

MAY 22, 1960 SOUTHERN CHILE EARTHQUAKE AND TSUNAMI

Updated: March, 2015

On May 22, 1960 a great Mw 9.5 earthquake, the largest earthquake ever instrumentally recorded, occurred off the coast of southern Chile. This earthquake generated a tsunami that was destructive not only along the coast of Chile, but also across the Pacific in Hawaii, Japan, and the Philippines. The earthquake was preceded by four important foreshocks, including a Mw 8.2 on May 21 that caused severe damage in the Concepción area and generated a small tsunami. Many aftershocks followed, with five of magnitude 7.0 or greater through November 1. The rupture zone was estimated to be about 1,000 km from Lebu to Puerto Aysen. The number of fatalities in Chile associated with both the earthquake and tsunami has been estimated to be between 490 and 5,700. The Chilean government estimated 2 million people were left homeless and the damage was USD \$550 million. In Hawaii, the tsunami caused 61 deaths, 43 injuries, and USD \$23.5 million in damage. Additional damage of USD \$1 million, 2 deaths, and 4 injuries resulted on the U.S. west coast from 1-2 m waves. The tsunami hit the Pacific coast of Japan almost a day after the earthquake causing 139 deaths and destroying or washing away almost 3,000 houses in the Hokkaido, Aomori, Iwate, and Fukushima Prefectures. Waves observed in Japan were higher than other adjacent regions nearer to the source due to the directivity of tsunami wave radiation. At least 21 people died in the Philippines due to the tsunami.

This is the largest earthquake ever instrumentally recorded and the global extent of this tsunami led to the creation of the International Tsunami Warning System of the Pacific (ITSU) in 1965.

MAY 22, 1960 EYEWITNESS AND INSTRUMENTAL RECORDINGS

Field survey results indicate the highest runup height was 25 meters (tide removed) on Isla Mocha, Chile. Runup is the difference between the elevation of maximum tsunami penetration (inundation line) and the sea level at the time of the tsunami. Waves over 10 meters were observed at locations in Hawaii and between 5-10 meters in New Zealand, Japan, Hawaii, and Russia. The tsunami was also recorded on tide gauges in the Atlantic Ocean (England, Bermuda, South Africa) and in the Indian Ocean (Mauritius, west coast of Australia), making this the first global tsunami.

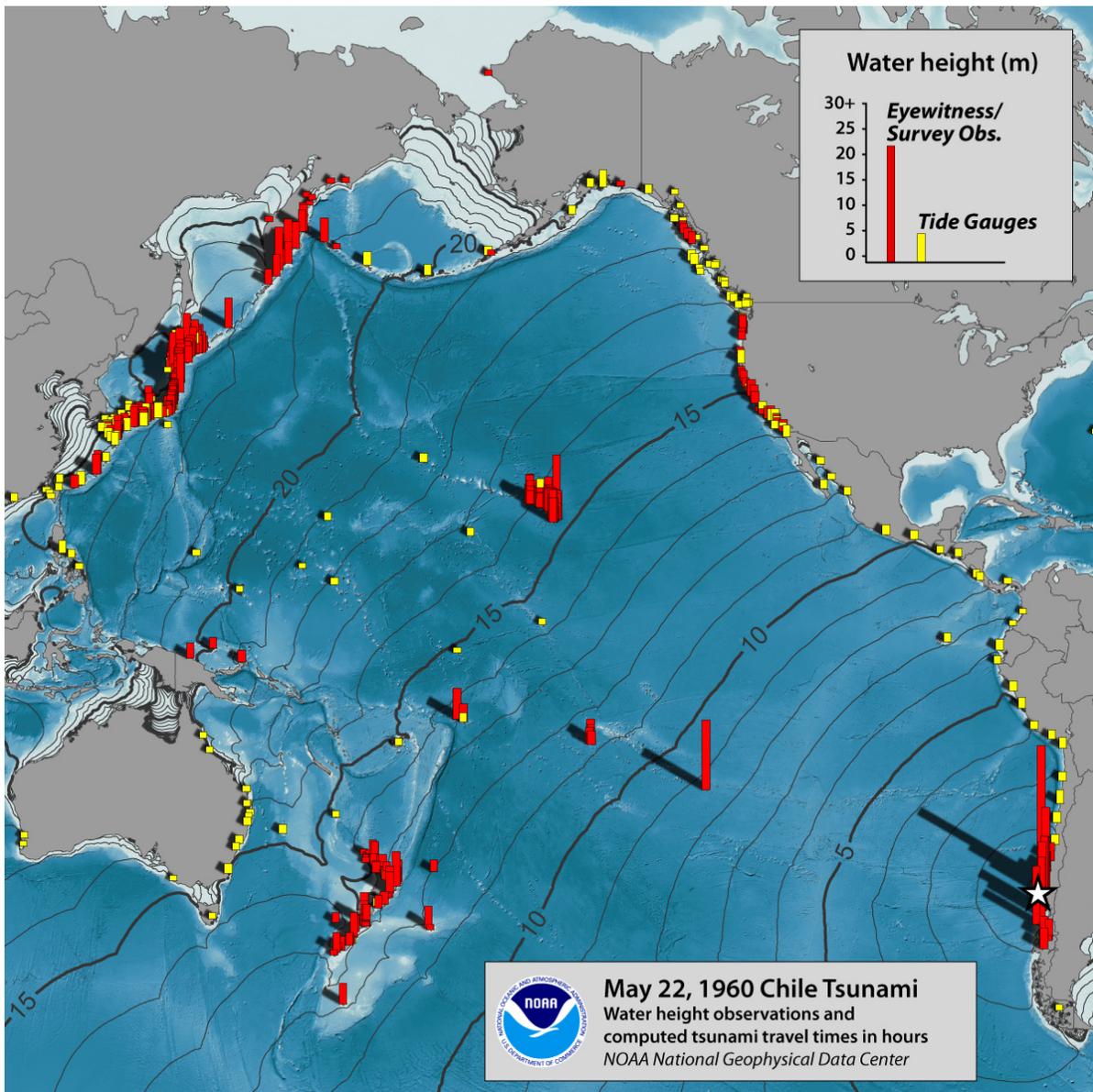
HISTORICAL EARTHQUAKES AND TSUNAMIS IN CHILE

Listed below are significant Chilean earthquakes and tsunamis:

- 1570 Concepcion, Chile earthquake generated a tsunami that caused over **2,000 deaths**
- 1575 Valdivia, Chile earthquake caused **1,200 deaths** and generated a tsunami that caused **100 deaths**
- 1647 Santiago, Chile earthquake caused over **1,000 deaths**
- 1868 Arica, Chile earthquake and tsunami caused **25,000 deaths**
- 1877 Iquique, Chile earthquake caused **64 deaths** and generated a tsunami that caused **2,477 deaths**
- 1906 Valparaiso, Chile earthquake caused **4,000 deaths** and generated a non-fatal tsunami
- 1939 Chillan, Chile earthquake caused over **30,000 deaths** in Chillan and Concepcion
- 2010 Maule, Chile earthquake and tsunami caused over **500 deaths**

* Data are collected from the US NOAA National Weather Service Tsunami Warning Centers, the US Geological Survey National Earthquake Information Center, the US NOAA National Data Buoy Center, IOC/UNESCO, International Tsunami Survey Teams, and news organizations. Refer to the NGDC event page for data and their sources (http://ngdc.noaa.gov/hazard/tsu_db.shtml). For more information on this event please see http://www.ngdc.noaa.gov/hazard/honshu_11mar2011.shtml.

† A validity score or confidence designation is assigned to each tsunami event ranging from -1 for erroneous entries to 4 for definite or confirmed tsunamis.



May 22, 1960 tsunami water heights from eyewitness accounts, field surveys, and tide gauges. Overlain are tsunami travel times plotted at 1-hour intervals (black lines) using the earthquake epicenter (star) as a point source. The maximum runup was 25 m at Isla Mocha, Chile. (Credit: J. Varner, NGDC)



View taken from a cliff on the Gulf of Corral near Valdivia, Chile, shows the second wave which is about 8 m high breaking on shore. (Credit: L. Bernucci, NGDC)



Aerial view of Valdivia, Chile, inundated by the 1960 tsunami. Valdivia and the surrounding area were the hardest hit by the 1960 earthquake and tsunami. (Credit: National Museum of History, Chile)