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1987 PHOTOMETRY OF XY URSAE MAJORIS

XY UMa [= +55° 1317, SAO 27143, #69 in the catalog of Strassmeier et al., 1988] is the most active member of the short-period RS CVn group (Budding and Zeilik, 1986). Geyer (1980) has observed the system since 1955; he attributes its photometric distortion wave to starspot activity on the primary star.

Aside from Geyer's persistent scrutiny, few complete light curves are available to track the magnetic activity cycles of this system. Zeilik et al. (1983) observed XY UMa in Jan-Feb 1982; Jassur (1986) in March 1979; Lorenzi and Scaltriti (1977) present Oct-Dec 1975 observations, but in general, their coverage is incomplete.

We conducted observations on 27 and 28 Feb 1987 and 29 Mar and 2 Apr 1987 (U.T.) to complete the light curve. We used the 61-cm telescope operated by San Diego State University on Mt. Laguna, California. The photoelectric photometer uses an EMI 6256 phototube operated at 1300 volts and cooled to -23 C. The photometer was fitted with an OG-515 filter for V-band. Each observation consisted of three separate 60-second observations through a 19 arcsec aperture. Phases were calculated from the ephemeris given in Strassmeier et al. (1988). The comparison star for all observations was SAO 27139 (Geyer's comparison star) and the check star was SAO 27151. Figure 1 shows the light curves in the instrumental V-band system, in the sense of comparison star-variable.

XY UMa V-band Delta Magnitudes
Laguna 1987

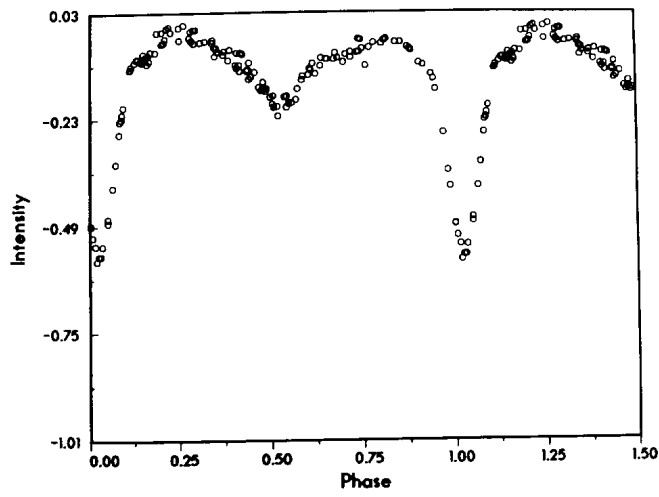


Figure 1

XY UMa V-band Laguna 1987

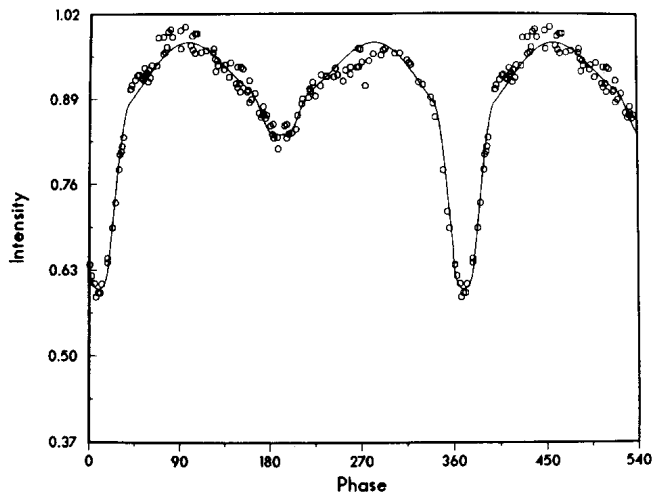


Figure 2

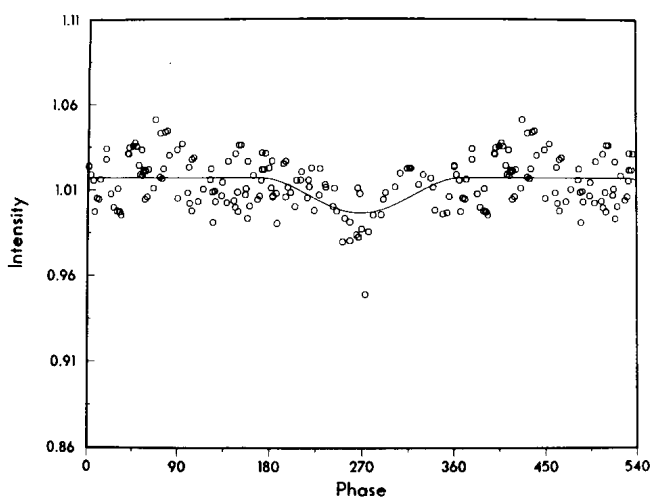
XY UMa V-band Laguna 1987
One Spot Fit

Figure 3

We analyzed the light curve by the technique of Budding and Zeilik (1987), in which we parameterize starspot indices by fitting a dark, circular spot to the distortion wave. We assumed a spot temperature = 0 K (completely black), a choice that minimizes the effective area. Figure 2 shows the observed points (open circles) compared to the theoretical light curve (solid line) for an unspotted system. The delta magnitudes have been converted to relative intensity units, normalized so that the shoulders of the light curves have a value ~ 1.0 . Figure 3 has the distortion wave (circles) extracted from Figure 1 and shows the starspot fit (solid line). We assume that the primary star is the active one. We optimized a fit with a single spot group located at longitude $269^\circ \pm 6^\circ$, latitude = $40^\circ \pm 36^\circ$ with a radius of $9.2' \pm 4.0'$. Note the large correlated error in the

latitude, which also affects the value of the radius. The longitude, though, is well-determined and further confirms the notion that the active regions tend to appear at quadrature in the short-period RS CVn systems. Budding and Zeilik (1987) find two spots at longitude $81.4^\circ \pm 3.2^\circ$ and $13.0^\circ \pm 0.3^\circ$ at a fixed latitude of 45° . Since 1982, the two spots have merged (or one has disappeared). The total spotted area has also decreased significantly.

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