

## Data Center at NICT

*Ryuichi Ichikawa, Hiroshi Takiguchi, Mamoru Sekido, Yasuhiro Koyama*

### 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 of 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

The IVS Data Center at National Institute of Information and Communications Technology (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, seven geodetic experiments using the two compact VLBI systems with a 1.6-m antenna were also carried out [2]. The analysis results in SINEX (Solution INdependent EXchange) format as well as in other formats are available on the Web server. Database files of non-KSP sessions, i.e., other domestic and international geodetic VLBI sessions, are also available on the Web server. Table 1 lists the Web server locations maintained by the NICT Data Center. 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` Web server was prepared to provide large size data files.

Table 1. URL of the Web server systems.

Service	URL
KSP Web pages	<a href="http://ksp.nict.go.jp/">http://ksp.nict.go.jp/</a>
IVS Web mirror pages	<a href="http://ivs.nict.go.jp/mirror/">http://ivs.nict.go.jp/mirror/</a>
Database files	<a href="http://www3.nict.go.jp/w/w114/stsi/database/">http://www3.nict.go.jp/w/w114/stsi/database/</a>
e-VLBI Sessions	<a href="http://www.nict.go.jp/w/w114/stsi/research/e-VLBI/UT1/">http://www.nict.go.jp/w/w114/stsi/research/e-VLBI/UT1/</a>
Hayabusa Sessions	<a href="http://www.nict.go.jp/w/w114/stsi/research/Navi/HAYABUSA/">http://www.nict.go.jp/w/w114/stsi/research/Navi/HAYABUSA/</a>

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 daily or bi-daily (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 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 with all 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 Geospatial Information Authority of Japan (GSI), the National Astronomical Observatory (NAO), and other organizations. These sessions are listed in Table 2. The recent observed data of these sessions were mainly processed by using the K5 software correlator at NICT either at Koganei or at Kashima or by using a real-time hardware correlator developed by NAO.

In 2010, 38 IVS geodetic VLBI sessions (442 hours in total) including 1 hour “Intensive” dUT1 sessions were carried out as shown in Table 2. The increase of IVS sessions is mainly due to the temporary replacement of the 32-m Tsukuba antenna operated by the GSI by the 34-m Kashima antenna during the repair of the lightning damage. Seven MARBLE experiments using the compact VLBI system were also performed together with the GSI Tsukuba 32-m antenna. In addition, nine time transfer sessions were performed. 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.

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-Gas-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
2010	IVS	38 sessions, 442 hours in total
	Radio astronomy	34 sessions, 324 hours in total
	Spacecraft (IKAROS, UNITEC-1, QZSS)	33 sessions, 259 hours in total
	domestic geodetic	13 sessions, 94 hours in total
	Time Transfer	9 sessions, 86 hours in total
	e-VLBI	9 sessions, 27 hours in total

### 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

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] Hobiger T., Takiguchi H., Ichikawa R., Sekido M., Koyama Y., and Kondo T., Analysis Center at NICT, *IVS 2010 Annual Report*, this volume, 2011.
- [3] Koyama, Y., T. Kondo, M. Kimura, and H. Takeuchi, IVS NICT TDC News, No. 26, Sep. 2005, pp. 9-12.