Comm. in Asteroseismology
Vol. 150, 2007

An old puzzle in a new light: PG 1336−018

M. Vučković,[1] C. Aerts,[1,2] R. Østensen,[1] G. Nelemans,[2] H. Hu,[1,2] V. S. Dhillon,[3]
T. R. Marsh,[4] and C. S. Jeffery[5]

[1] Instituut voor Sterrenkunde, K. U. Leuven, Belgium
[2] Department of Astrophysics, Radboud University Nijmegen, The Netherlands
[3] Department of Physics and Astronomy, University of Sheffield, UK
[4] Department of Physics, University of Warwick, UK
[5] Armagh Observatory, Northern Ireland

Abstract

We present the first preliminary results from VLT photometric and spectroscopic observations of PG 1336−018, a rapidly pulsating eclipsing sdB binary.

Observations

High–speed multicolour photometric observations of PG 1336−018 were acquired on May 19, 2005 with the 3-channel ULTRACAM camera (Dhillon & Marsh 2001) attached to the ESO VLT at Paranal Observatory in Chile. We gathered about 5 h of data simultaneously in three bands *u*', *g*' and *r*' of the SDSS system (Fukugita et al. 1996). The data were reduced using the standard ULTRACAM reduction pipeline software. Three differential light curves of PG 1336−018 were obtained, one for each filter. The *g*' light curve is presented in Fig. 1 (top panel).

We have also obtained high–resolution time series spectroscopy of this unique star. A total of 399 high–resolution spectra was gathered with the UVES spectrograph attached to the ESO VLT at Paranal Observatory, Chile, on 28 April 2005, covering about 4 full orbits.

Results

We measured radial velocities by fitting two Gaussians to the highest S/N Balmer lines in the spectrum. A sinusoidal fit to the radial velocity curve gives an amplitude $K_1 = 79.6 \pm 0.6$ km/s, in agreement with Kilkenny et al. (1998). The best simultaneous fit for $T_{\rm eff}$, $\log g$ and helium abundance yields: $T_{\rm eff} = 31300 \pm 250$, $\log g = 5.60 \pm 0.05$ and $\log y = -2.93 \pm 0.05$.

Numerical orbit solutions have been investigated using PHOEBE (Prša & Zwitter 2005). Even though a unique solution is impossible to select, given the large number of free parameters and the strong correlations between orbital parameters, theoretical considerations give a most favourable solution with a mass of the sdB primary of $0.484 \pm 0.006\, M_\odot$ and a mass ratio 0.262 ± 0.002 for the system. The best orbit solution is presented in Fig.1, together with the residuals before and after prewhitening with the four highest amplitude oscillation frequencies found in our data set.

A detailed presentation of this work can be found in Vučković et al. (2007).

References

Dhillon V., Marsh, T., 2001, New Astr. Rev., 45, 91

Fukugita M., Ichikawa T., Gunn J. E., et al., 1996, AJ, 111, 1748

Kilkenny D., O'Donoghue D., Koen C., Lynas-Gray A. E., van Wyk F., 1998, MNRAS, 296, 329

Prša A., Zwitter T., 2005, ApJ, 628, 426

Vučković M., Aerts C., Østensen R., et al., 2007, A&A, submitted

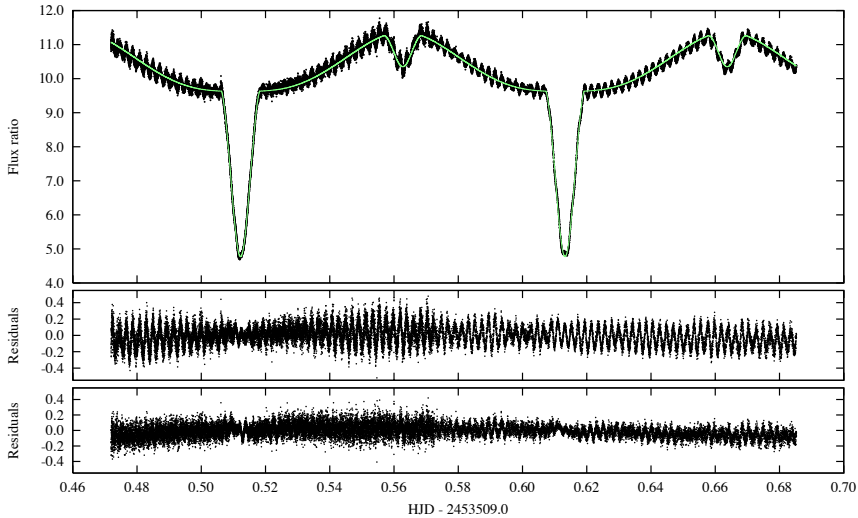

Figure 1: The ULTRACAM/VLT *g'* phase binned light curve together with the synthetic light-curve solution (PHOEBE). The middle panel shows the residuals. The bottom panel shows the residuals after prewhitening.

Dave Kilkenny enjoys Karen Pollard's and Maja Vučković's company.