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OUTBURST PHOTOMETRY OF DK Cas

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DK Cas is a poorly studied dwarf nova which was discovered by Hoffmeister (1943). The fourth edition of the General Catalogue of Variable Stars gives a range of 15.3–19.5 p. Little has been known regarding its nature and outburst characteristics. However, there have been a few evidences that outbursts of this object are relatively rare. Bruch et al. (1987) observed this object on 17 nights and found no outbursts. A vigorous search for outbursts since 1995 by visual and CCD observers (mainly by T. Vanmunster and G. Poyner), contributed to VSNET (http://www.kusastro.kyoto-u.ac.jp/vsnet/) had yielded no positive detections until the detection by P. Schmeer on 1999 November 27 (Schmeer 1999). Since the low frequency of outbursts as well as a relatively large outburst amplitude makes DK Cas a good candidate for an SU UMa-type dwarf nova, we started time-resolved CCD photometry.

The CCD observations were done using an unfiltered ST-7 camera attached to the Meade 25-cm Schmidt–Cassegrain telescope. The exposure time was 30 s. The images were dark-subtracted, flat-fielded, and analyzed using the Java^{TM}-based PSF photometry package developed by one of the authors (TK). The magnitudes were determined relative to BD $+56°35$ = GSC 3661.1642, whose Tycho-2 magnitude is $V = 10.02 \pm 0.03$ and $B - V = +0.28 \pm 0.04$. The constancy of comparison star during the run was confirmed by comparison with GSC 3661.1306. The log of observations together with nightly average magnitudes is given in Table 1. The light curve drawn from these data is presented in Figure 1.

DK Cas reached a maximum (unfiltered CCD magnitude 14.86, roughly corresponding to an R_c magnitude assuming the usual color close to $B - V = 0.0$ for outbursting dwarf novae) within two days of the outburst detection. The object stayed at maximum for three days and started fading slowly. Time-resolved CCD photometry during the outburst plateau showed only slow variation with small random fluctuations, and no clear indication of periodic modulations (Figure 2). In addition to the presence of a short plateau at maximum, followed by a slow fade, the absence of clear superhump modulations is sufficient to rule out the object as being an SU UMa-type dwarf nova. The suggested classification of an SS Cyg-type star (UGSS) is supported by this observation.

The later part of the fading from outburst is characterized by a linear fade at a rate of 0.30 ± 0.01 mag d^{-1}, which is relatively slow among SS Cyg-type dwarf novae. Based on the calibration by Szkody and Mattei (1984) of Bailey's relation, the orbital period of DK Cas is expected to be longer than 5 hours, and is most likely longer than that of a

Table 1: Nightly averaged magnitudes of DK Cas

JD start[a]	JD end[a]	mean mag[b]	error[c]	N^d
51509.992	51510.024	5.075	0.049	37
51511.002	51511.185	4.978	0.004	415
51512.056	51512.176	4.986	0.005	302
51516.187	51516.292	5.243	0.015	262
51520.162	51520.165	5.803	0.061	10
51521.147	51521.150	5.995	0.140	10
51521.981	51521.984	6.309	0.090	10
51522.975	51522.979	6.603	0.122	10
51523.965	51523.969	6.923	0.098	8

[a] JD − 2400000
[b] Magnitude relative to BD +56°35
[c] Standard error of nightly average
[d] Number of frames

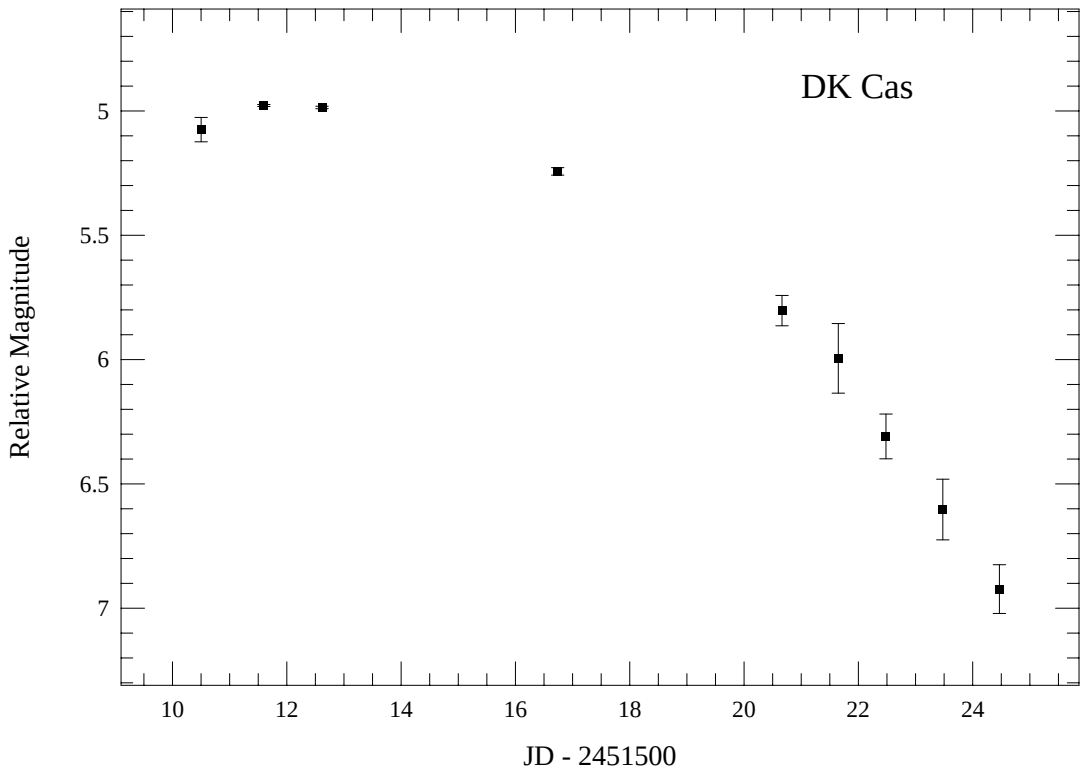

Figure 1. Light curve of DK Cas

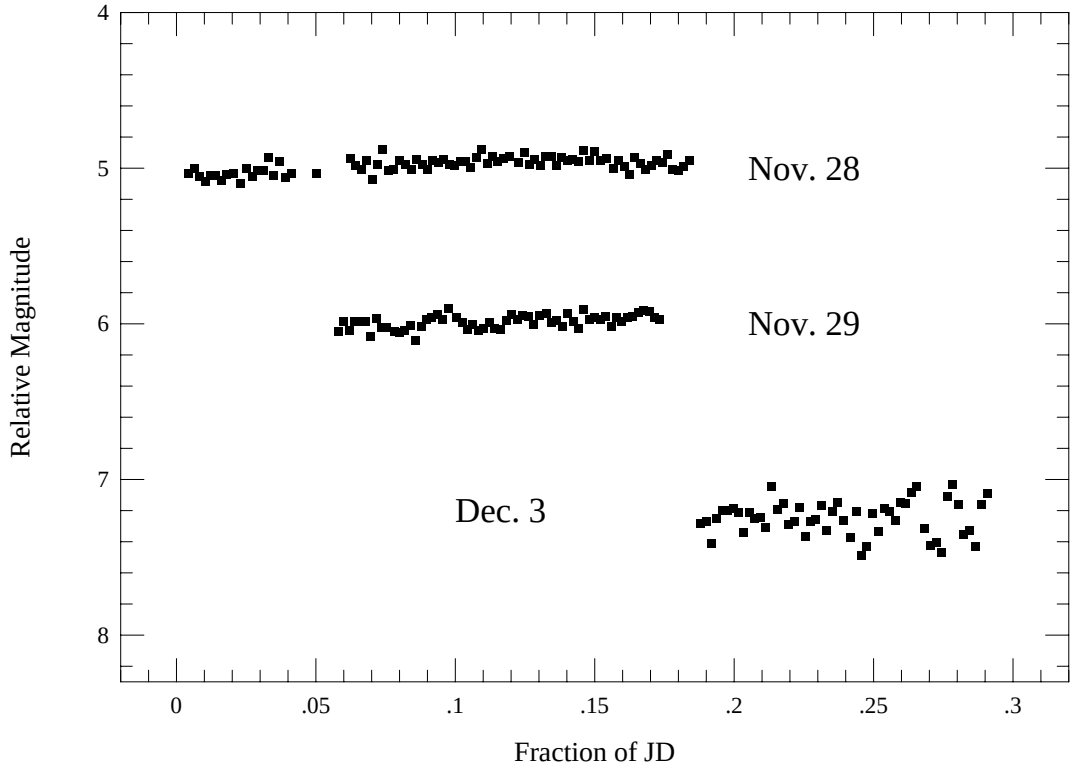

Figure 2. Time-series photometry of DK Cas. Each point represents an average of adjacent five frames. The magnitudes are arbitrarily shifted for clarity

long-period system DX And (10.6 hours, Drew et al. 1993). Although recent spectroscopic observation by Liu and Hu (2000) was not able to detect a feature of the secondary, the above data suggest that DK Cas belongs to a rare class of long-period dwarf novae with a low outburst frequency (i.e. low mass-transfer rate), a further spectroscopic search for the secondary and accurate determination of the orbital period are highly encouraged.

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