CO AND OH IN THE GALACTIC CENTER REGION

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The two-dimensional distribution of molecular clouds in the galactic center region has been investigated in the CO 115 GHz line and in the OH 1665 and 1667 MHz lines. As the former is an emission line, we can find molecular clouds without the unavoidable bias to continuum sources which is inherent in a survey of OH absorption lines. Because the CO line is usually optically thick, the brightness temperature of the line is directly related to the kinetic temperature of the cloud. On the other hand, the real optical depth of the OH line can be obtained from the intensity ratio between 1665 and 1667 MHz lines (assuming LTE). From this point of view we have compared the CO and OH observational results.

The CO observations were made with the 1.5-meter mm-wave radio telescope of Kisarazu Technical College, which has a half-power beamwidth of ∿10'. During the winter of 1977-78, the region $0.^\circ4 \leqslant \ell \leqslant 1.^\circ8$ and $|b| \leqslant 0.^\circ4$ was surveyed in a grid of $0.^\circ2$. The receiver front-end was a room-temperature Schottky-barrier diode mixer with system temperature ∿4000 K (SSB); a 158-channel 1 MHz filter-bank was used. During the spring of 1979, the region $2.^\circ75 \leqslant \ell \leqslant 3.^\circ50$ and $|b| \leqslant 0.^\circ50$ was surveyed in a grid of $0.^\circ25$. At this time a liquid nitrogen cooled front-end was available, and the system temperature was ∿1200 K (SSB); a 256-channel 1 MHz acousto-optic spectrometer was used as the back-end. The OH observations were made in 1974 with 43-meter telescope of NRAO which has a beamwidth of 18'; the region $-2.^\circ8 \leqslant \ell \leqslant 4.^\circ0$ and $-50' \leqslant b \leqslant 46'$ was surveyed in a grid of $0.^\circ2$. Details of these CO and OH observations are to be published elsewhere.

Here we discuss the four clouds which show the strongest OH absorption in the surveyed region. They are the 80 km/s and -30 km/s clouds located at $\ell = 1.^\circ3$, and the 100 km/s and 0 km/s clouds at $\ell = 3.^\circ0$. We will designate them as L1.3(80), L1.3(-30), L3.0(100) and L3.0(0).

<u>L1.3(80)</u>: The CO distribution (Fig. 1) shows that this is a very massive cloud with a diameter of ∿140 pc and a hydrogen mass of $\sim 3 \times 10^7\ M_\odot$ (according to Bania's 1977 formula). The velocity of this cloud changes

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from 75-80 km/s at negative latitudes to 100-105 km/s at positive latitudes.

L1.3(-30): There is no CO counterpart of this strong OH absorption, but there is an extended plateau of CO emission with velocities from -50 km/s to 50 km/s.

L3.0(100), L3.0(0): Both the CO emission and the OH absorption of these clouds show a similar distribution. However their CO brightness temperatures are considerably lower than those of L1.3(80) despite their having similar amounts of OH absorption.

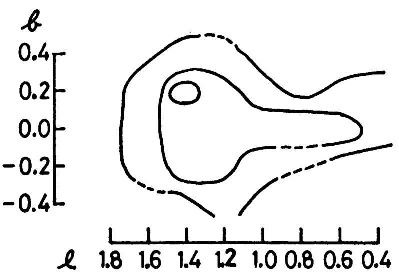

Fig. 1. Spatial distribution of the integrated CO emission in the velocity range 42<V<140 km/s. Contour unit is 100 K·km/s.

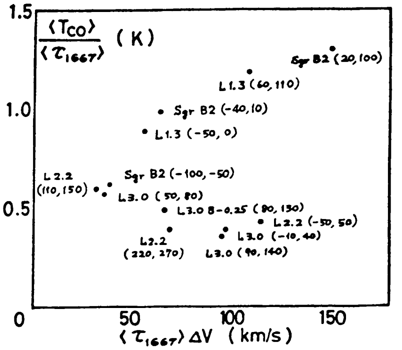

Fig. 2. Correlation between the averaged CO antenna temperature and the averaged OH real optical depth.

Fig. 2 shows the variation of the ratio between the CO antenna temperature T_{CO} and the OH real optical depth τ_{1667} from cloud to cloud. The ordinate indicates the ratio $\langle T_{CO} \rangle / \langle \tau_{1667} \rangle$ and the abscissa represents the integrated OH optical depth over the velocity width ΔV in each cloud (given in parenthesis); $\langle\ \rangle$ means a value averaged over ΔV. The points in Fig. 2 are divided in two groups. L1.3(80) and Sgr B2 form one group, and such clouds as L3.0(100) and L3.0(0) form the other. The former clouds have a three times greater value of the ratio $\langle T_{CO} \rangle / \langle \tau_{1667} \rangle$ than the latter. This difference may be due to the different kinetic temperatures of the clouds. The fact that L1.3 and Sgr B2 are accompanied by HII regions while L3.0 and L2.2 are not (Altenhoff et al. 1978) seems to support this idea.

REFERENCES

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