GALACTIC STRUCTURE WITH GSC-II MATERIAL

The North Galactic Pole and the Stock-2 cluster regions

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1. Introduction

Faint surveys of accurate colors and proper motions are fundamental for studying the physical and kinematical properties of the stellar populations in the Galaxy. A program designed to address such issues has been initiated on selected fields utilizing prototype material from the GSC-II project (see Lasker *et al.* in this volume). Photographic photometry V, B–V, V–R_c, is derived down to $V = 18.5$ with a precision of about 0.1 mag, together with absolute proper motions to $\sigma_\mu \simeq 3$ mas/yr.

Newly derived results are presented for a galactic plane region, containing the open cluster Stock 2, and for a high latitude field close to the North Galactic Pole.

2. Galactic models at the North Galactic Pole

A new magnitude limited survey ($\sim$ 12 000 stars with $V \leq 18.5$) of colors (BVR_c) and proper motions in a new field at the North Galactic Pole (NGP), with extent $4° \times 5°$ and centered at $b \simeq 87°$, has been presented in Spagna *et al.* (1996). Here we give comparisons with theoretical star-counts *and* kinematics provided by two integrated galactic models, the IASG Galaxy model (Ratnatunga *et al.* 1989), and the Besançon model of stellar population synthesis (Robin & Crézé 1986, Bienaymé *et al.* 1987). Besançon synthetic data are based on the version of 16 November 1994, while the IASG model adopts the default parameters for thin disk and halo, includes a thick disk with $h_z = 750$ pc, $\rho/\rho_0 = 10\%$ and uses the 47 Tuc luminosity function and M3 color-magnitude relation.

At intermediate magnitudes ($V \approx$ 14-15) both models provide a good match to the observed photometric and kinematical distributions, while a

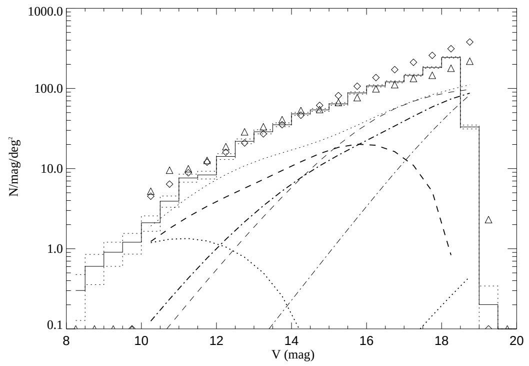

Figure 1. NGP starcounts (*solid* line and $\pm 1\sigma$ *dotted* line histograms) shown with Besançon (*triangles*) and IASG (*diamonds*) predicted counts. IASG individual components are also shown: thin disk (*dotted* lines), thick disk (*dashed* lines) and halo (*dotted-dashed* lines); thin and thickened symbols identify main sequence and giant stars (RG, AGB, HGB) respectively.

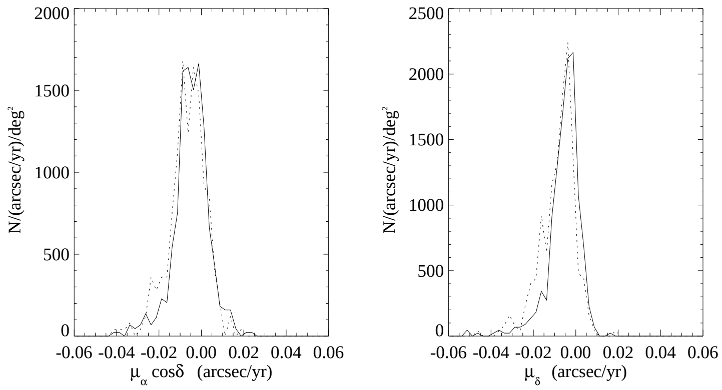

Figure 2. $17 < V \leq 17.5$ and $0.5 < B - V \leq 0.9$. Distribution of $\mu_\alpha \cos\delta$ and μ_δ from NGP data (*solid* line) and Besançon model (*dotted* line).

few discrepancies are noticeable at fainter magnitudes ($V > 17$).

NGP starcounts are shown in Figure 1, where systematic differences at faint magnitudes are apparent. These are more pronounced for IASG, and adjusting only for the thick disk scale-height and density normalization does not improve the fit. Color and proper motion distributions help identifying an excess of slow halo giants in IASG.

Besançon kinematics provide better fit to the data, also at faint magnitudes. This is shown in Figure 2 for (μ_α, μ_δ) of stars in the range $17 < V \leq 17.5$ belonging to the blue peak. (Here, a random error of $\sigma = 3$ mas/yr is included in Besançon proper motions.) Besides a small excess of stars at intermediate asymmetric drift ($\mu \simeq 20$ mas/yr) and an offset of ~ 1 mas/yr in μ_δ, the agreement of the two distributions is good.

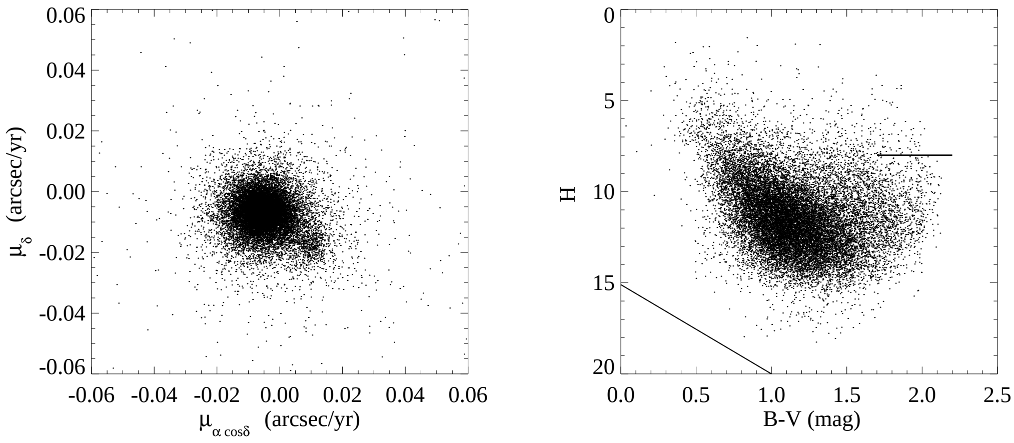

Figure 3. Stock 2. $\vec{\mu}$ VPD (*left*) and H (*right*) diagrams.

3. Stock 2 region

We have derived colors (BVR_c) and fundamental (FK5) proper motions for 20 000 stars down to $V = 18$ in a $1.8° \times 1.8°$ field towards the galactic anticenter ($b = 133.2°$, $l = -1.6°$). The field contains the open cluster Stock 2 (Krzeminski & Serkowski 1967) which is outstanding in the vector point diagram (Figure 3 left).

Although a detailed analysis is awaiting for a better modeling of the strong and patchy interstellar extinction in this line-of-sight, in Figure 3 (right) the reduced proper m otions, $H = V + 5\log\mu + 5$, already show the scientific potential of our data. The H-constant line represents the loci of red giants at 1 kpc, while the red line on the bottom left traces the theoretical region of POP I WD at 200 pc. Both lines have been appropriately corrected for mean interstellar reddening and extinction. Early type stars belonging to the Per OB1 association at about 2 kpc would appear in the region at $H \leq 10.5$ and $B - V \geq$ 1.3-1.5.

References

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