Southern China Earthquake

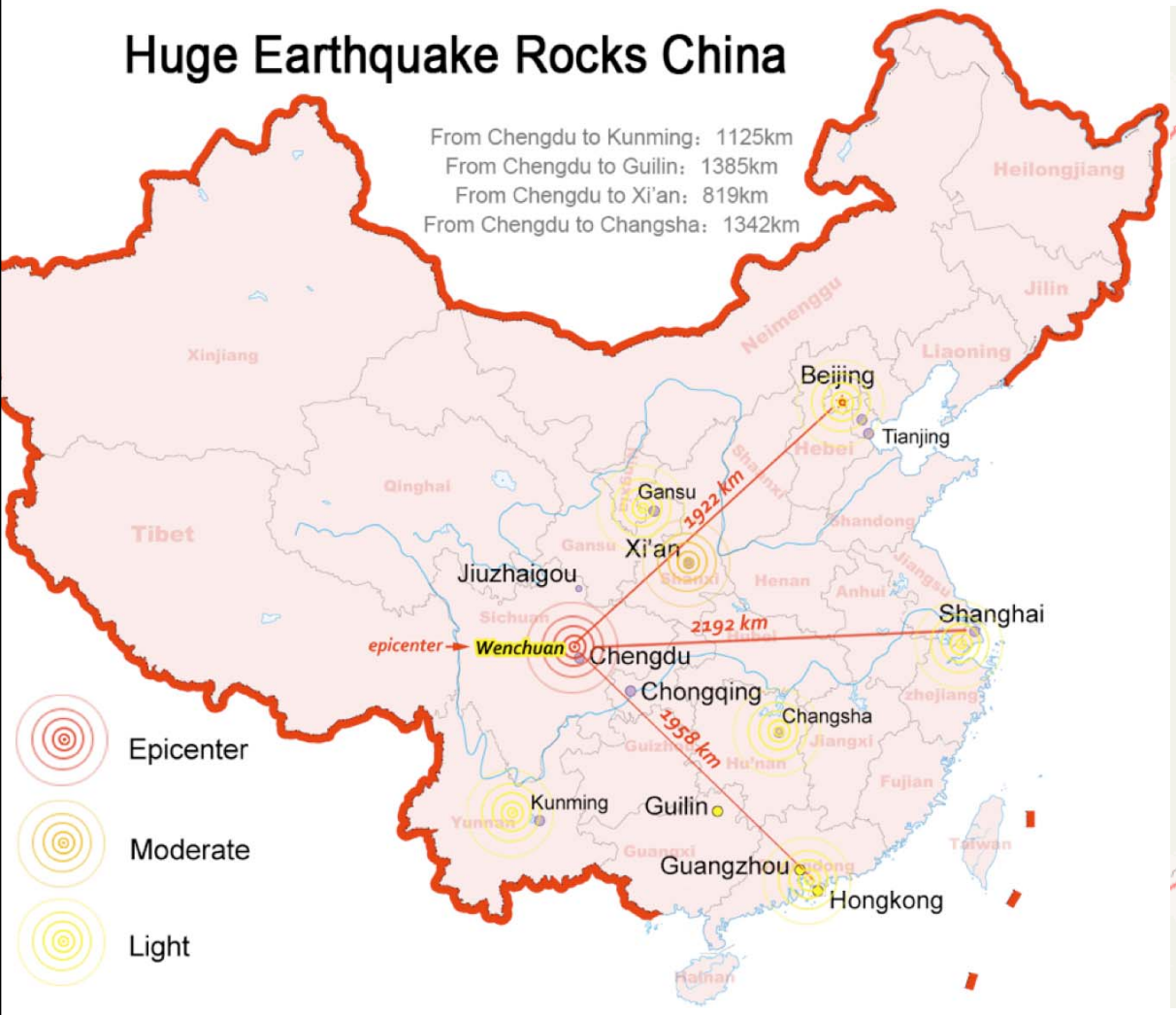
Meng Cai
Jan 16, 2009

image resource: http://www.chinatoday.com/china-news/china.earthquake.pictures.1.htm

Facts

- Magnitude of 7.9
- Epicenter: Wenchuan County, 31.099 N, 103.279 E
- Depth: 19km or 12 mi
- 14:28:01.42 @ local time, May 12, 2008
- Tremors lasted for around **3 min**

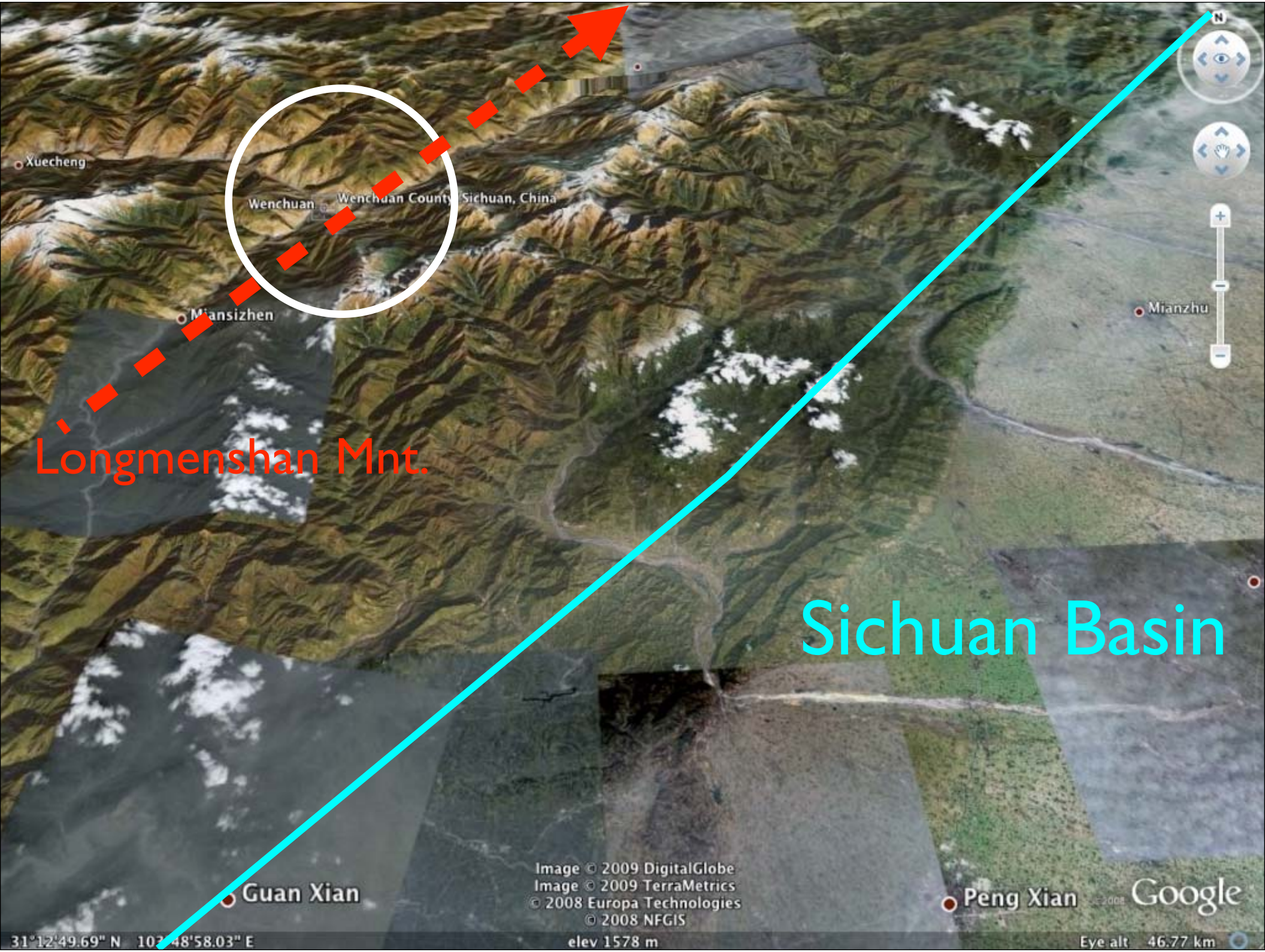
Epicenter: Wenchuan County



- **Area** 485,000 km²
- **Population** (2004)
  87,250,000 (3rd)
- **Density** 180 /km² (22nd)
- **Major nationalities**
  - Han 95.0%
  - Yi 2.6%
  - Tibetan 1.5%
  - Qiang 0.4%

Tectonic Summary

- Motion on a northeast striking reverse fault or thrust fault along Longmenshan Mnt. on the northwestern margin of Sichuan Basin.


Xuecheng
Wenchuan
Wenchuan County
Sichuan, China
Mianzhu
Longmenshan Mnt.
Sichuan Basin
Guan Xian
Peng Xian
Image © 2009 DigitalGlobe
Image © 2009 TerraMetrics
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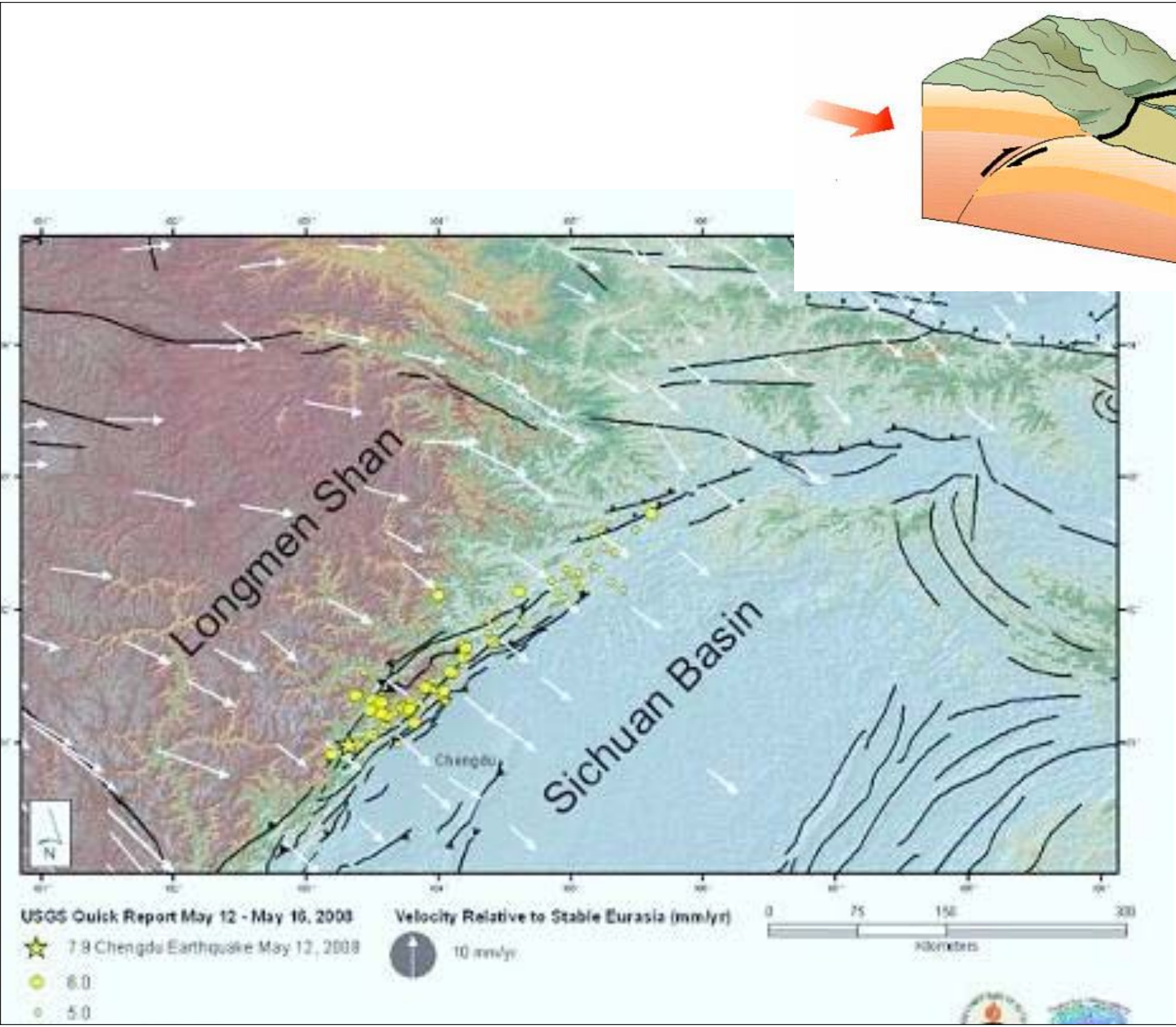
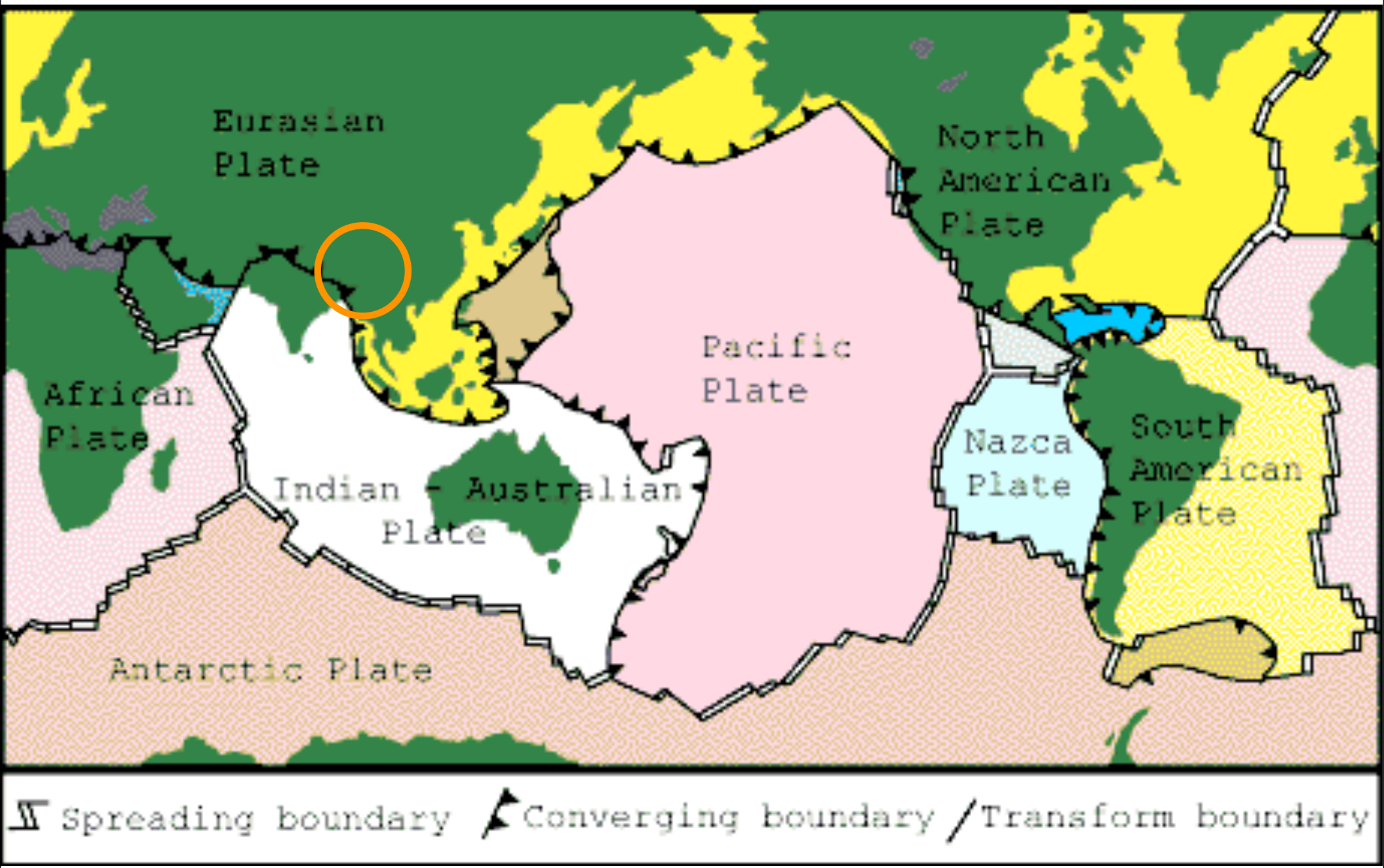
Google
elev 1578 m
Eye alt 46.77 km

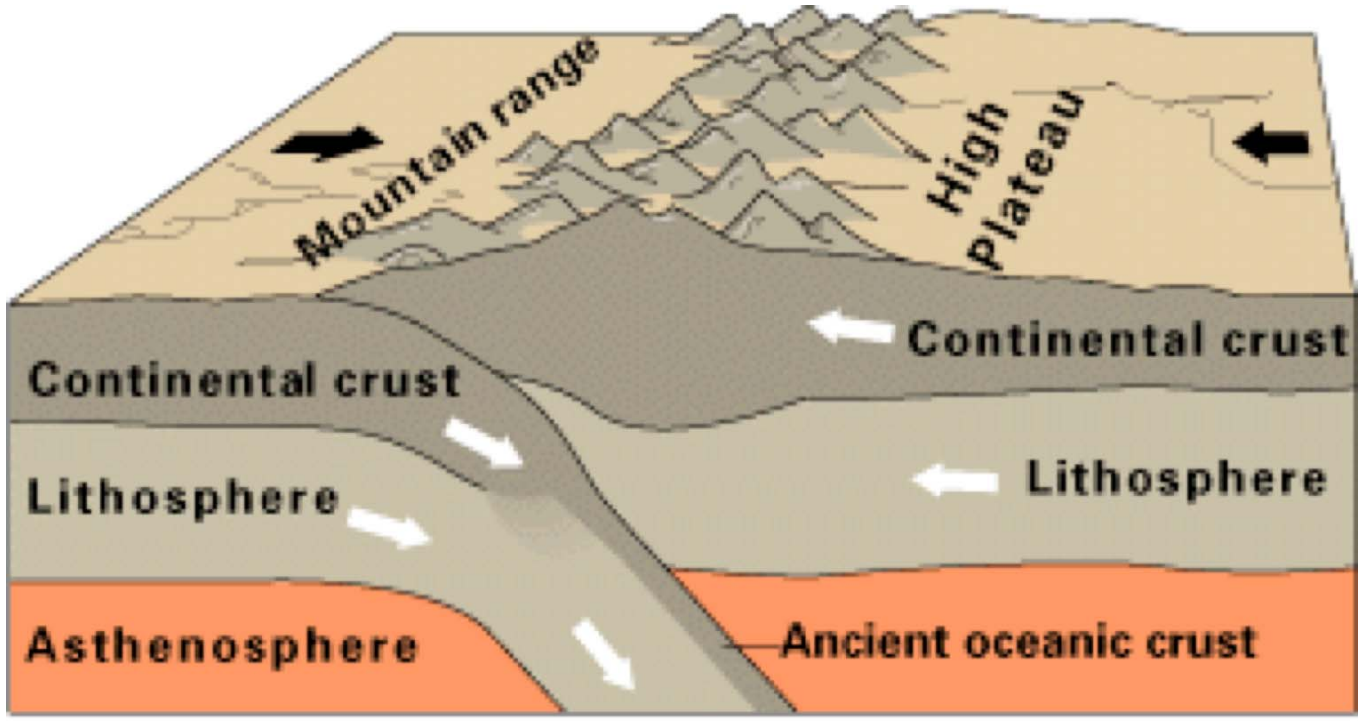

Longmen Shan
Sichuan Basin
Chengdu
N
USGS Quick Report May 12 - May 16, 2008
7.9 Chengdu Earthquake May 12, 2008
6.0
5.0
Velocity Relative to Stable Eurasia (mm/yr)
10 mm/yr
0
75
150
300
Kilometers

- A thrust formation along the border of *Indo-Australian Plate* and *Eurasian Plate*.

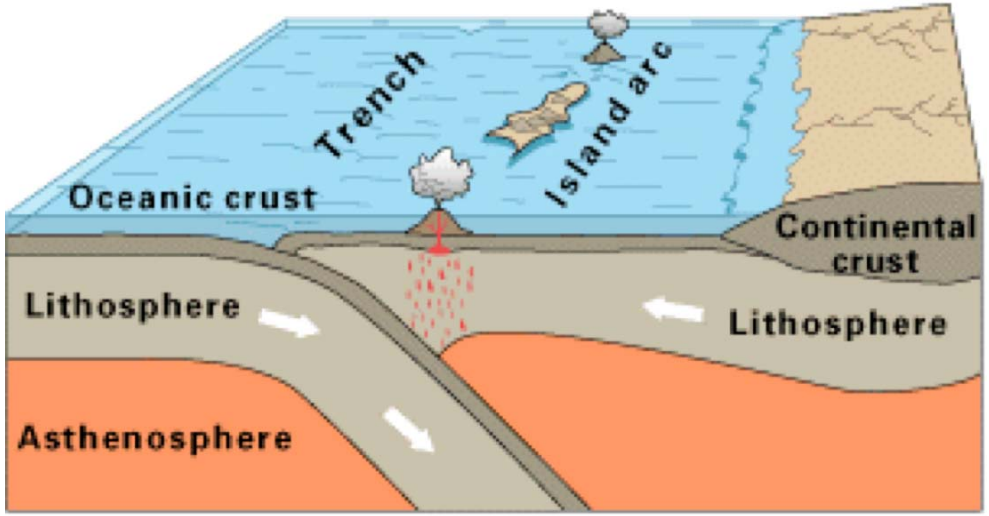

Eurasian Plate
North American Plate
Pacific Plate
African Plate
Indian - Australian Plate
Nazca Plate
South American Plate
Antarctic Plate
Spreading boundary
Converging boundary
Transform boundary

Q for “Bonus” !

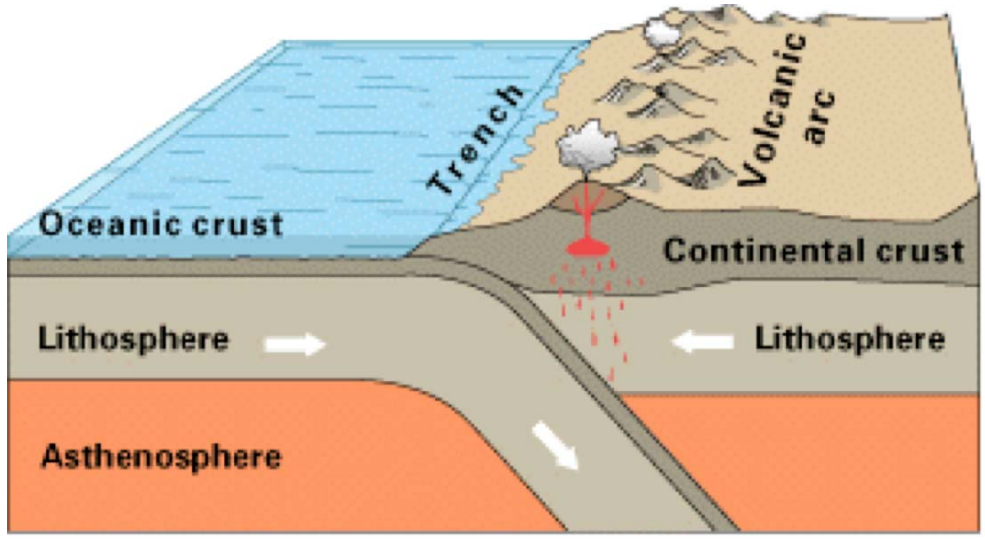
- What does a continental-continental convergence generate ?
- Mountains



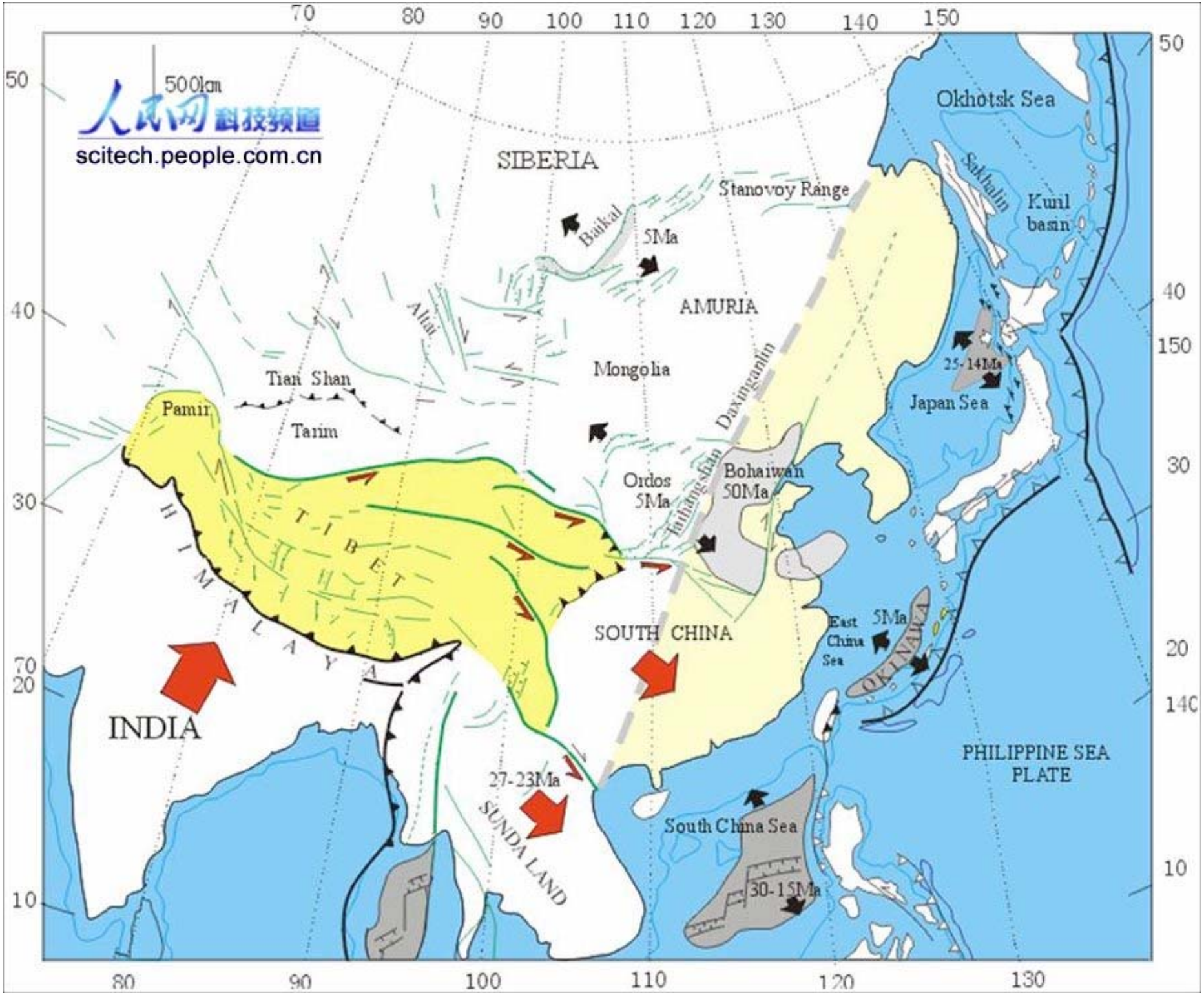
Continental-continental convergence



Oceanic-oceanic convergence



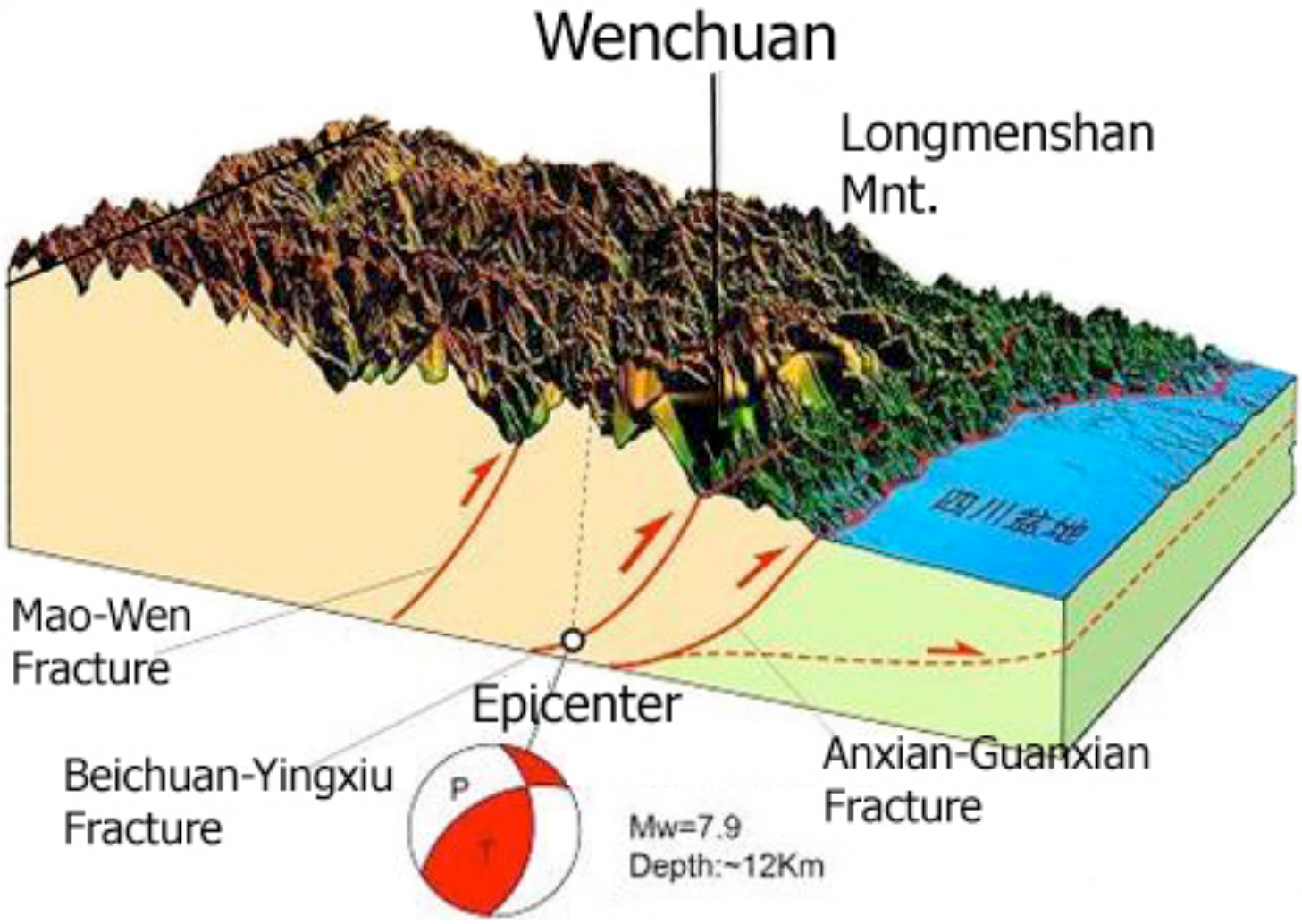
Oceanic-continental convergence


500km
人民网 科技频道
scitech.people.com.cn
SIBERIA
Okhotsk Sea
Sakhalin
Kuril basin
Stanovoy Range
Baikal
5Ma
AMURIA
Altai
Mongolia
Tian Shan
Tarim
Pamir
Daxinganlin
Taihangshan
Ordos 5Ma
Bohaiwan 50Ma
25-14Ma
Japan Sea
HIMALAYA
TIBET
SOUTH CHINA
East China Sea
5Ma
OKINAWA
INDIA
PHILIPPINE SEA PLATE
27-23Ma
SUNDA LAND
South China Sea
30-15Ma
70
80
90
100
110
120
130
140
150
50
40
30
20
10

Fractures

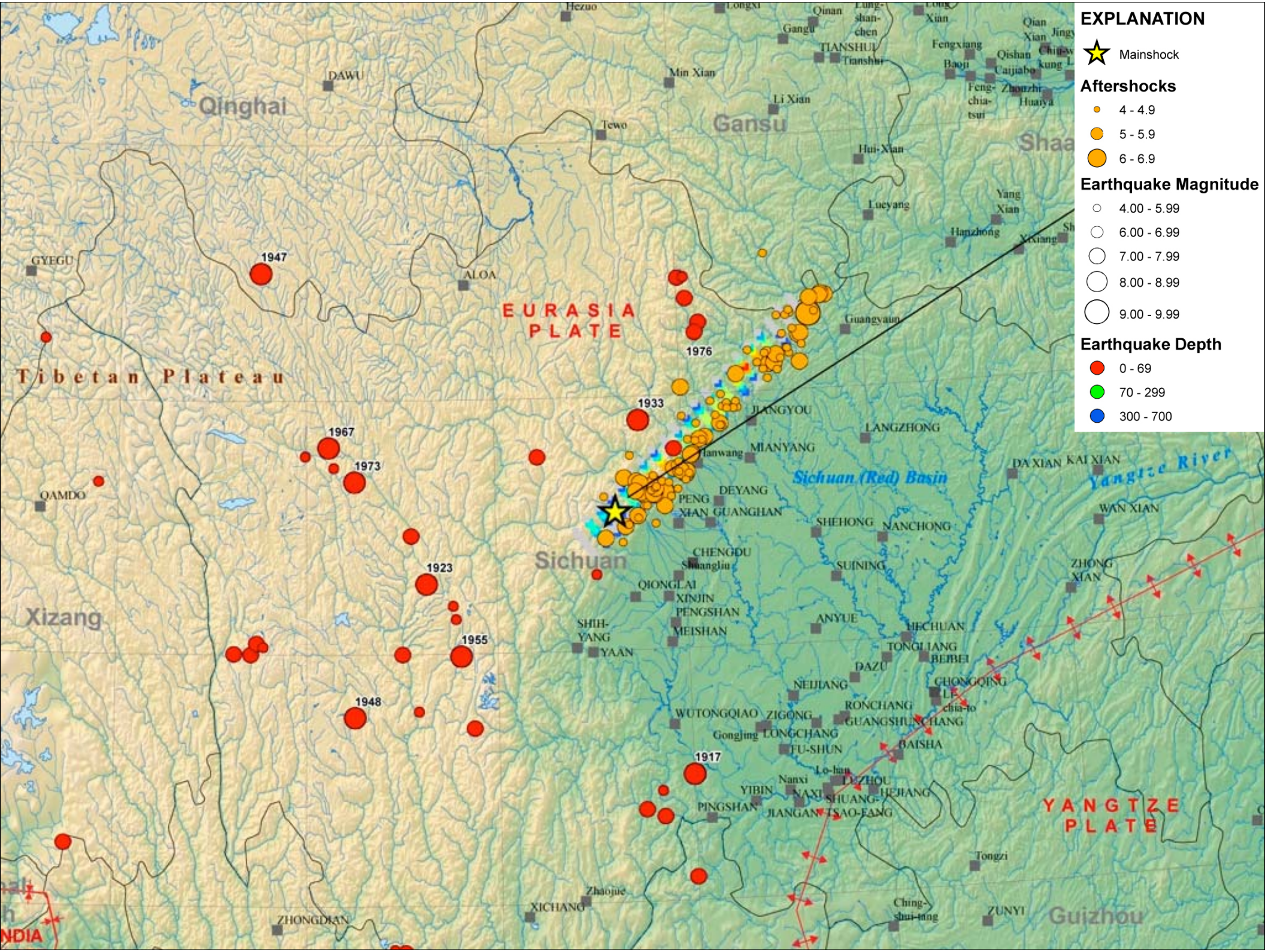
- Three fractures
- Seismic activities concentrated on the mid-fracture (Beichuan -Yingxiu fracture).

Fractures


Wenchuan
Longmenshan
Mnt.
四川盆地
Mao-Wen
Fracture
Epicenter
Beichuan-Yingxiu
Fracture
Anxian-Guanxian
Fracture
P
T
Mw=7.9
Depth:~12Km

Rupture

- 300 km or 186 mi fault
- Rupture lasted to 120 sec
- Majority energy released in the first 80 sec
- Up to 9 meters or 30 ft displacement


EXPLANATION
Mainshock
Aftershocks
4 - 4.9
5 - 5.9
6 - 6.9
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
EURASIA PLATE
YANGTZE PLATE
Tibetan Plateau
Sichuan (Red) Basin
Yangtze River
Qinghai
Gansu
Sichuan
Xizang
Guizhou
1947
1976
1933
1967
1973
1923
1955
1948
1917
DAWU
Min Xian
Li Xian
Tewo
Hui-Xian
Lueyang
Yang Xian
Hanzhong
Guangyaun
GYEGU
ALOA
QAMDO
JIANGYOU
LANGZHONG
Hanwang
MIANYANG
DEYANG
PENG XIAN
GUANGHAN
SHEHONG
NANCHONG
DA XIAN
KAI XIAN
WAN XIAN
CHENGDU
Shuangliu
SUINING
ZHONG XIAN
QIONGLAI
XINJIN
PENGSHAN
MEISHAN
SHIH-YANG
YAAN
ANYUE
HECHUAN
TONGLIANG
BEIBEI
DAZU
NEIJIANG
CHONGQING
RONCHANG
WUTONGQIAO
ZIGONG
GUANGSHUNCHANG
Gongjing
LONGCHANG
FU-SHUN
BAISHA
Lo-hsu
LUZHOU
Nanxi
YIBIN
NAXI
HEJIANG
SHUANG-LIU
PINGSHAN
JIANGAN
TSAO-FANG
Tongzi
Zhaojue
XICHANG
ZHONGDIAN
Ching-shui-ting
ZUNYI

Damage Assessment

Death and Injury

- 69,185 died
- 18,467 missing (and presumed dead)
- 374,171 injured
- 5 million were left homeless
- 15 million were excavated
- 45.5 million affected in 10 provinces

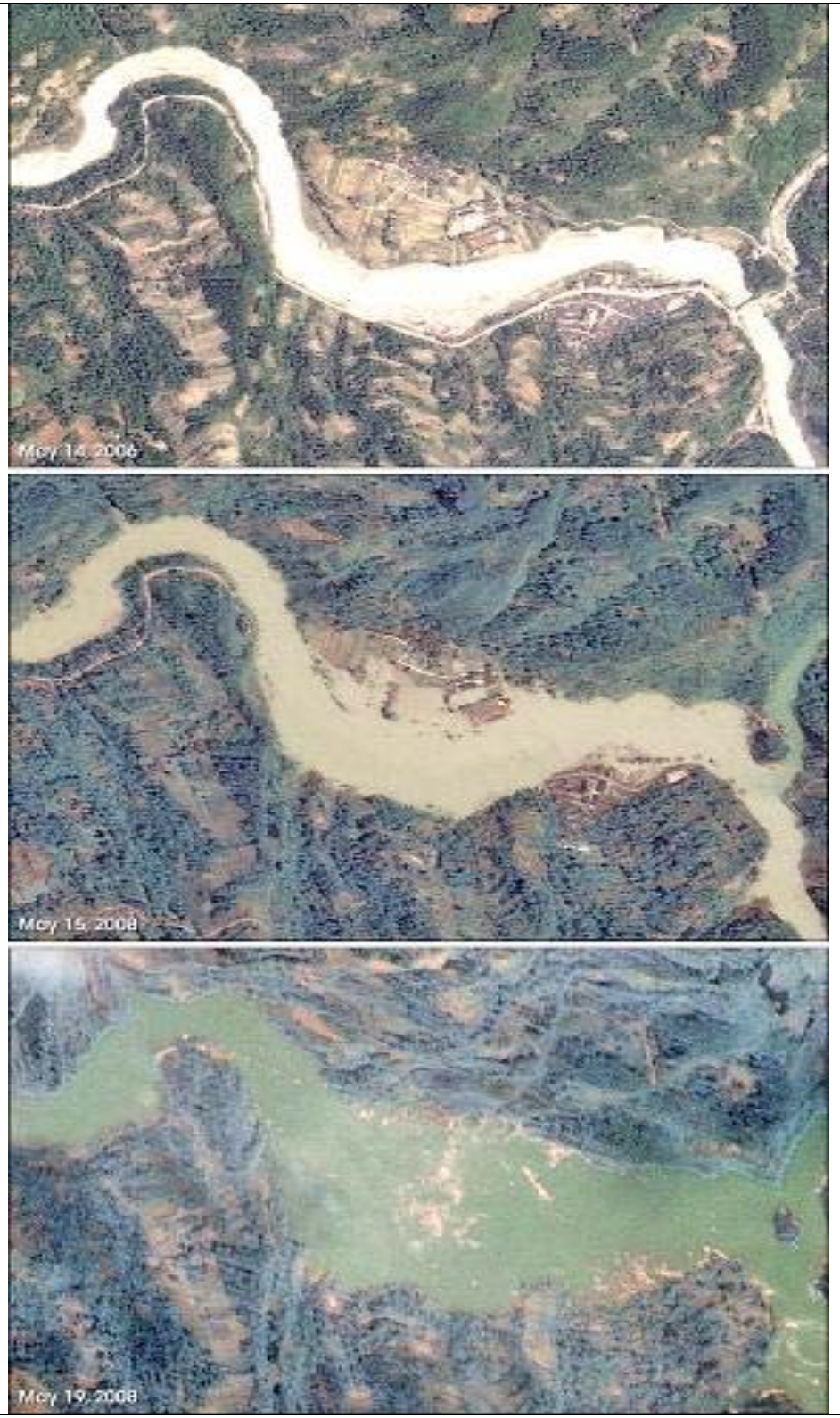
Economic Loss

- 5.36 million buildings collapsed in epicenter area
- 21 million buildings damaged in 5 provinces
- Beichuan, Dujiangyan, Wuolong, and Yingxiu almost completely destroyed
- Total economic loss at 86 billion US $

Other Damages

- Landslides cut off the access to epicenter area for several days
- Dammed rivers creating 34 barrier lakes threatened 700,000 downstream
- 2,473 dams were somewhat damaged
- 53,000 km roads and 47,000 water pipelines

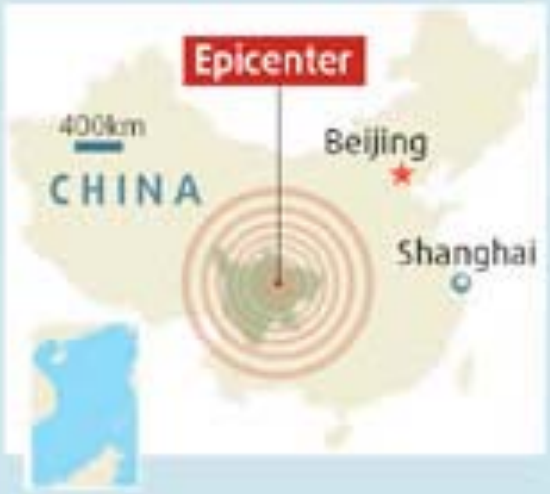
Lake Formation and Flood Threats



Photos

taken 2 months later...

Worst-hit areas



Key

- Total population
- Dead
- Injured
- Missing
- Damaged Highway
- Closed Highway

✓14,866 confirmed dead

Aba
- 874,000
- 161
- 725
- 11

Guangyuan
- 3 million
- 711
- 9,838
- 11

Mianyang
- 161,000
- 7,000
- unknown
- 1,396

Maoxian
- 109,000
- 95
- 896
- 92

Wenchuan
- 105,000
- 500 est
- unknown
- unknown

Kangding
- 110,000
- 9
- 13
- unknown

Dujiangyan
- [illegible]
- 60
- 900
- unknown

Meishan
- 820,000
- 10
- 549
- unknown

Chengdu
- 11 million
- 1,215
- 5,735
- unknown

Ziyang
- 4.9 million
- 16
- 542
- unknown

Deyang
- 3.8 million
- 6,049
- 21,020
- unknown

Suining
- 3.85 million
- 25
- 233
- unknown

Heavily damaged Bao-Cheng Railway

Sichuan

100km

Maerkang

Heishui

Epicenter

Shifang

Mian-Guang Highway

213

108

317

Source: Xinhua

Graphics by Li Yi and Kun Tian


售
房


中山路观林园
马老师等着你们
Land Van Jeans
Land Van Jeans
博雅美
鸿运娱乐室


土廟

Lessons Learned

- Earthquake is very difficult to predict
- Earthquake-resistant structures
- Building codes and legistlations
- Eco-preservation & eco-restoration