# OPERATIONAL AND RESEARCH ACTIVITY AT OPAR

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ABSTRACT. The IVS analysis center of the Paris Observatory (OPAR) was born in 1999 when the IVS was created. In the early years, the operational activity was mainly focused on the production of UT1 from intensive sessions. The activity was renewed in 2007 with the submission of a new long term solution to the IVS. OPAR now proposes a larger number of VLBI products.

## 1. THE ANALYSIS SERVICE

The base solutions provide up-to-date TRF and CRF data together with consistent EOP series. They are generally released on or about the first day of January, April, July and October. The analysis configuration includes all EOP and rates as session parameters, most of radio source and station coordinates as global parameters, a wise modeling of station non linear motions, and clock offsets and troposphere gradients as segmented parameters. The geophysical modeling includes the Vienna mapping functions (Böhm et al. 2006) for a priori zenith delay, and the APLO data (Petrov & Boy 2004) the FES 2004 model (Lyard et al. 2006) for atmospheric and oceanic loading, respectively. The latest solution (opa2010d) processed more than 5,000 sessions back to 1979 (7.3 million ionosphere-free group delays).

In a specific analysis configuration, we regularly estimate station and radio source coordinates per session. In addition, our web pages propose follow-ups of various physical phenomena like the free core nutation, the unmodeled tidal nutation terms, and the post-seismic displacement of the TIGO station at Concepción, Chile.

As soon as new observations are delivered at the IVS data center, an automated script launches a the rapid solution to process them. EOP, station and source coordinates are aligned to the current base solution. The updated EOP series (i.e., base + rapid, starting in 1979) are posted at

`ftp://ivsopar.obspm.fr/vlbi/ivsproducts/eops/opa*`

The intensive solution estimates UT1 from VLBI intensive sessions (short duration, about 1 hour). Up-to-date UT1 series are posted at

`ftp://ivsopar.obspm.fr/vlbi/ivsproducts/eopi/opa*`

SINEX files are routinely produced for diurnal and intensive experiments to participate in the IVS combination made at the Analysis Coordinator office. The files are made available at

`ftp://ivsopar.obspm.fr/vlbi/ivsproducts/daily_sinex/opa*`
`ftp://ivsopar.obspm.fr/vlbi/ivsproducts/int_sinex/opa*`

To better match the IERS requirements in terms of latency, the rapid and intensive operational solutions and the production of SINEX files have been running automatically since early 2010. The incoming new observations posted at one of the IVS primary data centers are analyzed at OPAR within a few hours.

## 2. THE DATA CENTER

OPAR is one of the three IVS primary data centers. Their activities are done in close collaboration for collecting files, and making them available to the community as soon as they are submitted. The access

protocol gives to the IVS community a transparent access to a data center through the same directory, and a permanent access to files in case of a data center breakdown. The OPAR data center is operated on a PowerEdge 2800 - Xeron 3.0 GHz server located at Paris Observatory, and running a Fedora Linux operating system. The server is equipped with a RAID 3 TB disk extensible up to 4.7 TB. The OPAR server is accessible 24/7 through a 2 Mb/s Internet connection. In 2009, 13 distinct users submitted data to OPAR.

## 3. RESEARCH AND DEVELOPMENT

OPAR personnel contributes to research in the fields of astrometry and geosciences. Some of the topics are directly related to VLBI analysis and take benefit from the OPAR analysis center facilities.

### 3.1 CONTRIBUTION TO THE ICRF2

Various schemes to select the most suitable radio sources to realize a stable celestial reference frames were investigated (e.g., Lambert & Gontier 2009) to prepare the next ICRF. OPAR personnel was involved in the ICRF2 project for selecting the defining sources and aligning the new frame to the ICRS. This work was done in collaboration with P. Charlot (Bordeaux Observatory) and E. F. Arias (BIPM). See more details in Fey et al. (2010).

### 3.2 DISSIPATION IN THE EARTH'S CORE REGIONS

We investigated the nutation offsets derived from VLBI measurements in order to improve the current determination of the outer core parameters, especially the quality factor (i.e., imaginary part of the free core nutation frequency) that expresses the energy dissipation at the core-mantle boundary due to viscosity and other dissipative processes (Rosat & Lambert 2009).

### 3.3 LIGHT DEFLECTION BY THE SUN

The post-Newtonian parameter $\gamma$ was determined by a global inversion of the full VLBI observational database in Lambert & Le Poncin-Lafitte (2009), yielding a value close to unity with an error of less than $2 \times 10^{-4}$. Recent new determinations with improved geophysical and astronomical models and an increased number of observations gave $|\gamma - 1|$ less than $10^{-4}$ with an error of $1.2 \times 10^{-4}$ (Lambert & Le Poncin-Lafitte 2010).

### 3.4 MEASUREMENT OF THE SECULAR ABERRATION DRIFT

We detected the effect of the Galactocentric acceleration of the Solar system barycenter in quasar proper motions at the level of $\sim$6 mas/yr oriented within $\sim 8^\circ$ around the Galactic center, in fair agreement with theoretical predictions from recent determinations of the Galactic parameters (Titov et al. 2010).

## 4. REFERENCES


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