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THE DOUBLE-MODE CEPHEIDS GZ Car AND UZ Cen

Pel (1) in his photometric study of Southern Milky Way cepheids suspected that the intrinsic scatter in the light curves of five cepheids (Y Car, GZ Car, UZ Cen, AP Vel and AX Vel) was caused by double-mode behaviour. Observations of Y Car, AP Vel and AX Vel (references 2,3,4 respectively) have been analysed for the component periodicities present. However, in the case of GZ Car and UZ Cen only the primary periods are known. I decided to analyse Pel's observations to try to determine any secondary periods present.

The procedure adopted was to plot the B and V light curves assuming the values for the primary periods quoted by Pel. Mean light curves were drawn and the residuals from these mean light curves calculated. These residuals were analysed in the period range P > 1 day using a least squares Fourier technique developed by Barning (5). For each star, Fourier analysis of both the B and V residuals identified the same period as being the most significant secondary period. Given the primary and secondary periods the observations were decomposed into their component waveforms using an iterative technique (6). Fig.1 illustrates the decomposition for GZ Car and UZ Cen using the B observations. Periods, amplitudes (ΔV, ΔB) and Julian dates of maximum light for each waveform are listed in the table. The two modes of pulsation present are identified as fundamental radial mode ($\equiv 0$) and first overtone radial mode ($\equiv 1$).

Star	Mode	P days	ΔV mag	ΔB mag	JD (Max.light) 2440000+
GZ Car	0	4.15885	0.16	0.23	742.6
	1	2.933	0.07	0.10	742.4
UZ Cen	0	3.33438	0.30	0.41	746.1
	1	2.355	0.06	0.09	746.2

The period ratios, P_1/P_0, for GZ Car and UZ Cen are 0.7052 and 0.7063 respectively, consistent with the period ratios obtained for other double-mode cepheids. The amplitudes of the secondary periods are in both cases by far the lowest known for double-mode cepheids. This supports Pel's suggestion that the excess scatter in some of his cepheid light curves may be caused by a low amplitude double-mode phenomenon. However, as the scatter for other stars is considerably less than the scatter exhibited in the light curves of GZ Car and UZ Cen, it would be exceedingly difficult to determine the values of any other secondary periods.

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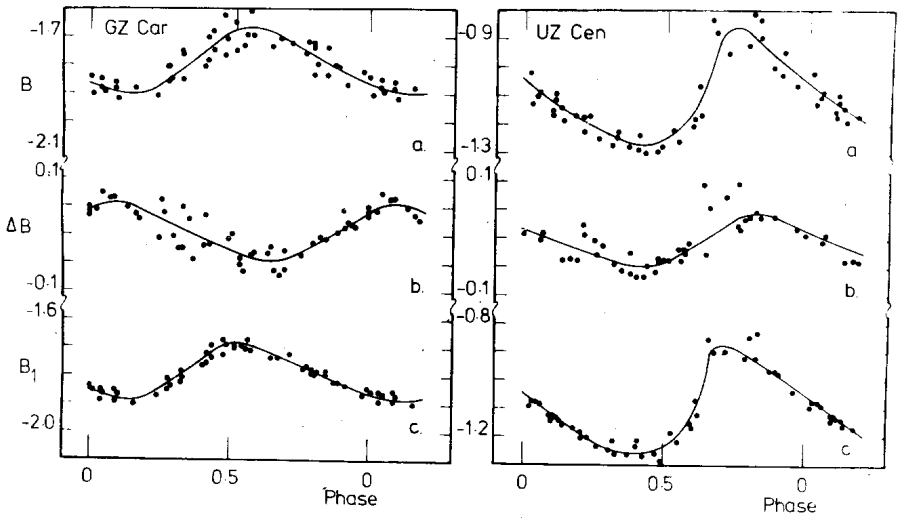

Fig. 1. Component waveforms for GZ Car and UZ Cen

(a) original B observations plotted with primary period

(b) residuals from mean B light curve plotted with secondary period

(c) B observations corrected for mean residual light curve plotted with primary period.