# Some Observations from Recent Chile Earthquake

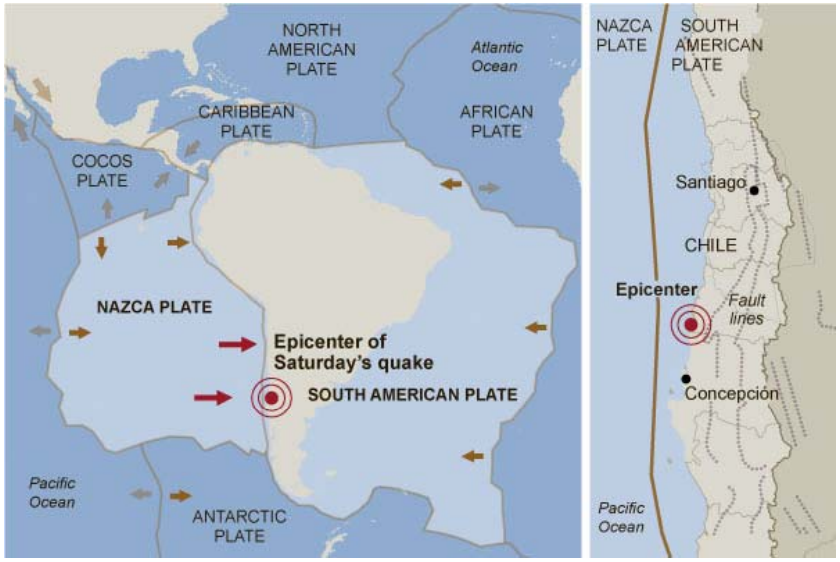

H. P. Hong
Dept. of Civil & Environmental Eng.
University of Western Ontario
London, Ontario, Canada
Hongh@eng.uwo.ca

# The Event: Chile earthquake

- Date:  February 27, 2010
- Magnitude: Mw = 8.8
- Epicenter: 35.909ºS 72.733ºW at a depth of about 35 km.
- Location: Offshore Maule, in a subduction zone in which the Nazca plate passes eastward and downward beneath the South American plate, with a rate of convergence of about 70 mm/year.

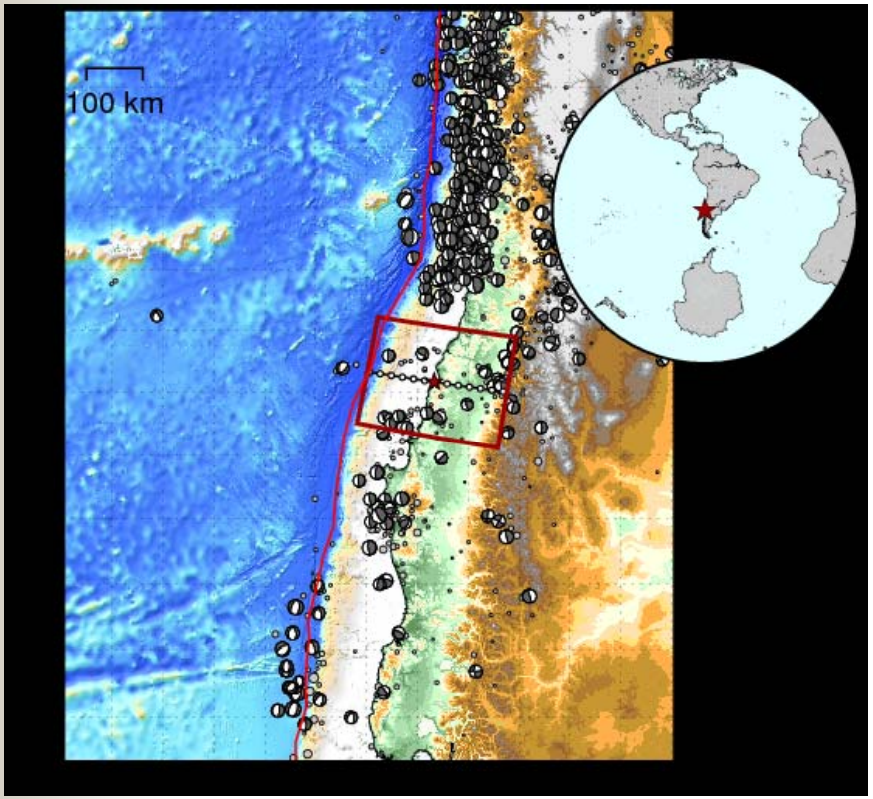
# Seismicity

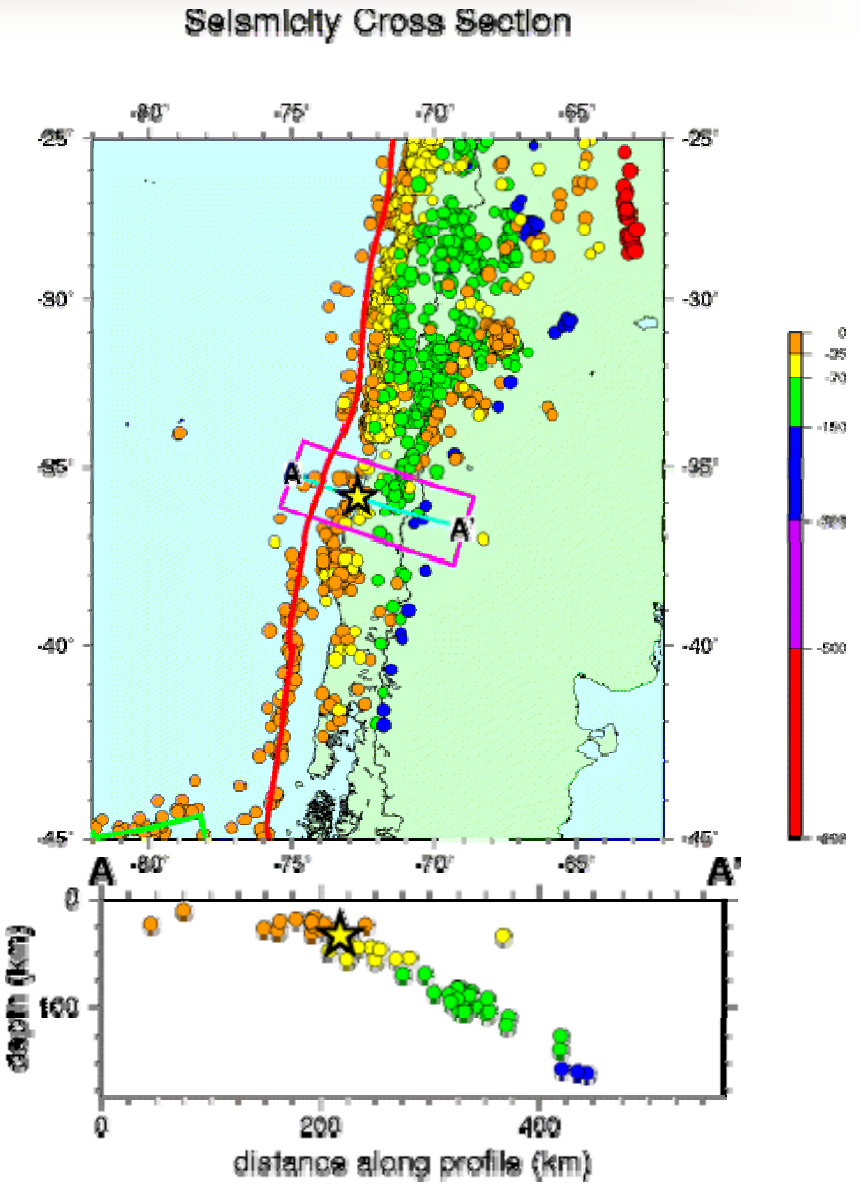





http://www.nytimes.com/interactive/2010/02/27/world/americas/0227-chile-quake-map.html

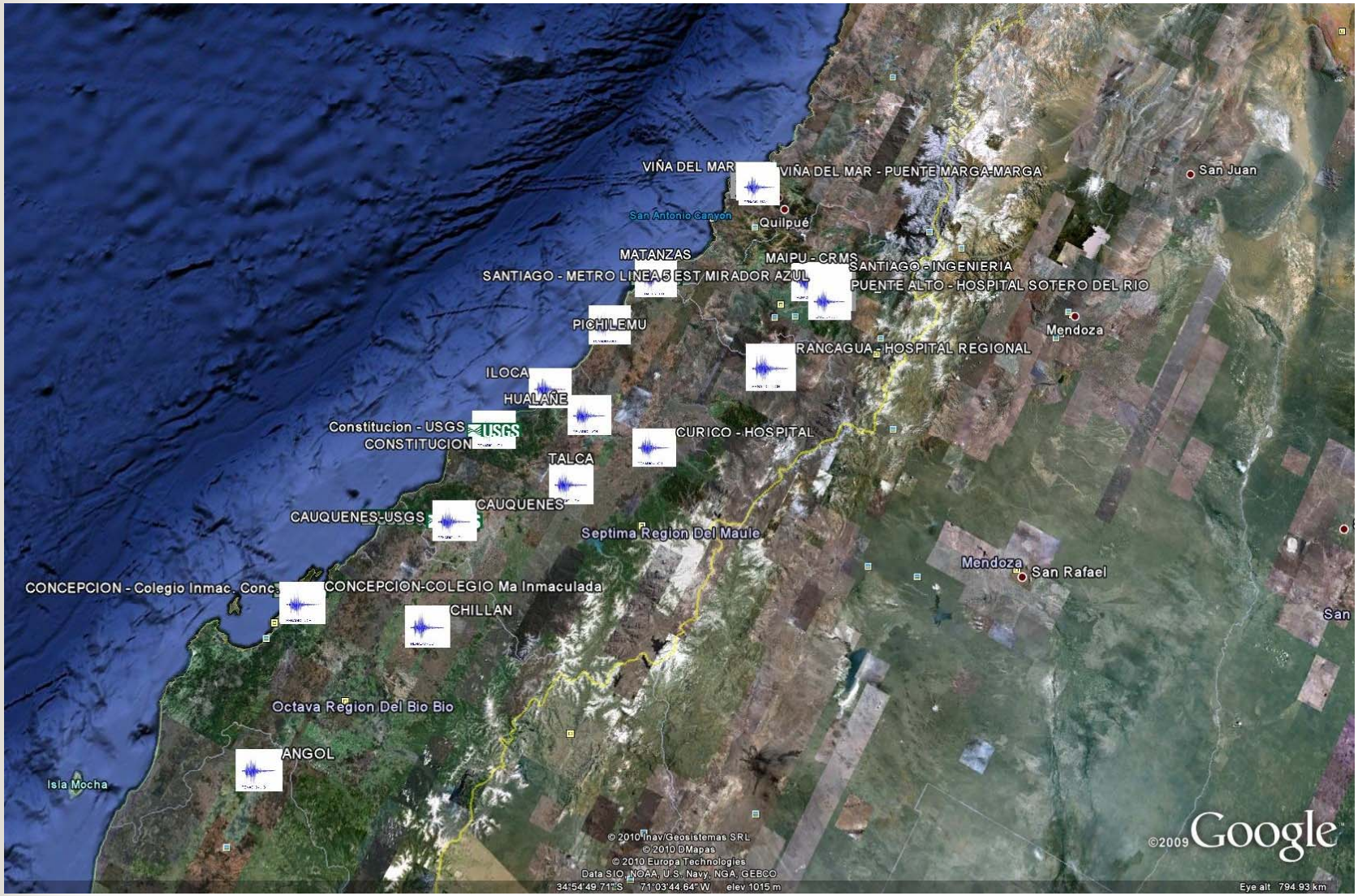
# Seismicity




http://neic.usgs.gov/neis/eq_depot/2010/eq_100227_tfan/neic_tfan_c.html

# Possible available ground motion records

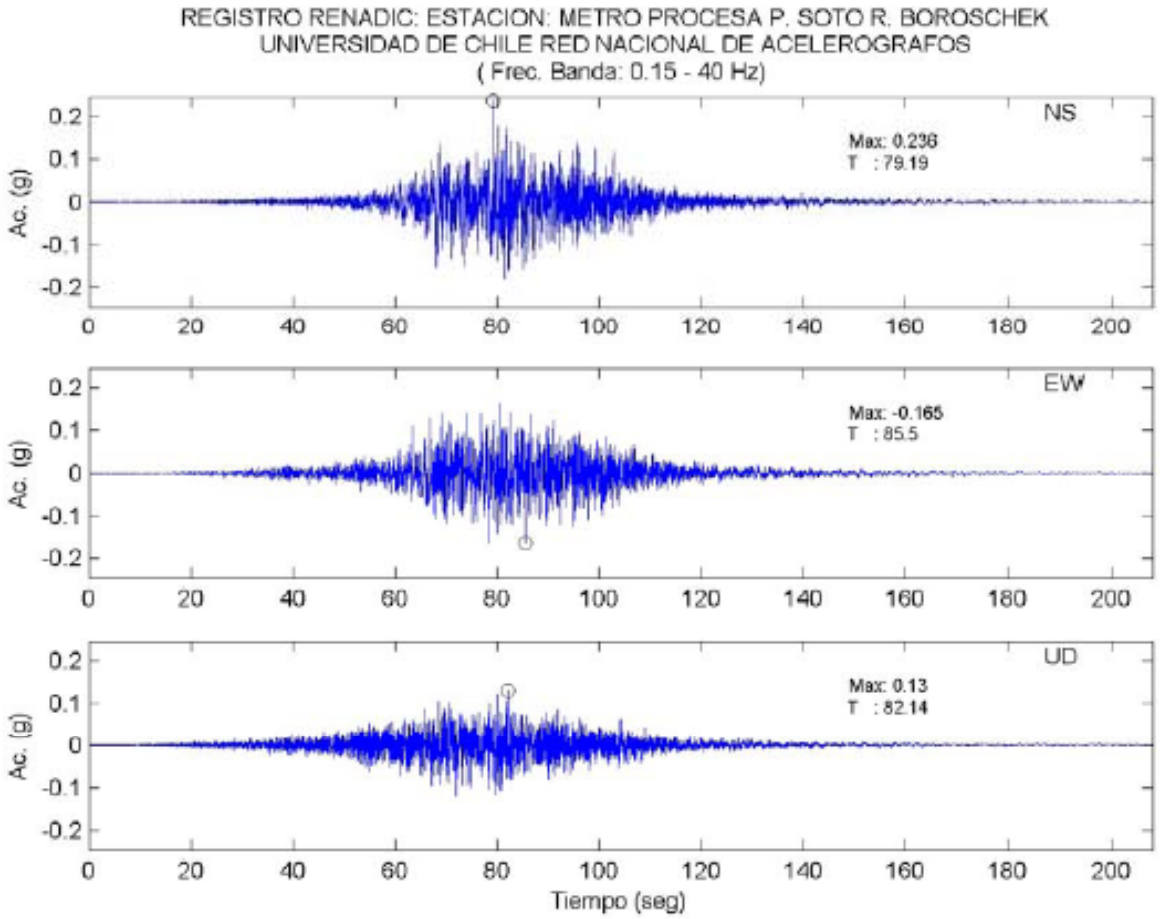


# Information from RENADIC

**Information based on preliminary report by Boroschek et al. (2010) using records from RENADIC.**

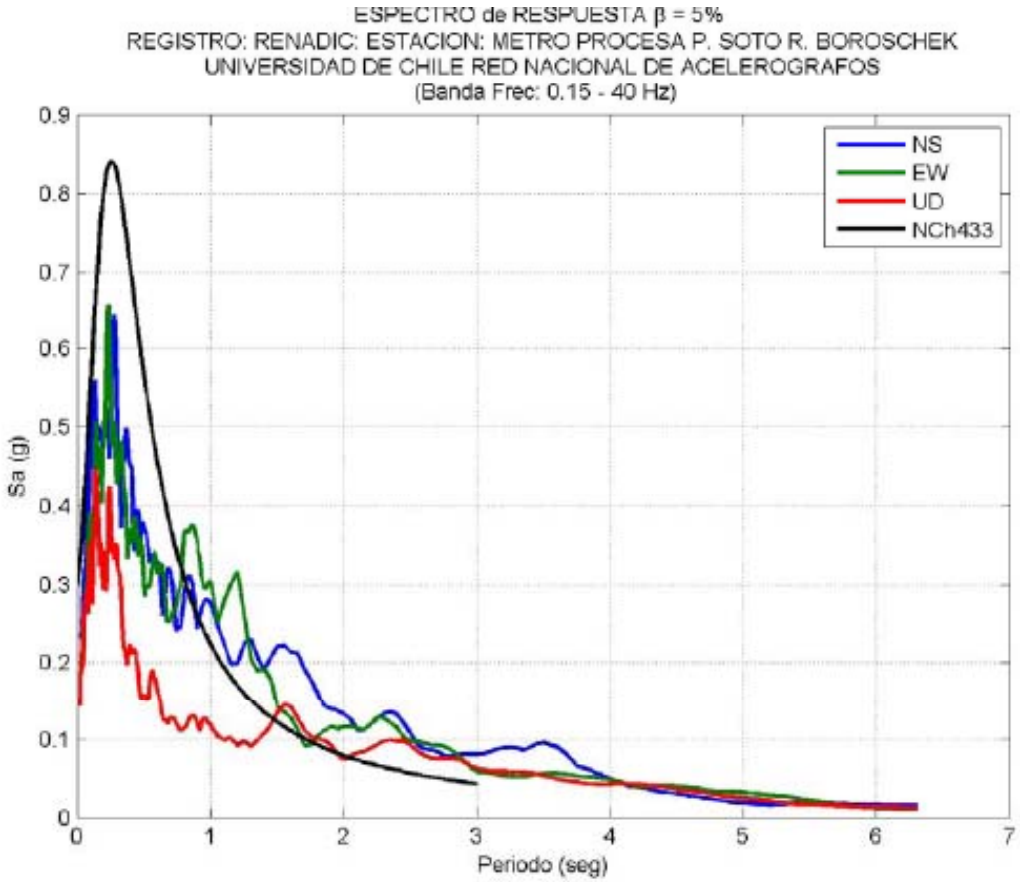
| Station | Peak horizontal ground acceleration (g) | Peak vertical ground acceleration (g) |
|---|---|---|
| Universidad de Chile, Dept. Ing. Civil (interior Edificio) Sandiago | 0.17 | 0.14 |
| Estacion Metro Mirador Santiago | 0.24 | 0.1 |
| CRS Maipu RM | 0.56 | 0.24 |
| Hosp. Tisner RM | 0.30 | 0.28 |
| Hosp. Sotero de Rio RM | 0.27 | 0.13 |
| Hosp. Curico | 0.47 | 0.20 |
| Hosp. Valdivia | 0.14 | 0.05 |
| Vina del Mar (Marga Marga) | 0.35 | 0.26 |
| Vina del Mar (Marga Marga) | 0.33 | 0.19 |

# Ground motion records at a station




**Ground motion records at Estacion Metro Mirador Santiago. Boroschek et al. (2010). Digital records is still not widely available.**

# Response Spectra




**Response Spectra for Estacion Metro Mirador Santiago (Boroschek et al. 2010).**

# Event reconnaissance & observations


**The first impression is that things are not extremely bad, at least, airport is open although the terminals are closed and a temporary tent and laptops are used by officers (March 8, 2010). Certainly, there is business interruption cost associated with it.**

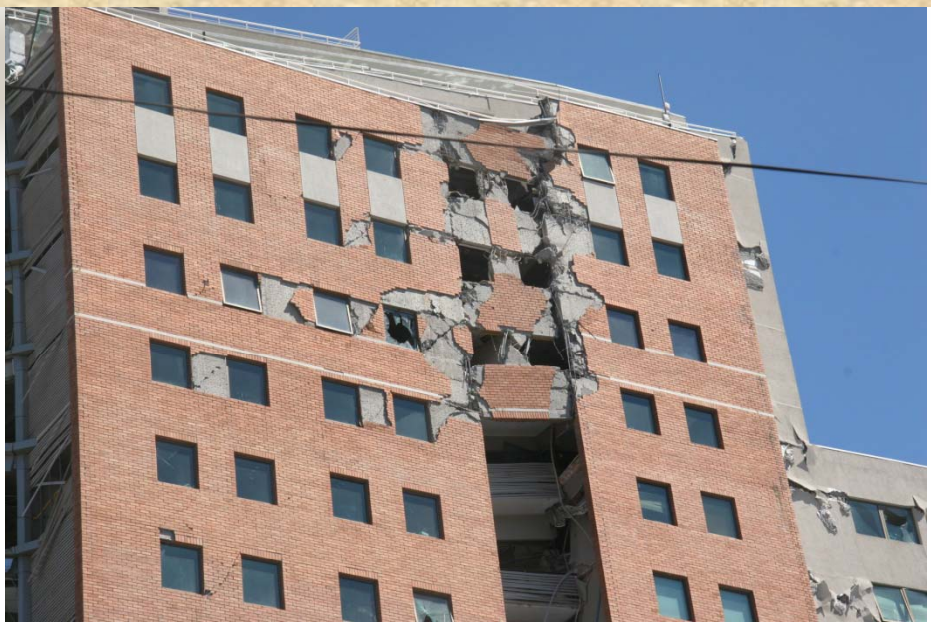
# Buildings

A building in Concepcion


PAZ

**A building in Concepcion:  Interstory collapse and will be demolished.**


VENTA OFICINA




VENTA OFICINAS


New Elegance

**Examples of buildings that survived this earthquake**

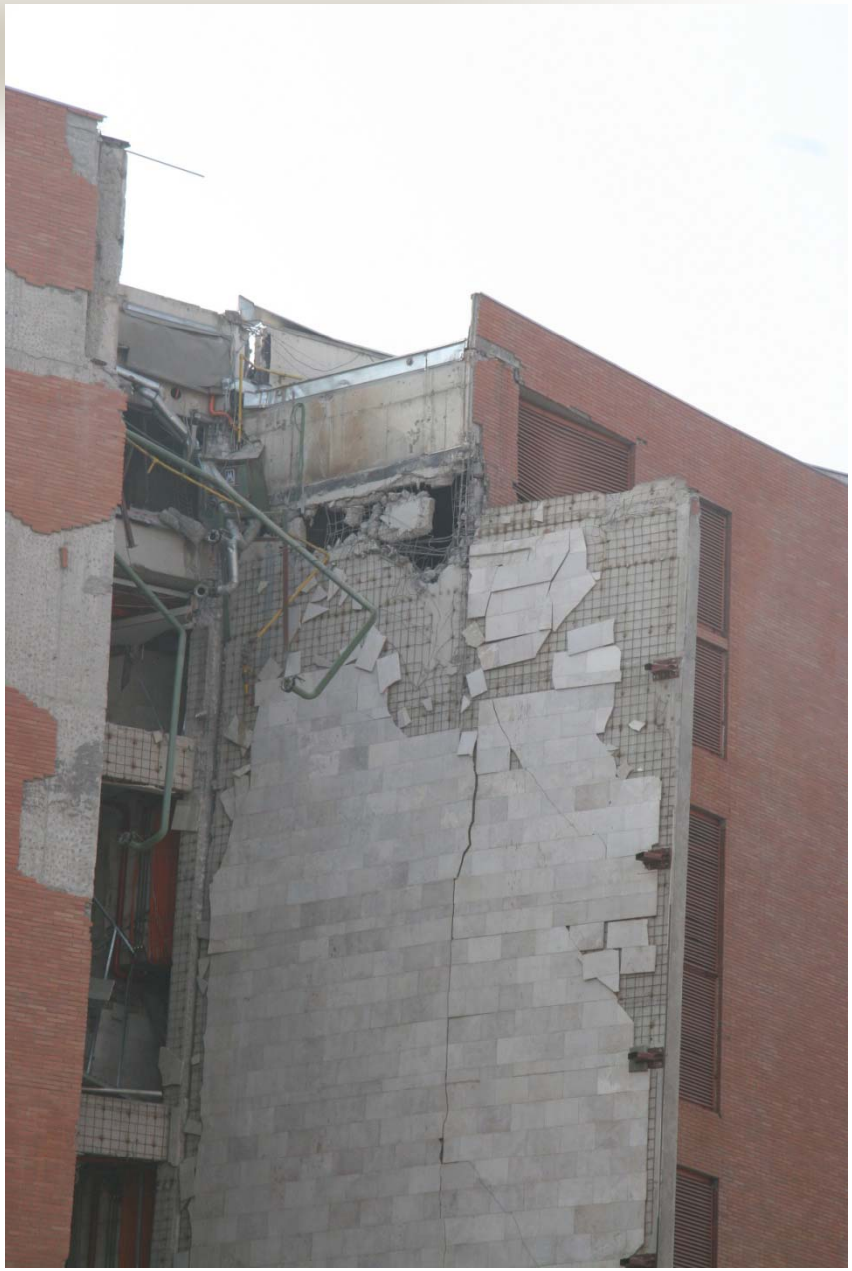


**Partial damage.  Possible consequences**


**A damaged building in Chillan**



**Twin buildings: the damage in one is more significant then the other Chillan)**



# Adobe constructions

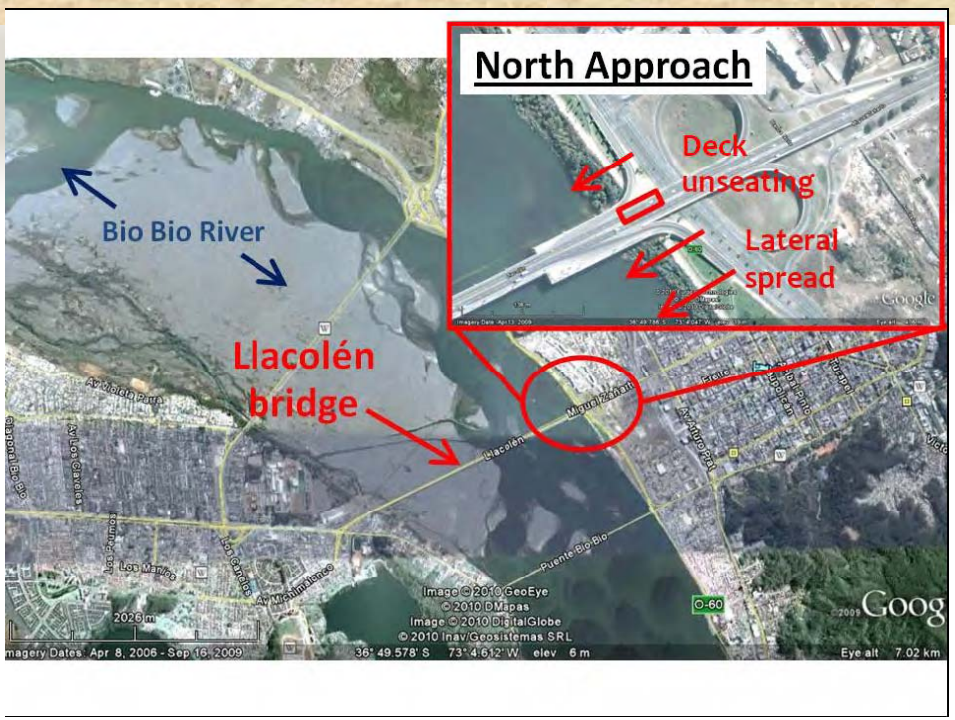


**A street view in Talco** →


"LOS MONITOS"
JUEGOS-ENTRETENCION
KA-2801

# Bridges

The Llacolén Bridge in Concepción was constructed in 2000. It supports four lanes traffic and pedestrian access to downtown Concepción)





The Llacolén bridge in Concepción (Report of the NSF Sponsored GEER Association Team, Edited by J. Bray and D. Frost

**Deck unseating at Llacolén bridge**

**This is a old bridge and it was not in service for several years.**

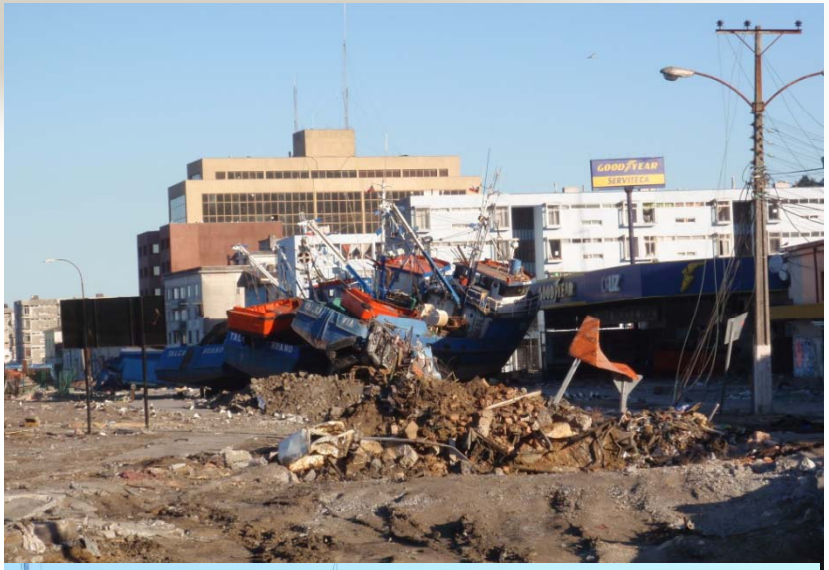

**Juan Pablo II bridge connects the cities of Concepción and San Pedro de la Paz. It opened to the public in 1974. "The bridge consists of 70 spans (L = 33 m, W = 21.9 m) each one composed of 7 reinforced concrete girders and a concrete slab. The segments sit on reinforced concrete bents with drilled pier Supports." (Report of the NSF Sponsored GEER Association Team, Edited by J. Bray and D. Frost**


TALCAHUANO
AEROPUERTO

**A damaged highway bridge**

**A damaged highway overpass**

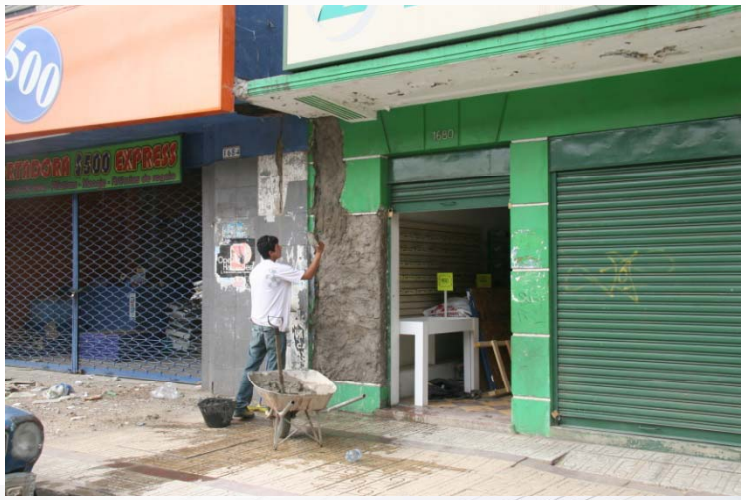
# Effect of tsunami


**in Talcahuano**

**In**
**Pelluhue**

# Some observed non-engineered repair



# Conclusions:

- Unreinforced adobe houses should not be used or strengthened in the seismic region to minimize the seismic vulnerability.
- Old and new structures can be vulnerable during an earthquake
- Emergency education and practice for natural disasters contributes to the safety of locals, but is not effective for visitors or tourists.
- The rush to non-engineered repair/retrofit should be highly discouraged, even though there is a need to restore normal life.