CO OBSERVATIONS OF THE NUCLEAR BAR OF IC 342

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We have mapped the nuclear region of an Scd galaxy IC 342 in the CO (J = 1-0) emission with an angular resolution of 15". This galaxy has a bright optical nucleus with a dark lane elongated in the north-south direction. A prominent molecular bar which has been discovered by Lo *et al.* (1984) using the Owens Valley Interferometer lies just on the dark lane. Their CO map was spatially limited by the primary beam pattern and the velocity coverage of their spectrometer was not sufficient. It is not known, therefore, whether the molecular bar is connected to the outer spiral arms or not. We made the highest resolution CO map accessible by a single-dish telescope with a sufficient velocity coverage.

The observations were made on 1985 March using the 45-m telescope of the Nobeyama Radio Observatory. The half power beam width was 15" and the overall pointing accuracy was better than 5". The velocity coverage of the wideband acousto-optic radiospectrometer was 600 km s^{-1} with a resolution of 0.65 km s^{-1}.

Figure 1 shows a gray scale representation of the integrated intensity of the CO (J = 1-0) emission. The cross sign near the center is the position of the 2.2 μm continuum emission measured by Becklin *et al.* (1980). The CO emission is concentrated in the central bar whose size is 1.3 kpc × 0.6 kpc after beam deconvolution. Little CO emission is seen outside the bar; the molecular bar is localized within the optical bulge and is not connected to the outer spiral arms.

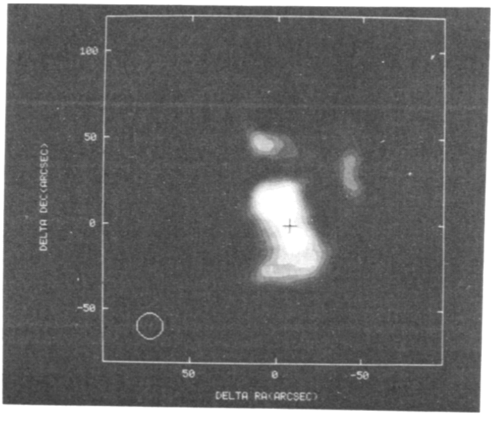

Fig. 1. Gray scale representation of the integrated CO intensity. The cross sign near the map centre is the peak position of the 2.2 μm continuum emission measured by Becklin *et al.* (1980): α (1950) = $3^h41^m57^s.15$ and δ (1950) = $67°56'27''.2$.

The CO bar has a double-peaked structure with a shallow dip toward the 2.2 μm nucleus, being symmetric with respect to it. The two maxima lie about 200 pc away from the nucleus. The molecular hydrogen mass of the nuclear bar is estimated to be $\sim 2\times10^8$ $M_\odot$; five percent of the total H_2 mass is accumulated in the central small area of the galaxy. This may explain the vigorous star forming activity in the nucleus of IC 342.

The beam deconvolved width (FWHM) of the bar is 0.6 kpc and is considerably wider than that measured by Lo *et al.* (1984). The narrower width of their CO map might be caused by the limited velocity coverage of their spectrometer.

REFERENCES

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MOLECULAR CLOUDS IN BARRED GALAXIES

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A stellar bar is an essential dynamical component for the behaviour of gas and molecular clouds in a spiral galaxy. It can trigger the formation of the arms and provokes radial transfer of gas. N-body simulations have shown that the bar forms easily and is very stable; according to classification, the majority of spiral galaxies are barred.

We have simulated the molecular clouds response to a bar forcing in a spiral galaxy, taking into account: collisions between clouds and the consequent dissipation of energy, the formation of giant molecular clouds by coalescence, the heating of the interstellar medium by star formation and the subsequent dissipation of giant clouds in small entities (cf. Combes and Gerin 1985). Star formation is enhanced in spiral arms because of the increased collision rate between clouds and the induced formation of GMC. This is due to the particular alignment of orbits in a bar potential: orbits crowding in spiral arms increases the density and the relative velocity of clouds, both favoring collisions. However, the equilibrium is never reached in the molecular clouds medium, since the arm crossing time is shorter than the collisional equilibrium time. In the arms, the GMC formation time becomes comparable to their lifetime, but it is much longer in the interarms. Because of the deficiency of GMC in the interarms, heating of the medium occurs essentially at the exit of spiral arms.