ON THE PUZZLING LINE SPECTRUM OF THE B[e] -SUPERGIANT R 4 OF THE SMC

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The early-type supergiants of the Magellanic Clouds (MC's) include a class of objects, the B[e] -supergiants, which are described in detail in Zickgraf et al. (1985, 1986) who suggested a two-component wind model consisting of a cool, dense and slowly expanding disk-like equatorial wind component and a hot line-driven fast polar wind. This model could explain many properties of most of the B[e] -supergiants as e. g. the occurrence of "shell" absorption lines. R 4 of the SMC, however, although well fitting to the general scheme of B[e] -supergiants exhibits several peculiarities of its line spectrum, which make this particular star an exceptional case among the B[e] -supergiants of the MC's.

The spectrum is dominated by very rich and complex emission-lines of H, FeII, [FeII] , [FeIII] , [SII] , [SIII], [NII] , and [OI] . The Balmer-lines have P Cygni profiles with a composite emission consisting of a sharp (FWHM = 75 km s^{-1}) strong central emission and a shallow and broad component.

In Fig. 1a the emission-line profiles of several ions are shown on a velocity scale. Obviously large differences of the radial velocities and line widths of the various ions are present with the very narrow FeII-lines being significantly less red-shifted than the broad [OI] -lines. Whereas the emission-lines generally are symmetric the line-profiles of [SII] and [SIII] are exceptional, being clearly asymmetric.

In addition to the emission lines several photospheric absorption lines of SiIII, SiIV, OII, and HeI (spectral type BO-BO.5) and some very sharp "shell" absorption lines of TiII and CrII are present. Surprisingly these "shell"-lines are red-shifted with respect to the systemic velocity (as given by the SiIV-lines (see Fig. 1b)) and with respect to all emission lines apart [OI] . A binary system with spatially separated absorption and emission regions could possibly provide an explanation for the complex line-spectrum of R 4.

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A more detailed discussion of the spectrum of R 4 is forthcoming.

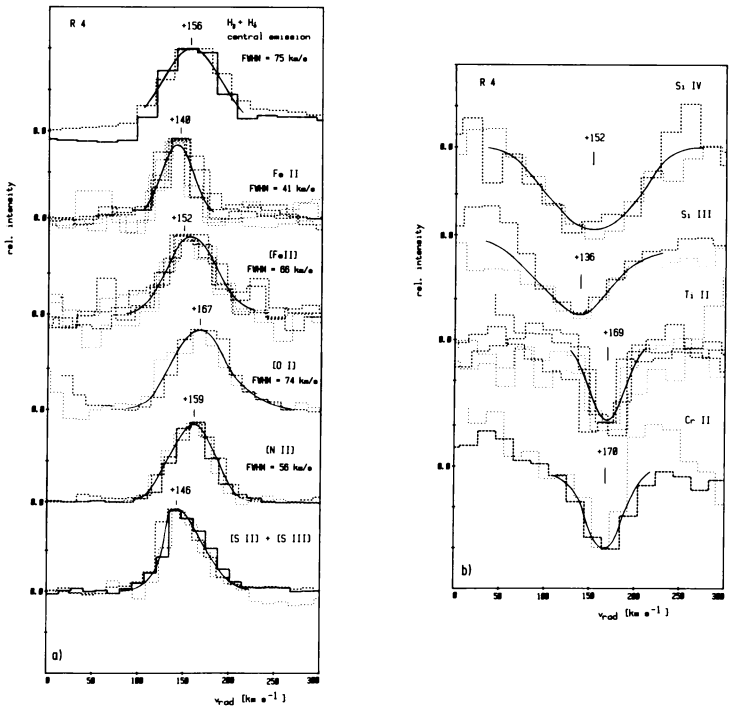

Figure 1. a) Emission-line profiles of various ions. After subtraction of the continuum the line fluxes were scaled to equal height of the emission peaks. Gaussian profiles were fitted to the mean line profile of each ion (solid lines) except the asymmetric lines of [SII] and [SIII] , for which only the mean profile is indicated. Large differences of the radial velocities and line widths are present.

b) same as a) for absorption lines. The "shell" absorption lines of TiII and CrII are much narrower than the photospheric lines of SiIII and SiIV. Surprisingly they are red-shifted with respect to the systemic velocity (given by SiIV) and with respect to all emission lines apart [OI] . The spectra (λλ 3920 - 4950, λλ 5740 - 6800 Å) were taken in August 1984 with the CASPEC spectrograph at the 3.6 m telescope at ESO/La Silla.

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