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# RELATION BETWEEN ACTIVITY, MORPHOLOGY AND ENVIRONMENT FOR A LARGE SAMPLE OF SDSS GALAXIES

R. A. Ortega-Minakata,[1] J. P. Torres-Papaqui,[1] H. Andernach,[1] J. M. Islas-Islas,[1] and D. M. Neri-Larios[1]

**We apply a stellar population synthesis code to the spectra of a large sample of SDSS galaxies to classify these according to their activity (using emission-line diagnostic diagrams), environment (using catalogues of isolated and cluster galaxies), and using parameters that correlate with their morphology.**

From the SDSS-DR7 (Abazajian et al. 2009), a flux-limited sample of galaxies was selected following selection criteria used by Cid Fernandes et al. (2005, hereafter Cid05). We apply a stellar population synthesis code known as STARLIGHT (Cid05) to the spectra of the resulting sample (175111 galaxies), obtaining the the intensity of the emission lines of each galaxy (from the residual spectra).

Using emission-line diagnostic diagrams (Baldwin et al. 1981, hereafter BPT; Coziol et al. 1998, hereafter Coz98), and the diagnostic lines of Kewley et al. (2001) and Kauffmann et al. (2003), we classified the sample in three classes: Star Forming galaxies (SFGs), AGN-hosts (AGNs) and Transition Objects (TOs), classifying only galaxies with $S/N \geq 3$ in the relevant lines of each diagram. Using the standard BPT diagram – $\log\left([\mathrm{NII}]\lambda6584\text{Å}/\mathrm{H}\alpha\right)$ vs. $\log\left([\mathrm{OIII}]\lambda5007\text{Å}/\mathrm{H}\beta\right)$, the fractions of galaxies in each class are $\sim$66% SFGs, 10% AGNs and 24% TOs, out of 91254 galaxies classifiable with this diagram. Combining this diagram with the "NII Diagram" (Coz98) – $\log\left([\mathrm{NII}]\lambda6584\text{Å}/\mathrm{H}\alpha\right)$ vs. $EW\left([\mathrm{NII}]\lambda6584\text{Å}\right)$, the fractions are $\sim$55% SFGs, 23% AGNs and 22% TOs, out of 127827 galaxies classifiable with this diagram.

Fukugita et al. (2007) found a correlation between the morphology and the K-corrected photometric colours ($u-g$, $g-r$, $r-i$, and $i-z$, defined in the SDSS photometric system), and also between the morphology and the concentration index $R_{50}(r)/R_{90}(r)$ (defined as the ratio of the 50% and 90% Petrosian radii). Using these relations, we classified all the galaxies in our sample adopting a "morphological index" T, ranging from 0 to 6 (0 = E, 1 = S0, 2 = Sa, 3 = Sb, 4 = Sc, 5 = Sd/Sm, 6 = Irr; see Fukugita et al. 2007).

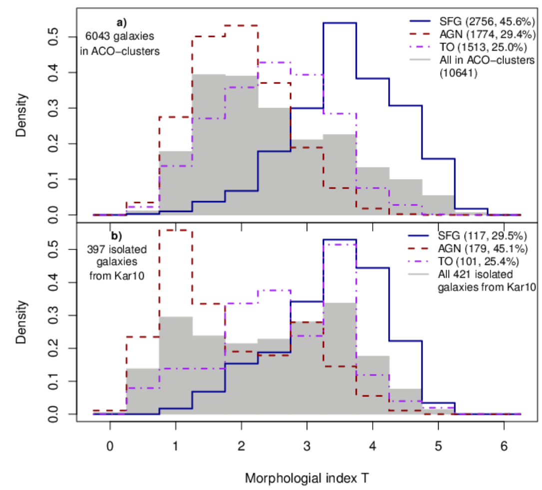


Fig. 1. Morphological distribution of activity types for (a) cluster galaxies, and (b) isolated galaxies.

We constructed a subsample of galaxies that live in a cluster environment, using the compilation of redshifts of ACO (Abell et al. 1989) cluster member galaxies maintained by one of us (see Andernach et al. 2005). Figure 1 shows the distribution of morphological index T of galaxies in this subsample with different activity types according to the NII Diagram. As a comparison, we show the same distribution for 421 narrow-emission-line isolated galaxies from Karachentseva et al. (2010). A strong morphological segregation between different activity types can be seen in both environments.

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[1]Departamento de Astronomía, Universidad de Guanajuato, Callejón de Jalisco S/N, Valenciana, 36240 Guanajuato, Guanajuato, Mexico (rene@astro.ugto.mx).