



The Beginnings and Ends of Double White Dwarfs

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Three-Dimensional Simulations of White Dwarf Mergers and Turbulently-Driven Detonation Initiation

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While the stellar progenitors of Type Ia supernovae (SNe Ia) remain a subject of active investigation, recent multi-wavelength observations of SNe Ia have tightly constrained near-Chandrasekhar mass (near-Mch) single-degenerate (SD) SNe Ia. In particular, the most extensive set of non-detections of nebular H-alpha from SNe Ia of 110 events of all classes (Tucker et al, 2019) guide us to seriously consider white dwarf mergers as the origin not only of normal SNe Ia, but also of SNe Ia types previously considered to originate from SDs – ranging from underluminous SNe Iax to bright 91Ts.

In this talk, I will present the first three-dimensional simulations of CO and ONe WD mergers and demonstrate that these may lead to very faint, rapid transients with possible connections to SNe Iax. Additionally, I will also present new three-dimensional simulations of CO WD binaries with thin He layers, and explore whether surface He detonations yield detonations of the underlying CO primary cores. Lastly, I will discuss new physical insights into the crucial physical process of turbulently-driven detonation initiation, which underlies all major SNe Ia channels.

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