Data Center at NICT

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Abstract

The Data Center at National Institute of Information and Communications Technology archives and releases the databases and analysis results processed at the Correlation Center and the Analysis Center at National Institute of Information and Communications Technology. 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, National Institute of Information and Communications Technology 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, Communications Research Laboratory was integrated into the Telecommunications Advanced Organization of Japan (TAO) and the National Institute of Information and Communications Technology (NICT) was established 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 in the end of November 2001, there were no additional data for the KSP regular sessions since 2002. In 2004, three geodetic VLBI sessions were carried out and processed. The analysis results in the SINEX (Solution Independent Exchange) file format and other form of data formats are available from the WWW server. Database files generated with the Mark III database file format are available upon request and will be sent to the users in DDS tape cartridges. Database files of non-KSP sessions, i.e. other domestic and international geodetic VLBI sessions, are also available from the FTP server. Table 1 shows the list of WWW server locations maintained by the Data Center at NICT. An FTP server has also been used to provide data files, but it was decided to terminate the FTP service considering the security risk of maintaining an anonymous FTP server. Instead, the WWW server www3.nict.go.jp 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/`
Data server	`http://www3.nict.go.jp/dk/c256/ivs/`

The maintenance of these server machines has been moved from the VLBI research group of the 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 (once every two days) basis until May 1999. The duration of each session was about 23.5 hours. Within the period, daily observations were performed from March 1 until April 1, 1999 to obtain continuous VLBI data series for various investigations such as studies about the atmospheric delay models and for the improvements of the data analysis technique. The high-speed ATM (Asynchronous Transfer Mode) network line to the Miura station became unavailable in May 1999 and the real-time VLBI observations with the Miura station became impossible. After this time, the real-time VLBI sessions were performed with three stations at Kashima, Koganei, and Tateyama. 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 three stations except for 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 Kashima, Miura, and Tateyama stations to Koganei station for tape-based correlation processing of the full six baselines. After the tape-based correlation processing 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 since July 22, 2000. The daily sessions were continued until November 11, 2000, and the site motion 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. 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 seems 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 from 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 near the area, and the unusual site motions at Tateyama and Miura are explained by the event.

2.2. Other VLBI Sessions

In addition to the KSP regular VLBI sessions, domestic and international geodetic VLBI sessions have been conducted by NICT in cooperation with Geographical Survey Institute (GSI) and other organizations. These sessions are listed in Table 2. The observed tapes of these sessions were correlated by using the K-4 correlator and the software correlation programs (K-5 correlator) at NICT either at Koganei or at Kashima.

In 2004, two e-VLBI sessions (tsev7 and tsev8) were performed for two hours and one hour, respectively, with Kashima 34m and Westford stations in cooperation with Haystack Observatory. The purpose of these experiments was to demonstrate rapid turnaround processing of the international VLBI observations by using e-VLBI. Especially, it was demonstrated that UT1-UTC can be estimated within 4.5 hours from the observations from the session tsev8 performed on June 29,

Table 2. Geodetic VLBI sessions conducted by NICT (since 2002)

Year	exp. names	sessions
2002	HOKT	HOKT02
	CUTE	CUTE01, CUTE02, CUTE03
	Usuda	USUDA1
2003	CUTE	CUTE04
	K5 Test	U03031, JD0306
	e-VLBI	evlbi4, tsev6
	Nozomi	34 sessions
	Hayabusa	10 sessions
2004	e-VLBI	tsev7, tsev8
	Geodetic	U04306
	Hayabusa	5 sessions
	Huygens	2 sessions

2004 [2]. One geodetic VLBI session, U04306, was performed to determine the precise position of the new VLBI observing site at Uchinoura. The station is a 34-m antenna station operated by the Japan Aerospace Exploration Agency (JAXA), and is located in the Uchinoura Space Center of JAXA. In the session, Kashima 34-m station and Tsukuba 32-m station were used along with the Uchinoura 34-m station. The K5/VSSP (Versatile Scientific Sampling Processor) system was used at the three stations and the data were correlated by the K5 software correlator program.

Hayabusa spacecraft was launched on May 9, 2003 by JAXA to investigate the asteroid Itokawa. The X-band telemetry signal from the spacecraft is used to demonstrate precise orbit determination by means of differential VLBI observations. Since precise orbit determination of the spacecraft Hayabusa is required to efficiently navigate the spacecraft to approach the asteroid Itokawa, many VLBI stations in Japan including the 34-m and 11-m VLBI stations at Kashima and the 11-m VLBI station at Koganei participated in the observations. The spacecraft Hayabusa is expected to arrive at the asteroid Itokawa in 2005 and precise orbit determination of the spacecraft will be essential to make the mission successful.

Huygens sessions were the preliminary rehearsal VLBI sessions conducted by many VLBI stations in USA, China, Australia, and Japan. In Japan, only the 34-m station at Kashima has the capability to receive the 2040MHz signal from the Huygens probe and participated in the rehearsal VLBI session. The probe landed on the surface of the Saturnian satellite Titan on January 14, 2005 and the 34-m station at Kashima participated in the VLBI observations.

Figure 1 shows the number of geodetic VLBI sessions and number of valid observed delays used in the data analysis for each year up to the year 2004.

3. Staff Members

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

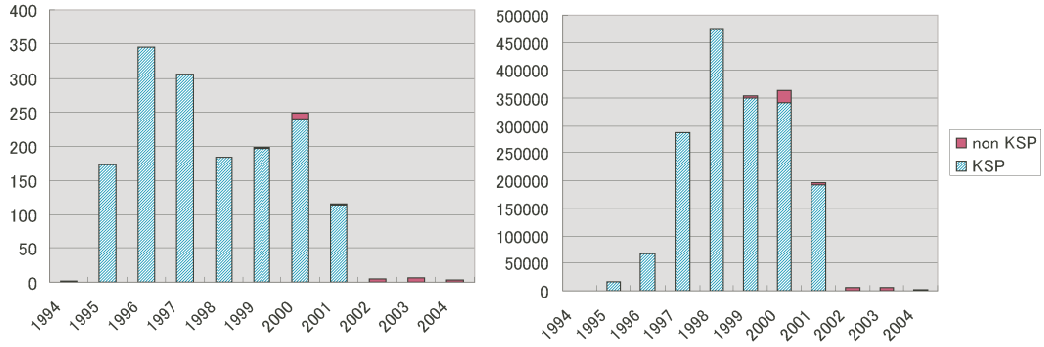

Figure 1. Number of sessions (left) and observed delays (right) used in the data analysis.

Table 3. Staff members of Radio Astronomy Applications Group, KSRC, NICT

Name	Main Responsibilities
Tetsuro KONDO	Group Leader
Eiji KAWAI	Antenna System
Yasuhiro KOYAMA	International e-VLBI
Ryuichi ICHIKAWA	Spacecraft Orbit Determination
Junichi NAKAJIMA	VLBI System Developments
Mamoru SEKIDO	Spacecraft Orbit Determination
Hiroshi TAKEUCHI	VLBI System Developments
Moritaka KIMURA	VLBI System Developments
Hiromitsu KUBOKI	Antenna System
Thomas HOBIGER	Visiting Researcher
Eric VIDAL	Visiting Researcher
Jose ISHITSUKA	Visiting Researcher

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 are planned to 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] Yasuhiro Koyama, Tetsuro Kondo, Hiroshi Takeuchi, Masaki Hirabaru, David Lapsley, Kevin Dudevoir, and Alan Whitney, Rapid UT1-UTC estimation from Westford-Kashima e-VLBI experiment (2), IVS NICT TDC News, No. 24, Jul. 2004, pp. 2-6