STRUCTURE AND KINEMATICAL PROPERTIES OF THE GALAXY AT INTERMEDIATE GALACTIC LATITUDES

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Abstract. We have carried out a sample survey in UBVR photometry and proper motions in various directions in the Galaxy. Three fields in the direction of galactic anticentre, centre, and antirotation have been surveyed. Using our new data together with wide-area surveys in other fields available to date, we discuss the radial and vertical structure of the Galaxy. Our results confirm that the thick disk population is distinct from other populations based on their kinematical and spatial distribution. The most probable value of scale height for the thick disk component is determined to be $h_z \simeq 760 \pm 50$ pc and a local density of $\simeq 7.4^{+2.5}_{-1.5}\%$ relative to the thin disk. The ratio of the number of thick disk stars in our galactic centre region to that in anticentre region yield $h_R \simeq 3 \pm 1$ kpc for the scale length of thick disk. These values are in perfect agreement with the recent determination given by Robin *et al.* (1996).

1. Fields Surveyed

The 3 fields chosen are in the direction of galactic anticentre ($l = 167°$, $b = 47°$; Ojha *et al.* 1994a, 1996b; hereafter GAC1,2), galactic centre ($l = 3°$, $b = 47°$; Ojha *et al.* 1994b; hereafter GC) and antirotation ($l = 278°$, $b = 47°$; Ojha *et al.* 1996b; hereafter GAR).

2. Structural and Kinematical Parameters of the Thick Disk

We have used the combination of 3 intermediate latitude fields (GAC1,2, GC & GAR) to derive the structural parameters of the thick disk population (Ojha *et al.* 1996a). The thick disk characteristics are, $h_z \simeq 760 \pm 50$ pc and

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local density $\simeq 7.4^{+2.5}_{-1.5}\%$ relative to the thin disk. We deduce that the scale length of the thick disk is $h_R \simeq 3\pm1$ kpc. Robin *et al.* (1996) recent determination gives $h_R \simeq 2.8\pm0.8$ kpc, $h_z \simeq 760\pm50$ pc, with a local density of 5.6±1.0 % of the disk.

To perform the kinematical separation, we have used a maximum likelihood method (SEM algorithm : Celeux & Diebolt 1986) in order to deconvolve the multivariate Gaussian distributions and estimate the corresponding parameters. SEM also gives an estimation of the proportions and densities of each population along the line of sight distance. By comparing the star count ratio between the two data sets (GAC1,2 & GC) in each distance bin, we obtain the scale length of thick disk is $h_R \simeq 3.6\pm0.5$ kpc.

From comparison of proper motion distributions in 4 fields (GAC1,2, GC, GAR and NGP (Soubiran 1993)), the kinematical results can be estimated on a base line of 5 kpc (Ojha *et al.* 1996a). By combining the kinematical results from 4 fields, we have derived the velocity ellipsoid of the thick disk population. The mean kinematic parameters are summarized in Table 1. The data constrain the asymmetric drift of the thick disk, which is found to be 53±10 km/s with respect to the Sun.

TABLE 1. The mean kinematic parameters of thick disk (in km/s) derived from 4 fields (GAC1,2, GC, GAR & NGP). σ_W is determined for the most probable vertical potential (see Ojha *et al.* 1996a). V_{lag} is with respect to the Sun.

	σ_U	σ_V	σ_W	V_{lag}
Thick disk	67±4	51±3	40	−53 ±10

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