

# Optical and Near-infrared Observations of the Nearby SN Ia 2017cbv

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### Abstract

Supernova (SN) 2017cbv in NGC 5643 is one of a handful of Type Ia supernovae (SNe Ia) reported to have excess blue emission at early times. This paper presents extensive BVRIYJHK(s)-band light curves of SN 2017cbv, covering the phase from -16 to +125 days relative to B-band maximum light. The SN 2017cbv reached a B-band maximum of 11.710 ± 0.006 mag, with a postmaximum magnitude decline of  $\Delta m(15)(B) = 0.990 \pm 0.013$  mag. The SN suffered no host reddening based on Phillips intrinsic color, the Lira-Phillips relation, and the CMAGIC diagram. By employing the CMAGIC distance modulus  $\mu = 30.58 \pm 0.05$  mag and assuming  $H_0 = 72$  km s<sup>-1</sup> Mpc<sup>-1</sup>, we found that 0.73 M Ni-56 was synthesized during the explosion of SN 2017cbv, which is consistent with estimates using reddening- and distance-free methods via the phases of the secondary maximum of the near-IR- (NIR-) band light curves. We also present 14 NIR spectra from -18 to +49 days relative to the B-band maximum light, providing constraints on the amount of swept-up hydrogen from the companion star in the context of the single degenerate progenitor scenario. No Pa beta emission feature was detected from our postmaximum NIR spectra, placing a hydrogen mass upper limit of 0.1 M. The overall optical/NIR photometric and NIR spectral evolution of SN 2017cbv is similar to that of a normal SN Ia, even though its early evolution is marked by a flux excess not seen in most other well-observed normal SNe Ia. We also

compare the exquisite light curves of SN 2017cbv with some M-ch delayed detonation models and sub-M-ch double detonation models.

## Palabras clave

**Palabras clave de autor:** Type Ia supernovae

**KeyWords Plus:** SUPERNOVA FACTORY OBSERVATIONS; DELAYED-DETONATION MODELS; LIGHT CURVES; DECLINE-RATE; ECHELLE SPECTROGRAPH; ABSOLUTE MAGNITUDES; IMPROVED DISTANCES; PRECISE DISTANCE; HUBBLE CONSTANT; SKY SURVEY

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