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 until today (December 2009). A cumulative total of 88 quasi-regular geodetic VLBI experiments were observed by the end of 2009. Syowa Station will participate in six OHIG sessions in 2010.

The data from five OHIG sessions in 2009 were recorded on hard disks through the K5 terminal. They will be brought back from Syowa Station to Japan in April 2010. The data from the OHIG59 through OHIG61 sessions observed by JARE48 and JARE49 have been transferred to the Bonn Correlator directly by way of one of NICT's servers. Analysis results obtained from the data until the OHIG56 session indicate that the length of the Syowa-Hobart baseline is increasing with a rate of 54.7 ± 0.4 mm/yr and that the length of the Syowa-HartRAO baseline is increasing with a rate of 11.7 ± 0.3 mm/yr. The length of the Syowa-O'Higgins baseline is slightly increasing with a rate of 1.7 ± 0.9 mm/yr.

1. Overview

Syowa Station has become one of the key observatories in the Southern Hemisphere's geodetic network, as reported in [1]. For VLBI, the Syowa antenna is registered as IERS Domes Number 66006S004 and as CDP Number 7342. The basic configuration of the Syowa VLBI front-end system has not changed from the description in [2].

A K5 recording system was introduced at Syowa Station in September 2004. Syowa's K4 recording terminal was fully replaced by K5 simultaneously with the termination of the SYW session at the end of 2004. Syowa has participated in the OHIG sessions in the austral summer season since 1999. Data transfer through an Intelsat satellite link from Syowa Station to NIPR became possible with the introduction of the K5 system, but huge VLBI data transfers are 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 observations from 2004 to 2009. A backup hydrogen maser set (Anritsu RH401A; 1001C) is also operating normally. The tube in the Cs frequency comparator and local oscillator will have to be replaced with a new one in the near future.

3. Session Status

Table 1 summarizes the status of processing as of December 2009 for the sessions after 2004. The SYW sessions consisted of Syowa (Sy), Hobart (Ho), and HartRAO (Hh). The OHIG sessions involved Fortaleza (Ft), O'Higgins (Oh) and Kokee Park (Kk), Parkes (Pa) with TIGO Concepción (Tc), together with the three antennas of the SYW sessions. In 2005, Syowa joined the CRD sessions, but after 2006, Syowa participated only in OHIG sessions. Syowa participated in five OHIG sessions in 2009.

Until 2004, K4 tapes containing the OHIG sessions' data 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. Since the introduction of the K5 system, K5 hard disk data brought back from Syowa Station have been transferred by ftp to the MIT Haystack Observatory or the Bonn Correlator through a NICT server and converted to Mark 5 format data there.

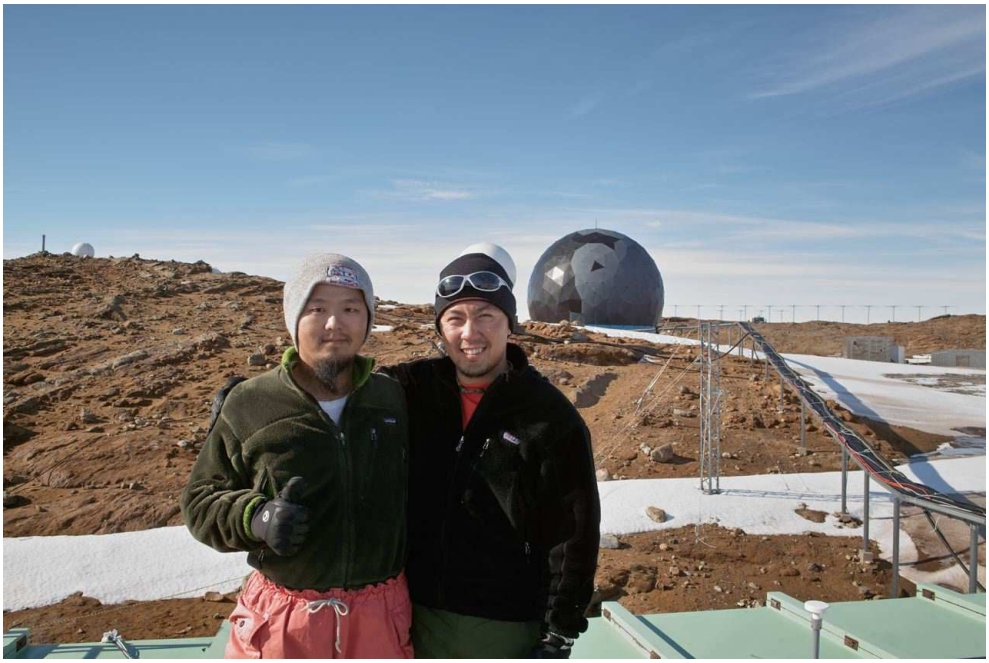

Figure 1. Syowa VLBI staff for JARE-50 (February 2009 — January 2010).

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

- Kazuo Shibuya, Project coordinator at NIPR.
- Koichiro Doi, Yuichi Aoyama, Liaison officer at NIPR.
- Naoki Arai (from Electric Navigation Research Institute), Chief operator for JARE-48 (February 2007 — January 2008).
- Sachiko Nagashima (from MontBell Co., Ltd.) Operator for JARE-48.
- Hitoshi Sugawara (from NEC), Antenna engineer for JARE-48.
- Yuichi Aoyama (from National Institute of Polar Research), Chief operator for JARE-49 (February 2008 — January 2009).
- Hideaki Kumagai (from NEC), Antenna engineer for JARE-49.
- Yusuke Murakami (from University of Tokyo), Chief operator for JARE-50 (February 2009 — January 2010) (right in Figure 1).
- Yuji Yamaguchi (from NEC), Antenna engineer for JARE-50 (left in Figure 1).

Table 1. Status of SYW and OHIG experiments as of December 2009

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	Yes	Yes	
OHIG45	2006/Nov/07	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG46	2006/Nov/14	Ho, Hh, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG47	2006/Nov/29	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG49	2007/Feb/13	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	J48
OHIG51	2007/Nov/06	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG52	2007/Nov/07	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG53	2007/Nov/13	Ho, Hh, Ft, Oh, Kk, Pa, Tc	24 h	Yes	Yes	
OHIG54	2007/Nov/14	Ho, Hh, Ft, Oh, Kk, Pa, Tc	24 h	Yes	Yes	
OHIG55	2008/Feb/06	Hh, Oh, Kk, Tc	24 h	Yes	Yes	J49
OHIG56	2008/Feb/12	Hh, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG57	2008/Feb/13	Hh, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG59	2008/Nov/12	Ho, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG60	2008/Nov/18	Ho, Ft, Oh, Kk, Pa, Tc, Ts	24 h	Not yet	Not yet	
OHIG61	2008/Nov/19	Ho, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG62	2009/Feb/04	Ft, Ho, Kk, Oh, Tc	24 h	Not yet	Not yet	J50
OHIG63	2009/Feb/10	Ft, Ho, Kk, Oh, Tc	24 h	Not yet	Not yet	
OHIG64	2009/Feb/11	Ft, Ho, Kk, Oh, Tc	24 h	Not yet	Not yet	
OHIG65	2009/Nov/10	Ho, Kk, Oh, Tc	24 h	Not yet	Not yet	
OHIG66	2009/Nov/11	Ho, Kk, Oh, Tc	24 h	Not yet	Not yet	

45: DSS45, Ts: Tsukuba32 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 J49: JARE-49 op Y. Aoyama eng H. Kumagai
J50: JARE-50 op Y. Murakami eng Y. Yamaguchi

5. Analysis Results

As of the end of December 2009, 63 sessions from May 1999 through February 2008 have been analyzed with the software CALC/SOLVE developed by NASA/GSFC. The data of nine OHIG sessions from OHIG57 through OHIG66 will be analyzed soon.

The length of the Syowa-Hobart baseline is increasing with a rate of 54.7 ± 0.4 mm/yr. The Syowa-HartRAO baseline shows a slight increase with a rate of 11.7 ± 0.3 mm/yr. These results agree approximately with those of GPS. The Syowa-O'Higgins baseline also shows a slight increase, although the rate is only 1.7 ± 0.9 mm/yr. 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.