γ Vel Revisited

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Abstract. We have carried out a full spectroscopic analysis of the WC8 star in the γ Vel binary (WR11). Through the binary radial velocity curve the mass of the WR star can be determined and hence its luminosity can be derived though the mass-luminosity relation for WR stars. This can be compared to the luminosity from the spectroscopic analysis. We find that the standard modeling methods underestimate the luminosity of the WR star.

1. The analysis

De Marco & Schmutz (1999) determined the parameters of the O star in the γ Vel binary by fitting simultaneously the absorption lines of the O star and the WR/O light ratio. In Table 1 the O star model parameters are summarized. The un-blended WR star spectrum is then recovered by subtracting the synthetic O star spectrum and scaling according to the WR/O light ratio. The de-convolved spectra of the O and WR stars are shown by Schmutz & De Marco (this proceedings).

The WR star is modeled using the Kiel code which implements the 'standard model' in the co-moving frame (Koesterke and Hamann 1995). The final model parameters are listed in Table 1, while example fits to the de-convolved WR11 spectrum are shown in Fig. 1. Helium lines are well fitted. The Balmer lines are under-fitted, which may point to the presence of hydrogen, possibly due to the contribution of the stellar wind from the O star. Not all lines of carbon are well fitted.

2. Conclusions

WR11 appears to be particularly hot for its spectral class (WC8). The model luminosity is lower than that inferred from its mass and the mass–luminosity relation (Schaerer & Maeder 1992; Table 1). When introducing line blanketing (a necessary step to determine the line force), this will be lower still, indicating that the model has too low a luminosity. Increasing the luminosity of the models, while maintaining the same synthetic spectrum and V brightness is one of the

Table 1. O and WR stellar parameters. For the system d=258^{+41}_{-31}pc, M_V=–5.39mag, ΔM=(1.47±0.13)mag and i = (63° ± 8°).

	O star	**WR star**
M_V(mag)	–5.14 ± 0.16	–3.67±0.16
$T_{\rm eff}$(K)	35 000±300	75 900±500
N[He](by number)	0.087	0.875
N[C](by number)	–	0.125
R($R_\odot$)	12.4±1.7	1.84±0.2
log($L/L_\odot$)	5.32±0.2	5.01
log($L/L_\odot$)M-L	–	5.18
$\mathcal{M}$($M_\odot$)	30±2[a]	9±2
log($\dot{M}/M_\odot$ yr^{-1})	–6.75±0.09[a]	–4.33
v_∞(km s^{-1})	2500±250[a]	1300±150

[a]Hydrodynamical wind solution.

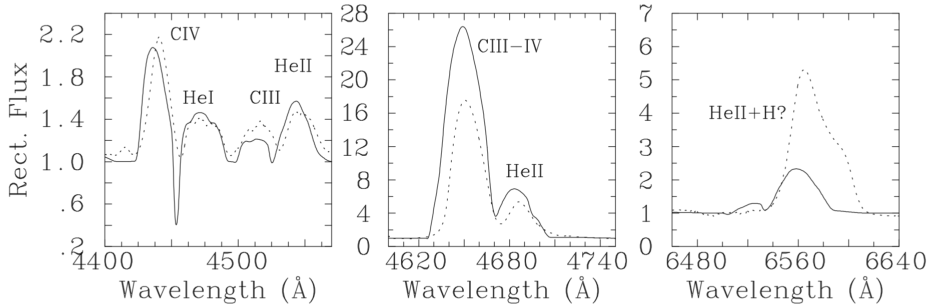

Figure 1. Example fits (solid line) to WR11 (dotted line).

achievements of the 'photon loss' mechanism (Schmutz 1997, see also 'γ Vel, photon loss and the velocity field' by De Marco et al., this proceedings).

References

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