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PHOTOMETRY OF THE δ SCUTI STAR HR 2100

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HR 2100 was discovered to be a δ Scuti star by Breger (1973). Its reported period is 0.054 days. No observation has been done since that time. This star has a δ Del like spectrum (Cowley et al., 1969) and is the primary of a visual binary system. Moreover, the pulsating variable HR 2100 also belongs to a spectroscopic binary. Strömberg v and y rapid photometry was carried out with the 85-cm reflector during 26 and 30 January in 1999 at Xinglong of Beijing astronomical observatory. Chevreton six-channel photometer (Michel, 1992) was used. This system allows a high-speed data acquisition with good accuracy, one record per second. Light from the stars is divided into v and y parts by means of a dichroic filter so that two bands can be simultaneously monitored through two identical photomultipliers. Therefore four of the channels are used for the program and comparison stars in v and y respectively. The sky background was obtained by the other two channels using standard v and y filters separately. The observational field is around 15 arcmin. The comparison star was SAO 113304, no variability has been reported on it. Finally, successive 5 day data were obtained. Due to bad weather, data on Jan. 29 was excluded in v dataset. Light curve of last night is not perfect, but the variability is obvious.

The instrumental magnitude of the variable can be obtained by dividing their photon counts after removing the sky background. Effect of response for the different channels has been taken into account. A polynomial fitting was applied to remove the effects from intrinsic variability, transparency turbulence and the instrumental drift caused by the temperature changes of photomultipliers. The final light curves in two filters are shown in Fig. 1 and 2. These data have been averaged so that each point represents one minute.

The pulsation period was analyzed through Fourier transform to v band data using code MFA (Hao 1991) because larger scatter exists in y . A frequency $f = 16.461$ c/d is found. It fits both v and y datasets well as displayed in Figure 1 and 2. Spectral window and power spectra are outlined in Figure 3. Table 1 lists the relevant parameters.

HR 2100 was firstly observed almost thirty years ago, the 6 hours data resulted in an estimation of frequency being 18.52 c/d that cannot be approved by new observation. This value fails to interpret new light curves. Its amplitude has also decreased. From the Hipparcos observation, absolute magnitude of HR 2100 is derived as $M_v = 0.72$. Effective temperature and gravity are obtained by means of the photometric calibration according to Domingo & Figueras (1999) giving $\log T_{\text{eff}} = 3.883$, $\log g = 3.64$. The Q -value was calculated $Q = 0.0124$ ($B.C. = -0.1$) implying a non-radial mode. The phase

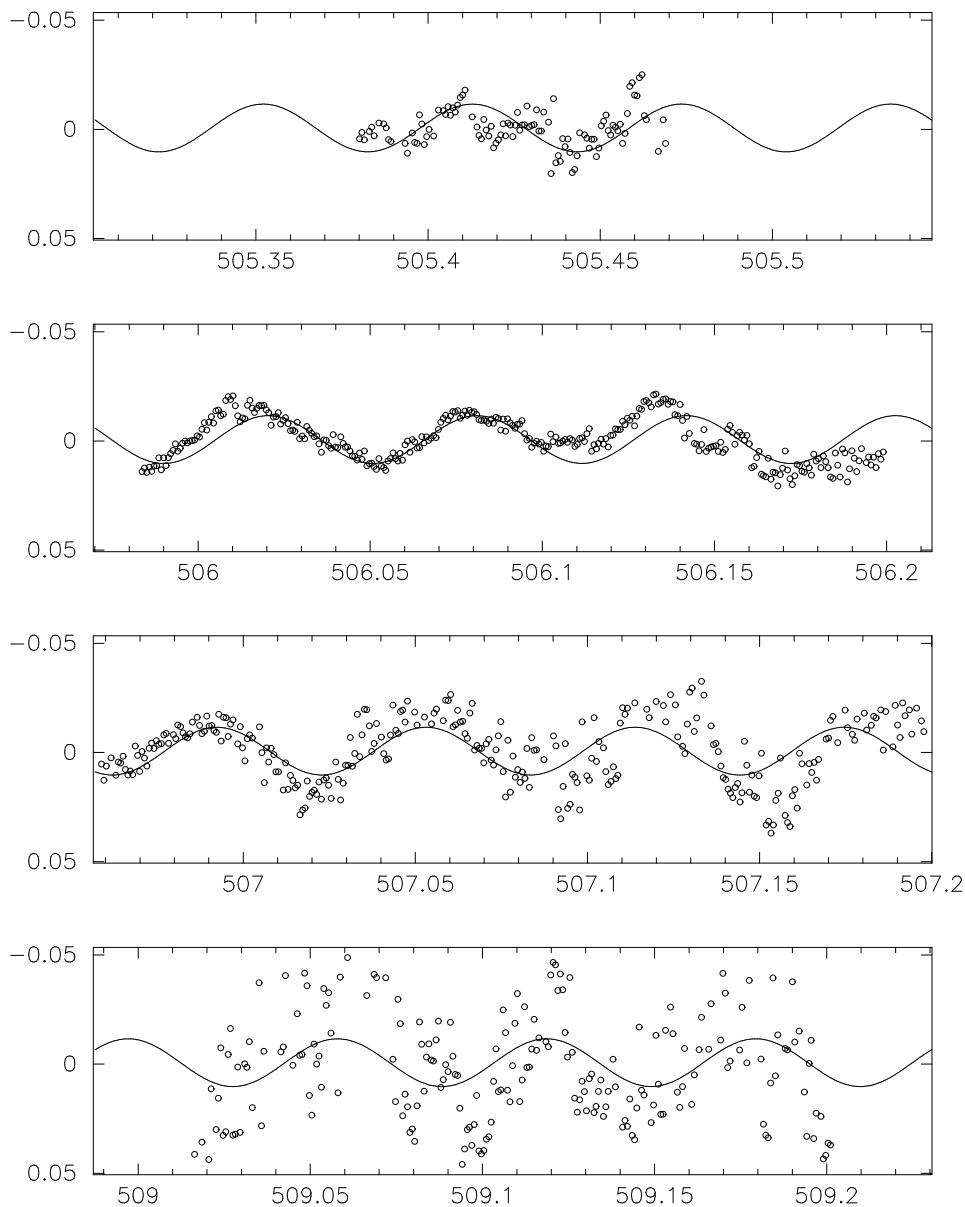


Figure 1. Observed light curves of HR 2100 in v band. The solid lines are the least-squares fit with the frequency listed in Table 1. The abscissa is HJD 2450700 +, and the ordinate in mag.

Table 1: Properties of the light curve of HR 2100 in v and y bands				
frequency (c/d)	Amp. (v) (mmag)	Phase (v) (rad)	Amp. (y) (mmag)	Phase (y) (rad)
16.461 ± 0.007	10.93 ± 0.63	0.211 ± 0.015	8.05 ± 0.58	0.192 ± 0.012
	$\sigma = 0.013$		$\sigma = 0.013$	

shift and amplitude ratio can be used to have insight about the pulsation modes. However, considering the short data base and low amplitude, the phase shift is uncertain and may not give meaningful explanation. In fact, unknown frequency can be hidden in the light curves, a second frequency around 17.701 c/d is probably an intrinsic one. More observation covering long time base is strongly needed to confirm it and then to understand the

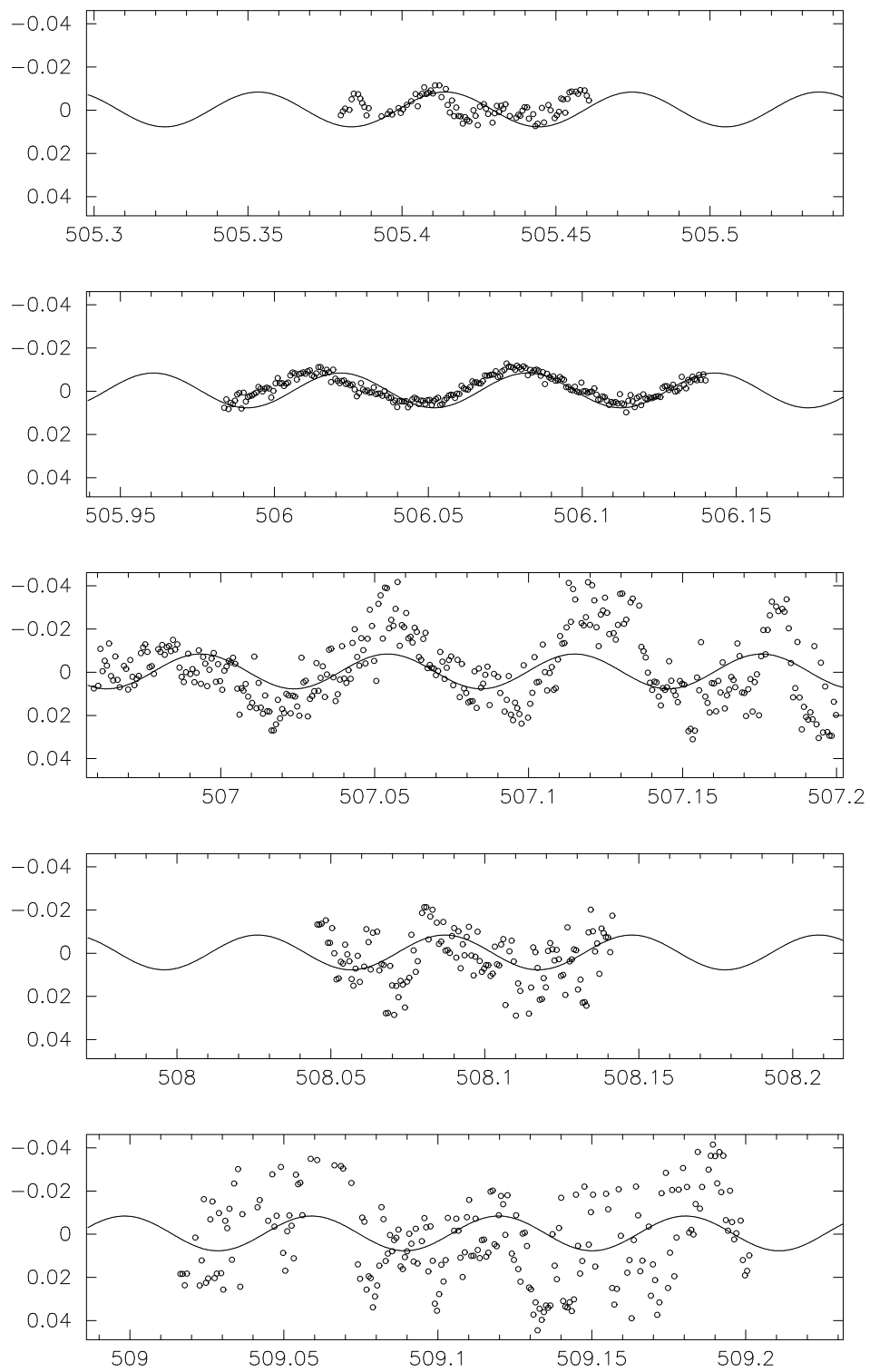


Figure 2. Same as Fig. 1 but in y band.

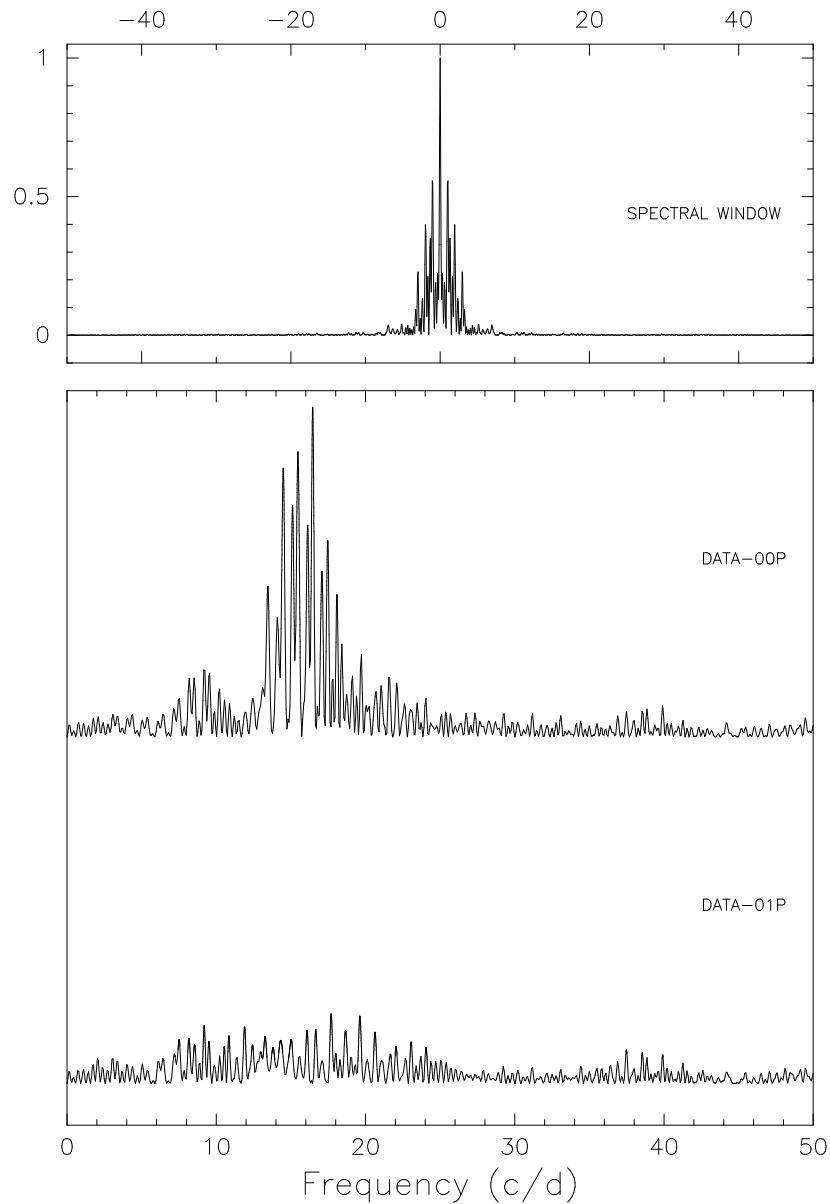


Figure 3. Spectral window and power spectra of HR 2100 in v band.

pulsation character of this star.

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