

February 27, 2010 Offshore Maule, Chile M8.8 Earthquake

OVERVIEW

On 27 February 2010 at 03:34:14 am local time, a magnitude 8.8 earthquake occurred at the boundary between the Nazca and South American tectonic plates approximately 2 miles off the Chilean coast at a depth of 21.7 miles. Tsunamis generated by the earthquake damaged coastal regions and triggered tsunami warnings across the Pacific. Fortunately, wave heights were minimal in Hawaii, Japan, and other areas around the Ring of Fire. As of 02 March 2010, over 700 deaths have been reported with over 2 million people displaced. Over 121 aftershocks of magnitude 5.0 or greater have been recorded. Global Risk Miyamoto has dispatched an engineering team to Chile to study the earthquake and assist clients in damage assessment and recovery. Field reports will be posted.

SEISMICITY AND EARTHQUAKE HISTORY

Chile has a history of very large earthquakes and is one of the most tectonically active regions in the world. The 1960 Chile earthquake measured at M9.5 is still the largest recorded modern earthquake on record. Most major Chilean earthquakes are thrust-faulting events on the interface between two major plates, with the Nazca plate subducting (moving down and landward) below the South American plate, causing the rise of the Andes mountain range. Subduction along the Peru-Chile Trench of the Nazca plate under the South American continent continues and is the cause of the many large earthquakes shown in Table 1. The two plates are converging at a rate of about three and a half inches per year. The February 27, 2010 M8.8 earthquake occurred along this same fault just north of the site of the 1960 M9.5 earthquake.

The United States has equivalent subduction zone regions along the Pacific Northwest and Alaska; which in 1964 had one of the largest

Upper right: USGS ShakeMap of the M8.8 earthquake, map of the area.
Middle right: Older unreinforced masonry bridge over Claro river near Camarico, Chile.
Lower left: A destroyed highway in Santiago, Chile, 200 miles from the epicenter.
Lower right: A collapsed building in Concepcion, Chile located 70 miles from the epicenter.

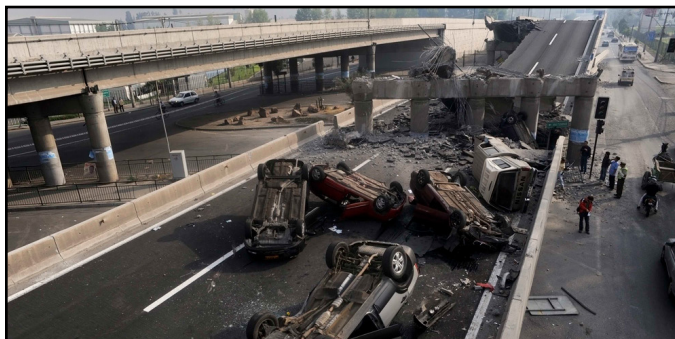
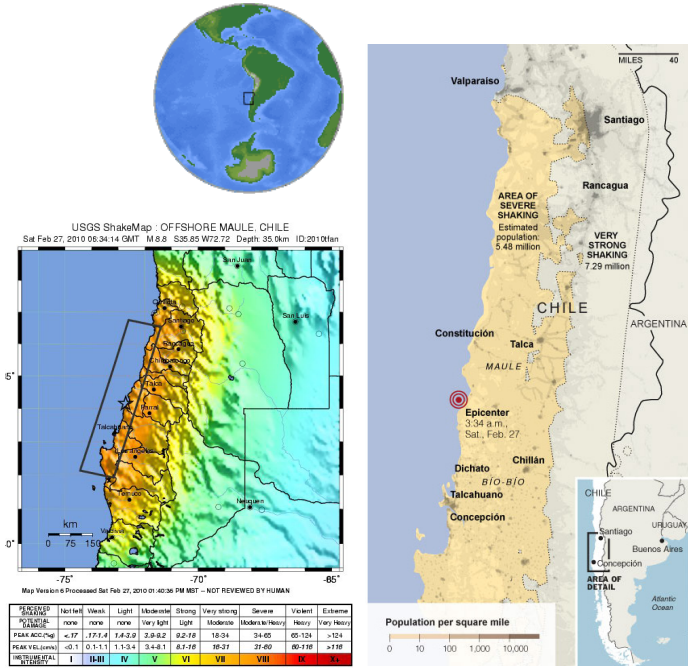


Table 1. Major Chilean Earthquakes

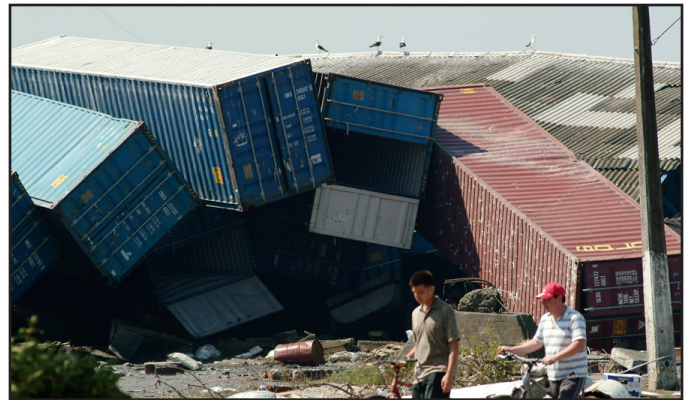
Event	Date	M	Death Toll
1570 Concepción earthquake	1570-02-08	8.3	
1575 Valdivia earthquake	1575-12-16	8.5	
1647 Santiago earthquake	1647-05-13	8.5	
1730 Valparaiso earthquake	1730-07-08	8.7	
1751 Concepción earthquake	1751-05-25	8.5	
1835 Concepción earthquake	1835-02-20	8.5	500
1868 Arica earthquake	1868-08-13	9.0	25,000
1877 Offshore Tarapaca earthquake	1877-05-10	8.3	34
1906 Valparaiso earthquake	1906-08-16	8.2	3,882
1922 Vallenar earthquake	1922-11-10	8.5	100
1928 Talca earthquake	1928-12-01	7.6	225
1939 Chillán earthquake	1939-01-25	7.8	28,000
1943 Coquimbo earthquake	1943-04-06	8.2	25
1949 Tierra del Fuego earthquake	1949-12-17	7.8	
1960 Valdivia earthquake	1960-05-22	9.5	1,655
1965 La Ligua earthquake	1965-03-28	7.4	400
1971 Valparaiso region earthquake	1971-07-09	7.5	90
1985 Offshore Valparaiso earthquake	1985-03-03	7.8	177
1987 Antofagasta earthquake	1987-03-05	7.3	
1995 Antofagasta earthquake	1995-07-30	8.0	3
1998 Near Coast of Northern Chile earthquake	1998-01-30	7.1	1
2005 Tarapacá earthquake	2005-06-13	7.8	11
2007 Antofagasta earthquake	2007-11-14	7.7	2
2010 Chile earthquake	2010-02-27	8.8	700+

earthquakes at M9.2. The Cascadia Subduction Zone, along the west coasts of Washington and Oregon, is also capable of generating very large earthquakes. These large earthquakes are concerns for the US because building stocks and infrastructure in those areas are not nearly as robust as those in Chile.

EARTHQUAKE ENGINEERING AND CODES

The earthquake was epicentered north of Concepcion and impacted a large 400 km area from Santiago to Temuco. Damage was extensive in older sections of Concepcion and Constitucion. Unreinforced masonry and non-ductile concrete buildings suffered heavy damage and some collapsed. Modern buildings performed well; which is consistent with our observations from the 1985 M8.0 Chile earthquake. This is because Chile has very high earthquake engineering standards and building codes that are equal to Japan and California. With the many large and frequent earthquakes, Chile is also one of the most earthquake prepared countries in the world.

Upper right: Shipping containers washed up by tsunami, Talcahuano Port, Chile.
Upper middle: Flooded area in Pelluhue, Chile, 200 miles southwest of Santiago, Chile.
Upper middle: Unreinforced masonry building damage in Talca, Chile.
Bottom: Collapsed bridge in Concepcion, Chile.



About Global Risk Miyamoto (GRM)

Global Risk Miyamoto was formed specifically to provide the risk management community with accurately quantified site-specific risk identification and loss expectancies resulting from natural hazard perils such as earthquakes, windstorms, hurricanes, typhoons, and floods.

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