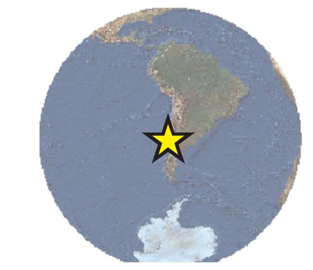
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP

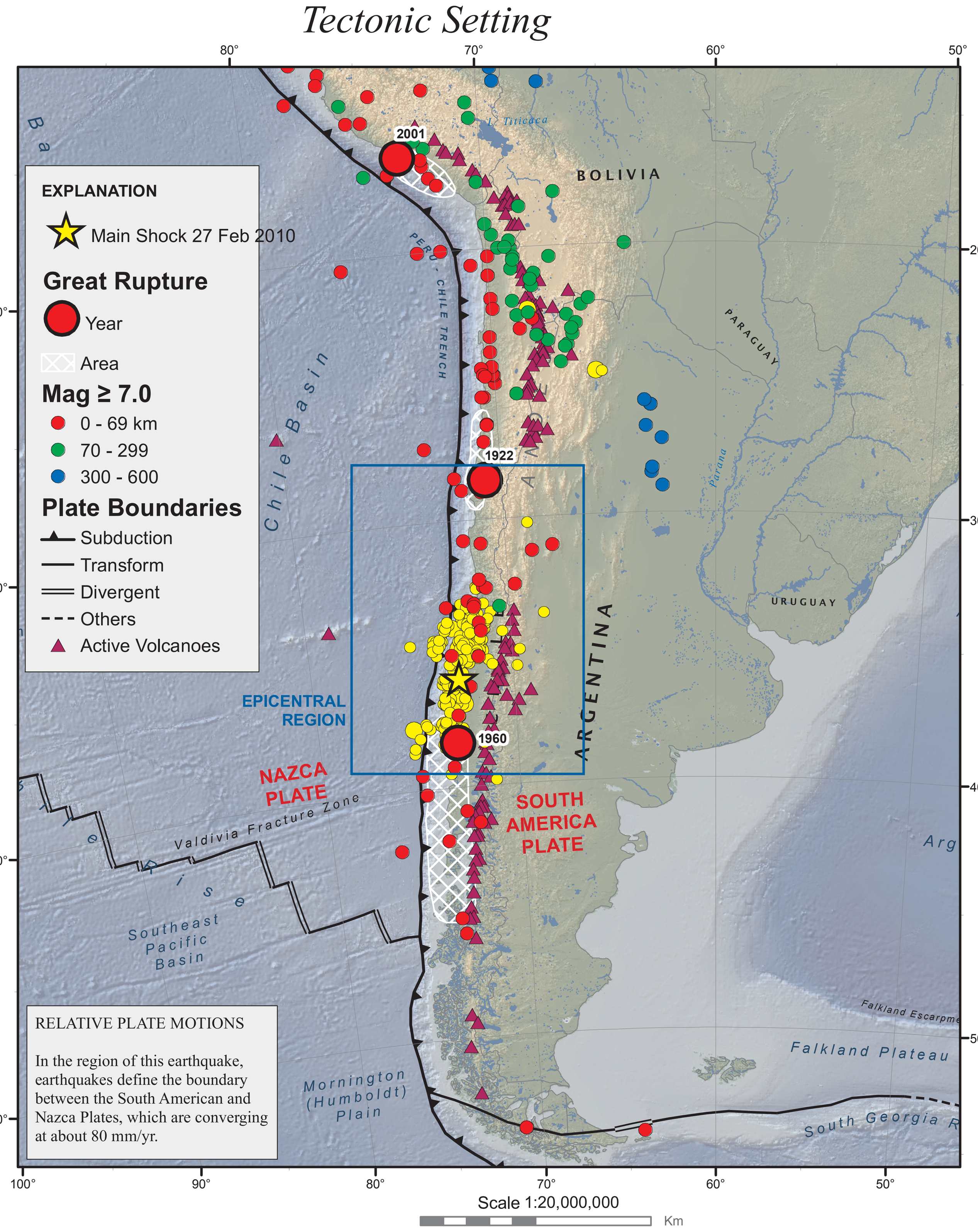
M8.8 Maule, Chile, Earthquake of 27 February 2010

updated 11 March 2010, 1500 UTC



Prepared in cooperation with the Global Seismographic Network

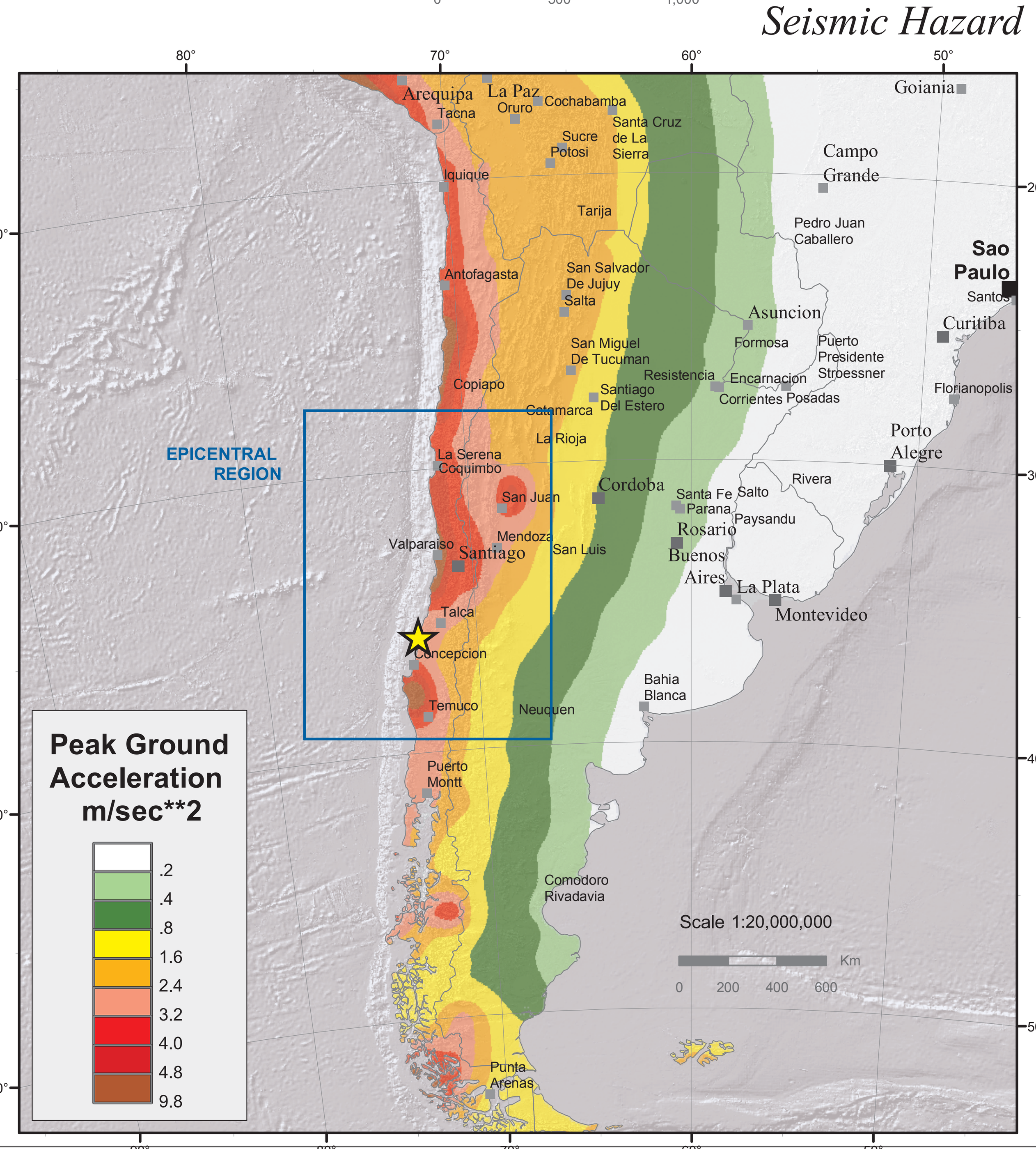
Tectonic Setting



RELATIVE PLATE MOTIONS

In the region of this earthquake, earthquakes define the boundary between the South American and Nazca Plates, which are converging at about 80 mm/yr.

Seismic Hazard



TECTONIC SETTING

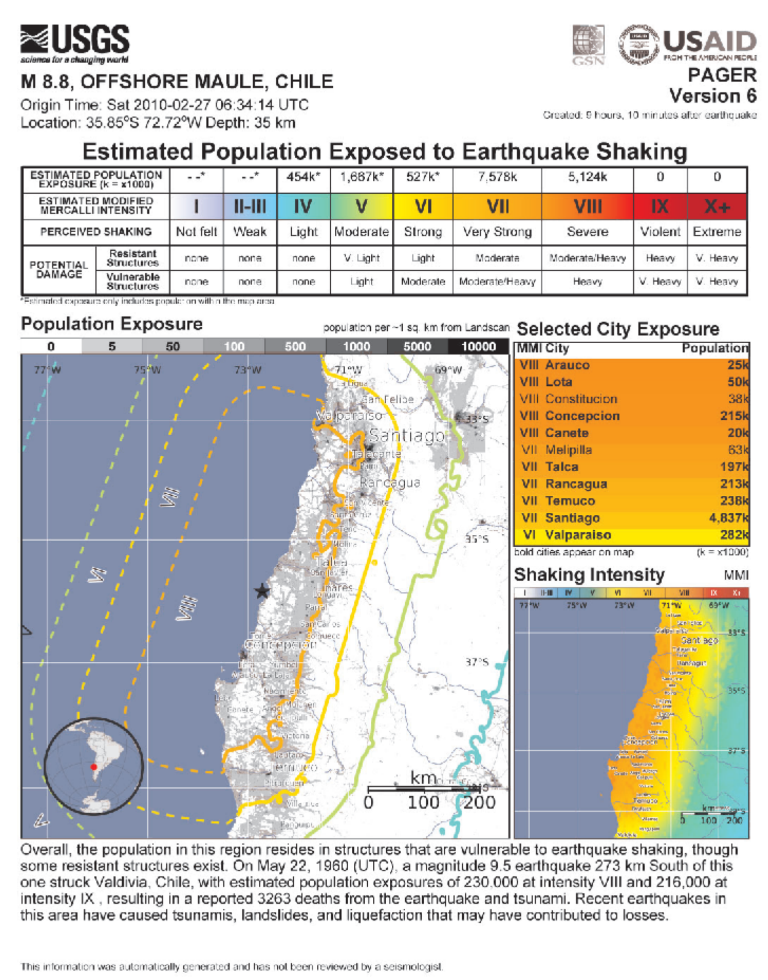
This earthquake occurred at the boundary between the Nazca and South American tectonic plates. The two plates are converging at a rate of 80 mm per year. The earthquake occurred as thrust-faulting on the interface between the two plates, with the Nazca plate moving down and landward below the South American plate.

Coastal Chile has a history of very large earthquakes. Since 1973, there have been 13 events of magnitude 7.0 or greater. The February 27 shock originated about 230 km north of the source region of the magnitude 9.5 earthquake of May, 1960 -- the largest earthquake worldwide since the beginning of instrumental seismology at the beginning of the twentieth century. The giant 1960 earthquake spawned a tsunami that caused destruction on coasts throughout the Pacific Ocean basin. An estimated 1600 lives were lost to the 1960 earthquake and tsunami in Chile, and the 1960 tsunami took another 200 lives among Japan, Hawaii, and the Philippines. Approximately 300 km to the north of the February 27 earthquake is the source region of the magnitude 8.2 earthquake of August 17, 1906. The tsunami associated with the 1906 earthquake produced some damage in Hawaii, with reported run-up heights as great as 3.5 m. Approximately 870 km to the north of the February 27 earthquake is the source region of the magnitude 8.5 earthquake of November, 1922. The 1922 earthquake significantly impacted central Chile, killing several hundred people and causing severe property damage. The 1922 quake generated a 9-meter local tsunami that inundated the Chile coast near the town of Coquimbo; the tsunami also crossed the Pacific, washing away boats in Hilo harbor, Hawaii. The magnitude 8.8 earthquake of February 27, 2010 ruptured the portion of the South American subduction zone separating the source regions of the 1960 and 1906 earthquakes.

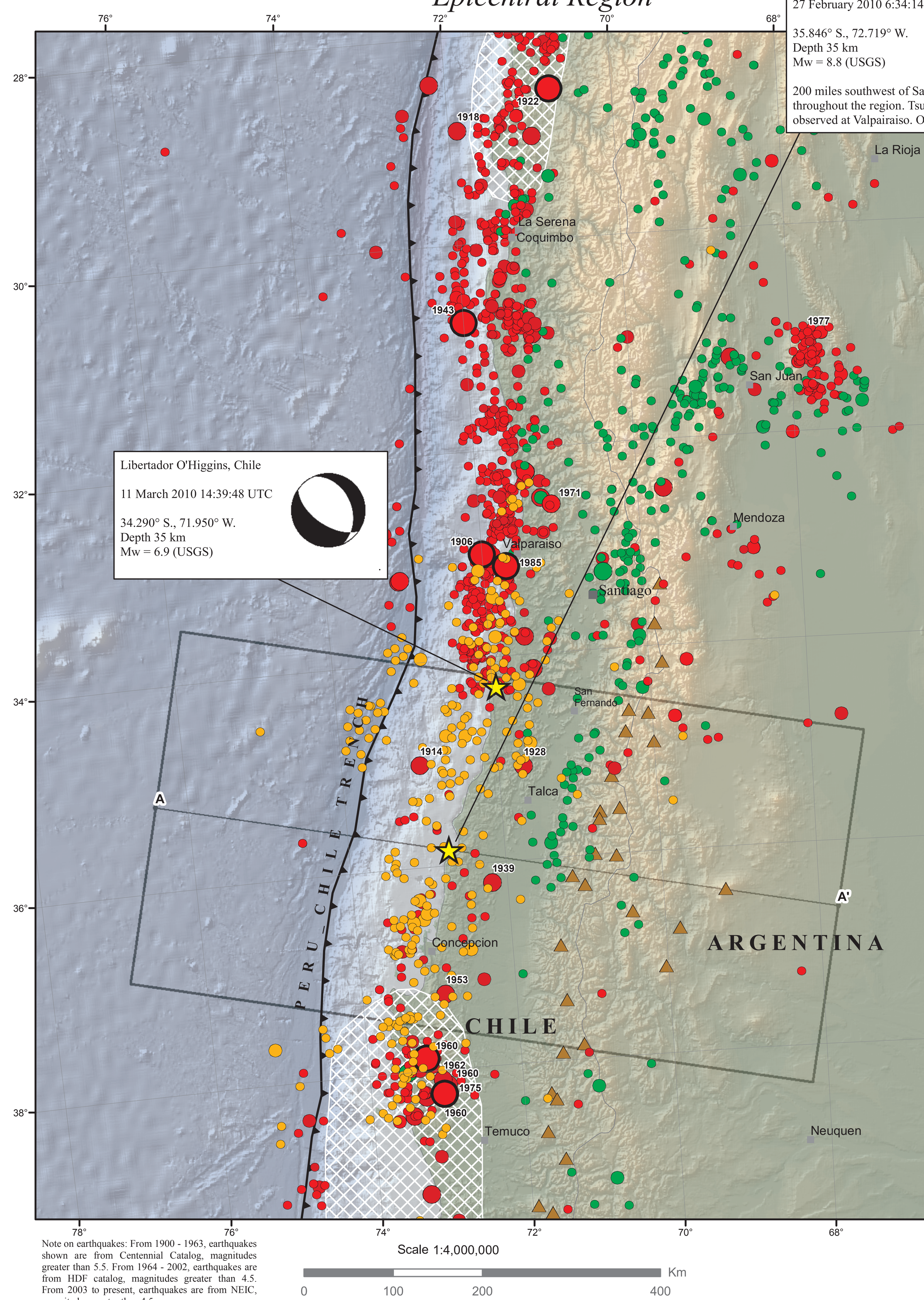
A large vigorous aftershock sequence can be expected from this earthquake.

Significant Earthquakes Mag >= 7.5

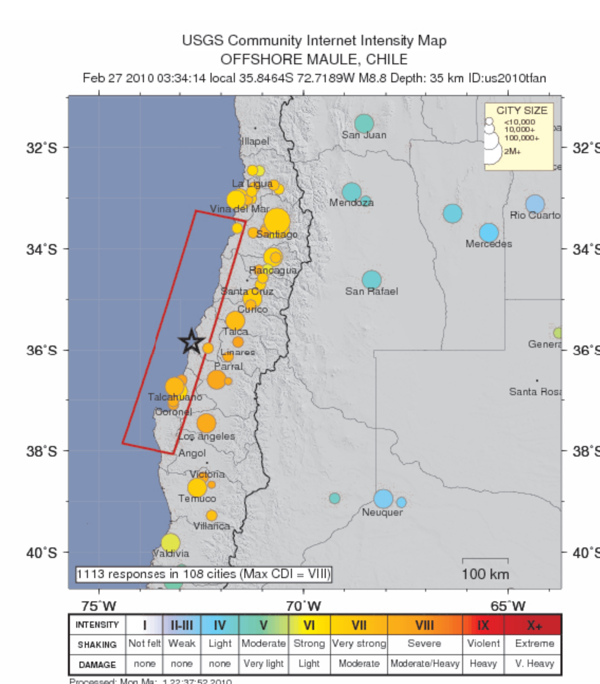
Year	Mon	Day	Time	Lat	Long	Dep	Mag
1906	08	17	0040	-33.000	-72.000	0	8.2
1914	01	30	0336	-35.000	-73.000	0	7.5
1928	12	01	0406	-35.086	-71.683	35	7.7
1939	01	25	0332	-36.200	-72.200	0	7.7
1943	04	06	1607	-30.750	-72.000	0	8.2
1953	05	06	1716	-37.254	-72.920	68.4	7.5
1960	05	21	1002	-37.872	-73.243	35	8.2
1960	05	22	1856	-38.147	-72.984	35	7.9
1960	05	22	1911	-38.235	-73.047	35	9.5
1962	02	14	0636	-38.091	-73.050	32.9	7.5
1971	07	09	0303	-32.558	-71.085	59	7.8
1975	05	10	1427	-38.215	-72.999	28	7.7
1977	11	23	0926	-31.083	-67.778	18.3	7.5
1985	03	03	2247	-33.132	-71.708	40	8.0



Epicentral Region



Note on earthquakes: From 1900 - 1963, earthquakes shown are from Centennial Catalog, magnitudes greater than 5.5. From 1964 - 2002, earthquakes are from HDF catalog, magnitudes greater than 4.5. From 2003 to present, earthquakes are from NEIC, magnitudes greater than 4.5.



EXPLANATION

- Main Shock 27 Feb 2010
- Aftershocks (through 11 Mar 2010)

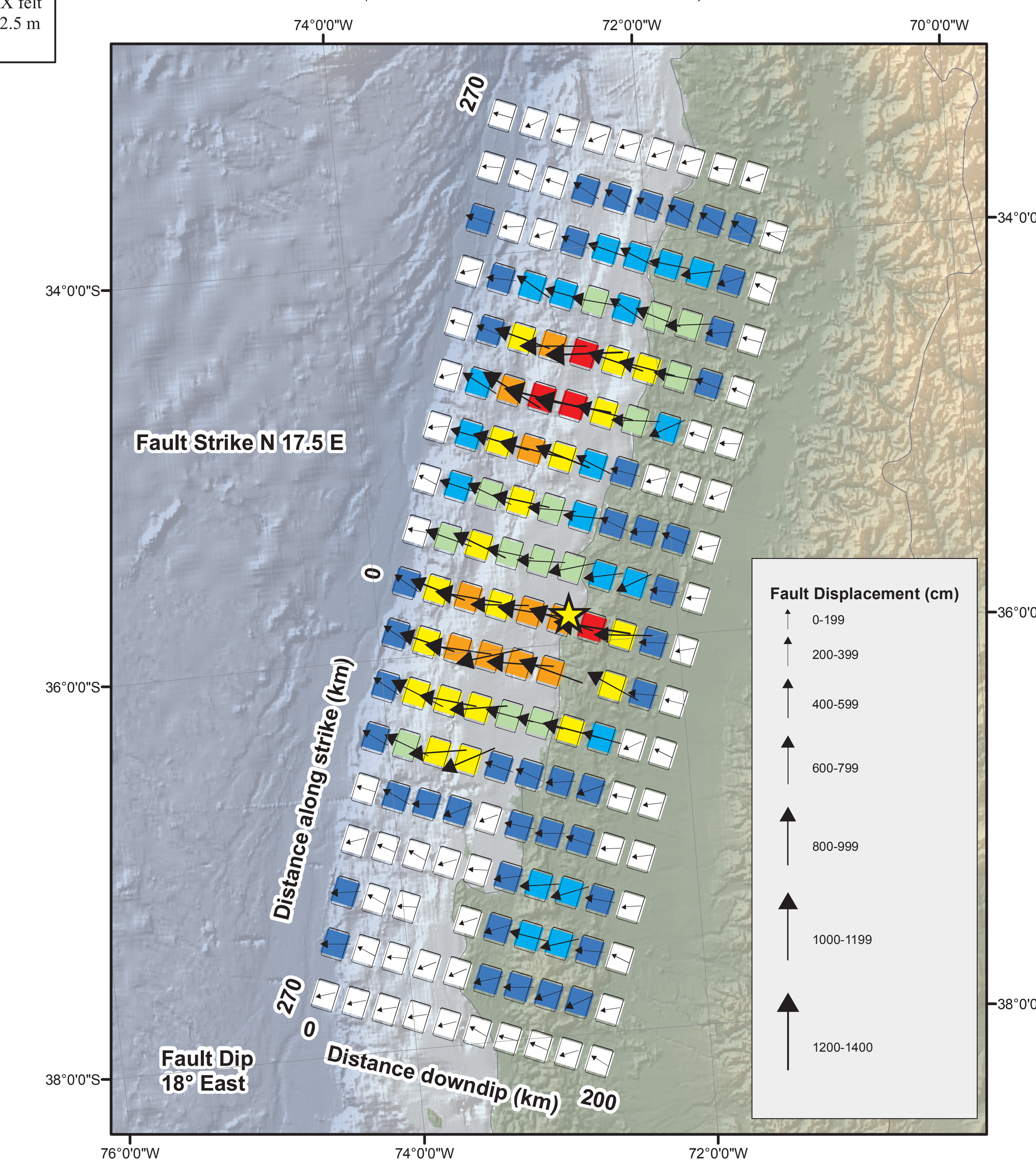
Earthquakes 1900 - 2009

- M 4.00 - 5.99
- M 6.00 - 6.99
- M 7.00 - 7.99
- M >= 8.00

Earthquake Depth

- 0 - 69
- 70 - 299
- 300 - 700
- Great Rupture Area
- Active Volcanoes

Fault Displacement Model (Finite Fault Model)

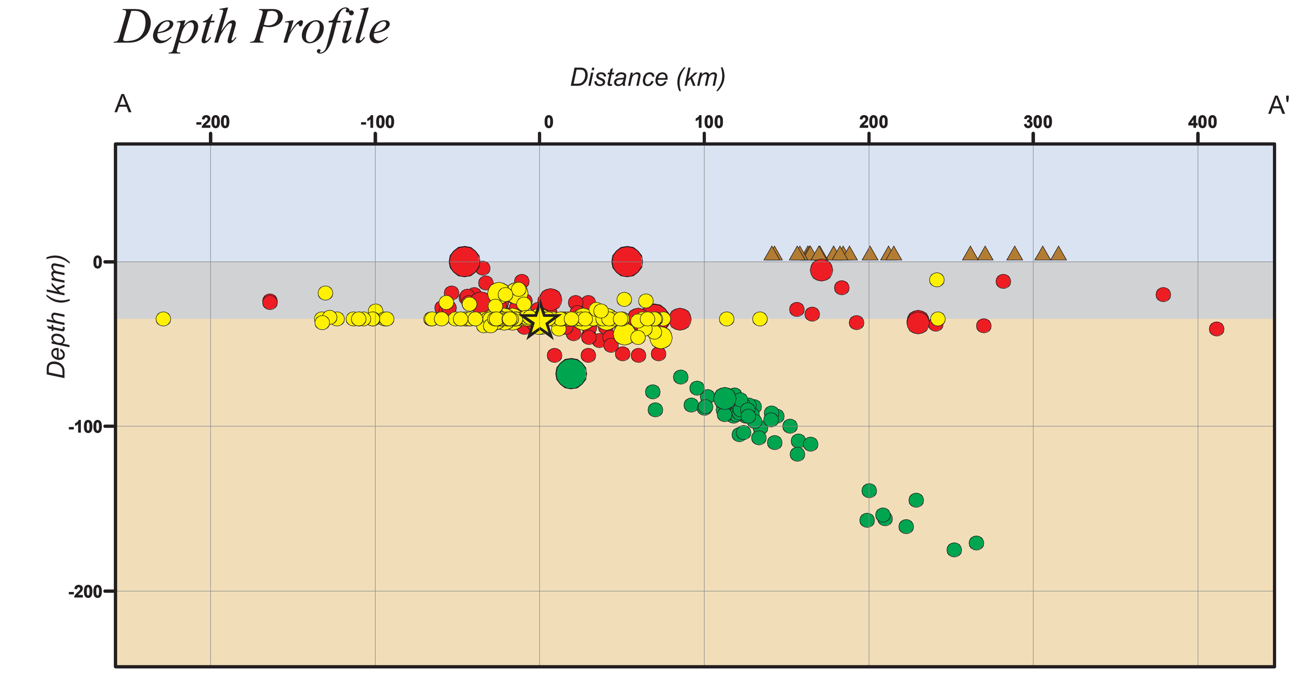


FINITE FAULT MODEL (Chen Ji, University of California at Santa Barbara and Gavin Hayes, USGS)

Distribution of the amplitude and direction of slip for subfault elements of the fault rupture model are determined from the inversion of teleseismic body waveforms. Arrows indicate the amplitude and direction of slip (of the hanging wall with respect to the foot wall); the slip amount is color-coded to match the arrows amount. The view of the rupture plane is from above.

The strike of the fault rupture plane is 17.5° NE and the dip is 18 E. The dimensions of the subfault elements are 30 km in the strike direction and 20 km in the dip direction. The seismic moment release based on this plane is 2.15E+29 dyne.cm.

Depth Profile



DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Centennial Catalog (1900 - 1999) and extensions (Engdahl and Villaseñor, 2002)
HDF (unpublished earthquake catalog) (Engdahl, 2003)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models

REFERENCES

Bird, P., 2003, An updated digital model of plate boundaries: Geochem. Geophys. Geosyst., v. 4, no. 3, pp. 1027- 80.

Engdahl, E.R. and Villaseñor, A., 2002, Global Seismicity: 1900 - 1999, chap. 41 of Lee, W.H.K., and others,eds., International Earthquake and Engineering Seismology, Part A: New York, N.Y., Elsevier Academeic Press, 932 p.

Engdahl, E.R., Van der Hilst, R.D., and Buland, R.P., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination: Bull. Seism. Soc. Amer., v. 88, p. 722-743.

DISCLAIMER

Map prepared by U.S. Geological Survey
National Earthquake Information Center
11 March 2010 V6
Map not approved for release by Director USGS