Chile earthquake

Nature of the earthquake

Origin and explanation of the strength

The strength of the earthquake on 27 February 2010 was 8. 8 on Richter's scale.

The quake hit 325 kilometers southwest of the capital, Santiago, at a depth of 35 kilometers at 3: 34 a. m., the U. S. Geological Survey reported that.

The epicenter was just 115 kilometers from Concepcion, Chile's second-largest city, where more than 200. 000 people live along the Bio Bio river.

The Northern two-thirds of Chile lie on top of the Nazca Plate, which, moving eastward about 10 centimeters a year, is making its way under the continental plate of South America. This movement resulted in the formation of the Peru-Chile Trench, which lies beyond a narrow band of coastal waters off the northern two-thirds of the country. The trench is about 150 kilometers wide and has averages about 5000 meters deep.

The same displacements that created the Peru-Chile Trench make the country highly prone to earthquakes. During the 20th century, Chile has been struck by 28 major earthquakes, all with a force greater than 6. 9 on Richter's scale. The strongest of these occurred in 1906 (8. 4 on the Richter scale) and in 1960 (8. 75). This last one caused a tidal wave that hit several fishing villages in the south and raised or lowered sections of the coast as much as two meters. The collision between the earth's surface plates has also generated the Andes, that, in Chilean territory alone, includes about 620 volcanoes, and many of them are active. Almost 60 of these had erupted in

the 20th century by the early 1990s. More than half of Chile’s land surface has a volcanic origin.

The region of the Chile Trench along the west coast of South America between about 45° 40′ S and 47° S is the site of a collision between the actively-spreading Chile Ridge and the Chile Trench subduction zone. The Chile triple junction region is one of only two active examples of a trench collision at the moment, an event that has occurred a lot around the convergent margins of the Pacific Ocean. Scientific investigations of the active Chile triple junction region can provide important observations that will improve our understanding of these important plate tectonic phenomenon’s, especially insights into past processes that may influence the present geological development and also influence the earthquake risk of coastal California.

Several researches have been going on in the region of Chile and the triple junction in the last decade, including a detailed SEABEAM swath bathymetric and seismic reflection survey led by several research cruises have been conducted in the region of the Chile’s margin triple junction in the last decade.

So the earthquakes are always pretty strong because Chile is located at e triple junction of three plates. This makes the surface vibrate more than when it is located at the boundary of 2 plates.

History of earthquakes

Chance of earthquakes in that region

The largest earthquake ever recorded was in Chile on May 22, 1960, with a magnitude of 9. 5 on Richter's scale and killed 1655 people and left 2 million people homeless. The tsunami that it caused killed people in Hawaii, Japan and the Philippines and caused damage to the west coast of the United States. The Chile triple junction margin is the only presently active ridge-trench collision where the overriding plate is composed of continental lithosphere. It provides the best, and only, active modern example of the geological results of ridge subduction along continental margins. This process has seriously affected the geology of Tertiary western North America. The detailed relationships between plate motions and continental margin geology can be effectively studied here. The reconstructions that they make while studying those relationships show that the Chile Ridge first collided with the Chile trench about 14 million years ago near the latitude of Tiera del Fuego. A long ridge part was subducted between Tiera del Fuego and the Golfo de Penas between about 10 and 14 million years ago. Another part was subducted adjacent to the Golfo de Penas about 6 million years ago and a short ridge part was subducted to the Taitao Peninsula about 3 million years ago. The relative plate motion vectors change considerably following the passage of the triple junction along the margin.

Prior to the ridge collision the Nazca plate was being subducted at a fast rate, about 8 cm/year for the past 3 million year and about 13cm/year for the late Miocene, in a slightly north-east direction. Following the passage of the triple junction, the Antarctic plate is subducted at a much slower rate, about

2 cm a year slightly south-east. New SEABEAM date accurately delineate the present-day geometry and location of ridge/trench collision. North is the Nazca plate being subducted beneath the South American plate, south the Antarctic plate is subducted beneath South America. The Nazca/Antarctic plate boundary is comprised of the Chile Ridge spreading center, which intersects the Chile Trench, forming a ridge-trench-trench triple junction. The ridge is spreading and moves nearly parallel to the trench, resulting in a ridge-trench collision. While the fracture zones associated with the Chile Ridge spreading system trend within about 20° of perpendicular to the trench. The triple junction region appears to be the origin of the great 1960 Chile earthquake with 9. 1 at Richter's scale.

Southern part of Chile

People thought that the Cascadia margin of offshore Oregon and Washington has the potential for a great earthquake based on similarities to strongly coupled subduction zones. Contributing to this conclusion are the observations that both margins have sediment filled trenches and both are subducting young crust. However, it is not clear how similar the two margins really are and what parameters are critical for comparing the margins. Thus, in order to realistically compare southern Chile with Cascadia it is necessary to learn a lot more about the southern Chile margin.

Three Stages in Ridge Subduction

The section of the Chile Ridge between the Darwin and Taitao fracture zones is currently passing beneath the landward trench slope.

The SEABEAM picture provides a more detailed picture of the interaction between the ridge and the trench. On the SEABEAM map we can follow the ridge axis from the Darwin fracture zone at 45ø 52’S south to 46ø 08’S. Along this part of the ridge, the axis is characterized by lots of small volcanoes and by an axial magnetic high. On the seaward side of the axis there are a linear sequence of rift valley walls. Based on these pictures/measurements, we can say that the spreading is occurring in a fairly normal manner. In a schematic diagram of the collision zone, we refer to this portion of the ridge and trench slope as the “ pre-contact zone.”

A small summary

The Triple Junction margin of Chile is the best modern example of the subduction of an active spreading ridge at a continental subduction zone. Thus it is as close as the modern world offers to what happened along the west coast of North America over the last 20 million years. The geologic effect of ridge subduction can easily be studied in Southern Chile because they are still occurring there. When you compare it to California you don’t have to look trough many million years of subsequent geologic events to identify the effects of the ridge subduction. Because ridge subduction represents a large change in the thermal structure of the continental margin, it has lasting effects on the structure of the crust where it has taken place. These changes might influence such important modern phenomena as earthquake seismicity.

The ring of Fire (also very nice song of Johnny Cash)

The Pacific Ring of Fire is an area where large numbers of earthquakes and volcanic eruptions occur in the basin of the Pacific Ocean. About 90% of the world's earthquakes and 80% of the world's largest earthquakes occur along the Ring of Fire. The Ring is a direct result of plate tectonics and the movement and collisions of plates. The eastern section of the ring is the result of the Nazca Plate and the Cocos Plate being subducted beneath the westward moving South American Plate.

On this site you can see that there are lots of earthquakes in that region and you can see that they have always at least a magnitude from 7 Ms. More info about this table later on.

Why yes/no a chance to tsunamis with the earthquake?

Here you see a list with all the earthquakes from Chile from 1570 until now. They indicate with a T if there was e tsunami and also if it was e destructive or a major one.

Because the Ring of Fire follows the coastlines of the Pacific Ocean, almost any large earthquake can also produce a tsunami, a powerful wave that travels from the epicenter across the ocean basin. That's what happened in 2004, when a 9. 3-magnitude earthquake caused a destroying Tsunami to the Indonesian island of Sumatra. That's what is likely to happen following today's 8. 8 magnitude earthquakes off the coast of Chile.

Sources

- http://www. huffingtonpost. com/2010/02/27/chile-earthquake-83-magni_n_479294. html
- http://earthquake. usgs. gov/earthquakes/world/index. php? region= Chile (very very good site!)
- http://ssn. dgf. uchile. cl/home/terrem. html

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