



Earthquake in Morocco

[Source: IE](#)

Why in News?

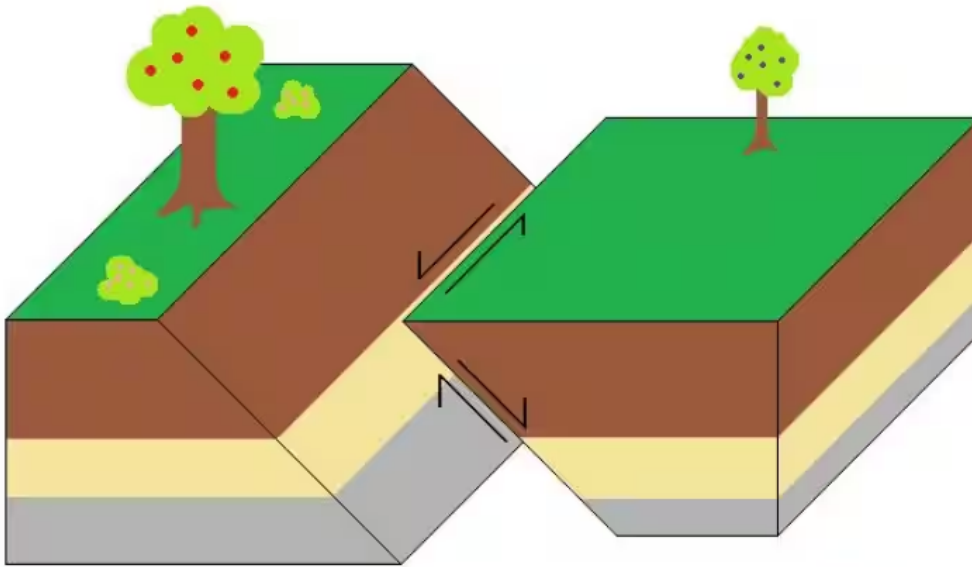
The most powerful [earthquake](#) in Morocco's history struck late on the 8th of September 2023. The earthquake had a **magnitude of 6.8** and its epicenter was located in the **Al-Haouz province, within the Atlas Mountains near the historic city of Marrakech.**

- A series of aftershocks, including a 4.9 magnitude tremor, added to the region's distress.

What are the Causes of the Earthquake in Morocco?

- The earthquake resulted from the **convergence of the [African plate and the Eurasian plate along a complex plate boundary.](#)**
- The earthquake's faulting mechanism was classified as "**oblique-reverse,**" indicating movement along the **fault plane where the upper block moves up and over the lower block** within the Moroccan High Atlas Mountain range.
 - Faults are **fractures in rock formations** that **enable rock blocks to move relative to each other.** Rapid movement along faults can trigger earthquakes.
 - Faults are categorized by their **dip (angle with respect to the surface) and slip direction.**
 - **Dip-slip faults** include **normal faults (upper block moves down lower block)** and **reverse faults (upper block moves up and over lower block),** reverse faults are common in areas of tectonic compression.
 - **Strike-slip faults** involve **horizontal movement along the fault plane.**
 - **Oblique-slip faults** exhibit characteristics of **both dip-slip and strike-slip faults.**

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Oblique-slip fault: Arrows represent relative movement.

- The earthquake occurred at a relatively **shallow depth beneath the Earth's surface**, which is a contributing factor to its destructive potential.
 - **Shallow earthquakes are more dangerous due to their proximity to the Earth's surface.**
 - They release more energy compared to deeper quakes, making them potentially more destructive.
 - Deeper earthquakes lose energy as seismic waves travel greater distances.

Key Facts About Morocco:

- Morocco is situated in western North Africa, directly across the [Strait of Gibraltar](#) from Spain.
- It shares borders with **Algeria to the east and southeast, the Western Sahara to the south,** and is surrounded by the **Atlantic Ocean to the west and the [Mediterranean Sea](#) to the north.**
- **Capital City : Rabat.**
- **Major Mountain Ranges:** The Atlas and Rif Mountains.
- **Morocco is situated on the [convergence plate](#) of Africa and Eurasia,** which are two of the major tectonic plates that make up the **Earth's crust.** These plates are constantly moving and colliding, creating mountains, volcanoes, earthquakes, and other geological features.
 - **The Atlas Mountains in Morocco** are a result of the collision between these plates, as they are squeezed and uplifted by the compressional forces.



EARTHQUAKE



ABOUT

- Shaking of the earth; caused due to release of energy, generating **seismic waves in all directions**

HYPOCENTER

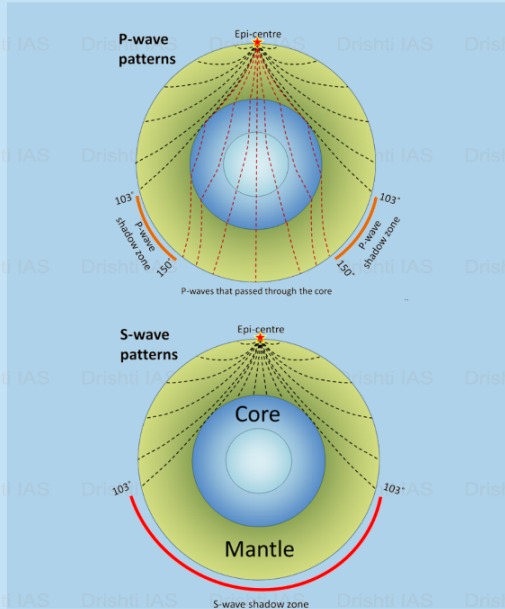
- Location where the earthquake starts (below earth's surface)

EPICENTER

- Location right above the Hypocenter (on the earth's surface)

EARTHQUAKE WAVES

- Body Waves:** Move in all directions travelling through the body of the earth
 - P Waves:** Move faster, First to arrive at surface, Similar to sound waves, Travel through gaseous, liquid and solid materials
 - S Waves:** Arrive at surface with some time lag, Travel only through solid materials
- Surface Waves:** Last to report on seismographs, More destructive, Cause displacement of rocks
 - Love Waves:** Same motion as S-waves (horizontal) without vertical displacement, Sideways motion perpendicular to the direction of propagation, Faster than Rayleigh waves
 - Rayleigh Waves:** Cause the ground to shake in an elliptical pattern, Spread out the most of all seismic waves, Move vertically and horizontally in a vertical plane



CAUSES OF EARTHQUAKES

- Release of energy along a **Fault/Fault Zones** (break in the crustal rocks)
- Movement of **tectonic plates** (most common)
- Volcanic eruption** (stress changes in rock-injection/withdrawal of magma)
- Human activities** (mining, explosion of chemical/nuclear devices etc.)

EARTHQUAKE IN INDIA

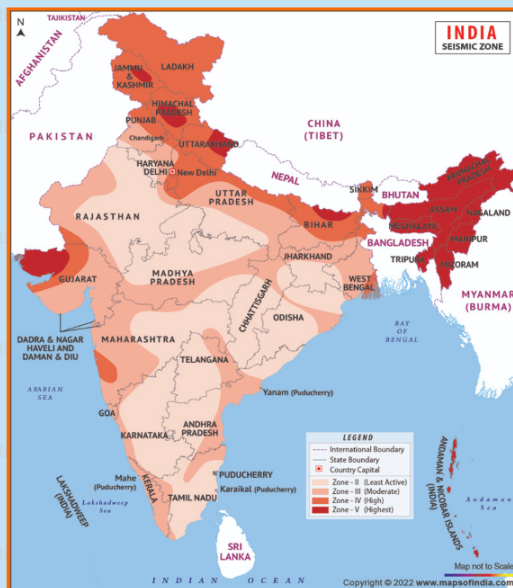
- India is **one of the highly earthquake affected countries** due to the presence of technically active mountains - the Himalayas.
- India has been divided into **4 seismic zones** (II, III, IV, and V)

MEASURING EARTHQUAKE

- Seismometers** - Measures seismic waves
- Richter Scale** - Measures magnitude (energy released; range: 0-10)
- Mercalli** - Measures intensity (visible damage; range: 1-12)

DISTRIBUTION

- Circum-Pacific Belt** - 81% of earthquakes
- Alpide Earthquake Belt** - 17% of the largest earthquakes
- Mid-Atlantic Ridge** - Mostly submerged underwater



UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. Consider the following: (2013)

1. Electromagnetic radiation
2. Geothermal energy
3. Gravitational force
4. Plate movements
5. Rotation of the earth
6. Revolution of the earth

Which of the above are responsible for bringing dynamic changes on the surface of the earth?

- (a) 1, 2, 3 and 4 only
(b) 1, 3, 5 and 6 only
(c) 2, 4, 5 and 6 only
(d) 1, 2, 3, 4, 5 and 6

Ans: (d)

Mains

Q. Why are the world's fold mountain systems located along the margins of continents? Bring out the association between the global distribution of fold mountains and earthquakes and volcanoes. **(2014)**

Q. Discuss about the vulnerability of India to earthquake related hazards. Give examples including the salient features of major disasters caused by earthquakes in different parts of India during the last three decades. **(2021)**