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URGENT NEED FOR SUSPENSION OF NUCLEAR AND
THERMONUCLEAR TESTS

Information relating to the creation of a world-wide
exchange of seismological data

Note by the Secretary-General

Addendum

For the period from 1 May to 1 June 1970, the Secretary-General had received in response to his letter dated 30 January, communications from nineteen States, the substantive portions of which are reproduced below.

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AUSTRALIA

[Original: English]
19 May 1970

... [transmitted herewith is] a collection of documents containing detailed statistics about all of Australia's seismograph stations, which we consider could be translated into a United Nations document by way of answering ... [the] request for information.

... also [attached is] a copy of a summary statement listing Australian seismograph stations and the seismographic systems of each station. This summary explains the degree to which Australian stations could contribute to an international exchange of seismic data, to help with verification of a comprehensive nuclear test ban. This summary statement shows that there are fifty-six seismograph stations in Australia, which have between them a total of seventy-three seismographic systems of various kinds. Of the fifty-six stations fifty-five are of the conventional type and one (at Warramunga in the Northern Territory) is an array station. As the summary indicates, fifty-five of the fifty-six stations could contribute in one form or another to an international exchange of data.

[It is hoped] ... that this information will be of value to the Conference of the Committee on Disarmament and to the General Assembly in the consideration of a comprehensive nuclear test ban. The data has been prepared for the Australian Government by the Bureau of Mineral Resources, which collected and assembled the data from the government and non-government stations listed in the attached papers.

/...

AUSTRALIAN SEISMOGRAPH STATIONS

1. Government (Bureau of Mineral Resources)

Western Australia

Mundaring	World Standard SP World Standard LP Supplementary SP
Kalgoorlie	SP - ZNE
Meekatharra	SP - Z

Territory of Papua-New Guinea

(a) Port Moresby Observatory network

Port Moresby	World Standard SP World Standard LP Supplementary SP Supplementary LP
Goroka	SP - Z
Konedobu	SP - Z
Lae	SP - ZNE
Momote	SP - Z
Wabag	SP - ZNE

(b) Rabaul Vulcanological Observatory network

Rabaul	World Standard SP World Standard LP Supplementary SP ZNE LP NE
*Taviliu	SP - Z
*Tavurvur	SP - Z
*Rabalamakaia	SP - Z
*Sulphur Creek	SP - Z
*Wanliss Street	SP - Z

/...

(b) Rabaul Vulcanological Observatory network (continued)

Agenahambo	SP - Z
Esa'ala	SP - ZNE LP - ZNE
Kobuan	SP - Z
Keravat	SP - ZNE
Tabele	SP - Z

*Stations in the Rabaul Harbour Network

Victoria

Toolangi	SP - ZNE *LP - ZNE
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*In co-operation with Lamont-Doherty Geological Observatory

<u>Macquarie Island</u>	SP - Z
<u>Mawson</u>	SP - Z LP - NE
<u>Norfolk Island</u>	SP - Z
<u>Northern Territory</u>	
Darwin	SP - Z

2. Non-governmentTasmania (University of Tasmania)

Hobart	World Standard SP World Standard LP
Lemonthyme	SP - Z
Moorlands	SP - Z
Sheffield	SP - Z
Savannah	SP - Z
Tarraleah	SP - Z

/...

Queensland (University of Queensland)

Brisbane	SP - ZNE LP - ZNE
Charters Towers	World Standard SP World Standard LP

South Australia (University of Adelaide)

Adelaide	World Standard SP World Standard LP
Cleve	SP - Z
Hallett	SP - ZN
Portacoota	SP - Z
Sevenhill	SP - Z
Umberatana	SP - Z

New South Wales and Australian Capital Territory

(Riverview College Observatory)

Riverview	World Standard SP World Standard LP
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(Australian National University)

Avon	SP - Z
Cabramurra	SP - Z
Canberra	SP - ZNE IP - ZNE LP - ZNE
Dalton	SP - Z
Hall's Lagoon	SP - Z
Inverloch	SP - Z
Jenolan	SP - Z
Jindabyne	SP - Z
Khancoban	SP - Z
Monteagle	SP - Z

/...

New South Wales and Australian Capital Territory (continued)

Talbingo	SP - Z
Wambook	SP - Z
Werombi	SP - ZNE

Victoria (Australian National University)

Bogong	SP - Z
Mt. Tassie	SP - Z

Northern Territory (Australian National University)

Warramunga array

In co-operation with United Kingdom Atomic Energy Authority (Blacknest, United Kingdom)

SEISMIC DATA EXCHANGE, SUMMARY

1. Government stations (B.M.R.)

(a) Geophysical Observatories and outstations. 16 mm film copies could be deposited regularly at an international centre;

(b) Vulcanological Observatories and outstations. Contact copies could be supplied on request.

The World Standard Stations already deposit copies at World Data Centre A.

2. Non-government stations

All World Standard stations deposit copies at World Data Centre A.

All operating authorities except Riverview are willing to supply copies or originals from their other stations on request. Provision of copies is beyond Riverview's capability at present.

WARRAMUNGA TAPE DATA

Tape copies are held for two to six months after production. Primary tapes are kept for four years at UKAEA, Blacknest, Brimpton, United Kingdom; thereafter they are compressed eight times and stored.

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PIT POSITIONS FOR WARRAMUNGA SEISMIC ARRAY- MARCH 1970

SEISMOMETER	X KM.	Y KM.	LATITUDE DEGREES	LONGITUDE DEGREES	LATITUDE DEG. MIN SEC	LONGITUDE DEG MIN SEC	DATE CHANGED
BLUE 1	-0.310	-1.476	-19.9611	134.3478	-19. 57. 39.81	134. 20. 52.17	
BLUE 2	0.183	0.373	-19.9444	134.3525	-19. 56. 39.99	134. 21. 9.14	
BLUE 3	0.638	2.558	-19.9248	134.3569	-19. 55. 29.30	134. 21. 24.80	
BLUE 4	1.025	4.724	-19.9053	134.3606	-19. 54. 19.20	134. 21. 38.14	
BLUE 5	1.762	7.519	-19.8802	134.3676	-19. 52. 48.79	134. 22. 3.47	
BLUE 6	1.863	10.095	-19.8571	134.3686	-19. 51. 25.46	134. 22. 6.98	
BLUE 7	3.150	11.662	-19.8430	134.3809	-19. 50. 34.75	134. 22. 51.26	
BLUE 8	3.291	14.635	-19.8163	134.3822	-19. 48. 58.62	134. 22. 56.09	
BLUE 9	3.623	17.132	-19.7938	134.3854	-19. 47. 37.82	134. 23. 7.52	
BLUE 10	4.554	19.816	-19.7697	134.3943	-19. 46. 10.97	134. 23. 39.60	
RED 1	1.033	0.391	-19.9443	134.3409	-19. 56. 39.39	134. 20. 27.28	
RED 2	1.552	-0.140	-19.9491	134.3656	-19. 56. 56.58	134. 21. 56.27	?
	1.356	-0.096	-19.9487	134.3638	-19. 56. 55.16	134. 21. 49.52	?
RED 3	3.934	-0.264	-19.9502	134.3884	-19. 57. 0.59	134. 23. 18.23	
RED 4	5.998	-0.465	-19.9520	134.4081	-19. 57. 7.08	134. 24. 29.26	
RED 5	8.052	-1.314	-19.9596	134.4278	-19. 57. 34.54	134. 25. 35.95	
	8.433	-0.654	-19.9537	134.4314	-19. 57. 13.23	134. 25. 53.08	SEPT 18
RED 6	10.998	-0.846	-19.9554	134.4559	-19. 57. 19.43	134. 27. 21.36	
	10.971	-0.919	-19.9561	134.4557	-19. 57. 21.80	134. 27. 20.42	?
RED 7	13.263	-1.004	-19.9568	134.4776	-19. 57. 24.54	134. 28. 39.31	
RED 8	15.826	-1.074	-19.9574	134.5021	-19. 57. 26.80	134. 30. 7.53	
RED 9	17.334	-1.281	-19.9593	134.5165	-19. 57. 33.50	134. 30. 59.44	
RED 10	20.016	-1.502	-19.9613	134.5421	-19. 57. 40.64	134. 32. 31.72	
C.P. 0	0.0	0.0	-19.9478	134.3508	-19. 56. 52.08	134. 21. 2.88	

ONE DEGREE OF LATITUDE AT WRA = 111.280 KM.
ONE DEGREE OF LONGITUDE AT WRA = 104.604 KM.

RADIUS OF INTERNATIONAL ELLIPSOID AT WRA = 6375.887 KM.

[A collection of documents containing detailed information on Australia's seismograph stations attached to the above communication, namely - co-ordinates of the stations; types of seismographic systems; recording facilities of stations, etc. - is deposited in the archives of the United Nations and interested delegations may consult them upon request to the Disarmament Affairs Division.]

AUSTRIA

/Original: English/
15 May 1970

List of Austrian seismic stations which (granted certain prerequisites described below) could make seismogram copies available:

Ad. A.: Conventional seismic stations

- (1) (i) Vienna - Hohe Warte (V I E) operated by the Central Institute for Meteorology and Geodynamics at A - 1190 Vienna, Hohe Warte 38;
 - (ii) Co-ordinates: $48^{\circ}14'54''$ N, $16^{\circ}21'42''$ E, $h=198$ m.;
 - (iii) One vertical wide-tape seismograph with ink recording;

$T_s=25$ s, $T_G=0.95$ s, $z=15$ mm/min

Magnification 5,000 times for 1 s

"	360	"	"	15 s
"	270	"	"	20 s (see annex)

Two horizontal wide-tape seismographs to become available around 1974;
 - (iv) Underground: early tertiary (a few hectometers), thereunder sandstone. Time accuracy: ± 0.1 sec.;
- (2) (i) Vienna - Kobenzl (V K A), operated by the Central Institute for Meteorology and Geodynamics at A - 1190 Vienna, Hohe Warte 38;
 - (ii) Co-ordinates: $48^{\circ}15'54''$ N, $16^{\circ}19'06''$ E, $h=400$ m.;
 - (iii) Three short-period seismometers (vertical, N-S, E-W) with photographic recording; presently acquisition of new pendula. Around September 1970 change-over to $T_s=1$ s, $T_G=1.5$ s, $r=30$ mm/min. Magnification approx. 5,000 to 10,000 times for 1 s.;
 - (iv) Underground: sandstone.

Time accuracy: ± 0.1 sec.

Seismogram copies on 35 mm film will be available from both stations (starting 1971?) within six days.

We would prefer the supplying of a seismological centre with seismogram copies to a bilateral exchange of data. Ad.B.: In Austria there are no array stations.

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[The annex to the above communication - containing response curves of Austria's seismographs - is deposited in the archives of the United Nations and interested delegations may consult it upon request to the Disarmament Affairs Division.]

/...

BRAZIL

/Original: English/Spanish/
21 May 1970

... the enclosed data on Brazilian seismic stations /are transmitted/ in accordance with the request contained in the annex to General Assembly resolution 2604 A (XXIV).

A. Conventional seismograph stations

I

- (1) Name of station and name and address of the organization,
"Estação Sismológica do Rio de Janeiro" (Rio de Janeiro Seismic Station);
operated by the National Observatory:

Observatório Nacional
Rua General Bruce, 586
São Cristóvão, Rio de Janeiro, Brazil.

- (2) Co-ordinates of the station:

Latitude: 22°53'42" S.

Longitude: 2^h52^m53.5^s W Gw.

Elevation: 30 m.

- (3) Instruments:

(a) Two Lehner and Griffith long-period (30 sec.) vertical seismographs

(b) One Lehner and Griffith long-period (20 sec.) horizontal (E-W)

seismograph

(c) One Lehner and Griffith long-period horizontal (N-S) seismograph

(d) Four Lehner and Griffith long-period galvanometers serving the above-mentioned four seismographs.

Speed of recording: 1.5 cm/min, with the time marked from minute to minute.
The recording is accurate to 1 second.

We have no short-period seismographs.

- (4) The Rio de Janeiro Seismic Station is situated on São Januário Hill, with a gneiss foundation. The seismographs are installed inside piers separate from the building and embedded in the rock.

Under a co-operative arrangement established in 1956 with the Lamont Observatory of Columbia University (United States of America), the National

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Observatory sends the recordings of its seismic station to the Lamont Observatory every three months. Seismographic records of earlier years are therefore found at the Lamont Observatory.

If necessary, the National Observatory could supply within one or two weeks (as required) good quality copies having the specified dimensions.

II

- (1) Name of station and name and address of the organization:

USCGS-Brasília Station, code BDF, operated by the Department of Geosciences of the University of Brasília. Address:

"Universidade de Brasília
Departamento de Geociências
Sismologia
Brasília - DF - Brasil"

- (2) Co-ordinates of the station:

Geographic latitude: $15^{\circ}45'57.5''$ S.

Geographic longitude: $48^{\circ}02'19.5''$ W.

Elevation: 1,200 m.

- (3) Instruments:

Standardized equipment, Vela-Uniform system, WWSSS type, of the United States Coast and Geodetic Survey: Short-period seismometers: one vertical and two horizontal, N-S and E-W (6 cm/min)

Long-period seismometers: one vertical and two horizontal, N-S and E-W (3 cm/min)

This equipment has not yet been installed, but the vault has already been built and the facilities for the recording equipment are already available. It is expected that normal operation will begin in June 1970. On the basis of experimental seismic recordings made at the point indicated under (2), it is expected that exceptional amplifications will be obtained for both systems, about 500,000 for the short-period system and possibly 6,000 for the long-period system, within the selected bands.

The station is situated on an outcrop of quartzite (Pre-Cambrian) north-east of Brasilia and is located inside Brasilia National Park, which means that there

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will be no local man-made noise. The seismometer and galvanometer piers are directly connected to the quartzite.

Recordings will be made daily and properly annotated; readings accurate to as little as 0.1 sec will be possible.

Actual-size photocopies of the recordings will be available. The United States Coast and Geodetic Survey will distribute copies of the originals on 35 mm microfilm. The originals are permanently kept at Brasilia. The Regional Seismology Centre for South America (CERESIS, Aptdo. 3747, Lima, Peru) also has files of data and copies of the recordings obtained at Brasilia.

We are prepared to furnish data and copies of seismograms to any institution which requests them.

B. Array stations

(1) Name of station and name and address of the organization:

"South American Array Station (SAAS)", code BRL, operated by the
Department of Geosciences of the University of Brasilia,
"Universidade de Brasília
Departamento de Geociências
Sismologia
Brasília - DF - Brasil"

(2) Co-ordinates of the station:

Geographic latitude: 15°38'03.6" S.
Geographic longitude: 47°59'29.5" W.
Elevation: 1175 m.

(3) Instruments:

Seismographs arranged in two perpendicular lines and spaced 2.5 km apart (see annexed diagram). A system of three short-period components at point E4. Radio connexion between detectors and recording equipment.

(4) Detectors:

Willmore MK II seismometers ($T_0 = 1$ sec)
Electronic amplifier and demodulator
UHF transmitter (470 MHz) + antenna

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Recording equipment: antennas + receivers

Amplifiers

Time coder

Time check receiver

Magnetic tape carrier

Magnetic tape: 7-inch diameter reels (1,800 ft. long by 1 inch wide)

Speed of recording: 0.113 in/sec

Recording time: 48 hours

Number of channels: 24, distributed as follows:

21 seismic channels (19 vertical and 2 horizontal seismometers)

2 channels for flutter compensation

1 channel for time coder

Note: Time check is made for 20 seconds every hour and recorded on one of the seismic channels.

Transcribing equipment: demodulators, amplifiers, frequency filters, eight-track paper recorder. Audio amplifier and loudspeaker.

The amplification obtainable is 3×10^6 , at one second period, using maximum gains of the transcribing system.

The station is situated north-west of Brasilia, on the Central Brazilian Plateau; most points in the array are situated on outcrops of Pre-Cambrian quartzite, while the rest are on recent sediments but installed in deep piers which give them good stability. The latter points are located in Brasilia National Park, which ensures an appreciable absence of local noise.

The signals are tape-recorded in frequency-modulated form, and subsequently demodulated for the analogue system and so recorded on paper. Readings can be made with a precision of 0.01 sec.

At present we are in the process of installing the points of the array, but we have continuous magnetic-tape recording of two of the points. We hope to have at least eight points operating normally by June 1970 and to complete the entire array by September 1970.

Experimental work was begun in 1967 (July), and since that time we can furnish copies on paper of the events we have recorded. We plan to obtain a tape-to-tape copier to be furnished by the United Kingdom Institute of Geological

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Sciences (IGS), which also supplied all of the equipment used in the array; in the future, therefore, we shall be able to furnish magnetic-tape copies of our recordings. The original tape recordings will be sent to IGS at Edinburgh, Scotland, for final study and subsequent erasure.

BYELORUSSIAN SOVIET SOCIALIST REPUBLIC

[Original: Russian]
17 April 1970

... the Byelorussian SSR has expressed and continues to express support for the reaching of agreement to prohibit underground nuclear tests on the basis of the use of national means of detection to verify compliance with such prohibition.

Given the present-day level of development of science and technology, national means are perfectly adequate for the purpose of verifying compliance with an agreement for the prohibition of underground tests and of providing an assurance that the agreement is being scrupulously observed. Accordingly, in circumstances where only a political decision is required to settle the problem, the efforts of some States to institute world-wide verification of compliance with a prohibition against underground nuclear tests are totally without foundation.

In view of the foregoing, the Byelorussian SSR considers that there is no need to have recourse to the international exchange of information on seismic stations, in order to verify compliance with the prohibition of underground nuclear explosions, the more so as the international exchange of seismological data is already taking place, with each State performing its own evaluation of the data collected.

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CHINA

[Original: English]
27 May 1970

... [enclosed] herewith [is] the information as requested [in General Assembly resolution 2604 A (XXIV)]. ... The Chinese Government is prepared to make the relevant data available on a bilateral basis.

/...

Table I. Geographical coordinates of the Seismological Station, Taiwan, China.

λ : Longitude φ : Geographical Latitude

φ' : Geocentric Latitude

$$a = \cos \varphi' \cos \lambda \quad b = \cos \varphi' \sin \lambda \quad c = \sin \varphi'$$

Station	φ :(N)	λ :(E)	φ'	Altitude	Subsoil	a	b	c	Seismographs
Anpu	25.11	121.31	25.02	827.0	Andesite	-0.4736	+0.7725	+0.4231	SP(H.V.)LP(H.V.)
Alishan(Mt.)	23.31	120.48	23.22	2406.1	Miocene Sandstone	-0.4700	+0.7855	+0.3966	W.(H.V.)O.S.
Chiayi	23.30	120.25	23.21	26.8	Alluvium	-0.4648	+0.7917	+0.3963	P ₂ S ₁
Hengchun	22.00	120.45	21.52	22.3	"	-0.4745	+0.7976	+0.3724	W.(H.V.)S ₂
Hsinkong	23.06	121.22	22.58	36.5	"	-0.4793	+0.7862	+0.3901	W. P ₁ S ₄ (H.V.)A ₁
Hsinchu	24.48	120.58	24.39	32.8	"	-0.4677	+0.7793	+0.4171	P ₁ S ₂
Hualien	23.58	121.37	23.49	17.6	"	-0.4796	+0.7791	+0.4038	W.(H.V.)P ₁ S ₂ A ₂
Ilan	24.46	121.45	24.37	7.4	"	-0.4784	+0.7731	+0.4165	W.(H.V.)P ₁ S ₁
Kaohsiung	22.37	120.16	22.29	29.1	"	-0.4657	+0.7980	+0.3824	P ₁ S ₁
Lanyu	22.02	121.33	21.54	322.3	Basalt	-0.4881	+0.7950	+0.3730	P ₂ S ₁
Penghu	23.32	119.33	23.23	9.4	"	-0.4527	+0.7985	+0.3969	P ₁
Taipei	25.02	121.31	24.53	8.0	Alluvium	-0.4742	+0.7733	+0.4208	W.(H.V.)O.S.P ₂ A ₁ P ₄
Tawu	22.21	120.54	22.13	7.6	"	-0.4754	+0.7944	+0.3781	W.(H.V.)S ₁
Taitung	22.45	121.09	22.37	8.9	"	-0.4775	+0.7900	+0.3846	W.(H.V.)S ₂
Tainan	23.00	120.13	22.52	12.7	"	-0.4637	+0.7962	+0.3886	W.(H.V.)S ₁ A ₁
Taichung	24.09	120.41	24.00	83.8	"	-0.4662	+0.7856	+0.4067	W.(H.V.)S ₂ P ₁
Yushan(Mt. Morrison)	23.29	120.57	23.21	3850.0	"	-0.4722	+0.7873	+0.3964	P ₁

W(H): Wiechert's horizontal seismograph. (V:80)

W(V): Wiechert's vertical seismograph. (V:80)

O: Omori's horizontal seismograph. (V:20)

P₁: C. M. O. type horizontal portable seismograph. (V:40)

P₂: Three components portable seismograph. (V:20)

P₃: Higuti-C. M. O. Spring type short period, horizontal seismograph. (V:50)

P₄: Hagihara type three component portable seismograph. (V:50)

S₁: C. M. O. Pivot type three components strong motion seismograph. (V:2)

S₂: Higuti-C. M. O. Spring type three components strong motion seismograph. (V:1)

S₃: C.M.O Spring type three components strong motion seismograph. (V:1)

S₄: C. M. O Spring type three components strong motion seismograph (V:2)

A₁: Isimoto's three components acceleration seismograph. (V:220)

A₂: Higuti's three components strong motion accelerometer. (V:16)

S.P.: Benioff short-period seismograph. (V:6250)

L.P.: Sprengnether long-period seismograph. (V:750)

Table II. Specification of instruments:-

Mass of the pendulum M (kg) Friction r (mm.)

Magnification V. Proper period of the pendulum To(sec.)

Damping ratio ν . Proper period of the galvanometer Tg(sec.)

The Constants of Seismographs are as follows.

Seismograph	Component	M. kg.	V.	ν .	r.	To sec.	Tg sec.
W(H) W(V)	E-W	200	80	9	0.10	5.0	
	N-S	200	80	9	0.13	5.0	
	U-D	80	80	8	0.08	5.0	
P ₁	E-W	18	40	8	0.13	5.0	
	N-S	18	40	8	0.13	5.0	
P ₂	E-W	10	20	2	0.24	4.0	
	N-S	10	20	2	0.41	4.0	
	U-D	7.5	20	2	0.29	4.0	
P ₃	E-W	20	50	10	0.08	2.2	
	N-S	20	50	10	0.08	2.2	
P ₄	E-W	12	25	10	0.10	5.0	
	N-S	12	25	10	0.10	5.0	
	U-D	12	25	10	0.20	2.0	
O	E-W	15	20	3	0.05	15.5	
	N-S	15	20	3	0.08	15.5	
S ₁	E-W	2	2	4	0.06	3.8	
	N-S	2	2	4	0.06	3.8	
	U-D	1.5	2	4	0.06	3.5	
S ₂	E-W	4	1	8	0.009	6.0	
	N-S	4	1	8	0.009	6.0	
	U-D	2	1	8	0.020	5.0	
S ₃	E-W	4	1	2	0.001	4.5	
	N-S	4	1	2	0.001	4.5	
	U-D	2	1	2	0.010	3.5	
S ₄	E-W	4	2	2	0.001	4.5	
	N-S	4	2	2	0.001	4.5	
	U-D	2	2	2	0.010	3.5	
A ₁	E-W	15	220	10	0.005	0.10	
	N-S	15	220	10	0.009	0.10	
	U-D	15	170	10	0.006	0.08	
A ₂	E-W	1	16	10	0.01	0.11	
	N-S	1	16	10	0.02	0.10	
	U-D	1	16	10	0.01	0.11	
SP	E-W	107.5	6250	17		1.0	0.75
	N-S	107.5	6250	17		1.0	0.75
	U-D	107.5	6250	17		1.0	0.75
LP	E-W	10.75	750	∞		30.0	100.0
	N-S	10.75	750	∞		30.0	100.0
	U-D	11.20	750	∞		30.0	100.0

The present publication inserts the following explanation of the notations only in the first number hereafter.

1. Phase.

P: Normal first phase (Longitudinal waves)

pP, PP, PPP,.....:Longitudinal waves reflected at the earth's surface.

S: Normal second phase (transverse waves)

sS, SS, SSS,.....:Transverse waves reflected at the earth's surface.

PS, PPS,.....:Waves suffered a change or changes from longitudinal to transverse oscillation, on reflection at the earth's surface.

SP, SPP,.....:Waves suffered a change or changes from transverse to longitudinal oscillation, on reflection at the earth's surface.

- L : Long waves at the beginning of the surface waves.
Q : Shorter and more regular waves in the surface waves.
M : Largest motion in the surface waves.
C : Tail or end portion.
F : End of the discernible movement
 Δ : Epicentral distance.
 ΔH : Focal distance.
H : Depth of focus.
 μ : Micron.
P-S : Duration of Preliminary tremor.
2. Nature of the motion.
i : Sudden commencement of a phase.
e : Gradual or indistinct commencement of a phase.
? : Questionable or uncertain.
3. Period and Initial motion.
T : Period, duration of one complete oscillation.
I : Amplitude of the true displacement of the ground from the position at rest.
 I_N : N-S component of I.
 I_E : E-W. component of I.
 I_Z : Vertical component of I.
Displacement to the north, east and upward are regarded as positive.
4. Scales of seismic intensity.
The intensity of the shock is estimated according to the scales O-VI, as follows:
O : No feeling: Shocks too weak to cause human feelings, registered only by seismographs.
I : Slight: Extremely feeble shocks only felt by persons at rest or by those who are observant to an earthquake.
II : Weak: Shocks felt by most persons, slight shaking of doors and latticed sliding doors.
III : Rather strong: Slight shaking of houses and buildings, rattling of doors and latticed sliding doors, swinging of hanging objects like the electric lamps, moving of liquids in vessels.
IV : Strong: Strong shaking of houses and buildings, overturning of unstable objects spilling of liquids out of vessels.
V : Very Strong: Cracks in the walls, overturning of gravestones, stone lanterns etc, damaging of chimneys and mud and-plaster warehouses.
VI : Disastrous : Demolition of houses landslips, fissures on the roads, the ground etc.

	No Feeling	Slight	Weak	Rather Strong	Strong	Very Strong	Disastrous
Scale Acceleration (gal)	O <0.8	I 0.8-2.5	II 2.5-8	III 8-25	IV 25-80	V 80-250	VI >250

5. The magnitude of an earthquake is classified according to the radius of the felt area assumed, roughly to be a circle as follows:-

- (r) Remarkable earthquake: The radius of the felt area is greater than 300 km.
(m) Moderate earthquake: The radius is smaller than 300 km. but greater than 200 km.
(s) Earthquake of small felt area: The radius is smaller than 200 km. but greater than 100 km.
(l) Local earthquake: The radius is smaller than 100 km.
(d) Distant earthquake: The epicentral distance is greater than 300 km. from the coast of Taiwan.
6. The depth of hypocenter is as a rule expressed in terms of kilometers, If it is not determined so definitely, the following scale will be adopted.
- | | | | | |
|-------|--------------|-----------|-------------|---------|
| Class | Very shallow | Shallow | Rather deep | Deep |
| Depth | 0~30km. | 30~100km. | 100~200km. | >200km. |
7. Geographical coordinates:
 λ : Longitude (E) ϕ : Latitude (N)
The coordinates are been **expressed** in degrees with one place of decimal.
8. Time
Time is referred to Greenwich Mean Time (G. M. T.)

[A map, showing the position of seismological stations and attached to the above communication, is deposited in the archives of the United Nations and interested delegations may consult it upon request to the Disarmament Affairs Division.]

CYPRUS

[Original: English]
9 May 1970

... there are no seismic stations in the Republic of Cyprus.

/...

HUNGARY

[Original: English]
19 May 1970

One of the major foreign policy objectives of the Hungarian People's Republic is the strengthening of international peace and security.

For this end Hungary is ready to participate in any undertaking and to support any initiative that may promote the realization of general and complete disarmament, first of all, nuclear disarmament.

In the opinion of the Hungarian Government a highly significant measure of nuclear disarmament would be the prohibition of underground nuclear tests, and consequently the achievement of a total and comprehensive nuclear test ban.

At the several international forums, primarily in the disarmament debates of the General Assembly and at the Conference of the Committee on Disarmament, representatives of Hungary have for a long time been voicing the conviction that the conditions are in all respects given for the prohibition of underground nuclear tests. At the present level of scientific and technical development the observance of such a ban can be verified in a satisfactory manner by means of national seismological installations. Therefore, any endeavour to make the conclusion of a comprehensive test ban treaty subject to on-the-spot inspection or to the establishment of an international control system is actually aimed not to guarantee the better safety of States but to prevent the conclusion of such a treaty. Accordingly, the solution of the problem today is not a scientific and technical question but a matter of policy decision, that of willingness to stop the underground tests.

Also the Government of the Hungarian People's Republic, like the majority of States, endorses the idea of an international exchange of seismological data, providing that the exchange of information will facilitate a total ban on nuclear tests under control through national seismological means, that the exchange will take place on an entirely voluntary basis and will not imply any form of liability to international control, and finally that every State will analyse by itself the information collected in this way. The competent Hungarian agencies have for a long time been conducting such exchanges of information and intend to continue doing so.

/...

On the basis of the above considerations the Government of the Hungarian People's Republic is of the opinion that it is unnecessary to publish and exchange the data concerning seismic stations, that such information will not help to promote the elaboration of an international treaty banning nuclear tests in all environments.

/...

INDONESIA

[Original: English]
15 May 1970

... [transmitted herewith is] a communication recently received from the Government of Indonesia regarding the seismological stations in Indonesia.

/...

STATION AND INSTRUMENTAL CONSTANTS

Operating Organization	Station	Position and Elevation	Instrument	Foundation	To	Tg	V (peak-magnification)	Paper Speed	Time Break Reference	Ground Motion Trace Up.
All stations are operated by the METEOROLOGICAL AND GEOPHYSICAL INSTITUTE Dj1. Arif Rachman Hakim 3 Djakarta - <u>INDONESIA</u>	DJAKARTA	06°11' S 106°50' E h = 8 m	Wiechert V=1300 kg N/E=1000 kg	River Quarternary	E/N=5.2 Z=4.0	--	215	17 mm/min.	Beginning	E/S D
	MEDAN	03°33' N 98°41' E h = 32 m	Sprengnether	Marine Sediments	N=1.5 E=14.0 Z=1.5	1.5 14.0 1.5	3000	50 mm/min.	Beginning	N E C
	TANGERANG	06°11' S 106°30' E h = 14 m	Sprengnether	Sandstone	Z=1.5	1.5	3000	25 mm/min.	Beginning	C
	LEMBANG	06°50' S 107°37' E h = 1247 m	Benioff	Quarternary Volcanic	S.P. N=1.0 E=1.0 Z=1.0	0.75 0.75 0.75	25000 25000 25000	60 mm/min	Beginning	N E C
			Sprengnether		L.P. N=15.0 E=15.0 Z=15.0	100 100 100	750 750 750	30 mm/min.		N E C
	DENPASAR	08°39' S 115°12' E h = 15 m	Sprengnether	Tuf Sandstone	N=1.7 E=16.4 Z=1.6	1.7 16.4 1.7	3000	50 mm/min.	Beginning	N E C
	MAKASSAR	05°04' S 119°38' E h = 28 m	Sprengnether	Brecy Volcanic	N=1.8 E=12.0 Z=1.2	1.7 11.8 1.1	3000	50 mm/min.	Beginning	N E C

NOTE : All records are deposited in the Main Office, which makes its data (or copies) available to everyone.

IRAN

Original: English
5 May 1970

... transmitted herewith is the enclosed memorandum of the Iranian Government, which contains a list and description of characteristics of all seismic stations in Iran, as requested in operative paragraph 1 of General Assembly resolution 2604 A (XXIV).

Introduction

The Seismological Branch of the Institute of Geophysics, Tehran University, comprises six stations in the following provincial cities:

- A. Tehran
- B. Mashad
- C. Shiraz
- D. Tabriz
- E. Kermanshah
- F. Menjil

A. Tehran Station

A.1. Location

The Seismological Station in Tehran is one of the constituent observatories of the Institute of Geophysics, Tehran University, with the following specifications:

Geographical co-ordinates

Latitude $35^{\circ}44'16.3''$

Longitude $51^{\circ}23'09''$

Geocentric co-ordinates

Geocentric Latitude, Longitude, geocentric direction cosines

a, b, c and the height are given below:

/...

Geocentric Direction Latitude: $35^{\circ}33'12''$ North
Geocentric Direction Longitude: $51^{\circ}23'09''$ East
Geocentric Direction Cosine a: + 0.50773
Geocentric Direction Cosine b: + 0.63570
Geocentric Direction Cosine c: + 0.58146
Height : 1360 m

A.2. Site and geological formations

The Institute is situated on the outskirts of Tehran at a distance of some six kilometres from the city centre. To the west the Institute is bordered by a river-bed of about 250 metres in width and 10 metres in depth with seasonal water flow from the mountains in the north. The compound covers an isolated area of about ten acres of land in peaceful hilly formations. The Institute also enjoys the remoteness from the Caspian Sea at a distance of about 150 km so that the microseisms do not cause any disturbance of the recordings of the earthquakes.

Geologically Amirabad, where the Institute is located, is a region at the foot of Alborz Mountains slightly inclined to the south with hilly anticlinal alluvium formations having the general north-west and south-east direction.

A.3. Instruments

The seismograph vault in the basement of the building is four metres below the ground level, and the foundation of the instruments is still sunk two metres deeper on solid compact sandy formations.

The foundations of the station are based on sub-recent compact alluvium, and the station has the following instruments:

A.3.1. Short-period seismographs

Stuttgart-Hiller Seismograph with transistor amplifier

Components:	N-S, E-W and Z
Mass of pendulums:	700 gm. in all components
Effective natural period of pendulums:	1.1 sec. in all components
Type of damper:	Electromagnetic
Damping ratio of pendulum:	10/1 in all components
Natural period of pen galvanometer:	0.25 sec. in all components
Transducer:	Changing flux displacements type

Static magnification:	10,000 in all components
Registration:	Smoked paper
Paper speed:	60 mm per minute

A.3.2. Long-period Galitzin electromagnetic seismograph

Components:	N-S, E-W and Z
Mass of pendulum:	3.5 kg in N-S and E-S; 3.0 kg in Z
Natural period of pendulum:	11.0 sec. in N-S and E-W; 10.8 sec. in Z
Type of damper:	Electromagnetic
Damping constant:	Critical in all components
Natural period of galvanometer:	12.3 sec. in N-S and E-W; 11.1 sec. in Z
Damping constant of galvanometer:	Critical in all components
Magnification factor (AK/ 1):	492 in N-S 600 in E-W 340 in Z
Registration:	Photographic paper
Paper speed:	30 mm per minute

The over-all magnification curves of seismographs are shown in Fig. A.

A.3.3. Time-marking system

For the master clock of the station a precision seconds-pendulum clock of Clemens Riefler is employed. The clock is equipped with air-pressure and temperature compensators and can be operated with a higher accuracy than 0.1 second per day, which is recognized as the change of daily rate.

Minute signals from the slave clock with electric contact and hour signals directly from the master clock are placed on the seismogram through the ordinary relay mechanism. Time marks are indicated by shifting the trace in Stuttgart-Hiller seismograph and by interruption of the optical beam in Galitzin.

Wireless time signals of the British Broadcasting Corporation or of W.W.V. and Moscow are received every day, and at the beginning and at the end of the recording, these signals are directly placed on the seismograms.

/...

Time correction is effected by comparison of the time delay between time signals and the master clock minute-mark on the seismograms, and the accuracy achieved is within 0.1 sec.

B. Tabriz Station

B.1. Location

Geographical co-ordinates

Latitude $38^{\circ}04'03''$ N

Longitude $46^{\circ}19'35''$ E

Geocentric direction cosines a, b, c, and the height are given as below:

a = + 0.54501

b = + 0.57088

c = + 0.61400

Height = 1430 metres

B.2. Site and geological foundations

The station is located in the valley of Tabriz River on the south-western edge of the city of Tabriz on the new Tabriz University **campus**. The surrounding countryside is low-lying sand and clay hills.

The station is constructed on hard formations about three metres in thickness. Below the hardpart is unconsolidated coarse grain sand. Sediment thickness below the station is not known but believed to be several hundred metres.

B.3. Instruments

The foundations of the instruments are sunk some 10 metres down and in the station two complete sets of WWSS types are operating:

B.3.1. Short-period seismographs

Components:	N-S, E-W and Z
Mass of pendulum:	107.5 kg in all components
Natural period of pendulum:	1.0 sec. in all components
Natural period of galvanometer:	0.75 sec. in all components
Type of damper:	Electromagnetic
Damping of galvanometer:	Critical in all components

/...

Damping ratio:	17/1 in all components
Magnification:	12.500 in all components for 1 sec.
Motor constant:	2.0 in all components

B.3.2. Long-period seismographs

Components:	N-S, E-W and Z
Mass of pendulum:	10.75 kg in N-S and E-W; 11.2 kg in Z
Natural period of pendulum:	15 sec. in all components
Natural period of galvanometer:	100 sec. in all components
Type of damper:	Electromagnetic
Damping of galvanometer:	Critical in all components
Magnification:	1500 in all components for 15 sec.
Motor constant:	0.0980 in E-W 0.0965 in N-S 0.1053 in Z

C. Mashad Station

C.1. Location

Geographical co-ordinates

Latitude $36^{\circ}18'40''$ N

Longitude $59^{\circ}35'16''$ E

Geocentric direction cosines a, b, c, and the height are given as below:

a = + 0.39654

b = + 0.67468

c = + 0.62251

Height = 987 metres

C.2. Site and geological foundations

The station is located in the valley of the Kashaf River on the south-western portion of the city of Mashad. The Kashaf River runs in a north-west to south-west direction and is approximately six kilometres east of the city at its closest point.

/...

The Binalud Mountains lie to the west and south of the city and the Hezarmasjid Mountains are to the north and east of Mashad.

The station is constructed on alluvial deposit of unknown depth. At the construction site some one hundred metres from the station the exposed sediments are unconsolidated sand and conglomerates. The exposed area is approximately sixty feet in depth.

C.3. Instruments

Seismograph vault is four metres below the ground level and the foundations of the instruments are sunk some six metres below the level.

In this station two complete sets of WSS types are operating:

C.3.1. Short-period seismographs

Components:	N-S, E-W and Z
Mass of pendulum:	107.5 kg in all components
Natural period of pendulum:	1.0 sec. in all components
Natural period of galvanometer:	0.75 sec. in all components
Type of damper:	Electromagnetic
Damping of galvanometer:	Critical in all components
Damping ratio:	17/1 in all components
Magnification:	12.500 in all components for 1 sec.
Motor constant:	2.0 in all components

C.3.2. Long-period seismographs

Components:	N-S, E-W and Z
Mass of pendulum:	10.75 kg in N-S and E-W; 11.2 kg in Z
Natural period of pendulum:	15 sec. in all components
Natural period of galvanometer:	100 sec. in all components
Type of damper:	Electromagnetic
Damping of galvanometer:	Critical in all components
Magnification:	1.500 in all components for 15 sec.
Motor constant:	0.1022 in N-S 0.1010 in E-W 0.1026 in Z

/...

D. Shiraz Station

D.1. Location

Geographical co-ordinates

Latitude $29^{\circ}30'40''$ N

Longitude $52^{\circ}31'34''$ E

Geocentric direction cosines a, b, c, and the height are given as below:

a = + 0.52972

b = + 0.69067

c = + 0.49225

Height = 1,959 metres

D.2. Site and geological foundations

The station is located in the north of the city on hills some distance from the city.

Shiraz is situated on a Quaternary formation and surrounded by Eocene and the Upper and Lower parts of Miocene to the south are Oligo-Miocene.

D.3. Instruments

Instrument piers are set directly on rocks in double walled building.

In this station two complete sets of WSS types are operating:

D.3.1. Short-period seismographs

Components:	N-S, E-W and Z
Mass of pendulum:	106.5 kg in all components
Natural period of pendulum:	1.0 sec. in all components
Natural period of galvanometer:	0.75 sec. in all components
Type of damper:	Electromagnetic
Damping of galvanometer:	Critical in all components
Damping ratio:	17/1 in all components
Magnification:	100 000 in all components for 1 sec.
Motor constant:	1.0 in all components

/...

D.3.2. Long-period seismographs

Components:	N-S, E-W and Z
Mass of pendulum:	10.75 kg in N-S and E-W; 11.2 kg in Z
Natural period of pendulum:	15.0 sec. in all components
Natural period of galvanometer:	100 sec. in all components
Type of damper:	Electromagnetic
Damping of galvanometer:	Critical in all components
Magnification:	1.500 in all components for 15 sec.
Motor constant:	0.0984 in N-S 0.1011 in E-W 0.0997 in Z

E. Kermanshah Station

E.1. Location

Geographical co-ordinates

Latitude $34^{\circ}21'08''$ NLongitude $47^{\circ}06'21''$ E

Geocentric direction cosines a, b, c, and the height are given as below:

a = + 0.56313

b = + 0.60606

c = + 0.56168

Height = 1,310 metres

E.2. Site and geological foundations

The station is located in the Technical School some 10 kilometres north of the city. The vault is isolated from the school campus, and includes three underground rooms for the instruments and three office rooms above.

This station is constructed on the massive, Cretaceous limestone to Upper Jurassic.

/...

E.3. Instruments

The seismograph vault is four metres below the ground level. In order to eliminate the defects of the soft foundation, concrete reinforced shafts are run to a depth of 20 metres and the foundation of the instrument is based on these shafts.

One complete set of Stuttgart-Hiller Seismograph with transistor amplifier is operating:

Components:	N-S, E-W and Z
Mass of pendulum:	700 gr in all components
Effective natural period of pendulum:	1.1 sec. in all components
Type of damper:	Electromagnetic
Damping ratio of pendulum:	10/1 in all components
Natural period of pen-galvanometer:	0.25 sec. in all components
Transducer:	Changing flux displacement type
Static magnification:	6.000 in all components
Registration:	Smoked paper
Paper speed:	60 mm per minute

F. Manjil Station

F.1. Location

Geographical co-ordinates

Latitude $36^{\circ}45'30''$ N

Longitude $49^{\circ}23'00''$ E

Geocentric direction cosines a , b , c , and the height are given as below:

$a = + 0.52281$

$b = + 0.60961$

$c = + 0.59583$

Height = 240 metres

/...

F.2. Site and geological foundations

The station is located in the valley of Sefid-Roud on the left side of the river about two kilometres north-west of Manjil. The highway of Gazvin-Rasht lies in the right side of the valley approximately three hundred metres away.

The station is located on the intermediate extrusive igneous rocks, their nature is gray andesite.

F.3. Instruments

The seismograph vault is constructed in a cave, piers are set directly on rocks perfectly scarped.

Short-period Labrouste pendulums with Schlumberger-Picard galvanometers, type AV 17, are operating in this station:

Components:	NE-SW, ES-WN, and Z
"N 28 E and E 28 S"	
Natural period of pendulum:	0.52 sec. in two horizontal components and 0.9 sec. in Z
Damping constant:	2.653 in the horizontal components and 1.546 in Z
Natural period of galvanometer:	0.45 sec. in all components
Damping constant:	3.25 in the horizontal components and 3.66 in Z
Registration:	Photographic paper
Paper speed:	60 mm per minute

Included in the above communication are figures A-F, containing the over-all magnification curves of seismographs of six stations of Iran. The text of the communication with these figures is deposited in the archives of the United Nations and interested delegations may consult it upon request to the Disarmament Affairs Division.

/...

JAMAICA

Original: English
27 May 1970

... herewith is the information supplied by the Seismic Research Unit of the University of the West Indies through the Jamaica Geological Survey Department. ... the Secretary-General is requested to consider the proposal that copies of records could be provided if materials and equipment are supplied to the University for the purpose.

Seismograph stations in Jamaica operated by the
Seismic Research Unit, C/o Department of Physics,
U.W.I., Mona, Jamaica

Category A. Conventional seismograph stations

<u>Location</u>	<u>Co-ordinates</u>	<u>Elevation</u>	<u>Geological Foundation</u>	<u>Magnification at period of 1 sec.</u>
1. Stony Hill (STH)	18.078°N 76.814°W	427 metres	Limestone	3,400
2. Hope (HOJ)	18.002°N 76.750°W	200 metres	Quaternary sand and gravel	10,000
3. Port Royal (PRJ)	17.935°N 76.844°W	2 metres	Alluvium	

Instrumentation

Each of the three stations is equipped with a Willmore short-period seismometer of period 0.8 second recording the vertical component of the earth motion only. Stations HOJ and PRJ are linked telemetrically to a single recording centre at STH. Recording is on photographic paper using a Sprengnether three channel helicorder moving at 60 mm per minute, with galvanometers of period 0.25 second. Records are changed every 24 hours, and calibrated against WWV time (Boulder, Colorado) at the beginning and end of each record. Timing with reference to WWV is believed to be accurate within ± 0.5 second.

Original records could be supplied after being read locally, subject to their being returned to Jamaica within four weeks of dispatch. Copies could be made if materials and equipment were supplied for such a purpose. All original

/...

records are finally deposited at the Seismic Research Unit's headquarters at U.W.I., Trinidad, where they may be consulted by visiting scientists. Quarterly seismological bulletins containing all phase arrivals at Caribbean stations, plus Caribbean regional hypocentres, are published by the Seismic Research Unit.

Category B. Array stations

None.

MALTA

[Original: English]
1 June 1970

... there is no modern seismograph in the country and we cannot therefore
be of any help ...

/...

MOROCCO

[Original: French]
20 May 1970

1. All information from all Moroccan seismic stations, which frequently pick up seismic waves caused by explosions, has always been and will continue to be available to the scientific community.
2. A list of all the stations, with the details requested, is attached.
3. Copies equal in quality to the original, and produced by means of a scale reproduction by photographic contact, are provided whenever requested, without any time-limit or discrimination between requestors. These copies include all the usual annotations, including precision of time-keeping, which is generally one tenth of a second in standard time (GMT).
4. Data is already supplied on a bilateral demand; if the Committee on Disarmament considered it necessary or desirable, approval could be given for all recordings to be regularly deposited in a centre which would make them available to everyone, on condition that the originals did not leave Morocco.

/...

Morocco: List of conventional seismograph stations

1.	Operating organization:	Institut Scientifique, Service de Physique du Globe, Avenue Moulay-Chérif, Rabat, Morocco				
2.	Name and code:	Averroes AVE	Ifrane IFR	Rabat RBA	Rabat-Zaers RBZ	Tiouine TIO
3.	Latitude north	33° 17' 53"	33° 31' 00"	34° 00' 32"	33° 55' 45"	30° 55.6'
4.	Longitude west	7° 24' 48"	5° 07' 38"	6° 50' 26"	6° 50' 24"	7° 15.7'
5.	Elevation (metres)	234	1,634	39	116	1,335
6.	Recording speed	60 mm/min.	120 mm/min.	20 mm/min.	60 mm/min.	60 mm/min.
7.	Electromagnetic seismographs	3	3	1	1	1
8.	Magnification at one-second period	Z) N-S } 30,000 E-W)	summer: Z 100,000 N-S 50,000 E-W 200,000 winter: Z 60,000 N-S 50,000 E-W 200,000	-	Z 30,000	Z 50,000
9.	Magnification at 20-second period	-	-	Z 1,000	-	-
10.	Brought into operation	1965	1 Nov. 1964	1966	1968	Dec. 1969

NETHERLANDS

[Original: English]
12 May 1970

... [enclosed are] two lists: one contains the locations and further information on seismograph stations in the European territory of the Kingdom of the Netherlands. Such stations do not exist in Surinam and the Netherlands Antilles. The other contains the magnification curves for the seismographs at De Bilt. For the other stations such information is not available.

The Netherlands Government favours the idea of establishing a world-wide exchange of seismological information, which would facilitate the achievement of a comprehensive test ban. The Netherlands seismograph stations do not deposit copies of all their records in a seismological centre. Upon request, however, copies of specific seismograms can be made available within twenty-four hours in the form of photoprints or on 35 mm film.

/...

Station	Co-ordinates and elevation	Instruments	Period seismomt.	Period galvanomt.	Magnifi- cation maximum	Speed of recording	Year of initiation	Geological foundation
De Bilt	52° 06.1' N 5° 10.6' E elevation 3 m	Galitzin Z	12 sec.	12 sec.	740	3 cm/min	1922	subsoil of pleistocene sands
		Galitzin NS	25 "	25 "	310	3 "	1914	
		Galitzin EW	25 "	25 "	310	3 "	1914	
		Press-Ewing Z	30 "	90 "	500	1.5 "	1966	
		Press-Ewing NS	30 "	90 "	500	1.5 "	1966	
		Press-Ewing EW	30 "	90 "	500	1.5 "	1966	
Witteveen	52° 48.8' N 6° 40.1' E elevation 2 m	Grenet Z	2.3 "	0.8 "	6.500	6 "	1951	subsoil of pleistocene sands
		Willmore Z	2 "	0.25 "	6.500	6 "	1966	
Heerlen	50° 53.0' N 5° 59.0' E elevation 100 m	Horizontal Seismograph (NS) M = 450 kg (smoked paper record)	2 "	-- "	600	1.5 "	1947	subsoil of löss on Oligo- cene/Miocene sands
Ravensbos	50° 53.3' N 5° 49.9' E elevation 135m	Willmore Z	2-4 "	4 "	10.000	6 "	1970	subsoil of löss on Oligo- cene/Miocene sands

Address for all stations: KNMI, Geophysical Division, De Bilt, The Netherlands.

[A list containing the magnification curves for the seismographs at De Bilt, attached to the above communication, is deposited in the archives of the United Nations and interested delegations may consult it upon request to the Disarmament Affairs Division.]

/...

NORWAY

[Original: English]
6 May 1970

... [enclosed is] a list of Norway's seismic stations ...

A Conventional seismograph stations

- (i) Name and address of operating organization:

Seismological Observatory
University of Bergen
Villavei 9
N - 5000 Bergen, Norway

The Seismological Observatory operates the conventional seismograph stations described in enclosure No. 1.

- (ii) Co-ordinates of stations, including elevations, see enclosure No. 1.
(iii) Instrumentation and component recorded, see enclosure No. 1.

The response curves for the stations are as standard for instruments; however, see attachment No. 1 to enclosure No. 1.

The geological description of the station foundation is given in enclosure No. 1.

The Seismological Observatory can provide fully annotated records including precision of the time. The time lag for making records available will be approximately one week for stations on the Norwegian mainland and approximately one month for the Kings Bay station. The records will be retained for a minimum of five years.

The Seismological Observatory deposits all records at Bergen and at the present time lends without any charge the original records (or copies) to everyone requesting them. Copies can either be on photographic paper (920 mm x 330 mm) or on 36 mm film. However, if the data exchange requests increase too much, better copying facilities must be provided. The form and the format of the copies of such a facility should be chosen when an international standard has been recommended. The Seismological Observatory is willing to undertake the work involved provided the costs will be compensated. If an international data centre is set up, all records will be available for copying and studying in such a centre.

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B Array stations

(i) Name of station:

Norwegian Seismic Array (NORSAR)

Name and address of operating organization:

(a) Until 30 June 1970:

Norwegian Defence Research Establishment
P.O. Box 25
N - 2007 Kjeller, Norway

(b) From 1 July 1970:

Norwegian Council for Scientific and Industrial Research
Gaustadalléen 30
Blindern
Oslo 3, Norway

(ii) Co-ordinates of station and array points, including elevation.

The array is located in the south-eastern part of Norway, centred around Nes Peninsula in Lake Mjøsa, some 100 kms north of Oslo.

Further information is given in enclosure No. 2, which gives co-ordinates for each short-period instrument and each three component long-period installation.

(iii) General account of the instrumentation geometry of the array. See enclosure No. 3, a map giving the NORSAR configuration.

(iv) Instrument specifications

(a) Short-period seismometers:

Model Hall-Sears HS-10-1/A

Natural frequency is 1 Hz \pm 3 per cent.

Pre-magnification by amplifier at each instrument is adjustable from 0 (Zero) to 10,000 (ten thousand) voltage gain.

(b) Long-period seismometers:

(1) Horizontal.

Geotech model 8700 D.

The natural period of instrument is adjustable between 10 and 30 seconds, normal setting is at 20 seconds (0.05 Hz).

Pre-magnification by amplifier at each instrument is 2,500 voltage gain at 0.05 Hz.

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(2) Vertical.

Geotech model 7505 B.

The natural period of instrument is adjustable between 10 and 30 seconds, normal setting is at 20 seconds (0.05 Hz).

Pre-magnification by amplifier at each instrument is 2,500 voltage gain at 0.05 Hz.

The array system response magnification is not available at the present.

Response curves for each short-period and each long-period instrument are given in enclosure No. 4.

Magnetic tape specifications.

Number of tracks: 9

Density : 1,600 BPI and 800 BPI

Tape width : 0.5 inch

Tape length : 2,400 feet or 67 minutes of data

All data on tape are in digitized form and have been recorded at a sampling rate of 10 Hz. The sampling rate may be changed to 20 Hz.

Analysed data will be available with a time lag of maximum two days.

All data recorded will be stored on magnetic tapes with the density of 1,600 BPI for at least six months. Selected events may be stored for a longer period of time. Tapes with a density of 800 BPI will be generated only to fulfil approved data exchange requirements.

(v) List of components which record on a parallel visual basis.

(a) Geotech RF-400 Develocorder.

Film width : 16 mm

Number of traces: 20

Selected events will be stored on film strips. (Retention period not available.)

(b) IBM 1627 (Calcomp) Plotter.

Plotting area: 11 inches x 120 feet

Selected events may be plotted and duplicated.

The geological foundation of NORSAR is given in enclosure No. 5.

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Deposition of copies of all array data recorded on magnetic tapes in a seismological centre can probably not be envisaged.

Copies of requested data may be available for a seismological centre or individual demands from two days until six months after recording. Selected events will probably be available for at least twelve months. Since the computer time is limited and the magnetic tape reels are expensive, the costs involved will have to be compensated.

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Name	Co-ordinates	Elevation	Enclosure No. 1							
			SP instruments	SP speed of rec.	SP mag.	LP instruments	LP speed of rec.	LP mag.	Response curve	Foundation
Kongsberg	59°38'57"N 09°37'55"E	216 m	Z, NS, EW Benioff	60 mm/min	50 000	Z, NS, EW Sprengnether	15mm/min	1500	Standard for instruments	Gneiss
Tromsø	69°37'57"N 18°55'41"E	15m	- " -	15 mm/min	- " -				- " -	Gneiss
Bergen	60°23'13"N 05°19'33"E	22m				Z, NS, EW Sprengnether	3 mm/min	6000	- " -	Green schist
Kings Bay	78°55'03"N 11°55'26"E	46m	- " -	60 mm/min	25000	- " -	15 mm/min	1500	- " -	Permafrost soil

Enclosure No. 2
Updated per
26 February 1970

NORWEGIAN SEISMIC SYSTEM
CO-ORDINATES

SITE	Geographical co-ordinates		NGO system axis III		UTM system zone 32		Level	Correc
	°North	°East	x	y	x	y		
01A00	60° 49' 25".4467	10° 49' 56".5011	314 419.110	6 145.935	6 744 705.346	599 649.573	379.000	
01A01 LP	60° 50' 39".2139	10° 53' 11".5139	316 708.590	9 087.596	6 747 070.597	602 529.342	426.399	
01A11	60° 50' 38".8475	10° 53' 11".7930	316 697.260	9 091.841	6 747 059.386	602 533.881	425.690	
01A02	60° 48' 20".5901	10° 53' 49".7203	312 419.270	9 676.110	6 742 799.352	603 230.033	362.500	
01A03	60° 47' 17".3003	10° 48' 30".1957	310 450.654	4 846.743	6 740 705.282	598 455.289	223.195	
01A04	60° 48' 37".8626	10° 45' 45".1532	312 941.885	2 348.022	6 743 129.410	595 892.790	297.374	
01A05	60° 51' 02".4496	10° 49' 09".4332	317 420.522	5 430.118	6 747 686.106	598 855.445	290.869	
01B00 LP	61° 01' 50".7636	10° 46' 38".6370	337 485.650	3 136.030	6 767 678.391	596 035.769	529.980	
01B10	61° 01' 50".2052	10° 46' 39".3379	337 468.220	3 146.570	6 767 661.247	596 046.761	524.010	
01B01	61° 03' 41".8050	10° 47' 0".1365	340 916.770	3 455.660	6 771 115.748	596 264.936	596.960	15.1.70
01B02	61° 02' 57".1350	10° 51' 24".9994	339 546.190	7 431.830	6 769 850.580	600 274.704	521.360	
01B03	61° 00' 46".6372	10° 50' 13".4160	335 504.720	6 364.640	6 765 783.572	599 314.426	429.860	15.1.70
01B04	61° 0' 43".0092	10° 43' 8".7000	335 387.351	1 786.500	6 765 545.944	594 742.249	398.557	
01B05	61° 03' 34".9711	10° 43' 18".8895	340 709.882	1 36.625	6 770 821.714	592 953.498	553.443	
02B00	61° 2' 23".0531	11° 12' 53".0995	338 583.840	26 770.540	6 769 397.297	619 627.121	717.924	15.1.70
02B01 LP	61° 2' 58".2816	11° 17' 38".0171	339 709.031	31 038.050	6 770 634.062	623 862.598	613.920	
02B11	61° 2' 58".8628	11° 17' 37".6300	339 726.971	31 032.085	6 770 651.834	623 856.164	614.110	
02B02	61° 0' 24".9597	11° 16' 40".0994	334 955.748	30 209.155	6 765 861.688	623 159.147	647.950	
02B03	61° 0' 33".6472	11° 10' 3".7824	335 333.910	24 250.816	6 766 083.009	617 194.300	730.910	
02B04	61° 2' 59".1637	11° 9' 29".1888	339 679.889	23 702.085	6 770 412.024	616 531.628	670.690	
02B05	61° 4' 15".6969	11° 11' 51".6295	342 063.740	25 822.450	6 772 850.250	618 588.076	637.030	15.1.70
03B00	60° 54' 46".7957	11° 16' 10".5773	324 484.855	29 852.962	6 755 387.395	623 078.274	529.240	
03B01	60° 57' 8".1710	11° 16' 33".6650	328 863.733	30 163.953	6 759 771.952	623 274.065	731.640	
03B02 LP	60° 54' 56".9749	11° 19' 51".1587	324 829.240	33 174.482	6 755 818.818	626 388.871	447.100	
03B12	60° 54' 56".9572	11° 19' 51".7286	324 828.770	33 183.073	6 755 818.575	626 397.471	447.770	
03B03	60° 52' 37".1660	11° 18' 1".9490	320 486.917	31 566.863	6 751 436.725	624 896.180	344.630	25.2.70
03B04	60° 53' 17".4661	11° 13' 15".7980	321 693.843	27 239.839	6 752 534.356	620 539.802	464.743	
03B05	60° 55' 29".7447	11° 12' 32".8454	325 782.366	26 561.575	6 756 603.716	619 754.534	700.508	

NORWEGIAN SEISMIC SYSTEM
CO-ORDINATES

SITE	Geographical co-ordinates		NGO system axis III		UTM system zone 32		Level	Corre
	° North	° East	x	y	x	y		
01C LPV	61°20'14,8263"	10°35' 7,5135"	371669,673	- 7170,428	680 1569,030	584-836,008	978,43	In oper
01C 10Y	61°20'13,4546"	10°35' 8,2385"	371625,330	- 7159,740	680 1524,999	584'847,858	974,54	"
01C 1A1	61°21'17,2450"	10°32' 36,2904"	373605,440	- 9413,957	680 3444,364	582 542,923	922,22	"
01C 1A2	61°22'59,9818"	10°28' 25,5383"	376797,890	- 13128,680	680 6536,715	578 746,490	904,95	"
01C 1A3	61°24'13,9596"	10°31' 50,6081"	379077,590	- 10076,870	680 8895,390	581 736,124	1004,63	"
01C 1C1	61°20'46,2759"	10°38' 4,0405"	372636,837	- 4543,950	680 2604,810	587 435,264	918,80	"
01C 1C2	61°21'12,9977"	10°43' 4,9589"	373460,872	- 70,293	680 3546,275	591 884,295	961,67	"
01C 1C3	61°19'29,9726"	10°42' 49,3073"	370271,712	- 303,339	680 0353,020	591 735,483	799,45	"
01C 1D1	61°18'32,0614"	10°38' 0,6381"	368482,250	- 4600,240	679 8451,451	587 488,536	931,81	"
01C 1D2	61°17'38,2190"	10°42' 20,3333"	366812,434	- 735,256	679 6884,583	591 395,026	864,40	"
01C 1D3	61°16' 9,3848"	10°37' 45,4451"	364065,990	- 4832,660	679 4031,946	587 372,649	990,42	"
01C 1F1	61°18' 0,8621"	10°31' 5,7732"	370107,560	- 10770,214	679 9913,060	581 279,788	939,98	"
01C 1F4	61°20' 2,2700"	10°34' 17,3629"	371280,771	- 7917,111	680 1160,699	584 100,071	928,35	"
02C 00	61°15'50,4921"	10°50' 7,4132"	365340,19	6222,82	679 5596,642	598 387,477	847,07	
02C 01	61°17'55,7048"	10°54' 49,8716"	367368,67	10424,89	679 7734,602	602 533,470	1033,10	
02C 02	61°15'16,2379"	10°54' 39,4914"	362431,92	10284,60	679 2797,208	602 523,358	1054,13	
02C 03	61°14'37,8121"	10°49' 54,5548"	361232,75	6038,15	679 1486,914	598 311,143	714,60	
02C 04LP	61°16'33,3783"	10°45' 46,4103"	364805,85	2334,79	679 4960,186	594 515,985	851,15	
02C 05	61°19'23,1899"	10°49' 21,9076"	370065,87	5537,61	680 0301,290	597 578,143	958,57	
03C 00	61°15'42,1596"	11°24' 50,9030"	363416,30	37284,10	679 4492,413	629 481,051	366,03	
03C 01	61°16'34,3000"	11°29' 25,7390"	365076,01	41361,86	679 6258,670	633 512,816	290,15	
03C 02	61°13'57,9289"	11°28' 21,3322"	360224,62	40458,58	679 1386,142	632 737,869	300,78	
03C 03LP	61°13'30,4434"	11°22' 8,5651"	359314,38	34904,61	679 0330,096	627 210,966	401,50	
03C 04	61°16'42,4397"	11°19' 55,2705"	365238,32	32859,91	679 6196,816	625 011,334	393,93	
03C 05	61°17'52,5649"	11°24' 12,5273"	367446,85	36669,97	679 8504,526	628 761,033	312,08	
04C 00	61° 4'44,6726"	11°43' 7,9837"	343277,00	53947,23	677 4802,674	646 665,505	522,40	
04C 01	61° 4'49,3993"	11°47' 57,9080"	343492,16	58291,34	677 5132,014	651 001,730	583,31	
04C 02	61° 2'40,5527"	11°45' 26,3601"	339467,51	56082,51	677 1051,308	648 899,894	450,56	
04C 03	61° 3'13,4686"	11°40' 5,9093"	340413,55	51258,36	677 1869,980	644 053,355	304,80	
04C 04	61° 5'53,4464"	11°38' 44,2690"	345347,70	49963,56	677 6767,481	642 629,430	332,55	
04C 05LP	61° 6'46,0384"	11°42' 55,2134"	347030,58	53698,77	677 8547,774	646 318,405	496,15	

NORWEGIAN SEISMIC SYSTEM
CO-ORDINATES

SITE	Geographical co-ordinates		NGO system axis III		UTM system zone 32		Level	Correc
	°North	°East	x	y	x	y		
05C 00	60°56' 48,5460"	11°48' 1,3805"	328610,13	58588,41	676 0265,315	651 689,943	425,65	
05C 01	60°58' 37,9490"	11°50' 3,6251"	332026,97	60371,24	676 3727,293	653 382,083	525,32	
05C 02	60°56' 44,9758"	11°53' 3,6147"	328577,40	63140,26	676 0352,208	656 240,384	467,86	
05C 03LP	60°54' 27,0983"	11°47' 53,3527"	324230,25	58539,42	675 5886,353	651 758,042	350,92	
05C 04	60°57' 2,8275"	11°43' 33,4130"	328988,08	54547,55	676 0536,894	647 641,207	391,06	
05C 05	60°58' 53,6814"	11°46' 5,1025"	332454,82	56776,10	676 4060,430	649 777,511	354,08	
06C 00	60°44' 50,3720"	11°27' 30,2163"	306124,80	40303,05	673 7311,772	634 004,365	321,22	
06C 01	60°46' 28,3955"	11°32' 29,7973"	309212,49	44803,57	674 0515,832	638 421,489	248,66	
06C 02LP	60°44' 6,9543"	11°32' 28,9724"	304834,58	44845,70	673 6141,357	638 578,406	305,57	
06C 03	60°42' 18,0246"	11°28' 50,5735"	301423,33	41574,85	673 2646,183	635 398,735	340,94	
06C 04	60°43' 34,6953"	11°23' 44,1020"	303745,73	36901,01	673 4844,818	630 667,158	378,05	
06C 05	60°46' 37,3604"	11°24' 37,2599"	309407,84	37648,19	674 0523,396	631 264,852	242,30	
07C 00	60°27' 19,1931"	11°29' 55,6830"	273615,48	42890,89	670 4887,858	637 442,132	221,50	
07C 01LP	60°29' 38,1724"	11°30' 49,4557"	277926,66	43661,20	670 9216,890	638 099,263	268,21	
07C 02	60°26' 30,8225"	11°34' 19,5752"	272168,23	46944,19	670 3547,369	641 531,136	224,19	
07C 03	60°24' 49,9261"	11°31' 44,3652"	269015,68	44608,83	670 0335,418	639 279,429	191,50	
07C 04	60°25' 14,1342"	11°26' 57,2186"	269713,78	40205,48	670 0918,031	634 860,180	207,57	
07C 05	60°28' 33,0704"	11°25' 37,9034"	275857,69	38925,84	670 7025,157	633 420,572	245,14	
08C 00LP	60°28' 32,1622"	11° 5' 12,4418"	275677,61	20204,27	670 6355,512	614 714,278	480,92	
08C 01	60°30' 7,9168"	11° 9' 24,5494"	278664,67	24036,31	670 9441,071	618 465,955	236,59	
08C 02	60°26' 45,9714"	11° 8' 49,4279"	272410,76	23540,48	670 3177,806	618 133,975	458,02	
08C 03	60°27' 1,2571"	11° 1' 43,2167"	272847,72	17020,89	670 3444,044	611 606,777	309,42	
08C 04	60°29' 45,8574"	11° 0' 49,6150"	277938,58	16178,81	670 8509,856	610 632,059	441,84	
08C 05	60°30' 43,6307"	11° 5' 13,8884"	279746,84	20203,83	671 0422,344	614 607,394	582,84	
09C 00	60°24' 33,8159"	10°36' 13,6448"	268250,96	- 6378,87	669 8238,598	588 346,677	478,76	
09C 01	60°27' 16,6760"	10°38' 23,0232"	273288,65	- 4386,90	670 3324,978	590 200,686	684,11	
09C 02LP	60°24' 30,2621"	10°41' 14,0780"	268135,59	- 1774,64	669 8243,495	592 945,973	665,82	
09C 03	60°22' 32,9233"	10°39' 17,4360"	264505,23	- 3564,08	669 4568,694	591 252,533	571,04	
09C 04	60°23' 48,5139"	10°31' 27,1462"	266859,37	- 10764,05	669 6733,193	583 995,722	339,99	
09C 05	60°26' 22,8824"	10°33' 32,0856"	271631,99	- 8838,77	670 1553,005	585 795,008	447,97	

NORWEGIAN SEISMIC SYSTEM
CO-ORDINATES

SITE	Geographical co-ordinates		NGO system axis III		UTM system zone 32		Level	Corre
	°North	°East	x	y	x	y		
10C 00	60°28' 10,3196"	10°17' 59,8294"	275020,71	-23075,85	670 4567,246	571 478,867	403,86	
10C 01	60°29' 1,1374"	10°22' 6,7829"	276571,33	-19293,84	670 6215,704	575 217,751	529,72	
10C 02LP	60°26' 37,8152"	10°22' 8,5435"	272135,21	-19290,76	670 1782,669	575 336,815	445,08	
10C 03	60°25' 59,6738"	10°16' 43,1658"	270984,82	-24274,55	670 0502,792	570 386,498	425,01	
10C 04	60°27' 53,2194"	10°14' 8,7904"	274515,82	-26610,12	670 3970,297	567 960,237	392,71	
10C 05	60°30' 35,4288"	10°16' 36,5280"	279520,38	-24318,32	670 9031,328	570 119,575	290,86	
11C 00	60°37' 1,6427"	10°14' 59,0637"	291484,58	-25719,86	672 0950,571	568 405,891	242,27	
11C 01	60°38' 13,7137"	10°18' 45,4501"	293692,19	-22262,40	672 3247,201	571 803,152	401,48	
11C 02	60°34' 20,4088"	10°15' 25,8483"	286491,25	-25347,75	671 5970,445	568 908,462	512,04	
11C 03LP	60°35' 28,1325"	10°11' 44,0547"	288612,86	-28709,31	671 8002,588	565 493,710	429,56	
11C 04	60°37' 57,7222"	10°11' 10,6326"	293246,98	-29180,34	672 2621,124	564 901,675	327,75	
11C 05	60°39' 13,4876"	10°14' 47,4537"	295566,67	-25866,91	672 5025,976	568 152,034	534,52	
12C 00	60°46' 22,4231"	9°59' 4,2799"	308974,81	-40047,81	673 8053,174	553 629,757	637,28	
12C 01LP	60°48' 3,0767"	10° 2' 19,0137"	312058,30	-37067,65	674 1212,580	556 526,905	580,42	
12C 02	60°45' 28,4900"	10° 3' 3,0905"	307266,70	-36449,96	673 6440,622	557 269,789	676,38	
12C 03	60°43' 53,2630"	10° 0' 3,4746"	304348,14	-39202,48	673 3452,020	554 595,755	713,33	
12C 04	60°45' 43,5013"	9°54' 25,2584"	307820,09	-44286,33	673 6788,175	549 424,612	763,03	
12C 05	60°48' 38,0582"	9°56' 56,0479"	313195,24	-41939,41	674 2220,922	551 628,862	705,98	
13C 00	61° 2' 59,4719"	9°53' 10,0375"	339899,41	-45016,44	676 8824,634	547 852,883	919,94	
13C 01	61° 5' 40,2799"	9°53' 42,4188"	344870,64	-44467,63	677 3806,613	548 270,570	892,35	
13C 02	61° 4' 14,6484"	9°57' 33,0994"	342178,01	-41032,75	677 1206,293	551 773,730	803,55	
13C 03LP	61° 1' 41,0480"	9°56' 17,3107"	337437,23	-42235,24	676 6437,376	550 696,753	735,15	
13C 04	61° 1' 2,2735"	9°50' 57,4154"	336297,85	-47054,94	676 5172,168	545 910,563	697,19	
13C 05	61° 2' 48,7745"	9°48' 3,6675"	339630,00	-49618,51	676 8434,443	543 261,328	976,68	
14C 00	61°11' 12,9241"	10°16' 22,5956"	354968,55	-24014,14	678 4435,463	568 443,683	492,75	
14C 01	61°13' 29,6828"	10°21' 17,2226"	359174,35	-19588,04	678 8754,901	572 755,990	725,64	
14C 02	61°11' 28,9249"	10°22' 40,8044"	355429,56	-18360,34	678 5044,997	574 081,454	563,12	
14C 03LP	61° 9' 9,9057"	10°18' 32,5541"	351147,81	-22096,36	678 0667,847	570 460,700	510,44	
14C 04	61° 9' 50,7254"	10°12' 52,4248"	352447,15	-27174,24	678 1832,644	565 352,158	829,40	

NORWEGIAN SEISMIC SYSTEM
CO-ORDINATES

SITE	Geographical co-ordinates		NGO system axis III		UTM system zone 32		Level	Corrected
	°North	°East	x	y	x	y		
04B00 LP	60°40'25."7531	11°11'17."2079	297 799.344	25 620.671	6 728 606.187	619 548.393	239.020	16.1.70 A
04B10	60°40'26."1054	11°11'17."0143	297 810.226	25 617.654	6 728 616.983	619 545.092	236.350	16.1.70 A
04B01	60°41'20."6502	11°14'59."4654	299 524.080	28 981.810	6 730 417.942	622 862.432	214.610	16.1.70 A
04B02	60°39' 1."6351	11°15' 2."2381	295 221.589	29 058.492	6 726 119.986	623 051.791	266.813	16.1.70 A
04B03	60°38'24."1940	11°11' 9."3614	294 036.034	25 528.055	6 724 842.619	619 554.433	253.457	16.1.70 A
04B04	60°40'51."5063	11° 7'33."3488	298 573.982	22 216.641	6 729 291.168	616 126.039	163.910	16.1.70 A
04B05	60°42'31."0721	11°10'48."0787	301 675.161	25 151.329	6 732 467.407	618 977.767	242.370	16.1.70 A
05B00	60°37'20."6141	10°50'12."7562	291 984.160	6 430.730	6 722 291.753	600 522.276	428.993	16.1.70 A
05B01	60°39'32."6922	10°51'17."5765	296 074.115	7 408.330	6 726 404.783	601 392.138	231.926	
05B02	60°37'20."4314	10°55'39."6527	291 990.588	11 402.410	6 722 428.384	605 490.734	379.405	
05B03	60°35'19."8492	10°52'31."8755	288 250.550	8 555.250	6 718 616.079	602 743.250	553.745	16.1.70 A
05B04 LP	60°35'46."1879	10°46'45."7102	289 057.376	3 284.358	6 719 284.402	597 454.506	444.804	
05B14	60°35'46."7088	10°46'45."7066	289 073.500	3 284.289	6 719 300.514	597 454.015	442.074	
05B05	60°37'56."1236	10°46'37."0956	293 079.044	3 149.904	6 723 300.027	597 214.821	375.784	
06B00	60°43'48."1278	10°27'32."1219	304 001.912	-14 214.585	6 733 760.942	579 575.342	630.410	
06B01	60°45'19."6419	10°31'47."8266	306 821.065	-10 330.343	6 736 680.046	583 383.110	447.235	
06B02	60°42'54."4478	10°31'21."7813	302 328.119	-10 738.474	6 732 179.362	583 093.015	588.630	
06B03 LP	60°41'54."8110	10°26'08."8603	300 499.776	-15 491.945	6 730 227.673	578 390.611	505.752	
06B13	60°41'54."5127	10°26'09."2101	300 490.519	-15 486.679	6 730 218.560	578 396.117	503.138	
06B04	60°43'54."9120	10°23'25."7891	304 228.808	-17 947.404	6 733 889.848	575 839.081	471.820	
06B05	60°46'21."1877	10°25'52."5552	308 745.857	-15 702.816	6 738 462.699	577 963.742	554.925	
07B00	60°55'11."9951	10°27'56."8184	325 168.072	-13 757.525	6 754 924.962	579 476.817	759.719	
07B01 LP	60°56'29."4167	10°31' 46."5550	327 552.680	-10 288.742	6 757 399.081	582 880.672	506.595	
07B11	60°56'28."9423	10°31' 45."9315	327 538.024	-10 298.174	6 757 384.186	582 871.631	505.175	
07B02	60°53'52."3833	10°31'20."0618	322 693.165	-10 702.505	6 752 531.912	582 594.786	601.367	
07B03	60°53'06."3318	10°25'00."1245	321 289.808	-16 438.120	6 750 978.925	576 899.841	451.793	
07B04	60°55'26."5335	10°23'36."6793	325 635.572	-17 675.114	6 755 289.276	575 549.586	717.609	
07B05	60°57'10."9518	10°27'35."3345	328 851.460	-14 066.513	6 758 597.772	579 071.300	564.279	

NORSAR FREQUENCY RESPONSE CURVES

Short-period seismometers

Frequency response curves from each SP-seismometer in use in a subarray are put together and form an attachment to enclosure No. 4.

The attachments are as follow:

No. 1	-	subarray	01A
No. 2	-	"	01B
No. 3	-	"	02B
No. 4	-	"	03B
No. 5	-	"	04B
No. 6	-	"	05B
No. 7	-	"	06B
No. 8	-	"	07B
No. 9	-	"	01C
No.10	-	"	02C
No.11	-	"	03C
No.12	-	"	04C
No.13	-	"	05C
No.14	-	"	06C
No.15	-	"	07C
No.16	-	"	08C
No.17	-	"	09C
No.18	-	"	10C
No.19	-	"	11C
No.20	-	"	12C
No.21	-	"	13C
No.22	-	"	14C

Sensor 01A00 is the centre SP-seismometer at subarray 01A. Numbering of SP-seismometers starts from the top (north) of the circle and follows the clock.

Note that one of the SP-seismometers in a subarray is collocated with the long-period installation. At subarray 01A this is true for sensor 01A01. At subarray 01B this is true for sensor 01B00. At subarray 13C this is true for sensor 13C03.

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Long-period installations

Frequency response curves from each long-period installation are gathered in attachment No.23.

LP-seismometers have not been installed at subarray 04C and subarray 11C.

[The detailed information on Norway's seismic stations, attached to the above communication, namely - magnification curves; response curves; map of Norwegian Seismic Array (NORSAR); map of bedrock geology; south-eastern Norway; amplitude/frequency diagrams; frequency response diagrams - is deposited in the archives of the United Nations and interested delegations may consult it upon request to the Disarmament Affairs Division.]

/...

REPUBLIC OF KOREA

/Original: English/
20 May 1970

... /transmitted herewith is/ the information concerning the seismic station of the Republic of Korea.

Station name: Seoul Station (SEO)
Station Director: Dr. Yang, In Ki
Address: Central Meteorological Office
1 Songwul-Dong, Sudamoon-Ku, Seoul, Korea
Co-ordinate: Latitude 37-34' N
Longtitude 126-58' E
Elevation above sea-level: 85,5 meters

Long-period system

Vertical

Seismometer free period 30 sec.
Electromechanical constant 0.10⁴ N/A.
Galvanometer free period 100 sec.
Magnification 1,500

North-South

Seismometer free period 30 sec.
Electromechanical constant 0.099 N/A.
Galvanometer free period 100 sec.
Magnification 1,500

East-West

Seismometer free period 30 sec.
Electromechanical 0.98 N/A.
Galvanometer free period 100 sec.
Magnification 1,500

Short-period system

Vertical

Seismometer free period 1.0 sec.
Electromechanical constant 2.0 N/A.
Galvanometer free period 0.78 sec.
Magnification 50,000

North-South

Seismometer free period 1.0 sec.
Electromechanical constant 2.0 N/A.
Galvanometer free period 0.79 sec.
Magnification 50,000

East-West

Seismometer free period 1.0 sec.
Electromechanical constant 2.0 N/A.
Galvanometer free period 0.7⁴ sec.
Magnification 50,000

/...

SPAIN

/Original: Spanish/
6 May 1970

... /attached herewith is/ the documentation containing the characteristics of Spanish seismic stations as well as their general, geographic and geological data and data on their instrumentation.

Part A

The Geographical and Cadastral Institute (Instituto Geográfico y Catastral) could supply on request either contact of 35 mm microfilm copies of records of special seismic events. We have no facilities for the free supply of copies on a regular basis. Thirty-five mm microfilm copies of all Standard-SP and LP records made by the two World-Wide Standard Seismograph Stations (WWSSS) - Toledo and Málaga - might perhaps be available on application to the Washington Data Center.

We enclose copies of the response curves and completed questionnaires for each station separately.

NOTE: The Geographical and Cadastral Institute has installed seismological equipment (which is in operation) in other observatories which are not responsible to the Institute, such as those of Cartuja (Padres Jesuitas) and San Fernando (Instituto y Observatorio de Marina). The latter has sent us the relevant data, which are set out in annex 1. The data supplied by the Fabra Observatory are set out in annex 2.

Part B

The Geographical and Cadastral Institute has no array stations.

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STATION: TOLEDO

1. General data

Name of station: Toledo (Observatorio Central Geofísico
"Alfonso Rey Pastor")

International station code: TOL

Operating organization: Instituto Geográfico y Catastral,
Servicio de Sismología e Ingeniería Sísmica.

Postal address: Calle General Ibañez de Ibero, 3,
Apartado 3007, Madrid 3, Spain.

2. Geographical and geological data

Latitude: $39^{\circ}52'53''$ N

Longitude: $04^{\circ}02'55''$ W

Elevation: 480.5 m

Foundation: Very compact clays of the Upper Miocene.

3. Instrumentation

MODEL	COMPONENT	PERIODS		ABSOLUTE MAGNIFICATION		TYPE OF THE RECORD	PAPER SPEED
		Seism.	Galv.	At 1 sec	At 15 sec		
Standard-SP	Z	1 sec	0.75 sec	25,000		Electromagnetic-Photographic	60 mm/min
Standard-SP	N-S	1 sec	0.75 sec	25,000		Electromagnetic-Photographic	60 mm/min
Standard-SP	E-W	1 sec	0.75 sec	13,000		Electromagnetic-Photographic	60 mm/min
Standard-LP	Z	15 sec	100 sec		1,500	Electromagnetic-Photographic	15 mm/min
Standard-LP	N-S	15 sec	100 sec		1,500	Electromagnetic-Photographic	15 mm/min
Standard-LP	E-W	15 sec	100 sec		1,500	Electromagnetic-Photographic	15 mm/min
Wiechert modified	Z	2.8 sec		2,900 (.)		Mechanical-Smoked paper	20 mm/min
Wiechert modified	N-S	10.8 sec		1,100 (.)		Mechanical-Smoked paper	20 mm/min
Wiechert modified	E-W	11.0 sec		1,000 (.)		Mechanical-Smoked paper	20 mm/min

Note (.): Maximal magnifications, at 2.4 sec, 9.0 sec and 9.0 sec, respectively.

STATION: MALAGA

1. General data

Name of station: Málaga (Observatorio Sismológico)

International station code: MAL (WWSSS)

Operating organization: Instituto Geográfico y Catastral,
Servicio de Sismología e Ingeniería Sísmica.

Postal address: Calle General Ibañez de Ibero, 3,
Apartado 3007, Madrid 3, Spain.

2. Geographical and geological data

Latitude: $36^{\circ}43'39''$ N

Longitude: $04^{\circ}24'40''$ W

Elevation: 60 m

Foundation: Triassic limestone.

3. Instrumentation

MODEL	COMPONENT	PERIODS		ABSOLUTE MAGNIFICATION		TYPE OF THE RECORD	PAPER SPEED
		Seism.	Galv.	At 1 sec	At 15 sec		
Standard-SP	Z	1 sec	0.75 sec	50,000		Electromagnetic-Photographic	60 mm/min
Standard-SP	N-S	1 sec	0.75 sec	25,000		Electromagnetic-Photographic	60 mm/min
Standard-SP	E-W	1 sec	0.75 sec	25,000		Electromagnetic-Photographic	60 mm/min
Standard-LP	Z	15 sec	100 sec		1,500	Electromagnetic-Photographic	15 mm/min
Standard-LP	N-S	15 sec	100 sec		1,500	Electromagnetic-Photographic	15 mm/min
Standard-LP	E-W	15 sec	100 sec		1,500	Electromagnetic-Photographic	15 mm/min

STATION: ALMERIA

1. General data

Name of station: Almería (Observatorio Geofísico)

International station code: ALM

Operating organization: Instituto Geográfico y Catastral,
 Servicio de Sismología e Ingeniería Sísmica.

Postal address: Calle General Ibañez de Ibero, 3,
 Apartado 3007, Madrid 3, Spain.

2. Geographical and geological data

Latitude: $36^{\circ}51'09''$ N

Longitude: $02^{\circ}27'35''$ W

Elevation: 65 m

Foundation: Pliocene limestone.

3. Instrumentation

MODEL	COMPONENT	PERIODS		ABSOLUTE MAGNIFICATION		TYPE OF THE RECORD	PAPEP SPEED
		Seism.	Galv.	At 1 sec	At 15 sec		
Hiller-Stuttgart	Z	1,5 sec	1,5 sec	8,500		Electromagnetic-Photographic	60 mm/min
Hiller-Stuttgart	N-S	1,5 sec	1,5 sec	8,500		Electromagnetic-Photographic	60 mm/min
Hiller-Stuttgart	E-W	1,5 sec	1,5 sec	8,500		Electromagnetic-Photographic	60 mm/min

STATION: ALICANTE

1. General data

Name of station: Alicante (Observatorio Sismológico "Vicente Inglada")

International station code: ALI

Operating organization: Instituto Geográfico y Catastral,
Servicio de Sismología e Ingeniería Sísmica.

Postal address: Calle General Ibañez de Ibero 3,
Apartado 3007, Madrid 3, Spain.

2. Geographical and geological data

Latitude: $38^{\circ}21'19''$ N

Longitude: $00^{\circ}29'14''$ W

Elevation: 35 m

Foundation: Upper Cretaceous.

3. Instrumentation

MODEL	COMPONENT	PERIODS		ABSOLUTE MAGNIFICATION		TYPE OF THE RECORD	PAPER SPEED
		Seism.	Galv.	At 1 sec	At 15 sec		
Hiller-Stuttgart	Z	1,5 sec	1,5 sec	8,500		Elec romagnetic-Photographic	60 mm/min
Hiller-Stuttgart	N-S	1,5 sec	1,5 sec	8,500		Electromagnetic-Photographic	60 mm/min
Hiller-Stuttgart	E-W	1,5 sec	1,5 sec	8,500		Electromagnetic-Photographic	60 mm/min

STATION: LOGROÑO

1. General data

Name of station: Logroño (Observatorio Geofísico)

International station code: LGR

Operating organization: Instituto Geográfico y Catastral,
Servicio de Sismología e Ingeniería Sísmica.

Postal address: Calle General Ibañez de Ibero 3,
Apartado 3007, Madrid 3, Spain.

2. Geographical and geological data

Latitude: $42^{\circ}27'28''$ N

Longitude: $02^{\circ}30'12''$ W

Elevation: 446 m

Foundation: Lacustrine Miocene.

3. Instrumentation

MODEL	COMPONENT	PERIODS		ABSOLUTE MAGNIFICATION		TYPE OF THE RECORD	PAPER SPEED
		Seism.	Galv.	At 1 sec	At 15 sec		
Hiller-Stuttgart	Z	1.3 sec	1.3 sec	6,800		Electromagnetic-Photographic	30 mm/min
Hiller-Stuttgart	N-S	1.3 sec	1.3 sec	6,800		Electromagnetic-Photographic	30 mm/min
Hiller-Stuttgart	E-W	1.3 sec	1.3 sec	6,800		Electromagnetic-Photographic	30 mm/min

STATION: TENERIFE

1. General data

Name of station: Tenerife (Observatorio Sismológico)

International station code: TEN

Operating organization: Instituto Geográfico y Catastral,
Servicio de Sismología e Ingeniería Sísmica.

Postal address: Calle General Ibañez de Ibero 3,
Apartado 3007, Madrid 3, Spain.

2. Geographical and geological data

Latitude: $28^{\circ}27'14''$ N

Longitude: $16^{\circ}14'22''$ W

Elevation: 1 m

Foundation: Volcanics

3. Instrumentation

MODEL	COMPONENT	PERIODS		ABSOLUTE MAGNIFICATION		TYPE OF SPEED	PAPER SPEED
		Seism.	Galv.	At 1 sec.	At 15 sec		
Hiller-Stuttgart	Z	1.5 sec	1.5 sec	8,500		Electromagnetic-Photographic	60 mm/min
Hiller-Stuttgart	N-S	1.5 sec	1.5 sec	7,400		Electromagnetic-Photographic	60 mm/min
Hiller-Stuttgart	E-W	1.5 sec	1.5 sec	6,200		Electromagnetic-Photographic	60 mm/min

Annex 1

Seismology

1. Name of station: SFS
Instituto y Observatorio de Marina,
San Fernando, Cadiz

2. Co-ordinates of station:

Latitude: $36^{\circ}27'42''$ N

Longitude: $06^{\circ}12'19.5''$ W

Elevation: 23 metres a.s.l.

3. <u>Seismometers</u>	<u>Galvanometer</u>	<u>Component</u>	<u>Magnification</u>	
			<u>T=1 sec.</u>	<u>T=15 sec.</u>
Sprengnether T=13.8 sec.	Tg=13.36 sec.	E-W	360	1550
Sprengnether T=13.3 sec.	Tg=55.25 sec.	N-S	154	709
Sprengnether T=1.631	Tg=1.78 sec.	Z	2503	21
Benioff T=1 sec.	Geotech Tg=0.6 sec.	Z		

Two photographic recorders operating at a speed of 30 mm/min. The time signals are obtained from the Time Service of the Observatory, consisting of three quartz clocks with precision greater than one ten thousandth of a second.

4. The station is situated in a tunnel six metres long drilled into a limestone hill.

Annex 2

Real Academia de Ciencias y Artes,
Observatorio Fabra,
Sección Meteorológica y Sísmica,
Rambla de los Estudios, 115,
Barcelona (2).

A. Conventional seismograph station

1. Fabra Observatory, operated by the Royal Academy of Sciences and Arts

2. Latitude: $41^{\circ}24'59.2''$ N

Longitude: $0^{\circ}8'30.2''$ E

Elevation: 415 m

- 3 (a) Short-period Hiller-Stuttgart seismographs

Recording speed: 60 mm/min. (photographic recording)

/...

Component	Period Pendulum	(sec.) Galvano- meter	Galitzin transference factor (K)	Magnification $\frac{aK}{ne}$ V_{max}		Magnification T=1 sec.
Z	1.36	1.34	5,605	14,921	6,591	6,280
E-W	1.31	1.33	5,903	15,224	6,476	6,076
N-S	1.08	1.11	6,195	15,903	5,577	4,615

(b) Long-period Mainka seismographs

Recording speed: 16 mm/min. (mechanical recording)

Annex 2 (i)

Component	Period, T_0	Magnification V	Damping, E : 1	Friction, $\frac{r}{T_0^2}$	Weight, kg
N-S	9.0	50.5	2.12	0.0070	141.2
E-W	9.4	49.4	2.67	0.0077	144.1

(c) Vicentini seismograph

Recording speed: 5 mm/min. (mechanical recording)

Component	Period, T	Magnification, V	Weight, kg
Z	0.9	125	56

Geological description of the station foundation: Palaeozoic slate.

In the recordings which would be supplied, the precision of the time would be indicated.

A response curve in absolute units for the Hiller-Stuttgart seismographs is attached.

/...

[Additional information on Spain's seismic stations, attached to the above communication, containing response curves of these stations, is deposited in the archives of the United Nations and interested delegations may consult it upon request to the Disarmament Affairs Division.]

UNITED ARAB REPUBLIC

Original: English
26 May 1970

... enclosed herewith is the available technical information received from the United Arab Republic Technical Authorities concerning ... seismograph stations.

The only seismic station in the United Arab Republic is the Helwan station:

A. Conventional seismograph stations:

- (i) Name of station and address: Helwan Seismic station.
Helwan Observatory, UAR.

International abbreviation: HIW

- (ii) Co-ordinates of station: 31°20' E
29°51' N

Elevation 115 m.

(iii) Instrumentation and components:

1. Three components Z,N,E of Benioff short-period seismographs.
Seismograph free-period 1 second
Magnification 50,000
Recording speed 60 mm
2. Three components Z,N,E of Ewing-press long-period seismographs.
Seismograph free-period 15 seconds
Magnification 3,000
Recording speed 30 mm/sec

The instruments are installed on a concrete-cement base on limestone bed layer. The observatory regularly makes available copies of the seismic records and sends them to international centres (USA, France and Russia) either as contact copies or 35 mm. microfilms. Such copies or films can be prepared and sent within three days time.

Old copies for the period from 1962 to 1965 are already deposited at the World Data Center, Albuquerque, USA, and are thus available for everyone. From 1965 onwards copies are being sent to the same centre to be filmed and individual

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copies or films are also available on request. It is hoped that our station should benefit from bilateral exchange of copies and data with other centres.

B. Array stations:

There is none at present, but it is planned that a new complete seismic station will be installed by the end of this year. The proposed site is in the region of Aswan south of the United Arab Republic. More particulars about this new station may be available later.

/...

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

/Original: English/
14 May 1970

... herewith /is/ a memorandum containing information about seismograph and array stations in the United Kingdom.

A. INFORMATION ON CONVENTIONAL SEISMOGRAPH STATIONS IN THE UNITED KINGDOM

I. Long-period station at Wolverton

1. Name of station and name and address of the operating organization:

Wolverton Long Period Seismic Station

run by: UKAEA Blacknest, Brimpton, near Reading, Berkshire.

2. Co-ordinates of station and elevation

51°19' N, 01°13' W

Altitude 500 feet above sea-level.

3. Instrumentation and recording

1 Long-period Geotek S11 Vertical Component Seismometer

Magnification approximately 15,000 at 20 seconds period.

(see attached sketch)

Tape and paper records are available for inspection at UKAEA Blacknest. At present only one of each type of recording is made for R and D purposes, but duplicate recording facilities could be installed in order to make the unprocessed data available to another centre at intervals of a few days.

II. Long-period station at Eskdalemuir

1. Name of station and name and address of the operating organization:

Eskdalemuir Long Period Seismic Station

run by: UKAEA Blacknest, Brimpton, near Reading, Berkshire.

2. Co-ordinates of station and elevation

55°20' N, 03°11' W

Altitude 800 feet above sea-level

3. Instrumentation and recording

1 modified Sprengnether long-period vertical component seismometer.

Magnification approximately 5,000 at 20 seconds period.

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Tape and paper records are available for inspection at UKAEA Blacknest. At present only one of each type of recording is made for R and D purposes, but duplicate recording facilities could be installed in order to make the unprocessed data available to another centre at intervals of a few days.

B. INFORMATION ON ARRAY STATIONS IN THE UNITED KINGDOM

1. Name of station and name and address of the operating organization:

Eskdalemuir Seismic Array

run by: UKAEA Blacknest, Brimpton, near Reading, Berkshire.

2. Co-ordinates of station and array points including elevation

Co-ordinates of intersection of crossed array

<u>Geographic</u>	- 55°	19'	59.0" N
	3°	09'	33.0" W
<u>Geocentric</u>	59°	09'	10.0" N
	3°	09'	33.0" W

Altitude of points of intersection 229 metres.

(For disposition of arms of the array and location of individual seismometers on arms, see attached sketch.)

3. Instrumentation geometry of the array 22 seismometers arranged in the form of a right angle cross, with 11 seismometers on each arm. Length of each arm approximately 10 kms, crossing point at 3 kms and 1 1/2 kms down the arms. Arms of the array roughly E-W, N-S. (see attached sketch).

4. Instrumentation and recording.

Vertical Willmore Seismometers MK II
(Response curve as attached).

The original tape recordings of Eskdalemuir Seismic Array are available at Blacknest for a period of two years. Thereafter they are available in compressed form in which they remain suitable for work on distant events only. Under existing arrangements only a single recording is made but it would be possible to supply a second identical tape recording at three-day intervals.

A partially processed record is automatically produced at the array of events which have a signal to noise ratio of two. This record can be supplied at one-month intervals.

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P-onset times of distant events recorded by Eskdalemuir are communicated every month to the International Seismological Centre, Edinburgh. Similar arrangements could be made with other data centres. The clock is kept within ± 50 ms of Universal Time, and times are read to 0.1 s when onsets are well defined.

The sketch of Eskdalemuir Seismic Array, over-all frequency response for constant velocity input of the Array, and response curves, attached to the above communication, are deposited in the archives of the United Nations and interested delegations may consult them upon request to the Disarmament Affairs Division.

VENEZUELA

Original: Spanish
15 May 1970

... transmitted herewith is the information regarding the world-wide exchange of seismic data requested in the communication PO 134/211, dated 30 January 1970, in connexion with General Assembly resolution 2604 A (XXIV).

A LIST OF ALL SEISMIC STATIONS IN VENEZUELA

There are at present five seismic stations in Venezuela, of which three are permanent stations and two auxiliary stations. The instrumentation at the various stations is such that only the equipment at the Instituto Sismológico de Caracas, with its intrinsic constants, could be used for participation in the seismographic monitoring of underground nuclear explosions.

In Venezuela, extensive studies are being conducted on the establishment of a national seismological institute with its own seismographic network. The objective of this is to improve the national and the international contributions both fundamentally and in terms of actual results. Consequently, the following list contains the names of all the seismic stations in Venezuela, including the non-permanent ones, which can be converted at any time into permanent stations with sensitive equipment.

A. Conventional seismograph stations1-1 Instituto Sismológico de Caracas (CAR)

Observatorio Cajigal

Comandancia General de la Marina
Apartado 6745,
Caracas, Venezuela.

(Station of the World-Wide Seismograph System (WWSS))

1-2 Co-ordinates: 66°55'24" W, 10°26'15" N (geoc.)

Elevation: 1,035 m.

/...

1-3 Instrumentation:

- (a) Three short-period Benioff seismographs, WWSS, with photographic recording of the N-S, E-W and Z components.
Speed of recording: 6 cm/min.
Magnification: 25,000 at 1 second period.
- (b) One short-period Benioff seismograph, with photographic recording of the vertical Z component.
Speed of recording: 6 cm/min.
Magnification: 31,500 at 1 second period.
- (c) Six short-period Hess-Akashi seismographs for special projects, with magnetic tape recording (2 x 6 tracks) and/or ink recording (2 x 4 tracks) of 2 x N-S, 2 x E-W and 2 x Z components.
Speed of magnetic tape recording: 5 mm/sec; on paper: variable, up to 50 cm/sec.
Magnification: varying from 0 to 4,000,000 at 1 second period; magnification generally used: 60,000-100,000, owing to natural and industrial vibrations in the subsoil of Caracas.
- (d) As for (b) but with different galvanometer.
Magnification: 2,200 at 1 second period, but is varied according to need.
- (e) One Wiechert seismograph of 20 tons (weight of pendulum), with recording on smoked paper of horizontal N-S and E-W components.
Recording speed: 6 cm/min.
Magnification: 2,200 at 1 second period.
- (f) Two short-period Wood-Anderson seismographs, with photographic recording of the two horizontal E-W and N-S components.
Recording speed: 6 cm/min.
Magnification: 1,300 at 1 second period.
- (g) Three long-period Ewing-Press seismographs (WWSS), with photographic recording of the N-S, E-W and Z components.
Recording speed: 1.5 cm/min.
Magnification: 3,000 at 1 second period.

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- (h) Three long-period Galitzin seismographs, at present disconnected, with photographic recording of N-S, E-W and Z components.
Recording speed: variable.
Magnification: 3,000 at 10 second period.
 - (i) Four long-period horizontal-component Sprengnether seismographs, at present disconnected and intended for the national seismographic network. Photographic recording.
Magnification: 3,000 at approximately 15 second period.
 - (j) Four accelerometers with a total of 11 components, consisting of 3 vertical and 8 horizontal (= 4 longitudinal and 4 transversal).
- 1-4 Foundation: Calcareous-micaceous schist, slightly meteoritic, of the Upper Cretaceous.
- 1-5 Precision of time-keeping: Quartz clock of the WWSS and an auxiliary chronometer, with an accuracy greater than 0.1 sec; automatic recording of GMT in the N-S component of the equipment referred to under 1-3 (a).
Accuracy greater than 0.01 sec for the equipment referred to under 1-3 (c), with own quartz clock for magnetic tape recordings.
- 1-6 Annex: Dynamic response curves of equipment most important for possible monitoring of underground nuclear explosions.
Synchronized equipment: 1 curve.
- 1-7 Exchange of copies and/or original recordings: The original recordings are deposited with the Instituto Sismológico, Caracas, Venezuela. Copies of the six daily recordings made by the WWSS equipment (1-3 (a) and 1-3 (g)) are to be found at the World Data Center, United States Coast and Geodetic Survey (USCGS), Rockville, U.S.A. Other copies (contact or on 16 mm microfilm) only on a bilateral demand.
- 1-8 The results of the analyses of the Caracas, Cumaná, Lagunillas, Mérida and Bailadores seismograms are published in the Boletín Sísmico Mensual (Monthly Seismic Bulletin) of the Instituto Sismológico de Caracas, a copy of which is attached.

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2-1 Cumaná Seismograph Station, in the State of Sucre:

Permanent station on a provisional site. Joint project by the Ministry of Public Works (National Cartography and Special Technical Office for Seismology) and the Instituto Sismológico de Caracas.

Address: Quinta Arismendi No. 179, Cumaná, Estado Sucre, Venezuela.

2-2 Co-ordinates: $64^{\circ}22'00''$ W, $10^{\circ}41'00''$ N (geoc.).

Elevation: 20 m approx.

2-3 Instrumentation:

Three short-period Sprengnether seismographs, with photographic recording of N-S, E-W and Z components.

Recording speed: 6 cm/min.

Magnification: 4,500 for the vertical component and 10,500 for the two horizontal components, all at 1 second period.

2-4 Foundation: Alluvium.

2-5 Precision of time-keeping: Chronometer, with accuracy greater than 0.5 sec; non-automatic recording of GMT.

2-6 Annex: Dynamic response curves of the seismographic equipment at Cumaná. (The long-period Sprengnether seismograph for the horizontal component is still being tested.)

2-7 Exchange of copies and/or original recordings: On a bilateral demand.

3-1 Lagunillas Seismograph Station, in the State of Zulia:

Non-permanent station, a joint project by Creole Petroleum Corporation and the Instituto Sismológico de Caracas.

3-2 Co-ordinates: $71^{\circ}16'13''$ W, $10^{\circ}04'43''$ N (geoc.).

Elevation: -3 m.

3-3 Instrumentation:

One short-period Sprengnether seismograph, with photographic recording of vertical Z component.

Recording speed: 6 cm/min.

Magnification: 3,600 at 1 second period.

3-4 Foundation: Alluvium of Lake Maracaibo, with a tendency for slight, gradual but continual subsidence.

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- 3-5 Precision of time-keeping: Quartz clock, with accuracy greater than 0.2 sec; non-automatic recording of GMT.
- 3-6 Annex: Dynamic response curve for the equipment at Iagunillas.
- 3-7 Exchange of copies: Copies (contact or on 16 mm microfilm) on a bilateral demand.
- 4-1 Mérida Seismograph Station, in the State of Mérida:
Permanent station (most probably), a joint project by the University of California (Seismographic Stations), the University of the Andes (School of Physics) and the Instituto Sismológico de Caracas.
Address: Escuela de Física, U.L.A., Mérida, Venezuela, and/or Instituto Sismológico, Caracas.
- 4-2 Co-ordinates: $71^{\circ}08'41''$ W, $8^{\circ}32'27''$ N (geoc.).
Elevation: 1,600 m.
- 4-3 Instrumentation:
One short-period vertical seismograph with thermosensitive recording.
Recording speed: 6 cm/min.
Magnification: 3,200 at 1 second period.
- 4-4 Foundation: Morainic tableland approximately 100 m thick.
- 4-5 Precision of time-keeping: Chronometer and automatic recording of GMT; accuracy greater than 0.2 sec.
- 4-6 Annex: Dynamic response curve for the equipment at Mérida.
- 4-7 Exchange of copies: On a bilateral demand addressed to the University of California, Seismographic Stations (Dr. Bruce Bolt) or the Instituto Sismológico de Caracas (Dr. Gunther Fiedler).
- 5-1 Bailadores Seismograph Station, in the State of Mérida:
Non-permanent station, a joint project by the University of California (Seismographic Stations), the Ministry of Mines and Hydrocarbons (Geology Department) and the Instituto Sismológico de Caracas.
- 5-2 Co-ordinates: $71^{\circ}49'32''$ W, $8^{\circ}11'27''$ N (geoc.).
Elevation: 1,100 m.
- 5-3 Insirumentation:
One short-period vertical seismograph, with thermosensitive recording.
Recording speed: 6 cm/min.
Magnification: 14,000 at 1 second period.

- 5-4 Foundation: Fluvialile alluvium.
- 5-5 Precision of time-keeping: Quartz clock, with automatic recording of GMT; possible accuracy greater than 0.1 sec.
- 5-6 Annex: Dynamic response curve for the equipment at Bailadores.
- 5-7 Exchange of copies: As for Mérida (4-7).
