Molecular Line Observations towards W58 and GL490

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ABSTRACT. We observed 3 mm transitions of several interstellar molecules toward star-forming regions in W58 and GL490 using the 14 m Daeduk Radio Telescope (Korea). We derive molecular abundances for the "broad" components observed with a high spectral resolution, which could represent the abundances of outflowing materials.

Several molecular transitions in Table 1 have been observed toward the strong galactic continuum source W58 having four compact HII regions A(K3-50), B, C(ON3), and D(NGC6857), and the infrared source GL490 showing a high velocity CO outflows. They are intensively studied star-forming regions in our Galaxy (cf. van Gorkom et al. 1981; Mundy & Adelman 1988; and references therein). All observations were carried out with the 14m telescope of the Daeduk Radio Astronomy Observatory which locates about 150 km south from Seoul, Korea during March to May 1991. A cryogenic Schottky diode mixer was employed with the 1024 channel autocorrelator (a total bandwidth of 20 MHz) and the 256 channel filter bank (a resolution of 250 kHz/channel). Observing method and telescope parameters are included in Roh et al. (1991).

CO and ^{13}CO line intensity maps of W58 show that the observed compact HII regions are embedded in a CO cloud elongated to the NE-SW direction, and locate at the maximum molecular density where the HI cloud and the HII region complex may interact (Israel 1980). The HCN line intensity toward GL490 peaks about 1 arcmin south from those of HCO^+ and ^{13}CO which may result from the different excitation or chemistry for these species.

Figure 1 shows sample spectra obtained with the autocorrelator and the dotted lines are gaussian fit results for the "broad" components (ΔV=10-20 km s^{-1}) which may represent outflowing materials in these regions. Beam averaged column densities in Table 2 are derived assuming optically thin emission and rotational temperatures (T_{rot}) of 10-15 K (5-10 K) and 30-60 K (10-30 K) for the CO J=1-0 line (for other molecular transitions in Table 1) of "broad" and "quiescent" components, respectively. Cosmic background radiation was corrected only for the case of T_{rot}= 5 K (see discussions in Roh et al. 1991). The molecular emissions in outflowing materials may arise from many small optically thick clumps in the gas. Our preliminary results indicate that the molecular abundances in outflowing gases are comparable to those for quiescent components.

TABLE 1. Observed molecules

Molecules (Tran.) (J-J')	Frequency (GHz)
CO (1-0)	115.271
^{13}CO (1-0)	110.201
C^{18}O (1-0)	109.782
CS (2-1)	97.981
C^{34}S (2-1)	96.413
HCO^+ (1-0)	89.189
$H^{13}CO^+$ (1-0)	86.754
HCN (1-0, F=2-1)	88.632
SiO (2-1, v=0)	86.847

P. D. Singh (ed.), Astrochemistry of Cosmic Phenomena, 225–226.

TABLE 2. Observed column densities (cm^{-2}).

Source		W58				GL490
Mol.		A(K3-50)	B	C(ON3)	D(NGC6857)	
CO	Q	8.9±2.5(18)	1.1±0.3(19)	1.6±0.5(19)	1.3±0.8(19)	2.0±0.6(19)
	B	1.8±0.2(18)	9.6±1.2(17)	≥1.7±0.2(17)	7.6±0.8(17)	2.2±0.2(18)
CS	Q	7.1±2.1(13)	1.3±0.4(14)	2.5±0.7(14)	8.3±2.4(13)	9.0±2.6(13)
	B	1.5±0.3(14)	1.6±0.4(14)	...	...	...
HCO^+	Q	2.0±0.7(13)	2.7±1.0(13)	2.0±0.7(13)	2.5±0.9(13)	2.0±0.7(13)
	B	1.1±0.1(13)	3.1±0.4(13)	...	...	7.1±0.8(12)
HCN	Q	1.8±0.6(14)	7.9±2.8(13)	7.7±2.7(13)	4.0±1.5(13)	7.3±2.6(13)
SiO	Q	≤ 3.3(13)	≤ 2.5(13)	≤ 3.8(13)	≤ 3.8(13)	...

Notes: Q: "Quiescent" component; B: "Broad" component. Upper limts are 3 σ. Numbers in parentheses are power of 10.

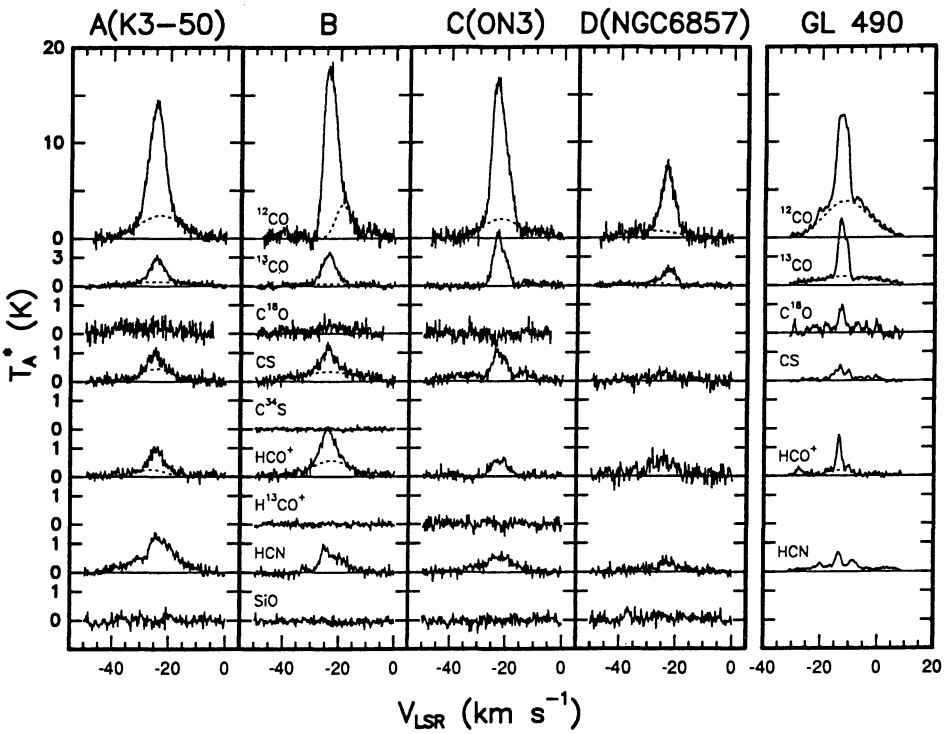

Figure 1. Sample spectra obtained toward W58(A, B, C and D) and GL490

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Roh,D.G., Kim,H.R., Minh,Y.C., Auh,B.R. and Koo,B.C. 1991, in preparation.

https://doi.org/10.1017/S0074180900090069 Published online by Cambridge University Press