

40 Years of Digital Recording at the Albuquerque Seismological Laboratory

The following supplement describes some of the notable earthquakes from the past 40 years that are flagged on the ASL 50th anniversary data poster. The notes are abridged from earthquake summaries presented on the USGS website, at <http://earthquake.usgs.gov/earthquakes/world/historical.php>.

Tangshan, China, 1976 July 27, Magnitude 7.5

This earthquake occurred in the northeastern part of China, near the coast. The epicenter was centered about 140 kilometers southeast of Beijing, in the vicinity of Tangshan. The first earthquake, magnitude 7.5, was followed by a major aftershock 15 hours later. According to official sources, the two earthquakes killed over 240,000 people, although some estimates of the death toll are as high as 655,000. Over 799,000 people were injured. Aftershocks in the 5.0-5.5 range continued after the main shock. Damage extended as far as Beijing. This is probably the greatest death toll from an earthquake in the last four centuries, and the second greatest in recorded history.

Southeast Alaska, 1979 February 28, Magnitude 7.5

This major earthquake was located about 50 kilometers northwest of Mt. St. Elias, near the east end of the Chugach Mountains. It affected the area only slightly because it centered in an unpopulated area of ice fields. Seven major earthquakes have been located in the region between Controller Bay and northern Chichagof Island in southeast Alaska from 1899 to 1979, three of which were of magnitude 8 or larger.

Michoacan, Mexico, 1985 September 19, Magnitude 8.0

At least 9,500 people were killed, about 30,000 were injured, more than 100,000 people were left homeless, and severe damage was caused in parts of Mexico City and in several states of central Mexico. According to some sources, the death toll from this earthquake may be as high as 35,000. It is estimated that the quake seriously affected an area of approximately 825,000 square kilometers, caused between 3 and 4 billion U.S. dollars of damage, and was felt by almost 20 million people. Over 3500 buildings were destroyed or seriously damaged in Mexico City alone, and a large percentage of these buildings were between 8 and 18 stories high, indicating possible resonance effects with dominant two-second period horizontal ground accelerations which were recorded in the area.

Spitak, Armenia, 1988 December 07, Magnitude 6.8

Two events about 3 seconds apart. At least 25,000 people killed, 19,000 injured and 500,000 homeless in the Leninakan-Spitak-Kirovakan area of northern Armenia, USSR. More than 20 towns and 342 villages were affected and 58 of them were completely destroyed. Damage totaled 16.2 billion U.S. dollars.

Santa Cruz Mountains (Loma Prieta), California, 1989 October 18, Magnitude 6.9

This major earthquake caused 63 deaths, 3,757 injuries, and an estimated \$6 billion in property damage. It was the largest earthquake to occur on the San Andreas Fault since the great San Francisco earthquake in April 1906. The most severe property damage occurred in Oakland and San Francisco, about 100 kilometer north of the fault segment that slipped on the San Andreas. MM intensity IX was assigned to San Francisco's Marina District, where several houses collapsed, and to four areas in Oakland and San Francisco, where reinforced-concrete viaducts collapsed: Nimitz Freeway (Interstate 880) in Oakland, and Embarcadero Freeway, Highway 101, and Interstate 280 in San Francisco. Communities sustaining heavy damage in the epicentral area included Los Gatos, Santa Cruz, and Watsonville.

Landers and Big Bear, California, 1992 June 28, Magnitudes 7.3 and 6.5

Landers, California: One person was killed at Yucca Valley, two people died of heart attacks, more than 400 people were injured and substantial damage occurred in the Landers - Yucca Valley area. Preliminary estimate of damage for this earthquake plus the following magnitude 6.5 event at 15:05 UTC is 92 million US dollars. Felt throughout southern California, southern Nevada, western Arizona and southern Utah. Felt in high-rise buildings as far north as Boise, Idaho, and as far east as Albuquerque, New Mexico, and Denver, Colorado.

Big Bear, California: A major aftershock, the Big Bear earthquake claimed no lives but caused substantial damage and landslides in the Big Bear Lake and Big Bear City areas. Maximum intensity VIII. Felt throughout much of southern California and in parts of southern Nevada and western Arizona.

Kobe, Japan, 1995 January 16, Magnitude 6.9

Five thousand five hundred two people confirmed killed, 36,896 injured and extensive damage (VII JMA) in the Kobe area and on Awaji-shima. Over 90 percent of the casualties occurred along the southern coast of Honshu between Kobe and Nishinomiya. A landslide at Nishinomiya killed at least 28 people. About 310,000 people were evacuated to temporary shelters. Over 200,000 buildings were damaged or destroyed. Numerous fires, gas and water main breaks and power outages occurred in the epicentral area.

Izmit, Turkey, 1999 August 17, Magnitude 7.6

At least 17,118 people killed, nearly 50,000 injured, thousands missing, about 500,000 people homeless and estimated 3 to 6.5 billion U.S. dollars damage in Istanbul, Kocaeli and Sakarya Provinces. Felt as far east as Ankara. Felt (III) at Anapa, Russia; Chisinau, Moldova; Simferopol and on the south coast of Crimea, Ukraine.

Sumatra, Indonesia, 2004 December 26, Magnitude 9.1

This is the third largest earthquake in the world since 1900 and is the largest since the 1964 Prince William Sound, Alaska earthquake. In total, 227,898 people were killed or were missing and presumed dead and about 1.7 million people were displaced by the earthquake and subsequent tsunami in 14 countries in South Asia and East Africa. The tsunami caused more casualties than any other in recorded history and was recorded nearly worldwide on tide gauges in the Indian, Pacific and Atlantic Oceans. Seiches were observed in India and the United States. Subsidence and landslides were observed in Sumatra.

Sumatra, Indonesia, 2005 March 28, Magnitude 8.6

At least 1000 people killed, 300 injured and 300 buildings destroyed on Nias; 100 people killed, many injured and several buildings damaged on Simeulue; 200 people killed in Kepulauan Banyak; 3 people killed, 40 injured and some damage in the Meulaboh area, Sumatra. A 3-meter tsunami damaged the port and airport on Simeulue. Tsunami run-up heights as high as 2 meters were observed on the west coast of Nias and 1 meter at Singkil and Meulaboh, Sumatra.

Sumatra, Indonesia, 2007 September 12, Magnitude 8.5

At least 25 people killed, 161 injured, 52,522 buildings damaged or destroyed and roads damaged in Bengkulu and Sumatera Barat. A tsunami with a wave height of 90 cm was measured at Padang. Power and telephone outages occurred. Felt by people in high-rise buildings at Jakarta and in Malaysia, Singapore and Thailand.

Port-au-Prince, Haiti, 2010 January 12, Magnitude 7

Casualty estimates vary but perhaps as high as 316,000 killed and 300,000 injured, 1.3 million displaced, 97,294 houses destroyed and 188,383 damaged in the Port-au-Prince area and in much of southern Haiti. This includes at least 4 people killed by a local tsunami in the Petit Paradis area near Leogane. Tsunami waves were also reported at Jacmel, Les Cayes, Petit Goave, Leogane, Luly and Anse a Galets. The tsunami had recorded wave heights (peak-to-trough) of 12 cm at Santo Domingo, Dominican Republic and 2 cm at Christiansted, US Virgin Islands. Felt in parts of The Bahamas, Puerto Rico and the US Virgin Islands and as far as southern Florida, northern Colombia and northwestern Venezuela.

Offshore Bio-Bio, Chile, 2010 February 27, Magnitude 8.8

At least 523 people killed, 24 missing, about 12,000 injured, 800,000 displaced and at least 370,000 houses, 4,013 schools, 79 hospitals and 4,200 boats damaged or destroyed by the earthquake and tsunami in the Valparaiso-Concepcion-Temuco area. At least 1.8 million people affected in Araucania, Bio-Bio, Maule, O'Higgins, Region Metropolitana and Valparaiso. The total economic loss in Chile was estimated at 30 billion US dollars. Electricity, telecommunications, and water supplies were disrupted and the airports at Concepcion and Santiago had minor damage. The tsunami damaged or destroyed many buildings and roads at Concepcion, Constitucion, Dichato and Pichilemu and also damaged boats and a dock in the San Diego area, USA.

Tohoku, Japan, 2011 March 11, Magnitude 9

At least 15,703 people killed, 4,647 missing, 5,314 injured, 130,927 displaced and at least 332,395 buildings, 2,126 roads, 56 bridges and 26 railways destroyed or damaged by the earthquake and tsunami along the entire east coast of Honshu from Chiba to Aomori. The majority of casualties and damage occurred in Iwate, Miyagi and Fukushima from a Pacific-wide tsunami with a maximum run-up height of 37.88 m at Miyako. The total economic loss in Japan was estimated at 309 billion US dollars. One person killed and several houses destroyed at Jayapura, Indonesia by a tsunami with a wave height of 2 m. One person killed south of Crescent City, California and several boats and docks destroyed or damaged at Crescent City by a tsunami with a recorded wave height of 247 cm. Several houses, boats and docks destroyed or damaged at Santa Cruz, California; Brookings, Oregon; Hale'iwa, Kailua Kona and Kealahou, Hawaii. Some buildings damaged slightly in the Galapagos Islands, Ecuador by a tsunami with a recorded wave height of 208 cm at Santa Cruz. Several houses destroyed at Pisco, Peru.