MULTIWAVELENGTH STUDIES OF β CEPHEI STARS

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As first pointed out by Moskalik and Dziembowski (1992) all β Cephei stars lie within the domain of H–R diagram where κ–mechanism effectively drives pulsations in the stellar layers with $T \approx 2\text{x}10^5$ K. For most of these objects a chemical composition described by X = 0.70 and Z = 0.02 is sufficient to account for the pulsations, cf. Dziembowski and Pamyatnykh (1993). Recently, Cugier, Dziembowski and Pamyatnykh (1993) have investigated how the present knowledge about nonadiabatic observables of β Cephei stars affects methods of identification of the spherical harmonic degree, l. They found that good photometric and radial velocity data should result in unambiguous identification of l. Cugier, Dziembowski and Pamyatnykh also concluded that nonadiabatic observables can be used to obtain mean stellar parameters of pulsating stars.

We report here, as examples, the studies of δ Ceti and BW Vulpeculae. The above mentioned analysis of the ground-based photometric data of δ Cet taken from Jerzykiewicz et al. (1988) indicates: $l = 0$, p_2, $\log T_{\rm eff} = 4.346$ and $\log g = 3.73$. Figure 1 shows that indeed only a model with $l = 0$ is able to explain the observed flux behaviour of δ Cet in the satellite ultraviolet region. Futhermore, the observed phases of flux maximum as a function of wavelength offer the possibility to determine the effective temperature of β Cephei stars with high precision as Fig. 2 shows for δ Cet.

In Fig. 3 the observed light ranges for BW Vul are compared with the nonadiabatic model ($l = 0$, p_1, $\log T_{\rm eff} = 4.29$ and $\log g = 3.71$). As one can see, a very good agreement exists even for this star, which is rather extreme case among β Cephei stars considering its large light and radial-velocity amplitudes.

Acknowledgements

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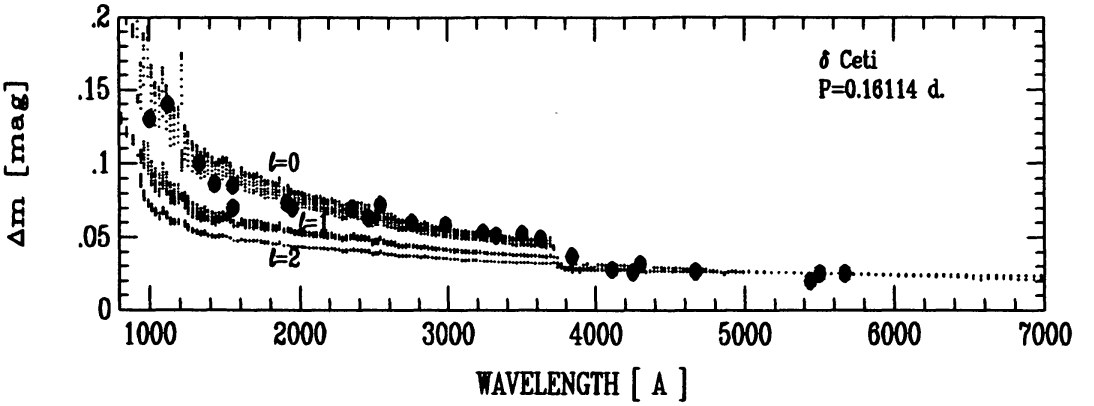

Fig. 1. Calculated light ranges Δm (dotted lines) in comparison with UV and visual observations (filled circles) for δ Cet. All nonadiabatic models with l=0, 1 and 2 have the same period ($P = 0.16114$ d)

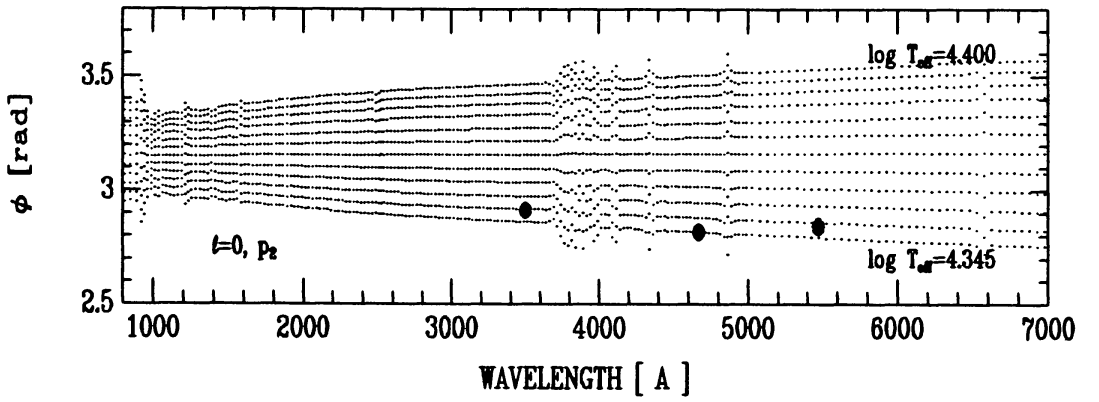

Fig. 2. The observed (filled circles with error bars) phases of flux maximum for δ Cet are plotted together with nonadiabatic calculations (dots) corresponding to p_2 mode of $l = 0$. Stellar models (all with the period equal to 0.16114 d) are labelled by $\log T_{\rm eff}$ values. The step in $\log T_{\rm eff}$ is equal to 0.005 dex.

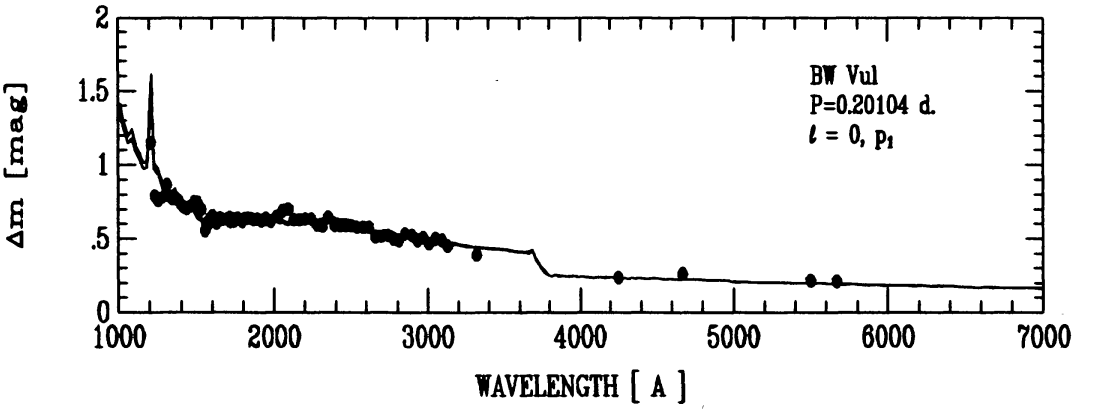

Fig. 3. The best-fit nonadiabatic model compared with the IUE observations of BW Vul.