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SN 2018bsz: significant dust formation in a nearby superluminous supernova

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We investigate the thermal emission and extinction from dust associated with a nearby superluminous supernova (SLSN) at $z = 0.0267$, SN˜2018bsz, in order to determine its nature. We use the 7-channel imager GROND to extensively monitor the photometric evolution of SN˜2018bsz. This is the first dataset with daily cadence and simultaneous optical and near-infrared (NIR) coverage for a SLSN. At $+230$ days, the SN is not detected in the optical and shows significant NIR excess, with $r-J > 3$ mag and $r-K_{\rm s} > 5$ mag. We use the *Spitzer Space Telescope* to detect the SN at late-times between $+384$ and $+535$ days in 3.6 and 4.5 μm images. In addition, we recover NEOWISE detections at 3.4 and 4.6 μm for SN˜2018bsz between $+68$ and $+423$ days. The time evolution of the IR lightcurve enables us to investigate whether the mid-infrared emission is from newly formed dust inside the SN ejecta or from a pre-existing circumstellar envelope or interstellar material heated by the radiation from the SN. We find the later two scenarios can be ruled out, and a scenario where new dust is forming at epochs > 200 days can self-consistently reproduce the evolution of the SN flux. We can fit the spectral energy distribution well between $+230$ and $+380$ days with 5×10^{-4} $M_{\odot}$ of carbon dust, subsequently a higher dust mass of 10^{-2} $M_{\odot}$ is required. SN˜2018bsz is the first SLSN showing evidence for dust formation within the SN ejecta, and it could potentially provide an analog for dust formation in the early Universe.

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