

Tectonic Summary

The September 8th, 2017, M 8.2 earthquake offshore Chiapas, Mexico, occurred as the result of normal faulting at an intermediate depth. Focal mechanism solutions for the earthquake indicate slip occurred on either a fault dipping very shallowly towards the southwest, or on steeply dipping fault striking NW-SE. At the location of this event, the Cocos plate converges with North America at a rate of approximately 76 mm/yr, in a northeast direction. The Cocos plate begins its subduction beneath Central America at the Middle America Trench, just over 100 km to the southwest of this earthquake. The location, depth, and normal-faulting mechanism of this earthquake indicate that it is likely an intraplate event, within the subducting Cocos slab, rather than on the shallower megathrust plate boundary interface.

While commonly plotted as points on maps, earthquakes of this size are more appropriately described as slip over a larger fault area. Normal-faulting events of the size of the September 8th, 2017 earthquake are typically about 200x50 km (length x width).

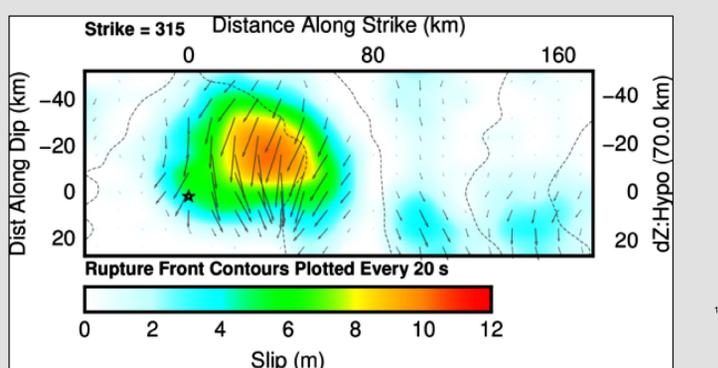
Over the preceding century, the region within 250 km of the hypocenter of the September 8th, 2017 earthquake has experienced 8 other M 7+ earthquakes. Most occurred in the subduction zone to the southeast of the September 8 event, near the Mexico-Guatemala border, and none were larger than M 7.5. The largest, a M 7.4 thrust faulting earthquake offshore Guatemala in November 2012, resulted in at least 48 fatalities and over 150 injuries, and significant damage near the coast.

Did You Feel It?

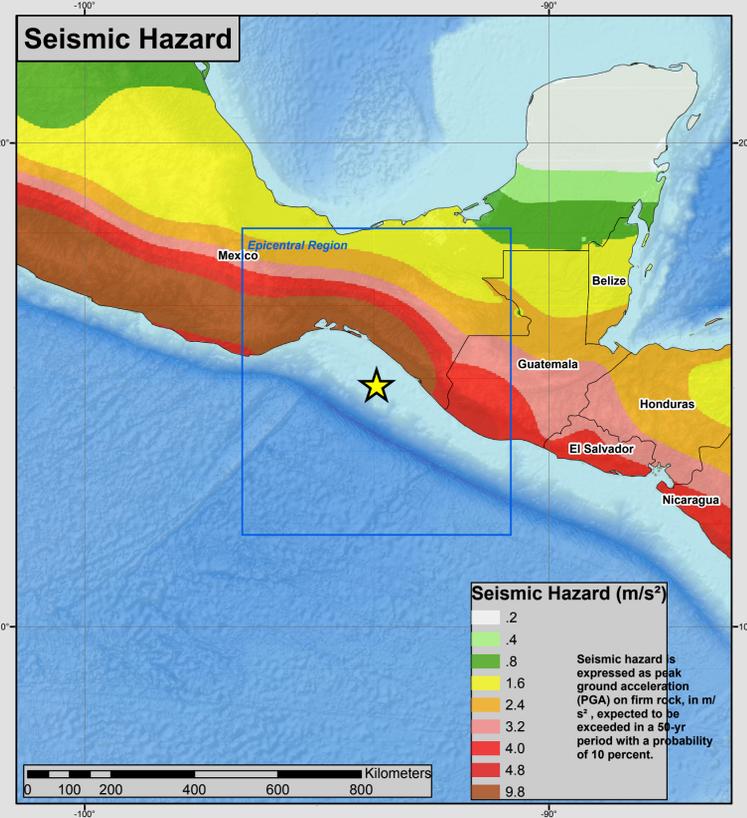
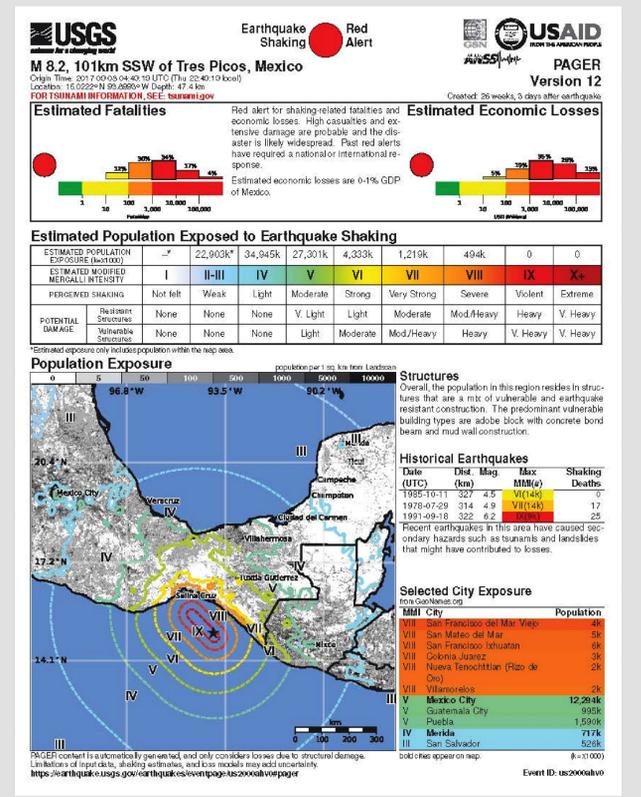


Finite Fault Model

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 and long period surface waves. Arrows indicate the direction of slip (of the hanging wall with respect to the foot wall); the slip is also colored by magnitude. The view of the rupture plane is from above. The strike of the fault rupture plane is 315° and the dip is 73°NE. The dimensions of the subfault elements are 10 km in the strike direction and 60 km in the dip direction. The rupture surface is approximately 80 km along strike and 60 km along downdip. The seismic moment release based upon this plane is 2.5e+28 dyne.cm.



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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)
EHB catalog (Engdahl et al., 1998)
RDF (unpublished earthquake catalog, Engdahl, 2003)
Global Seismic Hazard Assessment Program
Volcanoes of the World (Siebert and Simkin, 2002)

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Ji, C., D.J. Wald, and D.V. Helmlinger, Source description of the 1999 Hector Mine, California earthquake, Part I: Wavelet domain inversion theory and resolution analysis, Bull. Seism. Soc. Am., Vol 92, No. 4, pp. 1192-1207, 2002.
Deilets, C., Gordon, R.G., Argus, D.F., 2010.
Geologically current plate motions, Geophys. J. Int. 181, 1-80.

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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 Academic Press, 832 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

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.

Map updated by U.S. Geological Survey National Earthquake Information Center
13 September 2017
<http://earthquake.usgs.gov/>
Map not approved for release by Director USGS