

# 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 32-m VLBI AZ-EL telescopes are situated. This report contains the AC's VLBI data analysis activities and briefly outlines the investigations carried out at Medicina and Noto concerning gravitational deformations of the VLBI telescopes.

## 1. Current Status and Activity

Investigations on VLBI local tie surveying and antenna deformations continued in 2010. The deformation patterns of the structure were determined in previous years, and a complete signal path variation (SPV) model could be defined for the Medicina telescope [1, 2]. The same procedure adopted for Medicina was applied successfully to Noto. Particular attention was paid to accurate computation of the coefficients of the linear combinations that determine the SPVs [3]. The two models were used to correct the VLBI delay in routine geodetic VLBI data analysis. Results clearly show that the reference point height depends on elevation-dependent signal path variations, these latter being induced by gravitational deformations [4]. The height shift of the antenna reference point in Medicina is 8.9 mm, and it is 6.7 mm at Noto, much larger than the VLBI formal errors on positions. This bias cannot be determined by relying on VLBI data alone as its effect propagates directly into the estimated station height and antenna axis offset [4].

## 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 subsequent years, the same software was installed first on an HP360 workstation and later on an HP715/50 workstation. In more recent years, two HP785/B2600 workstations and an HP282 workstation were used. In 2007, a new Linux workstation was set up for the migration of all the VLBI data analysis, and Mark 5 Calc/Solve was installed. During 2010, we stored all the 1999-2010 databases available on the IVS Data Centers. All the databases were processed and saved with the best selection of parameters for the final arc solutions. The most recent IRA solution for crustal deformation comprises all the Europe sessions analyzed at IRA from 1987 to 2009, and the estimated horizontal and vertical velocities are presented in [5].

Our Analysis Center has participated in the IVS TROP Project on Tropospheric Parameters since the beginning of the activities. Tropospheric parameters (wet and total zenith delay and horizontal gradients) of all IVS-R1 and IVS-R4 24-hour VLBI sessions were regularly submitted in the form of SINEX files. In 2010 we regularly submitted our results to IVS. We have also computed and submitted a long time series of troposphere parameters using all VLBI sessions available in our catalog in order to estimate the variations over time of the content of water vapor in the atmosphere.

### 3. Outlook

For the time being, our catalog finally contains all available experiments. In 2011, using our new Linux workstation and the up-to-date Mark 5 Calc/Solve software, we plan to analyze all available databases, thus completing the catalog. We will continue with the regular submission of INAF tropospheric parameters to the IVS data centers, also studying the impact of the Vienna Mapping Function on the geodetic results.

### References

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