

# The V Photometric Light Curve of Supernova 2012aw from the Archive Data of Porziano Amateur Observatory

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**Abstract** In this brief paper we present photometric observations and the V photometric light curve of the type-IIP SN 2012aw. We observed this source at Porziano Astronomical Amateur Observatory (Umbria, Italy) from 2012 March 16 to 2012 June 2 for a total of 26 nights. We hope that our work can provide useful data for further studies and research.

## 1. Introduction

SN 2012aw in M95 was discovered by Paolo Fagotti (Assisi, Italy) in CCD images taken on 2012 March 16.86 UT with a 0.5-m reflector (Fagotti *et al.* 2012).

It was classified as a type-IIP supernova from spectra obtained on 2012 March 19.5 UT by Itoh *et al.* (2012) and confirmed to be a very young type-II Supernova from Asiago spectra gathered on 2012 March 17.77 and 19.85 UT by Siviero *et al.* (2012). It resembles the type-IIP Supernova 1999gi about 4 to 5 days after the core collapse.

## 2. Photometric observations and light curve

The photometric system of Porziano Observatory consists of a 0.35-m Schmidt-Cassegrain telescope, equipped with HiSIS 23 CCD camera (Kodak KAF-0401E with  $768 \times 512$  pixels) and B, V,  $R_c$ ,  $I_c$  Johnson-Cousins broad band filters.

The frames were first corrected for bias and flat-field and then processed using a PC-based aperture photometry package developed by one of the authors using DAOPHOT routines (Stetson 1987). Further observations were provided through Paolo Fagotti's 0.5-m reflector (Fagotti *et al.* 2012).

All photometric measurements were closely related to the BVR $_c$ I $_c$  photometric sequence around SN2012aw, optimized by CCD observations and color corrections reported by Henden *et al.* (2012).

However, to estimate the magnitudes in the V band, we did not use all the stars observed by Henden *et al.* (2012) but only a subset of them; in particular, to carry out the differential photometry, we considered the comparison stars indicated with the letters b, c, d, l, and f, while the errors were calculated as standard deviations from the average.

All V-band data are given in Table 1. The corresponding light curve is shown in Figure 1.

B, V,  $R_c$ ,  $I_c$  data reported in Table 2 were obtained using

differential aperture photometry with a sample of comparison stars (n, e, f, i, k, l) from Henden *et al.* (2012) having color indices similar to our target to reduce color effects.

Magnitude errors were evaluated as standard deviations of the mean.

Our photometry shows a long flat maximum in V, distinctive of type-IIP supernovae, which lasted for about 70 days. The maximum in the V band,  $V = 13.24$ , was reached on 2012 March 27 UT (JD 2456014.397).

B, V,  $R_c$ ,  $I_c$  observations of SN 2012aw for 10 nights are given in Table 2. A decrease in brightness in B and V magnitude was seen, as was an increase in brightness in  $R_c$  and  $I_c$ .

Figure 2 shows the variation of the color indices (B–V) versus (V– $I_c$ ). We can see that in the first phase of the explosion of SN 2012aw (B–V) is negative (–0.2), a color index value typical for a blue star. There is then a shifting towards positive values, with (B–V) = 0.8 being a color index value for a red star.

## 3. Conclusions

In this brief paper we presented our photometric observations of SN2012aw obtained at Porziano Amateur Observatory (Umbria, Italy) and a sample of B, V,  $R_c$ ,  $I_c$  photometric data in order to expand knowledge of the phenomenology of these peculiar stars.

The results presented here are part of a project devoted to obtaining multiband light curves of a sample of supernovae. Our aim is to extend the historical database and information on this class of cataclysmic variables to help construct theoretical models.

## 4. Acknowledgement

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Table 1. V data for SN 2020aw.

Date	JD 2450000+	V Magnitude	Error
12/03/16	6003.35	15.84	0.04
12/03/17	6004.44	13.87	0.01
12/03/17	6004.46	13.79	0.04
12/03/17	6004.48	13.77	0.05
12/03/17	6004.52	13.54	0.05
12/03/20	6007.4	13.38	0.03
12/03/20	6007.41	13.37	0.04
12/03/21	6008.47	13.39	0.01
12/03/22	6009.55	13.33	0.01
12/03/24	6011.5	13.31	0.01
12/03/26	6013.39	13.31	0.01
12/03/27	6014.4	13.24	0.05
12/03/27	6014.4	13.26	0.04
12/03/28	6015.41	13.24	0.05
12/03/29	6016.42	13.31	0.01
12/03/30	6017.53	13.31	0.01
12/04/01	6019.35	13.28	0.05
12/04/01	6019.35	13.25	0.03
12/04/08	6026.44	13.32	0.03
12/04/08	6026.46	13.33	0.04
12/04/08	6026.46	13.39	0.05
12/04/09	6027.32	13.37	0.04
12/04/09	6027.33	13.32	0.05
12/04/09	6027.33	13.29	0.05
12/04/20	6027.38	13.46	0.02
12/04/20	6038.38	13.45	0.03
12/04/21	6039.4	13.46	0.04
12/04/24	6042.37	13.53	0.05
12/04/24	6042.37	13.47	0.02
12/04/24	6042.37	13.68	0.04
12/04/27	6045.37	13.52	0.03
12/04/27	6045.38	13.53	0.04
12/05/04	6052.41	13.51	0.05
12/05/04	6052.42	13.57	0.03
12/05/10	6058.39	13.5	0.04
12/05/11	6059.37	13.57	0.05
12/05/12	6060.35	13.5	0.05
12/05/12	6060.36	13.52	0.05
12/05/12	6060.36	13.51	0.05
12/05/17	6065.37	13.54	0.04
12/05/17	6065.38	13.55	0.05
12/05/17	6065.38	13.56	0.03
12/05/18	6066.42	13.51	0.05
12/05/18	6066.42	13.55	0.04
12/05/19	6067.38	13.56	0.05
12/05/26	6074.42	13.57	0.05
12/06/02	6081.39	14.03	0.05

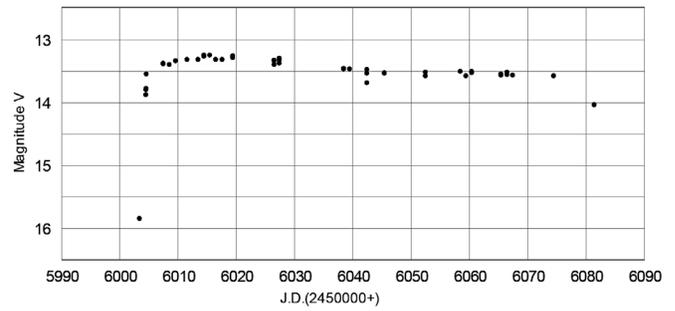


Figure 1. The V-band light curve of SN 2012aw from 2012 March 16 to 2012 June 2.

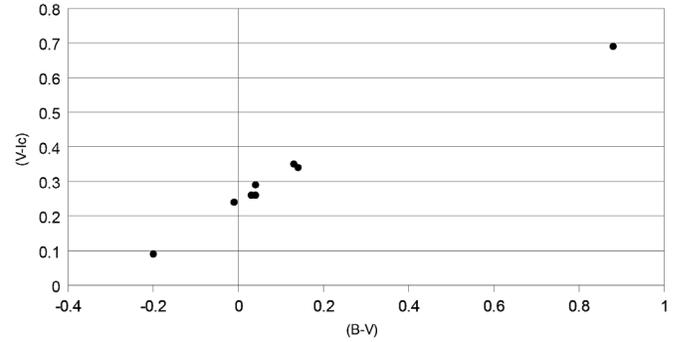


Figure 2. The color indices (B-V) versus (V-I<sub>c</sub>) for SN 2012aw.

References

Fagotti, P., et al. 2012, *Cent. Bur. Astron. Telegrams*, No. 3054, 1.  
 Henden, A., Krajci, T., and Munari, A. 2012, *Inf. Bull. Var. Stars*, No. 6024, 1.  
 Itoh, R., Ui, T., and Yamanaka, M. 2012, *Cent. Bur. Astron. Telegrams*, No. 3054, 2.  
 Siviero, A., et al. 2012, *Cent. Bur. Astron. Telegrams*, No. 3054, 4.  
 Stetson, P. B. 1987, *Publ. Astron. Soc. Pacific*, **99**, 191.

Table 2. B, V, R<sub>c</sub>, I<sub>c</sub> observations of SN 2012aw for 10 nights.

Date	JD 2450000.0+	B	Error	V	Error	R <sub>c</sub>	Error	I <sub>c</sub>	Error
12/03/17	6004.44	13.67	0.01	13.87	0.01	13.87	0.01	13.78	0.01
12/03/21	6008.47	13.38	0.01	13.39	0.01	13.28	0.01	13.15	0.01
12/03/22	6009.55	13.37	0.01	13.33	0.01	13.18	0.01	13.07	0.01
12/03/24	6011.5	13.34	0.01	13.31	0.01	13.17	0.01	13.05	0.01
12/03/26	6013.39	13.35	0.01	13.31	0.01	13.15	0.01	13.02	0.01
12/03/29	6016.42	13.44	0.01	13.31	0.01	13.13	0.01	12.96	0.01
12/03/30	6017.53	13.45	0.01	13.31	0.01	13.13	0.01	12.97	0.01
12/04/27	6045.52	14.31	0.01	13.44	0.01	13.07	0.01	12.75	0.01
12/05/10	6058.39	—	—	13.49	0.01	13.05	0.01	12.73	0.01
12/05/17	6065.36	—	—	13.51	0.01	13.03	0.01	12.69	0.01