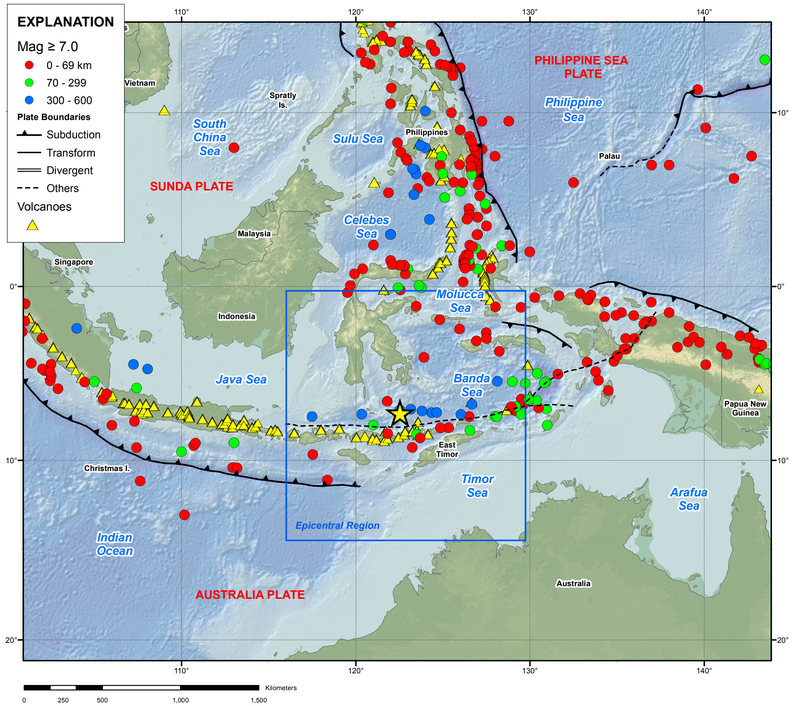
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

# M7.0 Flores Sea Earthquake of 27 February 2015

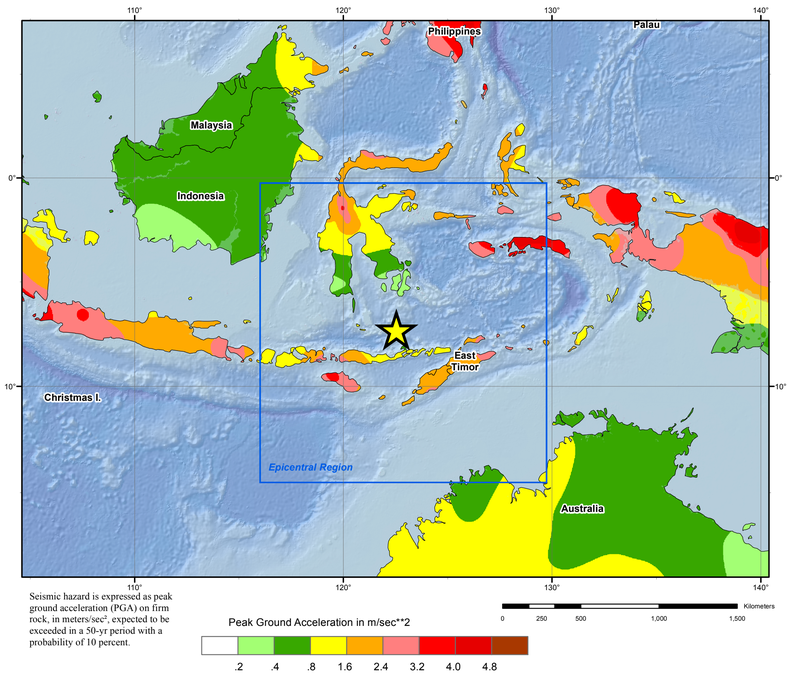
EARTHQUAKE SUMMARY MAP

*Prepared in cooperation with the Global Seismographic Network*

## *Tectonic Setting*

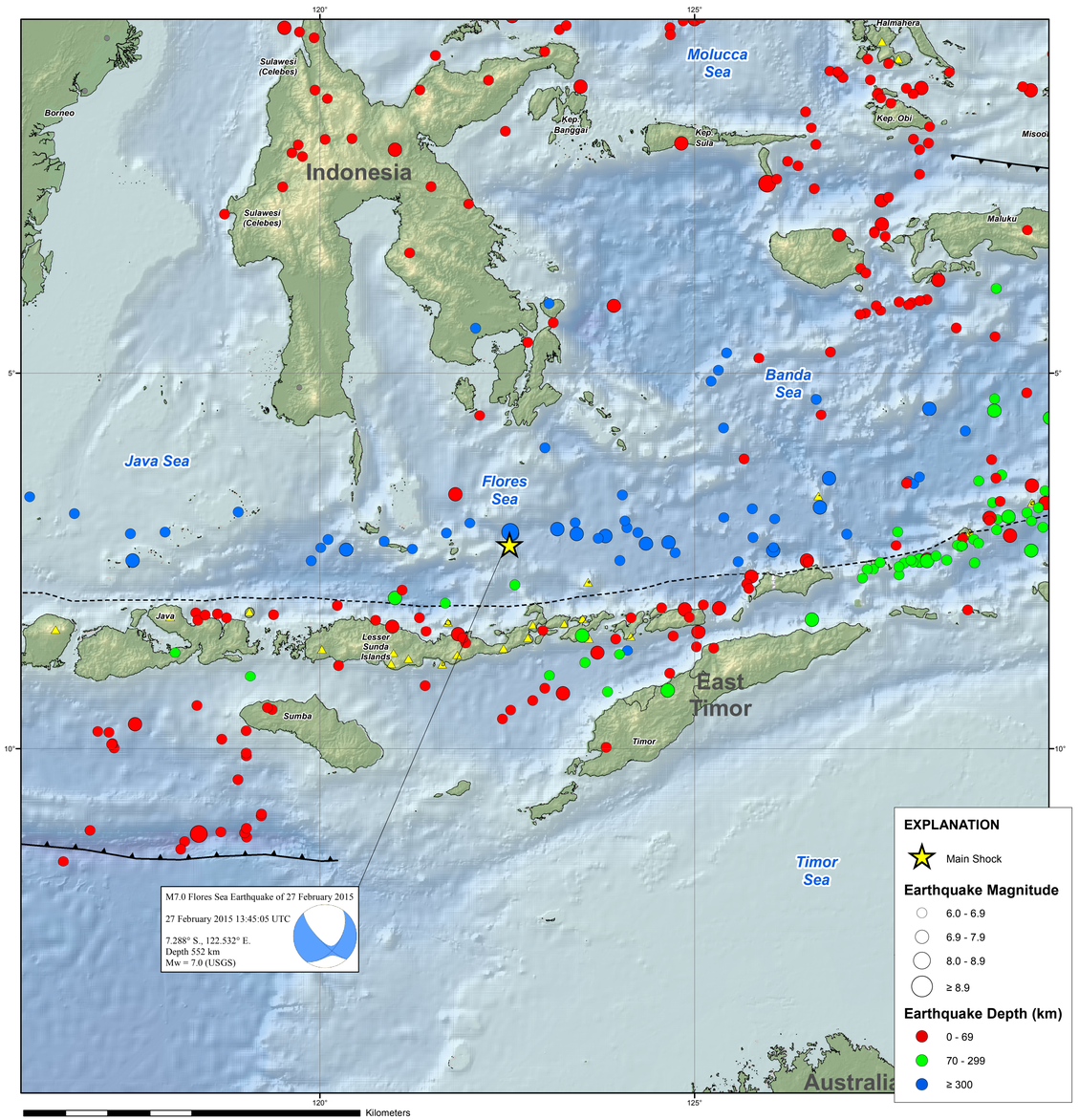



## *Seismic Hazard*




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.

## *Epicentral Region*




## TECTONIC SUMMARY

The February 27, 2015 M 7.0 earthquake north of Nebe, Indonesia occurred as the result of oblique strike-slip faulting within the subducted Australia plate, 550 km beneath the Flores Sea. Focal mechanisms for the earthquake indicate rupture occurred on either a left-lateral structure with a moderately dipping, northeast striking plane, or on a right lateral fault dipping steeply towards the southwest. The earthquake is located at the eastern end of the Australia slab that was originally subducted at the Sunda-Java trench, several hundred kilometers to the south of the event (and at the surface of the Earth). At the location of the earthquake, the Australia plate moves approximately northwards with respect to the Sunda plate at a rate of 74 mm/yr. The February 27, 2015 earthquake occurred in response to stresses generated by the slow distortion of the Australia plate at depth, rather than on the shallower interface with the overriding Sunda plate.

Earthquakes that have focal depths greater than 300 km are commonly termed "deep-focus". Deep-focus earthquakes cause less damage on the ground surface above their foci than is the case with similar magnitude shallow-focus earthquakes, but large deep-focus earthquakes may be felt at great distance from their epicenters. The largest recorded deep-focus earthquake was an M 8.3 event that occurred at a depth of 600 km within the subducted Pacific plate beneath the Sea of Okhotsk, offshore northeastern Russia, in 2013. The M 8.3 Okhotsk earthquake was felt all over Asia, as far away as Moscow, and across the Pacific along the western seaboard of the United States. Over the past century, 66 earthquakes with a magnitude of M7 or more have occurred at depths greater than 500 km; four of these were located in the same region as today's event. The largest nearby event at these depths was a M 7.9 earthquake in June 1996, just 18 km to the north and 40 km deeper than the February 2015 event.

## *PAGER*

**M 7.0, FLORES SEA**
Origin Time: Fri 2015-02-27 13:45:05 UTC (21:45:05 local)
Location: 7.29°S 122.53°E Depth: 552 km

Earthquake Shaking / Green Alert

**PAGER**
**Version 4**
Created: 2 hours, 42 minutes after earthquake

**Estimated Fatalities**

Green alert for shaking-related fatalities and economic losses. There is a low likelihood of casualties and damage.

**Estimated Economic Losses**

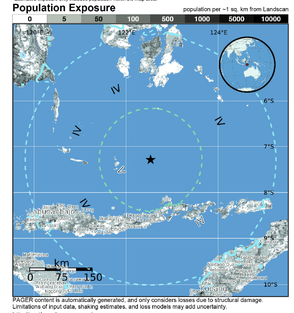
**Estimated Population Exposed to Earthquake Shaking**

| ESTIMATED POPULATION EXPOSURE (k = x1000) | -.-* | 4,339k* | 5,143k | 208k | 0 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| ESTIMATED MODIFIED MERCALLI INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X+ |
| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very Strong | Severe | Violent | Extreme |
| POTENTIAL DAMAGE: Resistant Structures | none | none | none | V. Light | Light | Moderate | Moderate/Heavy | Heavy | V. Heavy |
| POTENTIAL DAMAGE: Vulnerable Structures | none | none | none | Light | Moderate | Moderate/Heavy | Heavy | V. Heavy | V. Heavy |

*Estimated exposure only includes populations within the map area.

**Population Exposure**

population per ~1 sq. km from Landscan




PAGER content is automatically generated, and only considers losses due to structural damage. Limitations of input data, shaking estimates, and loss models may add uncertainty. http://earthquake.usgs.gov/pager

**Structures:**
Overall, the population in this region resides in structures that are vulnerable to earthquake shaking, though some resistant structures exist.

**Historical Earthquakes (with MMI levels):**

| Date (UTC) | Dist. (km) | Mag. | Max MMI(#) | Shaking Deaths |
|---|---|---|---|---|
| 1999-09-07 | 399 | 5.2 | IV(69k) | 0 |
| 1995-05-21 | 122 | 5.2 | VII(70k) | 1 |
| 1987-11-26 | 211 | 6.5 | VIII(6k) | 37 |

Recent earthquakes in this area have caused secondary hazards such as landslides that might have contributed to losses.

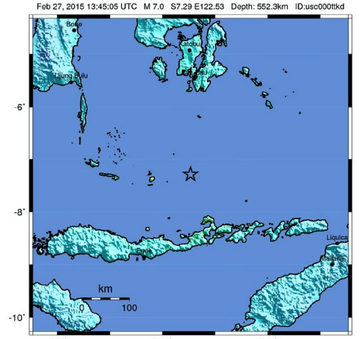
**Selected City Exposure**
from GeoNames.org

| MMI | City | Population |
|---|---|---|
| V | Riangpuho | < 1k |
| V | Konga | < 1k |
| V | Riangkroko | < 1k |
| V | Pemana | < 1k |
| V | Bedalewun | < 1k |
| V | **Maumere** | **49k** |
| IV | **Ende** | **77k** |
| IV | **Labuhanbajo** | **189k** |
| IV | Watampone | 82k |
| III | **Kupang** | **282k** |
| III | Ainaro | < 1k |

bold cities appear on map (k = x1000)

Event ID: usc000ttkd

## *ShakeMap*




| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
|---|---|---|---|---|---|---|---|---|---|
| POTENTIAL DAMAGE | none | none | none | Very light | Light | Moderate | Mod./Heavy | Heavy | Very Heavy |
| PEAK ACC.(%g) | <0.05 | 0.3 | 2.8 | 6.2 | 12 | 22 | 40 | 75 | >139 |
| PEAK VEL.(cm/s) | *<0.02* | *0.1* | *1.4* | *4.7* | *9.6* | *20* | *41* | *86* | *>178* |
| INSTRUMENTAL INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X+ |

Scale based upon Worden et al. (2012)

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

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 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
2 March 2015
http://earthquake.usgs.gov/
Map not approved for release by Director USGS