MOLECULAR CLOUDS IN STARBURST NUCLEI

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We have observed 2.6 mm CO J=1-0 emission in a complete sample of galaxies with starburst nuclei using the 14 m millimeter telescope of the Five College Radio Astronomy Observatory (HPBW=45"). The galaxies in this sample have distances between 15 and 40 Mpc, and central 10 μm luminosities (R < 500 pc) comparable to the starburst galaxy M82 (Devereux 1989). Molecular gas was detected in 16 of the 18 galaxies observed, with global H_2 masses in the range 10^9 to 2.5×10^{10} $M_\odot$.

1) The CO linewidths in 5 of the starburst nuclei are found to be less than 200 km s^{-1} after correcting for inclination. These unusually narrow lines may indicate that the molecular gas is confined to the central few arcseconds in these galaxies. The same galaxies also have compact 10 μm luminosity distributions, with more than 60% of the total emission arising in the central 5".

2) The yield of high mass stars per unit mass of molecular gas in the starburst galaxies, deduced from the ratio $L_{IR}/M(H_2)$, is 11 $L_\odot/M_\odot$, intermediate between that of isolated galaxies (5 $L_\odot/M_\odot$) and interacting galaxies (20 $L_\odot/M_\odot$) measured as part of the FCRAO Extragalactic CO Survey (Young *et al.* 1990).

3) Among the starburst galaxies, the highest star formation efficiencies are found in the galaxies with the narrow CO linewidths and the compact 10 μm distributions. If the gas distributions in these galaxies are also compact, as the narrow linewidths suggest, then the star formation rates and efficiencies are high when high nuclear gas concentrations are present. Such a situation could arise if, for example, cloud-cloud collisions are responsible for high mass star formation (Scoville *et al.* 1986).

References

Devereux, N.A. 1989, *Ap.J.*, **346**, 126.

Scoville, N.Z., Sanders, D.B., and Clemens, D. 1986, *Ap.J.(Letters)*, **310**, L77.

Young, J.S., *et al.* 1990, in preparation.

F. Combes and F. Casoli (eds.), Dynamics of Galaxies and Their Molecular Cloud Distributions, 311.