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AK CANCRI – A NEW LARGE-AMPLITUDE SU UMA-TYPE DWARF NOVA

AK Cnc was discovered by Morgenroth (1933), who classified it as a possible short-period variable star. After a long period of confusion, the object was identified as a dwarf nova (for a review, see Wenzel 1993). The peculiarity of this object was noted by Szkody and Howell (1992), who identified strong Balmer and helium emission lines and a red continuum in the spectrum of AK Cnc, and estimated the quiescent M_V value between 10.4 and 11.9. The faintness of quiescent M_V and a large outburst amplitude (> 6 mag) make AK Cnc a good candidate for a TOAD (Tremendous Outburst Amplitude Dwarf Nova; Howell 1993). A search for a photometric period, however, has remained unsuccessful (Howell et al. 1990).

On 1992 Jan. 13, the object was caught in one of its rare outbursts at m_V=13.6 (Koshiro, private communication). We obtained a V-band CCD photometry of this star on three nights between Jan. 17 and Jan. 22. The observations were carried out using a 60 cm reflector and a Thomson TH7882 chip (576×384 pixels) at Ouda Station, Department of Astronomy, Kyoto University (for a description of the instruments see Ohtani et al. 1992). The exposure time was between 30 and 60 s to avoid saturation from the strong moonlight. The frames were first corrected for standard de-biasing and flat fielding, and were then processed by a microcomputer-based automatic-aperture photometry package developed by the author. The differential magnitudes of the variables were determined using a local standard star (C_1: $08^h55^m15^s.42$ $+11°14'53''.8$ (J2000.0), V=13.3), whose constancy was confirmed using a check star (C_2: $08^h55^m26^s.05$ $+11°20'04''.5$ (J2000.0), V=15.1). Total number of useful frames was 1007.

The resulting overall light curve is shown in Figure 1. The zero-point corresponds to V=13.3. A general trend of slow linear decline is evident. Superimposed on this decline, superhumps with an amplitude of 0.18 mag were detected on all nights. The star was thus for the first time identified as being an SU UMa-type dwarf nova.

A representative light curve is shown in Figure 2; a large scatter in the light curve is caused by a high sky background due to the proximity of the object to the nearly full moon. A period analysis using the phase dispersion minimization (PDM) method (Stellingwerf 1978) implemented in the IRAF package after removing the steady decline yielded the best estimate of the superhump period of 0.06735 ± 0.00005 day. A light curve folded on this period is shown in Figure 3. Each point represents an average of 0.05 phase bin and its standard error. This clearly demonstrates all the characteristics of fully grown superhumps: a rather steep rise to maximum, slower decline, and a broader secondary maximum around superhump phase 0.4 – 0.5. The superhump makes AK Cnc a member of short orbital-period SU UMa-type dwarf novae. This picture is in good agreement with the spectroscopic features described by Szkody and Howell (1992).

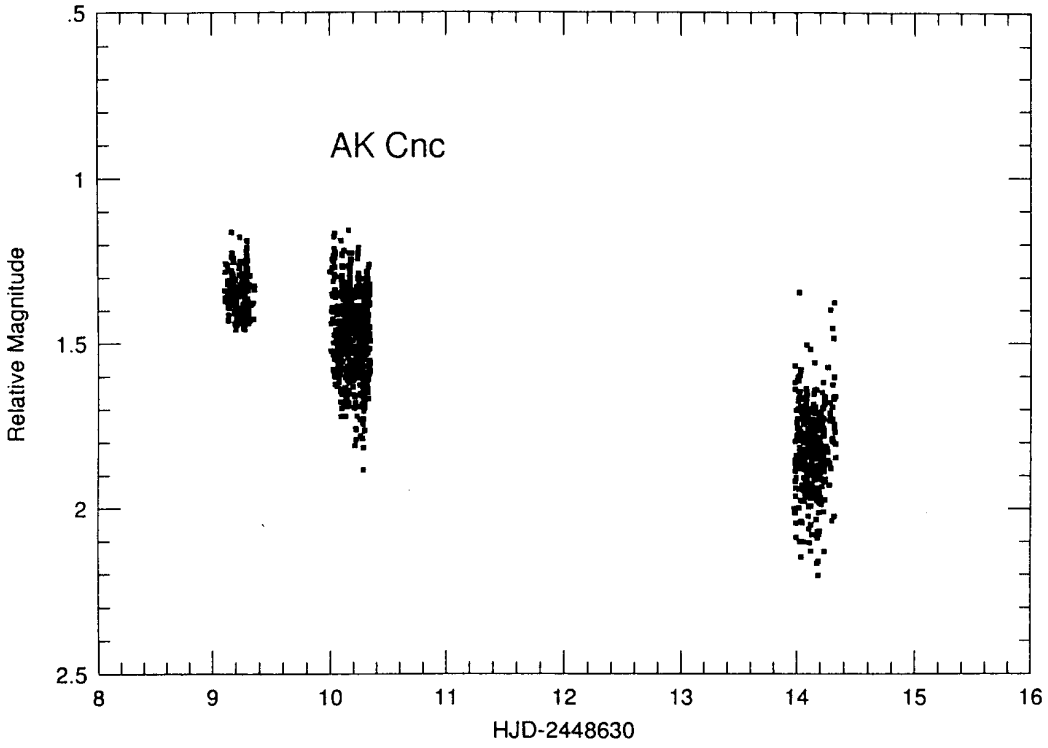

Figure 1. General V-band light curve of AK Cnc.
The zero point of the relative magnitudes corresponds to V=13.3.

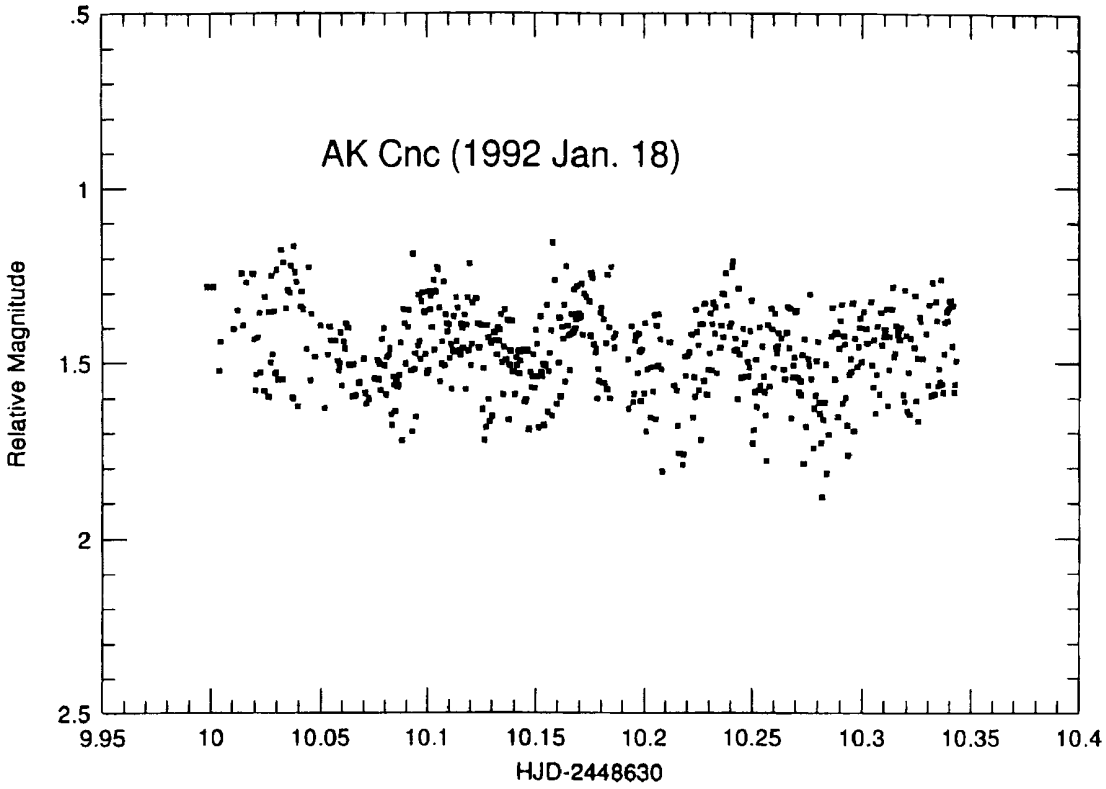

Figure 2. Sample light curve (1992 Jan. 18).
Superhumps with an amplitude of 0.18 mag are clearly seen.

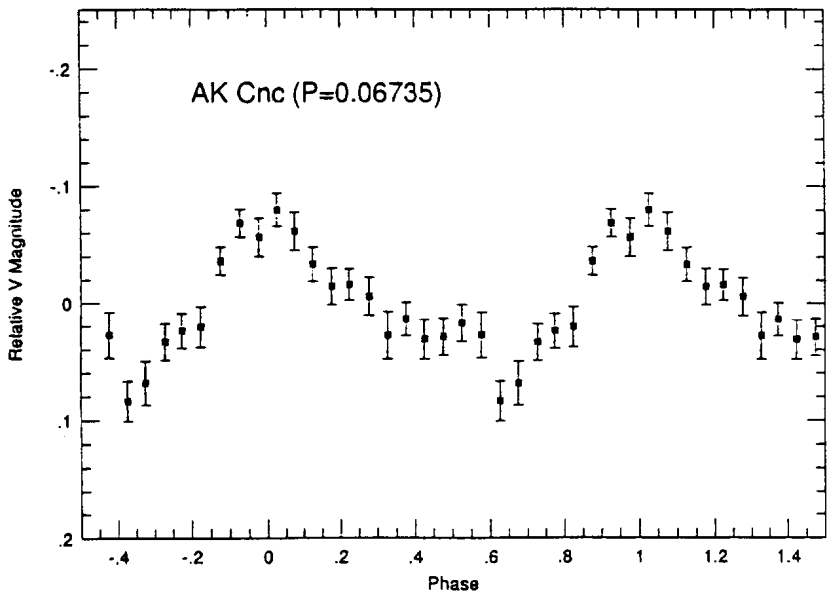

Figure 3. Light curve folded on the superhump period of 0.06735 day.

The outburst characteristics of this dwarf nova is still uncertain. Wenzel (1993) gives five outburst records from Sonneberg plates. The second one in his table (1993 March 8 – 15) is clearly a superoutburst. Further monitoring for outbursts of this dwarf nova is encouraged in order to determine its true outburst frequency and number ratio of super- and normal outbursts, both of which would also be good indicators for discriminating TOADs from other dwarf novae.

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