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Interacting galaxies II: physical properties and nuclear activity

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Abstract. In this proceeding is presented a study of the physical properties and nuclear activity of interacting galaxies selected from Arp & Madore catalogue (1987). In order to determine their nuclear activity and compare them with isolated galaxies we built diagnostic diagrams (DGs) using emission lines spectra.We found that interacting galaxies have an excess (of 30%) of composite type spectrum with respect to the isolated ones. Furthermore isolated have more star-burst type than the interacting.

Resumo. Neste proceeding é apresentado um estudo das propriedades físicas e atividade nuclear de galáxias em interação selecionadas do cátalogo Arp & Madore (1987). Com o objetivo de determinarmos suas atividades nucleares e compará-las com galáxias isoladas construímos diagramas de dignóstico (DGs) usando espectros de linhas de emissão. Obtemos que galáxias interagentes possuem um excesso (de 30%) de espectro do tipo composto em relação a galáxias isoladas. Além disso galáxias isoldas apresentaram mais tipo star-burst do que as interagentes.

Keywords. Galaxies: interactions – Galaxies: active – Galaxies: nuclei

1. Introduction

Interactions between galaxies are a key fenomen in evolution of galaxies. N-body and hydrodinamical simulations found that mergers of galaxies disturb the velocity field of gas, conduzing to distortions in rotational curves (Kronberger et al. 2006). The gas motion caused by interactions can change their metallicity (Dalcanton 2007), due to gas inflow to the galaxy center (Krabbe et al. 2008). This gas flux can trigger star formation and nuclear activity. Through the analysis of nuclear activity we intend understand the effect of interactions in the nuclear regions of galaxies.

2. Pairs and control sample

In this work we studied a sample of physical pairs presented in a work of this conference (see Interacting galaxies I: New Detected Systems from Arp-Madore Catalogue) and a control sample of isolated galaxies with similar r' magnitude, redshift and morphology of the interacting galaxies selected from SDSS DR9 (Ahn et al 2012). In order to determine the physical condition of the ionized gas and the nuclear activity of each galaxy, a central 2kpc spectrum, free from stellar population contribution, was obtained. The same procedure was used to built a pure emission line spectrum of a isolated control sample galaxies. For all galaxies, of both samples (physical pairs and isolated) the emission lines were identified and their fluxes were measured. The lines fluxes were corrected by dust extinction according (Osterbrock & Ferland 2006).

3. Nuclear activity with diagnostic diagrams (DGs)

Once the intensity of the emission line spectrum is sensible to radiation field, electron density and temperature, one can use diagnostic diagrams (Baldwin,Phillips,Terlevich 1981),(Osterbrock & Ferland 2006) to classify the sources according to their nuclear activity (Seyferts, LINERs, Starburst, and composite spectrum - which may indicate the presence a weak AGN component). We built several diagnostic diagrams with the emission line ratios: [OIII] 5007$\AA$/$H\beta$ 4861 $\AA$ vs [NII] 6584 $\AA$/ $H\alpha$ 6563 $\AA$, [OIII] 5007$\AA$/$H\beta$ 4861 $\AA$ vs [SII] 6717,6730 $\AA$/ $H\alpha$ 6563$\AA$,[OIII] 5007$\AA$/$H\beta$ 4861 $\AA$ vs [OI] 6300 $\AA$/ $H\alpha$ 6563 $\AA$ and [OIII] 5007$\AA$/[OII] 3727 $\AA$ vs [OI] 6300 $\AA$/ $H\alpha$ 6563 $\AA$. The theorical and empirical divisions curves of (Kewley et al. 2001), (Kauffmann et al. 2003) and (Kewley et al. 2006) were used.

The BPT diagram (upper left panel in figure 1) shows the predominance of starburst and composite spectrum in the pairs sample (black points). In others DGs,that can't separate composite from the others types, we noted an increasing number of black points in AGN and starburst regions.

4. Conclusions

The upper left panel of figure 2 present the histogram of the fraction of star-burst,composite and AGN galaxies in both samples given by the $[OIII]/H_\beta$ vs $[NII]/H_\alpha$ emission lines ratio. We can see in this panel that the interacting galaxies have an excess(30%) of composite type with respect to isolated galaxies, while the isolated galaxies have 30% more star-burst than interacting ones.These results suggest that, interaction would be an efficient mechanism to triggering nuclear activity in galaxies. The others histograms which do not include composite type, the frequency of AGNs and star-burst are similar, for both samples.

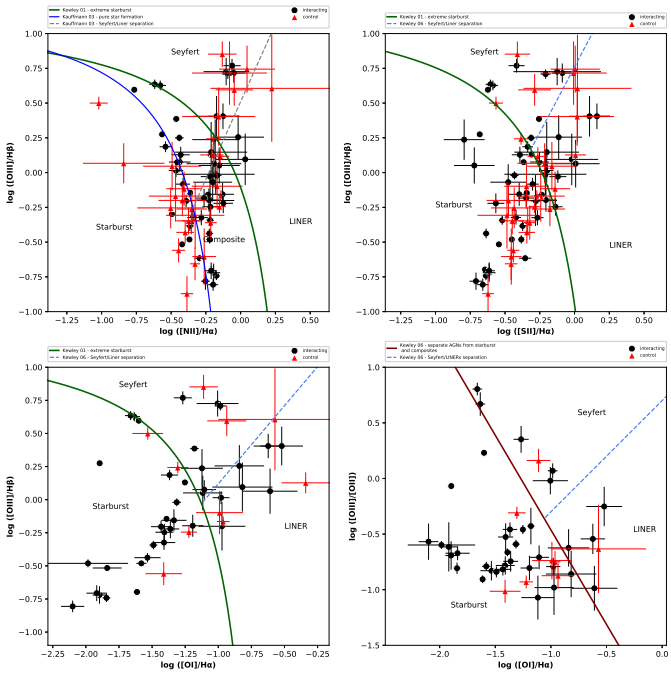

Figure 1. Diagnostic diagrams for interacting galaxies (black dots) and isolated (red dots) samples.

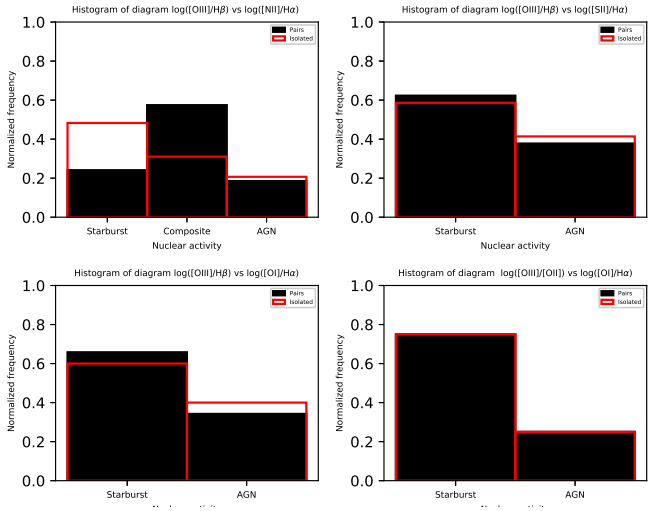

Figure 2. Histograms of diagnostic diagrams from 1.

References

Arp H. C., Madore B. F., 1987, A Catalogue of Southern Peculiar Galaxies and Associations, Cambridge University Press, Cambridge, 504 pp.
Ahn et al., 2012, ApJS, 203, 21
Baldwin, J. A.; Phillips, M. M.; Terlevich, R., 1981, PASP, 93:5-19
Dalcanton, Julianne J.,2007,ApJ,658:941-959
Kauffmann G. et al., 2003, MNRAS, 346, 1055
Kewley, L. J.; Dopita, M. A.; Sutherland, R. S.; Heisler, C. A.; Trevena, J.,2001,ApJ,556:121-140
Kewley, Lisa J.; Groves, Brent; Kauffmann, Guinevere; Heckman, Tim, 2006, MNRAS, 372,961–976
Krabbe, A. C.; Pastoriza, M. G.; Winge, Cláudia; Rodrigues, I.; Ferreiro, D. L.,2008,MNRAS,389,1593–1604
Kronberger, T.; Kapferer, W.; Schindler, S.; Böhm, A.; Kutdemir, E.; Ziegler, B. L., 2006, A&A,458,69-78
Osterbrock, D.E., Ferland, G.J., 2006, Astrophysics ofGaseous Nebulae and Active Galactic Nuclei, 2nd. ed., University Science Books, California.