

KSP-VLBI Correlation Center Report

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Abstract

Communications Research Laboratory has been regularly operating Key Stone Project (KSP) VLBI experiment to monitor crustal deformation around Tokyo metropolitan area. The KSP system detected crustal deformation at south part of Kanto region due to volcanic activities at Izu islands in 2000. Daily 23.5 hours VLBI experiments were performed to monitor the crustal motion. Such frequent experiment might not be performed without real-time VLBI system. At beginning of 2001, Miura station was closed and other three stations will continue monitoring of crustal movement. Optically linked real-time VLBI experiment with Usuda 64m antenna and Kashima 34m antenna as also performed several times.

1. Introduction

Communications Research Laboratory (CRL) has been doing regular geodetic VLBI experiments to monitor crustal deformation around Tokyo metropolitan area. The name of the project is Key Stone Project (KSP) [1]. The KSP VLBI has two types of correlation processing system. One is tape-based VLBI correlation system [2][3] and the other is real-time VLBI correlation system [4][5][6] (Figure 1). Both system is operated in data rate 256 Mbps. KSP VLBI with four stations had started in tape-base mode from fourth quarter of 1996 and 256Mbps real-time VLBI observation had started third quarter of 1997 by using Asynchronous Transfer Mode (ATM) network under the collaboration with NTT (Nippon Telephone and Telegraph Corporation). Tape-based and real-time VLBI correlation processing is performed with 6 units of single baseline correlators, correlation controller and operation software with GUI interface designed for easy operation [7].

2. Correlation center history of routine KSP operation

Real time VLBI experiments had been operated every other day with three stations (Kashima, Koganei, and Tateyama) for 23.5 hours, since optical fiber link of Miura station was closed in May 1999. The reason of the observation interval is to reduce abrasion of antenna system. Four stations tape-based VLBI observation had been performed once every 6 days. A reason of the low frequency observation with four stations tape-based system was that correlation processing of tape-based data took much time. Tape-based observation every other day is hard for both operator, tape recorder, and tape changer machine. Mechanical motion is the most frequent cause of the troubles in routine operation. From this point of view, real time VLBI was indispensable for daily VLBI observation as described in a latter section.

In July 2000, shortening of Kashima-Tateyama baseline was found and observation schedule was changed from every other day to every day with three stations and tape-based four stations VLBI observation in every 6 days. The crustal deformation was found to be caused by volcanic activities in Izu islands located at about 100km south west from Tateyama. The daily VLBI observation continued to 11 November 2000, then observation mode was changed to the same as before July, since rapid changing of the baseline length was finished and the change rate returned to the same state before July. Miura station was closed after tape-based four stations VLBI observation on



Figure 1. The KSP tape-based VLBI correlation system (left) and the KSP real-time VLBI correlation system (right) at Koganei. In the left figure, four racks at the left are automatic tape changer (DMS-24). The right three racks contains correlators, output interfaces, and correlation controller. All of these tape-based equipment will be transported to Kashima Space Research Center in near future.

4th January, because it had been planed before. After that date, routine KSP-VLBI observations have been carried out by real-time VLBI with three stations.

Except for the routine KSP-VLBI observation, domestic VLBI observation campaign have been performed for connection of KSP stations and Japanese geographical reference frame to International reference frame. The name of the campaign is JPNTI. The JPNTI VLBI experiments using KSP 4 stations, Kashima 34m antenna, Kashima 26m antenna, and Tsukuba 32m antenna were conducted in March June, September, October, and November in 2000. And the next JPNTI experiment is planed in February 2001. Most of these experiments were processed by KSP correlation system.

KSP-VLBI Kashima-Koganei baseline was also used for Giga-bit VLBI system performance check experiments, which were named GEX series. GEX-8 in May and GEX-9 in June 2000 were organized for delay measurement accuracy comparison between KSP and Giga-bit VLBI system.

3. Optically connected VLBI experiments

Optically linked VLBI experiments with large diameter antennas named GALAXY was performed several times under mutual collaboration among CRL, NTT, National Astronomical Observatory (NAO), and Institute of Space and Astronautical Science (ISAS). Kashima 34m antenna (CRL), Usuda 64m antenna (ISAS), KSP 11 diameter antennas, and rarely Nobeyama 45m antenna (NAO) had joined the observation. Current established real-time VLBI correlation system is only KSP correlators in Japan. Thus all the real-time VLBI experiment is processed at Koganei Correlation center at present. Also distributed multi baseline correlation processing was demonstrated with KSP correlator by sending observed data each other on ATM network at NTT R&D

Forum 2000. NAO's Mitaka FX correlator is under the preparation for adapting to the real time processing.

4. Technical Staff for the KSP VLBI Correlation Center

Technical staff members who are contributing KSP correlation center are listed below.

- Tetsuro Kondo, Responsible for overall operations and performance.
- Taizoh Yoshino, Leader of the Key Stone Project team in CRL.
- Hitoshi Kiuchi, Developments of correlation system and real-time VLBI interfaces.
- Jun Amagai, Responsible for management of correlation center.
- Mamoru Sekido, Development of correlation processing software.
- Naoki Goto and Muneo Takeda, Hiroyuki Shibata, Operator at the correlation center, Space Engineering Development Co., Ltd.

5. Current Status and Future Plans

After tape-based data processing including JPNTI experiments will have finished, tape-based correlation system (Figure 1) will be transported to Kashima Space Research Center for data processing of experimental VLBI observation.

References

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