"PROPER MOTIONS" OF EXTRAGALACTIC SOURCES AND THE PRECESSION CONSTANT

Shuhe Wang, Tongqi Xu, Peizhen Lu
Shanghai Observatory,Chinese Academy of Sciences
200030 Shanghai,
China PR

ABSTRACT. From the observational catalogues of the extragalatic sources,the common sources with larger observational intervals are selected. After a reduction of optical catalogue systems to the FK5, the "proper motions" of these sources are obtained in the FK5 system. With these values the correction of the precession constant has been estimated and compared with that obtained from the new techniques

1. INTRODUCTION

The fictitious "proper motion " of extragalatic source with respect to the optical catalogue is merely the systematic error of the optical catalogue at the place of the source .

In this paper the common sources with larger observational time intervals are selected. after a reduction of optical catalogue systems to the FK5 the "proper motions" of these sources are obtained in the FK5 system. With these values the precession constant correction has been estimated and compared with that obtained from the new techniques.

2.MATERIALS

Now, there are a lot of catalogues of optical counterparts of compact radio sources. In Table 1 the 14 observational catalogues of them observed with the optical telescopes are given. The reference catalogues are Perth 70, AGK3, FK4, and FK5 respectively. The mean external errors are from 0."05 to 0."3.

A total of 9 sources with the observationl time intervals more than 20 years are selected.

3."PROPER MOTIONS" OF THE EXTRAGALACTIC SOURCES

The positions of these sources for the epoch B1950.0 and the 1964

I.I. Mueller and B. Kołaczek (eds.),
Developments in Astrometry and Their Impact on Astrophysics and Geodynamics, 387–390.

TABLE 1. The Observational catalogues of the extragalactic sources

No	coordinate system	observation epoch	reference catalogue	source number	internal agreement	Note
1	B1950.0	1955,1976	Perth70	24	0".3	[1]
2	B1950.0		Perth70	39	0".2	[2]
3	B1950.0	1951-56	Perth70	50	0".19	[3]
		1975-77			0".21	
4	B1950.0	1972-79	Perth70	22	0".19	[4]
					0".17	
5	B1950.0	1980-82	Perth70	23	0".12	[5]
	J2000.0		AGK3			
6	B1950.0	1983-85	FK4	21	0".12	[6]
	J2000.0					
7	J2000.0	1985-88	FK5	8	0".05	[7]
8	B1950.0	1979-80	FK4	10	0".05	[8]
9	B1950.0	1980-85	AGK3	4		[9]
10	B1950.0		AGK3R	17	0".1	[10]
			FK4			
11	J2000.0	1985-88	AGK3	3	0".13	[11]
			SAO		0".11	
12	B1950.0	1966-67	FK4	16	0".20	[12]
					0".15	
13	B1950.0	1986-87	AGK3	11	0".2	[13]
14	J2000.0		FK5	28		[14]

Note:

[1] Walter,H.W.,et al.,(1980) A.Ap.,86,1.
[2] West,R.M.,et al.,(1981) A.Ap.Suppl.Ser.,46,277.
[3] Walter,H.W.,et al.,(1986) A.Ap.,156,1.
[4] Wroblewski,H.,et al.,(1981) A.Ap.,93,245.
[5] Torres,C.,et al.,(1984) A.Ap.Suppl.Ser.,58,193.
[6] Geffert,M.,et al.,(1989) A.Ap.,224,323.
[7] Russel,J.L.,et al.,(1991) A.J.,101,No.6,2266.
[8] Harrington,R.S.,et al.,(1983) A.J.,88,No.9,1376.
[9] Brosche,P.,et al.,(1991) A.Ap.,245,669.
[10] de Vegt,C.,et al.,(1978) A.Ap.,67,65.
[11] Xu T.Q.,et al.,(1990) Acta Astron. Sinica,31, No.3,267.
[12] Murray,C.A.,et al.,(1971) Royal Obs. Bulletins., No. 162,215.
[13] Dick,W.R.,et al.,(1990) IAU Sym., No.141,453.
[14] Ma,C.P.,et al.,(1990) A.J.,99,No.4,1284.

astronomical constant system have been transformed to that for the standard epoch J2000.0 and the new astronomical constant system according to the MERIT standard.

In order to transform the reference catalogue to the FK5 system, the systematic difference between the reference catalogue and FK5 has been added. According to the positions of these common sources in the FK5 system for the observational epoch the "proper motions" of these sources are obtained. The results are shown in the Table2.

TABLE 2. The "proper motions" of the extragalactic sources (in unit:1"/cy)

source	other name	$\mu_\alpha \cos\delta$	μ_δ
0106+013	4C+01.02	-0.20	-1.39
0316+413	3C84	0.18	0.17
0336-019	CTA26	-1.74	-2.86
1055+018		-0.30	-2.61
1226+023	3C273	1.58	-0.51
1404+286	OQ208	0.35	-0.01
1510-089		1.74	-1.78
1555+001		0.10	-1.10
1641+399		-1.60	-3.00

4.RESULT AND DISCUSSION

According to the relation between the proper motion and the precession correction, the formulae are given as follows:

$$\Delta\mu_\alpha = (\Delta p \cos\varepsilon + \Delta p \sin\varepsilon \sin\alpha \tan\delta)\Delta t$$

$$\Delta\mu_\delta = (\Delta p \sin\varepsilon \cos\delta)\Delta t$$

where Δp is the correction of the precession constant.

From the Table 2 and the above formulae, the correction of the precession constant is estimation.

$$\Delta p = -0''.34 \pm 0''.32/cy$$

The comparisons between the corrections of the precession constant obtained from different authors are given in Table 3. This value coincides with the estimation from the observations of the new techniques.

https://doi.org/10.1017/S0074180900173553 Published online by Cambridge University Press

TABLE 3. The comparison between the corrections of the precession constant (with respect to IAU 1976 astronomical constant system) (in unit: mas/yr)

correction of precession constant Δp	author	time	technique	note
-2.39 (±0.13)	Herring et al.	1986	VLBI	[15]
-5.00 (±1.10)	Herring et al.	1988	VLBI	[16]
-3.2	Herring et al.	1990	VLBI	[17]
-1.80 (±0.13)	Sovers et al.	1988	VLBI	[18]
-2.05 (±0.15)	Steppe et al.	1989	VLBI	[19]
-2.3	Steppe et al.	1990	VLBI	[20]
-3.76 (±0.47)	Zhu et al.	1990	VLBI	[21]
-2.53 (±0.24)	McCarthy et al.	1990	VLBI	[22]
-2.7 (±0.4)	Williams et al.	1990	LLR	[23]
-2.493(±0.634)	Fukushima et al.	1990	weighted average	[24]
-3.4 (±3.2)	authors	1992	optical	

Note:

[15] Herring,T.A.,et al.,(1986) J. Geophys. Res., 91, 4745.
[16] Herring,T.A.,et al.,(1987) BIH Annual Report for 1987,D-106.
[17] Herring,T.A.,et al.,(1990) J. G. R., 95, No.B8, 12561.
[18] Sovers,O.J.,et al.,(1987) BIH Annual Report for 1987,D-109.
[19] Steppe,J.A.,et al.,(1989) IERS Tech. Note, No.2, 13.
[20] Steppe,J.A.,et al.,(1990) IERS Tech. Note, No.5, 13.
[21] Zhu,S.Y.,et al.,(1990) Astron. J., 99, 1024.
[22] McCarthy,D.,et al.,(1990) to be submitted to Astron. J.
[23] Willams,J.G.,et al.,(1990) submitted to Astron. Astrophys. Letters.
[24] Fukushima,T.,et al.,(1991) IAU Colloquium 127,32.