Preliminary Report

Strong Motion Records Analysis

V.0
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INTRODUCTION

A Magnitude Mw=8.4 occurred on September 16, 2015. Some strong motion records have been made public. Preliminary analysis are presented here.

Warning: Data was accessed from National Seismological Center (CSN) as of October 10, 2015. This data includes CSN and Ministry of Interior (ONEMI) stations. Note that there are some differences in record scaling depending on download date.

All values could be subject to change.

MAIN FEAUTURES

In this report 17 strong motion stations are considered. Figure 1 show their location.

1. Maximum Horizontal Ground Acceleration: Monte Patria Station: 0.83g
2. Maximum Horizontal Ground Velocity: Monte Patria Station: 38.5 cm/sec
3. Maximum Horizontal Ground Displacement: Monte Patria Station: 14.9 cm.

Figure 2 to Figure 4 presents the acceleration and integrated velocity and displacement series for Monte Patria and Tololo stations.

4. Maximum Bracket Duration [5% g]: Monte Patria Station: 131.3 sec.
5. Maximum Arias Intensity (sum of three orthogonal axis): Monte Patria Station: 3.2 g-sec.
6. Central Frequency of horizontal motions according to Vanmarke (1976): Monte Patria Station: 9.2 Hz
7. Mean Period according to Rathje et al 2004: Tm = 0.23 sec.

In general records present good quality allowing integration to high period values. Formal soil classification for the sites is not yet available.

Acceleration Response Spectra is presented in Figure 6 for horizontal records and Figure 7 for vertical records. Most of the high demands are below 0.8 seconds. Clearly Monte Patria records have the largest demands.

Analysis of most of the records indicates that the earthquake presents large response spectral displacement demands in the long period range (10-15 second) on the order of 40 cm, Figure 8. This agrees with the long period signals observe on some of the displacement records, as shown at the Tololo Station, Figure 5.

Nonlinear spectra at La Serena Station (large city) show low ductility demands values for buildings with base shear coefficients larger than 0.08, Figure 9.

Damage due to shaking has been reported at very few engineered structures. Damage is considered light and consistent with observed velocities and common Chilean building characteristics (resistance, redundancy, detailing).

Damage in transport and water distribuition due to landslides is wide spread.

Damage due to tsunami is extensive and affected areas previously identify as risky.

STATION LOCATION

Location of Stations used for analysis according to station GPS

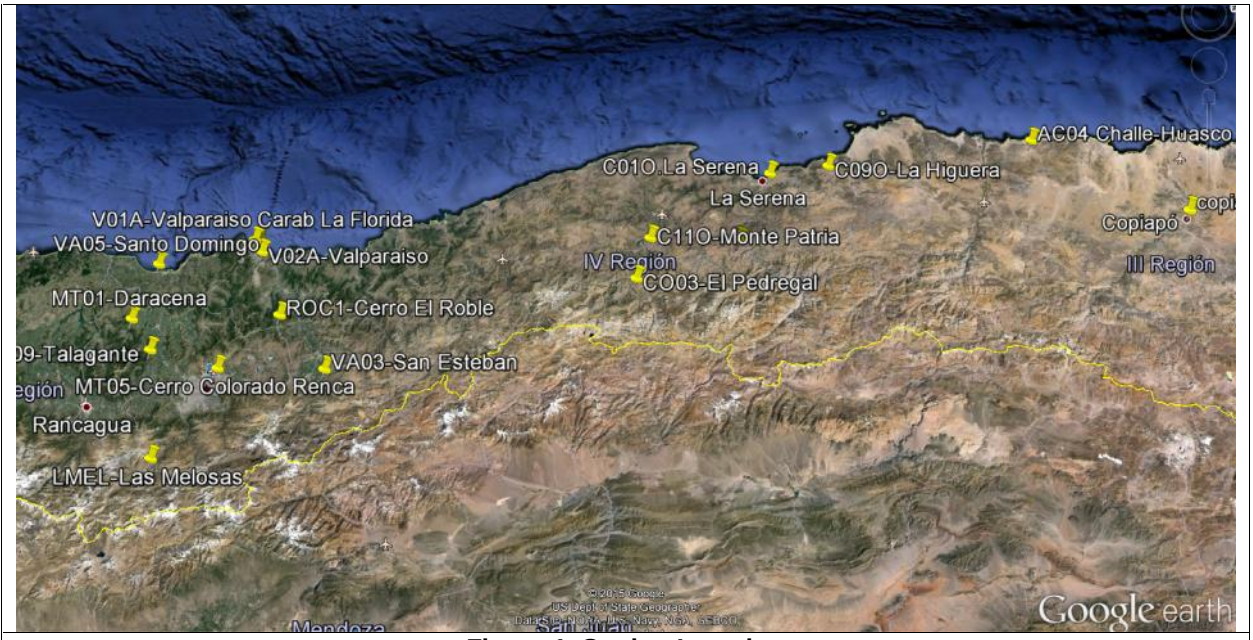

Figure 1. Station Location

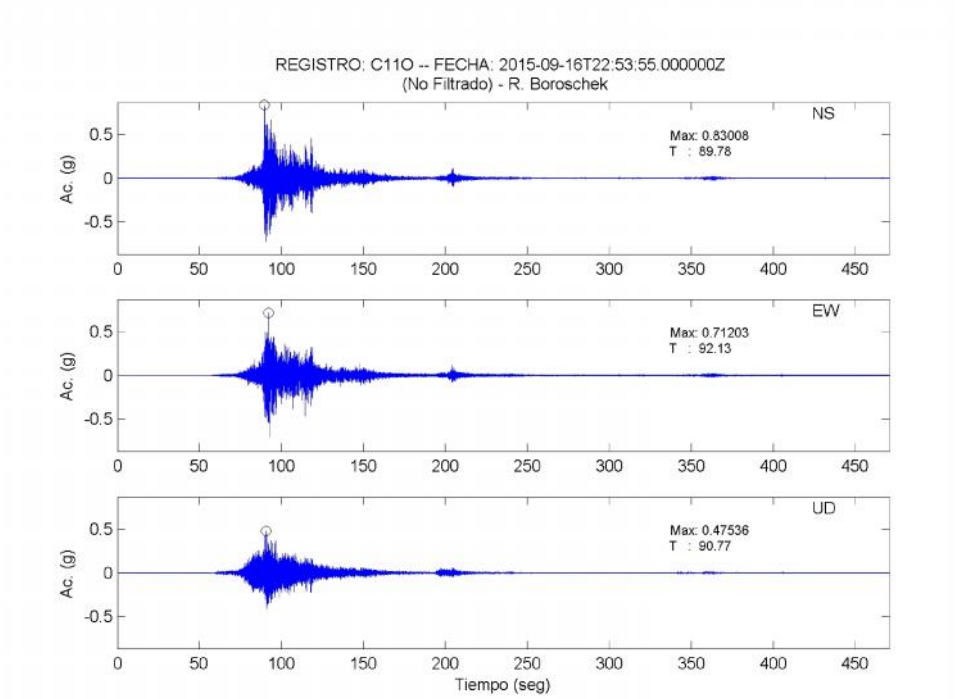

Figure 2. Monte Patria C110. Non corrected acceleration time series

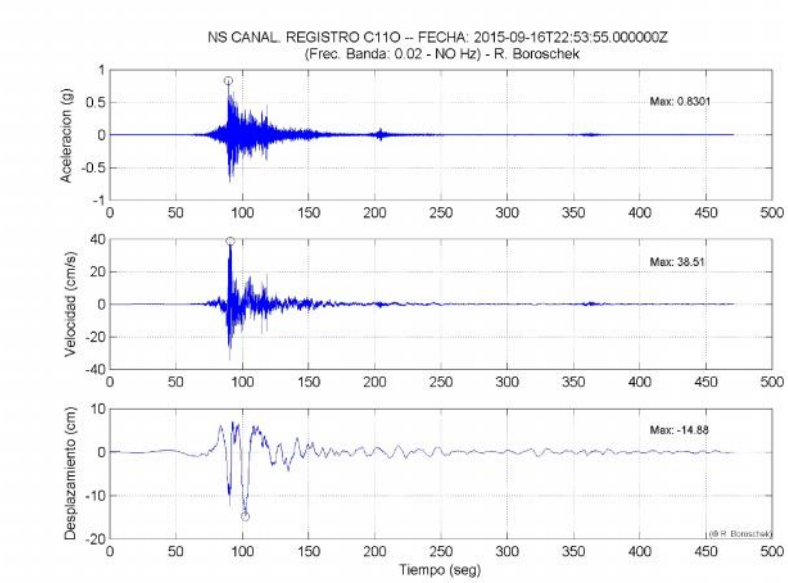

Figure 3. Monte Patria C110. NS Corrected record

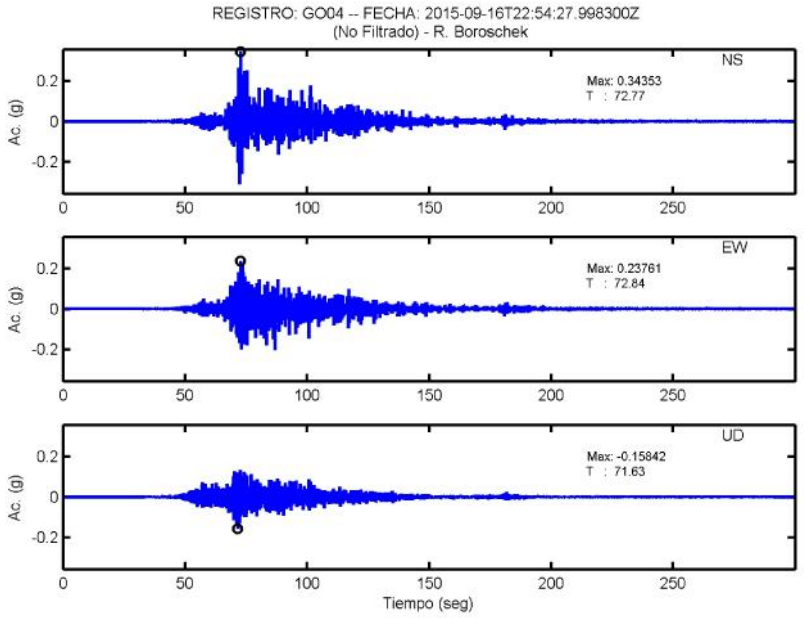

Figure 4. Tololo GO04. Non corrected acceleration time series

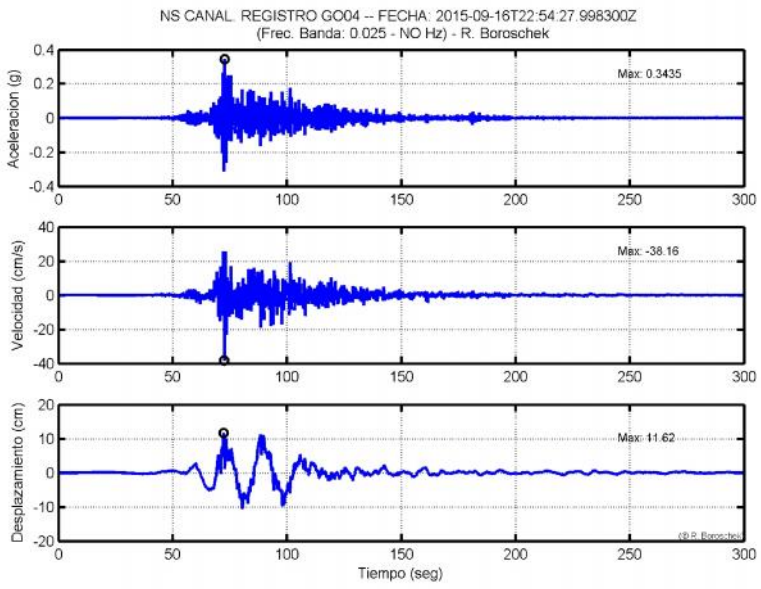

Figure 5. Tololo GO04. NS corrected time series

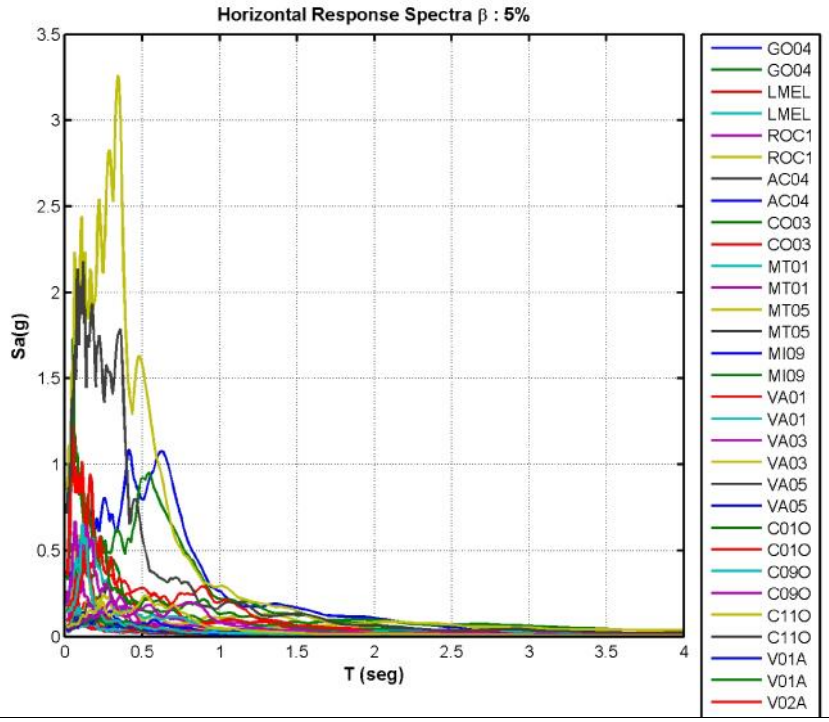

Figure 6. Horizontal Acceleration Response Spectra

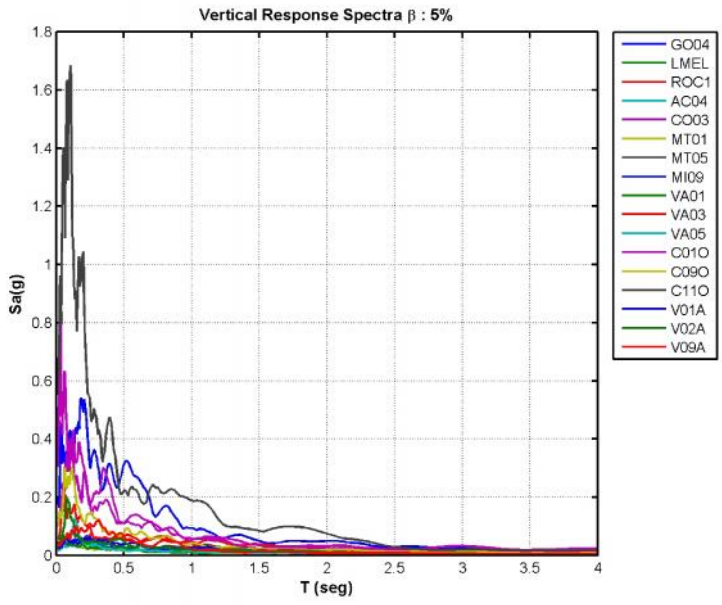

Figure 7. Vertical Acceleration Response Spectra

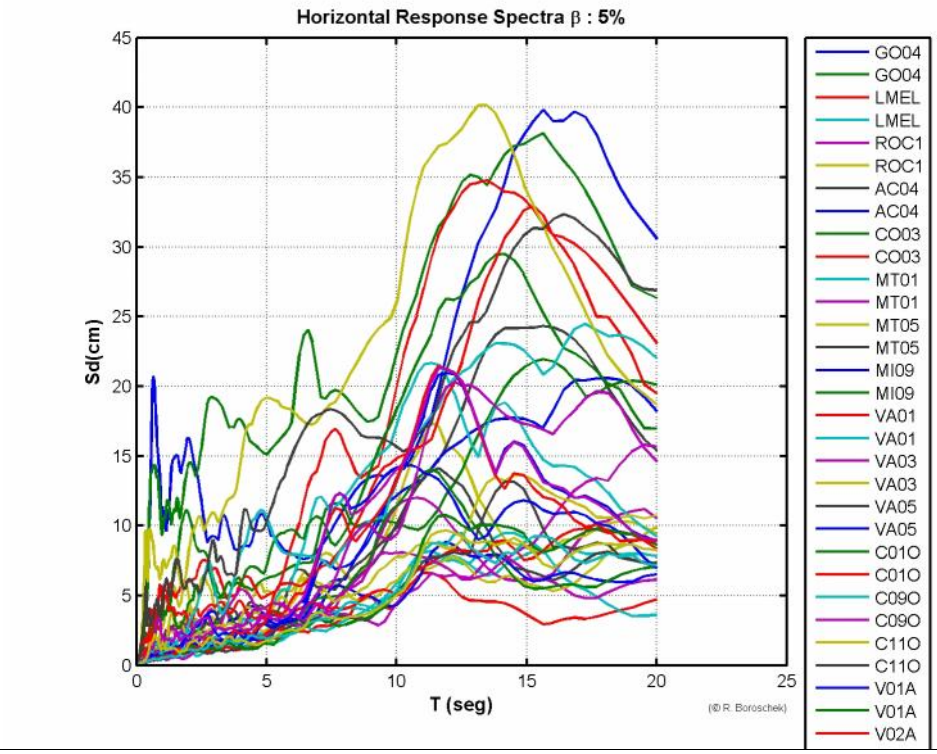

Figure 8. Horizontal Response Spectra Displacement

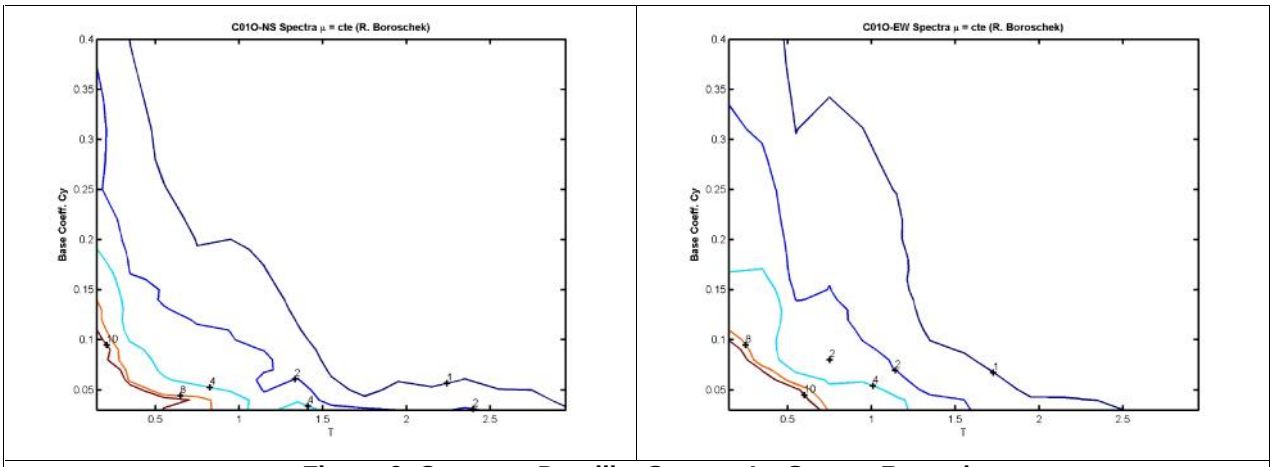

Figure 9. Constant Ductility Spectra La Serena Record

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SUMMARY OF MAIN VALUES

Station	GM HGA (g)	GM HGV (cm/s)	GM HGD (cm)	Max Dur H (s)	Max F_central H (Hz)	Max T_mRathje H (s)
'GO04'	0.29	34.83	12.99	72.46	2.53	0.69
'LMEL'	0.04	2.21	2.21	0.00	6.24	0.23
'ROC1'	0.06	6.03	4.13	0.19	4.13	0.71
'AC04'	0.03	3.37	5.82	0.00	6.53	0.37
'CO03'	0.32	14.32	9.61	71.70	8.64	0.19
'MT01'	0.02	1.93	2.16	0.00	5.75	0.31
'MT05'	0.06	4.44	3.02	23.26	3.41	0.44
'MI09'	0.03	2.92	2.26	0.00	5.34	0.40
'VA01'	0.04	3.03	3.93	0.00	8.82	0.21
'VA03'	0.11	5.14	3.38	77.95	6.16	0.27
'VA05'	0.03	3.08	2.80	0.00	3.68	0.38
'C01O'	0.16	10.12	8.81	56.23	5.96	0.35
'C09O'	0.19	6.83	7.44	47.18	11.28	0.18
'C11O'	0.77	35.09	12.60	131.34	9.22	0.23
'V01A'	0.05	3.12	3.60	0.00	6.19	0.31
'V02A'	0.11	3.97	3.62	84.82	8.33	0.15
'V09A'	0.05	5.69	3.67	23.72	3.26	0.52

GMHGA Geometric Mean of Peak Horizontal Acceleration Values
GMHGV Geometric Mean of Peak Horizontal Velocity Values
GMHGA Geometric Mean of Peak Horizontal Displacement Values
Max Dur H: Bracket Duration [5%g]
Max F_central H: Horizontal Central Frequency (Vanmarke 1976)
Max T_mRathje: Horizontal Mean Period (Rathje et al 2004)

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