

The Outer Disk of the Galaxy

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Abstract.

The outermost gaseous disk of our Galaxy is warped (Burton and de Lintell Hekker 1986; Wouterloot et al. 1990), and a stellar component may be present as well (Miyamoto et al. 1988; Djorgovski and Sosin 1989). If so, the outermost edges of the Galaxy's disk may be more readily studied using the warp than relying upon the terribly crowded and nearly to completely opaque mid-plane directions. The study of the outer disk, and of the warp, is crucial for several reasons, including estimating the core radius of the dark halo (Sparke and Casertano 1988), the disk metallicity gradient (which is a signature of the history of star formation efficiency), and of the ages of the oldest stars elsewhere in the Galactic disk (which can be used to determine if the disk grew slowly outward, as suggested by Gunn 1987).

We have begun a program to detect the old stellar population of the outer disk of the Galaxy by imaging fields at selected longitudes and latitudes where the H I maps of Burton and de Lintell Hekker (1986) suggest the warp has reached maximal elevations above the plane as seen from the solar perspective. We selected control fields to estimate foreground (disk plus thick disk) contamination to have the same longitudes as the warp fields but opposite latitudes. All fields were found to have relatively clear lines of sight, based on the appearance of galaxies on the ESO/SRC or POSS charts. Only the southern hemisphere warp appears to have such clean lines of sight.

Four 8' x 8' warp fields and their four control fields were imaged through V and I_c filters with the Tek 1024 x 1024 CCD at the $f/2.7$ focus of the CTIO 4-meter reflector. Seeing was sub-arcsecond and 30 minutes (V) and 18 minutes (I_c) cumulative exposures were obtained, with limiting magnitudes $V_{lim} \geq 24$ in all cases. A total of 15,829 stars were measured in the four warp fields, and 11,722 stars in the four control fields. The excess is due partially to the Sun's location above mid-plane, but is mostly due to our detection of the outer disk's main sequence. The control fields were used to statistically subtract out the foreground components from the warp fields, leaving well-defined main sequences and in one field, a clear main sequence turn-off. We claim the old stellar warp population has been detected, and plan to continue its study using detailed reddening vs. distance maps, and searches for followed by spectroscopy of the outer disk red giants.

Key words: Milky Way Galaxy - Galactic Disk - Galactic Warp

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