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Earthquake: An Overview

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***Abstract*—An earthquake (also known as a quake, tremor or temblor) is the shaking of the surface of the Earth, resulting from the sudden release of energy in the Earth's lithosphere that creates seismic waves. Earthquakes can range in size from those that are so weak that they cannot be felt to those violent enough to toss people around and destroy whole cities. The seismicity, or seismic activity, of an area is the frequency, type and size of earthquakes experienced over a period of time. The word tremor is also used for non-earthquake seismic rumbling. At the Earth's surface, earthquakes manifest themselves by shaking and displacing or disrupting the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity.**

***Index Terms*—earthquake**

I. Introduction

Earthquake, any sudden shaking of the ground caused by the passage of seismic waves through Earth's rocks. Seismic waves are produced when some form of energy stored in Earth's crust is suddenly released, usually when masses of rock straining against one another suddenly fracture and "slip." Earthquakes occur most often along geologic faults, narrow zones where rock masses move in relation to one another. The major fault lines of the world are located at the fringes of the huge tectonic plates that make up Earth's crust.

II. Definition

An earthquake is the result of a sudden release of stored energy in the Earth's crust that creates seismic waves.

III. Components of Earthquake

There may be foreshocks and aftershocks, which are the energy released before and after the main quake.

The point underground where the actual breaking of the rock occurs is called the focus. It might help to remember this by thinking of it as the focal point of the earthquake. This is where the main event occurs underground. The point directly above the focus on the surface of Earth is called the epicenter. This is where the ground shaking is usually the strongest. From this point on the surface, the waves of energy from below ground begin to travel outward, so you can think of this as the central point of shaking above ground. Because the shaking is strongest here, this is also where the most damage usually occurs

IV. Causes of Earth Quake

A. Plate Tectonic Movements

Plate tectonic movements cause the majority of the earthquakes. The movements occur because the plates float on the hotter and denser rock of the mantle. Consequently, these plates are usually in constant movement – past or from each other within the earth's crust. When these plates (rocks) break or slide past each other at boundaries known as fault lines, they release shock waves. The shock waves are results of the energy stored in the earth crust due to the underground pressure of the earth's inner core. Aside from the shock waves, the tectonic plate movements snag on coarse patches of rock and pull at entangled sections that further crack the earth's crust, producing more faults near the boundaries of the plates. After some period, the buildup energy and movement generates great tensions in the plates and builds pressure on the fault lines. The intense pressure from the shock waves makes the fault lines to collapse, and the plates move over, up and against each other. As a result, an earthquake occurs when the pressure build up along the fault lines becomes stronger than the force holding the tectonic plates together. This happens when the rocks (plates) suddenly rip apart or fall on either side at ultrasonic speeds releasing the pent-up pressure which moves outward in all directions. When it reaches the earth's surface, an earthquake occurs which is in the form of ripples (seismic waves) of escaping energy. The rippling effect is what causes the rapid and violent vibration of the earth surface – earthquake, shaking and tearing everything on it including the earth surface itself, structures, and houses. Majority of the earthquakes originate along the edges of the plates and occur in some regions more frequently than others. The National Geographic reports that 80% of the earthquakes occur around the edge of the Pacific plate in Japan, Canada, USA, Papua New Guinea, South America, and New Zealand. Earthquakes severity also differs depending on the amount of stored energy released and the extent of faulting. Geologists believe there is no regularity in the occurrence of earthquakes. Aftershocks may as well be experienced after earthquake events. Aftershocks refer to smaller shock waves that result from the adjustment of the crust after the principal shock. The aftershocks can worsen the aftermath of the disastrous earthquake outcomes.

B. Volcanic Activity

Apart from tectonic plate movements, volcanic activity can

significantly cause massive earthquakes. Earthquakes normally accompany escaping magma as it rises to the crust during a volcanic eruption. This is mainly due to the sudden displacement and shaking of underground rocks. Volcanic activity also creates fault lines and underground disturbances that can instigate the sudden ripping or falling of the tectonic plates, thus, releasing the pent-up pressure which moves outwards in all directions.

C. Underground Explosions

Seismic waves (wave shocks) similar to the ones causing earthquakes can be generated by underground explosions. These explosions can be as a result of underground mining or during the construction of railroads, subways, or underground tunnels. However, some of the seismic waves produced by these activities are not as strong as those produced by real earthquakes. Per se, they can only be felt within the adjacent areas. On the other hand, underground nuclear tests are known to be very dangerous and can produce powerful seismic waves similar to that of a natural earthquake. For this reason, underground nuclear tests have been banned globally.

V. Effects of Earth Quake

1. Ground Shaking
2. Ground Landslides
3. Rupture
4. Tsunamis
5. Liquefaction, Subsidence, and Related Effects
6. Fires

VI. Types of Seismic Waves

Seismology is the study of earthquakes and seismic waves that move through and around the earth. A seismologist is a scientist who studies earthquakes and seismic waves.

A. Types of Seismic Waves

There are several different kinds of seismic waves, and they all move in different ways. The two main types of waves are body waves and surface waves. Body waves can travel through the earth's inner layers, but surface waves can only move along the surface of the planet like ripples on water. Earthquakes radiate seismic energy as both body and surface waves.

1) Body waves

Traveling through the interior of the earth, body waves arrive before the surface waves emitted by an earthquake. These waves are of a higher frequency than surface waves.

2) P waves

The first kind of body wave is the P wave or primary wave. This is the fastest kind of seismic wave, and, consequently, the first to 'arrive' at a seismic station. The P wave can move through solid rock and fluids, like water or the liquid layers of the earth. It pushes and pulls the rock it moves through just like sound waves push and pull the air. Have you ever heard a big clap of thunder and heard the windows rattle at the same time? The windows rattle because the sound waves were pushing and pulling on the window glass much like P waves push and pull on rock. Sometimes animals can hear the P waves of an earthquake. Dogs, for instance, commonly begin barking hysterically just before an earthquake 'hits' (or more specifically, before the surface waves arrive). Usually people can only feel the bump and rattle of these waves.

P waves are also known as compressional waves, because of the pushing and pulling they do. Subjected to a P wave, particles move in the same direction that the wave is moving in, which is the direction that the energy is traveling in, and is sometimes called the 'direction of wave propagation.

3) S waves

The second type of body wave is the S wave or secondary wave, which is the second wave you feel in an earthquake. An S wave is slower than a P wave and can only move through solid rock, not through any liquid medium. It is this property of S waves that led seismologists to conclude that the Earth's outer core is a liquid. S waves move rock particles up and down, or side-to-side--perpendicular to the direction that the wave is traveling in (the direction of wave propagation).

4) Surface waves

Travelling only through the crust, surface waves are of a lower frequency than body waves, and are easily distinguished on a seismogram as a result. Though they arrive after body waves, it is surface waves that are almost enitrely responsible for the damage and destruction associated with earthquakes. This damage and the strength of the surface waves are reduced in deeper earthquakes.

5) Love waves

The first kind of surface wave is called a Love wave, named after A.E.H. Love, a British mathematician who worked out the mathematical model for this kind of wave in 1911. It's the fastest surface wave and moves the ground from side-to-side. Confined to the surface of the crust, Love waves produce entirely horizontal motion.

6) Rayleigh waves

The other kind of surface wave is the Rayleigh wave, named for John William Strut, Lord Rayleigh, who mathematically predicted the existence of this kind of wave in 1885. A Rayleigh wave rolls along the ground just like a wave rolls across a lake or an ocean. Because it rolls, it moves the ground up and down, and side-to-side in the same direction that the wave is moving. Most of the shaking felt from an earthquake is due to the Rayleigh wave, which can be much larger than the other waves.

VII. Conclusion

1) In this article overall view of earthquake concept is

discussed.

2) Types of Seismic waves is discussed in detail.
3) The Causes And Effects Of Earthquake Is Also Discussed.
4) The Latest Earthquake happened is also mentioned in collectively.

REFERENCES

[1] "Roberto Villaverde", Fundamental Concept of Earthquake Engineering.
[2] "Amr S. Elnashai", Fundamental Concept of Earthquake Engineering.
[3] "Sinan Akkar, Halûk Sucuoğlu", Basic Earthquake Engineering.