

Kashima and Koganei 11-m VLBI Stations

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Abstract

Two 11-m VLBI antennas at Kashima and Koganei are continuously operated and maintained by the National Institute of Information and Communications Technology (NICT). This brief report summarizes the status of these antennas, the staff, and the activities during 2011.

1. Introduction



Figure 1. 11-m VLBI antennas at Kashima (left) and Koganei (right).

Two 11-m VLBI antennas at Kashima and Koganei (Figure 1) used to be stations of the Key Stone Project (KSP) VLBI Network. The network consisted of four VLBI stations at Kashima, Koganei, Miura, and Tateyama (Figure 2). These 11-m antennas and other VLBI facilities at the Miura and Tateyama stations have been transported to the Tomakomai Experimental Forest of the Hokkaido University and to the campus of Gifu University, respectively. As a consequence, two 11-m stations at Kashima and Koganei remain as IVS Network Stations.

The KSP was a research and development project of the National Institute of Information

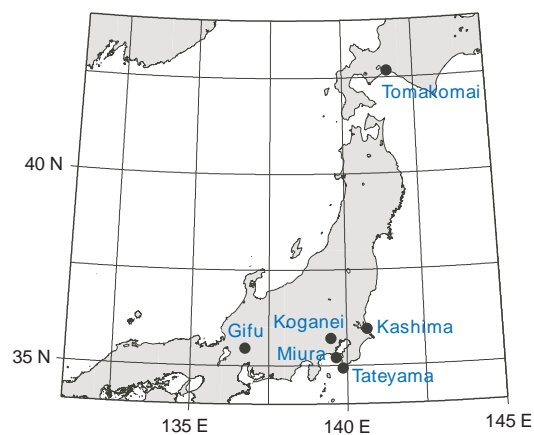


Figure 2. Geographic locations of four KSP VLBI stations and two stations at Tomakomai and Gifu.

and Communications Technology (NICT, formerly Communications Research Laboratory) [1]. After the regular VLBI sessions with the KSP VLBI Network terminated in 2001, the 11-m VLBI stations at Kashima and Koganei have mainly been used for the purposes of technical developments and miscellaneous observations.

2. Current Status

The main specifications of the antennas are summarized in Table 1. Both antennas can observe S- and X-band. The original specifications of these antennas were the same. The frequency of the first local oscillator of X-H band at the Kashima 11-m station was changed by 80 MHz, so that the observation frequency range became the same as the range of the Kashima 34-m station. The band-pass filter for S-band was replaced for RFI mitigation at both stations in 2010.

The optical loop-back controlled reference signal transmission system has been installed between the second building of NICT-HQ and the Koganei VLBI station operation building since 2009. That provides the reference signal (5MHz/1PPS) of UTC(NICT) to the Koganei 11-m station [2].

The reference signal (5MHz/1PPS) of the Kashima 11-m station has been provided by the H-maser atomic standard at the Kashima 34-m station via a long distance (about 500 m) co-axial cable. In November 2011, a mobile hydrogen maser atomic time standard was installed at the Kashima 11-m station, and its reference signal became independent from the reference signal of the Kashima 34-m station. A precise temperature control box, which was installed in the Kashima 11-m observation room in 2010, is keeping the temperature inside the box within a few tenths of degrees of Kelvin. Reference signal distribution units are placed inside this box.

Both stations are using phase calibration signal (P-cal) unit of 5-MHz interval instead of 1-MHz interval.

Table 1. The specifications of the KSP 11-m antennas.

		Kashima	Koganei
Antenna Type		Cassegrain type	
Diameter of the Main Reflector		11 m	
Mount Style		Az El mount	
Latitude		N 35° 57' 20.12"	N 35° 42' 38.01"
Longitude		E 140° 39' 26.93"	E 139° 29' 17.10"
Height of Az/El intersection above sea level		62.4 m	125.4 m
Input Frequency (MHz)	S band	2212 ~ 2360	2212 ~ 2360
	X Low band	7700 ~ 8200	7700 ~ 8200
	X High band	8180 ~ 8680	8100 ~ 8600
Local Frequency (MHz)	S band	3000	3000
	X Low band	7200	7200
	X High band	7680	7600

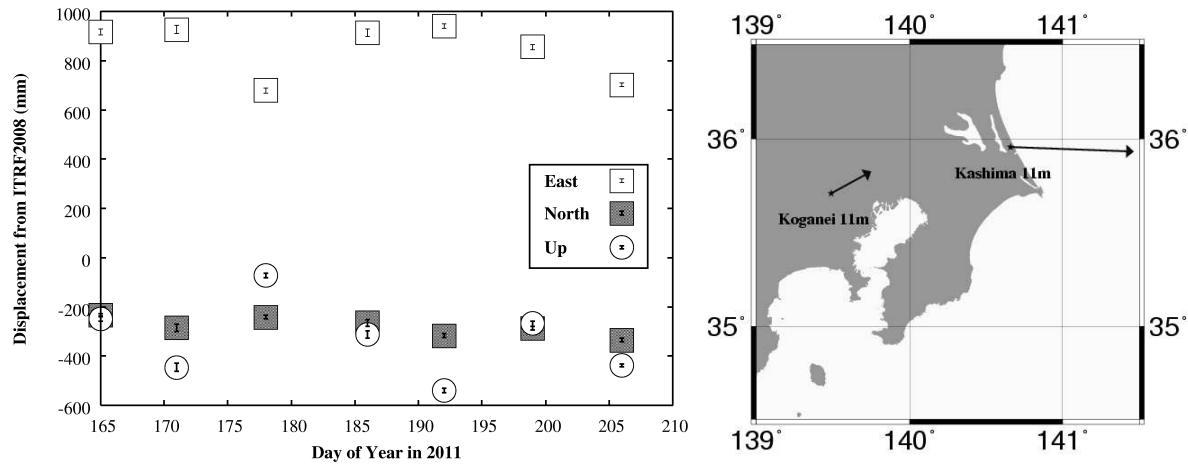


Figure 3. Displacement of the Kashima 11-m station's global coordinates obtained from R1 sessions (left). Horizontal displacement vector of the Kashima 11-m and Koganei 11-m stations derived from the JD1109 session (right).

3. Activities in 2011

The Kashima region was widely affected by the big earthquake that occurred on 11 March 2011 in the north east of Japan, although fortunately the Kashima 11-m and Koganei 11-m stations were not seriously damaged. We have performed antenna pointing parameter observations with the Kashima 11-m station several times (8 June, 4 July, 29 August, and 28 December) for monitoring of particular changes of pointing parameters caused by the earthquake and after-shocks. In a comparison of the pointing model parameters with those obtained in 2008, there were permanent changes to the Az-axis tilting angle and the Az-offset parameters in these observations (Figure 4).

Since the earthquake was so big, crustal deformation around the north east area of Japan is still continuing. For the purpose of monitoring the baseline changes on the Kashima — Koganei baseline, a series of VLBI observations have been conducted since 7 May. The time series of the baseline length changes, and a general list of experiments processed by the correlator at Kashima, is indicated in Figure 2 and Table 2, respectively, in the correlator report of Kashima in this volume.

Apart from the VLBI sessions, the Space Weather and Environment Informatics Laboratory of NICT is using the 11-m antenna at Koganei to download data from the STEREO spacecrafts. Two STEREO spacecrafts were launched by NASA in October 2006 to investigate the solar terrestrial environment and to provide 3D images of the Sun and solar storms. The Koganei 11-m antenna

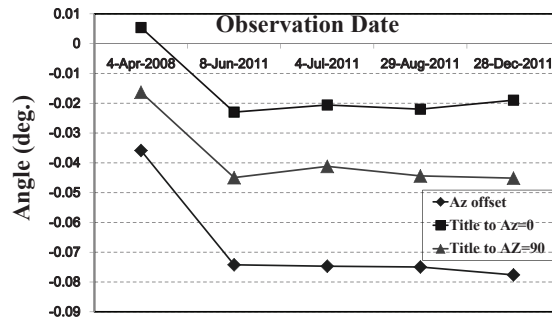


Figure 4. Changes of azimuthal axis tilting and azimuth angle offset were found after the earthquake on 11 March 2011.

is most of the time operated for this purpose, as long as VLBI sessions are not scheduled.

4. Staff Members

The 11-m antenna stations at Kashima and Koganei are operated and maintained by the members of the Space-Time Standards Laboratory at the Kashima Space Technology Center (KSTC) and headquarters of NICT. The staff members of the group are listed in Table 2. The operation and maintenance of the 11-m VLBI station at Koganei is also greatly supported by the Space Weather and Environment Informatics Laboratory and the Space Communication Systems Laboratory at the Koganei Headquarters of NICT.

Table 2. Staff members of the Space-Time Standards Laboratory, KSTC, NICT.

Name	Main Responsibilities
KAWAI Eiji	Antenna Systems
ICHIKAWA Ryuichi	Meteorological Sensors, IGS Receivers
AMAGAI Jun	Antenna System and Timing Systems at Koganei 11-m station
SEKIDO Mamoru	Antenna System, Field System, Calibration and Frequency Standard Systems
HASEGAWA Shingo	Computer System

5. Future Plans

In 2012, we plan to continue VLBI experiments for precise time and frequency transfer and crustal deformation monitoring. In 2012, the Kashima and Koganei 11-m stations will also participate in IVS-T2 sessions.

References

- [1] Special issue for the Key Stone Project, J. Commun. Res. Lab., Vol. 46, No. 1, March 1999.
- [2] Fujieda, M., M. Kumagai, S. Nagano, and T. Gotoh UTC(NICT) signal transfer system using optical fibers, IVS NICT-TDC News, No. 31, 17-20, 2010.
- [3] Sekido, M., R. Ichikawa, VLBI Correlators in Kashima, International VLBI Service for Geodesy and Astrometry 2011 Annual Report, this volume, 2012.