Plate material and image processing

The GSC-II is based on the photographic surveys carried out with the Schmidt telescopes at the Palomar and Anglo-Australian Observatory (AAO). These data are stored into an object-oriented federated database, COMPASS, which adopts a store hierarchy based on 32768 sky areas defined by the Hierarchical Triangulated Mesh (HTM) level 6 (McLean et al. 2000).

GSC-II database (COMPASS)

- Astronomical data
- Optical positions (2.5 deg)
- Celestial positions (0.5 deg)
- IAU2006 JD13-49
- Cepheids
- RR Lyrae
- Open Classifications (variable/evolving stars)
- Archives

GSC-II database mining for Galactic Astronomy

We briefly mention:
- The WD high proper motion surveys (150 deg) to search for ancient halo WDs and measure the baryonic fraction of local dark matter. We found 41 WDs, including 24 new discoveries (Carlo et al. 2006, A&A 448, 579), whose analysis is in preparation.
- Kinematic study toward the LMC to measure the velocity ellipsoid rotation velocity gradients of the thick disk and to constrain its IMF (Vallenari et al. 2006, A&A 451, 123).

GSC 2.3 All objects R<20

GSC 2.3 positions were derived by means of astrometric calibrations based on reference stars extracted from the Tycho-2 catalogue (Hog et al. 2000). A quadratic polynomial was adopted to model the transformation from the plate coordinates X,Y, previously corrected for refraction, to the standard coordinates from which celestial (0,α,δ) were derived. Finally, astrometric masks were applied to remove the typical 2D pattern of the position residuals which affect Schmidt plates. Finally, GSC 2.3 positions have been selected from the second epoch surveys, preferably from the objects closest to the center of the IILF plates.

Astrometry

GSC-II positions were computed by means of astrometric calibrations based on reference stars extracted from the Tycho-2 catalogue (Hog et al. 2000). A quadratic polynomial was adopted to model the transformation from the plate coordinates X,Y, previously corrected for refraction, to the standard coordinates from which celestial (0,α,δ) were derived. Finally, astrometric masks were applied to remove the typical 2D pattern of the position residuals which affect Schmidt plates. Finally, GSC 2.3 positions have been selected from the second epoch surveys, preferably from the objects closest to the center of the IILF plates.

GSC 2.3 as of October 2006, the version 2.3.02 contains positions, classifications, and photographic magnitudes Bp Rp I<.<<.<< for approximately 997,028,547 objects down to the plate limits, Bp<22, R<20. Public releases of GSC 2.3 are currently available to the community via the Web services:

- http://galex.stsci.edu/GSC2/GSC2WebForm.aspx (STScI)
- http://vo.oato.inaf.it/gsc2aq1/sql.aspx (INAF-OATo)
- and via the Open Sky Query of the National Virtual Observatory (NVO):
  - http://openskyquery.nvo.net/

For stellar objects, photometric passbands attain magnitude errors of 0.1 mag, with comparable systematic errors of 0.1 mag due to zero point variation as a function of position. Extended objects, which include galaxies and unresolved blends, show larger random and systematic errors up to 0.5 mag.

Figure: GSC2 vs. SDSS r - Red solid lines show ± RMS of the magnitude residuals averaged on all the HTM regions in common between the two catalogues (± random error). Asterisks indicate the mean magnitude residuals (± global systematic error) with error bars showing the RMS of the mean (± position systematic error). Statistics have been derived after applying a color transformation as a function of the mean color.

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Figure: GSC2 I<.<<.<< vs. Dennis H Gunn – Symbols as in previous figure.

Object classification

Starmarker classifications were assigned by voting all available classifications from 15 μm scans. Classifications from 25 μm scans were used only if no 15 μm data were available for the object. Ties were broken in favour of nonstar, and defect classifications were considered to be nonstellar for matched objects. Unmatched plate defects were excluded from the catalog. The incompleteness due to misclassification and image blending is discussed in more details by Drimmel et al. (“What Gaia will see”, poster D13-40).

Figure: Figure: Bp, Rp, I<.<<.<< passbands compared with Johnson-Cousins BV(RI)c filters

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Figure: GSC2 vs. UCAC2

Figure: GSC2 vs. USNO-B

Same symbols as in previous figure.

Comparisons with external catalogues (see figures) are consistent with the astrometric precision having a random error of 0.1-0.2 arcsec for stellar objects respectively brighter than Rp<17 and 19.5. The position error of extended objects (including both galaxies and blends) is about twice these values. In addition, local systematic errors at the HTM region level (1 deg) with RMS of about 0.1-0.15 arcsec are present. Globally, the GSC 2.3 reference frame is consistent with that of other all-sky catalogs (USNO, UCAC2, USNO+B) at level better than 0.1 arcsec. Finally, a systematic difference of about 0.1 arcsec is found between the North and South hemisphere possibly due to the presence of an uncorrected magnitude term which is currently under investigation and that will be removed in the next GSC release.

Table: position differences (arcsec) GSC2 vs. UCAC2 and USNO-B.