A NEW MODEL FOR ALGOL (β PERSEI)

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We studied the circumstellar gas in Algol (β Persei) by analysing Hα *difference profiles* (observed profiles minus composite theoretical (LTE) photospheric absorption line profiles of the stars), at 98 phases in the binary's orbit (cf. Richards 1986, Ph.D. thesis, University of Toronto). The data were obtained from Sept. 1976 to Dec. 1977; with an average phase interval of 0.02 over the entire orbit.

There was a smooth change in the profiles from strong, redshifted emission just outside primary eclipse, to an almost flat profile at mid-secondary eclipse, to strong, blueshifted emission just before primary eclipse began. Absorption was detected throughout primary eclipse, and there were smooth transitions between pure absorption and pure emission. The emission and absorption had FWHM's of $\sim$200 km s^{-1} and $\sim$200 to 450 km s^{-1}, respectively; with line strengths up to 10% and 19% of the continuum, respectively.

There was also a broad ($\pm$ 20 Å), weak (strength $\sim$5% of continuum), approximately symmetric, absorption trough on either side of the emission and the less-broad absorption discussed above. These features were visible at all phases, but only from Dec. 1976 to Mar. 1977.

The transition from pure absorption to pure emission (and *vice versa*) occurred over a part of the difference profile which represented a certain wavelength (or velocity) range. This range was unchanged throughout the transition, so the transition profiles were all produced by the same region of gas. We used the phase range over which each transition occurred to tightly define the location of the emitting/absorbing gas because we felt that the transitions occurred whenever there was a change in our view of the gas. In other words, absorption and emission were produced when the gas was seen against the disk of the primary, and the sky, respectively.

Our new model for Algol contains a two-component circumstellar gas. The first part is a variable, high density ($N_e \sim 10^{11}$ cm^{-3}), low mass ($M \sim 10^{-13} M_\odot$), *localized region* (LR) whose area is 1 to 3% of the surface area of the primary. The LR is found close to the photosphere of the primary, but high above the orbital plane, and between the primary and the secondary; and was the source of the Hα emission and the less broad Hα absorption. The second part is a *high-rotational-velocity region* (HRVR) which surrounds the primary, and which was the source of the very broad, shallow absorption component seen from Dec. 1976 to Mar. 1977.

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