Wolf-Rayet Phenomena in Massive Stars and Starburst Galaxies
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Wolf-Rayet stars in I Zw 18

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Abstract. Wolf-Rayet stars have been detected in the NW region of the metal–poor starburst galaxy I Zw 18. The integrated luminosity and FWHM of the bumps at 4650 Å and 5808 Å are consistent with the presence of a few individual stars of WC4 or WC5 type. The unexpected presence of WC stars in such a low-metallicity galaxy could, however, be explained by high mass loss rates, or alternatively favor a binary channel for WR formation. WC stars could also account for the strong and narrow He II 4686 Å emission line which peaks co-spatially with the WR bump emission (see Schaerer 1996).

1. Introduction

I Zw 18 is known to be the most metal-deficient object among the blue compact dwarf galaxies (BCDs), with a metallicity of 1/40th of the solar value and undergoing a strong star formation event. Moreover, this galaxy presents a strong He II 4686 Å narrow emission line.

2. Observations and discussion

Seventeen exposures of 3000 seconds each of the BCD I Zw 18 were obtained with the 3.6m *CFHT*. A long slit (1.″52 wide) was used with a position angle of 45°, covering the spectral range 3700–6900 Å. A complete description of the observations can be found in Legrand *et al.* (1997). We found two faint broad emission features, typical of WC stars, around 4650 Å and near 5812 Å (Fig. 1). Similar features have been observed by Izotov *et al.* (1998) with a different slit position.

Using the models of Stasińska & Leitherer (1996), we checked that these bumps were not due to narrow nebular emission lines such as C III 4650 Å, O II 4651 Å, [FeIII] 4658 Å, [ArIV] 4711,4740 Å and N III 4634,4640 Å. After subtraction of the expected nebular lines, the residual bumps appears centered at 4645 Å and 5820 Å with fluxes of respectively $9.90\,(\pm 3) \times 10^{36}$ erg s^{-1} and $4\,(\pm 1.5) \times 10^{36}$ erg s^{-1}. The calibration of Smith (1991), indicates that these

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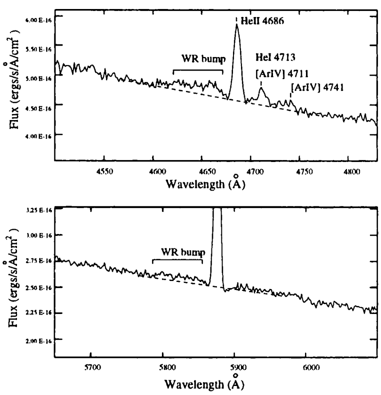

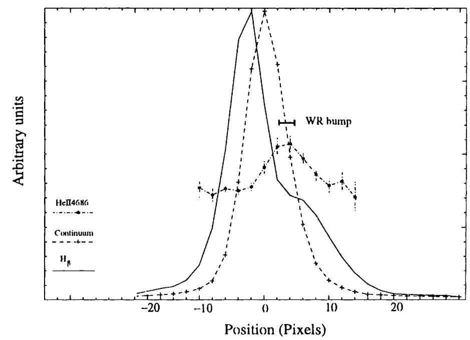

Figure 1. *Left:* Regions of the spectrum of I Zw 18 around the He II 4686 Å (upper) line and the He I 5876Å (lower). The spectrum is integrated over 7.″8 centered on the maximum continuum emission. The broken line shows the position of the fitted continuum.

Figure 2. *Right:* Spatial location of the different spectral emission features along the slit (1 pixel = 0.″3145). Position of the maximum emission in the WRbump is indicated with bold line.

fluxes are compatible with the presence of one or two WC4 or WC5 stars, and no WN. However, we cannot exclude the presence of WN in I Zw 18 at other positions, as discussed by De Mello *et al.* (1998).

Moreover, we find that the bumps at 4645 Å and 5820 Å are correlated in position with the maximum of the nebular emission line He II 4686 Å relative to Hβ (Fig. 2). This indicates, as suggested by Schaerer (1996), that WR stars can be responsible for the nebular emission line He II 4686 Å.

Finally, the presence of WR stars in such a low-metallicity galaxy indicates, that mass loss rates may be twice higher than the standard value adopted for very low metallicities, or that the binary channel is an important process of WR stars formation.

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