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

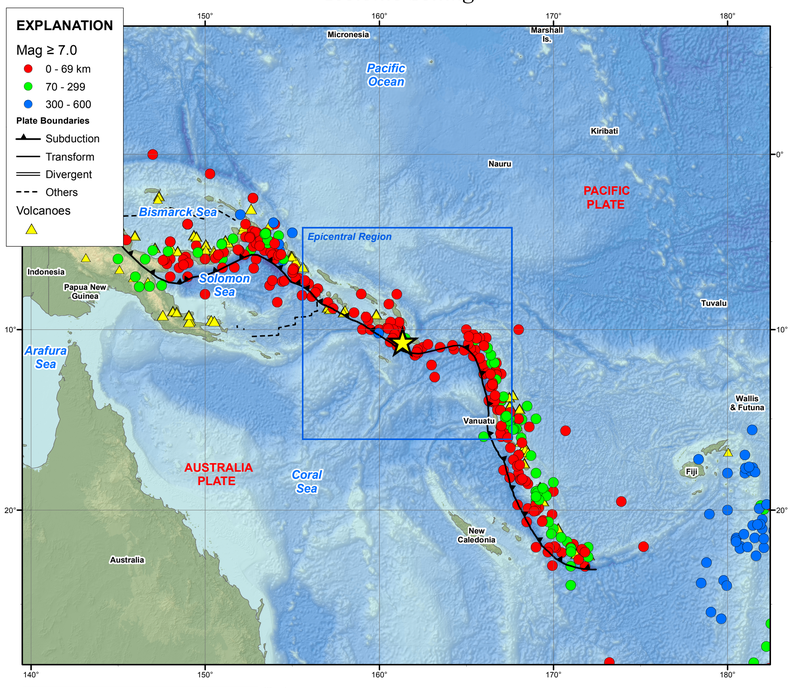
M 7.8 Solomon Islands Earthquake of 08 December 2016

EARTHQUAKE SUMMARY MAP

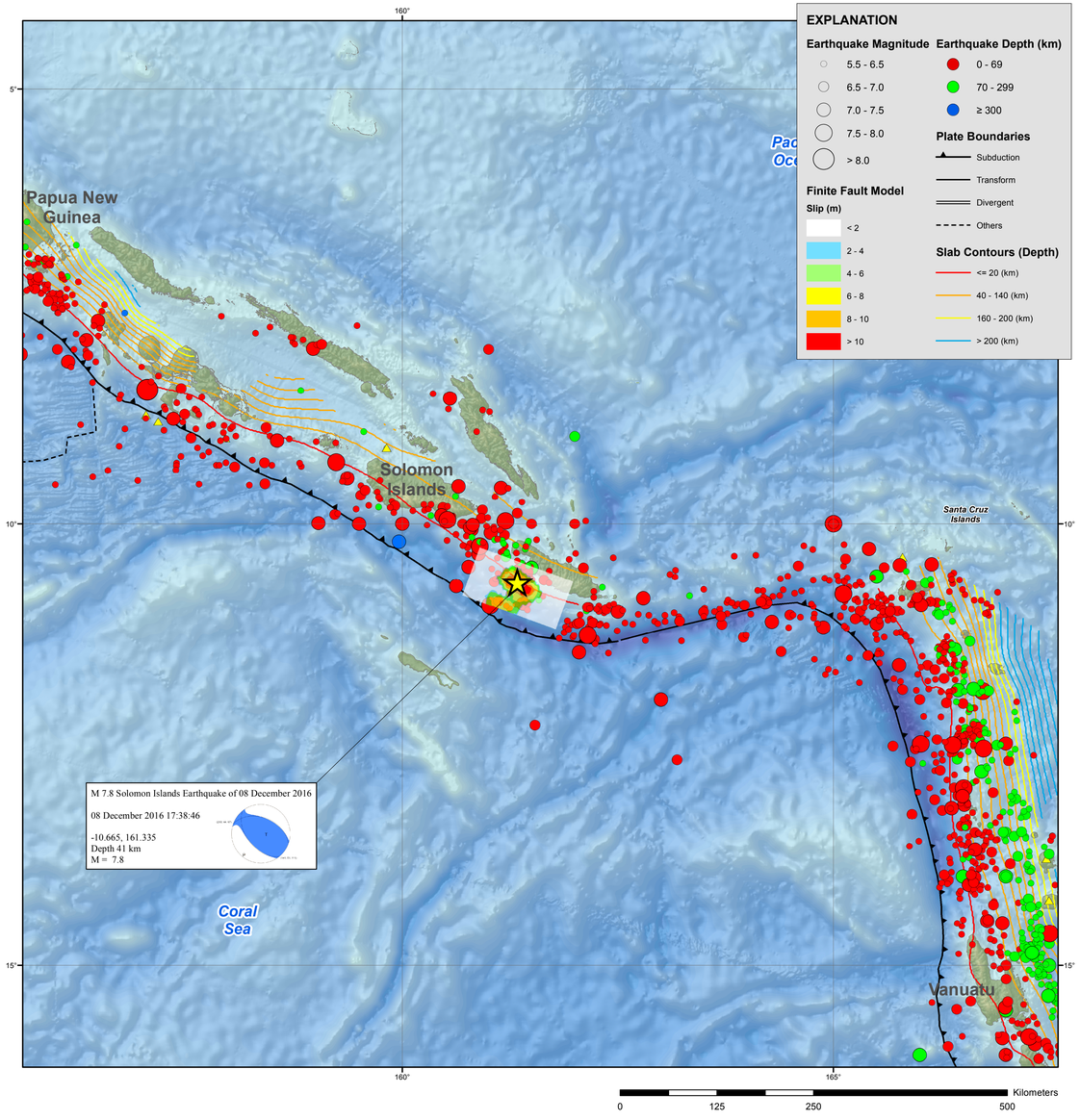
Prepared in cooperation with the Global Seismographic Network

GSN

Tectonic Setting



Epicentral Region



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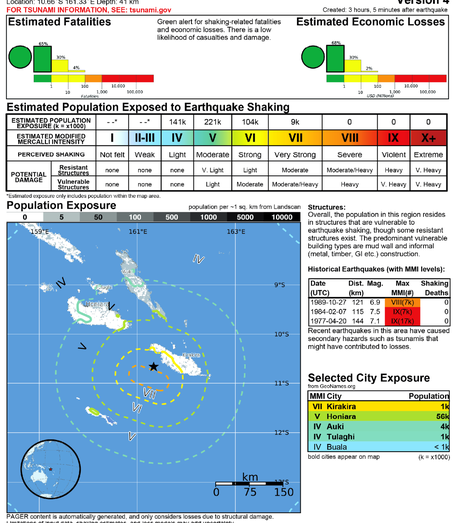
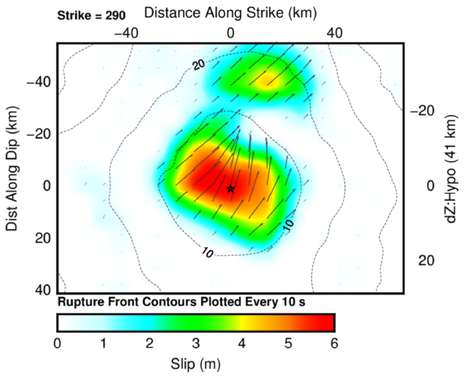


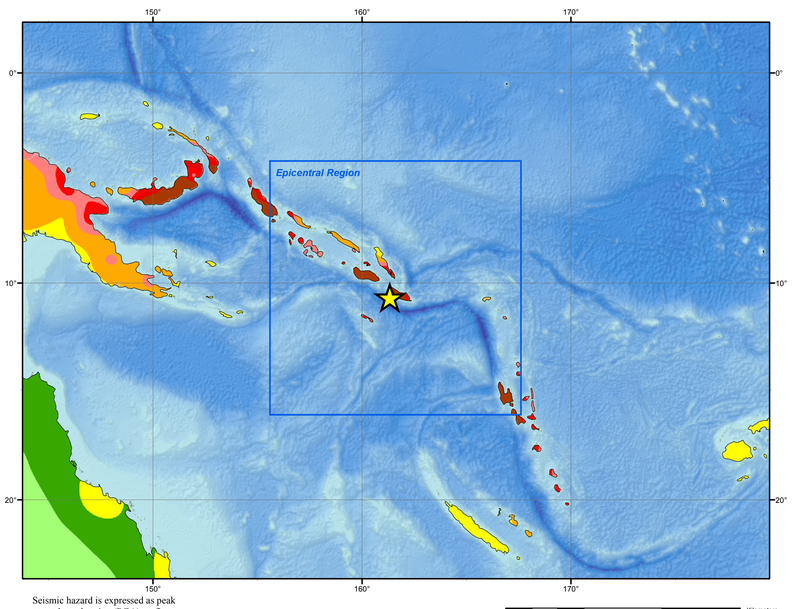
Event ID: us20007z80

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 amplitude and 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 290° and the dip is 44°NNE. The dimensions of the subfault elements are 7 km in the strike direction and 6.4 km in the dip direction. The rupture surface is approximately 60 km along strike and 70 km along downdip. The seismic moment release based upon this plane is 6.4e+27 dyne.cm.



Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec^2, expected to be exceeded in a 50-yr period with a probability of 10 percent.

Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

TECTONIC SUMMARY

The December 8, 2016, M 7.8 Solomon Islands earthquake occurred as the result of shallow, slightly oblique reverse faulting on or near the plate boundary between the Australia and Pacific plates. Focal mechanism solutions indicate that rupture occurred on either a northwest or north-south-striking, moderately dipping reverse fault. At the location of the earthquake, the Australia plate subducts beneath the Pacific plate towards the east-northeast at a velocity of about 96 mm/yr. The location, depth, and focal mechanism solutions of the December 8th earthquake are consistent with its relation to under-thrusting of the Australia plate beneath the Pacific plate (the northwest-striking plane of the focal mechanism solution).

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 8, 2016 earthquake are typically about 120x55 km (length x width).

The December 8th earthquake occurred about 100 km northwest of where the Australia:Pacific plate boundary transitions from thrust to transform tectonics between the New Britain Trench to the northwest and the New Hebrides Trench farther east. A pair of large earthquakes (M 7.6 and M 7.4) occurred in that plate boundary transition region in April 2014. More broadly, the Solomon Islands Arc is very seismically active, with 53 earthquakes of M 6.5+ occurring within 250 km of the December 8th event over the preceding century. The largest of these was a M 7.9 earthquake about 50 km to the southwest in October 1931, near the New Britain Trench. In 1979, a M 7.1 earthquake occurred in an almost identical location (8 km northwest) to the December 8, 2016 event. None of these historic earthquakes are known to have caused shaking-related fatalities, likely because of their remote location far from population centers that might be vulnerable to earthquake shaking.

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)
HDF (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. Helmberger, 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: 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, 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 correct or may contain inaccuracies and therefore should not be regarded as having official signifiance.

Map updated by U.S. Geological Survey National Earthquake Information Center
08 December 2016
http://earthquake.usgs.gov/
Map not approved for release by Director USGS