23 June 2020 Earthquake
Crucecita, Oaxaca, Mexico (M7.5)
10:29:02 hrs

PRELIMINARY REPORT
Ground Motion Parameters

Seismic Instrumentation Unit
Engineering Seismology

Mexico City
June, 2020

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**The earthquake is reported in Central Time (Mexico)*

Basic Information

On June 23, 2020, an earthquake of magnitude M7.5 occurred 23 km south of Crucecita Oaxaca, Mexico (National Seismological Service, 2020). The earthquake began at 15:29:02 UTC (10:29:02 central Mexico time). Its epicenter was located at a depth of 5 km, at latitude 15.57° N and longitude 96.09° W (see Figure 1).

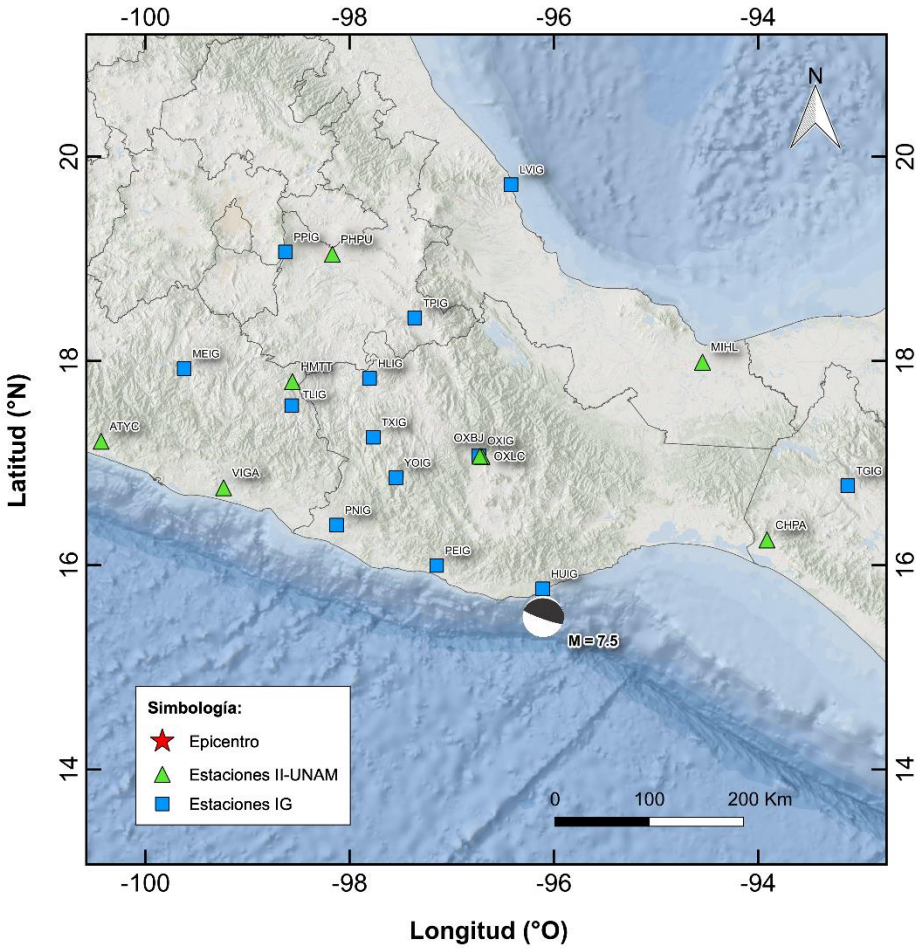

Figure 1. The epicenter of the M 7.5 23 June 2020 earthquake and seismic stations that recorded the event. The stations belonging to the Accelerographic Network of the National University of Mexico's Engineering Institute (RA-IIUNAM) are operated by the Seismic Instrumentation Unit (labeled *Estaciones II-UNAM)*. The stations operated by the National Seismological Service are labeled *Estaciones IG*.

Ground Motion Intensity Parameters

Table 1 shows the geographical location of the II-UNAM stations and the peak ground acceleration (PGA) that was recorded. The signals, received in real time, come from stations located at an epicentral distance ranging from 170 to 940 km. The maximum PGA recorded in the Institute of Engineering (IINGEN) Permanent Monitoring Network was 82.9 cm/s^2 at Oaxaca Las Canteras station (OXLC), located at an epicentral distance of 177 km. The records were baseline corrected and bandpass filtered between 0.1 and 20 Hz.

Table 1. Location of IINGEN stations and maximum recorded values

Institution	Key	State	Location		Distance Epicentral (km)	PGA (cm/s^2)
			Latitude No.	Length W (°)		
IINGEN	OXLC	OAX	17.065039	96.703157	177	82.9
IINGEN	OXBJ	OAX	17.067337	96.723804	179	70.91
IINGEN	CHPA	CHP	16.247374	93.912575	244	6.67
IINGEN	MIHL	VER	17.988778	94.54387	314	40.56
IINGEN	HMTT	GRO	17.798341	98.559717	360	13.99
IINGEN	VIGA	GRO	16.758703	99.233268	360	4.24
IINGEN	TAJN	CHP	14.922677	92.270957	416	2.64
IINGEN	VNTA	GRO	16.91426	99.81885	425	1.58
IINGEN	PHPU	PUE	19.044223	98.168466	443	26.67
IINGEN	COYC	GRO	16.997788	100.089963	455	1.84
IINGEN	ATYC	GRO	17.213361	100.432269	498	2.01
IINGEN	CMFZ	CDMX	19.384119	99.036316	525	44.68
IINGEN	CMMG	CDMX	19.332018	99.115699	525	28.73
IINGEN	CMP5	CDMX	19.307133	99.144384	525	27.14
IINGEN	CUP5	CDMX	19.33024	99.181076	530	8.06
IINGEN	SCT2	CDMX	19.394694	99.148678	533	22.81
IINGEN	PET2	GRO	17.535396	101.262608	593	1.02
IINGEN	UNIO	GRO	17.98762	101.810623	665	1.29
IINGEN	ACAM	GTO	20.043186	100.716777	696	3.46
IINGEN	URUA	MICH	19.421758	102.074059	765	1.8
IINGEN	COMA	COL	19.325266	103.760813	914	1.69
IINGEN	TON2	JAL	20.62461	103.235717	940	0.96

The preliminary map of PGA at the national level was obtained using the GenMaps program and the data recorded by RA-IIUNAM in real time. Ground motion parameters in places where a seismic station is not available were estimated using the Arroyo et al (2010) attenuation model. The Kitandis (1986) interpolation method was used to generate the map. Figure 2 shows the preliminary map of the quadratic mean of the horizontal components of peak ground acceleration (PGA_{rmsh}).

In Mexico City, the peak acceleration recorded at the Ciudad Universitaria station was 8 cm/s^2, the record was used for the calculation of acceleration and spectral response values in the country's capital through the MapasTRNet program. Figure 3 illustrates the distribution of peak acceleration.

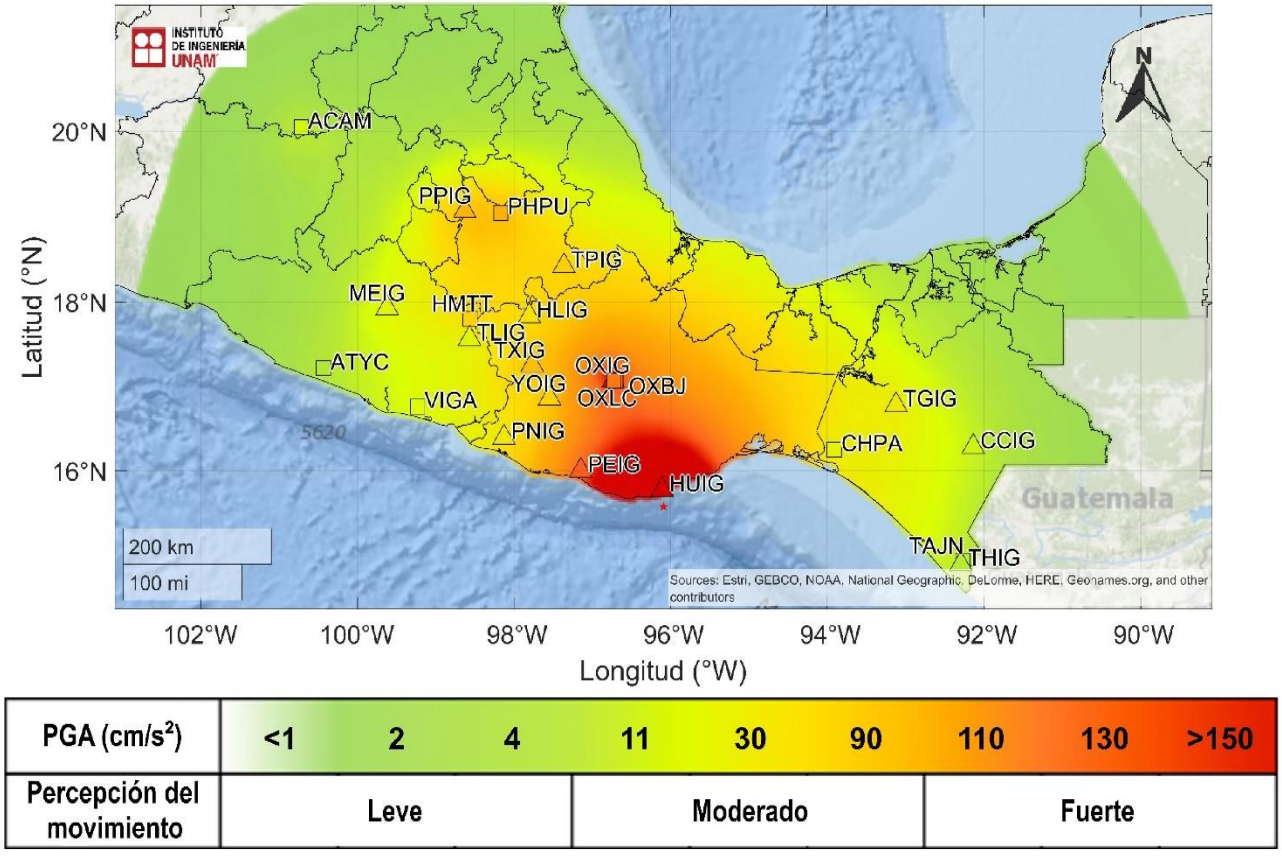

Figure 2. Maximum Soil Acceleration Intensity Map (PGA_{rmsh})

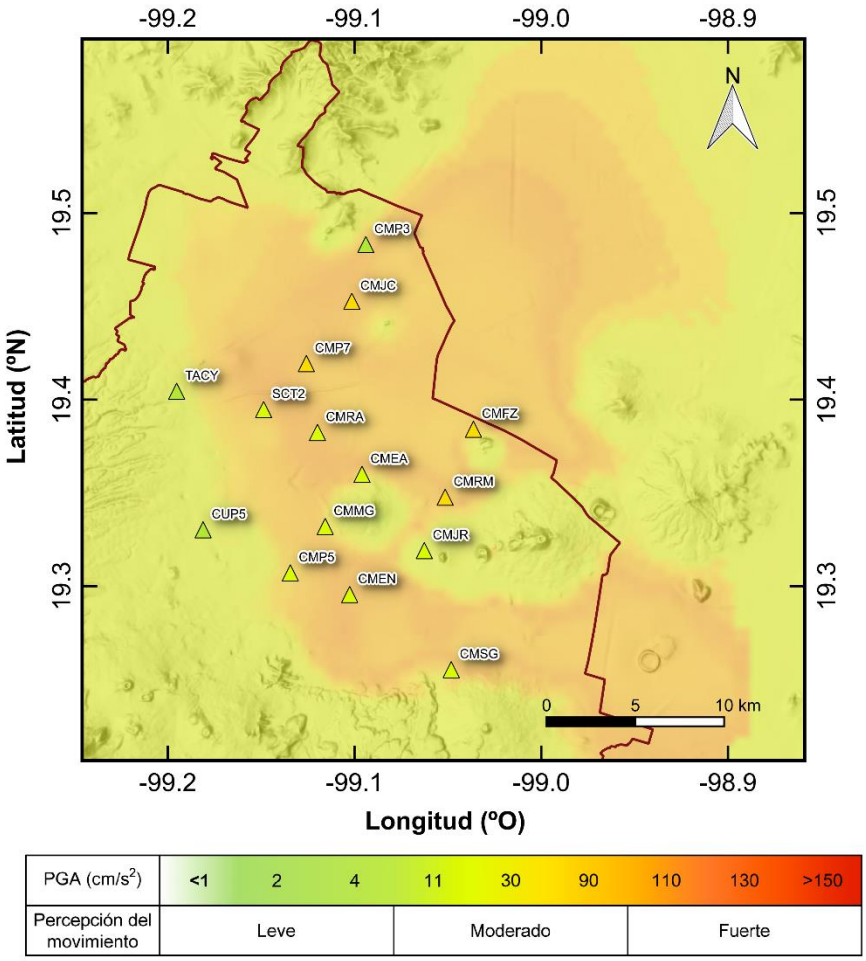

Figure 3. Preliminary map of Peak Ground Acceleration($PGA_{rmsh)}$in Mexico City.

Accelerograms and Response Spectra

Figures 4a to 4d show the accelerations recorded at the stations operated by II-UNAM and their acceleration response spectra (SA), with critical damping of 5%, obtained for the three orthogonal components of ground motion. Table 2 shows the peak acceleration values for each station and channel. Spectral acceleration values are included for the periods Te -0.1, 0.3, 0.5, 1.0, 1.5, 2.0, and 3.0 s, indicating the maximum SA value and the period to which it is associated. The accelerations were baseline corrected using a bandpass filter between 0.1 and 20 Hz.

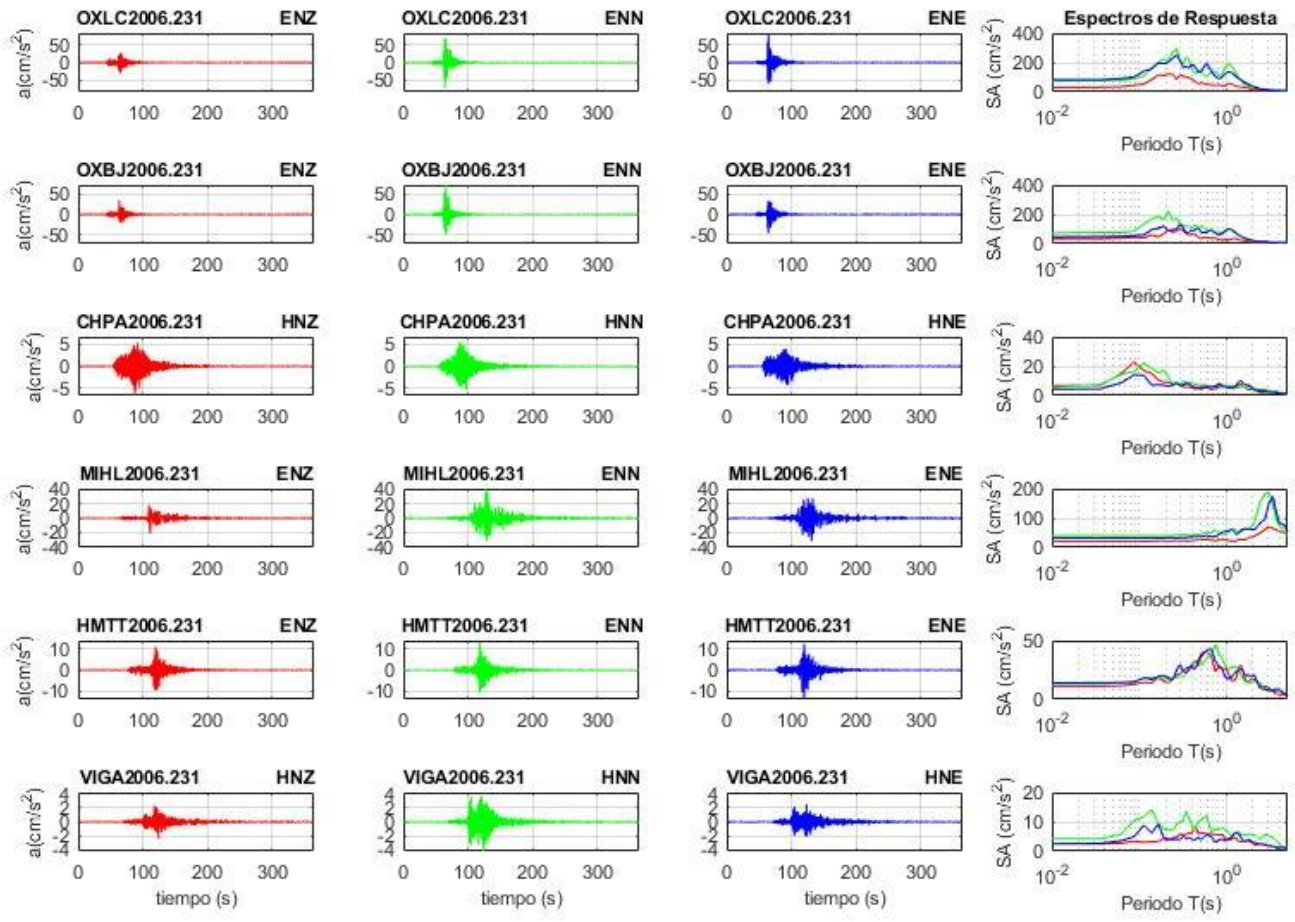

Figure 4a. Recorded accelerograms and estimated response spectra for records obtained during the earthquake of June 23, 2020 (M7.5)

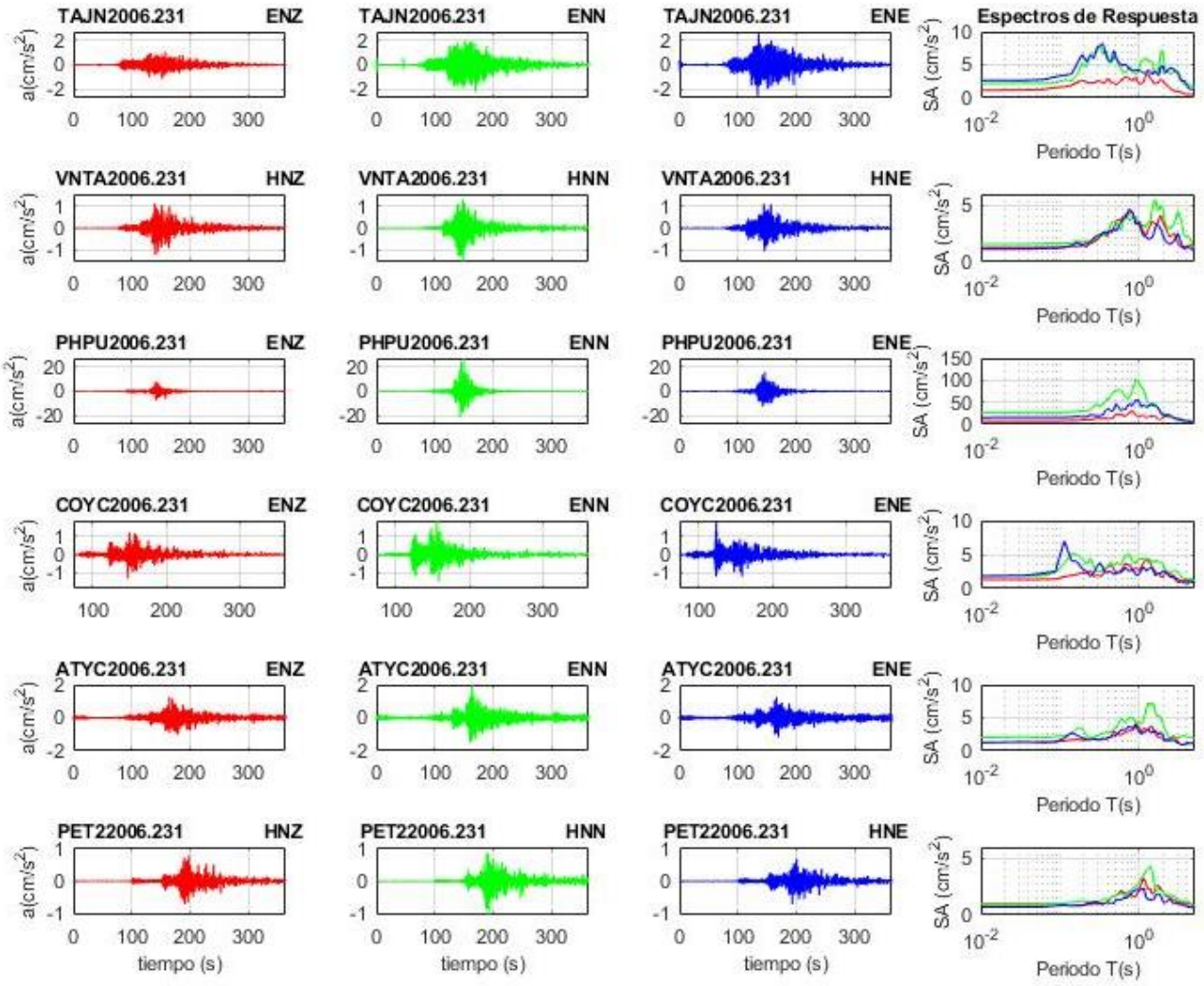

Figure 4b. Registered accelerograms and response spectra for records obtained during the June 23, 2020 (M7.5) earthquake.

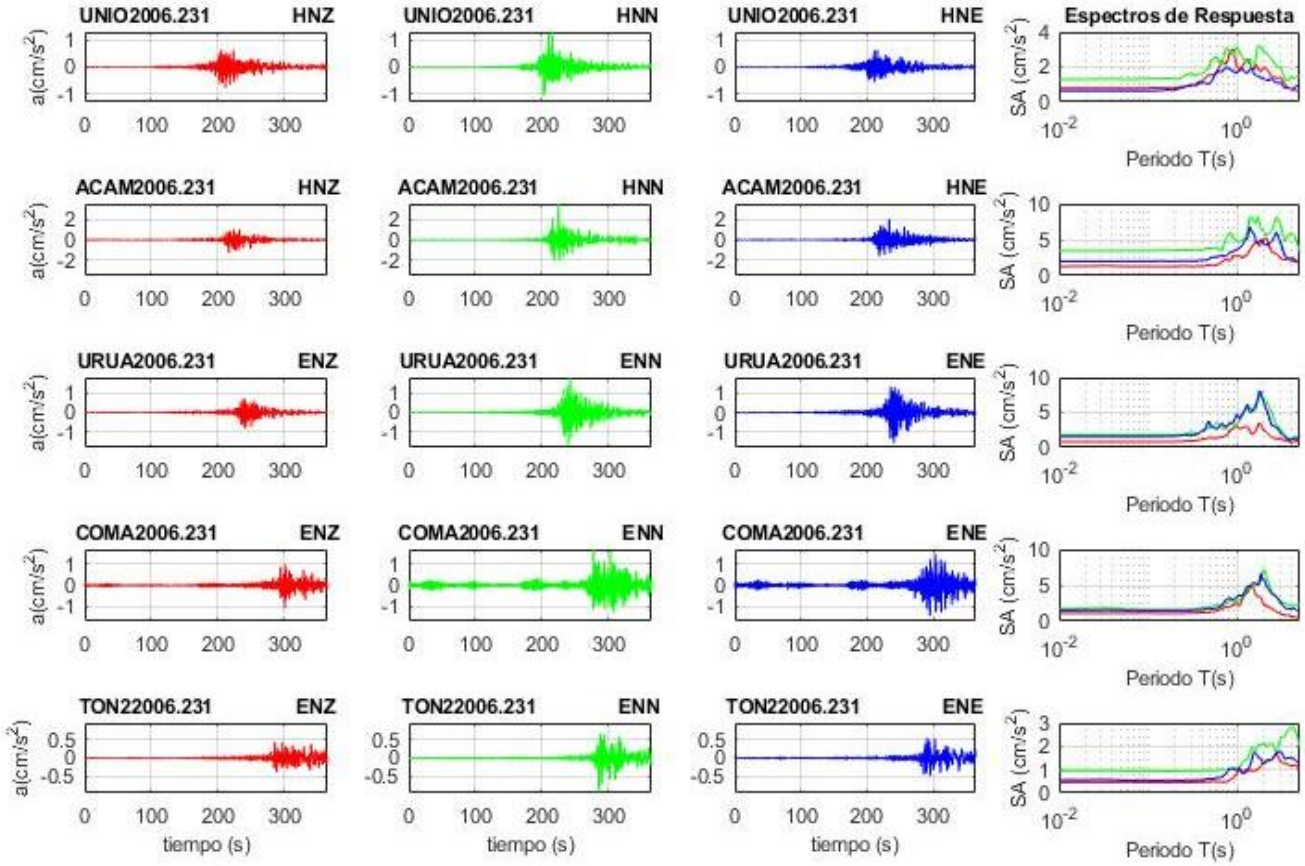

Figure 4c. Registered accelerograms and response spectra for records obtained during the June 23, 2020 (M7.5) earthquake.

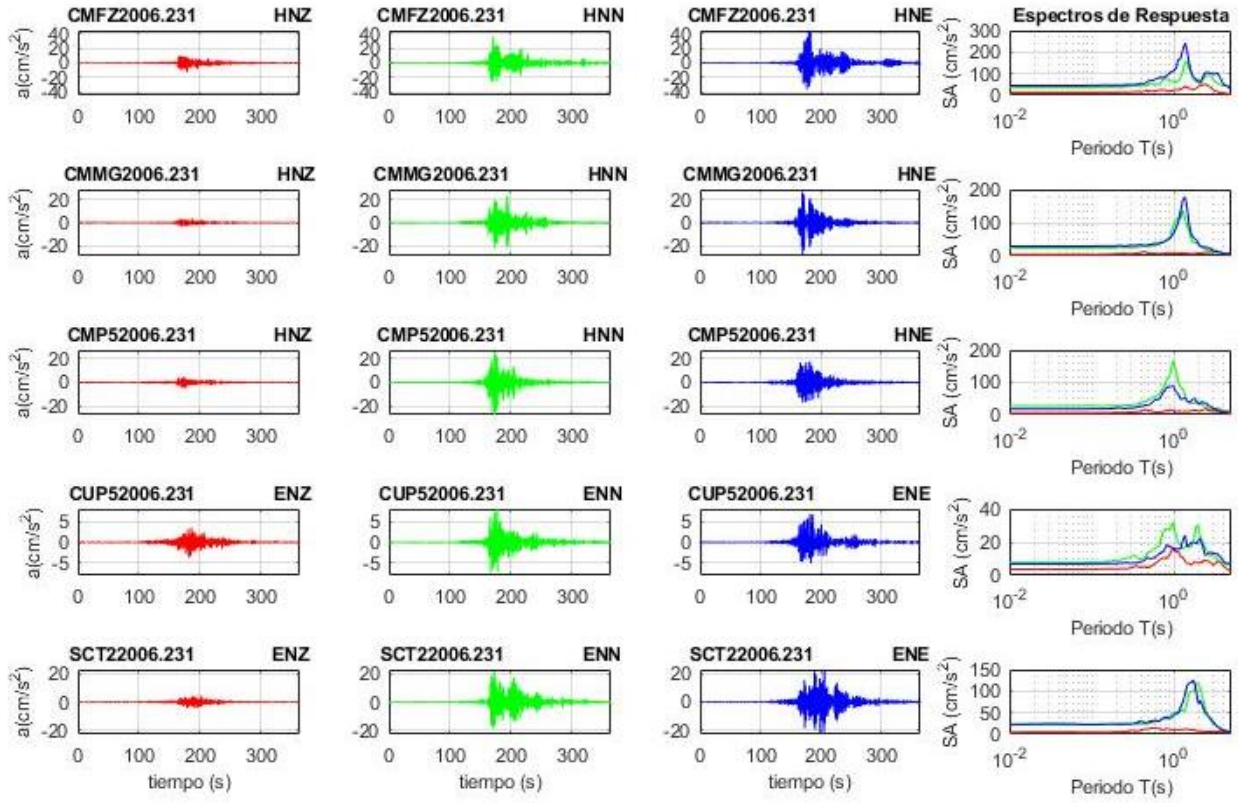

Figure 4d. Registered accelerograms and response spectra for records obtained during the June 23, 2020 (M7.5) earthquake.

Table 2. Peak acceleration values obtained for each station. Spectral acceleration (SA) values are included for the periods Te-0.1, 0.3, 0.5, 1.0, 1.5, 2.0, and 3.0 s. The maximum SA value and associated period are indicated.

Station	Canal	PGA	Spectral Acceleration (SA)							SAmax	SAmax
		(cm/s*s)	T=0.1s	T=0.3s	T=0.5s	T=1s	T=1.5s	T=2s	T=3s	(s)	(cm/s*s)
OXLC2006.231	ENZ	30.37	41.84	117.85	61.84	51.01	33.06	14.03	13.47	0.22	121.64
OXLC2006.231	ENN	72.50	90.83	190.48	146.00	184.20	66.96	24.92	14.84	0.27	294.43
OXLC2006.231	ENE	82.88	100.02	191.72	131.14	132.32	76.25	37.93	14.69	0.27	252.09
OXBJ2006.231	ENZ	33.93	39.03	98.72	37.14	29.31	22.05	8.81	9.74	0.29	99.56
OXBJ2006.231	ENN	70.91	100.29	139.45	118.42	93.84	43.84	16.89	10.58	0.22	220.85
OXBJ2006.231	ENE	45.57	56.06	135.48	87.86	94.13	46.39	21.83	12.63	0.29	134.99
CHPA2006.231	HNZ	6.67	25.38	6.19	5.56	6.52	6.93	4.96	2.69	0.09	22.88
CHPA2006.231	HNN	5.61	14.96	7.75	6.94	6.83	6.12	5.36	3.41	0.11	22.11
CHPA2006.231	HNE	4.38	17.28	6.95	4.70	5.55	9.38	4.55	2.17	0.09	14.16
MIHL2006.231	ENZ	21.17	21.68	23.10	25.50	23.85	26.82	36.04	66.96	3.07	70.40
MIHL2006.231	ENN	40.56	40.35	42.75	44.94	46.81	54.37	74.65	193.70	3.07	188.80
MIHL2006.231	ENE	31.98	32.16	33.80	36.71	54.31	62.38	61.56	145.11	3.39	173.96
HMTT2006.231	ENZ	11.13	13.40	22.54	34.22	25.16	26.64	17.18	10.54	0.59	40.78
HMTT2006.231	ENN	13.15	16.46	20.44	29.11	24.90	18.61	14.86	6.41	0.75	46.80
HMTT2006.231	ENE	13.98	14.97	28.34	36.72	17.99	25.16	20.92	9.14	0.67	43.12
VIGA2006.231	HNZ	2.46	3.59	5.77	6.18	3.60	3.34	2.49	1.96	0.45	8.03
VIGA2006.231	HNN	4.24	9.83	9.66	10.33	6.97	5.83	5.22	5.68	0.14	14.24
VIGA2006.231	HNE	2.52	5.90	4.43	4.24	3.73	4.16	2.96	1.86	0.16	9.23
TAJN2006.231	ENZ	1.14	1.69	2.54	1.99	2.08	2.45	2.52	0.90	1.29	3.62
TAJN2006.231	ENN	2.14	2.31	7.26	5.90	4.69	4.54	6.54	4.04	0.32	7.88
TAJN2006.231	ENE	2.63	3.48	7.36	6.55	3.99	3.83	4.72	3.93	0.35	8.24
VNTA2006.231	HNZ	1.25	1.32	2.08	3.40	3.76	3.52	3.43	1.73	0.82	4.41
VNTA2006.231	HNN	1.58	1.60	2.23	3.57	3.15	5.19	4.46	4.32	1.61	5.46
VNTA2006.231	HNE	1.14	1.25	2.28	2.80	3.37	2.30	2.26	2.63	0.75	4.64
PHPU2006.231	ENZ	7.72	7.89	13.72	21.69	15.98	18.94	15.58	12.87	0.82	31.10
PHPU2006.231	ENN	26.67	27.12	44.62	76.76	92.18	45.84	27.00	8.37	0.90	101.85
PHPU2006.231	ENE	15.45	15.71	18.96	44.15	47.49	43.40	19.98	12.92	0.90	55.58
COYC2006.231	ENZ	1.30	1.74	2.08	2.18	2.34	2.98	1.73	1.55	1.29	4.36
COYC2006.231	ENN	1.82	2.96	2.36	3.46	4.43	4.00	3.50	2.73	0.14	5.12
COYC2006.231	ENE	1.84	4.50	3.61	2.25	2.30	2.65	2.53	1.04	0.11	6.97
ATYC2006.231	ENZ	1.29	1.35	1.75	2.81	3.63	3.31	1.70	1.59	0.90	3.83
ATYC2006.231	ENN	2.01	2.23	2.31	3.46	4.28	7.16	3.83	2.04	1.29	7.30
ATYC2006.231	ENE	1.23	1.63	1.59	2.18	2.77	2.81	2.15	1.27	0.90	4.11
PET22006.231	HNZ	0.78	0.80	1.00	1.70	2.33	1.81	2.01	1.06	1.14	3.29
PET22006.231	HNN	1.03	1.12	1.15	1.68	2.93	3.28	2.01	1.23	1.37	4.34
PET22006.231	HNE	0.70	0.83	1.14	1.27	2.20	1.31	1.19	1.12	1.14	2.41
UNIO2006.231	HNZ	0.78	0.79	1.00	1.58	2.04	1.77	1.97	1.53	0.90	3.03

UNIO2006.231	HNN	1.30	1.31	1.63	2.28	3.20	1.97	2.88	2.15	1.69	3.23
UNIO2006.231	HNE	0.63	0.63	0.93	1.10	1.76	1.75	1.32	1.14	0.75	1.99
ACAM2006.231	HNZ	1.28	1.27	1.28	1.51	2.65	4.29	5.17	2.67	2.10	5.21
ACAM2006.231	HNN	3.46	3.47	3.57	3.78	4.79	7.81	6.17	7.66	1.69	8.25
ACAM2006.231	HNE	2.00	2.02	2.04	2.47	3.68	5.54	4.31	4.79	1.37	6.87
URUA2006.231	ENZ	0.80	0.81	0.94	1.37	3.04	2.01	2.32	1.26	1.76	3.54
URUA2006.231	ENN	1.80	1.81	2.15	2.95	3.11	5.47	6.74	2.84	1.84	7.78
URUA2006.231	ENN	1.57	1.58	1.69	3.20	4.52	5.13	6.22	2.06	1.76	8.13
COMA2006.231	ENZ	1.08	1.09	1.12	1.26	2.44	4.71	2.24	1.14	1.45	4.94
COMA2006.231	ENN	1.70	1.62	1.62	2.05	2.60	4.78	7.25	2.96	2.00	7.25
COMA2006.231	ENE	1.47	1.47	1.51	1.73	3.46	5.56	5.84	2.79	1.84	6.65
TON22006.231	ENZ	0.45	0.45	0.45	0.48	0.86	0.93	1.25	1.30	2.74	1.68
TON22006.231	ENN	0.95	0.94	0.94	0.96	1.08	1.95	2.17	2.24	4.03	2.85
TON22006.231	ENE	0.56	0.54	0.55	0.60	0.97	1.65	1.24	1.88	3.07	1.78
CMFZ2006.231	HNZ	12.79	12.73	14.80	19.94	22.61	35.67	39.82	24.73	2.42	50.93
CMFZ2006.231	HNN	36.49	36.84	41.51	52.49	65.82	132.34	55.83	73.50	1.37	156.94
CMFZ2006.231	HNE	44.69	45.27	48.21	64.94	113.43	165.10	66.28	95.19	1.37	242.65
CMMG2006.231	HNZ	3.81	4.19	6.02	7.79	8.45	6.07	8.08	9.83	0.45	11.65
CMMG2006.231	HNN	23.58	23.88	24.87	27.38	96.48	79.79	32.92	11.76	1.29	138.22
CMMG2006.231	HNE	28.73	28.81	31.68	33.12	69.39	113.40	36.69	15.59	1.37	177.05
CMP52006.231	HNZ	4.80	4.88	8.47	13.72	11.38	10.86	11.47	11.31	2.42	17.94
CMP52006.231	HNN	27.15	27.54	30.20	47.63	167.32	41.72	35.28	16.12	0.98	168.20
CMP52006.231	HNE	17.70	17.97	20.80	31.17	83.98	36.08	34.07	21.54	0.98	89.45
CUP52006.231	ENZ	3.69	3.76	4.36	4.73	16.90	6.83	7.59	6.45	0.98	16.80
CUP52006.231	ENN	8.06	8.11	10.81	14.35	29.98	15.93	28.95	12.19	0.98	32.10
CUP52006.231	ENE	6.84	6.87	7.25	10.27	17.24	16.75	21.51	13.42	1.37	24.07
SCT22006.231	ENZ	4.64	4.65	9.04	11.95	10.42	11.25	7.68	6.71	0.59	14.90
SCT22006.231	ENN	21.61	21.66	23.48	25.73	50.58	85.79	117.58	23.76	1.92	118.71
SCT22006.231	ENE	22.81	23.17	23.97	28.81	44.04	119.21	70.78	27.68	1.69	125.41

Figures 5 and 6 show the CUP5 and SCT2 station response spectra respectively, with uniform design and hazard spectra according to the current standard (NTC-2017) and NTC-2004.

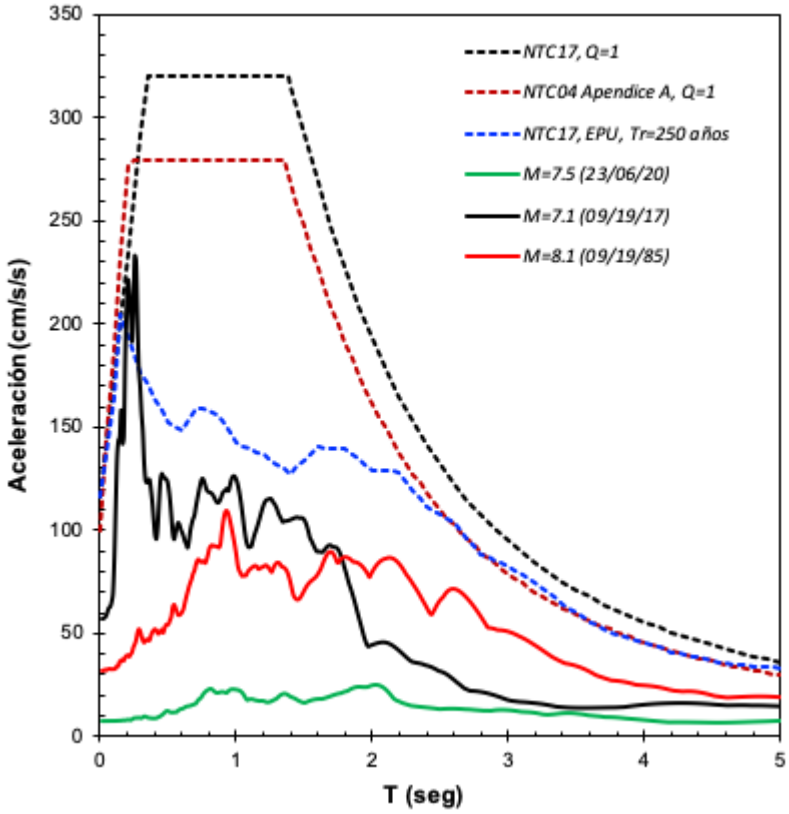

Figure 5. Comparison of design spectra, uniform hazard, and earthquake response spectra recorded at the CUP5 station.

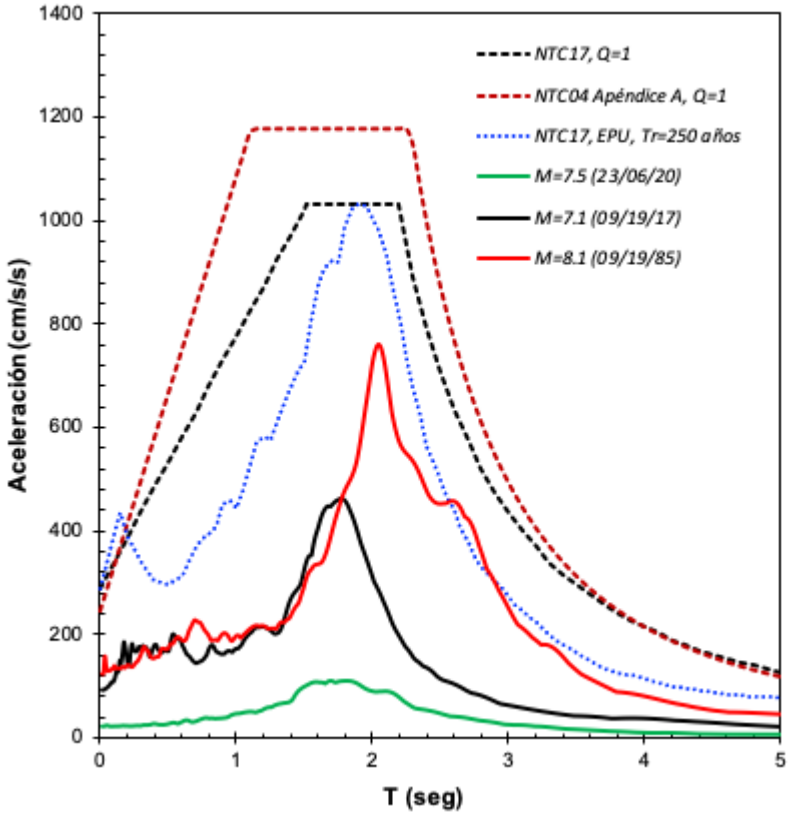

Figure 6. Comparison of design spectra, uniform hazard, and earthquake response spectra recorded at station SCT2.

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