HI IN THE GALACTIC DISK

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This review of 21-cm studies of the galactic disk will be rather short, because several aspects of such studies are being covered by other speakers. These include the galactic rotation curve, the warp, the outer limits of the hydrogen layer, high-velocity clouds, large supernova remnants and comparisons between observations and theory with respect to density waves.

Large-scale 21-cm survey work continues. The table gives the surveys which have been carried out since the publication of earlier comprehensive lists of surveys by Kerr (1968) and Burton (1974):

Surveys of Hydrogen Emission from Near the Galactic Equator, Part III

Author	Publication Date	Beam (arcmin)	Longitude Range (degrees)
Garzoli	1972	30	270-310
Wrixon and Sanders	1973	21	357- 3
Lindblad	1974	13,21	339- 72
Weaver and Williams	1974	36	10-250
Cohen	1975	31x35 13x13	355- 10
Kerr, Harten and Ball	1976	14	236-345
Jackson	1976	30	305-309
Mirabel	1977	28	348- 36
Bystrova and Rakhimov	1977	7'x5°	δ = -29° to +40°
Burton, Gallagher and McGrath	1977	21	349- 12
Braunsforth and Rohlfs	1978	9	20- 42
Sinha	1978	21	339- 11
Kerr, Bowers and Henderson	1978	14	230-350

Our group has recently carried out two 21-cm surveys of the Southern Milky Way at the Australian National Radio Astronomy Observatory at

W. B. Burton (ed.), The Large-Scale Characteristics of the Galaxy, 61–63.

Parkes, NSW, Australia. A new longitude-velocity diagram for the galactic equator from ℓ = 230° to 350°, obtained with the 64-meter telescope (Kerr, Bowers and Henderson 1978), was presented and discussed. Observations were obtained every 3 arcminutes with a beamwidth of 14 arcmin and an effective channel bandwidth of 2 km/sec. This and other contour maps will be published shortly.

This type of diagram tends to emphasize steep gradients, such as the slope at extreme negative velocities over the whole longitude range. The sharp step at zero velocity, first noted by Burton (1973) in the first quadrant, is also very clear; this is the place on the profile where we move from having two distances along the line of sight at the same velocity to only a single distance.

The spiral structure is patchy and not very clear, but we can see for example an arm bending around, with a tangential point at about 308°-310°. There is also a long outer ridge near the highest positive velocities; this feature is strongest well below the plane, in the region of the warp.

The diagram shows many holes and troughs, for example a deep hole at $\ell \sim 276°$, which is right beside a very high peak of brightness temperature. This hole also shows up well in scans across the plane at constant longitude.

The second survey was taken with the Parkes 18-meter telescope (Kerr, Bowers and Jackson 1978). This was a fully-sampled survey of the region ℓ = 240° to 350°, b = -10° to +10°, with a beamwidth of 48 arcmin and a channel width of 2 km/sec. It is a southern counterpart of the northern survey by Weaver and Williams (1974). Reduction of the 45,000-line profiles is well along; some of the results for the region of the warp are being shown by Henderson.

Various attempts have been made in recent years to derive the global spiral structure, but no generally-agreed solution has yet been obtained. The most recently published diagrams are those by Simonson (1976) and Henderson (1977). Simonson's model, based on density-wave kinematics, has a two-armed pattern with a pitch angle of 6°-8°, extending out to near the solar circle, where two additional major arms originate; in the outer parts the pattern is multi-armed, with a pitch angle of 16°. Henderson finds that a four-armed spiral with a 13° inclination can fit two optically-observed and four radio-observed regions quite well.

There is renewed interest in the degree of flatness of the hydrogen layer. For example, Lockman (1977) discusses quite systematic deviations which place the center of the layer at 35-50 pc below the galactic plane in the inner Galaxy, perhaps including the fourth, as well as the first, quadrant. There is also evidence of corrugations in the layer, with adjacent spiral arms being alternately above and below the plane in some regions. A new study of the warp in the outer parts has been carried out by Henderson, who finds that the warp on the southern side

extends to smaller z-distances than that on the north, if similar velocity fields are used on the two sides.

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