

Italy INAF Analysis Center Report

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Abstract

This report summarizes the activity of the Italian INAF VLBI Analysis Center. Our Analysis Center is located in Bologna, Italy, and belongs to the Institute of Radioastronomy which is part of the National Institute of Astrophysics. IRA runs the observatories of Medicina and Noto, where two 32m VLBI AZ-EL telescopes are situated. We illustrate the AC VLBI data analysis activity as well as other activities related to the local surveys performed at Medicina and Noto observatories.

1. Current Status and Activity

During summer 2006, we carried out GPS-based ties at both Noto and Medicina observatories. The Noto GPS tie was performed at the end of June and beginning of July 2006, while the Medicina survey was performed in mid-July 2006. Both surveys were carried out for testing a rapid static GPS-based indirect approach to eccentricity vector computation. The approach is based on the method that has been developed by our AC for local ties computation using terrestrial observations [4]. The surveys required a careful planning of the movements of the telescopes so as to ensure a good redundancy of points that are used for determining the elevation and azimuth circles and, finally, the telescope's reference point. The total duration of the procedure that has been implemented for driving the antennas during the surveys exceeds 72 hours. There are four complete azimuth circles, with 12 different positions and 8 elevation circles with 12 positions. The steps separating each position during the rotations were 30 and 10 deg respectively for azimuth and elevation movements. We were induced to investigate the possibility of computing GPS-based ties following the positive experience that was performed through the analysis of the 2002 Medicina GPS survey [1].

The 2006 GPS tie has been compared with all the other ties computed since 2001 in Medicina. Results have been summarized in a paper that has been presented in October at GRF meeting in Munich and that has been submitted in December for publication on the related IAG Symposium proceedings [2]. The GPS data acquired in Noto in 2006 are going to be processed in the near future and they will be compared to the results that have been obtained through the GPS survey carried out in 2003. GPS based ties and indirect methodologies are being investigated within a Ph.D. project realized by Claudio Abbondanza, in cooperation with the University of Bologna. Another Ph.D. activity is currently being developed by Simonetta Montaguti. It is also based on a cooperation with the University of Bologna and is related to gravitational deformation of VLBI telescopes. During 2006, a terrestrial survey of the position of the S/X receiver placed on the telescope's quadrupode in Medicina has been performed. Data are currently being processed and are going to integrate the information collected through the 2005 survey of the dish. It was performed for determining the deformation of the primary mirror using laser scanning [3] and for determining its position as the antenna rotates in elevation, so as to detect the existence and the entity of a possible gravitational sag.

2. Data Analysis and Results

The IRA started to analyze VLBI geodetic databases in 1989, using a CALC/SOLVE package on the HP1000 at the Medicina station. In the following years the same software was installed on an HP360 workstation and later on an HP715/50 workstation. We usually analyze databases with at least three European baselines. We are also storing all the databases which contain observations performed using the Ny-Ålesund antenna. All hardware resources are now located at Bologna headquarters. These are two HP785/B2600 workstations and one HP282 workstation. In the last months a new Linux workstation has been installed, with the aim to migrate all the VLBI analysis to Calc/Solve Version 10. During 2006, we have stored all the 1999-2006 databases available on the IVS data centers. All the databases have been processed and saved with the best selection of parameters for the final arc solutions.

Our AC has been participating in the IVS TROP Project on Tropospheric Parameters since its inception. Submission of tropospheric parameters (wet and total zenith delay, horizontal gradients) of all IVS-R1 and IVS-R4 24hr VLBI sessions was regularly performed in form of SINEX files. In the last year, due to several problems, we did not regularly submit results, but we tried to answer to a certain number of high priority requests. Long time series of troposphere parameters have been computed using all VLBI sessions available in our holdings, in order to estimate the variations in time of the content of water vapour in the atmosphere. We submitted a new solution for long time series of tropospheric parameters to IVS TROP Project.

3. Outlook

For the time being, our catalogue contains all experiments that involve European stations and all sessions performed after 1998. In 2007, together with the new Linux workstation and the up-to-date Calc/Solve Version 10 software, a new server with a storage capacity of 1 TB will be available. Therefore, all experiments performed in the previous years will be downloaded and analyzed, thus completing the catalogue. The regular submission of INAF tropospheric parameters to IVS data center will be resumed as soon as possible.

References

- [1] Abbondanza, C, M. Negusini, P. Sarti, L. Vittuari, An investigation on GPS-based approach to local tie computation in International VLBI Service for Geodesy and Astrometry 2006 General Meeting Proceedings, edited by Dirk Behrend and Karen Baver, NASA/CP-2006-214140 (2006), 162-166.
- [2] Abbondanza, C, M. Negusini, P. Sarti, L. Vittuari, VLBI-GPS Eccentricity Vectors at Medicina's Observatory via GPS Surveys: Reproducibility, Reliability and Quality Assessment of the Results Submitted to IAG Geodetic Ref. Frame Proc., Munich, Oct. 2006
- [3] Montaguti, S, M. Negusini, P. Sarti, L. Vittuari, Radiotelescopi di Noto e Medicina: deformazioni gravitazionali valutate mediante un'indagine laser terrestre Atti X Conferenza Nazionale ASITA, 14-17 Novembre 2006, Bolzano, 1463-1468.
- [4] Sarti, P., P. Sillard, L. Vittuari, Surveying co-located space geodetic instruments for ITRF computation Journal of Geodesy (2004) 78:210-222.