MODEL OF DUSTY ENVELOPE OF ETA CARINAE

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Eta Carinae is a well-known example of a star with a massive circumstellar nebulous shell. The shell is regarded as a remnant of a great outburst of the star in the last century. η Car parameters remain to be a matter of scientific debates: most often investigators revise stellar temperature T , mass loss rate $\dot{M}$, the velocity of outflow V . We have worked out several numerical evolutionary models of η Car envelope (the homunculus) paying attention to the dependence on the mentioned parameters. The dependence on the parameters of grain evolution was also considered. For a representative model we fixed: V=500km/s; $M=10^{-1}M_{\odot}/y$ during the first 15 years of the outburst and slowly decreasing in time, T=20000K. A coupled two-components hydrodynamical and radiation model transfer problem has been solved.

The theoretical light curve is shown in Fig. 1a together with the observed one (van Genderen A.M., Thé P.S., 1985, Space Sci. Rev., 39, 313). The theoretical curve properly reproduces the dimming timescale and the depth of the observed curve. Theoretical spectrum shown in Fig. 1b displays discrepancies with observations in short waves. The deficit of optical radiation can be explained only by non-uniformity of the dust envelope which increases the contribution of scattering. The slope of far infrared spectrum is due to the adopted extinction tables. Angular distribution of monochromatic brightness (normalized, in arbitrary units) is shown in Fig. 1d.

The analysis of the models with varied parameters gives the following results:

The temperature of the central source should be no less than 20000K (the best fitting at $25\text{-}30 \cdot 10^3$K).

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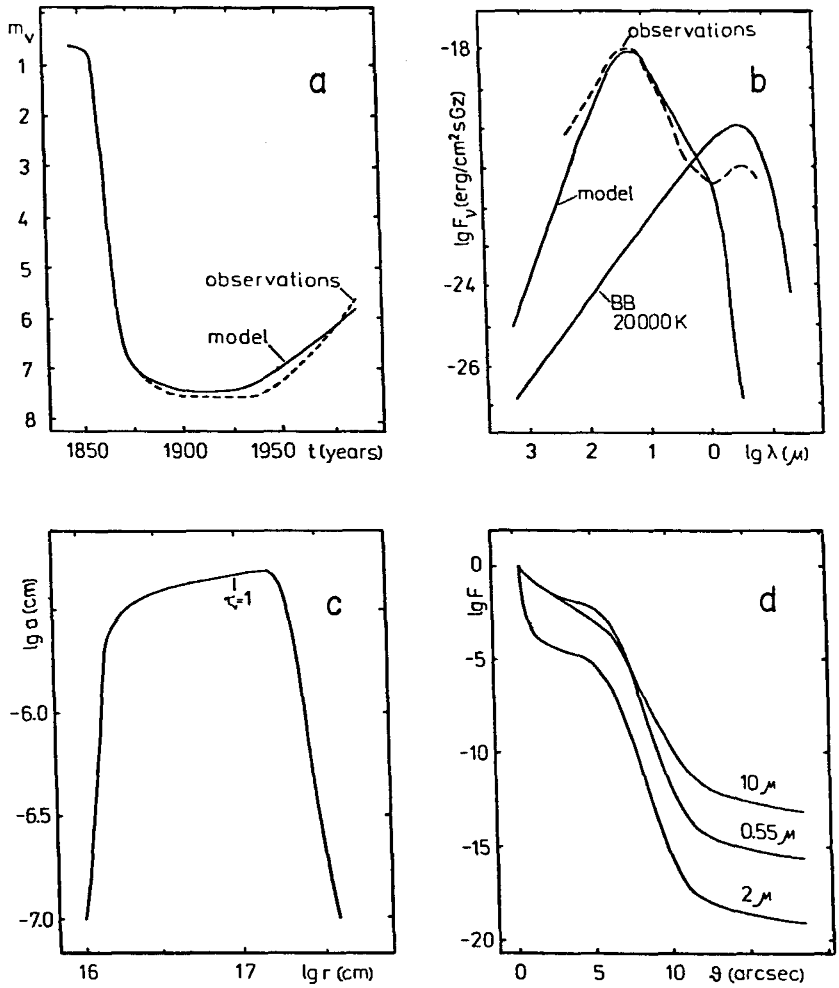

Fig. 1. η Car model (see explanations in text)

The velocity of the outflow (if constant in time !) should exceed 300-500 km/s.

Mass loss rate should be high during the last 150 years (presumably higher than $3 \cdot 10^{-2} M_{\odot}/y$).

Dust grains seem to be larger at larger distances, according to the model (Fig. 1c).