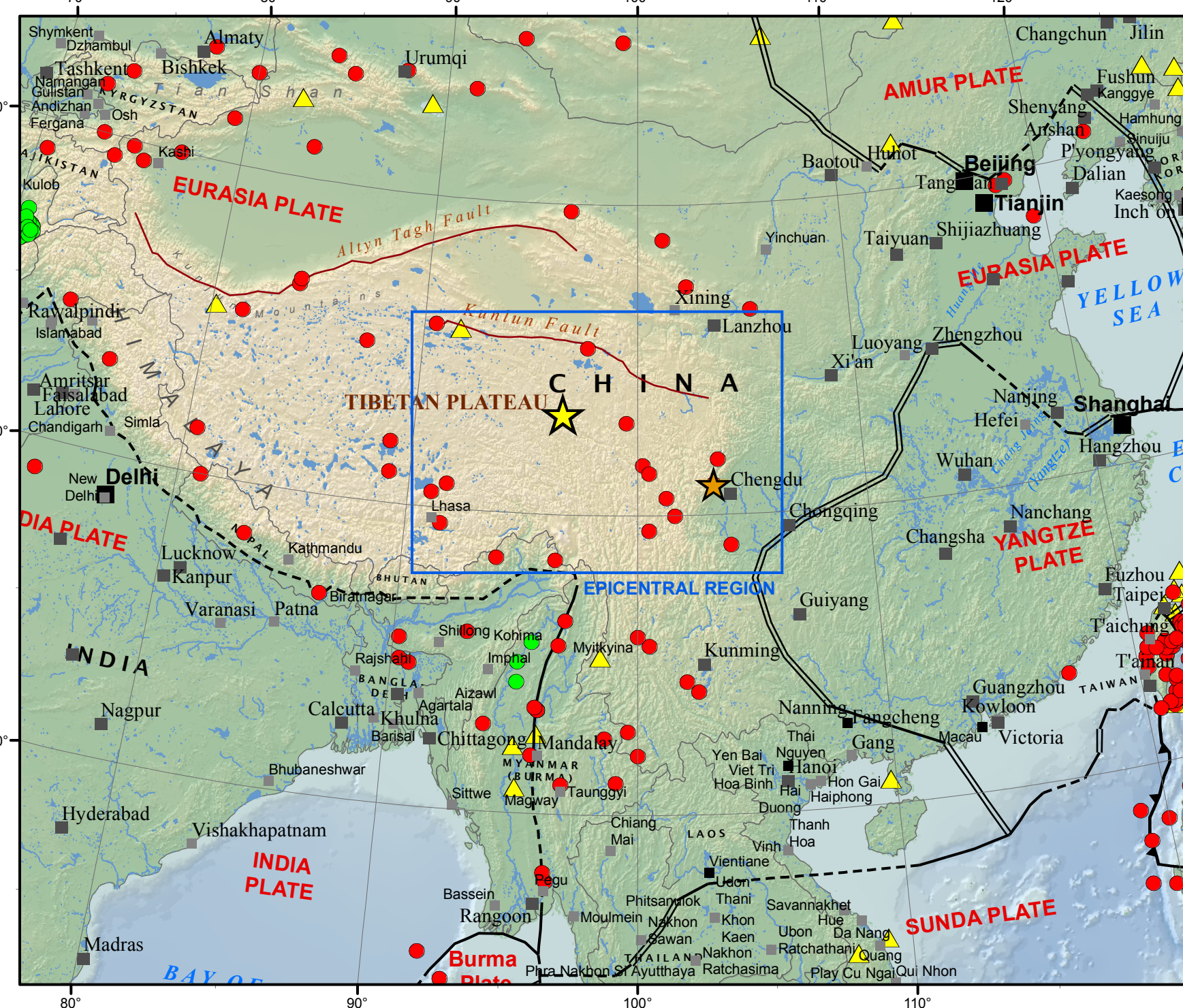


M6.9 Southern Qinghai, China Earthquake of 13 April 2010



Tectonic Setting



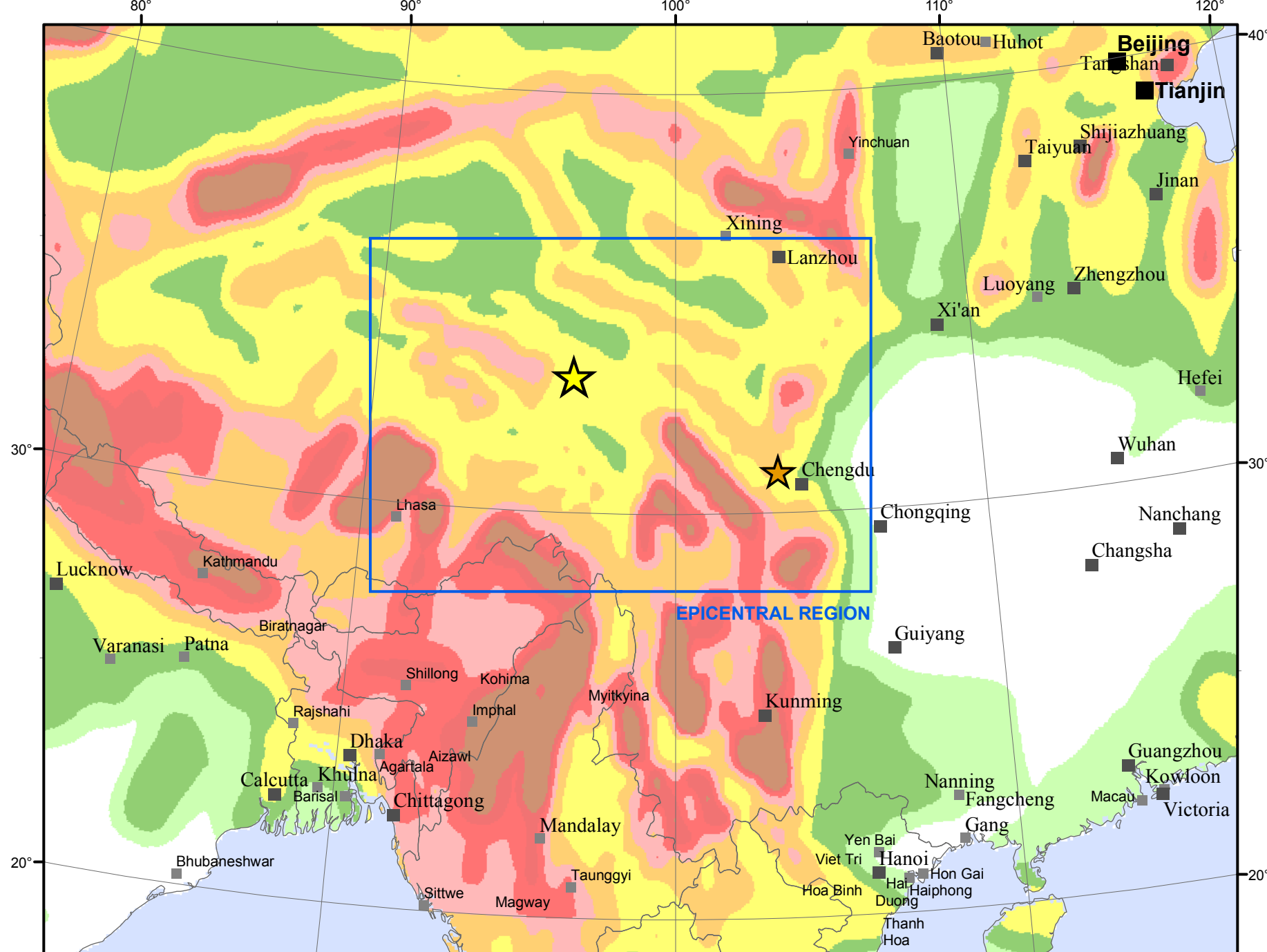
RELATIVE PLATE MOTIONS

The India Plate is moving northward relative to the Eurasia Plate at about 50 mm/yr.

Scale 1:20,000,000

Kilometers

Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

Scale 1:15,000,000

Kilometers

Peak Ground Acceleration in m/sec²

2 .4 .8 1.6 2.4 3.2 4.0 4.8

EXPLANATION

Mag ≥ 7.0

● 0 - 69 km

● 70 - 299

● 300 - 600

▲ Volcanoes

Plate Boundaries

— Subduction

— Transform

— Divergent

--- Others

EXPLANATION

★ Main Shock

● Aftershocks

★ Mainshock 20080512

Earthquake Magnitude

○ 4.00 - 5.99

○ 6.00 - 6.99

○ 7.00 - 7.99

○ 8.00 - 8.99

○ 9.00 - 9.99

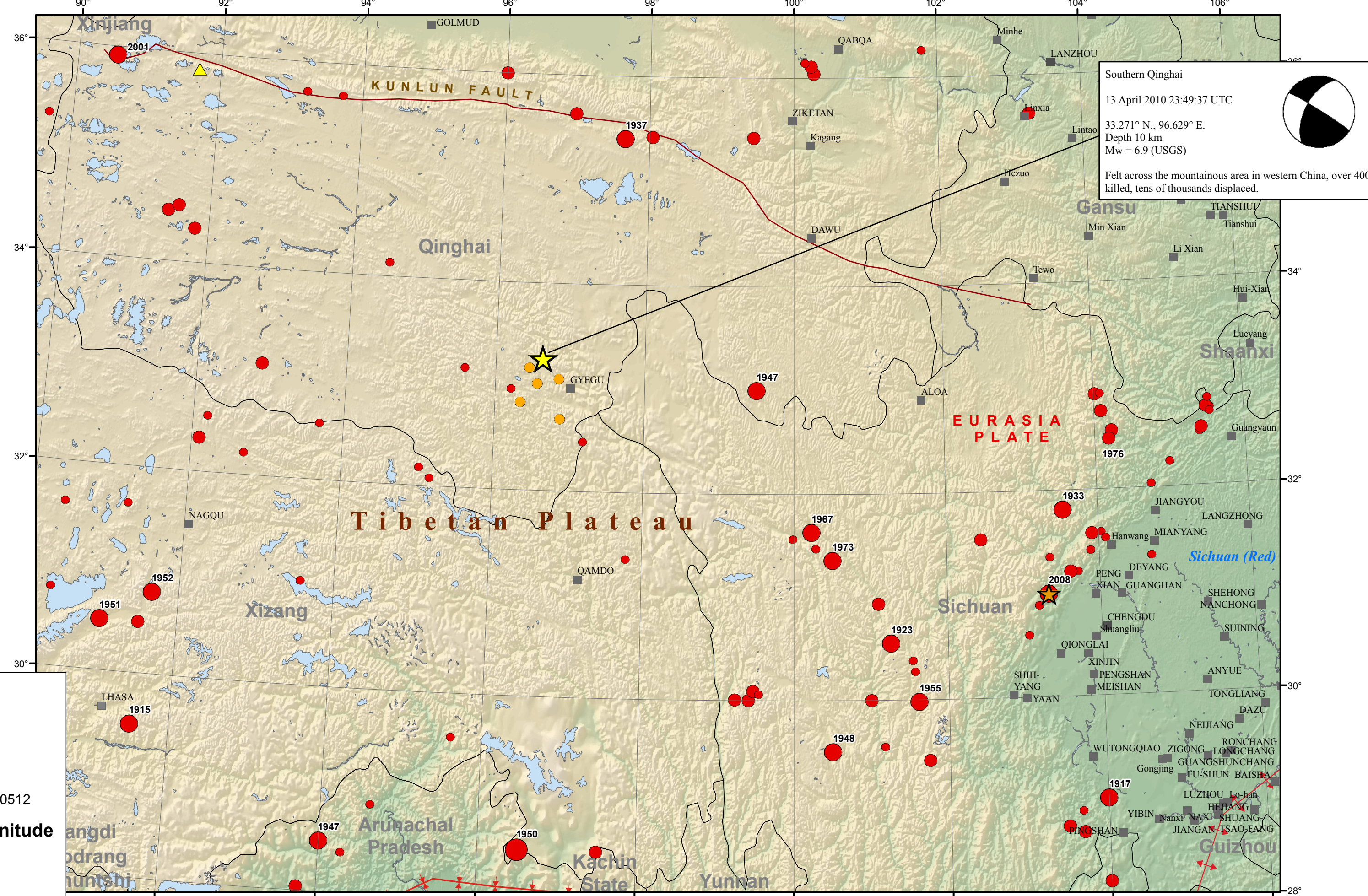
Earthquake Depth

● 0 - 69

● 70 - 299

● 300 - 700

Epicentral Region



Southern Qinghai
13 April 2010 23:49:37 UTC
33.271° N., 96.629° E.
Depth 10 km
Mw = 6.9 (USGS)
Felt across the mountainous area in western China, over 400 killed, tens of thousands displaced.



Scale 1:4,000,000

Projection Albers Equal Area

Kilometers

TECTONIC SUMMARY

The southern Qinghai Province, China earthquake of 13 April 2010 occurred as a result of strike-slip faulting in the tectonically complex region of the eastern Tibetan Plateau. This earthquake occurred several hundred kilometers north of the convergent India-Eurasia plate boundary, where the Indian Plate is moving northwards with respect to Eurasia at a rate of approximately 46 mm/yr. This convergence drives the uplift of the Himalaya Mountains, at a rate of approximately 10 mm/yr, and the Tibetan Plateau, which is an extremely broad region of thickened and uplifted crust sitting above 4.5-5 km.

In the region of the April 13th earthquake the Tibetan Plateau is extending and translating east-southeastward within a larger zone of generally north-south convergence. Based on the location, depth, and moment tensor of the event, the Qinghai Province earthquake likely reflects the interplay amongst these major tectonic forces, dominated in this location by southeastward translation along the Yushu fault, a strand of the larger Xianshuhe fault system. This fault accommodates approximately 9-12 mm/yr of motion, approximately one third of the overall eastward motion of Tibet. The April 13 earthquake is one of the largest known historic earthquakes within several hundred kilometers of its location. In 1738, a nearby earthquake of approximately magnitude 6.5 caused over 300 fatalities. Historic ruptures on the Xianshuhe fault system further to the southeast include the 1792 magnitude 6.8 earthquake; the 1816 magnitude 7.5 earthquake; the 1904 magnitude 7.0 earthquake; the 1973 magnitude 7.6 earthquake; and the 1981 magnitude 6.9 earthquake (Allen et al., 1991).

The magnitude 7.9 Wenchuan (Sichuan) earthquake of 12 May 2008 occurred on the margin of the Tibetan Plateau, in contrast with the 13 April 2010 earthquake, which occurred in the plateau's interior. The 2008 earthquake killed over 70,000 people and displaced over 15 million.

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.

Significant Earthquakes Mag ≥ 7.0

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1915	12	03	0239	29.500	91.500	0	7.0
1917	07	30	2354	29.000	104.000	0	7.3
1923	03	24	1240	30.553	101.258	25	7.2
1933	08	25	0750	31.810	103.541	25	7.3
1937	01	07	1320	35.404	97.667	15	7.6
1947	03	17	0819	33.000	99.500	0	7.5
1947	07	29	1343	28.500	94.000	0	7.3
1948	05	25	0711	29.500	100.500	0	7.2
1950	08	15	1409	28.500	96.500	0	8.6
1951	11	18	0935	30.500	91.000	0	7.7
1952	08	17	1602	30.797	91.648	10	7.7
1955	04	14	0129	29.981	101.613	10	7.5
1967	08	30	0422	31.631	100.232	8.1	7.0
1973	02	06	1037	31.361	100.504	6.6	7.4
2001	11	14	0926	35.918	90.543	10.8	7.8
2008	05	12	0628	31.002	103.322	19	7.9

REFERENCES

- Bird, P., 2003, An updated digital model of plate boundaries: *Geochim. 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.
- U.S. Geological Survey, 2002, *Earthquake Catalog*, <http://www.usgs.gov/earthquake>.
- U.S. Geological Survey, 2003, *Global Seismic Hazard Assessment Program*, <http://www.gshap.org/>.
- U.S. Geological Survey, 2004, *Plate Tectonics and Fault Model*, http://www.usgs.gov/plate_tectonics/.
- U.S. Geological Survey, 2005, *Finite Fault Model*, http://www.usgs.gov/finite_fault_model/.

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

PLATE TECTONICS AND FAULT MODEL

- PB2002 (Bird, 2003)
Finite Fault Model, Chen Ji, UC Santa Barbara (2007)

BASE MAP

- NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models

USGS

M 6.9, SOUTHERN QINGHAI, CHINA

Origin Time: Tue 2010-04-13 23:49:37 UTC

Location: 33.27°N 96.63°E Depth: 10 km

USAID

PAGER

Version 2

Created: 37 minutes, 64 seconds after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (N = 1100)	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	None	None	None	Light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy

Personal exposure only includes population within the map area.

Population Exposure

Shaking Intensity

Overall, the population in this region resides in structures that are highly vulnerable to earthquake shaking, though some resistant structures exist. On June 15, 1982 (UTC), a magnitude 5.6 earthquake 338 km Southeast of this one struck China, with estimated population exposures of 1,000 at intensity VII and 2,000 at intensity VI, resulting in a reported 11 fatalities.

This information was automatically generated and has not been reviewed by a seismologist.

<http://earthquake.usgs.gov/pager>

Event ID: us2010vcp

USGS Community Internet Intensity Map

SOUTHERN QINGHAI, CHINA

Apr 14 2010 07:49:37 local 33.2707°N 96.6286°E M6.9 Depth: 10 km ID: us2010vcp



INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
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

Processed: Wed Apr 14 08:11:12 2010