Matera CGS VLBI Analysis Center

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Abstract

This paper reports the VLBI data analysis activities at the Space Geodesy Center (CGS) at Matera from January 2004 through December 2004 and the contributions that the CGS intends to provide for the future as an IVS Data Analysis Center.

1. General Information

The Matera VLBI station became operational at the Space Geodesy Center (CGS) of the Italian Space Agency (ASI) in May 1990. Since then it is active in the framework of the most important international programs. VLBI data analysis activities are performed at CGS for a better understanding of the tectonic motions with specific regards to the European area. The CGS, operated by Telespazio on behalf of ASI, provides full scientific and operational support using the main space geodetic techniques: VLBI, SLR and GPS.

2. Staff at CGS contributing to the IVS Analysis Center

- Dr. Giuseppe Bianco, Responsible for CGS, ASI (primary scientific/technical contact).
- Dr. Cecilia Sciarretta, Responsible for scientific activities, Telespazio.
- Dr. Roberto Lanotte, Geodynamics data analyst, Telespazio.
- Dr. Mauro Pirri, Geodynamics data analyst, Telespazio.

3. Current Status and Activities

3.1. Global VLBI Solution cgs2005a

The main VLBI data analysis activities at the CGS in the year 2004 were directed towards the realization of a global VLBI analysis, named cgs2005a, using the CALC/SOLVE software (developed at the GSFC). The cgs2005a will be included in the IVS solutions "pool" and its main characteristics are:

- Data span:
  1980.04.11 - 2004.12.31
- Estimated Parameters:
  - Celestial Frame:
    right ascension and declination as global parameters for 537 sources and as local parameters for 7 sources.
  - Terrestrial Frame:
    Coordinates and velocities for 83 stations as global parameters and as local parameters for 30 stations.

– Earth Orientation:
Unconstrained X pole, Y pole, UT1, Xp rate, Yp rate, UT1 rate, dpsi and deps.

3.2. IVS Tropospheric Products

Regular submission of tropospheric parameters (wet and total zenith path delays, east and north horizontal gradients) for all VLBI stations observing in the IVS R1 and R4 sessions has continued during 2004.

3.3. IVS Pilot Project "Time Series of Baseline Lengths"

Regular submission of station coordinate estimates, in SINEX files, was started in 2004 for the IVS pilot project "Time Series of Baseline Lengths". At present 540 sessions have been analysed and submitted covering the period from 2000 to 2004.

3.4. Analysis of the 2004 Matera Survey and VLBI Invariant Point Determination

The role played by CGS as geodetic fundamental station, hosting the main space geodetic technique systems SLR, VLBI, and GPS, makes the whole survey theme (measurements, related corrections and processing) of great importance for the CGS activities.

The latest survey at CGS was performed in February/March 2004 and involved measurements connecting seven IERS geodetic reference points and 14 additional reference points of the local network. A technical report on the measurement procedure, with details on the local network is available at GeoDAF (Geodetic Data Archiving Facility) at the URL

http://geodaf.mt.asi.it/GDHTL/surv_rep.html.

A new software for the analysis of the survey raw measurements is under development. The main characteristics of this software are:

- atmospheric effects removed using continuously measured values of local temperature, pressure and humidity provided by the meteorological sensors operating at ASI CGS and disseminated as RINEX meteorological file in the GeoDAF database;
- rigorous network adjustment (weighted least squares method) with minimal constraints (minimal inner constraints choice is under development), using the whole covariance matrix at each step of the computation;
- outlier detection;
- designed to keep the human intervention on the data processing at the lowest;
- The VLBI invariant point can be estimated modeling the geometrical figure described by a retro-reflector located on the antenna. Using a least squares method the following three models and parameters can be estimated:
  - sphere: centre coordinates + radius
  - torus: centre coordinates + 2 radii
  - inclined torus: centre coordinates + 2 radii + 2 rotation angles

4. Future Plans

- Continue and improve the realization of global VLBI analysis.
- Continue to participate in IVS analysis projects.
- Complete the software for the analysis of geodetic local survey.