THE $^{12}CO/^{13}CO$ INTENSITY RATIO IN EXTERNAL GALAXIES

S. AALTO, L.E.B. JOHANSSON, and R.S. BOOTH
Onsala Space Observatory
S-439 00 Onsala
Sweden

ABSTRACT. We report observations of the ^{12}CO and ^{13}CO J=1–0 transitions in external galaxies. The $^{12}CO/^{13}CO$ intensity ratio tends to vary with the degree of interaction.

1. Observations and Results

The data were taken in 1990, at the 20 m telescope of Onsala Space Observatory. We find an average $^{12}CO/^{13}CO$ intensity ratio of ~10 (see Table 1), consistent with other studies (e.g.Young and Sanders 1986). However some of the galaxies are anomalous: Arp 220, Arp 299 and NGC 3256 exhibit ratios of 20-30. All three galaxies are violently interacting or merging with FIR luminosities 10^{11}-10^{12} $L_{\odot}$. Other more mildly interacting galaxies exhibit normal ratios. This small survey indicates that an elevated ratio is mainly observed in highly interacting systems. The interpretation may lie in a variety of factors including effects of optical depths in highly disturbed gas, enhanced temperature or abundance anomalies.

TABLE 1. The integrated intensity ratios (errors correspond to 1-σ)

Galaxy	$^{12}CO/^{13}CO$	V_{LSR} (km/s)	Type
NGC0520	9±3	2250	merger
NGC0660	15±5	890	merger?
NGC0828	11±4	5390	merger
NGC2146	12±3	890	interacting
NGC2276	9±4	2390	interacting?
NGC3079	11±4	1190	interacting
NGC3256	32±6	2800	merger
NGC4826	5±1	370	interior SF
NGC5033	9±4	990	interacting
NGC5055	6±2	500	
NGC5218	9±3	2940	interacting
UGC2855	10±5	1090	
Arp220	>30	5390	merger,AGN?
Arp299	>25	3150	merger,AGN?

Reference

Young, J.S., and Sanders, D.B. (1986), *Astrophys. J.* , **302**, 680

F. Combes and F. Casoli (eds.), Dynamics of Galaxies and Their Molecular Cloud Distributions, 151.