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SURVEY OF A SAMPLE OF STARBURST GALAXIES: THE EMISSION LINE OBJECTS

Christian Surace[1,2] and Georges Comte[2]

RESUMEN

Se ha elaborado una nueva muestra de "galaxias activas", con el telescopio ESO 1-m, seleccionadas por su exceso UV y sus líneas de emisión. El análisis se enfoca en un subconjunto de 95 galaxias con líneas de emisión, encontradas en un campo de 50 grados cuadrados y de las cuales no habían sido listadas la mitad. Se obtiene z hasta un valor de $z = 0.06$ y se hace espectrofotometría de 62 objetos hasta $m_r = 18.3$. La muestra está dominada por sistemas pequeños que son "starbursts" de alta ionización.

ABSTRACT

Using the ESO 1 meter Schmidt telescope, we have built a new sample of "active galaxies" selected by their UV excess and/or emission lines in their spectra. We specially focused our analysis on a subsample of 95 emission line galaxies, found in a 50 square degrees area, 50% of which have never been listed before. From direct imagery and objective-prism emission line spectra, we derived redshifts for 95 objects, up to a value of $z = 0.06$, as well as photometric and spectrophotometric results for 62 objects down to $m_r = 18.3$. Our sample is dominated by high ionisation starburst galaxies and especially small systems but we did not detect any extreme dwarf or objects in voids.

Key words: **GALAXIES: STARBURST – LINE: FORMATION**

1. INTRODUCTION

Since the pioneering works of Haro (1956), Zwicky (1966), Markarian (1962), among others, numerous surveys for active galaxies have been conducted (see Giovanelli & Haynes 1991; Surace 1993). Although photographic Schmidt surveys are less deep than CCD ones the huge size of the field observed remains a great advantage in studying the nearby universe. In order to select "starburst galaxies" without constraints either on the morphology or on the cause of the starburst phenomenon, we have conducted a survey using two criteria, ultraviolet excess images and emission line spectra (as the 2nd Byurakan and Case surveys). This allows us to get galaxies experiencing a recent and strong starburst as well as those showing an old dying burst. This paper focuses on *emission line objects* of the sample. An important technical aim of this study was to develop a reduction procedure that could allow us to derive the maximum astrophysical output directly from the digitized Schmidt plates (plates are digitized using the MAMA machine of the Observatoire de Paris). Observations and data processing techniques are described in detail in Surace & Comte (1994).

2. RESULTS

Table 1 compares the characteristics of this work with Wasilewski's survey (Wasilewski 1983), University of Michigan survey (hereafter UM) (MacAlpine et al. 1977; Salzer et al. 1989) and Case survey (Pesch & Sanduleak 1983; Salzer et al. 1995). Although the UM and Case surveys are deeper (they use a smaller dispersion), our results are consistent with them, with a completeness limit estimated at $m_B = 16.0$. The high projected density is due to the "rich" surveyed area of the Virgo cluster. The objects were classified in 8 groups

[1]Dept. of Astronomy, Cornell University, NY, USA.

[2]Observatoire de Marseille, Marseille, France.

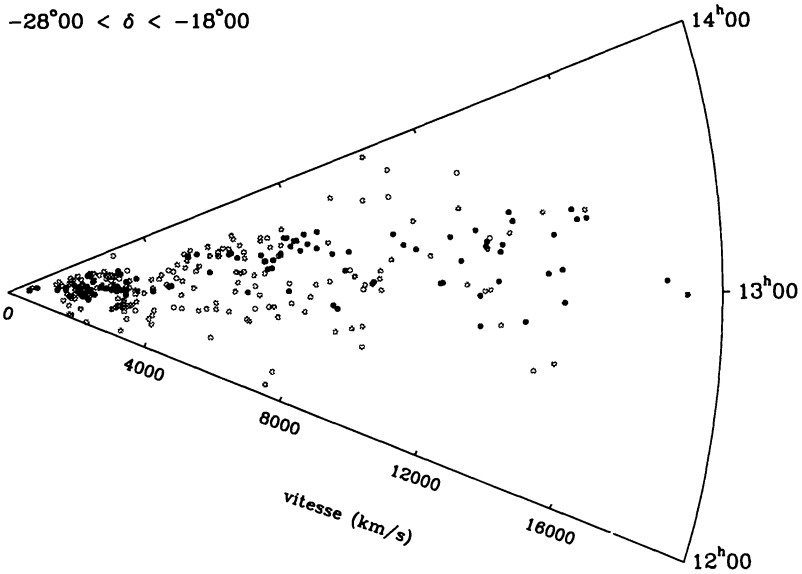

Fig. 1. Cone diagram : distribution of our galaxies (filled circle) and Dressler's (1991) normal galaxies (open circle).

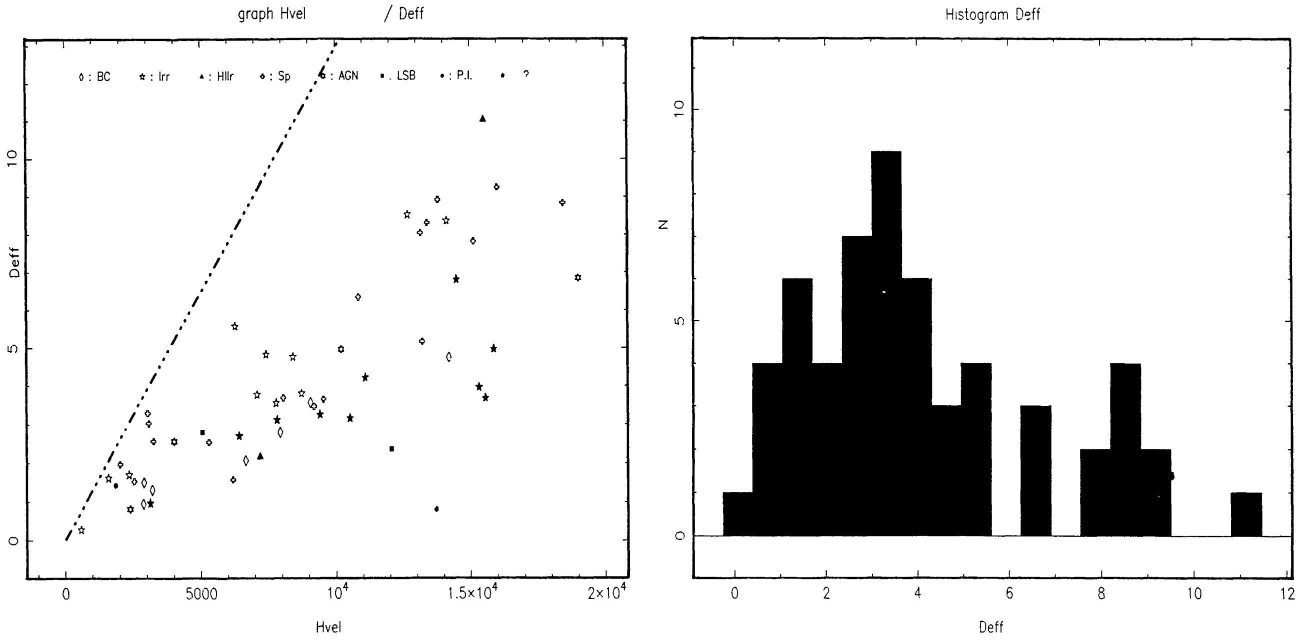

Fig. 2. *a)* effective diameter (kpc) vs. velocity (km s^{-1}) (dashed-dotted line: limiting effective diameter D = 10″). *b)* Effective diameter distribution (kpc).

(Table 2), using visual inspection and spectroscopic features: blue compact galaxies (BCG), irregular (Irr), H II regions in spirals (H IIr), spirals (Sp including starburst nuclei), AGN, low surface brightness (LSB), interactive pairs (IP), and unclassified objects ("?"). Our results are consistent with those from Wasilewski's survey, using a similar spectroscopic dispersion. We detected more BCG and Irr than the UM and Case surveys. This is because the UM survey is more sensitive to large equivalent widths lines (Salzer et al. 1989), due to the small dispersion used, while the Case survey is a color selected survey (only 20% of Case's galaxies are selected with

TABLE 1

CHARACTERISTICS

	Galaxies	Proj. density (per sq°)	B limiting magnitude	Complet. m_B	Median M_B	$M_B < -17$	$M_B < -16$
Wasilewski	96	0.16	17.0	15.7	−18.9	17%	04%
U.M. survey	158	0.50	20.0	16.5	−18.4	31%	15%
Case survey	161	0.88	19.8	15.4	−18.7	24%	10%
This study	95	1.90	17.5	16.0	−18.2	21%	11%

TABLE 2

CLASSIFICATION

	percentage %							
	BCG	Irr	H IIr	Sp	AGN	LSB	IP	?
Wasilewski	8.3	8.3	5.2	35.5	5.2	6.3	10.4	20.8
U.M. Survey	7.6	5.1	5.1	45.6	10.1	9.5	7.5	9.5
Case survey	5.0	2.5	11.8	49.7	6.8	...	1.2	2.3
This study	11.7	15.9	4.2	38.0	5.2	2.1	5.2	17.7

emission lines: Salzer et al. 1995) and addresses to a much larger population with a broader range of activity. We derive redshifts with a mean accuracy of 160 km s^{-1} (Surace & Comte 1994), and compare our sample with a test population of "red normal" galaxies (extracted from Dressler 1991) on the same sky area. We did not find any emission line galaxies in voids previously defined by the Dressler's sample. Applying a clustering analysis, we find that galaxies are distributed at the borders of large structures defined by Dressler's galaxies (Iovino et al. 1988; Salzer 1989; see Fig. 1). Figures 2*a* and Fig. 2*b* show the distribution of the effective diameter (D_{eff}, containing half the luminosity of the object). 25 % of our objects have D_{eff} < 2 kpc. Only part of this effect can be explained by a selection bias against large galaxies: because of the overlapping of R and UV images of large galaxies, it is impossible to measure their magnitude and effective diameter (see Fig. 2 *a*). Our emission-line objects are, on the average, quite small sized systems, in which the propagation of the burst is easier than in large systems (see Elmegreen, this volume) ensuring therefore an easier detectability in this kind of survey. Using the diagnostic diagram [O III]/Hβ vs. [O II]/[O III] we find most of our objects located in the starburst region (with weak extinction effects), in the high excitation part of the diagram (bias due to the selection of object spectra with the highest signal to noise ratio).

3. CONCLUSION

We listed 95 galaxies showing emission lines and derived redshifts, photometric and spectrophotometric properties. We thus show that it is possible to extract and use a lot of data from a photographic Schmidt survey to study the star formation process in the nearby universe. Indeed it must be remembered that this work was performed with data directly extracted from digitized photographic plates without any CCD follow-up.

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