

# 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 shortly outlines the investigations into the co-location of space geodetic instruments.

## 1. Current Status and Activity

Investigations into VLBI local tie surveying and antenna deformation continued in 2011. The impact of different contributing effects on the tie vector estimate has been simulated and evaluated. In particular, different local ground control network geometries, a varying number and distribution of ground pillars, the impact of the observing scheme adopted during the terrestrial survey, the impact of the redundancy of observations, the contribution of thermal and gravitational deformations of the space geodetic instrument structure were introduced into the tie vector computation, and their effects on the tie vector estimate were precisely evaluated [1]. In addition, a thorough investigation of the local stability of the geodetic monuments at the Medicina site and the determination of local, intra-site motions are currently in process. The starting data sets are those acquired during the terrestrial surveys of the GPS-VLBI tie vector during the period 2001 - 2010. The results derived by the analysis of the terrestrial data have been cross-checked against those obtained by the analysis of the GPS data acquired by the two permanent EUREF [2] stations MEDI and MSEL over the period 2004 - 2010. The results show a non-negligible, statistically significant motion of the local ground control network pillars, especially in the horizontal components, and are being summarized in a paper that has been almost finalized and is about to be submitted.

## 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 2011, we stored all the 1999 - 2011 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 Europe sessions analyzed at IRA from 1987 to 2009; the estimated horizontal and vertical velocities are presented in [3].

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. INAF solutions for the CONT08 campaign were used for intra-technique combination and the results published in [4]. In 2011 we regularly submitted our results to IVS.

### 3. Outlook

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. We will submit 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.

### References

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