

A powerful earthquake struck a border area of southeast Iran on Tuesday killing at least 35 people in neighbouring Pakistan and destroying hundreds of houses. Communications with the sparsely-populated desert and mountain region were largely cut off, making it difficult to assess Iranian casualties. The earthquake was centered about 50 miles east of the city of Khash, Iran, but shook tall buildings as far away as New Delhi, nearly 1,500 miles away.



Image courtesy of the BBC



Villagers gather on the rubble of their collapsed houses caused by Tuesday's earthquake in Mashkel, area of Pakistan's southwestern Baluchistan province. Hundreds of Pakistani soldiers joined the effort to rescue victims of a deadly earthquake near the Iranian border, evacuating 16 of the more seriously injured by helicopter, the military said Wednesday. (AP Photo/Ghulam Haider)

Earthquake and Historic Seismicity

This earthquake epicenter (green star), is plotted on the map with regional seismicity since 1990.

The frequency of moderate and large earthquakes within the subducted Arabian plate is not high compared with seismicity found within other subducting plates. However, there are many intraplate earthquakes within the Eurasian Plate adjacent to its boundaries with the Arabian and Indian plates and some of these have caused great loss of life.

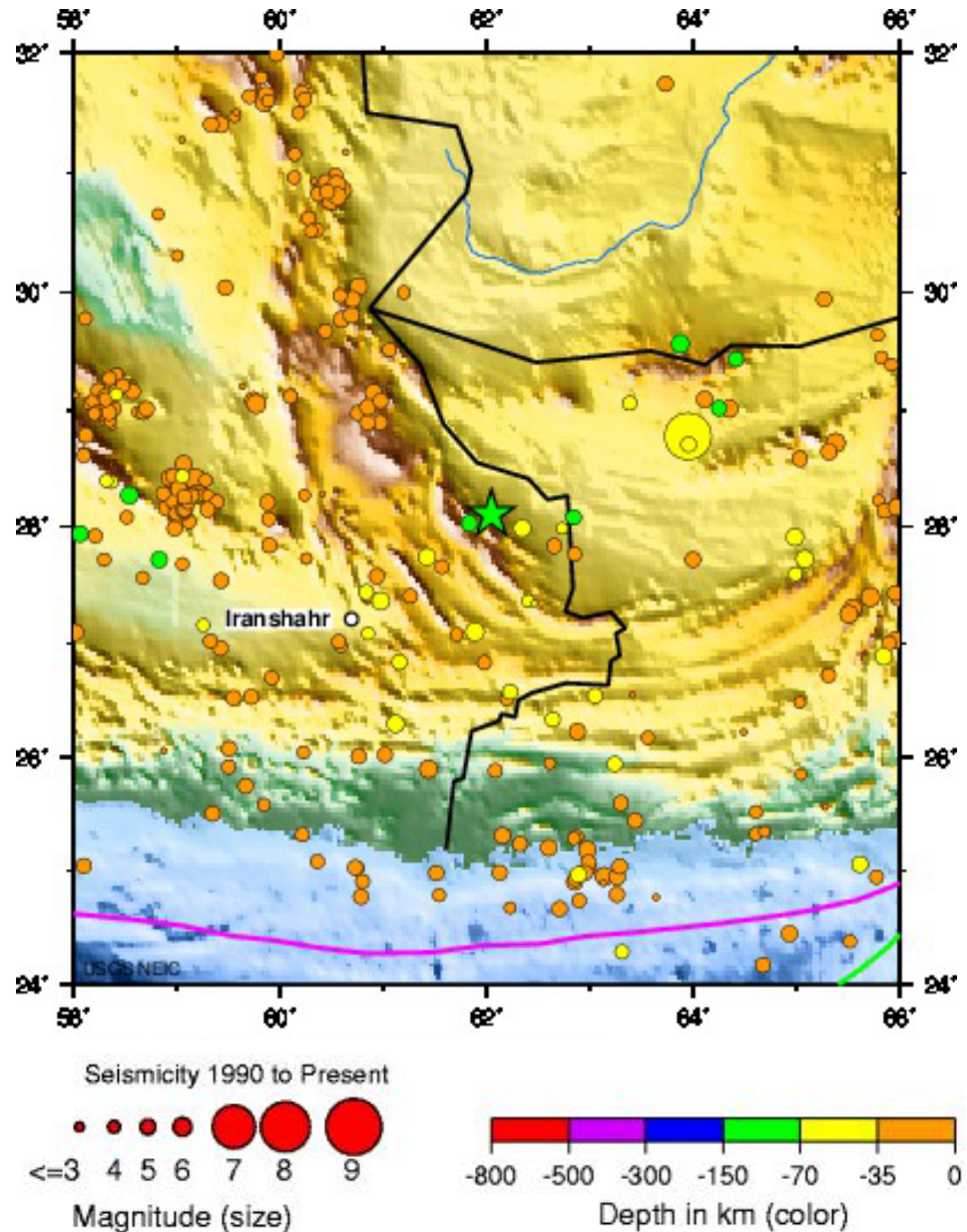
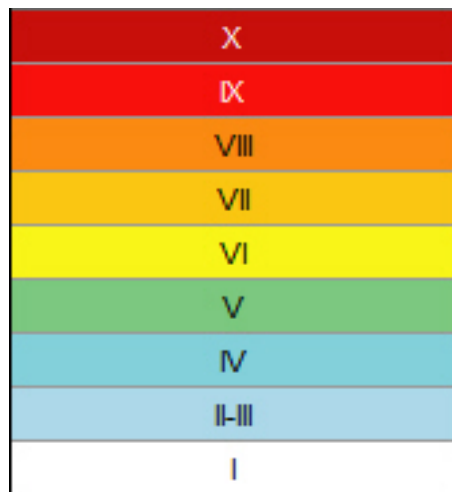


Image courtesy of the US Geological Survey

Ground Shaking Intensity

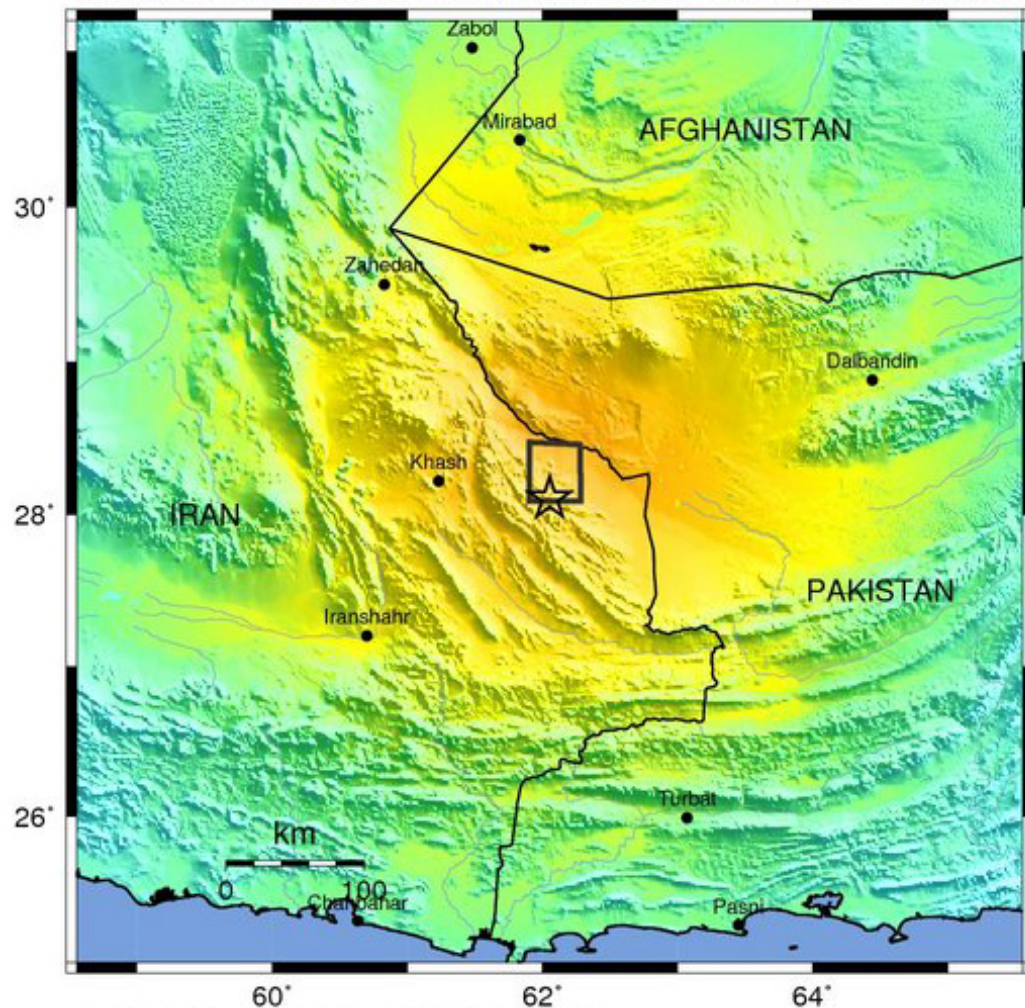
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking. The area nearest the epicenter of this earthquake experienced very strong to severe ground shaking.

Modified Mercalli Intensity



Perceived Shaking

Extreme
Violent
Severe
Very Strong
Strong
Moderate
Light
Weak
Not Felt



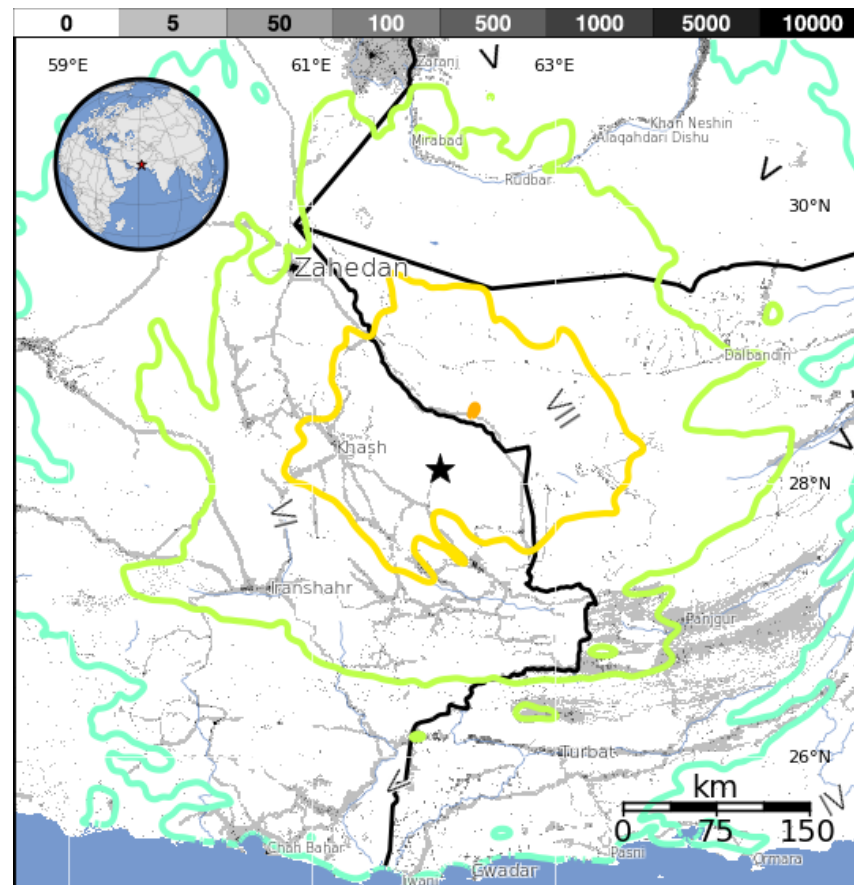
USGS Estimated shaking Intensity from M 7.8 Earthquake

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

The population within the MMI VIII (Severe) zone is approximately 2,000 people while the population within the MMI VII (Very Strong) zone is nearly 377,000 people.

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 below.

Image courtesy of the US Geological Survey

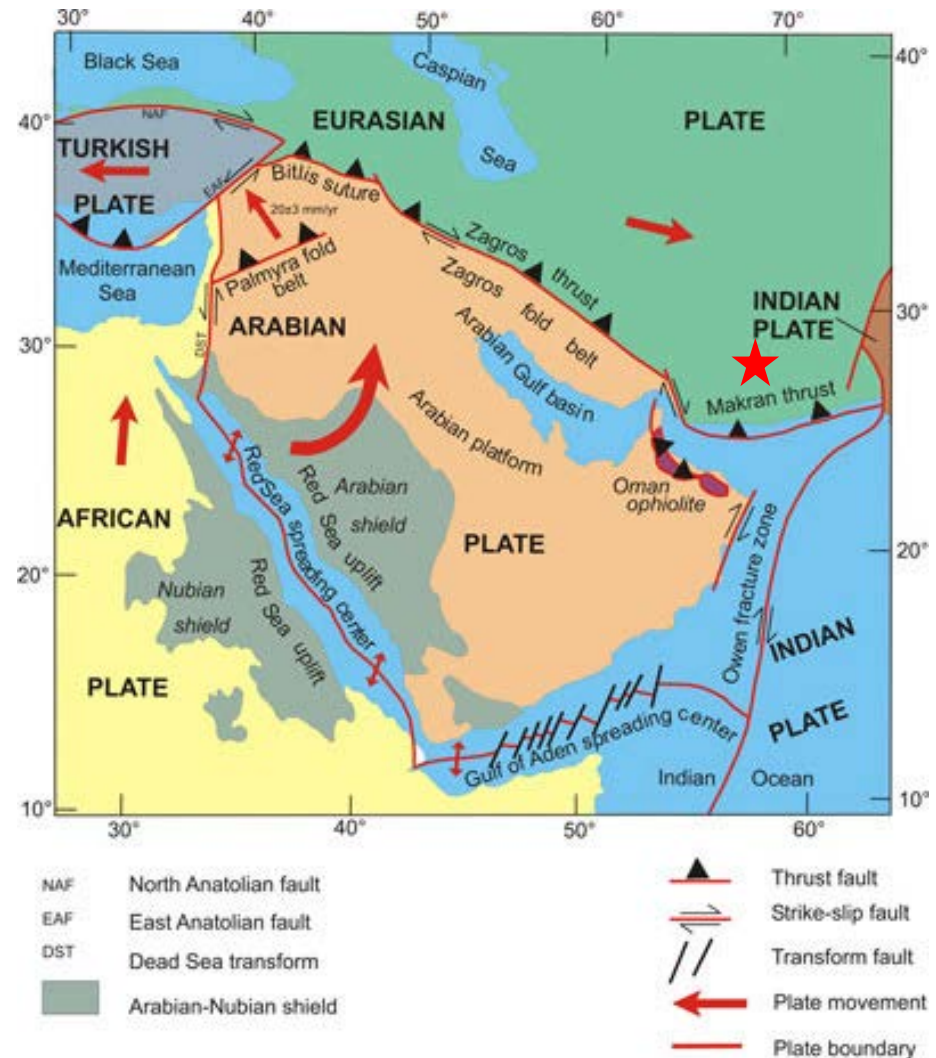


Estimated Modified Mercalli Intensity	I	II-III	IV	V	VI	VII	VIII	IX	X
Est. Population Exposure	--*	--*	135k*	2,600k*	1,682k	377k	2k	0k	0k
Perceived Shaking	Not Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme

The tectonics of this earthquake involves the motion of the Arabian Plate away from the African Plate and towards the Eurasian Plate.

According to the USGS “..at the longitude of this event, the Arabian plate is converging towards the north-northeast at a rate of approximately 37 mm/yr with respect to the Eurasian plate. Arabian plate lithosphere is subducted beneath the Eurasian plate at the Makran coast of Pakistan and Iran, and becomes progressively deeper to the north.”

In the region of this earthquake (red star), subduction of the Arabian Plate beneath the Eurasian Plate occurs along the Makran thrust.



Northwest of this active subduction zone, collision of the Arabia and Eurasia plates forms the approximately 1,500-km-long fold and thrust belt of the Zagros Mountains, which crosses the whole of western Iran and extends into northeastern Iraq.



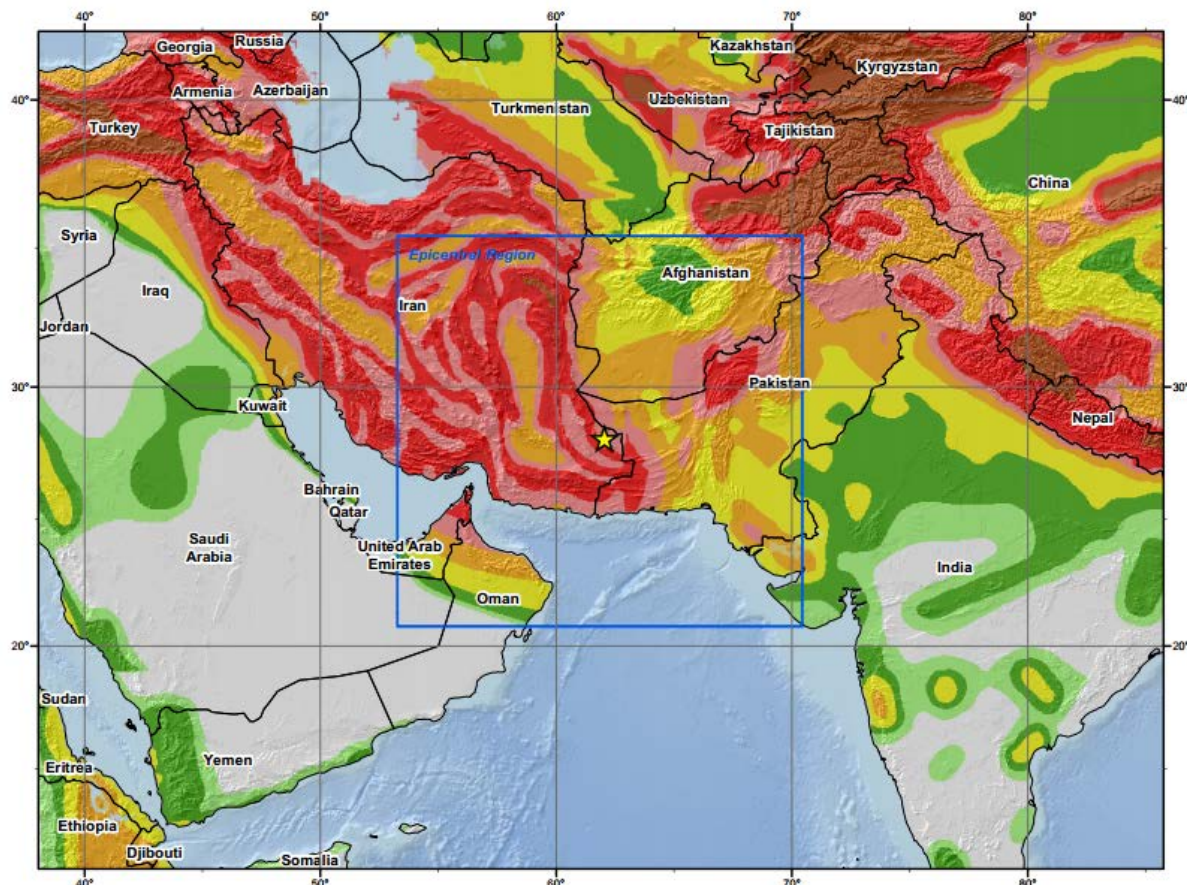
A summit of Zard Kuh in the High Zagros.
Source: Dr. M. Fakhari

Location of the Zagros Mountains in the plate tectonic framework of the Middle East.
Source: Satellite image: NASA; Structural map: Rasoul Sorkhabi

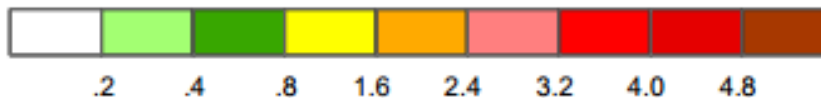
Regional Seismic Hazard

Although the Makran subduction zone has a relatively slow convergence rate, it has produced large devastating earthquakes and tsunamis and the region is at high seismic risk.

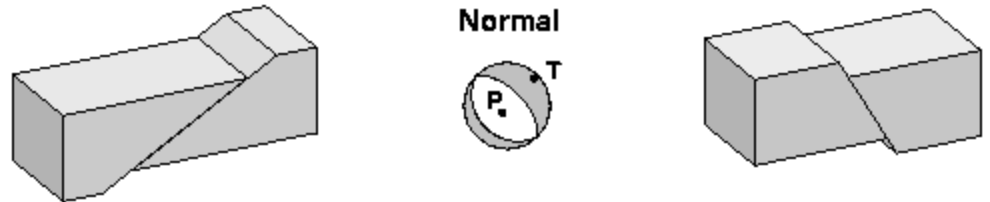
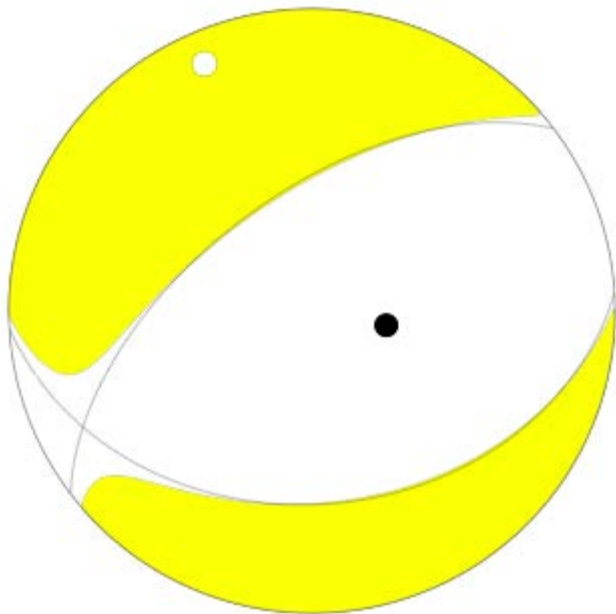
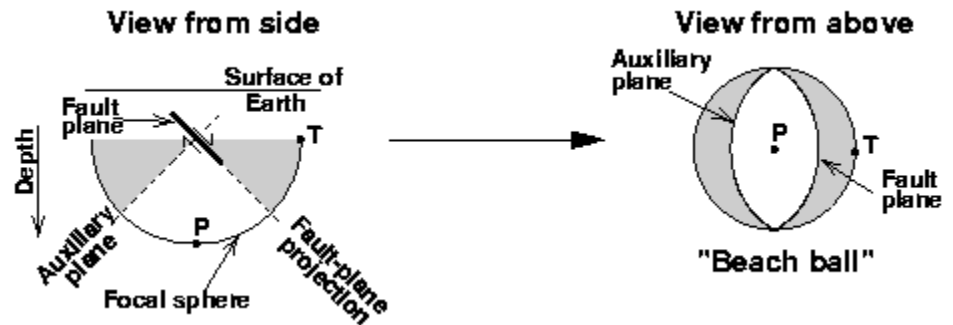
For example, the USGS reports that a November 27, 1945 M8.0 mega-thrust earthquake produced a tsunami within the Gulf of Oman and Arabia Sea, killing over 4,000 people.



Peak Ground Acceleration in m/sec^2



This earthquake occurred as a result of normal faulting at an intermediate depth in the Arabian plate lithosphere, approximately 80 km beneath the Earth's surface.



Shaded areas show quadrants of the focal sphere in which the P-wave first-motions are away from the source, and unshaded areas show quadrants in which the P-wave first-motions are toward the source. The dots represent the axis of maximum compressional strain (in black, called the "P-axis") and the axis of maximum extensional strain (in white, called the "T-axis") resulting from the earthquake.

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