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

EARTHQUAKE SUMMARY MAP XXX

M6.9 Nicaragua Earthquake of 9 October 2004

Seismicity of Nicaragua and Vicinity 1900 - 2002

SCALE 1:4,000,000
Mercator Projection

Kilometers: 0 25 50 100 150 200

EXPLANATION

Main Shock
- 9 October 2004

Earthquakes 1900 - 2002
- 0 - 69 km
- 70 - 299

Magnitude Classes
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9

Plate Boundaries
- Continental Convergent
- Subduction

Volcanoes

Generalized Seismic Hazard of Nicaragua and Vicinity

SCALE 1:4,000,000
Mercator Projection

Kilometers: 0 25 50 100 150 200

EXPLANATION

Main Shock
- 9 October 2004

Earthquakes 1900 - 2002
- 0 - 69 km
- 70 - 299

Magnitude Classes
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9

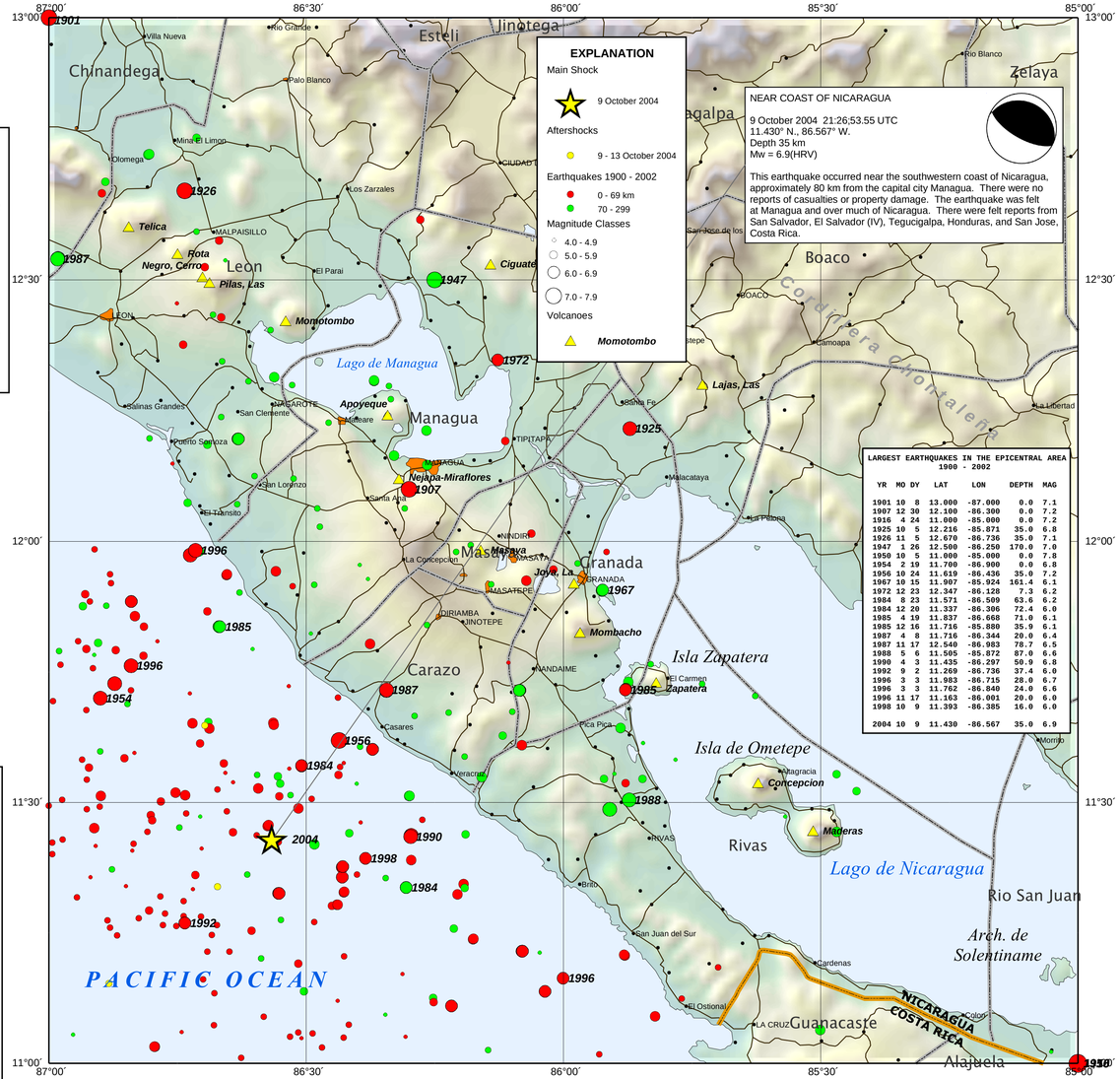
Seismic Hazard
- 0.4 - 0.8 m/sec²
- 0.8 - 1.6
- 1.6 - 3.2
- 3.2 - 5.5

Plate Boundaries
- Continental Convergent
- Subduction

Volcanoes

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.

Epicentral Area



SCALE 1:600,000
Mercator Projection

Kilometers: 0 10 20 40 60 80

EXPLANATION

Main Shock
- 9 October 2004

Aftershocks
- 9 - 13 October 2004

Earthquakes 1900 - 2002
- 0 - 69 km
- 70 - 299

Magnitude Classes
- 4.0 - 4.9
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9

Volcanoes
- Momotombo

NEAR COAST OF NICARAGUA

9 October 2004 21:26:53.55 UTC
11.430° N., 86.567° W.
Depth 35 km
Mw = 6.9(HRV)

This earthquake occurred near the southwestern coast of Nicaragua, approximately 80 km from the capital city Managua. There were no reports of casualties or property damage. The earthquake was felt at Managua and over much of Nicaragua. There were felt reports from San Salvador, El Salvador (IV), Tegucigalpa, Honduras, and San Jose, Costa Rica.

LARGEST EARTHQUAKES IN THE EPICENTRAL AREA 1900 - 2002

YR	MO	DY	LAT	LON	DEPTH	MAG
1901	10	8	13.000	-87.000	0.0	7.1
1907	12	30	12.100	-86.300	0.0	7.2
1916	4	24	11.000	-85.000	0.0	7.2
1925	10	5	12.216	-85.871	35.0	6.8
1926	11	5	12.670	-86.736	35.0	7.1
1947	1	26	12.500	-86.250	170.0	7.0
1950	10	5	11.000	-85.000	0.0	7.8
1954	2	19	11.700	-86.900	0.0	6.8
1956	10	24	11.619	-86.436	35.0	7.2
1967	10	15	11.907	-85.924	161.4	6.1
1972	12	23	12.347	-86.128	7.3	6.2
1984	8	23	11.571	-86.509	63.6	6.2
1984	12	20	11.337	-86.306	72.4	6.0
1985	4	19	11.837	-86.668	71.0	6.1
1985	12	16	11.716	-85.880	35.9	6.1
1987	4	8	11.716	-86.344	20.0	6.4
1987	11	17	12.540	-86.983	78.7	6.5
1988	5	6	11.505	-85.872	87.0	6.6
1990	4	3	11.435	-86.297	50.0	6.8
1992	9	2	11.269	-86.736	37.4	6.0
1996	3	3	11.983	-86.715	28.0	6.7
1996	3	3	11.762	-86.840	24.0	6.6
1996	11	17	11.163	-86.001	20.0	6.0
1998	10	9	11.393	-86.385	16.0	6.0
2004	10	9	11.430	-86.567	35.0	6.9

DISCUSSION

This thrust-fault earthquake occurred just east of the Middle America Trench at the interface between the Cocos and the Caribbean plates. The northwest-southeast trending trench marks the boundary where the Cocos plate begins subducting beneath the overriding Caribbean plate at a rate of about 80 millimeters per year. In addition to interface thrust-fault earthquakes, shallow strike-slip earthquakes occur within the deforming crust of the overriding Caribbean plate, and earthquakes occur within the subducting Cocos plate from shallow depths to depths of over 200 km. The world's largest earthquakes have been interface thrust-fault earthquakes, including the 1960 magnitude 9.5 Chilean earthquake and the 1964 magnitude 9.2 Alaskan earthquake. Historically, however, the most damaging Nicaraguan earthquakes have been earthquakes occurring beneath population centers at shallow depth in the Caribbean plate. The 1972 magnitude 6.2 Managua earthquake, for example, destroyed the center of the city and killed an estimated 6000 people.

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.

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
Extended EHB (Engdahl and Villaseñor, 2002)
Engdahl, E.R. (2004, unpublished data)
Global Seismic Hazard Assessment Program

PLATE TECTONICS
Plate boundaries from PB2002 (Bird, 2003)
Smithsonian Institution, Global Volcano Program

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

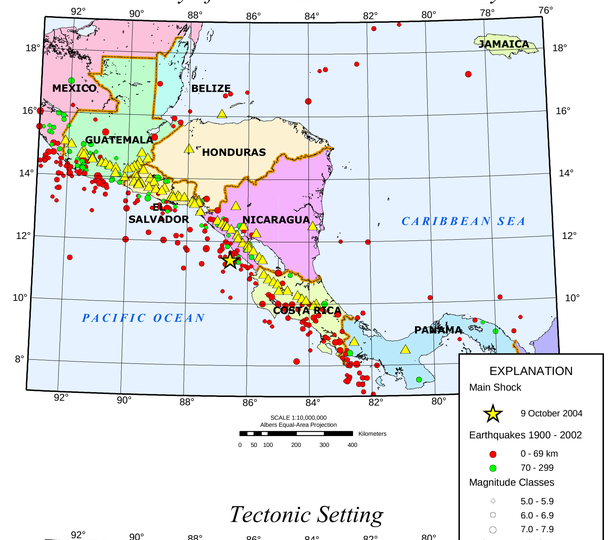
REFERENCES

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 telesesimic earthquake relocation with improved travel times and procedures for depth determination: Bull. Seism. Soc. Amer., v. 88, p. 722-743.

Seismicity of Central America and Vicinity



SCALE 1:10,000,000
Albers Equal-Area Projection

Kilometers: 0 50 100 200 300 400

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Earthquakes 1900 - 2002
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Magnitude Classes
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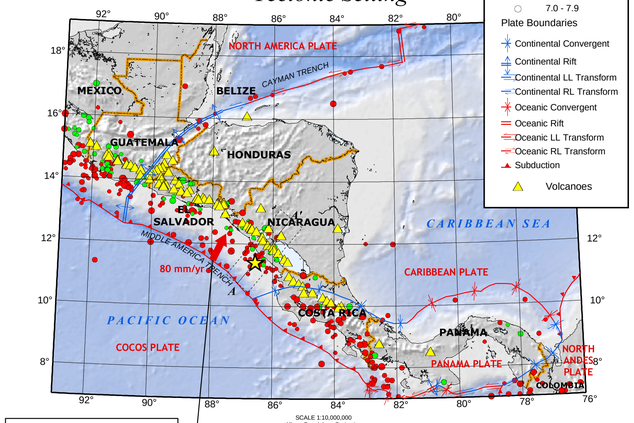
Plate Boundaries
- Continental Convergent
- Continental Rift
- Continental LL Transform
- Continental RL Transform
- Oceanic Convergent
- Oceanic Rift
- Oceanic LL Transform
- Oceanic RL Transform
- Subduction

Volcanoes

Tectonic Setting



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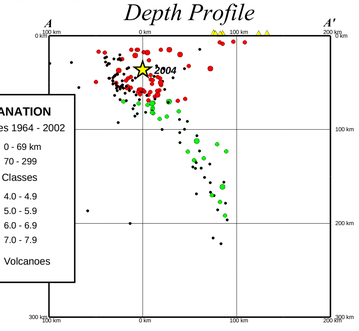
RELATIVE PLATE MOTIONS

The relative motion of adjacent tectonic plates is depicted on the map by short vectors located at selected points on the plate boundary. In this presentation, one plate (the reference plate) is assumed to be fixid. The vector therefore represents the direction of the moving plate relative to the reference 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.

In this case, the Cocos Plate is moving relative to the fixed Caribbean Plate at a velocity of about 80 mm/yr.

Depth Profile



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Volcanoes

Map prepared by U.S. Geological Survey
National Earthquake Information Center
20 October 2004
Map not approved for release by Director USGS