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 deformation of the VLBI telescopes.

1. Current Status and Activity

Investigations into VLBI local tie surveying and antenna deformation continued in 2009. On the operational side, a new GPS survey of the antenna reference point was carried out at the Medicina observatory in late June. On the computational side, the deformation patterns of the structure had been determined in previous years, and a complete signal path variation (SPV) model could be defined for the Medicina telescope (see [1] and [2]). The same procedure adopted for Medicina was applied successfully at Noto: the combination of terrestrial surveying methods also allowed the definition of an SPV model. Particular care was taken to accurately computate the coefficients of the linear combinations that determine SPV [3]. The two models were used to correct the VLBI delay in routine geodetic VLBI data analysis. Results clearly show that reference point height depends on elevation-dependent signal path variations, the 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 position formal errors. This bias cannot be determined by relying on VLBI data alone, as its effect is fully incorporated 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 2009, we stored all the 1999-2009 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 VLBI sessions analyzed at IRA from 1987 to 2008, 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 its beginning. Tropospheric parameters (wet and total zenith delay and horizontal gradients) of all IVS-R1 and IVS-R4 24-hour VLBI sessions were submitted regularly in the form of SINEX files. During the past year,we started again to regularly submit our results. 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 2010, 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.

References

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