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COMPLETE BVRI LIGHT CURVES OF THE VERY SHORT PERIOD W UMa VARIABLE YZ PHOENICIS

YZ Phoenicis (S7172) was discovered by Hoffmeister (1963). His paper includes a finding chart. Gessner & Meinunger (1975) determined seven timings of minimum light, and calculated a period of $0^d.3052$. Jones (1989) presented UBVRI photoelectric observations covering the primary eclipse and determined standard magnitudes at two orbital phases. Kilkenny & Marang (1990) published a complete V photoelectric light curve and determined nine epochs of minimum light. They found Gessner & Meinunger's period to be in error, and recalculated it to be $0^d.234727$, making YZ Phe one of the shortest period nondegenerate binaries known.

The present observations of YZ Phe were made on 1989, November 2-8, inclusive, at Cerro Tololo InterAmerican Observatory, Chile. The 1.0-m Yale Reflector was used in conjunction with the ASCAP photometer housing a dry-ice cooled Hamamatsu R943-02 GaAs PMT with standard Johnson-Cousins BVR_cI_c filters.

The coordinates of the check, comparison, and the variable stars are given in Table I. From 450 to 500 observations were taken in each pass band.

Table I

Star	R.A. (2000)	Dec. (2000)
YZ Phe	$01^h42^m22^s.6$	$-45°56'56''$
Comparison	$01^h42^m28^s.8$	$-45°52'35''$
Check	$01^h42^m21^s.4$	$-45°53'54''$

Four precise epochs of minimum light were calculated from observations made during three secondary and one primary eclipses. The bisection-of-chords method was used. Our epochs of minimum light are shown in Table II along with the one by Jones (1989).

Table II

JD Hel. (2440000+)	Min.	Cycles	$(O-C)_1$	$(O-C)_2$	Source
5621.3968	I	0.0	−0.0008	0.0001	Jones
7832.6428(7)	II	9420.5	0.0001	0.0003	Pres. Obs.
7833.8166(4)	II	9425.5	0.0003	0.0002	Pres. Obs.
7834.7557(13)	II	9429.5	0.0005	0.0005	Pres. Obs.
7836.7515(5)	I	9438.0	0.0011	0.0011	Pres. Obs.

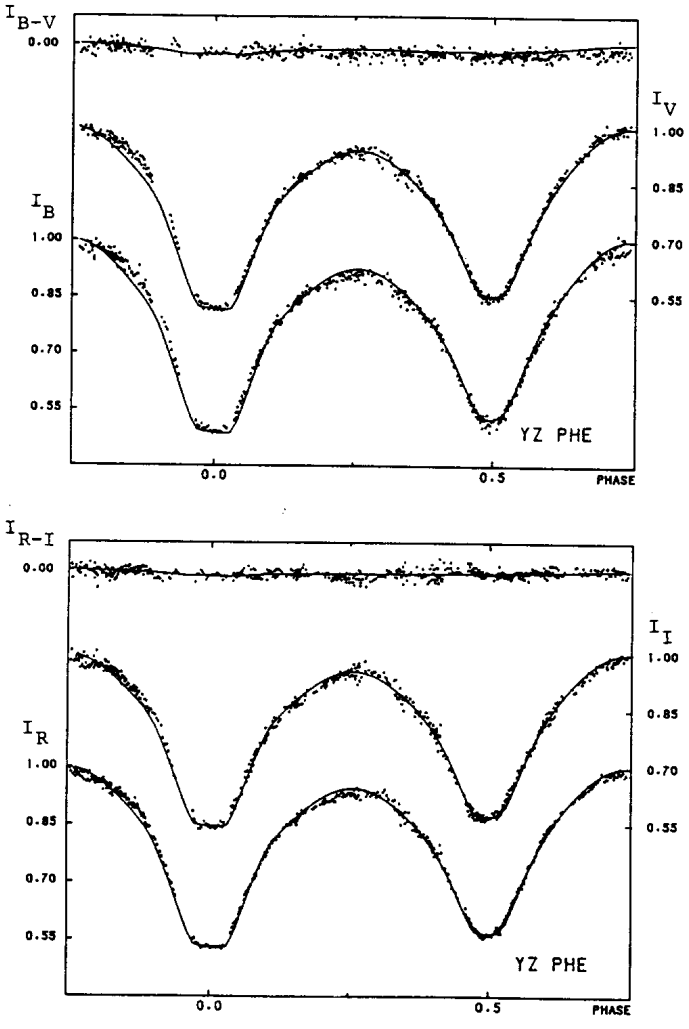

Figure 1. Intensity light curves of YZ Phe as defined by the individual observations and a preliminary light curve solution (solid line).

All available timings of minimum light were introduced into a least squares solution to obtain the linear ephemeris:

$$\text{JD Hel. Min.} = 2445621.3976 + 0^{d}.23472963 \times E \qquad (1)$$
$$\pm 9 \qquad \pm 8$$

A second ephemeris determined from photoelectric epochs only:

$$\text{JD Hel. Min.} = 2445621.3968 + 0^{d}.23472703 \times E \qquad (2)$$
$$\pm 5 \qquad \pm 5$$

The period of the system has remained fairly constant over the thirty years it has been observed. Ephemeris (1) was used to calculate $(O-C)_1$ residuals in Table II, and ephemeris (2) was used to phase our observations and its residuals appear as $(O-C)_2$ in the table.

The complete light curves of YZ Phe defined by the individual observations are shown in Figure 1 as intensity versus phase, overlaid with a preliminary light curve solution (solid line). An early analysis by DT indicates that YZ Phe is a W-type W UMa system with a mass ratio of 0.41, a fill-out of 16% and a component difference, $\Delta T \sim 380$ K. A large 46° radius single "dark spot" was simultaneously modeled on the cooler component with a temperature factor of only 0.96. The preliminary reductions and analyses were done by MBA for his undergraduate research project at Butler University.

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