LATITUDE DEPENDENT RADIATIVE WIND MODEL FOR Be STARS: LINE PROFILES AND INTENSITY MAPS

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1. The hydrodynamical code

We present theoretical line profiles and intensity maps from an axi-symmetric radiative wind model from a fast rotating Be star (Araújo & Freitas Pacheco, 1989; Araújo *et al*, 1993). The introduction of a viscosity parameter in the latitude dependent hydrodynamic code enables us to consider the effects of the viscous force in the azimuthal component of momentum equations. The line force is the same as Friend and Abbott (1986), but it is introduced a varying contribution of thin and thick lines from pole to equator by adopting latitude-dependent radiative parameters. The numerical calculation for parameters characteristic of early Be stars gives a density contrast between equator and pole of the order of 100. The total mass loss rates range from 10^{-8} to 10^{-7} solar mass per year. Furthermore, the "opening-angle" usually adopted in had-hoc models (Lamers and Waters, 1987; Waters et al.,1991) arises naturally as a result of our model. The velocity fields and density laws derived from the hydrodynamic equations have been used for solving the statistical equilibrium equations. By adopting the Sobolev approximation, we could easily obtain a good estimate of both electronic density and hydrogen level populations throughout the envelope (Stee and Araújo, 1994).

2. Results

We obtain double-peaked (asymmetric) Hα and Hβ emission profiles from our rotating and expanding wind model. Our computation takes into account the portion of the envelope occulted by the stellar disc and the absorption photospheric line. However the full width at half maximum of these profiles are larger than those usually seen in Be stars. This large FWHM reflects the strong radial flow present at all stellar latitudes in addition to the rotational field due to the fact that the star rotates at 70% of its breakup velocity.

On the other hand we have shown intensity maps of the circumstellar envelope in the lines and continuum. From them we could also estimate that the Hα emission region is wider then the Hβ one. Moreover, our results show clearly that the envelope morphology depends not only on the inclination angle but also strongly on the central observational wavelength and

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bandwidth. In addition the $\lambda = 0.65\ \mu$m map supports the usual interferometric calibrations based on a "point-like" continuum source which is used as a reference signal (Mourard et al., 1989).

The fast acceleration to high terminal velocities is characteristic of line-driven wind models (Poe and Friend, 1986; Koninx and Hearn, 1992), making them inadequate for equatorial regions of Be stars. In order to improve our line profiles for reproducing realistic FWHM we are currently considering several mechanisms for decelerating the wind. For instance Iglesias and Ringuelet (1993) have presented hydrodynamical codes including a weak magnetic field and an arbitrary force term of the form $1/r^2$. They obtain terminal velocities ranging from 24 to 740 km s^-1. We remember that the force term has a dependence of the form $\frac{1}{r^2}(\frac{dv}{dr})^\alpha$ with $\alpha = 1$ for optically thick and $\alpha = 0$ for optically thin lines. In addition Shimada *et al* presented in this meeting new calculations of the radiative force including 520000 lines. Their results indicate that the value of the α parameter is smaller than those used up to now, what would decrease the wind velocity. Another way to slow down our wind may consist on including a radial viscosity which however could introduce a meridional velocity gradient in contradiction to our initial assumption of no meridional flow. On the other hand, a supersonic wind produce shock waves which may perhaps slow down the expansion motion. These mechanisms will be investigated within the framework of our model to develop an improved physical model in the future and hopefully used to interpret directly the observations from optical long baseline interferometry.

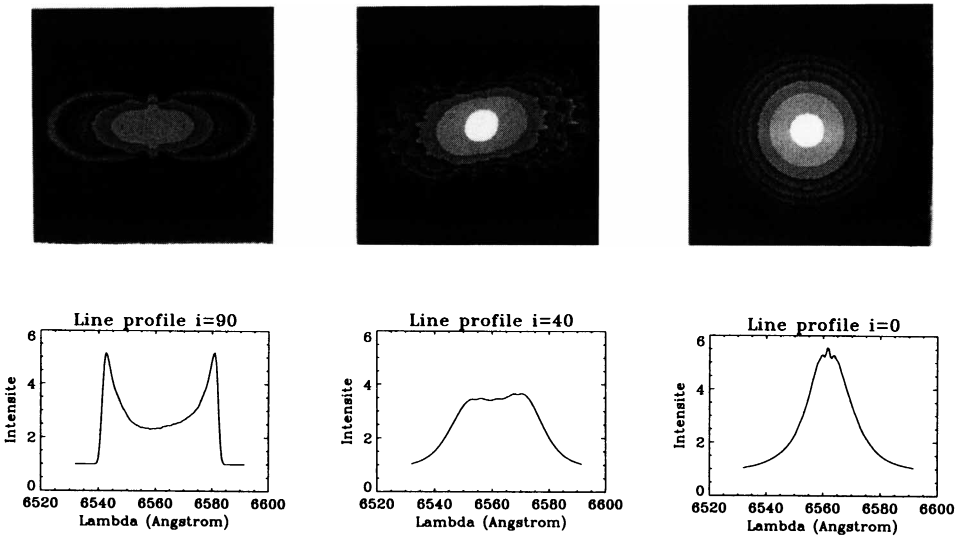

Fig. 1. Hα intensity maps at various inclinations, centered on 6562Å with a bandwidth of 1Å. Left $i = 90°$, center $i = 45°$, right $i = 0°$ (pole on)

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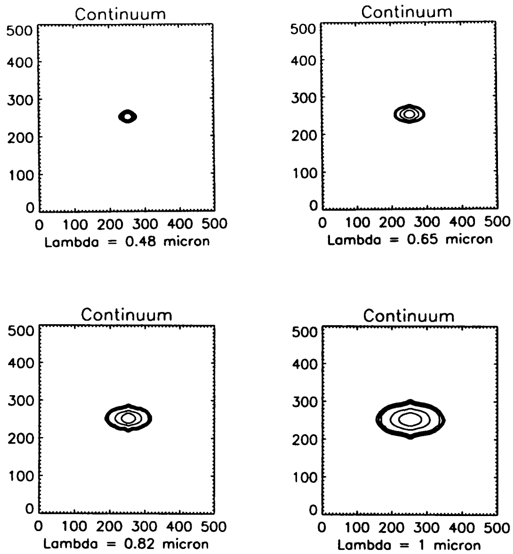

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