Photometric observations of SN 2017egm and peculiar transient AT 2018cow

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Abstract. We present 57 photometric epochs of superluminous SN 2017egm in NGC 3191, covering the period of 285 days, and 36 epochs of peculiar object AT 2018cow, for which observations lasted 69 days. $UBVRI$ photometry was carried out with 7 telescopes at 5 locations, including the 2.5-m telescope at the Caucasus Mountain Observatory of the Sternberg Astronomical Institute. The light and color curves of SN 2017egm were compared to several well-studied objects of similar type. The light curves of SN 2017egm show definite undulations: a shoulder at phase 114 days past maximum and a plateau lasting for a phase interval 155–235 days. We determined the basic parameters of the light curves for SN 2017egm and AT 2018cow: dates and magnitudes of maximum light, rates of decline at different stages of evolution in different bands.
Key words: supernovae: individual (SN 2017egm, AT 2018cow)

1. Introduction

Modern wide-field untargeted surveys resulted in discovery of new and rare types of transients. One of the most important was the discovery of stellar explosions with peak absolute magnitudes $M \leq -21$ mag, which are called superluminous SNe (SLSNe). SLSNe have been found to be divided into two major classes, hydrogen rich and hydrogen poor events: SLSNe-II, SLSNe-I (Quimby et al., 2011). SLSNe-I are among the least understood class of SNe. The explosion mechanism, the sources of energy supply and the nature of the progenitor stars are still debated (Gal-Yam, 2019).

Another interesting new class of objects is the fast blue optical transients (FBOTs) (Margutti et al., 2019). These events are characterized by fast rise (less than 5 days) and decay times, high peak luminosities ($M < -20$ mag), persistent blue colors throughout the decay, featureless spectrum at maximum light and luminous radio counterpart. The nature of these objects is debated, the

proposed models include the failed-supernova scenario, in which the transient is produced by a jet driven by fallback accretion onto a black hole (Soker & Gilkis, 2018), a tidal disruption event (Kuin et al., 2019), a peculiar type Ibn supernova (Perley et al., 2019; Xiang et al., 2021; Pellegrino et al., 2021), but there is a possibility that they represent a new astrophysical phenomenon.

SN 2017egm (Gaia17biu) was discovered by the Photometric Science Alert Team of the Gaia mission on 2017-05-23.9 UT at 16.7 mag [1]. The object was located at $\alpha = 10^{h}19^{m}05^{s}.62$, $\delta = +46°27'14''.08$ (J2000), that is $5''.1$ East and $0''.8$ South from the center of the parent galaxy NGC 3191, in the spiral arm. It was classified as a type II SN (Xiang et al., 2017), but later spectroscopic observations revealed the "W-shape" OII broad absorption features, and the SN was reclassified as SLSN-I (Dong et al., 2017). The photometric and spectroscopic monitoring of this object was reported by Bose et al. (2018), Nicholl et al. (2017), Hosseinzadeh et al. (2021). The polarimetry was collected by Maund et al. (2019), Saito et al. (2020). The parent galaxy was studied by Nicholl et al. (2017), Izzo et al. (2018). The circumstellar interaction model for the bolometric light curve was proposed by Wheeler et al. (2017).

Optical transient AT 2018cow was discovered by ATLAS (Smartt et al., 2018) on 2018-06-16.44 UT at 14.76 mag in the ATLAS o-band and was located at $\alpha = 16^{h}16^{m}00^{s}.223$ $\delta = +22°16'04''.83$ (J2000). The offsets from the center of the parent galaxy CGCG 137-068 were $3''.46$ South and $4''.86$ West.

The object has all observational characteristics of FBOT and several remarkable features: near-relativistic ejecta velocities at early times (Perley et al., 2019); luminous and fast-varying X-ray emission (Rivera Sandoval et al., 2018); high-velocity emission lines of hydrogen and helium emerging at late times (Perley et al., 2019).

AT 2018cow was intensively studied by numerous groups of researchers. Multiwavelength observations were reported by Yamanaka et al. (2018), Benetti et al. (2018), Perley et al. (2019) Prentice et al. (2018), Kuin et al. (2019), Margutti et al. (2019), Nayana & Chandra (2021), Bietenholz et al. (2020), Rivera Sandoval et al. (2018), Xiang et al. (2021).

The host galaxy and environment of AT 2018cow was studied by Lyman et al. (2020), Michałowski et al. (2019), Roychowdhury et al. (2019).

These analyses have proposed different interpretations of the progenitor, including a tidal disruption event in an intermediate mass black hole, a magnetar, and the electron capture of a merged white dwarf. A supernova origin was also considered, and similarities to the type IIn and Ibn SNe were found by Perley et al. (2019), Xiang et al. (2021), Pellegrino et al. (2021). The model of circumstellar interaction of a pulsational pair-instability SN was proposed by Leung et al. (2020).

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[1]https://wis-tns.weizmann.ac.il/object/2017egm/

2. Observations and data reduction

Photometric observations of SN 2017egm and AT 2018cow were carried out with
the 2.5-m telescope of Caucasus Mountain observatory of SAI (K250) (Potanin
et al., 2017), 1-m and 0.6-m telescopes of Simeiz Observatory of Crimean As-
trophysical Observatory (S100, S60) (Nikolenko et al., 2019), 0.6-m telescope of
Crimean Observatory of SAI (C60), 0.6-m telescope of the Stará Lesná Obser-
vatory of the Astronomical Institute of the Slovak Academy of Sciences (L60),
0.7-m and 0.2-m telescopes of SAI in Moscow (M70, M20).

The review of the photometric program and our preliminary data on
SN 2017egm are presented by Tsvetkov et al. (2019).

The standard image reductions and photometry were made using the IRAF[2].
The magnitudes of the SN were derived by a PSF-fitting relatively to a sequence
of local standard stars.

The CCD image of SN 2017egm and local standard stars is presented in
Fig. 1, and the image of AT 2018cow is shown in Fig. 2.

The magnitudes of the local standards were obtained from the APASS[3] and
SDSS[4] databases, the magnitudes in the *ugri* bands were transformed to the
Johnson-Cousins $UBVRI$ system using relations by Chonis & Gaskell (2008).
The magnitudes of the stars around SN 2017egm are presented in Table 1, and
those for AT 2018cow are listed in Table 3.

Table 1. $UBVRI$ magnitudes of local standard stars for SN 2017egm
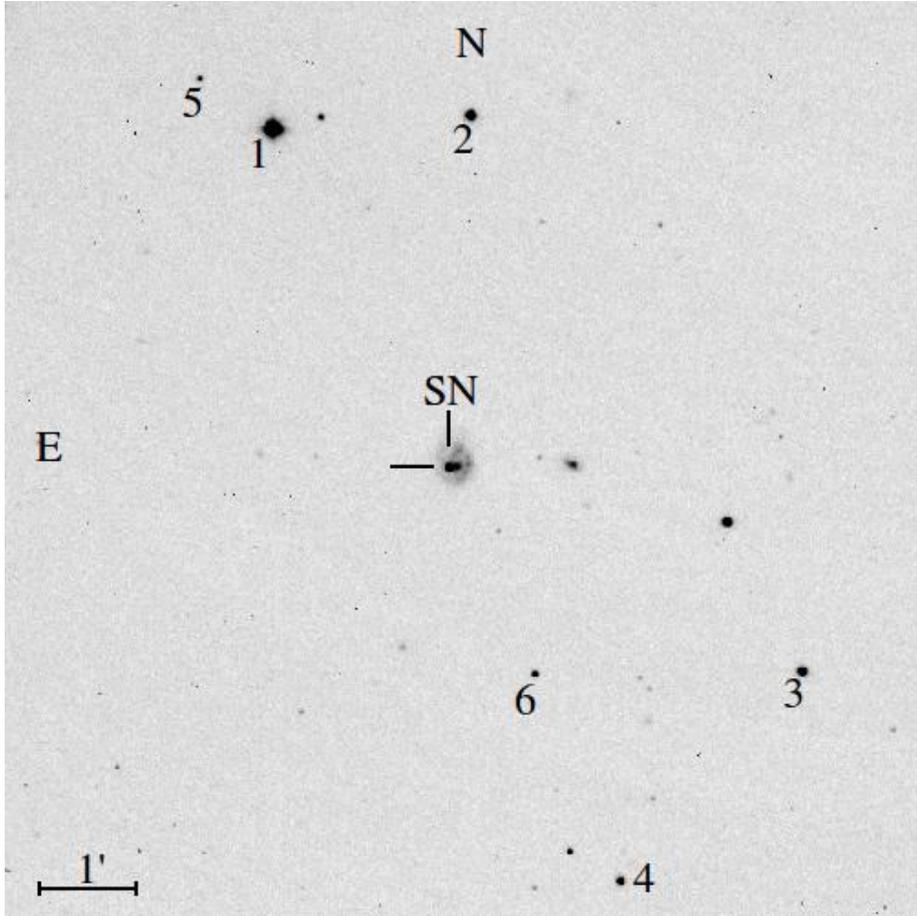
Star	U	σ_U	B	σ_B	V	σ_V	R	σ_R	I	σ_I
1	13.08	0.03	12.22	0.02	11.18	0.01	10.65	0.02	10.16	0.02
2	14.37	0.05	14.28	0.04	13.61	0.01	13.26	0.01	12.90	0.02
3	14.99	0.03	14.77	0.02	14.06	0.01	13.69	0.01	13.32	0.02
4	16.82	0.06	16.04	0.06	15.06	0.03	14.46	0.04	13.91	0.03
5	16.18	0.06	16.34	0.05	15.94	0.04	15.71	0.04	15.39	0.03
6	19.11	0.08	17.96	0.09	16.54	0.04	15.65	0.04	14.80	0.05

The surface brightness of the host galaxy at the location of the SN 2017egm
is high, and subtraction of the galaxy background was necessary for accurate
photometry. For AT 2018cow the influence of the background is smaller, but we
also applied image subtraction. We used the SDSS images, which were trans-
formed and subtracted using standard IRAF routines.

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[2]IRAF is distributed by the National Optical Astronomy Observatory, which is operated by
AURA under cooperative agreement with the National Science Foundation.

[3]https://www.aavso.org/download-apass-data

[4]http://skyserver.sdss.org/dr16/en/tools/search/radial.aspx

Figure 1. The image of SN 2017egm and local standard stars

The photometry was transformed to the standard Johnson-Cousins system by means of instrumental color-terms, determined from observations of standard star clusters.

Our photometry of SN 2017egm is presented in Table 2, and the results for AT 2018cow are reported in Table 4.
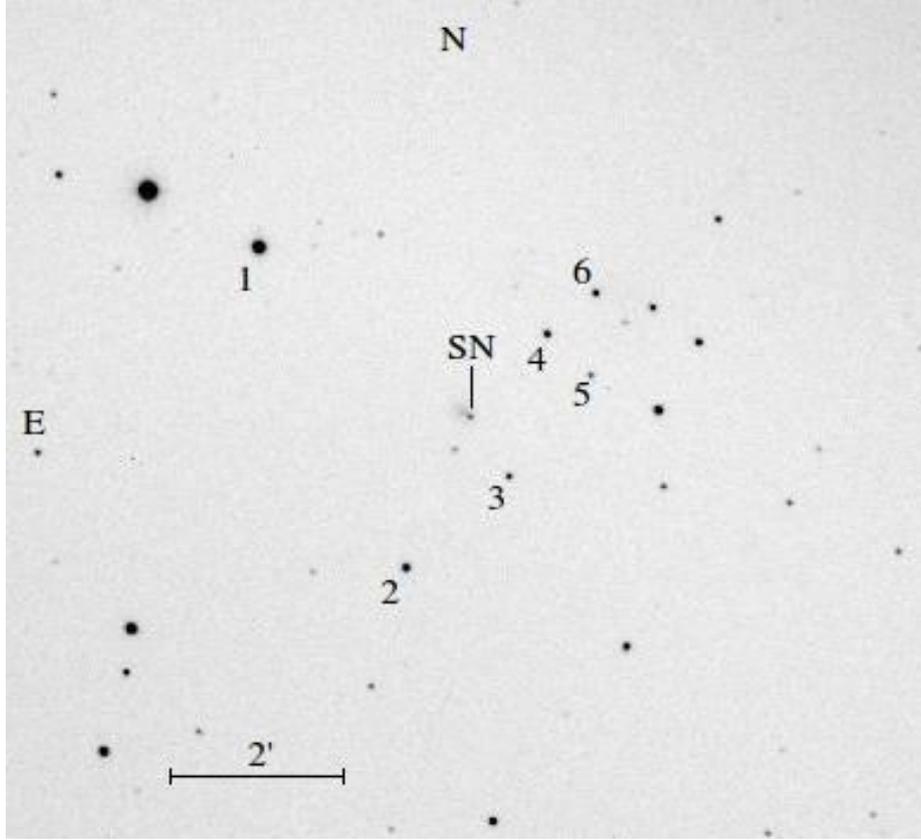
Figure 2. The image of AT 2018cow and local standard stars

Table 2.: $UBVRI$ photometry of SN 2017egm

JD−2450000	U	σ_U	B	σ_B	V	σ_V	R	σ_R	I	σ_I	Tel.
7924.29			14.79	0.03	14.81	0.02	14.88	0.02	14.88	0.03	S100
7925.28			14.80	0.03	14.79	0.02	14.84	0.02	14.84	0.03	S100
7926.29			14.81	0.03	14.78	0.02	14.83	0.02	14.82	0.03	S100
7926.36							14.81	0.03			L60
7927.28			14.79	0.04	14.78	0.02	14.83	0.02	14.77	0.03	S100
7928.28			14.81	0.03	14.78	0.01	14.81	0.01	14.83	0.03	S100
7929.29			14.84	0.03	14.82	0.02	14.83	0.02	14.82	0.05	S100
7929.36	14.09	0.05	14.95	0.04	14.80	0.01	14.83	0.02	14.83	0.02	L60
7930.29			14.86	0.03	14.81	0.01	14.83	0.02	14.81	0.03	S100

Table 2.: Continued.

JD− 2450000	U	σ_U	B	σ_B	V	σ_V	R	σ_R	I	σ_I	Tel.
7931.28			14.88	0.03	14.88	0.01	14.86	0.02	14.81	0.02	S100
7932.28			14.94	0.03	14.86	0.01	14.89	0.01	14.85	0.03	S100
7933.28			14.94	0.03	14.90	0.02	14.89	0.02	14.84	0.03	S100
7934.28			14.97	0.04	14.90	0.01	14.89	0.02	14.84	0.03	S100
7938.30	14.25	0.03	15.03	0.02	14.94	0.01	14.89	0.01			K250
7940.28			15.11	0.04	15.01	0.02	14.95	0.01	14.81	0.02	S100
7941.27			15.10	0.04	14.99	0.02	14.93	0.02	14.83	0.02	S100
7942.28			15.12	0.04	15.01	0.02	14.96	0.02	14.85	0.02	S100
7943.28			15.08	0.05	15.01	0.01	14.97	0.01	14.85	0.02	S100
7944.28			15.06	0.04	15.00	0.01	15.01	0.02	14.82	0.03	S100
7945.28			15.15	0.04	15.04	0.02	15.00	0.02	14.88	0.03	S100
7946.28			15.14	0.04	15.01	0.02	14.98	0.02	14.83	0.02	S100
7947.26			15.21	0.05							K250
7948.27	14.37	0.11	15.23	0.05	15.11	0.04	15.01	0.05	14.90	0.04	K250
7949.29	14.34	0.12	15.20	0.05	14.99	0.02	14.91	0.04	14.80	0.14	K250
7949.29					15.08	0.02	14.92	0.01			S60
7952.29	14.39	0.14	15.18	0.05	15.01	0.02	14.94	0.04	14.79	0.12	K250
7953.25	14.56	0.08	15.27	0.05	15.08	0.03	15.02	0.04	14.88	0.12	K250
7955.26	14.54	0.09	15.27	0.05	15.08	0.03	15.01	0.04	14.90	0.04	K250
7955.32			15.44	0.05	14.99	0.02	15.00	0.02	14.82	0.02	S60
7956.29			15.47	0.07	15.11	0.03	15.06	0.02			S60
7966.30							15.09	0.06			M20
7969.29					15.35	0.05	15.01	0.04			M20
7981.25					15.57	0.04	15.38	0.03			S100
7981.30			15.80	0.14	15.59	0.11	15.38	0.04			M20
7985.23							15.58	0.05	15.13	0.07	S100
7986.24			15.99	0.09	15.63	0.03	15.52	0.03	15.23	0.03	S100
7991.24							15.66	0.04			S60
7991.58					15.84	0.05	15.55	0.03	15.29	0.03	C60
7992.57			16.31	0.07	15.81	0.03	15.67	0.03	15.35	0.05	C60
7993.58			16.36	0.07	15.80	0.02	15.58	0.03	15.36	0.07	C60
7994.56					15.70	0.05	15.58	0.03	15.31	0.08	C60
7996.58					15.76	0.05	15.60	0.03	15.33	0.06	C60
7997.25					15.68	0.08	15.55	0.05			M20
8004.58			16.37	0.04	15.89	0.02	15.71	0.03	15.39	0.04	C60
8005.56			16.52	0.04	15.92	0.02	15.75	0.03	15.44	0.04	C60
8006.56			16.52	0.04	15.97	0.02	15.76	0.03	15.46	0.05	C60
8007.57			16.59	0.03	16.00	0.02	15.82	0.02	15.50	0.04	C60
8008.57			16.62	0.05	15.99	0.02	15.83	0.04	15.49	0.05	C60
8009.56			16.63	0.04	16.06	0.03	15.87	0.03	15.55	0.04	C60
8036.60							16.46	0.06	16.09	0.04	L60
8041.64			17.69	0.05	16.98	0.06	16.70	0.04	16.32	0.04	L60
8051.64			17.58	0.05	16.90	0.03	16.70	0.04	16.26	0.04	L60
8074.44					19.02	0.09	18.79	0.06	18.06	0.08	C60

Table 2.: Continued.

JD− 2450000	U	σ_U	B	σ_B	V	σ_V	R	σ_R	I	σ_I	Tel.
8075.53					19.05	0.05	18.70	0.05	18.07	0.04	C60
8125.40					19.08	0.06	19.02	0.09	18.36	0.09	S100
8145.62			19.73	0.09	18.95	0.04	18.72	0.05	17.91	0.05	K250
8209.40					20.73	0.12	20.91	0.21	19.82	0.09	K250

Table 3. $UBVRI$ magnitudes of local standard stars for AT 2018cow

Star	U	σ_U	B	σ_B	V	σ_V	R	σ_R	I	σ_I
1	14.85	0.07	13.57	0.02	12.47	0.02	11.80	0.02	11.23	0.02
2	15.31	0.05	15.19	0.02	14.52	0.02	14.12	0.02	13.74	0.02
3	17.82	0.06	16.97	0.05	15.86	0.03	15.18	0.03	14.58	0.03
4	16.88	0.06	16.19	0.04	15.15	0.03	14.50	0.03	13.96	0.03
5	16.87	0.06	16.73	0.04	16.06	0.04	15.66	0.03	15.27	0.04
6	16.14	0.05	15.86	0.03	15.17	0.03	14.74	0.03	14.35	0.03

3. SN 2017egm

The light curves of SN 2017egm are presented in Fig. 3, we show our data, the results from Bose et al. (2018), Hosseinzadeh et al. (2021) and Gaia[5]. We plotted the B, V magnitudes from Bose et al. (2018) and transformed their gri magnitudes to the RI bands. The gri magnitides from Hosseinzadeh et al. (2021) were transformed to the VRI magnitudes. The results by Bose et al. (2018), Hosseinzadeh et al. (2021) are in good agreement with our data, taking into account that transformation relations for normal stars may not work well for SNe.

The light curves clearly show that SN 2017egm belongs to the class of slowly-declining SLSN-I (Inserra et al., 2017). The peculiar feature of SN 2017egm was the linear rise of brightness before maximum, with the rate of 0.068 mag day^{-1} in all optical bands. The dates of maximum light and maximum magnitudes for the $BVRI$ bands are reported in Table 5. The upper limits of brightness presented by Bose et al. (2018) allows to estimate the explosion epoch at JD 2457890±3, so the rise to maximum lasted about 36 days, which is quite typical for SLSNe-I.

After a sharp maximum the brightness declined slowly until JD 2457963 (phase about 37 days past maximum), when the rate of decline increased. The

[5]http://gsaweb.ast.cam.ac.uk/alerts/alert/Gaia17biu/

Table 4. $UBVRI$ photometry of AT 2018cow

JD−2458000	U	σ_U	B	σ_B	V	σ_V	R	σ_R	I	σ_I	Tel.
291.33			14.95	0.04	14.87	0.03	14.85	0.03	14.91	0.04	M70
291.34	13.97	0.07	15.03	0.03	14.94	0.04	14.93	0.04	14.96	0.03	C60
291.39			15.09	0.04	14.94	0.05	14.93	0.03	14.98	0.04	S60
293.31			15.37	0.15							S100
293.46							15.08	0.04			S60
294.33	14.63	0.05	15.65	0.03	15.63	0.04	15.62	0.04	15.44	0.03	C60
295.29	15.07	0.14	15.88	0.04	15.94	0.04	15.81	0.03	15.69	0.04	C60
295.29			15.85	0.04	15.84	0.05	15.78	0.05	15.62	0.04	S100
296.32			16.05	0.04	16.08	0.04	16.02	0.03	15.88	0.04	S100
296.34			16.06	0.04	16.04	0.05	15.96	0.05	15.84	0.07	M70
296.36			16.07	0.04	16.09	0.04	16.03	0.03	15.88	0.05	L60
297.30	15.10	0.08	16.18	0.03	16.26	0.04	16.17	0.03	15.98	0.03	C60
297.33			16.16	0.04	16.16	0.04	16.15	0.06	15.93	0.06	S100
298.32	15.10	0.12	16.32	0.04	16.32	0.03	16.25	0.03	16.08	0.03	C60
299.30	15.31	0.09	16.33	0.04	16.41	0.03	16.36	0.03	16.20	0.03	C60
299.30			16.32	0.05	16.35	0.04	16.25	0.05	16.12	0.08	S100
299.45	15.25	0.05	16.32	0.11	16.44	0.05	16.39	0.04	16.14	0.12	S60
301.31			16.55	0.05	16.64	0.06	16.54	0.07	16.32	0.09	S100
301.33	15.52	0.06	16.66	0.03	16.71	0.03	16.66	0.03	16.45	0.03	C60
301.40	15.38	0.09	16.49	0.06	16.78	0.05	16.96	0.06	16.68	0.13	S60
301.45			16.69	0.05	16.69	0.04	16.62	0.04			L60
302.28			16.72	0.06	16.84	0.07	16.84	0.07	16.46	0.07	S100
303.31	15.89	0.11	16.98	0.04	17.10	0.04	17.07	0.03	16.78	0.04	C60
305.34	16.16	0.09	17.15	0.04	17.21	0.03	17.12	0.03	16.85	0.04	C60
306.29	16.23	0.09	17.20	0.05	17.27	0.04	17.15	0.04	16.90	0.04	C60
308.40			17.41	0.12	17.32	0.15	17.61	0.08	17.18	0.05	S100
309.30	16.43	0.11	17.56	0.04	17.62	0.04	17.52	0.04	17.21	0.04	C60
310.31			17.73	0.06	17.82	0.04	17.79	0.04	17.44	0.04	C60
310.32			17.70	0.04	17.74	0.04	17.69	0.03	17.36	0.03	K250
311.31	17.02	0.11	17.90	0.04	17.97	0.04	17.86	0.03	17.48	0.03	C60
313.37			18.20	0.05	18.26	0.07	18.10	0.08	17.79	0.06	C60
317.28			18.60	0.07	18.68	0.06	18.43	0.07			C60
321.33			19.05	0.06	19.19	0.05	19.00	0.08	18.80	0.08	C60
338.30			20.30	0.04	20.58	0.04	20.17	0.03	19.83	0.04	K250
360.21			22.05	0.08	22.08	0.10	21.43	0.08	21.36	0.11	K250
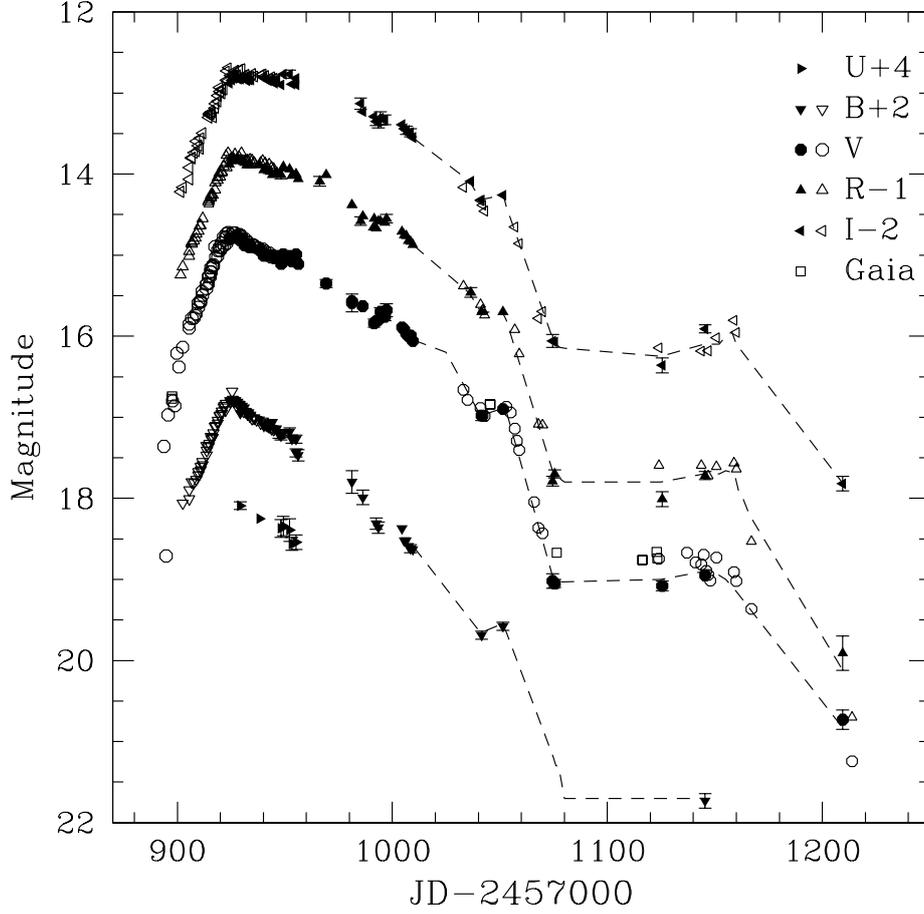
Figure 3. The light curves of SN 2017egm. Filled symbols show our data, and open symbols are for the results from Bose et al. (2018), Hosseinzadeh et al. (2021) and Gaia. The lines connecting points after JD 2458020 are plotted for visual clarity. The error bars are plotted only for out data, when they exceed the size of a symbol.

rates in the phase interval 0-37 days are denoted β_1 in Table 5, while β_2 are the rates from 37 to 100 days past maximum. We should note that β_1 is larger for shorter wavelengths, while β_2 is similar for all optical bands. A bump on the light curve is detected in the period JD 2458040-50. After the bump the decline was faster, at a rate ~ 0.10 mag day^{-1}. Then we observed the long plateau, which lasted approximately from JD 2458075 until JD 2458160. The existence of these features is confirmed by the data from Hosseinzadeh et al. (2021) and Gaia. After the plateau the rate of decline was quite fast ~ 0.04 mag day^{-1}.
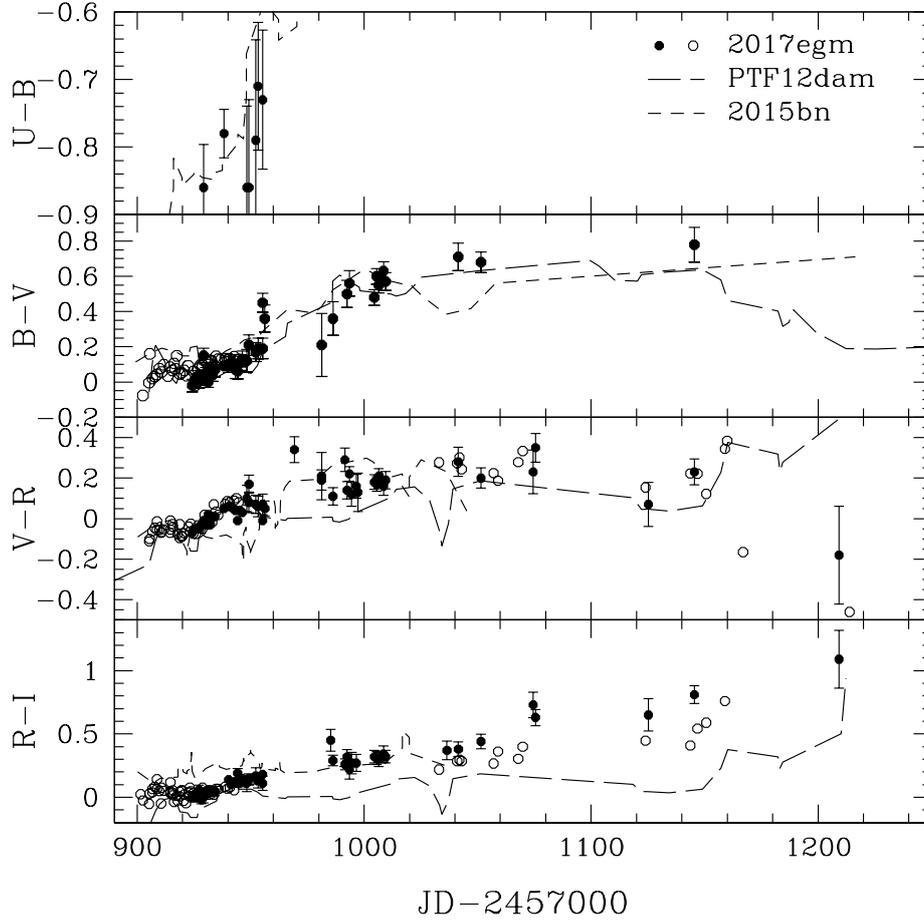
Figure 4. The color curves of SN 2017egm. Filled symbols show our data, and open symbols are for the results from Bose et al. (2018), Hosseinzadeh et al. (2021)

Table 5. Parameters of the light curves of SN 2017egm

	B	V	R	I
t_{max},JD-2457000	925.1	926.5	927.2	928.1
m_{max}	14.78	14.75	14.81	14.77
β_1, mag day^{-1}	0.020	0.012	0.007	0.004
β_2, mag day^{-1}	0.020	0.017	0.016	0.015
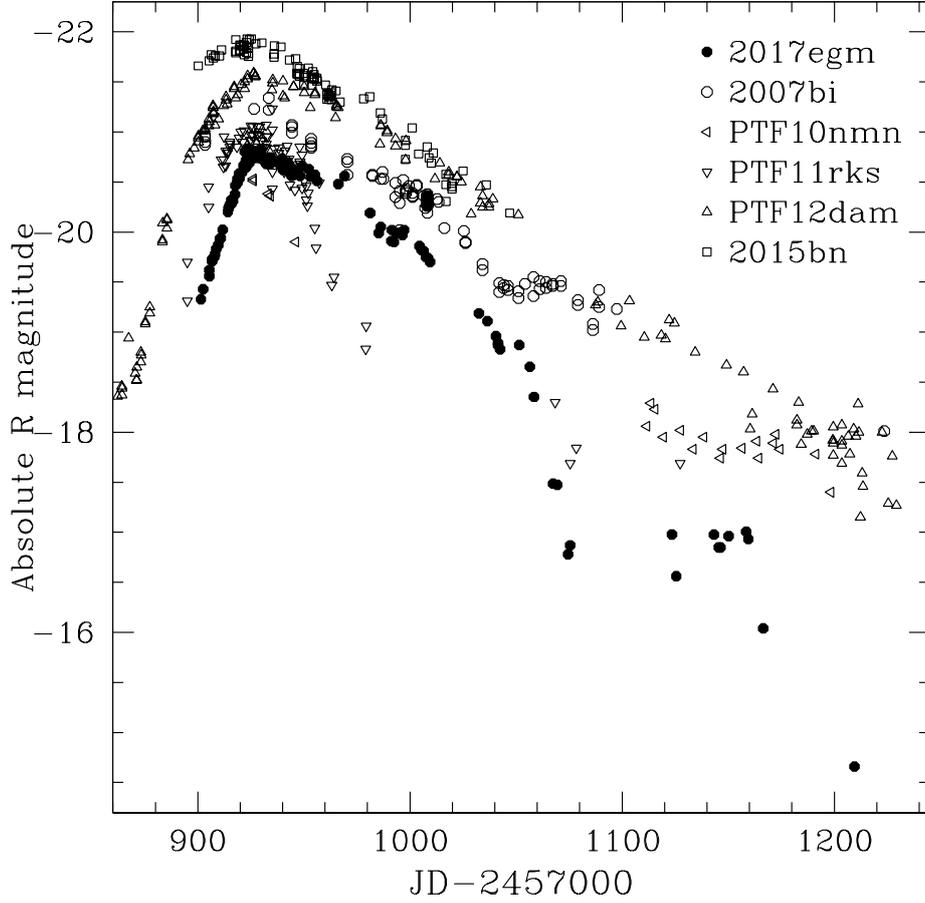
Figure 5. The absolute R-band light curve of SN 2017egm compared to the light curves for 5 other SLSNe-I

The color evolution is presented in Fig.4, where the color curves for SLSNe-I PTF12dam (De Cia et al., 2018; Nicholl et al., 2013) and 2015bn (Nicholl et al., 2016) are plotted for comparison. For SN PTF12dam the colors $g - r$ and $r - i$ were transformed to $B - V$, $V - R$ and $R - I$ using relations from Chonis & Gaskell (2008). The color curves show gradual slow reddening from maximum light until the phase ~ 100 days past maximum. After the period of nearly constant colors the color $V - R$ starts decreasing at the phase ~ 200 days, while $R - I$ color continues to increase. The color evolution of two other SLSNe-I is similar, although some difference is observed at late stages, when the colors depend on the variations of emission lines strength.

The absolute R-band light curve of SN 2017egm is presented in Fig. 5, it is compared to the light curves of SLSNe-I 2007bi, PTF10nmn, PTF11rks,

PTF12dam and 2015bn (Gal-Yam et al., 2009; Young et al., 2010; Nicholl et al., 2013; Inserra et al., 2013; Nicholl et al., 2016; De Cia et al., 2018).

The maximum luminosity of SN 2017egm is within the range for other SLSNe-I. The peculiar feature of SN 2017egm is the linear shape of the light curve before maximum, which is not observed in other objects of this class. The photometric behavior after maximum is similar for SN 2017egm and other SLSNe-I, it is best matched by SN 2007bi. The long plateau at phases 150–230 days is also observed for SN PTF10nmn, although the decline after maximum is faster for this SN. After the plateau the brightness of SN 2017egm declines very fast, and at the epoch ~ 280 days it is significantly fainter than other objects from the comparison sample.

4. AT 2018cow

The light curves are shown in Fig. 6. We plotted our data together with the results of $UBVRI$ photometry from Perley et al. (2019), Margutti et al. (2019) and Xiang et al. (2021). We also show the discovery magnitude and upper limit reported by Smartt et al. (2018), i-band magnitude and upper limit from Fremling (2018) and upper limit in the g band reported by Prentice et al. (2018). The light curves demonstrate very fast rise to the sharp maximum, which occured on JD 2458287.4. We can estimate maximum magnitudes: $B_{max} = 13.49; V_{max} = 13.58; R_{max} = 13.71; I_{max} = 13.88$, the uncertainties of these magnitudes are about $\sim 0.05 - 0.1$ mag. The decline was nearly linear for the first 10 days after peak, the rates of decline in the BVR bands were nearly equal, at about 0.34 mag day^{-1}. The rate was slightly slower in the U band: 0.31 mag day^{-1}, and significantly slower in the I band: 0.24 mag day^{-1}. The decline started to slow down at the phase ~ 10 days, and 10 days later the decline again becomes nearly linear, with the rates of about 0.08 mag day^{-1} for the $BVRI$ bands and slightly slower 0.07 mag day^{-1} for the U band.

Two bumps can be noticed on the light curves, especially in the U band, at phases ~ 10 and ~ 15 days past maximum. The magnitudes from different sets of data agrees well at the early stages, but for epochs later than ~ 30 days they show large scatter and some systematic differences.

The color evolution is presented in Fig. 7. The characteristic feature of AT 2018cow is the blue color, especially $U - B$, and slow color evolution. Only the $V - R$ color shows gradual reddening, which is the typical color evolution for supernovae.

Assuming the distance to AT 2018cow D=66.3 Mpc and Galactic extinction $E(B - V) = 0.08$ mag (Prentice et al., 2018), the absolute magnitudes at maximum are $M_B = -20.95; M_V = -20.78; M_R = -20.6; M_I = -20.37$ mag. Such high luminosity makes AT 2018cow close to SLSNe, although the light curves of SLSNe are generally much broader.
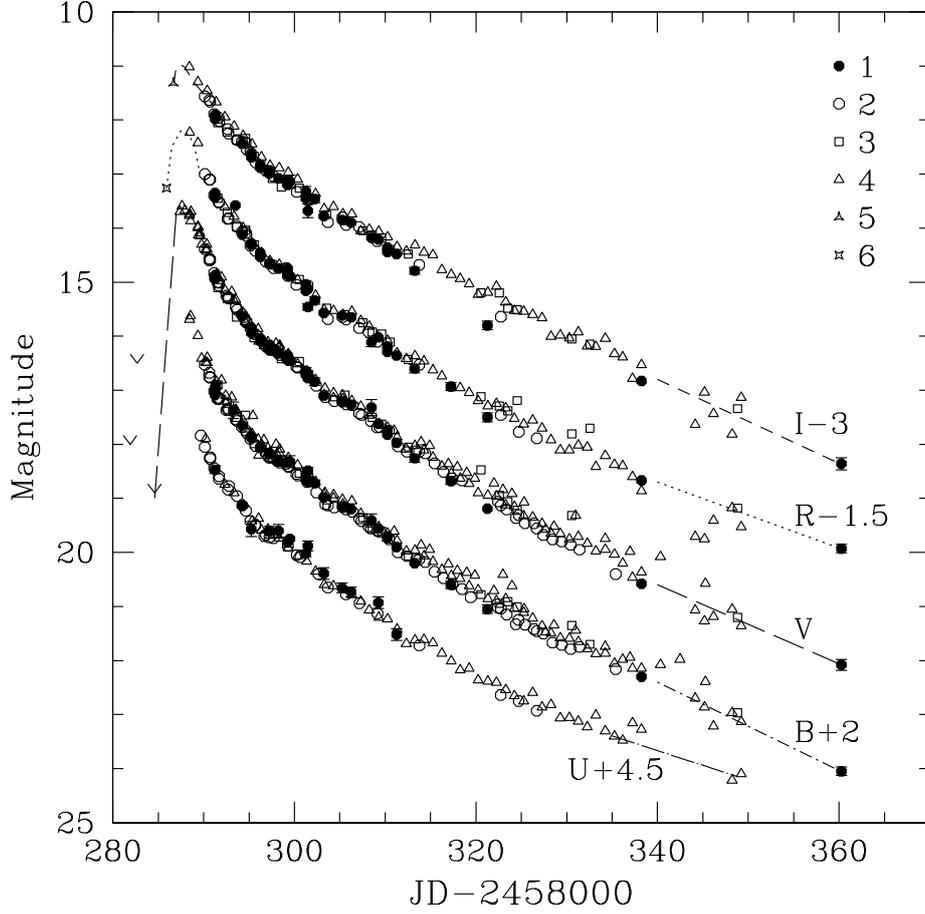
Figure 6. The $UBVRI$ light curves of AT 2018cow. Symbols coding: 1: out data, 2: Perley et al. (2019), 3: Margutti et al. (2019), 4: Xiang et al. (2021), 5: Fremling (2018), 6: Smartt et al. (2018)

The comparison of the light and color curves of AT 2018cow with those for different classes of SNe and other transients were made by Perley et al. (2019), Xiang et al. (2021). They showed that fast photometric evolution of AT 2018cow is matched by some objects, for example, by a peculiar fast-evolving transient KSN2015K and SN Ibn LSQ13ccw. The nearly constant blue color was observed for SN Ibn 2006jc. But the maximum luminosity of these objects was significantly lower than that of AT 2018cow.
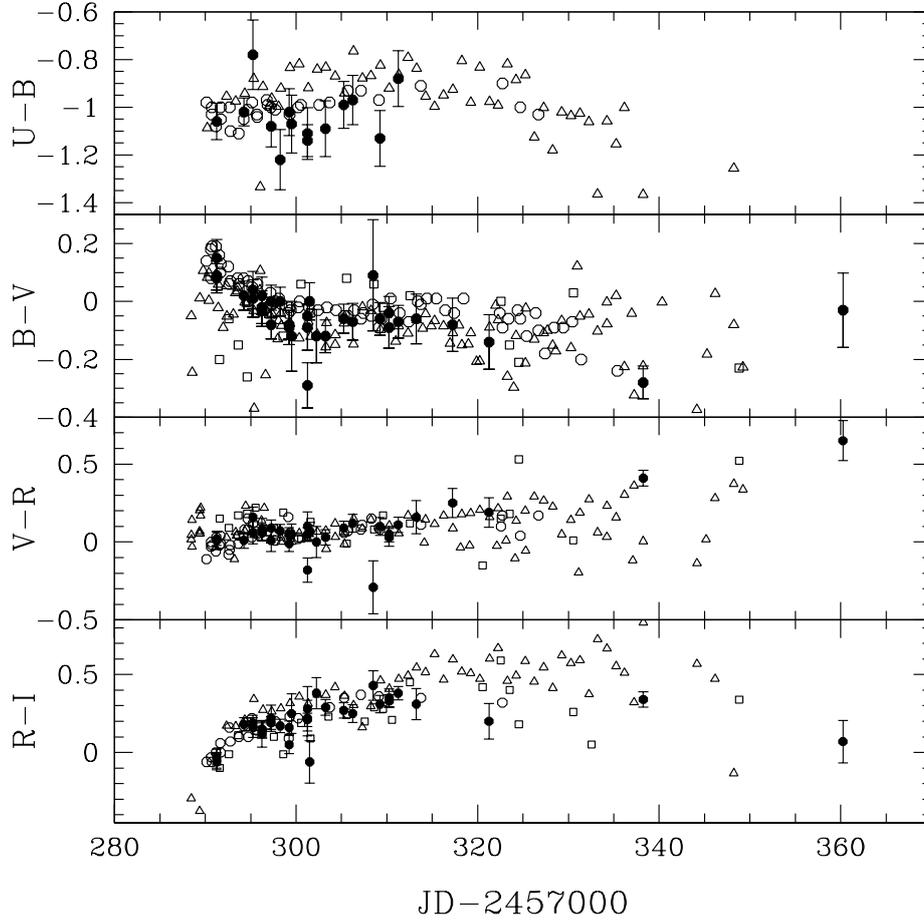
Figure 7. The color curves of AT 2018cow. The symbols are the same as in Fig. 6

.

5. Conclusions

We presented our photometric observations of type I superluminous supernova SN 2017egm and the peculiar transient AT 2018cow.

The multi-band photometry covered about 285 days of evolution for SN 2017egm. We determined the maximum magnitudes in different bands and the rates of decline for various stages of photometric evolution. The undulations on the light curves were definitely detected: a bump at phase 114 days past maximum and a plateau for phase interval from 155 to 235 days. Our photometric data are in good agreement with the results by Bose et al. (2018) and

Hosseinzadeh et al. (2021). The comparison of light curves and color evolution of SN 2017egm with several objects of similar class revealed that the maximum luminosity and post-maximum evolution of brightness and color of SN 2017egm was not significantly different from those for such well-studied objects, as SLSNe 2007bi, 2015bn and PTF12dam. The peculiar feature of SN 2017egm was the linear part of the light curves before maximum. The undulations on the light curves can be regarded as evidence for interaction of ejecta with the circumstellar material.

Our observations of AT 2018cow continued for about 70 days. They are in good agreement with the data from Perley et al. (2019), Margutti et al. (2019), and Xiang et al. (2021). Our last points in the $BVRI$ bands were obtained later than the data from these authors, they are useful for the determination of luminosity evolution at late stage. The main features of the light curves of AT 2018cow are the very short rise time of $\sim$ 2-3 days, very fast decline after maximum with a rate of about 0.34 mag day^{-1}. The undulations on the light curves were detected. The color evolution is characterized by nearly constant blue colors for the whole period of observations. Some of the features of photometric evolution can be also found for such objects as a peculiar fast-evolving transient KSN2015K and SNe Ibn LSQ13ccw, 2006jc. It is possible that AT 2018cow represents an extreme case of type Ibn SN and the explosion mechanism is the core collapse of a high mass star in a dense shell of circumstellar material (Xiang et al., 2021; Pellegrino et al., 2021).

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