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# Velocity distributions of surviving companion stars of type Ia supernovae in the Milky Way

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**Abstract.** The companion stars of type Ia supernovae (SNe Ia) would survive the explosions and show peculiar properties in the single-degenerate (SD) scenario. Whit different SD SN Ia channels, we obtained the velocity distributions of the surviving companion stars in the Milky Way. All properties presented may be verified by future observations.

**Keywords.** binaries: close – supernovae: general – Galaxy: kinematics and dynamics

## 1. Introduction

Type Ia supernovae (SNe Ia) are playing a major role in understanding galactic chemical evolution and determining cosmological parameters. However, the nature of their progenitors has remains unclear. At present, one of the most popular progenitor scenarios is single-degenerate (SD). In the SD scenario, companion stars would survive after the SN Ia explosions. The surviving companion stars would have particular velocity compare to their neighbour stars.

## 2. Model and Results

In this work, we used Monte Carlo simulations to trace the motion of surviving companion stars by considering the influence of the Galactic gravitational potential (Smith *et al.* 2007). The surviving companion star is kicked by the SN ejecta after the explosion. The runaway velocity of a surviving companion star is determined by the orbital velocity (Wang *et al.* 2009; 2010) and the kick velocity (Liu *et al.* 2012; 2013). We assume that the direction of runaway velocity vector is random. In our simulations, we obtained space velocity, transverse velocity and radius velocity distributions of the surviving companion stars from different SD progenitor scenarios in the Milky Way. We found that some surviving companion stars have higher space velocities than those of local stars there. Moreover, Our results showed that surviving companion stars of SNe Ia may be an origin of high velocity stars. Furthermore, our works indicated that some hypervelocity He stars may originate from the surviving companion stars in the WD+He star channel.

## References

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