Paris Observatory Analysis Center OPAR: Report on Activities, January—December 2010

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Abstract

We report on activities of the Paris Observatory VLBI Analysis Center (OPAR) for calendar year 2010 concerning the development of operational tasks and our Web site.

1. Operational Status

1.1. Reanalyses

Four reanalyses of diurnal sessions were done (2010a, b, c, and d), and the resulting EOP series and radio source catalogs were sent to the IVS. The latest solution processed 5,070 sessions since 1979. Each of these solutions estimated EOP and rates as session parameters, station coordinates and velocities as global parameters, and ∼1,400 sources' coordinates as global parameters, while the remaining sources' coordinates (about 1,000) were treated as session parameters. Troposphere and clock parameters were estimated every 20 minutes and 60 minutes, respectively, and gradients were estimated every six hours except for a list of 110 stations. Axis offsets were estimated as global parameters for a list of 66 stations. We used up-to-date geophysical and astronomical modeling to compute the theoretical delay and partials, including the IAU 2006 nutation and precession, the Vienna mapping functions 1, the FES 2004 ocean loading model, and the antenna thermal deformations as provided by A. Nothnagel (2009, J. Geod., 83, 787). We used the latest version of the Calc/Solve geodetic VLBI analysis software package. More details can be found on the Analysis Center Web site at `http://ivsopar.obspm.fr/earth/glo`.

1.2. Coordinate Time Series

Station and radio source coordinate time series were also produced and updated regularly (approximately every three months). Figures 1 and 2 show the Web pages relevant to the radio source coordinate time series. For each source, a page displays plots of original and smoothed time series and provides links to source information at various external databases (e.g., the French Virtual Observatory software package Aladin that permits to get the optical counterpart of the VLBI quasars, or the Bordeaux VLBI Image Database that gives the VLBI structure).

1.3. Operational Solutions

OPAR personnel have routinely analyzed diurnal sessions since 1979. The solution is aligned to the 2010c global solutions. All session types were analyzed, but only unconstrained normal equations relevant to the IVS rapid turn-around sessions (R1 and R4) were sent to the IVS in SINEX format for combination in the framework of the IVS Analysis Coordinator's task.

The operational solution 2010i analyzing Intensive sessions after 2006 was also submitted to the IVS together with corresponding SINEX files.

An important step was the automation of the treatment of diurnal and Intensive sessions, in order to match the IERS requirements in terms of latency. We built up homemade scripts, based

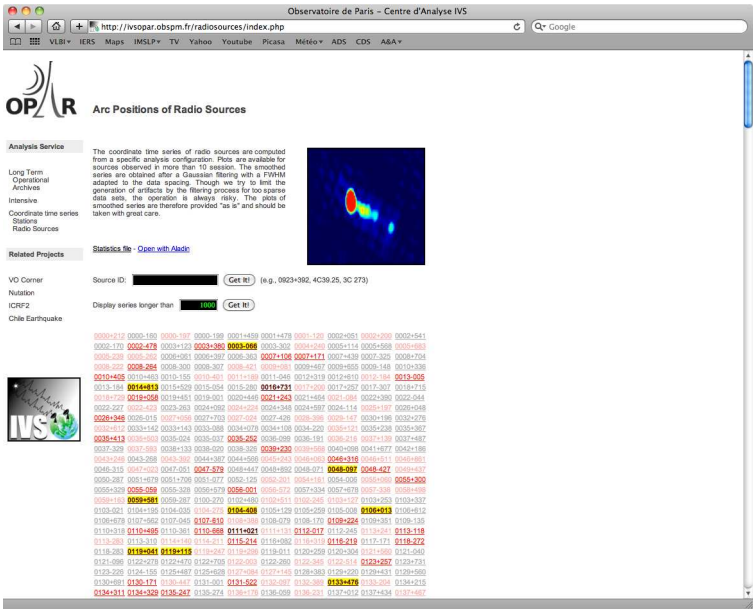

Figure 1. The Web page listing the sources for which coordinate time series are available. The color code indicates the number of observations: highlighted source names stand for sources having the longest observational history.

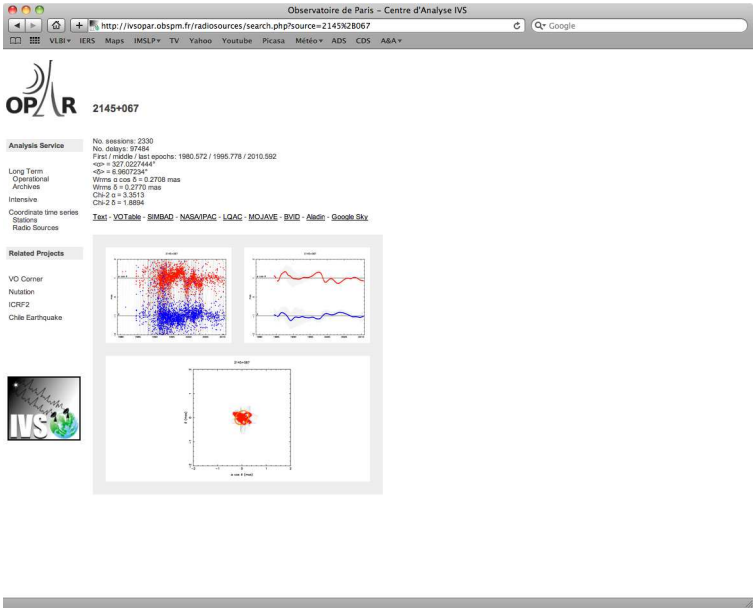

Figure 2. The Web page relevant to 2145+067 with the time series plots and the links to external databases.

on the UNIX cron command, to regularly check the local OPAR Data Center within 30 minutes after the mirroring between the three primary IVS Data Centers. If new sessions are available, a

bash script launches the solutions and sends the SINEX and EOP files back to the Data Center as IVS products. The main numerical results of the analysis are sent out by e-mail to the analyst so that he/she can check whether the solution is acceptable or needs special care. The Web site is also updated automatically by a crontab file located on a different machine. We therefore guarantee that newly arrived IVS databases are processed within less than 24 hours after submission.

Operational analysis of both diurnal and Intensive sessions will be continued in 2011. All the above products, except SINEX files, were also published on the OPAR Web site. SINEX files were only sent to the Data Centers.

2. Follow-up of Various Phenomena

2.1. Free Core Nutation

The free core nutation (FCN) is a free oscillation of the Earth's figure axis in space due to the presence of a liquid core rotation inside the viscoelastic mantle. Its period is close to 430 days and is retrograde. Understanding the excitation of the FCN and its amplitude and phase variations is still an open question, although the community generally believes that the key resides in improved atmospheric and oceanic circulation modeling at diurnal and subdiurnal frequencies. At OPAR, we maintain a FCN model directly fitted to routinely estimated nutation offsets (Fig. 3). More explanations and material can be found at `http://ivsopar.obspm.fr/earth/geo`.

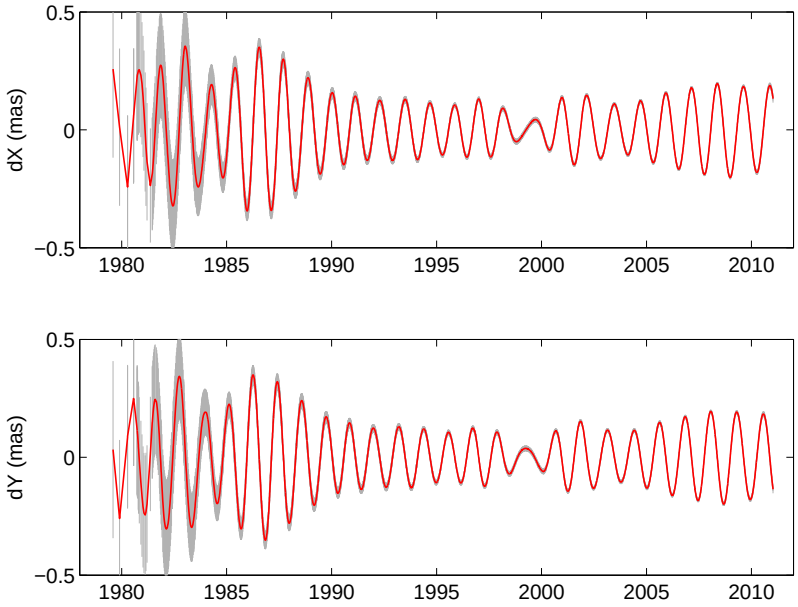

Figure 3. The free core nutation fitted to opa2010d nutation offsets with respect to the IAU 2006 nutation and precession models.

2.2. Displacement of TIGO at Concepción

Still using the routinely analyzed diurnal sessions, we monitored the displacement of the station of TIGO at Concepción after the 27 February 2010 (2010.15) earthquake. Figure 4 displays the UEN coordinates of TIGO with respect to the mean position estimated in the 2010d solution. The monitoring is continued at `http://ivsopar.obspm.fr/earth/tigo`.

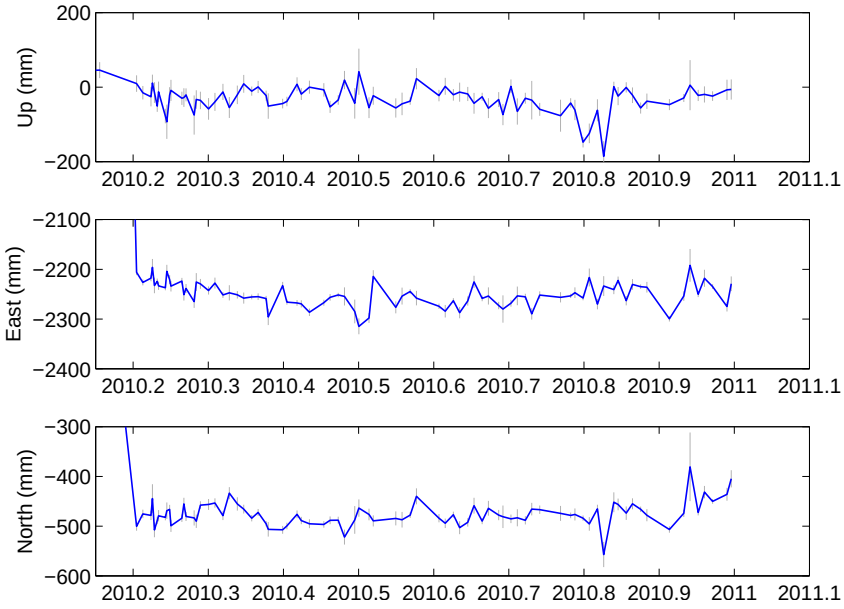

Figure 4. The UEN coordinates of TIGO with respect to the mean position estimated in the 2010d solution.

3. Staff Members

Staff members who contributed to the OPAR Analysis and Data Centers in 2010 are listed below:

- Sébastien Lambert, Analysis Center manager, responsible for data analysis, development of GLORIA analysis software,
- Christophe Barache, Data Center manager, data analysis,
- Daniel Gambis, responsible for the IERS Earth Orientation Center, interface with IERS activities,
- Anne-Marie Gontier, who headed OPAR since its inception in 1998, passed away on September 24th 2010.