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GALAXY-GALAXY INTERACTIONS AND STAR FORMATION ACTIVITY IN HIERARCHICAL SCENARIOS

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Using hydrodynamical simulations in a cosmological Λ-CDM model, we investigate the role played by mergers and interactions in the regulation of star formation (SF) activity and other internal properties of galaxies.

In agreement with observations (Lambas et al 2003), we find that the close encounters (with relative projected separations (r_p) less than 25 kpc h^{-1}) can induce the SF activity to levels higher than those exhibited by galaxies without a close companion (the control sample). Our results also indicate that the capability of interactions to trigger the SF activity depends on the internal properties of the systems, particularly, their stability properties (determined by their potential wells) and their gas reservoir (Perez et al. 2005). Thus, the recent past SF activity, measured by the fraction of stellar masses formed during the last 0.5 Gyrs, anticorrelates with the central circular velocity of the systems which quantifies the deepness of their potential wells. In order to analyse how the internal properties of galaxies can determine the efficiency of interactions to induce the SF activity, we segregate galaxies in pairs into passive and active star forming systems, according to their current SF activity (related to the mean SF activity measured for the control sample). We find that the passive SF pairs correlate with older, more stable and evolved systems, contrary to the active ones.

Our analysis of the colours for galaxy pairs show a bimodal colour distribution (Balogh et al. 2004) with a blue peak populated basically by the currently active SF galaxies or passive ones which have experienced important recent past SF activity. The red peak is determined by quiescent SF objects. Consistently with these results, we find that while 65% of the stellar mass in merging systems ($r_p < 25\,\mathrm{kpc\,h^{-1}}$) contributes to populate the blue peak, only 30% of stars in interacting ones ($25 < r_p < 100\,\mathrm{kpc\,h^{-1}}$) do so. This finding shows that interactions can drive a bimodal colour distribution.

In the control sample we found a red excess which could be a consequence of interactions being too efficient in transforming gas into stars in our simulation since we do not include SN feedback. Future works will address this point.

Finally, we study the global mean chemical abundance for the stellar populations (SP) and the interstellar medium (ISM) associated to each simulated galaxy pair. From the analysis of the chemical composition of the SP as a function of the projected separation, we find that independently of their relative separation, passive pairs are more chemically enriched than the active ones, as expected since they are in a more evolved stage of evolution. Analysing the metallicity of the SPs in pairs in comparison to that for the control sample, we find that both active and passive pairs show higher chemical abundance that galaxies without a near companion.

In summary, our analysis suggests that galaxy-galaxy interactions can produce a bimodal colour distribution and an increase in the global mean chemical properties of galaxies in pairs with respect to galaxies without a close companion (Perez et al. 2006).

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