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A search for pulsations in two Algol-type systems V1241 Tau and GQ Dra

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Abstract. We present new photometric observations of two eclipsing binary systems, V1241 Tau and GQ Dra. We use the following methodology: initially, the Wilson-Devinney code is applied to the light curves in order to determine the photometric elements of the systems. Then, the residuals are analysed using Fourier techniques. The results are the following. One frequency can be possibly attributed to a real light variation of V1241 Tau, while there is no evidence of pulsations in the light curve of GQ Dra.

Keywords. stars: binaries: eclipsing, stars: oscillations (including pulsations)

1. Introduction

V1241 Tau (= WX Eri) was found to be an eclipsing binary by Henrietta Leavitt (Pickering 1908). Sarma & Abhyankar (1979) claimed that the primary component shows periodic variations in its light. However, the periods of this variation were simply 1/5 and 1/6 of the orbital period which is likely a result of the rectification process they applied. Arentoft *et al.* (2004) found no trace of pulsations. The light variation of GQ Dra was discovered by *Hipparcos* (ESA 1997).

2. Observations and solution of the light curves

BVRI light curves of V1241 Tau were obtained with the 0.4-m telescope of the University of Athens Observatory in November 2012. GQ Dra was observed with the 1.22-m telescope of the Onsekiz Mart University Observatory on 7 nights in March and April 2013. Light curves of both systems were analysed using PHOEBE (Prša & Zwitter 2005) software. The results are the following. V1241 Tau has a semi-detached configuration with the inclination of about 81.5° and the mass ratio of 0.44. The hotter and cooler components have the effective temperatures equal to 7500 K and 4906 K, respectively. We find that 91 percent of the light in V filter comes from the primary component.

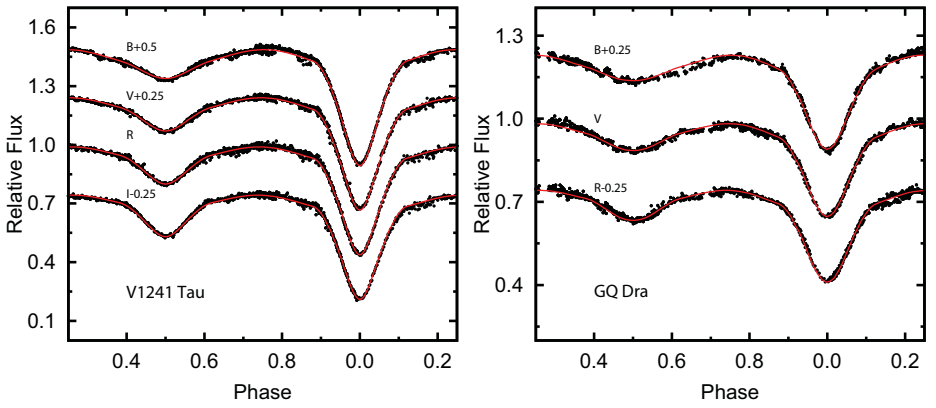

Figure 1. Observed (points) and theoretical (lines) light curves of the two systems. Some curves are shifted in flux axis for the sake of clarity.

Our solution for the semi-detached binary GQ Dra is the first light curve solution in the literature. Mass ratio of the system is found to be 0.25 and the orbital inclination was calculated to be 75.3°. The effective temperature of the secondary was found to be equal to 5050 K while the primary's $T_{\rm eff}$ was fixed at 8750 K. The comparison between observations and model light curve is shown in Fig. 1.

3. Search for pulsations

We searched the residuals from the PHEOBE fits for periodic variability using Fourier techniques. In the case of V1241 Tau, we found a significant peak at frequency of $f = 2.13$ d^{-1} and amplitude of 0.0097 mag which possibly can be attributed to real changes in one of the components. However, it is worth to emphasize that the variability can be also due to instrumental effects. The same method was applied to the residuals from the solution of the light curve of GQ Dra. No remarkable periodic variability was found.

4. Conclusions

The main result regarding the pulsational variability in the systems is that there is no convincing evidence of pulsations in either of them. The residual light curve of the system V1241 Tau shows periodic variation with a small amplitude, but its origin is probably an instrumental effect.

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