Special Associate Analysis Center at Communications Research Laboratory

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Abstract

Communications Research Laboratory is performing data analysis on the Key Stone Project VLBI experiments which are currently performed once every two days. The data analysis procedures are fully automated and the results are placed in the publicly accessible area via Internet. Geodetic VLBI experiments which have been organized by the laboratory are also analyzed. These activities are summarized in this report.

1. Introduction

Communications Research Laboratory (CRL) has organized various geodetic VLBI experiments in Japan and with foreign network stations. The analysis results of the experiments performed before October 1992 were summarized in a data analysis report published by CRL [1]. The VLBI experiments with the Key Stone Project VLBI stations began in August 1994 [2] and the analysis of the Key Stone Project VLBI data is the major activity as the special associate analysis center at present.

2. Data Analysis Software and Hardware Systems

For the data analysis of the Key Stone Project VLBI observation data, Mark III database files are created by using software developed at CRL and database handler library routines developed by Goddard Space Flight Center (GSFC) of National Aeronautics and Space Administration (NASA). The theoretical delay and delay rates are calculated by CALC version 8.1 (NASA/GSFC), and the least squares parameter estimations are performed by VLBEST (CRL) [3] [4]. Editing of bad data points and ambiguities are applied by MRKOBS (CRL) and REMAMB (CRL) respectively. The final results are processed and placed in a publicly accessible area via Internet in appropriate data formats. All the processes from the generation of the database files to the publication of the final results are fully automated and no human operations are required.

3. Data Analysis

In the data analysis, site coordinates of the 11-m antenna station at Kashima are fixed to the *a-priori* position in the ITRF96 which was defined by International Earth Rotation Service (IERS). The site coordinates of the other three stations are estimated along with the clock offset and atmospheric zenith delay at the time intervals of 1.5 and 3.0 hours, respectively. The *a-priori* coordinates of the 11-m antenna station at Kashima is derived from the results of seven tie VLBI experiments with the 34-m antenna station at Kashima. Positions of the observed radio sources are fixed to the RSC(WGRF)95R01 and the Earth rotation parameters are fixed to the EOP(IERS)97C04 data set, both of them are defined and maintained by IERS. Every time when the Earth rotation parameters are updated in an e-mail bulletin from IERS, the content of the

bulletin is processed and the affected databases are reanalyzed automatically.

Estimated site positions of the Koganei station are shown in the Figure 1 as an example. The precision of the estimates have been gradually improved. The major improvements were achieved by better temperature control of the receiver system and the use of higher data rate (256 Mbps) for the observations since June 1999 [5]. These results can be accessed at the URL of `http://ksp.crl.go.jp/obsdata.html`.

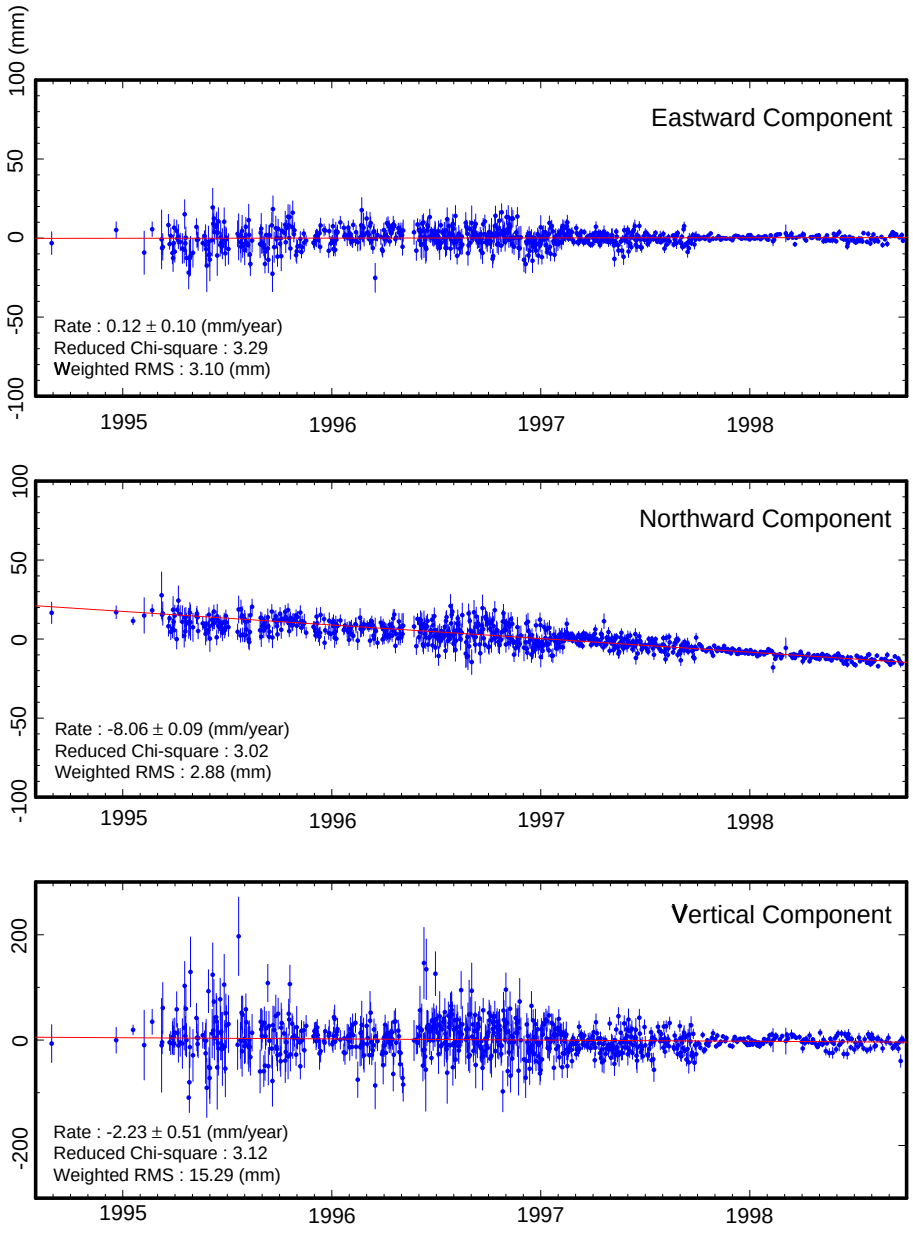

Figure 1. Estimated site positions of the Koganei station.

In addition to the regular data analysis described above, wobble parameters of the Earth's rotation pole position and the time difference between coordinated universal time and the universal

time (UT1-UTC) are estimated by fixing the site coordinates of the four stations. Figure 2 shows differences between the UT1-UTC values published by IERS in the monthly bulletins and the estimated UT1-UTC from the Key Stone Project VLBI data, when only the UT1-UTC values are estimated. Since the data analysis of the Key Stone Project VLBI data is performed immediately after a set of observations are performed, the UT1-UTC estimations are considered to have a potential to be included in a rapid service from IVS.

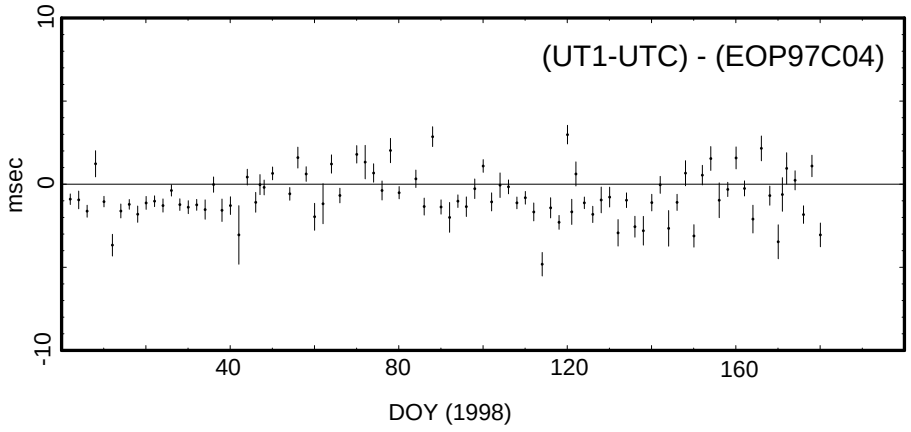

Figure 2. Estimated UT1-UTC values compared with the EOP90C04 data set.

4. Technical Staff for the KSP Analysis Center

Technical staff members who are contributing data analysis at the CRL are listed below. In principle, no operations are necessary for the regular VLBI observations of the Key Stone Project VLBI network.

- Tetsuro Kondo, Responsible for overall operations and performance.
- Yasuhiro Koyama and Masato Furuya, Development of data analysis software.
- Ryuichi Ichikawa, Research for atmospheric modeling.
- Jun Amagai, Maintenance of data analysis system.

5. Current Status and Future Plans

As of March 1999, a replacement of the Unix workstation with a new system is on the way and the new workstation will be used for regular data analysis of the Key Stone Project VLBI observations. The newer version of the CALC (version 8.2) will be used on the new system.

At present, only the zenith atmospheric delay parameters are estimated and a mapping function is used to model the elevation dependency of the atmospheric delay. Effectiveness of estimating tropospheric gradient parameters are being evaluated at present. It is also planned to generate the analysis results in SINEX (Solution Independent Exchange) format.

References

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