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19. *The Seismological Observation and the Earthquake Detection Capability of Syowa Station, Antarctica.*

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Abstract

The seismological observation at Syowa Station (SYO), Antarctica was carried out by JARE (Japanese Antarctic Research Expedition) using HES seismographs of three components. We examined how many earthquakes reported in the summary report of USCGS were detected as P or PKP phase at SYO during the period from March to December 1967. The earthquake detection capability in connection with the magnitude and the epicentral distance was investigated.

The detection capability of SYO is 7% in winter and 2% in summer. These values are the same order as those of DRV (Dumont d'Urville) and MIR (Mirny), but very low as compared with that of SPA (South Pole Station).

The detection capability for distance range around 30 degrees is clearly low and it can be considered that there is some relation between the detection capability and P-wave amplitude.

1. Introduction

The seismological observation at Syowa Station (SYO) in Antarctica was started in 1959 by the third party of JARE (Japanese Antarctic Research Expedition) using a HES seismograph of Z component. In 1961, we added HES seismographs of two horizontal components and thus the seismological observation was begun with a three component seismograph. When Syowa Station was closed in January 1962, all observations were discontinued. Station coordinates during these three years were lat:=69°0′18″ and long:=39°35′12″. The elevation was $h=23\,m$ above MSL.

In February 1966, Syowa Station was reopened and since then the seismological observation has been continued by JARE using HES seismographs of three components in the same place.

In 1967, a new seismographic vault was built and the data of phase readings were reported to all seismological stations in Antarctica as well as to USCGS telegraphically. According to the data, we can examine how many earthquakes reported in the summary report of USCGS were detected at Syowa Station for the period from March to December 1967. Thus, the detection capability of SYO in connection with the magnitude and the epicentral distance was investigated.

2. Seismological Observation

Eto (1962) and Kaminuma et al. (1968) reported that the seismological observation at Syowa Station has been operated using HES seismographs of three components. The period of pendulum is 1.0 second and that of galvanometer is also about 1.0 second. The constants of the HES seismographs and galvanometers used are tabulated in Table 1 and the frequency characteristics of seismograph magnification are shown in Fig. 1.

As there was no calibration set at Syowa Station, the calibration

Table 1. Each constant of HES seismographs and galvanometers.

Component	Z	N-S	E-W
T_1(s)	1.0	1.0	1.0
S_1(A/mm)	2.80×10^{-5}	2.03×10^{-5}	2.03×10^{-5}
$R_1(\Omega)$	940	920	930
$\Omega_1(\Omega)$	820	1160	920
h_1	1.0	1.0	1.0
1936-1967			
T_2(s)	1.06	1.04	1.0
S_2(A/mm)	1.47×10^{-9}	1.20×10^{-9}	1.34×10^{-9}
$R_2(\Omega)$	600	650	630
$\Omega_2(\Omega)$	1200	1200	1200
h_2	1.0	1.0	1.0
1968			
T_2(s)	0.995	0.975	0.963
S_2(A/mm)	1.21×10^{-9}	1.21×10^{-9}	1.53×10^{-9}
$R_2(\Omega)$	576	637	627
$\Omega_2(\Omega)$	1974	1583	1483
h_2	1.0	1.0	1.0

T_1: Period of the pendulum.
T_2: Period of the galvanometer.
S_1: Sensitivity of the galvanometer.
S_2: Sensitivity of the transducer.
R_1: Resistance of pendulum coil.
R_2: Resistance of the galvanometer coil.
Ω_1: External damping resistance of the transducr.
Ω_2: External damping resistance of the galvanometer.
h_1: Damping constant of the pendulum.
h_2: Damping constant of the galvanometer.

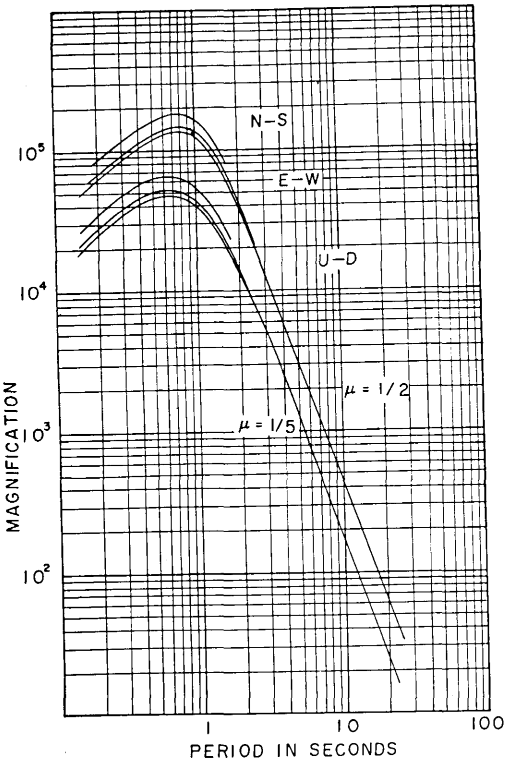

Fig. 1. Magnification curves of HES seismographs.
Attenuators of attenuation factor $\mu=1/2$ were used in winter and $\mu=1/5$ were used in summer.

of the seismograph was not carried out until January of 1968. The magnifications of seismographs in 1967 had about 10 percent errors in Fig. 1. Since 1967, seismographs have been set in the new room on the Precambrian gneiss about 350 m from the old vault. Nevertheless microseismic noise is extremely high during blizzards. New coordinates and height are lat:$=69°0'27''$, long:$=39°35'40''$ and $h=21\,m$.

There is large microseismic activity in the summer season at all Antarctic stations which are located around the continent (Hatherton and Orr (1959), Murauchi (1962), Murphy (1961) and Sytinskii (1964)). In Syowa Station, the seismographs are usually operated with the attenuation factor $\mu=1/5$ (Hagiwara, 1958) during the summer months (from January to May) and $\mu=1/2$ during the winter months (from June to December).

In 1967, a three component long-period seismograph was installed at Syowa Station. The period of the pendulum was 15.0 seconds and that of the galvanometer was about 1.0 second. Using an amplifier and an integrator between the pendulum and the galvanometer, we get the same characteristics of amplitude and phase as the long-period seismograph operated by USCGS. However, there were many defects in the system, and we could not obtain satisfactory data. Then, the long-period seismograph was operated without an amplifier and an integrator during 1968. It is operated with the long-period galvanometer of 20 seconds in 1969.

3. Detection Capability

Detection capability is defined as follows; "how many earthquakes reported in the summary report of USCGS were detected at SYO." When detection capability is discussed, how to treat the period of the extreme microseismic activity caused by rough weather is most important. In the case of Antarctica, there is one more problem which is how to consider the period during blizzards. The seismogram during blizzards is shown in Fig. 2. It is a matter of course that the blizzard is considered as a kind of rough weather. But the seismogram in Fig. 2 shows it undoubtedly impossible to identify earthquakes on the records during blizzards. About 100 days in a year there are blizzards. The pattern of extreme pressure change during blizzards is the same as the pressure pattern for a strong typhoon in Japan (for example 10 mb/h).

If detection capability means the capability of a staion to record earthquakes which occur anywhere in the world, detection capability may be discussed including the period of blizzards. But in case of the capability of a station to record the earthquakes occurring in a certain region, we had better discuss excluding the period of blizzards. The latter should be called "a possible detection capability".

4. The Detection Capability in Connetion with the Magnitude and the Epicentral Distance.

Figure 3 shows the location of earthquakes which were located by USCGS and were also identified with the phase of P or PKP at SYO. Earthquakes which occurred near the Japanese Islands, California USA, etc. were not recorded owing to their epicentral distances in the shadow zone.

The detection capability of each period in connection with the magnitude and the epicentral distance is given in Table 2. The periods are from March to May (the attenuation factor $\mu=1/5$), from June to December ($\mu=1/2$) and from March to December. The values in parentheses in Table 2 are the number of earthquakes in the period excluding blizzards and the corresponding possible detection capability. There was no earthquake with magnitude of more than 7 in 1967. It seems that there are two boundaries of magnitude to change the detection capability extremely. One is magnitude of 6.0 and the other is around 5.5. Almost all earthquakes of magnitudes of more than 6.0 were recorded except those which occurred in the shadow zone or during blizzards at SYO and the detction capability for magnitude of 5.5–5.9 is about half of that for magnitude of more than 6.0. Only a few earthquakes whose magnitudes are less than 5.0 are detected at SYO.

The detection capability for the epicentral distance from 15 to 30

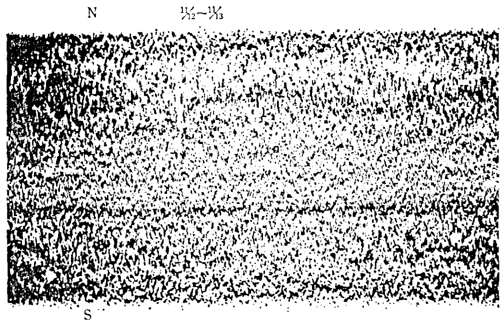

Fig. 2. The seismogram during blizzard.

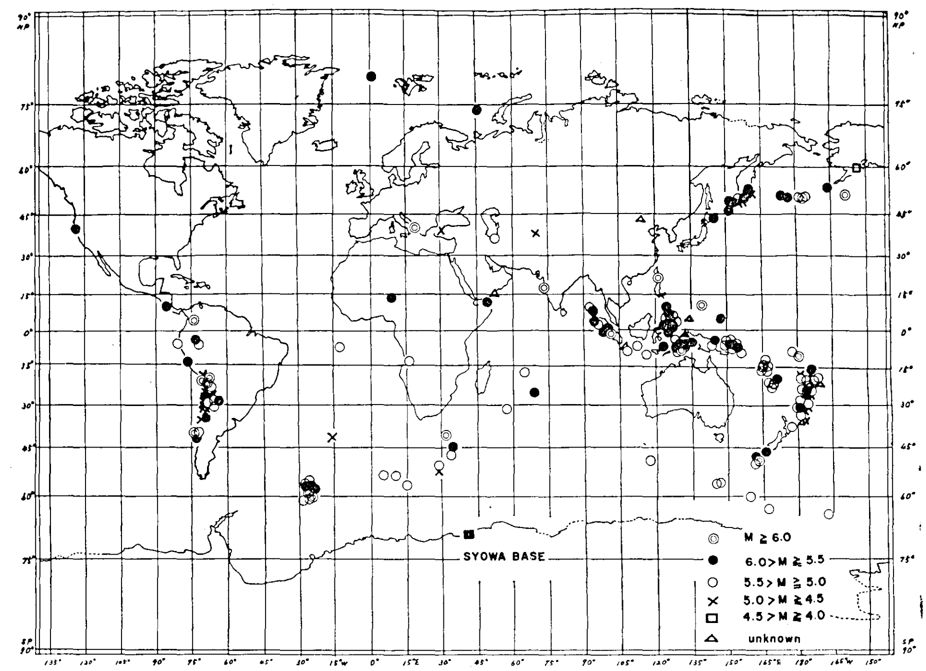

Fig. 3. Epicenters of earthquakes which were detected at SYO from March to December, 1967.

degrees is 41% in winter and is 35% through whole ten months, but the number of earthquakes in this distance range is only 1% of all shocks. As half of the earthquakes which occurred during the period are distributed in the distance range from 90 to 140 degrees, the detection capability for all earthquakes is 5-7% through the year. This value is one third or a quarter of the detection capability of MTJ (Tsukuba Seismological Station) obtained by Hagiwara and Iwata (1965). The seismographs at MTJ are also HES 1-1 seismographs operated with the maximum magnification of 33000 at period of 0.6

Table 2. Detection capability and number of earthquakes in

Mar.—Dec. 1967

Δ	15°~30°			30°~60°			60°~90°		
mag.	a	b	c	a	b	c	a	b	c
6.0~	2 (2)	2	100 (100)	1 (1)	1	100 (100)	12 (9)	9	75 (100)
5.5~5.9	5 (5)	3	60 (60)	11 (9)	6	55 (67)	46 (37)	24	52 (65)
5.0~5.4	19 (13)	7	37 (54)	55 (42)	15	27 (36)	226 (173)	47	27 (36)
4.0~4.9	11 (9)	2	18 (22)	39 (31)	2	5 (6)	643 (489)	34	5 (6)
~3.9				3 (2)	0	—	58 (42)	0	—
no mag	3 (1)	0	—	29 (16)	0	—	142 (98)	7	5 (7)
total	40 (30)	14	35 (47)	138 (101)	24	17 (24)	1127 (848)	121	11 (13)
Mar.—May. 1967									
6.0~							6 (3)	3	50 (100)
5.5~5.9	1 (1)	1	—	4 (2)	1	25 (50)	9 (5)	2	22 (40)
5.0~5.4	3 (1)	1	33 (100)	10 (6)	3	30 (50)	72 (49)	5	7 (10)
4.0~4.9				15 (11)	0	—	176 (115)	5	3 (4)
~3.9				2 (2)	0	—	7 (7)	0	—
no mag	1 (0)	0	—	9 (6)	0	—	46 (19)	1	2 (5)
total	8 (5)	1	13 (20)	40 (27)	4	10 (15)	316 (198)	16	5 (8)
June—Dec. 1967									
6.0~	2 (2)	2	100 (100)	1 (1)	1	100 (100)	6 (6)	6	100 (100)
5.0~5.9	4 (4)	3	75 (75)	7 (7)	5	71 (71)	37 (32)	22	60 (69)
5.0~5.4	16 (12)	6	38 (50)	45 (36)	12	27 (34)	154 (124)	43	27 (34)
4.0~4.9	8 (6)	2	25 (33)	24 (20)	2	8 (10)	467 (374)	29	6 (8)
~3.9				1 (0)	0	—	51 (35)	0	—
no mag	2 (1)	0	—	20 (10)	0	—	96 (79)	6	6 (8)
total	32 (25)	13	41 (52)	98 (74)	20	20 (27)	811 (650)	105	13 (16)

a : Number of earthquakes.
b : Number of earthquakes recorded at SYO.
c : Detection Capability in percents.
( ): Number of earthquakes and detection capability without the period of blizzard.

seconds.

To compare the detection capabilities of SYO and MTJ, only such earthquakes where the epicentral distance is more than 16 degrees are discussed because the epicentral distance of the nearest earthquake at SYO is 18 degrees. The detection capability of SYO for the distance range of 15 to 90 degrees in the periods from Jnue to Decembr and from March to December is 5% to 10% higher than that of MTJ, but the detection capability of MTJ is higher than that of SYO at the distance connection with the magnitude and the epicentral distances.

90°~110°			110°~140°			140°~			total		
a	b	c	a	b	c	a	b	c	a	b	c
10 (10)	4	40 (40)	5 (2)	2	40 (100)	2 (2)	2	100 (100)	32 (26)	20	63 (77)
51 (44)	9	18 (20)	29 (24)	3	10 (13)	23 (20)	10	43 (50)	165 (139)	55	33 (40)
266 (201)	18	7 (9)	102 (79)	0	—	62 (48)	2	3 (4)	730 (556)	89	12 (16)
664 (530)	5	8 (9)	615 (484)	0	—	397 (317)	6	1.5 (1.9)	2369 (1860)	49	2 (3)
19 (19)	0	—	99 (74)	0	—	116 (96)	0	—	295 (233)	0	—
167 (126)	3	2 (3)	38 (29)	0	—	123 (97)	1	0.8 (1.0)	502 (367)	11	2 (3)
1177 (930)	39	3 (4)	888 (692)	5	0.6 (0.7)	723 (580)	21	2.9 (3.6)	4093 (3181)	224	5.5 (7.0)
3 (3)	0	—	1 (0)	0	—	1 (1)	1	100 (100)	11 (7)	4	36 (57)
24 (21)	3	13 (14)	14 (10)	1	7 (10)	3 (3)	1	33 (33)	55 (42)	8	15 (19)
81 (55)	0	—	35 (22)	0	—	14 (10)	1	7 (10)	215 (143)	10	5 (7)
214 (163)	0	—	228 (169)	0	—	127 (96)	0	—	763 (557)	5	0.7 (0.9)
7 (7)	0	—	27 (20)	0	—	35 (32)	0	—	78 (68)	0	—
43 (30)	0	—	13 (8)	0	—	18 (17)	0	—	130 (80)	1	0.8 (1.3)
372 (279)	3	0.8 (1.1)	318 (229)	1	0.3 (0.4)	198 (159)	3	1.5 (1.9)	1252 (897)	28	2 (3)
7 (7)	4	57 (57)	4 (2)	2	50 (100)	1 (1)	1	100 (100)	21 (19)	16	76 (84)
27 (23)	6	22 (26)	15 (14)	2	13 (14)	20 (17)	9	45 (53)	110 (97)	47	43 (49)
185 (146)	18	10 (12)	67 (57)	0	—	48 (38)	1	21 (26)	515 (413)	79	15 (19)
450 (367)	5	11 (14)	387 (315)	0	—	270 (221)	6	22 (27)	1606 (1303)	44	2.7 (3.4)
12 (12)	0	—	72 (54)	0	—	81 (64)	0	—	217 (165)	0	—
124 (96)	3	2 (3)	25 (21)	0	—	105 (80)	1	1.0 (1.3)	372 (287)	10	2.7 (3.5)
805 (651)	36	4 (6)	570 (463)	4	0.7 (0.9)	525 (421)	18	3 (4)	2841 (2284)	196	7 (9)

range of more than 90 degrees in each period.

The detection capabilities of SYO and MTJ for magnitude larger than 5.0 are tabulated in Table 3. The figures of MTJ in this table for the distance range of more than 16 degrees are quoted from Table 2 of Hagiwara and Iwata (1965). It is clear from the table that the detection capability for magnitude larger than 6 is almost the same at both stations. This fact seems to be quite all right to consider that HES seismographs operating with the magnification of more than some ten

Table 3. The comparison of the detection capabilities of SYO in the period June to December, 1967 and MTJ obtained by Hagiware and Iwata (1965).

USCGS mag.	SYO				MTJ $\Delta \geqq 16$
	June-Dec. 1967		Mar.-Dec. 1967		
6.0～	76%	(84)	63%	(77)	81%
5.0～5.9	20	(25)	16	(21)	32

( ): Possible detection capability.

thousands can detect all earthquakes for magnitude larger than 6, except the shocks located in the shadow zone distance or which occurred during the time of blizzards at the stations.

The detection capability of MTJ for magnitude of 5.0 to 5.9 is better than that of SYO. The epicentral distances of about 85% of the earthquakes which were detected at MTJ are from 16 to 60 degrees, but in the case of SYO about 95% are located in the distance of more than 60 degrees. The discrepancy of about 10% in the detection capability of both stations is caused by the difference of epicentral distance at each station.

Though the number of earthquakes which are located by USCGS increases every year according to the increase of seismological stations, the detection capability of a station may also be changed year by year. From a practical point of view, the detection capability of each station must be compared with the data for the same period.

5. Detection Capability of Other Stations

To compare the detection capability of SYO with those of other stations in Antarctica, we investigated the detection capability of the next three stations, i.e. SPA (South Pole Station), as an example station of WWSSN of USCGS, MIR (Mirny) of USSR and DRV (Dumont d'Urville) of France. We have discussed the detection capability of these stations for the period from January to September 1967 on the basis of the Antarctic Seismological Bulletin of USCGS. As we have no information for the period of blizzards at these stations, the detection capability discussed refers only to cases which included the period of blizzards. Each constant of seismographs of these stations is shown in Table 4, but the magnifications of seismographs are unknown.

The detection capability of each station in connection with magnitude is tabulated in Table 5. The detection capability of SPA for all earthquakes is 44% and it seems to be surprisingly good compared with

Table 4. The position of stations and each constant of seismogram.

Country, station and station abbreviation	Position Latitute	Longitude	Instruments and components		To (seconds)	Tg (seconds)
Japan						
Syowa (S Y O)	69°00′27″ S	39°35′42″ E	H E S	Z	1.0	1.0
			H E S	N	1.0	1.0
			H E S	E	1.0	1.0
France						
Dumont d'Urville (D R V)	66°39′54″ S	140°00′31″ E	A P X	Z	1.38	0.53
			A P X	N	1.38	0.53
			A P X	E	1.38	0.52
USSR						
Mirny (M I R)	66°33′ S	93°00″ E	S V K M	Z	2.5	1.0
			S G K	N	12.5	1.1
			S G K	E	12.5	1.1
U.S.A.						
South Pole (S P A)	90° S	0°	Benioff	Z	1.0	0.75
			Benioff	N	1.0	0.75
			Benioff	E	1.0	0.75
			Sprengnether	Z	15.0	100.0
			Sprengnether	N	15.0	100.0
			Sprengnether	E	15.0	100.0

those of the other two stations which are 4% to 5%. As SPA is a station in inland Antarctica, seismographs can be operated with high magnification under very small microseismic activity. On the other hand, MIR and DRV are positioned around Antarctica, and it is impossible to operate the seismographs with high magnification under high microseismic activity (Sytinskii, 1964), especially in the summer season. It is obvious that the number of shocks in the Antarctic Seismological Bulletin reported from SCB (Scott Base) are few in comparison with that of SPA. SCB is one of the station of WWSSN and is situated Ross Island of Antarctica.

Seismographs at SPA, MIR and DRV are set in the rooms on the basement while the seismograph room of SYO is built on the ground. If it is a breezy day, seismograms record the microseismic activity well. Under this bad condition, the detection capability of SYO is a few percent better than those of MIR and DRV. If we had a good seismograph room, the detection capability of SYO would improve 10 percent.

6. The Regional Detection Capability of Some Regions.

To discuss the regional detection capability, we selected the following

Table 5. Detection capability and number of earthquakes of SPA, MIR, DRV and SYO.

USCGS mag.	Jan.-Sept., 1967							June-Dec., 1967		
		SPA		MIR		DRV			SYO	
	a	b	c	b	c	b	c	a	b	c
6.0-	30	26	87%	14	47%	15	50%	21	16	76%
5.5-5.9	154	119	77	39	25	46	30	110	47	43
5.0-5.4	640	447	70	95	15	103	16	515	79	15
-4.9	2519	994	40	32	1	26	1	1823	44	2
no mag.	400	152	38	9	2	11	3	372	10	3
total	3743	1738	46	189	5	201	5	2841	196	7

a: Number of earthquakes
b: Number of earthquakes recorded at each station
c: Detection capability

regions and obtained the detection capabilities for the respective regions. The regions are A(30°−60° S, 0°−60° E), B(50°−65° S, 20°−30° W), C(15°−45°S, 60°−75°W), D(15°−45°S, 178°E−180°−165°W), E(15°N−0°−15°S, 90°−160°E), F(20°−45°N, 120°−150°E), G(45°−60°N, 150°E−180°−150°W) and are shown in Fig. 4.

Table 6 shows the detection capability of each region from June to December. Almost all earthquakes which occurred in Region A were recorded at SYO. But, in spite of the comparatively small epicentral distance of around 30 degrees, the detection capability of Region B is not very high. For example, only 7 among 26 earthquakes (27%) for magnitude of 5.0 to 5.4 were recorded and three of unrecorded earthquakes occurred during extreme microseismic activity. If we exclude these shocks, the detection capability of Region B becomes 30%. This value is lower than that of Region C, the epicentral distance of which is about 60 degrees, and is almost the same value of Region D lying in the epicentral distance of about 70 degrees.

On the other hand, more than 50% of the earthquakes with magnitudes 5.5-5.9 were recorded in Region G whose distance is around 150 degrees. This fact shows that such large shocks whose magnitude is more than about 5.5 are better recorded in the region at the epicentral distance beyond the shadow zone, namely beyond the distance range of 90 to 110 degrees.

The so-called Gutenberg-Richter curve (1956) derived from the data of earthquakes in the different regions of the world may be taken as representing a world average showing the small P wave amplitude at the epicentral distance around 30 degrees. Mizoue (personal communi-

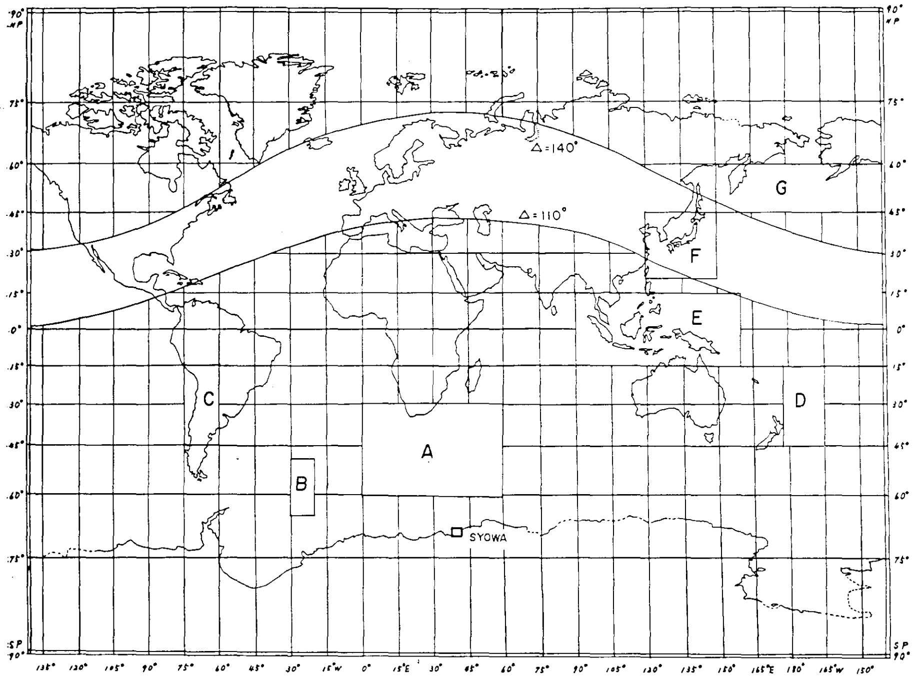

Fig. 4. The regions whose detection capability was obtained.

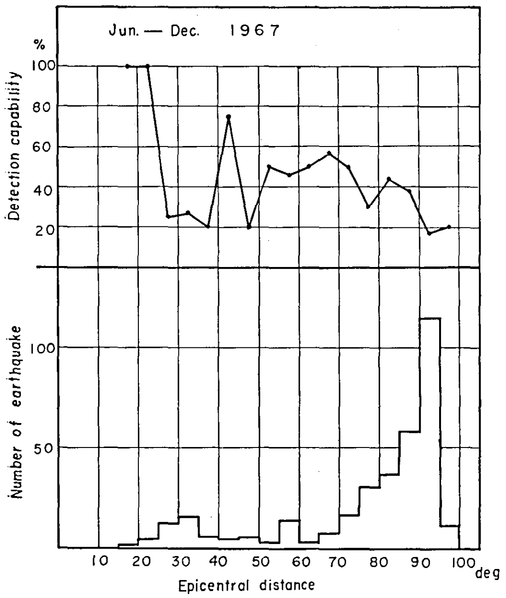

Fig. 5. The possible detection capability and the number of earthquakes with the epicentral distance for magnitude of 5.0 to 5.9 in the period from June to December, 1967.

cation) also obtained the small P wave amplitude for earthquakes whose epicentral distances were between 25 and 30 degrees. The detection capability of the Dodaira Micro-earthquake Observatory obtained by Miyamura (also personal communication) is low for the shock whose epicentral distances are from 25 to 30 degrees. Considering these results, the low detection capability of Region B is not a regional phenomenon but a global one. Figure 5 shows the detection capability and the number of earthquakes with epicentral distance every 5 degrees.

The magnitude for the earthquakes in Fig. 5 is 5.0 to 5.9 between June and December

Table 6. Detection capability and number of earthquakes of the regions shown in Fig. 4.

Δ from SYO	A			B			C			D			E			F			G		
	9°∼45°			23°∼37°			51°∼84°			62°∼94°			63°∼112°			107°∼137°			137°∼177°		
USCGS mag.	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
6.0∼				1 (1)	1	100 (100)	3 (3)	3	100 (100)	1 (1)	1	100 (100)	2 (2)	2	100 (100)	2 (2)	1	50 (50)			
5.5∼5.9	1 (1)	1	100 (100)	3 (2)	2	67 (100)	7 (7)	5	72 (72)	5 (4)	4	80 (100)	30 (25)	13	43 (52)	12 (10)	1	8 (10)	11 (10)	6	55 (60)
5.0∼5.4	5 (5)	5	100 (100)	26 (23)	7	27 (30)	16 (14)	6	38 (43)	42 (40)	12	29 (30)	152 (129)	20	13 (16)	30 (28)	0	0	32 (28)	3	9 (11)
4.0∼4.9	2 (2)	2	100 (100)	12 (8)	1	8 (13)	152 (122)	12	8 (10)	141 (128)	15	11 (12)	184 (151)	1	0.5 (0.7)	184 (142)	0	0	145 (129)	5	3 (4)
∼3.9							27 (18)	0	0	10 (9)	0	0				33 (30)	0	0	14 (14)	0	0
no mag	1 (1)	0	0	3 (2)	0	0	4 (4)	1	25 (25)	12 (10)	2	17 (20)	125 (97)	3	2 (3)	15 (13)	0	0	4 (4)	1	25 (25)
total	9 (9)	8	89 (89)	45 (36)	11	24 (31)	209 (168)	27	13 (16)	211 (192)	34	16 (18)	493 (404)	39	8 (10)	276 (225)	2	0.7 (0.9)	206 (181)	15	7 (8)

a : Number of earthquakes of each region.
b : Number of earthquakes recorded at SYO.
c : Detection capability in percents.
( ): Number of earthquakes and detection capability without the preiod of blizzard.

and the detection capability is obtained without the period of blizzards; i.e. it is the possible detection capability defined in section 3.

As the number of earthquakes for which epicentral distances are less than 70 degrees is few, there is a clear difference of possible detection capability between the distance of 30-50 and 50-90 degrees except the capability at the distance range of 40 to 45 degrees.

Moreover, the Gutenberg-Richter curve (1956) shows a large amplitude at the distance around 40 degrees. For SYO the number of shocks at that distance range is only four and three of them are detected, giving the possible detection capability as high as 75% which corresponds with the above maximum in Gutenberg-Richter curve at 40 degrees.

The curve in Fig. 5 indicates the possibility of the correlation between the possible detection capability and the Q-function of Gutenberg-Richter (1956). Since there are insufficient data, we have to leave the relation between the detection capability and P-wave amplitude or the Q-functions, for future study.

Conclusion

Since seismological observation at Syowa Station was started in 1959, we had only one study using the seismogram recorded at SYO (Murauchi, 1962). To use the seismological data at SYO, we discussed firstly the detection capability in connection with the magnitude and the epicentral distance. In spite of a bad observational condition, the detection capability is a few percent better than those of MIR and DRV in Antarctica but about one third of that of MTJ in Japan. The detection capability for distance range around 30 degrees is clearly low and it can be considered that there is some relation between the detection capability and P-wave amplitude. But we only introduce the problems in this paper.

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19. 昭和基地の地震観測と地震検知率

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1957 年国際地球観測年以来，日本南極観測隊により，昭和基地では，いろいろな分野の観測が行なわれている．地震観測も 1959 年に HES 地震計を使って開始された．1962 年昭和基地の閉鎖にともない，4 年間の空白はあったが，1966 年基地は再開され，地震観測も始まった．1967 年には長周期地震計（T_p=15 秒）3 成分も設置され，HES 地震計 3 成分の観測ともども現在に至っている．

地震観測は行なわれているが，その資料が研究に使われた例は少ない．そこで昭和基地の地震観測の資料整理の一環として，1967 年 3 月～12 月間の地震の読みとり結果にもとずき，昭和基地の地震検知率を求めた．

検知率は「USCGS で震源の決まった地震のうち，何%が昭和基地で P 又は PKP として読めたか」と定義した．一般に地震検知率を議論する場合に問題となることは，脈動の多い期間の扱い方であるが，南極の場合は，さらにブリザードの期間を考えなければならない．日本では一年間に数回しか現われない，台風に伴うような急激な気圧変化（たとえば 10 mb/h の変化）が昭和基地では月に何回かブリザードに伴い現われる．ブリザードの間は，完全に地震の読みとりは困難になる（第 2 図）．そこで「或る観測点で，或る地点に起った地震を検知できる能力」という意味からは，ブリザード期間を除いて議論した方が，地震学的には意味を持つことになる．この場合検知率とは区別して，検地能率（possible detection capability）と定義した．

昭和基地のような南極大陸周辺域の基地では，夏期に脈動が多くなり，地震計の倍率をあげることが出来ないので，夏期と冬期では検知率も違ってくる．

昭和基地の検知率は，全地震に対し，夏期（3 月—5 月）は 2%，冬期（6 月—12 月）は 7% である（第 2 表）．この値は，南極のMIR や DRV の検知率とほぼ同じであるが，WWSSN の一観測点であるSPA には及ばない（第 5 表）．

M≧6 の地震は shadow zone に起ったとか，ブリザードの最中に起ったとかいうことがない限り，震央距離に関係なく記録している．M=5.5～5.9 の検知率は M≧6 の地震に比べ約半分となる．さらに M=5.0～5.4 の場合には，M=5.5～5.9 の場合の約 1/3 と検知率は急激に悪くなる．M=5.0～5.9 の地震の検知率と震央距離の関係を第 5 図に示した．震央距離 30° 附近の検知率の方が，50°～80° の検知率に比べ低いという結果がでた．この事実は，C 層を最深点とする P 波はその振幅の減衰が著しいことを示すものと思われる．
