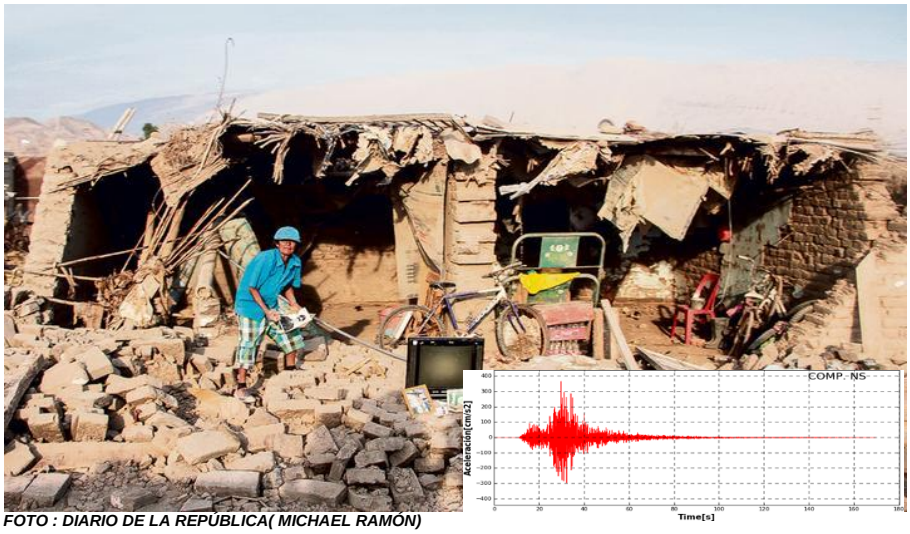
RED ACELEROGRAFICA CIP – UNI

SISMO DE LOMAS-ACARÍ, AREQUIPA
14 DE ENERO DEL 2018



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INFORME FINAL

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ENERO-2018

INFORME FINAL
SISMO DE LOMAS – ACARI, AREQUIPA DEL 14 DE ENERO DEL 2018

Mw = 6.8 (IGP) / Mw = 7.1 (USGS)

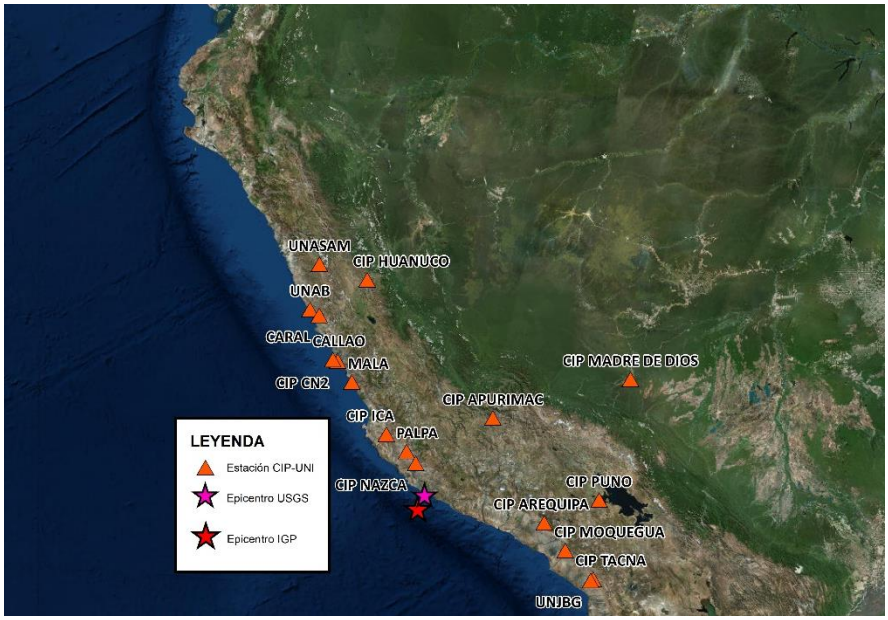
1. UBICACIÓN

El 14 de Enero del 2018, se registró un evento sísmico. La ubicación del sismo tiene dos fuentes: IGP (Instituto Geofísico del Perú) y USGS (United States Geological Survey) que se comparan en la Tabla N° 1 y Figura N° 1.

Tabla N° 1 Ubicación y hora epicentral del sismo según el IGP/USGS

Fuente	Coordenadas geográficas (°)		Profundidad (Km)	Hora Epicentral UTC
	Latitud Sur	Longitud Oeste		
IGP	-16.07	-74.89	48.00	09:18:48
USGS	-15.70	-74.70	10.00	09:18:46

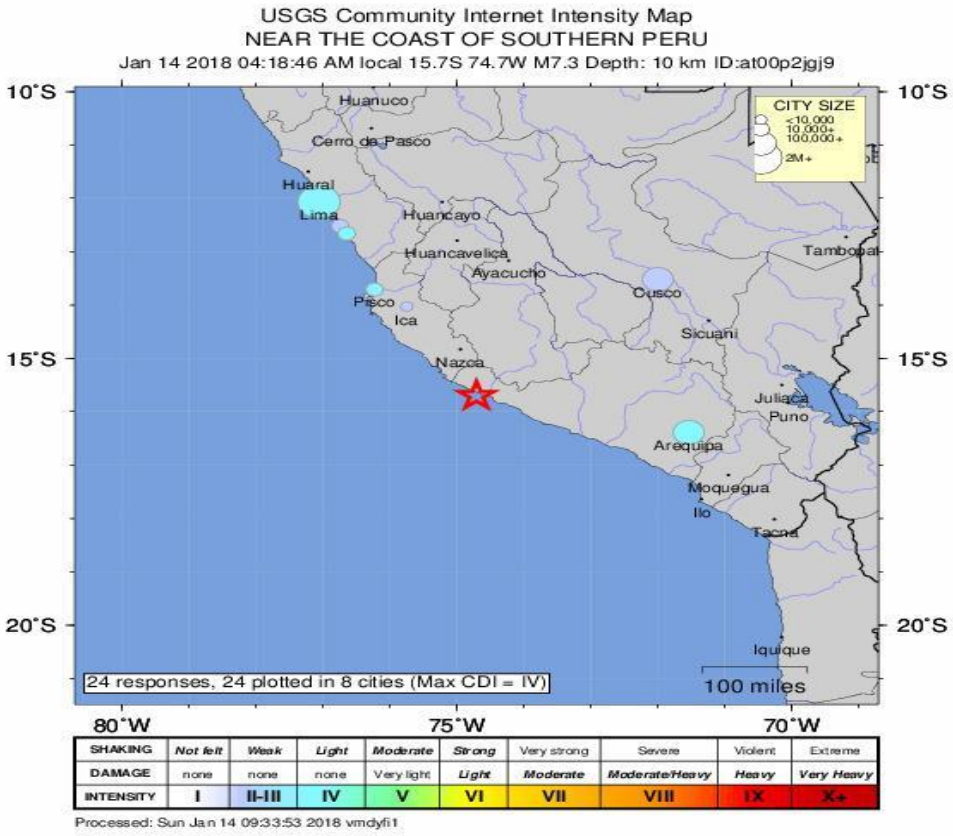
Figura N° 1. Epicentro según IGP/USGS y ubicación de las estaciones acelerográficas



El Instituto Geofísico del Perú (IGP) ubica su epicentro a 56 Km al Sur de Lomas Arequipa, con intensidad máxima en la escala modificada de Mercalli de VI en Lomas.

El USGS ubica el epicentro a 19.0 Km al Oeste-Suroeste de Yauca (Arequipa), a 69.7 Km al Sureste de Minas de Marcona (Ica), a 99.5 Km al Sur-Sureste de Nazca (Ica), a 126.3 Km al Sur-Suroeste de Puquio (Ayacucho) y a 211.8 Km al Sur-Sureste de Ica (Ica). En la Figura N° 2 se observa el mapa de intensidades instrumentales del USGS.

Fig N° 2. Mapa de intensidades del USGS de la Zona del sismo de Acari(Peru) del 14 de Enero del 2018. Epicentro en la estrella.



2. ESTACIONES ACELEROGRÁFICAS

La Red Acelerográfica del CIP - Posgrado FIC UNI, ha podido acceder a las señales acelerográficas de las estaciones NAZCA, PALPA, CIP ICA, CIP AREQUIPA, MALA, CIP MOQUEGUA, UNJBG, CALLAO, CIP CN 2, CIP LIMA, CIP TACNA, CIP APURIMAC, CARAL, UNAB, CIP HUÁNUCO, UNASAM, CIP MADRE DE DIOS Y CIP PUNO,. Los equipos son digitales de marca REFTEK y han sido calibrados para una frecuencia de muestreo de 200 Hz.

La Tabla N° 2 resume la ubicación y características de las estaciones acelerográficas y el tipo de suelo correspondiente.

Tabla N° 2 Ubicación de las estaciones acelerográficas que registraron el sismo del 14 de Enero del 2018

Nº	Institución	Estación	Ubicación	Lugar de asiento	Coordenadas geográficas		Distancia Epicentral (Km)
					Latitud Sur (°)	Longitud Oeste (°)	
1	CIP	CIP ICA	Nazca , Ica	Arenoso	-14.85	-74.94	135.11
2	CIP	CIP ICA	Palpa, Ica	Arenoso	-14.53	-75.19	172.99
3	CIP	CIP ICA	Ica, Ica	Arena media	-14.07	-75.73	238.59
4	CIP	CIP AREQUIPA	Jose Luis Bustamante y Rivero, Arequipa	Grava limosa	-16.45	-71.50	364.53
5	POSGRADO FIC UNI	MALA	Mala, Cañete, Lima	Grava saturada	-12.67	-76.65	421.18
6	CIP	CIP MOQUEGUA	Moquegua, Mariscal Nieto.	Arena arcillosa	-17.19	-70.93	440.05
7	POSGRADO FIC UNI	UNJBG	Alto de Alianza, Tacna	Arema limosa	-17.99	-70.26	537.27
8	CIP	CALLAO	Callao, Lima	No determinado	-12.07	-77.16	505.99
9	CIP	CIP CN	Miraflores, Lima	Grava aluvial	-12.12	-77.03	494.77
10	CIP	CIP LIMA	San Isidro, Lima	Grava aluvial	-12.09	-77.05	498.07
11	CIP/UTEA	CIP APURIMAC	Abancay , Apurimac	No determinado	-13.63	-72.88	345.47
12	CIP	CIP TACNA	Calana, Tacna	Grava, aluvial con bolonería	-17.95	-70.18	542.69
13	POSGRADO FIC UNI/INICTEL	CARAL	Supe, Barranca, Lima	Grava arenosa	-10.89	-77.53	640.62
14	POSGRADO FIC UNI	UNAB	Supe, Barranca, Lima	Grava arenosa	-10.73	-77.77	668.54
15	POSGRADO FIC UNI	UNASAM	Huaraz, Ancash	Arcilla de baja compresibilidad	-9.52	-77.53	779.26
16	CIP	CIP HUÁNUCO	Huánuco, Huánuco	Grava arcillosa	-9.94	-76.24	694.29
17	CIP	CIP MADRE DE DIOS	Puerto Maldonado, Madre de Dios	Arena, arcillosa	-12.60	-69.19	725.17
18	CIP	CIP PUNO	Puno, Puno	Arcilla	-15.83	-70.03	521.15

3. ACELERACIONES MÁXIMAS

Para realizar un tratamiento homogéneo de las señales del sismo ocurrido el 14 de Enero del 2018, se transformaron los registros obtenidos a formato ASCII. Los registros fueron corregidos por línea base y filtrados (pasabanda de 0.1 hertz a 25 hertz) antes de proceder a identificar los picos máximos de aceleración, con el uso del programa SIPA (CIP - UNI) v. 2017

La máxima aceleración registrada fue en la Estación NAZCA componente NS de 366.95 cm/seg². En la Tabla N° 3 y en el Anexo 01 se presentan los valores máximos de aceleraciones registradas en cada componente.

4. ESPECTROS DE SEUDOACELERACIÓN

Se determinaron los espectros de seudoaceleración a fin de tener una representación gráfica de la respuesta elástica máxima del suelo para un amortiguamiento del 5%. El valor máximo del espectro de seudoaceleración obtenido fue registrado en la Estación NAZCA componente NS de 1514.47 cm/ seg² . En la Tabla N° 4 se presentan los valores máximos de los espectros de seudoaceleración registrados.
En las Figuras del N° 3 a N° 17 se presentan las gráficas de comparación de espectros de seudoaceleración por componentes de los registros procesados.

5. ESPECTROS DE AMPLITUDES DE FOURIER

Los Espectros de Amplitudes de Fourier presentan contenidos de frecuencias en el intervalo de 0.1 hertz a 100 hertz.
En las Figuras del N° 18 a N° 32 se presentan las gráficas de comparación de espectros de seudoaceleración por componentes de los registros procesados.

6. OTROS PARÁMETROS DE INTENSIDAD

Se determinaron otros parámetros de intensidad importantes que caracterizan a los movimientos de sísmico registrados y aluden a su potencial para causar daños los que se presentan en la Tabla N° 5

Peak ground acceleration : $PGA = \max |a(t)|$

Peak ground velocity : $PGV = \max |v(t)|$

Peak ground displacement : $PGD = \max |d(t)|$

Root-mean-square of acceleration : $a_{rms} = \sqrt{\frac{1}{t_r}\int_0^{t_r} [a(t)]^2 \, dt}$

Root-mean-square of velocity : $v_{rms} = \sqrt{\frac{1}{t_r}\int_0^{t_r} [v(t)]^2 \, dt}$

Root-mean-square of displacement : $d_{rms} = \sqrt{\frac{1}{t_r}\int_0^{t_r} [d(t)]^2 \, dt}$

Peak velocity-acceleration ratio : $v_{\max} / a_{\max} = PGV / PGA$

Arias intensity : $I_a = \frac{\pi}{2g}\int_0^{\infty} [a(t)]^2 \, dt$

7. MAPA DE ISOACELERACIONES

Con los valores de aceleraciones máximas registradas en las 18 estaciones se elaboró un mapa de isoaceleraciones e isosistas de intensidades instrumentales en base a la escala de Mercalli Modificada (MM), que se muestra en la Figura N° 2.A
Se establecieron correlaciones entre las aceleraciones e intensidades como sigue:

Aceleración (cm/s2)	Intensidad (MM)
<1.0	I
1.0-10.0	II
10.0-30.0	III
30.0-50.0	IV
50.0-100.0	V
100.0-200.0	VI
200.0-370.0	VII

Fig N° 2.A Mapa de Isoaceleraciones e Intensidades

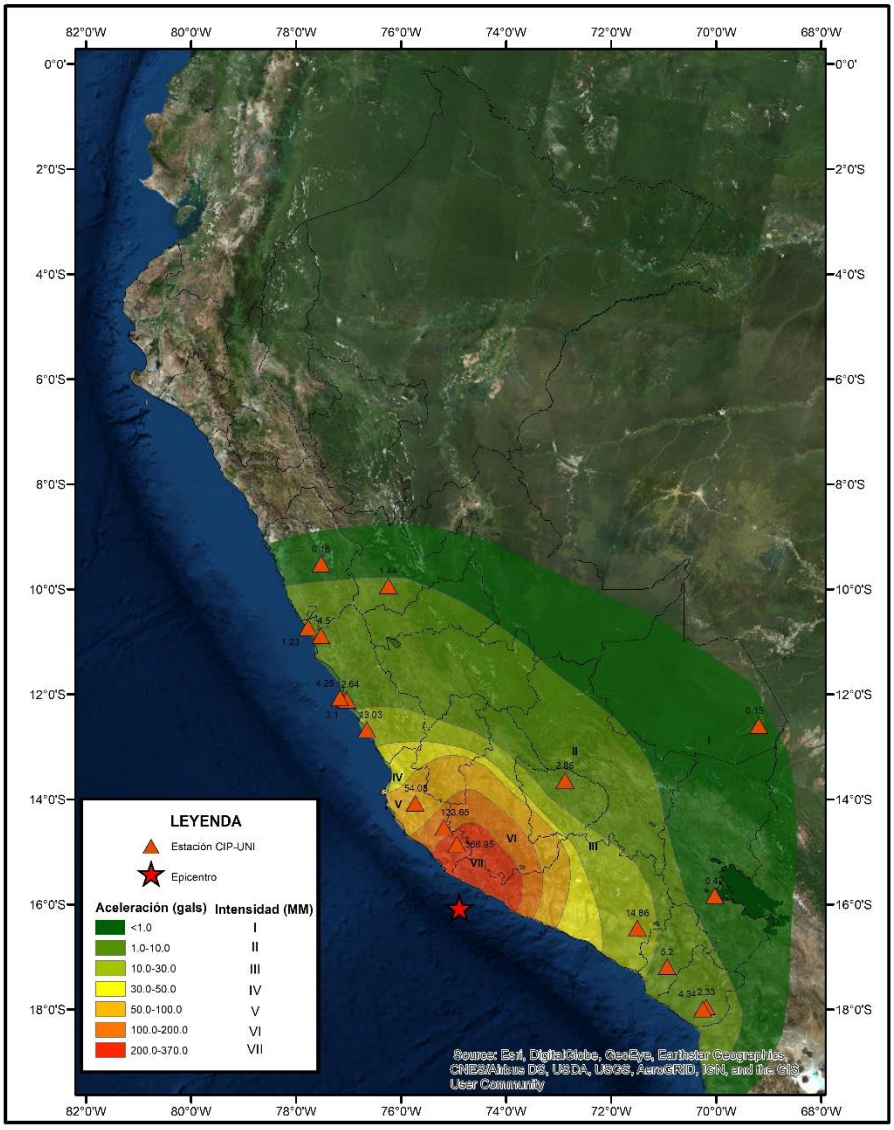


Tabla N° 3 Valores máximos de aceleraciones registradas en las estaciones acelerográficas.

Nro.	Institución	Estación	Ubicación	Lugar de asiento	Aceleraciones Máximas con filtrado (cm/seg^2)			Aceleración Máxima cm/seg ^{2}	Aceleración Máxima (g)
					PGA EO	PGA NS	PGA V		
1	CIP	NAZCA	Nazca , Ica	Arenoso	352.83	366.95	183.96	366.95	0.37
2	CIP	PALPA	Palpa, Ica	Arenoso	98.94	123.65	83.87	123.65	0.13
3	CIP	CIP ICA	Ica, Ica	Arena media	38.01	54.08	29.08	54.08	0.06
4	CIP	CIP AREQUIPA	Jose Luis Bustamante y Rivero, Arequipa	Grava limosa	12.45	14.86	10.41	14.86	0.02
5	POSGRADO FIC UNI	MALA	Mala, Cañete, Lima	Grava saturada	12.45	13.03	5.33	13.03	0.01
6	CIP	CIP MOQUEGUA	Moquegua, Mariscal Nieto.	Arena arcillosa	4.25	5.20	2.42	5.20	0.01
7	POSGRADO FIC UNI/INICTEL	CARAL	Supe, Barranca, Lima	Grava arenosa	4.49	4.50	2.42	4.50	0.00
8	POSGRADO FIC UNI	UNJBG	Alto de Alianza, Tacna	Arema limosa	4.43	4.34	4.03	4.43	0.00
9	CIP	CALLAO	Callao, Lima	No determinado	4.25	4.25	2.15	4.25	0.00

Nro.	Institución	Estación	Ubicación	Lugar de asiento	Aceleraciones Máximas con filtrado (cm/seg^2)			Aceleración Máxima cm/seg ^{2}	Aceleración Máxima (g)
					PGA EO	PGA NS	PGA V		
10	CIP	CIP CN	Miraflores, Lima	Grava aluvial	2.88	3.10	2.07	3.10	0.00
11	CIP/UTEA	CIP APURIMAC	Abancay , Apurimac	No determinado	2.39	2.85	2.56	2.85	0.00
12	CIP	CIP LIMA	San Isidro, Lima	Grava aluvial	2.36	2.64	1.81	2.64	0.00
13	CIP	CIP TACNA	Calana, Tacna	Grava, aluvial con bolonería	2.02	2.33	1.91	2.33	0.00
14	CIP	CIP HUÁNUCO	Huánuco, Huánuco	Grava arcillosa	0.89	1.44	0.48	1.44	0.00
15	POSGRADO FIC UNI	UNAB	Supe, Barranca, Lima	Grava arenosa	0.63	0.63	0.65	0.65	0.00
16	POSGRADO FIC UNI	UNASAM	Huaraz, Ancash	Arcilla de baja compresibilidad	0.84	0.64	0.37	0.84	0.00
17	CIP	CIP MADRE DE DIOS	Puerto Maldonado, Madre de Dios	Arena, arcillosa	0.48	0.43	0.44	0.48	0.00
18	CIP	CIP PUNO	Puno, Puno	Arcilla	0.33	0.42	0.45	0.45	0.00

Tabla N° 4 Valores máximos de espectros de seudoaceleración en las estaciones acelerográficas.

Nro.	Institución	Estación	Ubicación	Lugar de asiento	Seudoaceleración Espectral (cm/seg^2) 5% de amortiguamiento (con filtrado)			Seudoaceleración espectral máxima (cm/seg2)
					EO	NS	V	
1	CIP	NAZCA	Nazca , Ica	Arenoso	956.97	1514.47	661.14	1514.47
2	CIP	PALPA	Palpa, Ica	Arenoso	345.32	572.19	252.79	572.19
3	CIP	CIP ICA	Ica, Ica	Arena media	131.02	178.76	96.93	178.76
4	CIP	CIP AREQUIPA	Jose Luis Bustamante y Rivero, Arequipa	Grava limosa	45.79	48.04	43.58	48.04
5	POSGRADO FIC UNI	MALA	Mala, Cañete, Lima	Grava saturada	48.46	56.98	19.78	56.98
6	CIP	CIP MOQUEGUA	Moquegua, Mariscal Nieto.	Arena arcillosa	17.83	17.18	6.83	17.83
7	POSGRADO FIC UNI/INICTEL	CARAL	Supe, Barranca, Lima	Grava arenosa	20.04	19.00	1.43	20.04
8	POSGRADO FIC UNI	UNJBG	Alto de Alianza, Tacna	Arema limosa	17.34	18.83	13.92	18.83
9	CIP	CALLAO	Callao, Lima	No determinado	17.85	15.71	6.55	17.85

Nro.	Institución	Estación	Ubicación	Lugar de asiento	Seudoaceleración Espectral (cm/seg^2) 5% de amortiguamiento (con filtrado)			Seudoaceleración espectral máxima (cm/seg2)
					EO	NS	V	
10	CIP	CIP CN 2	Miraflores, Lima	Grava aluvial	8.73	10.53	6.98	10.53
11	CIP/UTEA	CIP APURIMAC	Abancay , Apurimac	No determinado	9.98	11.05	9.05	11.05
12	CIP	CIP LIMA	San Isidro, Lima	Grava aluvial	8.34	6.73	6.97	8.34
13	CIP	CIP TACNA	Calana, Tacna	Grava, aluvial con bolonería	7.28	6.2	6.64	7.28
14	CIP	CIP HUÁNUCO	Huánuco, Huánuco	Grava arcillosa	3.23	5.88	1.72	5.88
15	POSGRADO FIC UNI	UNAB	Supe, Barranca, Lima	Grava arenosa	20.04	19.00	11.43	20.04
16	POSGRADO FIC UNI	UNASAM	Huaraz, Ancash	Arcilla de baja compresibilidad	0.66	0.75	0.78	0.78
17	CIP	CIP MADRE DE DIOS	Puerto Maldonado, Madre de Dios	Arena, arcillosa	0.86	0.89	0.76	0.89
18	CIP	CIP PUNO	Puno, Puno	Arcilla	1.23	0.94	1.05	1.23

Tabla N° 5 Otros Paràmetros

Estación	Componente	PGA cm^2/sec	PGV cm/sec	PGD cm	V_{max}/A_{max} seg	RMS Acel. cm2/sec	RMS Vel. cm/sec	RMS Desp. cm	I_a m/seg	Densidad de energía específica cm^2/sec	Intensidad de Housner cm
CIP NAZCA	E-O	352.83	16.69	3.40	0.050	24.710	1.370	0.310	1.660	318.420	46.340
	N-S	366.95	14.22	1.89	0.040	29.590	1.420	0.190	2.380	342.800	39.650
	V	183.96	8.09	1.56	0.040	18.600	0.730	0.160	0.940	89.830	25.450
PALPA	E-O	98.94	3.87	0.91	0.040	9.350	0.500	0.150	0.230	40.950	15.240
	N-S	123.65	4.33	1.00	0.030	10.830	0.580	0.150	0.310	55.140	17.690
	V	83.87	2.01	0.70	0.020	6.980	0.260	0.100	0.130	11.150	7.730
CIP ICA	E-O	38.01	4.19	1.08	0.110	6.540	0.860	0.350	0.070	70.920	16.830
	N-S	54.08	5.89	1.36	0.110	8.120	1.050	0.350	0.100	105.740	25.450
	V	29.08	2.83	0.75	0.100	5.260	0.560	0.170	0.040	30.110	14.710
CIP AREQUIPA	E-O	12.51	0.72	0.24	0.060	1.560	0.110	0.050	0.010	1.970	2.460
	N-S	14.86	2.02	0.78	0.140	1.560	0.170	0.100	0.010	4.930	5.370
	V	10.41	0.47	0.20	0.040	1.280	0.080	0.050	0.000	1.100	1.740
MALA	E-O	12.45	0.71	0.20	0.060	1.650	0.100	0.040	0.010	1.990	2.280
	N-S	13.03	0.67	0.17	0.050	1.760	0.100	0.040	0.010	1.830	2.160
	V	5.33	0.38	0.18	0.070	0.770	0.060	0.040	0.000	0.660	1.240
CIP MOQUEGUA	E-O	4.25	0.6	0.24	0.140	0.790	0.100	0.070	0.000	1.000	2.570
	N-S	5.20	1.05	0.54	0.200	0.890	0.160	0.090	0.000	2.440	4.570
	V	2.42	0.28	0.22	0.110	0.430	0.060	0.070	0.000	0.360	1.220
CARAL	E-O	4.49	0.42	0.09	0.090	0.620	0.050	0.020	0.000	0.430	1.270
	N-S	4.5	0.33	0.08	0.070	0.630	0.050	0.020	0.000	0.400	1.180
	V	2.42	0.13	0.08	0.050	0.390	0.030	0.020	0.000	0.120	0.530
UNJBG	E-O	4.43	0.48	0.29	0.110	0.570	0.090	0.070	0.000	1.260	2.090
	N-S	4.34	0.39	0.43	0.090	0.560	0.100	0.110	0.000	1.480	1.500
	V	4.03	0.21	0.17	0.050	0.490	0.050	0.050	0.000	0.410	1.120
CALLAO	E-O	4.25	0.63	0.21	0.150	0.730	0.110	0.040	0.000	1.810	2.750
	N-S	4.25	0.58	0.14	0.140	0.730	0.110	0.040	0.000	1.720	2.560
	V	2.15	0.24	0.14	0.110	0.380	0.050	0.030	0.000	0.330	0.780

Estación	Componente	PGA cm^2/sec	PGV cm/sec	PGD cm	V_{max}/A_{max} seg	RMS Acel. cm2/sec	RMS Vel. cm/sec	RMS Desp. cm	I_a m/seg	Densidad de energía específica cm^2/sec	Intensidad de Housner cm
CIP CN 2	E-O	2.88	0.28	0.14	0.100	0.390	0.050	0.030	0.000	0.430	1.140
	N-S	3.10	0.24	0.11	0.080	0.380	0.050	0.040	0.000	0.380	1.010
	V	2.07	0.17	0.10	0.080	0.310	0.030	0.020	0.000	0.220	0.670
CIP APURIMAC	E-O	2.39	0.5	0.36	0.210	0.480	0.120	0.090	0.000	2.010	2.250
	N-S	2.85	0.51	0.51	0.180	0.380	0.130	0.130	0.000	2.350	1.440
	V	2.56	0.65	0.49	0.260	0.420	0.120	0.100	0.000	2.110	1.900
CIP LIMA	E-O	2.36	0.24	0.13	0.100	0.370	0.040	0.030	0.000	0.360	0.960
	N-S	2.64	0.2	0.12	0.070	0.340	0.040	0.030	0.000	0.290	0.840
	V	1.81	0.16	0.11	0.090	0.280	0.030	0.030	0.000	0.220	0.560
CIP TACNA	E-O	2.02	0.33	0.29	0.160	0.290	0.060	0.100	0.000	0.610	1.100
	N-S	2.33	0.37	0.38	0.160	0.280	0.080	0.110	0.000	1.010	0.890
	V	1.91	0.18	0.15	0.100	0.260	0.040	0.050	0.000	0.290	0.680
CIP HUÁNUCO	E-O	0.89	0.18	0.11	0.200	0.160	0.030	0.030	0.000	0.170	0.760
	N-S	1.44	0.17	0.11	0.120	0.200	0.030	0.030	0.000	0.170	0.900
	V	0.48	0.11	0.08	0.230	0.100	0.030	0.020	0.000	0.110	0.420
UNAB	E-O	1.23	0.14	0.09	0.110	0.200	0.020	0.020	0.000	0.080	0.430
	N-S	1.23	0.11	0.05	0.090	0.200	0.020	0.010	0.000	0.070	0.420
	V	0.80	0.07	0.04	0.090	0.130	0.020	0.010	0.000	0.040	0.270
UNASAM	E-O	0.84	0.18	0.12	0.210	0.110	0.040	0.030	0.000	0.190	0.530
	N-S	0.64	0.14	0.11	0.220	0.100	0.030	0.020	0.000	0.140	0.540
	V	0.37	0.11	0.11	0.310	0.070	0.020	0.040	0.000	0.070	0.390
CIP MADRE DE DIOS	E-O	0.48	0.34	0.38	0.700	0.120	0.070	0.070	0.000	0.850	0.460
	N-S	0.43	0.38	0.50	0.890	0.100	0.080	0.120	0.000	1.090	0.390
	V	0.44	0.29	0.35	0.660	0.080	0.060	0.100	0.000	0.590	0.340
CIP PUNO	E-O	0.33	0.16	0.20	0.470	0.080	0.040	0.080	0.000	0.120	0.380
	N-S	0.42	0.24	0.25	0.570	0.080	0.040	0.050	0.000	0.140	0.360
	V	0.45	0.2	0.22	0.450	0.070	0.050	0.050	0.000	0.170	0.400

Figura N°3.

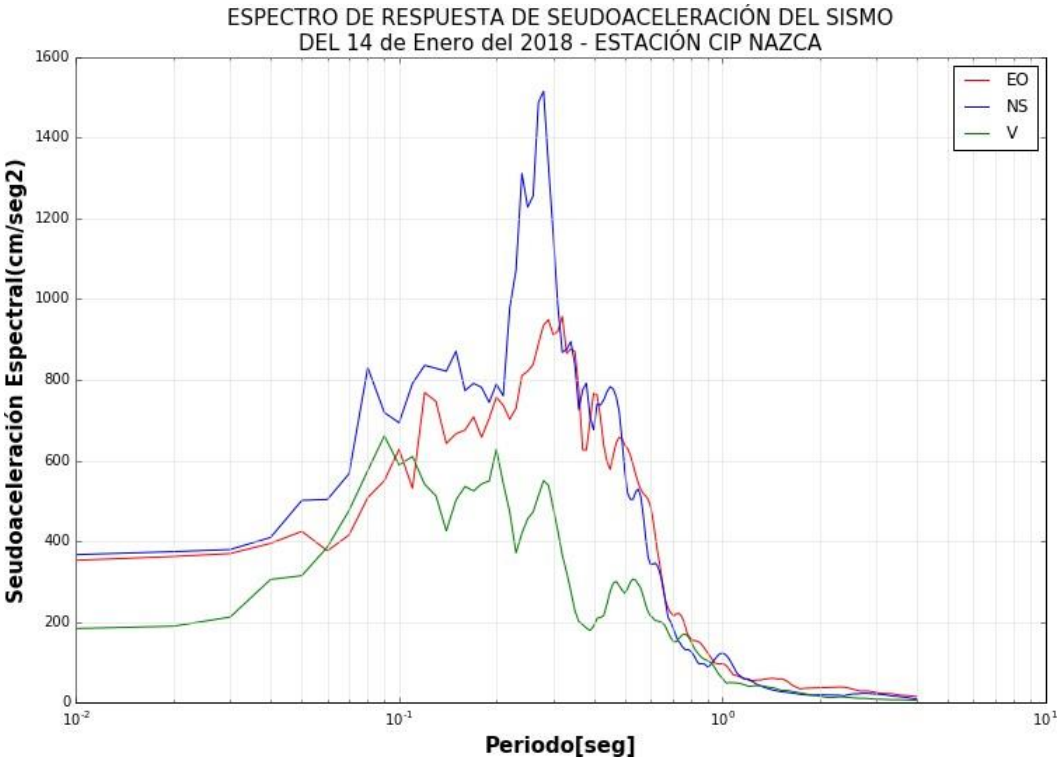


Figura N°18.

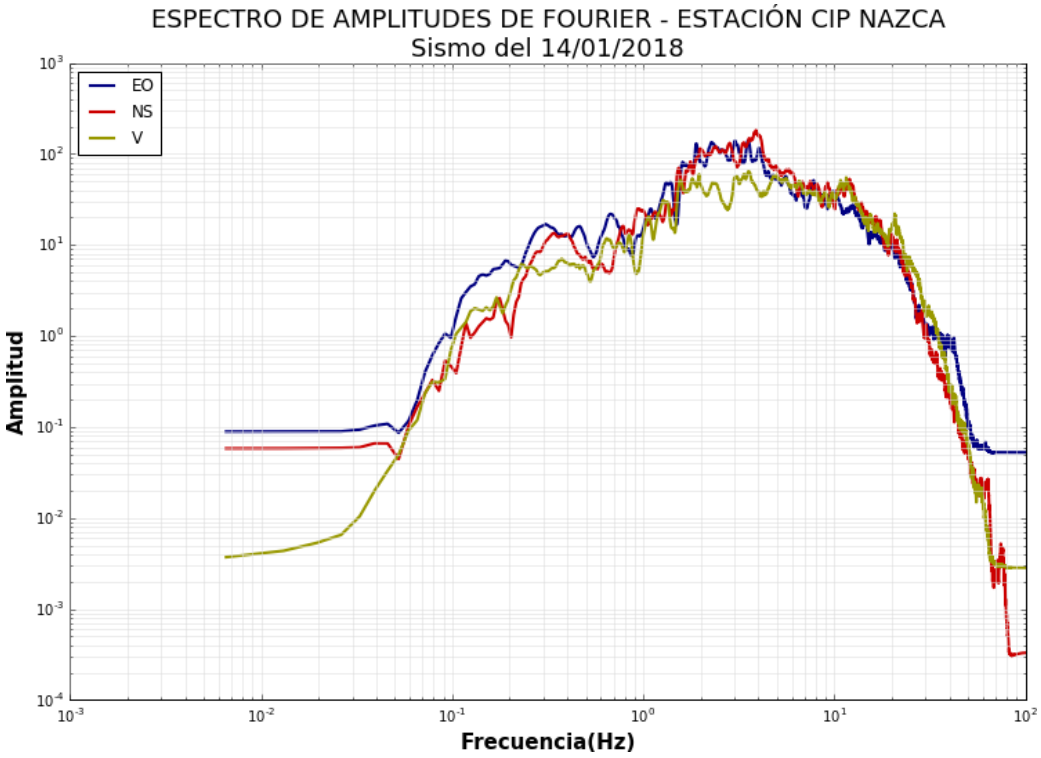


Figura N°4.

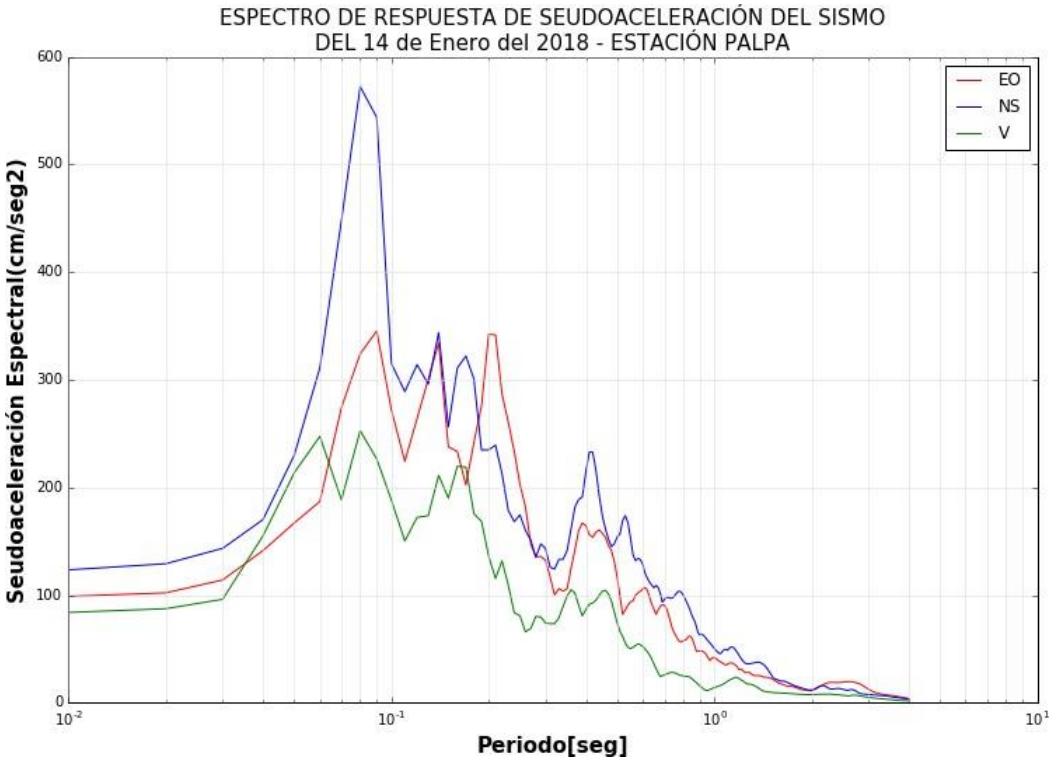


Figura N°19.

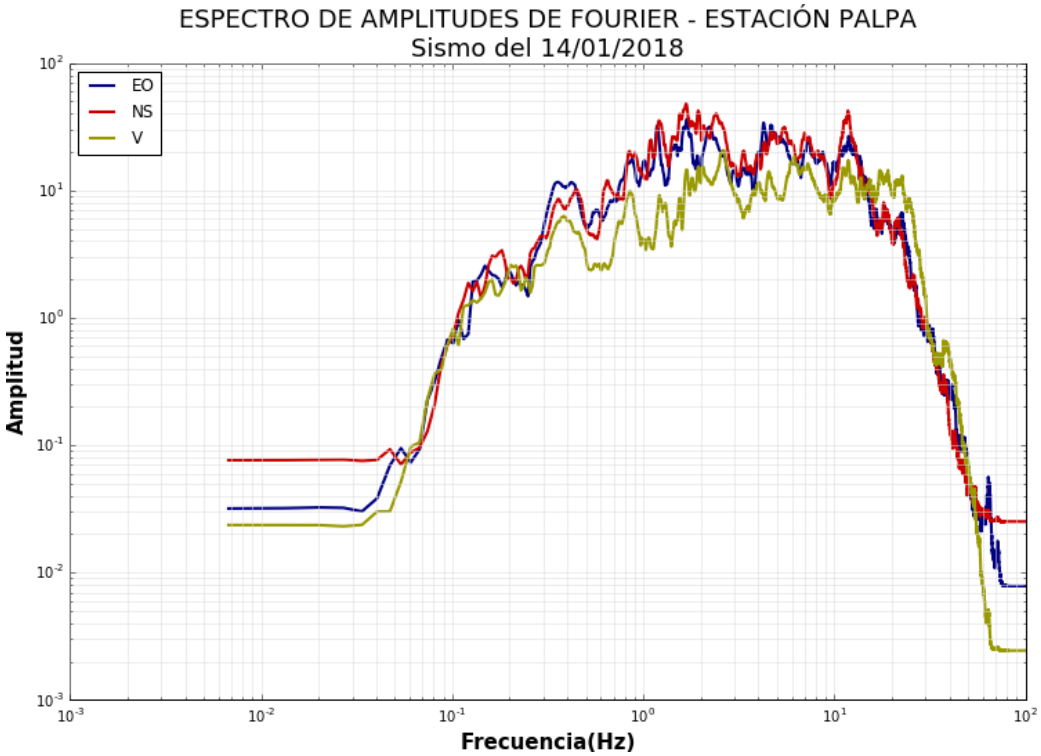


Figura N°5.

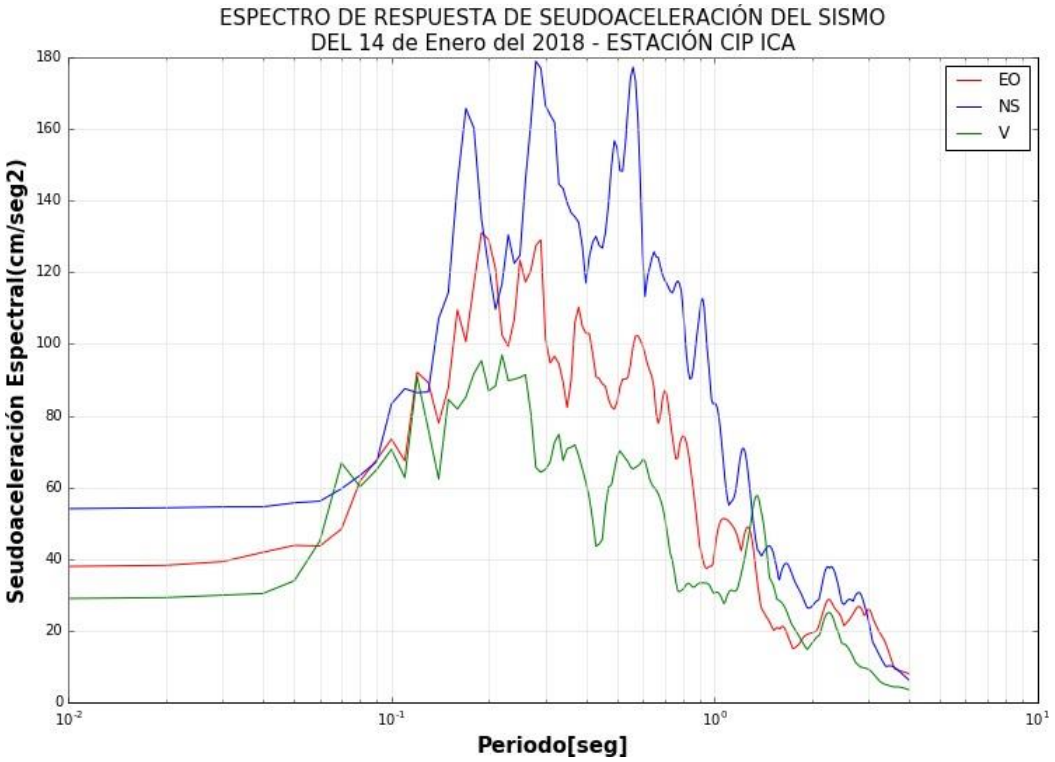


Figura N°20.

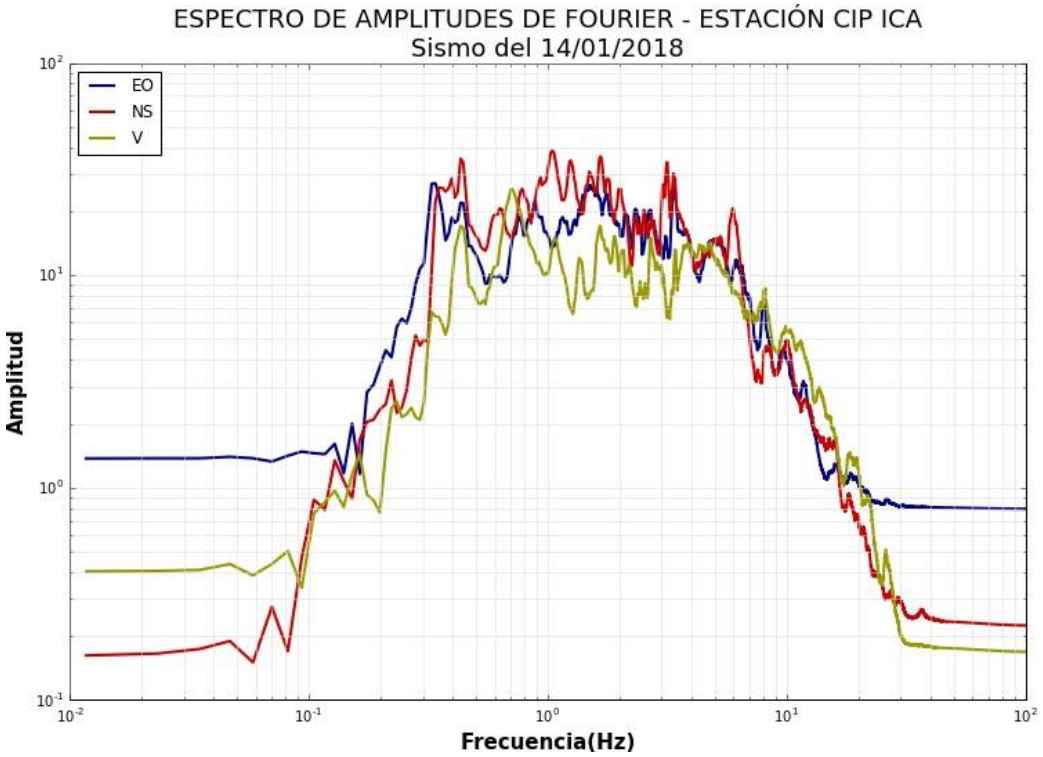


Figura N°6.

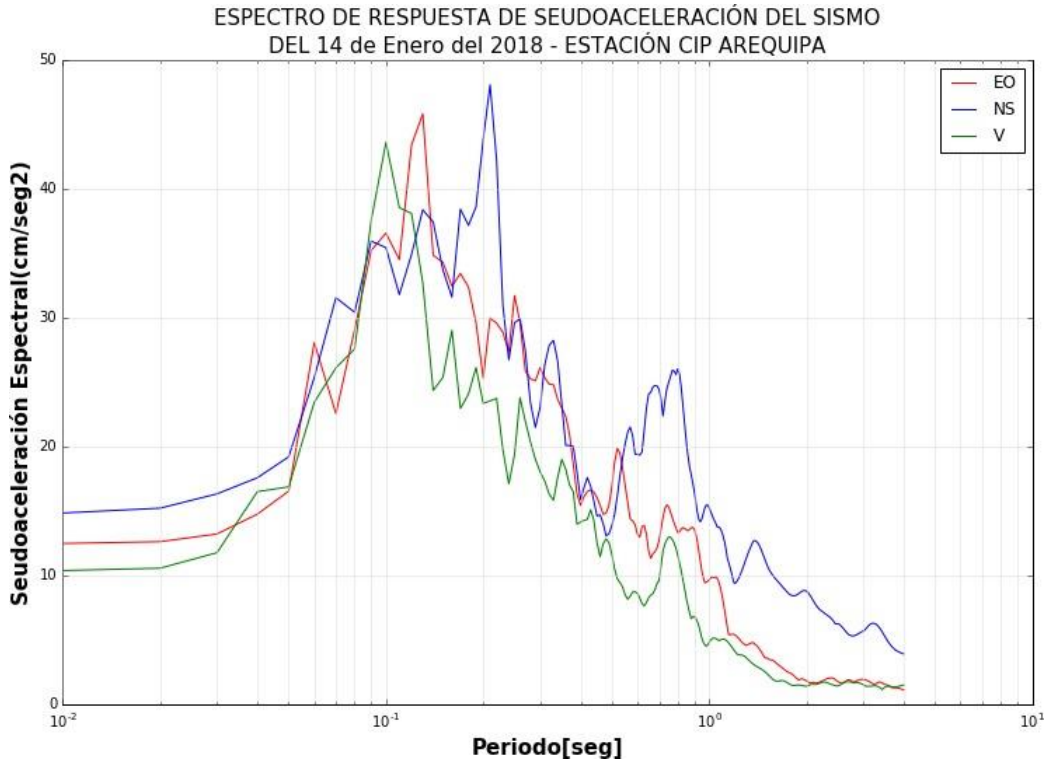


Figura N°21.

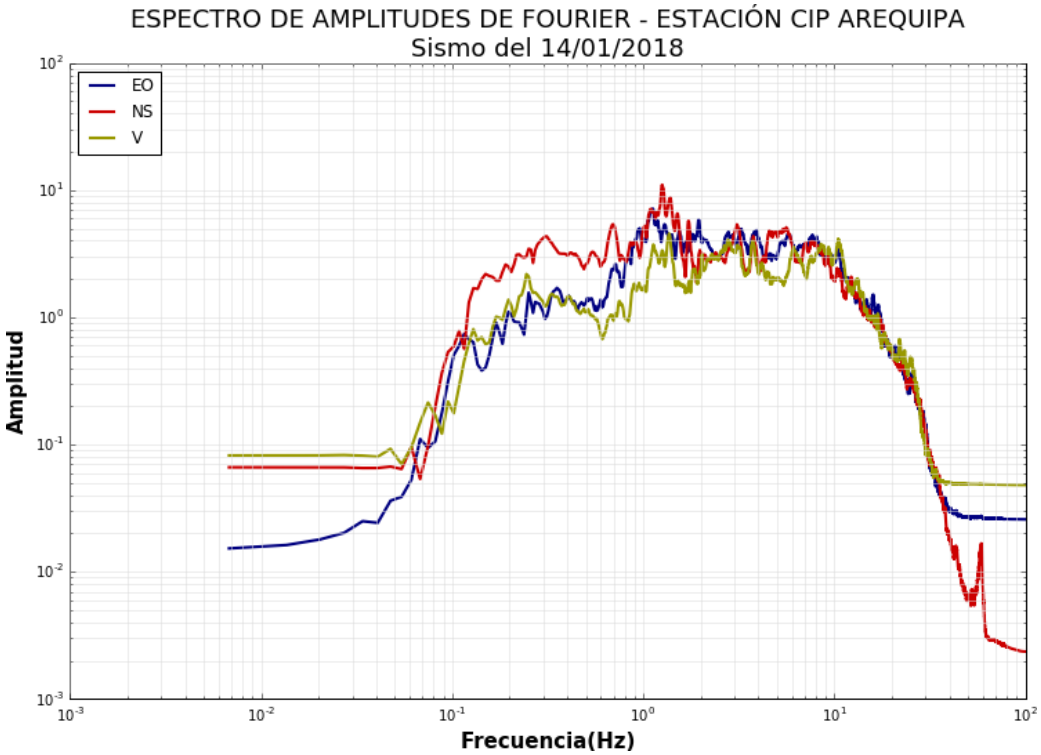


Figura N°7.

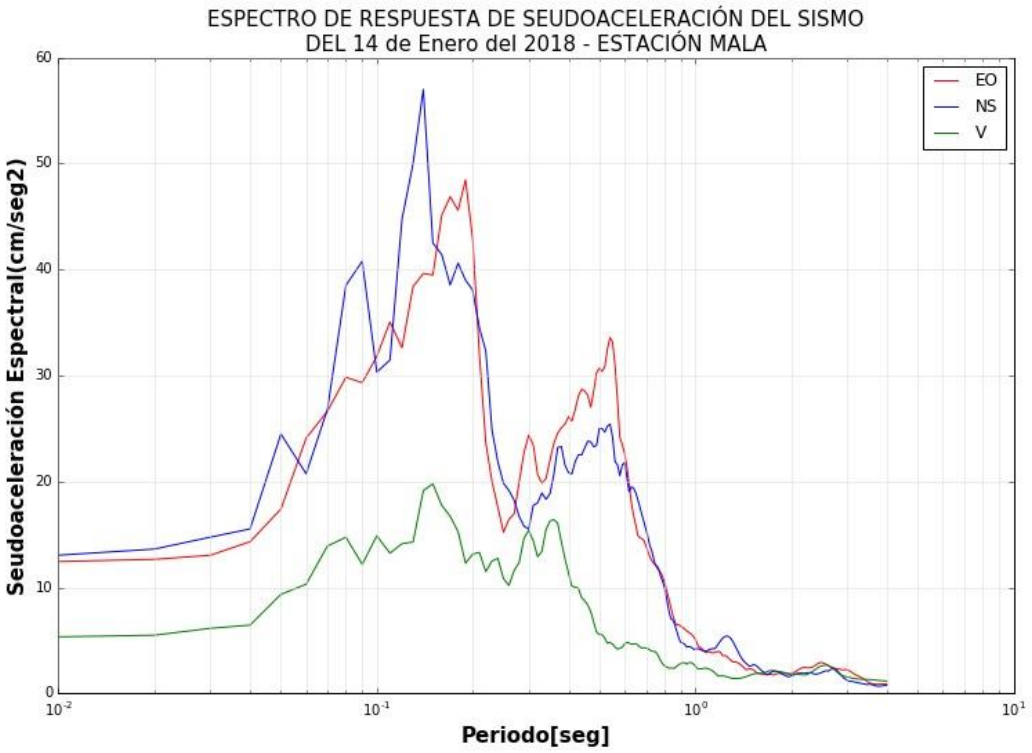


Figura N°22.

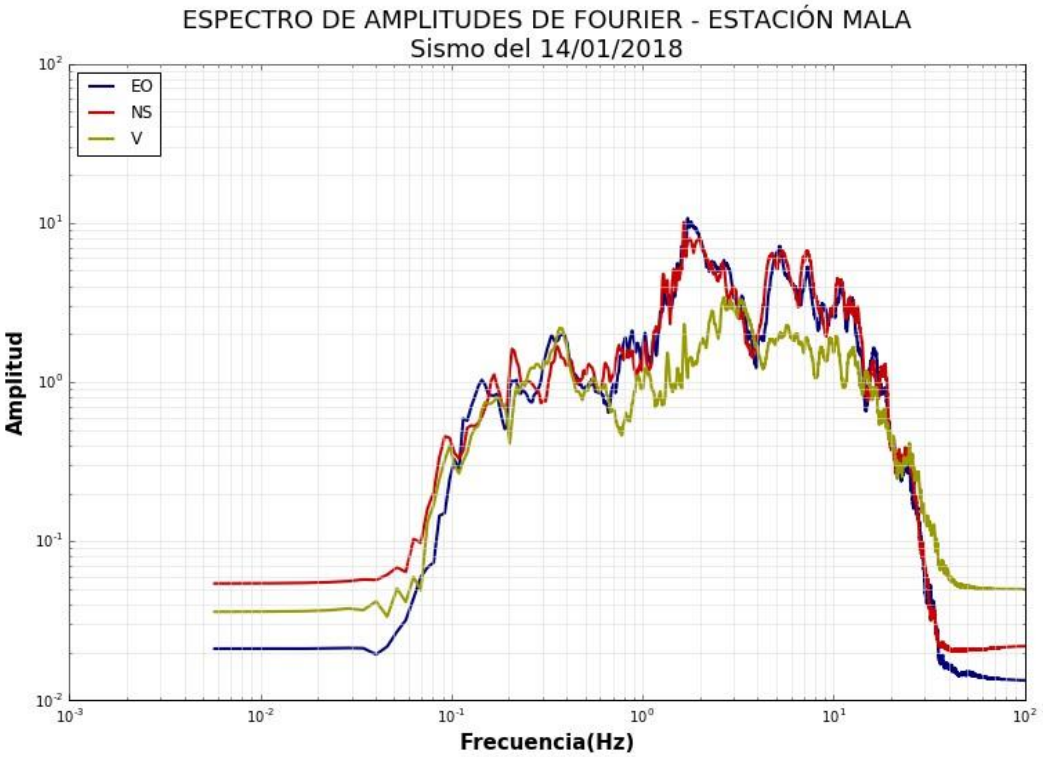


Figura N°8.

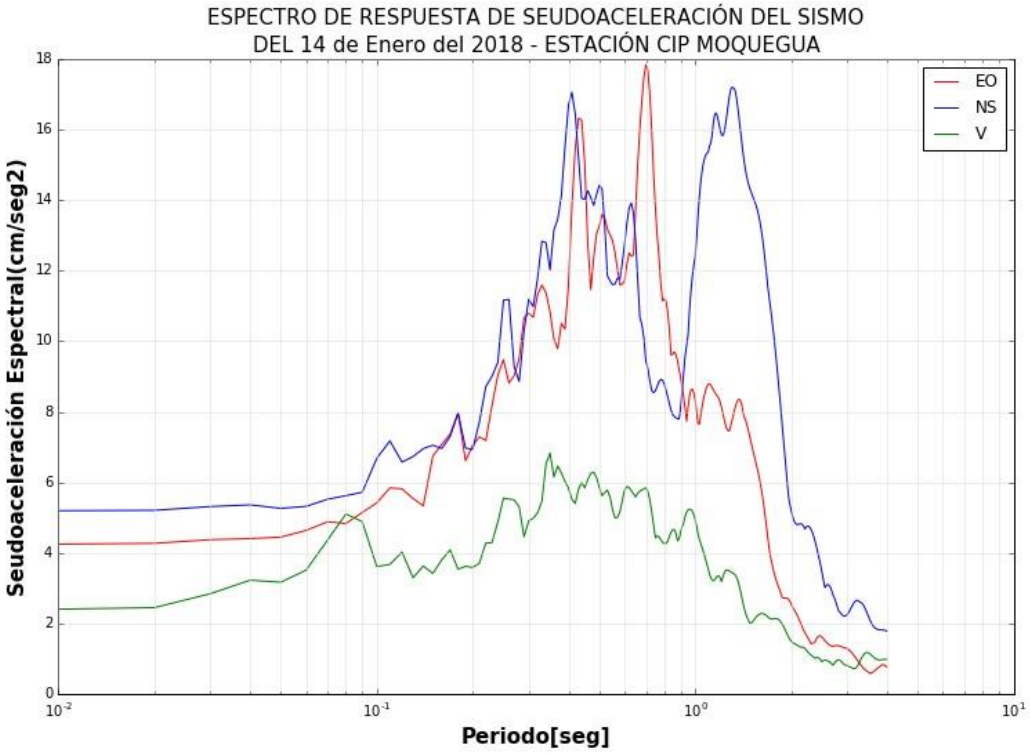


Figura N°23.

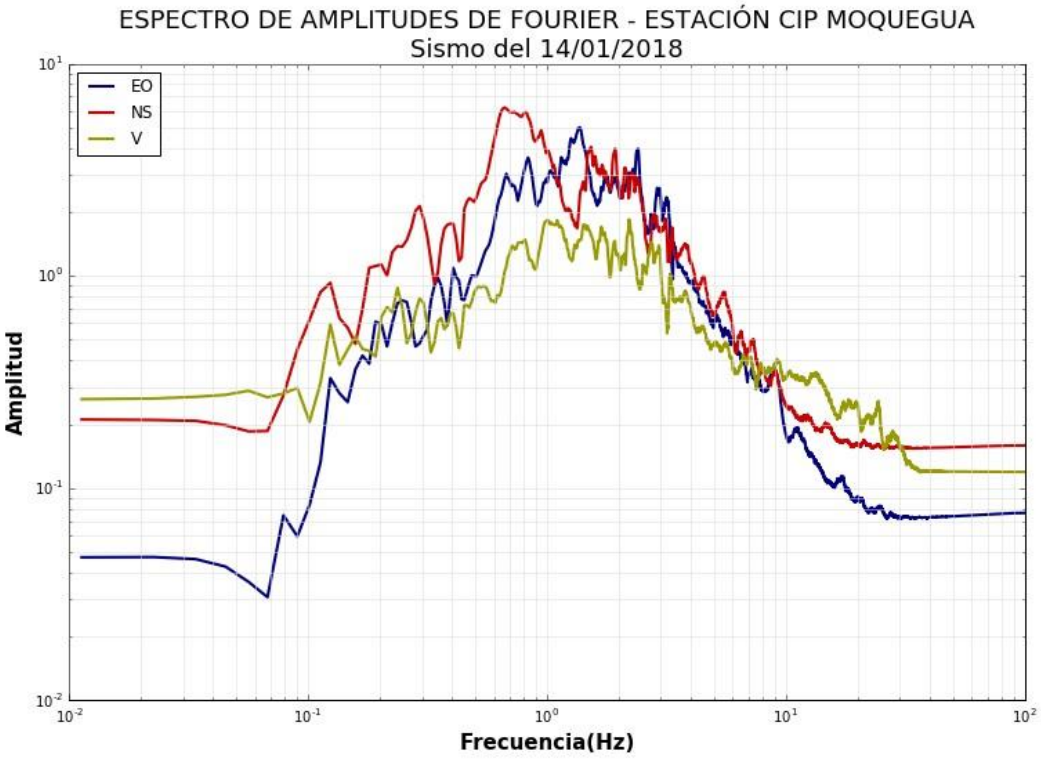
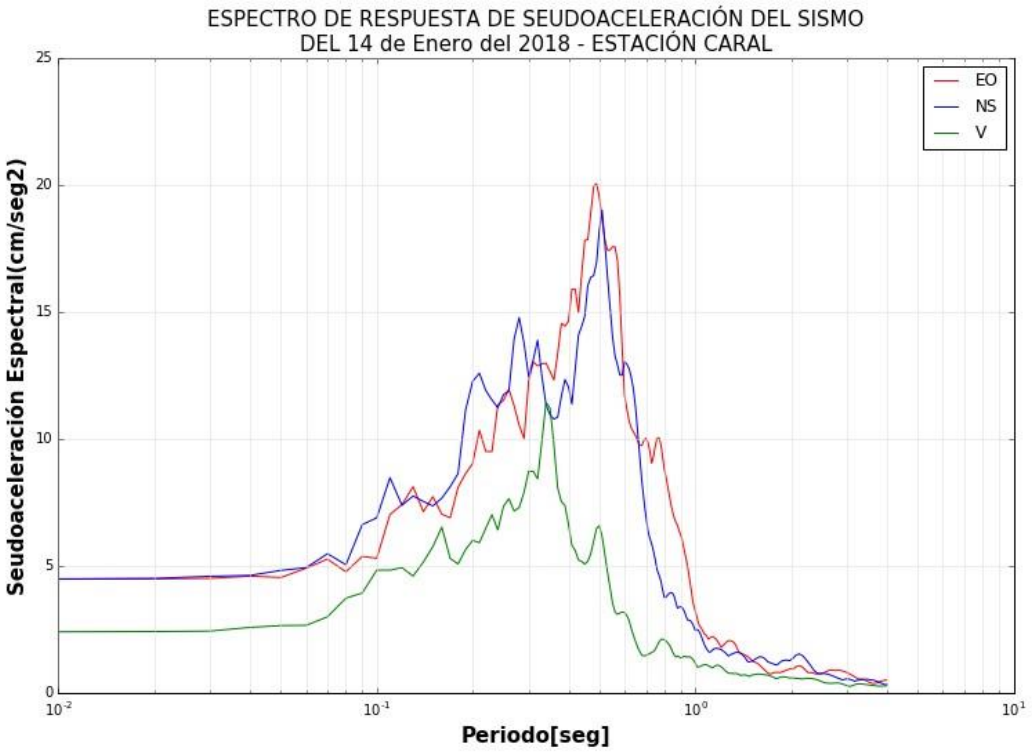


Figura N°9.



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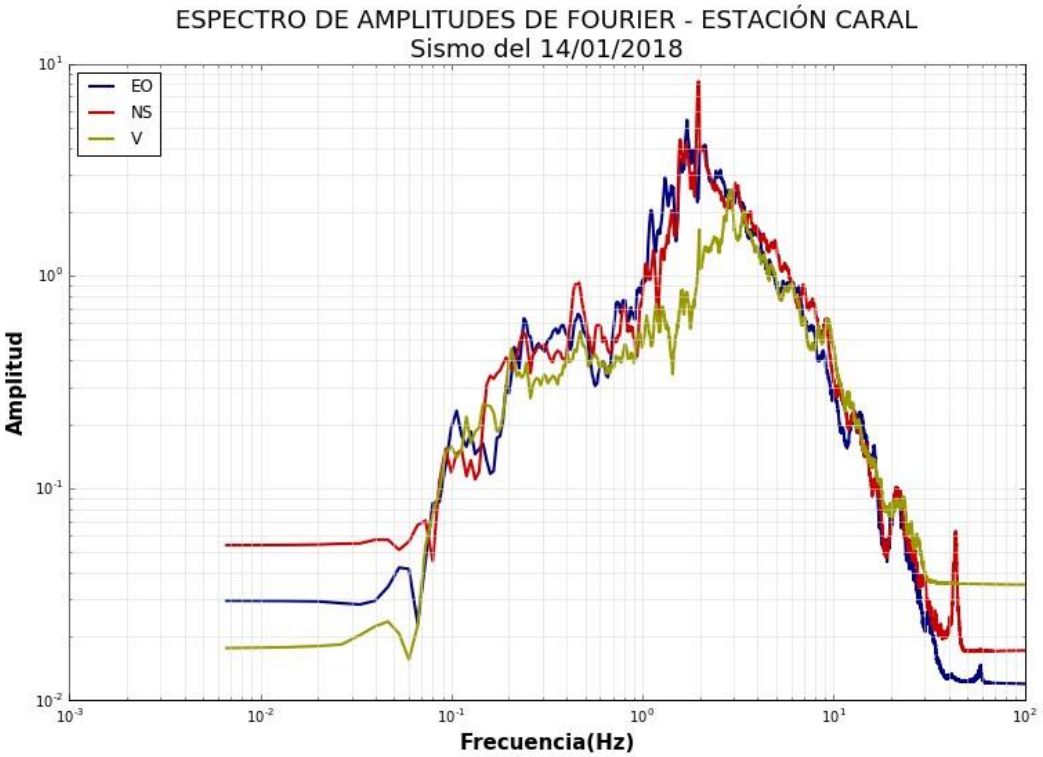
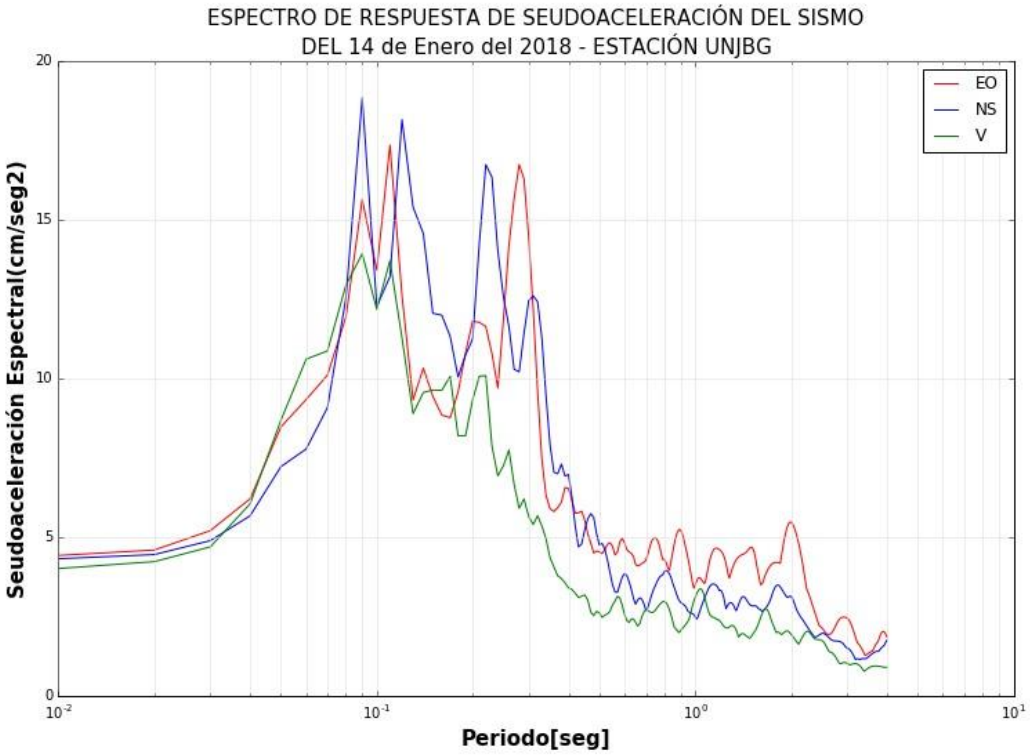


Figura N°10.



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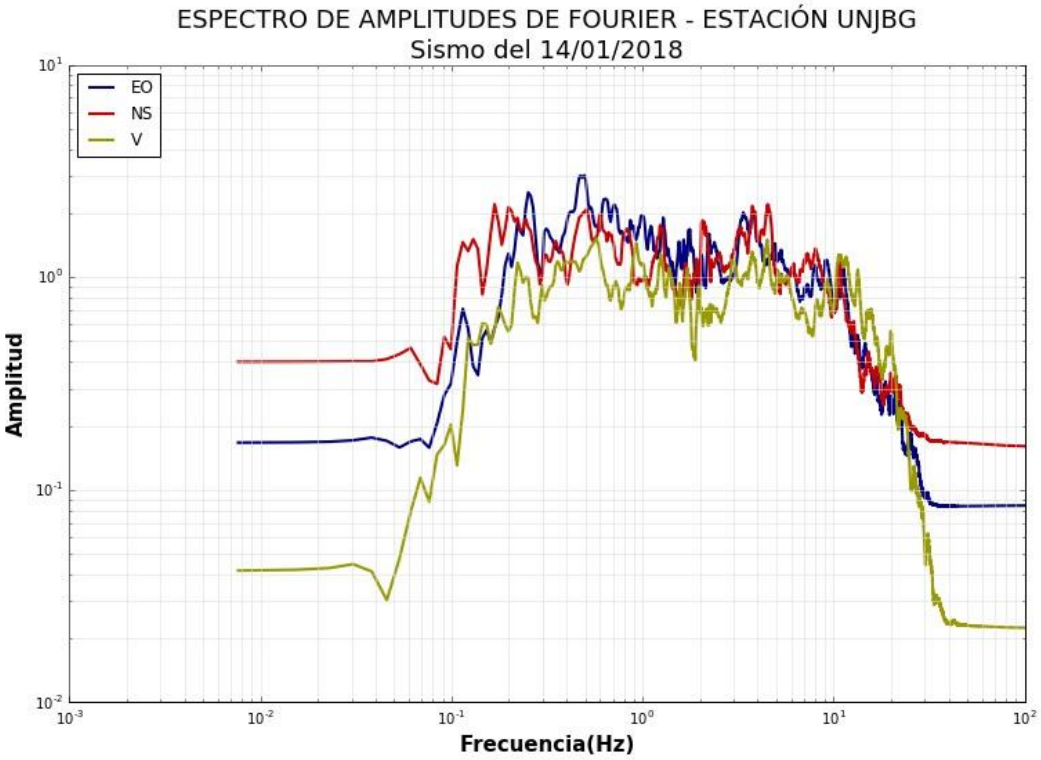


Figura N°11.

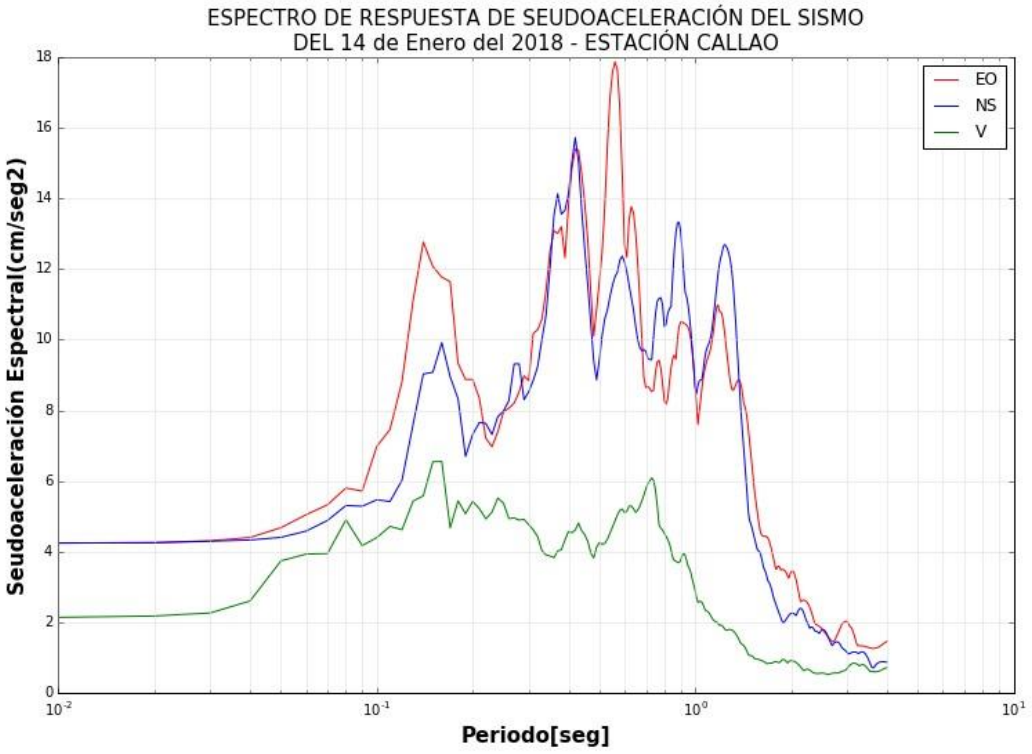


Figura N°26.

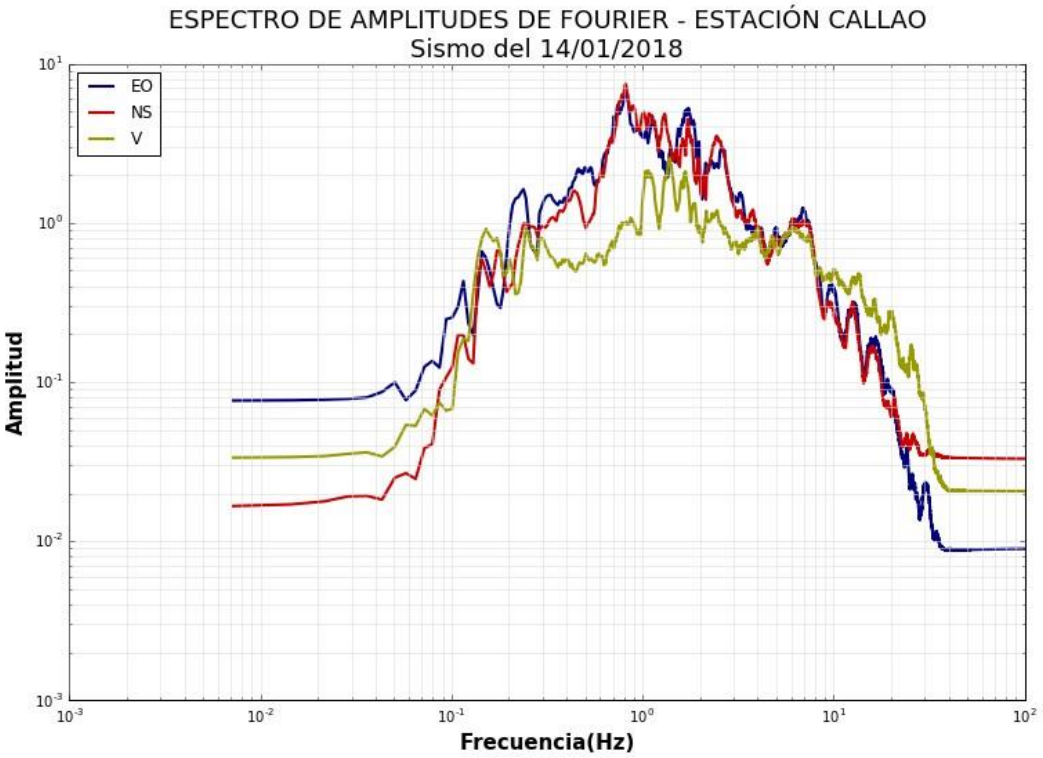


Figura N°12.

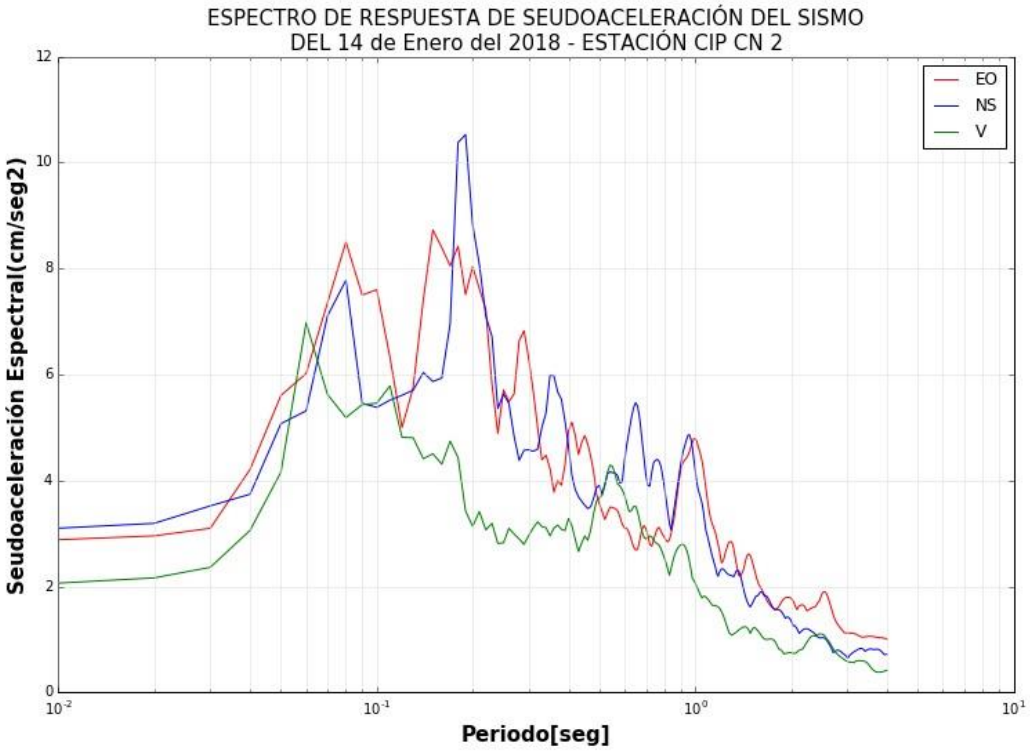


Figura N°27.

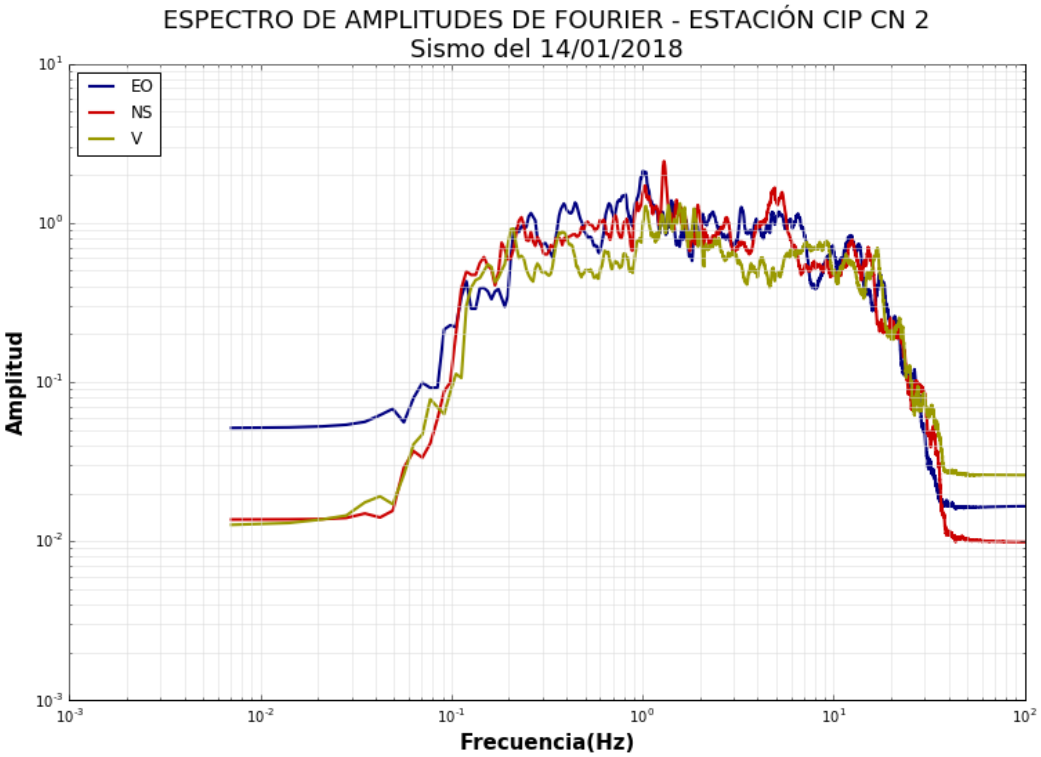


Figura N°13.

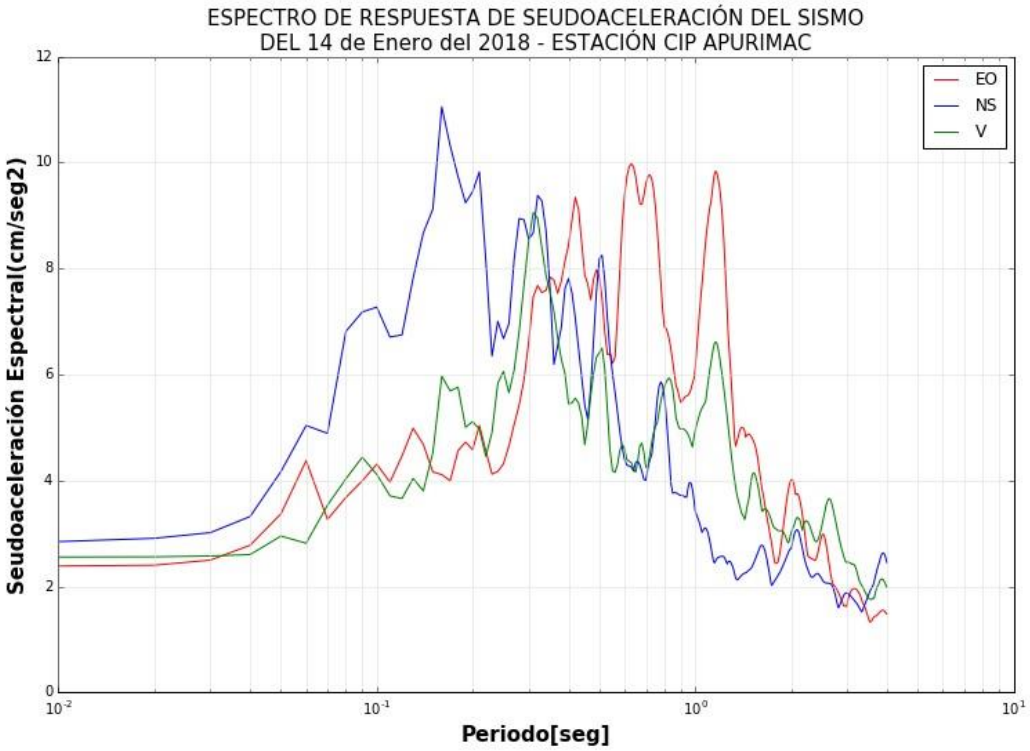


Figura N°28.

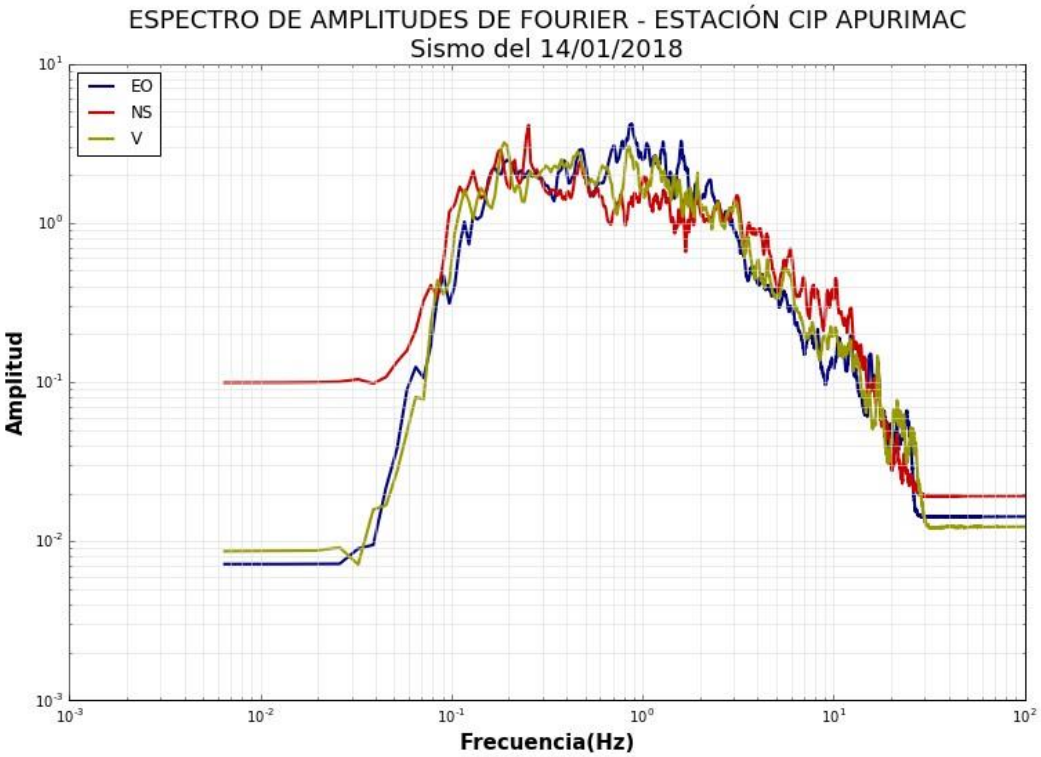


Figura N°14.

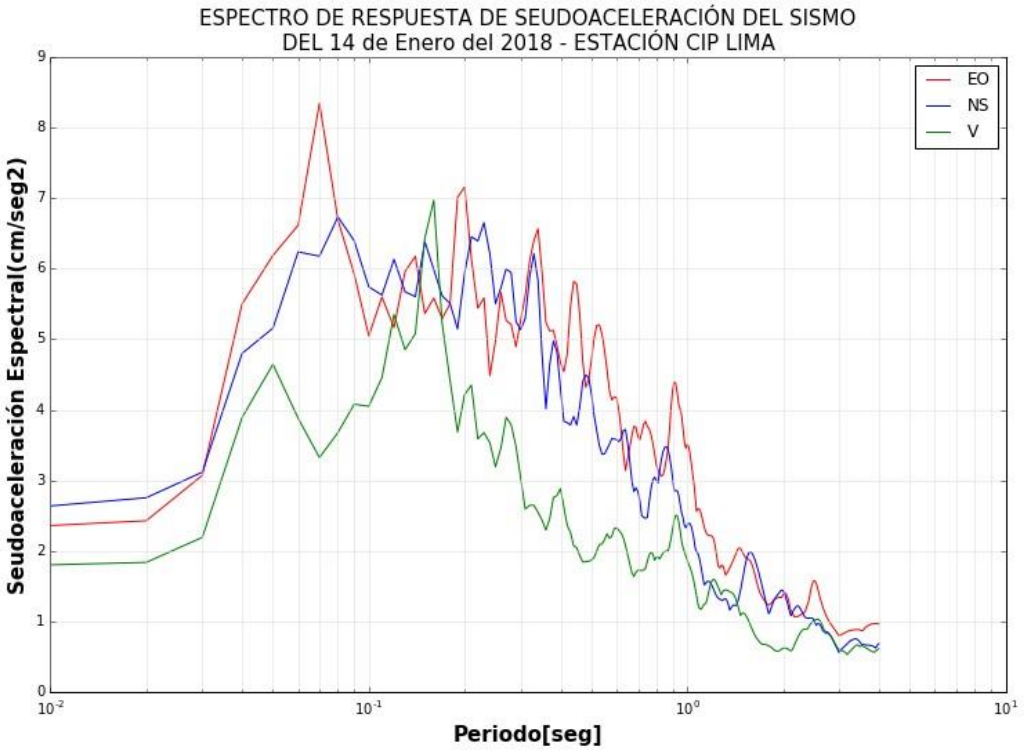


Figura N°29.

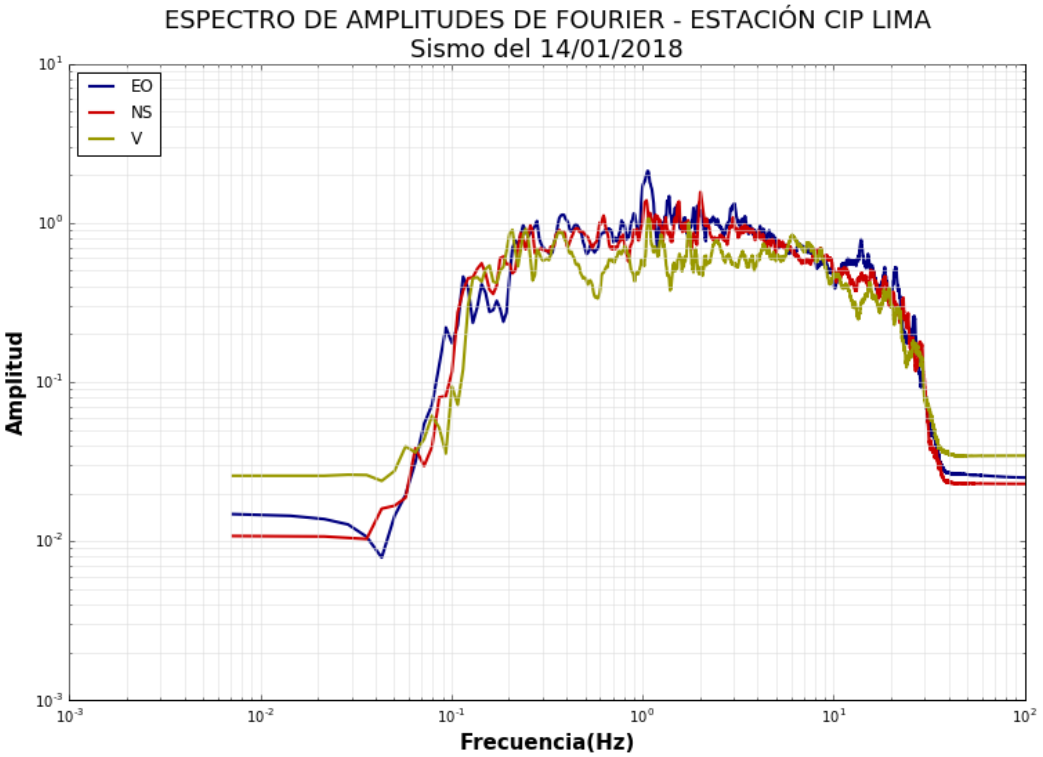


Figura N°15.

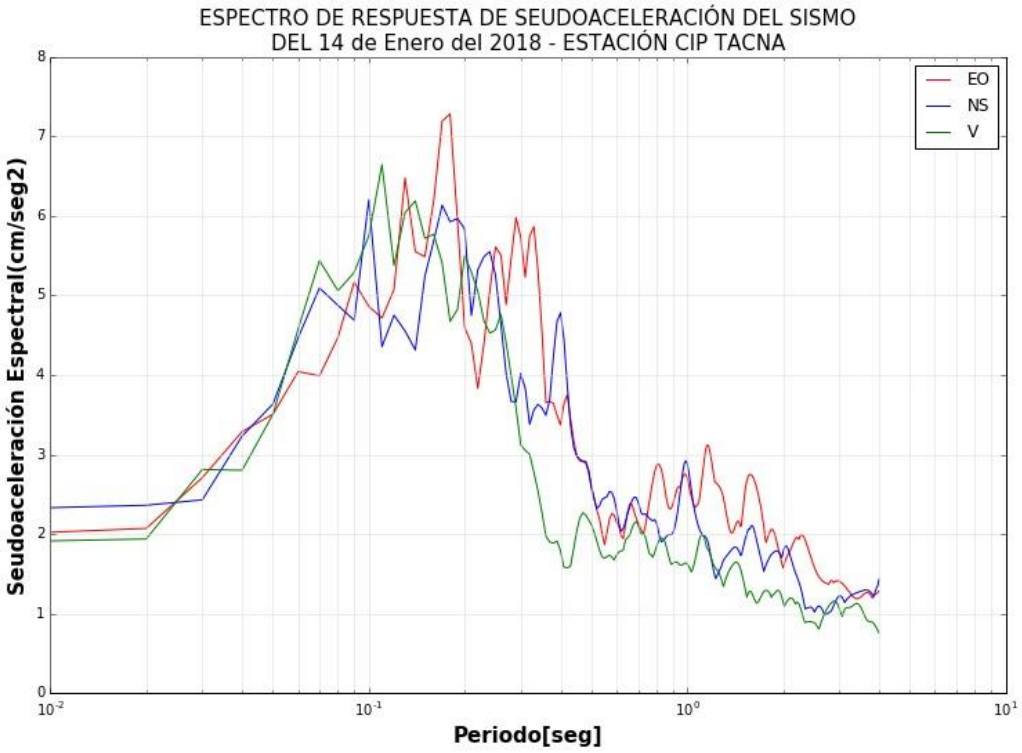


Figura N°30.

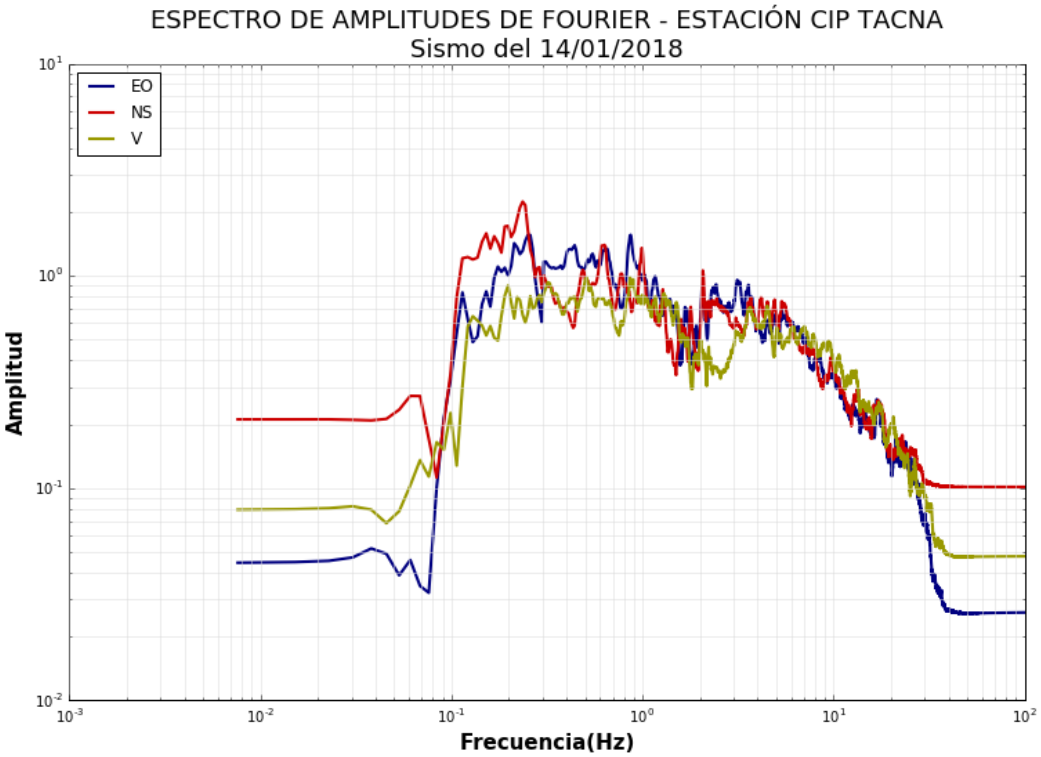


Figura N°16.

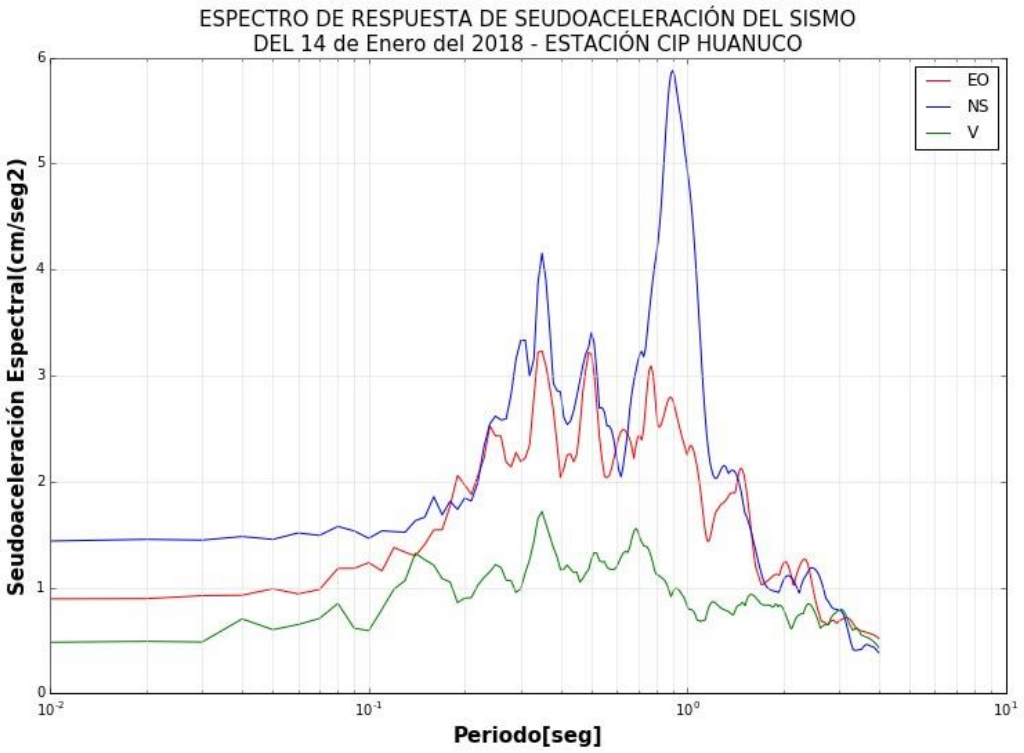


Figura N°31.

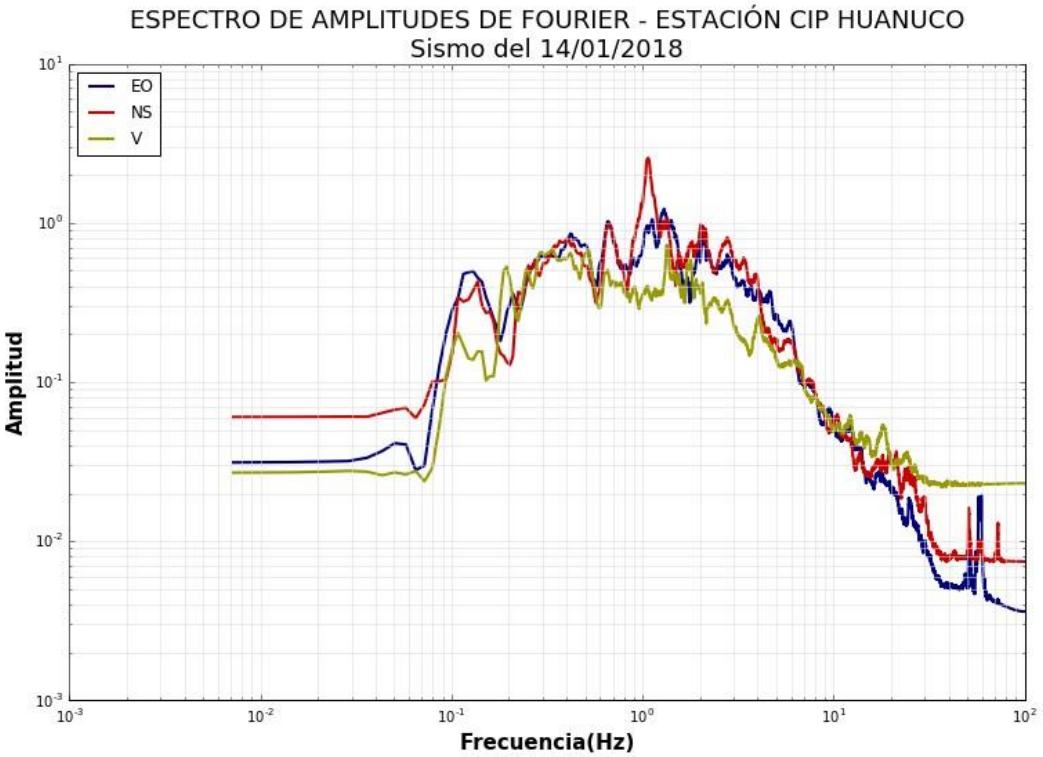


Figura N°17.

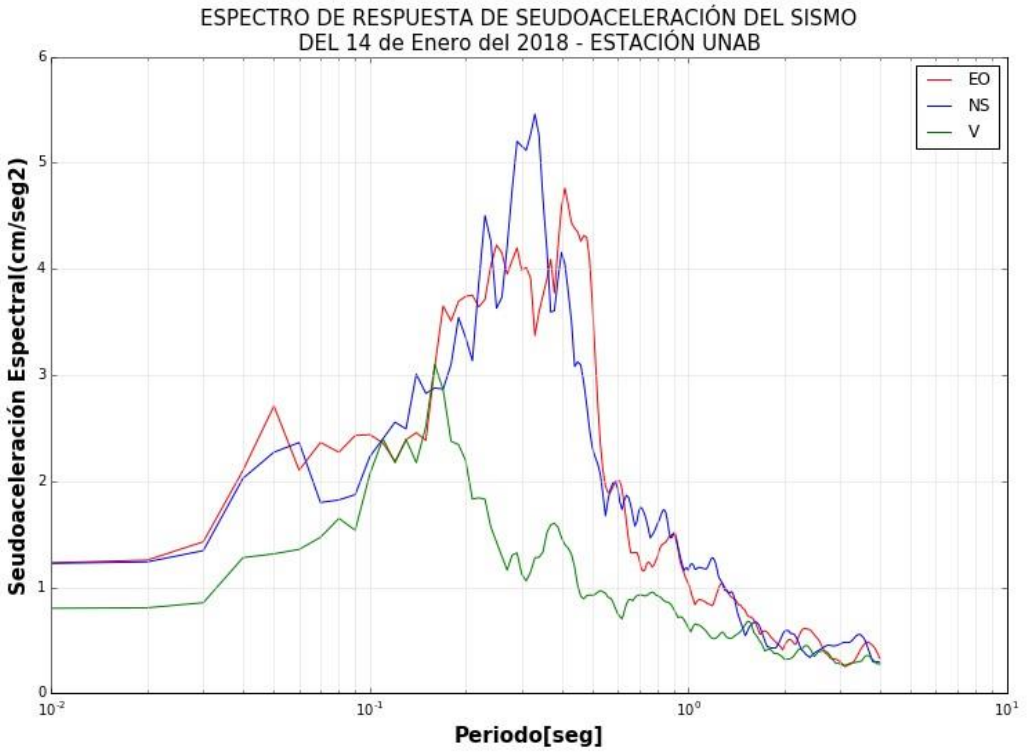
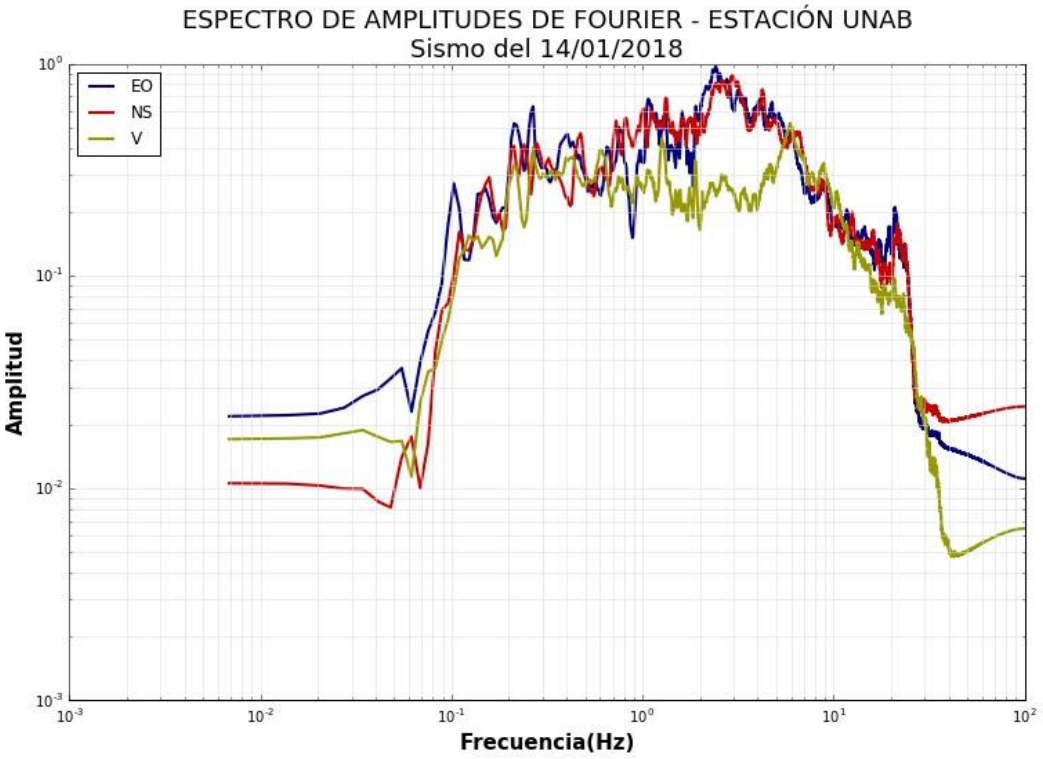


Figura N°32.

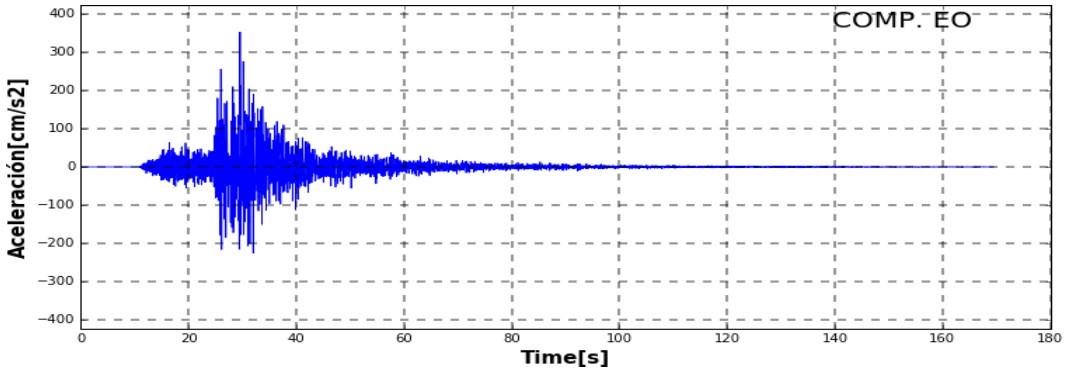


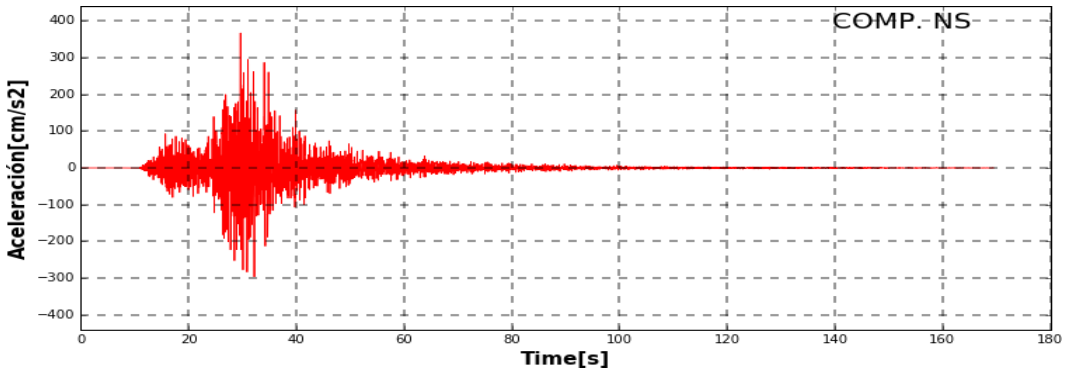
ANEXO 01

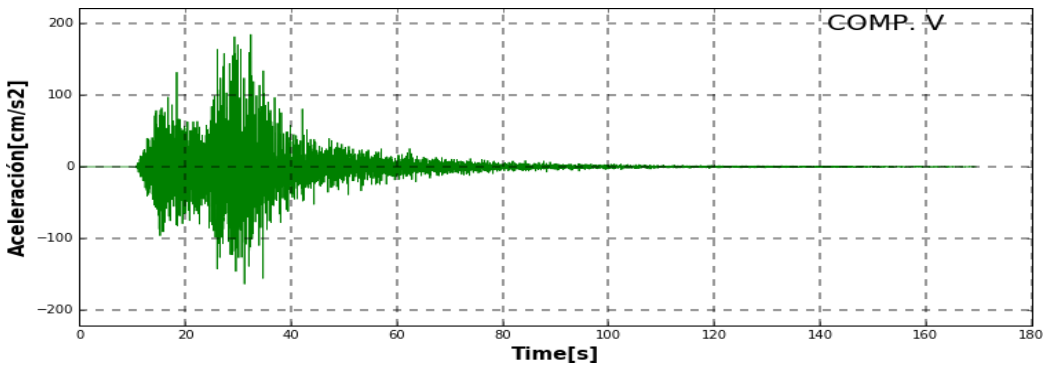
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP NAZCA

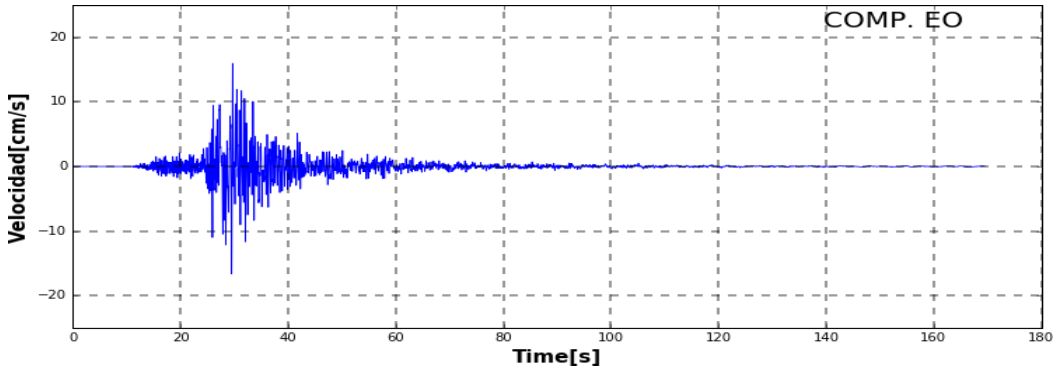
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
352.83	366.95	183.96

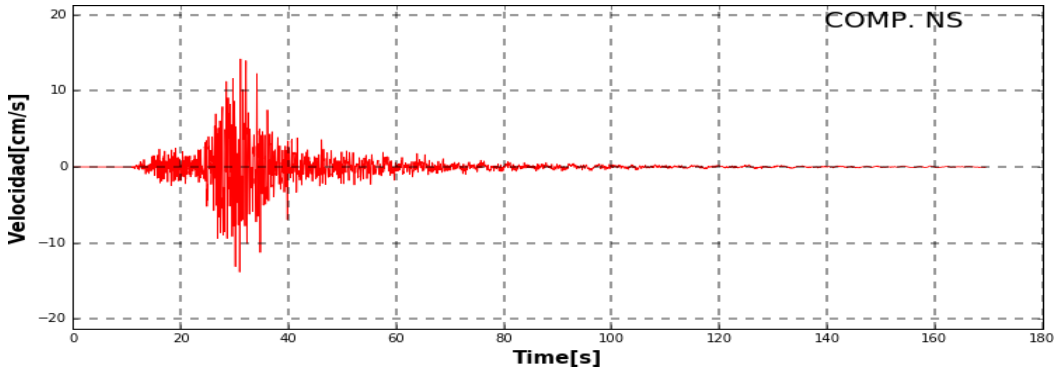


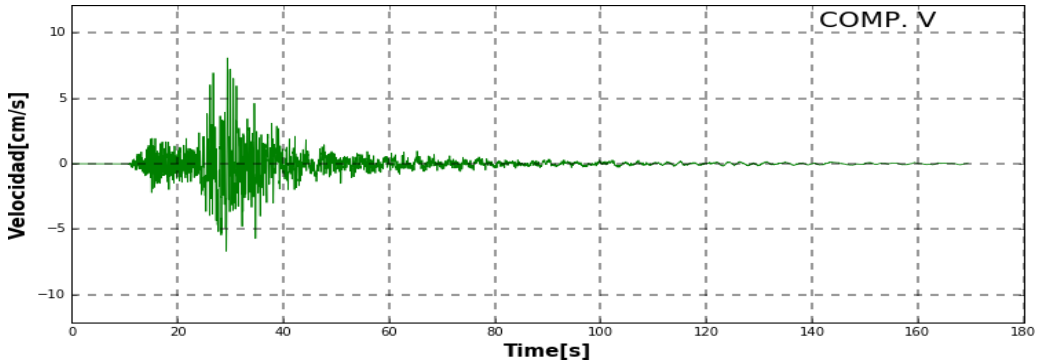




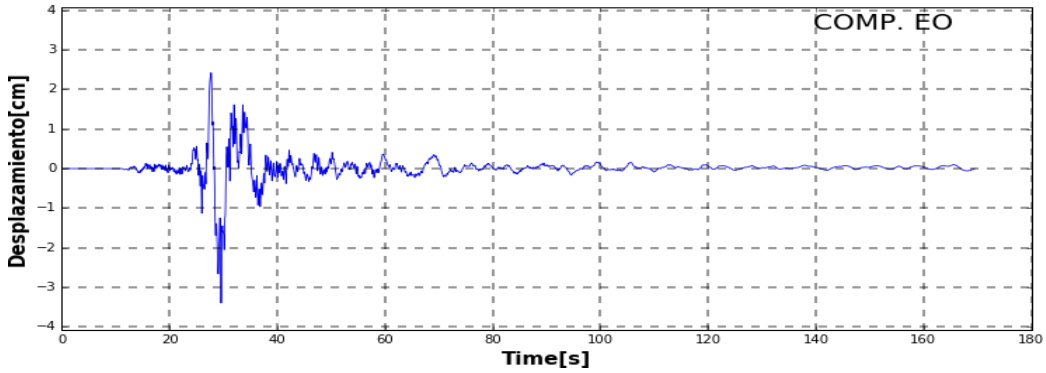
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
16.694	14.219	8.094

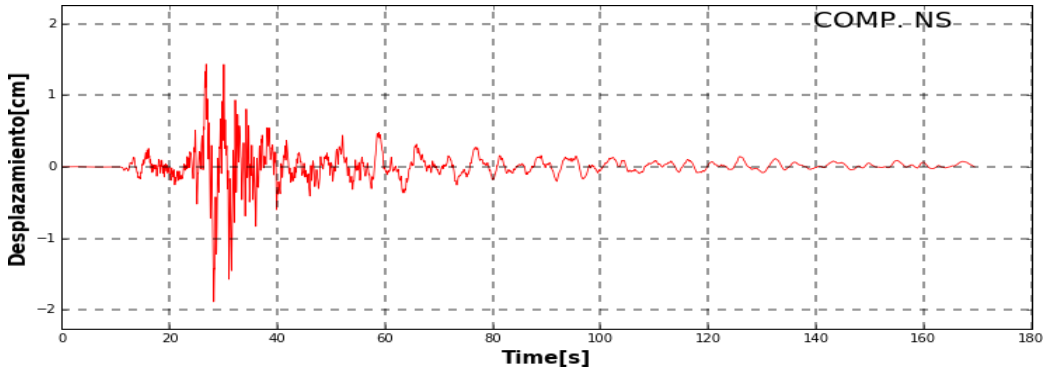


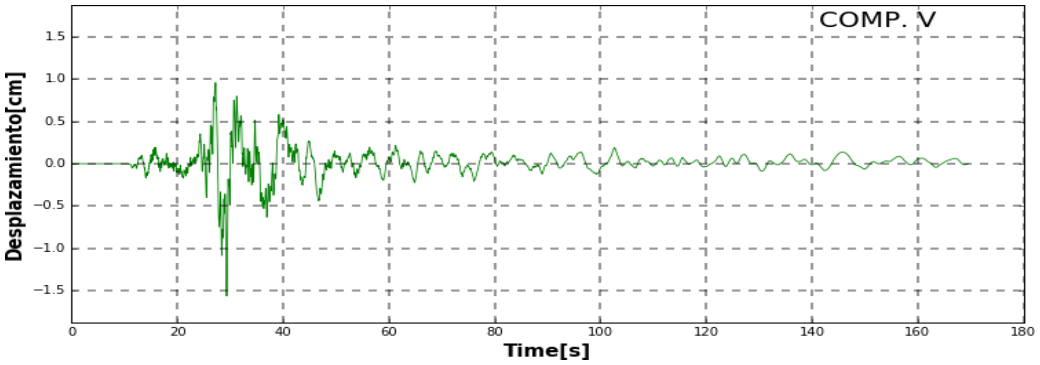




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
3.398	1.887	1.564



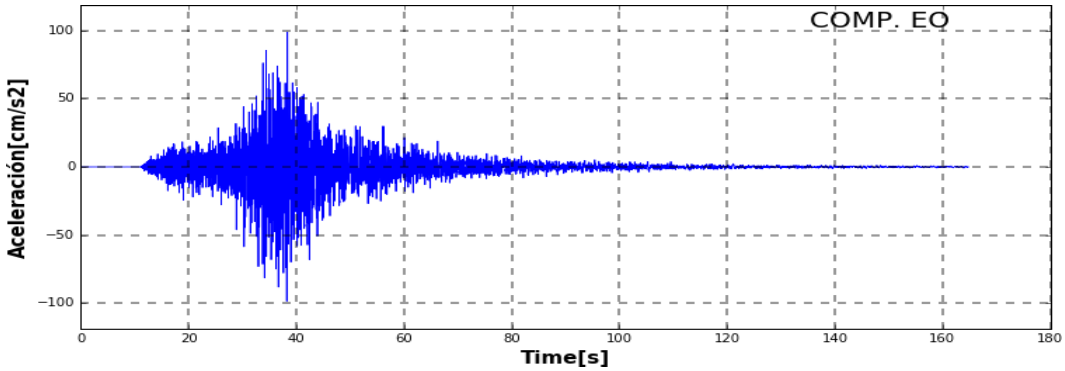


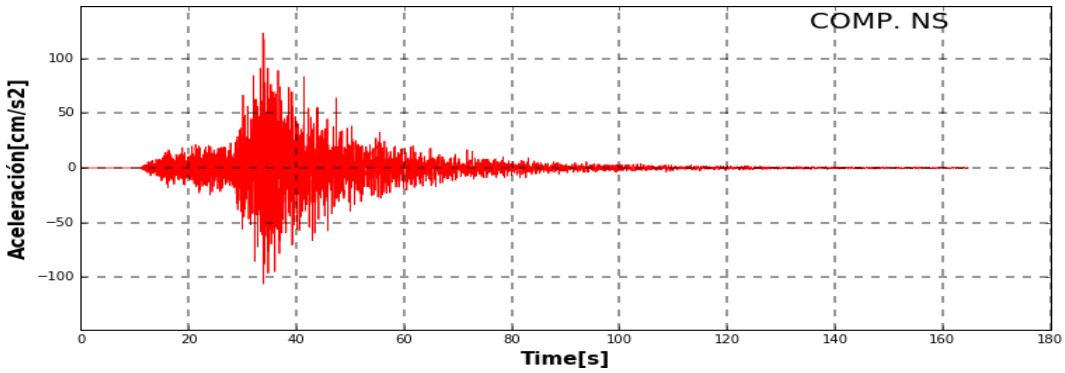


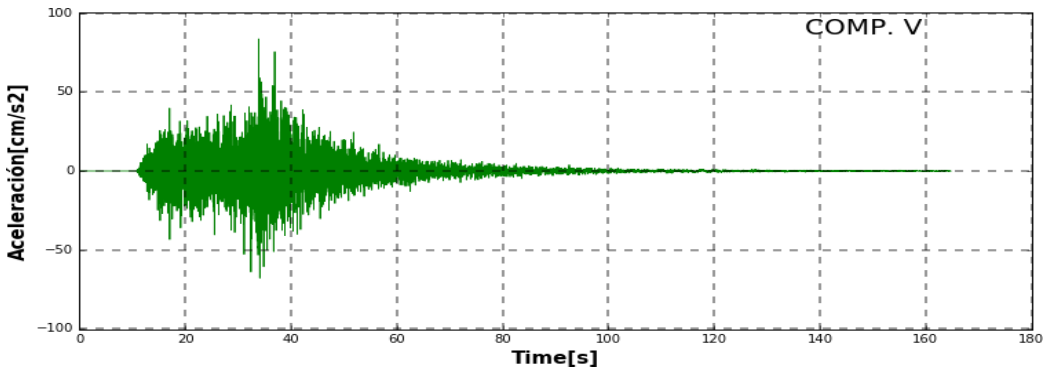
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. PALPA

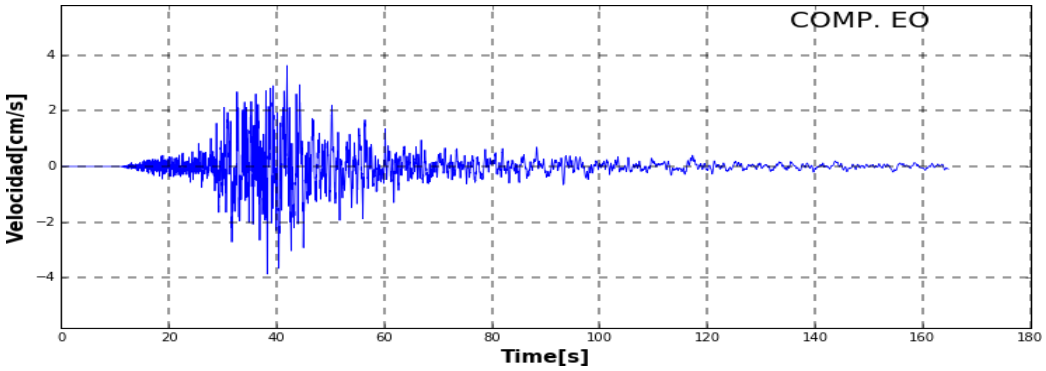
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
98.94	123.65	83.87

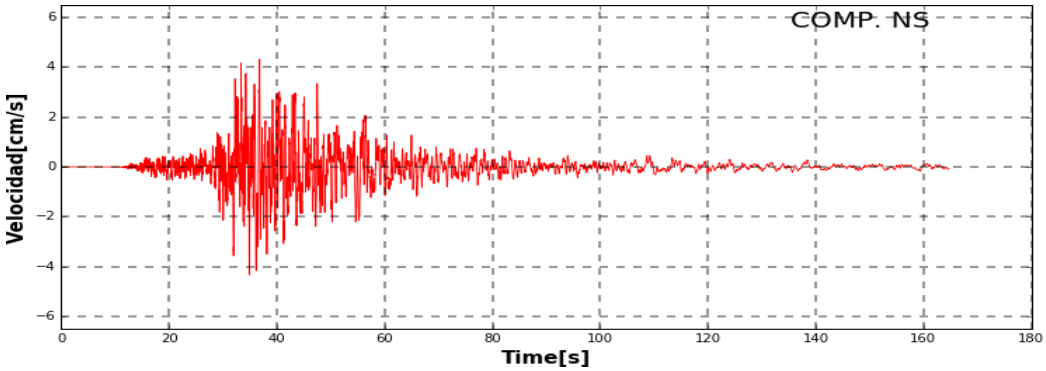


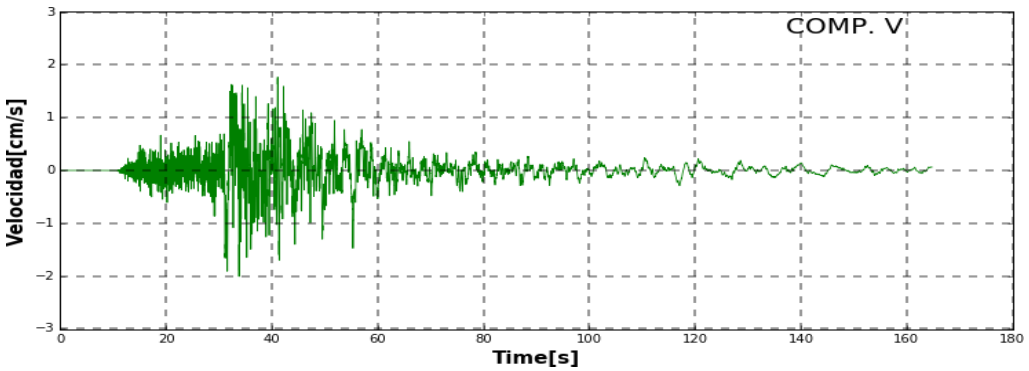




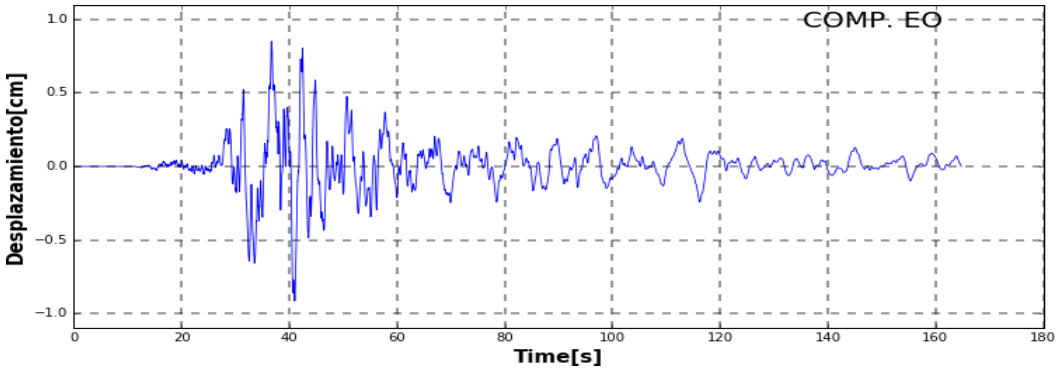
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
3.870	4.326	2.009

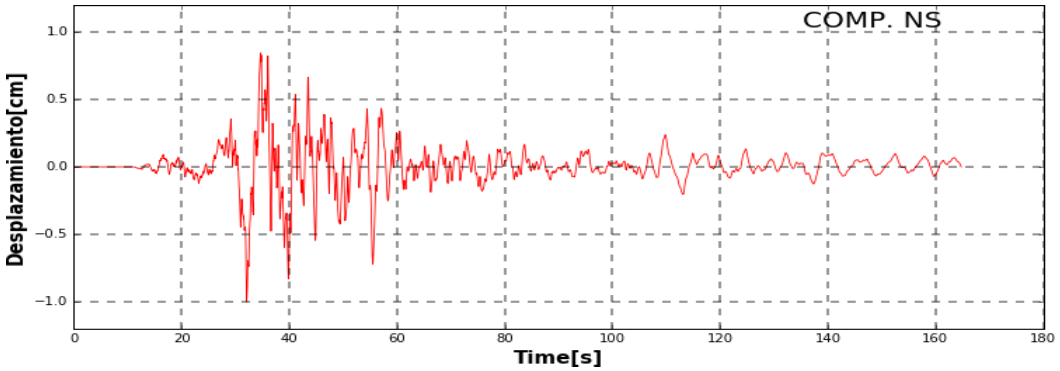


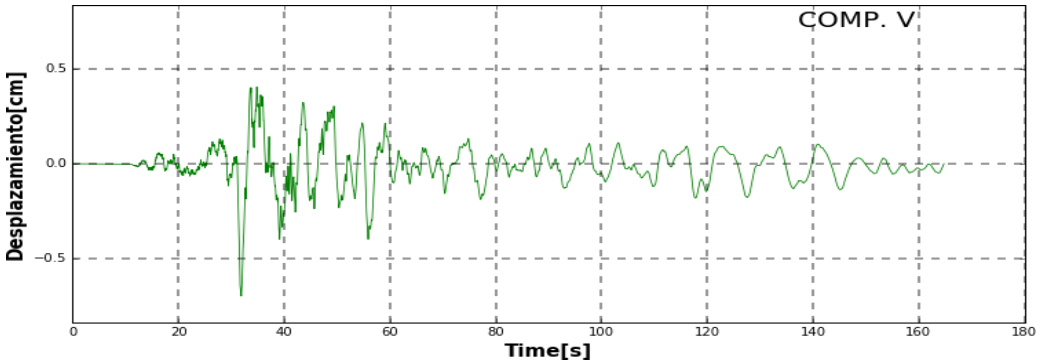




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.914	1.001	0.696



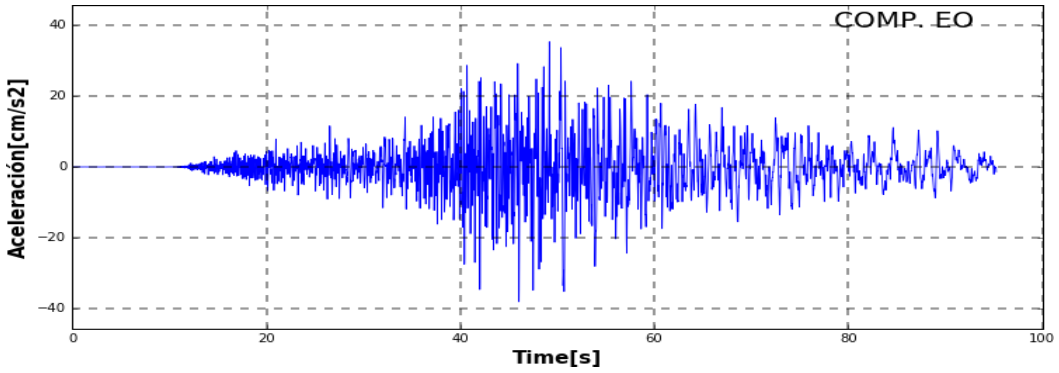


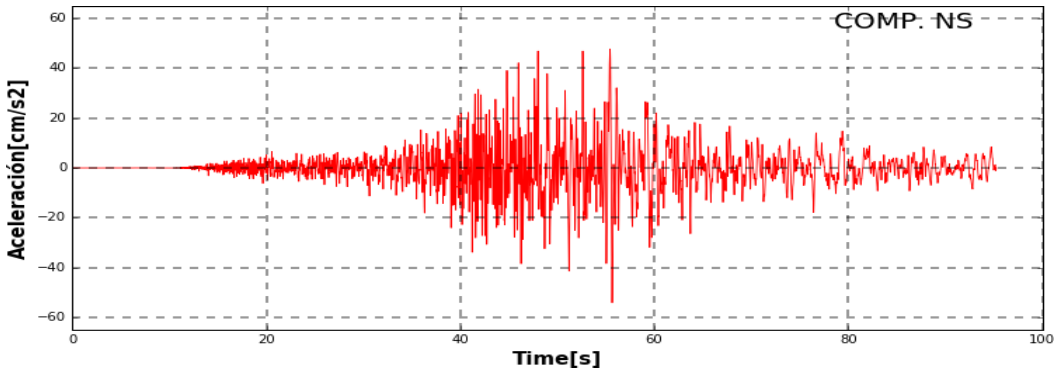


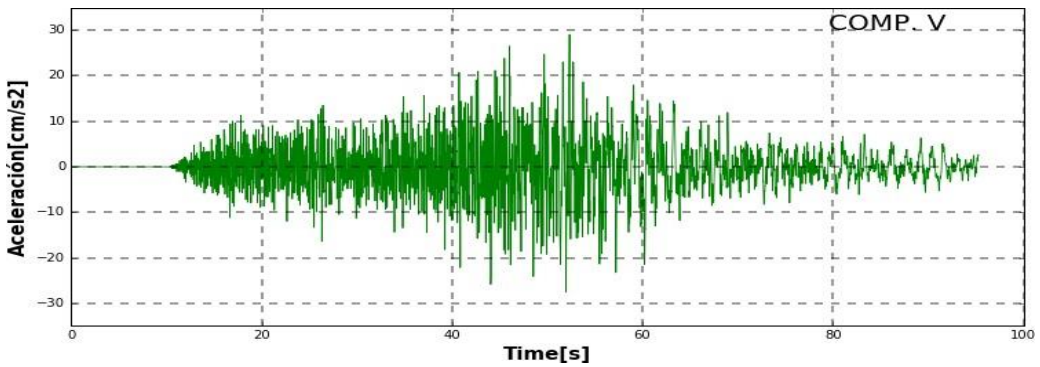
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP ICA

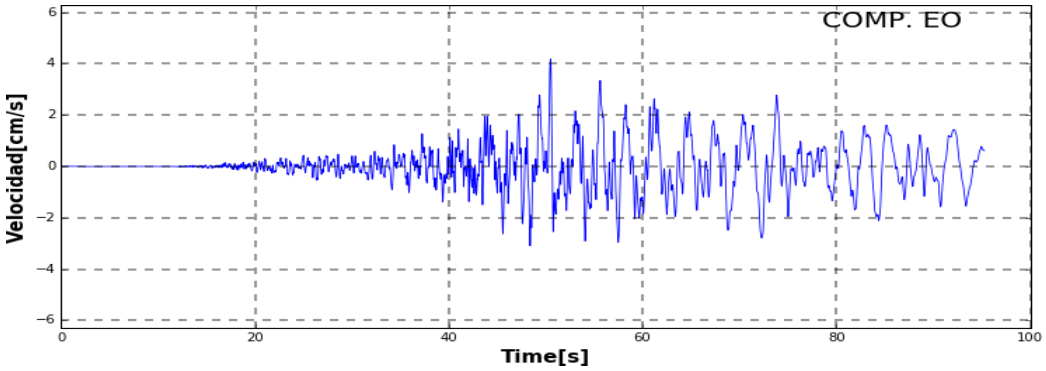
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
38.01	54.08	29.08

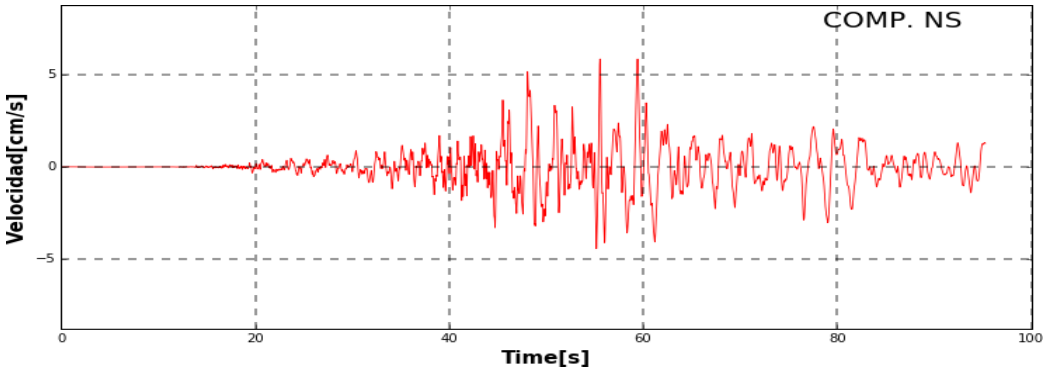


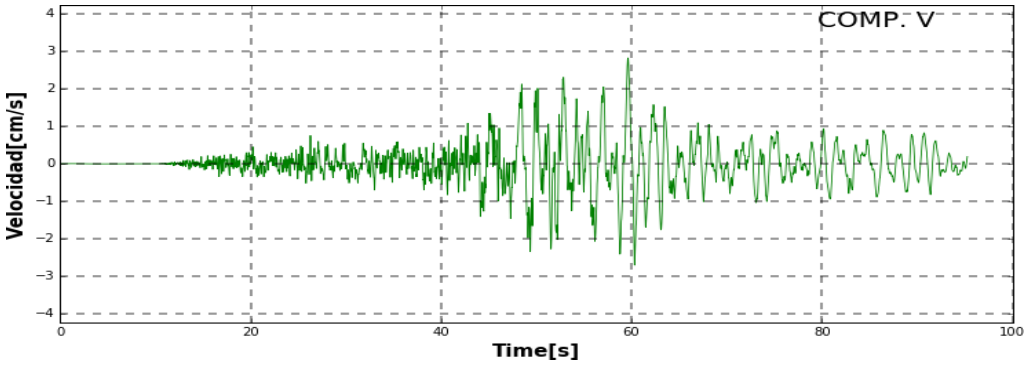




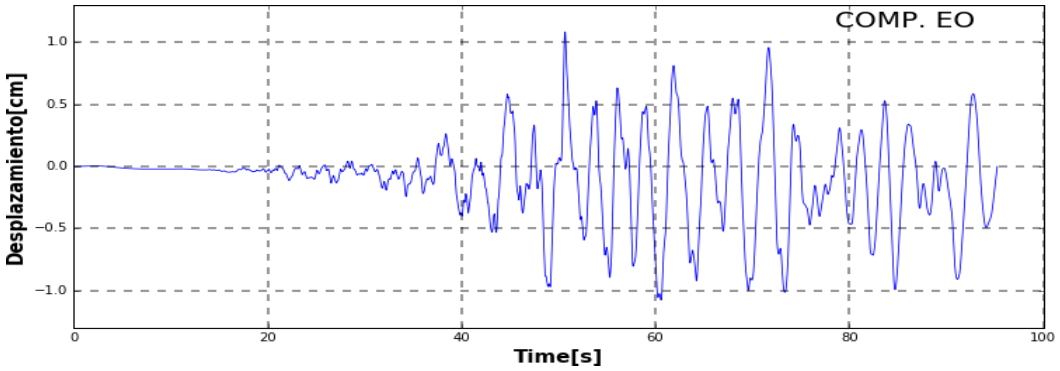
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
4.189	5.887	2.826

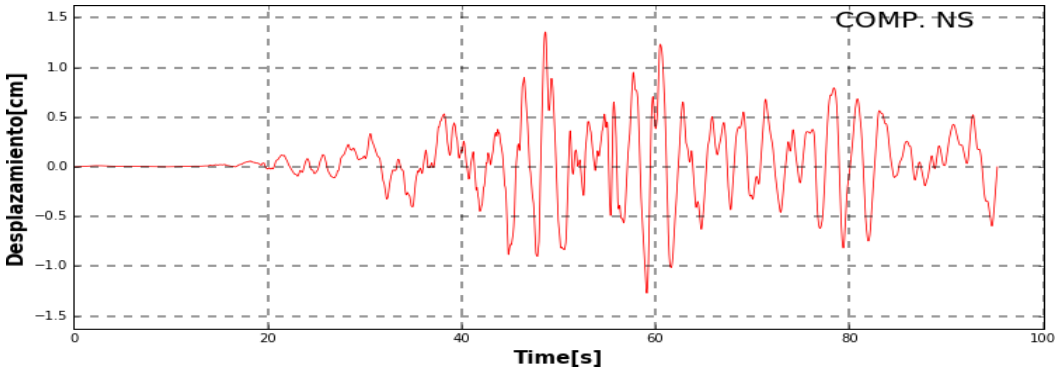


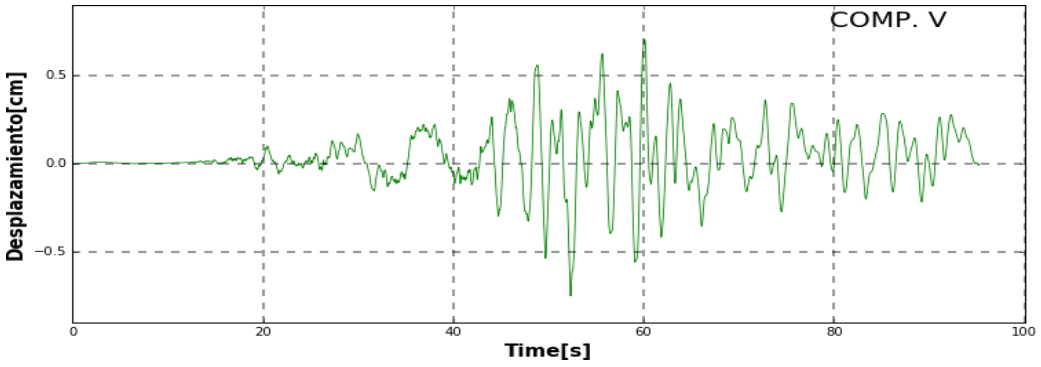




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
1.083	1.358	0.750



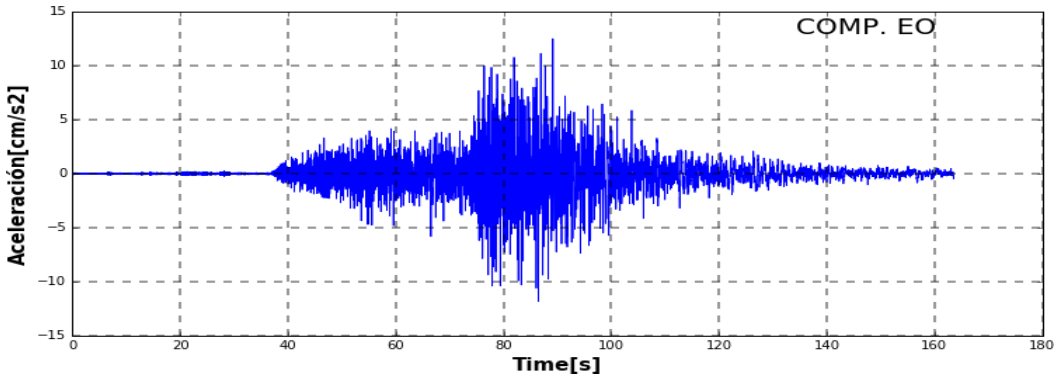


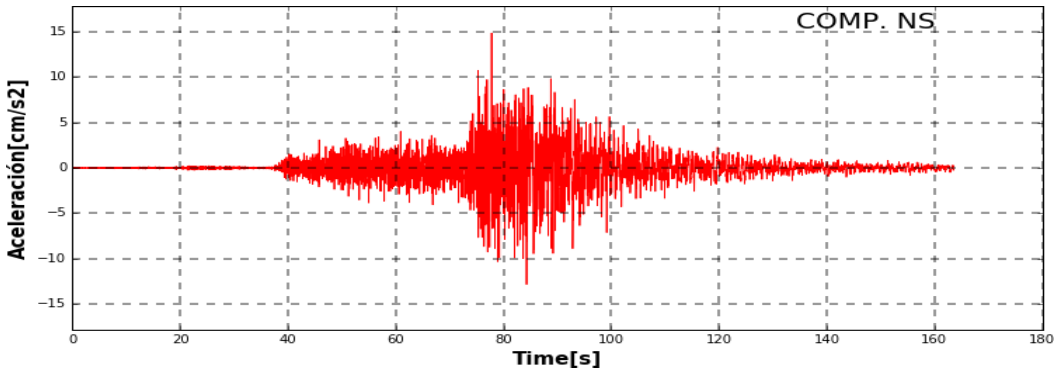


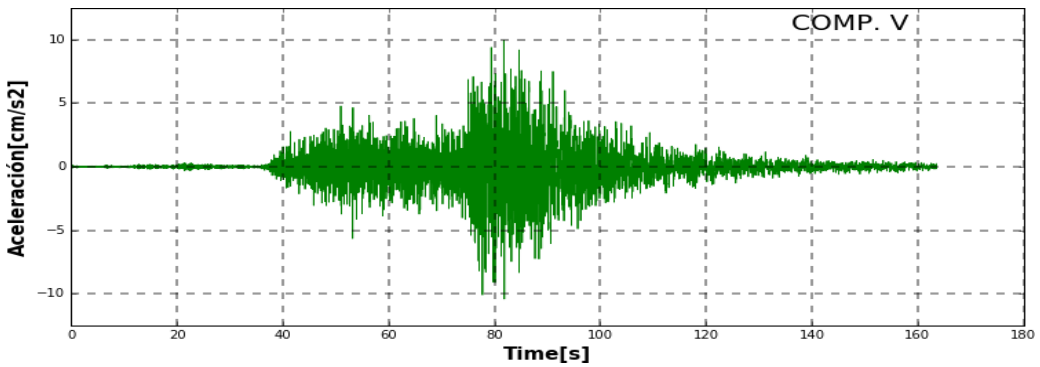
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP AREQUIPA

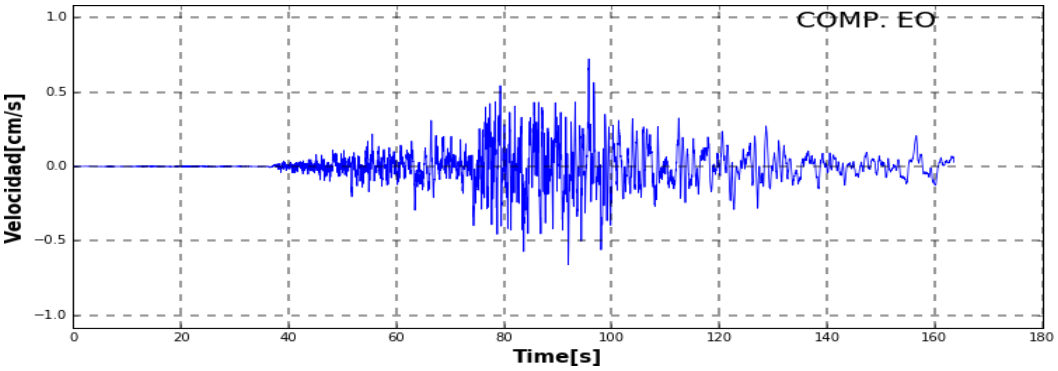
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
12.51	14.86	10.41

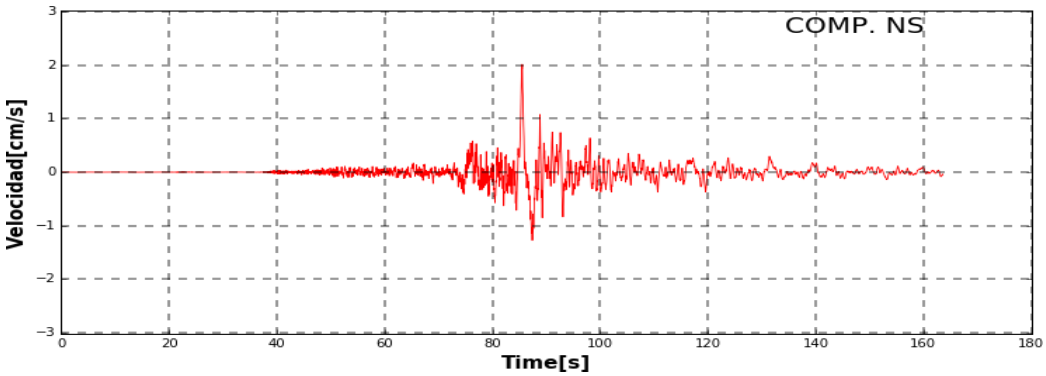


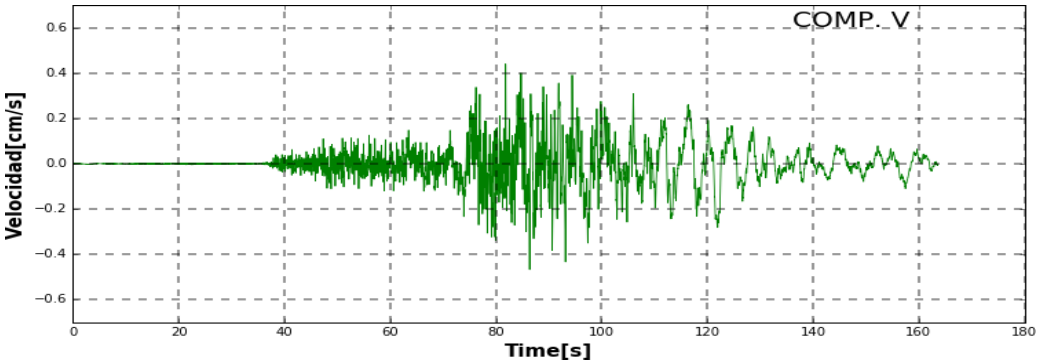




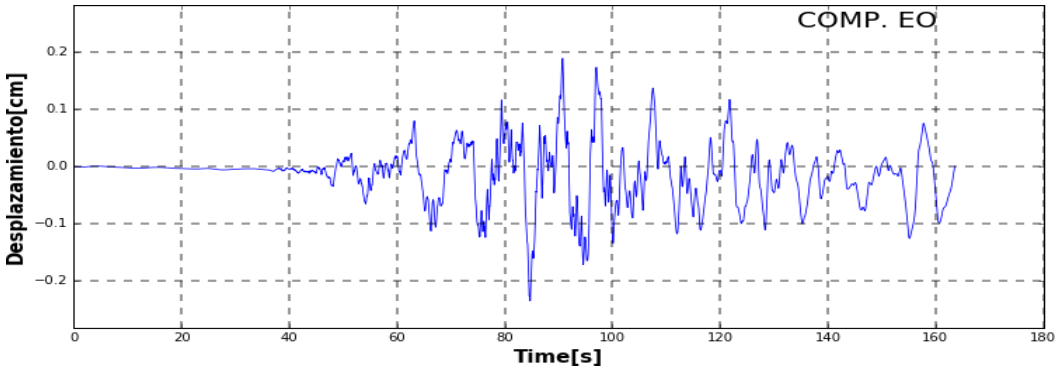
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.723	2.018	0.468

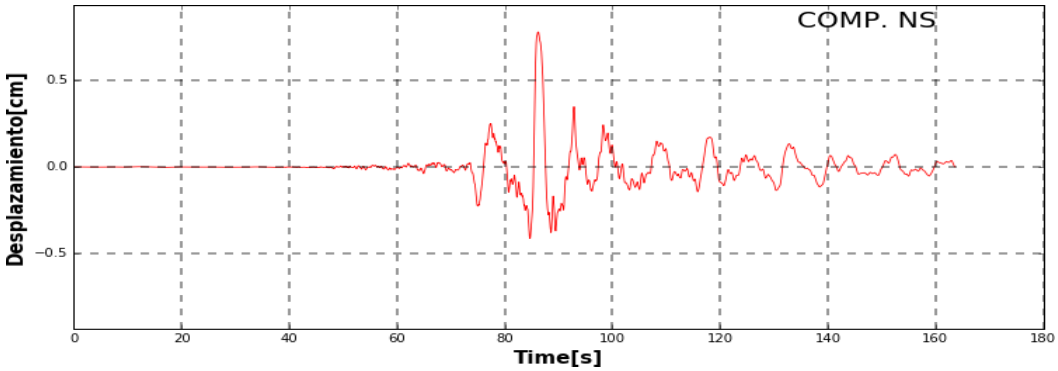


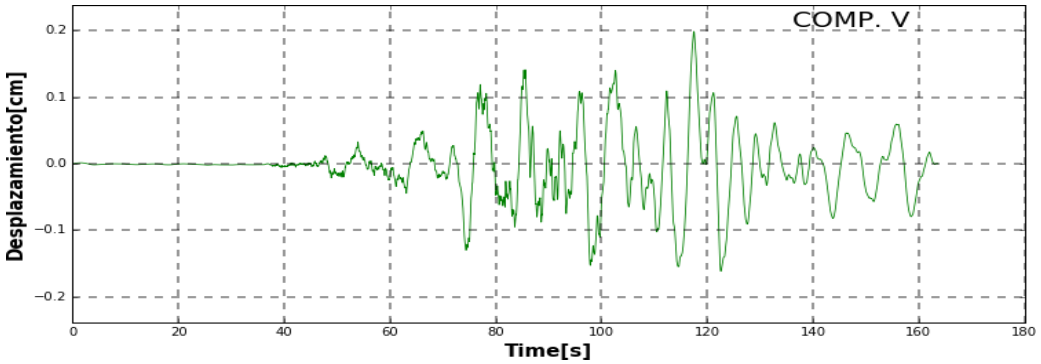




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.235	0.777	0.199



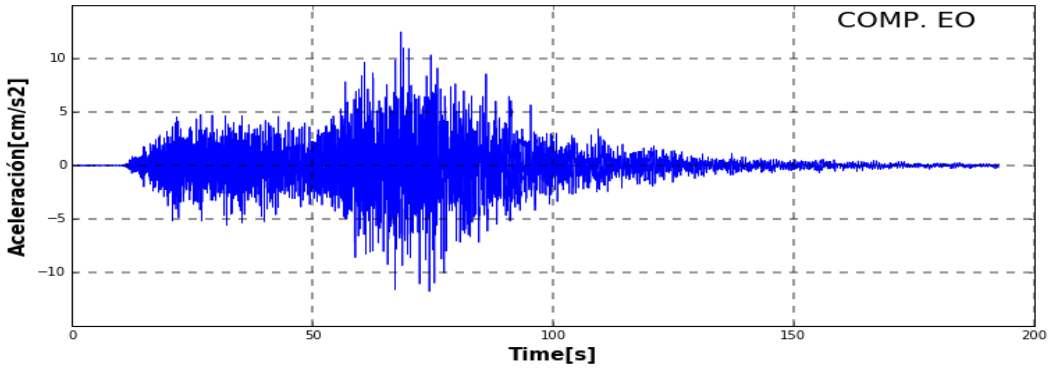


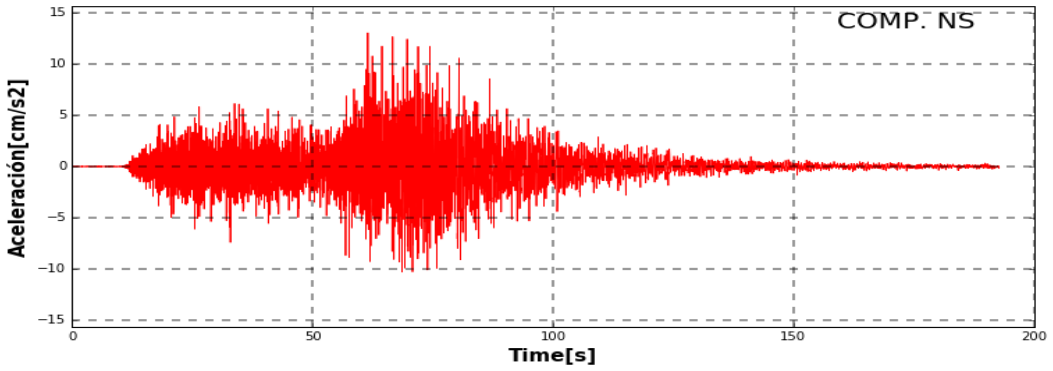


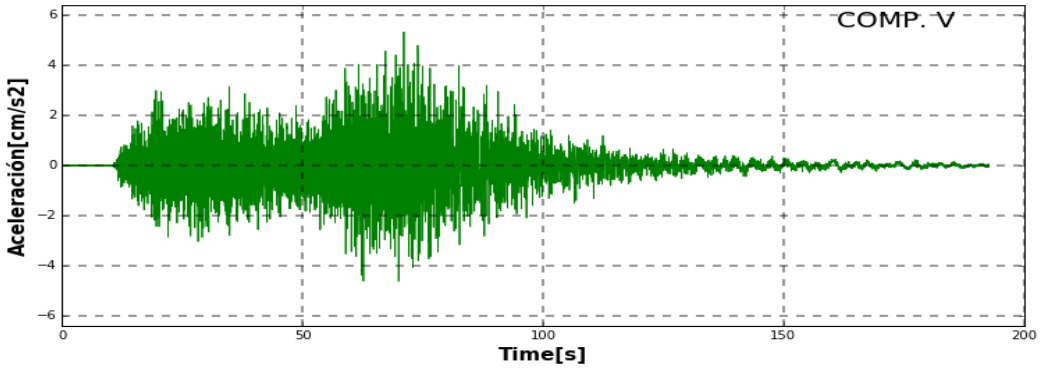
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. MALA

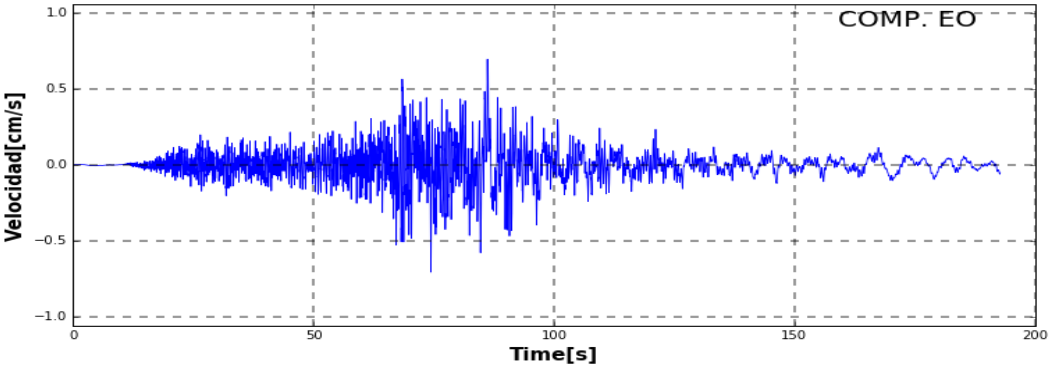
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
12.45	13.03	5.33

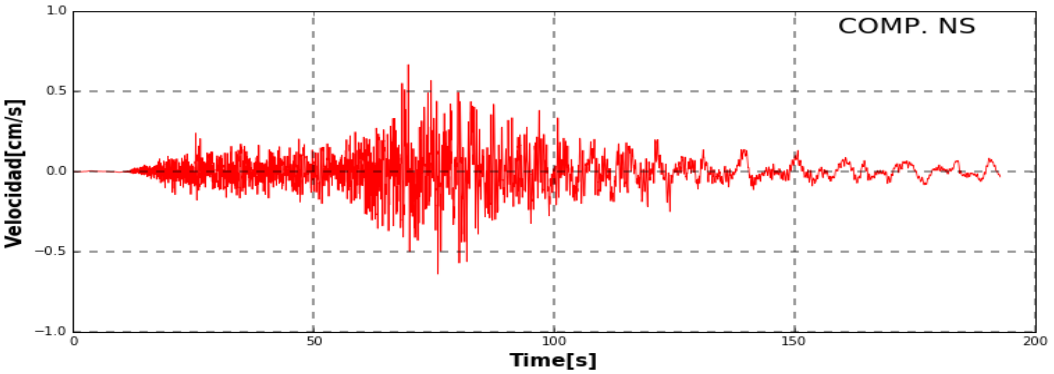


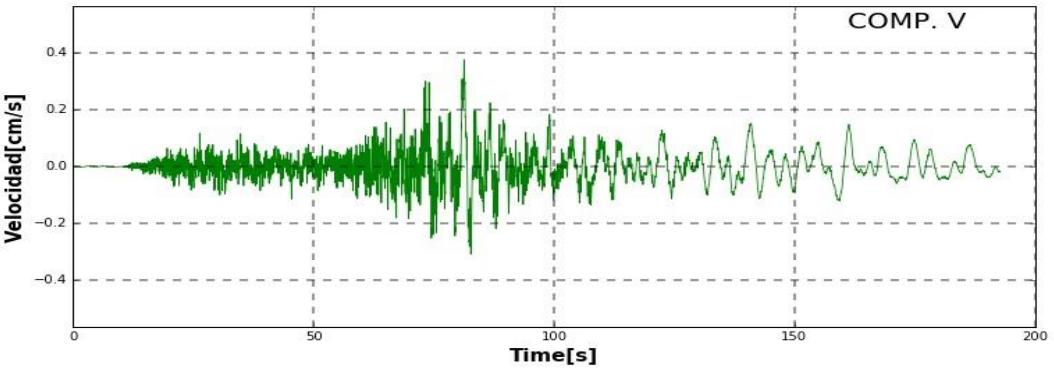




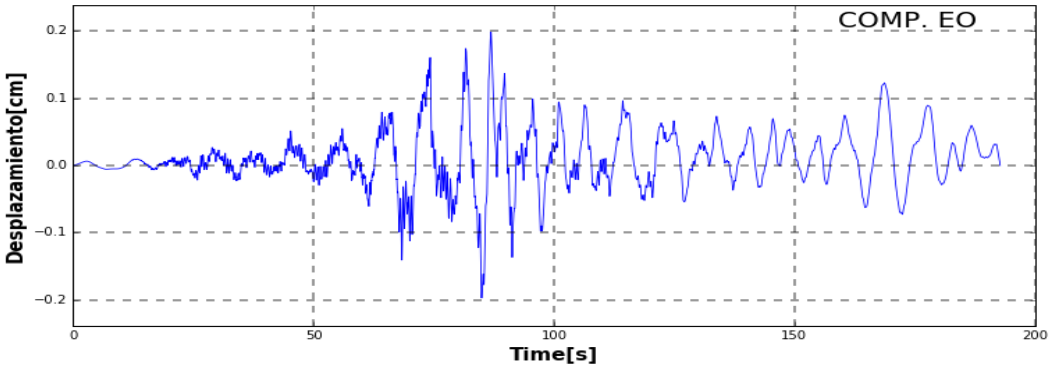
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.705	0.667	0.377

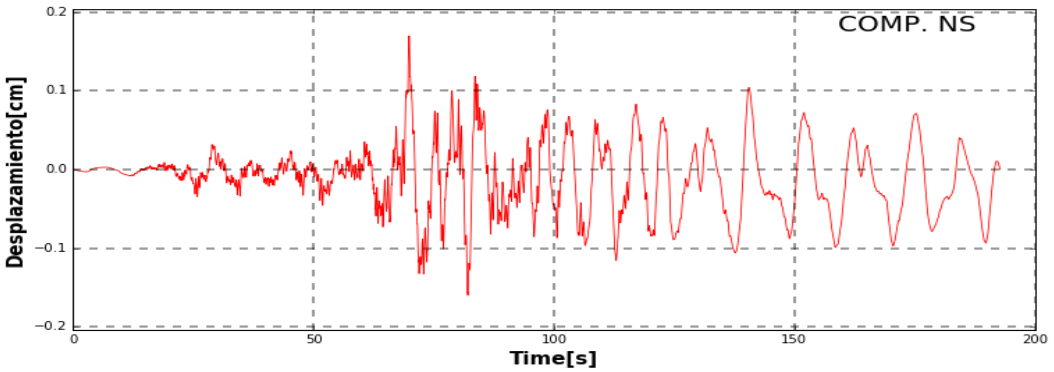


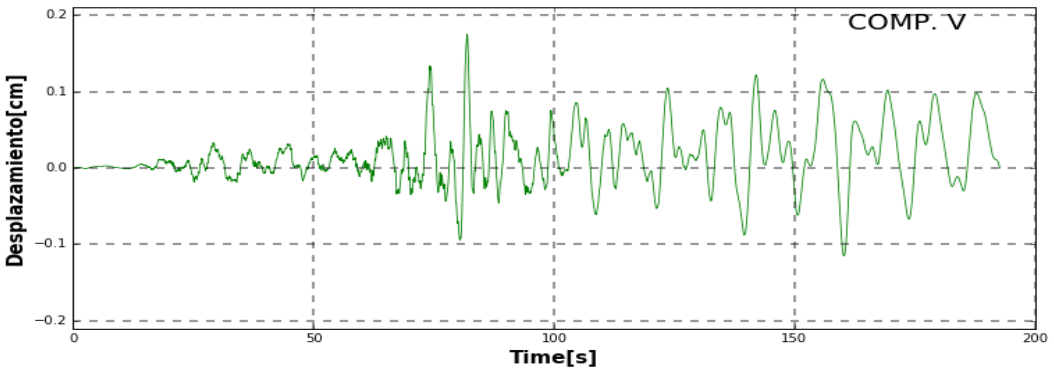




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.198	0.170	0.175



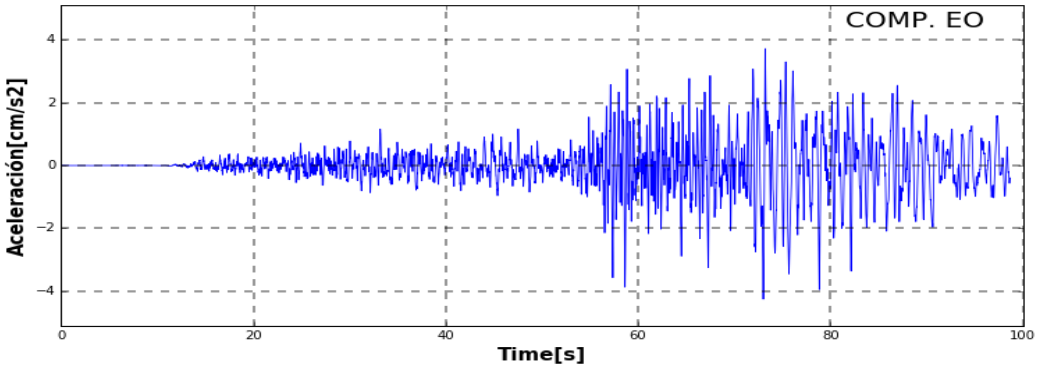


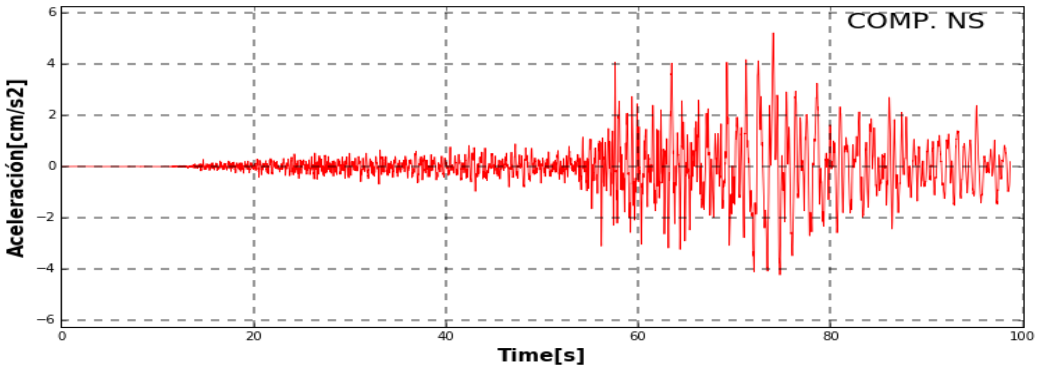


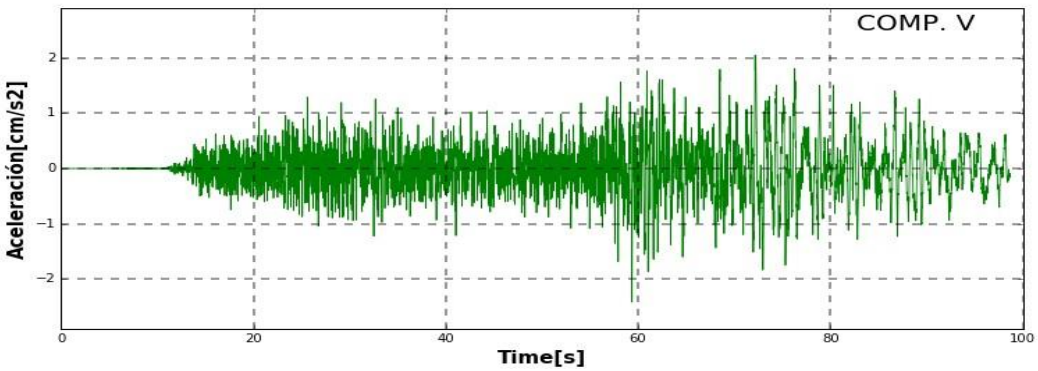
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP MOQUEGUA

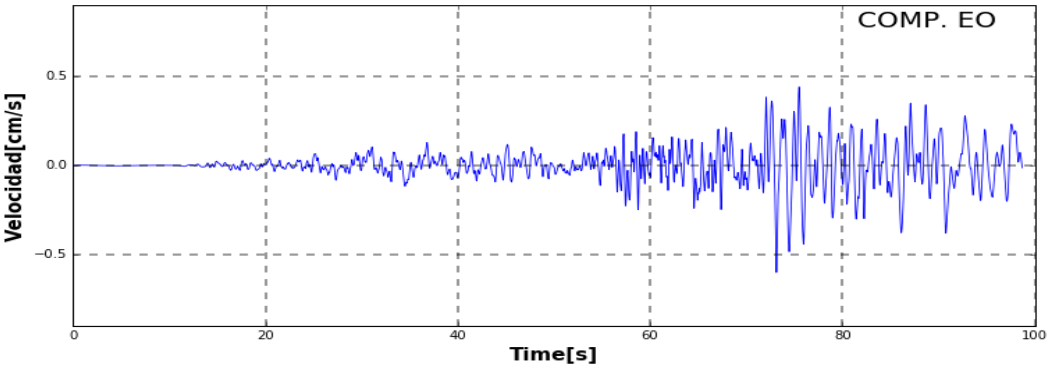
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
4.25	5.20	2.42

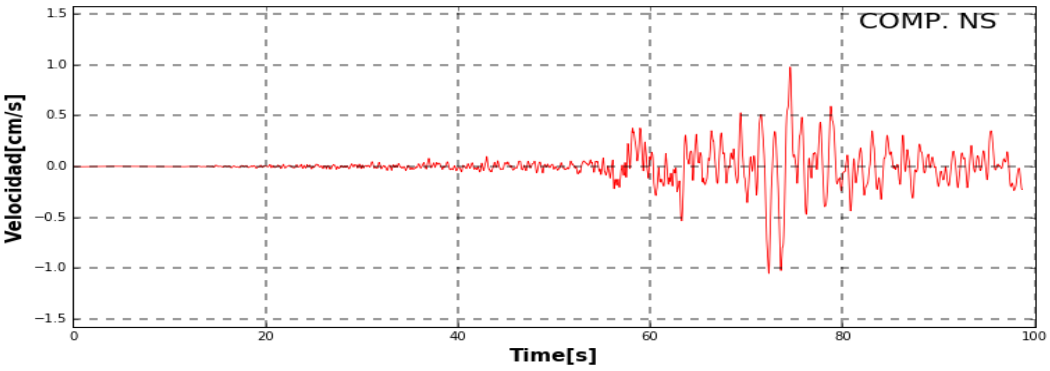


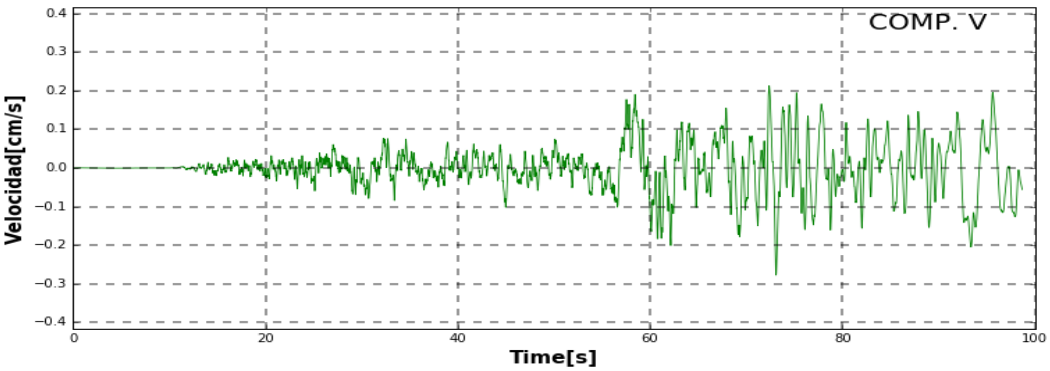




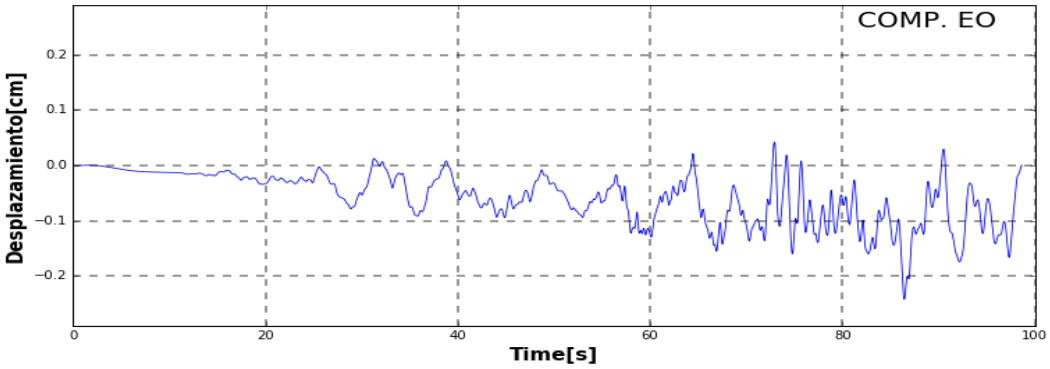
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.602	1.050	0.277

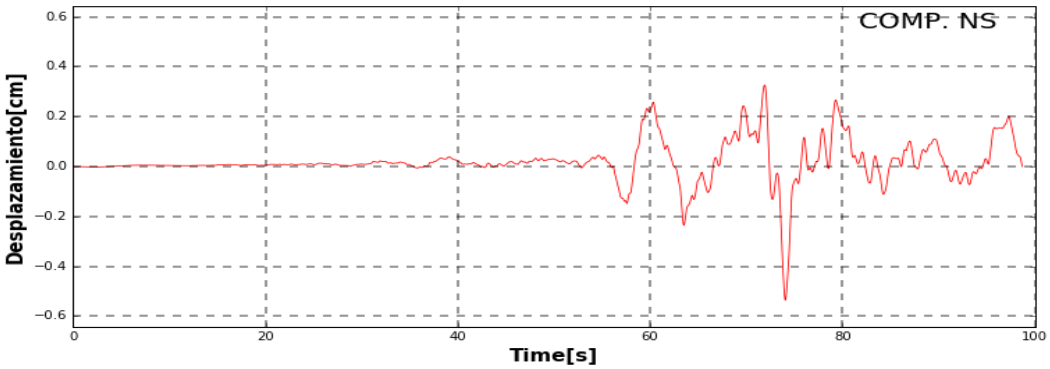


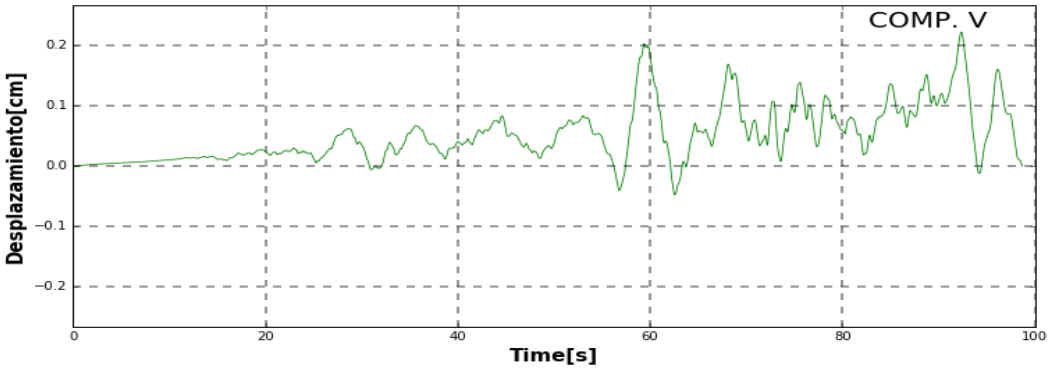




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.242	0.536	0.222



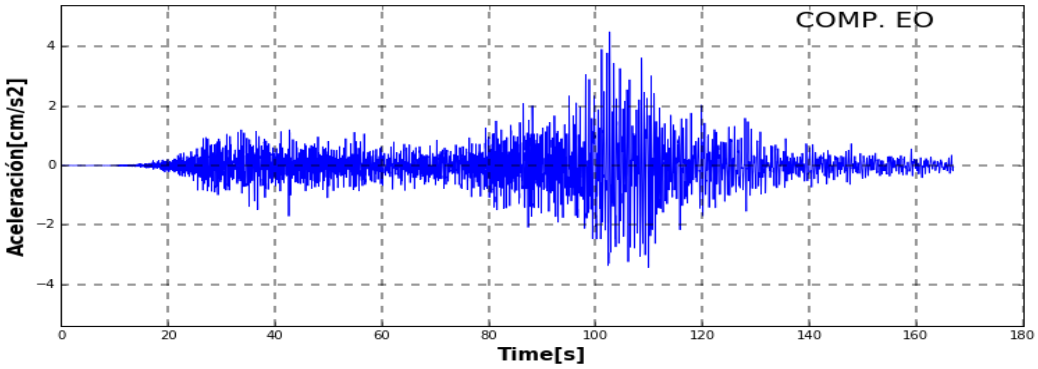


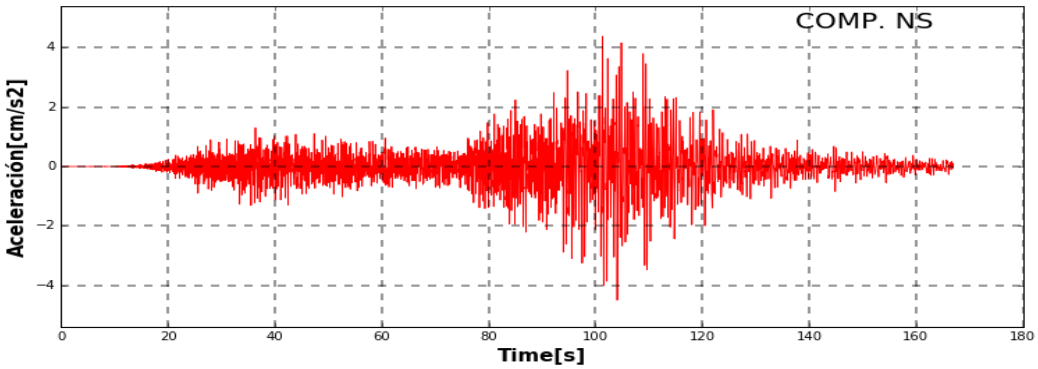


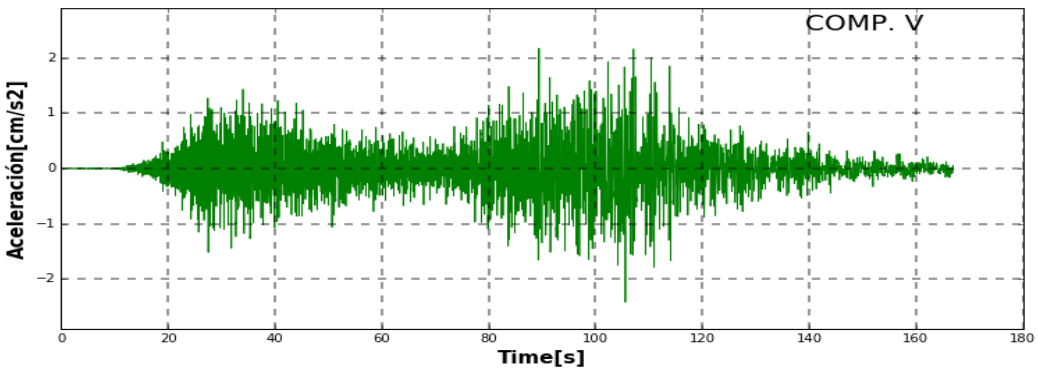
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CARAL

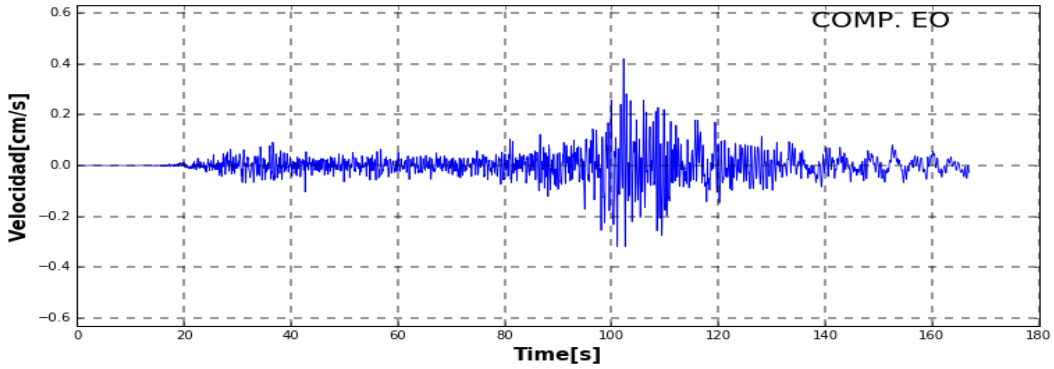
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
4.49	4.50	2.42

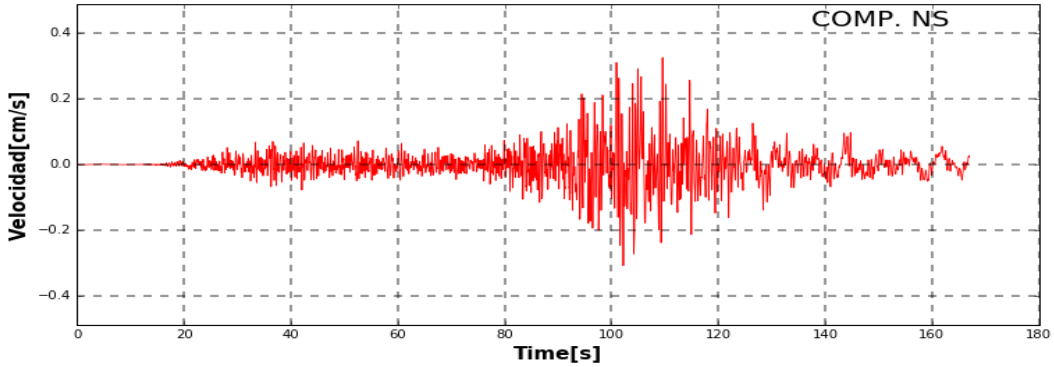


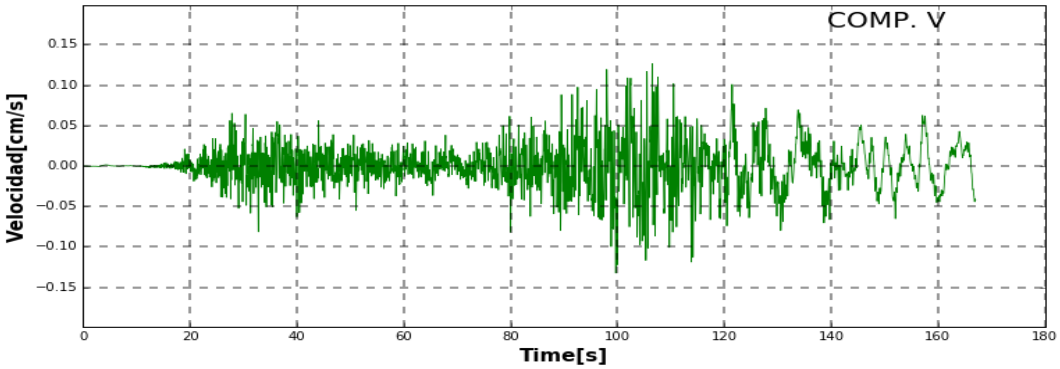




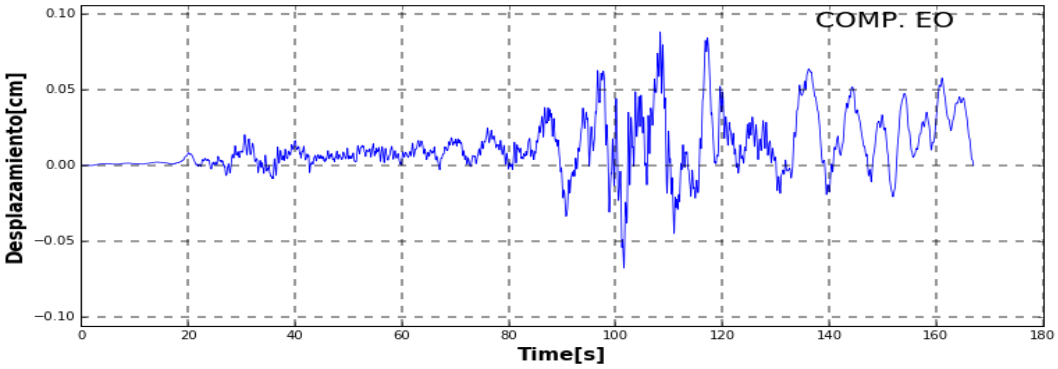
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.420	0.327	0.132

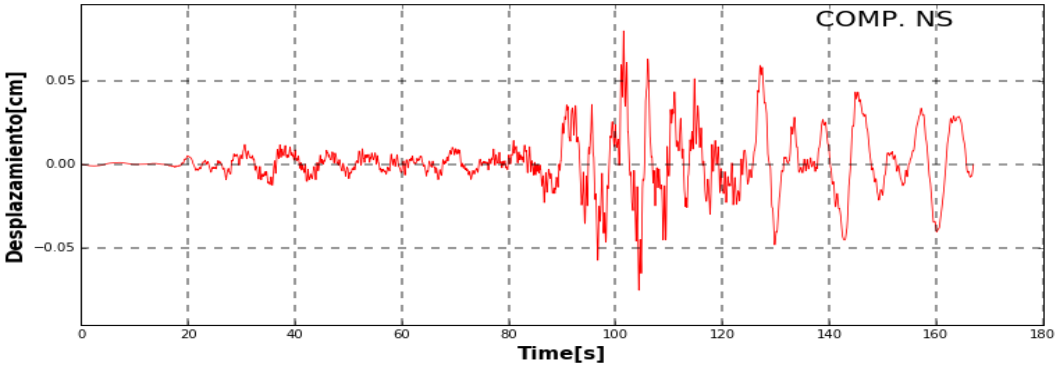


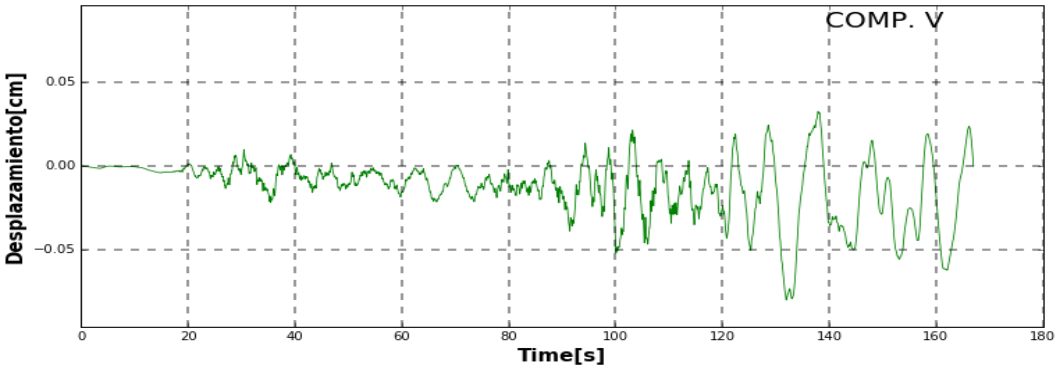




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.088	0.080	0.080



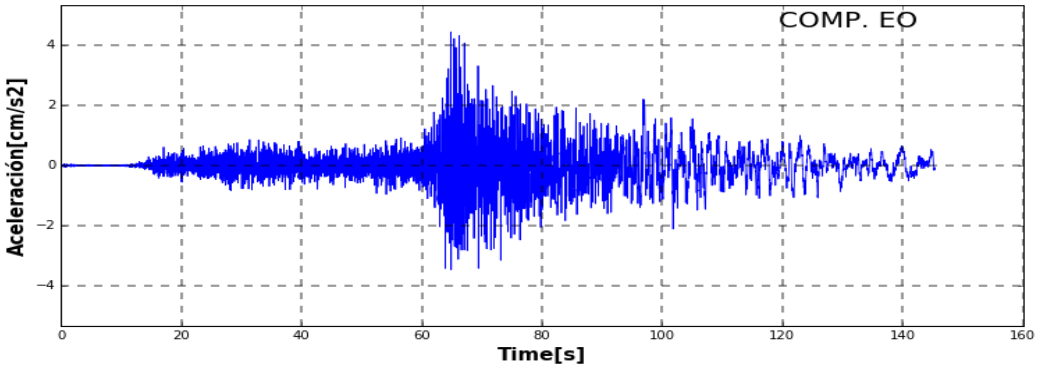


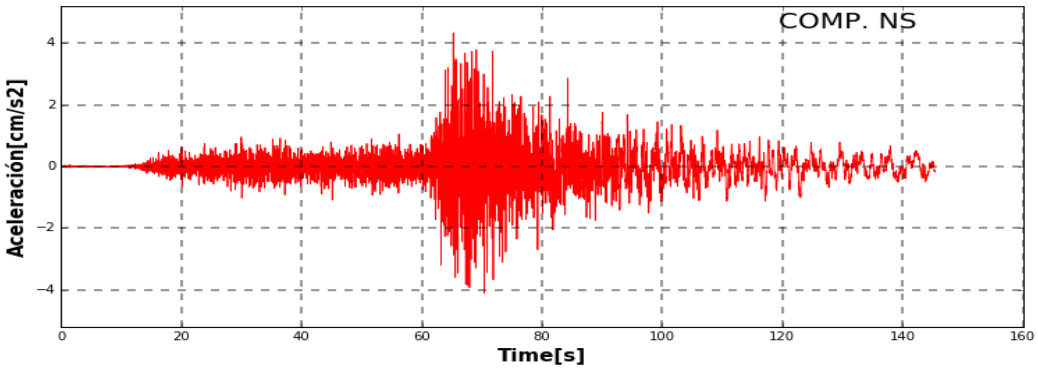


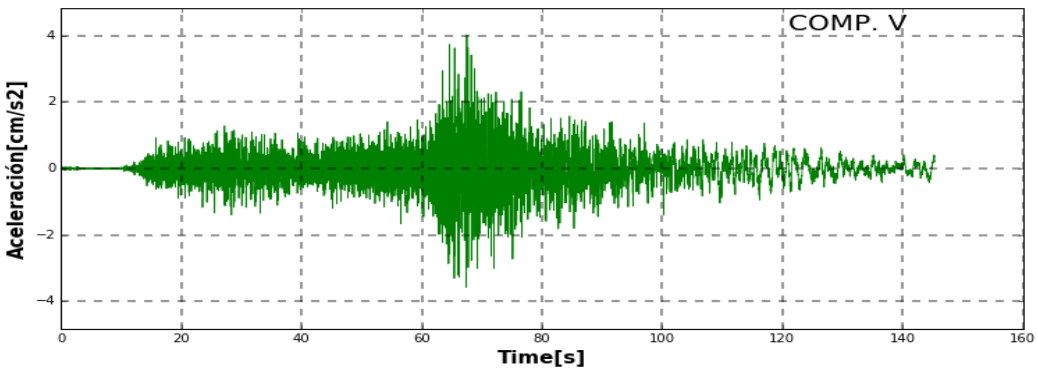
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. UNJBG

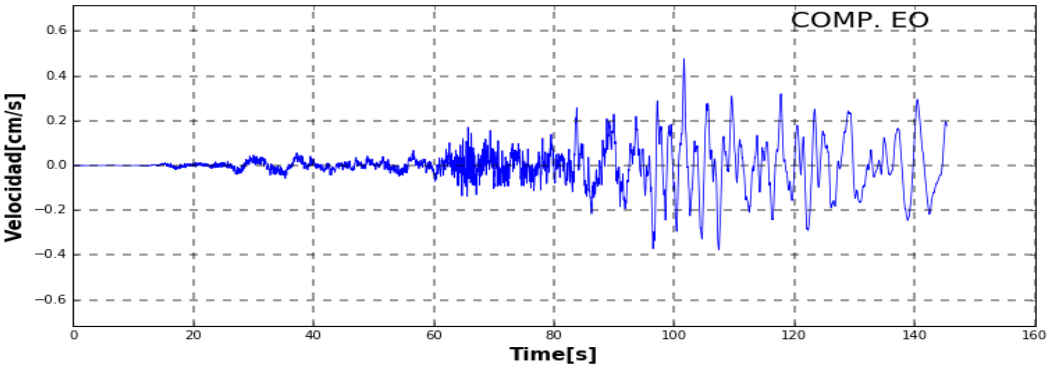
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
4.43	4.34	4.03

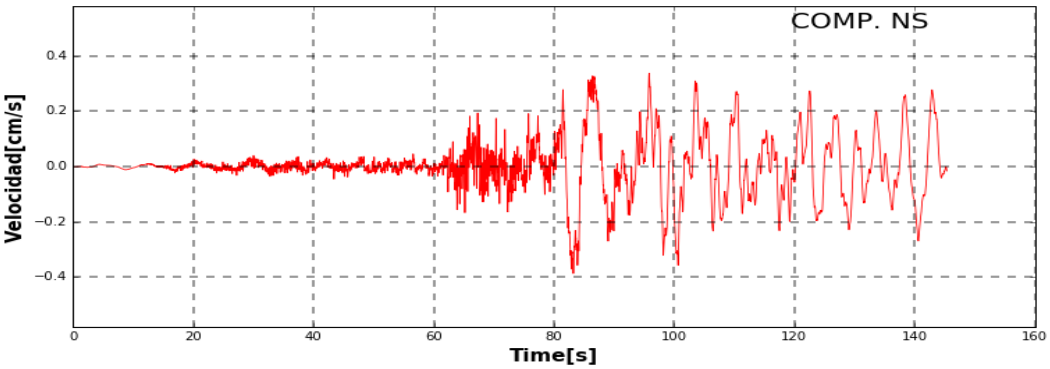


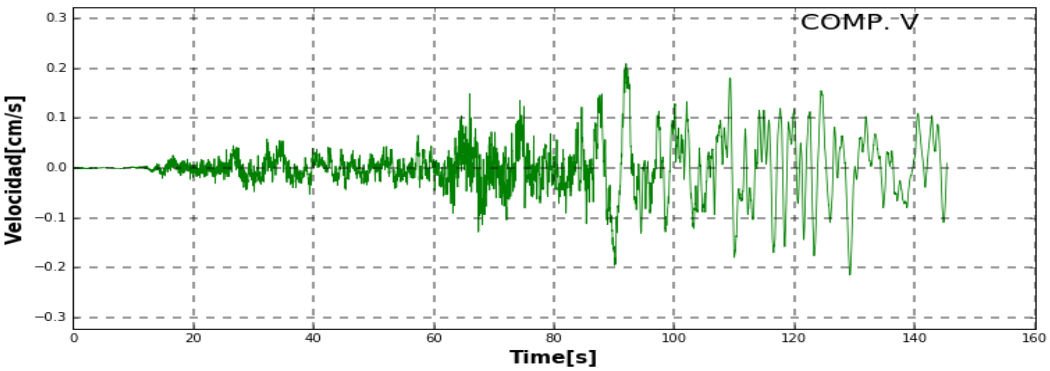




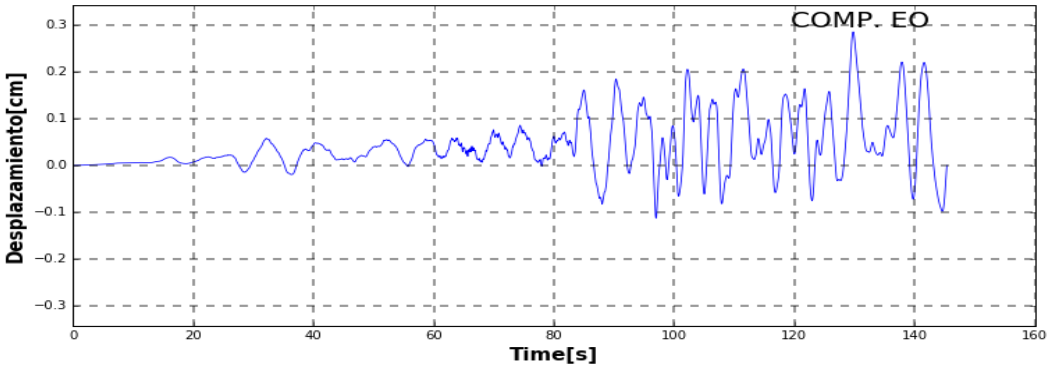
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.478	0.387	0.214

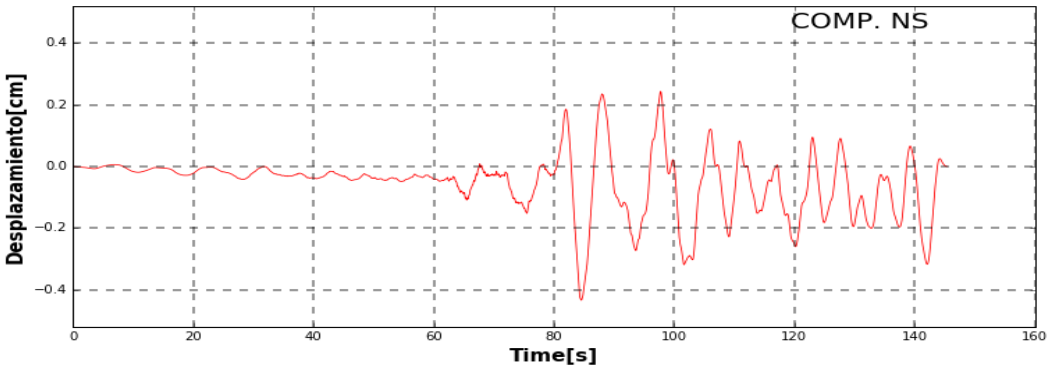


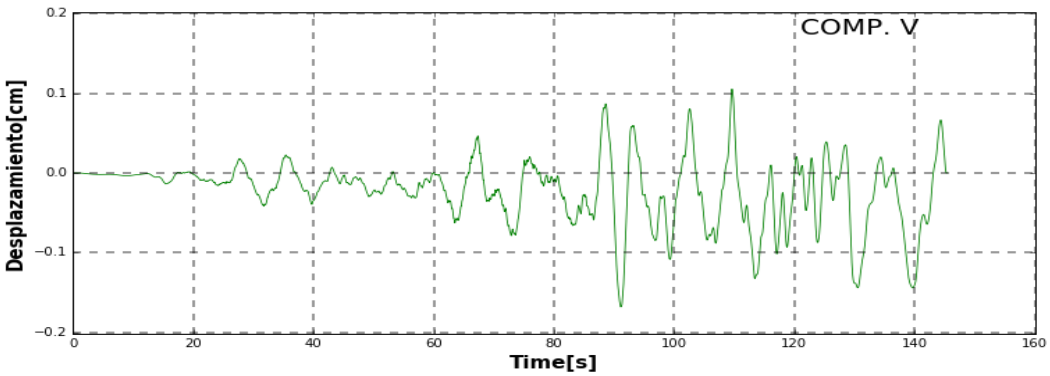




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.287	0.434	0.168



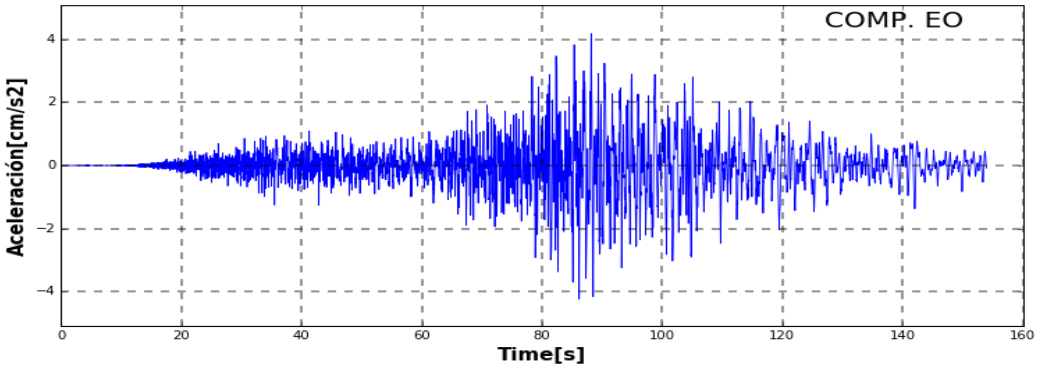


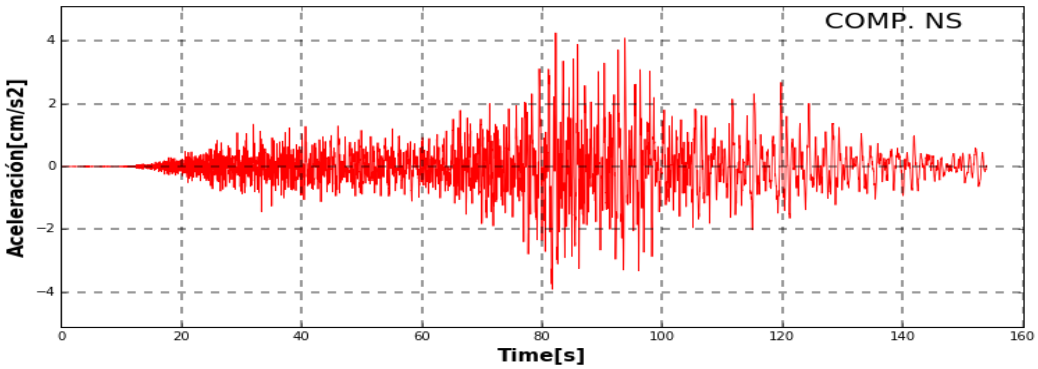


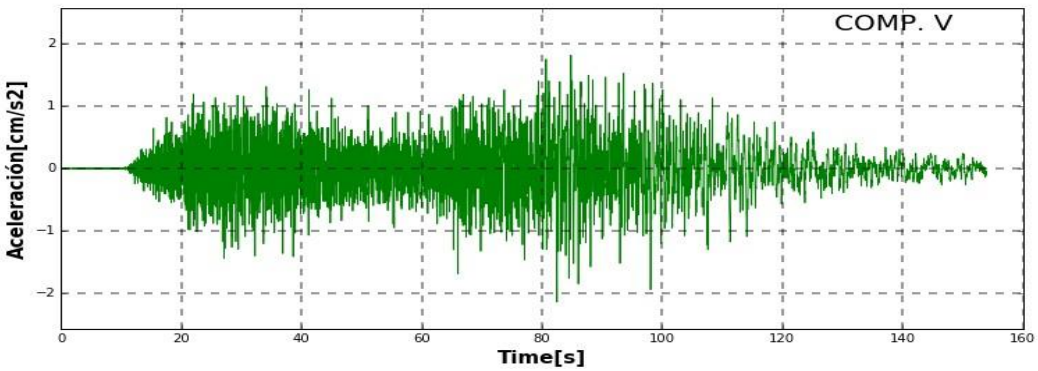
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CALLAO

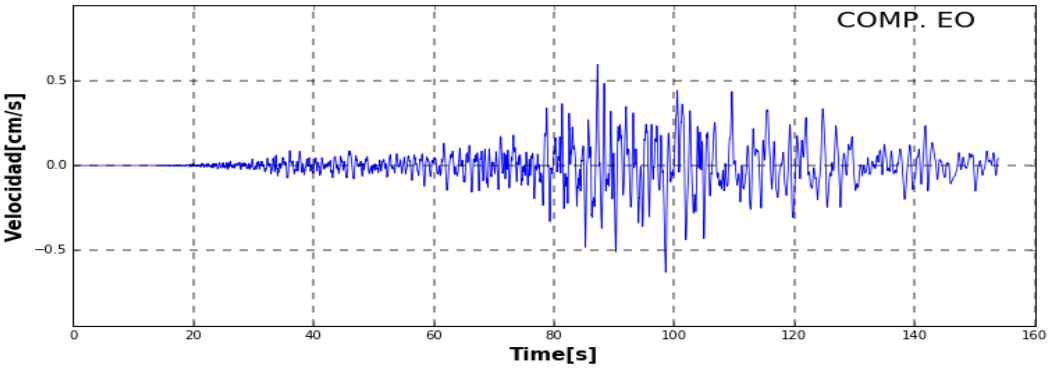
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
4.25	4.25	2.15

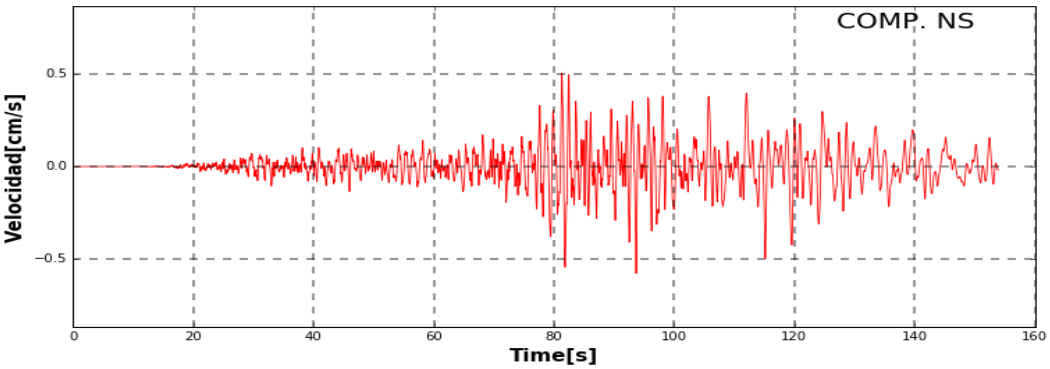


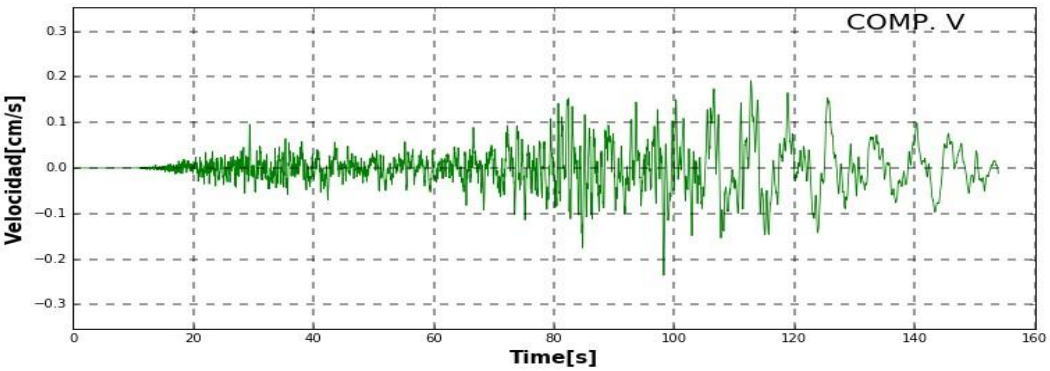




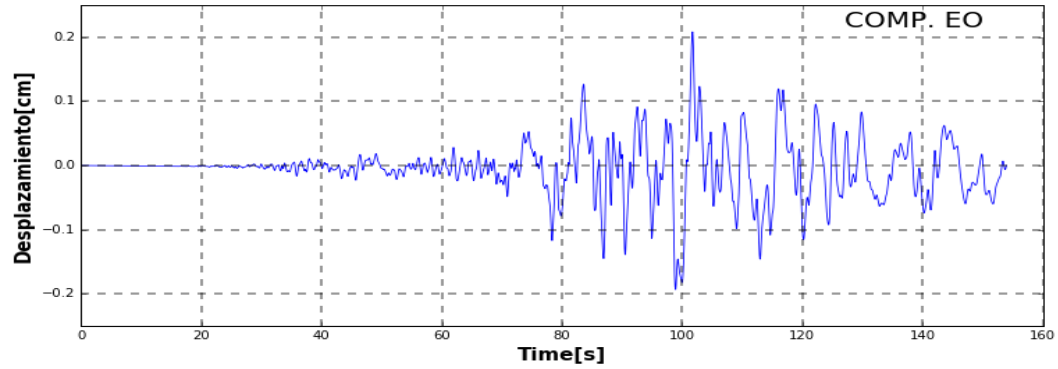
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.633	0.580	0.236

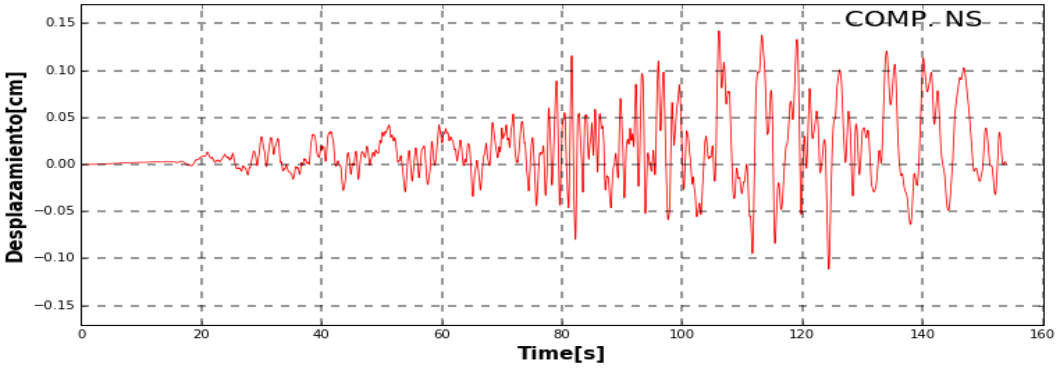


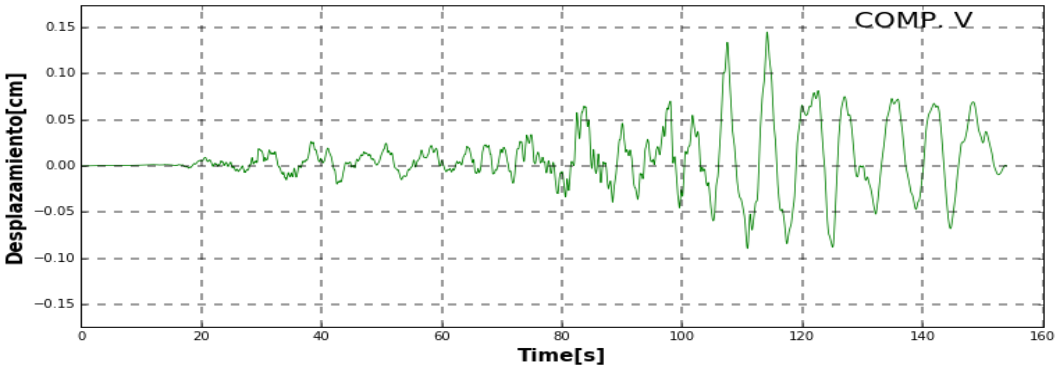




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.208	0.142	0.145



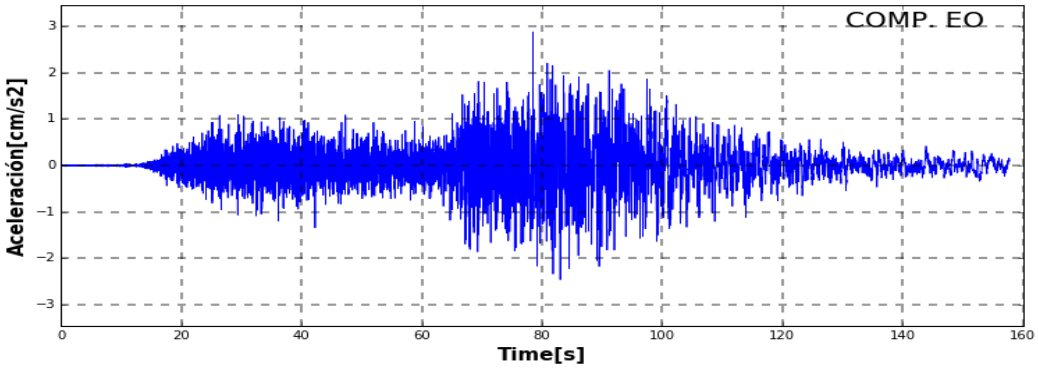


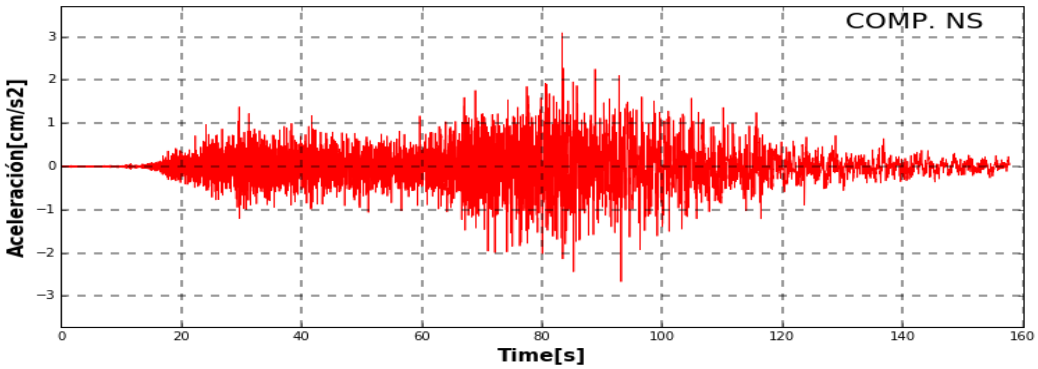


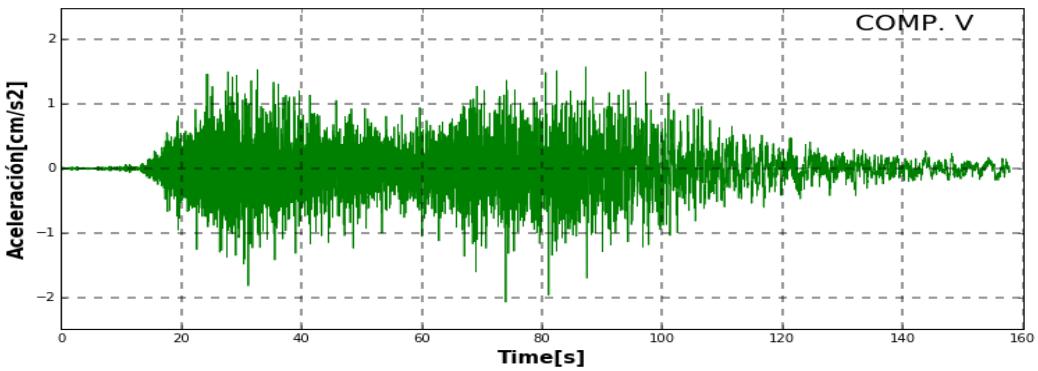
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP CN 2

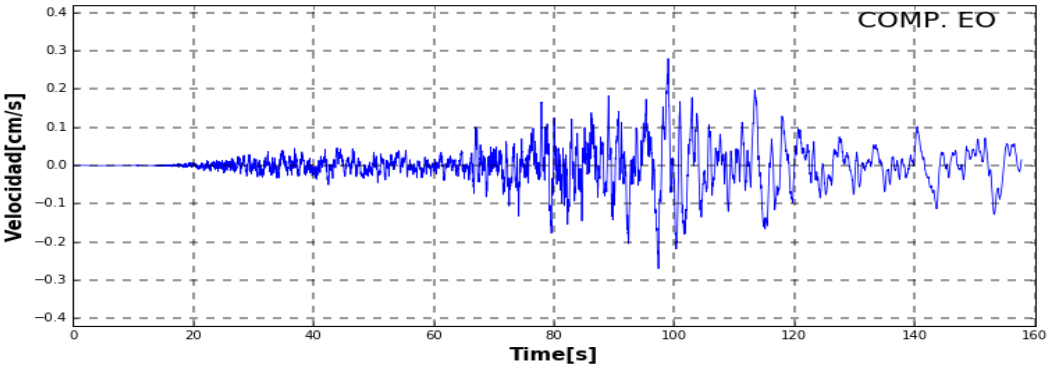
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
2.88	3.10	2.07

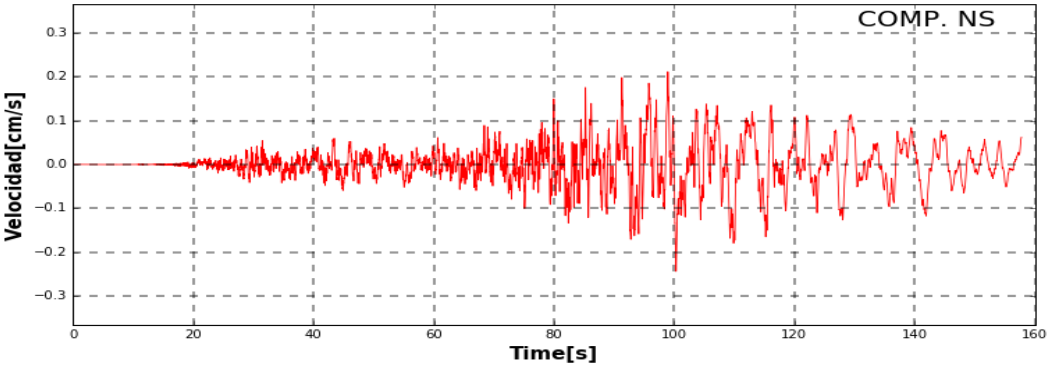


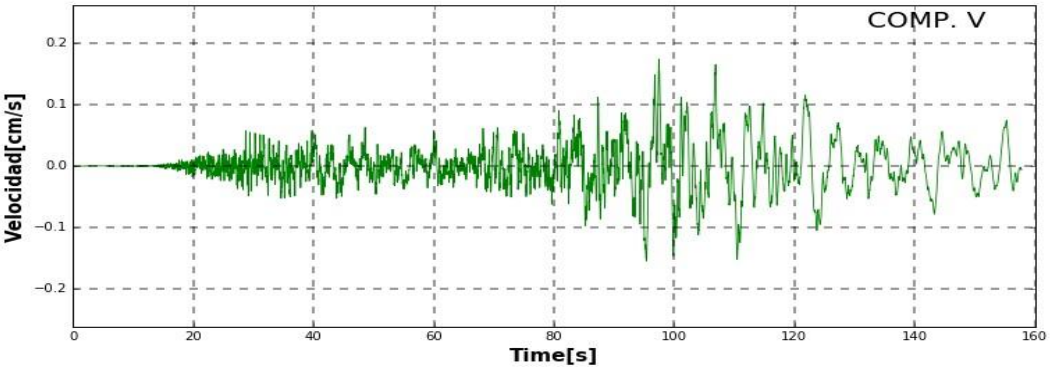




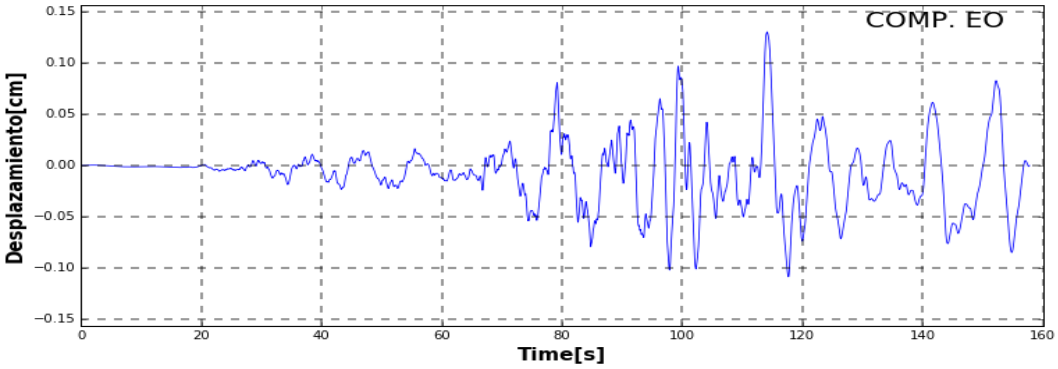
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.280	0.244	0.175

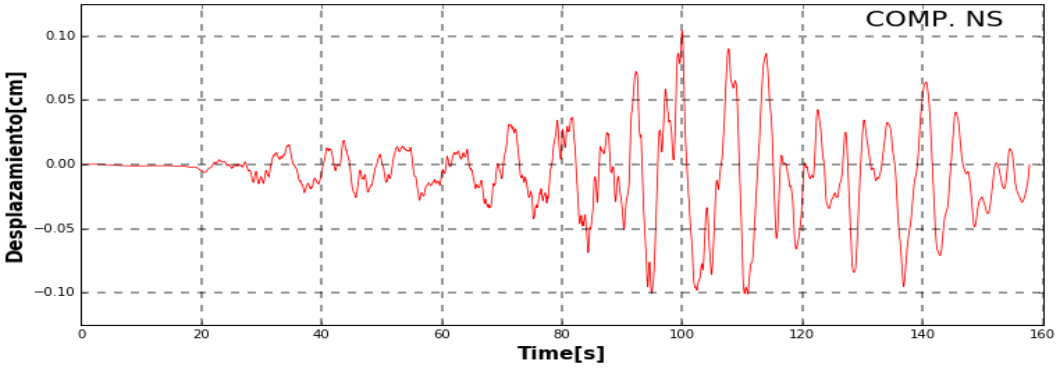


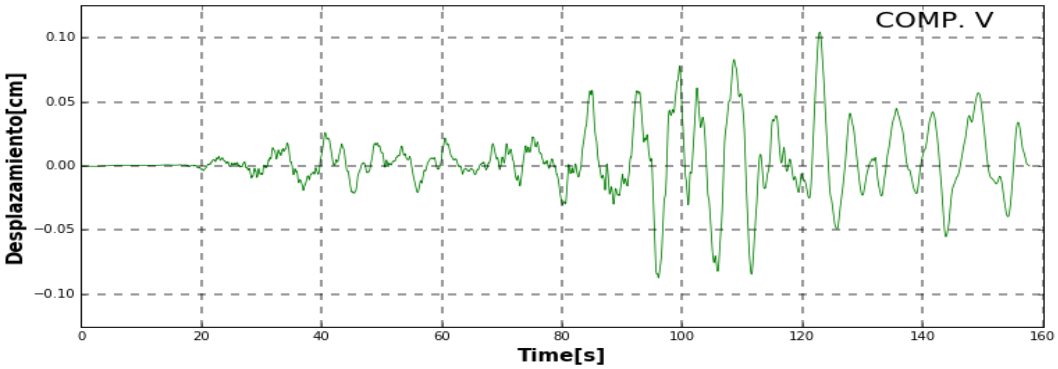




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.130	0.104	0.104



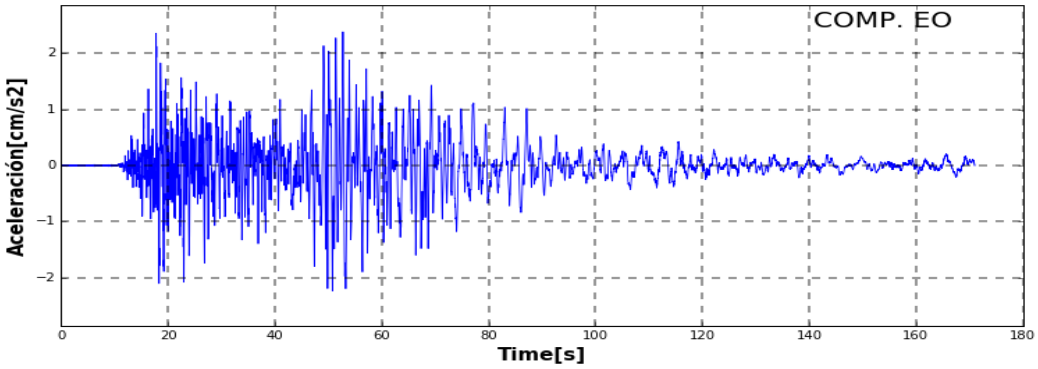


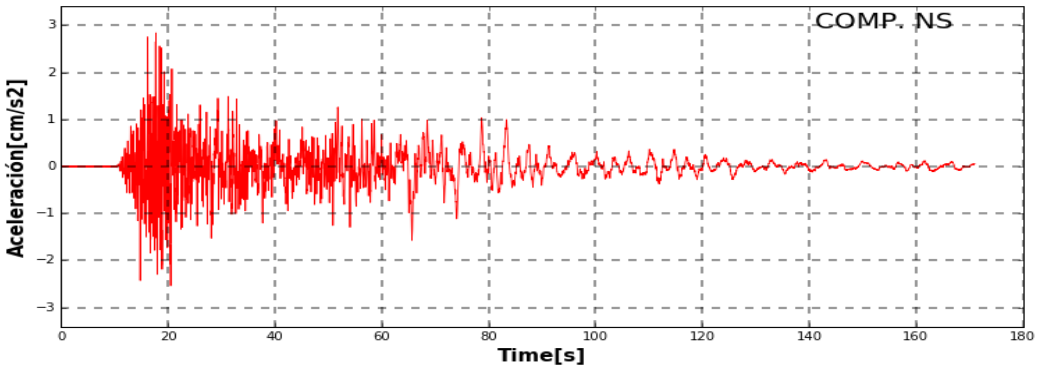


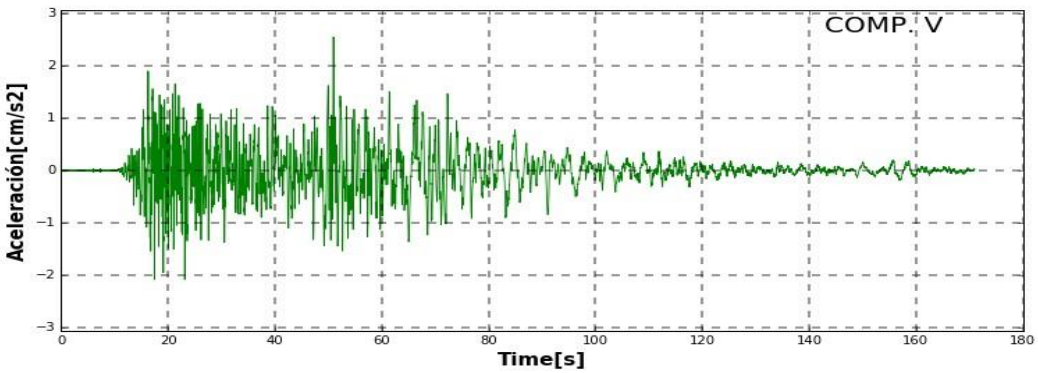
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP APURIMAC

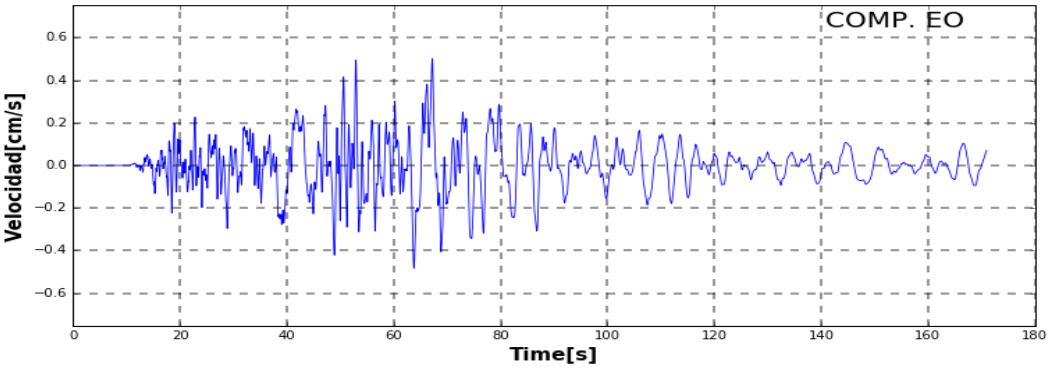
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
2.39	2.85	2.56

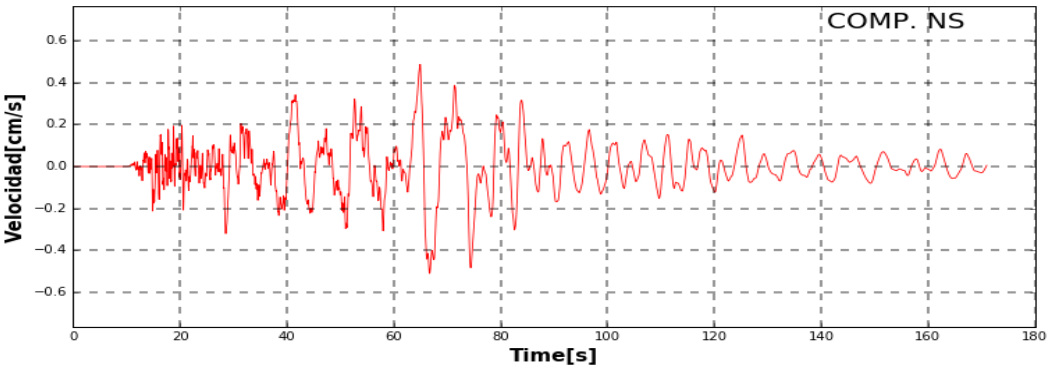


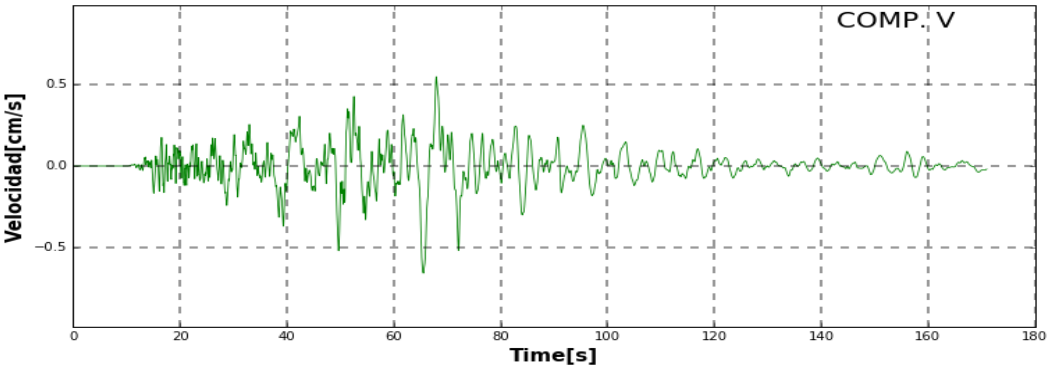




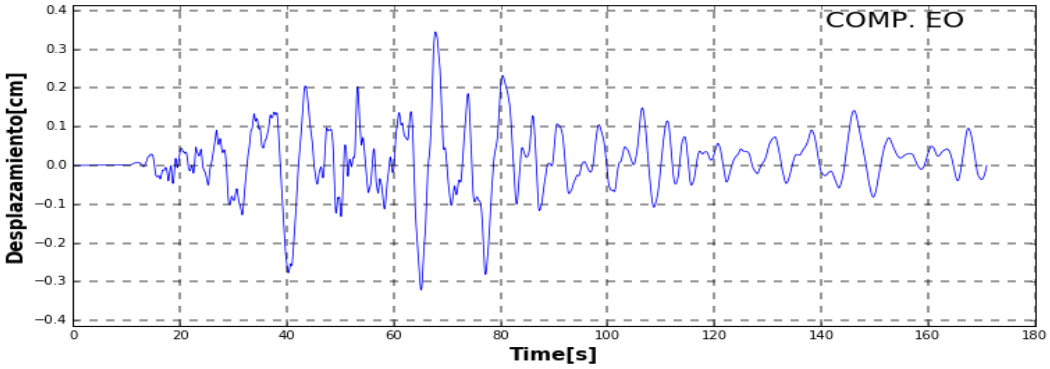
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.502	0.510	0.654

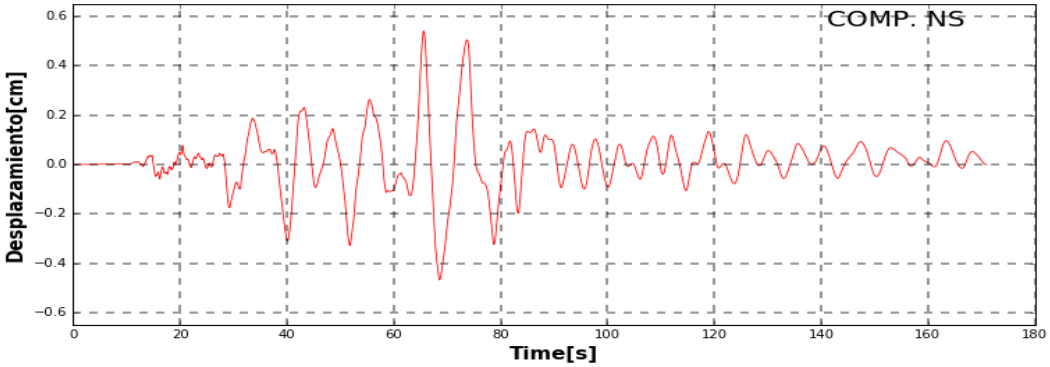


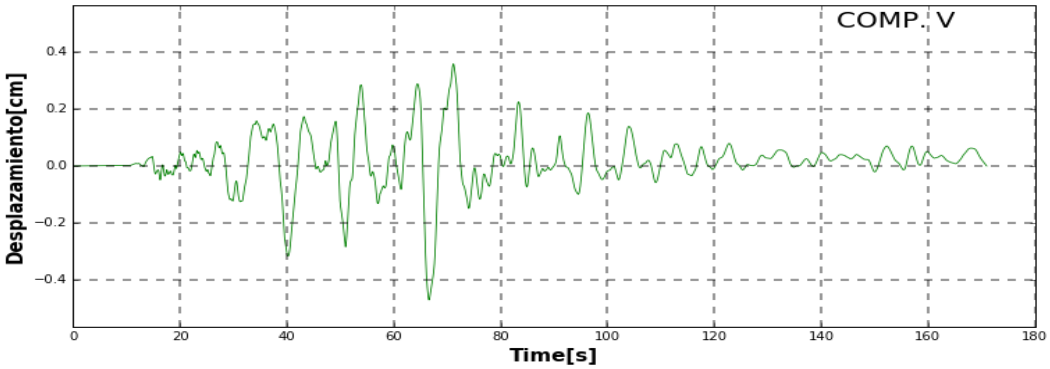




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.345	0.540	0.470



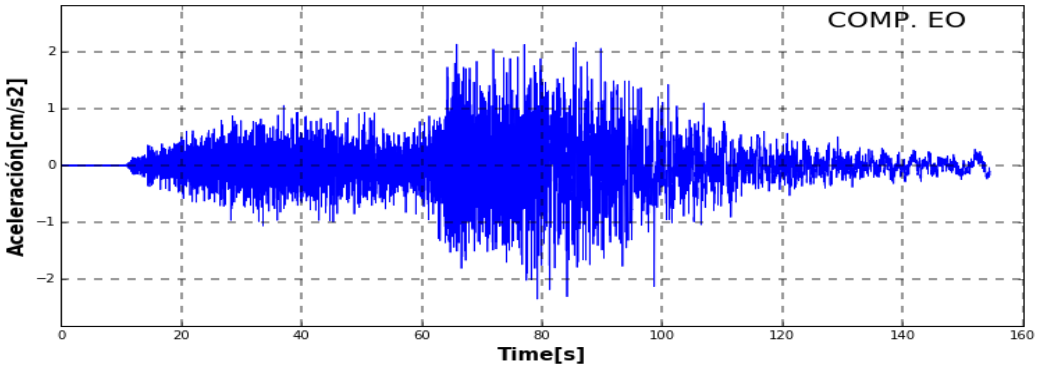


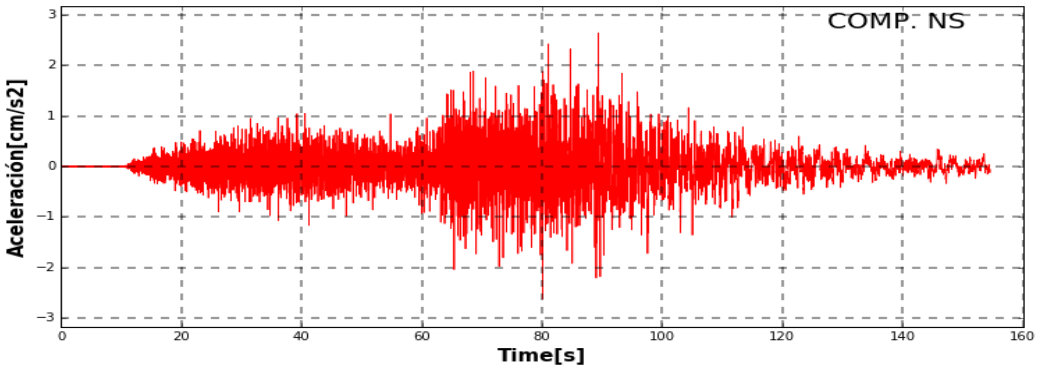


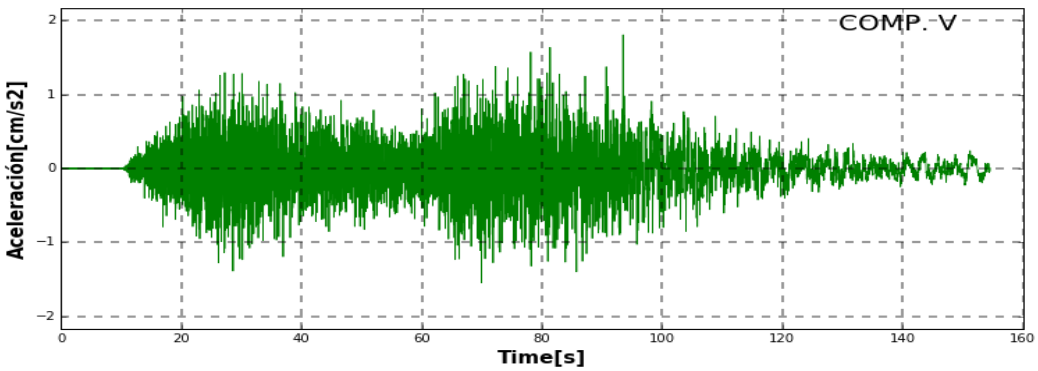
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP LIMA

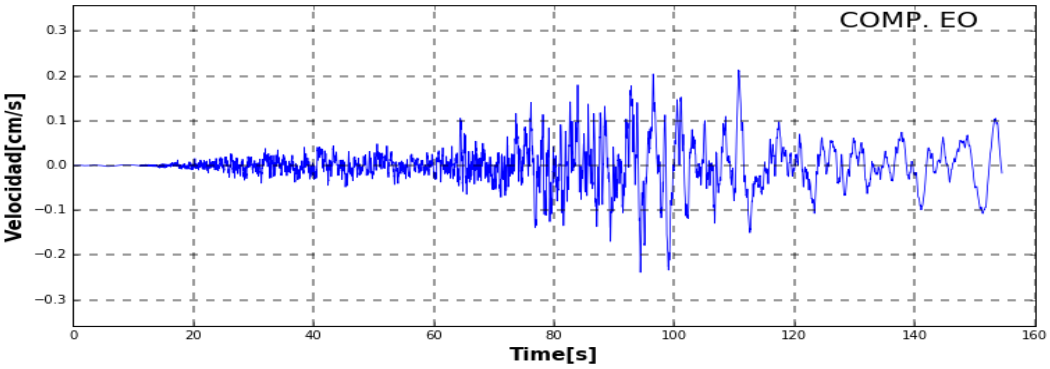
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
2.36	2.64	1.81

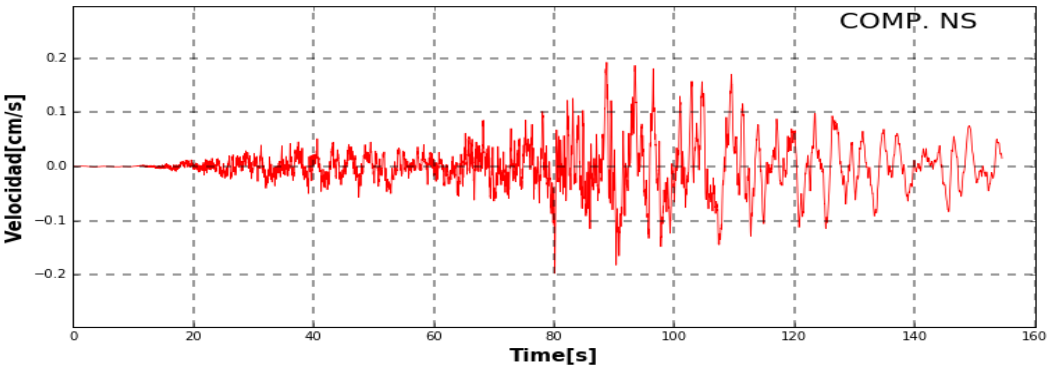


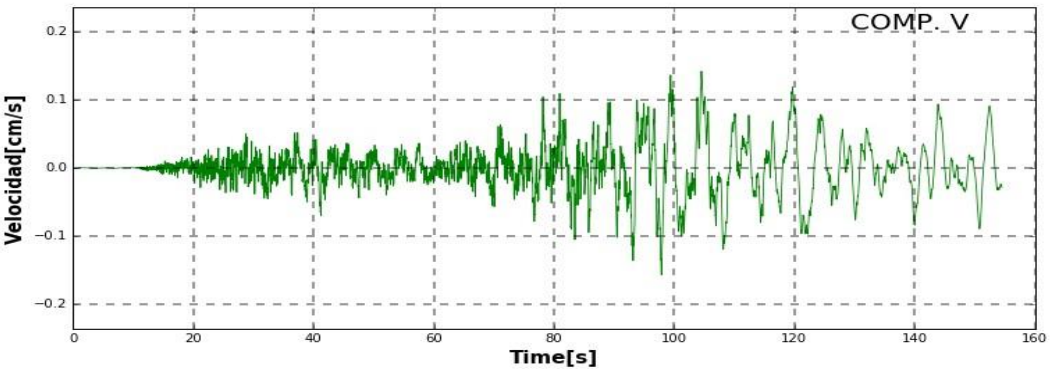




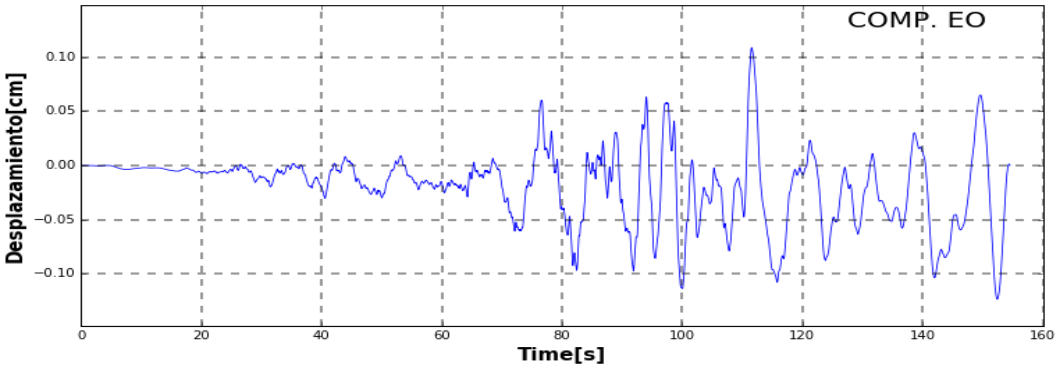
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.239	0.197	0.157

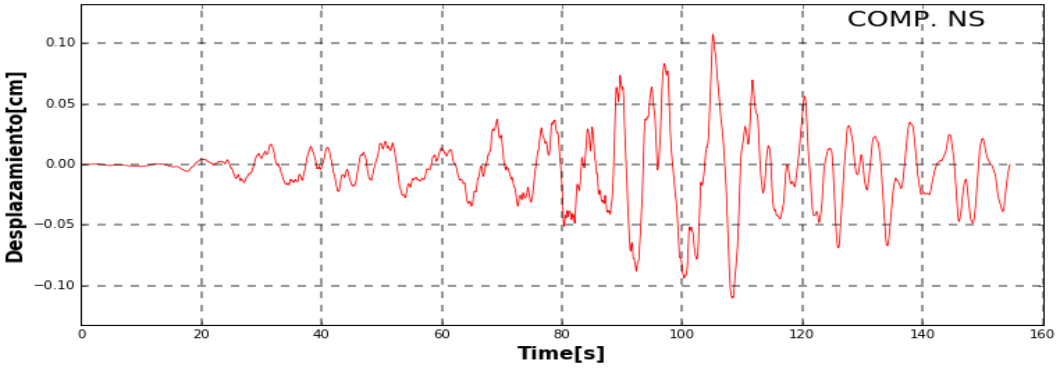


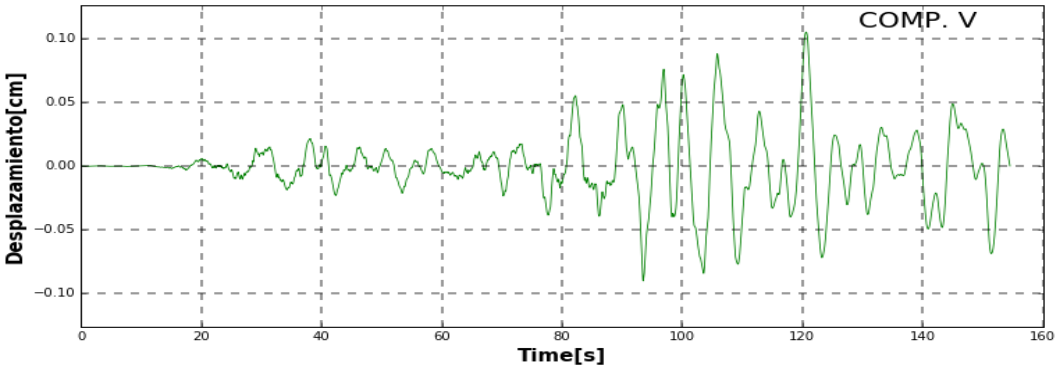




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.123	0.110	0.105



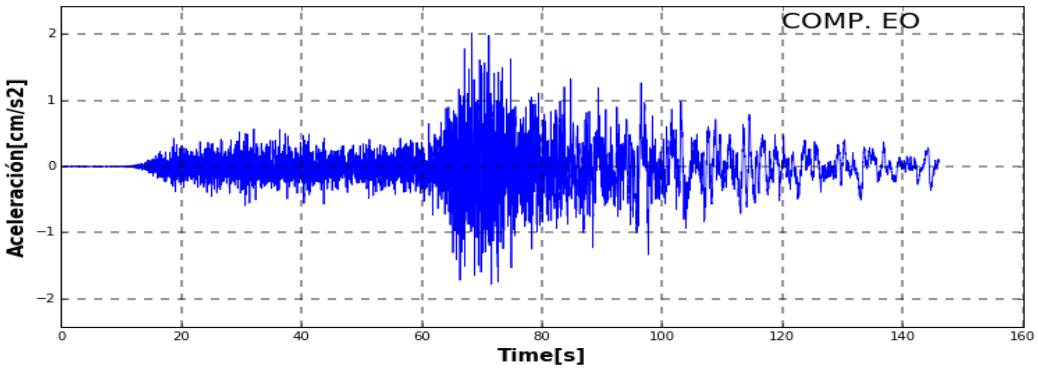


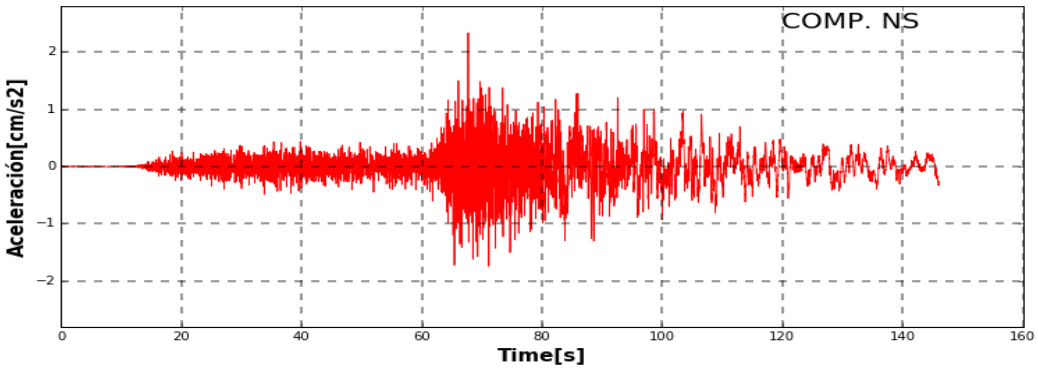


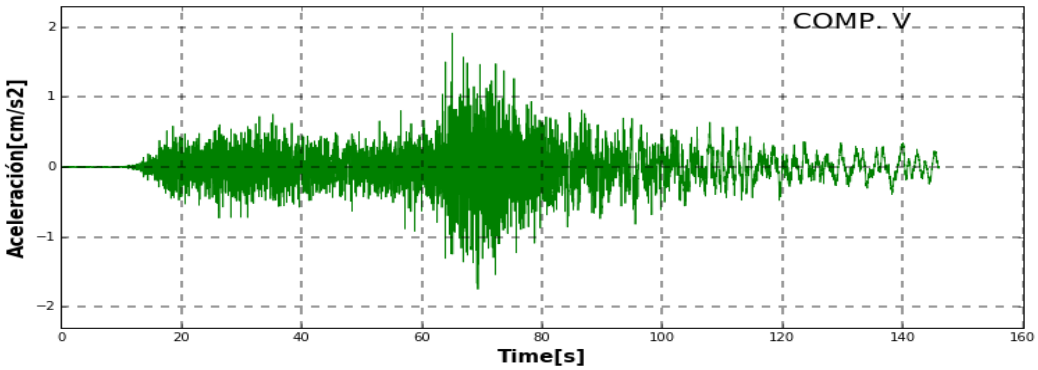
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP TACNA

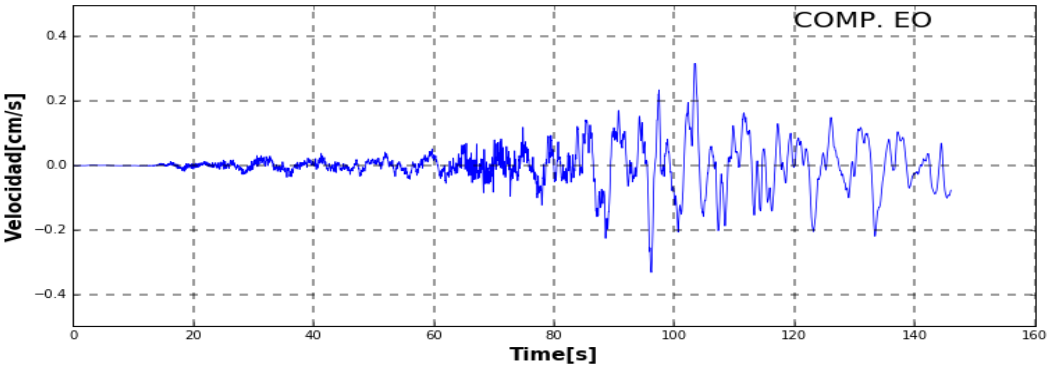
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
2.02	2.33	1.91

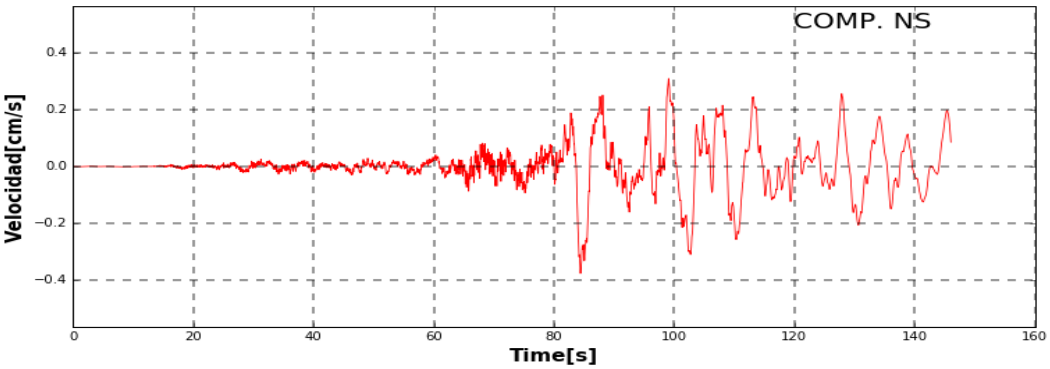


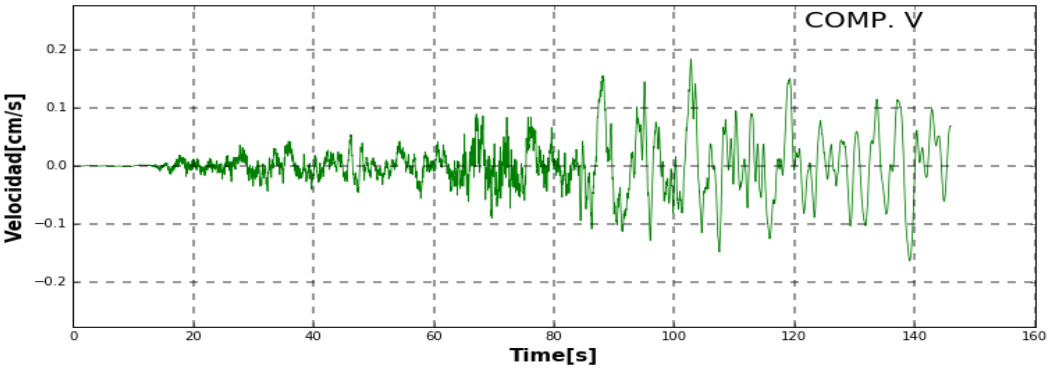




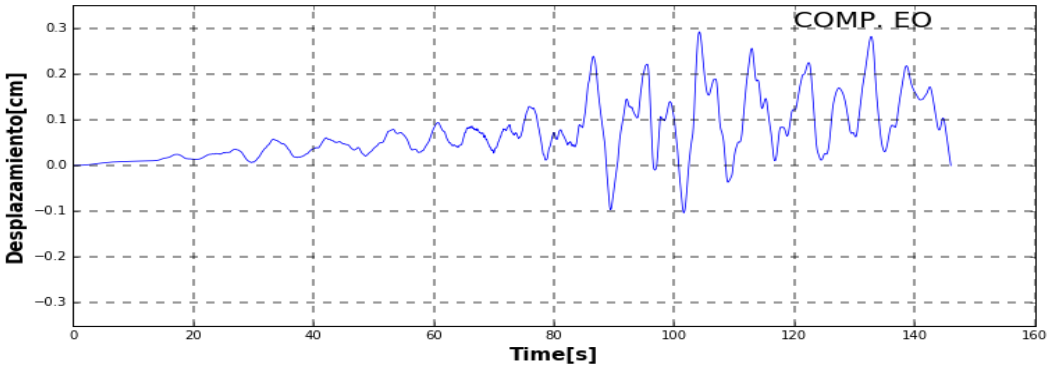
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.332	0.375	0.184

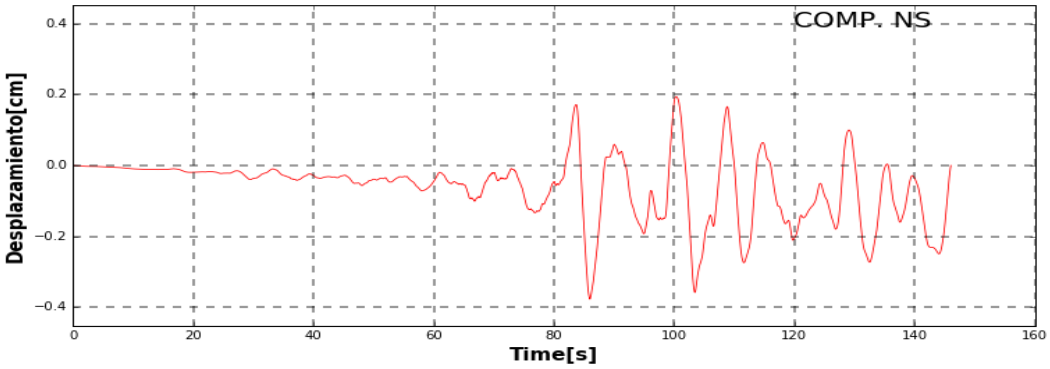


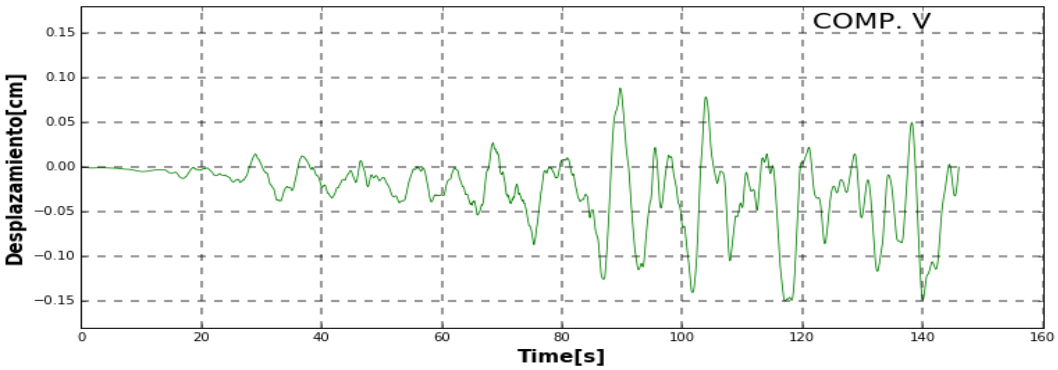




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.293	0.378	0.150



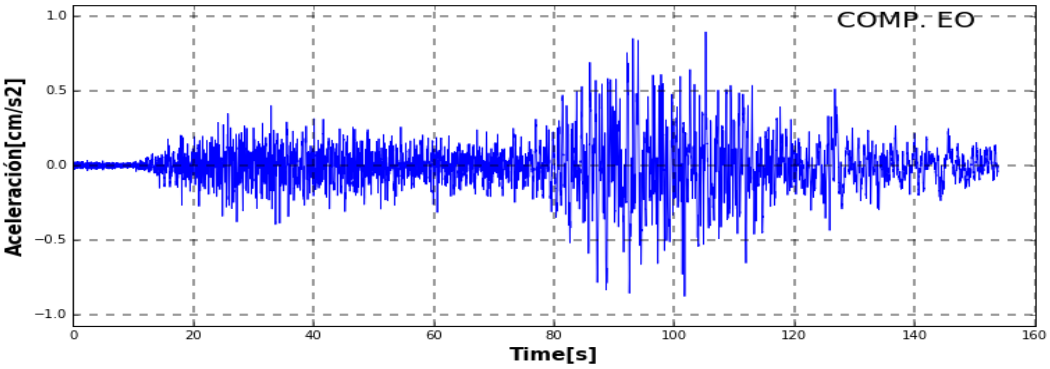


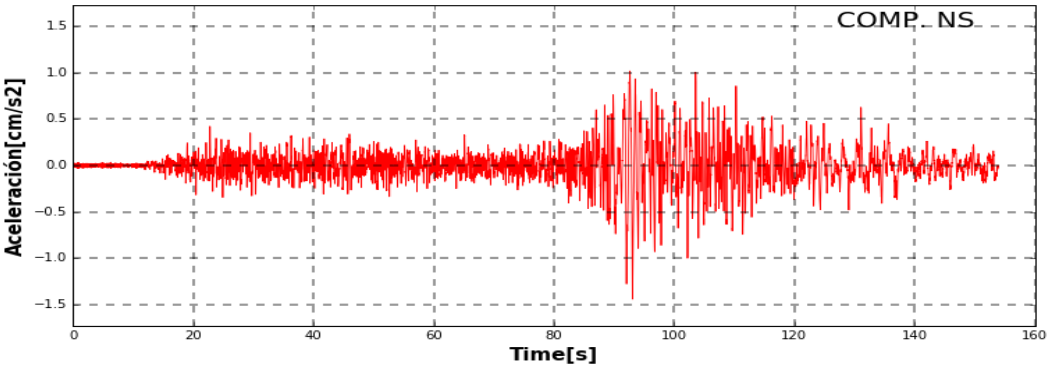


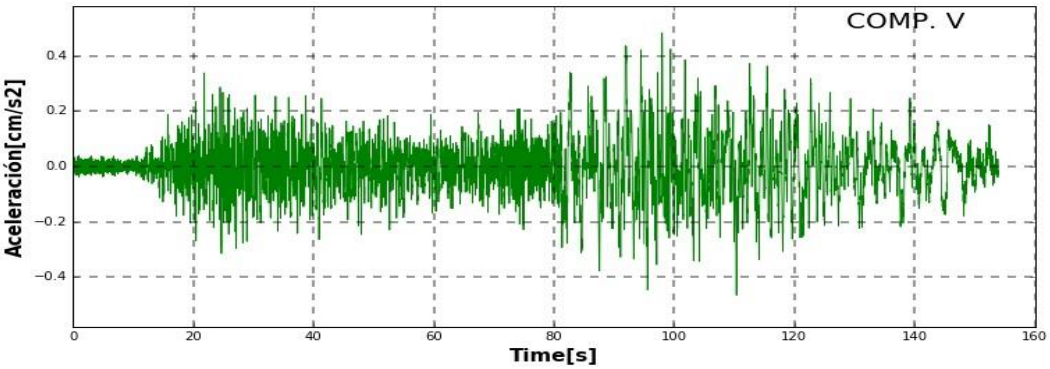
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. CIP HUANUCO

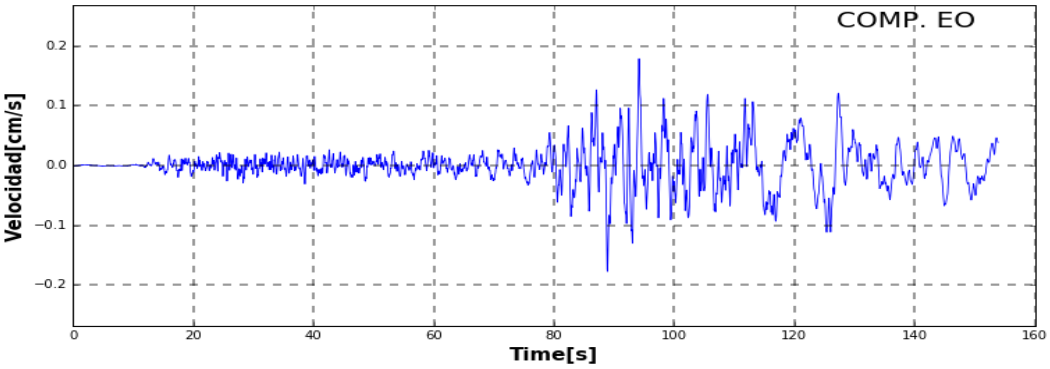
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
0.89	1.44	0.48

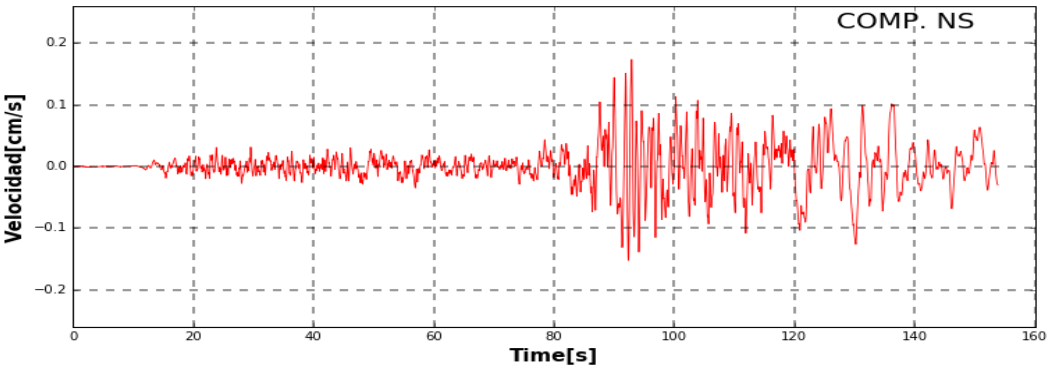


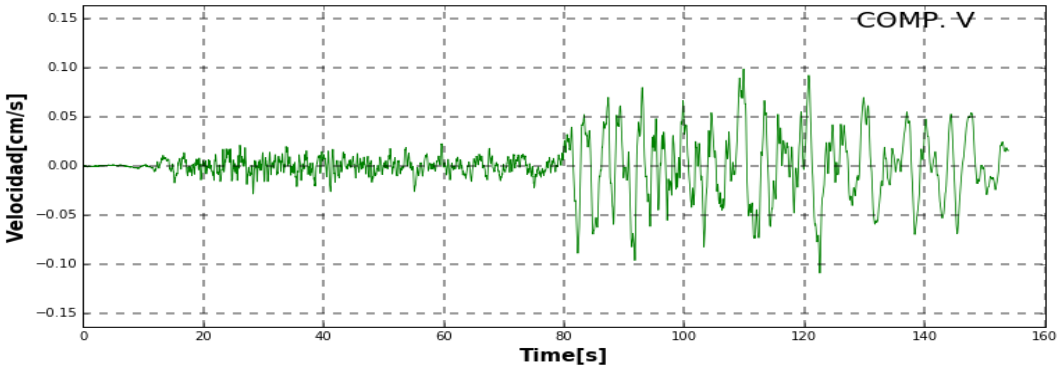




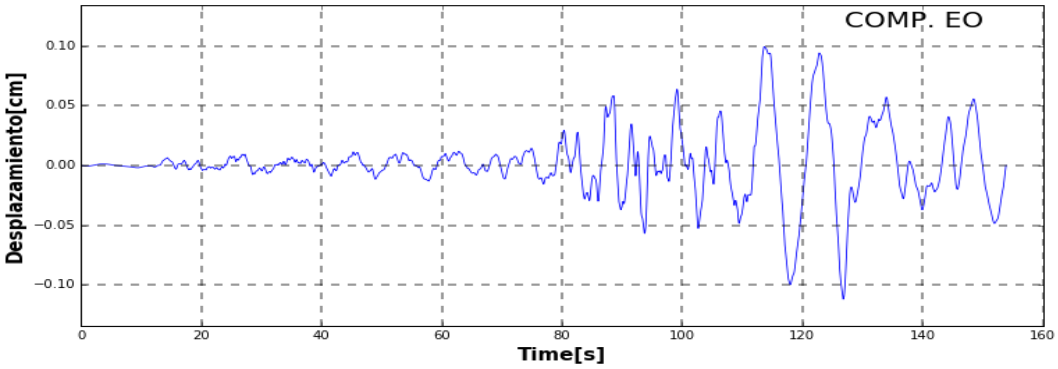
Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.178	0.174	0.109

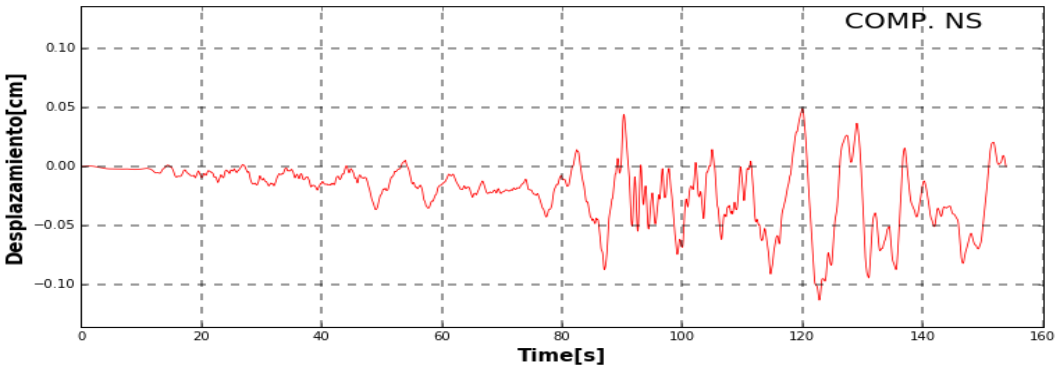


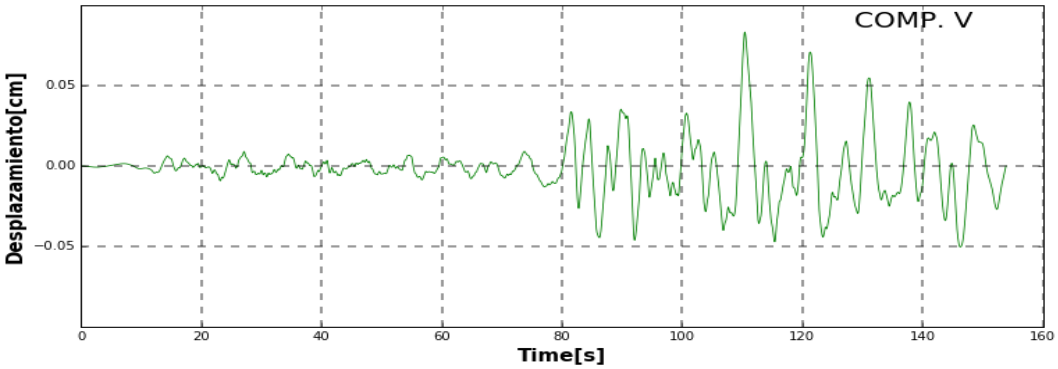




Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.112	0.113	0.083



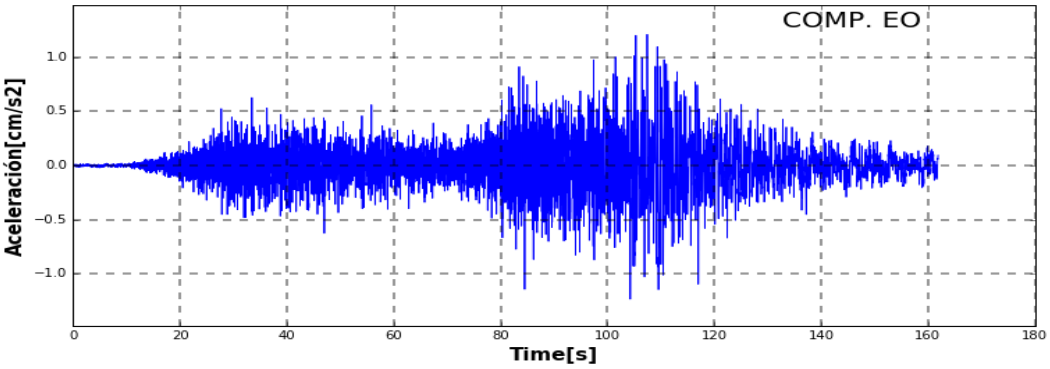


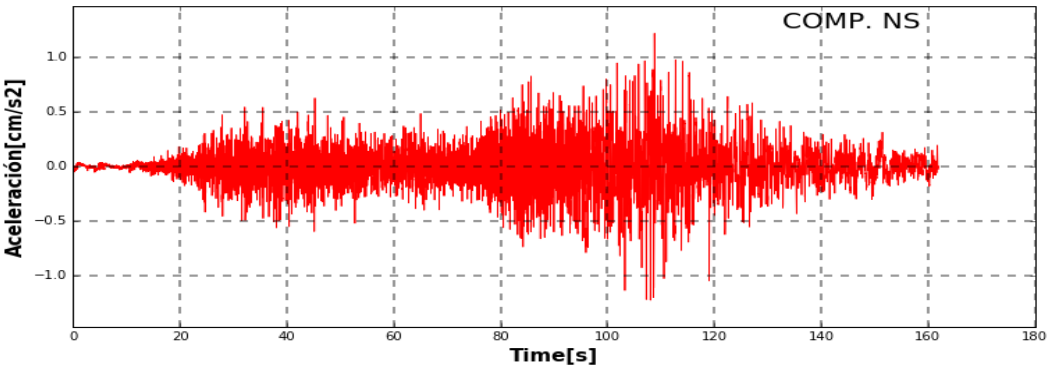


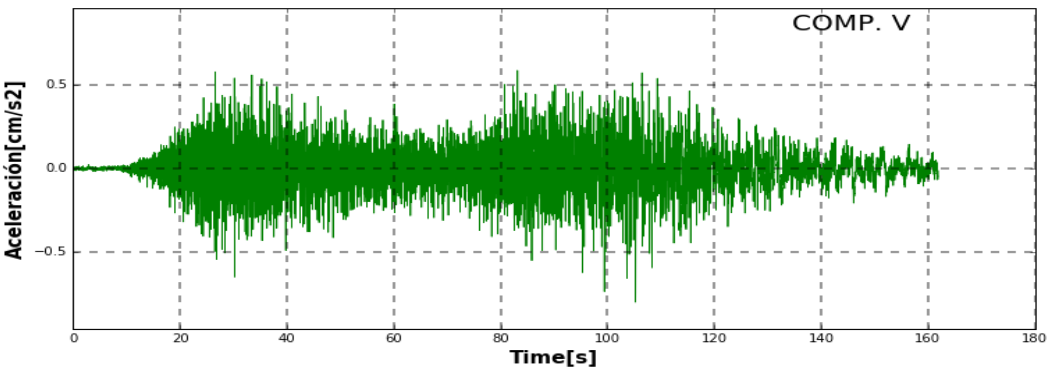
ANÁLISIS TIEMPO - HISTORIA: SISMO DEL 14 DE ENERO DEL 2018

EST. UNAB

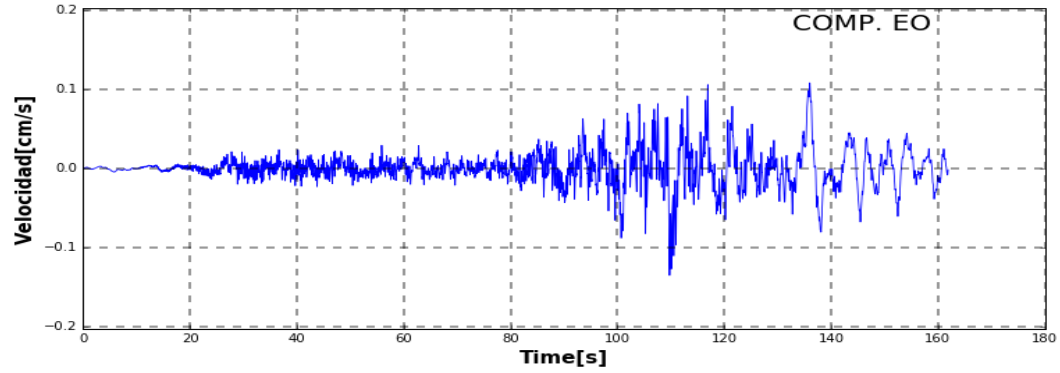
Aceleración Máxima(cm/seg²)		
EO	**NS**	**V**
1.23	1.23	0.80

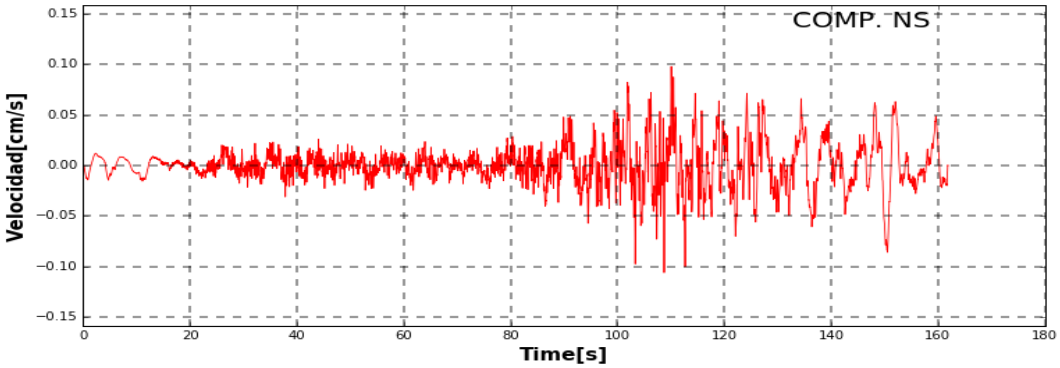


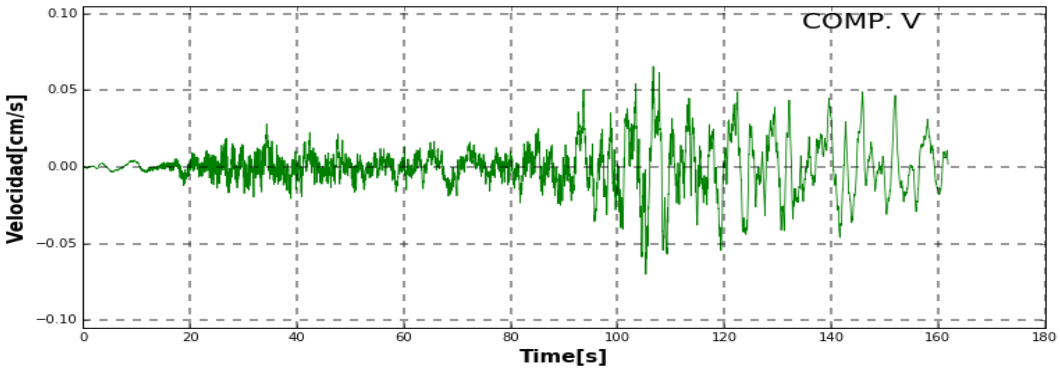




Velocidad Máxima(cm/seg)		
EO	**NS**	**V**
0.135	0.106	0.070







Desplazamiento Máximo(cm)		
EO	**NS**	**V**
0.091	0.049	0.039