SOURCE SELECTION FOR ICRF DEFINING SET FROM SOURCE POSITION TIME SERIES ANALYSIS

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ABSTRACT. Radio Sources Positions Time Series (TS) were analyzed with covariation analysis technique. List of the best and worse sources was used for form the set of sources for NNR constraints. The global solutions with different sets of sources for NNR constraints were obtained. Transformation parameters between this catalogues and ICRF-ext.2 were calculated and compared.

1. IAA SOURCES POSITION TIME SERIES GENERATION

Source positions TS iaa000b, iaa000c (WG ftp area) with more then 75 points were analyzed using covariance functions technique (Kurdubov, 2008). As a value indicated the stability of the time series we use the values $q(\tau_1)$ — the second point of covariance function which shows how much the TS are correlated and does not matter the origin of correlation the random walk or piece-wise linear or some else. We calculate the coefficient $k = 100 * Max(q(\tau_1)_{RA*cosDE}, q(\tau_1)_{DE})$ for each time series and use as TS stability indicator. The list of 140 sources sorted in order of increasing of the k value is presented at the Table 1 with the category of the sources in column c: "d" – defining, "c" – candidate, "o" – others.

N	*Source*	c	k	N	*Source*	c	k	N	*Source*	c	k	N	*Source*	c	k	N	*Source*	c	k
1	1351-018	c	4	29	1357+769	c	13	57	0458-020	c	18	85	1057-797	d	26	113	0014+813	d	38
2	0111+021	c	5	30	1638+398	o	13	58	1219+044	d	18	86	1923+210	c	26	114	1404+286	o	38
3	1128+385	d	5	31	1418+546	d	13	59	1308+326	d	18	87	1104-445	o	26	115	1803+784	c	39
4	2318+049	c	6	32	2136+141	d	13	60	0808+019	c	19	88	1034-293	o	26	116	0919-260	o	39
5	0201+113	c	7	33	0735+178	o	14	61	2121+053	o	19	99	2201+315	o	27	117	1548+056	o	40
6	2209+236	d	7	34	0336-019	c	15	62	1633+382	o	19	90	0814+425	c	27	118	0745+241	d	41
7	0133+476	d	7	35	0748+126	c	15	63	1611+343	c	19	91	0917+624	d	27	119	0106+013	o	41
8	1255-316	c	8	36	1101+384	c	15	64	1334-127	o	19	92	0229+131	c	28	120	2234+282	c	42
9	1606+106	d	8	37	0823+033	c	15	65	1555+001	c	19	93	1055+018	o	28	121	1510-089	o	42
10	1652+398	c	9	38	1144-379	c	15	66	0003-066	c	20	94	2216-038	o	28	122	1954-388	d	43
11	0556+238	d	9	39	2223-052	c	15	67	1124-186	c	20	95	1958-179	o	29	123	1730-130	o	44
12	1417+385	c	9	40	0805+410	d	15	68	2149+056	c	20	96	2200+420	o	29	124	1424-418	o	44
13	1144+402	o	9	41	0552+398	c	15	69	1849+670	d	21	97	0742+103	o	29	125	2134+004	o	45
14	0657+172	c	10	42	1156+295	c	15	70	2145+067	d	21	98	0528+134	c	29	126	1637+574	d	45
15	1908-201	c	10	43	1749+096	c	16	71	2255-282	o	21	99	0402-362	o	30	127	1044+719	c	48
16	0743+259	d	10	44	2113+293	d	16	72	0637-752	d	21	100	2251+158	o	30	128	1614+051	c	49
17	0642+449	d	10	45	2243-123	o	16	73	1502+106	o	21	101	0656+082	o	31	129	0954+658	d	50
18	0804+499	d	10	46	1004+141	o	16	74	0420-014	o	21	102	1610-771	o	31	130	0355+508	o	56
19	0602+673	c	10	47	0607-157	c	16	75	0119+041	c	22	103	0953+254	o	31	131	2128-123	o	57
20	0749+540	d	10	48	1726+455	d	16	76	0048-097	o	22	104	0923+392	o	32	132	1641+399	o	58
21	2356+385	c	10	49	0955+476	d	17	77	0235+164	d	22	105	1815-553	o	32	133	1226+023	o	58
22	2126-158	c	11	50	0104-408	o	17	78	0718+792	d	22	106	1145-071	c	32	134	1354+195	o	69
23	1807+698	c	11	51	1622-253	o	17	79	1741-038	o	22	107	0454-234	o	34	135	1053+815	d	73
24	1300+580	o	12	52	2037+511	d	17	80	1228+126	c	22	108	0212+735	o	35	136	2007+777	o	78
25	0059+581	o	12	53	0300+470	o	17	81	0119+115	c	24	109	0016+731	o	35	137	1313-333	c	84
26	1519-273	c	12	54	0727-115	o	17	82	0851+202	c	24	110	1823+568	d	35	138	1642+690	d	85
27	0234+285	c	13	55	0537-441	o	17	83	1514-241	c	24	111	0208-512	o	36	139	1253-055	o	121
28	1739+522	c	14	56	1745+624	d	18	84	0202+149	c	26	112	1921-293	o	37	140	0316+413	o	131

Table 1: Stability coefficients for some sources

As more unstable (K more then 50) were consider the last 11 sources, the next from which 1642+690 1053+815 0355+508 1313-333 1354+195 2128-123 need be removed from the stable 199 M. Fiessel stable sources list(MFV199) (Feissel-Vernier, 2003), this sources can be added to 163 M. Fiessel unstable sources list(MFV163): 0316+413 0355+508 1053+815 1226+023 1253-055 1313-333 1354+195 1641+399 1642+690 2128-123 and this two sources 1053+815 1642+690 are form category defining. The coefficient k value varies from 4 till 131. We consider sources with coefficient value less then 10 as the most stable. For this test the list of 212 defining sources can be supplemented by the next 14 sources: 1351-018, 0111+021, 2318+049, 0201+113, 1255-316, 1652+398, 1144+402, 0657+172, 1908-201, 0602+673, 2356+385, 2126-158, 1807+698, 1417+385. All this sources are from the category "c" and the last source is from the "other" sources. The MFV199 list can be supplemented by the next 6 sources: 1255-316, 1417+385, 2356+385, 2126-158 from the category "c" and 0556+238, 0743+259 defining ("d") sources.

solution	$A1$	$A2$	$A3$	Da	Dd	Bd
	μas	μas	μas	μas	μas	μas
$q55_1$	-7.1 ± 10.4	19.1 ± 9.7	-1.6 ± 11.6	0.0 ± 0.4	-0.2 ± 0.3	-1.7 ± 11.3
$q55_2$	-7.1 ± 10.4	30.8 ± 9.8	-7.5 ± 11.7	0.2 ± 0.4	-0.3 ± 0.3	2.0 ± 11.4
$q55_3$	-16.2 ± 10.3	17.3 ± 9.7	-6.0 ± 11.5	0.1 ± 0.4	-0.3 ± 0.3	1.9 ± 11.3
$q55_4$	-9.6 ± 10.4	18.3 ± 9.7	-6.0 ± 11.6	0.0 ± 0.4	-0.1 ± 0.3	-9.4 ± 11.3
$q55_5$	3.5 ± 10.3	16.1 ± 9.7	-14.1 ± 11.5	0.0 ± 0.4	-0.1 ± 0.3	-10.6 ± 11.3
$q65$	-7.8 ± 10.4	20.6 ± 9.7	-8.4 ± 11.6	-0.1 ± 0.4	-0.2 ± 0.3	-4.9 ± 11.3
$q75$	-1.5 ± 10.3	22.9 ± 9.7	-12.6 ± 11.5	0.4 ± 0.4	-0.2 ± 0.3	-0.5 ± 11.3
$q85$	-4.0 ± 10.4	26.4 ± 9.7	-14.5 ± 11.6	0.6 ± 0.4	-0.2 ± 0.3	-7.1 ± 11.3
$q95$	-6.4 ± 10.4	28.1 ± 9.7	-15.7 ± 11.6	0.6 ± 0.4	-0.1 ± 0.3	-13.0 ± 11.3
$q105$	-9.7 ± 10.4	25.7 ± 9.7	-20.4 ± 11.6	0.6 ± 0.4	-0.2 ± 0.3	-8.9 ± 11.3
$q115$	-9.0 ± 10.4	25.0 ± 9.7	-21.3 ± 11.6	0.6 ± 0.4	-0.2 ± 0.3	-6.2 ± 11.3
$q125$	-8.2 ± 10.4	29.1 ± 9.7	-26.4 ± 11.6	0.6 ± 0.4	-0.2 ± 0.3	-4.6 ± 11.3
$q135$	-5.5 ± 10.4	25.9 ± 9.7	-27.3 ± 11.6	0.6 ± 0.4	-0.2 ± 0.3	-3.4 ± 11.3
$q140$	-2.9 ± 10.4	23.7 ± 9.7	-25.6 ± 11.6	0.6 ± 0.4	-0.2 ± 0.3	-0.7 ± 11.3
$q212$	-4.1 ± 10.4	-41.4 ± 9.7	23.2 ± 11.6	0.6 ± 0.4	-0.5 ± 0.3	22.3 ± 11.3

Table 2: Transformation parameters from test catalogues to ICRF by MFV199

In order to test stability criteria described above, we calculated 15 VLBI global solutions uses various sets of sources from our list for NNR constraints the origin of the CRF. As input catalogues we used ICRF-Ext.2 (Fey et al., 2004) and VTRF2005. IAU2000A precession-nutation model was applied. The origin TRF was defined by the NNR/NNT constraints for 11 stations: MATERA, KOKEE, WETTZELL, FORTLEZA, WESTFORD, ALGOPARK, NYALES20, NOTO, ONSALA60, LA-VLBA, MK-VLBA. Estimated parameters: source positions (global), station positions and rates (global), Earth orientation: $X_p, Y_p, UT1-TAI, X_c, Y_c$ (local), zenith troposphere delay: linear+stochastic signal (local), troposphere gradient: east and north (local), station clocks: quadratic+stochastic signal (local). The solution designed as $q65$ calculated using the first 65 sources from out list (k¿20) for NNR constraints. This sources we consider as of rather good stable. For the solutions $q55_1$ – $q55_5$ we use for 55 sources from first 65 most stable sources: without first 10 sources from our list NNR constraints was used 55 sources from first 65 most stable sources without first 10 for $q55_1$, second 10 sources for $q55_2$ etc; in the solutions $q65$ – $q140$ for NNR constraints was used from 65 to 140 sources from our list correspondingly; solution $q212$ – with the 212 ICRF defining sources for NNR constraints. The obtained 15 catalogues were compared with the ICRF original catalogue. Transformation parameters by the MFV199 list calculated using standard IERS model with 6 parameters are shown in Table 2.

2. REFERENCES

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