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N87-15060

SUBMILLIMETRE MOLECULAR LINE OBSERVATIONS OF M17 - THE INTERACTION OF AN IONISATION FRONT AND MOLECULAR CLOUDS.

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An area of about 9 by 10 arc minutes in the M17 molecular cloud has been mapped in the J=3-2 transition of CO. The strongest CO emission is observed to come from the two bars to the north and southwest, which lie just outside the areas of ionised gas seen in the radio continuum studies.

We are viewing the boundary between the ionised and molecular gas almost edge on. The most intense CO emission is from the area around the dense molecular cloud core M17SW in the southwest bar. To the east of M17SW there are signs of recent or continuing star formation including H_2O masers and an ultra-compact HII region (Genzel and Downes 1977, White and Macdonald 1979 and Felli, Churchwell and Massi 1984).

The CO J=3-2 spectra observed are complex with considerable variation in line shapes occuring over distances of less than one arc minute. We interpret the velocity structure of this region as arising from an ensemble of molecular cloud fragments in addition to extended emission. We have identified several cloud components at different velocities within both the northern and southwest bars of CO emission. In the northern bar the 23 km s^{-1} cloud reported by Lada (1976) is clearly identified. This lies behind the northern bar observed at radio and optical wavelengths. There is also some spatial correlation between the positions of individual cloud components we have identified and the peaks of H_2 v=1-0 S(1) emission observed by Gatley and Kaifu (1985), from which it appears that some cloud components may consist of post-shock molecular gas.

A simple kinematic model of the cloud components in the southwest bar in which they are considered to be clumps of post-shock gas lying close to the edge of the expanding HII region, with the shock being driven by Kleinmann's star, gives a velocity of $10.8^{+2.8}_{-1.0}$ km s^{-1} for the expansion velocity of the HII region, which is currently at a distance of $2.4^{+0.5}_{-0.6}$ pc from Kleinmann's star. The resulting shock is thought to be preceding the ionisation front and appears to have led to the fragmentation of the original cloud.

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Figure 1. Maps of the CO J=3-2 emission integrated in 2 km s^{-1} intervals. The central velocity of the relevant interval is given on each map. The positions at which spectra were obtained are marked with a dot on the 8 km s^{-1} map.