

GALAXY ECOLOGY: THE FATE OF PASSIVE GALAXIES

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Galaxy evolution has an intrinsic environmental dependence, as suggested by the existence of a star formation-density relation. Besides affecting the population of gas-rich, star-forming galaxies, in the present study we show that even galaxies retired from forming stars, or passive galaxies, can be affected by environmental processes. Passive galaxies are dominated by old stars, with a relevant contribution of hot post-AGB and white dwarf stars which can be considered as relevant sources of ionisation. Adopting a spectral synthesis approach we can model the $H\alpha$ luminosity due to photoionisation by old stars ($t > 10^8$ years) and compare it to the observed one. From this comparison, two classes of passive galaxies emerge: those with significant $H\alpha$ emission, showing evidences of a gaseous component being ionised by old stars, referred here as “emission-line passives” (ELP); and galaxies without evidence of emission lines, referred as “passives” (P). We investigate the environmental properties of passive galaxies by analysing a volume limited sample drawn from the Data Release 7 of the Sloan Digital Sky Survey (SDSS). We used results obtained from the application of a spectral synthesis method (STARLIGHT code) to this sample and adopted different approaches to infer the environment of a galaxy. Our results show that the fraction of P galaxies increases in denser environments (as expected from the star formation-density relation). For ELP galaxies, we should also expect a higher fraction in denser environments, as they are also passive galaxies without ongoing star formation. However, that is not what we observe. Our results indicate a constant fraction of ELP galaxies in all environments probed by our analysis. These observations suggest that a significant fraction of passive galaxies lost their gaseous component through environment-related mechanisms and now they are classified as P galaxies. On the other hand, the gaseous content of ELP galaxies, photoionised by their old stars, survived to the hostile environment of high-density regions.