

INFLUENCE OF THE EARLY VLBI OBSERVATIONS ON THE ICRF STABILITY

J.R. SOKOLOVA

Astronomical Institute of St.-Petersburg State University

S-Petersburg, University pr.,28, NIAI

e-mail: S0lei@yandex.ru

ABSTRACT. We studied the cumulative effect of the early VLBI observations (before 1990 year) on the CRF solution stability. Three CRF solutions on different time intervals have been obtained using the Occam6.0 software. All sources were treated as global parameters. Calculation of the estimated coordinate differences between the individual solutions provides a criteria for detection of the highly unstable sources. Several sources with high visible motions are detected.

1. INTRODUCTION

The problem of stable radiosources selection is important for the next ICRF realization. The goal of the paper is to study a combined effect of early VLBI observations (before 1990). Discussion about quality of the early observation has arisen recently. Gontier et al., (2001) found that the yearly CRF solutions significantly vary from year to year before 1990. Therefore, Feissel-Vernier (2003) recommended to use a set of 199 'stable' radiosources studying the position time series over 1989.5 - 2002 from data set by Fey (2002). The set of 199 'stable' sources demonstrates better stability by a factor 3-5 than the set of 212 'defining' sources through the 13-year period. Nevertheless, general strategy for global solution preparation requires all VLBI observations to be included. We try to evaluate stability of the 'stable' source list over the period 1980-1989.

2. CATALOGUES

About 2.6 million of time delays have been processed by least squares collocation using OCCAM software (Titov et al., 2004). Three solutions covering 1980-2003, 1990-2003 and 1996-2003, respectively were produced. Then we made up differences between the radiosource positions in the three catalogues. The range of position differences between 1980-2003 and 1990-2003 solutions is a measure of stability for individual radiosources for the first decade of VLBI observations. The last solution (covering 1996-2003) is used for additional control.

3. DISCUSSION

Fig. 1,2 show position differences between two first catalogues. The radiosources observed only after 1990 are plotted on the Fig.1. Their differences were made up from the same set of observation, therefore, they are small because they reflect just internal instability of the

solutions. All the values are less than 0.003 msec in RA and 0.02 mas in DEC. In opposite, the radiosources observed both before as well as after 1990 show greater differences (fig.2), that reach 0.01 msec in RA and 0.2 mas in DEC. The largest offset was found for the radiosource 2134+00 - almost 1 mas.

-	Solution 1	Solution 2	Solution 3
Years	1980 - 2003	1990 - 2003	1996 - 2003
Num of obs	2.584,417	2.274,925	1.369,344
WRMS(cm)	0.6274	0.6058	0.5902

Table 1: Solution statistics

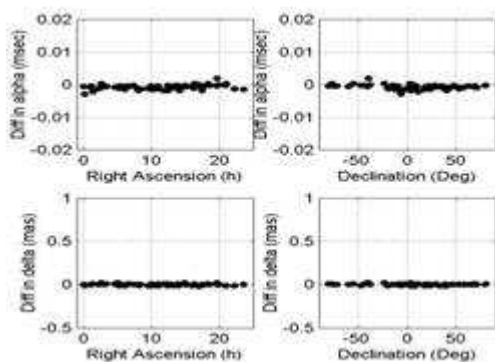


Fig. 1 Coordinate differences between two first catalogues for radiosources observed after 1990 year.

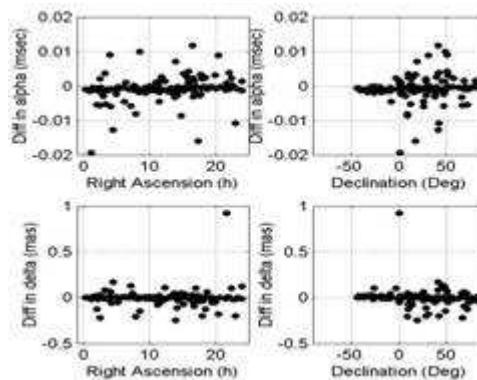


Fig. 2 Coordinate differences between two first catalogues for radiosources observed both before and after 1990 year.

To study a behavior of the 199 ‘stable’ sources over 1980-1990 we developed a special criteria dividing all the sources into two groups - observed after 1990 only and observed both before and after 1990. For the latter case the small differences in positions are caused by inner instability of the solution. We used the maximum difference by factor three sigma as a criteria for random deviation. For those sources observed both before and after 1990 the position differences would reflect an actual displacement due to instability over 1980-1990. Using the combined formal error the significance of the every source instability can be evaluated. Almost all ‘stable’ sources are really stable over the period 1980-1990. Only 8 sources should be excluded from the list if the early VLBI data to be used for the CRF solution.

Acknowledgments. I am very grateful to ‘Descartes - Nutation’ fund, Harald Schuh and Nicole Capitaine for support for participation in the Journées 2004 Conference.

4. REFERENCES

- Feissel-Vernier, M., 2003., AA 403, 105-110
 Titov et al., IVS 2004 General Meeting Proc., pp. 257-271
 Fey A., 2002 (private communication).
 Gontier A.-M., et al., 2001, AA 375, 661-669.