for a ^{13}CO cavity of approximately 0.6 pc in radius around the Trapezium stars, whose form is fairly anisotropic. The velocity distribution of the material comprising the cavity wall is rather systematic but is as well asymmetric, which does not permit an explanation in terms of the uniform expansion of a simple shell.

Outside the central 1 pc of the nebula, the ^{13}CO emission is extended in a complicated shape. It seems that a significant portion of the extended ^{13}CO emission is also interacting with the H II region. On the northeast rim of the nebula, a belt of ^{13}CO emission is likely to be responsible for the asymmetric expansion of the nebula.

It is not clear if the ^{13}CO features identified represent swept-up material due to the H II region; in some cases, we find that initial inhomogeneities of the undisturbed cloud can explain better the molecular distribution.

We investigated gravitational stability of each ^{13}CO feature by using the virial theorem, taking into account the pressure of the H II region. Most of the ^{13}CO features are found to be in nearly gravitational stable equilibrium, and we find no strong evidence of unstable molecular features which may lead to the formation of OB subgroups.

THE SHOCKED MOLECULAR GAS IN THE ORION BRIGHT BAR

Toshihiro Omodaka
Kagoshima University, Japan
Masahiko Hayashi
University of Tokyo, Japan
Tetsuo Hasegawa
Nobeyama Radio Observatory, Japan
Ian Gatley
United Kingdom Infrared Telescope, Hawaii, USA

The Orion bright bar, a bar shaped optical feature, is seen about 2 arcmin southeast of the Trapezium stars in the Orion nebula. Since the bright bar is probably an ionization front seen edge on, this region has an ideal configuration to investigate a shocked region generated by an expanding H II region.

We have observed CO, ^{13}CO, CS(J = 1-0/2-1), HCO^+, HCN and H51α lines across the bright bar using the 45m telescope at Nobeyama. Figure 1 shows the position velocity diagram for the CO, ^{13}CO and CS(J = 1-0 and J = 2-1) lines across the bar. The intensities of all the molecular lines increase rapidly at the southeastern side of the ionization front where the emission peak moves from $V_{LSR} \cong 9$ km s^{-1} to V_{LSR}= 10-11 km s^{-1}. Then the intensity falls off at about 50"(0.1 pc) away from the bright bar with the peak velocity moving back to 9 km s^{-1}. The intensity and velocity variations are caused by the presence of the 11 km s^{-1} molec-

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ular cloud associated with the bright bar (Schloerb and Loren 1982). We have shown that the edge of this molecular cloud is very sharp and is consistent with the ionization front (Omodaka, Hayashi, and Hasegawa 1984) and that this cloud is localized to the southeast of the bright bar with its width of 50"(0.1 pc).

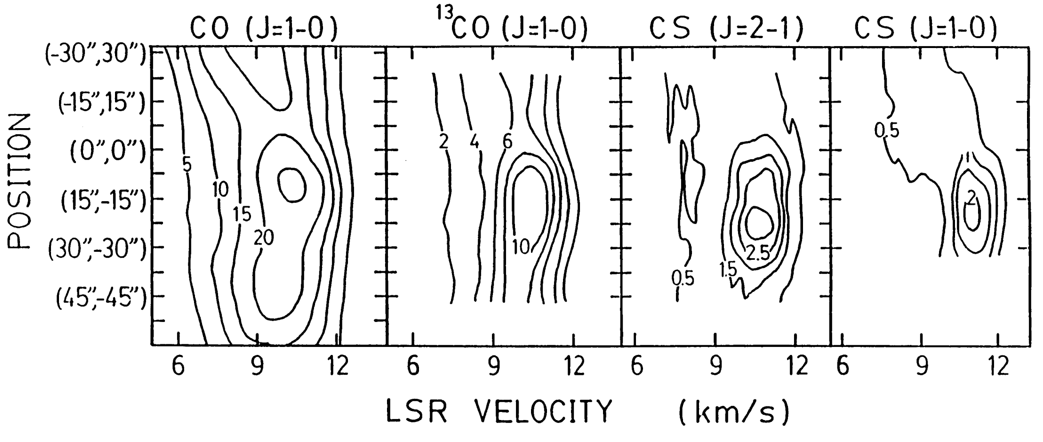

Fig. 1. Position velocity maps of the CO, ^{13}CO, and CS(J = 2-1 and J = 1-0) emission across the bright bar. Positions are expressed in terms of offsets in right ascension and declination from a reference position, R.A. = $5^h32^m52.7^s$, decl. = 5°27'00" (1950.0); this position is the one of the optically bright bar (Omodaka *et al.* 1984).

Figure 2 summarizes the spatial variations of the 11 km s^{-1} component of the molecular line emission together with the molecular hydrogen emission from the vibrationally excited states. The molecular hydrogen emission with larger v = 1-0 S(1) to v = 2-1 S(1) line ratio originates from shock fronts as has been discussed by Hayashi *et al.* (1985). Since the spatial variation at this ratio is similar to those of the 11 km s^{-1} component of the millimeter-wave molecular lines, the molecular cloud associated with the bright bar is probably a shock compressed layer. The shock is driven by the expansion of M42 as has been suggested by Schloerb and Loren (1982).

Since the shocked molecular hydrogen emission arises from very thin and hot shock fronts and the millimeter-wave molecular lines may originate from a thick an cold post-shock layer, the apparent similarity in the distribution between the shocked molecular hydrogen emission and the millimeter-wave molecular line emission may suggest that both pre- and post shocked regions are inhomogeneous or clumpy, so that the shock fronts exist everywhere in the 11 km s^{-1} molecular cloud (Figure 3). A simple model with only one shock front preceding a homogeneous shock compressed region may not be valid to explain this similarity.

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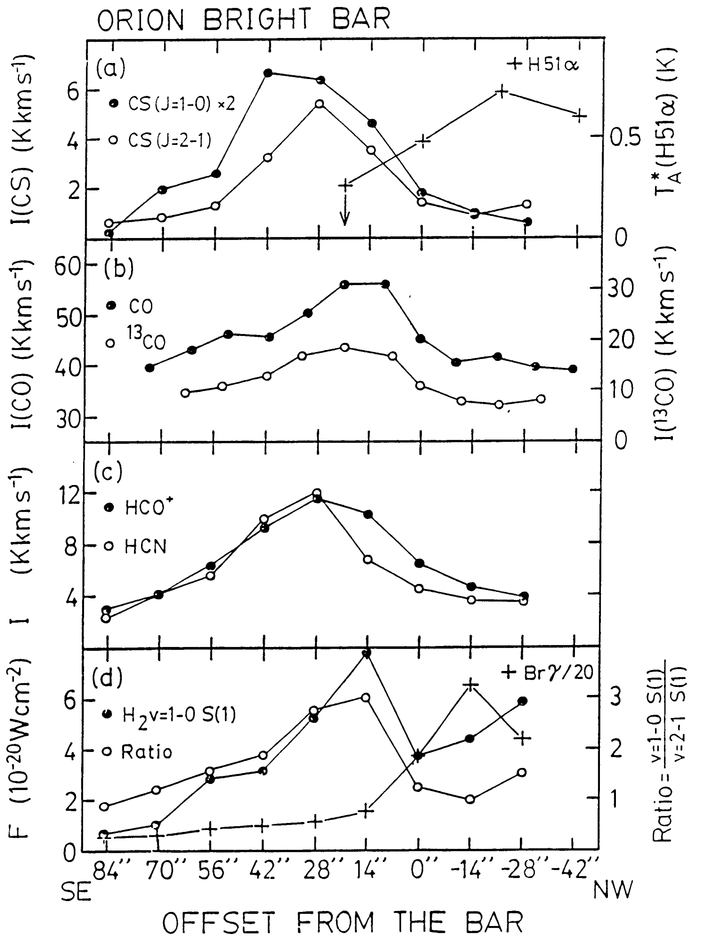

Fig. 2. Intensity variations of the 11 km s^{-1} component across the bright bar for (a) CS(J = 1-0 and J = 2-1), (b) CO and ^{13}CO, and (c) HCO^+ and HCN. Also indicated are the variation of H51α. (d) The spatial variations of the v = 1-0 S(1) line intensity, the v = 1-0 S(1) to v = 2-1 S(1) ratio and Brγ intensity are indicated (Hayashi *et al.* 1985).

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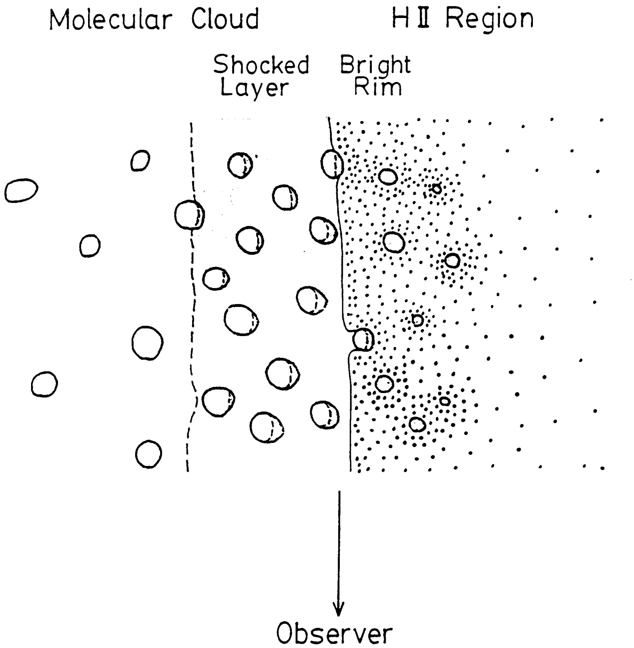

Fig. 3. A schematic representation to show the inhomogeneous or clumpy structure of the bright bar. Dashed lines represent shock fronts.

THE SUBMILLIMETRE WAVELENGTH SPECTRUM OF ORION A

Glenn J. White[1], Tania Monteiro[2], Ruth Rainey[1], Kevin Richardson[1], Matthew Griffin[1], L. Avery[3]
[1]Queen Mary College, University of London, England.
[2]University of Newcastle-upon-Tyne, England.
[3]National Research Council, Ottawa, Canada.

We report on the first submillimetre wavelength spectral scan of the Orion A molecular cloud in the frequency range 342-463 GHz (0.88-0.65 mm) using the Queen Mary College Submillimetre Heterodyne Receiver at UKIRT. Twenty-eight molecular transitions were detected, the majority of these for the first time. The lines include transitions of CO, CS, HCN, HCO^+, H_2CO, H_2CS, SO, SO_2, CCH, SiO and CH_3OH. Upper limits are reported for a number of lines including CO^+ and the ground state transition of NH_2. A number of the lines are surprisingly intense, and we will present maps of the relative distributions of HCO^+, HCN, H_2CO and CCH, which show striking differences in their spatial structures. We will present details of the excitation of a number of the lines based on the results from this survey.