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PHOTOMETRY OF STARS IN THE FIELD OF NOVA CASSIOPEIAE 1993

Nova Cassiopeiae 1993 was discovered by Kanatsu (1993) on 7 December 1993 UT. The nova reached a fairly bright maximum near visual mag. 5.5 about 18 December following a standstill at mag. 6.5. In order to provide visual observers with a sequence of comparison stars as the eruption faded, I measured a number of stars in the field. The results were distributed quickly via e-mail over the "nova net" maintained by members of the Arizona State University Department of Physics and Astronomy. This report gives the details of the observations.

I observed the stars using the Lowell 53cm photometric telescope on 13 and 30 December 1993, and 4 January 1994 UT. Strömgren y and b filters were used through a 29-arcsec diaphragm. Each observation consisted of at least three 10s integrations on 'star' and two 10s integrations on 'sky', with greater numbers for stars fainter than V~9.0. In addition to primary four-color standards (Perry, Olsen, and Crawford 1987), I have adopted a set of secondary standards to enable the calibration of V magnitudes of red and reddened stars beyond the color limits of the primary Strömgren standards. V magnitudes were taken mostly from the lists of Landolt (1983a, 1983b, 1992), supplemented by values from Menzies et al. (1991). Strömgren $b-y$ colors were taken from lists by Olsen (1983, 1993),

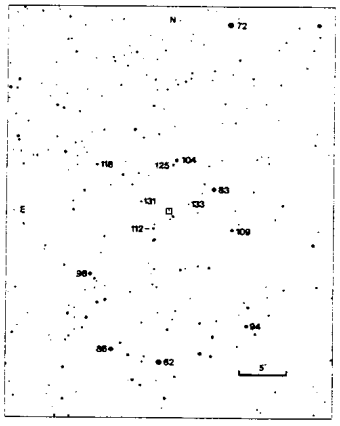

Figure 1. The field of Nova Cassiopeiae 1993 showing stars from the GSC. V magnitudes are indicated to the nearest tenth with the decimal point omitted.

Table 1. Standard Star Observations

Name	V (std)	$b-y$ (std)	V (obs)	$b-y$ (obs)	n
HD 224930	5.748	0.430	5.746	0.439	2
HD 225003	5.699	0.200	5.700	0.209	2
HD 315	6.440	−0.078	6.450	(−0.097)	1
HD 4790	6.624	0.862	6.622	0.867	2
HD 5319	8.046	0.607	8.046	0.592	1
HD 6479	6.363	0.258	6.349	0.252	1
HD 6480	7.267	0.321	7.259	0.318	1
HD 7446	6.031	0.650	6.032	0.654	1
HD 7615	6.693	0.025	6.691	0.029	3
HD 11577	7.707	0.112	7.708	0.101	1
HD 13421	5.635	0.361	5.637	0.355	3
HD 16581	8.200	−0.033	8.203	−0.036	1
HD 22211	6.487	0.408	6.496	0.399	1
HD 22695	6.189	0.585	6.185	0.588	2
HD 24482	8.188	1.256	8.189	1.257	4
HD 26462	5.707	0.231	5.713	0.233	1
HD 33021	6.165	0.398	6.170	0.391	1
HD 42824	6.627	0.025	6.619	0.034	1
HD 43261	6.090	0.553	6.091	0.541	1
HD 44974	6.524	0.563	6.534	0.562	1
HD 209960	5.254	0.897	5.256	0.902	2
HD 213119	5.584	0.998	5.586	0.995	1
HD 217014	5.454	0.415	5.454	0.410	2
HD 218155	6.783	−0.004	6.780	−0.001	3
HD 221950	5.690	0.306	5.688	0.303	1
HD 222732	8.860	0.735	8.852	0.735	2

Anthony-Twarog, et al. (1991), and Stetson (1991) – in that order of preference. Some V magnitudes come from these sources as well. Several of the Landolt stars have $b-y$ values determined using the Lowell 53cm telescope. The data for each night were reduced separately using linear transformations. Atmospheric extinction was estimated on the nights involved in these observations.

Because of the mix of standards, Table 1 shows both the adopted and observed mean V and $b-y$, along with the number of observations 'n'. The stars are listed in equinox 2000 RA order. The $b-y$ data for HD 315 (in parentheses) were omitted from the transformations. The mean deviations of the observed averages from the assumed values in this group of data are: V = 0.000 ± 0.006; $b-y$ = 0.000 ± 0.007.

Results for the stars near Nova Cas 1993 are shown in Table 2, listed in order of decreasing brightness. The stars are identified by HD, BD, or GSC number; positions come from astrometric catalogues via SIMBAD or the GSC. SIMBAD is also the source of the spectral types from the literature. Uncertainties (sigma) are shown in the second line of each entry. For three fainter stars measured on only one night I give the internal uncertainty (in parentheses) of the batch of integrations plus the uncertainty in the fit of the standards taken in quadrature, which provides an estimate of the true errors. The uncertainties are greatly dominated at these light levels by photon statistics.

Table 2. Photometry of Stars in the Field of Nova Cas 1993

Star	RA (2000)	Dec (2000)	V	$b-y$	n	sp.	remarks
HD 222618	23 41 54.4	+57 15 36	6.249	0.628	2	G8III	= HR 8985
			.004	.003			
N Cas 1993	23 41 47.2	+57 31 01	6.461	0.557	1		1993 Dec 13.1 UT
HD 222514	23 41 00.7	+57 50 19	7.215	0.107	2	Am	
			.003	.007			
HD 222543	23 41 13.1	+57 33 18	8.280	0.182	2	A3	
			.004	.006			
HD 222671	23 42 31.2	+57 16 54	8.559	0.088	2	A0	
			.013	.018			
HD 240359	23 40 47.7	+57 19 19	9.353	0.166	2	A0	
			.005	.001			
BD +56°3072	23 42 47.8	+57 24 37	9.796	0.197	2	A0	
			.006	.011			
BD +56°3064	23 41 41.9	+57 36 16	10.366	0.300	3		
			.009	.013			
GSC 4008-1356	23 40 59.1	+57 29 08	10.915	0.555	2		
			.006	.005			
GSC 4008-1427	23 41 59.3	+57 29 16	11.170	0.178	1		
GSC 4008-0539	23 42 43.5	+57 35 48	11.829	0.579	1		
			(.017)	(.019)			
GSC 4008-0687	23 41 44.3	+57 35 47	12.523	1.504	2		
			.033	.027			
GSC 4008-1393	23 42 08.9	+57 32 02	13.090	1.119	1		
			(.031)	(.036)			
GSC 4008-1712	23 41 32.3	+57 31 46	13.281	0.443	1		= Munari "A"
			(.043)	(.037)			

The photometry of the nova itself included here was first reported on an IAU Circular (Skiff 1993b). Because of the strong emission-line nature of the spectrum, the values cannot be said to be strictly on the standard system. The faintest star in the list is called star "A" in a recent study by Munari et al. (1994) of archival Asiago plates showing the progenitor. Their independent identification of the pre-nova matches the one visible on the POSS-I prints (Skiff 1993a) and the best available position for the nova in eruption (Argyle and Morrison 1994).

For the convenience of observers, a chart derived from the GSC is shown in Figure 1. The comparison stars are indicated by their V magnitudes rounded to the nearest tenth (decimal point omitted) in the style of visual variable-star charts.

The photometric data herein were reduced using a clever IDL routine written by Laura Woodney and Eliza Fulton. Preparation of this report was facilitated by the use of SIMBAD, maintained by the Centre de Données astronomiques, Strasbourg, France.

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