A multiwavelength view of a puzzling dragon

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Abstract

In this contribution, I will present a comprehensive multiwavelength study of SN 2024jlc, a superluminous supernova (SLSN) that exploded on 2024 May 25 at a redshift of z = 0.039. With a peak g-band absolute magnitude of only –19.38 mag, it is among the least luminous SLSNe ever discovered. As one of the nearest SLSNe exploded in recent years, and among the closest ever observed, SN 2024jlc provided a unique opportunity to investigate the diversity of this class through an extensive multiwavelength campaign. Our analysis combines optical and UV photometry and spectroscopy with observations in soft and hard X-rays, as well as high-energy gamma-rays. We investigate the physical mechanisms powering the light curve, constrain the properties of the circumstellar environment, and explore the similarities and differences between SN 2024jlc and stripped-envelope supernovae (SE-SNe). Our results suggest that SN 2024jlc bridges the gap between SLSN-I and broad-light-curve SE-SNe. Its emission can be explained by either ejecta–circumstellar medium interaction or magnetar spin-down, with a significant contribution from radioactive nickel decay. We also report a suggestive 3.6σ hint of gamma-ray emission, representing the most significant evidence for gamma-ray emission from a SLSN since the confirmed detection of SN 2017egm. I will discuss the implications of this result for the powering mechanism of SLSNe and the prospects for future gamma-ray observations of these remarkable transients.

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