Boletim da Sociedade Astronômica Brasileira, **31**, no. 1, 104-105

Interacting galaxies I: New detected systems from the Arp-Madore Catalogue

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Abstract. We present spectroscopic observations of 107 galaxies from a sample of 48 candidates to physical pairs or groups, optically selected from Arp & Madore (1987). The galaxies belongs to classes I and II (spirals with well defined arms, but showing signs of interaction, where the companion is less than half of the size of the main galaxy), most of them previously unobserved. We found that seventy four (74) galaxies form truly physical systems, while 33 galaxies are apparent systems. A control sample galaxies was built, selecting from the SDSS survey, isolated galaxies with r' magnitude and similar morphology to the pairs members. We compare the properties of both samples and found that the interacting galaxies are redder (A_v), have average younger population age and are more metallic than the control sample galaxies.

Resumo. Apresentamos observações espectroscópicas de 107 galáxias de uma amostra de 48 candidatos a pares físicos ou grupos, óticamente selecionados do catálogo Arp & Madore (1987). As galáxias pertencem as classes I e II (espirais com braços bem definidos, mas mostrando sinais de interação, onde a companheira possui menos que a metade do tamanho da galáxia principal), a maioria deles anteriormente não observada. Descobrimos que setenta e quatro (74) galáxias formam sistemas verdadeiramente físicos, enquanto 33 galáxias são sistemas aparentes. Uma amostra de controle foi gerada escolhendo galáxias isoladas do SDSS Survey com magnitude r' e morfologia similar aos membros dos pares. Comparando suas propridades encontramos que as galáxias em interação são mais vermelhas, têm idade média da população estelar mais jovem e são mais metálicas do que as galáxias da amostra de controle

Keywords. Galaxies: interactions – Galaxies:stellar content –

1. Introduction

Mergers or interactions between galaxies play a fundamental role in the formation, growth and subsequent galactic evolution (Hopkins 2010, and references therein). As shown in merger trees of hierarchical models of galaxy formation, the galactic growth is driven by accretion of other galaxies, most often minor companions (Cole et al. 2010; Wechsler et al. 2002). Observation and numerical simulations indicate that interactions can trigger star formation, nuclear activity and transform the morphology of galaxies. In this proceeding we present a comparative spectroscopic study of galaxies, which belongs to 48 candidates to physical pairs, and their corresponding isolate galaxies with similar r magnitude and morphology.

2. The interacting and isolated samples

The data were obtained using the GMOS-S spectrograph at the Gemini-South telescope. Instrument configuration was the 0.5 arcsec slit with the R150 grating, binned 2×4 pixels (spectral $\times$ spatial). Two grating settings were used, centred at 870 and 880 nm, in order to cover the chip gaps. This setup provided full spectral coverage from 350 nm to beyond 800 nm (rest wavelength), at a spectral resolution enough to separate the [NII]+$H\alpha$ blend, while at the same time covering the whole optical spectrum for redshifts up to 0.2. The slit was aligned to include both (or two of the) galaxies, and to improve sky subtraction. For all observed galaxies were extracted a central spectrum with radius of 2 kpc and identified the emission and absorption spectra, respectively , adopting $H = 75$ km/sec/Mpc. In order to determine if the galaxies form a physical system, we constraints the difference between their radial velocities in $\Delta V < 500$ km/sec. The control sample galaxies was built selecting from SDSS survey, isolated galaxies which their r' magnitude, redshifts and morphology are similar to the pair members.

3. Results: The new detected systems

We found that seventy four galaxies form truly physical systems (pairs or small groups), while 33 galaxies are apparent systems. The radial velocity of the observed physical systems expand a wide range: from 1788 km/sec to 29116 km/sec. In Figure 1 is presented r' images of new detected physical pairs. The underlying stellar population synthesis was performed using the method described by Cid Fernandes et al. (2005), where the full spectrum is synthesized using the Bruzual & Charlot (2003) models. The result is a model spectrum which gives several relevant parameters that characterize the stellar population mixture. Therefore age, metallicity and reddening are derived from the spectral synthesis for the interacting and isolated galaxies.

4. Conclusions

We present spectroscopic observations of 107 galaxies from a sample of 48 candidates to physical pairs or groups, optically selected from Arp & Madore (1987). For this sample of galaxies was found that seventy four (74) galaxies form truly physical

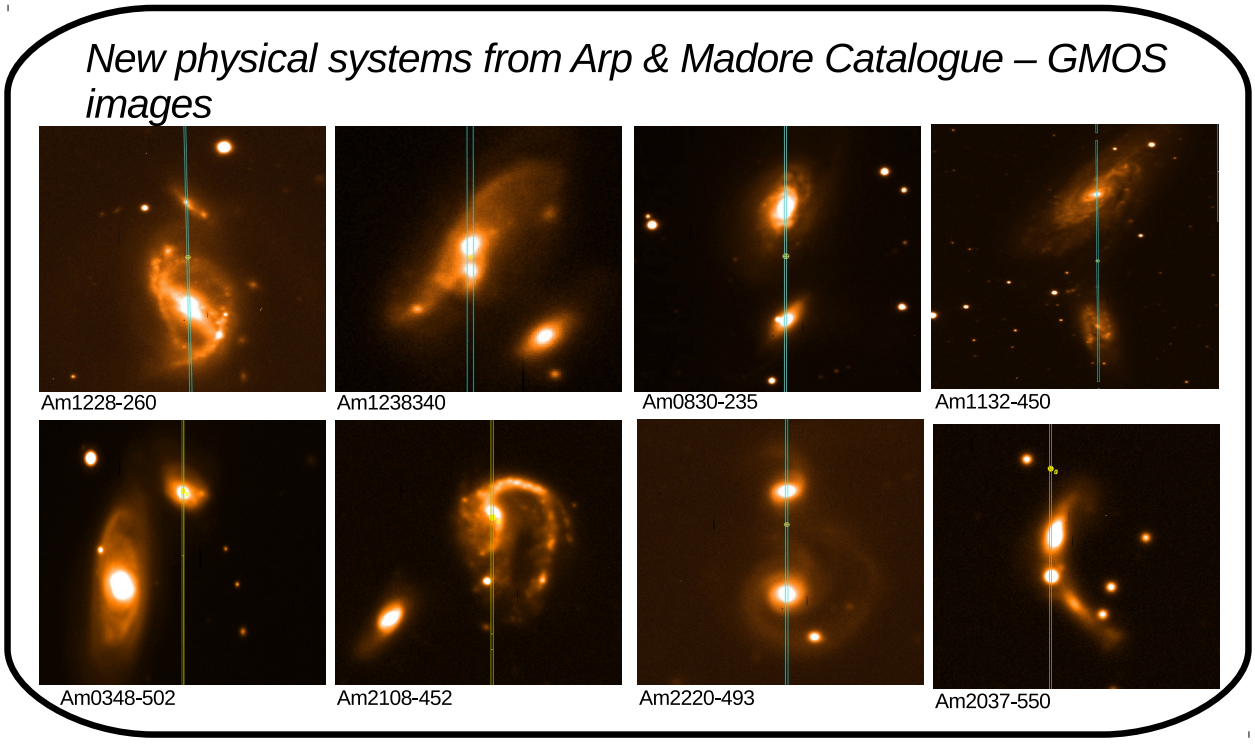

Figure 1. Examples of new detected physical pairs.

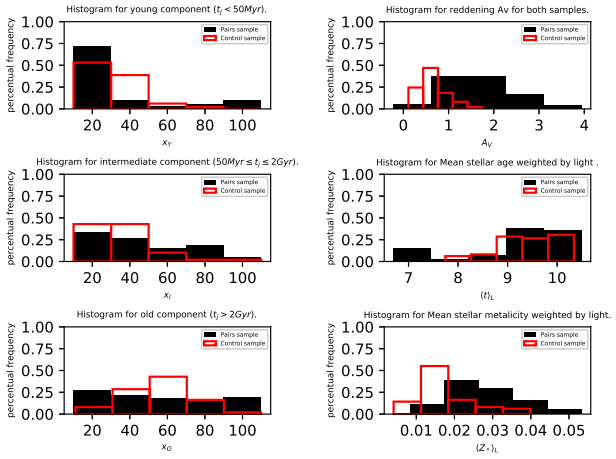

Figure 2. Histograms with concise results for stellar populations in pairs and isolated samples.

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From the performed stellar population synthesis, of interacting galaxies, we found that the contribution in light at 5880Å, of younger component is larger than 70%, for an small number of interacting systems. However, only interacting galaxies have 100% contribution of younger (Xy < 50 Myr) stellar population. In addition 35% of interacting objects present larger contribution (> 70%) of intermediate age stellar population (50 Myr ≤ Xi ≤ 2 Gyr).The histograms of the percentage of contribution of the young, intermediate and old stellar populations for both samples are presented in left panels of Figure 2. The right panels of the Figure 2 display the reddening, means stellar age weight by light and metallicity for both samples.The interacting galaxies are redder (A_v), have average younger population age and are more metallic than the control sample of galaxies.

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