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UBV photoelectric and photographic photometry of Nova Cassiopeiae 1993

Nova Cassiopeiae 1993 has been discovered by K. Kanatsu on Dec. 7, 1993 (*cf.* IAU Circ. 5902). Munari *et al.* (1994) have reported on BVI photographic photometry of the progenitor on patrol plates obtained over the period 1970-1985 at the Asiago Astrophysical Observatory.

Nova Cas 1993 belongs to the rare group of *DQ Her*-type novae (*cf.* IAU Circ. 5925, 5945). In this note we present UBV photoelectric and photographic photometry secured up to the beginning of the rapid fading event characterizing this type of novae. The data have been collected at a number of sites using different instrumental set-ups. The results are collected in Table 1.

Photographic photometry has been secured with the 67/92 cm Schmidt telescope in Asiago (Italy), which is operated by the Astronomical Observatory of Padova. The filter + emulsion combinations are: U=103a-O(plate) + UG2, B=103a-O(plate) + GG13, V=T-Max400(film) + GG14. The magnitude of the nova has been measured with an Iris microphotometer against a set of comparison star extracted from the SIMBAD database in Strasbourg. The Asiago data are labelled *As* in Table 1.

Additional photographic photometry has been obtained with the twin 0.25 cm f/3 Schmidt cameras at the private observatory of one of us (I.D.). The filter + emulsion combinations are: U=103a-O(film) + UG2, B=103a-O(film) + GG13, V=T-Max400(film) + GG14. The magnitude of the nova has been measured with an Iris microphotometer against the same set of comparison stars used to reduce the Asiago photographic data. These data are labelled *D* in Table 1. Photographic photometry has been also secured in the V band with a f=30 cm Zeiss lens of the Associazione Friulana di Astronomia e Meteorologia (AFAM), Udine, Italy. A combination T-Max3200(film) + commercial yellow filter (matching the GG14 transmission curve) was adopted and the magnitude of the nova was estimated visually at the microscope against the same set of comparison stars used for the Asiago photographic photometry. These data are labelled *P* in Table 1.

When the photographic data in Table 1 are given with two decimal figures, this means that more than one plate or film (generally from 3 to 6) were obtained and the reported

Table 1: UBV photometry of Nova Cassiopeiae 1993. The telescope identification is given in the text.

Date		JD	U	B	V	Telescope
Dec. 12	1993	2449334.34			6.7	As
Dec. 16	1993	2449338.30	6.6	6.6	5.9	As
Dec. 16	1993	2449338.31	6.4	6.63	6.1	D
Dec. 17	1993	2449339.28		6.4	5.7	As
Dec. 17	1993	2449339.29	5.99	6.17	5.53	Bk
Dec. 17	1993	2449339.34	6.19	6.14	5.71	D
Dec. 18	1993	2449340.33	7.35	6.90	6.24	D
Dec. 18	1993	2449340.37	7.68	7.15	6.22	Bk
Dec. 18	1993	2449340.42		7.2	6.4	As
Dec. 19	1993	2449341.30	7.22	7.24	6.46	Bk
Dec. 22	1993	2449344.34			6.7	P
Dec. 23	1993	2449345.29			6.9	P
Dec. 27	1993	2449349.38			6.4	P
Dec. 28	1993	2449350.23			6.7	P
Dec. 29	1993	2449351.28	7.10	7.70	7.23	Af
Dec. 30	1993	2449352.23	6.9	7.30	6.9	D
Dec. 30	1993	2449352.25			7.0	P
Jan. 2	1994	2449355.42			6.8	P
Jan. 12	1994	2449365.24			7.0	P
Jan. 14	1994	2449367.29	6.93	7.70	7.31	Rz
Jan. 15	1994	2449368.27			7.5	P
Jan. 15	1994	2449368.31	7.12	7.85	7.45	Rz
Jan. 16	1994	2449369.24			7.6	P
Jan. 18	1994	2449371.25			7.7	P
Jan. 18	1994	2449371.31	7.32	7.77		D
Jan. 19	1994	2449372.25	7.46	8.06	7.81	Rz
Jan. 19	1994	2449373.29	7.25	7.91		D
Jan. 21	1994	2449374.35			7.8	P
Jan. 22	1994	2449375.23		7.97	7.64	Af
Jan. 22	1994	2449375.26			7.7	P
Jan. 24	1994	2449377.25	7.3	8.0	7.6	As
Jan. 25	1994	2449378.24	7.4	8.0	7.6	As
Jan. 26	1994	2449379.25			7.5	P
Jan. 27	1994	2449380.27			7.9	P
Jan. 28	1994	2449381.24			7.9	P
Jan. 29	1994	2449382.30			7.8	P
Jan. 30	1994	2449383.25			8.0	P
Jan. 31	1994	2449384.23			7.8	P
Jan. 31	1994	2449384.31	7.50	8.25	7.4	D
Feb. 4	1994	2449388.28	8.12	8.78	8.61	Rz
Feb. 7	1994	2449391.25			7.9	P
Feb. 9	1994	2449393.28	8.3	8.72	8.3	D
Feb. 10	1994	2449394.26			8.2	P
Feb. 11	1994	2449395.29	8.29	8.70		D
Feb. 14	1994	2449398.25			8.4	P
Feb. 15	1994	2449399.27			9.0	P

value is the mean of the individual magnitudes. The internal errors associated to these mean photographic values are of the order of ~0.04-0.06 mag.

Photoelectric photometry was obtained at three sites against the same set of comparison stars (primary star: HD 223173, U=8.92, B=7.17, V=5.52). We used the photoelectric photometer attached at the 0.45 m reflector of AFAM (data labelled *Af* in Table 1), which has been briefly described by Munari *et al.* (1993). We also used the two identical photometers attached at the 0.6 m telescopes of the National Astronomical Observatory in Rozhen and the Astronomical Observatory of Belogradchik, Bulgaria (respectively labelled *Rz* and *Bk* in Table 1). The internal errors of the photoelectric photometry are of the order of 0.01-0.04 mag in all bands.

The photometry in Table 1 confirms (*cf.* IAU Circ. 5902-5945) that Nova Cas 1993 experienced substantial brightness fluctuations – even on short time scales – before the onset the deep *DQ Her*-type minimum. We made two attempts to detect flickering-like variability. We observed Nova Cas 1993 in U band with the photoelectric photometer attached to the 0.6 m telescope in Rozhen and 1^{sec} integration time. The observations extended from UT 19.45 to 21.00 on Jan. 14 and from UT 19.65 to 21.05 on Jan. 15, 1994. No flickering-like variability was detected, the readings being stable at a 0.015 mag level.

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