Data Center at NICT

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Abstract

The Data Center at the 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 objects 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 the 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 from the KSP regular sessions since 2002. In 2009, a series of geodetic VLBI sessions were carried out by using the Kashima 34 m, Kashima 11 m, and Koganei 11 m stations to demonstrate precise time comparison. Another 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. In addition, three geodetic experiments using the compact VLBI system with a 1.6 m antenna were also carried out [2]. The analysis results in the SINEX (Solution INdependent EXchange) file format as well as other formats are available on the WWW server. Database files generated with the Mark III database file format are available upon request and will be sent to the 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 the security risks of maintaining an anonymous FTP server. Instead, the www3.nict.go.jp WWW server was prepared to place large size data files.

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 on a daily or bi-daily basis until May 1999. The high-speed ATM

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/

(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 three other stations. Once every six days (every third session), the observed data were recorded to the K4 data recorders at three stations, and the Miura station participated in the sessions with the tape-based VLBI technique. In this case, the observed data at the three stations other than the Miura station 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 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 bi-daily 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 Tateyama station moved about 5 cm to the northeast direction. 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. By investigating the time series of the site positions, 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 KSP regular VLBI sessions, domestic and international geodetic and astronomical VLBI sessions were conducted by NICT in cooperation with the Geographical Survey Institute (GSI), the 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.

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

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

Year	exp. names	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 Transfer	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 Transfer	26 sessions
	Variable Star e-VLBI	31 sessions
2009	e-VLBI	15 sessions, 90.5 hours in total
	IVS	12 sessions, 332 hours in total
	Time Transfer	9 sessions, 72 hours in total
	VERA	16 sessions, 149 hours in total
	Survey	26 sessions, 276 hours in total

demonstrate e-VLBI capabilities for ultra-rapid data processing after Intensive type short period (typically one hour) observing schedules. Observed data at one site are transferred to the other site in real-time by using high speed research networks, and the format conversion and data correlation processing are done immediately after the real-time file transfer. Thus, it is expected that the database will be provided with a minimum time of latency after each session. 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 whenever the regular IVS Intensive session (INT2) is used for the project. Under 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's WWW server as soon as possible, as well as to release the analyzed results to the general community by using e-mail. At the end of fiscal year 2008, a software package for the ultra rapid e-VLBI was implemented in the Tsukuba stations, and GSI has routinely used it for their INT2 sessions since then. In 2009, about 20 geodetic VLBI sessions (350 hours in total) including IVS campaigns and MARBLE experiments were performed. In addition, 15 e-VLBI sessions including the IYA2009 (International Year of Astronomy 2009) session, VLBI time transfer sessions, and astronomical survey experiments were also performed. In 2009, 15 e-VLBI sessions including the IYA2009 (International Year of Astronomy 2009) session were also performed in collaboration with JIVE.

In addition, nine time transfer sessions were also performed in 2009. The purpose of the sessions is to evaluate the capability of geodetic VLBI experiments for precise and accurate time transfer between Time and Frequency Laboratories located worldwide. A series of astronomical observations (276 hours in total) were also performed to monitor flux density of radio variable

stars.

3. Staff Members

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

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

Name	Main Responsibilities
KOYAMA Yasuhiro	Administration of Data Servers
ICHIKAWA Ryuichi	Development of compact VLBI system
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 the 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] Takefuji K., Ichikawa R., and Sekido M., Technology Development Center at NICT, *IVS 2009 Annual Report*, this volume, 2010.

[3] Koyama, Y., T. Kondo, M. Kimura, and H. Takeuchi, IVS NICT TDC News, No. 26, Sep. 2005, pp. 9-12.