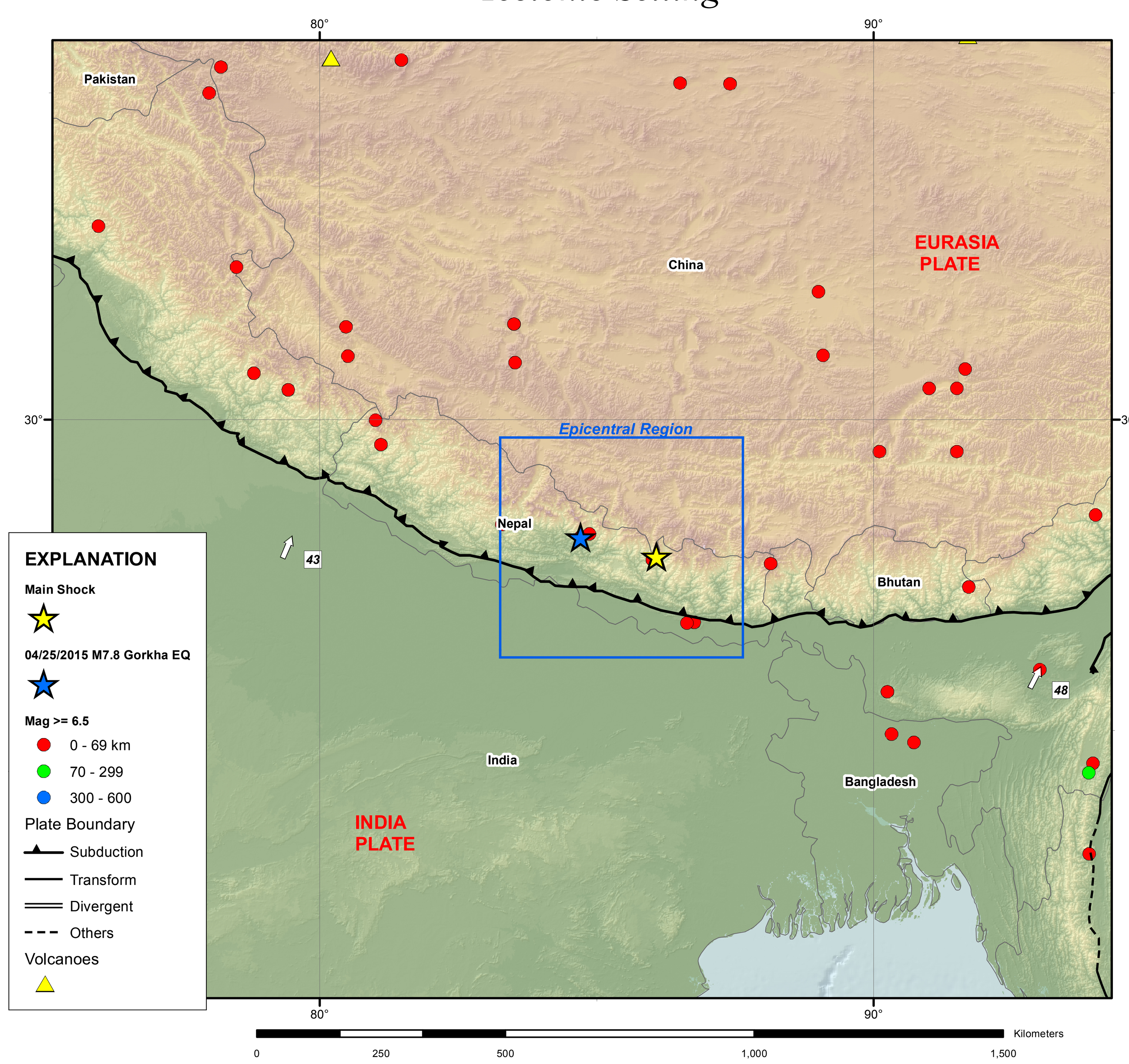
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

M7.3 Nepal Earthquake of 12 May 2015

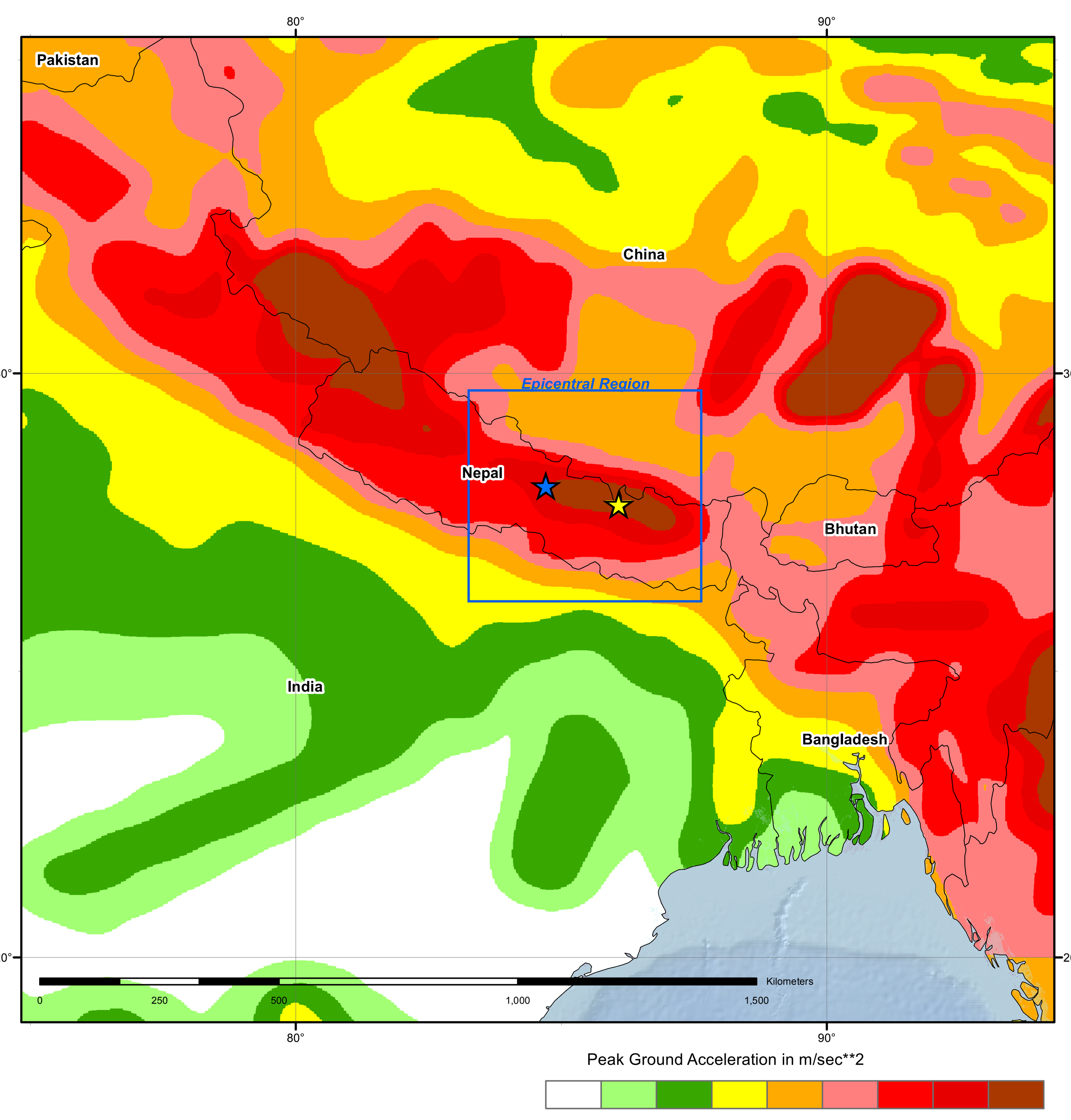
EARTHQUAKE SUMMARY MAP

Prepared in cooperation with the Global Seismographic Network

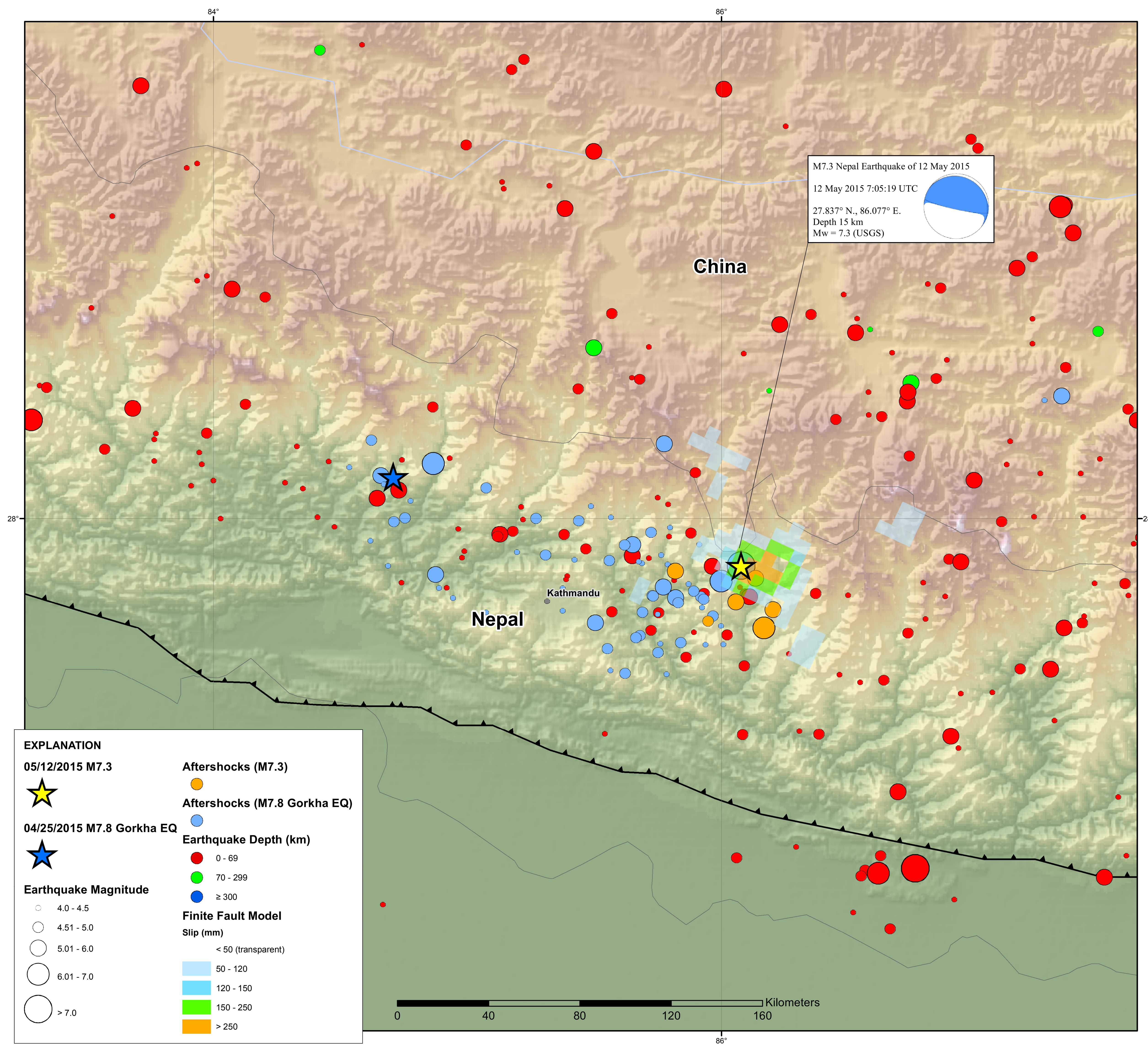
Tectonic Setting



Seismic Hazard



Epicentral Region



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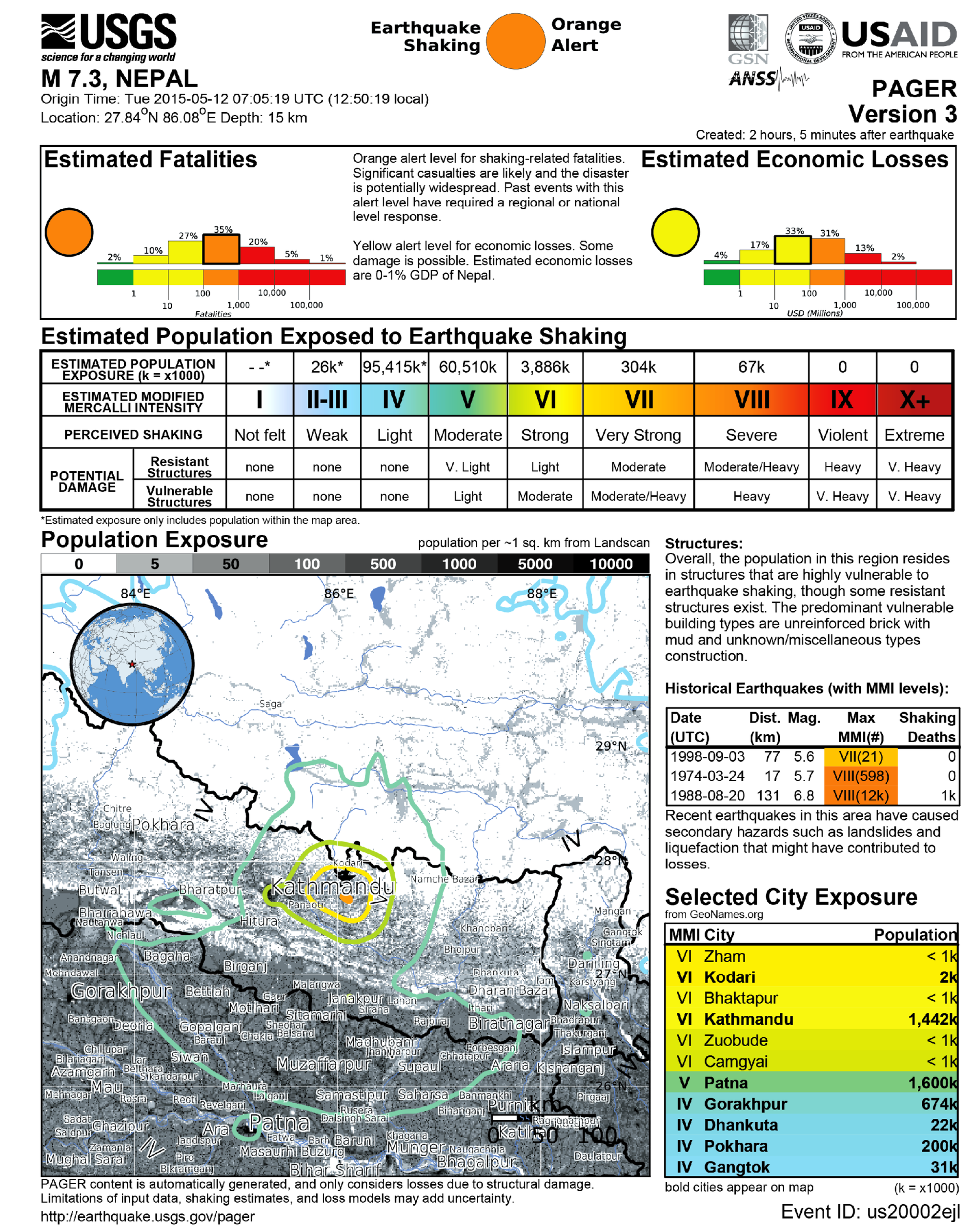

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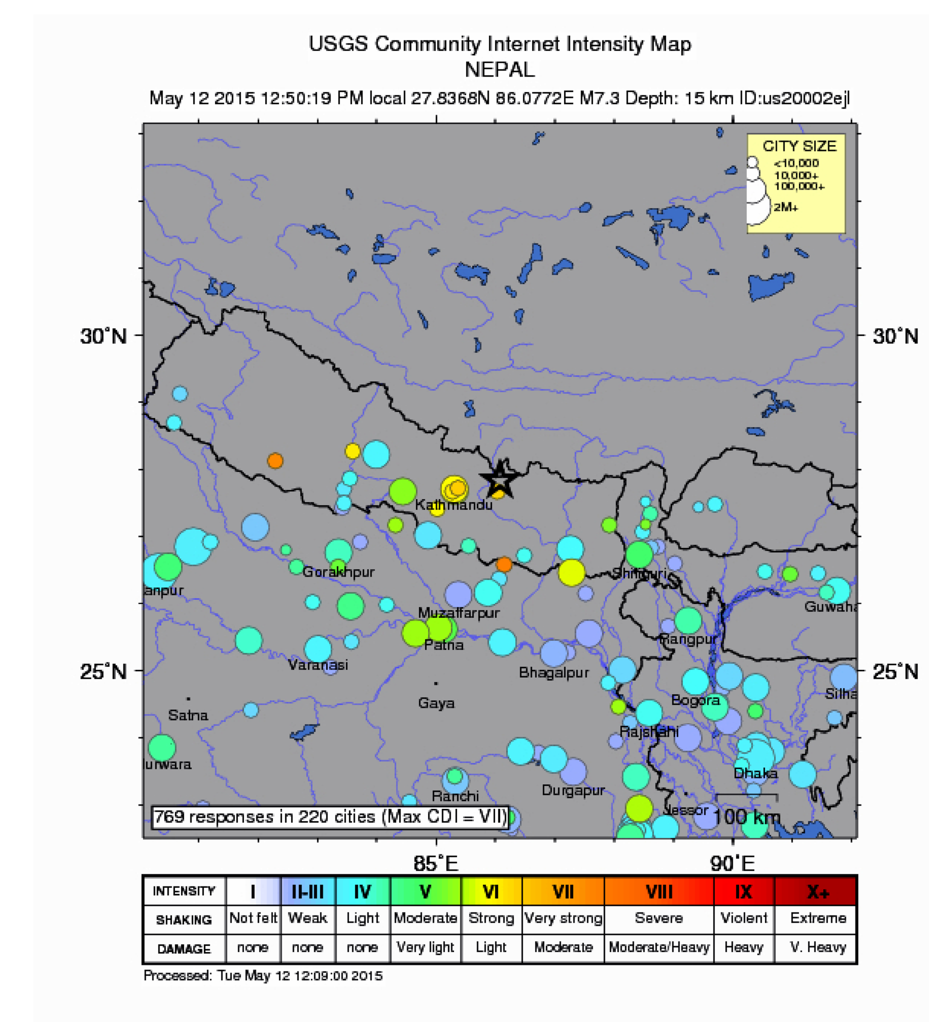


Tectonic Summary

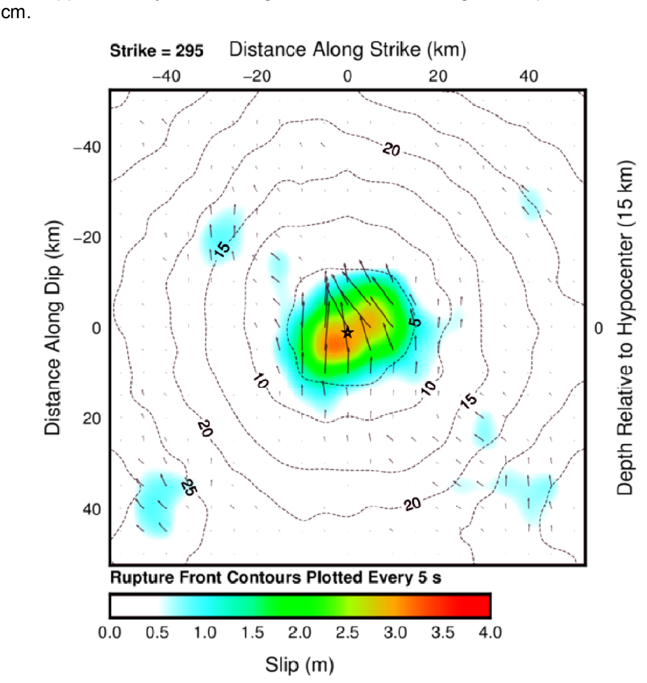
The May 12, 2015 M 7.3 Nepal earthquake (SE of Zham, China) occurred as the result of thrust faulting on or near the décollement associated with the Main Himalayan Thrust, which defines the interface between the underthrusting India plate and the overriding Eurasia plate to the north. At the location of this earthquake, approximately 80 km to the east-northeast of the Nepalese capital of Kathmandu, the India plate is converging with Eurasia at a rate of 45 mm/yr towards the north-northeast – a fraction of which (~18 mm/yr) is driving the uplift of the Himalayan mountain range. The May 12, 2015 event is the largest aftershock to date of the M 7.8 April 25, 2015 Nepal earthquake – known as the Gorkha earthquake - which was located 150 km to the west, and which ruptured much of the decollément between these two earthquakes.

While commonly plotted as points on maps, earthquakes of this size are more appropriately described as slip over a larger fault area. Events of the size of the May 12, 2015 earthquake are typically about 55x30 km in size (length x width). The April 25, 2015 M 7.8 mainshock had approximate dimensions of ~120x80 km, directed from its hypocenter eastwards, and towards Kathmandu. The May 12, 2015 earthquake is located just beyond the eastern end of that rupture.

The boundary region of the India and Eurasia plates has a history of large and great earthquakes. Prior to April 25, four events of M6 or larger had occurred within 250 km of this area over the past century. One, a M 6.9 earthquake in August 1988, 140 km to the south-southeast of the May 12 event, caused close to 1500 fatalities. The largest, an M 8.0 event known as the 1934 Nepal-Bihar earthquake, ruptured a large section of the fault to the south of this May 2015 event, and east of the April 2015 mainshock, in a similar location to the 1988 earthquake. It severely damaged Kathmandu, and is thought to have caused around 10,600 fatalities. Prior to the 20th century, a large earthquake in 1833 is thought to have ruptured a similar area as the April 25, 2015 event. To date, there have been close to 100 M3+ aftershocks of the Gorkha earthquake. In the first two hours after the May 12 event, six further aftershocks have occurred, to the southwest-to-southeast of that earthquake.

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 295° and the dip is 7°NNE. The dimensions of the subfault elements are 5 km in the strike direction and 5 km in the dip direction. The rupture surface is approximately 30 km along strike and 20 km along downdip. The seismic moment release based upon this plane is 1.0e+27 dyne.cm.



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)
Hayes, G. P., Wald, D. J., and Johnson R. L., 2012, A three-dimensional model of globalsubduction zone geometries: Journal of Geophysical Research, v. 117, B01302, doi:10.1029/2011JB008524.
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

Map updated by U.S. Geological Survey National Earthquake Information Center
12 May 2015
http://earthquake.usgs.gov/
Map not approved for release by Director USGS