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The Exceptional X-ray Evolution of SN 1996cr in High Resolution

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We present X-ray spectra spanning 18 years of evolution for SN1996cr, one of the five nearest (~4 Mpc) SNe detected in the modern era. Chandra-HETG exposures allow us to resolve spectrally the velocity profiles of Ne, Mg, Si, S, and Fe emission lines and monitor their evolution as tracers of the ejecta-circumstellar medium (CSM) interaction. To explain the diversity of X-ray line profiles, we explore several possible geometrical models. Based on the highest S/N 2009 epoch, we find that a polar geometry with two distinct opening angle configurations and internal obscuration can successfully reproduce all of the observed line profiles. Furthermore, We extend this model to seven further epochs with lower S/N ratio and/or lower spectral-resolution between 2000-2018, yielding several interesting trends.

Topic

Multi-messenger and transient astronomy

Affiliation

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