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SN 2020jgb

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ABSTRACT

Keywords: keywords

1. INTRODUCTION

2. OBSERVATIONS

2.1. *Detection and Classification*

SN 2020jgb was first discovered by the Zwicky Transient Facility (ZTF; Bellm et al. 2019; Graham et al. 2019) on 2020 May 03.463 UT (MJD 58972.463) with the 48-inch Samuel Oschin Telescope (P48) at Palomar Observatory. The internal designation is ZTF20aayhacx. It was detected at a magnitude of 19.86 in ZTF g-band, and J2000 coordinates $\alpha = 17^{\rm h}53^{\rm m}12^{\rm s}.651$, $\delta = -00^\circ51'21''.81$. The last non-detection was on 2020 April 27.477 (MJD 58966.477; 5.99 days before the first detection) up to a limiting magnitude of 20.7 in ZTF r-band.

Classification, ...

2.2. *Optical Photometry*

We obtained gr-band photometry of SN 2020jgb with the ZTF camera. A Galactic extinction of $E(B-V) = 0.404$ is reported by the maps of Schlafly & Finkbeiner (2011), for which we correct all our photometry using the extinction model proposed by Fitzpatrick (1999). We do not account for any additional host extinction due to the lack of any Na I D absorption in our spectra (**Is it in the outskirt?**).

2.3. *Optical Spectroscopy*

2.4. *Near-infrared (NIR) Spectroscopy*

We obtained one NIR spectrum of the transient using the Gemini near-infrared spectrometer (GNIRS; Elias et al. 1998) on the Gemini North telescope on 2020 June 9 (≈22 days after r-band peak), for an integration time of 2400 s. The spectra were reduced with the `PypeIt` Python package (Prochaska et al. 2020; Prochaska et al. 2020).

3. ANALYSIS

Table 1. Spectroscopic Observations of SN 2020jgb

$t_{\rm obs}$ (MJD)	Phase (d)	Telescope/ Instrument	R ($\Delta\lambda/\lambda$)	Range (Å)	Air Mass
58,976.42	−9.7	P60/SEDM	100	3770–9220	1.23
58,982.12	−4.2	NOT/ALFOSC	360	4000–9620	1.17
58,990.43	+3.9	P60/SEDM	100	3770–9220	1.23
58,997.44	+10.7	P60/SEDM	100	3770–9220	1.29
58,998.00?	+11.2?	Shane/Kast	500?	3620–10720	
59,008.41	+21.3	P60/SEDM	100	3770–9220	1.28
59,010.00?	+22.9?	P200/DBSP	700	3200–9500	
59,023.58	+36.1	Keck I/LRIS	1100	3200–10250	2.04
59,107.29	+117.3	Keck I/LRIS	1100	3200–10250	1.31
59,143.26	+152.2	Keck I/LRIS	1100	3200–10250	2.16

Note—Phase is measured relative to $t_{r,\rm peak}$ in the host galaxy rest frame. The resolution R is reported for the central region of the spectrum.

3.1. *Photometric Properties*

- sub-luminous
- first light time, peak time
- color evolution

3.2. *Spectroscopic Properties*

- infrared Ca II triplet (Ca II IRT)
- tentative He I absorption at ≈9900 Å

3.3. *Optical Spectroscopy*

4. HOST GALAXY

5. MODEL COMPARISONS

6. DISCUSSION AND CONCLUSION

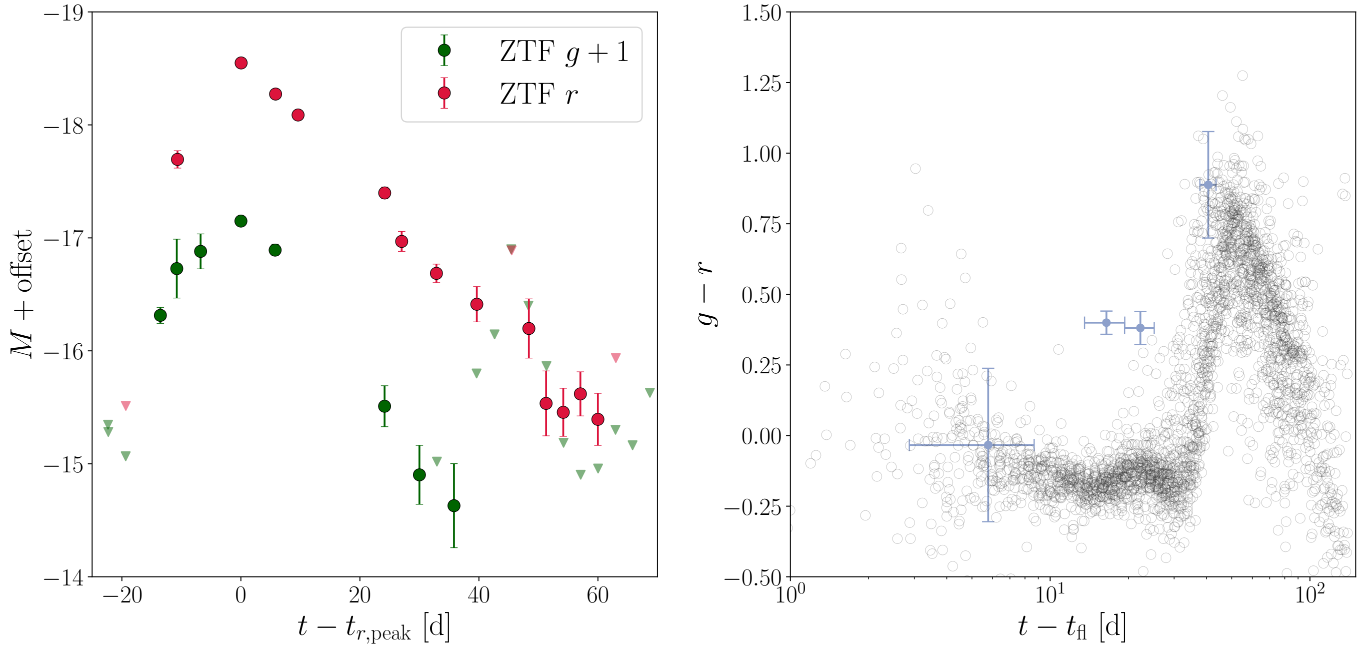

Figure 1. *Left*: multi-color (ZTF g and r bands) light curves of SN 2020jgb after extinction correction. The inverted triangles are 5-σ upper limits. *Right*: $g - r$ color evolution of SN 2020jgb (blue dots), accompanied by 62 normal SNe Ia (open circles) with prompt observations within 5 days of first light by ZTF (Bulla et al. 2020). The shaded region denotes the 1-σ credible interval of the color of SN 2020jgb until ≈40 days after the peak, estimated using Gaussian process.

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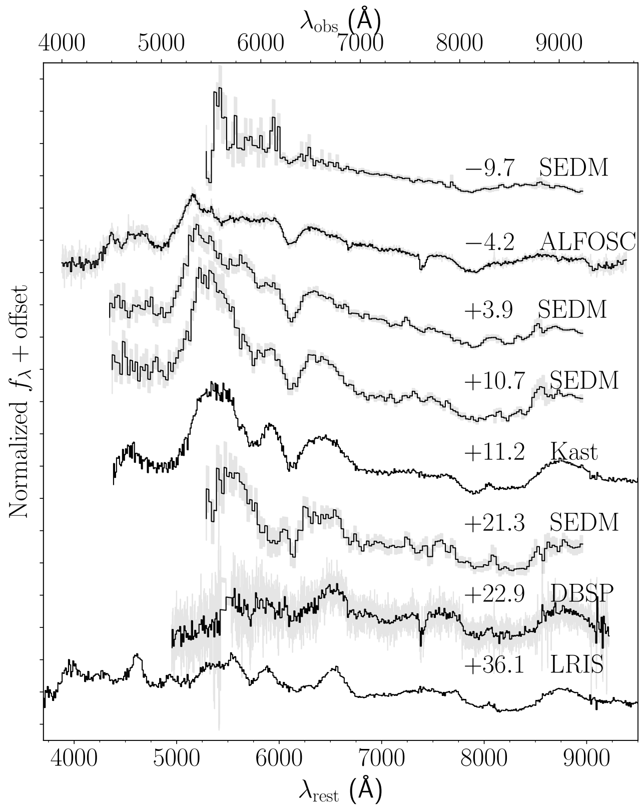

Figure 2. Optical spectroscopic sequence of SN 2020jgb. Rest frame phases (days) relative to the r-band peak and instruments used are posted next to each spectrum. The black curves are binned spectra with a bin size of 10 Å, except for the SEDm spectra, whose resolution is lower. The 1-σ uncertainties of raw spectra are shown in grey. Only regions with SNR > 3 after binning are plotted.

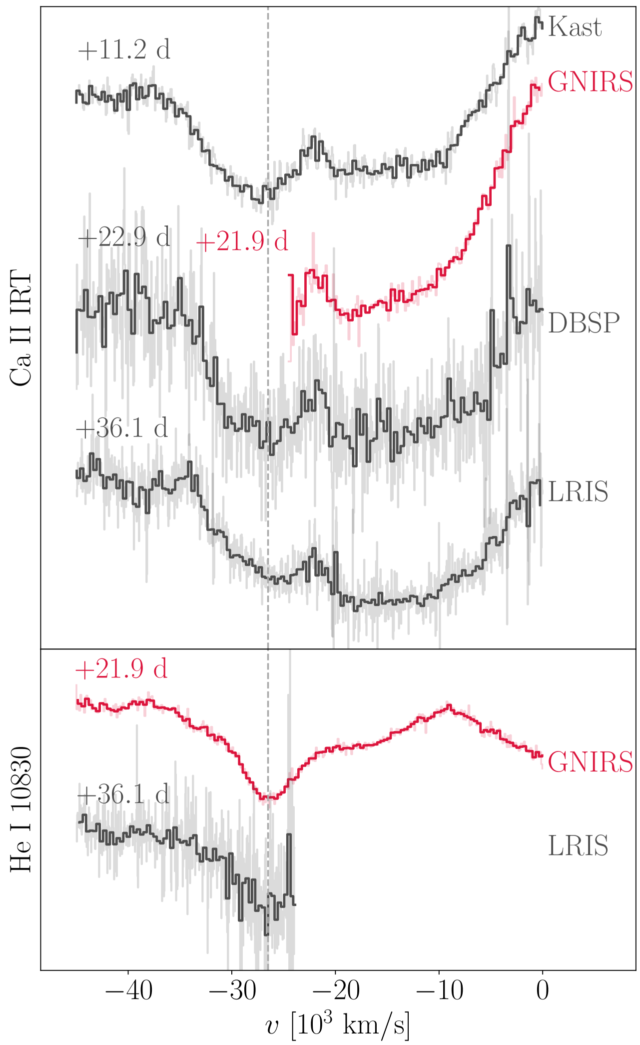

Figure 3. Spectra in the velocity space, comparing the high-velocity component of Ca II IRT and the absorption feature at ≈9900 Å assuming it is associated with He I at 10830 Å.