

Data Center at NICT

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Abstract

The Data Center at National Institute of Information and Communications Technology (NICT) archives and releases the databases and analysis results processed at the Correlation Center and the Analysis Center at NICT. Regular VLBI sessions with the Key Stone Project VLBI Network were the primary objective of the Data Center. These regular sessions continued until the end of November 2001. In addition to the Key Stone Project VLBI sessions, NICT has been conducting geodetic VLBI sessions for various purposes, and these data are also archived and released by the Data Center.

1. Introduction

In April 2004, the Communications Research Laboratory was integrated with the Telecommunications Advanced Organization of Japan (TAO) to establish the National Institute of Information and Communications Technology (NICT) as a new institute. The IVS Data Center at NICT archives and releases the databases and analysis results processed by the Correlation Center and Analysis Center at NICT. Major parts of the data are from the Key Stone Project (KSP) VLBI sessions [1], but other regional and international VLBI sessions conducted by NICT are also archived and released. Since routine observations of the KSP network terminated at the end of November 2001, there have been no additional data for the KSP regular sessions since 2002. In 2008, a series of geodetic VLBI sessions were carried out using the Kashima 34 m, Kashima 11 m, and Koganei 11 m stations to demonstrate precise time comparison. A series of astronomical VLBI sessions were carried out between the Kashima 34 m and Koganei 11 m stations to monitor the flux densities of radio variable stars using real-time e-VLBI data transfer and processing. The analysis results are available on the WWW server in the SINEX (Solution Independent Exchange) file format as well as other formats. Database files generated in the Mark III database file format are available upon request and will be sent to users on DDS tape cartridges. Database files of non-KSP sessions, i.e. other domestic and international geodetic VLBI sessions, are also available on the WWW server. Table 1 lists the WWW server locations maintained by the Data Center at NICT. In the past, an FTP server was used to provide data files, but it was decided to terminate the FTP service because of security risks of maintaining an anonymous FTP server. Instead, the www3.nict.go.jp WWW server was prepared to hold large size data files.

Table 1. URL of the WWW server systems.

Service	URL
KSP WWW pages	http://ksp.nict.go.jp/
IVS WWW mirror pages	http://ivs.nict.go.jp/mirror/
Database files	http://www3.nict.go.jp/w/w114/stsi/database/
e-VLBI sessions	http://www.nict.go.jp/w/w114/stsi/research/e-VLBI/UT1/
Hayabusa sessions	http://www.nict.go.jp/w/w114/stsi/research/Navi/HAYABUSA/

The responsibilities for the maintenance of these server machines were moved from the VLBI

research group of NICT to the common division for the institutional network service of the laboratory in 2001 to improve the network security of these systems.

2. Data Products

2.1. KSP VLBI Sessions

The KSP VLBI sessions were performed with four KSP IVS Network Stations at Kashima, Koganei, Miura, and Tateyama once a day or once every two days until May 1999. The high-speed ATM (Asynchronous Transfer Mode) network line to the Miura station became unavailable in May 1999, and real-time VLBI observations with the Miura station became impossible. Thereafter, the real-time VLBI sessions were performed with the other three stations. Once every six days (every third session), the observed data were recorded to the K4 data recorders at the three stations, and the Miura station participated in the sessions with the tape-based VLBI technique. In this case, the observed data at Kashima, Koganei, and Tateyama were processed in real-time, and the analysis results were released promptly after the observations completed. A day later, the observed tapes were transported from the Kashima, Miura, and Tateyama stations to the Koganei station for tape-based correlation processing of the full set of six baselines. After the tape-based correlation processing was completed, the data set produced with the real-time VLBI data processing was replaced by the new data set.

In July 2000, unusual site motion of the Tateyama station was detected from the KSP VLBI data series, and the frequency of the sessions was increased from once every two days to daily on July 22, 2000. The daily sessions were continued until November 11, 2000, and the site motions of the Tateyama and Miura stations were monitored in detail. During the period, it was found that the Tateyama station moved about 5 cm to the northeast. The Miura station also moved about 3 cm to the north. The unusual site motions of these two stations gradually settled, and the current site velocities seem to be almost the same as the site velocities before June 2000. Investigation of the time series of the site positions shows that the unusual site motion started sometime between the end of June 2000 and the beginning of July 2000. At the same time, volcanic and seismic activities near the Miyakejima and Kozushima Islands began. These activities are believed to have caused the regional crustal deformation in the area, explaining the unusual site motions at Tateyama and Miura.

2.2. Other VLBI Sessions

In addition to the regular KSP VLBI sessions, domestic and international geodetic and astronomical VLBI sessions were conducted by NICT in cooperation with Geographical Survey Institute (GSI), National Astronomical Observatory (NAO), and other organizations. These sessions are listed in Table 2. The observed data of these sessions were correlated by using the K4 correlator and the K5 software correlator at NICT either at Koganei or at Kashima or by using a real-time hardware correlator developed by NAO.

In 2008, 90 geodetic VLBI sessions were performed in total. Ultra-rapid e-VLBI sessions were performed based on the proposal submitted to and approved by the IVS Observing Program Committee in May 2007. The purpose of these sessions is to demonstrate e-VLBI capabilities for ultra-rapid data processing after Intensive type, short period (typically 1 hour) sessions. Observed data at one site are transferred to the other site in real-time by using high speed research networks,

Table 2. Geodetic VLBI sessions conducted by NICT (since 2005)

Year	Exp. Categories	Sessions
2005	Geodetic	c0505 (CONT05, partial participation), GEX13
	Hayabusa	14 sessions
2006	Geodetic	GEX14, viepr2, CARAVAN (3 sessions)
	Spacecraft	Geotail: 1 session
	Pulsar	1 session
2007	Ultra Rapid e-VLBI	15 times, 29 sessions
	Time Comparison	4 sessions, 12 days in total
	Cs-Gass-Cell	1 session
	Spacecraft	Hayabusa: 1 session
2008	Ultra Rapid e-VLBI	8 times, 33 sessions
	Time Comparison	26 sessions
	Variable Star e-VLBI	31 sessions

and the format conversion and data correlation processing are done immediately after the real-time file transfer. Thus, generation of the database with a minimum time of latency after each session is expected. Two stations in Japan, Tsukuba and Kashima, and two stations in Europe, Onsala and Metsähovi, are the regularly participating stations, and the Wettzell station will participate when regular IVS Intensive (INT2) sessions are used for the project. Within the project, we are developing the necessary software programs to realize real-time and near real-time data processing and automated data analysis. Our goal is to release the database file on the data center WWW server as soon as possible, as well as to release the analyzed results to the wide community by using e-mail. For this purpose, 33 sessions were scheduled over 8 days. The number of sessions performed for each day varied because of different reasons. Sometimes, only two sessions were scheduled and performed (e.g., on April 22), whereas 6 sessions were scheduled and performed on February 21, July 7, and July 11, 2008.

A series of time transfer sessions were also performed in 2008. The purpose of the sessions was to evaluate the capacity of geodetic VLBI experiments for precise and accurate time transfer between Time and Frequency Laboratories located worldwide.

In March 2008, the network connection between the Kashima and Koganei sites was upgraded from a mixture of ATM and IP connections over the OC192 network to a pure IP connection over the 10GbE network. To utilize the capabilities of the 10GbE network, a newly developed network interface unit from the National Astronomical Observatory (NAO) was installed at both the Kashima 34 m and the Koganei 11 m stations. Four ADS1000 high speed VSI-H A/D sampler units were connected to the interface units at each site, and it became possible to perform real-time e-VLBI observations between these two stations at the maximum data rate of 8 Gbps (1024 Msps, 2 bits/sample, 4 channels). From May 2008 to August 2008, a series of astronomical VLBI sessions were performed to monitor the flux density of radio variable stars at S-band and X-band.

Figure 1 shows the number of geodetic and astronomical VLBI sessions and the number of valid observed delays used in the data analysis for each year up to the year 2008.

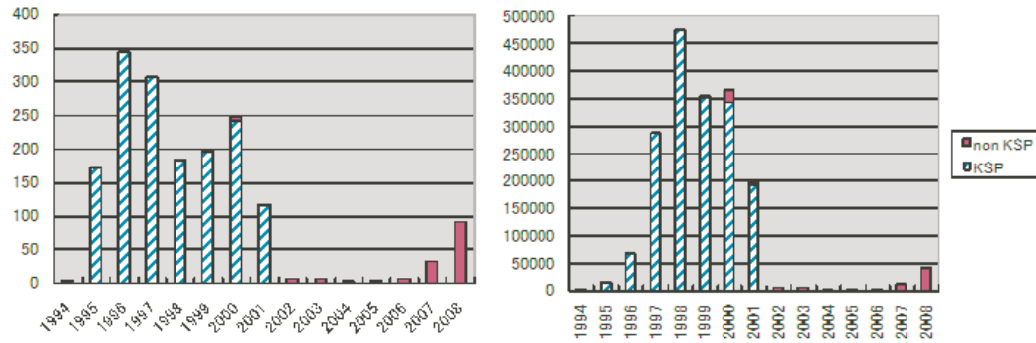


Figure 1. Number of sessions (left) and observed delays (right) used in the data analysis.

3. Staff Members

The data center at NICT is operated and maintained by the Space-Time Standards Group at Kashima Space Research Center, NICT. The staff members are listed in Table 3.

Table 3. Staff members of Space-Time Standards Group, KSRC, NICT

Name	Main Responsibilities
KOYAMA Yasuhiro	Administration of Data Servers
SEKIDO Mamoru	Responsible for e-VLBI sessions
TAKIGUCHI Hiroshi	Time Transfer
HASEGAWA Shingo	System Engineer

4. Future Plans

Although the regular VLBI sessions with the KSP VLBI network finished in 2001, the IVS Data Center at NICT will continue its service and will archive and release the analysis results accumulated by the Correlation Center and Analysis Center at NICT. In addition, a number of VLBI sessions will be conducted for the purposes of various technology developments.

References

- [1] Special issue for the Key Stone Project, J. Commun. Res. Lab., Vol. 46, No. 1, March 1999.
- [2] Koyama, Y., T. Kondo, M. Kimura, and H. Takeuchi, IVS NICT TDC News, No. 26, Sep. 2005, pp. 9-12.