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THE PERIOD AND LIGHT CURVE OF V1028 ORI

The variability of V1028 Ori (HDE 255930, BD +10° 1104) was discovered by Turner (1976a) during a study of OB stars in Northern Monoceros. From these first observations the star was classified as a β Lyrae type eclipsing variable with an estimated period of 3 days.

Additional photoelectric UBV observations of V1028 Ori were obtained by AMH in 1975-1978 during several observing runs at Kitt Peak National Observatory. The variable was measured differentially with respect to HD 46223 on 11 nights and with respect to HD 43526 on 17 nights; however, the final differential values were all adjusted to HD 46233. The differential data have been corrected for atmospheric extinction and transformed to the UBV system via observations of Praesepe standard stars. The errors in these KPNO differential observations range from about ±0.002 to ±0.007 mag in V, ±0.003 to ±0.010 mag in B–V, and ±0.004 to ±0.013 mag in U–B.

The new UBV observations are presented in Table 1. Values of V = 7.28, B–V = +0.22 and U–B = –0.78 for HD 46223 (Heiser 1977) were used to obtain the magnitudes and colours from the differential data.

The analysis of variance technique (Schwarzenberg-Czerny 1989) was applied to the data to determine a more accurate value for the period of the system. The new ephemeris for V1028 Ori is:

$$\text{JD Hel Min I} = \underset{\pm 1}{2442359.659} + \underset{\pm 3}{3.011428} \times E.$$

The V, B–V and U–B light curves for V1028 Ori are presented in Figure 1. The observations of Turner (1976a) are marked by open circles and those from Table 1 by filled circles. The discordance of a few of the original observations by Turner (crosses) from the mean light curve can be attributed to problems arising from incomplete corrections for a seasonal dust extinction component (due to nearby open pit mining) which can affect the skies over Cerro Las Campanas in Chile.

Table 1. New UBV photoelectric photometry for V1028 Ori

JD Hel 2443000+	V	B–V	U–B	JD Hel 2443000+	V	B–V	U–B
102.0049	9.874	0.111	–0.605	224.6398	9.753	0.113	–0.581
102.9665	9.779	0.121	–0.586	225.6377	9.851	0.124	–0.622
103.8616	9.814	0.117	–0.593	226.6379	9.841	0.132	–0.585
104.8891	9.848	0.121	–0.622	482.8743	9.916	0.114	–0.574
105.9334	9.774	0.112	–0.575	483.8814	9.747	0.119	–0.602
106.9548	9.802	0.111	–0.593	484.8882	9.779	0.123	–0.612
107.9130	9.852	0.119	–0.618	485.8814	9.924	0.111	–0.582
108.8823	9.751	0.126	–0.594	488.8854	9.921	0.118	–0.567
127.8092	9.848	0.119	–0.589	489.8692	9.749	0.118	–0.598
128.8400	9.814	0.129	–0.611	602.6434	9.738	0.121	–0.586
156.8316	9.749	0.123	–0.588	603.6454	9.848	0.113	–0.594
157.7190	9.930	0.126	–0.583	604.6431	9.822	0.119	–0.605
158.7250	9.766	0.100	–0.596	605.6479	9.745	0.128	–0.582
222.6475	9.841	0.126	–0.603	609.6507	9.859	0.095	–0.572

The shape of the light curve, the period and the spectral type of B2 IV (Turner 1976b) all confirm the original classification of V1028 Ori as a β Lyrae type system. The system undergoes partial eclipses, and the amplitude of the brightness variation is relatively small: 0.19 magnitude in V. The parameters for the light curve of V1028 Ori are summarized in Table 2.

Table 2. Parameters for the light curve of V1028 Ori

V_{max} = 9.74	$(U-B)_{min}$ = –0.62 (at secondary eclipse)
$V_{min\ I}$ = 9.93	$(U-B)_{max}$ = –0.58 (at primary eclipse)
$V_{min\ II}$ = 9.86	<B–V> = 0.12

The amplitude of the U–B light curve is only 0.04 mag; nevertheless it exhibits a pronounced maximum at secondary eclipse and a minimum at primary eclipse, which indicates that the secondary is of later spectral type than the primary. The B–V colour index, on the other hand, does not appear to pass through obvious maxima or minima throughout the cycle; it varies about a mean <B–V> = 0.12, with a dispersion of ~0.01 magnitude. This difference can be explained by the stronger dependence of the U–B index on temperature for early spectral types.

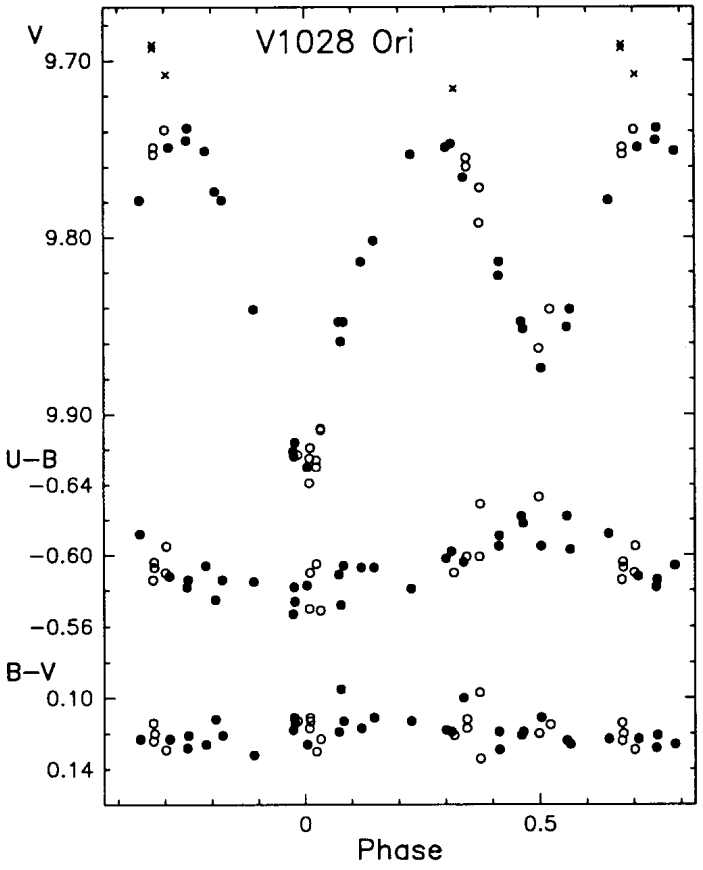

Figure 1. V, U−B and B−V light curves for V1028 Ori

The original classification spectrogram for this star was the basis for its assigned spectral type of B2 IV, although there was some suggestion of diffuseness in the spectral lines which might arise from rotation or mild line doubling. This was not sufficient to warrant a classification of B2 IVn for the variable, but, in the light of the star's duplicity, this should be investigated further with higher dispersion spectra.

Because of the somewhat uneven phase coverage, we did not attempt to construct a complete model of the binary. Rough estimates of the properties of the system show an overall consistency between the observed and derived parameters, even though the estimated separation of the stars in this system, based on their likely masses and the orbital period, is only slightly larger than the calculated dimensions of a subgiant B2 star.

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