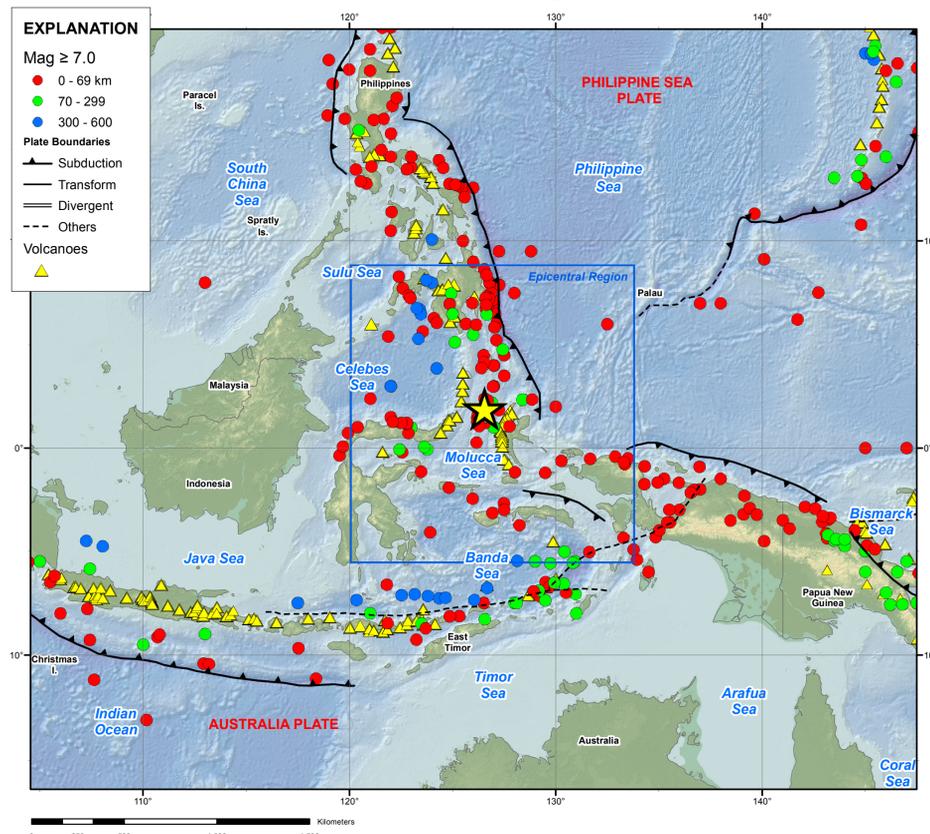


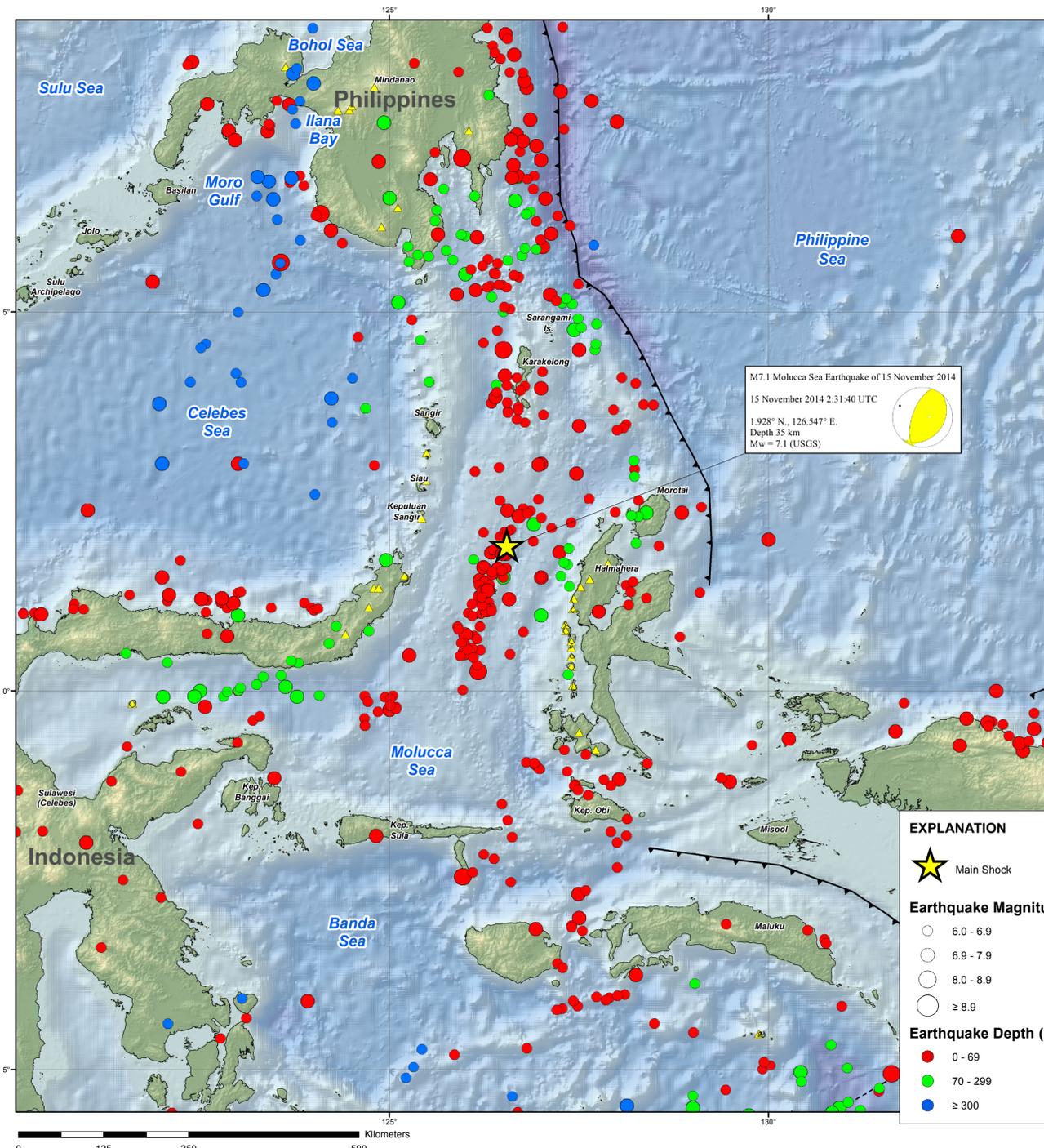
M7.1 Molucca Sea Earthquake of 15 November 2014



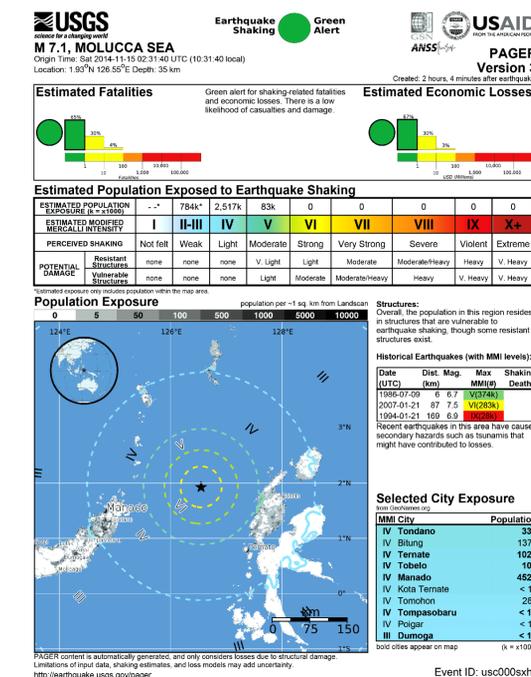
Tectonic Setting



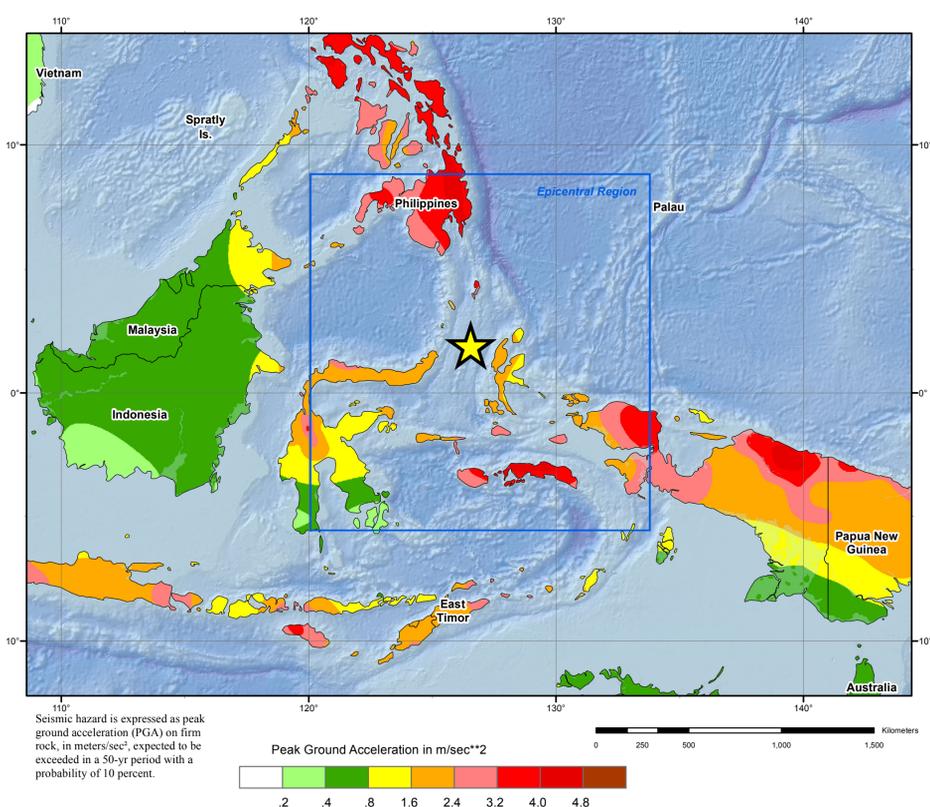
Epicentral Region



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Seismic Hazard

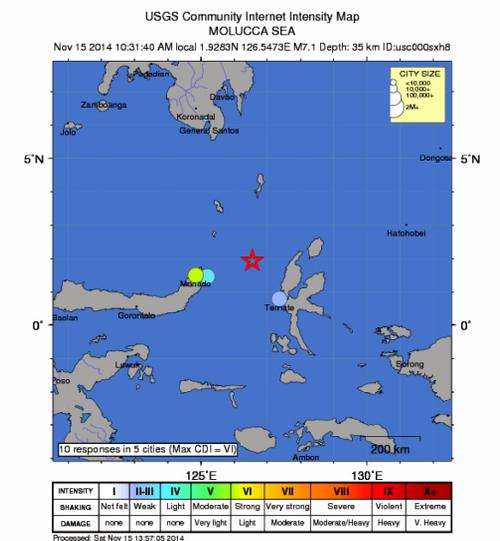


TECTONIC SUMMARY

The November 15, 2014 M 7.1 earthquake northwest of Kota Ternate, Indonesia, occurred within the shallow oceanic crust of the Sunda plate, in the complex plate boundary region of eastern Indonesia, some 300 km to the west of the major plate boundary structure between the Sunda and Pacific plates. Faulting mechanisms for the event indicate it activated a reverse faulting structure, dipping either steeply towards the northwest, or more gently towards the southeast, in line with the general trend of earthquakes in the region. Tectonics in eastern Indonesia are extremely complex, and are dominated by the mostly convergent interactions of the Pacific, Australia, Philippine Sea and Sunda Plates, with some authors labeling the most proximate edge of the Pacific Plate here as a separate tectonic block called the Caroline Plate. The edges of the Sunda and Australia plates are also often subdivided into smaller tectonic blocks, including the Molucca Sea and Birds Head microplates immediately to the south and east of the November 2014 earthquake, respectively. In this context, the November 2014 event most closely aligns with the boundary between the broader Sunda Plate and the Birds Head microplate. At depth beneath this earthquake and the Molucca Sea in general, the inverted-U-shaped Halmahera Plate, which has no surface expression, also plays a role in regional tectonics. At the location of the November 15 earthquake, the Sunda and Philippine Sea plates are converging in an east-west direction at a rate of approximately 109 mm/yr.

This area of the Molucca Sea is no stranger to moderate-to-large earthquakes; nearly 120 M6+ events have occurred within 250 km of the November 15, 2014 earthquake in the last century, two-dozen of which were M7+. The largest, a M 8.1 event in 1932, struck along the same microplate boundary structure approximately 190 km to the south of the 2014 event. Despite the large number of events in the region, few have been damaging, because of their oceanic setting. The exception was a M 7.5 earthquake that struck 90 km to the south of the 2014 event in January 2007, causing 4 fatalities.

Did You Feel It?



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)
HDF (unpublished earthquake catalog, Engdahl, 2003)
Global Seismic Hazard Assessment Program

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, Geophysics, J. Int. 181, 1-80.

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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
17 November 2014
http://earthquake.usgs.gov
Map not approved for release by Director USGS