

# TYPE IA SUPERNOVA PROGENITORS: SEARCHING THE SDSS-II SUPERNOVAE FOR COMPANION STAR INTERACTIONS

Brian Hayden  
University of Notre Dame  
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Type Ia supernovae have proven to be one of the most valuable instruments in the study of our universe. The measurement of their distances from Earth led astrophysicists to the discovery of dark energy, an energy density with an unknown source that is causing the expansion of the universe to accelerate. Despite their value in cosmology, the progenitor system of these supernovae has been difficult to confirm. From the set of nearly 500 spectroscopically confirmed Type Ia supernovae (SNe) and around 10,000 unconfirmed candidates from SDSS-II, we select a subset of 108 confirmed SNe Ia with well-observed early-time light curves to search for signatures from shock interaction of the SN with a possible companion star. No evidence for shock emission is seen; however, the cadence and photometric noise could hide a weak shock signal. We simulate shocked light curves using SN Ia templates and a simple Gaussian shock model to emulate the noise properties of the SDSS-II sample and estimate the detectability of the shock interaction signal as a function of shock amplitude, shock width, and shock fraction. We find no direct evidence for shock interaction in the rest-frame B-band, but place an upper limit on the shock amplitude at 9% of SN peak flux ( $M_B > -16.6$  mag).

If the single degenerate channel dominates type Ia progenitors, this result constrains the companion stars to be less than about 6 M sun on the main sequence and strongly disfavors red giant companions.

Astrophysics  
Seminar

All interested  
persons are  
cordially  
invited to  
attend.