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The physical parameters of the binary V1034 Sco

M. Y. Bouzid[1], T. Pribulla[2], and C. Sterken[1]

[1] Astronomy Group, Vrije Universiteit Brussels (VUB), Pleinlaan 2, 1050 Brussels, Belgium
[2] Astronomical Institute of the Slovak Academy of Sciences, 05960 Tatranská Lomnica, The Slovak Republic

Abstract. Strömgren photometric monitoring of the open cluster NGC 6231 was carried out during several years. Several stars are under study, one of them is the eclipsing binary V1034 Sco for which more than 3000 data points were collected. The derived masses of the componenents are M_1 = 16.8±0.5 $M_\odot$ and M_2 = 9.4±0.3 $M_\odot$, and a cluster distance modulus $V_0 - M_V$ = 10.73±0.02 was found.

Key words. Photometry, binaries, – binaries – eclipsing

1. Introduction

V1034 Sco was studied by several authors. Hill et al. (1974) first determined the orbital period and eccentricity based on spectroscopic observations. Sana et al. (2003) derived a more accurate radial-velocity period P = 2.44062±0.00005, and classified the system as 09 III+B1 III. Our observations were carried out in 2000 June/July, 2001 March, 2001 April and 2001July in the framework of the "Long-term Photometry of Variables" (LTPV) project using the Danish 1.54-m telescope at ESO.

2. Phometric data reduction

The photometric reduction was carried out with MOMF (Kjeldsen & Frandsen 1992).This package is designed for CCD time-series photometry and uses a combination of PSF and aperture photometry. We used a weighted average of 6 constant stars, and the choice of the aperture was based on the lowest standard deviation. Sana et al. (2003) found a low eccentricity, but our analysis using the method of Kwee & van Woerden (1956) did not reveal any shift in the times of minimum. Using Claret et al. (1995) we found a circularization time-scale of 40000 years, which led us to the conclusion that the small eccentricity found by spectroscopy could be due to the presence of circumstellar matter.

3. Modeling

The modeling of our photometric data together with the spectroscopic data from Sana et al. (2003) was done using the code ROCHE, based on the principles of Wilson & Devinney (1971) and Wilson (1979). The method assumes that the shapes of the components are represented by Roche equipotentials and that the local monochromatic fluxes are interpo-

Send offprint requests to: M.Y. Bouzid

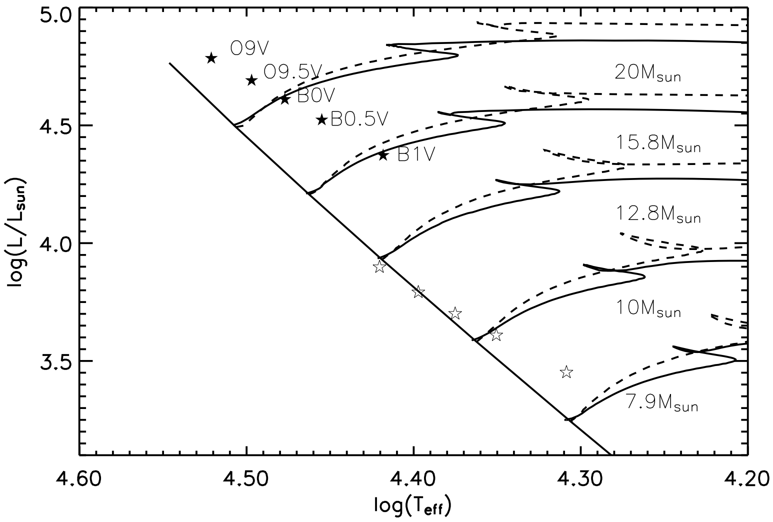

Fig. 1. The evolutionary tracks for massive stars with 7.9 $M_\odot < M < 20$ $M_\odot$, $Z = 0.02$ and initial hydrogen content $X = 0.80$. The standard models are plotted as solid lines, the models taking into account the overshooting are repreented by dotted lines (overshooting parameter $d = 0.20$). The positions of the components for several classifications of the primary are marked by asterisks.

lated from the atlas of stellar atmosphere models (see Lejeune et al. 1997). An inclination of $\approx 81°$ was found, and the best period is 2.440656±0.000002 days. We assumed a detached configuration and synchronous rotation.

4. Conclusions

As seen in Fig. 1, both components of the system for O9V are highly over-luminous for their mass. We then determined four additional combined solutions of light and radial velocity observations assuming later spectral types for the primary component (O9.5V, B0V, B0.5V and B1V). The best agreement with the predictions by stellar models was found for B0.5V + B2V classification. The masses of the components as determined from the combined solution are $M_1 = 16.8 \pm 0.5$ $M_\odot$ and $M_2 = 9.4 \pm 0.3$ $M_\odot$. Using the new combined solution in our best agreement, we derived a distance modulus of $V_0 - M_V = 10.73 \pm 0.02$. More details can be found in Bouzid et al.(2005).

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References

Bouzid, M. Y., Sterken, C., Pribulla, T. 2005, A&A, 437, 769
Claret, A. 1995, A&AS, 109, 441
Claret, A., Gimenez, A., Cunha, N. C. S. 1995, A&AS, 299, 724
Hill, G., Crawford, D. L., Barnes, J. V. 1974, AJ, 79, 1271
Kjeldsen, H., Frandsen, S. 1992, PASP, 104, 413
Kwee, K.K., van Woerden, H. 1956, Bull. Astron. Inst. Nether., 12. 327
Lejeune, T., Cuisinier, F., Buser, R. 1997, A&AS, 125, 229
Sana, H., Hensberge, H., Rauw, G. 2003, A&A, 1063, 1074
Wilson, R. E., 1979, ApJ, 234, 1054
Wilson, R. E., Devinney, E. J. 1971, ApJ, 166, 605