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

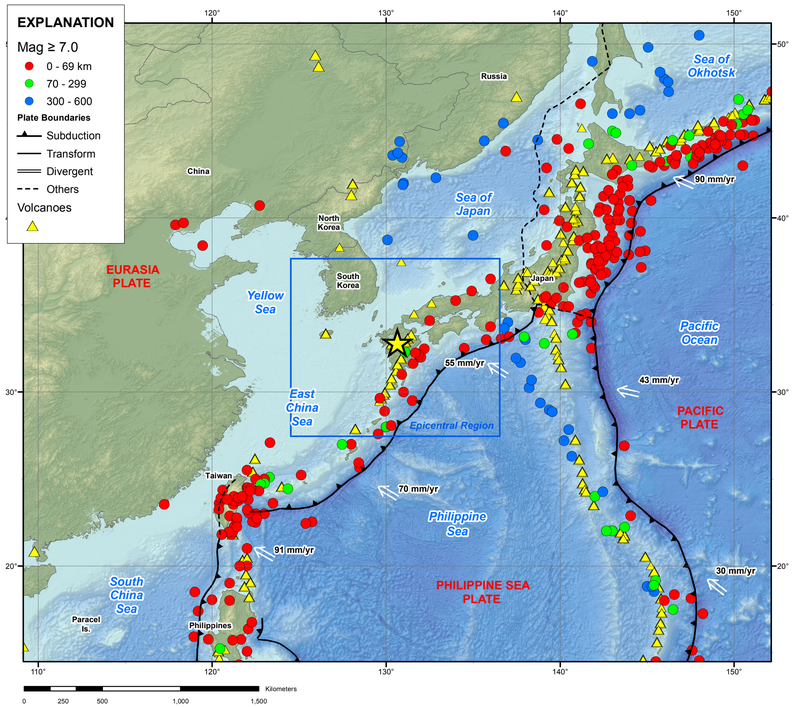
M6.2 Kyushu, Japan Earthquake of 14 April 2016

EARTHQUAKE SUMMARY MAP

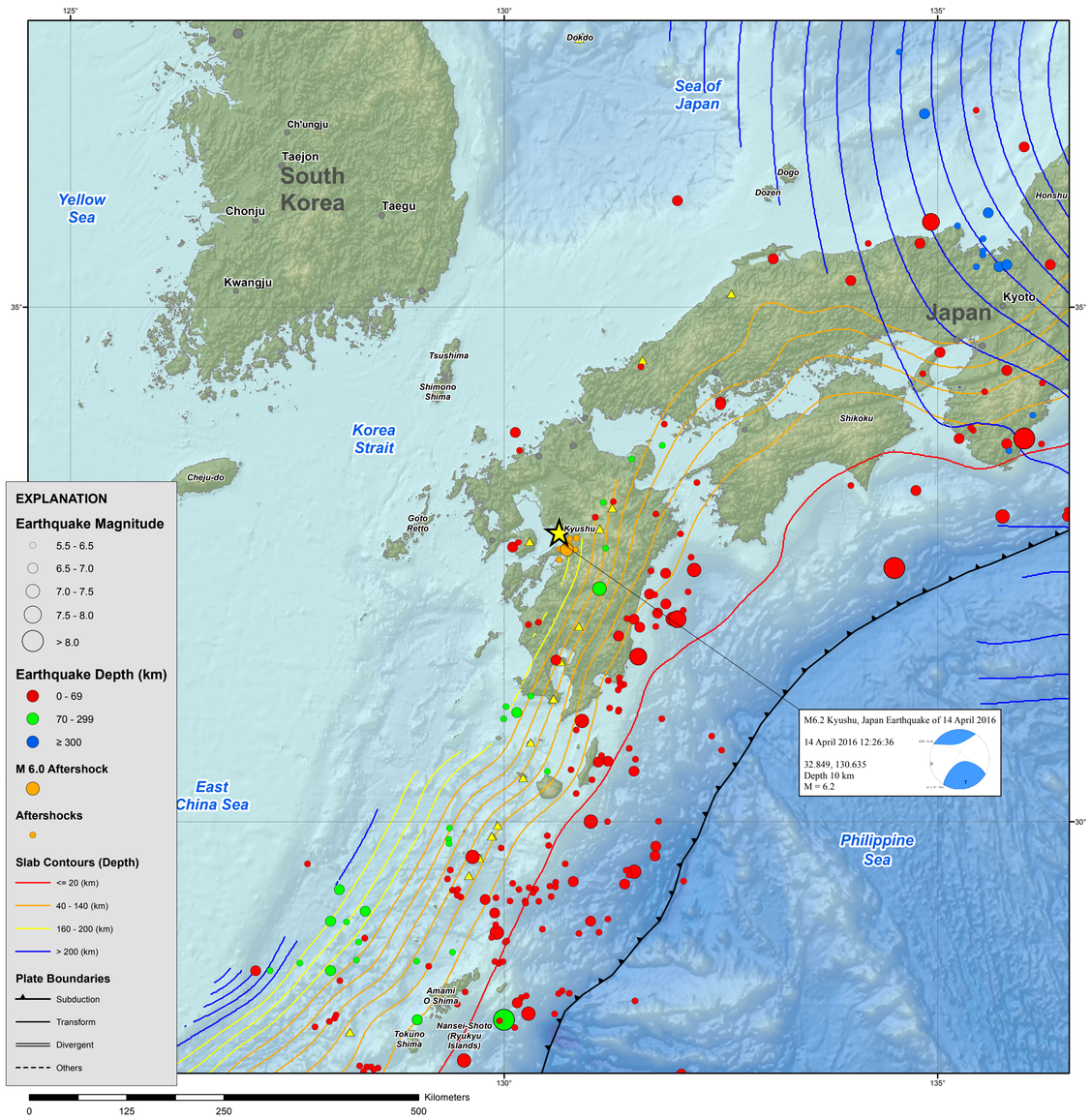
Prepared in cooperation with the Global Seismographic Network

GSN

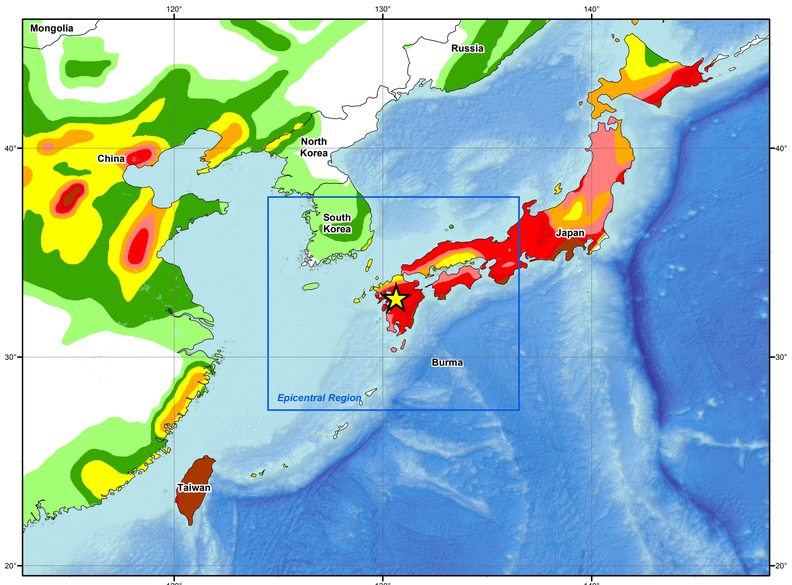
Tectonic Setting



Epicentral Region



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

PAGER

USGS science for a changing world

Earthquake Shaking — Red Alert

USAID FROM THE AMERICAN PEOPLE

ANSS

M 6.2, KYUSHU, JAPAN
Origin Time: Thu 2016-04-14 12:26:36 UTC (21:26:36 local)
Location: 32.85°N 130.63°E Depth: 10 km

PAGER
Version 5
Created: 3 hours, 7 minutes after earthquake

Estimated Fatalities

Red alert level for economic losses. Extensive damage is probable and the disaster is likely widespread. Estimated economic losses are less than 1% of GDP of Japan. Past events with this alert level have required a national or international level response.

Yellow alert level for shaking-related fatalities. Some casualties are possible.

Estimated Economic Losses

Estimated Population Exposed to Earthquake Shaking

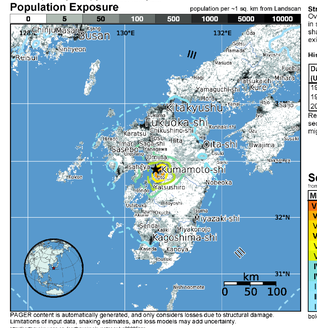
ESTIMATED POPULATION EXPOSURE (k = x1000)	- -*	13,469k*	10,398k	1,187k	386k	192k	756k	0	0
ESTIMATED MODIFIED MERCALLI INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE: Resistant Structures	none	none	none	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 population within the map area.

Population Exposure

population per ~1 sq. km from Landscan

0 5 50 100 500 1000 5000 10000



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/earthquakes/eventpage/us20005hzn

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

Historical Earthquakes (with MMI levels):

Date (UTC)	Dist. (km)	Mag.	Max MMI(#)	Shaking Deaths
1996-10-19	141	5.7	VI(389k)	0
1987-03-18	140	6.6	VII(503k)	1
2001-03-24	226	6.8	VIII(5k)	2

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

Selected City Exposure
from GeoNet.org

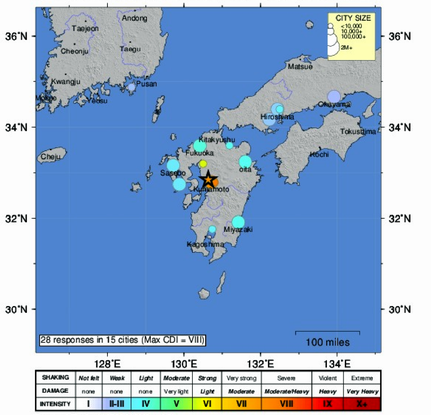
MMI	City	Population
VIII	Kumamoto-shi	680k
VII	Uto	39k
VII	Matsubase	26k
VII	Ozu	30k
VI	Ueki	32k
VI	Tamana	46k
IV	Fukuoka-shi	1,392k
IV	Kagoshima-shi	555k
III	Hiroshima-shi	1,144k
III	Busan	3,679k
III	Changwon	550k

bold cities appear on map (k = x1000)

Event ID: us20005hzn

Did You Feel It?

USGS Community Internet Intensity Map
KYUSHU, JAPAN
Apr 14 2016 09:26:36 PM local 32.8494N 130.6345E M6.2 Depth: 10 km ID:us20005hzn



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Processed: Thu Apr 14 07:23:04 2016 wmdyfi1

TECTONIC SUMMARY

The April 14, 2016 M 6.2 earthquake north of Kumamoto, on the island of Kyushu in southwest Japan, occurred as the result of strike-slip faulting at shallow depth. Focal mechanisms for the earthquake indicate slip occurred on either a left-lateral fault striking to the northwest, or on a right-lateral fault striking northeast. While the earthquake occurred several hundred kilometers northwest of the Ryukyu Trench, where the Philippine Sea plate begins its northwestward subduction beneath Japan and the Eurasia plate, the shallow depth and faulting mechanism of this earthquake indicate it occurred on a crustal fault within the upper Eurasia plate. At the location of this event, the Philippine Sea plate converges with Eurasia towards the northwest at a velocity of 58 mm/yr.

Moderate-to-large, shallow earthquakes in Kyushu are infrequent – most seismicity in the region is related to the subduction of the Philippine Sea plate at depth. Thirteen M 5+ earthquakes have occurred at shallow depths (> 50 km) within 100 km of the April 2016 event over the past century. In January and April of 1975, two shallow events with magnitudes of M 5.8 and M 6.1 - 40 km and 65 km to the northwest of the April 2016 earthquake, respectively – caused injuries, but no known fatalities. A shallow M 6.6 earthquake in March 2005, just off the north coast of Kyushu and 110 km north of the April 2016 event, caused over 1000 injuries and at least one fatality.

Mapped faults in the region generally trend east-west or northeast-southwest, in agreement with the right-lateral plane of preliminary focal mechanisms, and the trend of early afterhsocks. In the first three hours after the M 6.2 event (12:26:36 UTC), 7 aftershocks have been located, the largest of which is a M 6.0 event at 15:03:47 UTC.

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 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 signifiance.

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