LINE FORMATION IN THE WIND OF ALPHA CYGNI.

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ABSTRACT

We summarize the results of recent IUE observations of the spectra of α Cygni and discuss possible explanations for the Doppler-shifted pure absorption profiles in the resonance lines of the singly ionized metals. The results of detailed modeling for MgII λ 2795, 2802 are presented, and discussed in the context of observations of α Cyg in the radio, infrared, visible, ultraviolet and X-ray parts of the spectrum.

Our results indicate that the broadly satured sharp-sided profiles of these lines could be the result of any of several atmospheric/wind models. A set of models with mass-loss-rate about 10^{-5} solar masses per year is presented in which the deep, violet-shifted absorption lines with no emission features are formed in a dense, relatively compact accelerating layer by collisional de-excitation of the upper state. However, recent 6 cm radio observations (Abbott et al. 1979) place an upper limit of 2×10^{-7} $M_{\odot}$/yr on the mass-loss-rate of α Cyg. We conclude that a more plausible structure, with $\dot{M} \approx 2 \times 10^{-7}$ $M_{\odot}$/yr, which also produces profiles like those observed is one in which the P Cygni emission feature from scattering in the wind is just cancelled by the broad photospheric absorption profile. The range of mass-loss-rates and the role of microturbulence in this class of models is discussed.

C. Chiosi and R. Stalio (eds.), Effects of Mass Loss on Stellar Evolution, 159–160.

DISCUSSION

STALIO: How did you adopt a velocity law when it is clear that different velocities laws give profiles which are the same within the observational errors?

KUNASZ: I will try to describe briefly the range of velocity functions which predict the profiles observed in Cyg. The maximum velocity is limited by the displacement of the blue edge of the observed line, and the microturbulent velocity together with the density of the wind: V_{edge} (observed) = V_{max} + V_{turb}, where depends on . The accelerating layers must terminate between 1.2 and 1.6 stellar radii. The actual velocity field in model "C", with $\dot{M}$ = 5×10^{-8} $M_{\odot}$/yr, accelerates from very small values to V_{max} between 1.2 and 1.4 x R* and is linear in this zone. The speed of the wind below 1.2 x R_* is used as a parameter to chose $\dot{M}$ for any candidate model.

https://doi.org/10.1017/S0252921100094744 Published online by Cambridge University Press