

COLOUR AND MAGNITUDE FUNCTION FOR ABSOLUTE
DECLINATION IN ASTROLABE DATA

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RESUMO: Este trabalho contém as equações de cor e magnitude de declinações obtidas de três catálogos astrolábico observados em Valinhos.

ABSTRACT: This paper contains the colour-index and magnitude dependence in declinations derived from three astrolabe catalogues observed at Valinhos.

Key words: ASTROMETRY

1. INTRODUCTION

The stellar observational programmes with the Danjon astrolabe at Valinhos ($\beta = -23^\circ$, $\lambda = +3^{\text{h}}06^{\text{m}}$), have the aim to improve the stellar positions in the adopted fundamental Reference System (FK5).

In the case of the astrolabe the $\Delta\alpha$ corrections are determined independently of systematic instrumental errors. They result from the semi-differences between eastern and western observational mean residuals of the same star.

On the other hand, the $\Delta\delta$ corrections result of the average of these same residuals and therefore may contain instrumental effects (Débarbat and Guinot, 1970).

A research about absolute declination is under way at Valinhos with observations of the same stars in two zenith distances. In this condition it is necessary a good knowledge of such effects affecting the declinations (Clauzet, 1987).

2. MATERIAL AND METHODS

An absolute declination can be expressed by

$$D = D_0 + d_1 D_1 + d_2 D_2 + d_3 D_3 \quad (1)$$

where D_0 is the catalogued declination, D_1 is the observed declination, D_2 the colour-index and magnitude dependence and D_3 the difference to the true equator.

In order to analyse the colour-index and magnitude dependence we used the residuals of a set of maximum digression condition stars taken from the programmes which originated the first and second astrolabe catalogues at Valinhos (VL₁ and VL₂) (Clauzet, 1983, Clauzet and Benevides-Soares, 1985), observed at 30° zenith distance, and the third astrolabe catalogue (VL₃) (Clauzet, 1989) observed at 45° zenith distance.

The average of the eastern and western residuals of each maximum digression condition star is, in principle, free from systematic errors of the catalogue (see Débarbat and Guinot, 1970).

These averages are expressed as a colour-index and magnitude polynomial function:

$$D_2 = A_0 + A_1 I_C + A_2 I_C^2 + A_3 mg + A_4 mg^2 \quad (2)$$

The coefficients of this equation were obtained by a least square solution.

The values of D_2 were computed for the VL₁, VL₂ and VL₃ catalogues.

From statistical point of view, the coefficient A_2 does not appear significantly in any analysed catalogue. All data were re-reduced without the coefficient A_2 in expression (2).

III. RESULTS

The results obtained by the least square method are the following:

Coefficients of the colour-magnitude function for the different catalogues at Valinhos

	A_0 (")	A_1 (")	A_2 (")	A_3 (")
VL ₁	-0.088 ±0.036	-0.094 ±0.051	0.082 ±0.079	0.189 ±0.107
VL ₂	-0.060 0.027	-0.110 0.031	0.025 0.040	0.138 0.051
VL ₃	-0.207 0.033	-0.220 0.044	0.393 0.059	0.260 0.104

These results are displayed in the graphics (Figures 1, 2 and 3).

They show that the curves have the same tendency. The results are in fair agreement with the individual values presented in the VL₁, VL₂ and VL₃ catalogues. The mean residuals of blue and red stars have opposite signs and the magnitude influence is greater for faintest stars.

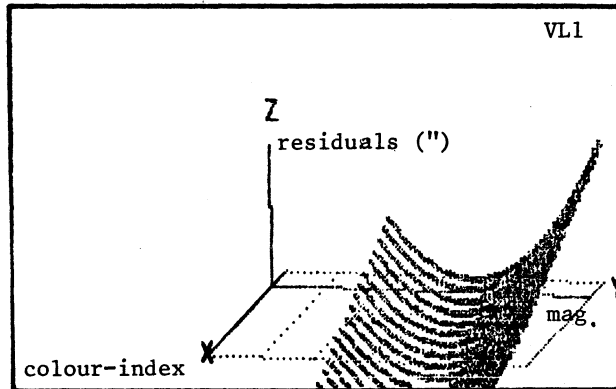


FIG. 1

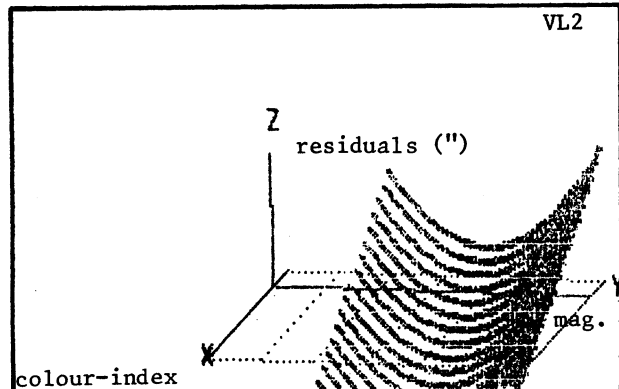


FIG. 2

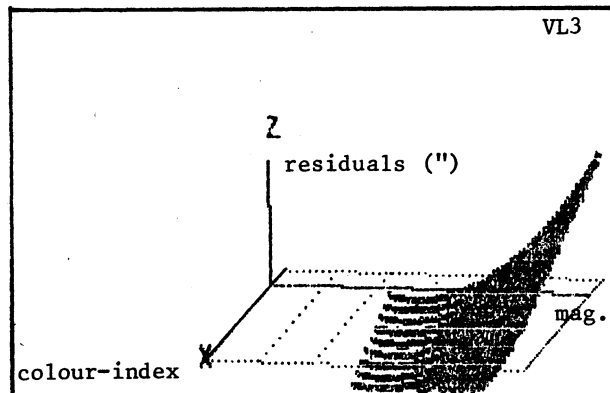


FIG. 3

Figures 1, 2 and 3: Three-dimensional D_2 (mg, I_C) graphics for the three catalogues at Valinhos (VL₁, VL₂ and VL₃).

They show also a consistent agreement in comparison with other methods developed in order to find the same dependence (see e.g. Boczeko, 1989).

In the VL₃ catalogue the effects are more pronounced. This may be due to the fact that the VL₃ was observed at 45° zenith distance and also that we have had instrumental problems during this programme (see Clauzet, 1987, 1989).

We gratefully acknowledge financial support from CNPq, CAPES and FAPESP.

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