Small Galaxy Groups
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Inventory of Galaxy Properties in Small Scale Structures

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Abstract. We report on a broad-band R surface photometric and low resolution spectroscopic study of a set of galaxies located in small groups and pairs of galaxies considered to be in low density environment. Groups span a wide range in density and show different morphological mix. We are analyzing systemic velocities, photometric parameters and spectral properties of the dominant galaxies in the groups. Our aim is to investigate the connection between interaction and induced galaxy activity, from star formation to AGN activity.

1. Introduction

During the last two decades we learned that interactions could severely alter the properties of a galaxy up to modifying its original morphological class (see reviews of Schweizer 1998, Barnes 1998 and Kennicutt 1998 and references therein). Encounters could then re-direct the evolution of a galaxy. In this picture, the environment plays a key role since it basically governs the type of encounters. A connection should then exist between the local environment and the global properties of galaxies inhabiting it. This link between the environment and the galaxy evolution is still not fully explored for small scale structures in low density environments (LDE), even in the local Universe.

In LDE, galaxy encounters are less frequent than in galaxy clusters and may lead to a merging (Barnes 1998), differently from clusters (Moore et al. 1996). Although galaxies could survive the encounters, depending on the impact parameters, the sudden variation of the potential induces strong modification in their morphological properties (see Schweizer 1998). Star formation episodes could re-juvenate their spectro-photometric properties (see Longhetti et al. 1999 and references therein) as a consequence of the fresh gas refueling. Furthermore, it is still controversial if the interaction plays a dominant role in activating an AGN nucleus or it is only marginally linked to the presence of activity phenomena (see e.g. Kelm, Focardi & Palumbo 1998 and references therein).

We illustrate here an on-going project for studying small scale structures in LDE analyzing photometric and spectro-photometric data for main members of each group. Our objectives are:

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• to investigate the photometric and structural properties of galaxies in order to perform a comparative analysis with objects resident in dense regions (see Rampazzo et al. 1999) and

• to analyze the possible induced activity, from star formation events to nuclear activity, using a medium resolution spectroscopy and specific models for the interpretation.

2. The Sample, Observations and Preliminary Results

The sample is defined using an algorithm which computes the local and the environment space density for each single galaxy using the redshift information. The algorithm (for a detailed description see Kelm, Focardi & Palumbo, this meeting) produces samples of close associations (e.g. isolated pairs of galaxies compact groups, etc.) having similar environmental characteristics (e.g. in LDE, medium or high density environments).

Long-slit spectra were acquired at ESO 1.52m telescope equipped with a Boller & Chivens spectrograph using a FA 2048L UV Coated CCD (ESO CCD #15), in the range $3500 \leq \lambda \leq 11000$ Å with a dispersion of 3.7 Å pix^{-1}. Imaging was carried out with the 0.91m ESO-Dutch telescope. Bessel R band images were obtained with a SIT 512×512 pixel CCD detector (ESO CCD #33) with a scale of 0.442 arcsec pix^{-1} yielding a field of view of $3'.8 \times 3'.8$. Present observations consist of 23 multiplets of galaxies. Spectra and images were calibrated using standard procedures in IRAF and MIDAS. Systemic velocities were derived both from absorption (FCORR) and emission lines. The analysis of emission line ratios, looking for induced activity, is in progress.

At the present stage of the reduction, we obtained an independent check of the systemic velocities of the multiplet members necessary to test our selection and the density of the environment (Table 1). *The systemic velocity of a consistent fraction of objects shows a remarkable difference with the values reported in the literature.* Excluding these objects, we found an average systemic velocity difference (ours − literature) of 57 km s^{-1} with a standard deviation of 123 km s^{-1}.

References

Barnes, J. 1998, in Interaction and Induced Star Formation, Saas-Fee Advanced Course 26, Lecture Notes 1996, p.275

Schweizer, F. 1998, in Interaction and Induced Star Formation, Saas-Fee Advanced Course 26, Lecture Notes 1996, p. 105

Kelm, B., Focardi, P. and Palumbo G. G. C. 1998, A&A, 335, 912

Kennicutt, R. 1998, in Interaction and Induced Star Formation, Saas-Fee Advanced Course 26, Lecture Notes 1996, p.1

Longhetti, M., Bressan, A., Chiosi, C. and Rampazzo, R. 1999, A&A, 345, 519

Moore, B., Katz, N., Lake, G., Dressler, A. and Oemler A. Jr. 1996, Nature, 379, 613

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Table 1. Salient spectroscopic results and properties of multiplets.

Group ident.	RA (2000)	Dec (2000)	T	V_{hel} km s^{-1} abs.	V_{hel} km s^{-1} emis.	objects within (1 Mpc)	Notes[a]
#1a	17 15 08.8	08 27 22	E	10001±11		1C	EL, opt. align.
b	17 15 12.0	08 24 42	S	6444±10	6299±6		
#2a	17 17 25.2	07 41 43	S0	6730±11		3C+4pC	Group
b	17 17 33.4	07 39 43	S0	6367±13			
#3a	17 31 50.0	06 28 54	E/S0	6846±13		6C+8pC	Group
b	17 31 50.0	06 29 54	E	6686±15			
c	17 31 56.7	06 28 03	S		6631±174		
d	17 31 56.0	06 31 54	S		6586±33		
#7a	20 50 23.6	−52 44 38	S0	13224±6		24C	cluster outskirts
b	20 50 28.6	−52 44 57	S		14450±66		
c	20 50 32.7	−52 46 19	E	6935±152			
#8a	20 50 48.0	−52 57 17	E	12334±13		23C	cluster outskirts
b	20 50 48.9	−52 56 04	S		12745±42		
c	20 50 53.2	−52 54 35	S0		12501±43		
#9a	20 51 06.3	−52 32 56	S0	13479±7			opt. align.
b	20 47 27.8	−52 44 11	S0		14789±81		
#10a	20 51 04.4	−52 44 58			14362±31	3C + 3pC	
b	20 51 07.1	−52 43 30			14825±37		
#12a	20 52 08.8	−53 05 45	S0	13684±9		30C	opt. align.
b	20 52 11.5	−53 05 24	S0/S		9152±47		
#16a	20 59 47.3	−01 53 12	I		5767±47	isolated	P
b	20 59 48.4	−01 52 23	S pec		5770±7		
#17a	21 45 14.5	−20 00 28	E	17183±6		1C + 4pC	P
b	21 45 15.5	−19 59 40	E	17563±11			
#18a	21 54 04.1	−16 09 28	S		11083±2	1pC	P
b	21 54 05.3	−16 09 32	S		11066±6		
#19a	22 01 01.7	08 06 34	E/S0	8474±11		1C + 8pC	P
b	22 00 53.0	08 02 30	S		8578±6		
#26a	22 50 30.4	−19 14 34	E	20531±14		3pC	opt. align.
b	22 50 37.6	−19 13 36	S0 pec		21940±37		
#27a	22 58 51.1	−07 34 56	E	23136±7		1pC	P
b	22 58 54.5	−07 36 08	E	23247±5			
c	22 58 55.5	−07 36 54	S0/E	9716±7			
#29a	00 02 34.8	−03 42 40	S		6448±30	1C + 3pC	P
b	00 02 38.5	−03 37 51	S0/S		6242±11		
#31a	00 03 22.3	−10 46 14	S0	8861±11		isolated	P
b	00 03 32.1	−10 44 40	S	8788±19			
#32a	00 16 11.5	02 26 42	S		17527±1	2pC	
b	00 16 13.9	02 27 16	S		17491±6		
#35a	00 30 22.0	06 57 36	E/S0	18010±13		2pC	P + 2 bkg obj.
b	00 30 28.7	06 58 34	S		17366±25		
c	00 30 34.7	06 56 34	S0/E		19717±134		
#36a	00 41 47.0	08 22 24	E	12714±6		3pC	P
b	00 41 30.0	08 21 24	SB	13000±11	12872±19		
#56a	01 51 26.0	−08 24 53	pec		15445±4	2pC	opt. align.
b	01 51 34.0	−08 23 56	SB		5389±2		
#58a	02 02 17.3	−01 07 40	E	12707±13		1pC	P
b	02 02 20.3	−01 06 38	E/S0	12920±12			
#63a	02 37 34.8	−11 01 34	S	4588±11	4694±15	5C + 1pC	
b	02 37 38.9	−11 00 20	E	4754±17			
#65a	02 43 58.5	05 26 19	E	7046±14		2pC	
b	02 44 05.0	05 26 12	S		7250±7		

[a]Notes: EL, indicating the presence of emission line, is reported only for early-type galaxies. P=pair; C = Companion (the redshift is known); pC = possible companion the redshift is not known. We consider in LDE galaxies for which within 1 Mpc there are less than 5 companions.

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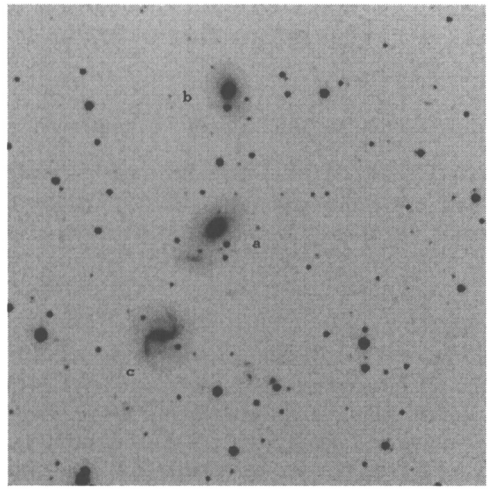

Figure 1. R-band image of three members in the multiplet #3. None of the early-type galaxies show fine structure.

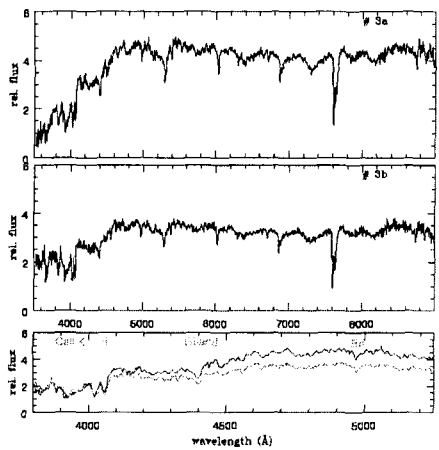

Figure 2. Composition of early-type galaxies spectra in the multiplet #3.

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