On the FON astroplate project accomplishment

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FON – Photographic survey of the Northern Sky

Idea: four-fold overlap of the sky with instruments of the same type;

6 observatories: Kyiv(Ukraine), Kitab(Uzbekistan), Zelenchuk(Russia), Abastumani(Georgia), Zvenigorod(Russia), Dushanbe(Tajikistan)

- Instruments: Double wide-angle astrographs; D/F=40/200,40/300
- Years of observations: 1981-1998

Zelenchuk

Zvenigorod
Abastumani

Four-fold overlap

Kyiv
Kitab

Dushanbe
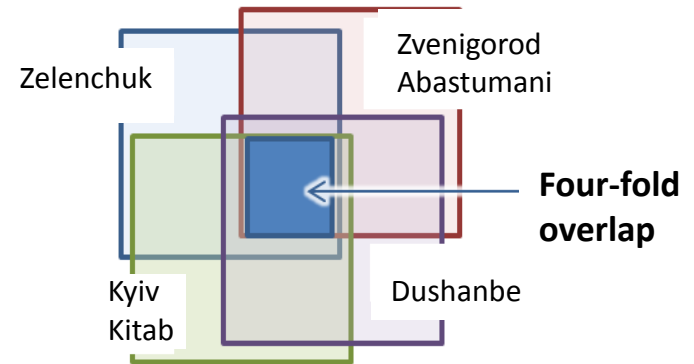
OBSERVATIONAL DATA FOR THE COMPILED CATALOG:

❖ **FON-KIEV: 2260 plates, 24 752 709 stars and galaxies, epoch 1988.16, B color band, sky area from -04 to +90° on declination**

❖ **FON-KITAB: 1963 plates, 13 413 268 stars and galaxies, epoch 1984.97, B color band, sky area from -20.5 to -3.5^o on declination**

❖ **FON-DUSHANBE: 1560 plates, B color band, sky area from -04 to +90 ^{o} on declination**

   ADDITIONAL DATA:

❖ **1.2m Schmidt telescope, Baldone: 779 plates,   U color band**

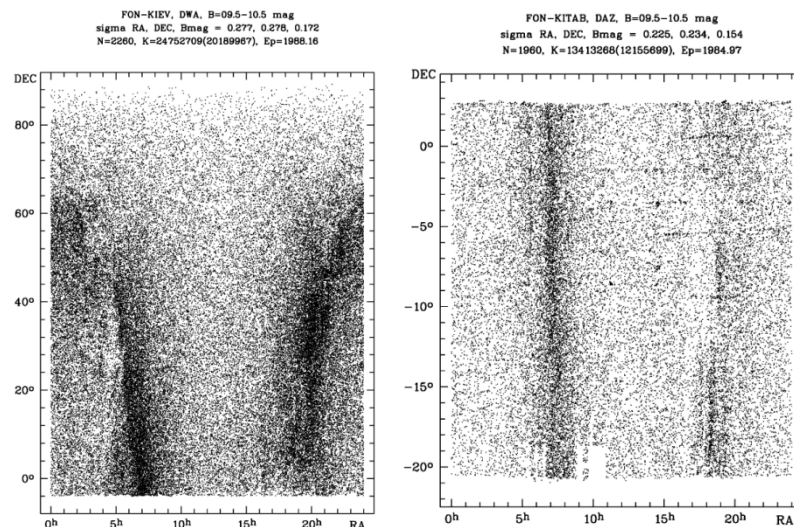❖ **1.2m Schmidt telescope, Baldone : 4656 plates,   V color band**

COMPONENTS OF THE COMPILED CATALOG:

❖ FON-KIEV: zone DE from -4 to +90 degrees, 24.7 million objects, B ≤ 16.5^m, $\sigma_{RA,DE}$ = ±0.28", σ_B = ±0.17^m

❖ FON-KITAB: zone of DE from -20.5 to +2.5 degrees, 13.4 million objects, B ≤ 17.5^m, $\sigma_{RA,DE}$ = ±0.23" , σ_B = ±0.15^m.

❖ FON-DUSHANBE: in progress, preliminary estimated $\sigma_{RA,DE}$ = 0.33", σ_B = 0.12^m.

PHOTOMETRIC ENHANCEMENT:

❖ 1.2m Schmidt telescope, Baldone: 779 plates,   U color band , in progress.

❖ 1.2m Schmidt telescope, Baldone : 4656 plates,   V color band, in progress

**STAR MAPS OF
FON-KIEV
AND
FON-KITAB CATALOGS**

FON-KIEV, DWA, B=09.5-10.5 mag
sigma RA, DEC, Bmag = 0.277, 0.278, 0.172
N=2260, K=24752709(20189967), Ep=1988.16

FON-KITAB, DAZ, B=09.5-10.5 mag
sigma RA, DEC, Bmag = 0.225, 0.234, 0.154
N=1960, K=13413268(12155699), Ep=1984.97

Photometric determinations from plate images with two exposures.

Wide-angle observational material of FON project was obtained with two exposures of different durations shifted by both coordinates. The aim was to restore the characteristic curve for photometric determinations as a compiled one from two exposures in order to achieve the same accuracy for stars on the entire range of magnitudes.

The combined characteristic curve 1' has been obtained by shifting the characteristic curve of short exposure 2 by ΔB in order to continue the long exposition curve 1 to the region of faint and extremely faint stars with B>13^m. In practice, the curve 1' has been used for determination of photographic Bph magnitudes of objects registered on all 2260 negatives of FON collection.

DWA, FON, Plate N0001
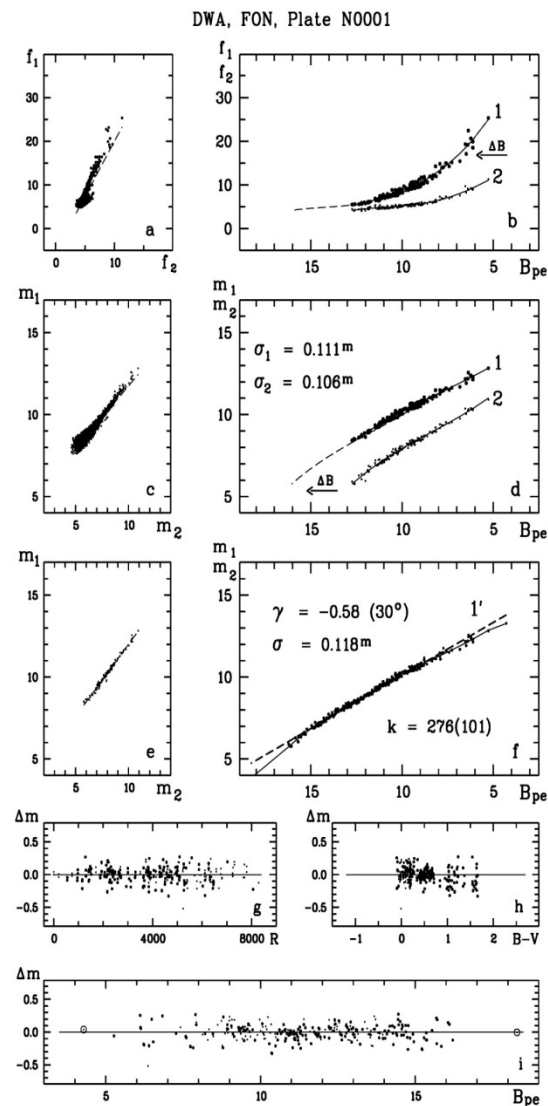
Photometry from plate images with a single exposure.

The photographic material of Baldone Schmidt telescope was obtained with a single exposition. Fig. 4 presents the example of the characteristic curve from the Baldone digitized astronegative and the errors of its restoration.

The errors are given as the differences between calculated U-magnitudes and their photoelectric counterparts Upe versus rectangular coordinates X and Y, the distance from the plate center R, a color index B-V, and photoelectric magnitudes Upe.
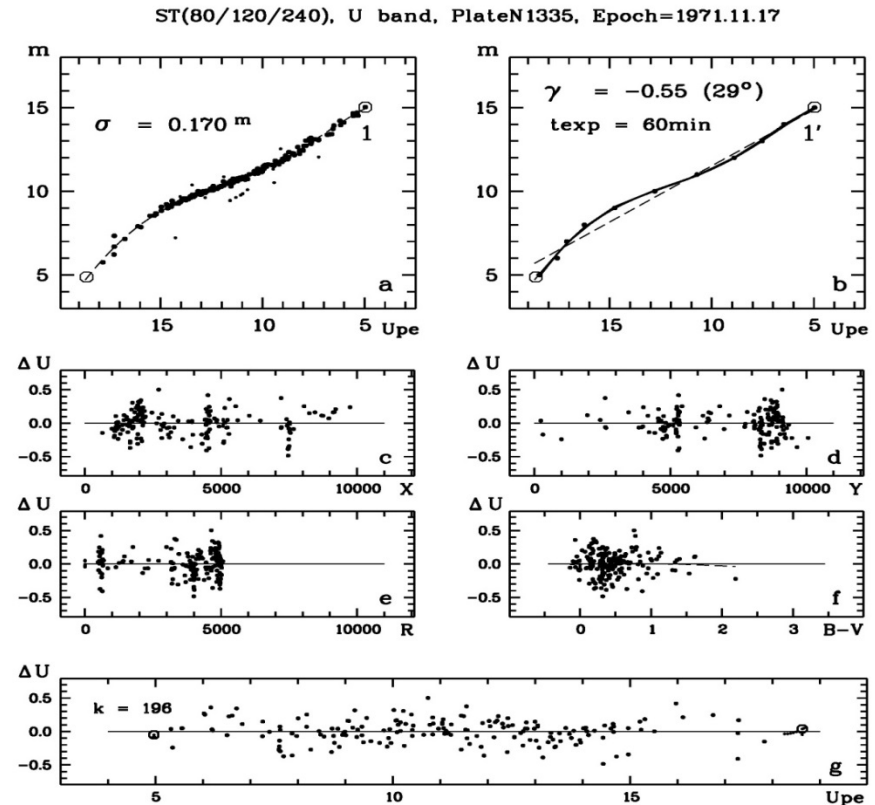

ST(80/120/240), U band, PlateN1335, Epoch=1971.11.17

The photometric system of the catalog.

FON observational material was exposed by telescopes-refractors. Due to this, the results of the photometric processing of digitized plates comprise a color equation.

Panels a and c show the trend of differences ΔB relative to B_{pe} for Kyiv and Kitab parts of FON catalog. Panels b and d give the dependences of ΔB on photoelectric data B-V. The numbers of compared stars for parts of the catalog are 29 776 and 6135. Rms errors σ_m of magnitude differences are ±0.140^m and ±0.156^m respectively. Panels c and d for Kitab demonstrate the conspicuous color equation with the value of 0.16(B-V) of star magnitude.
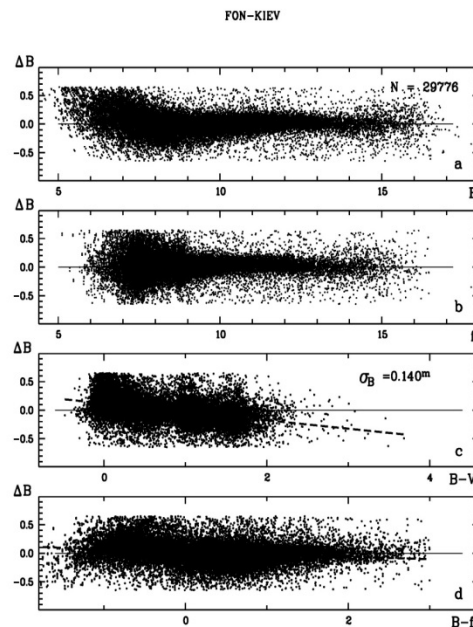
FON–KIEV

$$B(pe) = a(B-V) + bB(ph) + c$$
$$B(pe) = 0.154(B-V) + 0.998B(ph) + -0.094$$
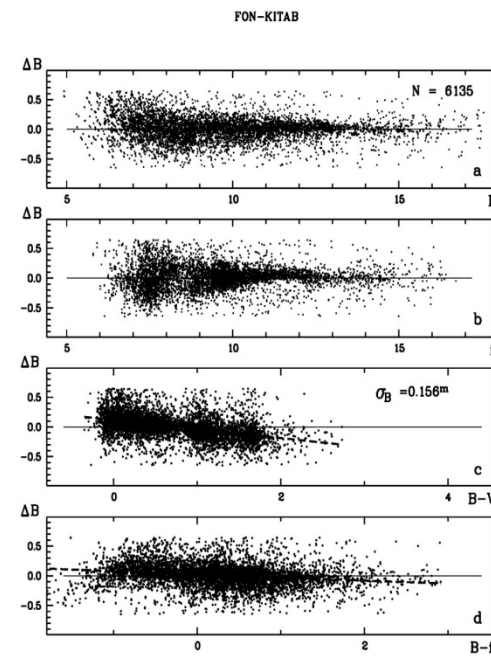
FON–KITAB

$$B(pe) = a(B-V) + bB(ph) + c$$
$$B(pe) = 0.167(B-V) + 0.997B(ph) + -0.091$$

In publications [Akhmetov, 2016; Akhmetov, 2018; Protsyuk, 2016] the results of the comparison of three obtained (FON-Kiev, FON-Kitab) or being created (FON-Dushanbe) catalogs are given. The estimation of random accuracy of stars positions from the mentioned catalogs was performed by the Wielen method [Wielen, 1995].

Final dispersions were calculated for every sub-range of magnitudes. The results of the comparison of mentioned catalogs with PMA [Akhmetov, 2017], XPM [Fedorov, 2009], UCAC4 [Zacharias, 2013], PPMXL [Roeser, 2010]are represented in corresponding publications.

The external accuracy of stars position of catalogs of FON project is in a good agreement with their internal accuracy and equal from 50 and 300 mas for brightest and faintest stars respectively.