

EVIDENCE FOR SHOCKING BEHAVIOUR IN WR133

(HD 190918, WN4.5+O9.5I)

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Abstract. Analysis of radial velocities of the WR binary WR133 yield semi-amplitudes $K_{WR} = 49 \pm 2 \text{ km s}^{-1}$ and $K_O = 21 \pm 2 \text{ km s}^{-1}$ respectively and a mass ratio $q = 0.43$. The He II 4686Å profiles show increased blue emission when the base of the wind-interaction cone is directed towards the observer.

1. Introduction

The WN4.5 + O9.5Iab binary WR133 was observed using the 160cm telescope of l'Observatoire du Mont-Mégantic. Forty-three blue ($\lambda\lambda$ 4300–5000Å) and 21 yellow ($\lambda\lambda$ 4300–5000Å) spectra were taken from 1990 October to 1993 March and were processed using NOAO's IRAF package. They were then analyzed for radial velocity and emission line-profile variations.

2. Results

2.1 ORBITAL PARAMETERS

A radial velocity analysis was performed on the WR and O spectral components to derive the orbital parameters of the system assuming a period $P = 112^d.8$ (Fraquelli *et al.* 1987). The semi-amplitudes of the velocity curves were found to be 49 ± 2 and $21 \pm 2 \text{ km s}^{-1}$ for, respectively, the WR component (using the He II 4686, 5412Å and N V 4603Å emission lines) and the O component (using the H I 4340Å, He I 4471Å and C III 4650Å absorption lines). These give a mass ratio $q = 0.43$, giving a WR mass of $14.6 M_\odot$ adopting $M_{O9.5Ib} = 34 M_\odot$ (Prinja and Howarth 1990). This value of q is entirely compatible with the trend of q with spectral subclass (Cherepashchuk 1991). Those velocities and the assumed mass of the O star imply that the inclination of the system is $i = 53^\circ \pm 4^\circ$, in sharp contrast to the value of 15° found from the previous RV study of Fraquelli *et al.* (1987).

2.2 LINE-PROFILE VARIATIONS

The He II 4686Å emission line is the only line strong enough to make a search for variability worthwhile. However, even He II 4686Å shows no obvious changes to the eye. Only by submitting the line-profile to a skewness test was it found to be varying in phase with the orbital revolution. From orbital velocities, we find that the O star is nearly exactly in front of the WR star at phase 0.8. Consequently, near periastron, the wind interaction shock cone that wraps around the O star in a direction pointing away from

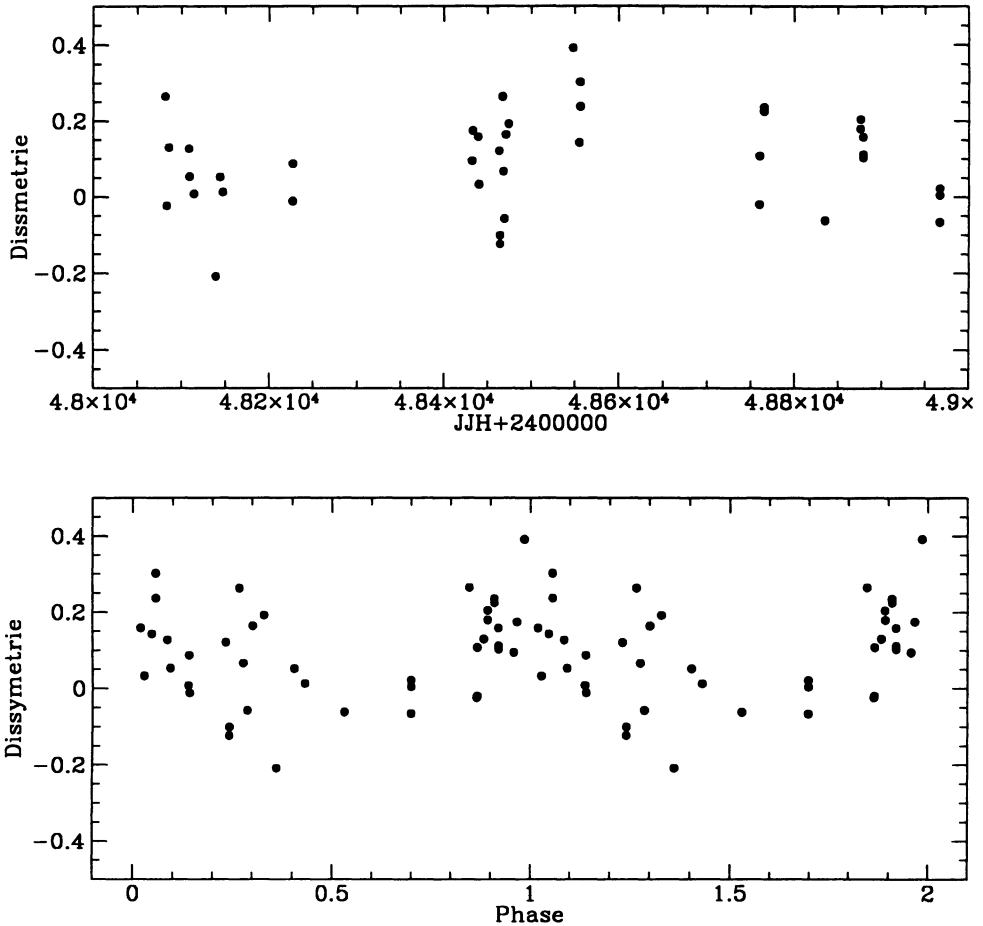


Fig. 1. Line profile skewness of He II 4686 Å as a function of phase. Note that the calculations were made ignoring the central part of the line-profile, which is perturbed by absorption from the O companion.

the WR star points toward the observer. The resulting increase in emission on the blue side of the line at this phase explains the observed behaviour of the skewness *vs.* phase-curve (Fig. 1).

References

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