DISTRIBUTION OF $C^{18}O$ AND HNCO EMISSION IN THE SAGITTARIUS B2 MOLECULAR CLOUD

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1. Introduction and Observations

Sgr B2, located at a distance of ~100 pc from the Galactic center, is one of the most active, recent massive-star formation regions in the Galaxy. Based on the ^{13}CO ($J = 1-0$) line data taken with the Nobeyama 45 m telescope, we presented a cloud collision scenario as the triggering mechanism of the burst of massive-star formation there (Hasegawa et al. 1994). In order to obtain further evidence supporting our model, we observed the Sgr B2 molecular cloud in various molecular lines with the 45 m telescope in 1992 February. Twelve points each with 20″ spacings were observed along several strips 3.67′ long at constant galactic longitudes through the major HII region complexes. Here we report the results of the two lines in the 110 GHz band, $C^{18}O$ ($J = 1 - 0$) and HNCO ($5_{0,5} - 4_{0,4}$). Full description of the observations will be given elsewhere (Sato et al. 1997).

Y. Sofue (ed.), The Central Regions of the Galaxy and Galaxies, 181-182.

2. Results

Along the strips through the compact HII regions Sgr B2 (N), (M), and (S), the velocity structures of the $C^{18}O$ and HNCO emission are rather similar. The peak velocities along each strip are higher at the lower latitudes (northwest) than at the higher latitudes (southeast), and change discontinuously at the compact HII regions. However, their intensity distributions are quite different. The $C^{18}O$ emission peaks at the compact HII regions, and its distribution is rather symmetric about their positions. On the other hand, the HNCO emission shows no remarkable enhancement there, and is stronger at their lower-latitude sides than at the higher latitudes.

3. Discussion

The velocity structures common to the two species can be well explained by our cloud collision model: the colliding clouds with differnt velocities are bordered by the compact HII regions excited by the young massive stars, which have formed in the interface of the two clouds. The high-velocity 'clump' lies at the lower-latitude side of the HII regions, and the low-velocity gas around the 'hole' is observed at the higher latitudes.

$C^{18}O$ is excited mainly by collisions with H_2 molecules, while HNCO in the Sgr B2 cloud is excited by far-infrared radiation from warm dusts (Churchwell et al. 1986). The excitation temperatures of the two species are almost uniform throughout the Sgr B2 molecular cloud except in the immediate vicinity of the intense continuum sources and at the outer edge of the cloud (Lis and Goldsmith 1990; Goldsmith et al. 1990). In addition, both transitions are optically thin. Therefore, the intensity distributions of the $C^{18}O$ and HNCO emission probably represent the distributions of their abundances except in the immediate vicinity of the compact HII regions and in the marginal area of the cloud. The observed difference in the intensity distributions of the two species at the both sides of the compact HII regions suggests that the molecular gas there has different chemical abundances. This fact probably indicates that there exist two molecular clouds with different properties, and probably with different origin, adjoining to each other at the compact HII regions, which further supports our cloud collision scenario (Hasegawa et al. 1994).

References

Churchwell, E., Wood, D., Myers, P. C., & Myers, R. V. 1986, ApJ, 305, 405
Goldsmith, P. F., Lis, D. C., Hills, R., & Lasenby, J. 1990, ApJ, 350, 186
Hasegawa, T., Sato, F., Whiteoak, J. B., & Miyawaki, R. 1994, ApJ, 429, L77
Lis, D. C., & Goldsmith, P. F. 1990, ApJ, 356, 195
Sato, F., Hasegawa, T., Whiteoak, J. B., & Shimizu, M. 1997, in preparation