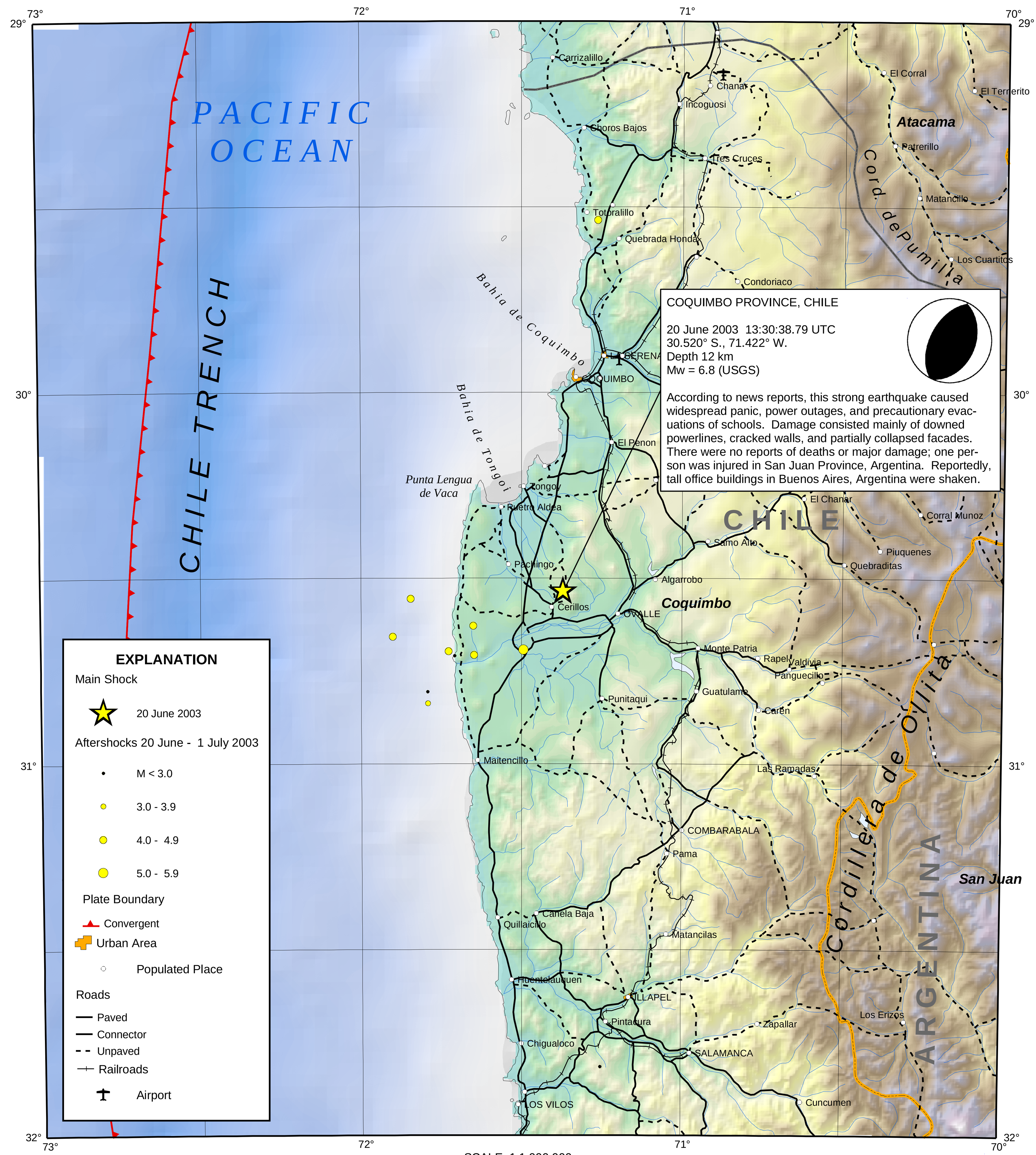
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP XXX

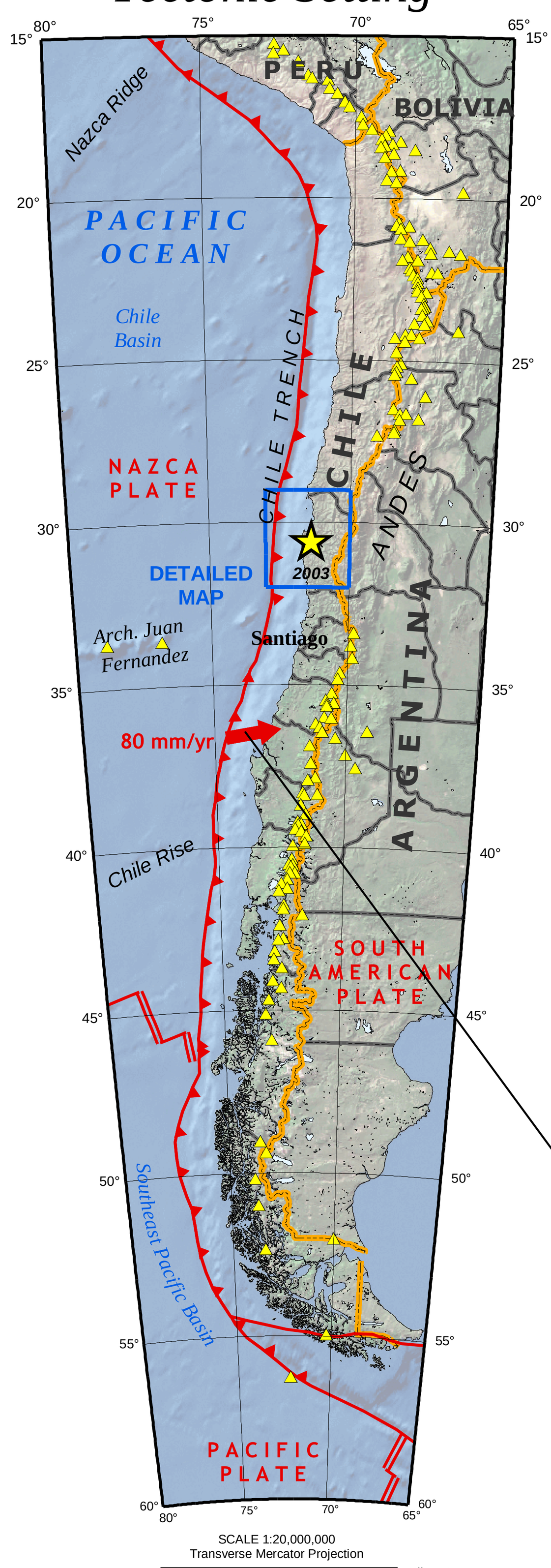
M6.8 Coquimbo Province, Chile Earthquake of 20 June 2003

Epicentral Area



SCALE: 1:1,000,000
Albers Equal- Area Projection
0 10 20 40 60 80 Kilometers

Tectonic Setting



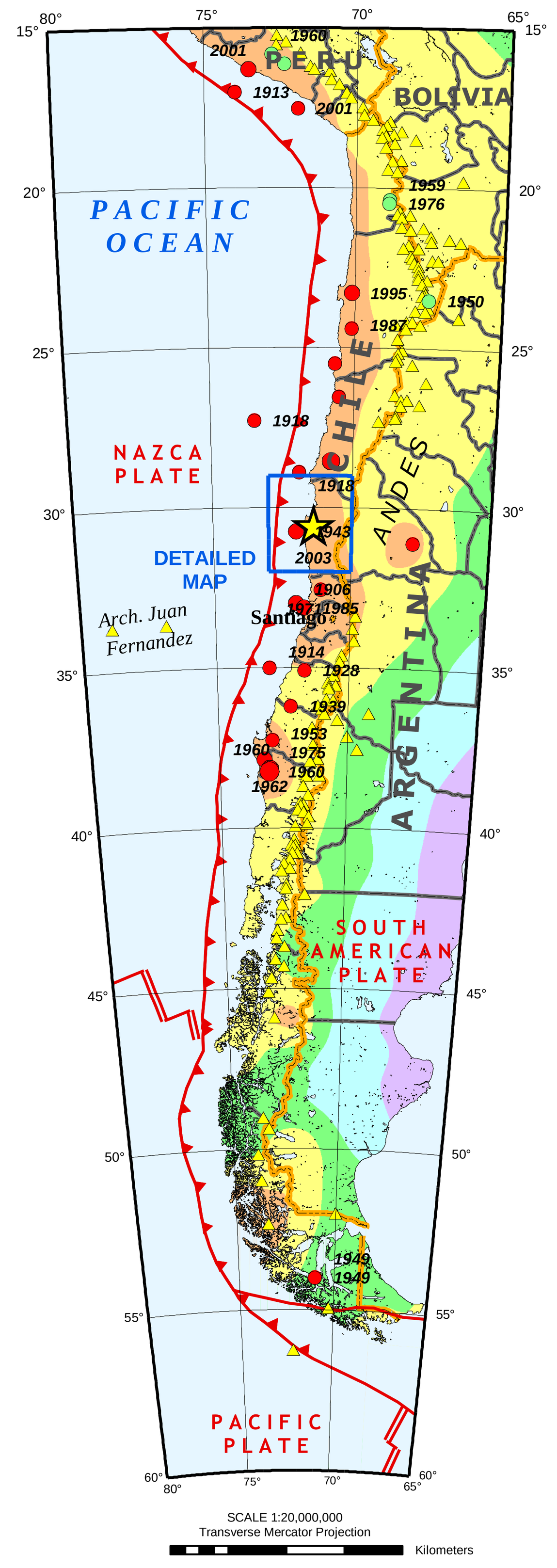
EXPLANATION
Main Shock
20 June 2003
Largest Earthquakes 1900 - 2002
1960
Volcano
Plate Boundary
Convergent
Divergent
Transform

RELATIVE PLATE MOTIONS

The relative motion of adjacent tectonic plates is depicted on the map by short vectors located at selected locations on the plate boundary. In this presentation, one plate is assumed to be rigid and fixed. The vector therefore represents the direction of the moving plate relative to the fixed plate. The rate of relative motion is labelled next to the vector.

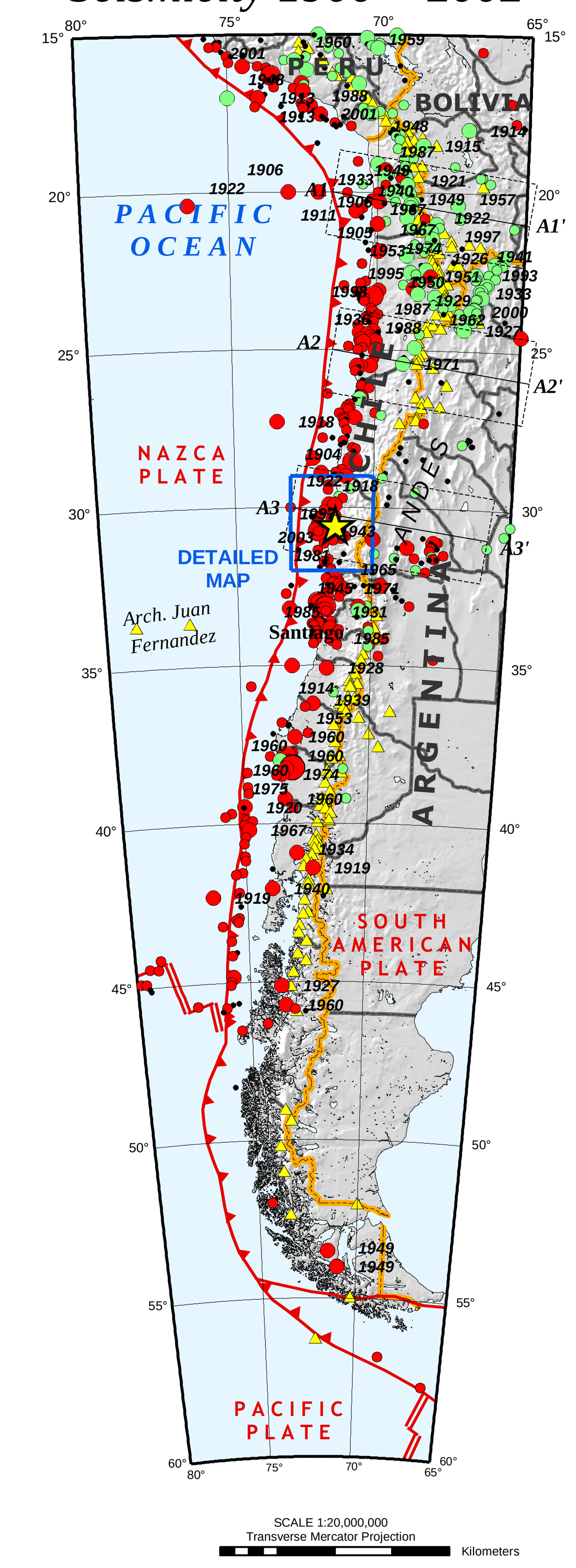
The components of the vector perpendicular and parallel to the plate margin approximate convergent/divergent and transverse direction of motion between the plates, respectively. As viewed from the fixed plate, an inward directed component suggests convergence at and near the plate boundary that may be expressed as crustal folding, uplift, thrust faulting, or plate subduction. Similarly, an outward directed component suggests plate divergence such as would be expected at a zone of crustal spreading. Transcurrent or transform faulting would be expected when the predominant vector component is parallel to the plate margin.

Generalized Seismic Hazard

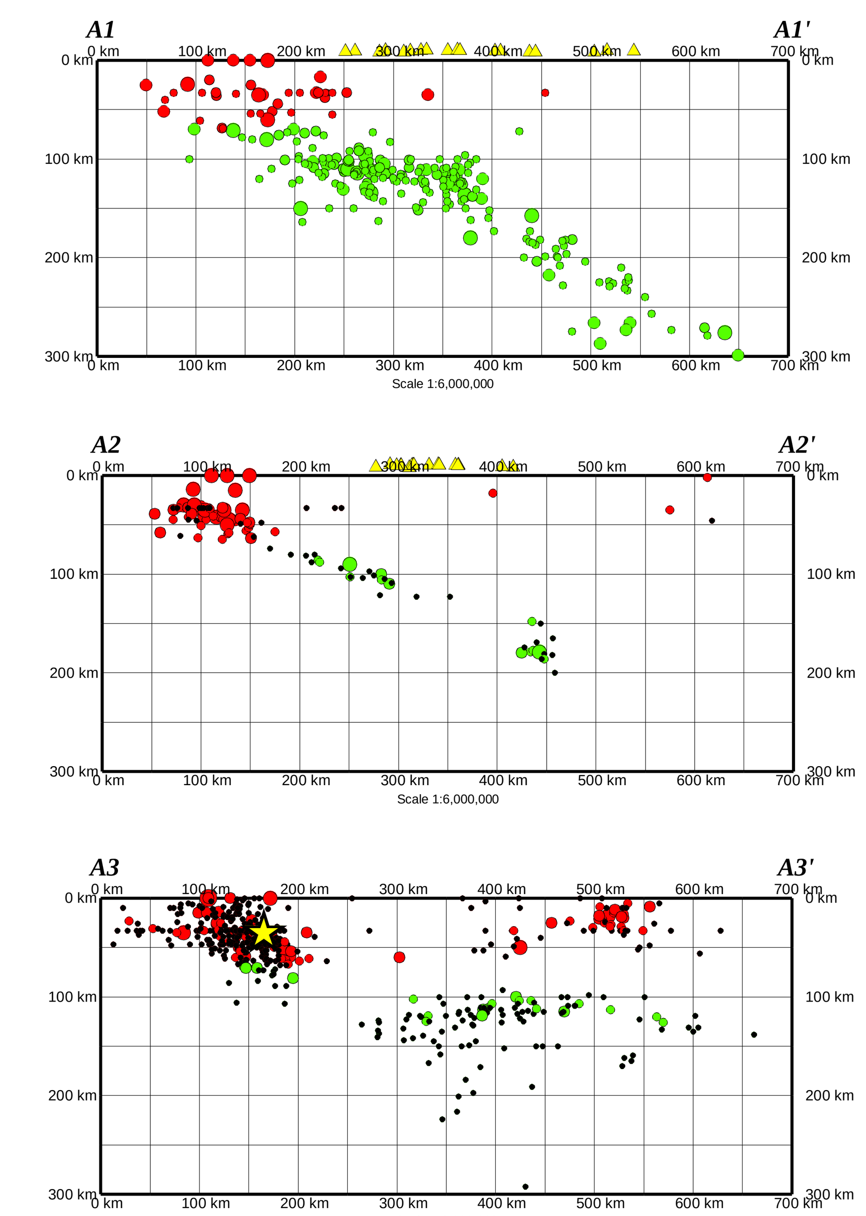


Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50 - yr period with a probability of 10 percent.

Seismicity 1900 - 2002

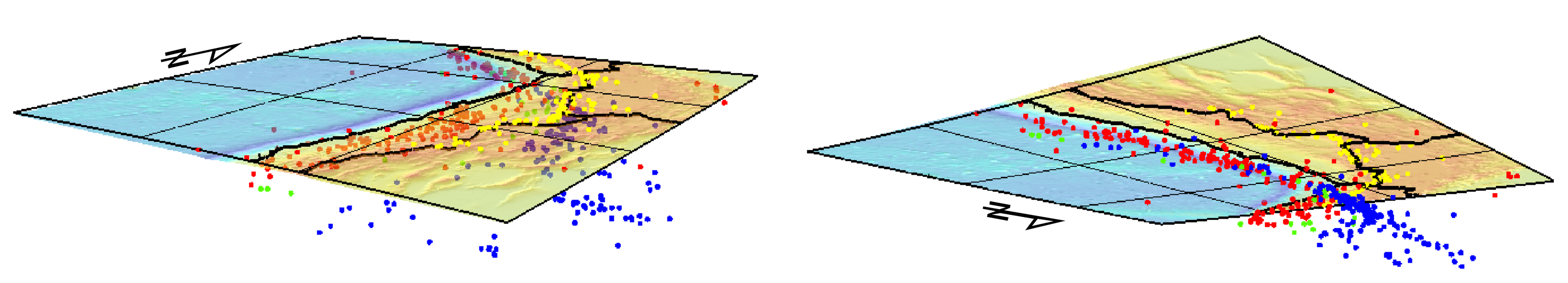


Depth Profiles



EXPLANATION
Main Shock
20 June 2003
Largest Earthquakes 1900 - 2002
1960
Depth Classes
0 - 69 km
70 - 299
300 - 500
Volcano
Magnitude Classes
4.0 - 4.9
5.0 - 5.9
6.0 - 6.9
7.0 - 7.9
8.0 - 8.9
Plate Boundary
Convergent
Divergent
Transform

Perspective Views



Northern Chile seismic zone viewed from the south - southeast above and below the Earth's surface. The depth of earthquakes (dots) is designated by color: Red (0 - 49 km); green (50 - 100 km); and blue (100 - 300 km). Yellow dots are volcanoes. The subduction of the Nazca plate beneath the South American plate is the cause of the seismicity extending from the Chile Trench into the upper mantle. The 20 June earthquake is located just south of this representative view of the plate tectonics of western South America.

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Centennial Catalog (1900 - 1999)
Handbook of Seismology and Earthquake Engineering
Global Seismic Hazard Assessment Program

PLATE TECTONICS
Smithsonian Institution, Global Volcano Program

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center

NEWS REPORTS
Reuters AlertNet

DISCUSSION

This earthquake occurred in the Chilean subduction zone, in which the dominant tectonic process is the subduction and underthrusting of the Nazca plate to the east beneath the South American plate at a rate of about 8 cm/yr. The currently available location and moment tensor of the earthquake imply that the shock occurred as a sudden slippage on the thrust-fault boundary between the plates. The hypocenter of this event is located within a segment of the plate boundary that was ruptured in 1943 by a magnitude 7.9 earthquake.

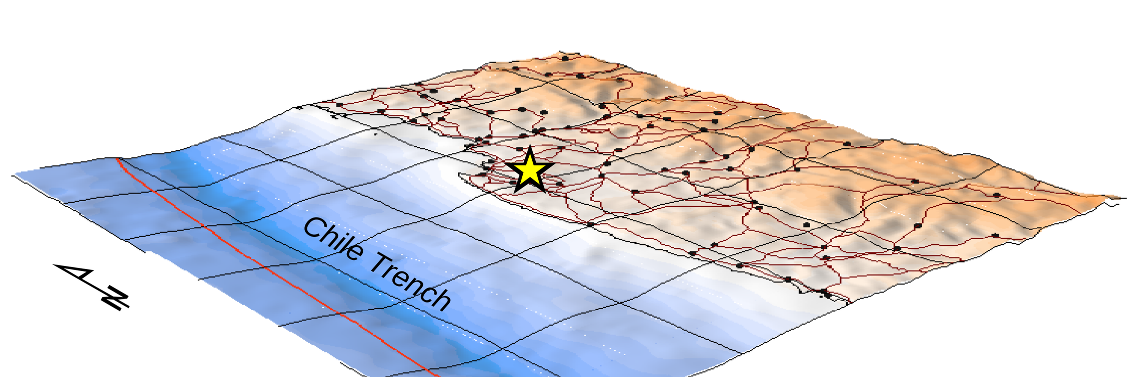
DISCLAIMER

Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.

LARGEST EARTHQUAKES 1900 - 2002
CHILE AND VICINITY

YR	MO	DY	LAT	LON	DEPTH	MAG
1906	8	17	-33.000	-72.000	0.0	8.2
1913	8	6	-17.000	-74.000	0.0	7.8
1914	1	30	-35.000	-73.000	0.0	7.5
1918	5	20	-28.899	-71.893	35.0	7.6
1918	12	4	-27.275	-73.464	25.0	7.5
1922	10	11	-16.125	-72.385	160.0	7.6
1922	11	11	-28.553	-70.755	35.0	8.7
1928	12	1	-35.086	-71.683	35.0	7.7
1939	1	25	-36.200	-72.200	0.0	7.7
1943	4	6	-30.750	-72.000	0.0	8.2
1949	12	17	-54.000	-71.000	0.0	7.8
1949	12	17	-54.000	-71.000	0.0	7.8
1950	12	9	-23.500	-67.500	100.0	7.7
1953	5	6	-37.254	-72.920	68.4	7.5
1959	6	14	-20.369	-68.881	111.6	7.5
1960	1	13	-15.814	-72.788	95.4	7.5
1960	5	21	-37.872	-73.243	35.0	8.2
1960	5	22	-38.147	-72.984	35.0	7.9
1960	5	22	-38.235	-73.047	35.0	9.5
1962	2	14	-38.091	-73.050	32.9	7.5
1966	12	28	-25.502	-70.655	30.0	7.7
1971	7	9	-32.558	-71.085	59.0	7.8
1975	5	10	-38.215	-72.999	28.0	7.7
1976	11	30	-20.472	-68.893	133.7	7.6
1977	11	23	-31.083	-67.778	18.3	7.5
1983	10	4	-26.539	-70.503	24.6	7.7
1985	3	3	-33.132	-71.708	40.0	8.0
1987	3	5	-24.395	-70.102	45.3	7.6
1995	7	30	-23.285	-70.103	46.0	8.0
2001	6	23	-16.305	-73.550	29.8	8.4
2001	7	7	-17.522	-71.938	17.4	7.6

Perspective View of Epicentral Area



Vertical exaggeration: 3.0

The 20 June earthquake (star) occurred just east of the Chile Trench and the approximate boundary (red line) between the Nazca and South American plates.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
16 July 2003
Map not approved for release by Director USGS