Wolf-Rayet Stars
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Results Of The Spectroscopic Analysis Of WR6 Using CMFGEN

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Using ESPaDOnS optical spectra of WR6, we search variations on the stellar wind parameters during the different phases of the spectral variations. We use the radiative transfer code CMFGEN (Hillier & Miller 1998) to determine the wind parameters.

Our work gives mean parameters for WR6, $T_{\rm eff} = 55\,$kK, $\dot{M} = 2.7 \times 10^{-5}\,M_\odot$/yr and $v_\infty = 1700\,$km/s. Furthermore the line profiles variations at different phases are the consequence of a variation of mass loss rate and temperature un the winds. Effective temperature reaches 59 kK at the highest intensity, whereas the mass-loss rate decreases to $2.5 \times 10^{-5}\,M_\odot$/yr in that case. On the other hand, effective temperature decreases to 52.5 kK and the mass-loss rate increases to $3 \times 10^{-5}\,M_\odot$/yr when the line profile reach its minimum intensity.

Results confirm the variable nature of the stellar wind, presented in this case on two of its fundamental parameters: temperature and mass-loss; which could be used to constrain the nature of the instability at the basis of the wind.

WR6 shows a large-scale variability observed with a period of $P = 3.77$ days (Lamontagne et al. 1986). Morel et al. (1997) suggested this variability might be caused by Corotating Interaction Regions (CIR) as modelled by Cranmer & Owocki (1996).

The results of our analysis of the mean spectrum and at the maxima and minima line profile intensity phases are presented in Table 1. A comparison to previous studies is also presented.

The variation of HeII line profiles are due to variations of stellar wind properties. Since these line profile variabilities are an observational consequence of the presence of CIRs (Cranmer & Owocki 1996), we suggest the idea that the variations found are due to the difference in the structure of the wind across the different observed faces of WR6 during its rotation.

By the other side, it is known the CIRs are probably produced by instability on the stellar surface (Cranmer & Owocki 1996). In that case, the range of the variations found could be a first-order representation of the CIR physical conditions.

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Tab. 1: Parameters found by the present work for WR6 for mean, lowest profile and highest profile, compared with those determined by Morris et al. (2004) and Hamann et al. (2006).

Parameter	Morris et al.	Hamann et al.	Mean	Lowest Profile	Highest Profile
$T_{\rm eff}$ [kK]	52	54.3	55.0 ± 1.0	52.5 ± 1.5	59 ± 1.5
$\dot{M}[M_\odot/{\rm yr}]$	1.25×10^{-5}	5×10^{-5}	$2.7(\pm 0.2) \times 10^{-5}$	$3(\pm 0.2) \times 10^{-5}$	$2.5(\pm 0.2) \times 10^{-5}$
v_∞ [km/s]	1 800	1 700	$1\,700 \pm 10$	$1\,700 \pm 10$	$1\,700 \pm 10$
f	0.1	0.25	0.09 ± 0.01	0.1 ± 0.01	0.08 ± 0.01
$v_{\rm CL}$	-	-	50 ± 30	50 ± 30	50 ± 30