Magnitude 7.3 SOUTHERN QUINGHAI, CHINA

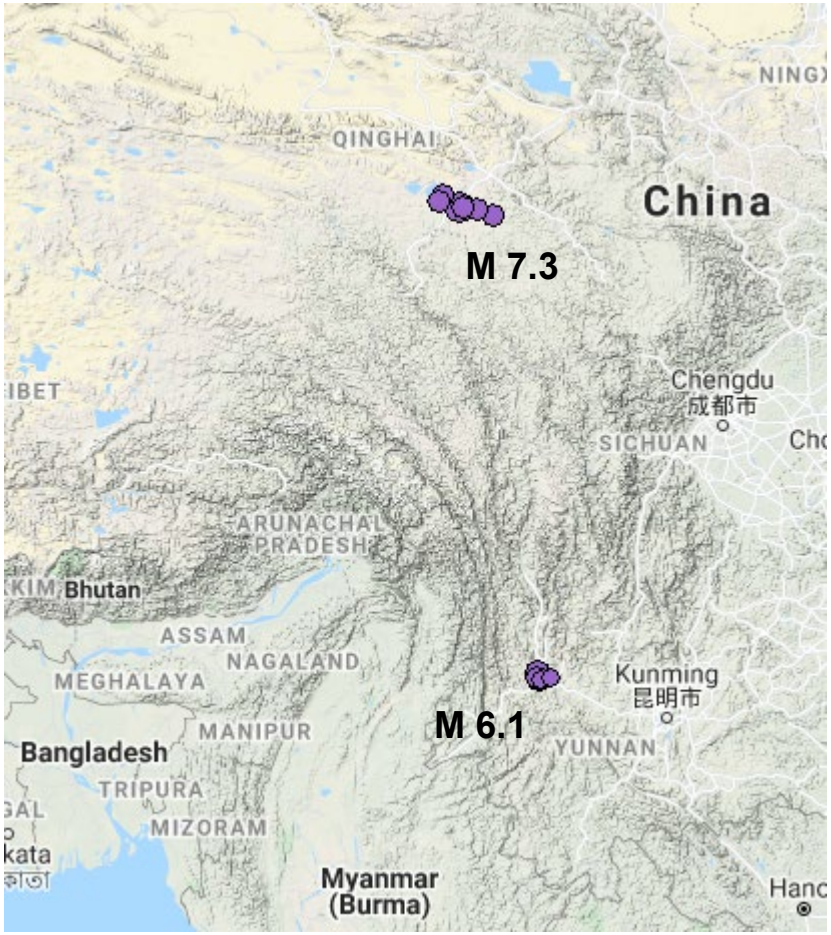
Friday, May 21, 2021 at 18:04:13 UTC

Latitude 34.586° N
Longitude 98.255° E
Depth 10.0 km

Two strong earthquakes have rattled north-west and south-west China.

The Yunnan quake, which had a magnitude of 6.1, struck first at 9.48pm on Friday (1348 GMT) near the city of Dali. It was followed by at least two aftershocks. Two people were confirmed dead in the mountainous area, local officials said in a statement, adding that at least 17 others had been injured and were receiving treatment.

Then a few hours later, at 1804 GMT, more than 1,200 kilometers away, a 7.3-magnitude quake jolted China's sparsely populated Qinghai province in the north-west, followed by an aftershock. There were no immediate reports of casualties or damage from the remote area.



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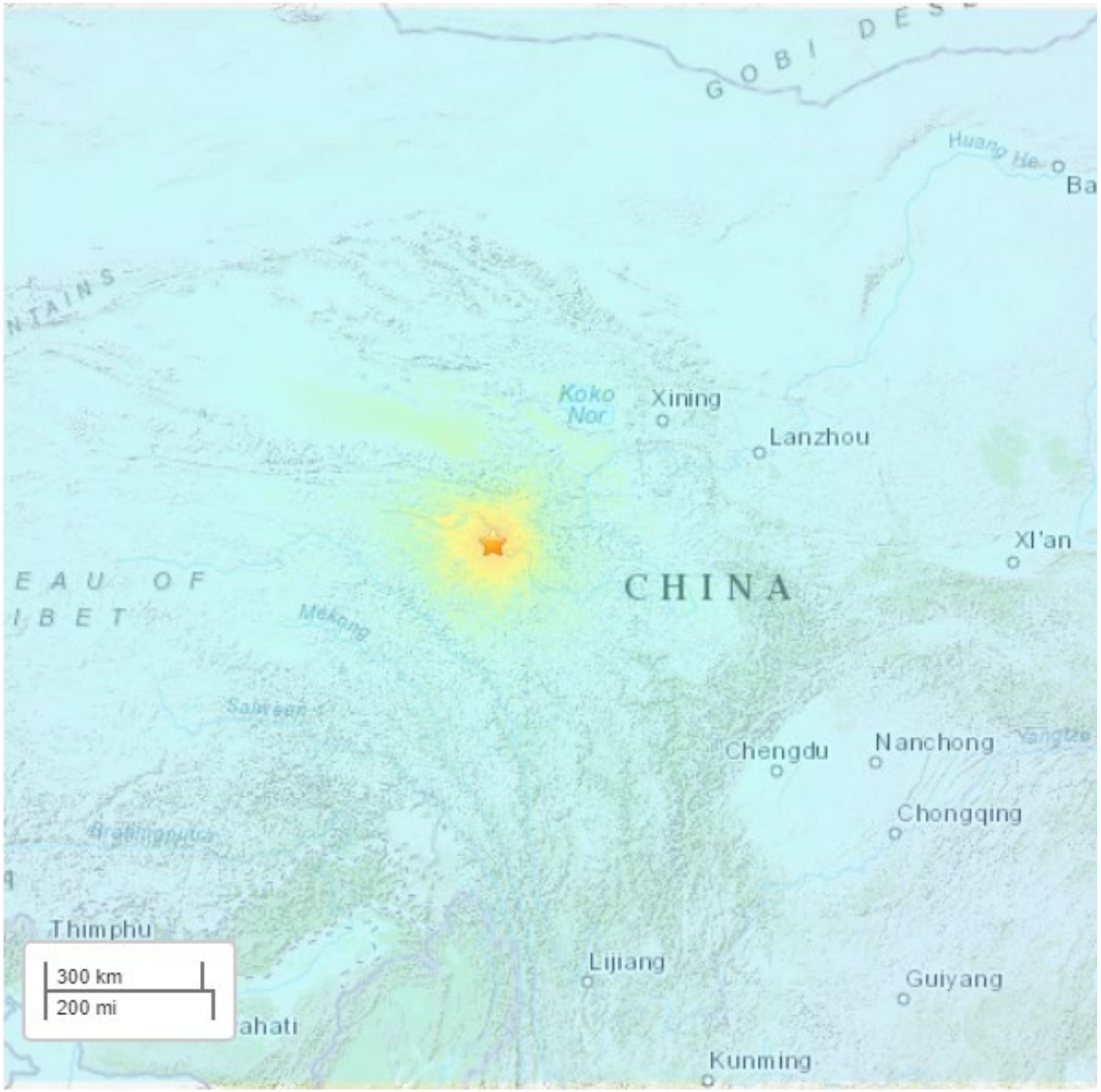
The Modified-Mercalli Intensity (MMI) scale is a ten-stage scale, from I to X, that indicates the severity of ground shaking. Intensity is based on observed effects and is variable over the area affected by an earthquake. Intensity is dependent on earthquake size, depth, distance, and local conditions.

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 7.3 Earthquake

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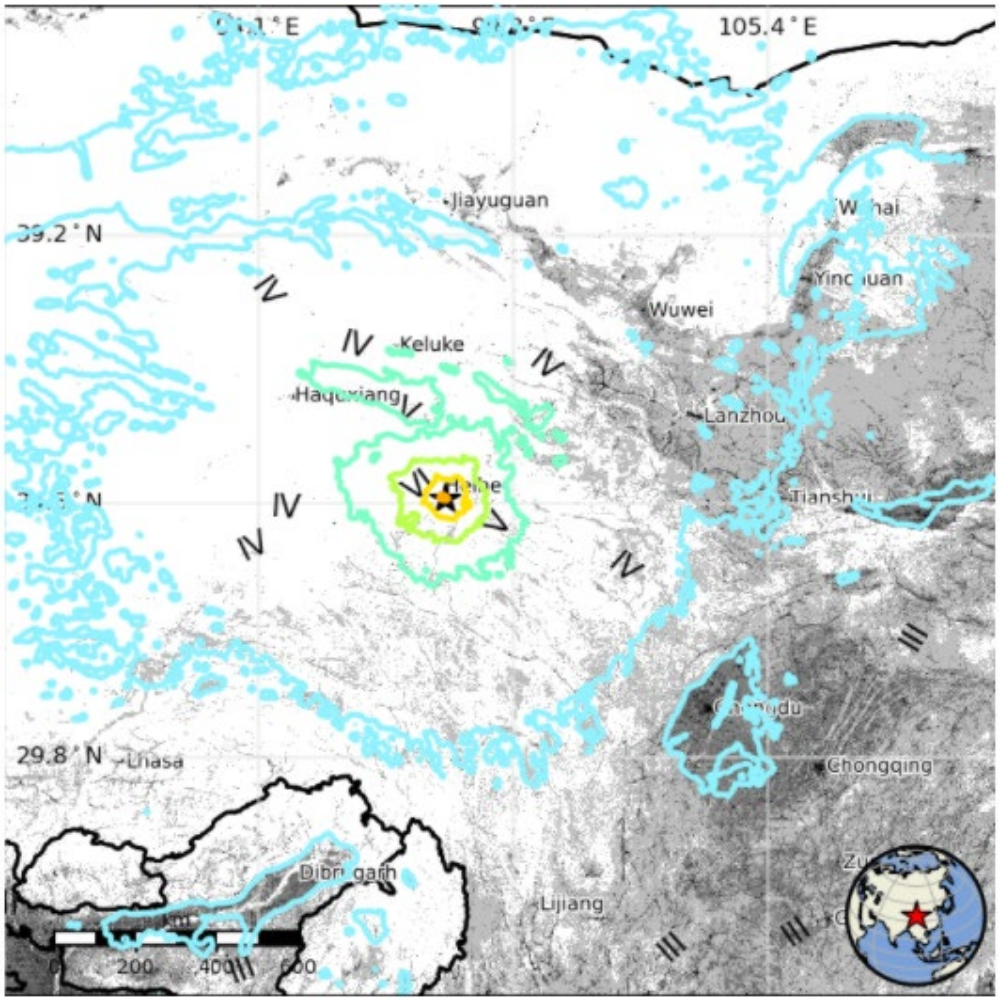
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

The USGS estimates that 6,000 people felt very strong shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	243,225 k*
IV	Light	111,877 k
V	Moderate	369 k
VI	Strong	28 k
VII	Very Strong	6 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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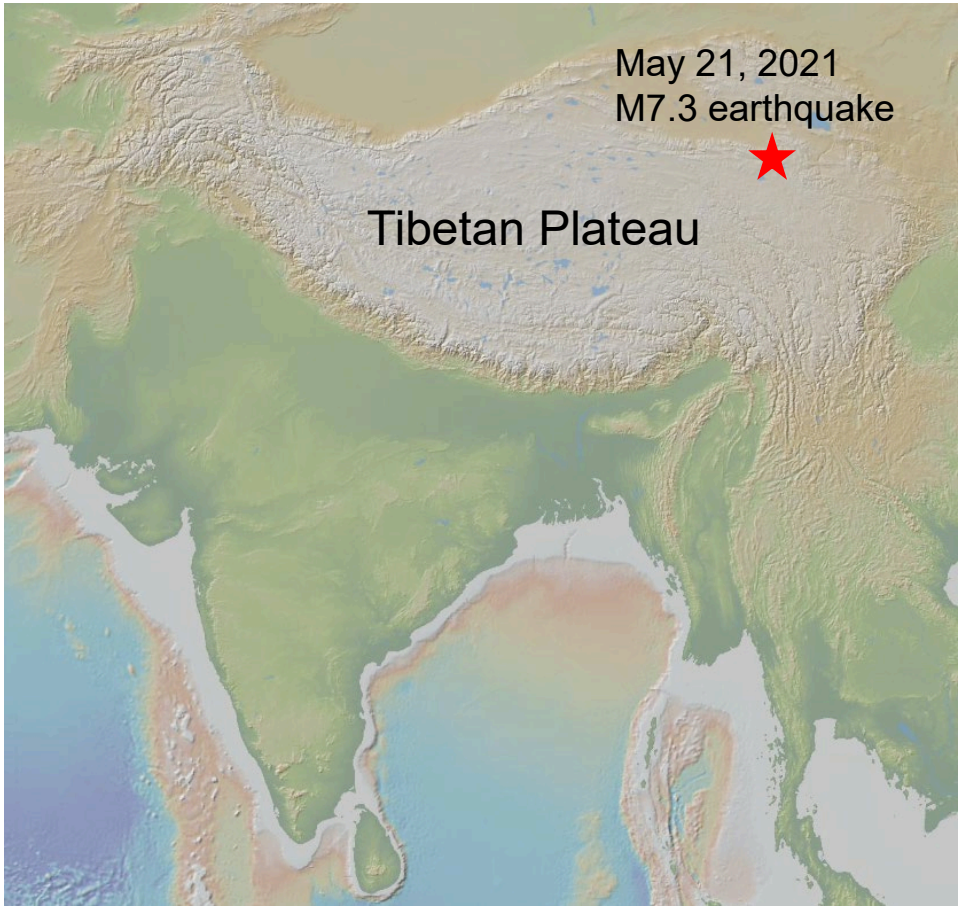
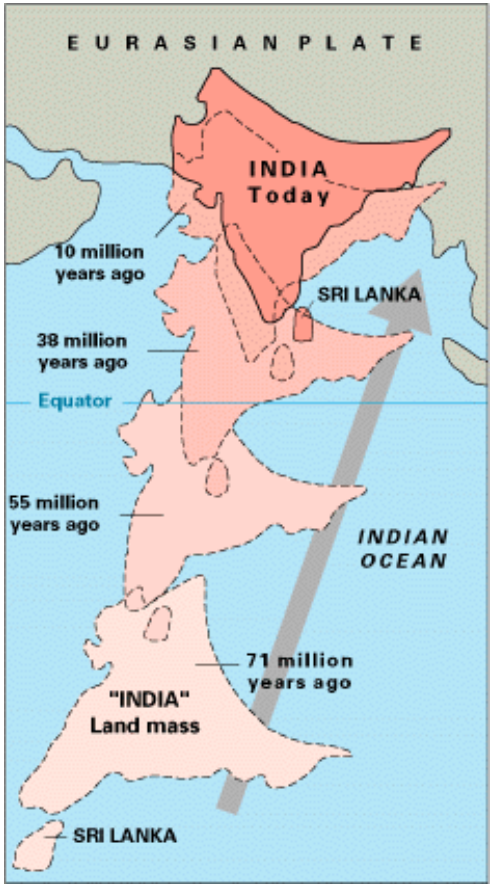
Earthquake activity in the Himalaya Mountains and the Tibetan Plateau is caused by continent-continent collision between India and Asia. Uplift of and faults within the Tibetan Plateau result from this collision. The red star on the map below shows the epicenter of the May 21, 2021 earthquake that occurred on a fault within the northeastern Tibetan Plateau.





The motion of India into Asia is nearly perpendicular to the Himalaya Mountains in Nepal. Convergence between India and Asia occurs at a rate of 4 to 5 cm/yr.

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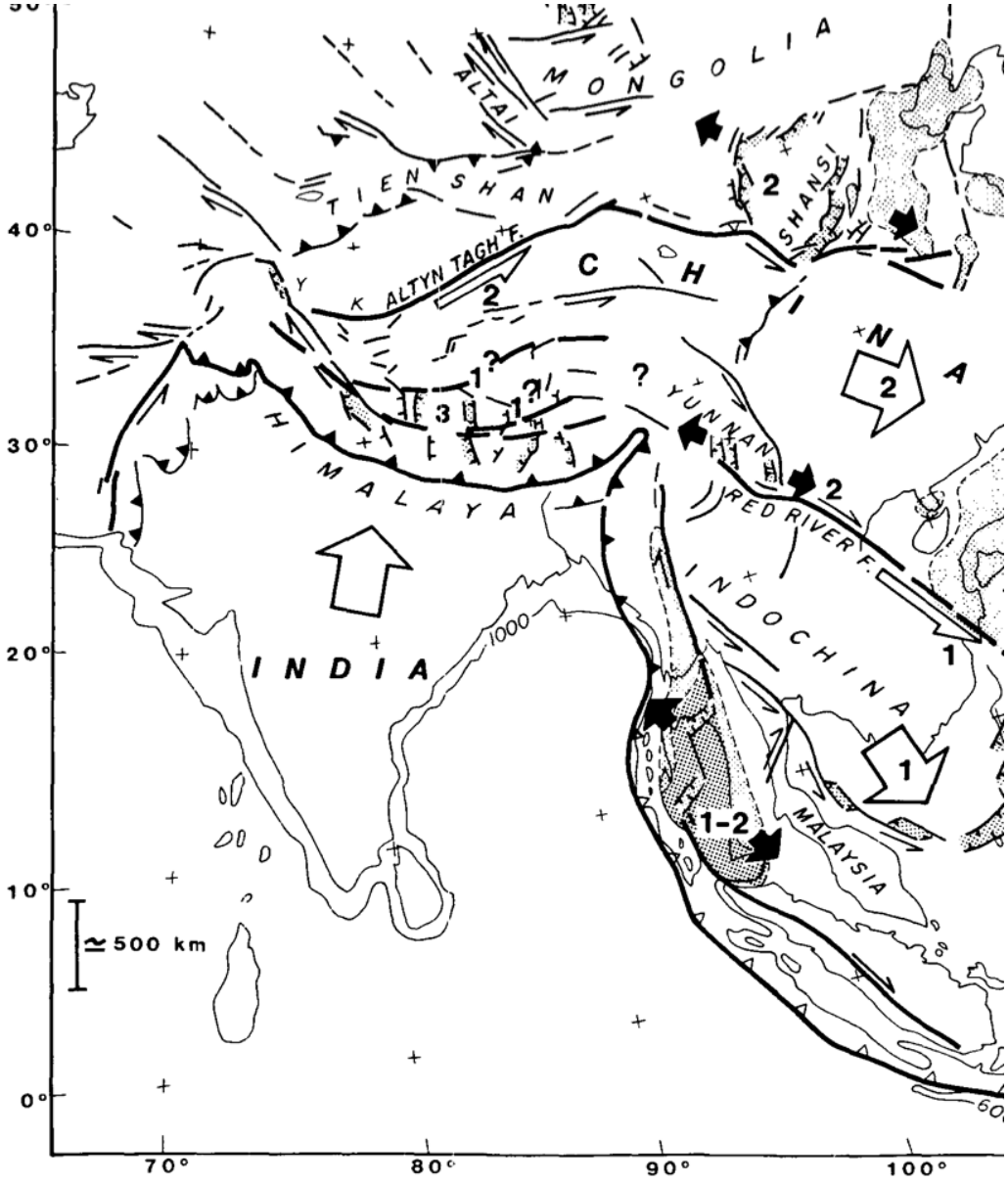

A fundamental concept of India – Asia collision tectonics is “extrusion tectonics”. The basic idea is that deformation produced by this continent – continent collision has propagated deep into Asia, perhaps as far north as Siberia. As crust of the Tibetan Plateau is thickened by compression between India 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, including the Kunlun Fault, contribute to eastward extrusion of crustal blocks that override lower elevation regions east of the plateau.

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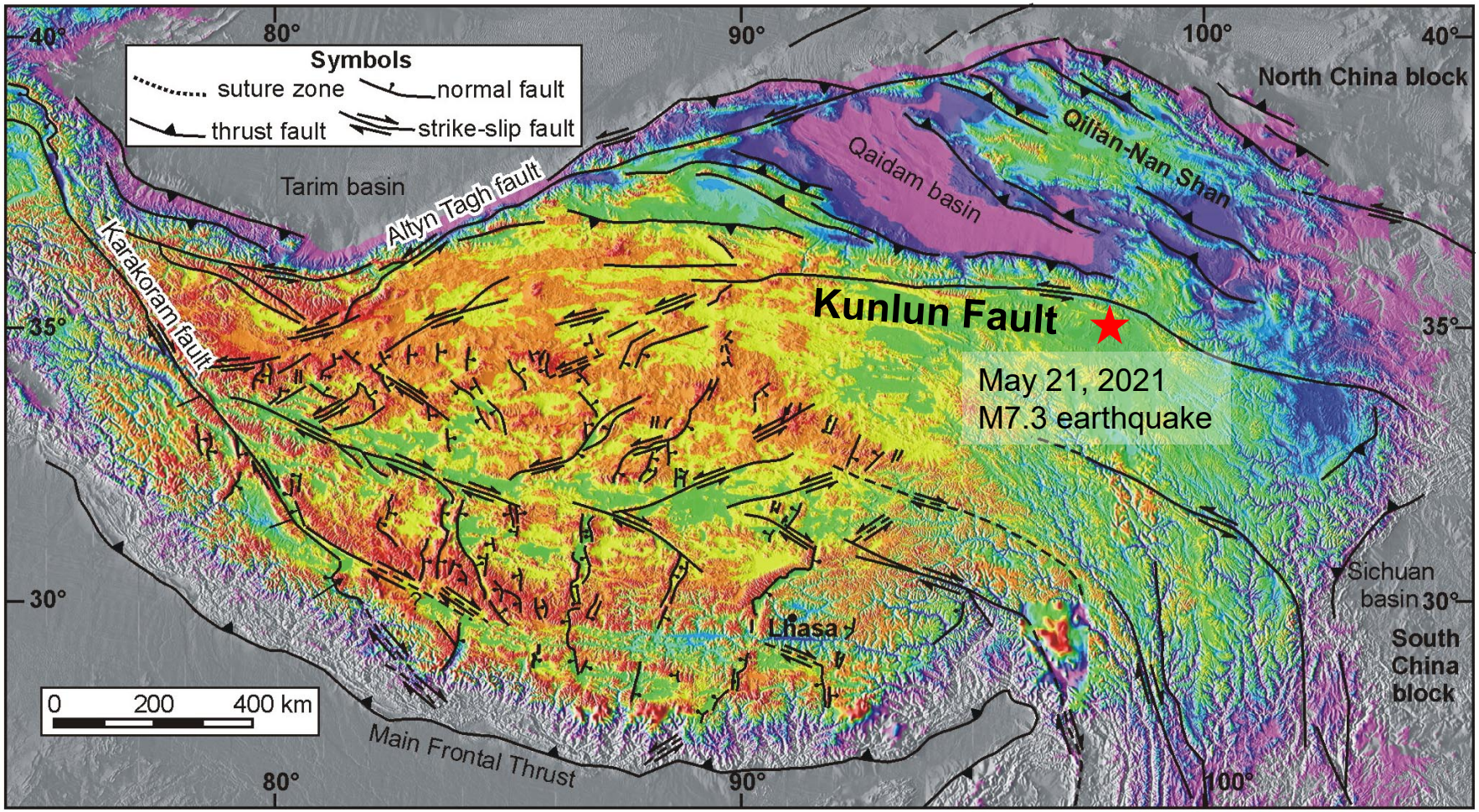

The northern Tibetan Plateau contains several very large left-lateral strike-slip faults, including the Altyn Tagh and Kunlun faults. Although not precisely located on the Kunlun Fault, the May 21, 2021 earthquake does have a left-lateral strike-slip focal mechanism and is almost certainly related to the Kunlun Fault system.

Map courtesy of Paul Kapp, University of Arizona

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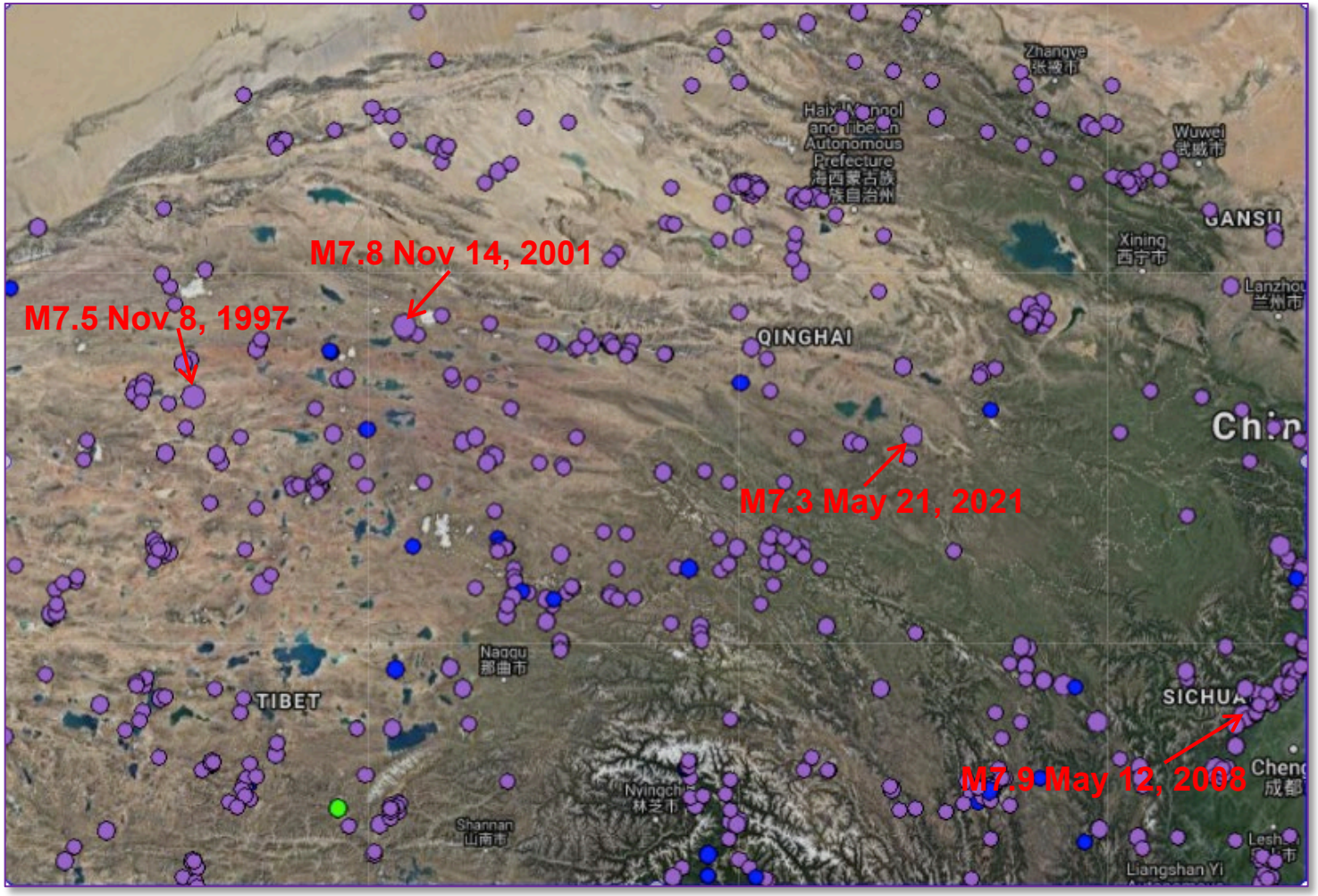

This map shows epicenters of the 555 earthquakes since 1970 with magnitudes of 5.0 or larger. The M7.5 November 8, 1997, M7.8 November 14, 2001, and M7.3 May 21, 2021 earthquakes are the largest to occur on or near the Kunlun Fault. The deadliest earthquake in this region since 1970 was the Sichuan M7.9 earthquake on May 12, 2008 that caused over 87,000 fatalities.

Image created by the IRIS Earthquake Browser

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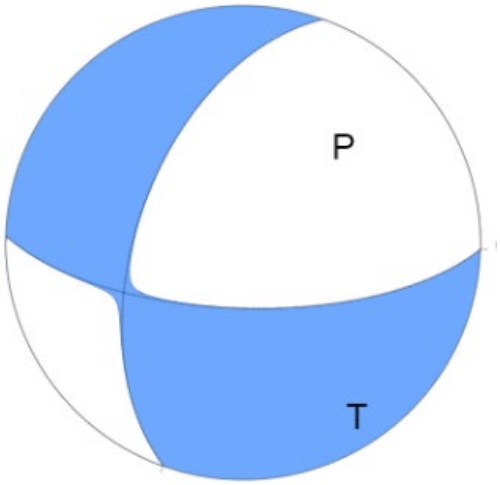
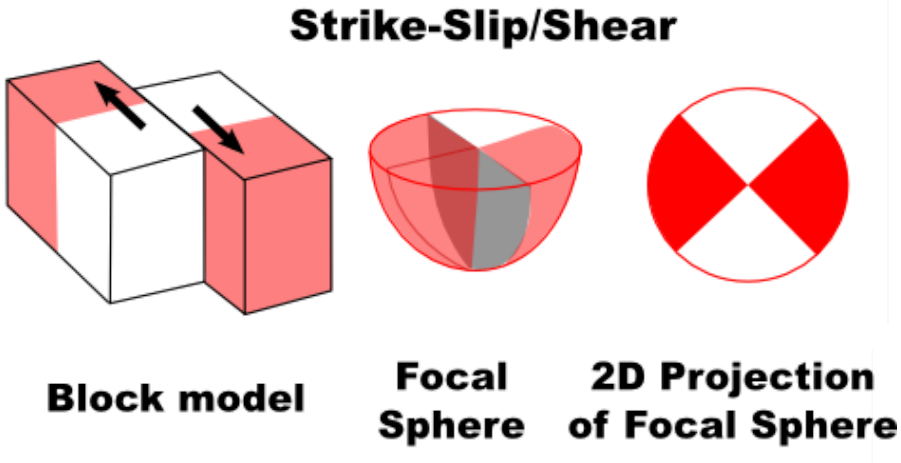
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation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



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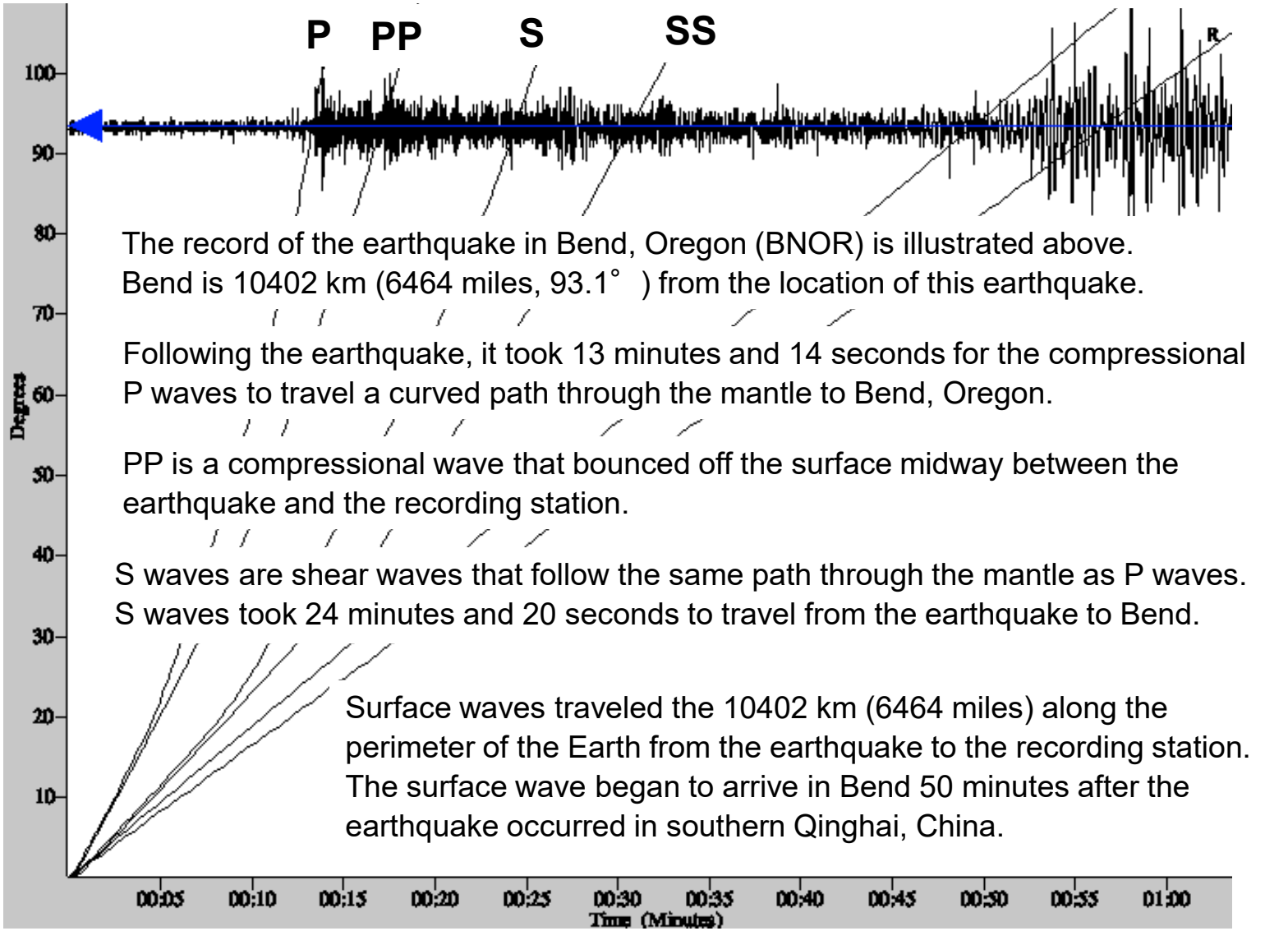

The record of the earthquake in Bend, Oregon (BNOR) is illustrated above. Bend is 10402 km (6464 miles, 93.1˚) from the location of this earthquake.

Following the earthquake, it took 13 minutes and 14 seconds for the compressional P waves to travel a curved path through the mantle to Bend, Oregon.

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 20 seconds to travel from the earthquake to Bend.

Surface waves traveled the 10402 km (6464 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface wave began to arrive in Bend 50 minutes after the earthquake occurred in southern Qinghai, China.

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