The GIUB/BKG VLBI Analysis Center

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Abstract

The activities at the GIUB/BKG VLBI Analysis Center for the year 2003 consist of routine computations of Earth orientation parameter (EOP) time series and a number of research topics in geodetic VLBI. At BKG the new interactive graphic tool REPA [1] was developed for the VLBI Analysis Software Calc/Solve [2]. In 2003 the VLBI group at BKG has started regular submissions of tropospheric parameters for the IVS-R1 and IVS-R4 sessions, and generating of daily SINEX (Solution INdependent EXchange format) files for IVS. Quarterly updated solutions were computed for the IVS products Terrestrial Reference Frame (TRF) and Celestial Reference Frame (CRF). At GIUB analysis activities concentrated on investigations concerning the Wettzell - Tsukuba K4 UT1 Intensive series and on combinations of VLBI data using SINEX files.

1. General Information

The GIUB/BKG VLBI Analysis Center has been established jointly by the Bundesamt für Kartographie und Geodäsie (BKG), Leipzig, and 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. BKG is responsible for the computation of EOP time series and tropospheric parameters of the IVS-R1 and IVS-R4 sessions, the generating of daily SINEX files, and quarterly updated global solutions for the TRF and the CRF.

On May 9-10, 2003 the 16th Working Meeting on European VLBI for Geodesy and Astrometry was organized by the BKG and took place at the BKG branch at Leipzig [3].

2. Data Analysis

At BKG the Mark 5 VLBI data analysis software system Calc/Solve, release of September 25, 2003 [2], is currently used for VLBI data processing. In addition, the older Mark 4 version, release of May 15, 2003 and an independent program environment for the Calc/Solve software are available. The latter is used for the pre- and post-interactive part of the EOP series determination. The Mark 4 Calc/Solve software under Fortran77 is installed on a HP9000/280/1 workstation with an HP-UX10.20 operating system and the Mark 5 software under Fortran90 on another HP workstation with an HP-UX11.00 operating system.

- **Processing of correlator output**
  The BKG group continued the generation of calibrated databases for the sessions correlated at the MPIfR/BKG Mark 5 Astro/Geo Correlator at Bonn (e.g. R1, T2, OHIG, EURO) and submitted them to the IVS Data Centers for distribution.
- **IVS EOP time series**
  The EOP time series bkg00003, bkg00004, and bkg00005 computed from 24 hour VLBI sessions were replaced by the series bkg00006 with all 24 hour sessions since 1984 suitable for EOP determination. The main differences to the older series are the use of a new a priori TRF

called VTRF2003 [4] estimating TRF and CRF parameters in the global solution together with the EOP. From the beginning of 1984 to the end of 2003 altogether 2894 sessions of 24-hour observing time were processed.

The EOP time series bkgint02 computed from the UT1 intensive sessions was replaced by the series bkgint03. The new one is generated with fixed TRF (VTRF2003) and fixed CRF derived from the global BKG solution for EOP determination. 1074 UT1 intensive sessions with about 1 hour measurement duration were analysed for the period between Jan. 1, 1999 to Dec. 31, 2003.

- **Quarterly updated solutions for submission to IVS**
  For the IVS products TRF and CRF quarterly updated solutions were computed. There are no differences in the solution strategy compared to the continuously computed EOP time series bkg00006. The results of the radio source positions were submitted to IVS in IERS format. The TRF solution is available in SINEX format, version 2.1, with station coordinates, velocities, and covariance matrix.

3. Research Topics

- **Development of a new graphic tool for the Calc/Solve software**
  The new interactive graphic tool REPA [1] has been implemented into the latest Calc/Solve releases. Both Fortran77 and Fortran90 versions are available. So it will be possible to transfer the program to LINUX. REPA allows the user to manage all necessary manipulations on VLBI observations and can create various plots of the baselines in the data base. The program can solve ambiguities for all baselines of a database in one step automatically. As of now the program is useful only for the data type "Group Delay and Rate".
- **IVS Product - Tropospheric Parameters**
  After the completion of the IVS Pilot Project - Tropospheric Parameters the VLBI group of BKG has started regular submissions of tropospheric parameters to IVS (wet and total zenith delays, horizontal gradients) for all IVS-R1 and IVS-R4 sessions since Jan. 1, 2002. The tropospheric parameters are directly extracted and transformed into SINEX for tropospheric estimates from the results of the solution for the EOP time series bkg00006. It is planned to submit long time series of tropospheric parameters from 1984 on.
- **Daily SINEX files**
  The BKG VLBI group has started the regular submissions of daily SINEX files as base solutions for the planned IVS time series of baseline lengths and for combination techniques. In addition to the global solutions independent session solutions are computed for the parameter types station coordinates, EOP, and nutation parameters.
- **Investigations of Solve SINEX Output for Combination**
  Currently the IVS Analysis Centers at BKG and at GSFC regularly produce datum-free normal equation matrices of VLBI sessions while the USNO Analysis Center is testing its output. Thus, for selected epochs three different SINEX files (V. 2.0) are available which are used for extensive testing of the combination procedures on the basis of the DGFI DOCS-CS software. First efforts concentrate on the combination of earth orientation parameters (EOP) only. In a second step it is intended to combine TRFs as well. More details can be found in the proceedings of the Third IVS General Meeting, Ottawa, Canada, February 9 - 11, 2004.

- **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.
- **Analysis of Tsukuba–Wettzell K4 UT1-UTC Intensive Observations**
  In 2003 thirty-one 1-hour sessions were observed in the Tsukuba–Wettzell K4 Intensive UT1–UTC Project. At Bonn the sessions have been analyzed in great detail. The main task is a consistent integration of the results in other series like the Wettzell–Kokee Park MK5 UT1–UTC series. Figure 3 depicts the series based on differences w.r.t. the IERS C04 series together with the Wettzell - Kokee Park results using identical analysis strategies.

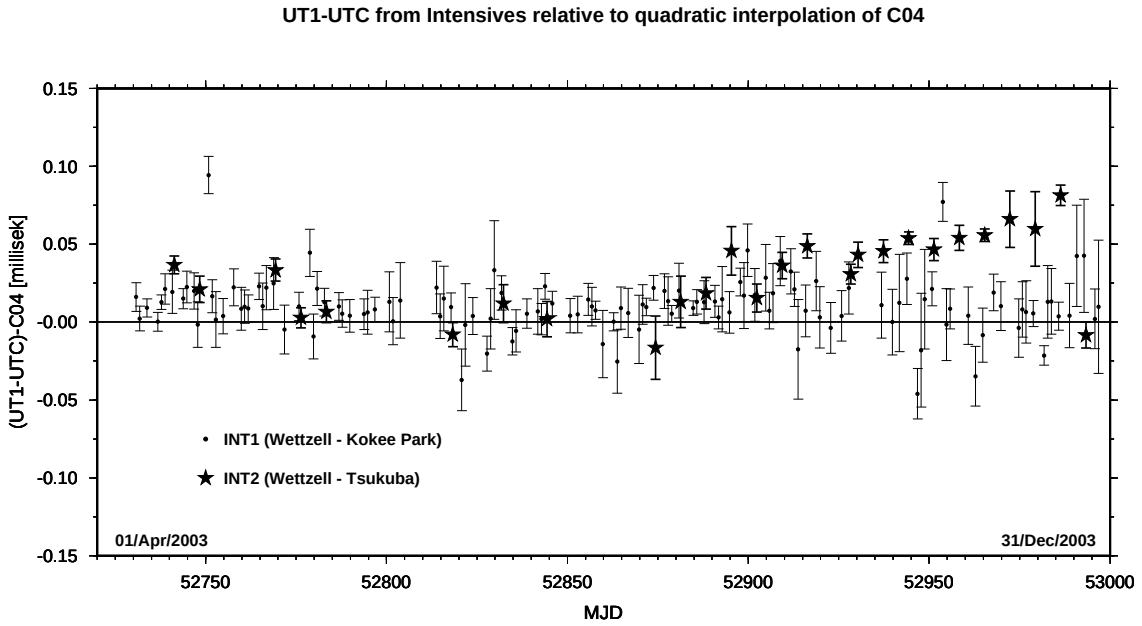

Figure 1. Residuals of Tsukuba - Wettzell and Kokee Park - Wettzell UT1-UTC Intensive Series w.r.t. IERS C04

Questions on reference frames and analysis strategies have been investigated in view of a consistent integration of this series in other UT1 observing series. Apriori polar motion series and nutation modeling play an important role in the analysis. More details can be found in the proceedings of the Third IVS General Meeting, Ottawa, Canada, February 9 - 11, 2004.

4. Personnel

Table 1. Personnel at GIUB/BKG Analysis Center

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References

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