

Paired galaxies with different activity levels and their supernovae

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Abstract We investigate the influence of close neighbor galaxies on the properties of supernovae (SNe) and their host galaxies using 56 SNe located in pairs of galaxies with different levels of star formation (SF) and nuclear activity. The statistical study of SN hosts shows that there is no significant difference between morphologies of hosts in our sample and the larger general sample of SN hosts in the Sloan Digital Sky Survey (SDSS) Data Release 8 (DR8). The mean distance of type II SNe from nuclei of hosts is greater by about a factor of 2 than that of type Ibc SNe. The distributions and mean distances of SNe are consistent with previous results compiled with the larger sample. For the first time it is shown that SNe Ibc are located in pairs with significantly smaller difference of radial velocities between components than pairs containing SNe Ia and II. We consider this as a result of higher star formation rate (SFR) of these closer systems of galaxies. SN types are not correlated with the luminosity ratio of host and neighbor galaxies in pairs. The orientation of SNe with respect to the preferred direction to-

ward neighbor galaxy is found to be isotropic and independent of kinematical properties of the galaxy pair.

Keywords Supernovae: general · Galaxies: fundamental parameters · Galaxies: interactions · Galaxies: starburst

1 Introduction

Stellar populations and history of SF are crucial parameters that determine the nature of galaxies. Among other triggers, interactions and mergings can play an important role in explaining the origin and processes underlying the active SF phenomena observed in galaxies (e.g., Blanton and Moustakas 2009; Bournaud 2011). Particularly, merging is considered as the mechanism that changes the properties of galaxies dramatically and is able not only to bring additional amount of gas for fueling nuclear activity and starburst, but also to change the efficiency and timescales of SF in galaxies significantly (e.g., Kennicutt 1998; Cox et al. 2008). Connection between interaction/merging and SF has been shown in many observational studies (e.g., Barton et al. 2000; Patton et al. 2011) and theoretically has been modeled and explained in many papers (e.g., Mihos and Hernquist 1996; Di Matteo et al. 2007). According to large-sample statistical studies, in most cases gravitational interaction can be a triggering mechanism for nuclear activity and/or circumnuclear starburst in interacting and merging galaxies (e.g., Ho 2008; Ellison et al. 2011; Liu et al. 2012; Patton et al. 2011, 2013). In several studies enhanced SF was revealed also in tidal arms and in bridges connecting galaxies in interaction (e.g., Smith et al. 2007). There also exists the possibility, that interactions can enhance SF in disk, while the nucleus is not undergoing even a modest SF phase (e.g., Jarrett et al. 2006).

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