

Observational properties of Type Ia Supernovae according to the Double Degenerate model

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Type Ia Supernovae (SNe) are explosive events of relevant importance in Physics and Astrophysics but many aspects about their origin are nowadays unclear. In particular there is a great debate about the nature of the progenitor binary system and its evolution up to the explosion. The aim of this work was to verify if a selected model of SNe Ia progenitors is able to provide observational counterparts whose existence can be observationally tested. We refer to the Double Degenerate system in which two White Dwarfs (WDs) merge because of Gravitational Waves emission from the system. It has been assumed that the less massive WD is completely dissolved into an optically thick disk which accretes matter into the remaining WD of the system [1]. Since the amount of matter that can be accreted on the star depends on its structural features, it is possible to determine the properties of the accreting WD and that of the disk all along their time evolution from first principles ([2],[3]) and to numerically follow the full evolution of the merged system from the merging to the explosion [4]. Since the evolutionary time scales are known and also known is the rate of type Ia SNe occurring in the Galaxy, we could easily derive the expected number of systems existing in the Galaxy and statistically estimate their spatial distribution. We reproduced the spectral distribution of each expected pre-exploding system once the position, the dust extinction in the Galaxy and the WD and disk properties were known. From the obtained spectral distribution, the fluxes in various relevant observational bands have been obtained (namely those of the Sloan Digital Sky Survey and those of the GALEX telescopes). The apparent magnitudes have been obtained to make a comparison with the matched GALEX and SDSS data catalogs.

[1] Lorén-Aguilar, P., Isern, J., García-Berro, E. 2010, MNRAS, 406, 2749

[2] Piersanti, L., Gagliardi, S., Iben, I.Jr., Tornambé, A. 2003, ApJ, 583, 885

[3] Piersanti, L., Gagliardi, S., Iben, I.Jr., Tornambé, A. 2003, ApJ, 598, 1229

[4] Tornambé, A. & Piersanti, L. 2013, MNRAS, 431, 1812-1822

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