

Evolution of the Galactic Disk from a Local Sample

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Abstract. The Geneva-Copenhagen Survey (Nordström *et al.*, 2004) gives ages, metallicities, velocities, and Galactic orbits for a complete, magnitude-limited sample of 14,000 F and G dwarfs. We have verified the calibrations used in the GCS, improved those of T_{eff} , [Fe/H], distance, and age from $wby\beta$, and checked the effect on the resulting Galactic relations by end-to-end numerical simulations. All the main results of the GCS remain unchanged.

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The solar neighbourhood is a fundamental benchmark for all models of the evolution of galaxy disks. The Geneva-Copenhagen Survey (Nordström *et al.*, 2004; GCS) provided complete data on ages, metallicities, and kinematics for a complete, volume-limited sample of nearby F and G dwarf stars. We have re-checked the GCS calibrations and ascertained if any of the major results were significantly biased by residual calibration errors (see Holmberg *et al.* 2006, *A&A* subm., for a detailed account).

The key parameters are [Fe/H] and especially T_{eff} , which enters critically in the determination of stellar ages from theoretical isochrones. We have therefore compared the GCS T_{eff} data with values derived from spectroscopic excitation equilibria, as well as from V-K photometry (the most robust photometric temperature indicator) and calibrations tied directly to stellar angular diameters.

We find substantial differences, which we ascribe to the neglect of NLTE and 3D effects in the stellar atmosphere models, and derive a new calibration of T_{eff} from wby photometry, which agrees with that based on V-K, but with better photometric precision.

We then use recent high-resolution spectroscopy based on correct T_{eff} scales to recalibrate [Fe/H] from wby , and find small corrections for early F and solar-type stars. We also find that the Hyades wby data cannot be used to check the GCS metallicity scale. No correction is needed to the distance and reddening calibrations, and ages derived from the revised T_{eff} and [Fe/H] agree with those in the GCS to within $\sim 10\%$.

In order to check whether the new calibrations, and our age computation procedure in particular, affect the key Galactic diagnostic relations, we have performed extensive end-to-end simulations of the resulting metallicity distribution, age-metallicity, and age-velocity diagrams, using artificial samples as well as the real data. We find that no spurious trends are introduced, apart from the selection effects inherent in the sample and already discussed in the GCS; no significant revision of the GCS findings is needed.

References

Nordström B., Mayor M., Andersen J., *et al.*, 2004, *A&A* 418, 989 (GCS).