COMPARISONS OF THE USNO-B1.0 CATALOGUE WITH PUL-3 AND UCAC1 IN SELECTED FIELDS

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ABSTRACT. The recently released USNO-B1.0 catalogue which contains more than billion objects, may be widely used in processing of positional CCD-observations with small fields. The goals of this paper are preliminary estimation of the precision and investigation of the systematic errors of astrometric data of USNO-B1.0 by comparing of the USNO-B1.0 catalogue with Pul-3 (northern hemisphere) and UCAC1 (southern hemisphere) catalogues in selected fields. The positional precision of the USNO-B1.0 relative to Pul-3 (epoch 1963.25) and UCAC1 (epoch 2000.0) is inhomogeneous and in average is equal to $0.18''$. Magnitude-dependent systematic errors of the USNO-B1.0 are most significant for stars that are fainter than 15 magnitude.

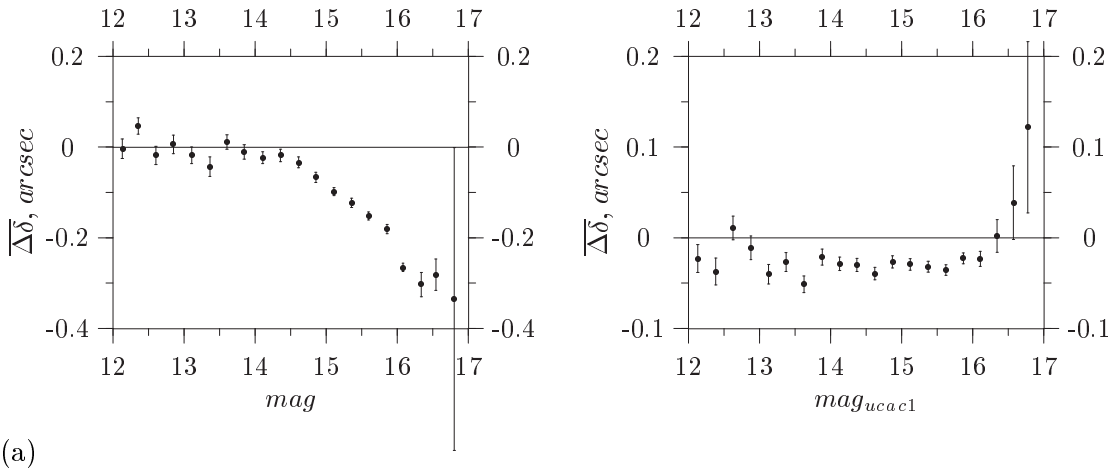
1. THE RESULTS OF COMPARISONS

The comparison of the USNO-B1.0 (Monet et. al. 2003) with Pul-3 (E.V.Khrutskaya et. al. 2002) catalogue was based on the data of 16 fields (5042 stars, $m \geq 12$). The data for 5 fields from UCAC1 (N.Zacharias et. al. 2000) (16035 stars, $m \geq 12$) were used in comparison of the USNO-B1.0 with UCAC1. The fields radius is 1°. These fields were selected in different zones of RA and DECL. The Tycho-2 stars have been excluded. The mean epoch of USNO-B1.0 positions was about 1980.0 for comparing fields.

The comparison of the USNO-B1.0 catalogue with Pul-3 has been made in the mean epoch of the Pul-3 catalogue. The average differences in coordinates and in proper motions (PUL-3 – USNO-B1.0) are $\Delta\alpha\cos\delta = -0.003''$, $\Delta\delta = -0.038''$, $\Delta\mu_\alpha\cos\delta = -0.7 mas/yr$, $\Delta\mu_\delta = -3.6 mas/yr$. The mean errors of astrometric data of the USNO-B1.0 catalogue (from comparison with PUL-3 for epoch 1963.25) are $\epsilon_\alpha\cos\delta = \pm 0.157''$, $\epsilon_\delta = \pm 0.181''$, $\epsilon_{\mu_\alpha\cos\delta} = \pm 8.6\, mas/yr$, $\epsilon_{\mu_\delta} = \pm 9.2\, mas/yr$.

The systematic differences in coordinates and in proper motions of stars are depended on magnitude and color of ones. The color-dependent systematic errors in positions and proper motions are nonlinear. There are linear dependence on magnitude of differences in RA and in proper motions in RA. These systematic errors are within $\pm 0.1''$ in α and $\pm 4\, mas/yr$ in $\mu_\alpha\cos\delta$. The linear dependence on magnitude of differences in DEC is considerable for stars that are fainter than 14 magnitude (Figure 1 (a)). The systematic differences in μ_δ are within $\pm 4\, mas/yr$ and nonlinearly depend on magnitude.

The comparison of the USNO-B1.0 catalogue with UCAC1 has been made on the epoch 2000.0. The average differences in coordinates between UCAC1 and USNO-B1.0 (UCAC1-



(a) (b)

Figure 1: The systematic differences (PUL-3 – USNO-B1.0)(a) and (UCAC1 – USNO-B1.0)(b) in DEC as functions of stars magnitude.

USNO-B1.0) are $\Delta\alpha\cos\delta = 0.015''$, $\Delta\delta = -0.095''$. The errors of stars coordinates of the USNO-B1.0 relative to UCAC1 for epoch 2000.0 are $\epsilon_\alpha\cos\delta = \pm 0.183''$, $\epsilon_\delta = \pm 0.180''$. The dependencies of the systematic differences in RA and in DECL on magnitude are similar The considerable magnitude-dependent systematic errors have been revealed for faint stars ($> 15^m$)(Figure 1 (b)).

2. CONCLUSIONS

The investigation has shown that the precision of the USNO-B1.0 astrometric data is inhomogeneous. The dependencies of the systematic differences from positions have not been revealed. The individual significant systematic differences in positions ($\geq 0.2'' \div 0.3''$) have been revealed in both comparisons. The values of differences (Pul-3–USNO-B1.0) and (UCAC1–USNO-B1.0) are comparable.

There are magnitude-dependent systematic errors in USNO-B1.0 catalogue. These errors are considerable for stars that are fainter than $14 \div 15$ magnitude.

3. REFERENCES

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