OUTFLOW OF MATTER IN THE CHROMOSPHERE OF α ORIONIS

L. Goldberg
Kitt Peak National Observatory

The spectrum of α Orionis is composite and consist of three components: 1) a photospheric spectrum characterized by symmetric absorption lines more or less typical of the spectrum of an M2 supergiant, except for their very great widths; 2) a shell spectrum consisting of P Cygni-type profiles of neutral and singly-ionized metallic lines of very low excitation potential; and 3) asymmetric absorption lines, including H_α, H_β, FeI lines of intermediate excitation potential and the infrared triplet of Ca+, which appear to be formed in a relatively warm layer, probably an extended chromosphere.

Previous studies of these lines by Weymann and by the author and his collaborators at KPNO have shown that they are probably formed at considerable heights above the photosphere (>1 R_*), but interior to the circumstellar shell, in a region in which the outward flow is accelerating from the center-of-mass velocity 21-22 km/sec to about 15 km/sec heliocentric velocity. Recently, new observations of the 8498Å and 8542Å lines of Ca+ with signal-to-noise of 500 have been obtained at KPNO with the Fourier Transform Spectrometer at the coudè focus of the 4m telescope. Measurements on these low-noise profiles show that the radial velocity varies from 22 km/sec in the wings of the lines to about 11 km/sec at the point of minimum intensity in the 8542 line, the latter value being almost exactly equal to the shell velocity. Detailed study of this transition region, in which the mass flow is being initiated and accelerated, is of critical importance to improved knowledge of the mechanism and rate of mass loss in late-type supergiants. Calculations will be presented on the feasibility of direct observational determinations of the heights and thicknesses of such transition regions in bright supergiants by the techniques of speckle interferometry and lunar occulations.

C. Chiosi and R. Stalio (eds.), Effects of Mass Loss on Stellar Evolution, 111–112.

DISCUSSION

KUNASZ: Please comment further on the erosion of the blue edge due to emission. Do you imagine a predominantly emission larger at a greater distance from the photosphere than the layers where absorption dominantes?

GOLDBERG: About half of the emission is outside a radius of 1" and therefore the profile depends very much on the spectrometer aperture and the seeing. But the separation of emission and absorption is purely empirical and independent of any assumption about the heights of origin of the absorption and emission.

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