ON THE ASTROMETRIC WORK OF THE LA PLATA ASTRONOMICAL OBSERVATORY

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A. DIFFERENTIAL OBSERVATIONS

I. The La Plata Catalogues

The Astronomical Observatory at La Plata began preparing the Catalogues of differential stellar positions in 1913, adopting, together with the Córdoba Observatory, a general program, similar to the Deutsche Astronomische Gesellschaft (AG); it meant the extension to the south of the vast plan formulated in 1868 by the AG. The La Plata observations program has included the stars of the Cape Photographic Durchmusterung (CPD) between 52° and 82° south declination. The zones from —22° to —52° and from —82° to the pole, were assigned to the Córdoba Observatory.

In accordance with the adopted plan, the La Plata Observatory has finished the observations and published the following Catalogues:

1.	La Plata	A, 7412	stars	between	— 52°	and	— 57°	declination
2.	»	B, 7792	»	»	— 57	»	— 62	»
3.	»	C, 4412	»	»	— 62	»	— 66	»
4.	»	D, 4513	»	»	— 66	»	— 72	»
5.	»	F, 4828	»	»	— 47	»	— 52	»

The La Plata E Catalogue, of approximately 4500 stars in declinations —72° to —82° is under observation; it is expected to have finished by 1962. To hasten the completion of the whole program, the zone from —47° to —52° that had been assigned to the Córdoba Observatory, was observed at La Plata. The Córdoba Observatory

has already published its A, B, C and D Catalogues of the zones from —22° to —47°, and now is reducing the last zone which goes from —82° to —90°. Therefore, the program adopted by the La Plata and Córdoba Observatories which includes the differential observations of the southern stars from —22° to the south pole, will be completely finished by the end of 1962.

In addition, I should mention the following special differential Catalogues:

[1] Kapteyn Stars, [2] Eros Stars, [3] Latitude Stars [4] 2123 Stars from Boss Catalogue, —15° and —80°, [5] 3170 Southern Galactic Stars and [6] 6744 Stars from the General Boss Catalogue, between —47° and —82°.

II. Fundamental Catalogue of Faint Stars

Towards the end of 1955 the observations of the Fundamental Catalogue of Faint Stars (CFD), with declination between +10° and the south pole, were started. The Catalogue will include about 650 stars from about magnitude 7.5 to about magnitude 8,5, and it is expected to observe every star 3 times in each position of the instrument. The observations are carried out with the differential method on the system of the FK3, and in the observing programs, for each 4 observations hours, are included about 20 fundamental stars, to ascertain, as much as possible, the values of the "Equator point", M_e, and the values of $(\Delta T + m)$ and "n" of Bessel's formula.

Periodically, the so called "Fundamental Series", are also observed, in order to establish the relation between the "Instrument System" and the "Fundamental System" and the "Jump in zenith": feet to the south and to north of the zenith.

Besides, a study is being made of the best way of determining "n" of Bessel's formula.

Up to now, the number of observations has not been as large as expected. This was due to unavoidable circumstances, firstly, the poor meteorological conditions throughout almost all the past years; secondly, the fact that on two occasions, the instrument could not be operated on account of fundamental mechanical modifications of the micrometer and some other repairings.

Up to date, the observations of the zones between + 10° and — 60° declinations, and 6^h of the zone — 60° to — 80°, with clamp W, are completed. The reductions are going on.

To establish the relation "Instrument System — Fundamental System", the method of succesive approximation was used, considering separetely:

a. Each one of the Series
b. Clamp W and Clamp E
c. "Feet to the south and feet to the north".

Primarily were compensated in the time the values of M_e and $(\Delta T + m)$, received directly from the observations of Fundamental Series and the positions of FK3. The method of least squares was here used according to the formulae:

$$M_e^0 + (t_i - t_0)\frac{dM_e}{dt} - M_e^i = 0$$

$$(\Delta T + m)^0 + (t_i - t_0)\frac{d(\Delta T + m)}{dt} - (\Delta T + m)^i = 0$$

The residuals, Observation — computed $\Delta\delta^1$ and $\Delta\alpha_\delta^1$ were arranged in groups according to declinations, and then a graphical compensation was performed.

Thus, the first approximation of the wanted relation, was obtained.

Afterwards, the values of M_e and $(\Delta T + m)$, corrected by $\Delta\delta^1$ and $\Delta\alpha_\delta^1$ were compensated once more.

The values $\Delta\delta^2$ and $\Delta\alpha_\delta^2$ were used to obtain the relation "Instrument - FK3", in the second approximation, etc.

From the sum of the squares of the residual, $[vv]$), of these compensations in the first approximation, we can receive an indication on the error of one observation. The probable errors r_δ and r_α of one observation, that is of one determination of "Equator point" or one Clock correction, derived as an average of all Series already reduced, are:

$r_\delta = \pm\ 0''.29$ (22 Series, each of approx. 25 stars),
$r_\alpha = \pm\ 0^s.027$ (10 » » » » 25 »

Taking into account that these values represent the average for all the stars from $+10°$ to $-100°$ of declination, they may be considered as acceptable [1].

To find the relation "Instrument-Fundamental System", we have also made use of the data obtained from observed zones. The follow-

(1) F. KÜSTNER, processing the Fundamental Series with the stars, δ from $-26°$ to $+50°$ and using the similar compensation method, has received the following values: $r_\delta = \pm\ 0''.31$, $r_\alpha = \pm\ 0^s.024$ See: *Beobachtungen von 4070 Sternen, Veröffentl.* d. Königl. Sternwarte zu Bonn, nº 4, Bonn, 1900.

ing errors of one observation. r_δ and $r_\alpha \cos\delta$, obtained from the sum $[vv]$ of the compensation in the first approximation, have been derived from the observations already reduced:

Zone	Cl. W.		Number of nights (In average 16 stars)	Cl. E.		Number of nights (In average 16 stars)
	r_δ	$r_\alpha \cos\delta$		r_δ	$r_\alpha \cos\delta$	
+10° to −10°	±0″28	±0ˢ027	24	±0″27	±0ˢ024	7
−10 » −35	.27	.024	23	.22	.027	13
−35 » −60	.31	.022	17	—	—	—
−60 » −80	.34	—	4	—	—	—

For the right ascensions observations was the RIEFLER pendulum clock with pen chronograph used, and the micrometer was driven by hand.

Since the number of observations of the fundamental stars of the Zones, is larger than that of the Series, we think that the relation "Instrument - Fundamental system", obtained from the observations of the Zones, will be better defined in its details than if we make use of the Series, because the observations of the Series provide this relation over wide declination interval.

The values of $(\Delta T + m)$ for both, the observations of the Series and of Zones, are computed with two different "n": one obtained from the four circumpolars (2 above and 2 below, at the beginning and at the end of the night) during the night of observations, and the other derived from the stars of the program, plus special stars, added out of zone. The provisional results give, on the average a difference in r_α equal to $\pm$ 0ˢ003 en favor of the former method.

B. ABSOLUTE OPSERVATIONS

III. CATALOGUE OF ABSOLUTE DECLINATIONS.

Towards the end of 1949, an investigation on *the Astronomical Refraction*, including the determination of the *Refraction Constant*, of the exact *Latitude* of the pier of the Meridian Circle and a *Catalogue of absolute declinations* of 157 FK3 stars, was started. In addition, the purpose of this wide study is also to find out the anomalies of astronomical refraction existing in the observing site, to obtain the value of the coefficient of the air expansion, to know the influence of the tension of water vapor, etc.

The observations were finished in December, 1954, but the extensive reductions of the observing material began in 1953. It is ex-

pected that the computational work and the analysis of the results, will be finished by the middle of 1961.

Independently we have also determined the variation of the latitude by means of the provisional declinations from the observations of 18 circumpolars in upper and lower transits, directly from the observed zenith distances. The results agree well enough with those provided by the B.I.H.

The error of one observed zenith distance was determined with *Peter's* formula, and can be given by the following relation:

$$\varepsilon_1 = \pm \sqrt{(0.45)^2 + (0.21)^2 \, tg^2 z}.$$

In this formula the factor 0″.45 appears to be slightly too large. This value is composed of the error of bisection of the star and the error of the "Zenith point" together with the corresponding errors of circle readings. The error of one bisection of a star came out to be: $\varepsilon_1{}^b = \pm 0''.20$ (average of 1054 obs.), therefore, greatest part of this factor originates in some uncertainty of the determinations of the "Zenith point", which were always difficult in La Plata because of the unsteadiness of mercury.

The mean error of a Catalogue stellar position, in declination up to $\delta = -80°$, can be estimated in approximately $\pm$ 0″.1.

C. THE OBSERVATORY'S ASTROMETRIC STATION LA LEONA, (SANTA CRUZ)

The setting up of the Repsold Meridian Circle (160 mm, 1883), which has been recently loaned by Lick Observatory, began in early October, 1960.

In general, the instrument is not in condition to start functioning at once because the objective, the pivots, the micrometer, the lighting systems of field and of the microscopes, and inversion system are badly in needing of repairing; this consisting of an special cleaning, polishing and changing of the structure parts which do no fit, neither to the pier nor to the building that will house it. That is why it was decided to set up only the heavy pieces and some other accesories which could be cleaned and repaired at the Station with the existing means. The most delicate parts which can only be repaired at the Observatory Workshop, were sent to La Plata and they are expected to be ready in about 3 months. The Meridian Circle will be then definitely set up, and the Station will start with its planned observing program.