Paris Observatory Analysis Center OPAR: Report on Activities, January - December 2006

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Abstract

The OPAR Analysis Center, its organisation and technical means are briefly presented. Its general scientific and operational aims are summarized. The current state of the operational determination of EOP and coordinate time series are described.

1. The OPAR Analysis Center

1.1. The Team

The analysis center is now run by the following team: A.-M. Gontier is the head of the group, C. Barache is in charge of all the technical, database and computer aspects, S. Lambert is participating in the scientific developments and in operational analysis. There are two associated members, M. Bougeard and D. Gambis.

1.2. Characteristics of the Analyses

During 2006 the Linux version of Calc 10 and Solve 2006.06.08 software was installed on our computer and used to analyze VLBI observations. The French geodetic VLBI analysis software package GLORIA is undergoing some developments and testing and will be operational in the near future.

1.3. Main Objectives of the Analysis Center

The following activities are done operationally:

- quarterly (long term) and weekly solutions for the Earth's orientation,
- time series of radio source and station coordinates.

Activities under investigations:

- different scheme to obtain time series of radio sources and station coordinates,
- software development and documentation,
- studies of celestial reference frame.

2. Determination of EOP

First, a long term EOP solution was computed. About 1500 sessions of VLBI data from January 1994 until December 2006 were used. Together with the EOP, clocks, axis offsets, atmospheric and gradients parameters were estimated. The station coordinates and velocities were adjusted as global parameters. A no-net-rotation condition with respect to ITRF 2000 was applied on 33 station positions and velocities. The source coordinates were adjusted as global parameters, except

for few of them estimated as local (poorly observed sources). The orientation of the celestial frame was defined by a no-net-rotation with respect to ICRF-Ext.2 tie to the Feissel-Vernier et al. (2006) 247 stable sources. The global postfit rms delay was 21 ps.

A rapid EOP solution is run weekly when the databases of the latest sessions are made available and gives estimates for each sessions, of polar motion, UT1 and corresponding rates, and precession-nutation. The same analysis as for the long term solution is applied, except for the terrestrial and celestial frames. The station coordinates and velocities and the source coordinates are fixed to the values obtained in the long term solution.

The long term and operational solutions will be submitted to the IVS in early 2007.

3. Time Series of Radio Source and Station Coordinates

The production and analysis of time series of radiocenter positions is a key action to select the best subset of radio sources to define a stable, non-rotating celestial reference frame. It was shown that VLBI results based on Feissel-Vernier (2003) source selection scheme are more consistent than those obtained in the conventional ICRF manner (Gontier & Feissel-Vernier 2006, Arias & Bouquillon 2004, Feissel-Vernier et al. 2005).

In order to contribute to the ICRF revision, we compute time series of radio source positions per session. Four analyses are conducted, in order to keep at least one third of the 247 sources of 'definition' as globals (thus, the NNR is applied to this third) and to get local estimates for all the other sources. Polar motion and rate and UT1 are fixed to the latest IERS Bulletin A values (only UT1 rate is estimated). However, station coordinates are estimated as local parameters. As for the long term EOP solution, the analysis currently starts in 1994. Figure 1 shows an example of time series for the source 2145+067.

4. Current Developments

The results of the current analyses are available on the OPAR web site (http://ivsopar.obspm.fr) and the operational series will be submitted regularly to the IVS in the near future.

It has been recently shown that the network geometry is a key problem in VLBI and some network inconsistencies are showing up in the Earth Orientation Parameters, thus producing 'fake' EOP values (Lambert & Gontier 2006). Studies are currently conducted to find out whether the use of GNSS derived station coordinates could improve the VLBI determination of EOP.

Time series of radio source and stations coordinates will be extended to all the observations since 1984 when new computer and disk will be available. We will then investigate those longer time series by using and developping the Feissel-Vernier selection scheme and compare to the previous list of stable sources.

References

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[2] Feissel-Vernier, M., 2003. A&A, 403, 105.

[3] Feissel-Vernier, M., Ma, C., Gontier, A.-M., Barache, C., 2005, A&A 438, 1141.

[4] Feissel-Vernier, M., Ma, C., Gontier, A.-M., Barache, C., 2006, A&A, 452, 1107.

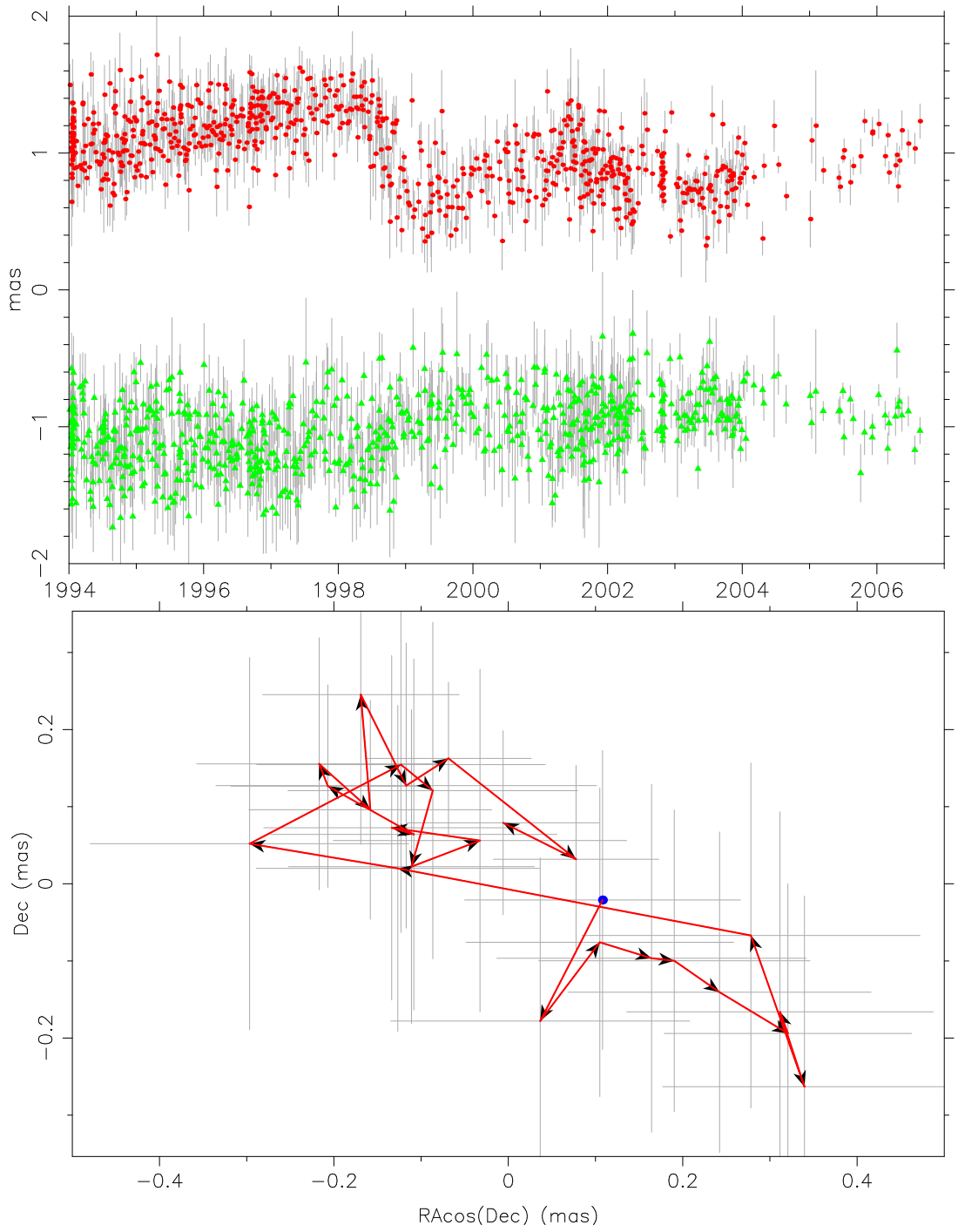

Figure 1. Time series from 1994 to 2006 for the source 2145+067. Average values of the right ascension and the declination over the observational time span have been removed. For the top plot right ascension (red solid circle) and declination (green solid triangle) have been shifted by +1 and -1 mas, respectively. Bottom plot shows normal points at 0.5 year intervals for the same source.

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