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 (February 2005). The number of quasi-regular geodetic VLBI experiments attained 57 at the end of 2004. We summarize the status of the experiments. We replaced the K4 back-end terminal with a K5 terminal. Fringe detection test was made on September 9, 2004, with the 32-m GSI/Tsukuba antenna. It was proved successful after Intelsat transfer of data (about 200 MB) from Syowa Station to GSI/Tsukuba and correlated there. The antenna time drastically decreased as receiving activity of remote sensing satellites became very low. We will increase, with the help of the observing program committee, the OHIG and CRF sessions than those planned in the 2005 year schedule (eight 24hr sessions).

1. Overview

Syowa Station has become one of the key observatories in the southern hemisphere geodetic network, as reported in [1]. As for VLBI, Syowa antenna is registered 66006S004 as the IERS Domes Number, and 7342 as the CDP Number. Basic configuration of the Syowa VLBI front-end system did not change from the description in [2]. In November 2003, JARE-45 brought down a K5 recording terminal (Figure 1) to replace the K4 terminal. The fringe detection test was made by using radio-source 1921-293 between Syowa and Tsukuba (GSI 34-m antenna). Data transfer rate of 0.5 - 1 Mbps by Intelsat transponder link assisted easy correlation. The test was found successful; this can be repeated for future maintenance. The Syowa experiments consisted of two sessions, SYW and OHIG from 1999 through 2004.

2. Notes on System Maintenance

There is no significant problem in the "mechanical system". The hydrogen maser set (Anritsu RH401A; 1001C), which was in good condition until 2003 was brought back to Japan for overhaul (H2 ran out). The 1002C is to be used for the 2004 and 2005 year observations until JARE-46 installs again 1001C to Syowa (planned January 2006). The tube in the Cs frequency comparator has to be changed, and the down-converter/local oscillator has to be replaced with a new one in the near future.

3. Session Status

Table 1 summarizes status of processing as of January 2005. The SYW session consists of Syowa (Sy), Hobart (Ho) and HartRAO (Hh). The OHIG session has involved Fortaleza (Ft), O'Higgins (Oh) and Kokee Park (Kk) with TIGO Concepcion (Tc) from November 2002, together with the SYW 3 antennas. In 2005, we will terminate SYW sessions. Instead, 2 CRF sessions are added to 6 OHIG sessions. We are going to test the capability of data transfer for a short-term (1h, 2h) experiment.

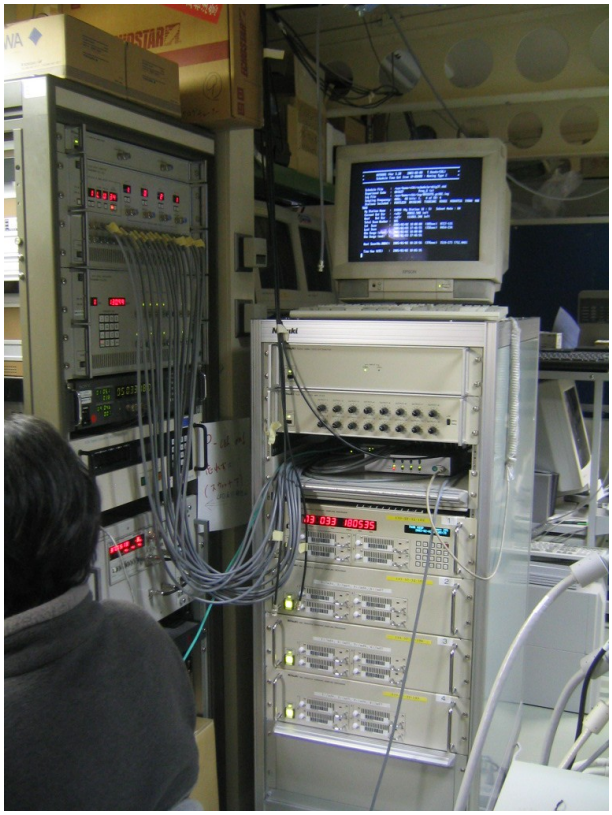

Figure 1. Hard Disk based 16 ch (4 ch x 4) data storage enabled us easy handling of recorded VLBI data.

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

- Kazuo Shibuya, Project coordinator at NIPR.
- Koichiro Doi, Liaison officer at NIPR.
- Hiroshi Ikeda (from Tsukuba University), Chief operator for JARE-44 (Feb. 2003 - Jan. 2004).
- Hirozaku Soeda (from NEC), Antenna engineer for JARE-44.
- Koichiro Doi (from NIPR), Chief operator for JARE-45 (Feb. 2004 - Jan. 2005).
- Kazuo Fukuhara (from NEC), Antenna engineer for JARE-45.

5. Analysis Results

Until the end of 2004, 37 sessions from May 1999 to February 2004 have been analyzed with the software CALC/SOLVE developed by NASA/GSFC. The data tapes of 10 sessions by JARE-45 (7 OHIG and 3 SYW) are not returned yet. The length of the Syowa-Hobart baseline is increasing with a rate of 55.04 ± 0.98 mm/yr. The Syowa-HartRAO baseline shows slight increase with a rate of 11.10 ± 0.82 mm/yr. These results agree approximately with those of GPS. We cannot find yet obvious change in the Syowa-O'Higgins baseline. The coordinates of Syowa VLBI ARP were determined with an error of 1.1 mm for the X component, 0.9 mm for the Y component and 2.4 mm for the Z component, respectively. These errors are 10 times smaller (better) than those in the IERS2000 Bulletin.

Table 1. Status of SYW and OHIG experiments as of January 2005

Code	Date	Station	Hour	Correlation	Solution	Notes
JA981	1998/Feb/09	Ho, Hh, Ka	48 h	S only	No	(J39)
JA982	1998/May/11	Ho, Hh, Ka	48 h	partial	No	
JA983	1998/Aug/09	Ho, Hh	48 h	No	No	
JA984	1998/Nov/09	Ho, Hh, Pa	48 h	Yes	Yes	(1)
CRF07	1999/Feb/15	Ho, Hh, Ft, Kb, Wz	24 h	No	No	(J40)
SYW991	1999/Feb/17	Ka	24 h	Yes	Yes	
COHIG6	1999/Feb/18	Ho, Hh, Ft, Kk	24 h	No	No	
SYW992	1999/May/13	Ho, Hh	24 h	Yes	Yes	
SYW993	1999/Jul/15	Ho, Hh	24 h	Yes	Yes	
SYW994	1999/Aug/26	Ho, Hh	24 h	Yes	Yes	
SYW995	1999/Sep/09	Ho, Hh	24 h	Yes	Yes	
SYW996	1999/Oct/07	Ho, Hh	24 h	Yes	Yes	
COHIG7	1999/Nov/08	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
COHIG8	1999/Nov/10	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
COHIG9	1999/Nov/11	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
SYW997	1999/Nov/18	Ho, Hh	24 h	Yes	Yes	
SYW008	2000/Feb/02	Ho, Hh	24 h	Yes	Yes	(J41)
COHG12	2000/Feb/10	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
SYW009	2000/Mar/20	Ho, Hh	24 h	Yes	Yes	
SYW010	2000/Jul/03	Ho, Hh	24 h	Yes	Hh-Ho only	(Syf)
SYW011	2000/Aug/08	Ho, Hh	24 h	Yes	Yes	
SYW012	2000/Sep/11	Ho, Hh	24 h	Yes	Yes	
SYW013	2000/Oct/05	Ho, Hh	24 h	Yes	Yes	
COHG13	2000/Oct/09	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
SYW014	2000/Nov/20	Ho, Hh	24 h	Yes	Yes	
SYW015	2000/Dec/07	Ho, Hh	24 h	Yes	Yes	
SYW016	2001/Feb/07	Ho, Hh	24 h	Yes	Sy-Ho only	(Hhf)
COHG14	2001/Feb/14	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	(J42)
COHG15	2001/Feb/19	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
SYW017	2001/Apr/23	Ho, Hh	24 h	No	No	(Stf)
SYW018	2001/Jul/30	Ho, Hh	24 h	Yes	Sy-Hh only	(Hof)

Code	Date	Station	Hour	Correlation	Solution	Notes
SYW019	2001/Oct/04	Ho, Hh	24 h	Yes	Sy-Hh only	(Hof)
SYW020	2001/Nov/14	Ho, Hh	24 h	Yes	Yes	
COHG16	2001/Nov/26	Hh, Ft, Kk	24 h	Yes	Yes	
SYW021	2002/Jan/16	Ho, Hh	24 h	Yes	Yes	
OHIG19	2002/Feb/11	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	(J43)
SYW022	2002/Apr/29	Ho, Hh	24 h	Yes	Yes	
SYW023	2002/Aug/12	Ho, Hh	24 h	Yes	Yes	
SYW024	2002/Nov/04	Ho, Hh	24 h	Yes	Yes	
OHIG20	2002/Nov/12	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG22	2002/Nov/20	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
SYW025	2003/Jan/16	Ho, Hh	24 h	Not yet	Not yet	
OHIG23	2003/Jan/20	Ho, Hh, Ft, Oh, Tc	24 h	Yes	Yes	
SYW026	2003/Apr/10	Ho, Hh	24 h	Yes	Yes	(J44)
SYW027	2003/Aug/06	Ho, Hh	24 h	Yes	Yes	
OHIG27	2003/Nov/19	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
SYW028	2003/Nov/26	Ho, Hh	24 h	Not yet	Not yet	
OHIG28	2003/Dec/03	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
SYW029	2004/Jan/07	Ho, Hh	24 h	Yes	Yes	
OHIG29	2004/Feb/10	Ho, Hh, Ft, Oh, Tc	24 h	Yes	Yes	(J45)
SYW030	2004/Apr/07	Ho, Hh	24 h	Not yet	Not yet	
SYW031	2004/Aug/18	Ho, Hh	24 h	Not yet	Not yet	
OHIG32	2004/Oct/16	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG33	2004/Nov/09	Ho, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG34	2004/Nov/30	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
OHIG35	2004/Dec/08	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Not yet	Not yet	
SYW032	2004/Dec/13	Ho, Hh	24 h	Not yet	Not yet	
OHIG36	2005/Jan/26	Ho, Hh, Ft, Oh, Kk	24 h	Not yet	Not yet	
OHIG37	2005/Feb/02	Ho, Hh, Ft, Oh, Kk	24 h	Not yet	Not yet	
OHIG38	2005/Feb/15	Ho, Hh, Ft, Oh, Kk	24 h	Not yet	Not yet	

(1) Pa: Parkes Ka: Kashima (Stf) S tape failed (Hhf) Hh failed (Hof) Ho failed (Syf) Sy failed
(J39) JARE-39: op T. Jike eng T. Tanaka
(J40) JARE-40: op Y. Fukuzaki eng. T. Ino (J41) JARE-41: op K. Doi eng S. Takao
(J42) JARE-42: op S. Iwano eng. Y. Tamura (J43) JARE-43: op K. Sakura eng M. Abe
(J44) JARE-44: op H. Ikeda eng. K. Soeda (J45) JARE-45: op K. Doi eng K. Fukuhara

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.