

#### ***4.10. The Kharkiv's XC1 catalogue of positions and proper motions of faint stars around extragalactic ICRF sources***

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We present a new astrometric catalogue of faint reference stars around ICRF sources of northern hemisphere. The XC1 catalogue was created at our Institute. This catalogue contains the positions and proper motions in ICRS/Tycho2 system of about 1 million stars in  $10^m$ - $19^m$  magnitude range within 255 selected areas of northern sky. The XC1 catalogue is based on our results of measurements and astrometric reduction of digitized images of Schmidt plates POSS-I and POSS-II sky surveys, obtained from USNOFS PMM Image Archive. The Tycho-2 catalogue was used as reference one. The

epoch difference between these surveys is about 45 years. Here is present only 255 selected fields from XC1 catalogue. In these 255 selected fields minimum 5 individual positions from O, E, J, F, and N plates were used to derive mean positions and proper motions. Additionally, the 2MASS positions for identified stars also were used. For the rest about of 100 fields, the quality of some images is unsatisfactory, so we were not able to use all 5 individual positions to derive mean positions and proper motions.

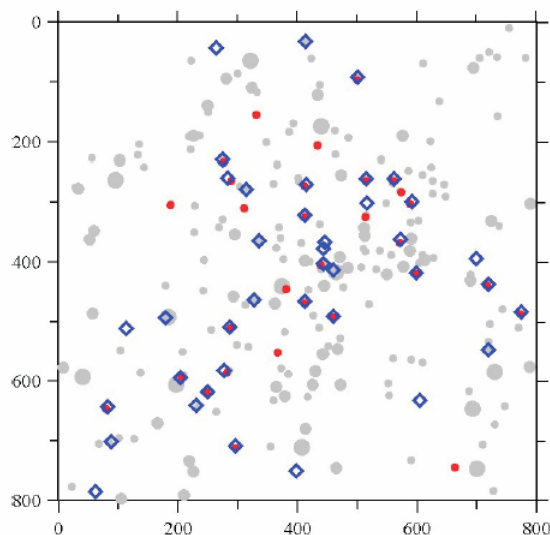


Figure 38. The finding chart for the variable stars in the central region of the globular cluster M15. The size and orientation of the plot corresponds to orientation of WFPC1 chip of HST during M15 observations ( $\approx 35'' \times 35''$ , cf. Fig. 37), the axes designation is given in units of WFPC1 pixels. The variables discovered with the HST and with 4.2-m WH telescope are plotted as red dots, the variables from our list are plotted as blue open diamonds. Black open circles denote brightest non-variable stars measured with HST in M15; the circle size roughly proportional to star's R magnitude

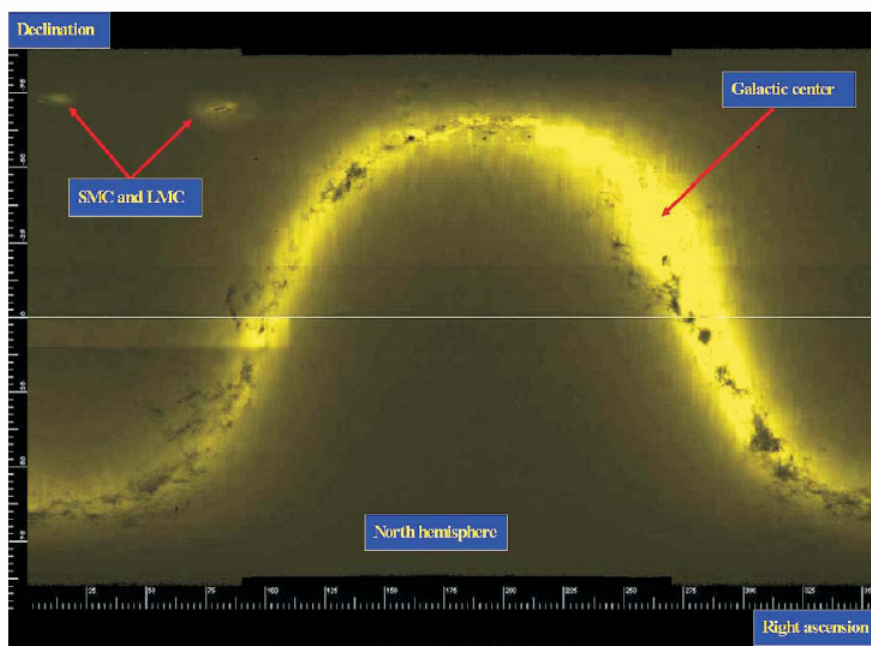


Figure 39. The distribution of the XPM catalogue stars

The averaged internal errors of the positions (on J2000) are about 70 to 100 mas for stars  $< 17^m$ - $18^m$  and are 100 to 200 mas for faintest stars. Proper motions are derived from comparison POSS-1 and POSS-2 epoch positions. Their internal errors are about 2 to 5 mas/yr, depending on magnitude. In order to estimate external errors of the XC1 catalogue, various external comparisons with modern catalogues were performed. The significant systematic errors in XC1 positions and proper motions have not been found. The estimated external proper motion errors for stars fainter than  $15^m$  are 3÷5 mas/yr, depending on magnitude. Magnitude-dependent systematic errors were removed. Color-dependent systematic errors were not removed.

Catalogue	UCAC2	2MASS	CMC14	KMAC1CU	DR3	LEDA
Number of common stars	118786	551641	355111	34869	285	4195
Percent of the stars with position deviations more $3\sigma$	4 %	3.5 %	3.5 %	3.5 %	1.5 %	2.5 %
The RMS errors of position differences, mas	50–150	70–350	70–250	80–600	110	600
Systematic differences in RA, mas	-10..+10 $\pm 2$	-10..+10 $\pm 1.5$	-20..+10 $\pm 2$	-50..+20 $\pm 5$	+12 $\pm 6$	-460 $\pm 9$
Systematic differences in DEC, mas	-10..+10 $\pm 2$	-10..+10 $\pm 1.5$	0...+40 $\pm 2$	-20..0 $\pm 5$	-2 $\pm 7$	-89 $\pm 9$
The RMS errors of proper motion differences, mas/yr	2.5–6	–	–	–	3.3	4.0
Systematic differences in proper motion by RA, mas/yr	-1..+1 $\pm 0.1$	–	–	–	-0.18 $\pm 0.2$	+0.07 $\pm 0.06$
Systematic differences in proper motion by DEC, mas/yr	-1..+1 $\pm 0.1$	–	–	–	-0.12 $\pm 0.2$	+0.24 $\pm 0.06$

The XC1 catalogue is available: <http://cdsweb.u-strasbg.fr/cgi-bin/qcat?l/302>