New Eclipsing Binary Systems: HD 189735 and HD 116274

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Abstract We present two new eclipsing binary stars: HD 189735 (EB, P = 0.78154d) and HD 116274 (EW, P = 0.60471d). Light curves, periods, classifications, and Wilson-Devinney models are presented and discussed. Results for HD 189735 were originally presented at the Spring Meeting of the AAVSO in Tucson, Arizona in April of 2003.

1. Discussion

Variability of HD 189735 was identified by WS statistics (Welch and Stetson 1993) in data acquired by the Amateur Sky Survey (TASS: Droege (2002), and Henden (2001)). Variability of HD 116274 was discovered in data acquired by Stardial (McCullough and Thakkar 1997) with the procedure described in Wils (2003). Extensive followup observations were performed to characterize the light curves, in R_C for HD 189735 and in VR_C for HD 116274. TASS I_C data are not presented because they appear to have night-to-night zeropoint problems. Data were taken through standard filters, but not transformed to the standard system. Zeropoints for the photometry were obtained by using transformed Tycho-2 magnitudes (Hog 2000) for the ensemble comparison stars.

We modeled the stars using the current Wilson-Devinney code (WD; Wilson and Devinney 1971; Wilson 1979). For HD 189735 the WD code was run in mode 2 with an assumed temperature of T_1 = 9000K for the primary, based on the MK calibration of the HD spectral type of A2. Mass ratios in the range $0.2 < q < 0.4$ all gave equivalent results. The adjusted parameters are shown in Table 1. For HD 116274 the WD code was run in mode 3 with an assumed temperature for the primary of T_1 = 7200K based on the HD spectral type of F0. The system has an apparent total eclipse, which yields a highly accurate estimate of the mass ratio. The adjusted parameters for HD 116274 are shown in Table 2. The light curves, WD fits, and residuals are shown in Figures 1 and 2.

The ephemerides of the systems are:

$$\text{HD 189735: } \text{HJD}_{\text{Min I}} = 2452458.847 + 0.78154\,E$$
$$\text{HD 116274: } \text{HJD}_{\text{Min I}} = 2452772.717 + 0.60471\,E$$

In the manner of Terrell and Henden (2002) we describe HD 189735 as a short-period Algol eclipsing binary of type EB. HD 116274 is clearly an EW-type W UMa over-contact eclipsing binary system. It is unclear whether the apparent increased scatter at the minima of HD 116274 is observational error or whether it reflects the actual behavior of the system. The 1-σ of the comparison star magnitudes was < 0.02 magnitude for all data presented.

2. Acknowledgements

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Table 1. Adjusted Parameters of Light Curve Solution for HD 189735.

Parameter	*Value*	*Standard Error*
i	$71^\circ.5$	$0^\circ.2$
T_1	9000 K	(assumed)
T_2	5050 K	80 K
q	0.25	0.02
Ω_1	2.83	0.04
$L_1/(L_1+L_2)_V$	0.96	0.01
$L_1/(L_1+L_2)_R$	0.94	0.01
HJD_0	2452458.847	0.0011
P	$0^d.78154$	$0^d.000002$

Table 2. Adjusted Parameters for Light Curve Solution for HD 116274.

Parameter	*Value*	*Standard Error*
i	$82^\circ.7$	$0^\circ.6$
T_1	7200 K	(assumed)
T_2	7300 K	80 K
q	0.235	0.002
Ω_1, Ω_2	2.289	0.004
$L_1/(L_1+L_2)_V$	0.79	0.01
$L_1/(L_1+L_2)_R$	0.79	0.01
HJD_0	2452772.717	0.0011
P	$0^d.60471$	$0^d.00001$

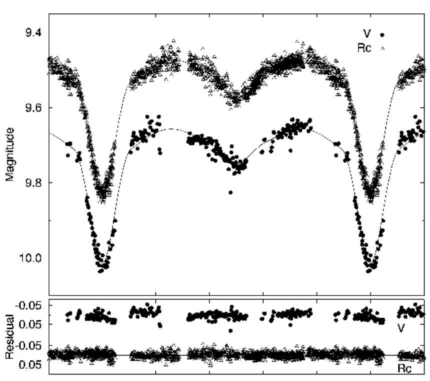

Figure 1. HD 189735. TASS *V* (filled circles) and Koppelman R_C (triangles).

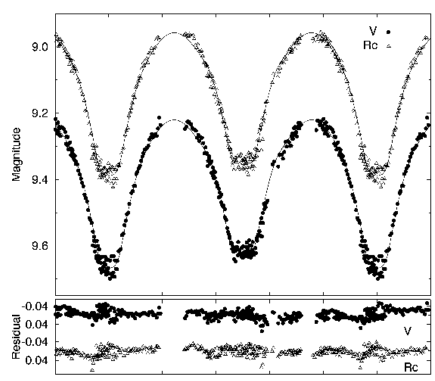

Figure 2. HD116274. Koppelman *V* (triangles) and R_C (circles).