THE VERTICAL DISTRIBUTION OF GALACTIC HI: THE ARECIBO-GREEN BANK SURVEY

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We have measured the vertical distribution of HI in the first quadrant of galactic longitude between tangent-point radii, $R_t = R_o \sin \ell$, of 2.5 kpc and 9.75 kpc at 250 pc intervals of tangent-point distance, using the 305m Arecibo telescope and the 91m and 43m NRAO telescopes. The survey is complete to at least z = ±500 pc and it was sampled with half-beamwidth spacings; the angular resolutions at 21cm wavelength are 4, 11 and 20 arcmin for these instruments.

The HI distribution at the 4' resolution shows many discrete emission minima caused by absorption of hot background HI emission by cooler foreground gas. The special geometry required for self-absorption provides a resolution of the kinematic-distance ambiguity for cool HI clouds at positive LSR velocities in our survey. We have compiled a catalog of ≃200 self-absorbing HI clouds with such kinematic distances. These objects provide a new population of dense, cool clouds for further study. (The sample is not biased towards discrete sources of continuum radiation, either extra-galactic objects or pulsars, for example.) Accurate masses and sizes can in principle be derived for these clouds with known distances.

We have used this survey to study the vertical structure of both the HI distribution and galactic rotation. There is 21cm emission from corotating HI in the inner Galaxy to $|z| > 1500$ pc from the plane. At least 10% of the HI emission at the subcentral point comes from gas at $|z| > 500$ pc. The HI terminal velocity is often not symmetric about the plane, but varies linearly over hundreds of parsecs in the manner of a vertical shear. Typically, dV_t/dz is -10 km s^{-1} kpc^{-1} between 5 and 8 kpc from the galactic center. This implies that the HI below the plane is rotating faster than the HI above the plane.

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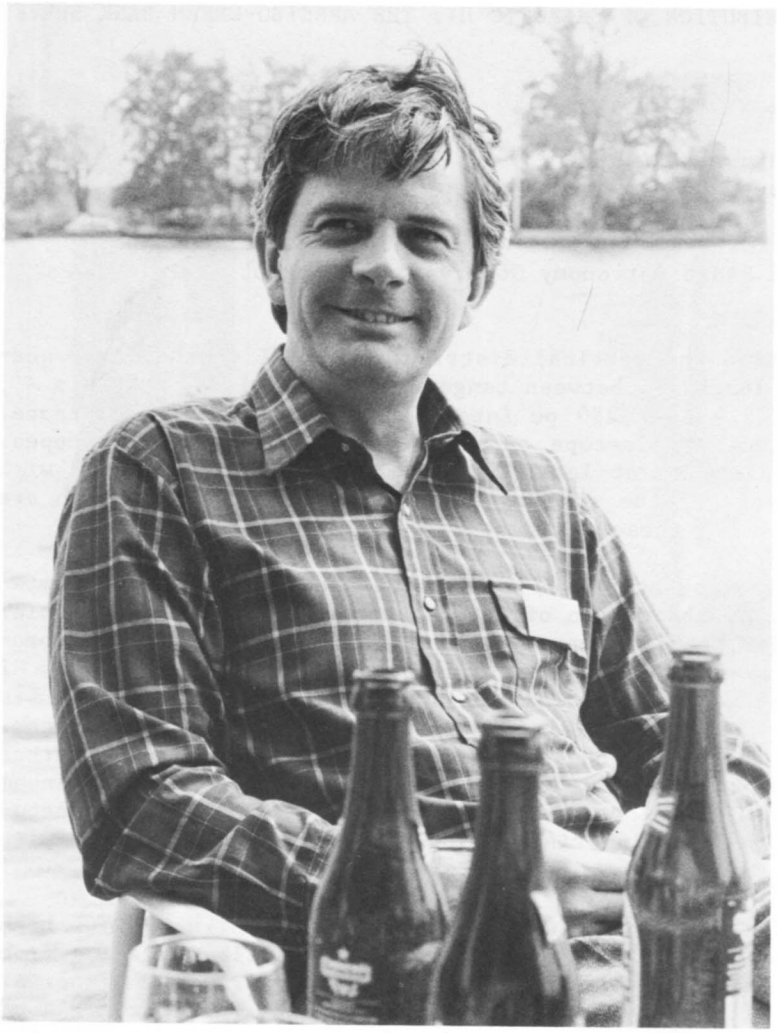

Butler Burton relaxes on the lakes. GSS

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