

# JARE Syowa Station 11-m Antenna, Antarctica

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## Abstract

The Antarctic geodetic VLBI sessions with participation of Syowa Station (69.0 degS, 39.6 degE) 11-m S/X band paraboloid antenna continued during 1999-2000. Seven 24-hour experiments were made each year with the University of Tasmania at Hobart 26-m antenna and the Hartebeesthoek Radio Astronomical Observatory (HartRAO) 26-m antenna. In the year 2001, four similar experiments are planned. Syowa antenna participated/will participate also in the CORE-OHiggins sessions.

## 1. Introduction

As reported in [1], regular geodetic VLBI experiments started from February 1998 at Syowa Station (69.0 degS, 39.6 degE) by the 39th Japanese Antarctic Research Expedition (JARE-39). The southern hemisphere VLBI sessions with participation of Syowa Station 11 m antenna, the University of Tasmania 26 m antenna at Hobart and the Hartebeesthoek Radio Astronomical Observatory (HartRAO) 26 m antenna, were named the SYW sessions and seven 24-hour experiments have been made in each year of 1999 and 2000. The observation system is maintained by trained JARE wintering members. They change over at February 1 every year. We had already 6 wintered-over staffs: two for each of JARE-39 (1998 Feb. - 1999 Jan.), -40 (1999 Feb. - 2000 Jan.) and -41 (2000 Feb. - 2001 Jan.). Syowa Station is always being reformed and its overview in February 2000 is shown in Figure 1.



Figure 1. Overview of Syowa Station in February 2000 and the antenna radome.

## 2. Antenna Specifications

There was no significant change to the configuration of the “mechanical system”, “receiver system”, “hydrogen maser systems and time comparison”, and “VLBI backend system” which were described in the 1999 IVS Annual Report [2]. Therefore notices in the maintenance and

changes in the operational procedure after the above report are briefly summarized. (1) Accidental power failures occurred several times, and several modules (ACU control PC, DC power supply, hard disk etc.) had damages. Changing to spare parts enabled uninterrupted experiments. (2) In January 1999, HP workstation was installed to make a schedule file at Syowa Station, and the file was transferred to the IVS Coordinating Center in order that the other two stations can access the file. Schedule format was adjusted to the standard S2-FS9 system with the support of the IVS Coordinating Center. (3) Test source receiving was repeated to obtain more precise receiver performance and the revised parameters are summarized in Table 1. The tabulated values correspond to good conditions of the air temperature above -10 degC, and they become worse as the air temperature becomes lower. (4) Hobart antenna system was found to be affected by artificial noise around the S-band 14th channel, so that the CDP narrow-band frequencies of the S band were shifted 10 MHz lower than the previous one after the SYW995 (Sep. 09, 1999) experiment. The recording rate (64 or 128 Mbits/s), channel number (8 ch) and the frequency range (2217 - 2302 MHz) were not changed. (5) One hydrogen maser set (Anritsu RH401A; 1002C) began malfunctioning at 21 July 2000, but 1001C is operational under good conditions. The system GPS timing receiver (Model 9000B from the TRAK Co. Ltd.) was also malfunctioning around November 1999, but backup GPS receiver enabled us to monitor the UTC-recorder time offset within 4 microseconds.

Table 1. Receiver performance of the Syowa 11-m antenna.

Band	Frequency (MHz)	Tsys (K)	Efficiency	SEFD (Jy)
S	2200-2320	114	0.55	6000
X	7860-8600	128	0.53	7000

### 3. On-going Project

As part of JARE Earth science program titled “Study of dynamical process of the Earth by geodesy and solid-earth geophysics”, JARE-40 and -41 continued geodetic VLBI experiments at Syowa Station after JARE-39. As compared to 48-hour experiments of SYW981 through SYW984 during JARE-39, 24-hour experiments were made by JARE-40 and -41 as summarized in Table 2. For the year 2001, the number of the SYW experiments will be reduced to 4. Syowa Station also participated in the CORE-OHiggins sessions. Although there were some uncertain points in the performance of the overall Syowa system at changeover of JARE-39/-40, the SYW991 experiment with Kashima (both use K4 system) gave reasonable baseline solution as referred to the 1990 experiment, which ascertained good performance of the Syowa system. The SYW experiment data are being processed at the VSOP correlator center of NAO Mitaka. The SYW981 (1998, Feb), SYW982 (1998, May), and SYW984 (1998, Nov) data were correlated and the FITS database has been created. However, geodetic solutions for these and the later experiments are not obtained yet because of delay of the baseline analysis software adaptation for the FITS database. The main difficulty with the VSOP correlated FITS database is deletion of time-tags during the S2-K4 copying. We are trying to solve this problem by making an S2-K4 copier which keeps the original S2 time-tag and shifts it into the copied K4 tape, as this procedure will produce the MarkIII database to be linked to the standard SOLVE software. Development of the K4-MarkIV copier in

GSI enabled participation of Syowa Station in the CORE-OHiggins sessions [3].

Table 2. Summary of the SYW experiments in the years 1999 and 2000

Code	Start time	Obs. hour	Obs. number
SYW991	1999/Feb/17 05:00	24 h	123
SYW992	1999/May/13 06:00	24 h	172
SYW993	1999/Jul/15 08:00	24 h	163
SYW994	1999/Aug/26 08:00	24 h	180
SYW995	1999/Sep/09 08:00	24 h	189
SYW996	1999/Oct/07 08:00	24 h	199
SYW997	1999/Nov/18 08:00	24 h	220
SYW008	2000/Feb/02 10:00	24 h	183
SYW009	2000/Mar/20 08:00	24 h	215
SYW010	2000/Jul/03 08:00	24 h	182
SYW011	2000/Aug/09 08:00	24 h	175
SYW012	2000/Sep/11 08:00	24 h	178
SYW013	2000/Oct/05 08:00	24 h	198
SYW014	2000/Nov/20 08:00	24 h	229
SYW015	2000/Dec/07 08:00	24 h	214

#### 4. Staffs for the JARE Syowa Station 11-m antenna

- Kazuo Shibuya, Project coordinator at NIPR.
- Koichiro Doi, Liaison officer at NIPR.
- Seiji Manabe, Project coordinator at NAO Mizusawa.
- Takaaki Jike (from NAO Mizusawa), Chief operator of JARE-39 (Feb. 1998 - Jan. 1999).
- Teruhito Tanaka (from NEC), Antenna maintenance staff of JARE-39.
- Yoshihiro Fukuzaki (from GSI), Chief operator of JARE-40 (Feb. 1999 - Jan. 2000).
- Takeshi Ino (from NEC), Antenna maintenance staff of JARE-40.
- Koichiro Doi (from NIPR), Chief operator of JARE-41 (Feb. 2000 - Jan. 2001).
- Seiji Takao (from NEC), Antenna maintenance staff of JARE-41.

#### 5. Collocated Observations

Syowa Station is located on the interior of the geologically stable Antarctic plate. It is situated on firm bedrock without sedimentary layer. Syowa VLBI antenna was registered 66006S004 as the IERS Domes Number, and 7342 as the CDP Number. Collocated observations by GPS (IERS Dome Number 66006S002) and DORIS (IERS Dome Number 66006S003) are continuing. PRARE (CDP Number 7711) stopped observations after 1997. Other geophysical instruments running are broadband seismometer (STS-1), superconducting gravimeter (GWR TT70), pressure-type sea level meter, fluxgate magnetometers, etc.

## References

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