

## SECOND RIO GRANDE CATALOGUE (RG2)

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Resumen: El primer catálogo de Rio Grande (RG1) fue publicado en 1985 (Mondinalli et al.). Contiene correcciones a 130 estrellas FK4 y FK4 Sup. para la época media 1981.5. Un nuevo programa de catálogo comenzó en 1984 incluyendo unas 200 estrellas, entre ellas las del RG1 que son parte de los grupos fundamentales. En este trabajo se presentan correcciones a 122 estrellas FK4 y FK4 Sup. para la época media 1986.0. Se trata básicamente de las mismas estrellas del RG1, de manera que es posible realizar una comparación. Las diferencias RG1-RG2 son del orden de 0.1 segundos de arco en ambas coordenadas, lo que puede considerarse satisfactorio considerando que las diferencias del RG2 con el FK4 son típicamente tres veces más grandes.

Abstract: The first catalogue of Rio Grande (RG1) was published in 1985 (Mondinalli et al.). It contains corrections to 130 FK4 and FK4 Sup. stars for mean epoch 1981.5. A new catalogue program was began in 1984. It comprises more than two hundred stars including those from the RG1 which are part of the fundamental groups. In this paper, 122 FK4 and FK4 Sup. corrections with mean epoch 1986.0 are given. They are basically the same stars included on RG1, so a careful comparison is carried out. RG1-RG2 differences are of the order of 0.1 arc sec. in both coordinates. This result can be considered quite satisfactory, mainly taking into account that RG2-FK4 differences are typically three times greater.

Key words: FUNDAMENTAL STARS — ASTROMETRY — ATLASES

## I. INTRODUCTION

The RG2 catalogue was observed at Rio Grande station (Latitude -54 deg., Longitude -4 hs. 31 min.) with the Danjon Astrolabe OPL 01. It contains corrections to 122 FK4 and FK4 Sup. stars with declinations ranging from -27 deg. to -80 deg, mean epoch 1986.0 and reference system J2000. It was used the classical reduction method given by Guinot (1955). Group corrections were obtained by the chain method.

## II. THE RG2 CATALOGUE

The first step to produce this catalogue was to obtain group corrections by the classical chain method using pairs of groups observed the same night by the same observer. Close errors are the following:

time: .022 sec.  
latitude: .22 arc sec.  
zenith distance: .83 arc sec.

The first two errors were equally divided among the individual differences, while the third one was treated as suggested by Clauzet (1982). Zenith distance differences for consecutive groups were linearly correlated with the variation of temperature difference between the air and the astrolabe, forcing the close error to zero by addition of the appropriate condition in the least square solution.

The individual mean residuals of the stars were referred to the "mean group" by applying these group corrections. These corrected residuals are designed with M.

The second step was to look for a relation between magnitude and residuals. When present, this "magnitude equation" seriously affects declination determinations. No residuals - magnitude correlation was found for RG2 stars.

The third step was to determine the constant

$$2A = \overline{M_e + M_w}$$

where  $M_e$  and  $M_w$  are the mean residuals of the stars observed near maximum elongation at the east or west passage, respectively. The value obtained was:

$$2A = ".017 \pm ".025$$

Unfortunately, only twelve stars are appropriate for this determination ( $|\cos s| < .15$ , with  $s$  parallactic angle) which prevents from making further analyses concerning magnitude or spectral type equations. However, typical error of the mean is so small that it seems quite reasonable to suppose that these equations are not important for this catalogue.

The catalogue is shown in Table I. It contains corrections in both coordinates in the sense RG2-FK4 for 122 stars with the following detail:

right ascension	87 d.p.	31 s.p. ( $ \cos s  < .15$ )
declination	65 d.p.	4 s.p. ( $ \sin A  < .50$ )

d.p. means "double passage"

s.p. means "single passage"

Only "north stars" satisfying the condition  $|\sin A| < .50$  ( $A$ : azimuth) were used for declination determinations because "south stars" are very near to the critical FK4 zone where right ascension errors are so important to turn dangerous the obtention of declination corrections with only one passage.

All the stars on this catalogue were observed at least 15 times. A complementary group of about 90 stars is being observed and will be added to this same catalogue in 1990.

### III. THE RG2 vs. THE RG1

Although the mean epochs differ in 4.5 years, it is possible to compare directly the RG1 and the RG2 catalogues by assuming that proper motions will not affect the main conclusions seriously.

First of all, it is necessary to point out that a conspicuous magnitude equation appears in RG1 stars (Mondinalli et al, 1985). This equation mainly affects the bright stars. RG2 results are not corrected by

TABLE 1

RG2: second catalogue of RIO GRANDE

FK4	R.A. (sec)	DEC (°)	FK4	R.A. (sec)	DEC (°)
101	-0.0222	0.052	2244	0.0212	0.662
128	0.0792	0.082	2272	0.0114	0.014
141	-0.0436		2636	-0.0400	
170	-0.0009	-0.017	2681	0.0397	0.157
189	0.0187		2737	0.0512	0.407
229	0.0201	0.362	2831	0.0294	-0.305
235	0.0207	-0.218	2891	0.0413	
272	0.0074	-0.080	2990	-0.0601	
281	-0.0281		3024	0.0566	-0.182
283	0.0166	0.065	3080	0.0013	0.059
301	0.0243	0.323	3141	0.0237	
303	0.0238	-0.379	3174	-0.0479	
327	0.0228	-0.031	3288	-0.0514	-0.310
343	-0.1052		3312	0.0193	
375	-0.0166	-0.144	3329	-0.0373	-0.051
393	0.0123		3471	-0.0098	0.026
439	0.0053	-0.118	3495	0.0025	-0.356
455	0.0148		3499	0.0119	-0.081
481	-0.0389		3583	-0.0399	-0.025
519	0.0202	0.104	3606	0.0007	0.077
589	-0.0155		3658	-0.0027	-0.366
592	0.0112	-0.148	3660	0.0325	
631	-0.0100	-0.291	3683	0.0320	0.218
651	-0.0448	0.040	3684	0.0248	0.225
661	-0.0367		3845	-0.0237	-0.480
662	0.0110	-0.268	3910	0.0139	0.304
679	0.0125	-0.139	69	-0.0285	*
704	0.0151		177	-0.1313	*
708	0.0309	-0.707	196	0.0268	*
754	0.0442		212	-0.0263	*
776	0.0007	-0.018	348	-0.1492	*
805	-0.0609		362	-0.1551	*
825	0.0736		385	-0.0974	*
876	0.0038		406	0.0100	*
886	0.0028	0.530	436	0.0124	*
1026	0.0297	-0.081	487	-0.1309	*
1055	-0.0042	0.035	539	-0.0304	*
1075	0.0092	-0.187	574	-0.0212	*
1121	0.0273	0.074	610	-0.0498	*
1159	-0.0475	0.113	625	-0.1017	*
1178	0.0559	0.284	820	-0.0555	*
1183	0.0151	0.042	903	-0.0882	*
1189	-0.1033		1038	-0.0108	*
1241	-0.0006	-0.340	1065	-0.1335	*
1248	-0.0142	0.326	1166	-0.0397	*
1268	0.0110	0.302	1243		-0.092 *
1342	-0.0085	0.314	1385		-0.161 *
1389	-0.0029	0.219	1554	0.0285	*

FK4	R.A. (sec)	DEC (")	FK4	R.A. (sec)	DEC (")
1398	0.0073	-0.208	2057	0.0128	*
1399	-0.0020	0.261	2191	-0.0552	*
1418	-0.0080	-0.375	2389	0.0193	*
1487	0.0237	-0.064	2473	-0.0742	*
1504	-0.0136	-0.564	2490		-0.888 *
1540	-0.0580	-0.393	2610	-0.0893	*
1556	0.0278	0.021	2720	-0.1810	*
1573	0.0103	0.068	2792		-0.161 *
1599	-0.0297	0.044	2944	-0.0168	*
1605	-0.0177	-0.460	3071	-0.0741	*
1611	-0.0019	-0.047	3253	-0.0596	*
1617	0.0125	-0.174	3580	-0.0525	*
2064	-0.0127	-0.415	3904	-0.1041	*

\* "single passage"

magnitude equation; however, individual corrections of bright stars are very close to those of RG1.

The 2A value used in RG1 was ".05. It is also close to the value obtained for RG2.

The fundamental groups are basically the same. So group corrections are also directly comparable. Rms of group corrections differences are:

Time .002 sec.  
 Latitude .03 arc sec.  
 Zenith distance .06 arc sec.

The individual results show differences with the following rms and maximum discrepancies for 118 stars in right ascension and 69 stars in declination:

right ascension: rms .011 sec. max. .028 sec.  
 declination: rms .13 arc sec. max. .34 arc sec.

The distribution of these individual differences is virtually normal (actually 70% of the differences are within one rms about the mean).

This comparison is a realistic test of the actual accuracy of Rio Grande catalogues. It is of the order of 0.1 arc sec.

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