

MOLECULAR GAS IN THE NUCLEAR REGION AND THE BAR OF NGC 253

K. SORAI

*Department of Astronomy, University of Tokyo
Bunkyo-ku, Tokyo 113, JAPAN*

*Nobeyama Radio Observatory
Minamimaki, Minami-Saku, Nagano 384-13, JAPAN*

AND

N. NAKAI, N. KUNO, K. NISHIYAMA

*Nobeyama Radio Observatory
Minamimaki, Minami-Saku, Nagano 384-13, JAPAN*

1. Introduction

In order to study relationship between molecular gas and star-forming activities, we have made observations of the barred spiral galaxy NGC 253 in $^{12}\text{CO}(J = 1 - 0)$, $^{13}\text{CO}(J = 1 - 0)$, and $\text{HCN}(J = 1 - 0)$ emission lines with the Nobeyama 45-m radio telescope. NGC 253 is located in a distance of 2.5Mpc (*Mauersberger et al.* (1996)) and has an inclination angle of $78^\circ.5$ (Pence 1980). This galaxy has a starburst nuclear region and is suggested in an early stage of a starburst (Rieke, Lebofsky, & Walker (1988)).

2. Observations & Results

Mapping observations were done about $10' \times 4'$ region in ^{12}CO line. The integrated intensity map of ^{12}CO of the galaxy is shown in Figure 1. This map reveals that molecular gas strongly concentrates on its nucleus and along the bar seen in $2.2\ \mu\text{m}$ image (Scoville et al. (1985)), on the other hand, spiral arms and a ring-like structure are not so clear, which are seen in $\text{H}\alpha$ (Hoopes, Walterbos & Greenawalt (1996)) or HI (Puche, Carignan, van Gorkom (1991)) images.

The total mass of molecular gas within our observed region is $6.6 \pm 0.2 \times 10^8 M_{\odot}$, assuming that $X = 1.0 \times 10^{20} [cm^{-2} (K km s^{-1})^{-1}]$. The central region and the bar contain more than 40% of the total molecular gas mass.

We have made observations of ^{13}CO and HCN lines simultaneously toward 13 points selected from ^{12}CO observed points. These points were chosen from the nuclear region, the bar, and spiral arms. In Figure 2., we plot the intensity ratio between HCN and ^{13}CO emission along with the results of M51 (Kuno et al. (1995)). Molecular gas in the central region is clearly different from other region, probably due to high density of molecular gas, however, the ratio in the bar and the arm cannot be well distinguished. More detail analyses are now performed.

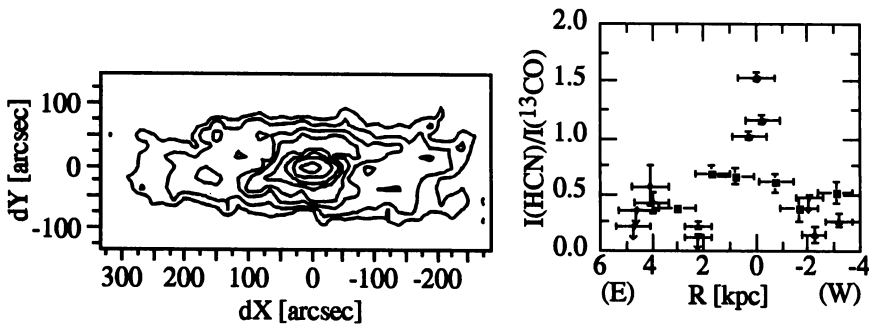


Figure 1. (Left) The ^{12}CO integrated intensity map of NGC 253. Contours are at 10, 20, 40, 60, 100, 150, 250, 600 $K km s^{-1}$ in T_{MB} scale. Figure 2. (Right) The HCN/ ^{13}CO intensity ratio of observed positions: central region (circle), bar (square), and arm (diamond). The results of M51 (Kuno et al (1995)) are also represented: arm (Δ) and interarm (∇).

3. References

- Hoopes, C.G., Walterbos, R.A.M., & Greenawalt, B.E. 1996, AJ, 112, 1429
 Kuno, N., Nakai, N., Handa, T., & Sofue, Y. 1995, PASJ, 47, 745
 Mauersberger, R., Henkel, C., Wielebinski, R., Wiklind, T., & Reuter, H.-P. 1996, A&A, 305, 421
 Puche, D., Carignan, C., & van Gorkom, J.H. 1991, AJ, 101, 456
 Pence, W.D. 1980, ApJ, 239, 54
 Rieke, G.H., Lebofsky, M.J., & Walker, C.E. 1988, ApJ, 325, 679
 Scoville, N.Z., Soifer, B.T., Neugebauer, G., Young, J.S., Matthews, K., & Yerka, J. 1985, ApJ, 289, 129