

A DOUBLE-LINED SPECTROSCOPIC BINARY IN THE OPEN CLUSTER TRUMPLER 14

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RESUMEN

En trabajos previos hemos propuesto que la estrella #3 del cúmulo abierto Trumpler 14 es un objeto que presenta líneas dobles en su espectro. Hemos supuesto que tal observación es consecuencia de la naturaleza binaria del objeto. En trabajos previos también se ha discutido la importancia de la determinación de la incidencia de binarias en cúmulos tan jóvenes como Trumpler 14. Indicamos aquí el progreso realizado en la observación de la estrella 3 de Trumpler 14, en un proyecto destinado a la determinación del período y demás elementos orbitales de este sistema binario. Hasta la fecha hemos adquirido 12 nuevos espectrogramas de Tr 14 #3, en 8 de los cuales hemos podido medir la velocidad radial correspondiente a las componentes primaria y secundaria respectivamente.

ABSTRACT

We have proposed in previous works, that the star #3 in the open cluster Trumpler 14 displays double lines in its spectrum. We believe that this is due to the binary nature of this object. We have also discussed in previous papers the importance of determining the incidence of binary systems in clusters as young as Trumpler 14. Here we report the progress we have made in the observation of Tr 14 #3, in a project devoted to determining the period and orbital elements of this binary system. We have obtained so far 12 new spectrograms of the star Tr 14 #3 which have been measured for radial velocities. Among them, we found 8 on which the radial velocities of the primary and secondary components can be derived.

Key words: OPEN CLUSTERS AND ASSOCIATIONS — STARS: BINARIES — STARS: EARLY TYPE

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1. INTRODUCTION

The open cluster Trumpler 14 in the η Carina complex contains a large number of O-type stars, for which high masses are expected. Two studies, namely Levato et al. (1991) and Penny et al. (1993), presented discrepant results about the binary nature of some of the brightest members of the cluster: for seven stars in common, three of them seem to be spectroscopic binaries according to Levato et al. (1991), while the same stars present constant radial velocities in the work by Penny et al. (1993). García et al. (1998) re-observed the brightest stars in Trumpler 14. These authors, while finding important coincidences with the results obtained by Penny et al. (1993), concluded that Tr 14 #3 (numbering from Feinstein, Marraco, & Muzzio 1973) presented a double-lined spectrum on some of their observations.

The present project is an effort to determine the period of variation of the radial velocity of this star with the final aim of deriving the orbital elements of this binary system.

2. OBSERVATIONS AND RESULTS

We have obtained 12 new échelle spectra of Tr14 #3. We used the Jorge Sahade 2.15-m Telescope at CASLEO, San Juan, Argentina, with a REOSC Cassegrain échelle spectrograph and a grating of 400 grooves mm^{-1} as cross dispersor. The useful wavelength range covered by each observation is around 2500 Å, with a spectral resolution of 0.12 Å px^{-1} . We have recorded the spectra on a Tek 1024 $\times$ 1024 CCD. The data were processed and analysed using IRAF routines.

Radial velocities were derived for several H, He I, and He II lines. Double features were observed in He I lines on 8 observations.

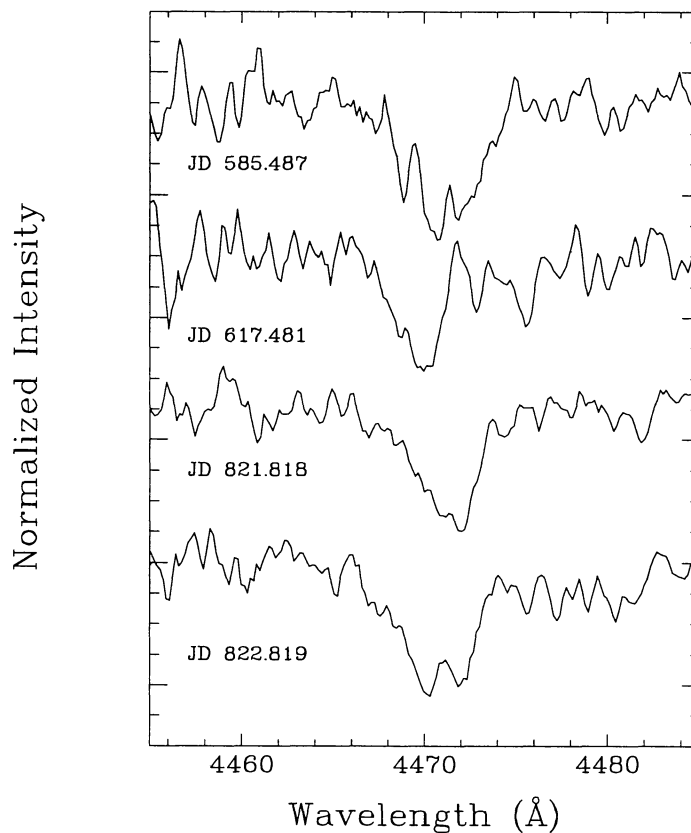


Fig. 1. Profiles of He I $\lambda 4471$ Å observed in star Tr 14 #3, showing the reported variations. 2,450,000.0 days must be added to the dates in the figure in order to obtain the Heliocentric Julian Date of each observation.

Figure 1 shows the profiles of the He I line $\lambda 4471 \text{ \AA}$ extracted from some of our observations of Tr 14 #3. From this figure, it is clear that a variation exists. The maximum measured separation between the two sets of lines is roughly 300 km s^{-1} . It is probable that the period of the radial velocity variations is a short one, because line shapes change noticeably from one night to the other. However, although from the present material we can safely conclude that Tr 14 #3 is a double-lined spectroscopic binary, more data are obviously needed for a proper determination of the period of radial velocity variations and remaining orbital elements. A higher signal-to-noise relation would be desirable in order to properly identify the secondary spectrum. We hope to obtain this material during the next observing season.

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REFERENCES

- Feinstein, A., Marraco, H. G., & Muzzio, J. C. 1973, *A&AS*, 12, 331.
García, B., Malaroda, S., Levato, H., Morrell, N. & Grosso, M. 1998, *PASP*, 110, 53.
Levato, H., Malaroda, S., García, B., Morrell, N., Solivella, G., & Grosso, M. 1991, *Ap&SS*, 183, 147.
Penny, L. R., Gies, D. R., Hartkopf, W. I., Mason, B. D., & Turner, N. H. 1993, *PASP*, 105, 508.