Magnitude 6.6 SICHUAN PROVINCE, CHINA

Monday, September 5, 2022 at 04:52:19 UTC

Latitude 29.726° N
Longitude 102.279° E
Depth 10.0 km

A strong earthquake shook a mountainous area in southwestern China on Monday. Current reports indicate that at least 65 people were killed, more than 250 injured, and at least 12 people were missing. The full extent of the damage remains unclear, however, as the quake damaged communications in the remote, isolated region.

View of the Moxi township after the 6.6-magnitude earthquake hit Luding county in Ganzi Prefecture in southwest China's Sichuan province. Photo By Feng Zi/ColorChinaPhoto) Color China Photo/AP Images

Cellphone video of landslides in Sichuan province.

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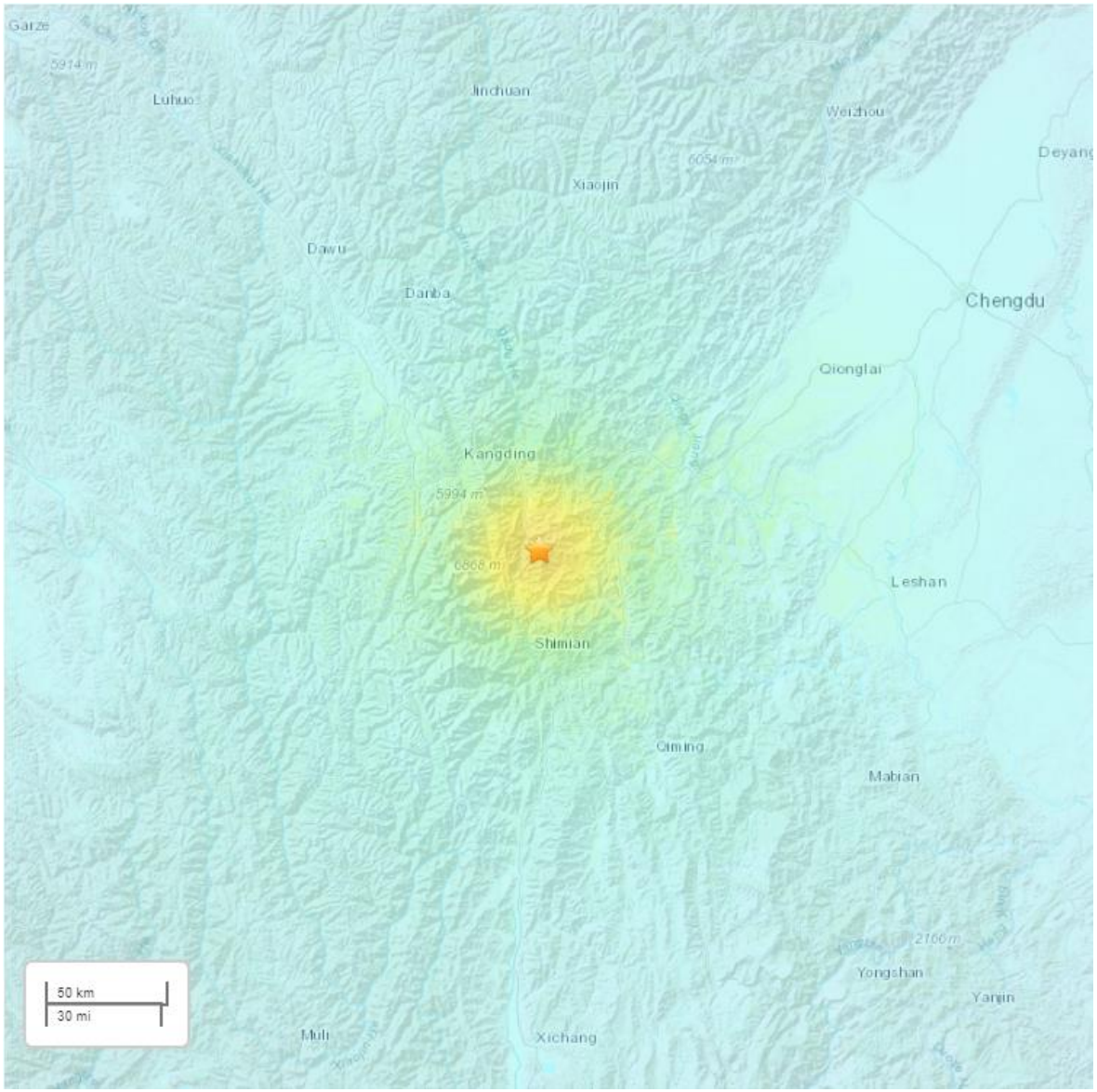
The Modified-Mercalli Intensity (MMI) scale is a ten-stage scale, from I to X, that indicates the severity of ground shaking. Intensity is based on observed effects and is variable over the area affected by an earthquake. Intensity is dependent on earthquake size, depth, distance, and local conditions.

MMI	Perceived Shaking
X	Extreme
IX	Violent
VIII	Severe
VII	Very Strong
VI	Strong
V	Moderate
IV	Light
II-III	Weak
I	Not Felt



USGS estimated shaking intensity from M 6.6 Earthquake

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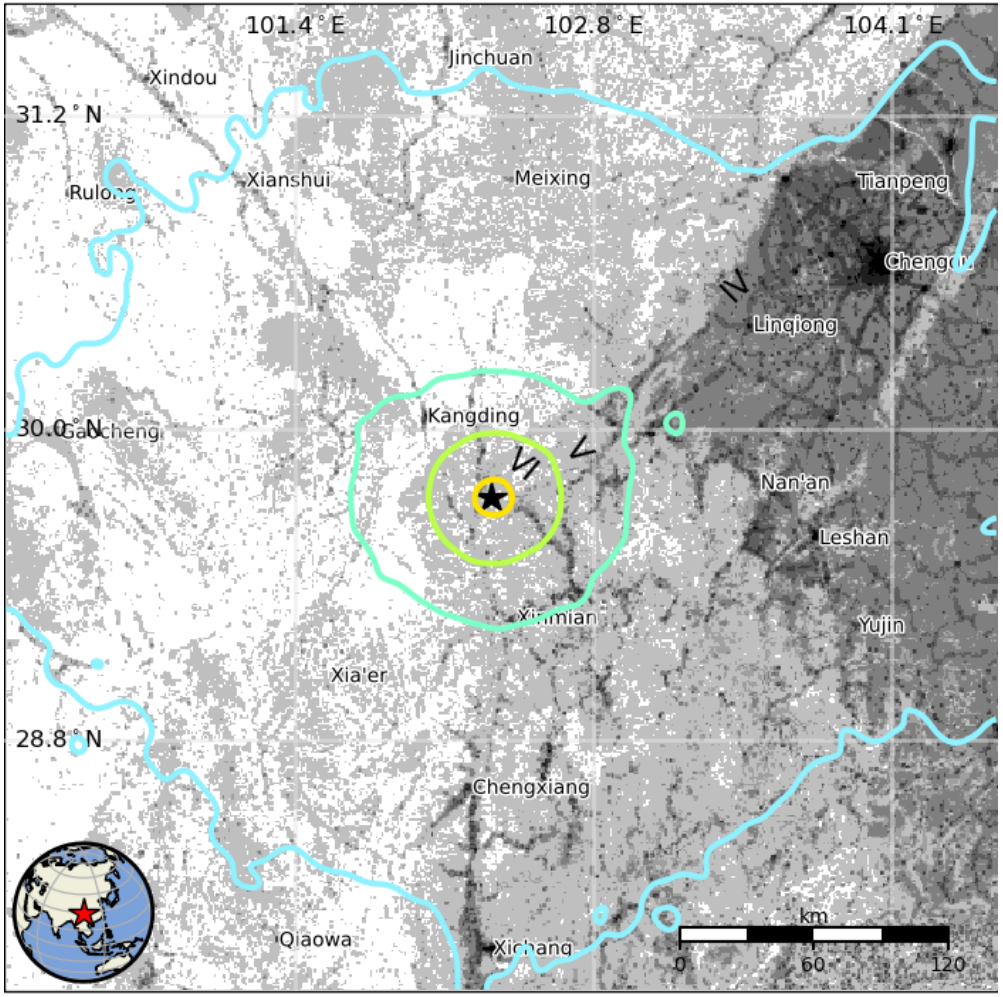
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

The USGS estimates that 20,000 people felt very strong shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	3,625 k*
IV	Light	30,128 k
V	Moderate	1,304 k
VI	Strong	119 k
VII	Very Strong	20 k
VIII	Severe	0 k
IX	Violent	0 k
X	Extreme	0 k



The color-coded contour lines outline regions of MMI intensity. The total population exposure to a given MMI value is obtained by summing the population between the contour lines. The estimated population exposure to each MMI Intensity is shown in the table.

Image courtesy of the US Geological Survey

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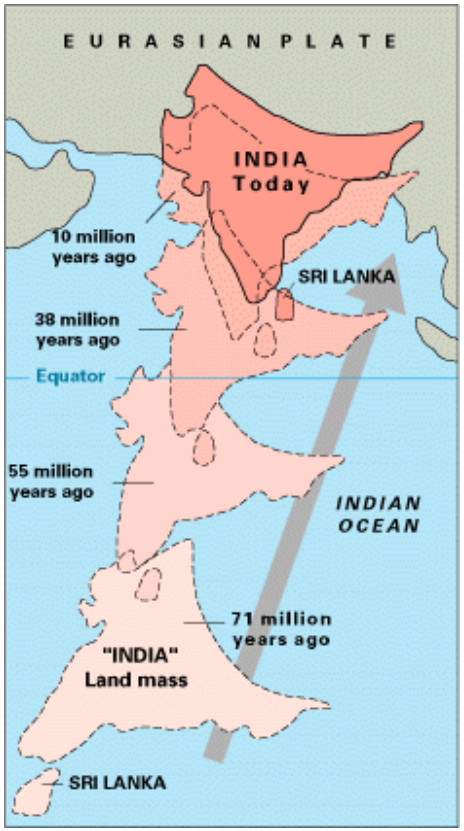
Earthquake activity in the Himalaya Mountains and the Tibetan Plateau is caused by continent-continent collision between India and Asia. The convergence of the two plates is accommodated by the uplift of the Plateau as the region is being shoved forcefully against the Eurasian Plate. Faults in this region (see Slide 6) are related to the compression of crustal rock between the plate boundary underlying the Sichuan Basin and southeastern China. The red star on the map shows the epicenter of this earthquake.



Convergence between India and Asia occurs at a rate of 4 to 5 cm/yr.

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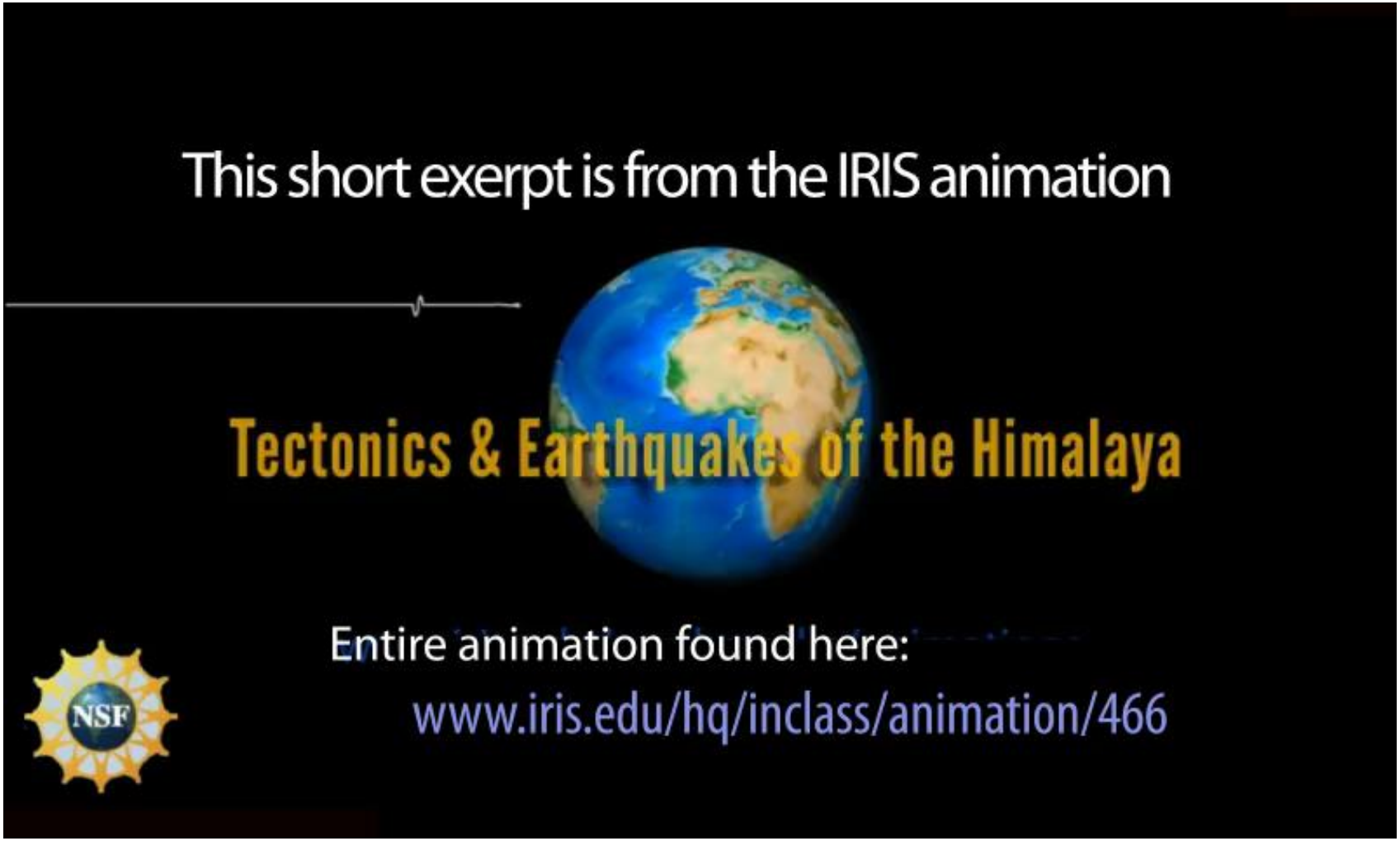
This animation discusses the evolution of the Himalaya in a broad tectonic context.



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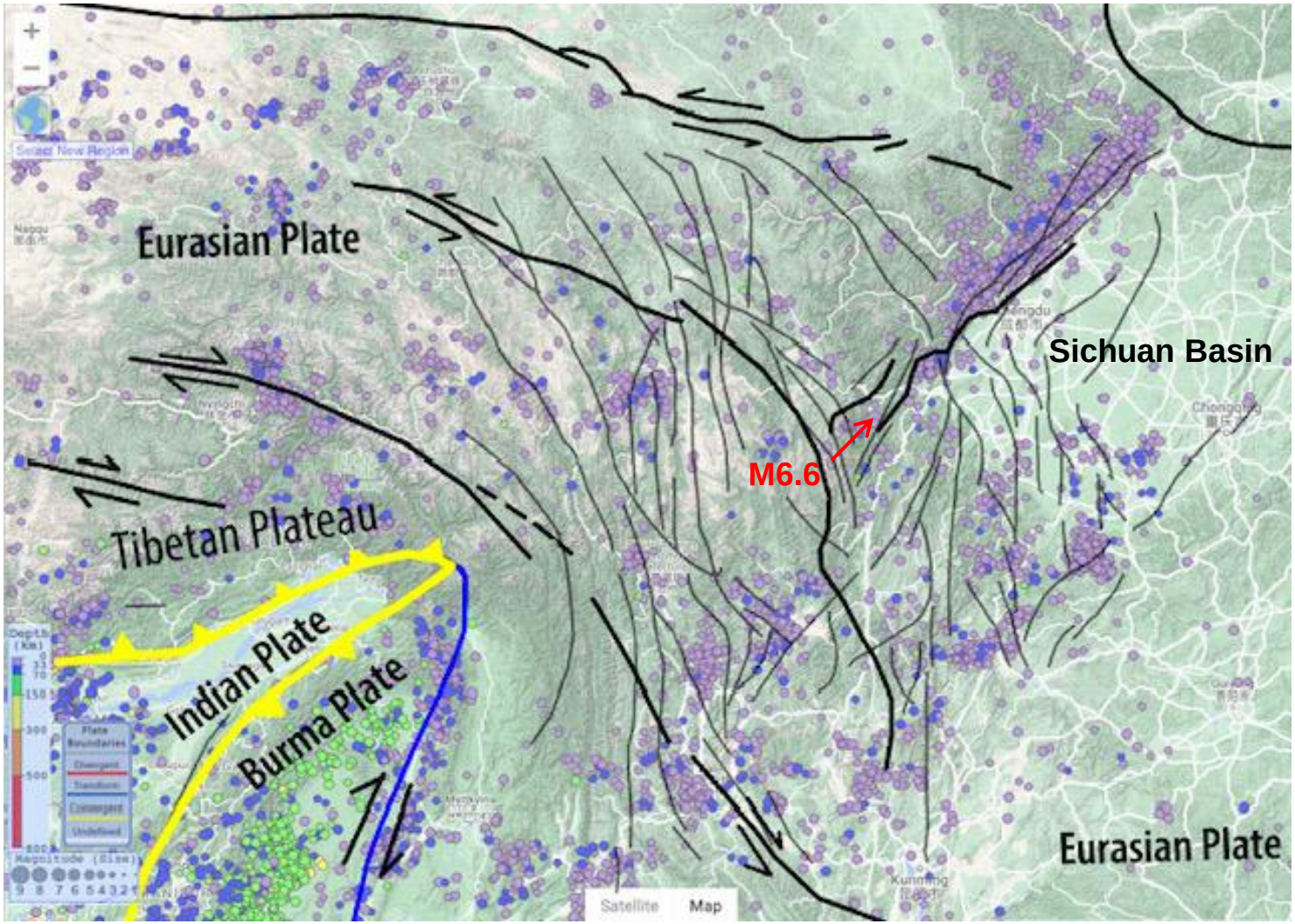
This map from the IRIS Earthquake Browser, shows epicenters of the 4500 earthquakes with magnitudes of 4.0 or larger since 1970 plotted with generalized active faults in the surrounding region.



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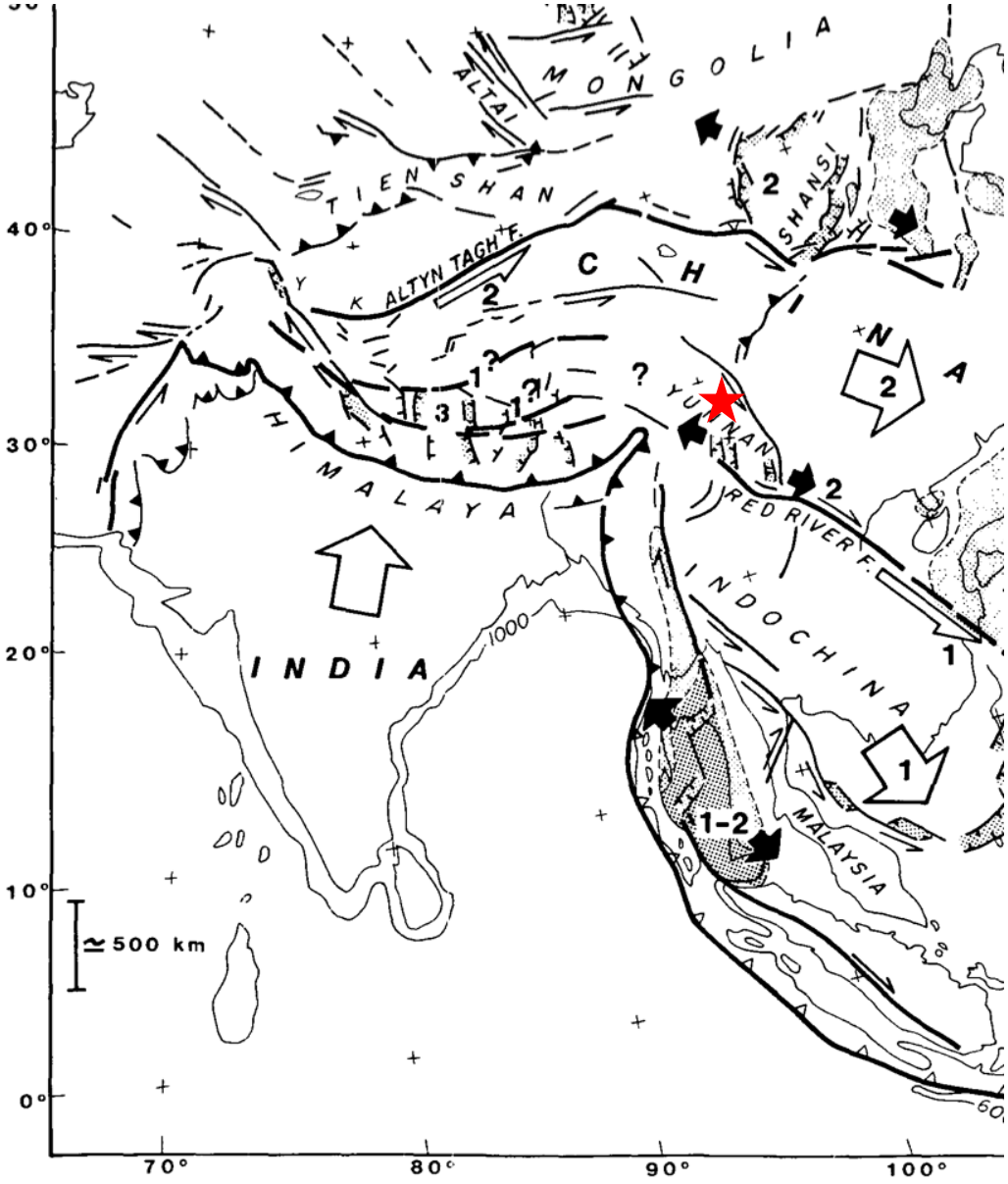

A fundamental concept of India – Asia collision tectonics is “extrusion tectonics”. The basic idea is that deformation produced by this continent–continent collision has propagated deep into Asia, perhaps as far north as Siberia. As crust of the Tibetan Plateau is thickened by compression between India and Asia, the plateau is “extruded” eastward as shown by block arrow #2.

In part, this extrusion is accommodated by the Altyn Tagh Fault, a large left-lateral strike-slip fault on the northwest margin of the Tibetan Plateau. In addition, left-lateral strike-slip faults within the northern plateau contribute to eastward extrusion of crustal blocks that override lower elevation regions east of the plateau.

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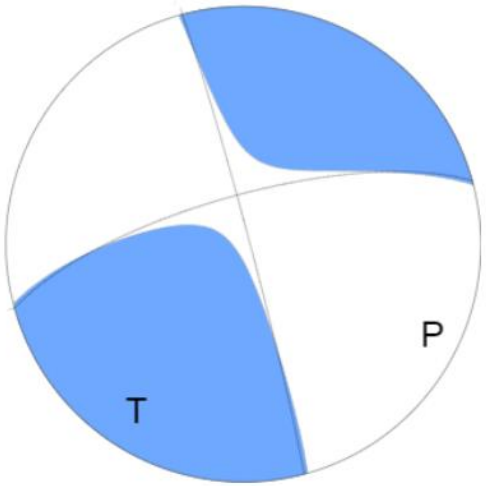
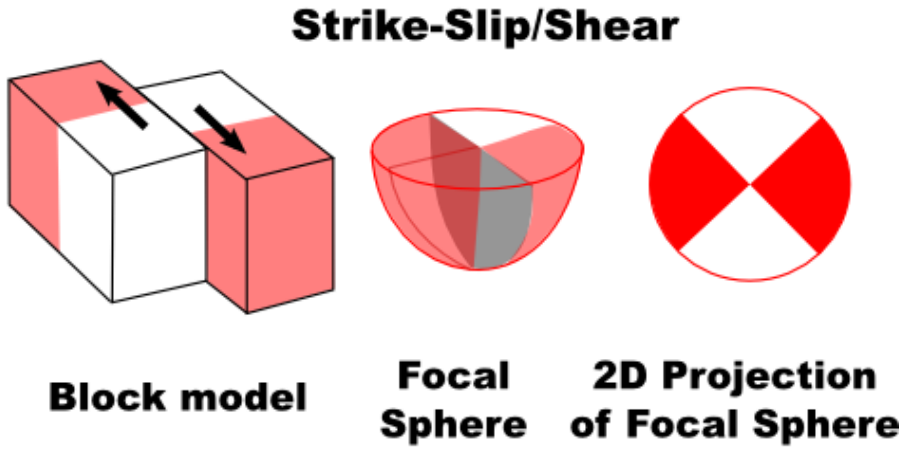
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation of these quadrants calculated from recorded seismic waves determines the type of fault that produced the earthquake.



USGS W-phase Moment Tensor Solution

The tension axis (T) reflects the minimum compressive stress direction. The pressure axis (P) reflects the maximum compressive stress direction.

In this case, the earthquake focal mechanism indicates it was due to strike-slip faulting earthquake on the western margin of the Sichuan Basin.



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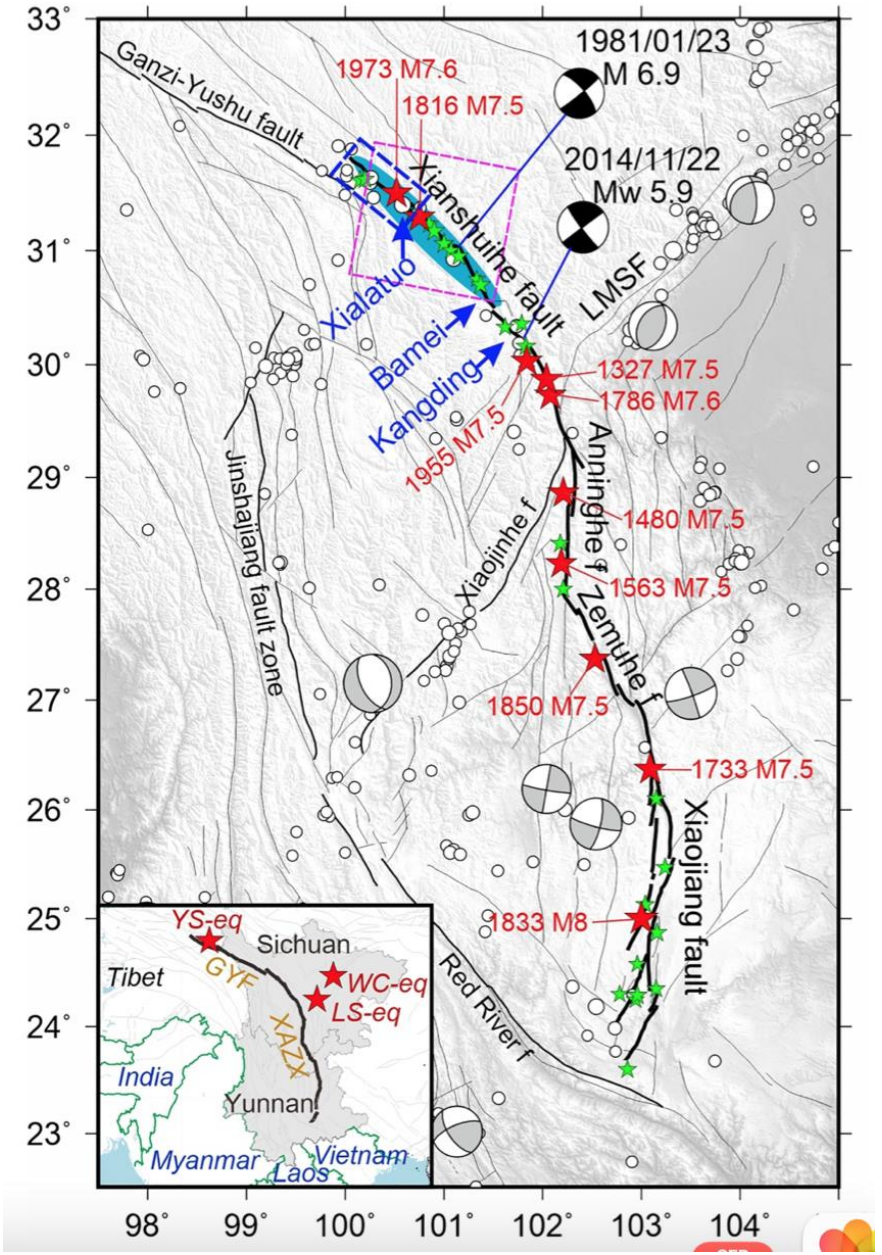
The US Geological Survey National Earthquake Information Center indicates that the M6.6 occurred as a result of left-lateral motion on the southern part of the Xianshuihe Fault or the northern part of the Anninghe Fault.

This figure shows earthquake epicenters and focal mechanisms on the Xianshuihe-Anninghe-Zemuhe-Xiaojiang fault system. The epicenter of the M6.6 is very near to the epicenter of the 1786 M7.6. Additionally, note the focal mechanisms on the Xianshuihe Fault look very similar to the focal mechanism from this M6.6.



Map from Li et al.

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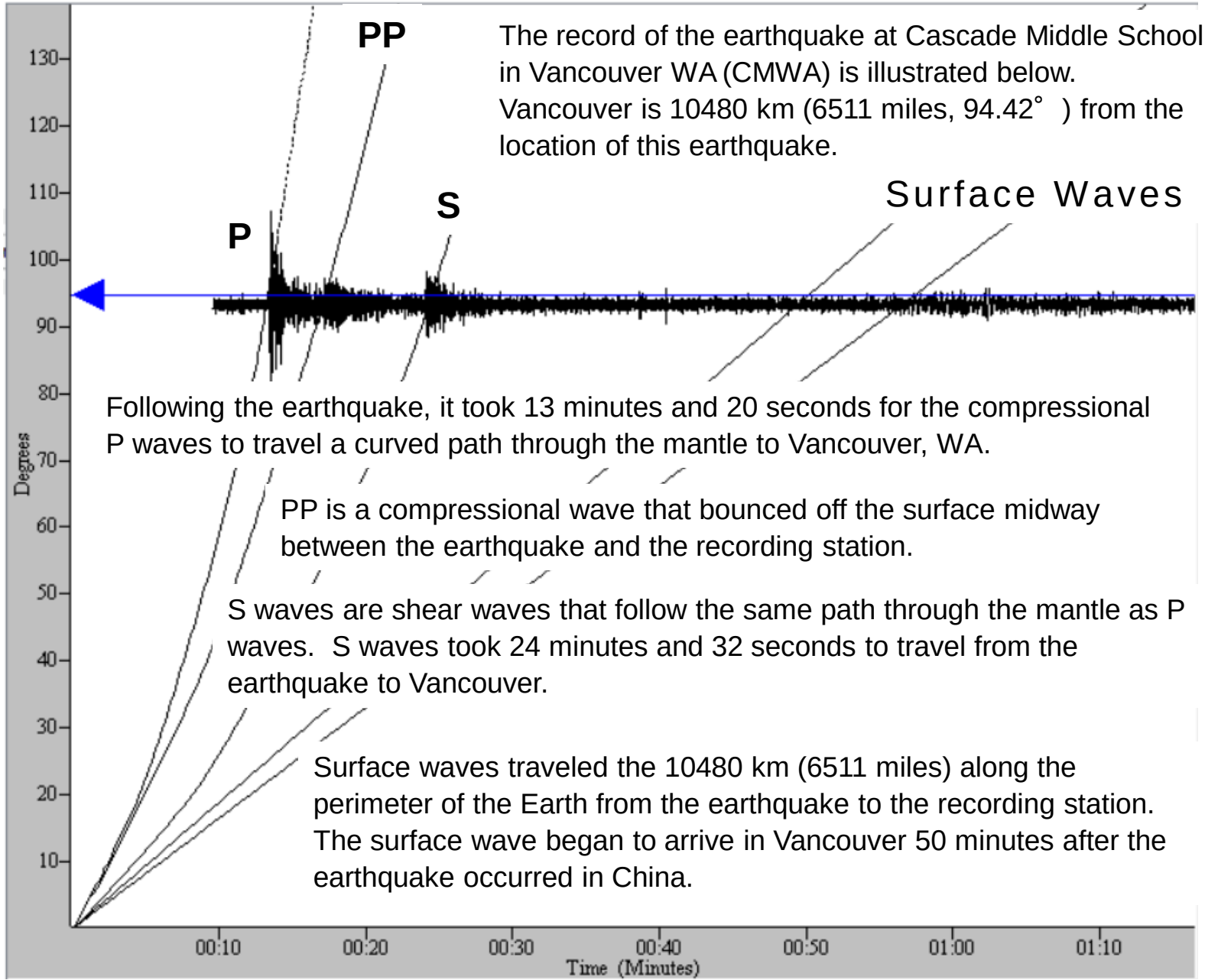

The record of the earthquake at Cascade Middle School in Vancouver WA (CMWA) is illustrated below. Vancouver is 10480 km (6511 miles, 94.42˚) from the location of this earthquake.

Following the earthquake, it took 13 minutes and 20 seconds for the compressional P waves to travel a curved path through the mantle to Vancouver, WA.

PP is a compressional wave that bounced off the surface midway between the earthquake and the recording station.

S waves are shear waves that follow the same path through the mantle as P waves. S waves took 24 minutes and 32 seconds to travel from the earthquake to Vancouver.

Surface waves traveled the 10480 km (6511 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface wave began to arrive in Vancouver 50 minutes after the earthquake occurred in China.

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These resources have been developed as part of the SAGE facility operated by IRIS via support from the National Science Foundation.