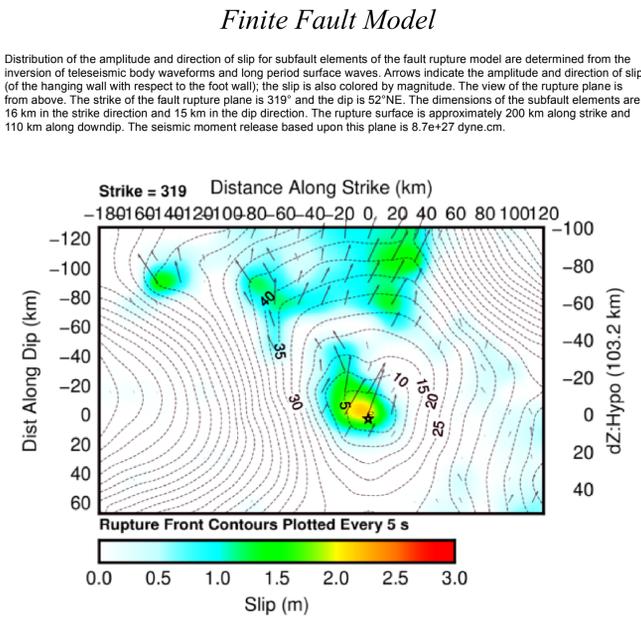
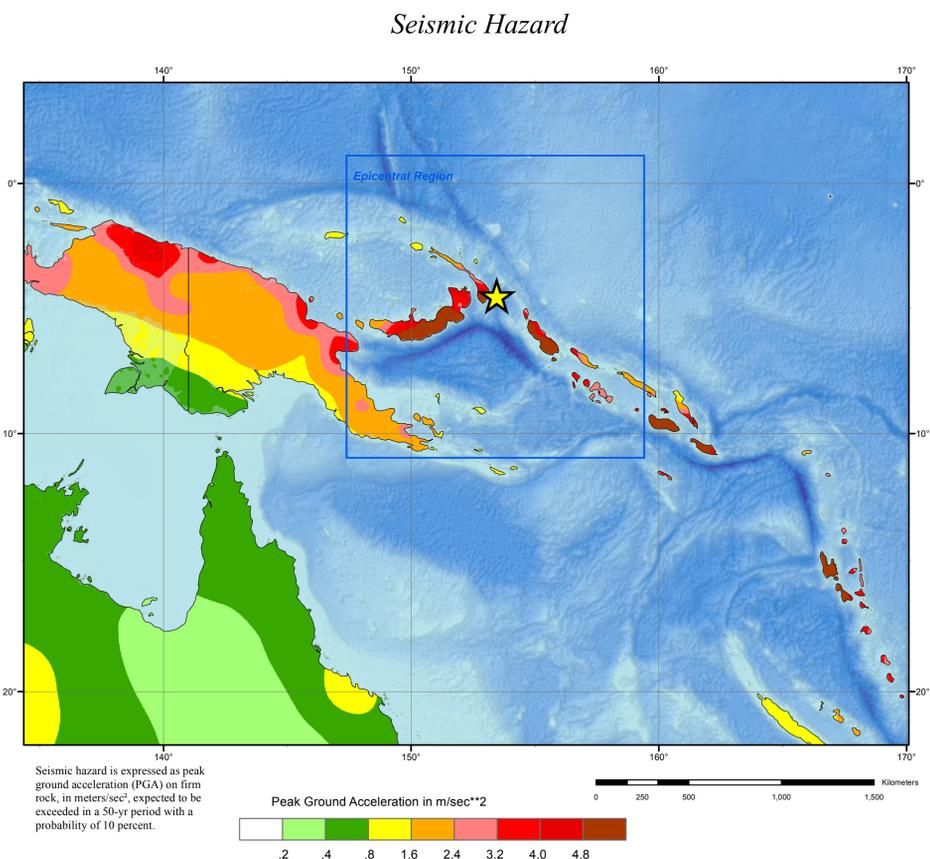
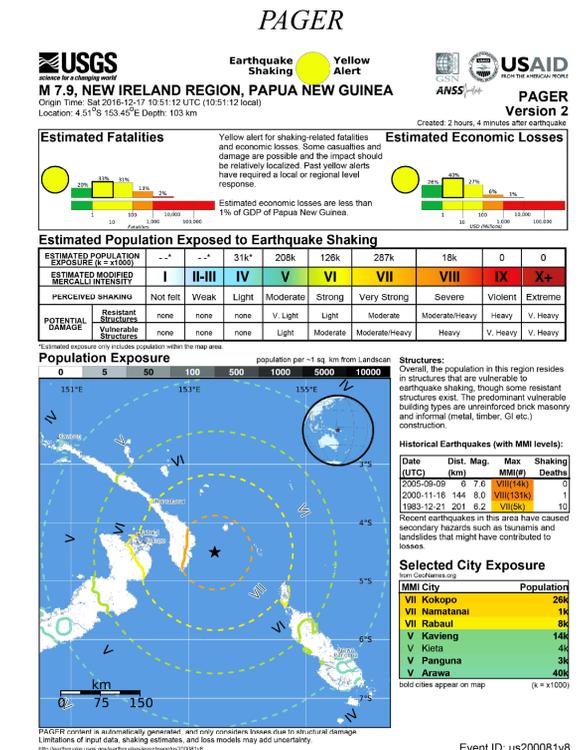
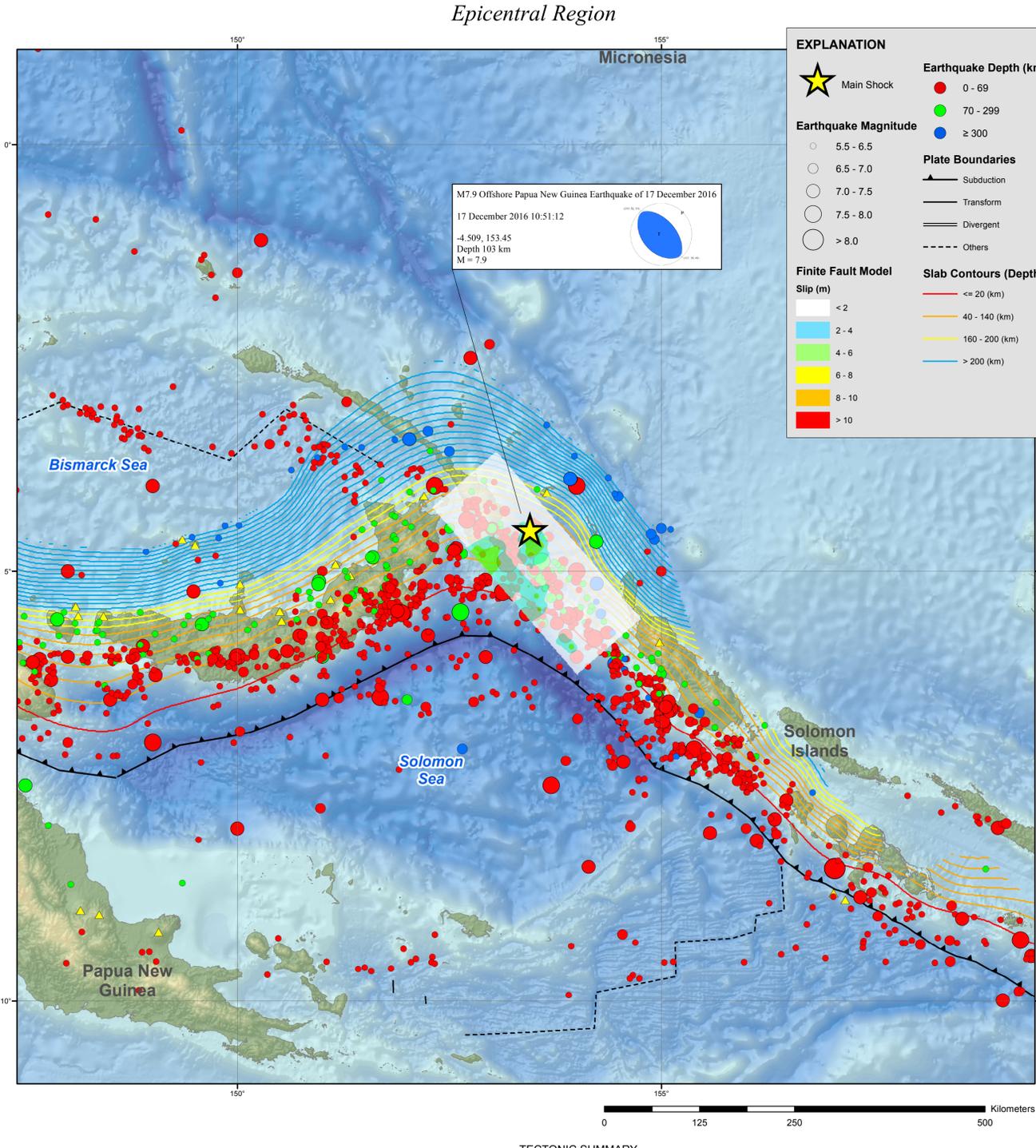
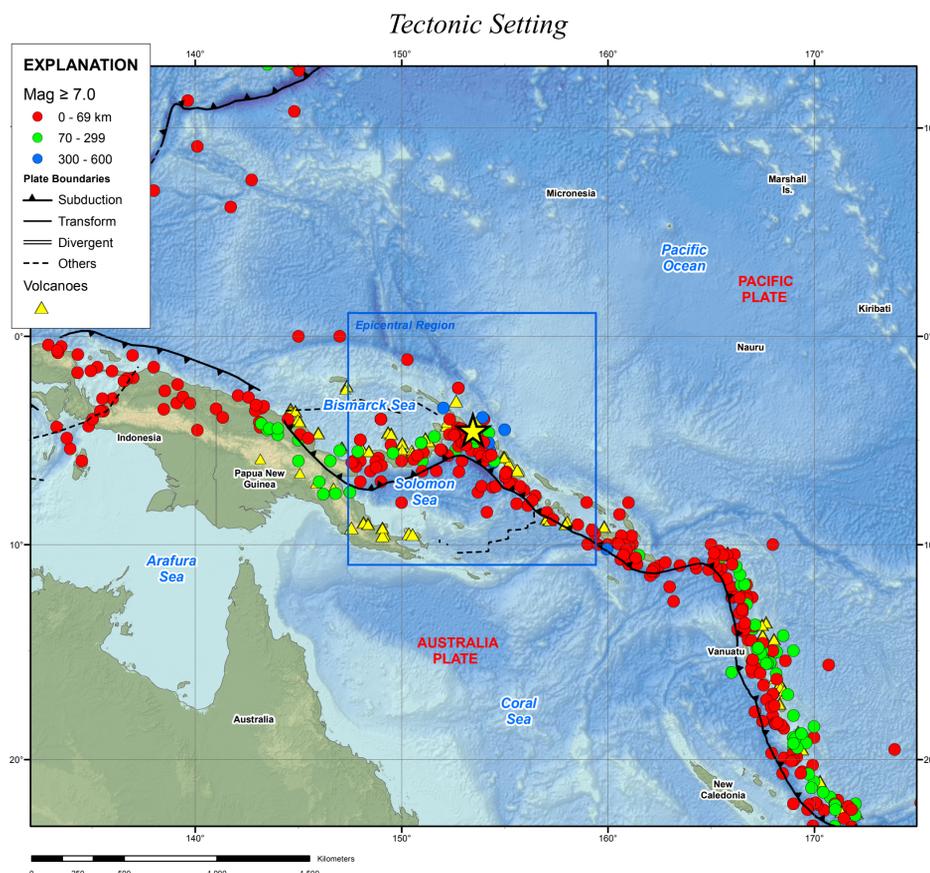


# M7.9 Offshore Papua New Guinea Earthquake of 17 December 2016



The December 17, 2016, M 7.9 earthquake east of New Ireland, Papua New Guinea occurred as the result of reverse faulting at an intermediate depth. Focal mechanism solutions indicate rupture occurred on a structure striking either northwest or southeast, and dipping at a moderate angle. At the location of the earthquake, the Australia plate converges with and subducts beneath the Pacific plate at a rate of about 105 mm/yr towards the east-northeast. At the location of the earthquake, some researchers consider the edges of the Australia and Pacific plates to be divided into several microplates that take up the overall convergence between Australia and the Pacific, including the Solomon Sea and South Bismark microplates local to this event. In this context, the December 17th event occurred along the boundary between the Solomon Sea and South Bismark microplates. The Solomon Sea microplate moves slightly faster and more northeasterly with respect to the Pacific plate (and South Bismark microplate) than does the Australia plate due to sea-floor spreading in the Woodlark Basin several hundred kilometers to the southeast of the December 17th earthquake, facilitating the classic subduction evident beneath New Britain and New Ireland. The location, depth, and focal mechanism solutions of the December 17th event are consistent with its occurrence within the interior of the subducted Australia plate lithosphere, rather than on the shallow thrust interface between these two plates.

While commonly plotted as points on maps, earthquakes of this size are more appropriately described as slip over a larger fault area. Reverse-faulting events of the size of the December 17, 2016, M 7.9 earthquake are typically about 135x60 km (length x width).

Earthquakes like this event, with focal depths between 70 and 300 km, are commonly termed "intermediate-depth" earthquakes. Intermediate-depth earthquakes represent deformation within subducted slabs rather than at the shallow plate interface between subducting and overriding tectonic plates. They typically cause less damage on the ground surface above their foci than is the case with similar-magnitude shallow-focus earthquakes, but large intermediate-depth earthquakes may be felt at great distance from their epicenters. "Deep-focus" earthquakes, those with focal depths greater than 300 km, also occur in the subducted Solomon Sea microplate to the north. Earthquakes have been reliably located to depths of about 500 km in this region.

The Papua New Guinea region frequently hosts large earthquakes. Over the preceding century, 33 other earthquakes with M 7+ occurred within 250 km of the December 17th event. 8 of these occurred at intermediate (70-300 km) or deep (300+ km) depths. The December 17th, 2016 earthquake is almost co-located with a M 7.6 event in September 2005, with a similar faulting mechanism. The 2005 event is not known to have caused damage or fatalities. One of the largest nearby historic events was a shallow M 8.0 earthquake in November 2000, about 140 km to the northwest, which resulted in at least 2 fatalities and left more than 5,000 people homeless.

**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 Villasenor, 2002)  
EHB catalog (Engdahl et al., 1998)  
IHF (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. Helmenberger. 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.  
DeMets, C., Gordon, R.G., Argus, D.F., 2010. Geologically current plate motions. Geophys. J. Int. 181, 1-80.

**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. Geochim. Geophys. Geosyst., v. 4, no. 3, pp. 1027-80.

Engdahl, E.R., and Villasenor, 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, 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**

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  
19 December 2016  
http://earthquake.usgs.gov/  
Map not approved for release by Director USGS