THE *SP VRANCEA NT* DATABASE WITH RESULTS FROM THE PROCESSING OF VRANCEA EARTHQUAKE RECORDS OBTAINED AT GROUND LEVEL. EXAMPLES OF USE: SEISMIC RECORDS OBTAINED IN THE REPUBLIC OF MOLDOVA

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SUMMARY

The SP VRANCEA NT Database (Strong Earthquakes with Epicenters in the Vrancea Seismogenic Zone - Records at Ground Level) contains results obtained by the processing of Vrancea ground level seismic motions recorded from the seismic networks of Romania (INCERC, INCDFP and ISPH-GEOTEC), Bulgaria and Republic of Moldova. The equations of definition and the computed values of peak ground acceleration, peak ground velocity and peak ground displacement - as well as their "effective" values, corner (control) periods, T_C

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(velocity / acceleration) and T_D (displacement / velocity), response spectra and instrumental intensity spectra are provided. The free access to SP VRANCEA NT Database on INCD URBAN-INCERC website is also presented.

***Key words**: seismic records, instrumental intensities, response spectra, databases.*

1 INTRODUCTION

Databases containing: - ground motion records and seismic records of strong earthquakes obtained on seismic instrumented buildings, seismic records obtained in INCERC national seismic network during 1977, 1986 and 1990 earthquakes; - primary processing (time-histories of acceleration, velocity and displacement, peak acceleration, velocity and displacement) and - secondary processing (response spectra, "effective" values of peak acceleration, velocity and displacement, global instrumental intensities based on the response spectrum) of seismic records were created and described in two guides, developed during 2001 and 2002, GT 054-2004 and GT 055-2004.

Between 1999 and 2009, new ground motion records from Vrancea moderate earthquakes with moment magnitudes Mw > 5 were obtained. During the same period, new numerical processing methodologies were developed and applied to the records of strong Vrancea earthquakes (i.e. instrumental intensities spectra with averaging on different period intervals, response spectrum based intensities, Arias intensities, destructiveness spectrum based intensities), being used in defining the seismic action for building research and design and for a better understanding of the structural behaviour of buildings during strong Vrancea earthquakes.

With the finalization of the pre-normative research „*Processing of seismic records obtained at INCERC national seismic network (at ground level and in seismic instrumented buildings)*", financed in the framework of the contract INCERC-MDRT no. 401/2009, the SP VRANCEA NT Database (*Strong Earthquakes with the epicenter in Vrancea seismogenic area, ground level seismic records*) was created and published, as an useful tool for researchers and structural engineers.

2 ADVANCED PROCESSING OF SEISMIC RECORDS OBTAINED AT GROUND LEVEL

After performing the initial processing of the recorded accelerograms (i.e. obtaining the time-histories of (corrected) acceleration, velocity and displacement (Borcia I. S., 2006)), the calculation of: peak acceleration, PGA, peak velocity, PGV, peak displacement , PGD; for the records obtained at ground level secondary processing of accelerographic information was performed. Subsequently, response spectra (Saa - absolute acceleration response spectrum, Svr - relative velocities response spectrum, and Sdr - relative displacement response spectrum) were calculated and based on these response spectra «effective» measures: epa: "effective" value of maximum acceleration, EPV: "effective" value of maximum velocity, EPD: "effective" value of maximum displacement (as defined in (Dubina D., Lungu D. (eds.), 2003) and in Appendix A of the Romanian P 100-1/2006 seismic design code) were estimated, according to the following relations:

$$epa = \frac{(Saa_{averaged\ on\ 0.4s})max}{2.5}$$

$$epv = \frac{(Svr_{averaged\ on\ 0.4s})max}{2.5}$$

$$epd = \frac{(Sdr_{averaged\ on\ 0.4s})max}{2.5},$$

The above quantities were obtained by averaging the response spectra computed for n=5% damping ratio, where (0.4s) is the averaging time interval of 0.4 s, and retaining the maximum of all the values calculated on each time interval of 0.4 s situated in the range 0.1s – 4.0s. Based on these quantities, the control periods, T_C and T_D were obtained, as follows:

$$T_C = 2 * p * epv / epa$$

$$T_D = 2 * p * epd / epv .$$

Instrumental seismic intensities (alternative definitions).

The interest for new definitions of instrumental seismic intensities, as well as the developments that it created, have their point of departure in INCERC, based on the experience acquired following the earthquake of March 4, 1977, when the elementary instrumental criteria present in MSK and MMI macro seismic scales led to results inconsistent with reality.

Two main ways of obtaining complex instrumental criteria (Sandi et al, 2010) were used: first, destructivity spectra were defined, which can be extended to tensor characteristics (Sandi, 1979), (Sandi, 1980), as generalization of the Arias approach (Arias, 1970); second, the intensity (response) spectrum was defined, based on absolute acceleration response spectra and absolute velocities (Sandi, 1986).

Two requirements were considered in the development of instrumental seismic intensity concepts synthesized in (Sandi & Floricel, 1998):

- obtaining the best possible compatibility with traditional macro seismic scales,
- achieving a flexible and practical tool for the cases requiring more detailed information than that provided by a global measure of seismic intensity.

Global instrumental intensities:

1.1 The *global intensity based on response spectrum*, I_S, a measure of the severity of ground motion, is defined by using the following parameters:

$$EPAM\ (m/s2) = \max_T s_{aa}(T, 0.05) / 2.5$$

$$EPVM\ (m/s) = \max_T s_{va}(T, 0.05) / 2.5$$

$$EPDM\ (m) = \max_T s_{dr}(T, 0.05) / 2.5$$

where:

$s_{aa}(T,n)$ is the absolute acceleration response spectrum and $s_{va}(T,n)$ is the absolute velocities spectrum, both expressed as functions of period;

$s_{dr}(T,n)$ is the relative displacement spectrum, expressed as a function of period; n = damping ratio, and $\max_T$ is the maximum spectral value, for periods, T, between 0.0625 s and 4.0 s.

$$I_S = \log_{7.5} (EPAM*EPVM) + 8.0$$

1.2 *The Arias type intensity*:

$$I_A = \log_{7.5} \int[w_g (t)]^2 dt + 7.14$$

(where $w_g(t)$ is the ground acceleration on one horizontal direction),

2. Additionally, for intensities depending on the frequency φ(Hz), the following quantities were computed:

2.1. *response spectrum-based intensity*, $i_s(\varphi)$:

$$i_s(\varphi) = \log_{7.5}[s_{aa}(\varphi, 0.05)*s_{va}(\varphi, 0.05)] + 7.79$$

2.2. *destructivity spectrum based intensity*, $i_d(\varphi)$, I_s, determined from the (absolute) accelerogram $w_a(t,\varphi,0.05)$, for a pendulum having the natural (undamped) frequency φ and 0.05 damping ratio;

$$i_d (\varphi) = \log_{7.5} (\int w_a^2(t, \varphi, 0.05)\, dt) + 6.45$$

3. Intensities based on the application of the averaging rule on a specified frequency band (φ ', φ ") were also computed, using the following expressions:

3.1. for response spectrum based intensity, $i_s(\varphi)$:

$$i_s*(\varphi', \varphi'') = \log_{7.5} \{1/\ln (\varphi''/\varphi') \int[s_{aa}(\varphi, 0.05)*s_{va}(\varphi, 0.05)\, d\, \varphi/\varphi]\} + 7.79$$

3.2. for destructivity based intensity, $i_d(\varphi)$:

$$i_d^*(\varphi', \varphi'') = \log_{7.5}\{1/\ln(\varphi''/\varphi') \int[(\int w_a^2(t, \varphi, 0.05)\, dt)\, d\varphi/\varphi]\} + 6.45$$

Averaging rules for the two horizontal orthogonal directions were also provided.

Note: Originally, in the alternative equation of definition of the instrumental intensities the base 4 was used for logarithms; by considering the results presented in (Aptikaev, 2005) and (Sandi et al, 2010), base 7.5 is used for the present database.

The following notations were used in the following charts: Id1 = id*(0.25Hz, 16.0Hz), for averaging on the whole interval (0,0625 sec – 4,0 sec), Id31= id*(0.25 Hz, 1.0 Hz), Id32= id*(1.0 Hz, 4.0 Hz), Id33= id*(4.0 Hz, 16.0 Hz), so averaging on 3 periods interval ((1 - 4 sec), (0.25 - 1 sec) and (0.0625 - 0.25 sec)), etc., for averaging on 6 and 12 intervals at once.

Table 1. Averaging intervals for instrumental intensities

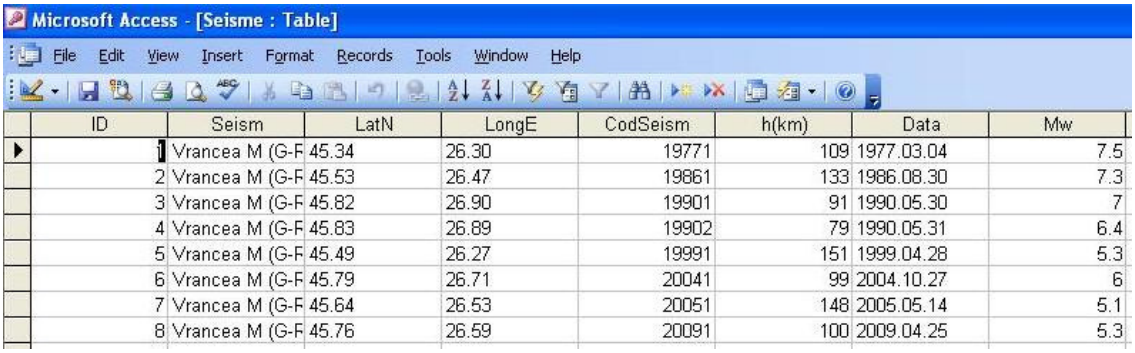
		Frequency intervals		Period intervals	
Is12x	**Id12x**	**Hz.**		**sec.**	
Is121	Id121	0,25	0,354	2,825	4
Is122	Id122	0,354	0,5	2	2,825
Is123	Id123	0,5	0,707	1,414	2
Is124	Id124	0,707	1	1	1,414
Is125	Id125	1	1,414	0,707	1
Is126	Id126	1,414	2	0,5	0,707
Is127	Id127	2	2,828	0,354	0,5
Is128	Id128	2,828	4	0,25	0,354
Is129	Id129	4	5,657	0,177	0,25
Is1210	Id1210	5,657	8	0,125	0,177
Is1211	Id1211	8	11,314	0,088	0,125
Is1212	Id1212	11,314	16	0,0625	0,088
Is6x	**Id6x**	**Hz.**		**sec.**	
Is61	Id61	0,25	0,5	2	4
Is62	Id62	0,5	1	1	2
Is63	Id63	1	2	0,5	1
Is64	Id64	2	4	0,25	0,5
Is65	Id65	4	8	0,125	0,25
Is66	Id66	8	16	0,0625	0,125

Is3x	**Id3x**				
Is31	Id31	0,25	1	1	4
Is32	Id32	1	4	0,25	1
Is33	Id33	4	16	0,0625	0,25
Is1	**Id1**	**Hz.**		**sec.**	
Is1	Id1	0,25	16	0,0625	4

Numerical values for seismic records of Vrancea earthquakes with moment magnitude, M_w, higher than 5, obtained from seismic networks from Romania (INCERC, INCDFP and ISPH-GEOTEC), Bulgaria and Republic of Moldova, were determined by using software developed at INCERC. The numerical values and graphical information thus obtained were used in four Excel Tables (SP VRANCEA NT.xls) and in the Access database (SP VRANCEA NT.mdb).

3 THE STRUCTURE OF THE DATABASE WITH RESULTS FROM THE PROCESSING OF VRANCEA EARTHQUAKE RECORDS

The codifications adopted and the fields associated with seismic events (source parameters) are explained in the Table SP VRANCEA NT Earthquakes (it contains information on the 8 Vrancea earthquakes with Mw> 5, recorded during 1977 and 2009).



ID	Seism	LatN	LongE	CodSeism	h(km)	Data	Mw
1	Vrancea M (G-F	45.34	26.30	19771	109	1977.03.04	7.5
2	Vrancea M (G-F	45.53	26.47	19861	133	1986.08.30	7.3
3	Vrancea M (G-F	45.82	26.90	19901	91	1990.05.30	7
4	Vrancea M (G-F	45.83	26.89	19902	79	1990.05.31	6.4
5	Vrancea M (G-F	45.49	26.27	19991	151	1999.04.28	5.3
6	Vrancea M (G-F	45.79	26.71	20041	99	2004.10.27	6
7	Vrancea M (G-F	45.64	26.53	20051	148	2005.05.14	5.1
8	Vrancea M (G-F	45.76	26.59	20091	100	2009.04.25	5.3

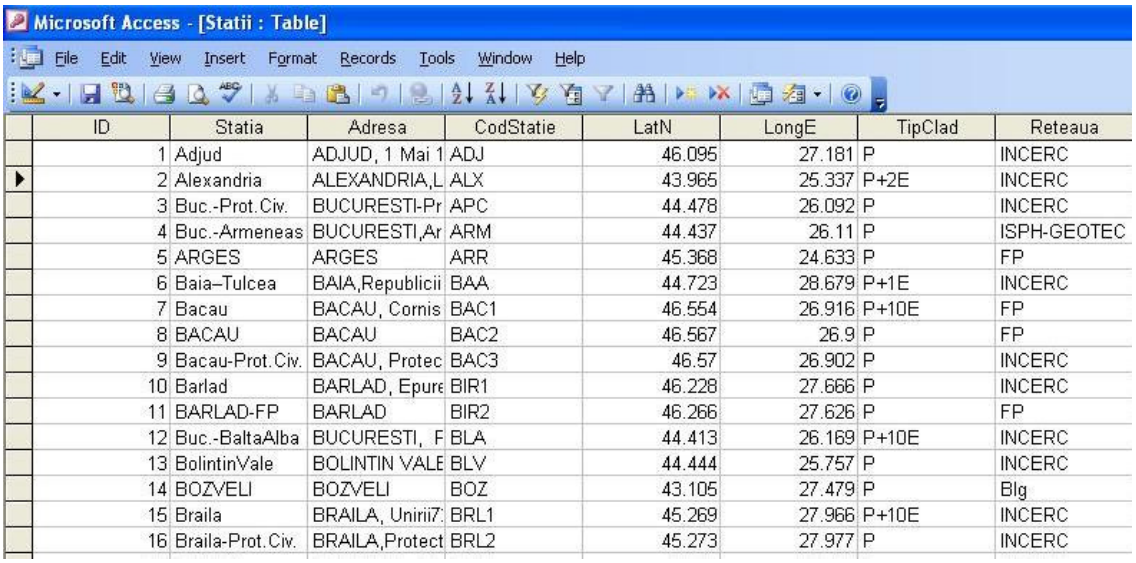
Figure. 1 Table SP VRANCEA NT *Seisme*

The codifications adopted and the fields associated with seismic stations (geographical coordinates, station code) are explained in Table SP VRANCEA NT *Statii* (containing information on the 94 stations that provided at least one record in one of the earthquakes listed in Table SP VRANCEA NT *Seisme*).

The codifications adopted and the fields associated with seismic records (obtained at the stations during the above-mentioned earthquakes, and for which graphic presentations are

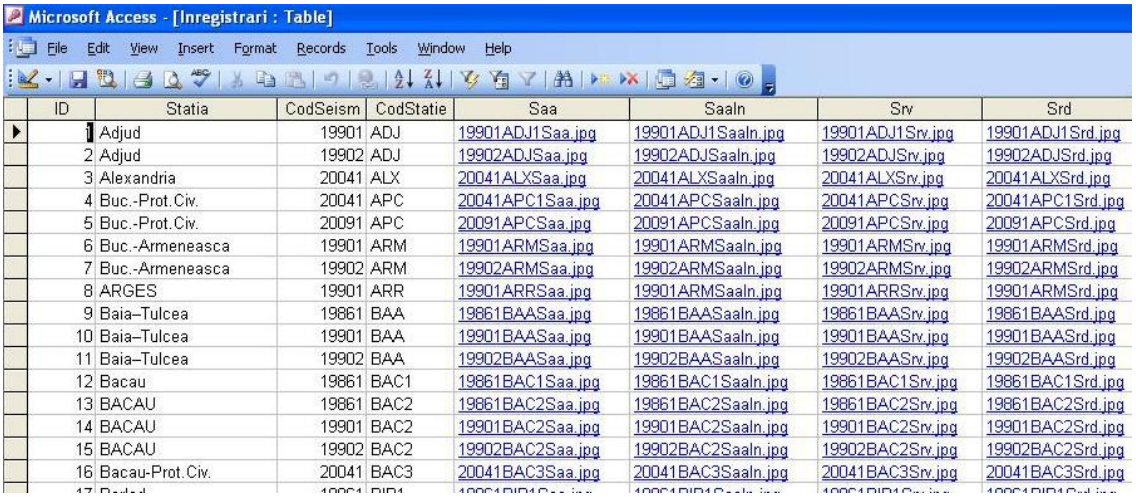
provided for absolute acceleration response spectra, relative velocities and displacements and for instrumental intensities) are explained in Table SP VRANCEA NT *Inregistrari*, containing information on the 205 records obtained from the networks in Romania, Bulgaria and Moldova.

The codifications adopted and the fields associated with the representative parameters of seismic motion (peak sizes and "effective" values of acceleration, velocity and displacement, global instrumental intensities and intensities averaged on various period intervals) are explained in Table SP VRANCEA NT *Componente*, containing information on the 615 record components in the table VRANCEA NT SP records.



ID	Statia	Adresa	CodStatie	LatN	LongE	TipClad	Reteaua
1	Adjud	ADJUD, 1 Mai 1	ADJ	46.095	27.181	P	INCERC
2	Alexandria	ALEXANDRIA,L	ALX	43.965	25.337	P+2E	INCERC
3	Buc.-Prot.Civ.	BUCURESTI-Pr	APC	44.478	26.092	P	INCERC
4	Buc.-Armeneas	BUCURESTI,Ar	ARM	44.437	26.11	P	ISPH-GEOTEC
5	ARGES	ARGES	ARR	45.368	24.633	P	FP
6	Baia–Tulcea	BAIA,Republicii	BAA	44.723	28.679	P+1E	INCERC
7	Bacau	BACAU, Cornis	BAC1	46.554	26.916	P+10E	FP
8	BACAU	BACAU	BAC2	46.567	26.9	P	FP
9	Bacau-Prot.Civ.	BACAU, Protec	BAC3	46.57	26.902	P	INCERC
10	Barlad	BARLAD, Epure	BIR1	46.228	27.666	P	INCERC
11	BARLAD-FP	BARLAD	BIR2	46.266	27.626	P	FP
12	Buc.-BaltaAlba	BUCURESTI, F	BLA	44.413	26.169	P+10E	INCERC
13	BolintinVale	BOLINTIN VALE	BLV	44.444	25.757	P	INCERC
14	BOZVELI	BOZVELI	BOZ	43.105	27.479	P	Blg
15	Braila	BRAILA, Unirii7	BRL1	45.269	27.966	P+10E	INCERC
16	Braila-Prot.Civ.	BRAILA,Protect	BRL2	45.273	27.977	P	INCERC

Figure. 2 Table SP VRANCEA NT *Statii*



ID	Statia	CodSeism	CodStatie	Saa	Saaln	Srv	Srd
1	Adjud	19901	ADJ	19901ADJ1Saa.jpg	19901ADJ1Saaln.jpg	19901ADJ1Srv.jpg	19901ADJ1Srd.jpg
2	Adjud	19902	ADJ	19902ADJSaa.jpg	19902ADJSaaln.jpg	19902ADJSrv.jpg	19902ADJSrd.jpg
3	Alexandria	20041	ALX	20041ALXSaa.jpg	20041ALXSaaln.jpg	20041ALXSrv.jpg	20041ALXSrd.jpg
4	Buc.-Prot.Civ.	20041	APC	20041APC1Saa.jpg	20041APCSaaln.jpg	20041APCSrv.jpg	20041APC1Srd.jpg
5	Buc.-Prot.Civ.	20091	APC	20091APCSaa.jpg	20091APCSaaln.jpg	20091APCSrv.jpg	20091APCSrd.jpg
6	Buc.-Armeneasca	19901	ARM	19901ARMSaa.jpg	19901ARMSaaln.jpg	19901ARMSrv.jpg	19901ARMSrd.jpg
7	Buc.-Armeneasca	19902	ARM	19902ARMSaa.jpg	19902ARMSaaln.jpg	19902ARMSrv.jpg	19902ARMSrd.jpg
8	ARGES	19901	ARR	19901ARRSaa.jpg	19901ARMSaaln.jpg	19901ARRSrv.jpg	19901ARMSrd.jpg
9	Baia–Tulcea	19861	BAA	19861BAASaa.jpg	19861BAASaaln.jpg	19861BAASrv.jpg	19861BAASrd.jpg
10	Baia–Tulcea	19901	BAA	19901BAASaa.jpg	19901BAASaaln.jpg	19901BAASrv.jpg	19901BAASrd.jpg
11	Baia–Tulcea	19902	BAA	19902BAASaa.jpg	19902BAASaaln.jpg	19902BAASrv.jpg	19902BAASrd.jpg
12	Bacau	19861	BAC1	19861BAC1Saa.jpg	19861BAC1Saaln.jpg	19861BAC1Srv.jpg	19861BAC1Srd.jpg
13	BACAU	19861	BAC2	19861BAC2Saa.jpg	19861BAC2Saaln.jpg	19861BAC2Srv.jpg	19861BAC2Srd.jpg
14	BACAU	19901	BAC2	19901BAC2Saa.jpg	19901BAC2Saaln.jpg	19901BAC2Srv.jpg	19901BAC2Srd.jpg
15	BACAU	19902	BAC2	19902BAC2Saa.jpg	19902BAC2Saaln.jpg	19902BAC2Srv.jpg	19902BAC2Srd.jpg
16	Bacau-Prot.Civ.	20041	BAC3	20041BAC3Saa.jpg	20041BAC3Saaln.jpg	20041BAC3Srv.jpg	20041BAC3Srd.jpg

Figure. 3 Table SP VRANCEA NT *Inregistrari*

4 FINAL CONSIDERATIONS

Primary (corrected) digitization of seismic records obtained from networks that are monitoring Vrancea seismic activity were obtained, in collaboration, within various Romanian and international research projects. Thus, INCDFP records were obtained during MENER project, contract 090/2001, "The seismic database for Romanian earthquakes" (2001-2004); ISPH-GEOTEC records were obtained during MENER project, contract 092/2001 "Study of the influence of the attenuation phenomenon and local conditions on seismic ground motion, during Vrancea earthquakes" (2001-2003); records from the Republic of Moldova were obtained during the project: project NATO SfP 981619 "Quantification of Earthquake Action on Structures "(2005-2008) (Institute of Geology and Seismology of the Academy of Sciences, Chisinau, Moldova); records from Bulgaria have been obtained during the project: project NATO SfP 980468" Harmonization of Seismic Hazard and Risk Reduction in Countries influenced by Vrancea Earthquakes "(2005-2008) from Central Laboratory for Seismic Mechanics and Earthquake Engineering, Sofia, Bulgaria.

Microsoft Access - [Componente : Table]

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ID	Statia	CodSeism	CodStatie	CodAxa	NrAxa	pga	pgv	pgd	epa	epv	epd	Tc	Td	Is	Is1	Is31	Is32	Is33	Is61	Is62	Is63	Is64	Is65	Is66
1	Adjud	19901	ADJ	N50E	1	0.8214	0.0992	0.0238	0.8037	0.0974	0.0316	0.76	2.04	7	6.95	6.77	7.06	6.99	6.43	6.96	6.87	7.2	7.2	6.75
2	Adjud	19901	ADJ	N40W	2	0.8959	0.1044	0.0275	0.9687	0.0951	0.0361	0.62	2.39	7.2	7.09	6.74	7.13	7.27	6.31	6.97	7.04	7.2	7.5	6.83
3	Adjud	19901	ADJ	V	3	1.05	0.0419	0.0068	0	0	0	0	0	7.1	7.03	6.75	7.1	7.15	6.37	6.97	6.96	7.2	7.4	6.79
4	Adjud	19902	ADJ	N40W	1	0.3514	0.0204	0.0035	0.3212	0.0214	0.0065	0.42	1.91	5.8	5.79	4.98	6.06	5.84	4.78	5.12	5.97	6.1	6.0	5.58
5	Adjud	19902	ADJ	N50E	2	0.3646	0.0263	0.003	0.335	0.0174	0.0064	0.33	2.33	6	5.88	5.09	5.87	6.17	4.75	5.29	5.6	6.0	6.4	5.74
6	Adjud	19902	ADJ	V	3	0.3301	0.0106	0.0027	0	0	0	0	0	5.9	5.84	5.04	5.97	6.03	4.77	5.21	5.82	6.1	6.2	5.66
7	Alexandria	20041	ALX	0	1	0.176	0.0063	0.0008	0.1038	0.0063	0.0014	0.38	1.42	4.8	4.75	3.37	4.88	4.99	2.8	3.62	4.71	5.0	5.0	4.95
8	Alexandria	20041	ALX	0	2	0.1556	0.0069	0.0005	0.1143	0.0058	0.0014	0.32	1.55	4.8	4.74	3.02	4.87	5	2.63	3.23	4.48	5.1	5.0	4.96
9	Alexandria	20041	ALX	V	3	0.1129	0.0036	0.0007	0	0	0	0	0	4.8	4.75	3.22	4.87	5	2.72	3.46	4.61	5.1	5.0	4.95
10	Buc.-Prot.Civ.	20041	APC	0	1	0.3706	0.0202	0.0021	0.2531	0.0129	0.0016	0.32	0.8	5.7	5.63	4.16	5.73	5.9	3.14	4.48	5.44	5.9	5.9	5.92
11	Buc.-Prot.Civ.	20041	APC	0	2	0.3314	0.011	0.001	0.228	0.0102	0.0011	0.28	0.66	5.6	5.51	3.7	5.42	5.89	2.49	4.02	5.1	5.6	5.9	5.87
12	Buc.-Prot.Civ.	20041	APC	V	3	0.2277	0.0055	0.0004	0	0	0	0	0	5.7	5.57	3.98	5.6	5.9	2.92	4.3	5.3	5.8	5.9	5.9
13	Buc.-Prot.Civ.	20091	APC	EW	1	0.0996	0.0032	0.0003	0.0643	0.0026	0.0003	0.25	0.82	4.3	4.23	2.66	4.02	4.64	1.31	2.99	3.47	4.3	4.7	4.54
14	Buc.-Prot.Civ.	20091	APC	NS	2	0.1185	0.0042	0.0008	0.07	0.0035	0.0006	0.32	1.08	4.5	4.42	3.32	4.26	4.8	2.33	3.62	4.05	4.4	4.8	4.8
15	Buc.-Prot.Civ.	20091	APC	V	3	0.1221	0.0032	0	0	0	0	0	0	4.4	4.33	3.09	4.16	4.73	2.05	3.4	3.84	4.4	4.8	4.69
16	Buc.-Armeneas	19901	ARM	0	1	0.251	0.815	0.0815	0.0996	0.0032	0.0003	0.12	0	6.9	6.91	6.51	7.18	6.81	6.21	6.7	7.26	7.1	6.9	6.72
17	Buc.-Armeneas	19901	ARM	0	2	0.3156	1.0835	0.1083	0.0643	0.0026	0.0003	0.07	0	6.5	6.45	5.98	6.64	6.52	5.27	6.26	6.65	6.6	6.6	6.43
18	Buc.-Armeneas	19901	ARM	V	3	0.3156	1.0835	0.1083	0	0	0	0	0	6.7	6.73	6.31	6.98	6.68	5.93	6.52	7.04	6.9	6.8	6.6
19	Buc.-Armeneas	19902	ARM	0	1	0.2217	0.0205	0.002	0.2896	0.019	0.0052	0.41	1.74	5.7	5.73	5.03	6.06	5.65	4.42	5.29	5.85	6.2	5.8	5.4
20	Buc.-Armeneas	19902	ARM	0	2	0.2342	0.0247	0.0025	0.251	0.0199	0.008	0.5	2.53	5.7	5.68	5.19	5.95	5.64	5.05	5.29	5.73	6.1	5.7	5.52
21	Buc.-Armeneas	19902	ARM	V	3	0.2342	0.0247	0.0025	0	0	0	0	0	5.7	5.71	5.11	6.01	5.64	4.83	5.29	5.79	6.2	5.8	5.47
22	ARGES	19901	ARR	NS	1	0.2463	0.0383	0.0201	0.2653	0.0297	0.018	0.7	3.81	6.1	5.81	5.25	6.11	5.75	5.3	5.2	5.5	6.4	5.9	5.55
23	ARGES	19901	ARR	EW	2	0.1154	0.0286	0.022	0.1092	0.0203	0.0123	1.17	3.81	5.4	5.26	5.16	5.45	5.11	5.05	5.24	5.27	5.6	5.2	5.06
24	ARGES	19901	ARR	V	3	0.0682	0.0257	0.0205	0	0	0	0	0	5.8	5.61	5.21	5.88	5.53	5.19	5.22	5.4	6.1	5.7	5.36
25	Baia-Tulcea	19861	BAA	N175W	1	0.3127	0.0255	0.0042	0.3591	0.0271	0.0072	0.47	1.66	6	5.9	5.07	6.27	5.72	4.81	5.24	6.1	6.4	5.8	5.61
26	Baia-Tulcea	19861	BAA	N85W	2	0.3294	0.0317	0.0058	0.4258	0.0317	0.0072	0.47	1.43	6.3	6.07	5.2	6.45	5.86	4.87	5.4	6.25	6.6	6	5.72
27	Baia-Tulcea	19861	BAA	V	3	0.1554	0.0125	0.0033	0	0	0	0	0	6.2	5.99	5.14	6.37	5.79	4.84	5.32	6.18	6.5	5.9	5.67
28	Baia-Tulcea	19901	BAA	N175W	1	0.8928	0.0522	0.0067	0.9212	0.0743	0.0107	0.51	0.91	7.1	6.86	5.52	7.2	6.81	5.16	5.72	7.25	7.2	7	6.56
29	Baia-Tulcea	19901	BAA	N85W	2	0.7774	0.063	0.0084	0.9796	0.0884	0.0105	0.57	0.75	7.2	6.92	5.76	7.32	6.72	5.27	6	7.43	7.2	6.9	6.47
30	Baia-Tulcea	19901	BAA	V	3	0.1305	0.0111	0.0034	0	0	0	0	0	7.1	6.89	5.65	7.26	6.77	5.22	5.88	7.35	7.2	6.9	6.52
31	Baia-Tulcea	19902	BAA	N175W	1	0.606	0.0396	0.0042	0.6777	0.0602	0.0058	0.56	0.61	6.9	6.49	4.99	6.92	6.23	4.04	5.3	7.03	6.8	6.4	6.05
32	Baia-Tulcea	19902	BAA	N85W	2	0.3875	0.0345	0.0041	0.6218	0.0588	0.0062	0.59	0.67	6.9	6.39	5.16	6.84	5.98	3.96	5.48	7.05	6.5	6.1	5.79
33	Baia-Tulcea	19902	BAA	V	3	0.4131	0.0085	0.0041	0	0	0	0	0	6.9	6.44	5.08	6.88	6.12	4	5.4	7.04	6.7	6.3	5.94
34	Bacau	19861	BAC1	N110E	1	0.5767	0.0492	0.0093	0.5649	0.0353	0.0159	0.39	2.84	6.4	6.45	5.69	6.62	6.6	5.59	5.77	6.43	6.8	6.8	6.25
35	Bacau	19861	BAC1	N20E	2	1.165	0.0833	0.0124	0.8555	0.0785	0.0145	0.58	1.16	7.0	7	6.36	7.18	7.12	5.48	6.66	7.19	7.2	7.3	6.78
36	Bacau	19861	BAC1	V	3	0.2516	0.0305	0.0052	0	0	0	0	0	6.8	6.79	6.13	6.97	6.92	5.54	6.39	6.94	7.0	7.1	6.59
37	BACAU	19861	BAC2	NS	1	0.8838	0.0913	0.0221	0.9655	0.069	0.0199	0.45	1.82	7.0	6.85	6.31	7.13	6.81	5.83	6.55	7.05	7.2	7.1	6.32
38	BACAU	19861	BAC2	EW	2	0.7261	0.0817	0.0213	0.8244	0.0705	0.0192	0.54	1.71	6.9	6.74	6.26	7.06	6.58	5.81	6.49	7.04	7.1	6.9	5.89

Figure. 4 Table SP VRANCEA NT *Componente*

The SP VRANCEA NT Database (Strong Earthquakes with epicenter in Vrancea seismogenic zone, records from ground level) will be further improved, in partnership with colleagues

from INCDFP (coordinator) and UTCB, in a Romanian national research project that will be carried on during the period 2012 -2015.

In the following, the graphic part of NT SP VRANCEA database is presented for the 19861CHI1 seismic record (August 30, 1986 earthquake record obtained at Chisinau site - Iss1) and the 19901CAH seismic record (May 30, 1990 earthquake record obtained at CAHUL site), i.e.: time histories for the horizontal components of the acceleration (Figures 5 and 6), spectral intensities $i_s \sim (\varphi\ ', \varphi')$ (Is6) and $i_d \sim (\varphi\ ', \varphi')$ (ID6), averaged over intervals of 6 dB in length for horizontal components (Figures 7 and 8), absolute acceleration response spectra, relative velocities and relative displacements (Figures 9 ... 12) and S_{aa} – S_{rd} spectra (Figure 13).

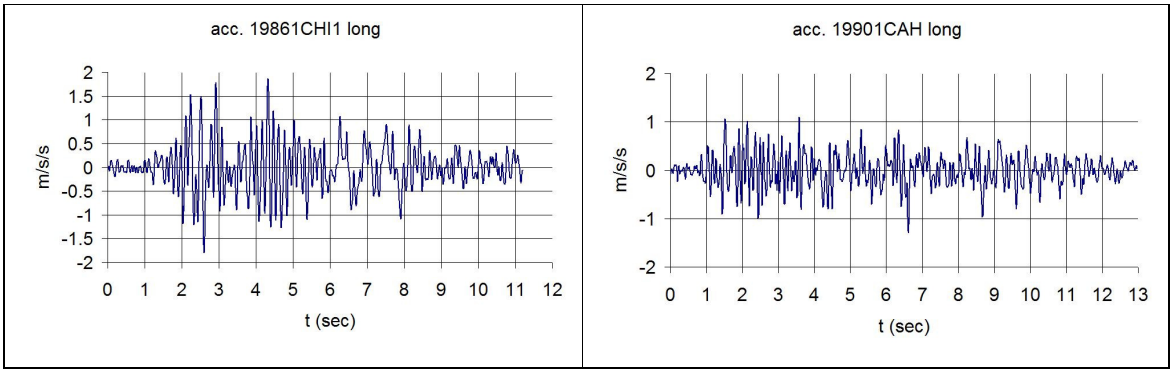

Figure. 5. Accelerograms (longitudinal components) recorded at Chisinau stations – ISS1 and CAHUL

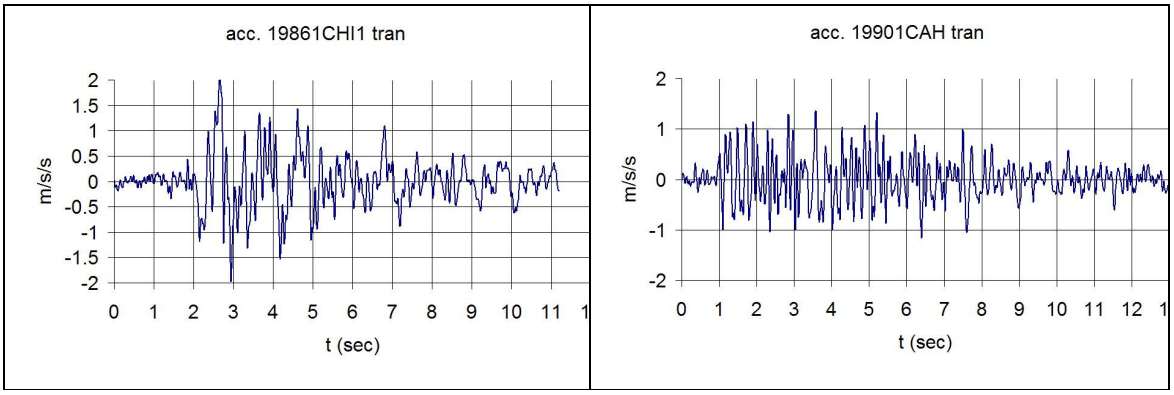

Figure. 6. Accelerograms (transversal components) recorded at Chisinau stations – Iss1 and CAHUL

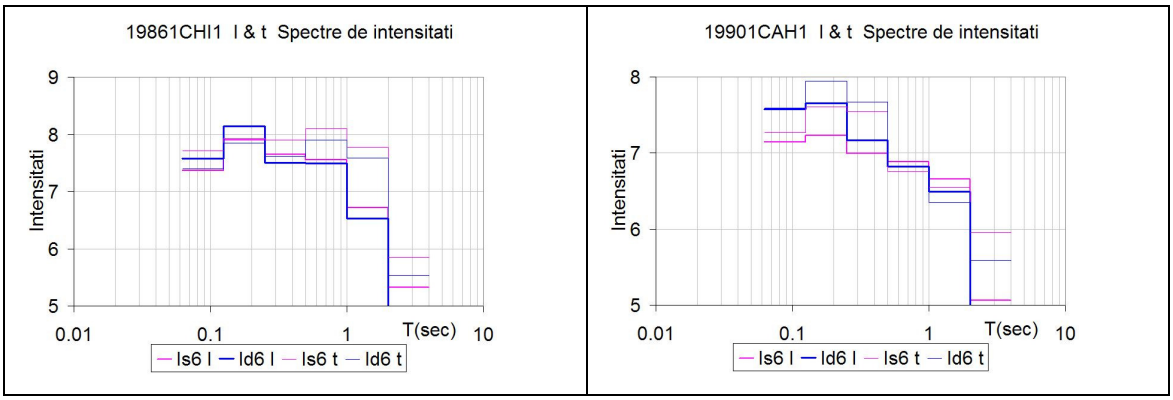

Figure. 7. Spectra of $i_s^{\sim}(\varphi', \varphi'')$ (Is6) and $i_d^{\sim}(\varphi', \varphi'')$ (Id6) intensities, averaged on intervals of 6 dB in length, for the two horizontal components (longitudinal l and transversal t), 19861CHI1 and 19901CAH seismic records

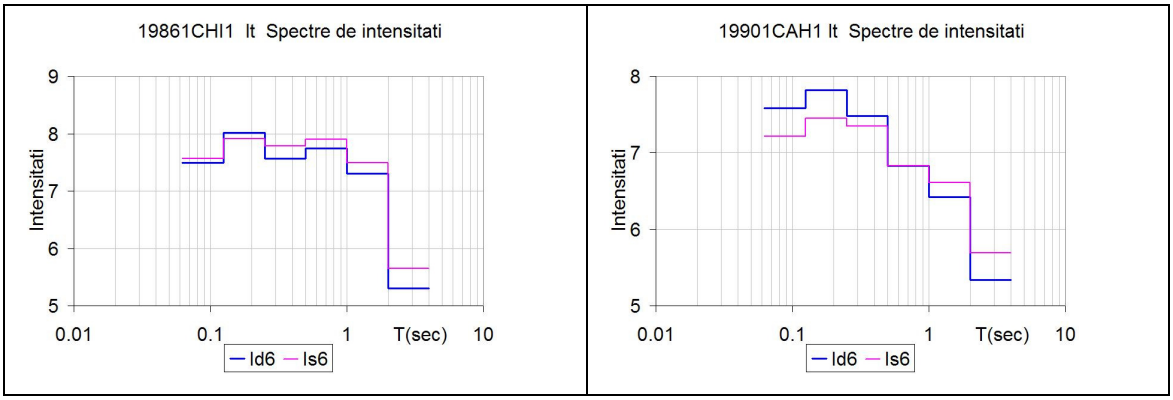

Figure. 8. Spectra of $i_s^{\sim}(\varphi', \varphi'')$ (Is6) and $i_d^{\sim}(\varphi', \varphi'')$ (Id6) intensities, averaged on intervals of 6 dB in length, for the two horizontal components, 19861CHI1 and 19901CAH seismic records

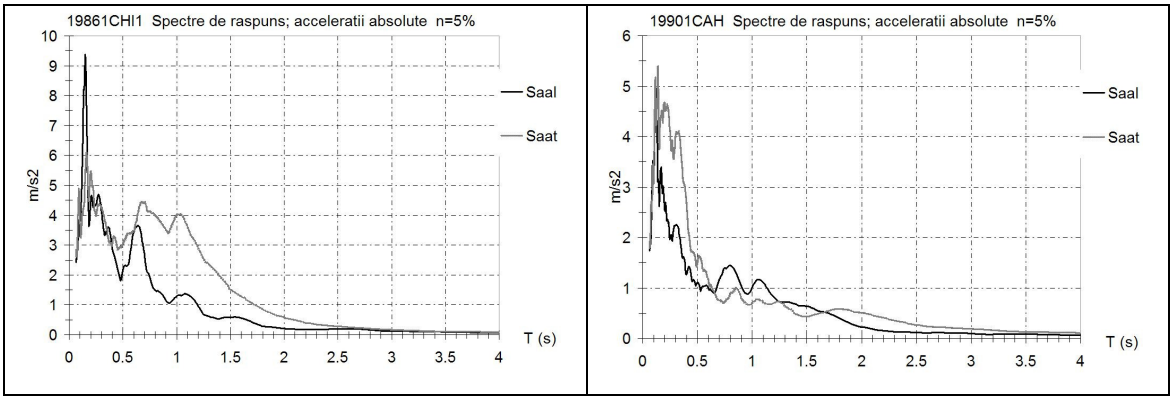

Figure. 9. Absolute acceleration response spectra, 19861CHI1 and 19901CAH seismic records

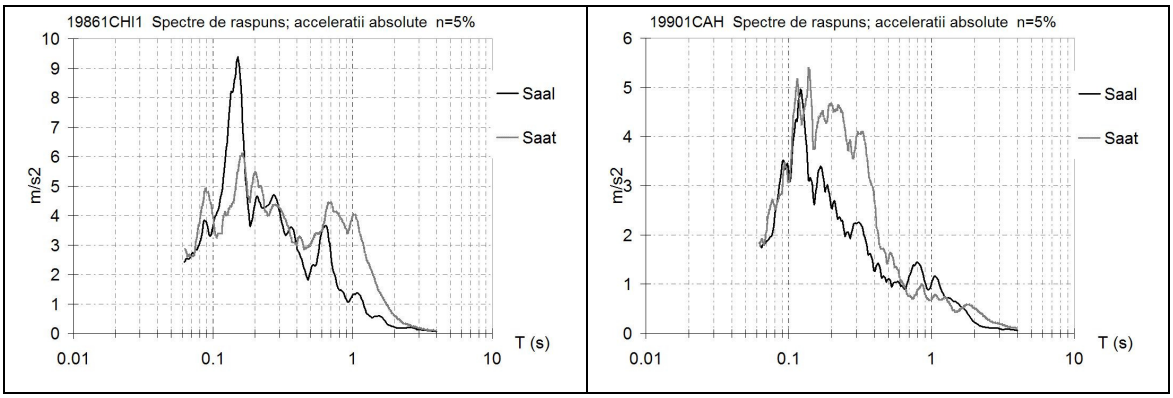

Figure. 10. Absolute acceleration response spectra (logarithmic scale on the abscis), 19861CHI1 and 19901CAH seismic records

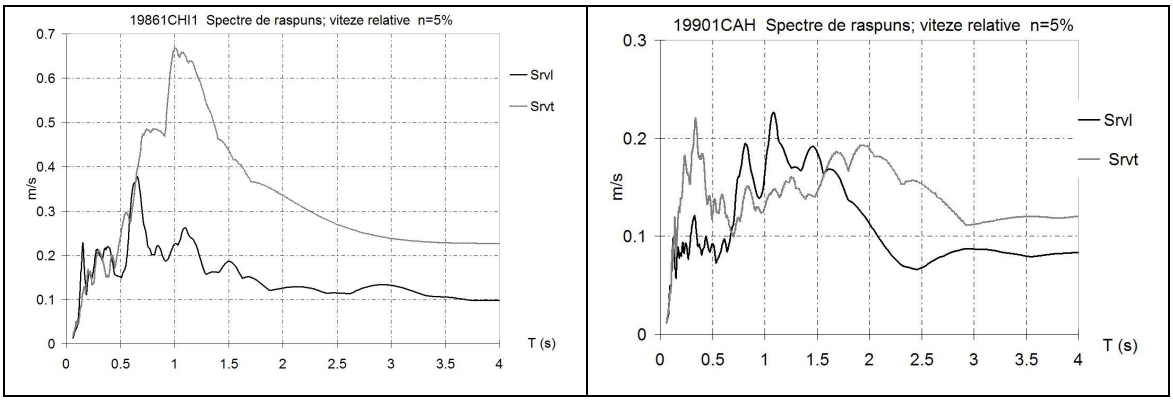

Figure. 11. Relative velocity response spectra, 19861CHI1 and 19901CAH seismic records

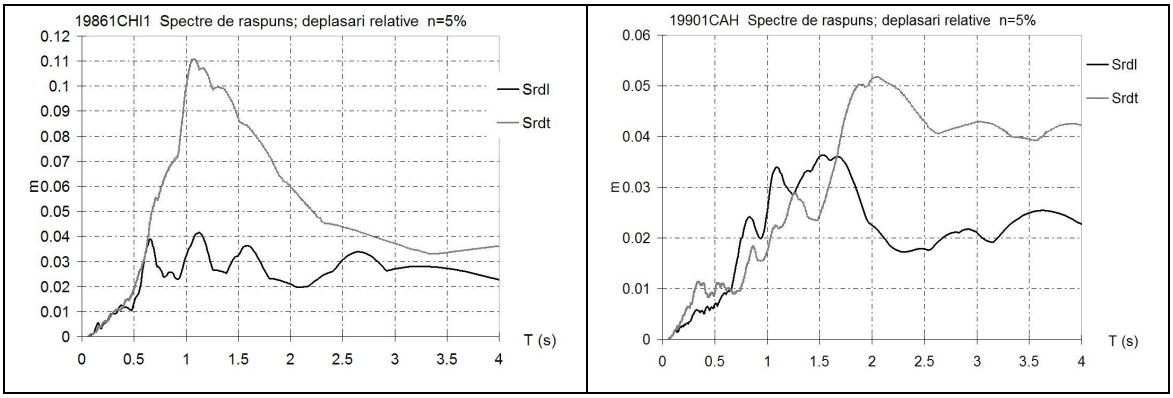

Figure. 12. Relative displacement response spectra, 19861CHI1 and 19901CAH seismic records

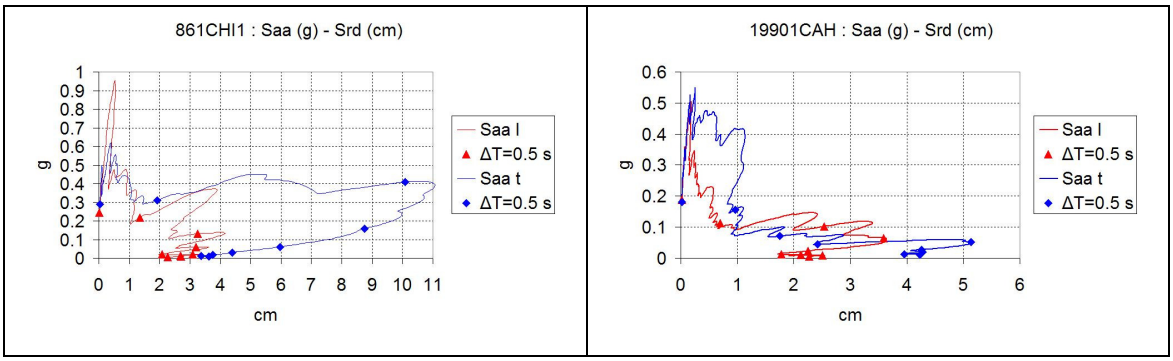

Figure. 13. S_{aa}– S_{rd} Spectra, 19861CHI1 and 19901CAH seismic records

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SP VRANCEA NT BANCĂ DE DATE CUPRINZÂND PRELUCRĂRI ALE ÎNREGISTRĂRILOR CUTREMURELOR VRÂNCENE OBȚINUTE LA NIVELUL TERENULUI. EXEMPLIFICARE PENTRU ÎNREGISTRĂRILE OBȚINUTE ÎN REPUBLICA MOLDOVA.

REZUMAT

Banca de date SP VRANCEA NT *(Seisme Puternice cu epicentrul in zona seismogenă VRANCEA, înregistrări la Nivelul Terenului) cuprinde prelucrări ale înregistrărilor mişcărilor seismice vrâncene obţinute la nivelul terenului de reţelele seismice din România (INCERC, INCDFP şi ISPH-GEOTEC), Bulgaria şi Republica Moldova. Sunt prezentate relaţiile de definiţie şi rezultatele calculelor pentru valorile de vârf ale acceleraţiei, vitezei şi deplasării, valorile «efective», perioadele de colţ (de control)* T_c *(viteză/acceleraţie) şi* T_d *(deplasare/viteză), spectre de răspuns şi valori şi spectre de intensităţi instrumentale. Exemplificarea este făcută pentru înregistrări obţinute în Republica Moldova. Este prezentat accesul gratuit la Banca de date SP VRANCEA NT pe site-ul INCD URBAN-INCERC.*

***Cuvinte cheie**: inregistrari seismice, intensitati instrumentale, spectre de raspuns, baze de date.*

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