MOLECULAR GAS IN GALACTIC NUCLEI: STARBURST vs. SEYFERT GALAXIES

Y. TANIGUCHI
Kiso Observatory, Institute of Astronomy, The University of Tokyo
Mitake, Kiso, Nagano 397-01, Japan

N. NAKAI and O. KAMEYA
Nobeyama Radio Observatory, National Astronomical Observatory of Japan
Minamimaki, Minamisaku, Nagano 384-13, Japan

We have made a search for circumnuclear ^{12}CO (J=1-0) emission from 28 starburst and 29 Seyfert galaxies with recession velocities less than 5000 km s^{-1}, using the Nobeyama Radio Observatory 45-m telescope. The full half-power beam width of 17 arcsec covers less than about 5 kpc in diameter for the sample galaxies. The mean beam size-to-optical diameter ratios are 0.19±0.13 and 0.16±0.11 for the starburst and Seyfert galaxies, respectively. Circumnuclear CO emission has been detected from 12 starburst and 14 Seyfert (7 type 1, 6 type 2, and one peculiar AGN) galaxies.

The derived surface densities of molecular gas, corrected for galaxy inclination, of the sample galaxies cover a range from 10^7 to 10^8 $M_\odot$ kpc^{-2}. This scatter may be attributed to fundamental properties of the host galaxies (*i. e.*, morphology, luminosity, etc.). The most important point is that there is no significant difference in the circumnuclear molecular gas densities between the Seyfert and the starburst galaxies. Moreover, this above range of surface densities is similar to that for Virgo spiral galaxies studied by Kenney and Young (1989; the mean beam size-to-optical diameter ratio is 0.19±0.06). This implies that the circumnuclear molecular gas density within a diameter of less than 5 kpc is not a key parameter determining which activity occurs in galactic nuclei. Note that the surface densities of early-type (S0 to Sa) starburst galaxies are comparable to those of early-type Seyfert ones, while late-type starburst galaxies have smaller values of surface density in comparison to late-type Seyferts.

What is the difference between starburst and Seyfert galaxies ? Molecular gas should be accumulated into circumnuclear regions to activate nucleus in both cases of starburst and Seyfert activities. Schlosman, Frank, and Begelman (1989) suggested that successive dynamical instability occurring in the self-gravitating circumnuclear gas can fuel onto the supermassive black hole. This scenario means that much circumnuclear gas is necessary for Seyfertization. They also noted that if enough gas is not available, the gas cloud may be consumed by the circumnuclear starburst phenomenon. These arguments suggest that there is a systematic difference in circumnuclear molecular gas contents between Seyfert and starburst galaxies; *i. e.*, Seyfert galaxies have more molecular gas clouds in their circumnuclear regions than starburst galaxies. However, our observations show that there is no significant difference in the mean circumnuclear molecular gas densities between the Seyfert and the starburst galaxies. Although much gaseous content may be a necessary condition for Seyfertization, this may *not* be a sufficient one. It is suggested that the presence of triggering mechanism is a more important factor for Seyfertization.

REFERENCES

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