DISTRIBUTION OF CO IN THE SOUTHERN MILKY WAY AND LARGE-SCALE STRUCTURE IN THE GALAXY

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The southern galactic-plane region, in the ranges $294° \leq l \leq 358°$, $-0°.075 \leq b \leq 0°.075$, has been surveyed in the J = 1-0 line of ^{12}CO with a sampling interval of 3' arc. Observations were made with the 4-metre telescope at the CSIRO Division of Radiophysics in 1980 and 1981. Details of equipment and observing procedure are given in Robinson et al. (1982, 1983); see also McCutcheon et al. (1983).

The variation of radial velocity with longitude shows well-defined terminal velocities whose locus matches fairly well (with deviations not exceeding about 10 km s^{-1}) rotation curves determined from HI and CO observations along the northern galactic plane. Over certain ranges of longitude, absence of CO emission near the tangential velocity is more apparent in the southern observations and strongly suggests that there are arm-like structures in the CO distribution. In particular, the HI 3.5-kpc Expanding Arm has a clearly defined CO counterpart. Combining our l-v diagram with that of Sanders (1982) and using a standard model of the Galaxy, we identify much of the CO emission with sections of four spiral-like arms, namely: Local, Sagittarius-Carina, Scutum and Perseus. There is good agreement with much of the distribution of the 1720-MHz OH sources (Turner 1983). Some of the CO gas and OH sources lie between the major arm-like features, indicating perhaps the presence of spurs and bifurcations. Using models with velocity deviations of ~ 10 km s^{-1} from circular velocities changes parameters of the spirals but does not destroy the overall pattern. Thus, while certain arm-like patterns appear to stand out well, we cannot specify a unique picture since there are deviations from circular velocities and also some uncertainties in the distances of emitting regions.

The radial distribution of CO displays two pronounced peaks: a sharp peak near R = 3.5 kpc and a broader peak near R = 7 kpc. This contrasts with the northern CO distribution, which shows only a broad peak, centred near R = 6 kpc.

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