. On the other hand, there are some Seyfert galaxy candidates among the KUG samples. Our conclusions are summarized as follows:

(1) The KUG survey collects efficiently a number of starburst galaxies of various morphological types, which are rich in young stars, gas and dust.

(2) Starburst areas are located out to the peripheral regions of galaxies as well as in their nuclear regions.

(3) Interactions among galaxies may be an important mechanism for inducing bursts of star formation.

https://doi.org/10.1017/S0074180900096777 Published online by Cambridge University Press

REFERENCES

Bottinelli, L., Gouguenheim, L., Hamabe, M., Heidmann, J., Maehara, H., and Takase, B.: 1987, this symposium.
Maehara, H., Inoue, M., Takase, B., and Noguchi, T.: 1985, Publ. Astron. Soc. Japan 37, 451.
Maehara, H., Noguchi, T., and Takase, B.: 1986a, Ann. Tokyo Astron. Obs. 2nd. Ser. 21, in press.
Maehara, H., Noguchi, T., Takase, B., and Handa, T.: 1986b, in preparation.
Takase, B., and Miyauchi-Isobe, N.: 1984, Ann. Tokyo Astron. Obs. 2nd. Ser. 19, 595.
Takase, B., and Miyauchi-Isobe, N.: 1985a, Ann. Tokyo Astron. Obs. 2nd. Ser. 20, 237.
Takase, B., and Miyauchi-Isobe, N.: 1985b, Ann. Tokyo Astron. Obs. 2nd Ser. 20, 335.
Takase, B., Noguchi, T., and Maehara, H.: 1983, Ann. Tokyo Astron. Obs. 2nd. Ser. 19, 440.

FIR AND BLUE LUMINOSITIES AND GAS MASS IN SPIRAL GALAXIES

T.N. Rengarajan, R.P. Verma
Tata Institute of Fundamental Research
Homi Bhabha Road, Bombay-400 005, India

We present results on correlations between gas mass in spiral galaxies and their FIR and blue luminosities. We have used the published ^{12}CO emission data of the University of Massachusetts and the FIR data from IRAS Galaxy Catalogue. In order to derive the H_2 mass from ^{12}CO data, we have used a relation of the form, $N(H_2) = A\ T_A\ dV\ cm^{-2}$ with $A = 2\times10^{20}\ K^{-1}\ km\ s^{-1}\ cm^{-2}$. The total gas mass M_g was obtained using an additional factor of 1.36 to take care of the fraction of mass in He. Those galaxies that were classified as peculiar, interacting or included in Arp's catalogue were termed peculiar and the rest normal.

Figures 1a-b, show plots of M_g in the central 45" against L_{IR} for samples A and B, which are normal and peculiar galaxies respectively, observed with 45" or 50" beams. A good correlation is seen between the two quantities. Samples C and D include all normal and peculiar galaxies. In Figures 1 c-d, we plot the gas mass in the central 2' (roughly the same as IRAS beam sampling) against L_{IR}, for these two samples. For computing the gas mass within the 2' from the central beam observations, an exponential radial scale size of 5 kpc was assumed. Corrections were also made for the inclination of the galaxies. The values of slopes and r^2 for the fits are given in Table 1. The difference in the slope for normal and peculiar galaxies, is mainly due to high luminosity inter-

https://doi.org/10.1017/S0074180900096777 Published online by Cambridge University Press