MOLECULAR-LINE STUDIES OF THE BIPOLAR FLOW SOURCE GL490*

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We have made HCO^+(J = 1-0), HCN (J = 1-0) and CS (J = 2-1) observations of a bipolar flow source GL490 (Lada and Harvey 1981; Snell *et al.* 1984) using the Nobeyama 45-m telescope with 20" resolution. A HCO^+ spectrum obtained toward a central infrared source (Harvey *et al.* 1979) has prominent line wings extending up to 15-25 km s^{-1} from the line center (Figure 1). Figure 2 shows a map of HCO^+ high velocity emission

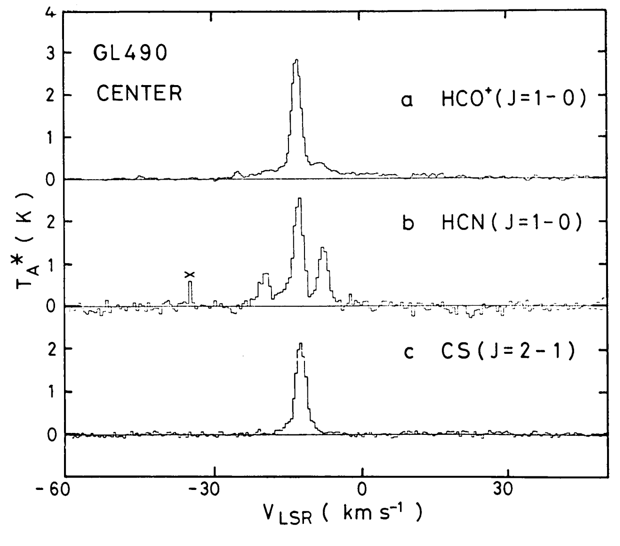

Fig. 1. HCO^+ (J = 1-0), HCN (J = 1-0), and CS (J = 2-1) spectra obtained toward the central infrared source.

more than 8 km s^{-1} off the line center. The emission has "head-tail"-structures in both the blue- and the red-shifted sides; a "head" with stronger emission and a "tail" with weaker narrow ridge emission extend-

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ing to the opposite side of the "head" through the center. The "head" emission has the same bipolar structure as the CO flow. Intermediate velocity emission at 3-8 km s^{-1} from the line center shows (1) a narrow ridge elongated in the NE-SW direction, at the blue-shifted side, and (2) a pair of shell-like structures symmetrically placed SW and NE of the center of the high velocity emission, at the red-shifted side (Figure 3).

The observed HCN spectrum shows a low velocity line wing at the blue-shifted side, but it shows no line wings with a larger width. The HCN emission is confined to a central region with a size of about 30" and an elongated structure perpendicular to the flow direction (Figure

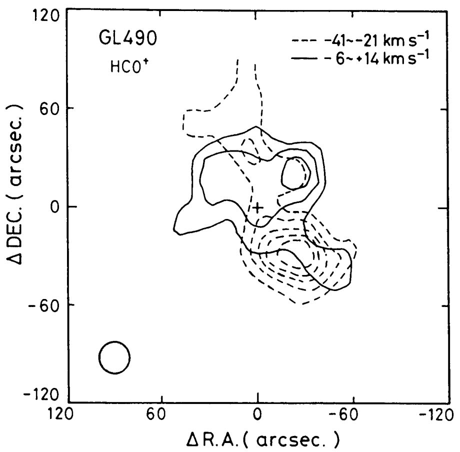

Fig. 2. Map of the HCO^+ high velocity emission. The solid line indicates the distribution of the red-shifted emission integrated for a velocity range between V_{LSR}= -6 km s^{-1} and +14 km s^{-1}. The doted lines show distribution of the blue-shifted emission integrated for a velocity range between V_{LSR}= -41 and -21 km s^{-1}. The contour interval is 0.5 K km s^{-1}.

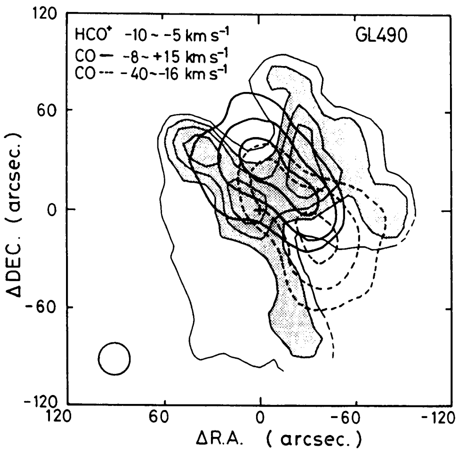

Fig. 3. Map of HCO^+ emission at the velocity range V_{LSR}= -10 km s^{-1} to -5 km s^{-1}. The map is superposed on a map of CO high velocity emission (Snell *et al.* 1984). The HCO^+ map is indicated with a thin solid line, the CO red- and blue-shifted emissions are shown with solid and doted lines, respectively.

4(b)). The structure is similar to that of the CS compact cloud (Kawabe *et al.* 1984). The HCN cloud also shows shell-like structures (Figure 4 (c)). The bipolar HCO^+ and CO flows at the high velocities, and the narrow HCO^+ ridge coincide with holes surrounded by the shell-like structures (Figure 3). The shell-like structures of the flow correspond to the Shell structures seen in the bipolar flow source L1551 (Snell and Schloerb 1985).

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These results suggest a model in which the high velocity emission originates from shock-compressed stellar-wind bubbles which are expanding toward the polar directions of a molecular disk. The shell-like structures probably reflect emission from tangential parts of the bubbles with relatively lower projected velocities and the high and intermediate velocity emission may arise from the near-side or far-side of the bubbles seen apparently inside of the tangential part.

In the flow, HCO^+ abundance is marginally enhanced by a factor of 2-10 relative to that at the spike velocity component.

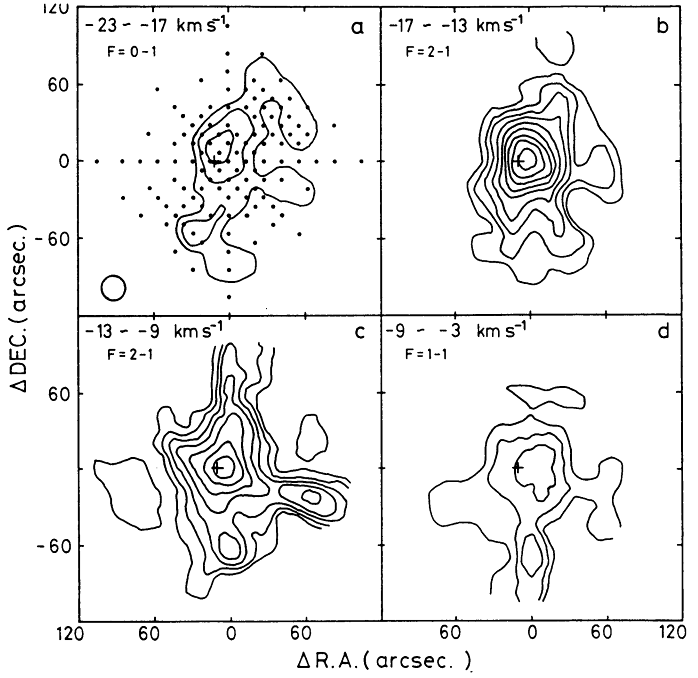

Fig. 4. Maps of HCN (J = 1-0) emission for four velocity intervals indicated in the panels. Cross shows the position of the infrared source GL490, which is shifted by 12" to the east from the map center with zero Dec. and R.A. offsets.

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