

# JARE Syowa Station 11-m Antenna, Antarctica

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## Abstract

The operation of the 11 m S/X-band antenna at Syowa Station (69.0°S, 39.6°E) by the Japanese Antarctic Research Expeditions (JAREs) started in February 1998 and continues till today (January 2008). The number of quasi-regular geodetic VLBI experiments attained 77 at the end of 2007. Syowa Station will participate in six OHIG sessions in 2008.

Data of five OHIG sessions in 2007 were recorded on hard disks through the K5 terminal. They will be brought back from Syowa Station to Japan in April 2008. Data of OHIG44 to OHIG49 sessions observed by JARE47 in 2006 are now being transferred to Bonn Correlator directly by using one of NICT's servers. Analysis results obtained from the data until OHIG43 session indicate that baseline length between Syowa and Hobart is increasing with a rate of  $53.8 \pm 0.5$  mm/yr and the one between Syowa and HartRAO is also increasing with a rate of  $11.5 \pm 0.4$  mm/yr.

## 1. Overview

Syowa Station has become one of the key observatories in the southern hemisphere geodetic network, as reported in [1]. As for VLBI, the Syowa antenna is registered with 66006S004 as the IERS Domes Number, and with 7342 as the CDP Number. Basic configuration of the Syowa VLBI front-end system did not change from the description in [2].

K5 recording system was introduced to Syowa Station in September 2004. Syowa's recording terminal K4 was fully replaced by K5 simultaneously with the termination of the SYW sessions at the end of 2004. Syowa participated in the OHIG sessions in the austral summer season of 2007. Data transfer through Intelsat satellite link from Syowa Station to NIPR became possible according to the introduction of K5 system, but huge VLBI data transfer is not realistic because of the low transfer speed.

## 2. Notes on System Maintenance

There is no significant problem in the "mechanical system". The hydrogen maser set (Anritsu RH401A; 1002C) was used for the observations from 2004 to 2007. JARE-48 (2007-2008) re-installed 1001C at Syowa Station; the maser was brought back to Syowa Station in January 2007 after a major overhaul. A backup video-converter was also brought to Syowa Station by the JARE-48. The tube in the Cs frequency comparator and local oscillator has to be replaced with a new one in the near future.

## 3. Session Status

Table 1 summarizes the status of processing as of January 2008 for the sessions after 2004. The SYW sessions consisted of Syowa (Sy), Hobart (Ho) and HartRAO (Hh). The OHIG sessions involved the Fortaleza (Ft), O'Higgins (Oh), Kokee Park (Kk), Parkes (Pa), TIGO Concepcion (Tc), and Syowa (Sy) antennas. In 2005, Syowa joined the CRD sessions, but after 2006, Syowa participated only in OHIG sessions. The number of OHIG sessions in which Syowa participated during 2007 was five.

Until 2004, OHIG sessions' data on K4 tapes from Syowa Station were copied to Mark IV tapes at GSI and the Mark IV tapes were sent to the Mark IV Correlator for final correlation. After introducing the K5 system, K5 hard disk data brought back from Syowa Station were ftp transferred to MIT Haystack Observatory or Bonn Correlator through a NICT server and converted to the Mark 5 format data there.

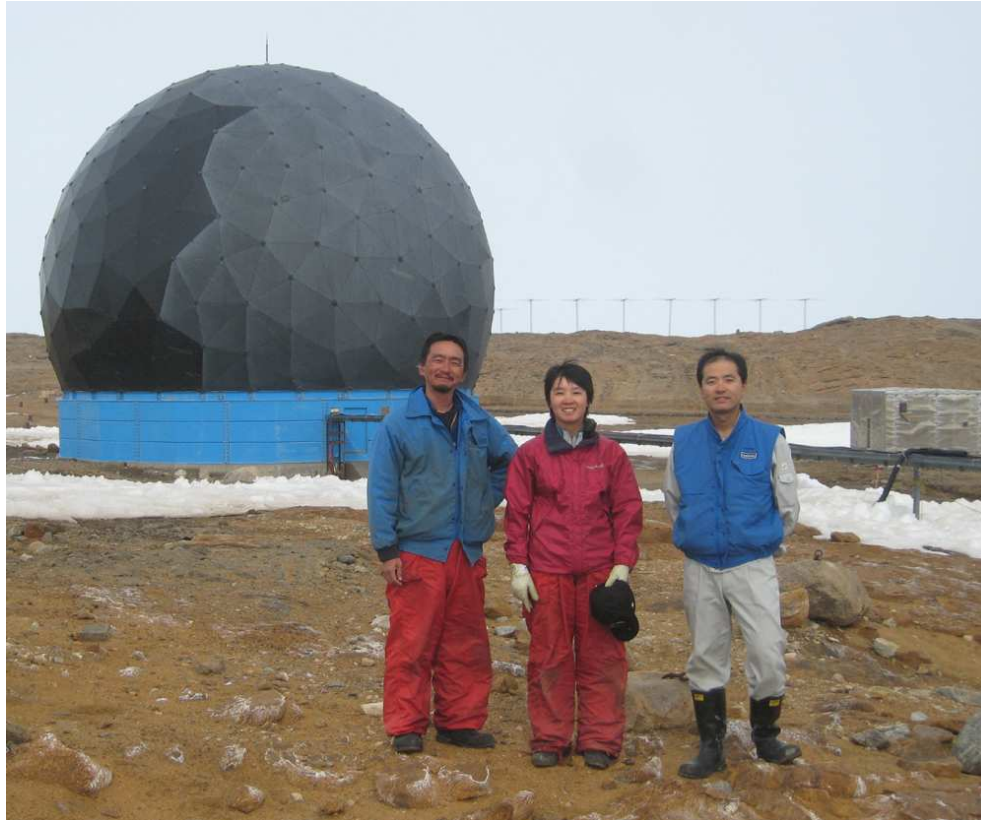


Figure 1. Syowa VLBI staff for JARE-48 (Feb. 2007 - Jan. 2008).

#### 4. Staff of the JARE Syowa Station 11-m Antenna

- Kazuo Shibuya, Project coordinator at NIPR.
- Koichiro Doi, Liaison officer at NIPR.
- Takanobu Sawagaki (from Hokkaido University), Chief operator for JARE-47 (Feb. 2006 - Jan. 2007).
- Hiroshi Ishii (from NEC), Antenna engineer for JARE-47.
- Naoki Arai (from Electric Navigation Research Institute), Chief operator for JARE-48 (Feb. 2007 - Jan. 2008). (right in Figure 1)
- Sachiko Nagashima (from MontBell Co., Ltd.) Operator for JARE-48. (center in Figure 1)
- Hitoshi Sugawara (from NEC), Antenna engineer for JARE-48. (left in Figure 1)

Table 1. Status of SYW and OHIG experiments as of January 2008

Code	Date	Station	Hour	Correlation	Solution	Notes
OHIG29	2004/Feb/10	Ho, Hh, Ft, Oh, Tc	24 h	Yes	Yes	(J45)
SYW030	2004/Apr/07	Ho, Hh	24 h	Yes	Yes	
SYW031	2004/Aug/18	Ho, Hh	24 h	Yes	Yes	
OHIG32	2004/Oct/16	Ho, Hh, Ft, Oh, Kk, Tc	24 h	No	No	
OHIG33	2004/Nov/09	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG34	2004/Nov/30	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG35	2004/Dec/08	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
SYW032	2004/Dec/13	Ho, Hh	24 h	Yes	Yes	
OHIG36	2005/Jan/26	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG37	2005/Feb/02	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	(J46)
OHIG38	2005/Feb/15	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
CRDS18	2005/Apr/11	Ho, Hh	24 h	Yes	Yes	
CRDS19	2005/May/10	45, Hh	24 h	Yes	Yes	
OHIG39	2005/Nov/08	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG40	2005/Nov/09	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG41	2005/Nov/16	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG42	2006/Jan/31	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG43	2006/Feb/08	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	(J47)
OHIG44	2006/Feb/14	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG45	2006/Nov/07	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Not yet	
OHIG46	2006/Nov/14	Ho, Hh, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG47	2006/Nov/29	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG49	2007/Feb/13	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	(J48)
OHIG51	2007/Nov/06	Ho, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG52	2007/Nov/07	Ho, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG53	2007/Nov/13	Ho, Hh, Ft, Oh, Kk, Pa, Tc	24 h	Not yet	Not yet	
OHIG54	2007/Nov/14	Ho, Hh, Ft, Oh, Kk, Pa, Tc	24 h	Not yet	Not yet	

(1) 45: DSS45

(J45) JARE-45: op K. Doi eng. K. Fukuhara (J46) JARE-46: op K. Egawa eng I. Okabayashi

(J47) JARE-47: op T. Sawagaki eng H. Ishii (J48) JARE-48: op N. Arai eng H. Sugawara

## 5. Analysis Results

At the end of 2007, 52 sessions from May 1999 through February 2006 have been analyzed with the software CALC/SOLVE developed by NASA/GSFC. The data of 5 OHIG sessions from OHIG44 through OHIG49 will be analyzed soon.

The length of the Syowa-Hobart baseline is increasing with a rate of  $53.8 \pm 0.5$  mm/yr. The Syowa-HartRAO baseline shows a slight increase with a rate of  $11.5 \pm 0.4$  mm/yr. These results agree approximately with those of GPS. We do not detect a significant change in the Syowa-O'Higgins baseline. Detailed results from the data until the end of 2003 as well as comparisons with the results from other space geodetic techniques are reported in [3].

## References

- [1] Shibuya, K., Doi, K. and Aoki, S. (2003): Ten years' progress of Syowa Station, Antarctica, as a global geodesy network site. *Polar Geoscience*, 16, 29-52.
- [2] Shibuya, K., Doi, K. and Aoki, S. (2002): JARE Syowa Station 11-m Antenna, Antarctica, in *International VLBI Service for Geodesy and Astrometry 2002 Annual Report*, 149-152, NASA/TP-2003-211619, ed. by N.R. Vandenberg and K.D. Baver.
- [3] Fukuzaki, Y., Shibuya, K., Doi, K., Ozawa, T., Nothnagel, A., Jike, T., Iwano, S., Jauncey, D.L., Nicolson, G.D. and McCulloch, P.M. (2005): Results of the VLBI experiments conducted with Syowa Station, Antarctica. *J. Geod.*, 79, 379-388.