

accuracy using double images of PPM stars on each plate are as follows: $0''.25$ and $0''.004/\text{yr}$ for positions and proper motions, respectively.

Some researches regarding the processing of FON plate measurements will be carried out in cooperation with the Sternberg Astronomical Institute (Moscow, Russia) and the Astronomisches Rechen-Institut (Heidelberg, Germany).

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3 Planned observational programmes

3.1 Tokyo PMC DISC-II (Yoshizawa)

Meridian observations with a drift-scanning CCD micrometer of stars and extra-galactic compact objects fainter than mag 12 will complement the forthcoming HIPPARCOS/TYCHO catalogs in forming a new definition of the stellar reference frame based on the geometrical concept of an inertial system. A survey of proper motions of young stars and old giants may be especially interesting for the study of galactic kinematics under a quasi-inertial reference frame.

The performance of DISC-II (second DIGital Strip scanning CCD micrometer) is reported in Yoshizawa (1994, IAU Symposium No. 166). A short summary of the results is as follows:

- The internal error of a single observation averaged over a wide range of zenith distance is ~ 60 mas at mag 10, increasing to 150 mas at mag 15.
- With a field of view of 0.6 degrees in declination, DISC-II attached to the Tokyo PMC and working under the drift-scanning mode at a fixed declination, can sweep out a long strip, and can digitize all the positions and magnitudes of $\sim 60\,000$ stars down to mag 16 during eight consecutive hours.
- Fourfold observations of the same strip with DISC-II will enable us to determine the positions of tens of thousands of stars with an internal precision better than 50 mas.

As for equipping the Tokyo PMC program with DISC-II, we are tentatively proposing to perform drift-scanning observations of two (or three) years duration. The scope of the program is planned to be the fourfold coverage of the sky comprising $\sim 10\,000$ square degrees, yielding the positions of a few million stars down to mag 16 with expected internal precision better than 50 mas. For a technical reason the drift-scanning observations with DISC-II will be restricted to the equatorial zone $\pm 35^\circ$.

3.2 USNO catalog programs (Gauss)

The Astrometry Department of the US Naval Observatory in Washington has several projects currently active that will provide new star positions. The Navy

Prototype Optical Interferometer will be put into operation momentarily and the first program will be a list of approximately 1000 FK5 stars, carefully selected to avoid multiplicity. This program will take about two years and is expected to produce a catalog with accuracies of around 2-3 mas. Included in this list will be the eleven stars observed with the Mark III interferometer on Mt. Wilson to provide an immediate check on the performance of the new instrument.

A Catalog of Positions of Infrared Stellar Sources (CPIRSS) has been produced (Hindsley, R.B & Harrington, R.S (1994): *The US Naval Observatory Catalog of Positions of Infrared Stellar Sources*, AJ 107, 280-286). It was formed by comparing IRAS objects with astrometric star catalogs using not only position, but also magnitude and spectral characteristics. The resulting catalog of about 33 000 sources contains IRAS flux data, as well as theoretical fluxes calculated for 2.2 microns.

The USNO 8-inch Twin Astrograph is being refurbished with a new lens designed for the red wavelength region. It is planned to begin a photographic program involving stars of 9-14 mag to produce a catalog with accuracies on the order of 50 mas or better within two or three years. A reference system in this magnitude range is needed for numerous projects, including the USNO participation in the Sloan Digital Sky Survey.

3.3 Flagstaff Astrometric Scanning Transit Telescope (Stone)

The 20-cm Flagstaff Astrometric Scanning Transit Telescope (FASTT) is involved in a number of large cataloging projects. Calibration regions in support of the US Naval Observatory measurement of the Palomar Sky Survey plates for astrometry was completed. Nine long strip scans across selected regions were made, and the positions for about 210 000 stars were determined with the FASTT to a accuracy of 50 mas.

The FASTT is currently determining star positions in eight equatorial regions for the Sloan Digital Sky Survey. Each region is 2.5 degrees square and includes ~ 200 000 stars. These regions will be used to calibrate the 47 CCDs in the Sloan focal plane array. The Sloan Survey will determine star positions in 10 000 square degrees of the sky down to V=18 mag with an accuracy of 30 mas. The FASTT is also determining the positions of selected objects in the VLBI extragalactic reference frame. Current observations include 221 radio stars, the Basic FK5 stars for linking the optical and radio reference frames, as well as the outer planets and many asteroids.

3.4 Bordeaux MC (Réquière)

The Bordeaux automatic meridian circle was recently equipped with a focal CCD camera working in drift-scanning mode. From the preliminary tests obtained since March 1994, the expected accuracy on positions of stars in the

range $9 < V < 15$ is $0''.03$ – $0''.06$ for fourfold measurements. The raw night-to-night differences give clear evidence of slow image motion which will limit the final accuracy. However, it is expected that by using the TYCHO positions and proper motions as reference this will allow us to take these slow fluctuations into account.

The present camera will be moved soon to the Sao Paulo meridian circle (Brazil), and a new one will be mounted on the Bordeaux instrument. These cameras were developed mainly to extend the HIPPARCOS/TYCHO frame to $V=15$ at least. The present observing programme concerns narrow strips in the Bordeaux AC zone ($+11^\circ$ to $+17^\circ$) and selected fields which could be used for calibration of other CCD instruments.

3.5 Future catalogue projects at Pulkovo (Polojentsev)

Taking into consideration the development of space astrometry (the success of HIPPARCOS, the AIST project of Pulkovo etc.), Pulkovo Observatory is reconsidering its plans for meridian and photographic astrometry. Preference will be given to the projects which complement the space programme.

However, as a first stage, it is necessary to carry out a comparison of the results by classical methods with those from space missions. For this reason, during the next 10 years all traditional Pulkovo observations will be continued, and after that only those observational programmes which supplement the space programme will be prolonged. Meanwhile, the AIST space project (Artificial Astrometric Earth Satellite) for *mas* astrometry and a photometric survey of a large number of stars is progressing. Several Industrial Space Enterprises are participating (M S Chubey).

Another important project which is in progress is the Reflector Infrared Meridian Circle. The instrument will observe in the near *I* and middle *K* bands using a PbS matrix photo detector and CCD matrix (V N Yershov).

The experimental investigation into the construction of an astrograph with a CCD matrix and field of 0.74×1.10 degrees is in progress (I S Guseva).

The classical meridian and photographic instruments are now mainly equipped with CCD micrometers. In photographic astrometry, new plates specially manufactured at Pereslavl-Zalessky are beginning to be used.

Here we list some future catalogue projects:

- Infrared Meridian Catalogue. In the first stage (K-band only) the catalogue will contain only 5000 stars brighter than 7 mag in declination zone -10° to $+90^\circ$. The purpose is to extend the fundamental reference frame to the infrared waveband and obtain positions with an accuracy of $0''.05$. The programme is planned to start in 1996 (T R Kirian).
- Meridian catalogue of stars with the new Sukharev Automatic Horizontal Meridian Circle (MAGIS), starting in 3–4 years.
- Photographic catalogue of ~ 8000 stars with $V < 16$ in 73 small fields around radio sources in declination zone $+30^\circ$ to $+90^\circ$. Work started

in 1993 (A A Dementieva).

- Photographic catalogue of fields of 100 radio stars in the Northern hemisphere. Work started in 1994 (N V Narignaya).

4 Discussion

The Chairman (L V Morrison) summarised the following areas of overlapping interest and invited discussion on collaboration, possibly by forming new Working Groups.

- Meridian Circle CCD programmes – $V \sim 16$ – $\sigma \sim 50$ mas
Sloan Digital Sky Survey – $V \sim 18$ – $\sigma \sim 50$ mas
- Photographic surveys
FON – fourfold coverage of Northern sky
USNO 8-inch twin astrograph red-plate survey
FOKAT – Southern hemisphere – remeasure
AGK2 – Northern hemisphere – remeasure
- POSS/UK Schmidt plate measurement
RGO, APM Cambridge, UK
USNO, Flagstaff, USA
STScI, Baltimore, USA
Minnesota, USA
- AC reduction
ARI, Germany
USNO, USA
Sternberg Inst., Russia
- Linking optical and radio reference frames
Several groups are using faint reference stars in the fields of extragalactic radio sources to link the optical to the primary radio frame.
- Astrolabe projects
International catalogue projects in N and S hemispheres.

After some discussion it was decided to refer the coordination of the work on selecting reference stars for linking the optical and radio reference frames to the WG on Star Lists.

Given the early stage of development of most of the Meridian Circle CCD programmes, it was considered premature to form a WG to coordinate their observational programmes.

There was no consensus on forming a WG for the POSS measurement projects.