Report of the Mizusawa 10m Telescope

Seiji Manabe, Osamu Kameya, Kenzaburo Iwadate, Takaaki Jike

Abstract

The status and activities of the Mizusawa 10m VLBI telescope are reported.

1. General Information

There are two radio telescopes dedicated to VLBI at Mizusawa. These antennas are shown in Figure 1. One is the 10m telescope which has been registered as an IVS network station telescope. The other is the 20m dual-beam telescope which is part of the VERA (VLBI Exploration of Radio Astrometry) network together with three other telescopes deployed at Iriki, Ogasawara and Ishigakijima, respectively. This telescope has not been registered as an IVS network station. The 10m telescope once participated in international geodetic VLBI observations, namely IRIS-P. However, in recent years it was used only for domestic observations, namely, domestic geodetic observations with the 32m telescope of the Geographic Survey Institute. After the VERA geodetic observation system became fully operational in November, 2004, the 10m antenna passed its geodetic mission to the VERA 20m telescope. However, only the 10m antenna will be described in the following since the 20m telescope is operated in the framework of the VERA project and it is not yet ready to report its activities to the IVS.

Table 1. General information of the Mizusawa 10m telescope

Sponsoring agency	VERA Observatory, National Astronomical Observatory of Japan
Contribution type	Network observing station
Location	39 8 1412(N) 141 7'56.4518 (E) 111.048m(H) in WGS84

2. Component Description

Main specifications of the 10m telescope are summarized in Tables 2 and 3.

3. Staff

There are seven staff members working for the 10m telescope. Other staff members of the VERA observatory also contribute to observations.

4. Activities in 2004

The activities in 2004 can be divided into three groups. The first group encompasses the geodetic observations to continue monitoring the position of Mizusawa. This class of observations was performed by joining the JADE sessions of the GSI. The second one is simultaneous observations

Figure 1. The Mizusawa 10m antenna (left) and the 20m VERA antenna (right)

Table 2. Antenna parameters

Diameter	10m		
Mount	Azimuth-Elevation		
Surface accuracy	0.34mm(rms)		
	S	X	K
HPBW	54'	13'	5.2'
Aperture efficiency	38%	63%	36%
Beam efficiency	55%	73%	
Slew	Azimuth	Elevation	
range	180+/-267	3–90	
speed	3.14/sec	3.06/sec 2	
acceleration	3.78/sec 2	3.71	
Pointing accuracy	<1'(rms)	<1'(rms)	

Table 3. Receiver specifications

Frequency band	Frequency range(GHz)	Receiver temperature(K)	Tsys(K)	Polarization	Receiver type
S	2.15—2.35	50	340	RHC/LHC	FET
X	8.13—8.60	55	103	RHC	HEMT
K	19.5—25.0	80	150	RHC/LHC, Linear	cooled HEMT

Table 4. Staff

Chief	Osamu Kameya
Scientist	Yoshiaki Tamura, Takaaki Jike, Seiji Manabe
Chief engineering technician	Kenzaburo Iwadate
Engineering technician	Seisuke Kuji, Katsuhisa Sato

with the 20m telescope to calibrate differential fringe phases between two beams of the 20m telescope. In these observations each beam observes a common radio source alternately by switching the antenna pointings while the 10m telescope continues its observation without interruption. The third one consists of experiments that prepare the Japanese lunar exploration project SELENE in which the Mizusawa group is undertaking the RISE project. The RISE project applies space geodetic techniques for exploring lunar gravity field and surface topography with unprecedented accuracy. Differential VLBI technique is one of the key observational technologies to achieve the aimed accuracy. There were some additional observations such as observations of stability of atmospheric phase fluctuations. The telescope was also used as a single dish antenna for monitoring maser sources in the Orion KL region.

The X-band receiver was renewed and the nominal system temperature decreased from 130K to 103K.

5. Plans for 2005

The first geodetic observation within the VERA network using 1Gbps recording system was successfully done in November, 2004. Internal precision of a few mm was achieved for horizontal positions. Details of the results will be reported elsewhere. Regular geodetic observations every two weeks are under way and will be continued throughout 2005. Geodetic observation has been passed to the 20m telescope and the use of the 10m antenna will be limited to backing up the observations for the GSI when the 20m telescope is not available. However, it is needless to say that it will be used for other purposes such as the phase calibration of the VERA system and tracking experiment of artificial satellites.