Deriving a V magnitude from UCAC3

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ABSTRACT

The LONEOS photometric catalogue is a compilation by Brian Skiff that contains the V magnitudes of more than 17,000 standard stars. The catalogue contains stars from various publications of photometry of open clusters, magnitudes of AAVSO comparison stars and all the Landolt standard stars. The catalogue is considered as the best source of V magnitudes and is available on VizieR.

In a previous work Roger Dymock and Richard Miles derived a formula for calculating V magnitudes from the CMC14 catalogue using the r' Sloan magnitude with a precision of 0.05. However CMC14 only covers an area with declinations from +20 to -20. The recently published UCAC3 catalogue however covers the whole sky and has an aperture and model fit magnitudes as well as R magnitude from SuperCosmos.

In this work I analytically determine transformation for deriving a V magnitude from UCAC3 with a standard error of 0.08 magnitudes.
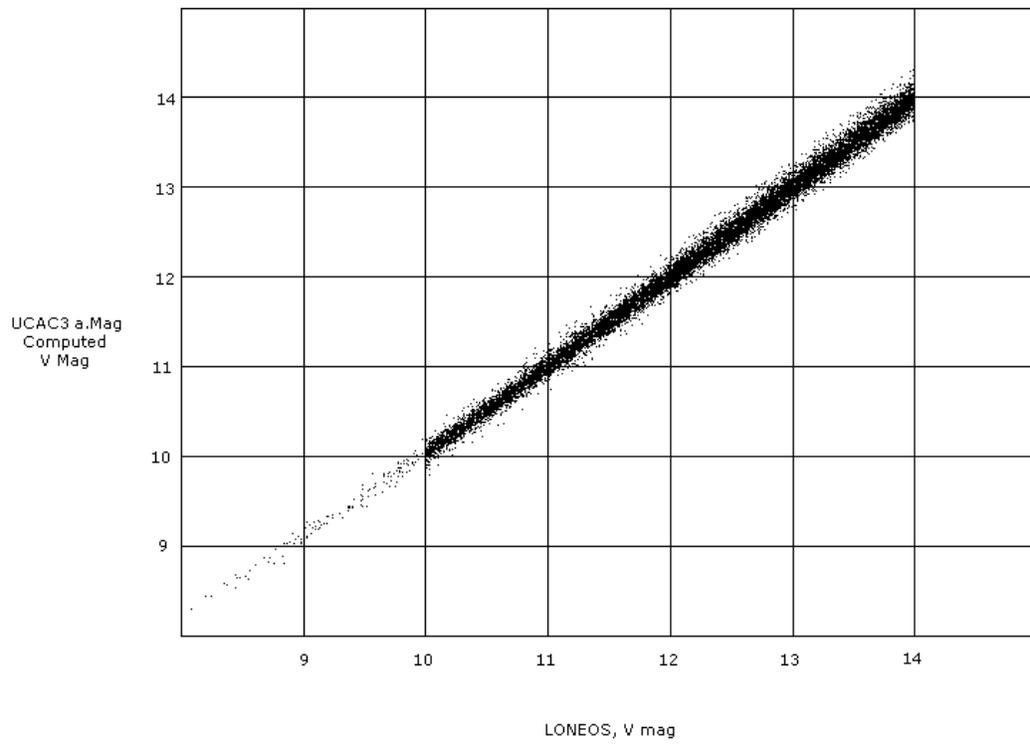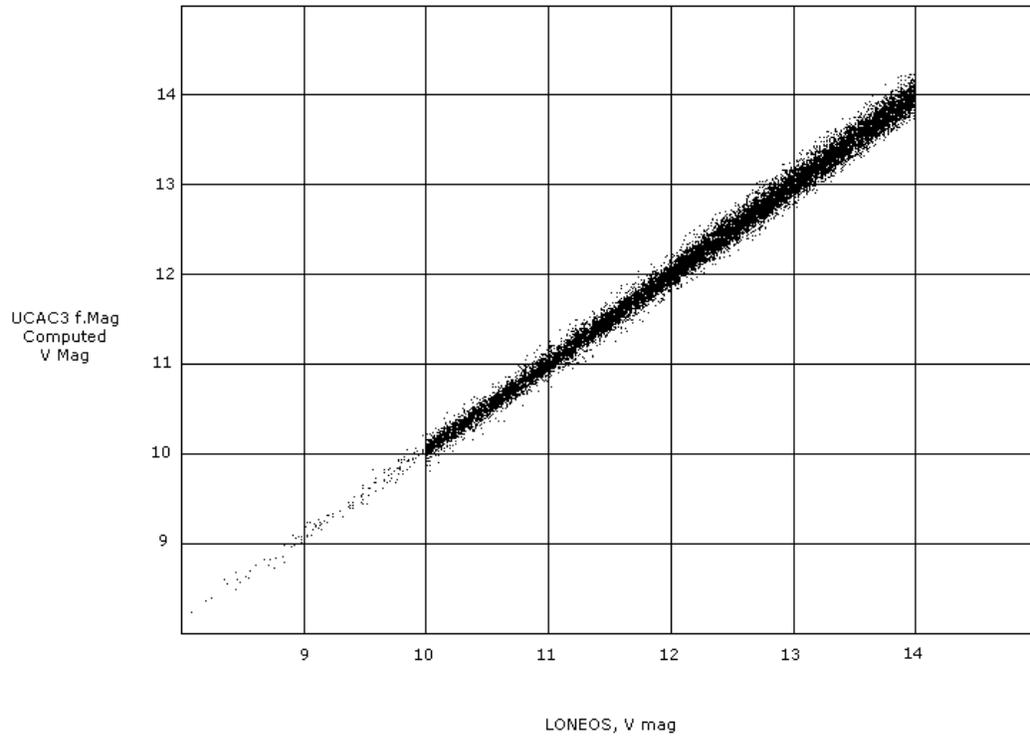
RESULTS

Using an automated process and VizieR I did a cross reference between LONEOS and UCAC3 for stars in the region from 8 to 14 magnitudes. I then did a linear least squares to derive a transformation from UCAC3 magnitudes to LONEOS magnitudes using the 2MASS (J –K) as a colour index. After the first fit all stars with residuals greater than 0.3 magnitudes were excluded and a second fit was done using the left more than 16,500 stars.

As a result I got the following transformations from the model fit **fMag** and the aperture photometry **aMag**:

$$V = 0.531 * (J_{2MASS} - K_{2MASS}) + 0.9060 * fMag_{UCAC3} + 0.95 \quad \pm 0.08$$

$$V = 0.529 * (J_{2MASS} - K_{2MASS}) + 0.9166 * aMag_{UCAC3} + 0.83 \quad \pm 0.08$$

UCAC3 f.Mag
Computed
V Mag

LONEOS, V mag

UCAC3 a.Mag
Computed
V Mag

LONEOS, V mag

I also did a fit with the R2 magnitude in UCAC2 which is a magnitude from photographic plates from SuperCosmos. The standard error was two times bigger than the error from the model fit and aperture photometry magnitudes (f.Mag and a.Mag) in UCAC3.

LONEOS, V mag
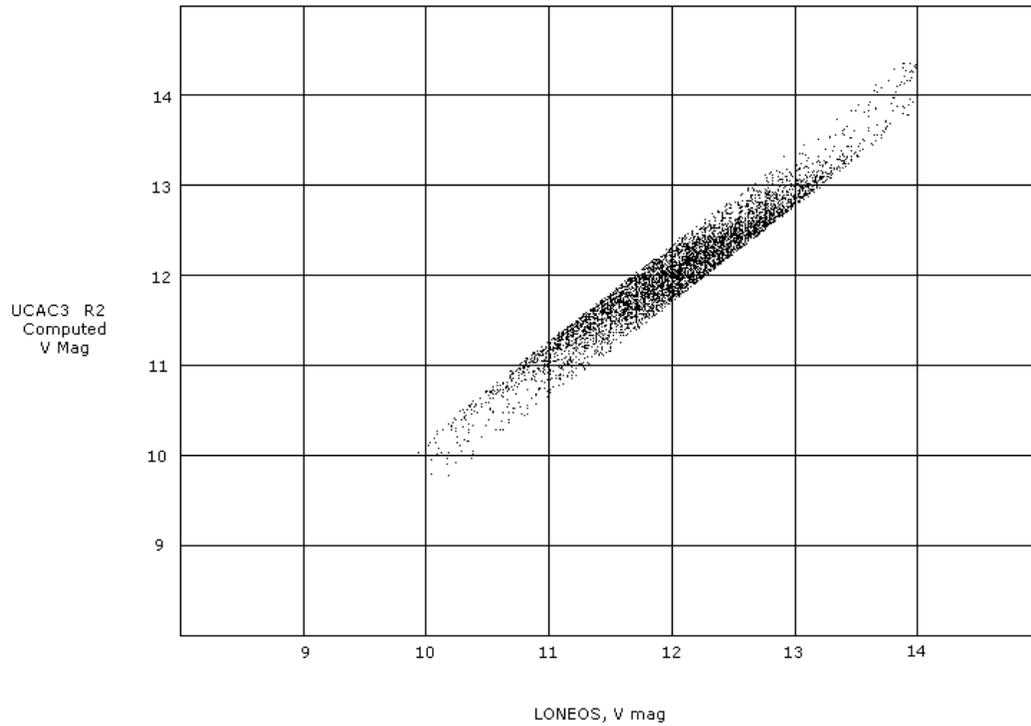
The derived transformation was:

$$V = 0.499 * (J_{2MASS} - K_{2MASS}) + 0.557 * R2_{UCAC3} + 5.50 \quad \pm 0.17$$

The two plots below show the residuals of the V magnitudes derived from UCAC3 f.Mag:

Δ mag (y-axis) vs 2MASS, J - K (x-axis)

Δ mag (y-axis) vs UCAC3 f.mag (x-axis)
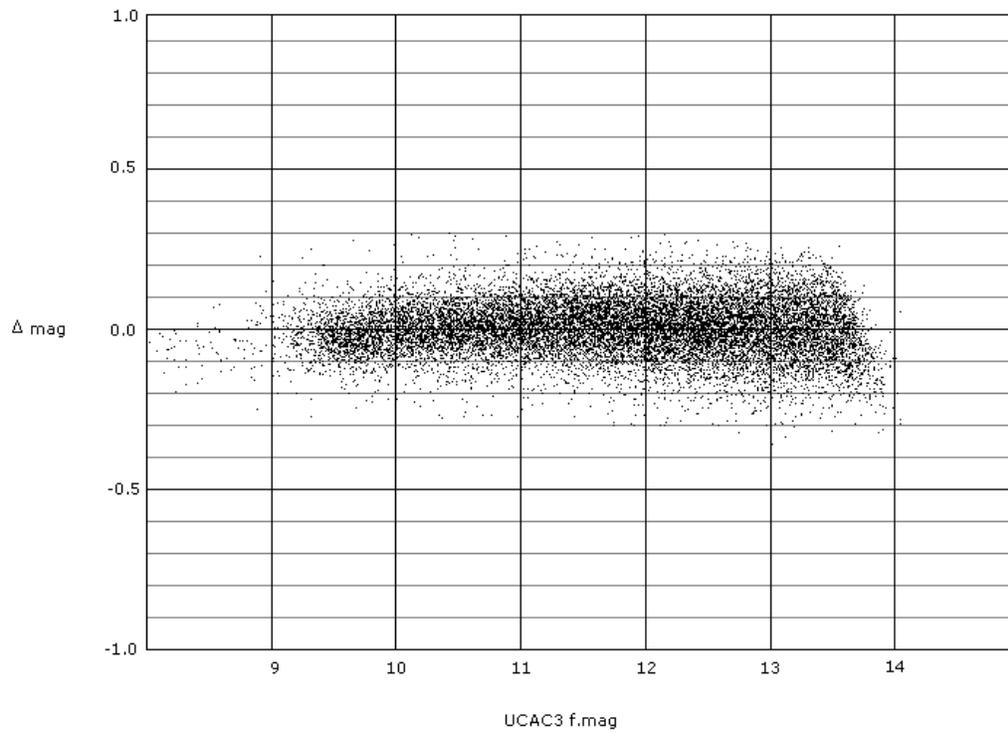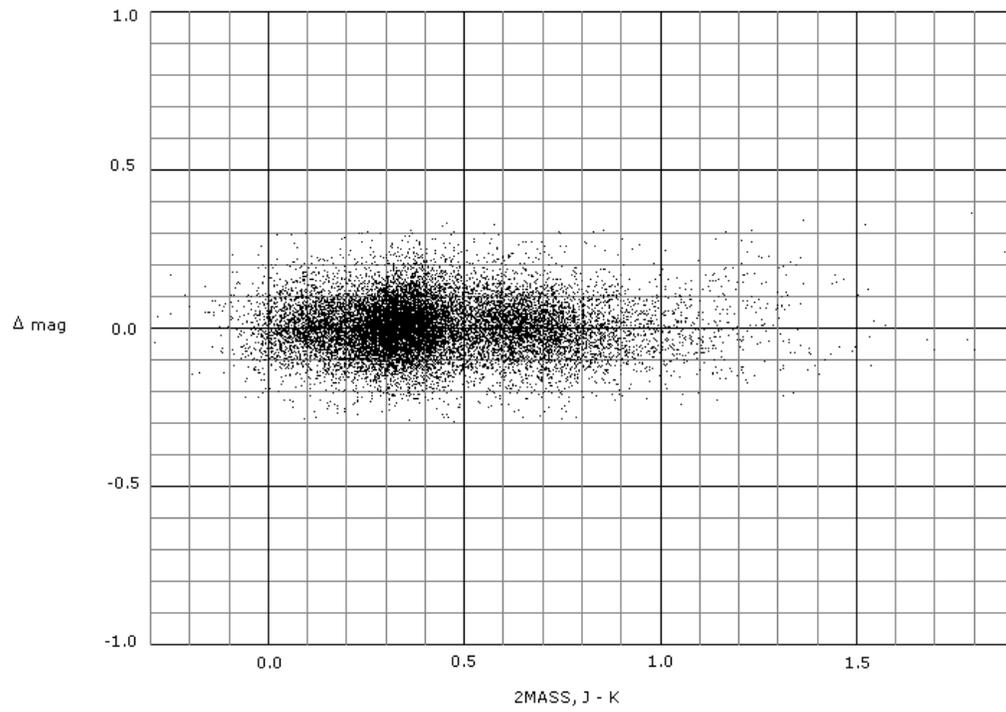
REFERENCES

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