

Earthquakes and their geological basis

Very simply explained, earthquake is considered as the sudden release of energy stored in some parts of the crust, and which therefore causes a shaking of the earth. They occur when the plates found on the crust move about relative to each other and when they either collide or are pulled apart. The energy of an earthquake is released in the form of waves. This can be compared to a piece of wood subjected to a strong stress (Fig 1) and which breaks when the application of the stress is continued. The location at which the energy is released is termed the focus and this is within the earth. The location on the surface directly above the focus is termed the 'epicenter' (Fig 2).

The earthquake waves so produced travel within the earth as well as on the surface. There are two types of such waves, namely surface waves and body waves. The waves originating from the earthquake and which travel on the surface of the earth are the surface waves while those that travel within are the body waves. The body waves are further classified as primary and secondary waves.

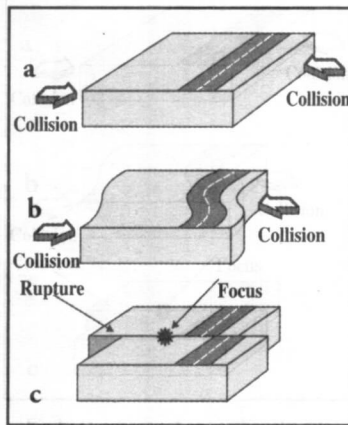


Fig 1 : Occurrence of an earthquake due to collision

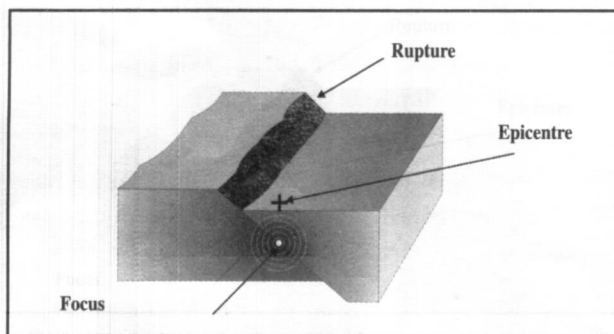


Fig. 2 : Focus and epicentre of an earthquake

As seen in (Fig 3) the vast majority of earthquake occur at margins of the plates. There are 12 major and a few minor plates. These plates move relatively to one another driven by forces originating within the earth. The plates can either collide or one plate can sink under the other. It is the collision of the plates that cause the majority of the earthquakes. In mountain ridges beneath the sea there is a growth of the plates and here too earthquakes are frequent. The theory of plate tectonics can explain the occurrence of volcanoes, High Mountain ranges etc. Countries such as Japan, Philippines, and Indonesia are located near plate margins. The strong forces of the earthquakes can destroy buildings, rupture gas pipes, damage large electrical cables and cause fire. Due to the loosening of the soil, earthquakes in the sea. It is reported that the tsunami that occurred near the Japanese island of Rikyo n 1971 gave rise to waves as high as 85 meters. The destruction that is caused by this to the costal zone is enormous.

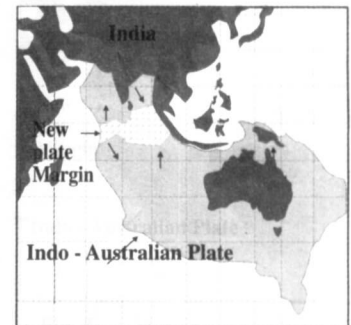


Fig 3: Margins in the Indian Ocean plates

The Magnitude of an Earthquake

When calculating the magnitude and the location of an earthquake, research stations situated on the earth's surface use both surface and body waves. The strength of an earthquake is measured by the 'Richter Scale' first introduced by the American scientist-Charles Richter. According to this scale, earthquakes measuring 7 or more are very destructive while those less than 5 do not cause much damage. According to table 1, the earthquake, which struck the city of kobe, Japan in 1995 had a magnitude of 6.8.

Earthquakes in Sri Lanka

Earth tremors reported in Sri Lanka occasionally. During the last 500 years, about 60 earthquakes felt by man had been listed. From among these, Portuguese records state

that in 1615 April 17 an earthquake that occurred in 1938, 1993, 1999, 2001 and 2004 had been strong enough to be felt. It has been found that many earthquakes not strong enough to be felt, occur in Sri Lanka. Even though destructive earthquakes as observed in countries such as Japan, India have not been reported, no one can quite definitely state that such events will not occur in the future.

Up to now, Sri Lanka was considered as a country away from a plate margin. However, according to recent investigations it has been found that there is a new developing plate margin about 480 kms South of Sri Lanka in the Indian Ocean. According to the American and French scientist involved in this study, it has been estimated that



this originated about 7.5 million years ago. The gravity change in the Indian Ocean also confirms this view.

It has been recorded that the epicenter of earth tremors felt in Sri Lanka has their locations at this new plate boundary. According to the French geologists who studied this, the fault had shortened by 32-37 km during the last 7 million years. Accordingly, Sri Lanka is moving as a little platelet 6-7 mm/year towards the Southeast.

Some scientists suspect that the earth tremors within Sri Lanka are caused by the large reservoirs. Due to the weight of the large amount of the water there is a stress built up in the rock layer underneath. This stress is expected to cause movement with a resulting earth tremor. Geologists say that earth tremors can occur. However, a study of the earth tremors in Sri Lanka shows that medium sized earth tremors had occurred even before the reservoirs were built.

Table 1 : Earthquake Severity

Richter Magnitudes	damage
Less than 3.5	Not felt, but recorded
3.5-5.4	Often felt, but not causes damage
5.5-6.0	Slight damage over small regions
6.1-6.9	Can be destructive in areas up to about 100 km
7.0-7.9	Major earthquake, can cause serious damage over large areas
8.0 or greater	Great earthquakes, can cause serious damage in areas several hundred kilometers across

Table 2 : Destructive earthquakes occurred in the world

Year	Location	Richter Scale	No. of deaths (approximately)
September 1923	Tokyo, Japan	8.3	140000
May 1935	Pakistan	7.6	60000
January 1970	China		66000
February 1976	Peru	7.8	23000
July 1976	China	8.0	655000
September 1978	Iran	7.8	15000
September 1985	Maxyco	8.1	30000
December 1998	Turkey	7.0	25000
June 1990	Iran	7.7	50000
January 1999	Turkey	7.4	17000
January 2001	India	7.9	13805
December 2004	Sumathra	9.0	200000

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