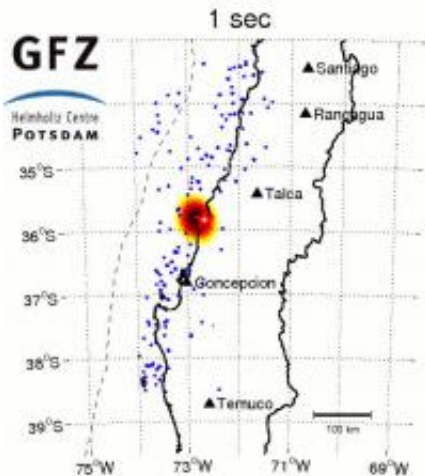


Earthquake in Chile -- a complicated fracture

March 9 2010



Rupture Propagation

The extremely strong earthquake in Chile on 27 February this year was a complicated rupture process, as scientists from the GFZ German Research Centre for Geosciences found out. Quakes with such magnitude virtually penetrate the entire Earth's crust. After closer analysis of the seismic waves radiated by this earthquake during the first 134 seconds after start of the rupture, the researchers came to the conclusion that only the region around the actual epicentre was active during the first minutes. In the second minute the active zone moved north towards Santiago. After that the region south of Concepción became active for a short time. This rupturing trend agrees well with the distribution of the aftershocks during the following three days, as observed by the GEOFON-measuring network of the GFZ up to

03.03.2010.

In the year 1960, the strongest earthquake measured at all to date, with a magnitude of $M=9.5$, had its origin at Valdivia, south of the region affected now. "The quake of 27 February connects directly to the rupture process of Valdivia", explains Professor Jochen Zschau, Director of the Section "Earthquake Risk and Early Warning" at the GFZ. "With this, one of the last two seismic gaps along the west coast of South America might now be closed. With the exception of one last section, found in North Chile, the entire earth crust before the west coast of South America has been ruptured within the last 150 years."

The underlying plate tectonic procedure is such that the Nazca-Plate as part of the Pacific Ocean Floor moves eastwards with approximately seventy millimetres per year, collides with South America and thereby pushes under the continent. The hereby developing earthquakes belong to the strongest world-wide. In the course of about one century, the Earth's ruptures completely in a number of strong quakes from Patagonia in the South to Panama in the North. Even Darwin reported, in his diary, of the strong earthquake in Concepción on 20 February 1835 and the resulting Tsunami.

In order to examine the aftershock activity in the now fractured seismic gap, scientists from the GFZ are travelling to Chile on March 13, 2010 where, together with the Chilean Seismological Service, they will set-up a seismological-geodetic network in the area of Concepción-Santiago. Partners from Germany (IFM Geomar, Kiel; Free University of Berlin) and from abroad (Institut de Physique du Globe, Paris; University of Liverpool; United States Geological Survey; IRIS) are also taking part in this measuring campaign. The mission will last about three months. The results, one expects, will be able to provide an insight into the mechanisms of the fracture in the Earth's crust. This activity is financed on the German side by the GFZ.

Scientists from the GFZ have been examining the collision of the Nazca plate and the South American continent since 1994. As a result of numerous expeditions and measuring campaigns in this area this Potsdam Helmholtz Centre avails of the probably the most dense data record on such a subduction zone. "Within the framework of the DFG Priority Programme "Deformation processes in the Andes", and with the Geotechnology Project TIPTEQ we have just been able to collect a unique data record for the southern part of the Andes" says Professor Onno Oncken, Director of the Department Geodynamics and Geomaterials at the GFZ, and leader of these studies. The current [quake](#) puts us in the position to precisely compare the tectonics before and afterwards, a unique situation both internationally and in [Earth](#) science.

Currently, the GFZ operates a so-called Plate Boundary Observatory PBO in the north of Chile, exactly in the last remaining seismic gap in Chile. This observatory will be handed over to Chilean colleagues by the Chairman of the Board of the GFZ, Professor Reinhard Huettl, within the framework of the cooperation with the [Earthquake](#) Service of [Chile](#) during a festive event on 15 March.

Provided by Helmholtz Association of German Research Centres

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