

DGFI Special Analysis Center Annual Report 2001

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Abstract

This report summarizes the activities of the DGFI Special Analysis Center in 2001 and the planned activities for the year 2002.

1. Special Analysis Center Operation

The general task of the IVS Analysis Center at DGFI is to support and to improve VLBI data analysis and to generate VLBI products (see DGFI web server <http://www.dgfi.badw.de>).

2. Initial Activities

During 2001, the IVS Special Analysis Center at DGFI has carried out the following activities:

1. Investigations on highly resolved EOP determined with VLBI

During 2001, the determinability and significance of subdiurnal EOP with VLBI was investigated (Kutterer and Tesmer, 2002). In addition, a reassessment of highly resolved EOP determined with VLBI was carried out (Tesmer et al., 2001).

The principal results are:

- Subdaily resolved coordinates of the Earth's rotational pole cannot be separated from nutation. Thus, nutation must be fixed to the best known model values.
- Using OCCAM 5.0, EOP can be determined well with a resolution down to one hour. The technological limit for the resolution must be supposed to be about 15 minutes. However, such a high resolution yields high temporal correlations between the estimates.
- Shortening the time intervals increases the variances of the estimated parameters drastically. They become less and less homogeneous. In such cases, it is recommended to use the full variance-covariance-matrix of the estimated EOP in further analysis to avoid misinterpretation.
- By accumulating highly resolved EOP from different sessions, the influence of random errors can be reduced to reveal subdaily periodical parts with known frequencies.

2. Computation of a solution for coordinates and velocities of VLBI telescopes

During 2001, a data base for NGS card files was compiled for all available 24 h VLBI sessions from 1979 until the end of 2000. Data sources were NASA's CDDIS and the IVS servers. Solutions were computed for all reasonable sessions. Scripts to automatically recompute all sessions with OCCAM were prepared. About 2000 sessions were selected to compute a solution for station coordinates and velocities of 47 stations with a representative amount and time span of observations. The first solution is to be expected in early 2002.

3. Contribution to the 2nd IVS Pilot Project

Please refer to the homepage of the IVS Analysis Coordinator.

3. Staff

The following DGFI personnel were involved in the IVS Analysis Center during the year 2001:

Hermann Drewes, Hansjörg Kutterer and Volker Tesmer.

4. Plans

For 2002 the plans of the DGFI Special Analysis Center are:

- Further investigations of highly resolved EOP determined with VLBI
The scientific work on subdaily variations of the Earth's rotation will be continued. A best-fitting model representing these measurements will be computed using statistical methods to evaluate their reliability.
- Further investigations of the stochastic model in VLBI data analysis
Besides applying robust methods to detect outliers, it is planned to determine more realistic weights of VLBI observations, using variance components for stations, sources or elevation-dependent variance components. Additionally, investigations of the stochastic properties of VLBI observations will be continued. Earlier studies at DGFI (Schuh and Tesmer, 2000) and results from GPS (Howind et al., 1999) show that the usage of a priori correlations between geodetic observables induce more realistic formal errors as well as more stable parameters.
- Contribution to the VLBI terrestrial reference frame
The computation of a first solution for coordinates and velocities of 47 VLBI telescopes with OCCAM will be finished in early 2002. In addition, time series of station coordinates and EOP parameters will be provided for all sessions in the solution.
- Contribution to the IVS products
It is planned to participate in future IVS Pilot Projects and to contribute to IVS products.

5. References

Kutterer, H., V. Tesmer: Subdiurnal Earth Orientation Parameters from VLBI networks - determinability and significance. In: Proceedings of the IAG 2001 Scientific Assembly, Springer, Berlin, Heidelberg, 2002 (in press).

Howind, J., H. Kutterer, B., Heck: Impact of temporal correlations on GPS-derived relative point positions, *Journal of Geodesy* 83, 246-258, 1999.

Schuh, H., V. Tesmer: Considering A Priori Correlations in VLBI Data Analysis. In: Vandenberg, N., K. Baver, (Eds): International VLBI Service for Geodesy and Astrometry 2000 General Meeting Proceedings, NASA/CP-2000-209893, 237-242, 2000.

Tesmer, V., H. Kutterer, B. Richter, H. Schuh: Reassessment of highly resolved EOP determined with VLBI. In: Proceedings of the 15th Working Meeting on European VLBI for Geodesy and Astrometry, Institut D'Estudis Espacials de Catalunya, Barcelona, 2001 (in press).