

The GIUB/BKG VLBI Analysis Center

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Abstract

The activities at the GIUB/BKG VLBI Analysis Center consist of routine computations of Earth orientation parameter (EOP) time series and a number of research topics in geodetic VLBI. At BKG a first version of a new graphics tool (REPA) was developed for the VLBI Analysis Software Solve which is independent of a specific operating system. The automated VLBI data analysis tools at BKG were improved. The VLBI group at BKG has participated in the IVS Pilot Project - Tropospheric Parameters.

The research activities at Bonn have been concentrated on preparing the SINEX output of the Solve analysis software for combination within the DOGS/CS combination software of DGFI.

1. General Information

The GIUB/BKG VLBI Analysis Center has been established jointly by the Bundesamt für Kartographie und Geodäsie (BKG), Leipzig, and by the Geodetic Institute of the University of Bonn (GIUB). Both institutions closely cooperate in the field of geodetic VLBI maintaining their own analysis groups in Leipzig and Bonn. The responsibilities include data analysis and software development. The BKG is responsible for the computation of EOP time series and annual solutions to be submitted to the IVS and to the IERS. The group at GIUB carries out special investigations in the field of geodetic VLBI and analyzes sessions correlated at the Bonn Correlator.

2. Data Analysis

At BKG the Mark IV data analysis software system Solve, release of December 27, 2002 [1], is currently used for the VLBI data processing. In addition, an independent program environment for the CALC/SOLVE software is used for the pre- and post-interactive part of the EOP series determination. The CALC/SOLVE software is installed on a HP9000/280/1 workstation with the HP-UX10.20 operating system and also on another HP workstation with the HP-UX11.00 operating system.

- **Processing of correlator output**

The BKG group continued the generation of calibrated databases for the sessions correlated at the Bonn Astro/Geo Mark IV Correlator (e.g. R1, T2, OHIG, EURO) and submitted them to the IVS Data Centers for distribution.

- **IVS EOP time series**

The EOP time series bkg00001, bkg00002 computed from 24 hour VLBI sessions were replaced by the series bkg00003 with all 24 hour sessions since 1984 suitable for EOP determination. From the beginning of 1984 to the end of 2002 altogether 2601 sessions of 24-hour observing time were processed. The EOP time series bkgint01 computed from the UT1 intensive sessions was replaced by the series bkgint02. 906 UT1 intensive sessions with about 1 hour measurement duration were analysed for the period between Jan. 1, 1999 to Jan. 14, 2003. The main difference to the previous EOP series is the implementation of the ITRF2000 reference frame.

- **Annual solution for submission to IERS**

A new combined global solution with a data span from January 1984 to December 2001 was computed for submission to IVS and IERS. The main parameters, i.e. station coordinates and velocities, radio source positions and EOP, were estimated in one global solution. In contrast to the previous annual solution the set of stations in the no-net-rotation and no-net-translation constraints refers to ITRF2000. The results of the EOP and radio source positions were submitted to IVS/IERS in IERS format. The TRF solution is available in SINEX format, Version 1.00, with station coordinates, velocities, and covariance matrix.

3. Research Topics

- **Development of a new graphic tool for the Solve software**

The graphics tool currently used in the Solve software called CNPLT for interactive editing of the observations is not transferable to other non-HP operating systems, e.g. LINUX. For this reason a new graphics tool for the Solve software had to be developed in preparation for a port of Solve to LINUX. On the basis of DiaGI (Dialogue Graphic Interface) by Leonid Petrov, NASA Goddard Space Flight Center [2], a first version of a new graphics software REPA was developed by the BKG VLBI group. Currently REPA is installed in the Solve software at BKG in parallel to the old program CNPLT for testing.

- **Technology developments**

The automated system to manage data flow and analysis tasks currently running at the BKG IVS Data and Analysis Center has been improved for more stability in the operational process and reduction of errors in the sub-processes.

- **Pilot Project - Tropospheric Parameters**

The VLBI group of BKG has joined the IVS Pilot Project - Tropospheric Parameters. The estimated tropospheric parameters (wet and total zenith delays, horizontal gradients) for all IVS-R1 and IVS-R4 sessions since Jan. 1, 2002, have been submitted regularly in a special defined solution independent exchange format for tropospheric estimates.

- **Analysis of Tsukuba–Wettzell UT1–UTC Intensive Observations**

In the second half of 2002 twenty 1-hour sessions were observed within the Tsukuba–Wettzell UT1–UTC Project for an intensive-type series of UT1 measurements. At Bonn the sessions have been analyzed and comparisons with the Wettzell–Kokee Park short duration series have been carried out. The results are still in a preliminary stage but the agreement is quite promising [3].

- **Preparation of Solve SINEX Output for Combination**

In the second half of 2002 GSFC has augmented the Solve analysis software with a SINEX output feature. In order to prepare this output for use in the DGFI's combination software DOGS/CS a conversion program was developed. Current investigations concentrate on the reference epoch definition within the combination process and the treatment of the datum definition within the combination process.

- **Correlations between estimated parameters**

The investigations of correlations between estimated parameters have been continued now concentrating on a detailed analysis of the observation equations by singular–value decomposition.

- **Calibration of INTENSIVE observations with GPS troposphere results**

The 2002 observing sessions of the Tsukuba–Wettzell UT1-UTC Intensive project have been analyzed using wet zenith delays from GPS observations. A detailed assessment of the quality of the results is in progress.

4. Future Plans

The development of the new graphic tool REPA will be continued in order to replace the old program CNPLT. The new annual solution and also the quarterly global solutions of the BKG VLBI group will be updated with a different set of stations for the definition of the reference frame.

5. Personnel

Table 1. Personnel at GIUB/BKG Analysis Center

Gerald Engelhardt	BKG	
Dorothee Fischer	GIUB	
Axel Nothnagel	GIUB	
Wolfgang Schwegmann	GIUB	until 01/2002
Christoph Steinforth	GIUB	
Volkmar Thorandt	BKG	
Dieter Ullrich	BKG	
Markus Vennebusch	GIUB	from 05/2002
Reiner Wojdziak	BKG	

References

- [1] GSFC, NASA (2002): Release of Mark-IV VLBI Analysis Software CALC/SOLVE from Dec. 27, 2002 (web-reference: http://gemini.gsfc.nasa.gov/solve_root/release).
- [2] GSFC, NASA (2002): DiaGI user guide (web-reference: http://gemini.gsfc.nasa.gov/solve_root/help).
- [3] Nothnagel A., D. Fischer, A. Müskens (2003): The Bonn Geodetic VLBI Operation Center, this issue.