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Low-Excitation Herbig-Haro Objects and Interstellar Extinction

Final Technical Report

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Previous work on low-excitation Herbig-Haro (HH) objects (Schwartz 1983)¹ has confirmed the existence of a strongly-enhanced hydrogen two-photon continuum which is produced by low-velocity shocks in neutral material. In the present study, we have compared the theoretical two-photon energy distribution with that observed for HH 43. With the addition of optical ($3300 < \lambda < 7000\text{\AA}$) data to the ultraviolet ($1200 < \lambda < 3100\text{\AA}$) data obtained with the I.U.E, the wavelength dependence of interstellar extinction toward HH 43 has been determined.

In summary, the extinction curve appears to follow that found for the nearby θ Ori group of stars, with nearly neutral UV extinction, and an enhanced ratio of total to selective absorption ($A_V/E(B-V) > 5$). A best fit of observed data to the theoretical curve yields $E(B-V) = 0.2$. Continuum and emission-line data for HH 43 have been corrected for extinction, and an analysis of the energetics of the shock-excited pockets of gas has been carried out. Evidence suggests that a young, embedded stellar object with a luminosity of about $5 L_\odot$ is producing a collimated, supersonic flow of material in which the HH 43 shocks appear with a luminosity of $\sim 0.25 L_\odot$. The mechanical luminosity associated with the outflow must therefore be a substantial fraction of the total luminosity of the young star.

This work has been reported at the January, 1985 meeting of the A.A.S. in Tucson (Schwartz and Dopita 1984), and a detailed paper is in press (Schwartz, Dopita, and Cohen 1985).

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