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STRONG EARTHQUAKE GROUND MOTION DATA IN EQINFOS:
ACCELEROGRAMS RECORDED IN BULGARIA
BETWEEN 1981 AND 1987

by

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PREFACE

The task of the development of the National System for Recording, Analysis and Prediction of Strong Earthquakes shaking in Bulgaria was based on decision No. 117 of the Bureau of the Ministry Council held on 27 Dec. 1977, after the earthquake which took place on 4 March 1977 and had epicenter in the region of Vrancea (Romania). The necessary equipment, mainly accelerographs, were purchased with the financial support from various government ministries, industry and national councils. At present, at 26 settled areas, 84 accelerographs have been installed and are operating. The establishment, development and maintenance of this National Strong Motion Recording System is carried out by the Central Laboratory of Seismic Mechanics and Seismic Engineering of the Bulgarian Academy of Sciences.

The existence of this National System makes it possible to obtain data on 1) strong earthquake shaking on the territory of Bulgaria and the neighboring countries, and 2) on the effect of this shaking on earth and other structural systems. The important conclusions, based on the analysis of these data, can be used directly in the design practice, and in the development of methods for design of seismically safe structures. The ultimate goal of this work is to reduce the material and human losses during strong earthquakes.

During the period 1981-1987, numerous earthquakes have been recorded, including the ones in the cities of Strazitsa and of Provadia. More precisely, about 60 three-component accelerograms have been registered, which made the data base of stronger earthquakes recorded in Bulgaria. All the records were processed and analyzed in the Central Laboratory of Seismic Mechanics and Seismic Engineering of the Bulgarian Academy of Sciences, considering most recent developments in the field in the USSR, USA, Japan, China and other countries.

The Central Laboratory of Seismic Mechanics and Seismic Engineering is proposing to organize this data into a formal catalogue, to be used in scientific research and in solving various practical problems, in our country and abroad. This catalogue will contain graphical presentation of corrected acceleration, velocity and displacement time histories. Fourier amplitude spectra and response amplitude spectra will be presented for damping

ratios 0, 2, 5, 10, and 20%. The present catalogue does not include some of the recorded components, because of the poor quality of the film copies.

The publishing of the catalogue should be considered as an important step in the efforts of our scientists and specialists in the field in their pursuit to reduce the seismic risk in Bulgaria and on the Balkan peninsula.

Sofia, March 1990.

Prof. Dr. D. Nenov

Director

Central Laboratory of Seismic Mechanics
and Seismic Engineering

INTRODUCTION

The national network for recording, analysis and estimation of strong ground motions in Bulgaria was completed at the end of 1982. To date, 84 accelerographs have been installed at 26 residential sites (Fig. 1). The distribution of the accelerographs is such that the zones with high seismicity are covered. The network consists mainly of SMA-1 accelerographs recording the motion on photographic film. Nine of the instruments have sensitivity 0.5g, and 59 have sensitivity of 1g. There are three SMA-2 accelerographs recording the motion on analog magnetic tape. The FBA-3 accelerometers (12 units), together with the seismic triggering systems, form the FBA-3 system that records on a magnetic tape. Other four FBA-3 accelerometers belong to the CRA-1 system, recording on photographic film.

Part of the accelerographs are installed in buildings. In the buildings with two instruments, one is installed in the basement and the other one on the roof or on the upper floors. In the buildings with one instrument, the instrument is installed either in the basement or at the ground level. Past experience indicated also need for local networks of instruments (in the surroundings of the cities of Strazhitsa and Provadia, for example).

This national network of accelerographs recorded about 60 three-component accelerograms during the last 5 years. This required organization of the resulting data base (Dokey et al, 1987). The gathering of this data base of accelerograms and of various parameters of strong earthquakes, required by the design practice, is in fact an ever lasting process. This process requires organization of the data in such a way that the user spends least time on deciding on the type of data he has to extract from the data base for his work.

It is noted that this report does not contain all the records of events that have happened up to the present. This is because of the time period required for digitization, processing and analysis of the new records. This time period is longer when there are poor quality records and unidentified records.

The operation of the procedure for processing and analysis of the accelerograms can be described by four basic phases:

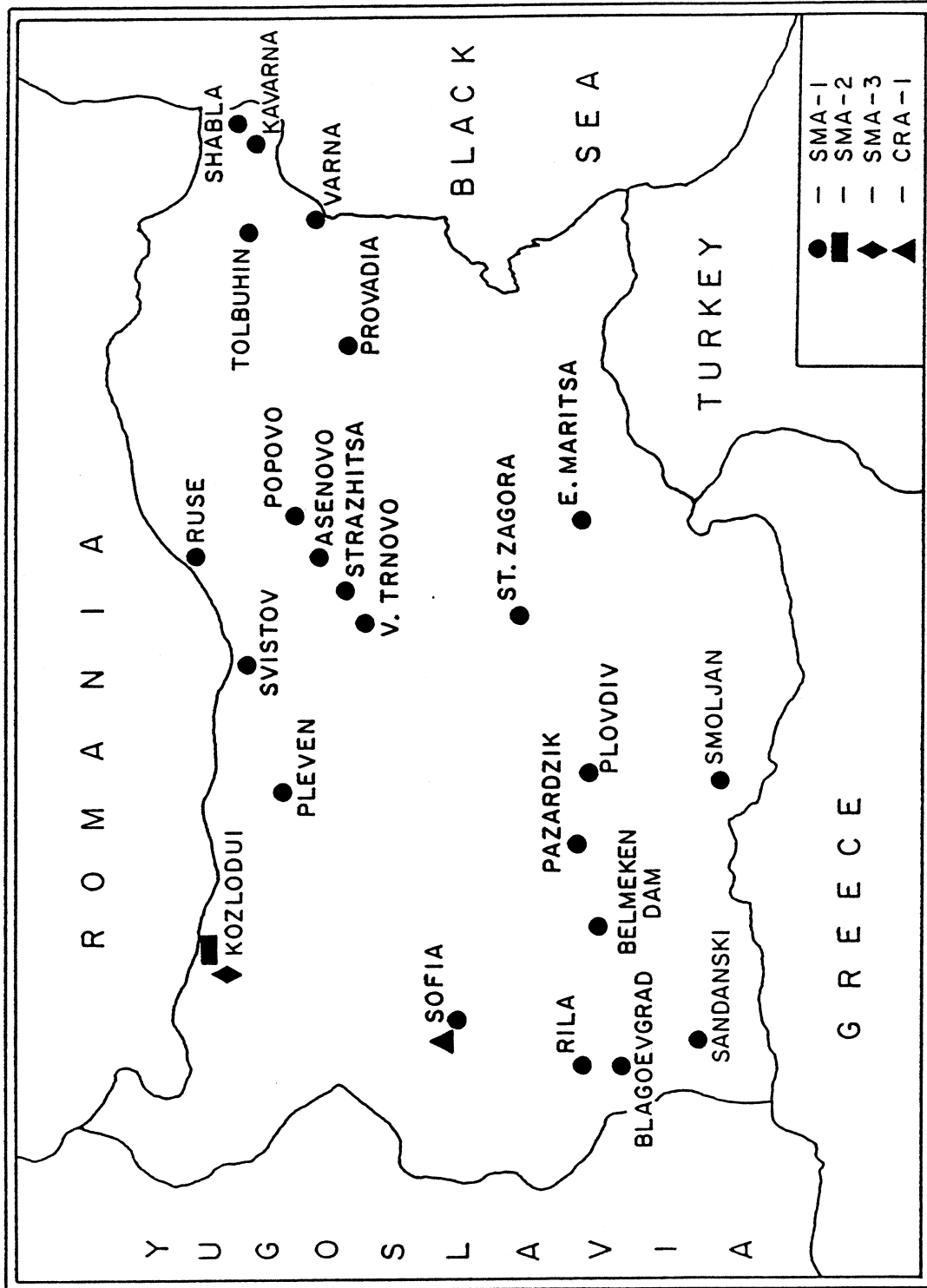


Figure 1 Geographical distribution of strong motion recording sites in Bulgaria.

- digitization and preparation of the uncorrected data;
- instrument correction and correction of errors in the uncorrected data;
- base line correction and calculation of velocity and displacement;
- calculation of Fourier and Response spectra,

For each phase, special investigations are performed so that the data is as close as possible to the actual seismic motion that took place, and according to the latest developments in the area of data processing.

The accelerograms included in this report have been recorded mostly in the basements of buildings or at ground level of one story houses. The latter ones can be considered as "free-field" records (Lee et al, 1982; Moslem and Trifunac, 1987).

From the available data, histograms have been prepared for the number of components of ground motion recorded. In Fig. 2 a histogram is shown representing the distribution of the recorded components of ground motion versus year, magnitude and intensity. In Fig. 3 the distributions of the recorded peak acceleration, velocity and displacement, are shown.

Table 1 represents a list of the earthquakes recorded by the national network of accelerographs. In the first column the sequential number of the earthquake is shown, in the second column - the date of the event (day, month, year) and in the third column - the time of the event (hour, minute, second and part of a second, using Greenwich Mean Time, GMT). In the next two columns are the coordinates of the epicenters (in degrees). The sixth column presents the depth of the focus (in kilometers). In the seventh and eighth columns, the corresponding magnitude and epicentral intensity are given. The name of the earthquake is in the last column. The data for this table have been extracted from the data base of the Geophysical Institute.

In Table 2 the identification numbers of the recordings are presented. The first six columns are analogous with those of Table 1. The last column shows the identification numbers of all records (according to the disk file names in the data base). In the identification number, e.g. IIB013, II-means that the accelerogram has been corrected; B - that

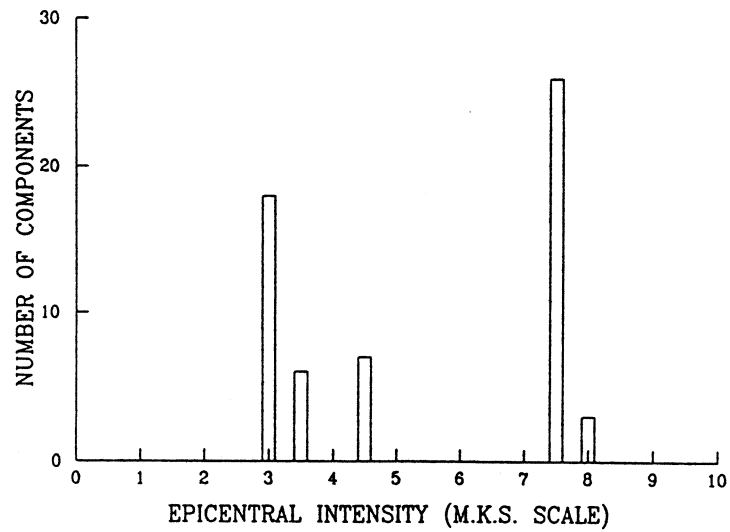
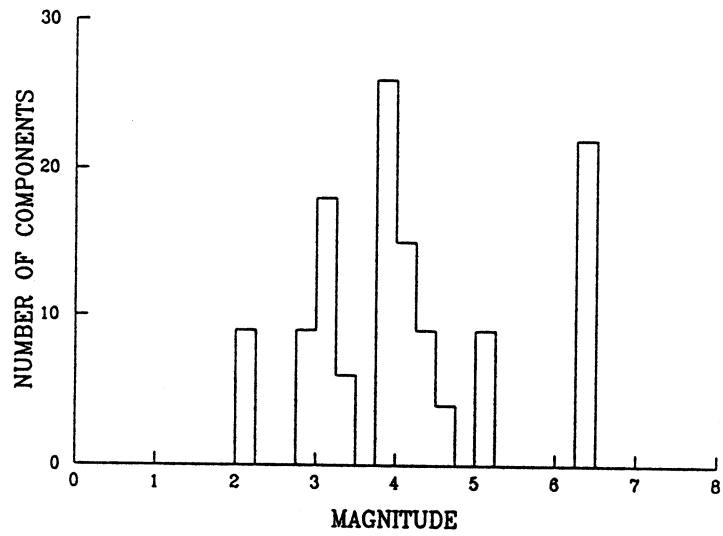
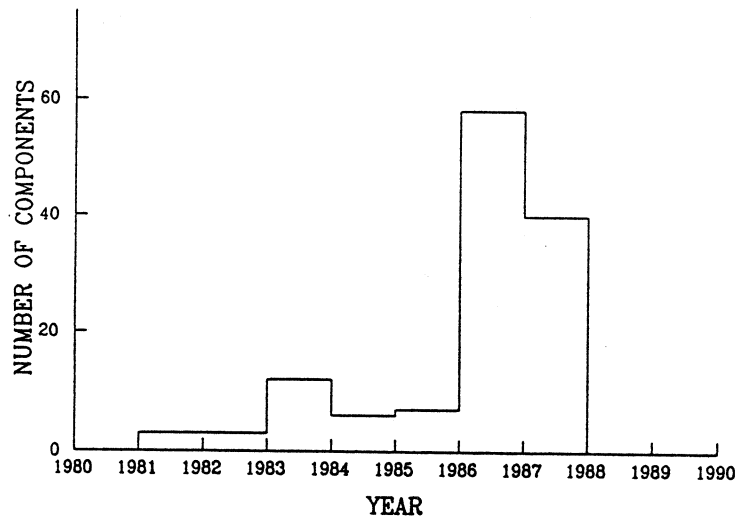


Figure 2 Distribution of recorded components by year, magnitude and epicentral intensity.

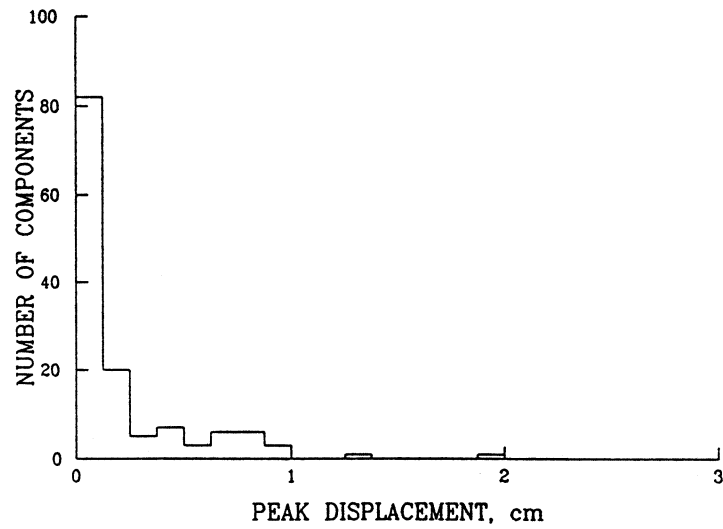
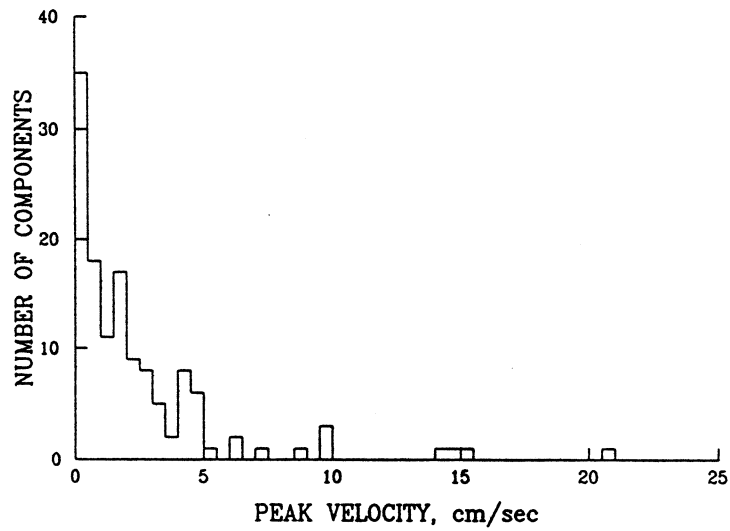
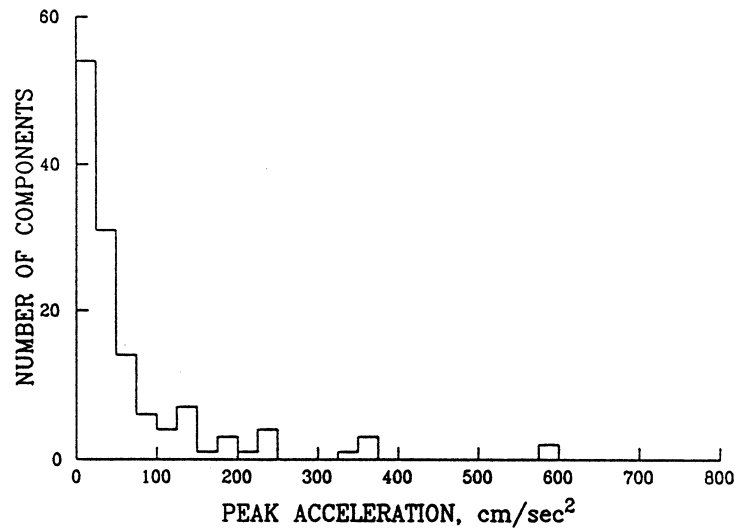


Figure 3 Distribution of recorded components by peak acceleration, peak velocity and peak displacement.

Table 1
LIST OF CONTRIBUTING EARTHQUAKES

EQ#	DATE	TIME, GMT	LAT	LONG	DEPTH	MAG	I (MSK)	EQ NAME	
1.	xxx xx,	1981						PROVADIA	
2.	AUG 31,	1982	0345	43.1	27.5	3.2	IV	PROVADIA	
3.	JUN 15,	1983	1507	43.4	27.3	2.7		PROVADIA	
4.	NOV 10,	1983	1728	43.1	27.5	4.0	4.2	VI-VII	PROVADIA
5.	JUN 14,	1984	1411	43.2	27.4	3.2	III	PROVADIA	
6.	JUN 12,	1985	1405	43.1	27.6	6.0	4.0	VI	PROVADIA
7.	FEB 21,	1986	0539	43.3	26.0	11.0	5.1	VII-VIII	STRAZHITSA
8.	MAY 15,	1986	1645	41.9	23.1	34.0	4.3	V-VI	KRUPNIK
9.	AUG 30,	1986	2128	45.6	26.3	139.0	6.3	VII-VIII	VRANCEA
10.	DEC 07,	1986	1417	43.2	26.0	9.7	5.7	VIII	STRAZHITSA
11.	DEC 12,	1986	0128	43.2	26.1	0.0	3.5		STRAZHITSA
12.	DEC 12,	1986	1929	43.3	26.1	13.0	4.3		STRAZHITSA
13.	DEC 17,	1986	2201	43.3	26.1	9.0	4.6	VI-VII	STRAZHITSA
14.	DEC 18,	1986	1716	43.3	26.1	13.0	4.4	VI-VII	STRAZHITSA
15.	DEC 18,	1986	2339	43.2	26.1	7.0	3.1		STRAZHITSA
16.	DEC 20,	1986	1143	43.2	26.2	9.0	2.6		STRAZHITSA
17.	DEC 27,	1986	0159	43.2	26.1	0.0	2.2		STRAZHITSA
18.	JAN 17,	1987	2045	43.3	25.9		2.25		STRAZHITSA
19.	JAN 18,	1987	0932	43.2	26.0	6.0	2.9		STRAZHITSA
20.	JAN 21,	1987	0954	43.3	26.1	7.0	4.0	VI	STRAZHITSA
21.	JAN 29,	1987	2143	43.2	26.0	7.0	3.1		STRAZHITSA
22.	MAY 02,	1987	1402	43.1	27.4	7.0	3.6	III	PROVADIA

* - Data Base of Geophysical Institute, BAS, Sofia

Table 2

CROSS-INDEX OF EARTHQUAKES AND RECORD DATA FILES

#	YEAR	TIME, GMT	EQ NAME	MAG	I (MSK)	FILE REF #
1.	1981		PROVADIA			IIB001
2.	1982	034506.2	PROVADIA	3.2	IV	IIB002
3.	1983	150703.2	PROVADIA	2.7		IIB003, IIB004
4.	1983	172820.7	PROVADIA	4.2	VI-VII	IIB005, IIB006
5.	1984	141140.7	PROVADIA	3.2	III	IIB007, IIB008
6.	1985	140519.0	PROVADIA	4.0	VI	IIB009, IIB010, IIB012
7.	1986	053956.3	STRAZHITSA	5.1	VII-VIII	IIB013, IB14
8.	1986	164521	KRUPNIK	4.3	V-VI	IIB015, IIB016, IIB017
9.	1986	212835.4	VRANCEA	6.3	VII-VIII	IIB018, IIB019, IIB020, IIB021, IIB022, IIB023, IIB024, IIB026
10.	1986	141709.1	STRAZHITSA	5.7	VIII	IIB025
11.	1986	012848.6	STRAZHITSA	3.5		IIB027
12.	1986	192953.7	STRAZHITSA	4.3		IIB028
13.	1986	220146.2	STRAZHITSA	4.6	VI-VII	IIB029
14.	1986	171616.2	STRAZHITSA	4.4	VI-VII	IIB030
15.	1986	233916.4	STRAZHITSA	3.1		IIB031
16.	1986	114328.7	STRAZHITSA	2.6		IIB032
17.	1986	015950.2	STRAZHITSA	2.2		IIB033
18.	1987	204542	STRAZHITSA	2.25		IIB034
19.	1987	093246.3	STRAZHITSA	2.9		IIB035
20.	1987	095405.2	STRAZHITSA	4.0	VI	IIB036, IIB037, IIB038, IIB039, IIB040, IIB041
21.	1987	214331.3	STRAZHITSA	3.1		IIB042A, IIB042B, IIB042C
22.	1987	140227	PROVADIA	3.6	III	IIB043, IIB044, IIB045

the recording has been in Bulgaria; and 13 - is the sequential number of the record in the data base.

In Table 3 the epicentral distances of the stations are shown. In the first three columns the sequential number and the name and the date of the earthquake are shown. In the fourth and the fifth columns are the identification number and the address of the station, respectively. In the last column the distances D in km from the epicenter to the stations are presented.

For a given identification or a logical file number of the record, Table 4 gives the address of the recording site. The first two digits of the logical file number, for example 87.122.3872, stand for the year of the recording. The next three digits, 122 in the above example, represent the date of the event according to the Julian calendar, and the last four digits, 3872 in this example, designate the serial number of the accelerograph.

In Table 5, the corresponding orientations of the components are given for each of the identification and the logical file numbers of the record.

Table 6 presents information on the maximum amplitude of the recorded acceleration, A_{max} , velocity, V_{max} , displacement, D_{max} , the times of their occurrence (t_{max}) and the frequency window of the filter ($f_1 - f_2$) used. The amplitudes of the acceleration are in cm/s^2 , of the velocity - in cm/s and of the displacement in cm . The frequency window is in Hz and, for the frequencies in this interval, signal-to-noise ratio is greater than one (Georgiev and Paskaleva, 1987).

The main part of this report consists of figures which give graphical presentation of the records. The first figure presents the corrected acceleration. In the second figure the Fourier and the Response Spectra of the accelerograms are shown. Such a pair of figures repeats for the three components of each record. In the title data of the first figure are shown: the name, the date and the time of the earthquake, the identification numbers of the record (II means that the data has been corrected), the place where the data has been recorded, and the maximum amplitudes of acceleration. The title data of the second figure repeats most of the same information. The Fourier amplitude spectrum is drawn

Table 3

EPICENTRAL DISTANCE FROM THE SOURCE TO THE ACCELEROGRAPH STATION

#	EQ NAME	DATE	REF #	ADDRESS	D, km
1.	PROVADIA	XXX XX, 1981	IIB001	PROVADIA, Clock tower	
2.	PROVADIA	AUG 31, 1982	IIB002	PROVADIA, Clock tower	6
3.	PROVADIA	JUN 15, 1983	IIB003	PROVADIA, Clock tower	13
			IIB004	PROVADIA, Salt plant	14.5
4.	PROVADIA	NOV 10, 1983	IIB005	PROVADIA, Clock tower	9
			IIB006	PROVADIA, Salt plant	10.5
5.	PROVADIA	JUN 14, 1984	IIB007	PROVADIA, Clock tower	9.2
			IIB008	PROVADIA, Salt plant	10.5
6.	PROVADIA	JUN 12, 1985	IIB009	PROVADIA, Salt plant	9.5
			IIB010	PROVADIA, Vinprom	9
			IIB012	DOBRINA, Prov. obst.	8
7.	STRAZHITSA	FEB 21, 1986	IIB013, IIB014	V. TARNOVO, "Novo vreme"	17
8.	KRUPNIK	MAY 15, 1986	IIB015	RILA, Obst. savet	27.5
			IIB016, IIB017	BLAGOEVGRAD, University	12.5
9.	VRANCEA	AUG 30, 1986	IIB018-IIB023	KOZLODUI	209
			IIB024	RUSE, Power plant	200
			IIB026	SVIZTOV, Stud. house	235
10.	STRAZHITSA	DEC 07, 1986	IIB025	V. TARNOVO, "Novo vreme"	16
11.	STRAZHITSA	DEC 12, 1986	IIB027	STRAZHITSA, "Dunav" str.10	5.5
12.	STRAZHITSA	DEC 12, 1986	IIB028	STRAZHITSA, "Dunav" str.10	4.5
13.	STRAZHITSA	DEC 17, 1986	IIB029	STRAZHITSA, "Dunav" str.10	3.5
14.	STRAZHITSA	DEC 18, 1986	IIB030	STRAZHITSA, "Dunav" str.10	5.5
15.	STRAZHITSA	DEC 18, 1986	IIB031	STRAZHITSA, "Dunav" str.10	23.5
16.	STRAZHITSA	DEC 20, 1986	IIB032	STRAZHITSA, "Dunav" str.10	4.5
17.	STRAZHITSA	DEC 27, 1986	IIB033	STRAZHITSA, "Osogova" str.	4
18.	STRAZHITSA	JAN 17, 1987	IIB034	STRAZHITSA, "Osogova" str.	7
19.	STRAZHITSA	JAN 18, 1987	IIB035	STRAZHITSA, "Osogova" str.	21.5

Table 3
(cont.)

20. STRAZHITSA JAN 21, 1987	IIB036	STRAZHITSA, "Osogova" str.	4.0
	IIB037	POPOVO, City market	18.0
	IIB038	ASENOVO	7.0
	IIB039	POPOVO, Hospital	18.5
	IIB040	STRAZHITSA, "Dunav" str.10	5.0
	IIB041	STRAZHITSA, "B.Kiro" str.41	5.5
21. STRAZHITSA JAN 29, 1987	IIB042A	STRAZHITSA, "Osogova" str.	9.0
	IIB042B	STRAZHITSA, "B.Kiro" str.41	9.5
	IIB042C	STRAZHITSA, "Dunav" str.10	9.5
22. PROVADIA MAY 02, 1987	IIB043	PROVADIA, Salt plant	27.0
	IIB044	DOBRINA, Prov.obst.	25.0
	IIB045	PROVADIA, Vinprom	26.5

Table 4

CROSS-INDEX OF RECORD DATA FILES AND STATION ADDRESSES

REF.#	LOG.#	EQ#	ADDRESS
IIB001	81.000.4167	1	PROVADIA,Clock tower, top
IIB002	82.243.4167	2	PROVADIA,Clock tower, top
IIB003	83.166.4167	3	PROVADIA,Clock tower, top
IIB004	83.166.4240	3	PROVADIA,Salt plant, chem.lab
IIB005	83.314.4167	4	PROVADIA,Clock tower, top
IIB006	83.314.4240	4	PROVADIA,Salt plant,chem.lab.
IIB007	84.166.4167	5	PROVADIA,Clock tower, top
IIB008	84.166.4240	5	PROVADIA,Salt plant,chem.lab.
IIB009	85.163.4240	6	PROVADIA,Salt plant,chem.lab.
IIB010	85.163.3872	6	PROVADIA,Vinprom
IIB012	85.163.3848	6	DOBRINA,Provad.obst.
IIB013	86.052.4183	7	V.TARNOVO,"Novo vreme",6 st.block,bsmnt
IIB014	86.052.4177	7	V.TARNOVO,"Novo vreme",6 st.block,top
IIB015	86.135.4172	8	RILA, building, bsmnt
IIB016	86.135.3850	8	BLAGOEVGRAD,University,bsmnt
IIB017	86.135.3851	8	BLAGOEVGRAD,University,top
IIB018	86.243.193-2	9	KOZLODUI, station #1
IIB019	86.243.194-1	9	KOZLODUI, station #2
IIB020	86.243.192-3	9	KOZLODUI, station #3
IIB021	86.243.192-2	9	KOZLODUI, station #4
IIB022	86.243.193-1	9	KOZLODUI, station #5
IIB023	86.243.193-3	9	KOZLODUI, station #6
IIB024	86.243.3846	9	RUSE, Power plant, PPO
IIB026	86.243.3866	9	SVISTOV,Stud.house , 7-th floor

Table 4
(cont.)

IIB025	86.341.4183	10	V.TARNOVO, "Novo vreme", 6 st.block, bsmnt
IIB027	86.346.3845	11	STRAZHITSA, "Dunav"str. 10
IIB028	86.346.3845	12	STRAZHITSA, "Dunav"str. 10
IIB029	86.351.3845	13	STRAZHITSA, "Dunav"str. 10
IIB030	86.352.3845	14	STRAZHITSA, "Dunav"str. 10
IIB031	86.352.3845	15	STRAZHITSA, "Dunav"str. 10
IIB032	86.354.3845	16	STRAZHITSA, "Dunav"str. 10
IIB033	86.361.4174	17	STRAZHITSA, "Osogova"str.
IIB034	87.017.4174	18	STRAZHITSA, "Osogova"str.
IIB035	87.018.4174	19	STRAZHITSA, "Osogova"str.
IIB036	87.021.4147	20	STRAZHITSA, "Osogova"str.
IIB037	87.021.4236	20	POPOVO, City market
IIB038	87.021.4169	20	ASENOVO, D.Ivanov house
IIB039	87.021.4165	20	POPOVO, Hospital-ATZ
IIB040	87.021.3845	20	STRAZHITSA, "Dunav"str. 10
IIB041	87.021.4221	20	STRAZHITSA, "B.Kiro"str. 41
IIB042A	87.029.4171	21	STRAZHITSA, "Osogova"str.
IIB042B	87.029.4221	21	STRAZHITSA, "B.Kiro"str. 41
IIB042C	87.029.3845	21	STRAZHITSA, "Dunav"str. 10
IIB043	87.122.4240	22	PROVADIA, Salt plant, chem.lab
IIB044	87.122.3848	22	DOBRINA, Provad. obst.
IIB045	87.122.3872	22	PROVADIA, Vinprom

Table 5

CROSS-INDEX OF RECORD DATA FILES WITH COMPONENT DIRECTION

REF.#	LOG.#	EQ#	ADDRESS	COMP. DIR.
IIB001	81.000.4167	1	PROVADIA, Clock tower, top	S15W, UP, S75E
IIB002	82.243.4167	2		
IIB003	83.166.4167	3		
IIB005	83.314.4167	4		
IIB007	84.166.4167	5		
IIB004	83.166.4240	3	PROVADIA, Salt plant, chem.lab.	S00E, UP, S90E
IIB006	83.314.4240	4		
IIB008	84.166.4240	5		
IIB009	85.163.4240	6		
IIB043	87.122.4240	22		
IIB012	85.163.3848	6	DOBRINA, Prov.obst.	S00E, UP, S90E
IIB044	87.122.3848	22		
IIB010	85.163.3872	6	PROVADIA, Vinprom	N00W, UP, N90W
IIB045	87.122.3872	22		
IIB013	86.052.4183	7	V.TARNOVO, res.building	S46E, UP, N44E
IIB025	86.341.4183	10	"Novo vreme",6 st.block, bsmnt	
IIB014	86.052.4177	7	V.TARNOVO, res.building "Novo vreme",6 st.block, top	S60W, UP, S30E
IIB015	86.135.4172	8	RILA, Obst.bldg.	N68W, UP, S22W
IIB016	86.135.3850	8	BLAGOEVGRAD, University, bsmnt	N61E, UP, N29W
IIB017	86.135.3854	8	BLAGOEVGRAD, University, top	N23W, UP, S67W
IIB018	86.243.193-2	9	KOZLODUI, station #1	*
IIB019	86.243.194-1	9	KOZLODUI, station #2	*
IIB020	86.243.192-3	9	KOZLODUI, station #3	*
IIB021	86.243.192-2	9	KOZLODUI, station #4	*
IIB022	86.243.193-1	9	KOZLODUI, station #5	*
IIB023	86.243.193-3	9	KOZLODUI, station #6	*
IIB024	86.243.3846	9	RUSE, Power plant, PPO	S20W, UP, S70E
IIB026	86.243.3866	9	SVISTOV, Stud.house	N79W, UP, S11W
IIB027	86.346.3845	11	STRAZHITSA, "Dunav"str.10	S90W, UP, S00W
IIB028	86.346.3845	12		
IIB029	86.351.3845	13		
IIB030	86.352.3845	14		
IIB031	86.352.3845	15		
IIB032	86.354.3845	16		
IIB040	87.021.3845	20		
IIB042C	87.029.3845	21		

Table 5
(cont.)

IIB033	86.361.4174	17	STRAZHITSA, "Osogova"str.	S00E, UP, S90E
IIB034	87.017.4174	18		
IIB035	87.018.4174	19		
IIB036	87.021.4174	20		
IIB042A	87.029.4174	21		
IIB041	87.021.4221	20	STRAZHITSA, "B.Kiro"str.41	S00E, UP, S90E
IIB042B	87.029.4221	21		
IIB037	87.021.4236	20	POPOVO, City market	N00W, UP, N90W
IIB038	87.021.4169	20	ASENOVO, house of D.Ivanov	S00E, UP, S90E
IIB039	87.021.4165	20	POPOVO, hospital - ATZ	S00E, UP, S90E

* - FBA-3 ORIENTATION NOT AVAILABLE AT THE TIME OF WRITING OF THIS REPORT

Table 6

CROSS-INDEX OF RECORD DATA FILES WITH PEAK ACCELERATION (A_{max} , cm/s**2),
 PEAK VELOCITY (V_{max} , cm/s), PEAK DISPLACEMENT (D_{max} , cm),
 TIME OF THERE MAXIMUM (t_{max} , s) AND FREQUENCY BAND ($f_1 - f_2$, Hz)

REF.#	Amax	tmax	Vmax	tmax	Dmax	tmax	f1 - f2
IIB001L	-12.458	0.5	0.419	0.34	-0.02	0.24	1.3 - 25
IIB001V	11.388	0.12	0.295	0.14	-0.01	0.12	1.5 - 25
IIB001T	10.914	0.7	-0.3	1.5	0.017	2.34	1.25 - 25
IIB002L	-18.054	0.06	-0.727	0.1	0.444	0.64	0.9 - 25
IIB002V	-20.689	0.12	-0.584	0.14	0.014	0.1	1.60 - 25
IIB002T	19.487	0.38	-0.768	0.14	0.037	0.56	1.00 - 25
IIB003L	12.587	0.74	0.698	0.34	0.034	0.42	1.1 - 25
IIB003V	12.463	1.42	0.293	0.06	0.01	0.32	1.6 - 25
IIB003T	-18.101	0.22	-0.554	0.26	0.02	0.22	1.0 - 25
IIB004L	-12.571	0.08	0.317	0.06	0.014	0.08	2.0 - 25
IIB004V	- 6.523	0.46	0.143	0.56	-0.005	0.52	2.1 - 25
IIB004T	16.356	0.08	-0.357	0.54	-0.024	0.08	2.0 - 25
IIB005L	-248.450	1.66	9.730	1.62	-0.742	2.14	0.55 - 25
IIB005V	201.278	1.74	-4.276	1.70	0.248	3.08	0.50 - 25
IIB005T	253.975	1.72	-14.478	1.66	1.265	1.50	0.30 - 25
IIB006L	194.010	0.44	6.354	0.50	-0.357	0.44	0.62 - 25
IIB006V	108.462	0.53	-2.678	0.44	-0.119	0.52	1.0 - 25
IIB006T	-130.343	0.48	4.358	0.68	0.215	0.48	0.90 - 25
IIB007L	57.328	0.84	-2.146	2.30	-0.142	1.90	1.0 - 25
IIB007V	56.830	2.40	-1.175	2.38	-0.039	2.52	0.75 - 25
IIB007T	54.549	2.38	-1.336	2.34	0.071	2.18	1.10 - 25
IIB008L	18.846	0.16	-1.004	0.12	0.027	0.04	1.30 - 25
IIB008V	-9.333	0.02	-0.189	0.10	-0.008	0.12	2.0 - 25
IIB008T	13.085	1.1	0.542	0.52	-0.02	1.10	1.50 - 25
IIB009V	45.758	0.50	0.82	0.52	-0.020	0.50	2.00 - 25
IIB009L	46.773	0.64	0.78	1.26	-0.040	0.52	1.40 - 25
IIB009T	42.017	0.86	1.62	0.88	0.042	0.50	1.10 - 25
IIB010L	-194.664	0.56	4.628	0.36	-0.229	0.66	0.70 - 25
IIB010V	133.730	0.30	-2.624	0.26	-0.180	0.30	0.625- 25
IIB010T	-149.254	0.30	-4.488	0.38	0.269	0.30	0.55 - 25
IIB012T	586.365	0.57	-20.526	0.54	-0.975	0.59	0.45 - 25
IIB013L	-28.512	3.38	2.084	3.30	0.214	3.40	0.55 - 25
IIB013V	17.979	2.94	-0.890	2.86	0.074	2.72	0.75 - 25
IIB013T	-38.439	2.50	-2.632	2.64	0.243	2.52	0.50 - 25

Table 6
(Cont.)

IIB014L	124.598	8.94	8.841	9.06	-0.667	10.50	0.45 - 25
IIB014V	-31.027	5.86	-1.398	8.88	-0.089	8.98	0.70 - 25
IIB014T	-72.368	9.74	-5.046	7.92	0.563	9.72	0.55 - 25
IIB015L	-6.160	0.44	-0.281	0.48	0.008	0.46	2.00 - 25
IIB015V	4.295	0.04	0.158	0.08	-0.007	0.48	2.00 - 25
IIB015T	7.687	0.42	0.380	0.50	-0.010	0.44	2.00 - 25
IIB016L	-11.484	2.20	-0.572	2.24	-0.036	2.34	1.10 - 25
IIB016V	6.024	0.22	-0.197	3.66	-0.012	4.54	1.10 - 25
IIB016T	-13.484	2.12	0.437	2.08	0.021	2.42	1.10 - 25
IIB017L	33.339	2.46	1.493	3.36	-0.069	3.28	1.30 - 25
IIB017V	12.220	0.22	-0.506	4.46	-0.023	4.90	1.30 - 25
IIB017T	-34.350	2.62	-1.841	4.78	-0.118	4.88	1.25 - 25
IIB018L	46.248	2.81	-4.637	2.71	0.861	8.69	0.32 - 50
IIB018V	17.666	1.58	1.653	23.32	0.408	27.58	0.27 - 50
IIB018T	19.629	0.90	-2.216	0.78	0.457	37.06	0.30 - 50
IIB019L	-43.140	2.92	3.817	2.80	0.652	35.86	0.30 - 50
IIB019V	22.892	1.66	-1.721	26.56	-0.503	31.64	0.25 - 50
IIB019T	49.873	2.94	-4.151	2.82	0.855	7.14	0.375- 50
IIB020L	47.075	2.92	-4.456	2.80	0.820	7.12	0.23 - 50
IIB020V	26.990	1.64	1.943	1.82	-0.409	1.64	0.30 - 50
IIB020T	27.865	1.02	-2.461	16.44	-0.627	12.28	0.25 - 50
IIB021L	47.888	2.92	-4.898	2.80	0.780	7.14	0.225- 50
IIB021V	23.059	1.70	1.603	23.38	0.418	25.52	0.325- 50
IIB021T	21.354	1.06	-2.187	0.92	-0.577	16.98	0.225- 50
IIB022L	46.186	3.00	-4.620	1.04	0.684	7.16	0.275- 50
IIB022V	21.874	1.72	-1.638	26.36	0.424	26.02	0.375- 50
IIB022T	-46.101	3.02	4.104	2.92	0.892	6.12	0.325- 50
IIB023L	32.045	1.42	2.218	1.10	-0.245	0.96	0.750- 50
IIB023V	-17.154	1.52	1.473	1.42	0.167	1.54	0.800- 50
IIB023T	40.596	0.78	4.217	0.90	0.451	1.04	0.750- 50
IIB024L	-75.491	30.58	-9.809	26.96	-2.070	27.40	0.280- 25
IIB024V	27.348	30.82	-1.598	23.32	0.262	25.68	0.350- 25
IIB025L	-66.927	5.58	3.476	5.52	-0.290	7.46	0.500- 25
IIB025V	-40.534	6.12	2.774	6.08	0.164	8.24	0.700- 25
IIB025T	74.502	4.94	4.229	3.14	-0.738	4.12	0.275- 25
IIB026L	84.748	26.66	8.014	27.14	-1.560	26.66	0.225- 25
IIB026V	-36.896	27.96	-2.287	36.24	0.455	35.72	0.275- 25
IIB026T	74.278	27.36	-7.010	34.56	1.414	28.32	0.200- 25

Table 6
(Cont.)

IIB027L	-10.110	1.56	0.266	1.54	0.010	3.66	1.300- 25
IIB027V	-3.640	1.76	0.163	1.68	-0.007	2.22	1.400- 25
IIB027T	7.837	1.56	0.261	3.72	0.027	3.94	0.800- 25
IIB028L	157.056	2.19	-3.220	2.16	0.120	2.04	0.450- 25
IIB028V	-48.197	2.26	0.900	1.95	0.036	1.97	0.525- 25
IIB028T	-134.426	2.16	3.033	2.14	-0.161	1.97	0.550- 25
IIB029L	-329.513	2.23	6.332	2.21	0.206	2.70	1.00 - 25
IIB029V	88.310	2.32	-1.614	2.96	-0.119	2.12	0.550- 25
IIB029T	361.822	2.22	9.937	2.28	-0.898	2.22	0.320- 25
IIB030L	130.466	2.32	-3.826	2.28	-0.214	5.00	0.500- 25
IIB030V	-26.046	2.38	0.746	2.56	-0.045	2.46	0.550- 25
IIB030T	-135.783	2.34	4.701	2.30	0.219	2.34	0.500- 25
IIB031L	27.286	0.08	-0.384	0.06	-0.016	0.08	1.100- 25
IIB031V	-8.239	0.08	0.102	0.76	0.007	2.68	1.250- 25
IIB031T	-32.416	0.16	-0.545	0.18	0.031	0.16	0.900- 25
IIB032L	19.538	0.86	-0.257	0.84	-0.008	1.96	1.400 - 25
IIB032T	6.494	0.82	0.118	0.90	0.006	0.92	1.500 - 25
IIB033L	6.152	0.02	-0.236	1.70	0.012	1.54	1.300 - 25
IIB033V	5.650	0.00	0.110	0.04	0.005	0.34	1.500 - 25
IIB033T	-3.620	0.20	0.182	0.84	0.011	0.92	1.400 - 25
IIB034L	9.489	0.54	-0.218	0.64	0.018	2.90	1.300 - 25
IIB034V	4.567	0.52	0.130	0.56	-0.007	3.46	1.600 - 25
IIB034T	5.530	0.38	-0.150	0.32	0.012	2.30	1.300 - 25
IIB035L	18.138	0.72	-0.490	0.70	-0.019	1.48	1.300 - 25
IIB035V	10.516	0.16	-0.195	0.70	-0.008	0.74	1.500 - 25
IIB035T	-14.135	1.00	0.339	0.96	0.017	0.88	1.400 - 25
IIB036L	72.226	1.82	-2.633	1.76	0.169	1.68	0.650 - 25
IIB036V	-17.169	0.10	0.406	1.84	0.009	4.26	2.00 - 25
IIB036T	-38.820	1.78	1.368	1.66	0.060	1.72	1.30 - 25
IIB037L	-43.872	3.38	1.843	3.32	-0.059	3.26	1.30 - 25
IIB037V	10.890	2.38	-0.404	3.50	0.019	5.28	1.00 - 25
IIB037T	-108.234	2.30	-2.918	2.14	-0.129	2.20	0.70 - 25
IIB038L	-135.101	1.04	1.711	1.02	0.160	1.04	0.90 - 25
IIB038V	34.351	1.82	1.134	1.86	-0.030	3.26	1.40 - 25
IIB038T	194.760	0.98	-4.538	0.96	-0.144	1.00	1.10 - 25
IIB039L	78.871	2.36	-2.003	2.94	0.099	2.90	2.00 - 25
IIB039V	-24.204	3.28	-0.788	2.86	0.032	3.12	2.00 - 25
IIB039T	-105.964	2.14	-2.939	2.18	0.181	2.14	0.90 - 25

Table 6
(Cont.)

IIB040L	-41.680	1.74	1.650	1.68	0.093	1.76	0.80	- 25
IIB040V	-14.738	1.94	0.407	1.90	0.011	1.94	2.00	- 25
IIB040T	-67.174	1.84	1.829	1.82	-0.096	1.72	0.55	- 25
IIB041L	57.289	1.46	1.908	1.50	-0.134	1.46	0.525	- 25
IIB041V	11.346	1.66	0.326	3.24	0.022	2.50	0.750	- 25
IIB041T	46.545	1.48	-1.633	1.44	-0.105	1.48	0.550	- 25
IIB042AL	72.283	1.00	1.733	1.04	-0.047	1.00	0.90	- 25
IIB042AV	24.710	1.00	-0.449	1.08	0.020	0.94	1.00	- 25
IIB042AT	61.068	0.98	-1.145	0.96	0.033	1.08	1.10	- 25
IIB042BL	21.915	0.04	0.504	0.08	0.019	0.30	1.25	- 25
IIB042BV	12.933	0.10	0.256	0.32	-0.007	0.12	2.00	- 25
IIB042BT	24.150	0.14	0.368	1.18	-0.015	0.14	1.00	- 25
IIB042CL	-232.376	0.64	-2.860	0.65	0.068	0.63	1.30	- 25
IIB042CV	-64.066	0.66	0.760	0.58	0.036	0.66	1.30	- 25
IIB042CT	243.880	0.65	3.074	0.67	-0.084	0.65	1.50	- 25
IIB043L	76.346	0.20	2.458	1.08	-0.085	0.20	1.10	- 25
IIB043V	-52.690	0.32	1.252	0.28	0.046	0.32	1.20	- 25
IIB043T	70.626	0.28	-2.042	0.26	0.081	0.12	1.00	- 25
IIB044L	-77.023	0.46	-3.262	1.32	0.229	1.00	0.625	- 25
IIB044V	44.400	1.90	1.300	1.94	-0.104	1.90	0.750	- 25
IIB044T	-89.941	0.50	1.680	0.46	0.062	0.50	1.100	- 25
IIB045L	-582.923	0.39	-15.420	0.43	0.800	0.38	0.650	- 25
IIB045V	358.876	0.19	-7.378	0.15	-0.494	0.19	0.325	- 25
IIB045T	-358.367	0.33	-14.954	0.36	0.766	0.30	0.700	- 25

with dashed lines, and the Response Spectra, for damping values 0, 2, 5, 10 and 20% of critical, are drawn with solid lines.

This first edition of the accelerograms, recorded on the territory of Bulgaria, will give the users an opportunity for efficient selection of records with specified parameters on their amplitudes and duration (Trifunac and Westermo, 1976). In future, more advanced system for data access will be available (Lee and Trifunac, 1984,1987), in form which is same as the one used in this report. The simplified graphical presentation of the data, as presented here, has proved to be most practical for quick visual access and interpretation of the data.

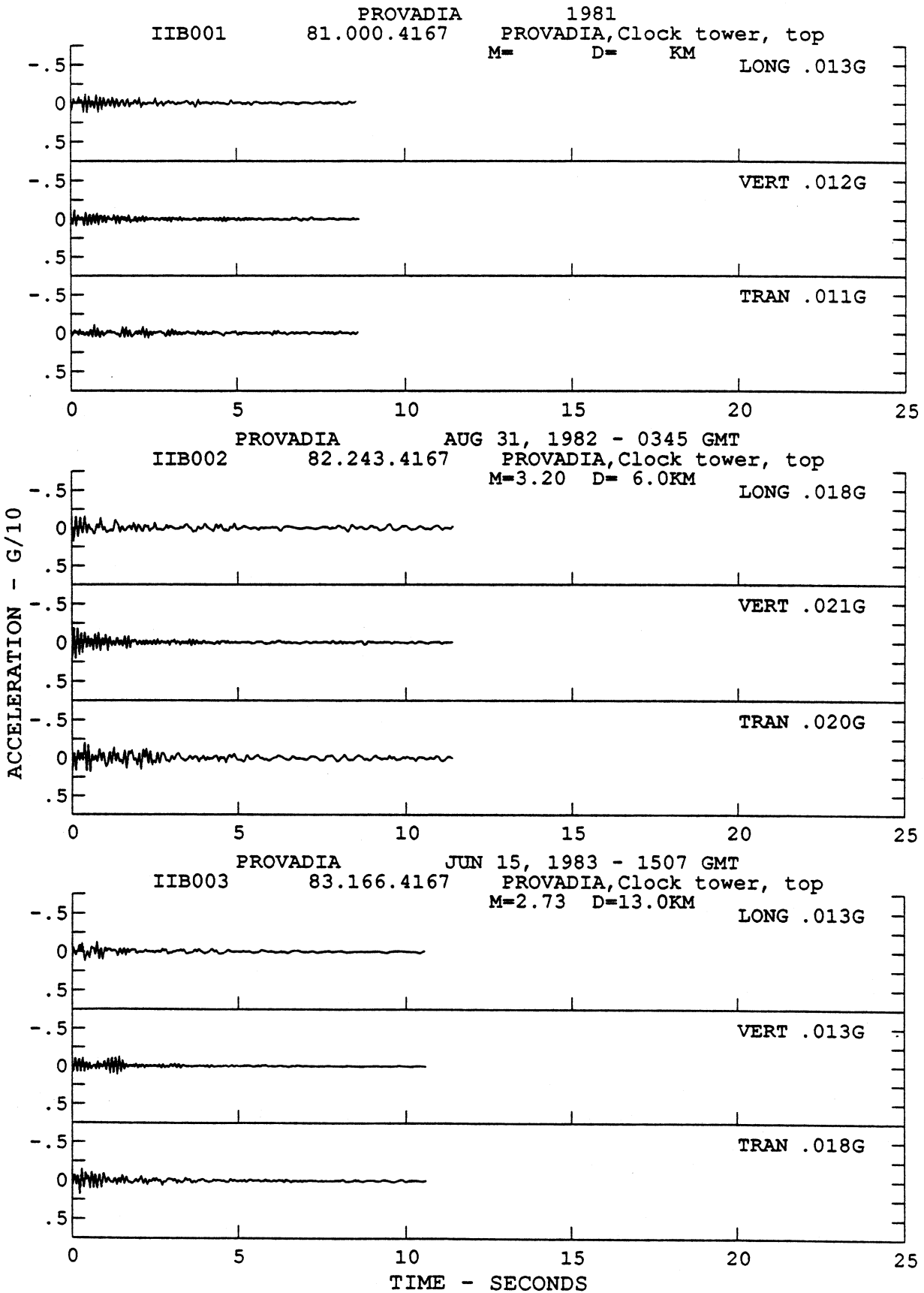
REFERENCES

- Amini, A., V.W. Lee and M.D. Trifunac (1986). "Noise in earthquake accelerograms", ASCE-EMD, Vol. 108, pp. 1121-1129.
- Dokev, Č., I. Paskaleva and G. Georgiev (1987). "Analiz na zapisite ot silni zemni dvizenia s ogleđ na organiziraneto im v geofizicheska baza danni". Bulgarian Geophysical Journal, Vol. XIII, No. 2, pp. 88-96, (in Bulgarian).
- Georgiev, G. and I. Paskaleva (1987). "Spectralni harakteristiki na zemetresenieto ot 21.02. 1986 s epicentr v Stražica", Č., Stroitelstvo, No. 4, pp. 31-34 (in Bulgarian).
- Gvišiani, A.D., M.N. Žižin, A.Z. Mostinskiĭ and others (1986). "Klasifikacia silnih diviženii algoritmami raspoznavania. Problemi geofizicheskoi informatiki", M.; IFZ AN SSSR, pp. 125-170, (in Russian).
- Lee, V.W., M.D. Trifunac and C.C. Feng (1982). "Effects of foundation size on Fourier spectrum amplitudes of earthquake accelerations recorded in buildings", Int. J. Soil Dynamics and Earthquake Eng. Vol. 1 No. 2, 52-58.
- Lee, V.W. and M.D. Trifunac (1984), "Current developments in data processing of strong motion accelerograms", Dept. of Civil Eng., Univ. of Southern Calif., Los Angeles, Report CE 84-01.
- Lee, V.W. and M.D. Trifunac (1987). "Strong earthquake ground motion data in EQINFOS: Part I", Dept. of Civil Eng., Univ. of Southern Calif., Los Angeles, Report CE 87-01.
- Moselem, K. and M.D. Trifunac (1987). "Spectral amplitudes of strong earthquake acceleration recorded in buildings", Int. J. Soil Dynamics and Earthquake Eng. Vol. 6, No. 2, 100-107.
- Trifunac, M.D. and B.D. Westermo (1976). "Dependance of duration of strong earthquake ground motion on magnitude, epicentral distance, geologic conditions at the recording station and frequency of motion", Dept. of Civil Eng., Univ. of Southern Calif., Los Angeles, Report CE 76-02.

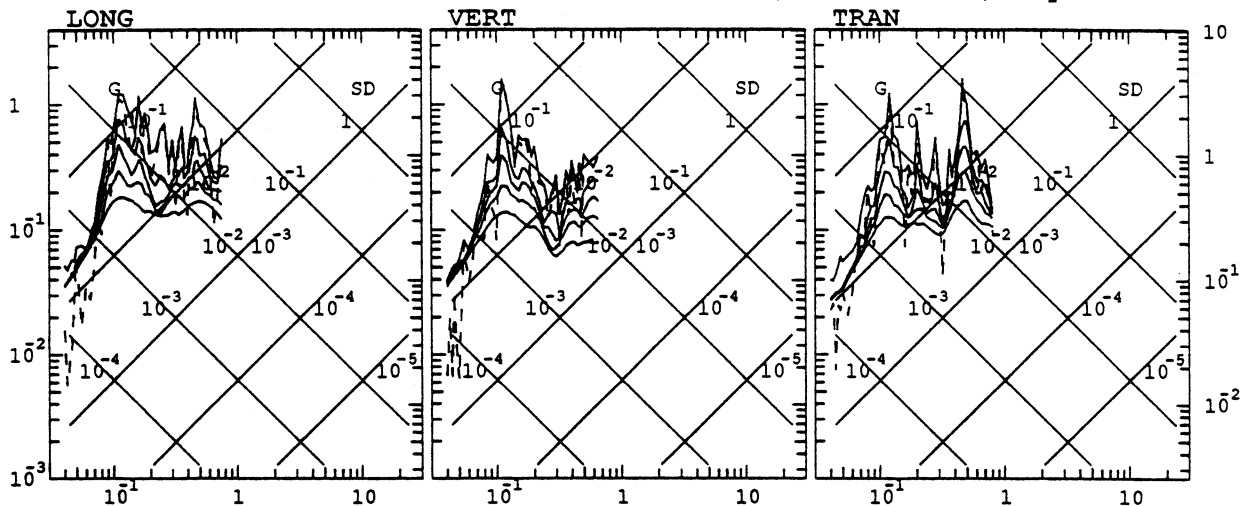
ACKNOWLEDGEMENTS

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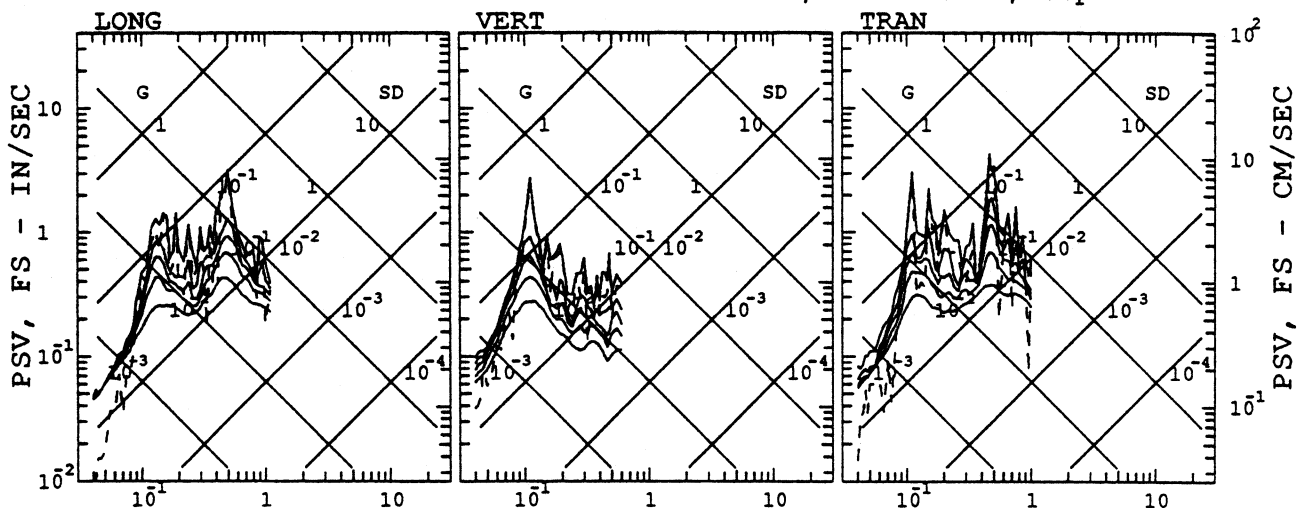
- A. Paskov and V. Ivanov, the technical team, who maintained in operating condition the entire network of earthquake recording instruments. On several occasions, they showed much enthusiasm during collection of the records, working in the earthquake epicentral regions;
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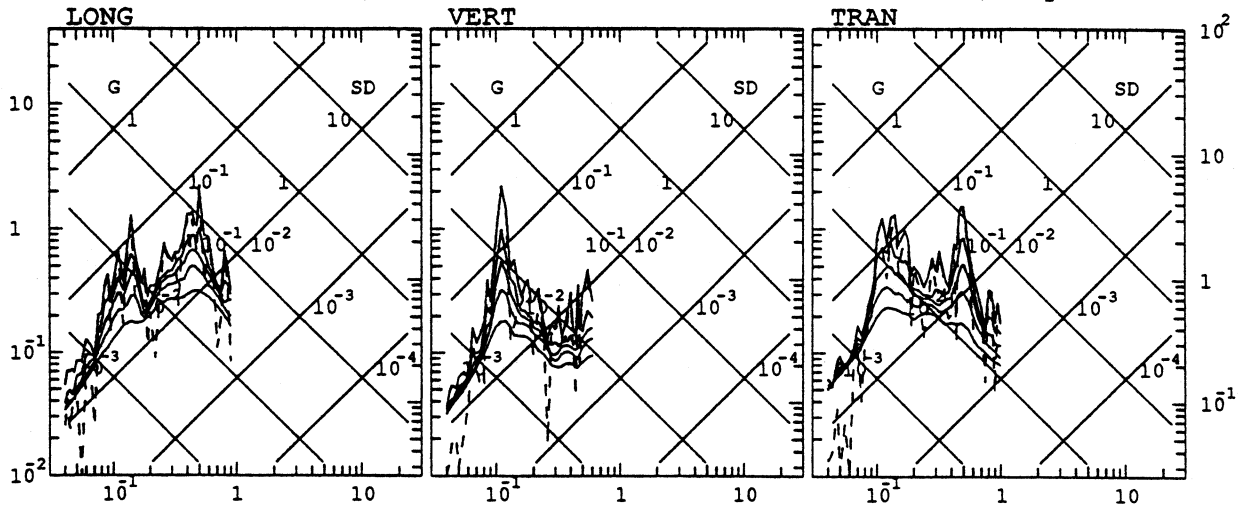
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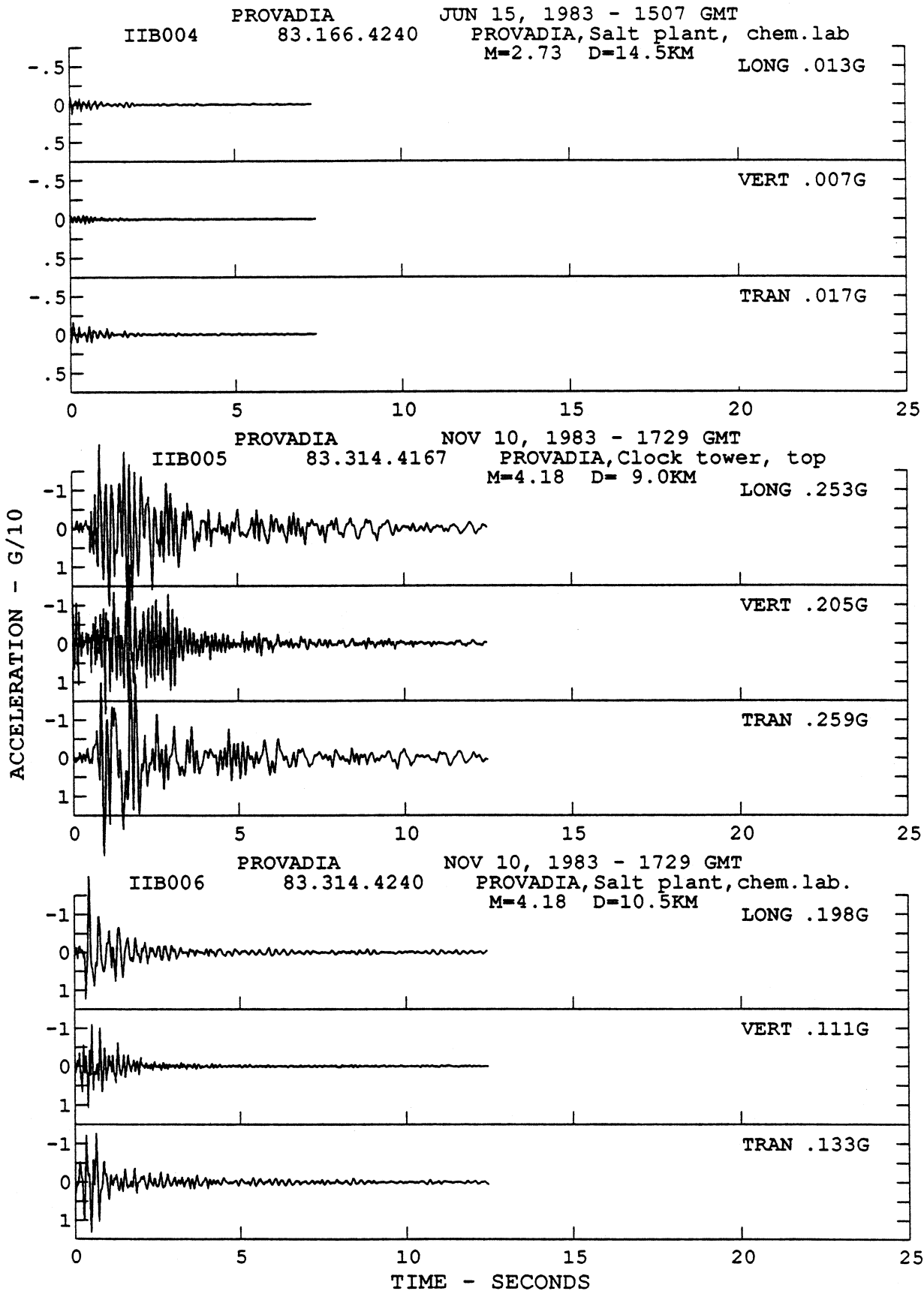
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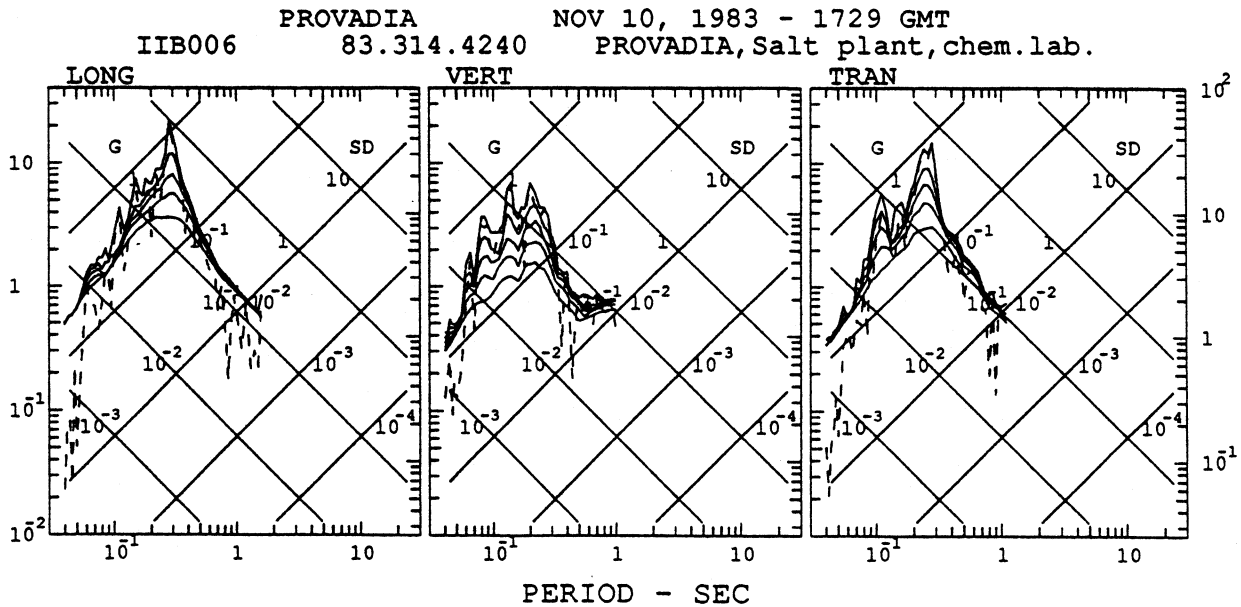
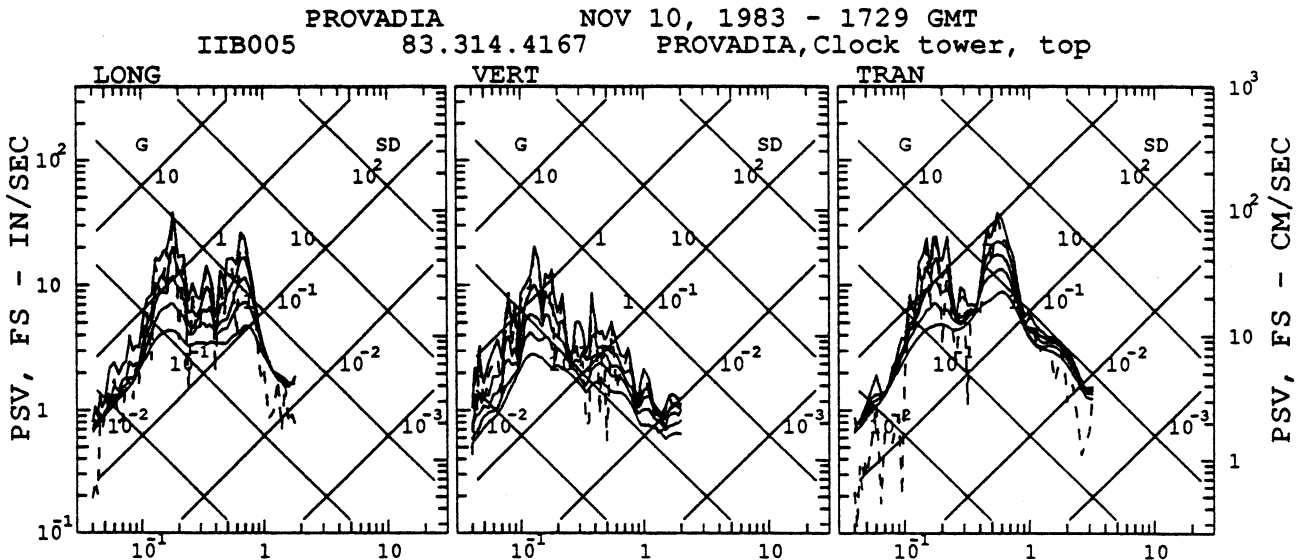
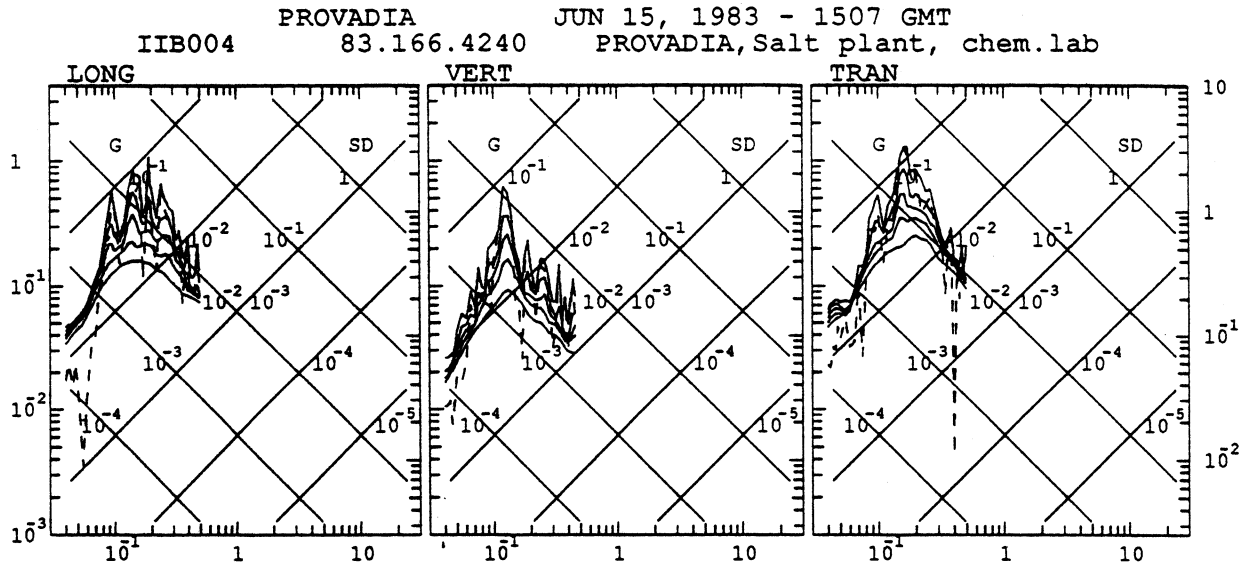


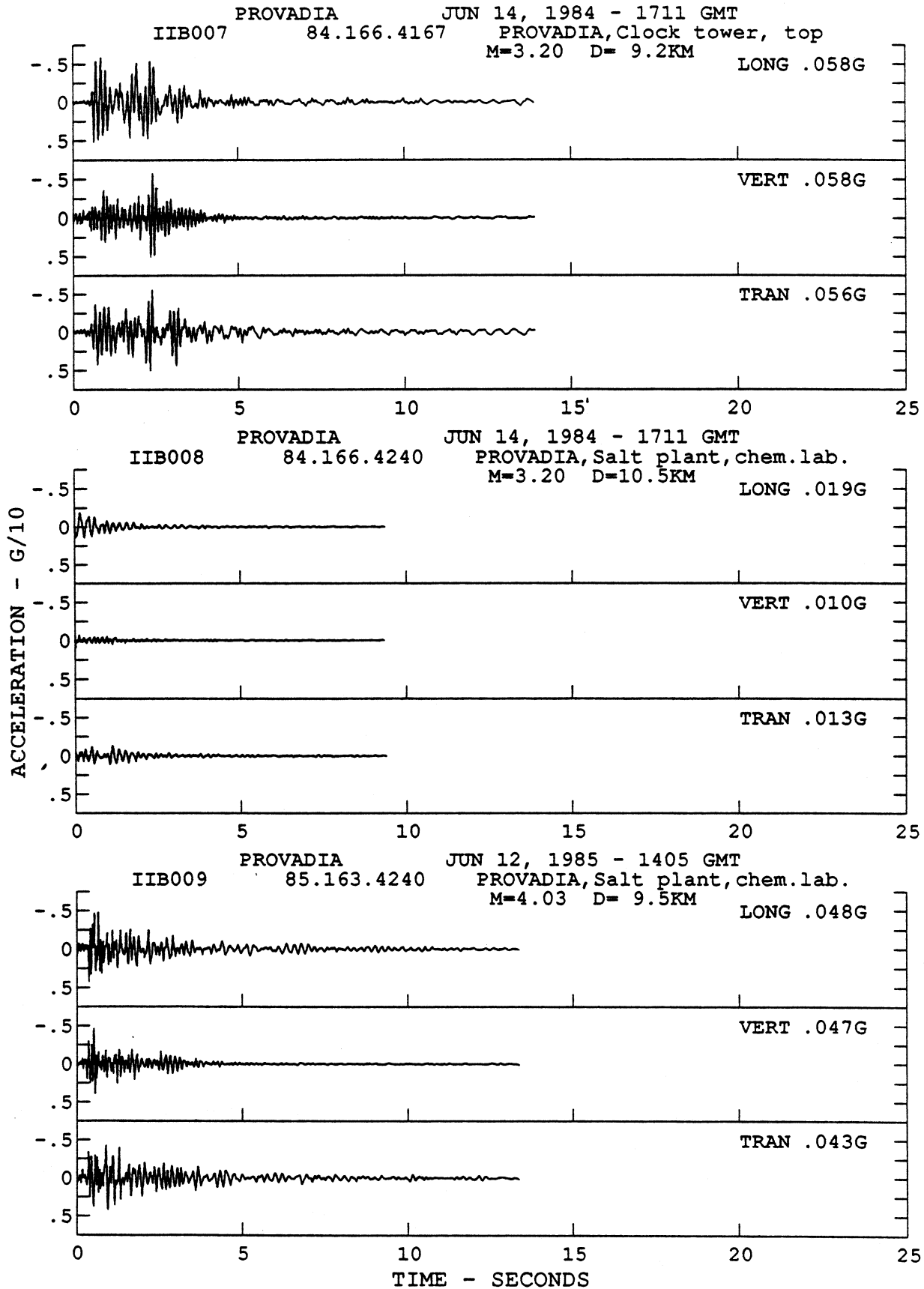
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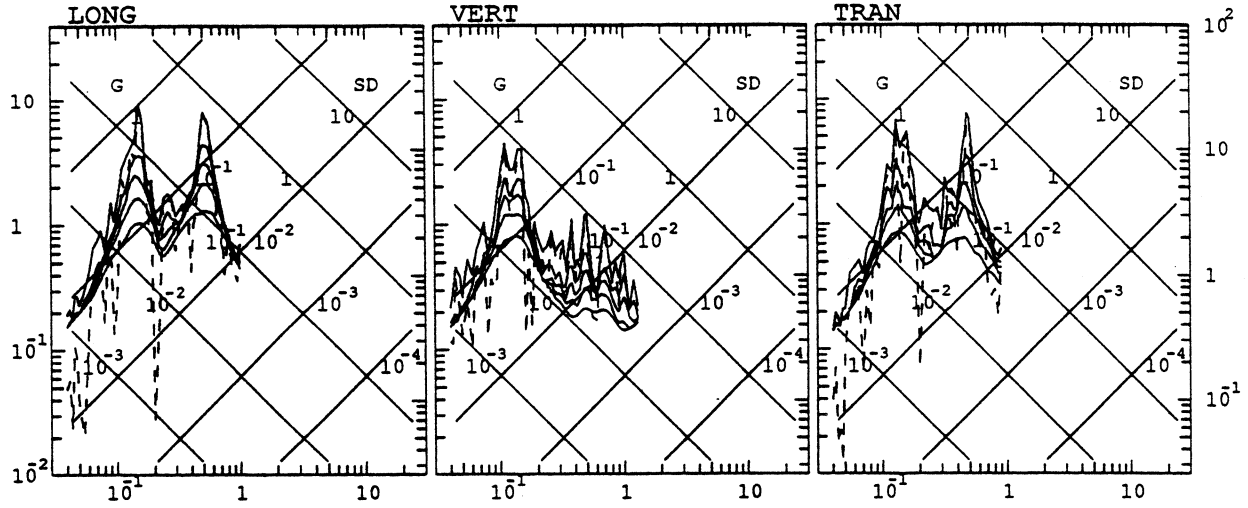
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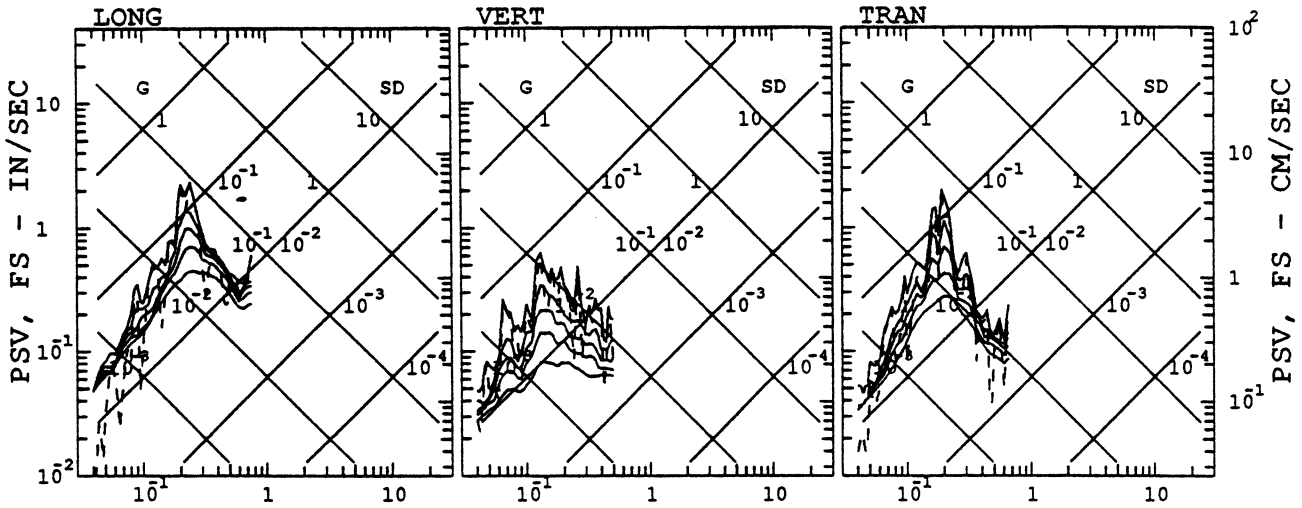




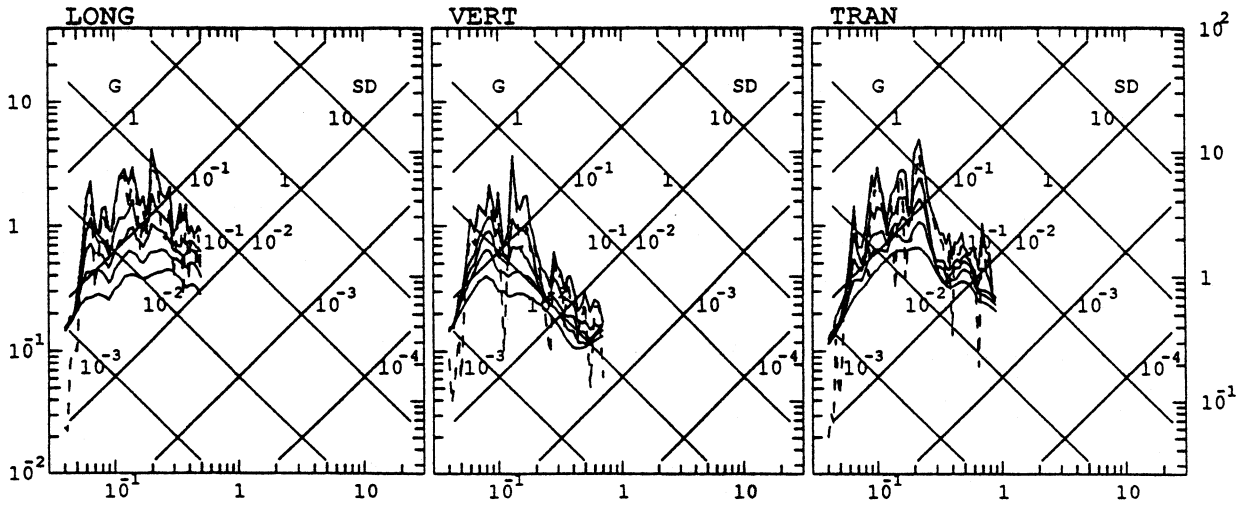
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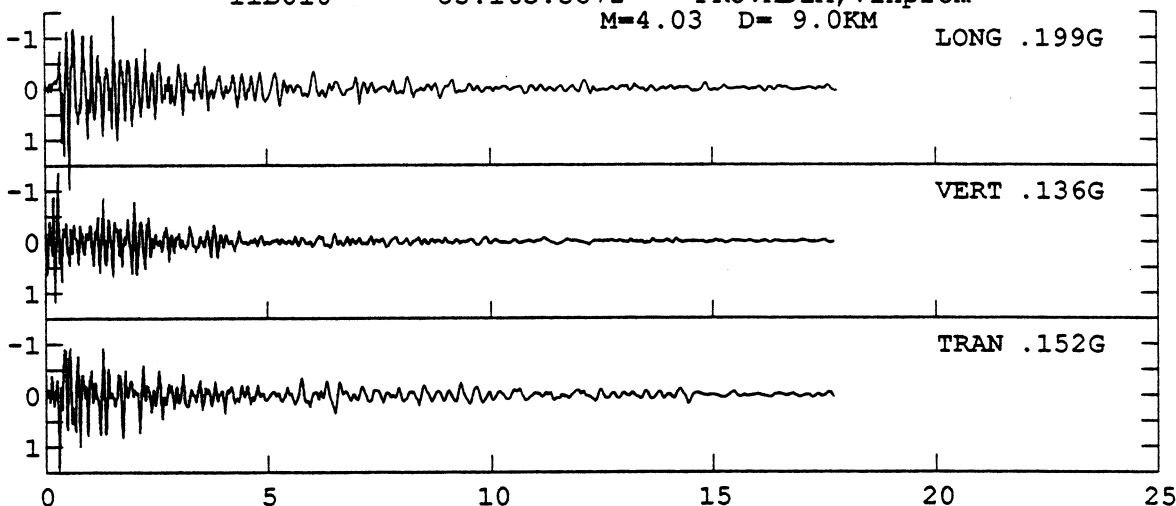


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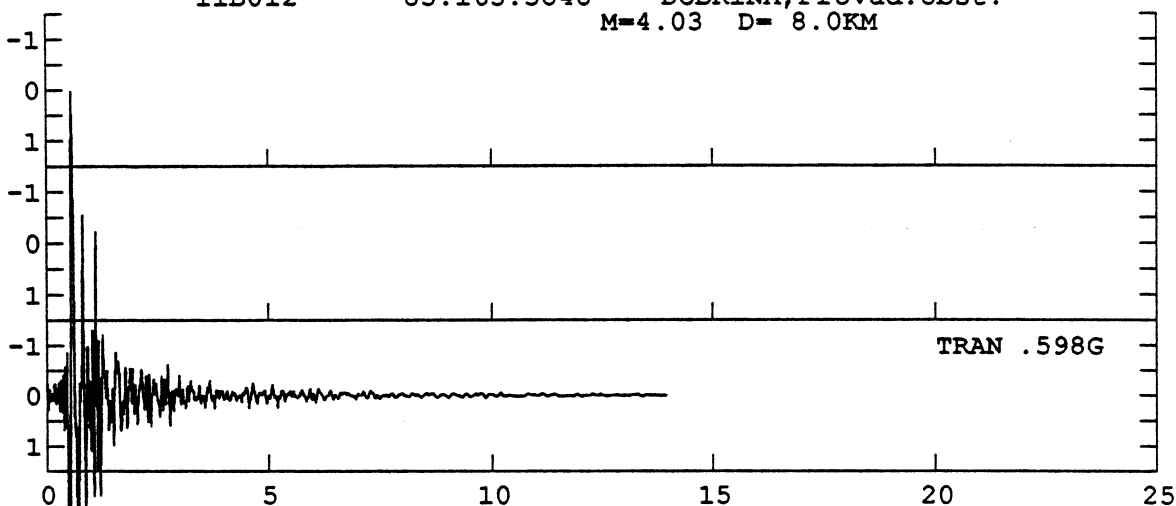
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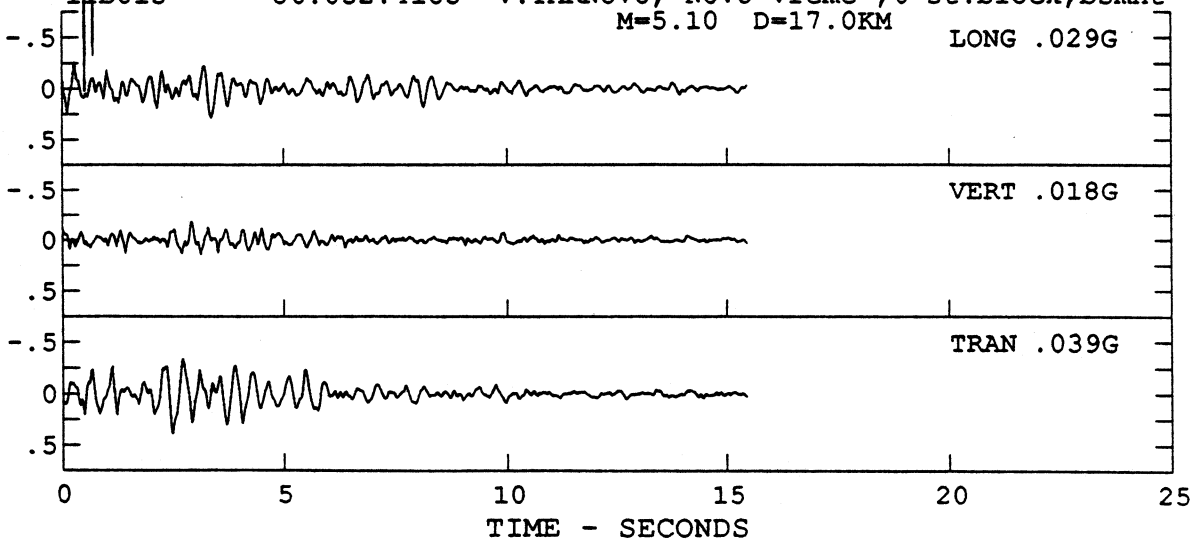


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ACCELERATION - G/10

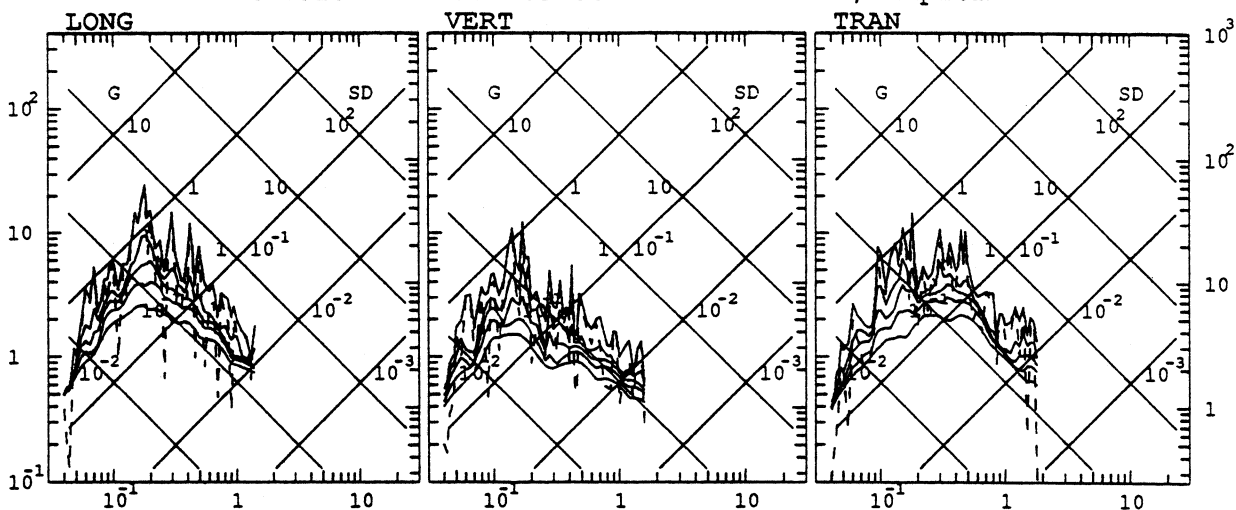


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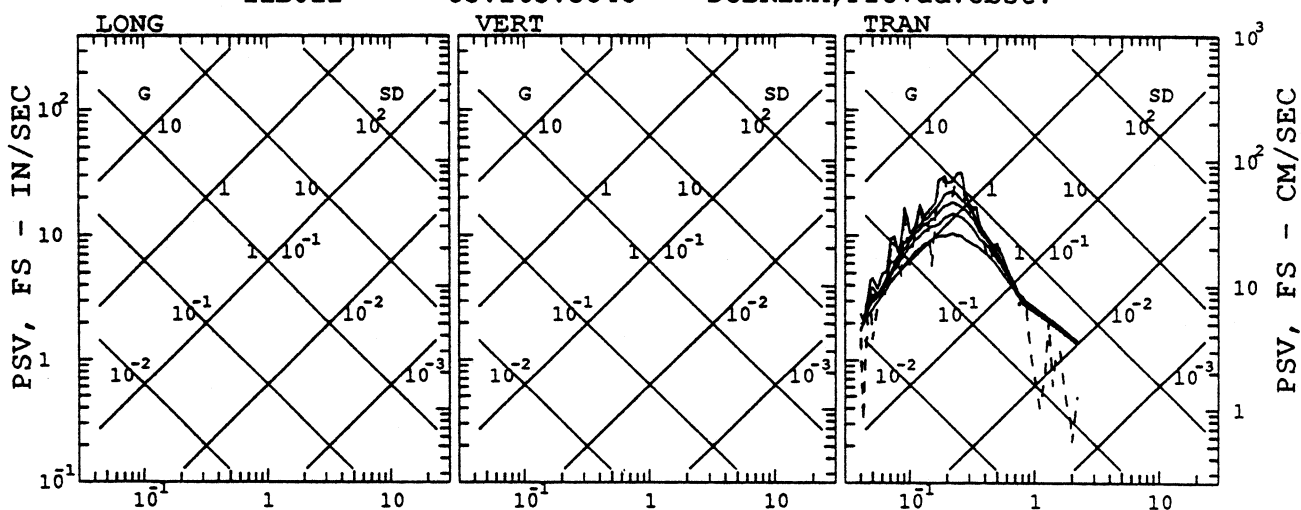


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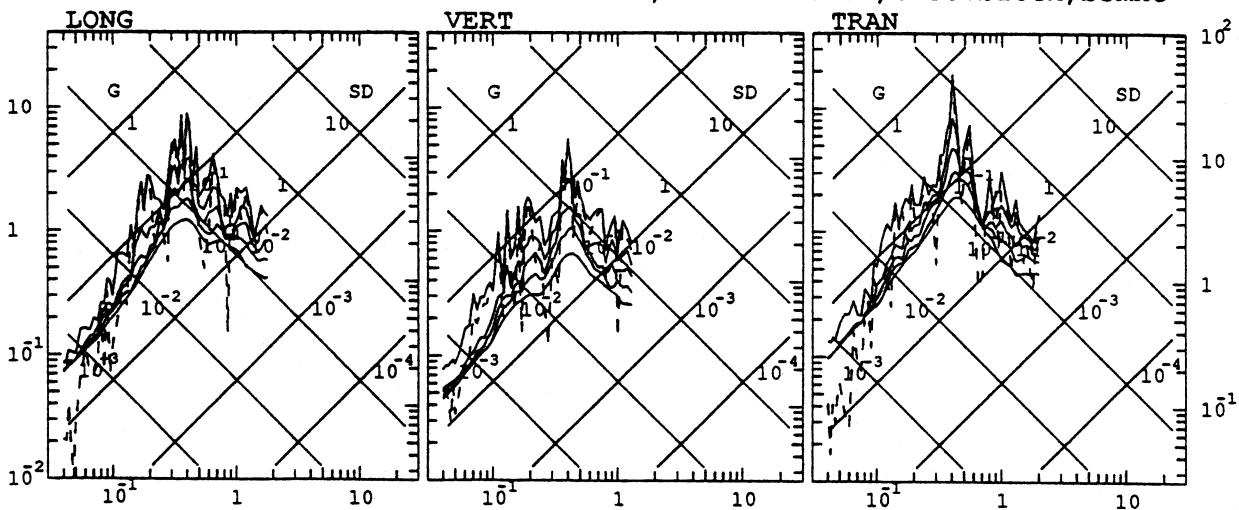
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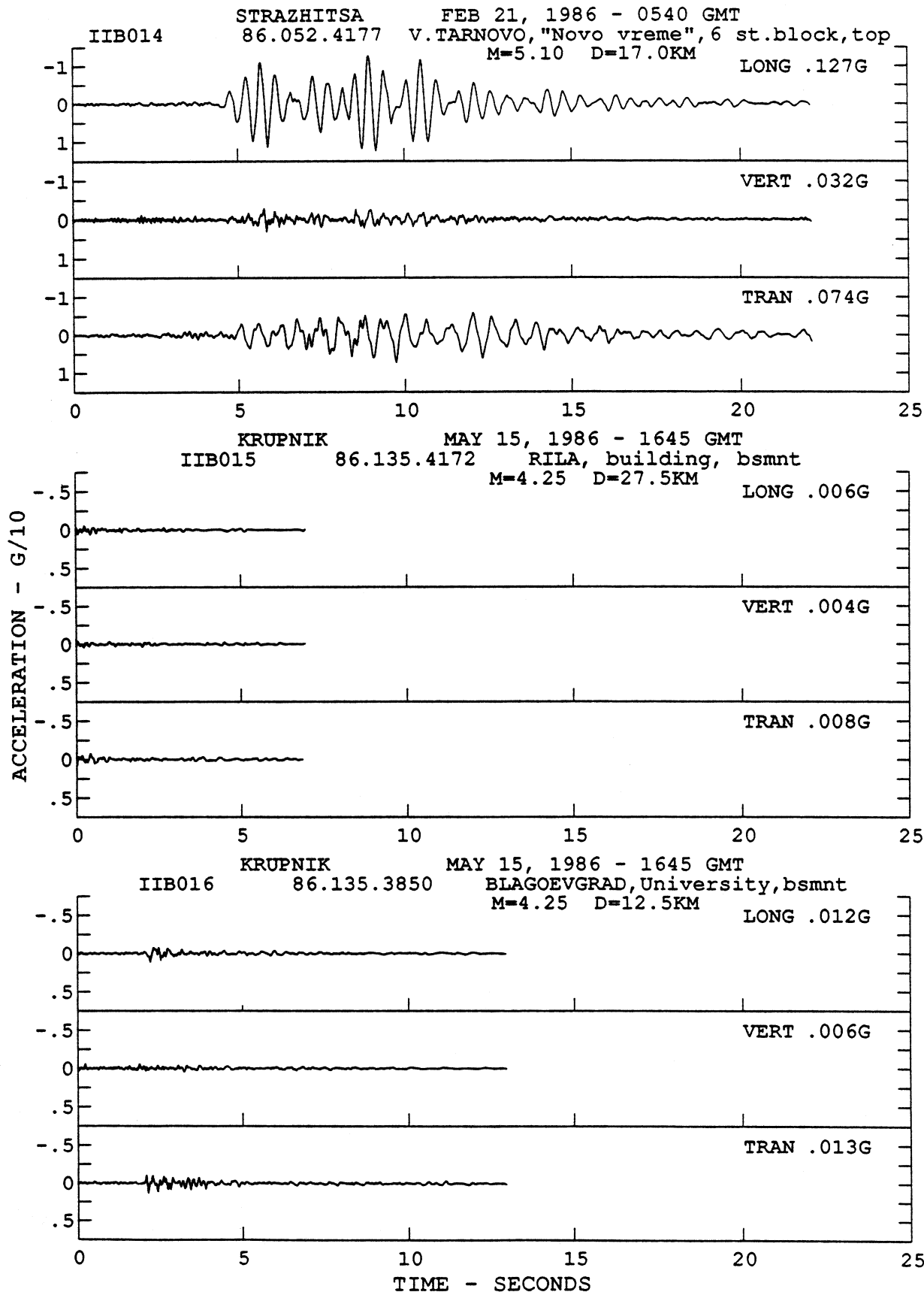
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STRAZHITSA FEB 21, 1986 - 0540 GMT
 IIB013 86.052.4183 V. TARNOVO, "Novo vreme", 6 st. block, bsmt

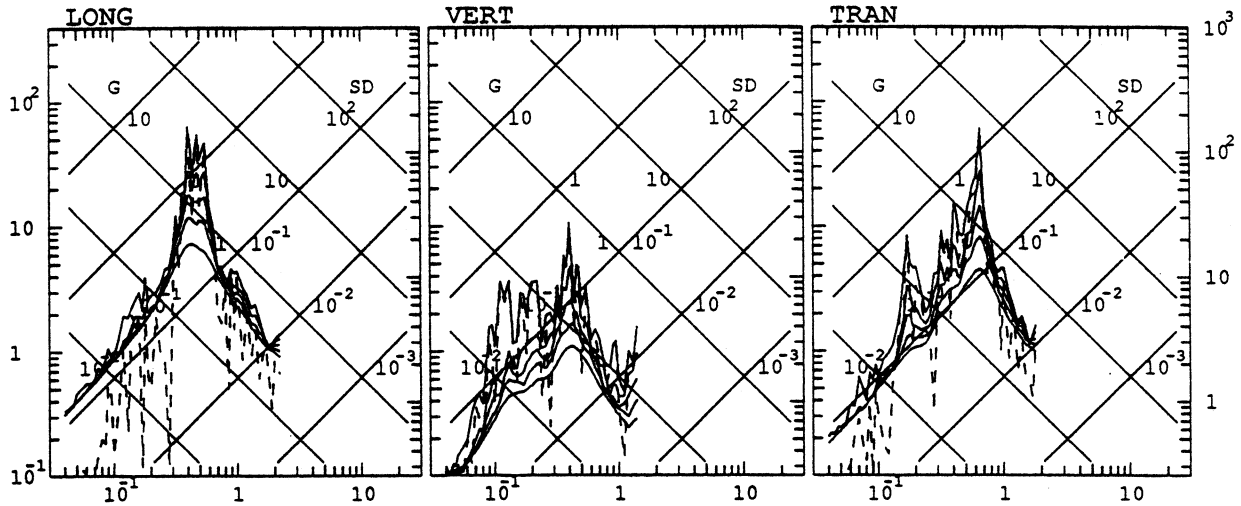


PERIOD - SEC

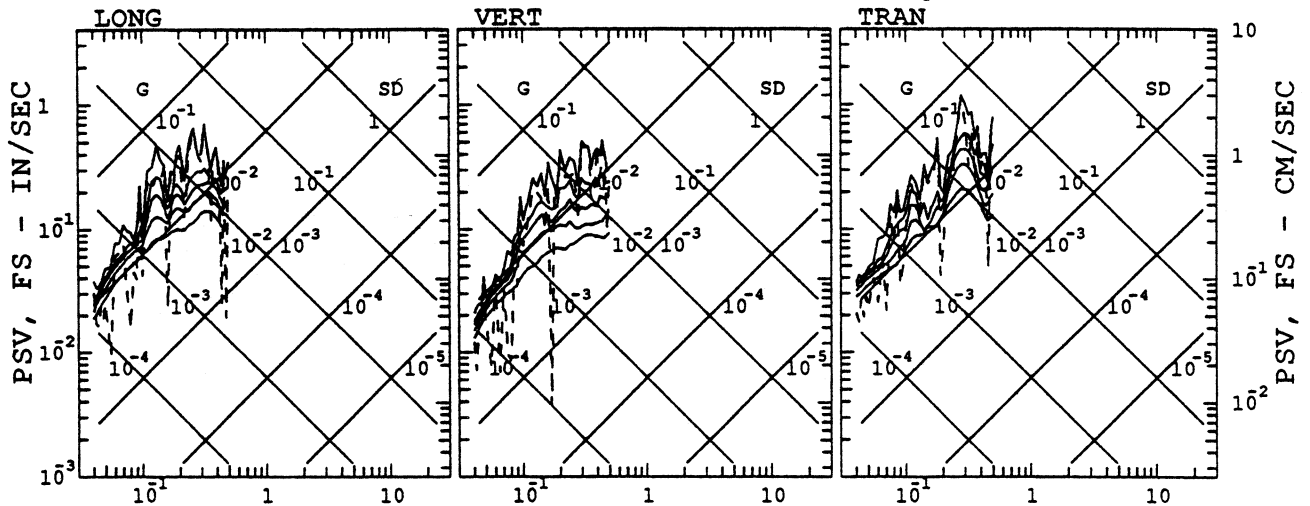


STRAZHITSA FEB 21, 1986 - 0540 GMT

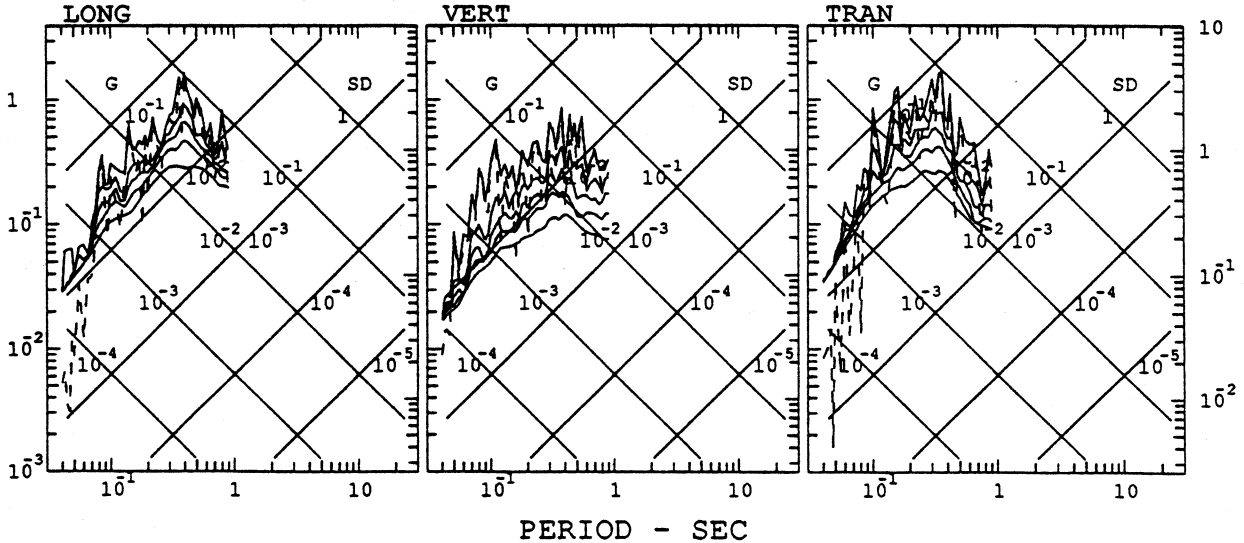
IIB014 86.052.4177 V.TARNOVO, "Novo vreme", 6 st.block, top



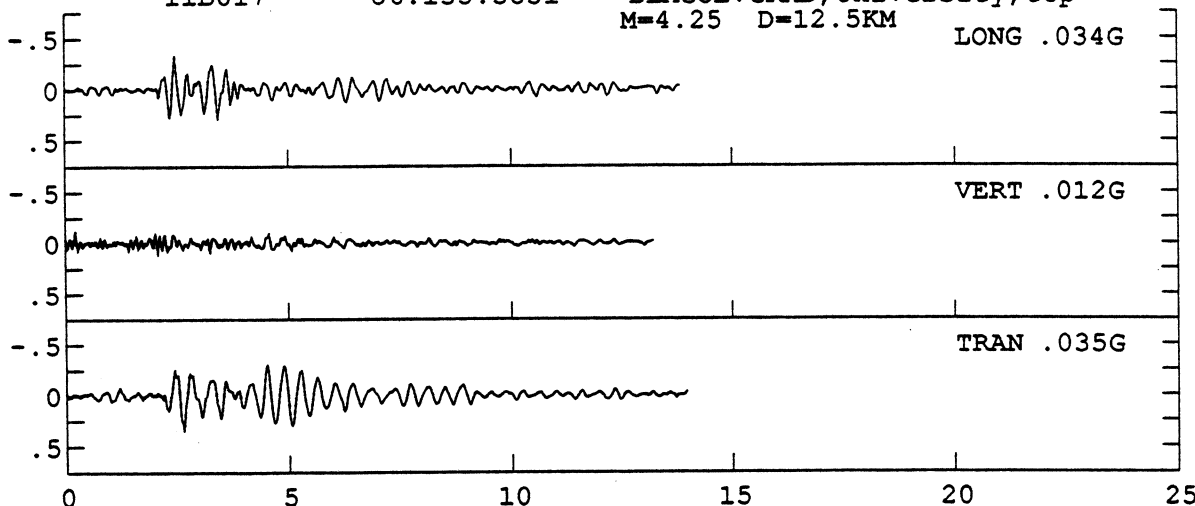
KRUPNIK MAY 15, 1986 - 1645 GMT
IIB015 86.135.4172 RILA, building, bsmnt



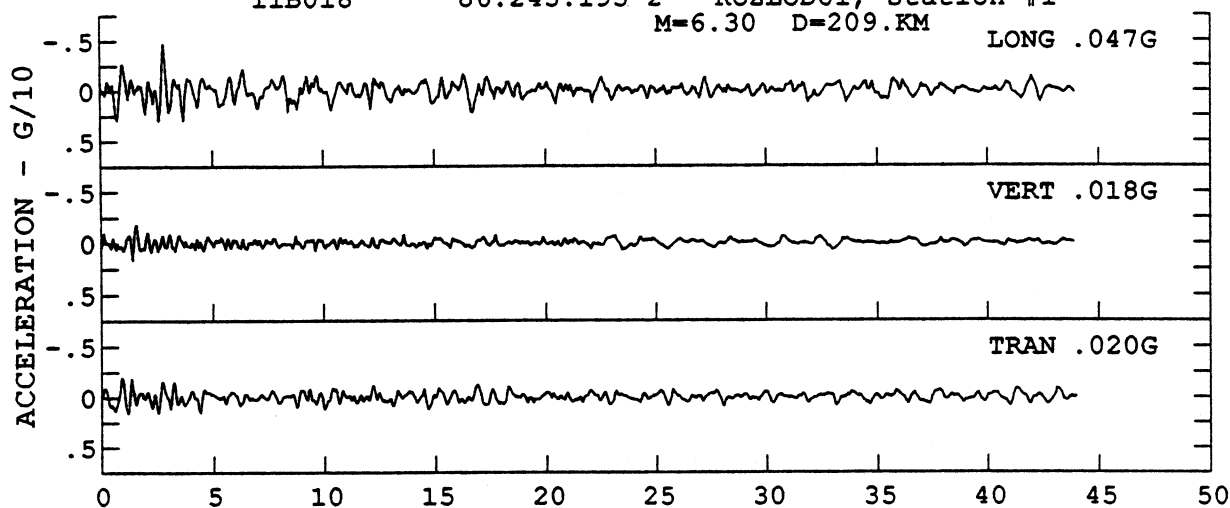
KRUPNIK MAY 15, 1986 - 1645 GMT
IIB016 86.135.3850 BLAGOEVGRAD, University, bsmnt



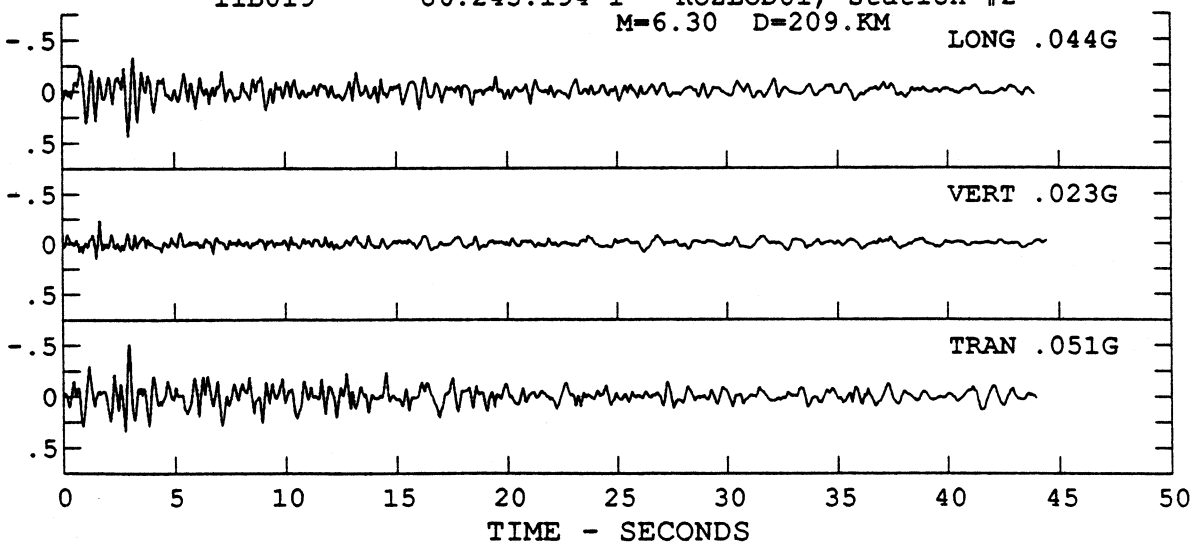
KRUPNIK MAY 15, 1986 - 1645 GMT
IIB017 86.135.3851 BLAGOEVGRAD, University, top
M=4.25 D=12.5KM LONG .034G



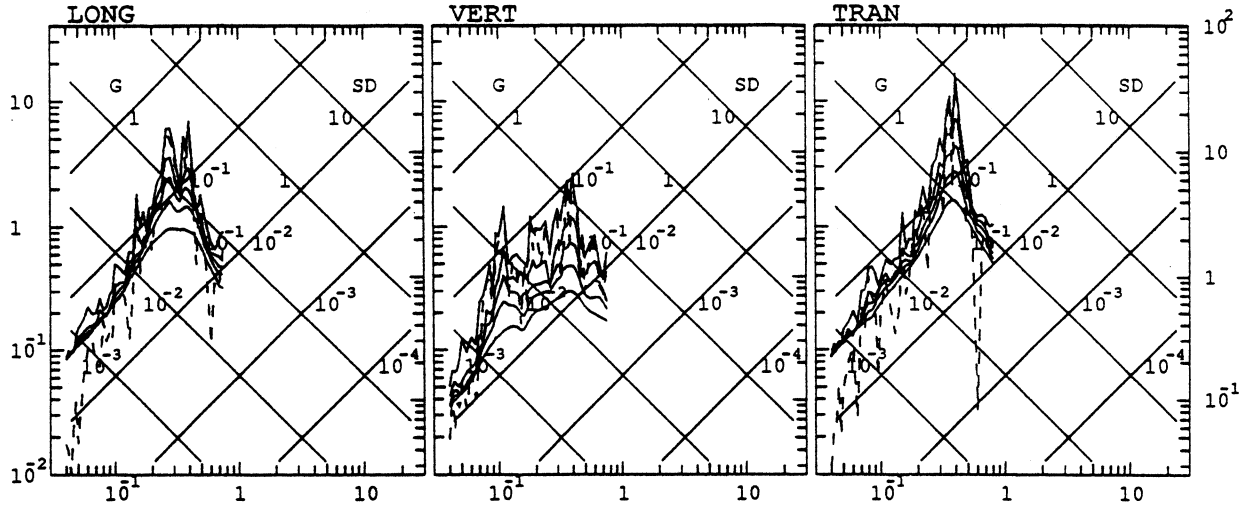
VRANCEA AUG 30, 1986 - 2128 GMT
IIB018 86.243.193-2 KOZLODUI, station #1
M=6.30 D=209.KM LONG .047G



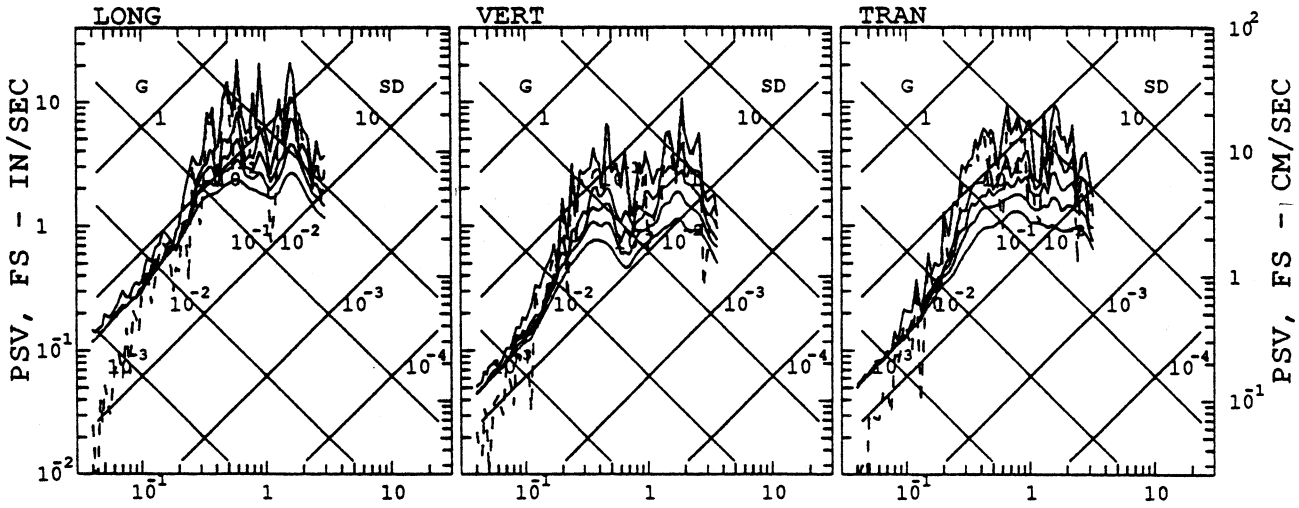
VRANCEA AUG 30, 1986 - 2128 GMT
IIB019 86.243.194-1 KOZLODUI, station #2
M=6.30 D=209.KM LONG .044G



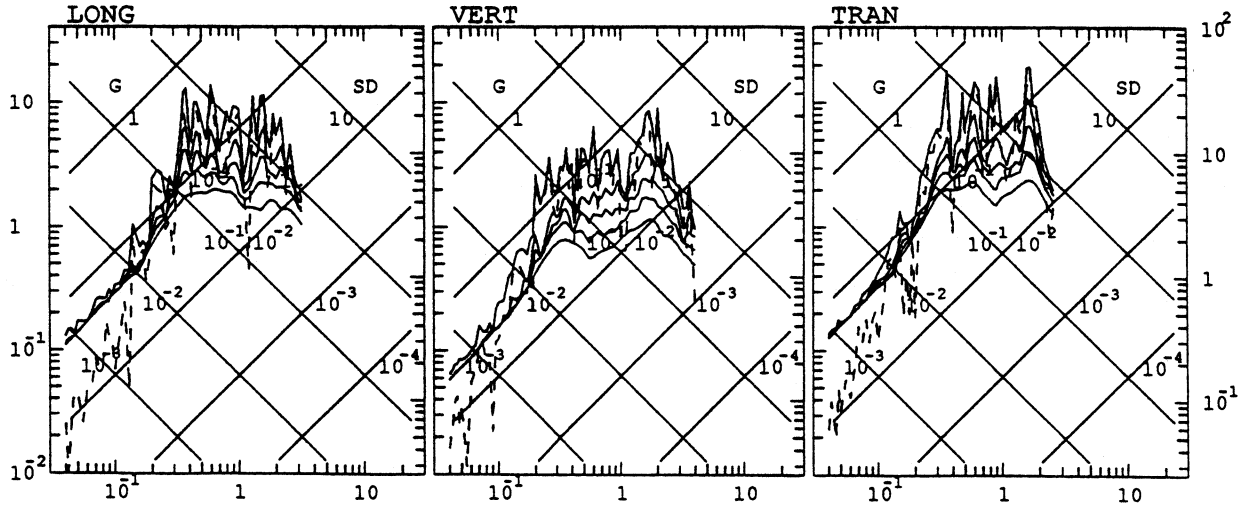
KRUPNIK MAY 15, 1986 - 1645 GMT
 IIB017 86.135.3851 BLAGOEVGRAD, University, top



VRANCEA AUG 30, 1986 - 2128 GMT
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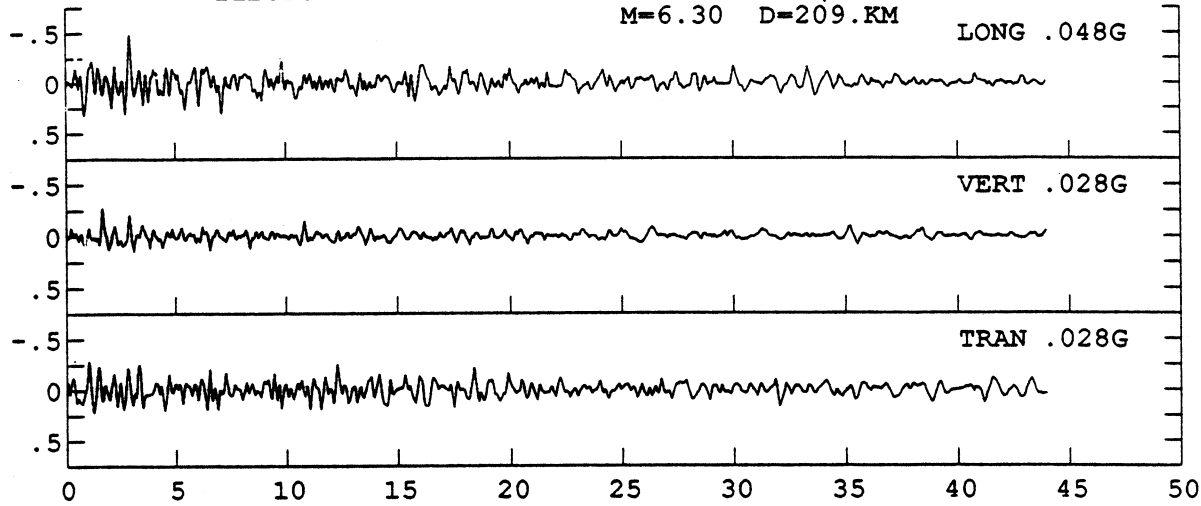


VRANCEA AUG 30, 1986 - 2128 GMT
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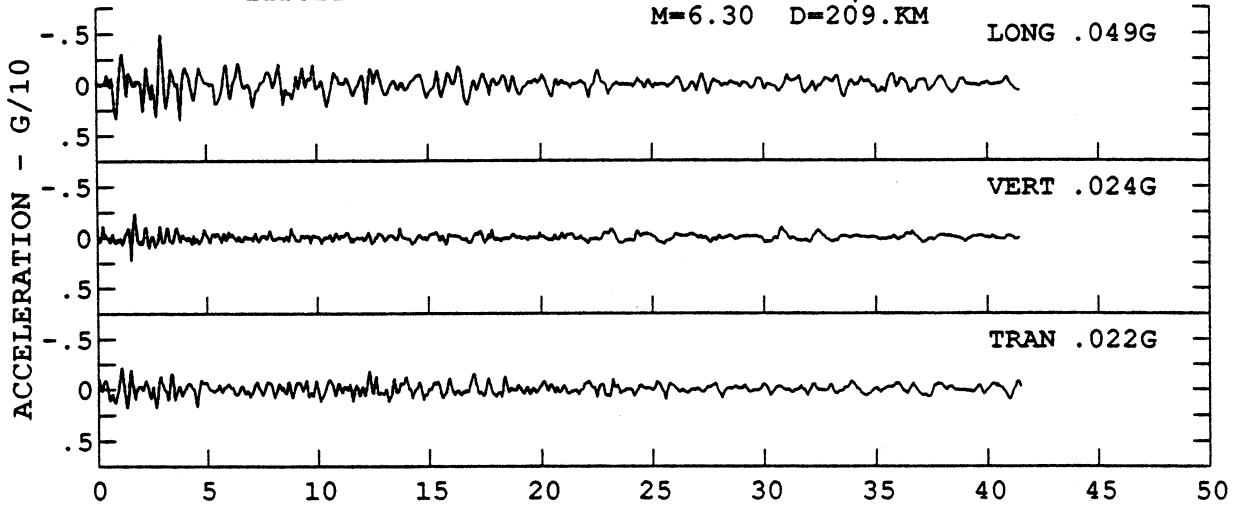


PERIOD - SEC

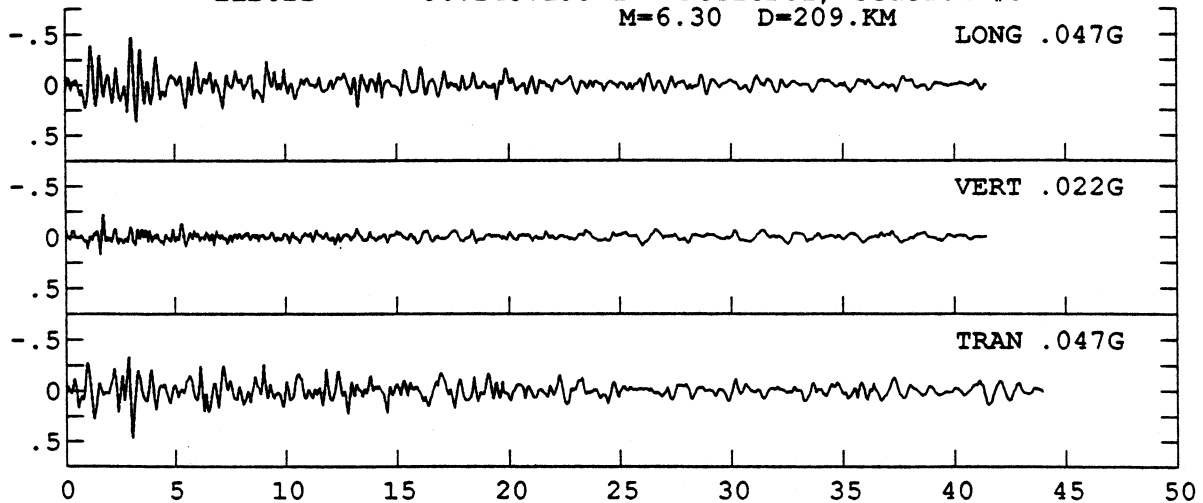
VRANCEA AUG 30, 1986 - 2128 GMT
IIB020 86.243.192-3 KOZLODUI, station #3
M=6.30 D=209.KM LONG .048G



VRANCEA AUG 30, 1986 - 2128 GMT
IIB021 86.243.192-2 KOZLODUI, station #4
M=6.30 D=209.KM LONG .049G

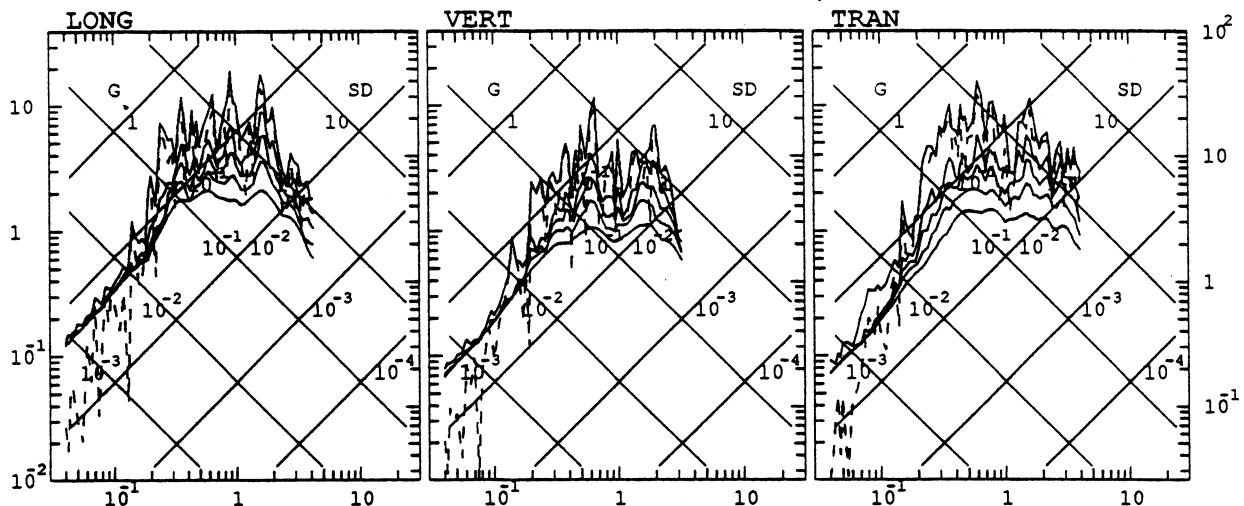


VRANCEA AUG 30, 1986 - 2128 GMT
IIB022 86.243.193-1 KOZLODUI, station #5
M=6.30 D=209.KM LONG .047G

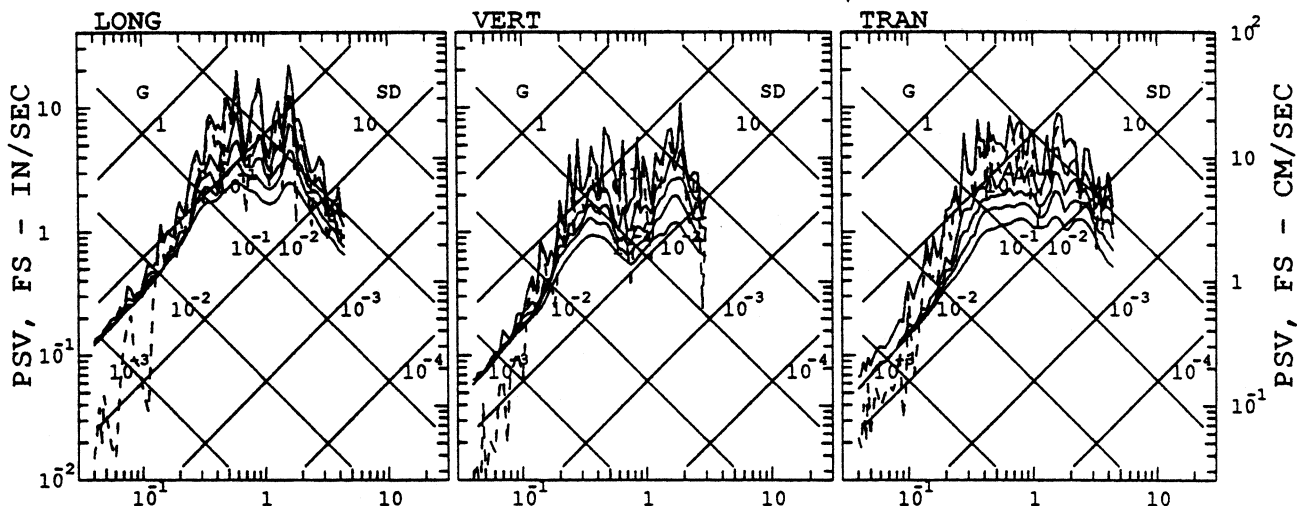


TIME - SECONDS

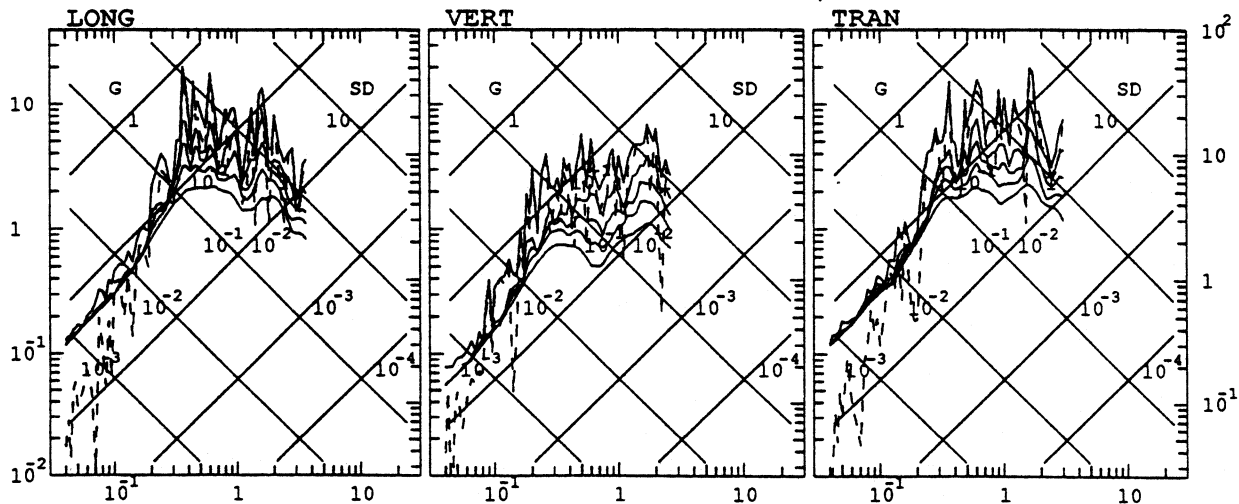
VRANCEA AUG 30, 1986 - 2128 GMT
 IIB020 86.243.192-3 KOZLODUI, station #3



VRANCEA AUG 30, 1986 - 2128 GMT
 IIB021 86.243.192-2 KOZLODUI, station #4

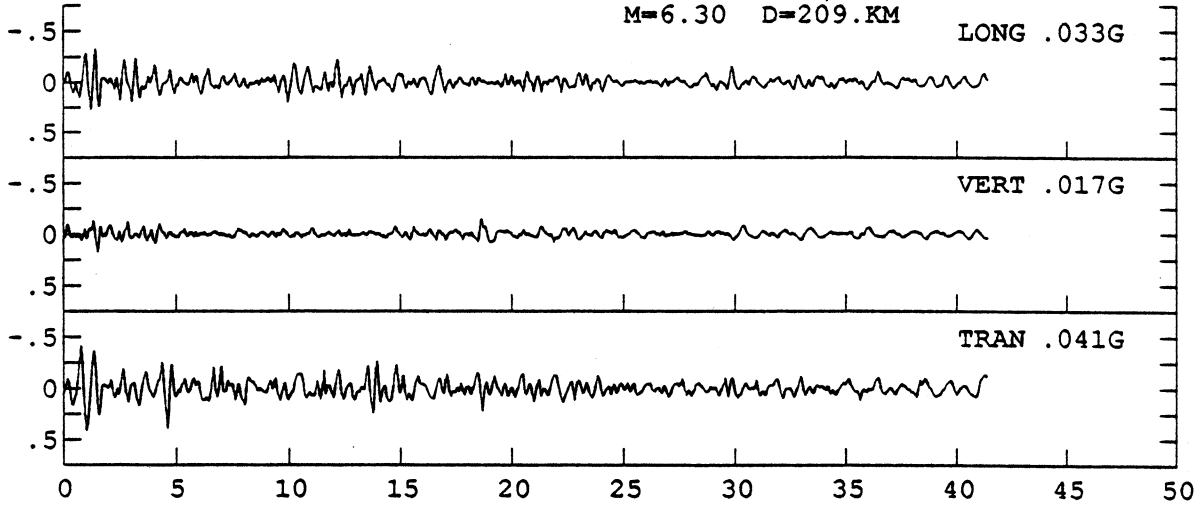


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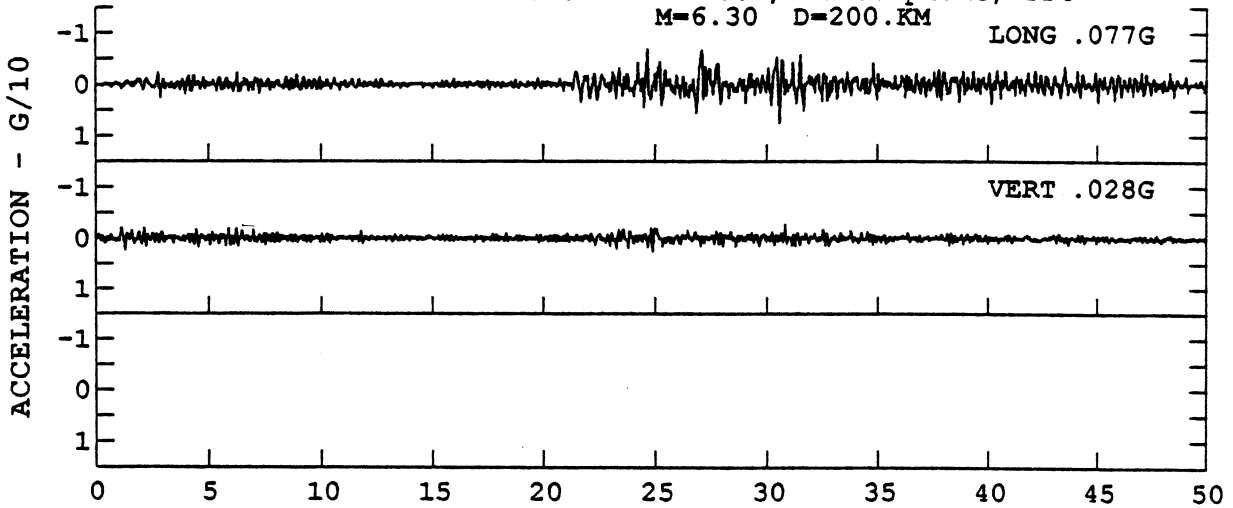


PERIOD - SEC

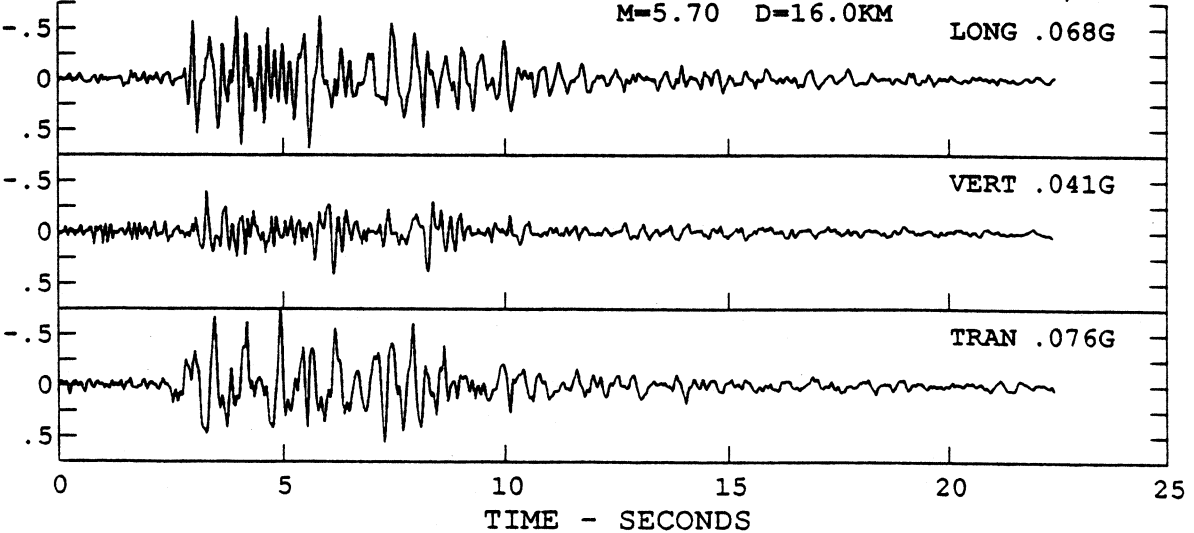
VRANCEA AUG 30, 1986 - 2128 GMT
 IIB023 86.243.193-3 KOZLODUI, station #6
 M=6.30 D=209.KM LONG .033G



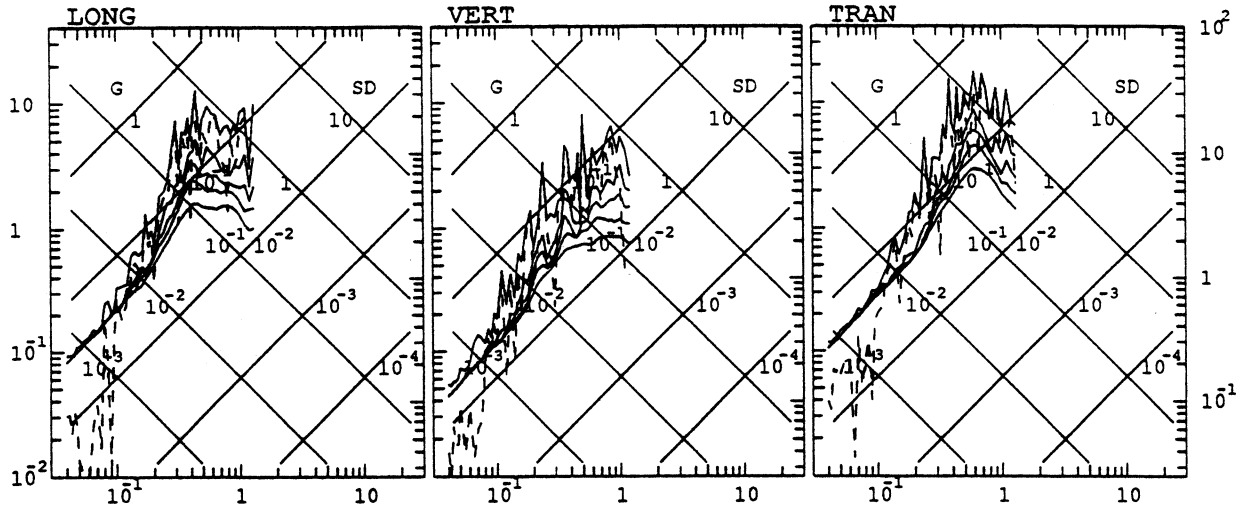
VRANCEA AUG 30, 1986 - 2128 GMT
 IIB024 86.243.3846 RUSE, Power plant, PPO
 M=6.30 D=200.KM LONG .077G



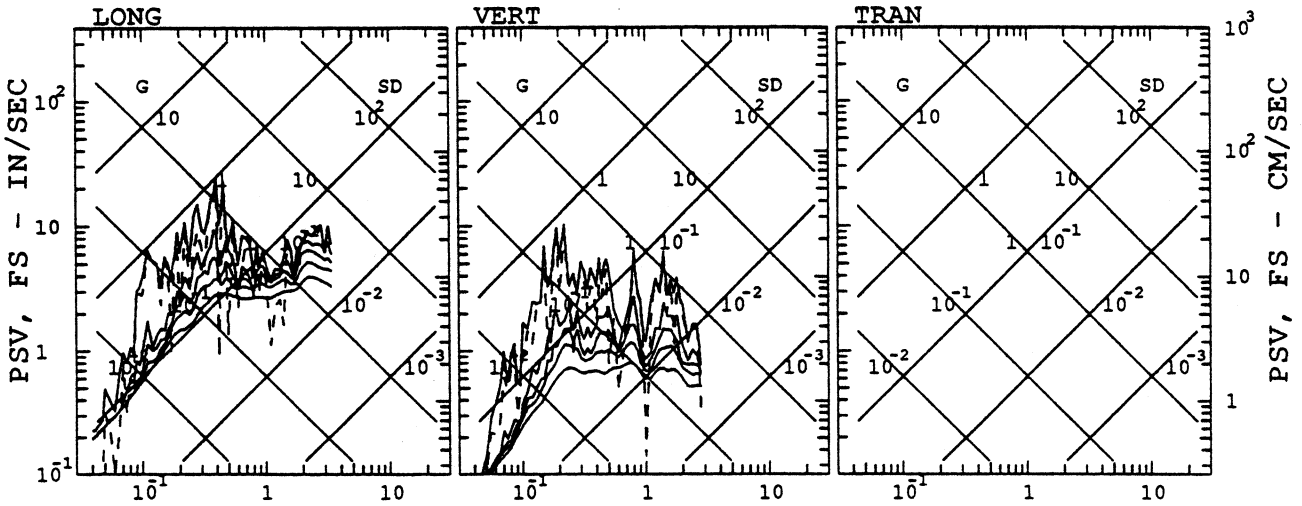
STRAZHITSA DEC 07, 1986 - 1417 GMT
 IIB025 86.341.4183 V.TARNOVO, "Novo vreme", 6 st.block,bsmnt
 M=5.70 D=16.0KM LONG .068G



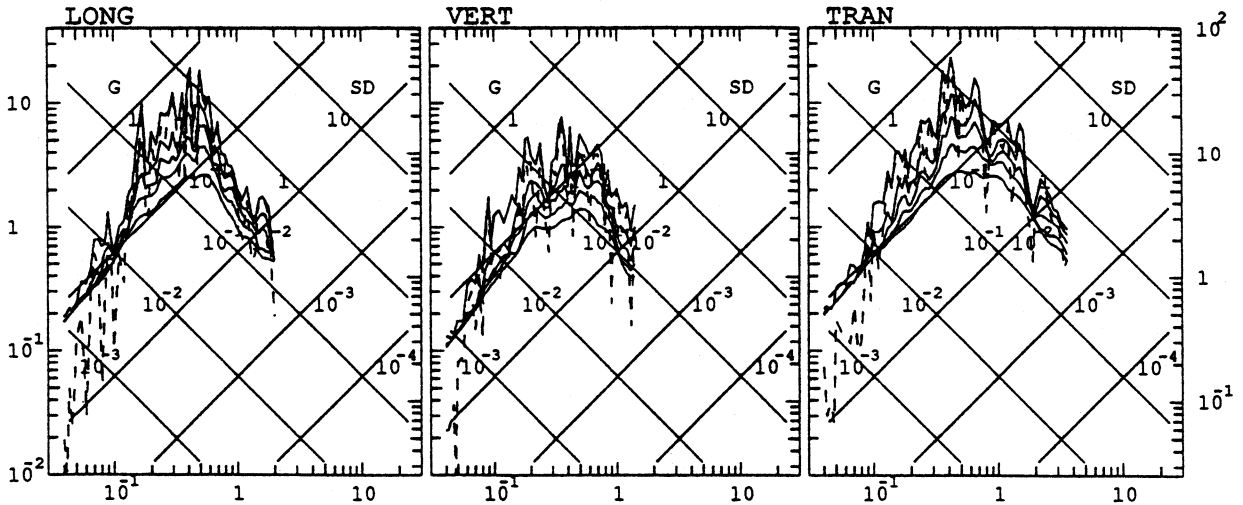
VRANCEA AUG 30, 1986 - 2128 GMT
 IIB023 86.243.193-3 KOZLODUI, station #6



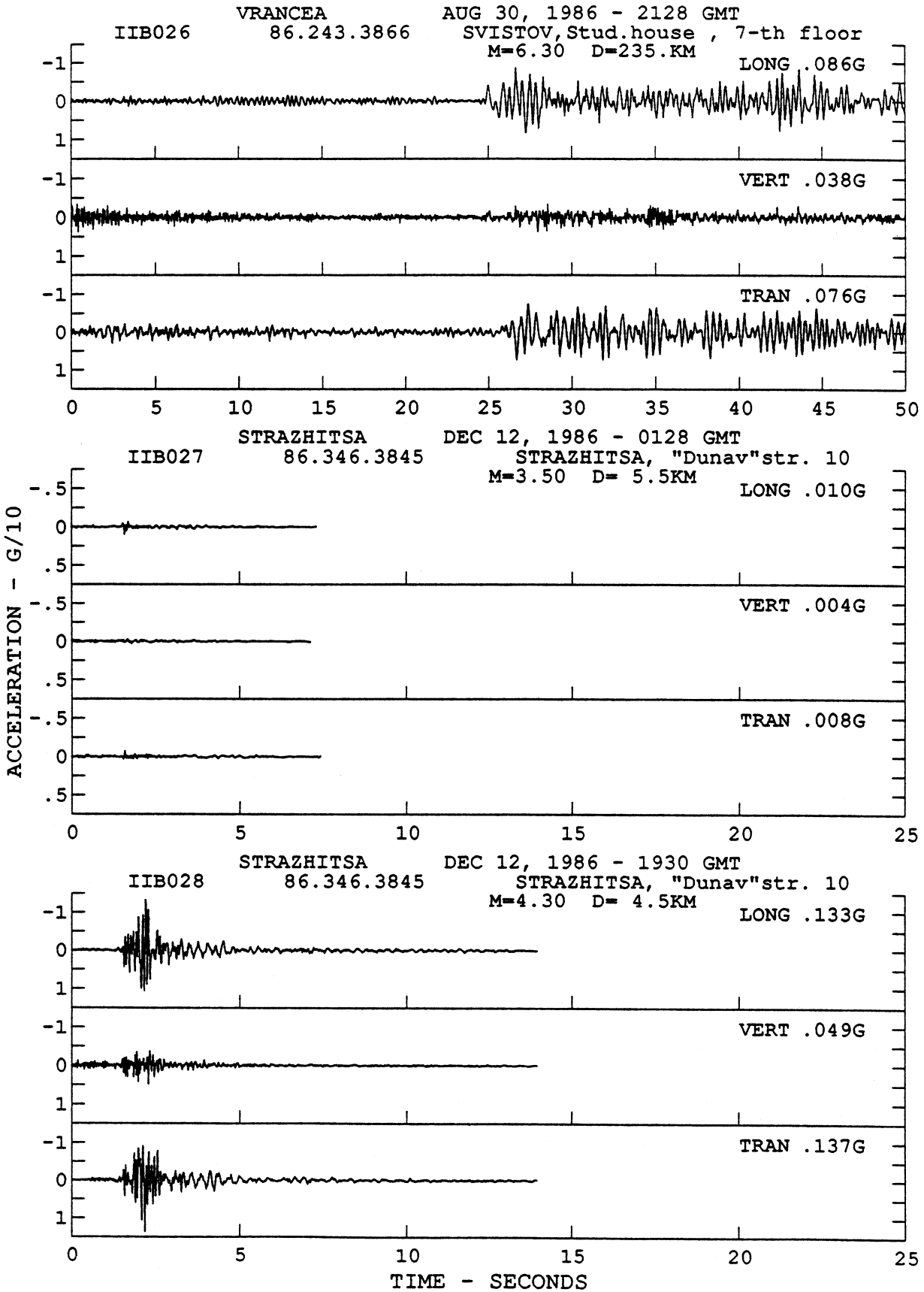
VRANCEA AUG 30, 1986 - 2128 GMT
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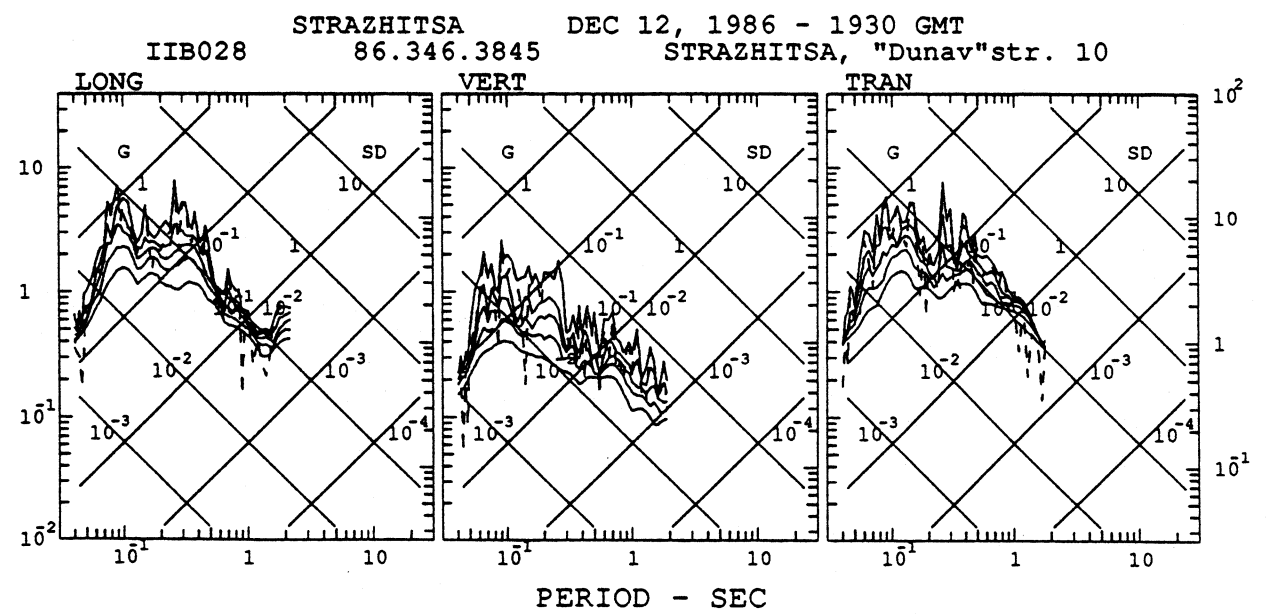
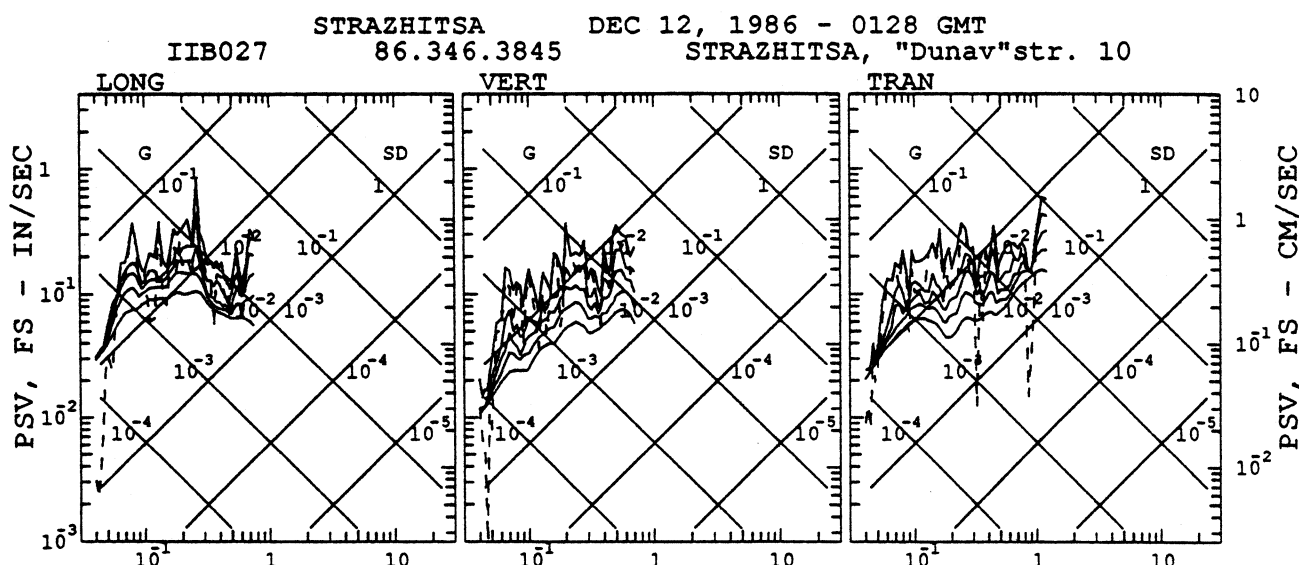
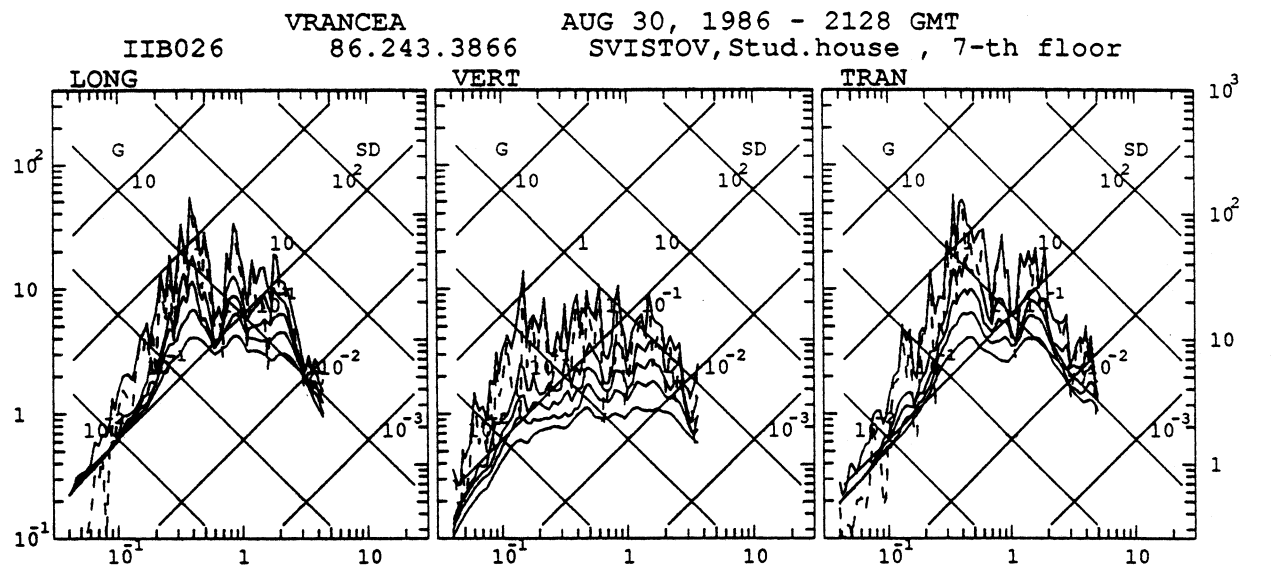


STRAZHITSA DEC 07, 1986 - 1417 GMT
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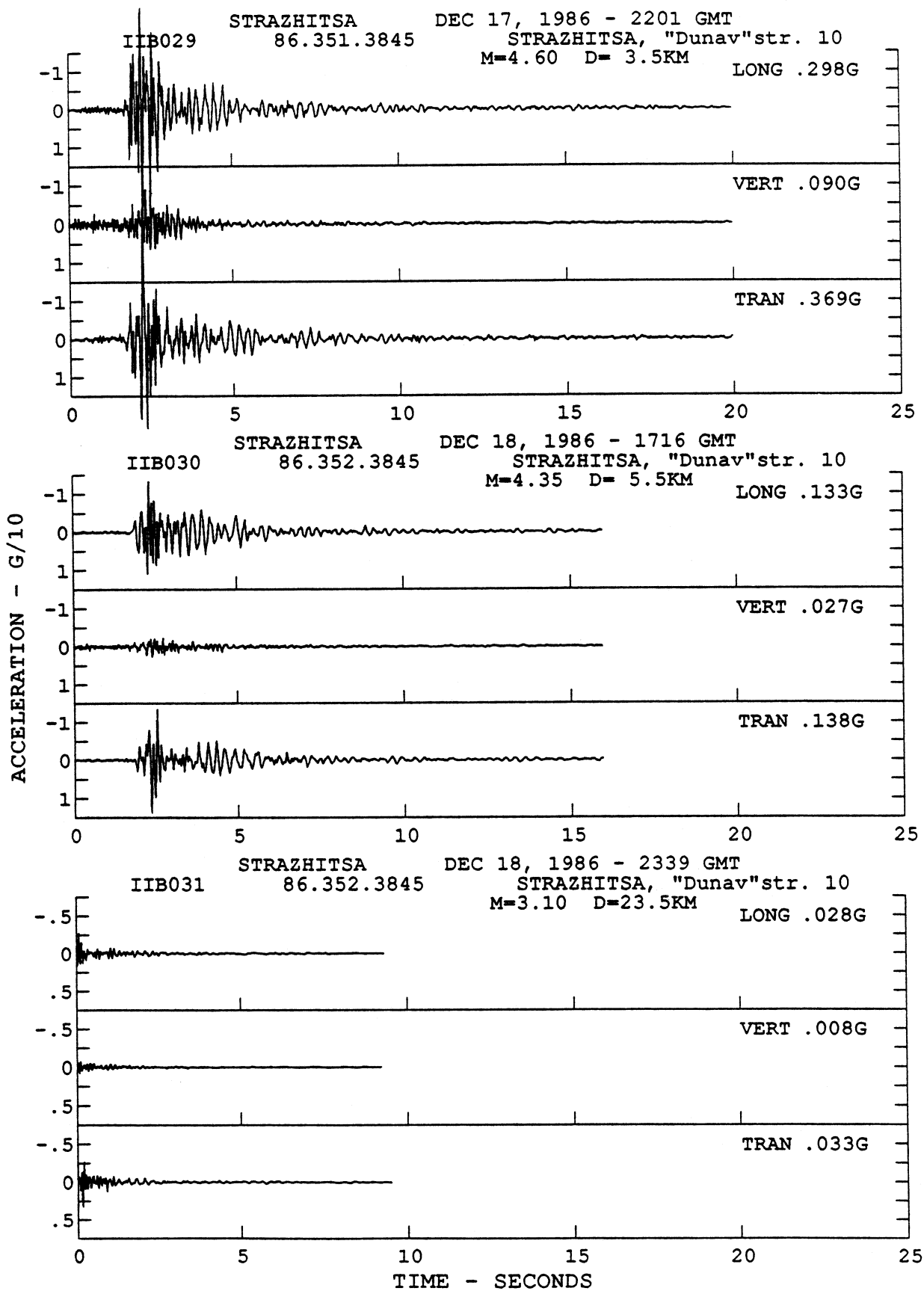


PERIOD - SEC

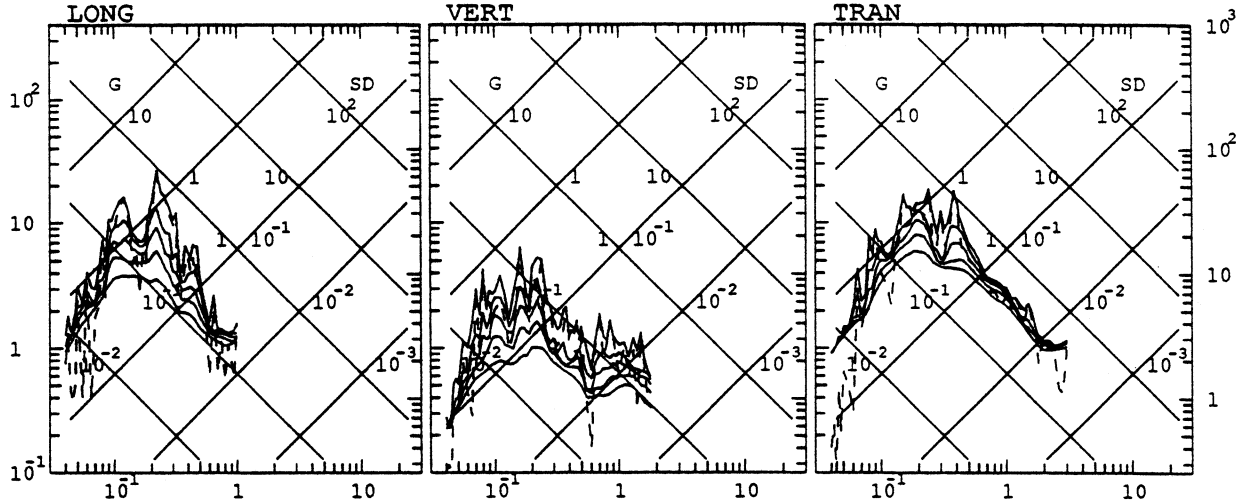




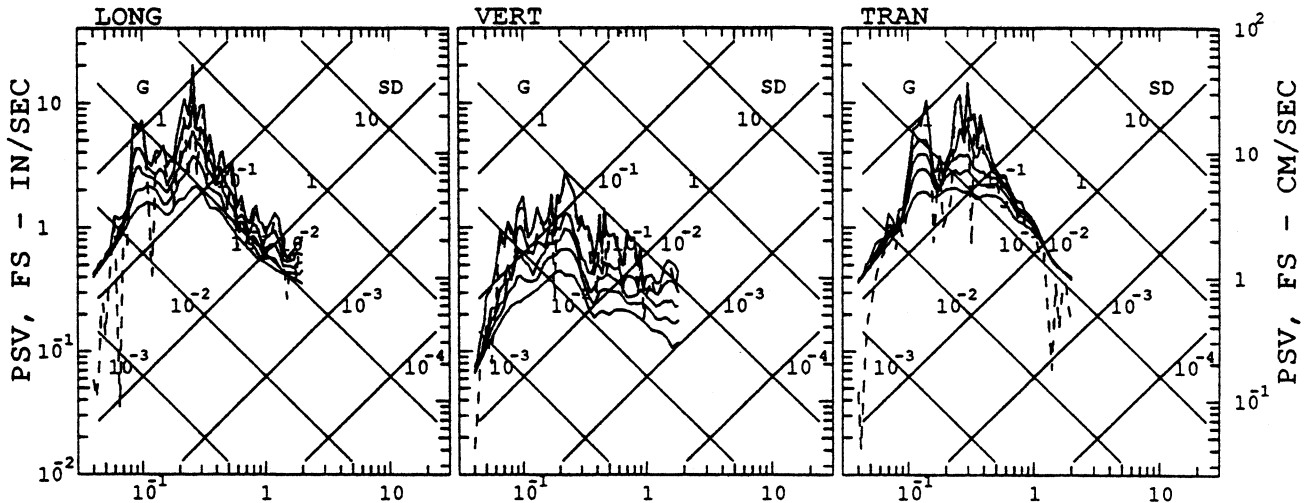
PERIOD - SEC



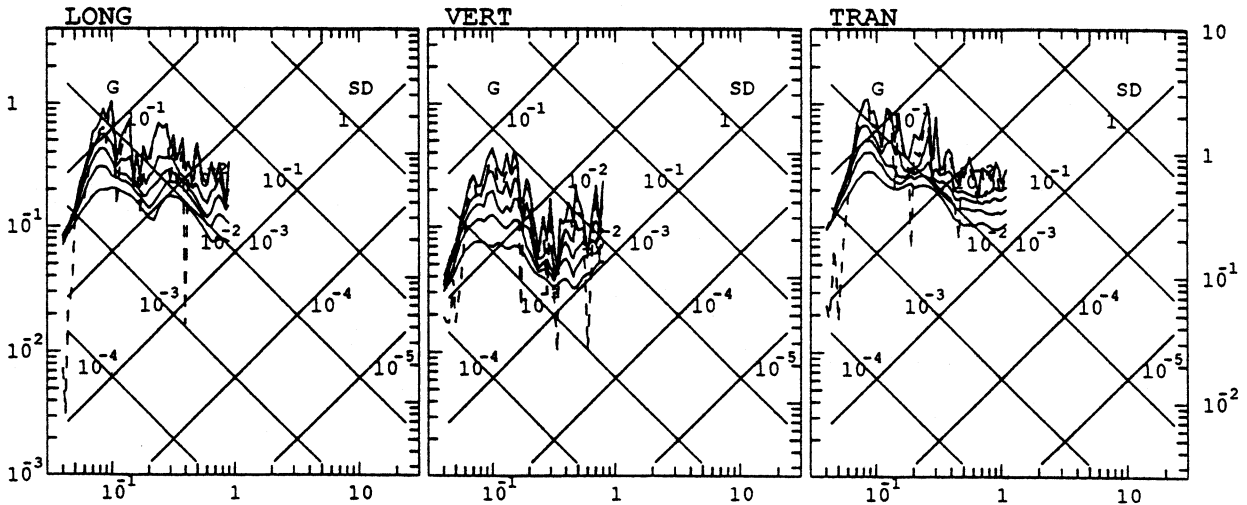
IIB029 STRAZHITSA DEC 17, 1986 - 2201 GMT
 86.351.3845 STRAZHITSA, "Dunav"str. 10



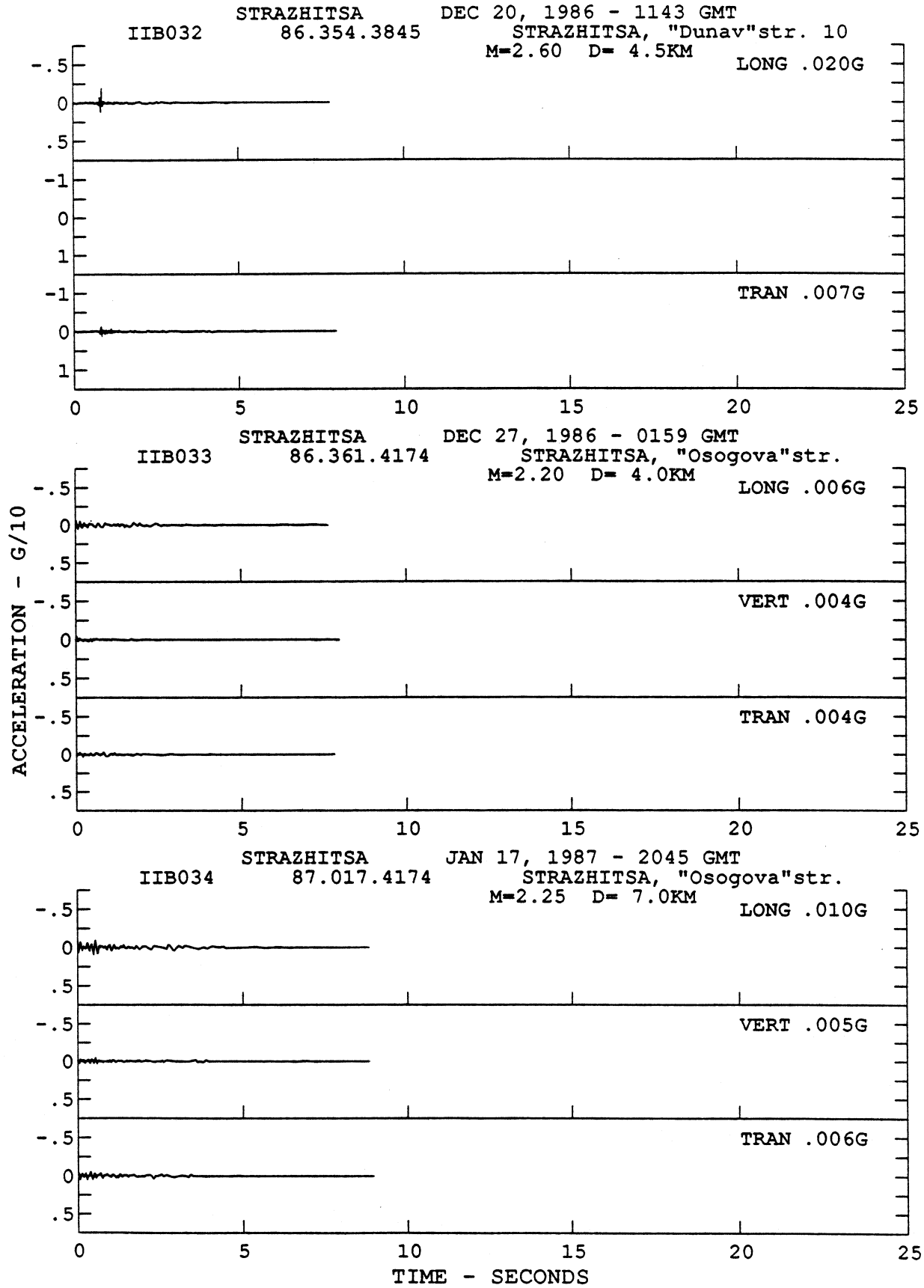
IIB030 STRAZHITSA DEC 18, 1986 - 1716 GMT
 86.352.3845 STRAZHITSA, "Dunav"str. 10



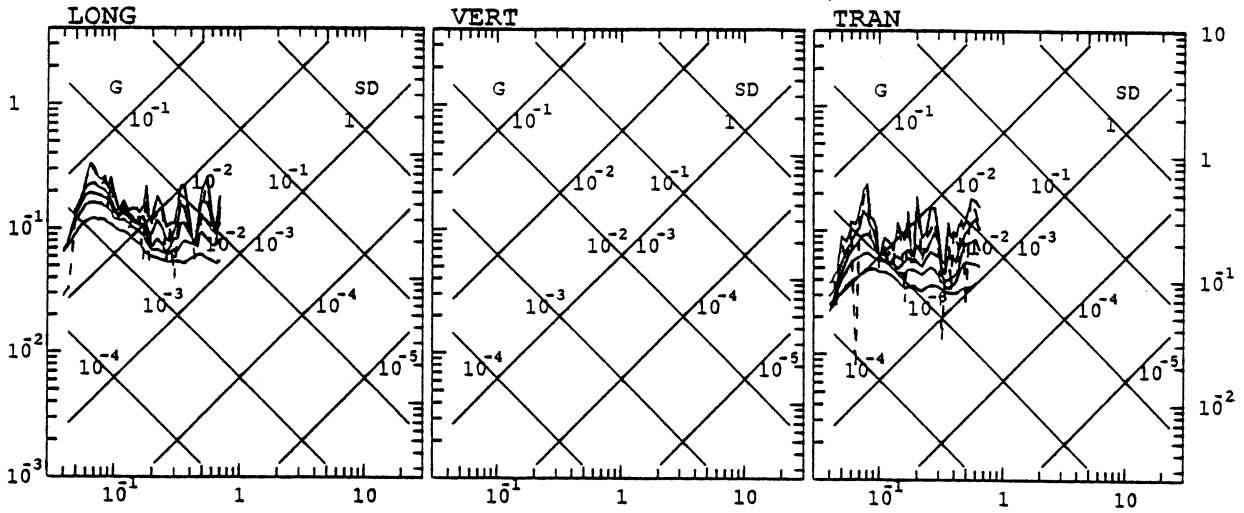
IIB031 STRAZHITSA DEC 18, 1986 - 2339 GMT
 86.352.3845 STRAZHITSA, "Dunav"str. 10



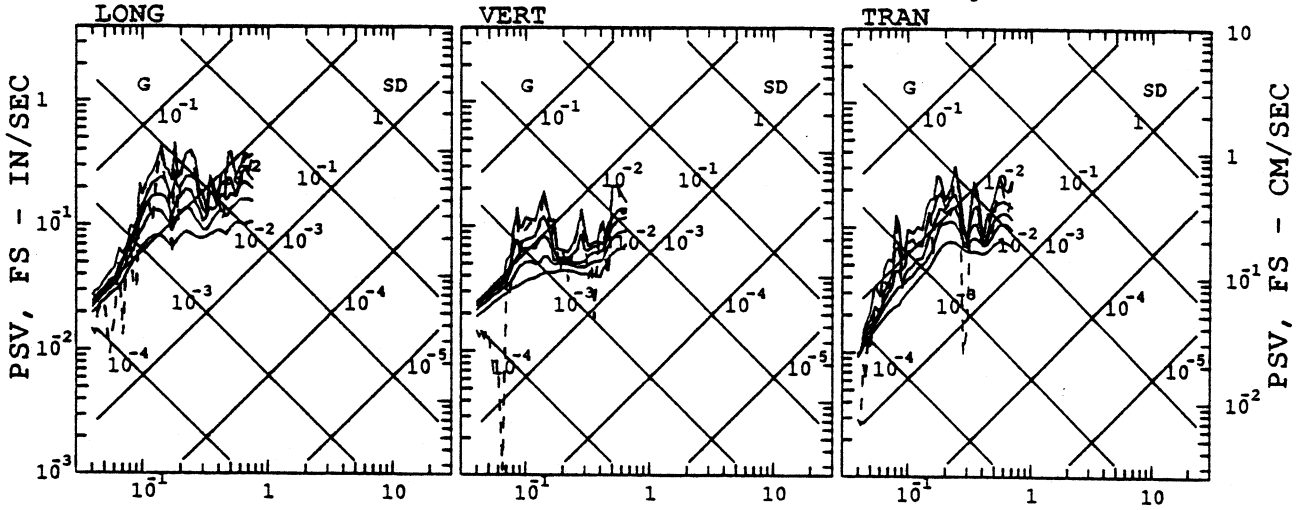
PERIOD - SEC



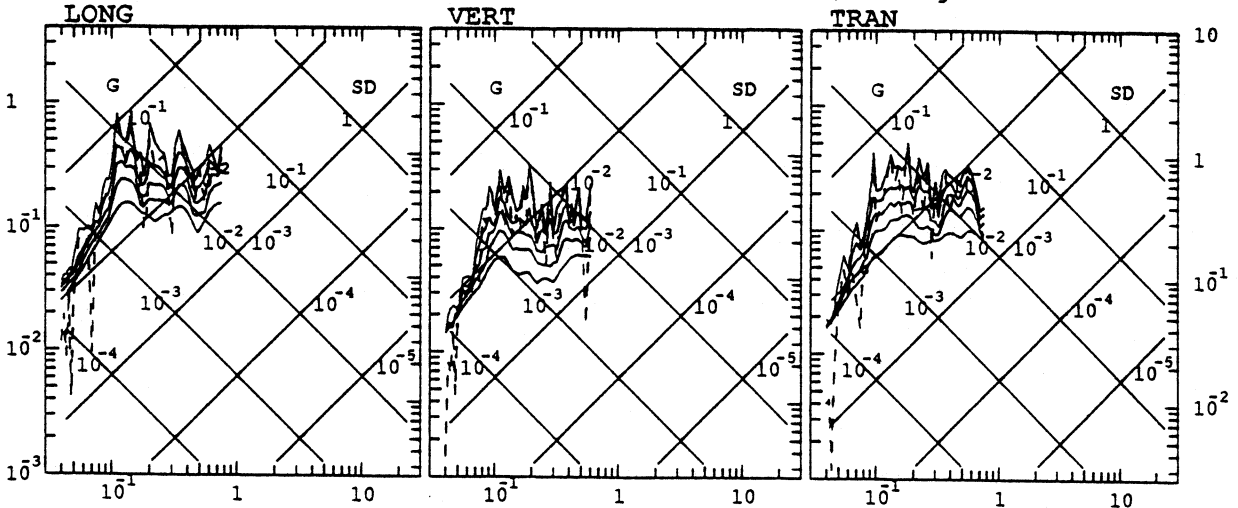
STRAZHITSA DEC 20, 1986 - 1143 GMT
IIB032 86.354.3845 STRAZHITSA, "Dunav"str. 10



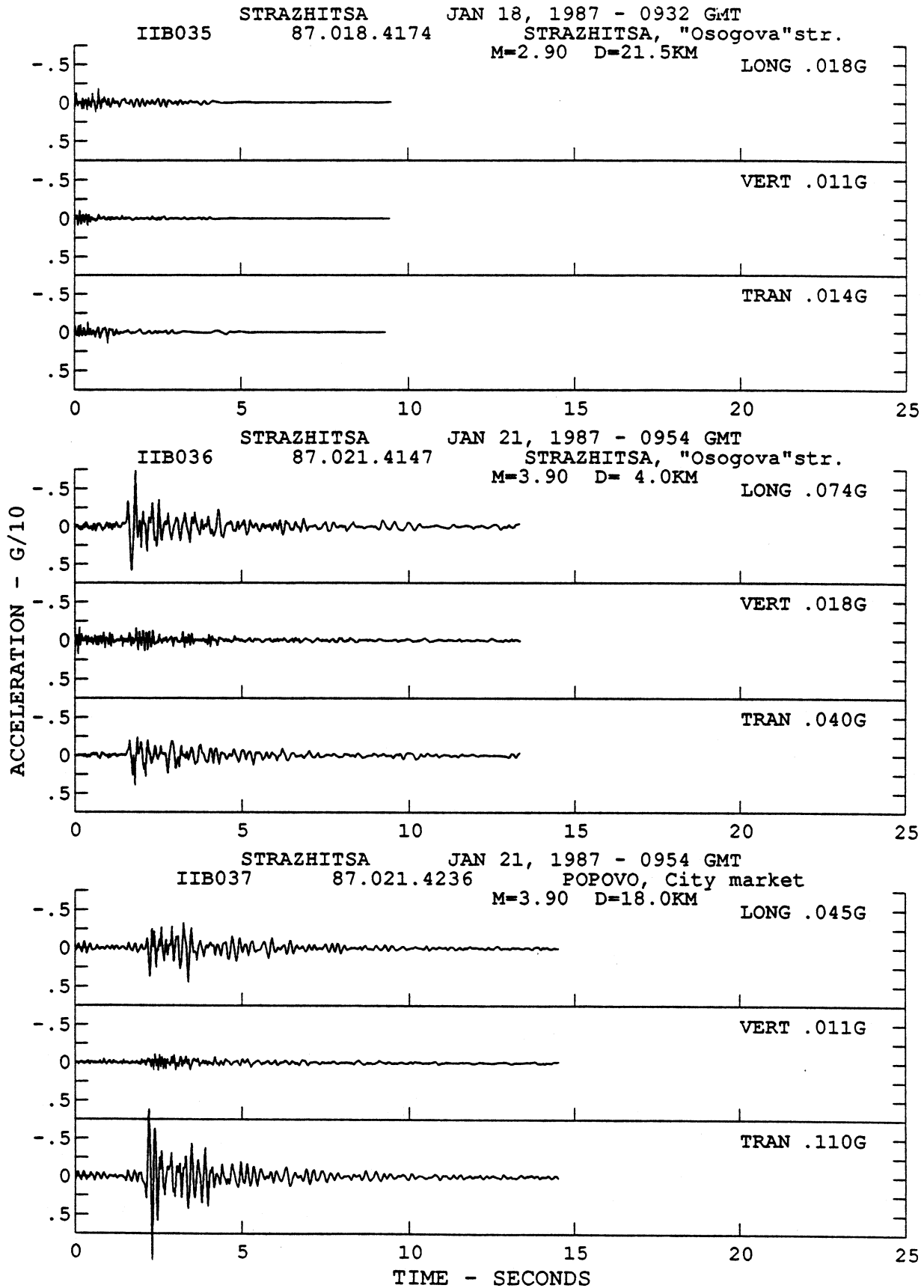
STRAZHITSA DEC 27, 1986 - 0159 GMT
IIB033 86.361.4174 STRAZHITSA, "Osogova"str.



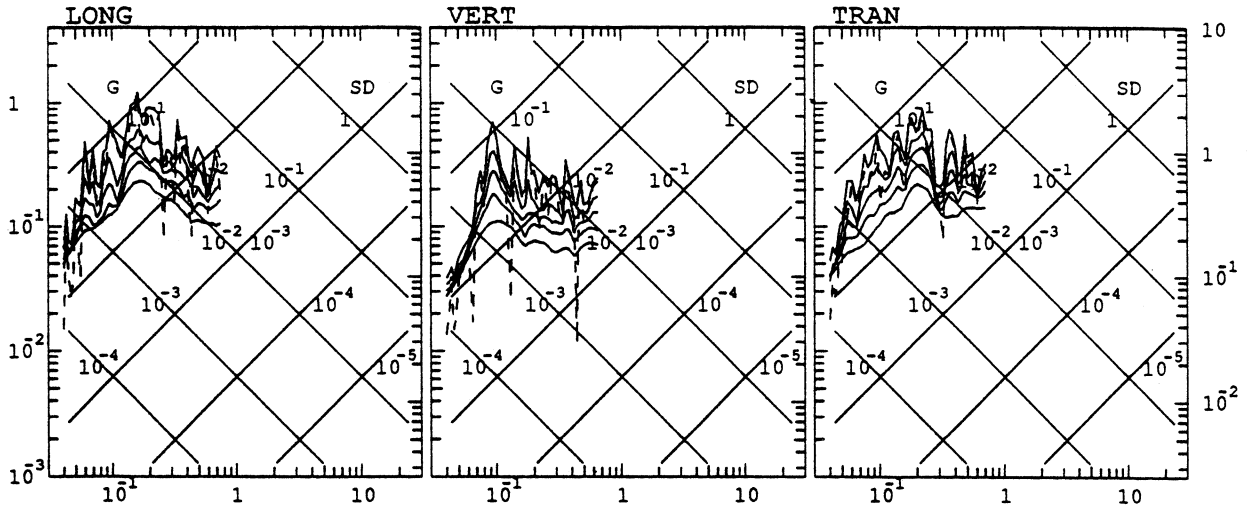
STRAZHITSA JAN 17, 1987 - 2045 GMT
IIB034 87.017.4174 STRAZHITSA, "Osogova"str.



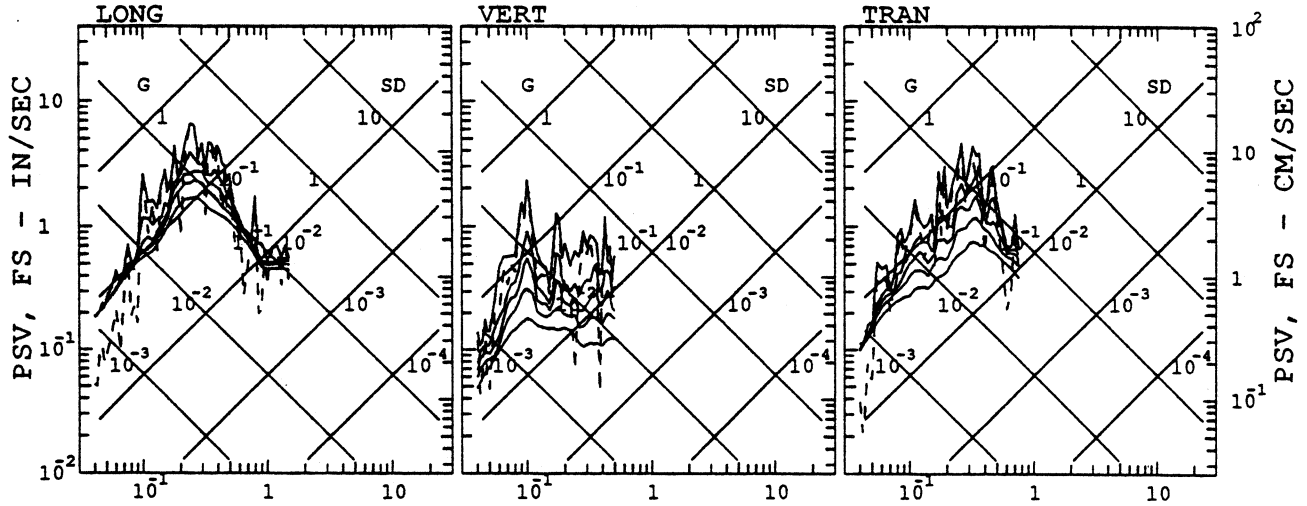
PERIOD - SEC



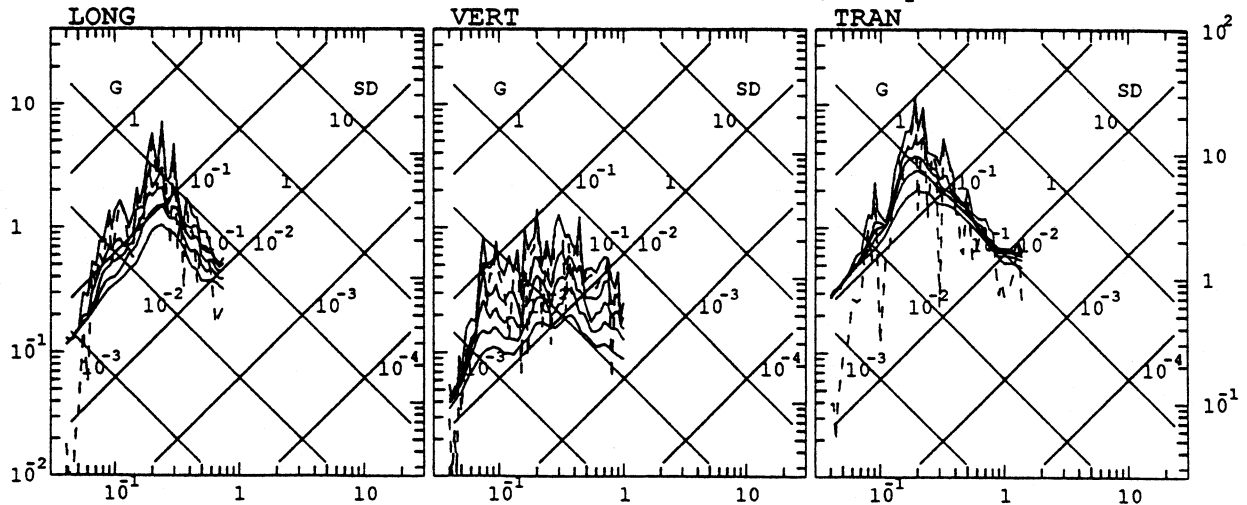
STRAZHITSA JAN 18, 1987 - 0932 GMT
 IIB035 87.018.4174 STRAZHITSA, "Osogova"str.



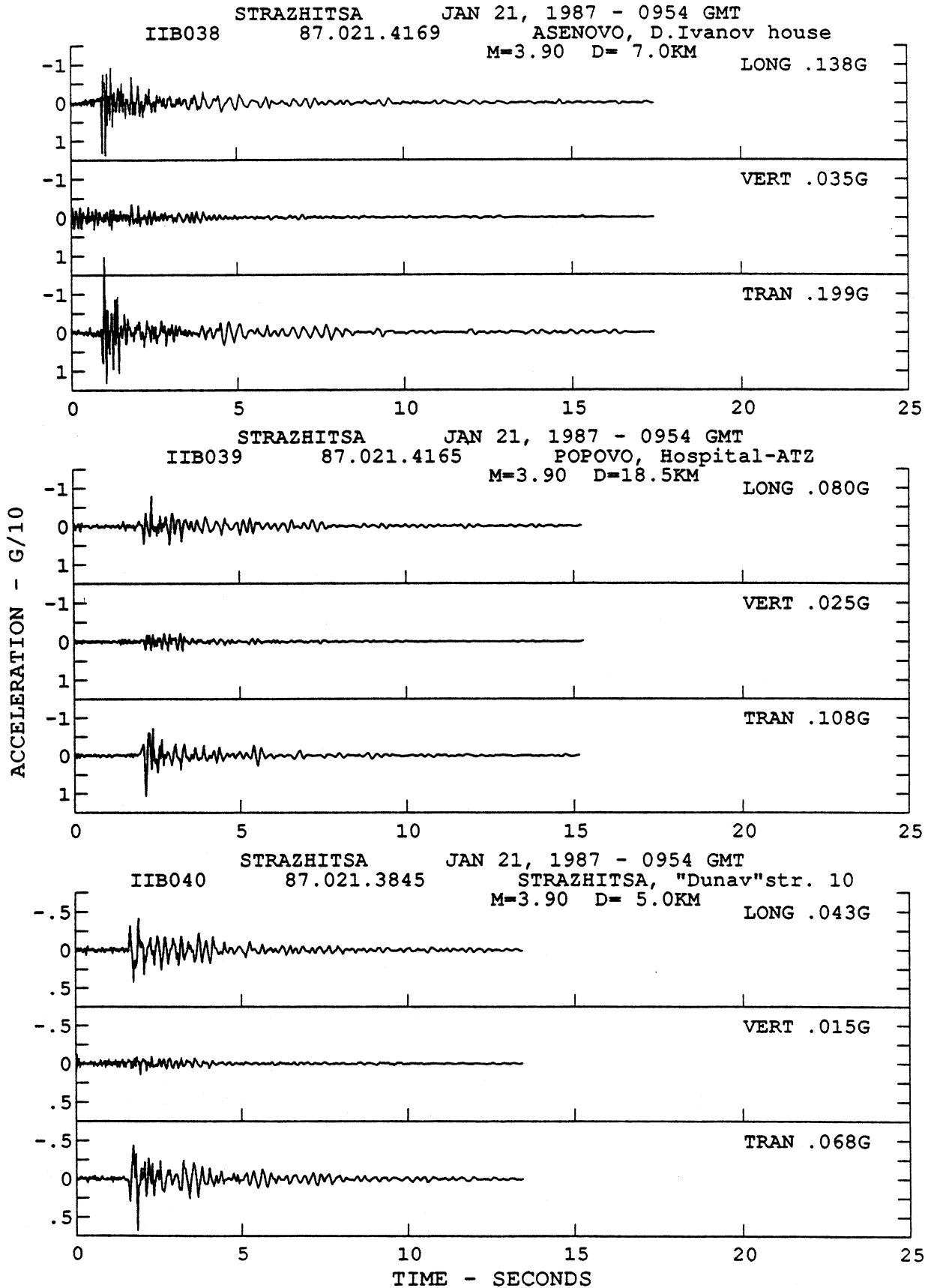
STRAZHITSA JAN 21, 1987 - 0954 GMT
 IIB036 87.021.4147 STRAZHITSA, "Osogova"str.



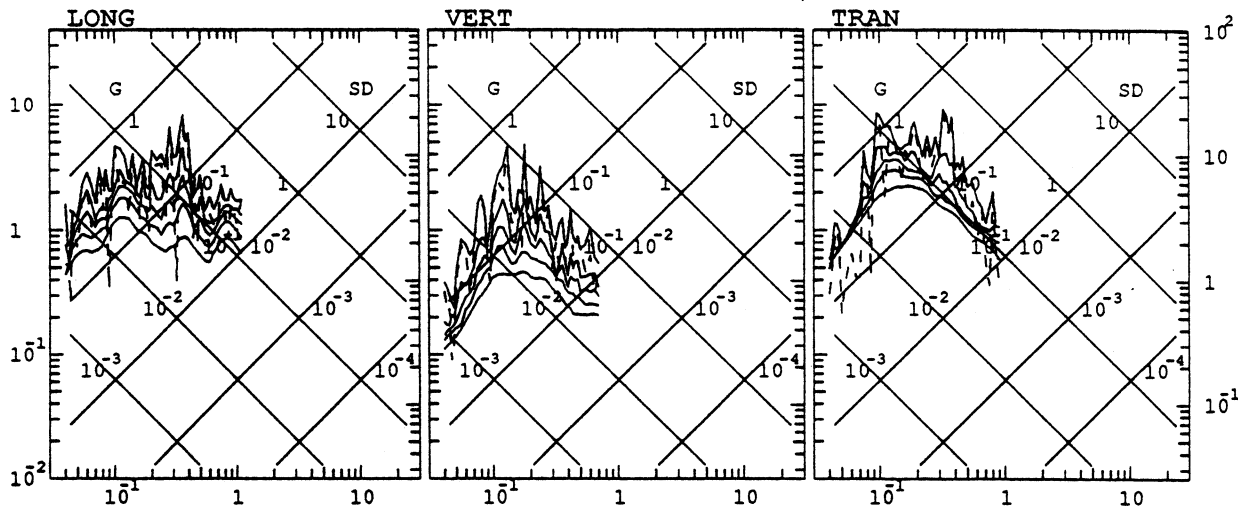
STRAZHITSA JAN 21, 1987 - 0954 GMT
 IIB037 87.021.4236 POPOVO, City market



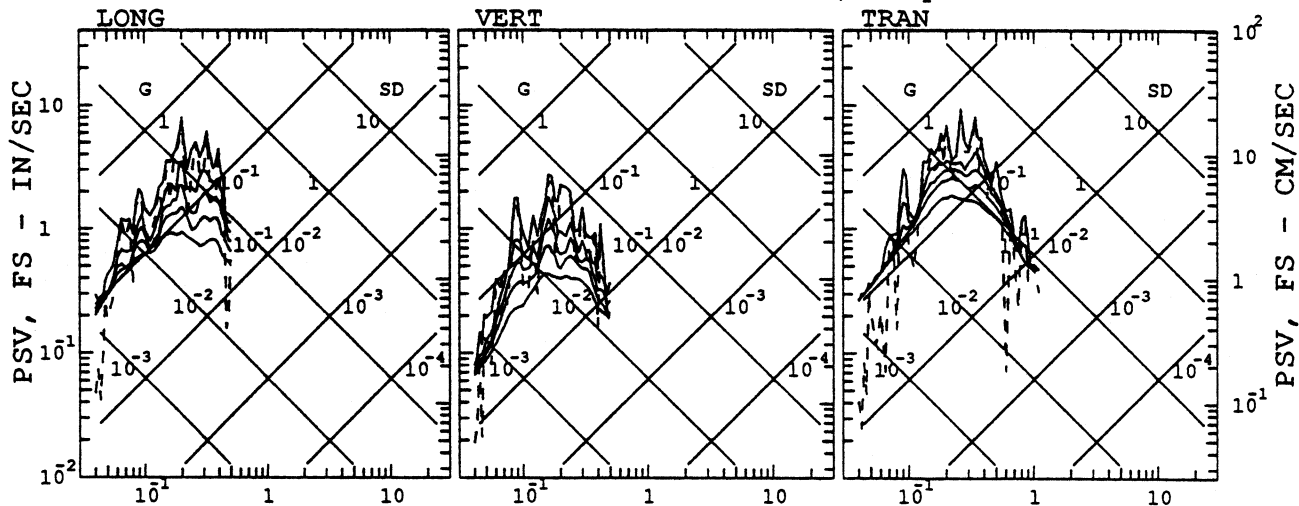
PERIOD - SEC



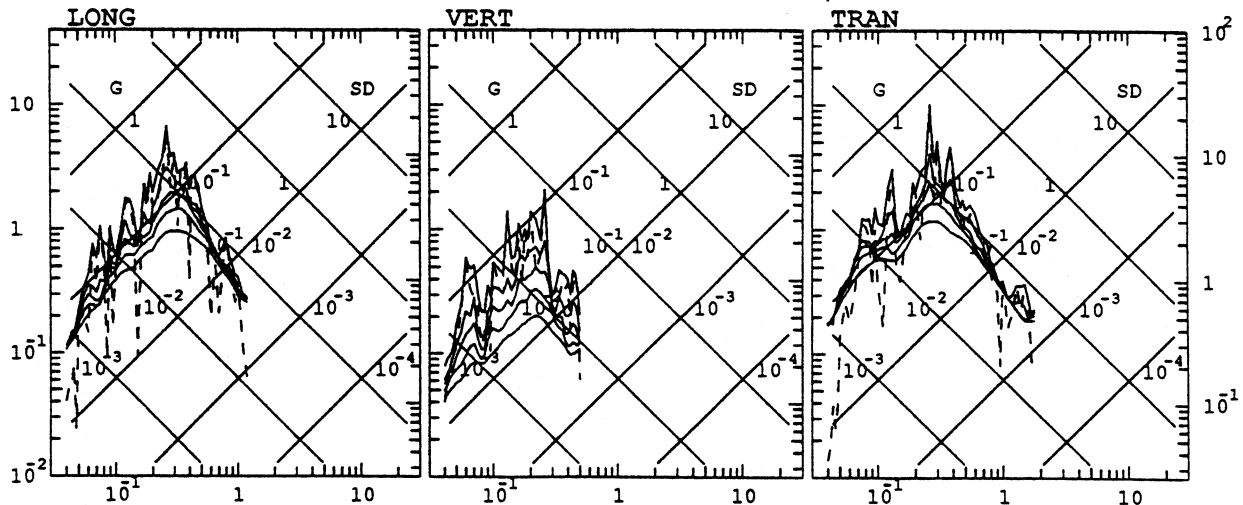
STRAZHITSA JAN 21, 1987 - 0954 GMT
 IIB038 87.021.4169 ASENOVO, D.Ivanov house



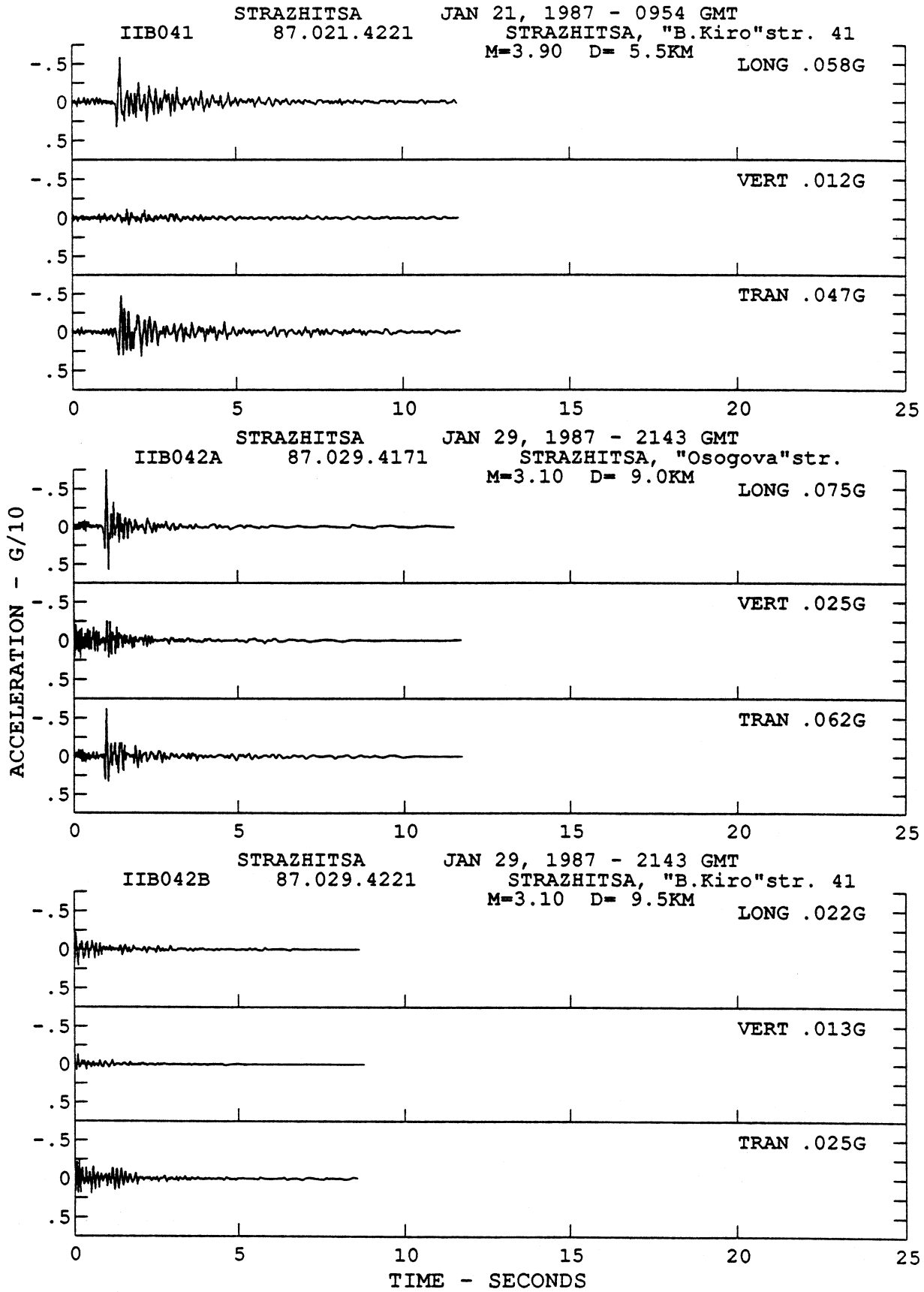
STRAZHITSA JAN 21, 1987 - 0954 GMT
 IIB039 87.021.4165 POPOVO, Hospital-ATZ

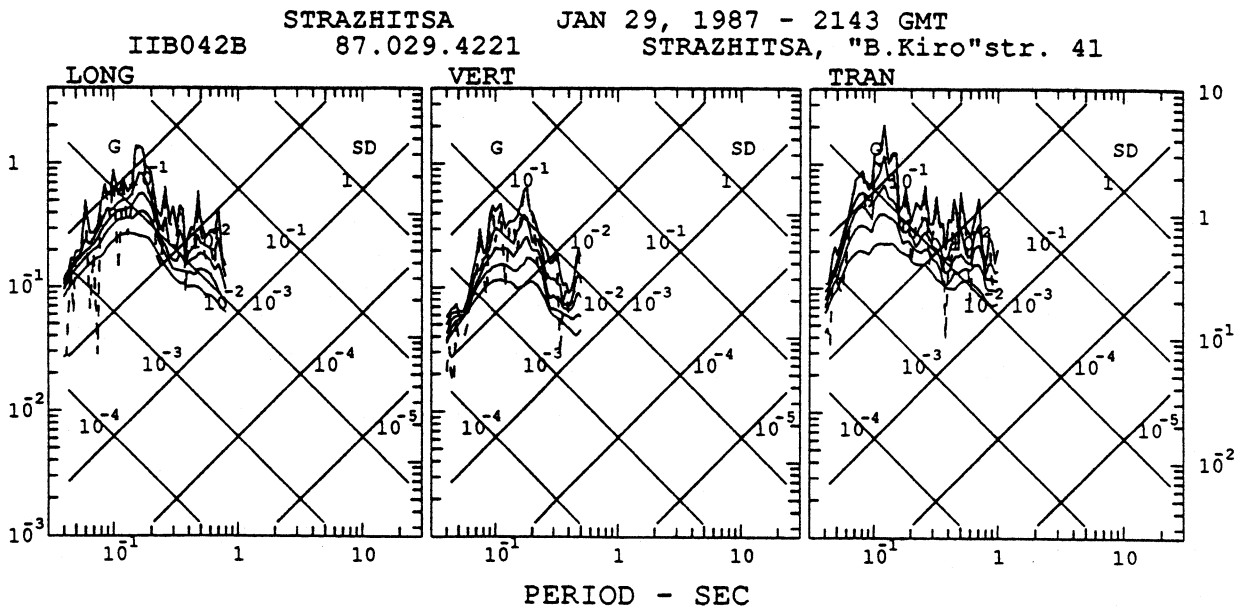
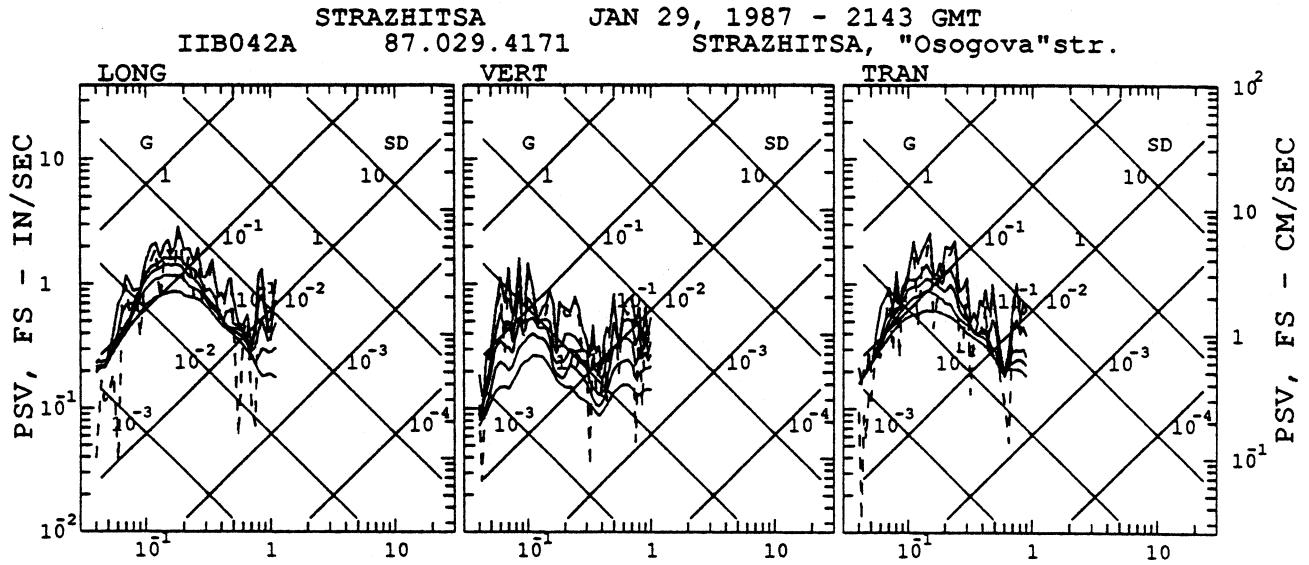
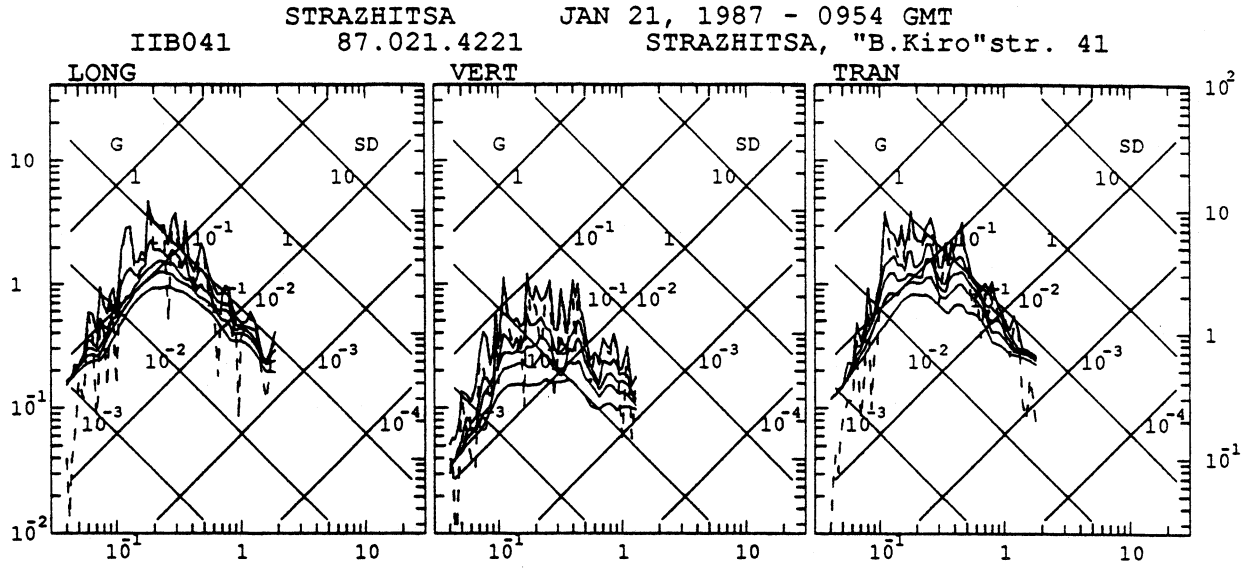


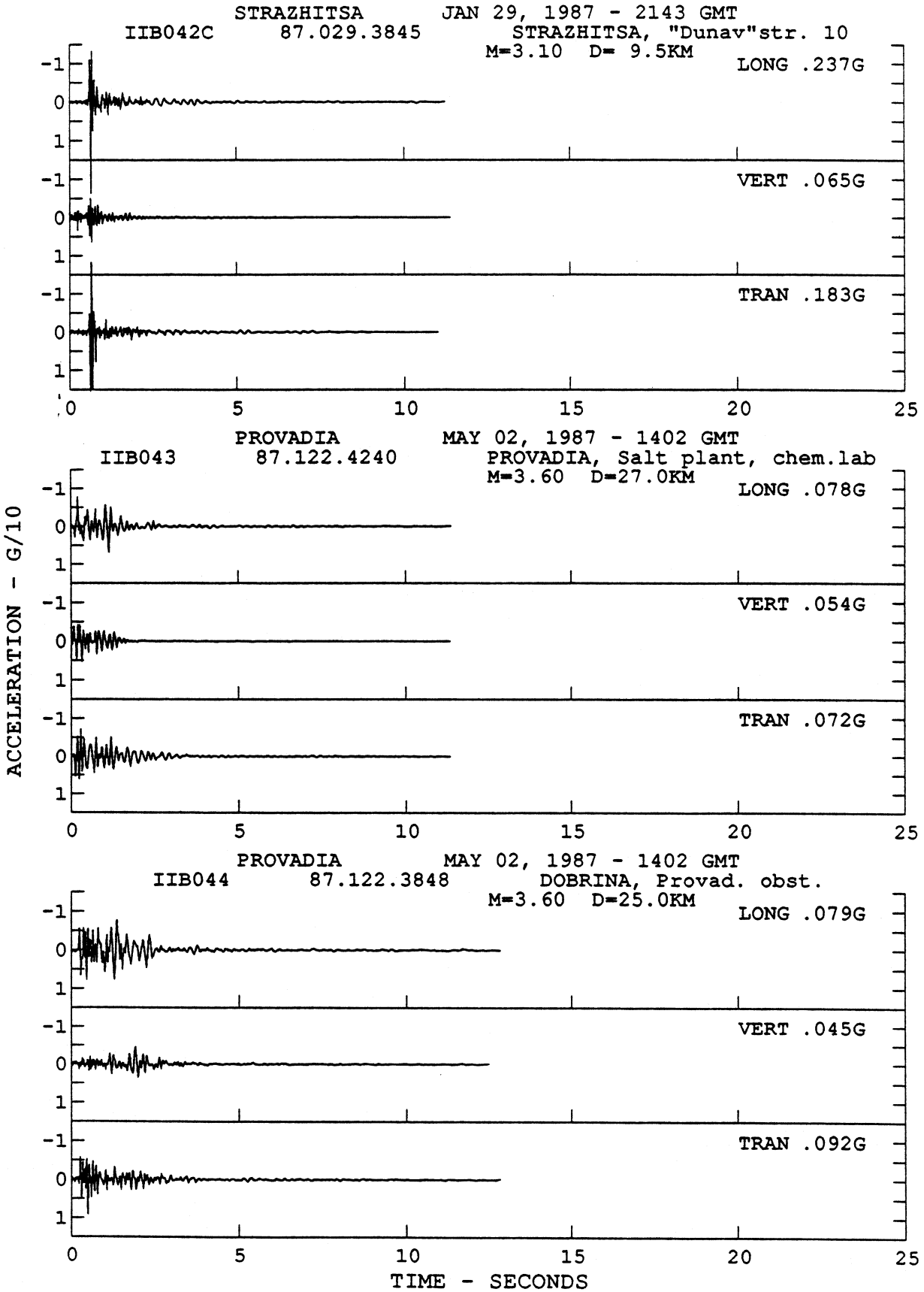
STRAZHITSA JAN 21, 1987 - 0954 GMT
 IIB040 87.021.3845 STRAZHITSA, "Dunav"str. 10



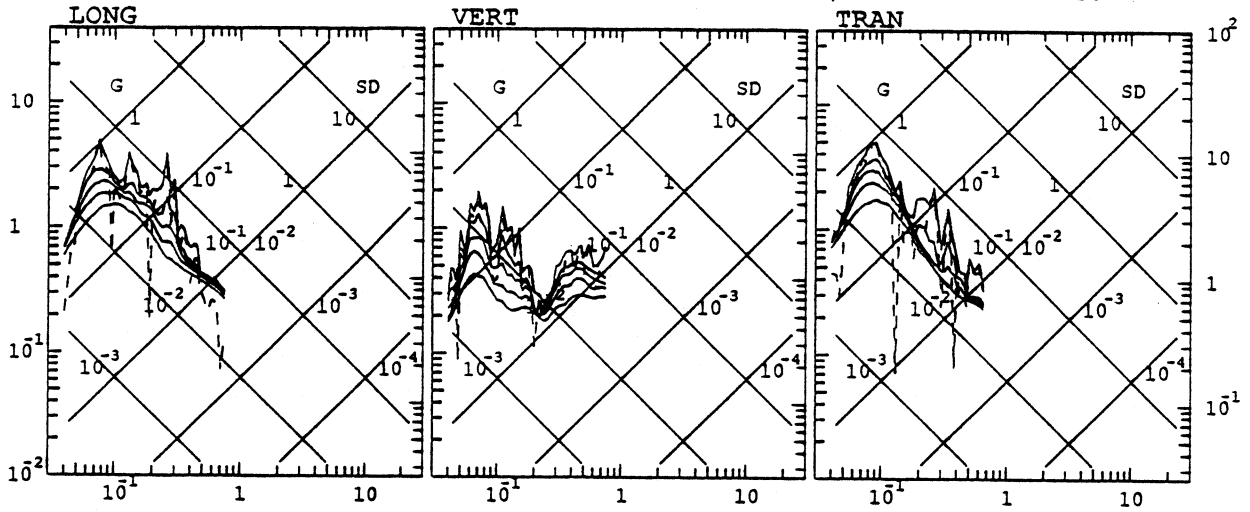
PERIOD - SEC



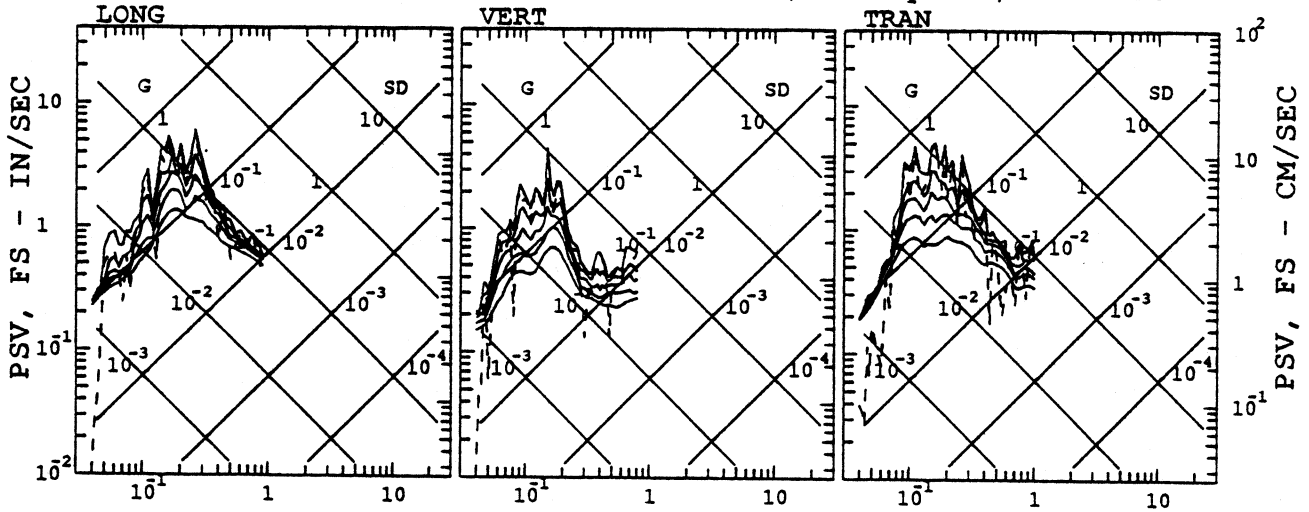




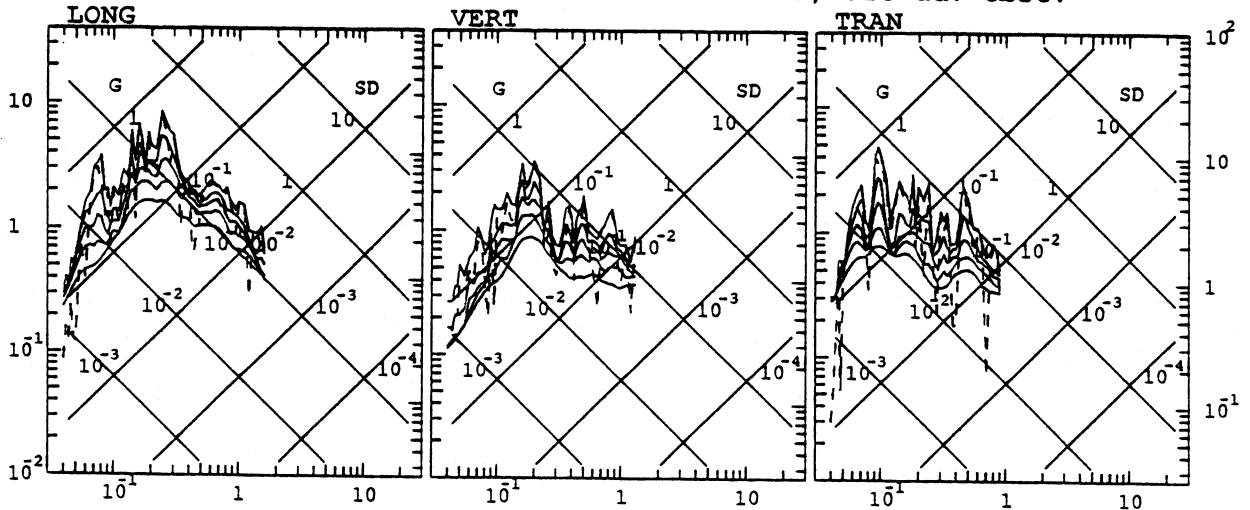
IIB042C STRAZHITSA JAN 29, 1987 - 2143 GMT
 87.029.3845 STRAZHITSA, "Dunav"str. 10



IIB043 PROVADIA MAY 02, 1987 - 1402 GMT
 87.122.4240 PROVADIA, Salt plant, chem.lab

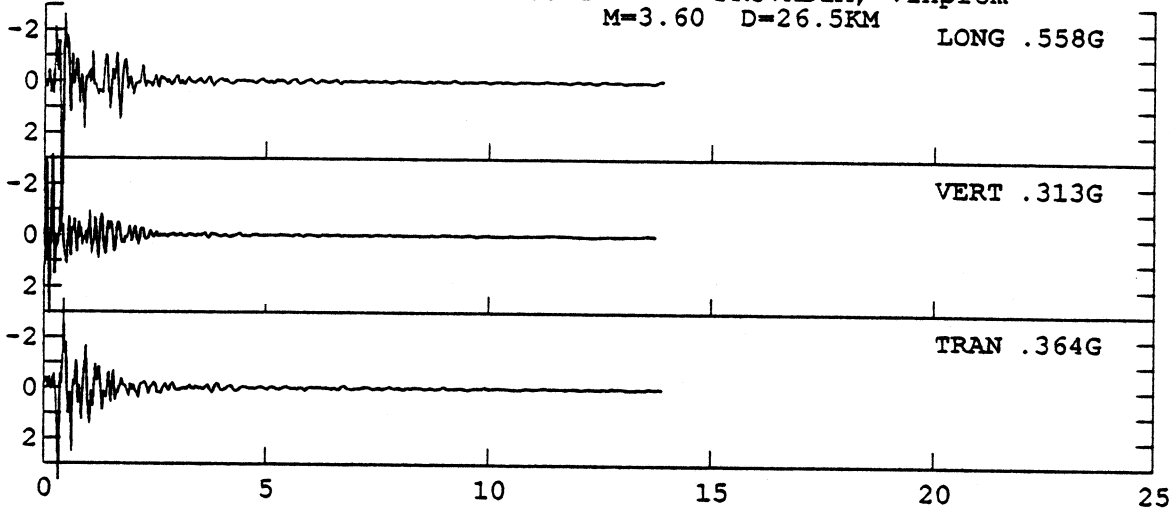


IIB044 PROVADIA MAY 02, 1987 - 1402 GMT
 87.122.3848 DOBRINA, Provad. obst.



PERIOD - SEC

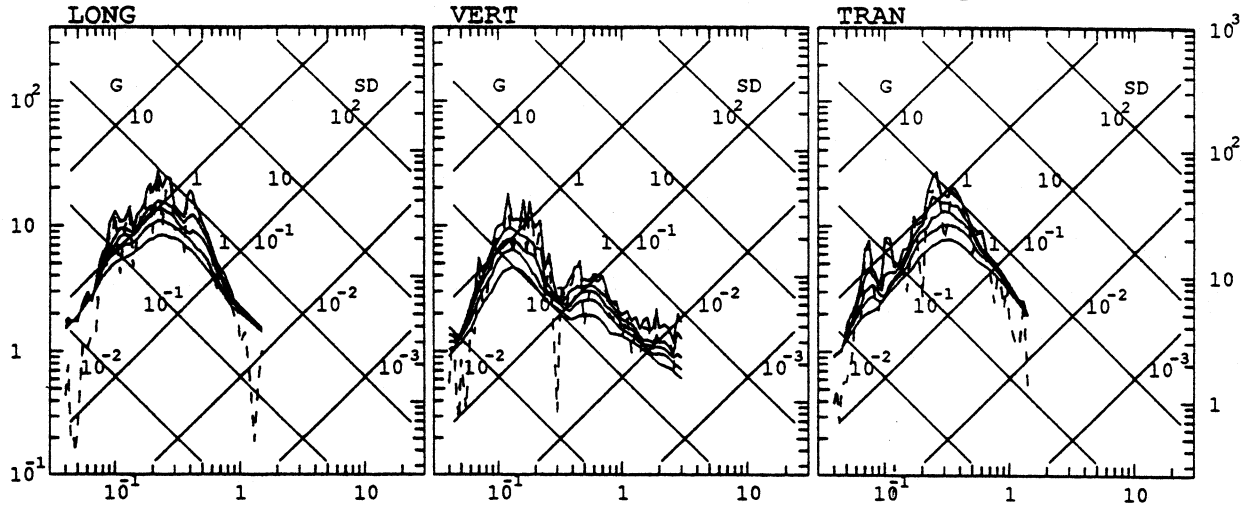
PROVADIA MAY 02, 1987 - 1402 GMT
IIB045 87.122.3872 PROVADIA, Vinprom
M=3.60 D=26.5KM LONG .558G



ACCELERATION - G/10

TIME - SECONDS

PROVADIA MAY 02, 1987 - 1402 GMT
IIB045 87.122.3872 PROVADIA, Vinprom



PSV, FS - IN/SEC

PSV, FS - CM/SEC

PERIOD - SEC