FeII IN THE UV SPECTRUM OF LUMINOUS EMISSION LINE STARS

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Following the excessive mass loss rates we derived in a previous analysis of the FeII emission and absorption lines of some luminous Magellanic Clouds stars, assuming the two components formed in the same region (Muratorio et al., 1984), we again analysed the FeII data using the same method (Muratorio, 1985), but taking into account the presence of high velocity winds detected in some stars (R66, R126) by the study of the high dispersion IUE spectra (Stahl et al., 1983; Zickgraf et al., 1985).

The synthetic UV spectra calculated with such an hypothesis is found to fit very well the observed IUE spectra not only for R66 (Fig. 1), but also for S22 (Fig. 2). For this later star, we derived a wind velocity of 280 km s^{-1} and a density of Fe^+ of 6 10^4 ions cm^{-3} at a maximum radius of 1.4 10^{13} cm. Assuming most hydrogen ionized in the wind, all iron in the Fe^+ state, a metastable level excitation temperature of 5700 K derived from the emission line study (Muratorio, 1985), a mass loss rate of 7 $10^{-6} M_\odot$ y^{-1} is obtained. In such an hypothesis, the optical region emission lines originate from a zone which, most of part, cannot lie on the line of sight of the star, while the above defined wind produces by itself the observed UV dominant absorption line spectra. The emitting region could be a disk, whose radius would lies between a minimum of 4.8 10^{13} cm and a maximum of 5 10^{14} cm. These quite high values compared with the stellar radius $R = 3.2$ 10^{12} cm, calculated assuming for the star an effective temperature of 18000 K, exclude the formation of the emission lines in a chromosphere. Moreover, an illuminated disk can explain (Friedjung, 1985) the peculiar near-infrared energy distribution of S22 as well as that of various other stars studied (Muratorio, 1985). The presence of dust, generally argued to explain the infrared excess longward of 2 μm is compatible with this model, as the physical conditions in the outer parts of a disk favour the formation of dust grains.

In the case of R66 the figure 1 synthesis is computed assuming the ultraviolet absorption lines formed in a wind of 300 km s^{-1} originating at the photosphere of radius 8.6 10^{12} cm with a density at that radius of 4 10^9 cm^{-3}; these values lead to a mass loss rate of 6 10^{-6} $M_\odot$ y^{-1}. The optical emission lines may originate in a disk whose radius lies between 1.6 10^{13} cm and 3.3 10^{14} cm. The same metastable level excitation temperature (6300 K) is assumed for both media.

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In the case of R126, the absence of FeII absorption lines in the IUE spectra suggest that the emission lines can be formed in a disk like region as was pointed out by Zickgraf et al.(1985). The disk radius is estimated to lie between 3.9 10^{13} and 7.8 10^{13} cm, while the radius of the star is 5 10^{12} cm.

FeII emission and absorption lines of the variable P Cygni star AG Car, originate from a variable velocity wind for which at the date of our observations (1981/11/9) we derived the values: V = 70 km s^{-1} Metastable level $T_{exc} = 7500K$ $4\ 10^{12} < R < 1.2\ 10^{13}$ cm $\dot{M} = 6\ 10^{-6}\ M_{\odot}\ y^{-1}$.

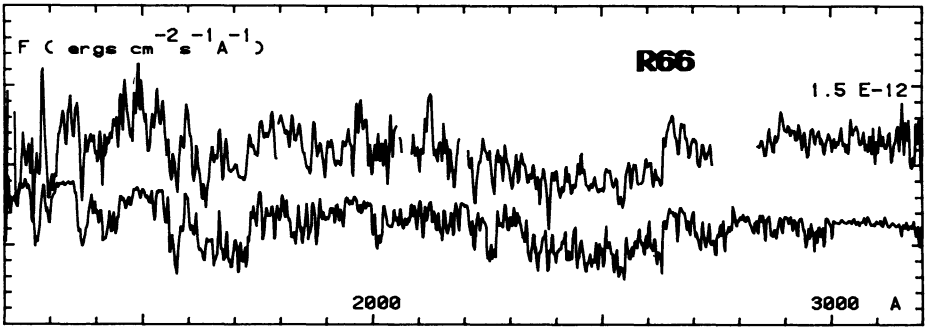

Fig 1 : R66 IUE spectra (SWP 12856,LWR 16619) Dereddened (E(B-V)= .12)
5 E-13 verticaly shifted (upper curve)
Fe II synthetic spectrum (Disk + High velocity wind) (lower curve)

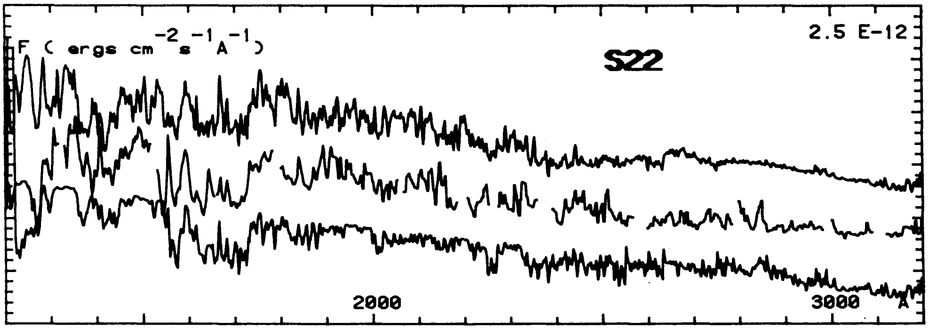

Fig 2 : Fe II synthetic spectrum (Low velocity wind) 1E-12 vert shifted (upper curve)
S22 IUE spectra (SWP 6868,LWR 7881) Dereddened (E(B-V)=.17)
5E-13 vert shifted (intermediate curve)
Fe II synthetic spectrum (Disk + High velocity wind) (lower curve)

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