



भारतीय ताराभौतिकी संस्थान  
**INDIAN INSTITUTE OF ASTROPHYSICS**  
कोरमंगला Koramangala, बेंगलूरु Bengaluru – 560034.

Ph.D THESIS DEFENCE.

Name: Mr. Avinash Singh, JAP - Student

Title: "Observational study of Core-Collapse Supernovae".

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सार Abstract

The advent of dedicated surveys for studying transient events has invoked a great interest in the study of core-collapse supernovae (CCSNe). The rate of discovery of SNe has hence gone up ten-folds, relinquishing their diversity. SNe not only help in probing the endstages of stellar evolution but also in understanding the cosmic enrichment. Besides, SNe play a significant role in driving the chemical and dynamical evolution of galaxies and have been proposed to be substantial contributors to dust when the Universe was young.

In this talk, I will present the observational study performed on CCSNe. CCSNe result from the gravitational collapse of the core in stars more massive than 8 solar masses. The observational differences in the properties of various subclasses of CCSNe (even within a subclass) are attributed to the mass, metallicity, and environment of its progenitor star. The temporal (i.e., light curve) and spectral evolution of a SN allow the inference of these critical parameters related to the progenitor. In this work, we have performed a detailed observational study of hydrogen-rich (aka Type II) SNe, namely, ASASSN-14dq, SN2016gfy, and SN2018hna. The study was conducted in the ultraviolet, optical, and near-infrared wavelengths using data from ground and space-based telescopes. We examined the explosion parameters (such as  $^{56}\text{Ni}$  mass, ejecta mass, explosion energy), progenitor properties (such as mass, radius, and metallicity) and tried to understand their inherent peculiarities of these SNe. Factors such as the presence of immediate circumstellar material and the effect of nickel and its degree of mixing were also investigated.

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