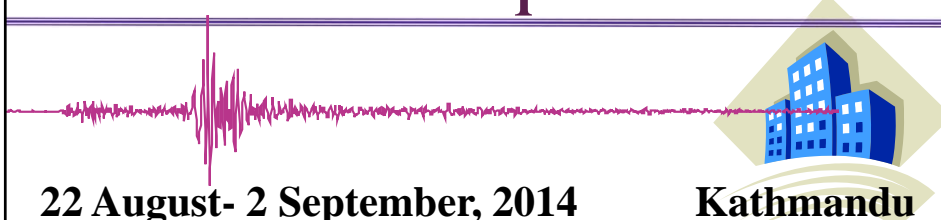


Training Program on NBC and Structural Analysis Software

Eathquake Basics and Effects of Earthquake



22 August- 2 September, 2014

Kathmandu

Presented by: D. Shrestha

विषय सूची

- भूकम्पजन्य क्षतिको सिंहावलोकन
- भूकम्प के हो ?
- भूकम्प कसरी जान्छ ?
- भूकम्पको मापन
- नेपालमा भूकम्पको इतिहास
- विगतका भूकम्पले सिकाएका पाठहरु
- भूकम्पीय प्रकोपबाट बच्न भवन निर्माण तर्फ गर्नु पर्ने कुराहरु

भूकम्पजन्य विनाश



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3

भूकम्पको समयमा



DUDBC 2012

4

भूकम्पको समयमा



DUDBC 2012

5

माटोको जोडाइमा निर्माण भएको गारो



ताप्लेजुङ भूकम्प
१८ सेप्टेम्बर, सन् २०११ ६.९ रेक्टर

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6

गारोले भारवहन गर्ने भवन



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५
७.६ रेक्टर

सिमेन्ट मसलाको जोडाइ



DUDBC 2012

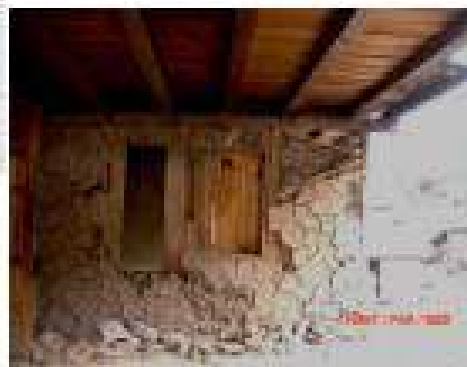
ढलान गरिएको भवन



ताप्लेजुङ भूकम्प
१८ सेप्टेम्बर, सन् २०११ ६.९ रेक्टर

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धज्जी दिवारी प्रविधि



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५
७.६ रेक्टर

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9

बस्तीकै विनाश



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५ ७.६ रेक्टर

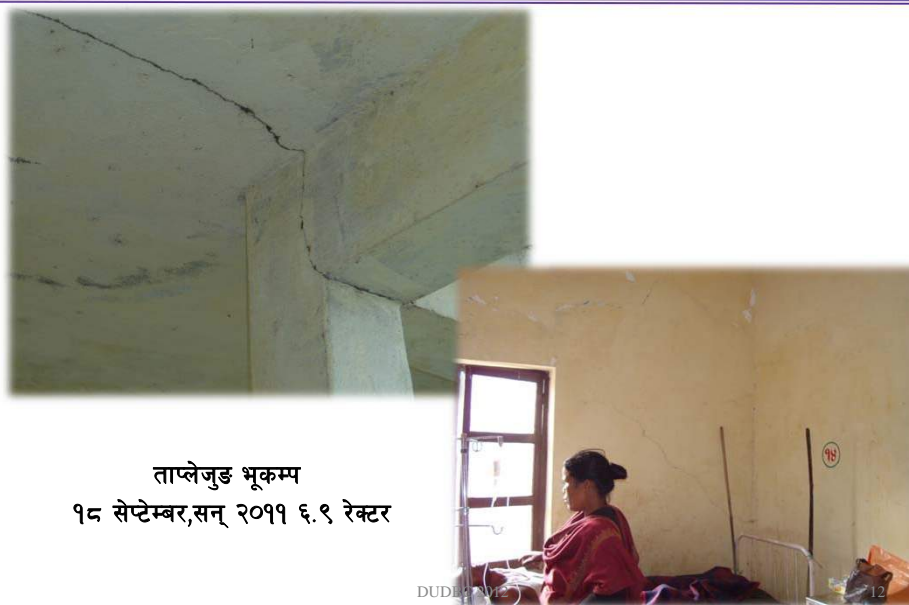
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विद्यालय भवन



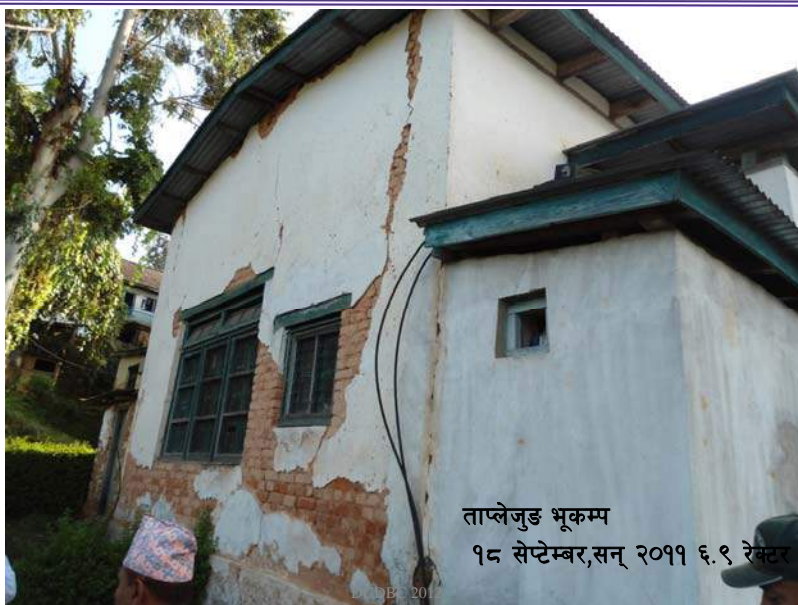
ताप्लेजुङ भूकम्प
१८ सेप्टेम्बर, सन् २०११ ६.९ रेक्टर

अस्पताल भवन



ताप्लेजुङ भूकम्प
१८ सेप्टेम्बर, सन् २०११ ६.९ रेक्टर

सरकारी भवन



होटेल भवन



भौतिक पूर्वाधार



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५
७.६ रेक्टर



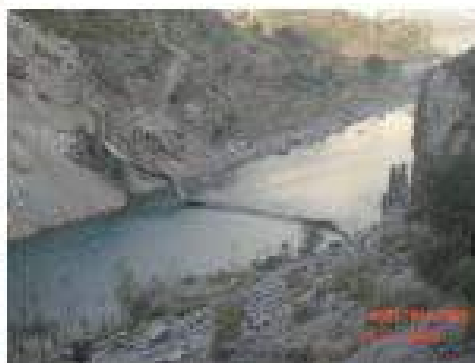
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15

पुलहरु



काश्मिर, ८ अक्टुबर, सन् २००५ ७.६ रेक्टर



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16

भत्केको सामग्रीले आवागमनमा अवरोध



जमीनको कम्पनबाट भवनमा क्षति



जमीनको कम्पनबाट चिजबिज खस्नु



Northridge, CA 1994



जमीनको कम्पनबाट पुलमा क्षति



Loma Prieta, CA 1989

KGO-TV News ABC-7

जमीनको कम्पनबाट भवनमा क्षति



USGS

Kobe, Japan 1995

जमीनको कम्पनबाट भवनमा क्षति



USGS

Kobe, Japan 1995

जमीन सतहमा चिरा पर्नु



Landers, CA 1992



तरलीकरणबाट माटोको भारवहन क्षमतामा हास



Source: National Geophysical Data Center



Niigata, Japan 1964

पहिरो जानु



नु



Source: National Geophysical Data Center



Turnagain Heights, Alaska, 1964 (upper left inset);
Santa Cruz Mtns, California, 1989

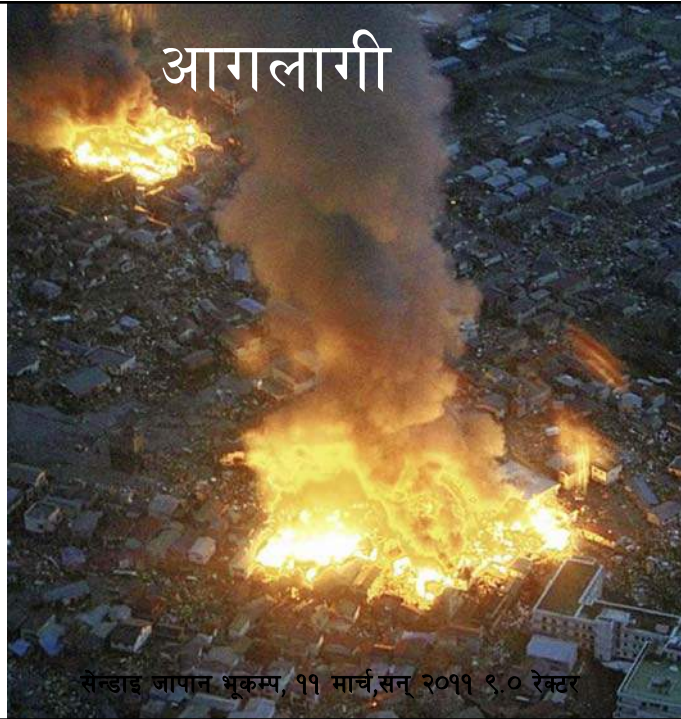
पहिरो जानु



काइस्टचर्च न्युजिल्याण्ड भूकम्प, २२ फेब्रुअरी, सन् २०११ ६.३ रेक्टर



आगलागी



सेन्डाइ जापान भूकम्प, ११ मार्च, सन् २०११ ९.० रेक्टर

सुनामी जानु

1957 Aleutian Tsunami



भूकम्प के हो ?

पृथ्वी



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31

भूकम्प के हो ?

भूकम्प भनेको पृथ्वीको आवरण तह वा चट्टानको भाग अकस्मात् फुटेर पृथ्वीको बाहिरी सतहमा उत्पन्न हुने तरङ्ग वा कम्पन हो ।

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32

भूकम्प कसरी जान्छ ?

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33

भूकम्प किन जान्छ ?

- के यी संभावित कारण हुन् ?
 - सामाजिक रुढिवादी मान्यता
 - ग्रह गोचर
 - कष्टुवा, हात्तीको हलचल
 - अधर्म, पाप कर्मको भार

भूकम्प सम्बन्धि आधारभूत जानकारी

34

भ्रम

A painting of a landscape with a large red 'X' over it. The scene depicts a body of water in the foreground, a rocky island in the middle ground with two elephants, and a tall, dark, conical structure on a hill in the background under a blue sky with clouds.

35

भ्रम

A drawing of a cow with a globe behind it and a large red 'X' over it. The cow is black and white, standing on a patch of grass. Behind the cow is a globe showing the Earth's continents and oceans.

36

भूकम्पको वैज्ञानिक परिभाषा

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37

What is an earthquake?

- An earthquake is the vibration of Earth produced by the rapid release of accumulated energy in elastically strained rocks
 - Energy released radiates in all directions from its source, the focus
 - Energy propagates in the form of seismic waves
 - Sensitive instruments around the world record the event

Causes of earthquakes

Earthquakes

Natural Sources

- **Tectonic Earthquakes**
- **Volcanic Earthquakes**
- **Rock Faults**

Manmade Sources

- **Controlled Sources (Explosives)**
- **Reservoir Induced**
- **Mining Induced**

भूकम्प जानुको वैज्ञानिक कारणको खोजी

अल्फ्रेड वेजेनरको महादेशीय विचलन सम्बन्धी सिद्धान्त



अल्फ्रेड वेजेनर
— जर्मन भूगर्भविद्



सन् १९१५ मा प्रतिपादित



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41

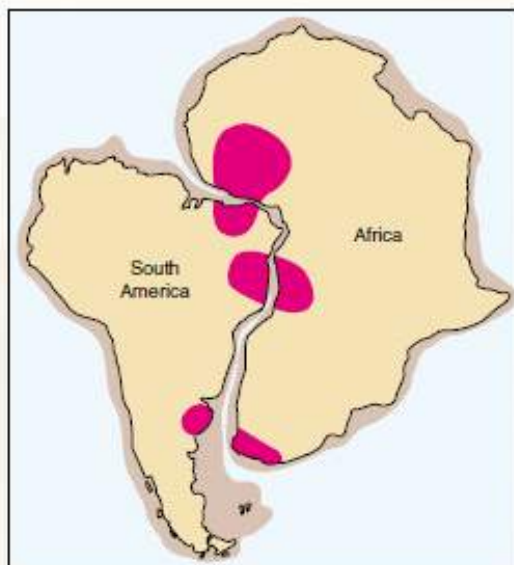
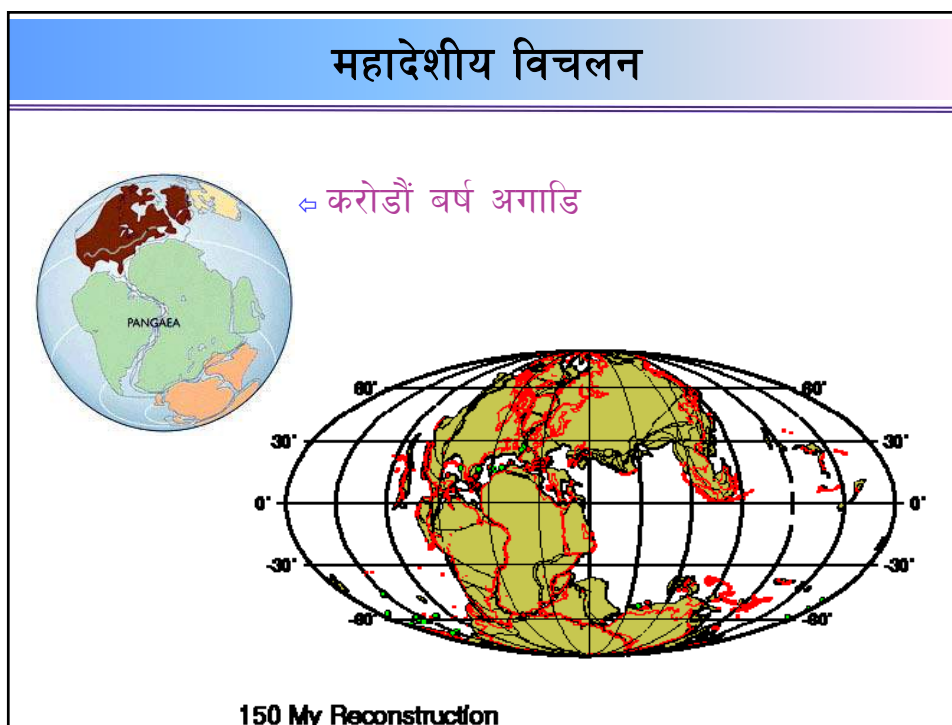
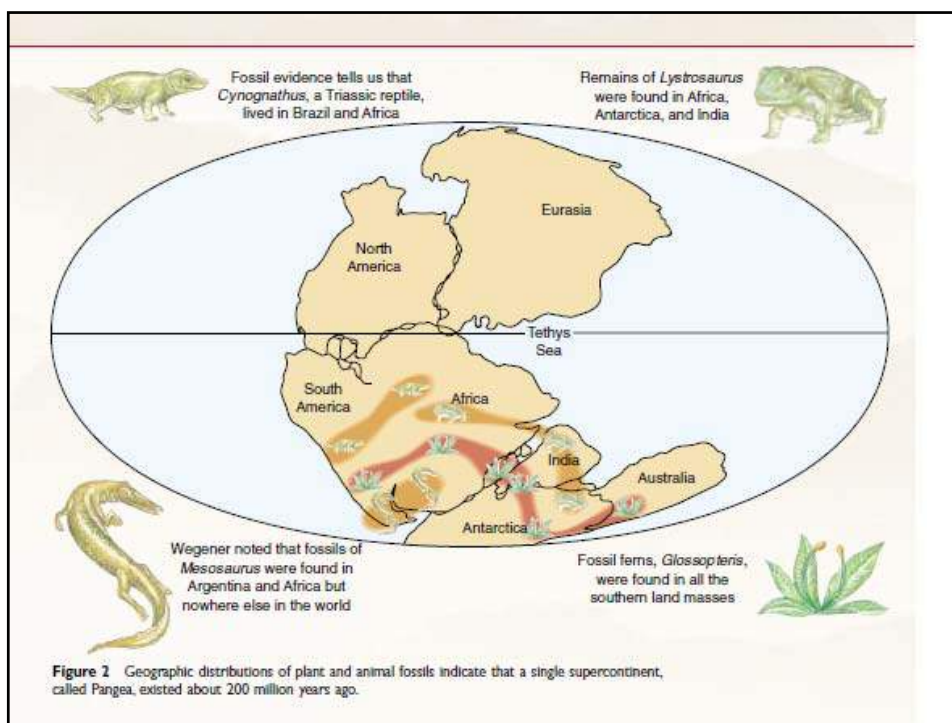


Figure 1 The African and South American coastlines appear to fit together like adjacent pieces of a jigsaw puzzle. The pink areas show locations of distinctive rock types in South America and Africa.

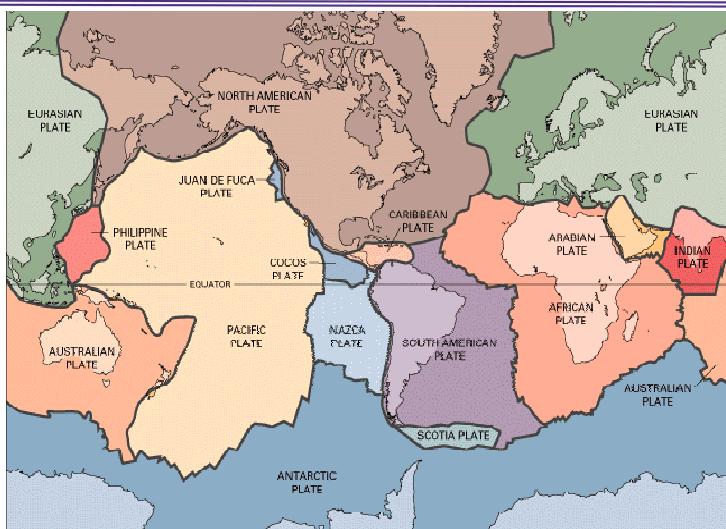


भूकम्प जानुको वैज्ञानिक कारण

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विभिन्न प्लेटहरू



- भूकम्प अधिकतर यी प्लेटहरूको सिमानामा केन्द्रीत हुन्छन्

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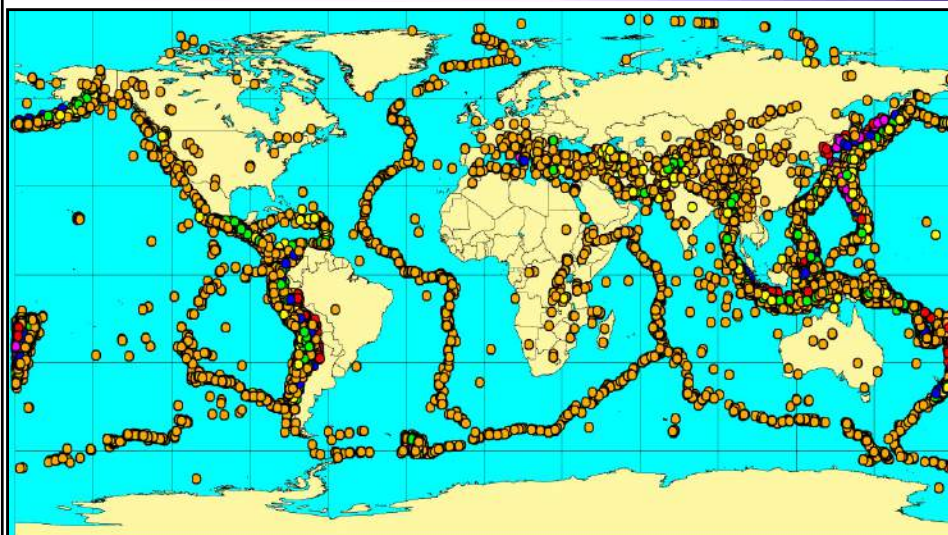
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भूकम्प कहाँ कहाँ जान्छ ?

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47

भूकम्पको कारण

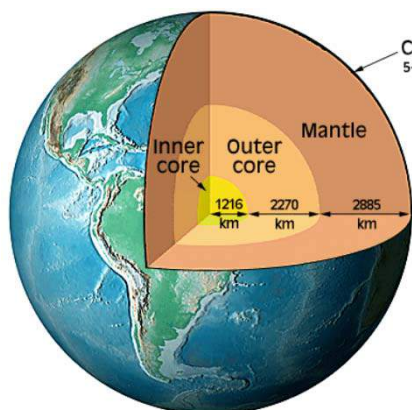


seismic eruption →

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48

पृथ्वीको आन्तरिक बनोट



आवरण तह

- महादेशीय परत (२५-४० कि.मि.)
- सामुद्रिक परत - भण्डै ६ कि.मि.)

मध्य परत

- माथिल्लो मध्य परत (६५० कि.मि.)
- तल्लो मध्य परत (२२३५ कि.मि.)

गर्भ

- बाह्य गर्भ (२२७० कि.मि.)
- भित्री गर्भ (१२१६ कि.मि.)

कोष्ठाभित्रका अङ्कहरूले परतको अन्दाजी मोटाई जनाउँछन्

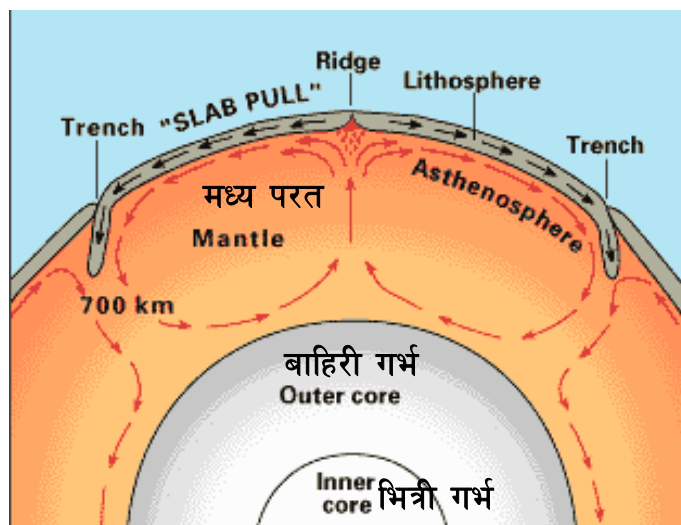
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49

Plate Tectonics

- Convection currents - in the viscous Mantle, because of prevailing high temperature and pressure gradients between the Crust and the Core result in a circulation of the earth's mass.
- hot molten lava comes out and the cold rock mass goes into the Earth.
- Many such local circulations are taking place at different regions underneath the Earth's surface, leading to different portions of the Earth undergoing different directions of movements along the surface.

प्लेटको गति






संवाहन द्वारा
पानी तातेको

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51

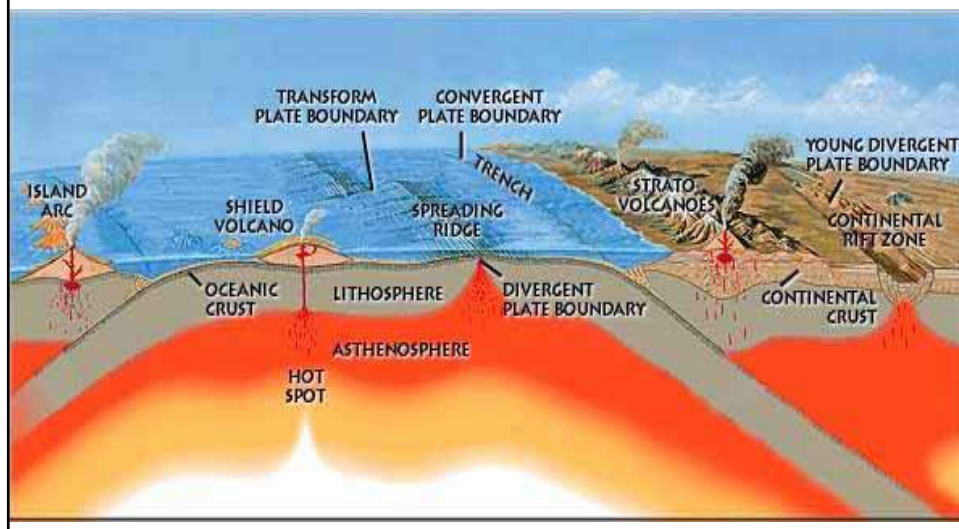
प्लेटको सीमाना

A Divergent	B Convergent	C Transform
		
<ul style="list-style-type: none"> •plates are moving apart •new crust is created •Magma is coming to the surface 	<ul style="list-style-type: none"> •plates are coming together •crust is returning to the mantle 	<ul style="list-style-type: none"> •plates are slipping past each other •crust is not created or destroyed

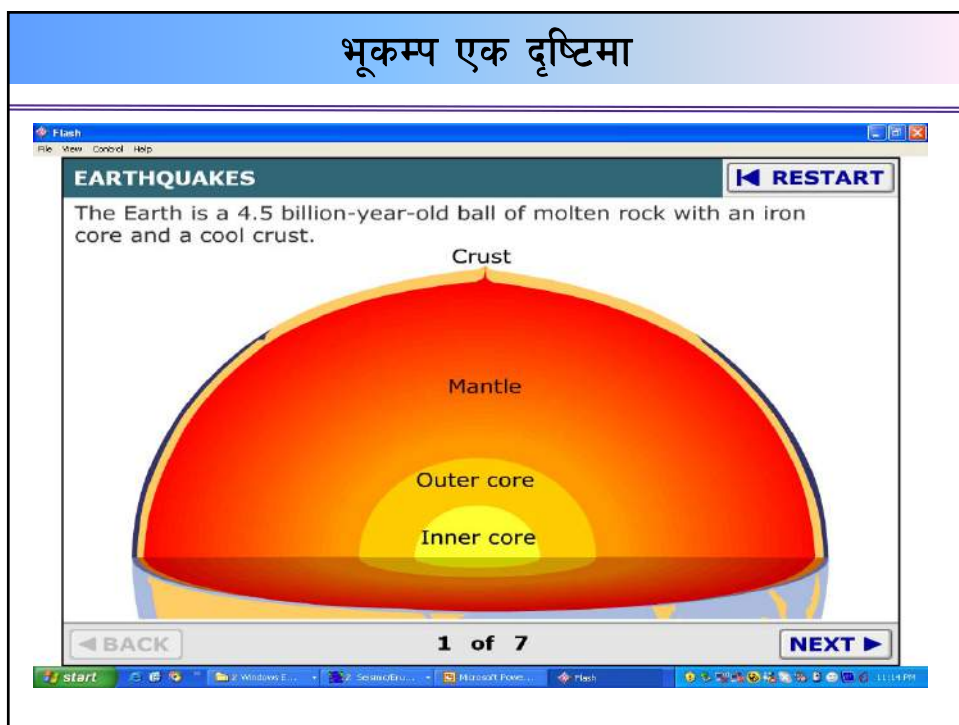
DUDBC 2012

52

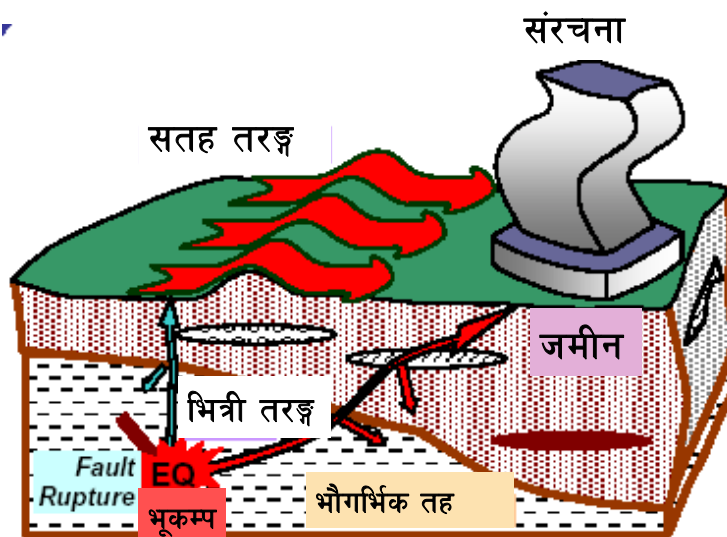
So here's the big picture of what we're living on



भूकम्प एक दृष्टिमा



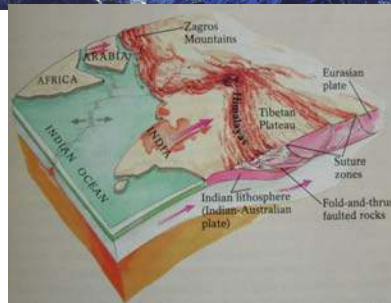
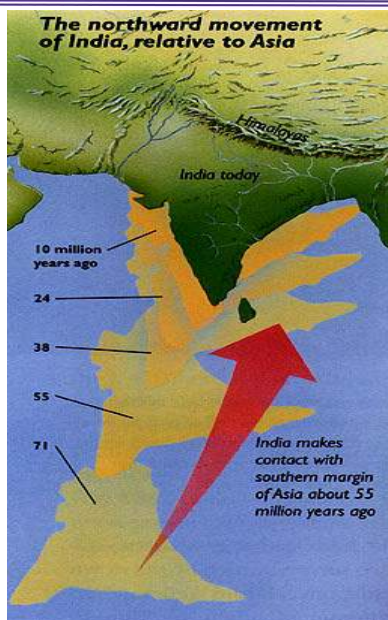
भूकम्पको असर



DUDBC 2012

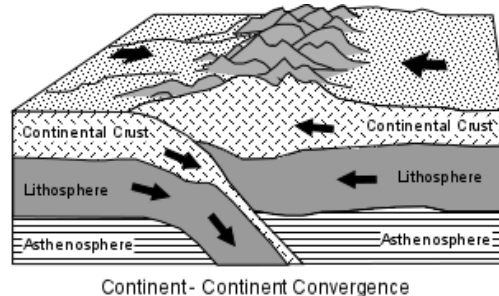
55

हिमालय कसरी बन्यो ?



Earthquake Mechanism

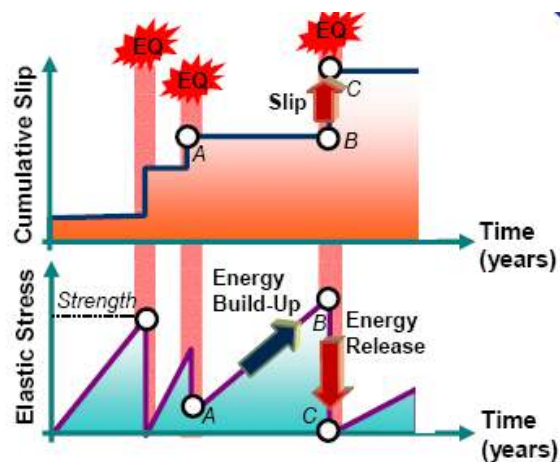
- Earth's crust is under tremendous strain at the plate boundaries
- Relative motion across a fault line will eventually lead to rupture
- Fault ruptures suddenly releases energy causing an **EARTHQUAKE**



Elastic Re-bound Theory:



H. F. Reid
American Geophysicist



- Elastic strain energy is stored in Rocks during the deformations that occur due to the tectonic plate actions. But, rocks are very brittle, when the rocks along a weak region reach their strength, a sudden movement takes place there and release the large elastic strain energy stored. This causes the earthquake. And, after the earthquake is over, the process of strain build-up at this modified interface between the rocks starts all over again. Earth scientists know this as the Elastic Rebound Theory.

Where Do EQ Occur?

- Faults
 - Fracture in the Earth's crust where one side moves with respect to another

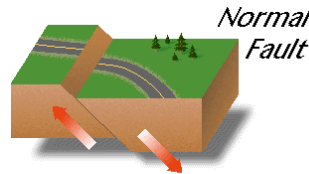


Faults associated with Earthquakes

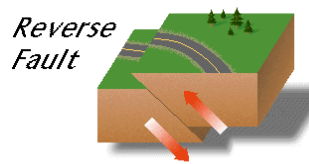
- Faults are planes of weakness along which the Earth has been broken
- Movements on a fault can be either **slow** (ductile deformation) or **fast** (brittle fracture)
- When a fault behaves in a brittle manner and breaks, **earthquakes are generated**

Three types of dominantly vertical faults

- A normal fault is the result of **tensional forces** (e.g., rifting)
- Reverse and thrust faults are the result of **horizontal compression**



Normal Fault



Reverse Fault



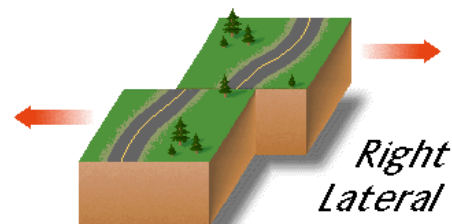
Blind Thrust Fault

Faults whose movement is dominantly **horizontal**

- These faults are termed **strike-slip** faults
- They are a small-scale version of transform plate tectonic margins
- They are termed **left-lateral** (sinistral) or **right-lateral** (dextral) according to their movement

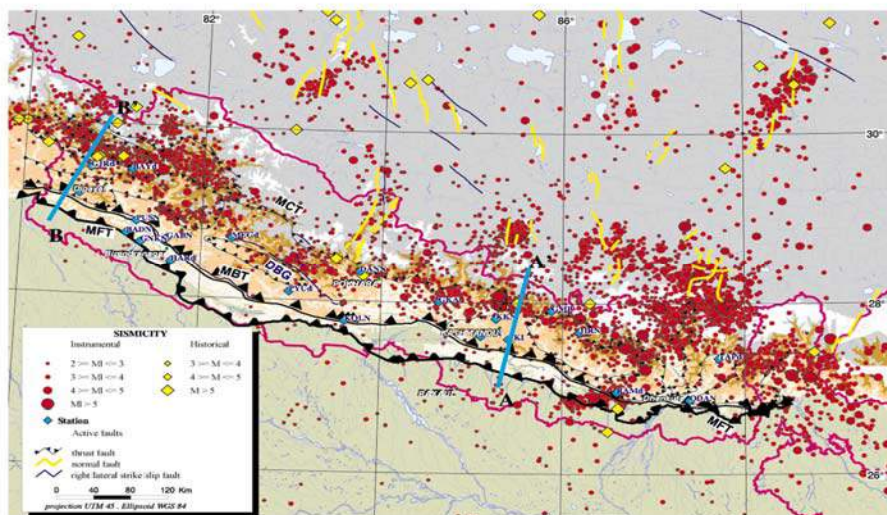


Left Lateral



Right Lateral

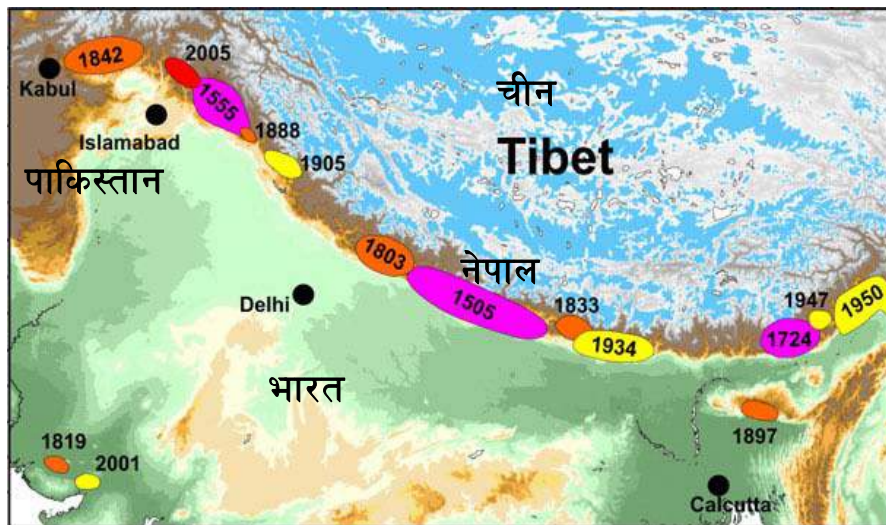
नेपालमा गएका भूकम्पहरु



हिमालय शृङ्खला



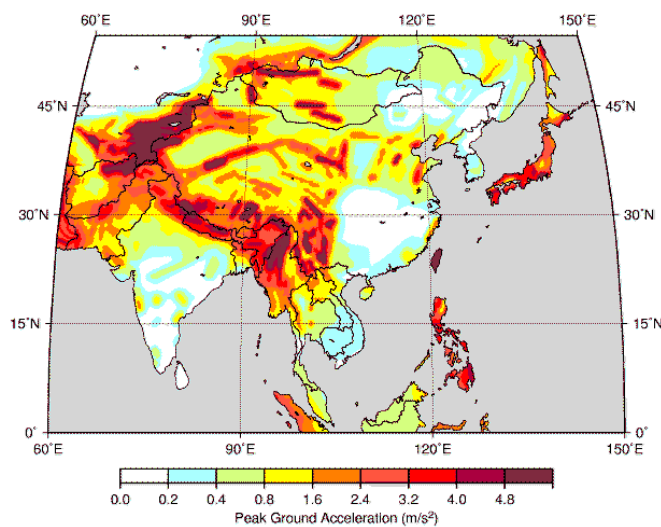
हिमालय क्षेत्रमा गएका भूकम्पहरु



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65

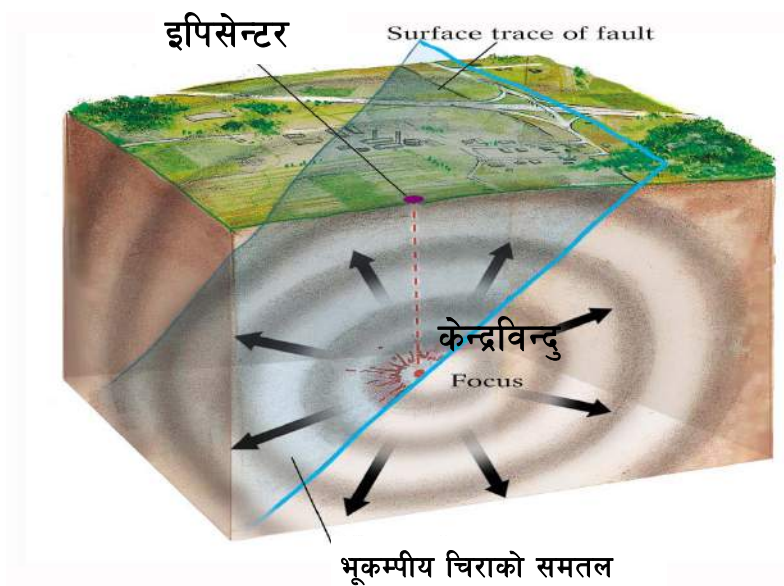
एशियाको भूकम्पीयता



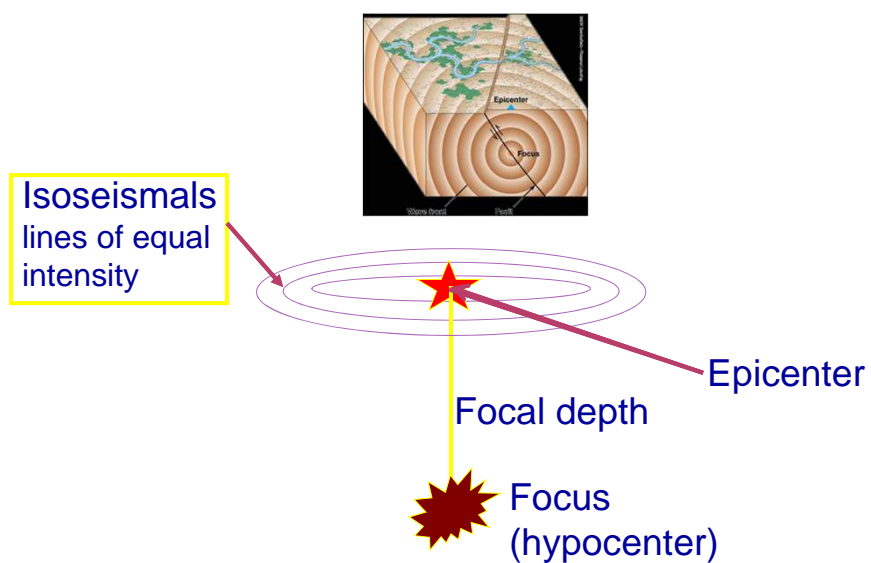
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66

भूकम्प सम्बद्ध शब्दावली



भूकम्प सम्बद्ध शब्दावली



भूकम्प सम्बद्ध शब्दावली

FOCAL DEPTH:

The depth of focus from the epicenter, called as Focal Depth, is an important parameter in determining the damaging potential of an earthquake. Most of the damaging earthquakes have shallow focus with focal depths less than about 70km.

MAIN SHOCKS, FORESHOCKS, AFTER SHOCK:

A number of smaller size earthquakes take place before and after a big earthquake (i.e., the Main Shock). Those occurring before the big one are called Foreshocks, and the ones after are called Aftershocks.

भूकम्पका किसिम

1. According to Plate Boundaries

- **Inter-plate earthquakes:** earthquakes occurring along the boundaries of the tectonic plates. e.g. Assam earthquake 1897.
- **Intra-plate earthquake:** earthquakes occurring within a plate. E.g. Latur earthquake 1993.

भूकम्पका किसिम

2. According to Focal Depth

- **Shallow Focus earthquakes:** focal depth <70 km. Nearly 80% of the world's earthquakes are shallow focus earthquakes.
- **Intermediate focus earthquake:** earthquakes with focal depth from 70-300 km.
- **Deep focus earthquake:** focal depth >300 km

भूकम्पका किसिम

3. According to Origin of the Earthquakes

- Tectonic earthquakes
- Volcanic earthquake
- Submarine (undersea) earthquake

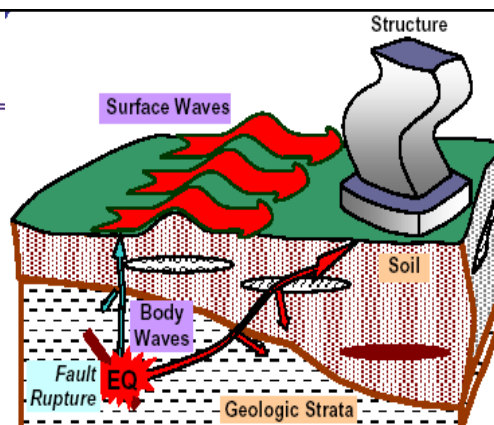
भूकम्पका किसिम

4. According to the Magnitude of the Earthquakes

- **Micro earthquakes** $M < 3.0$
- **Intermediate earthquake** $3 < M < 4$
- **Moderate earthquake** $5 < M < 5.9$
- **Strong earthquake** $6 < M < 6.9$
- **Major earthquake** $7 < M < 7.9$
- **Great earthquake** $M > 8.0$

Seismic Waves

भूकम्पीय तरङ्गहरू



Large strain energy released during an earthquake travels as seismic waves in all directions through the Earth's layers, reflecting and refracting at each interface. These waves are of two types

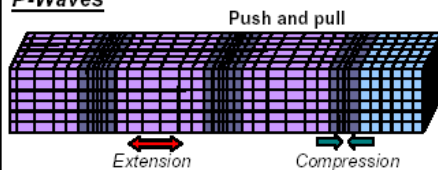
Seismic Waves

Two types of seismic waves

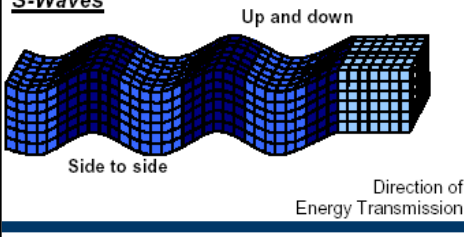
- ❖ Body waves- transmit energy through earth's interior
 - Primary (P) wave- rocks vibrate parallel to direction of wave
 - Secondary (S) wave- rocks move perpendicular to wave direction
- ❖ Surface waves- transmit energy along earth's surface
 - Rock moves from side to side like snake
 - Rolling pattern like ocean wave

Body Waves

P-Waves



S-Waves



▼ P (primary) waves

- comparable to sound waves
- alternating dilatations and compressions
- transmitted through liquid or solid
- may be heard when they emerge at surface

■ S (secondary or shear) waves

- slower traveling
- sideways perpendicular to direction of propagation
- not transmitted through liquid

Some typical velocities (granite)

P= 4.8 km s S= 3.0 km s

Surface Waves

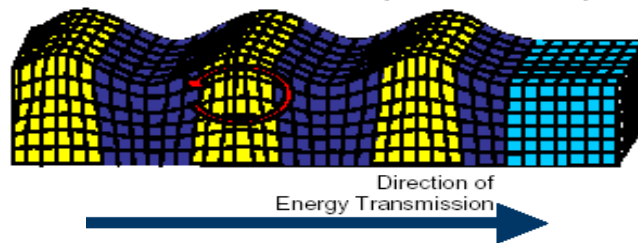
- ❑ Rayleigh wave
- Rayleigh wave makes a material particle oscillate in an elliptic path in the vertical plane (with horizontal motion along direction of energy transmission)



Lord Rayleigh
(1842-1919, born John William Strutt).
British Physicist and Mathematician

Rayleigh Waves

Elliptic in vertical plane



Surface Waves

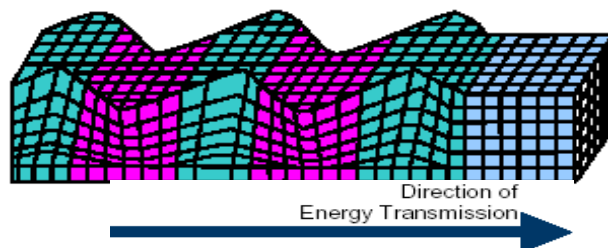
- ❑ Love waves
- Love wave cause surface motions similar to that by S-waves, but with no vertical component.



A.E.H. Love
Augustus Edward Hough Love
British mathematician
(1863-1940)

Love Waves

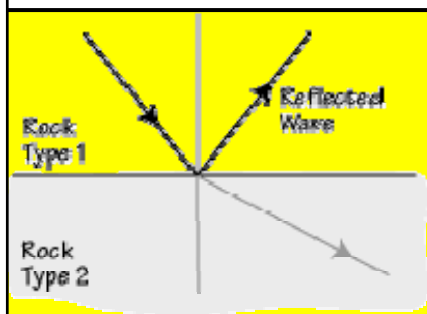
Sideways in horizontal plane



Damage Implications

- **P-waves are fastest, followed in sequence by S-, Love and Rayleigh waves.**
- **S-waves in association with effects of Love waves cause maximum damage to structures by their racking motion on the surface in both vertical and horizontal directions.**
- **Shaking is more severe (about twice as much) at the Earth's surface than at substantial depths. This is often the basis for designing structures buried underground for smaller levels of acceleration than those above the ground.**

Damage implications



➡ Seismic Waves

- **Wave motion of S waves more damaging than P**
- **L-waves particularly damaging to foundations**
- **Damage due to body waves enhanced by refraction & reflection**
 - causes energy of one wave type to be converted to waves of other type
 - after early stages reflection & refraction ensures both kinds of waves felt
- **Body waves reflected back from surface - amplifying incoming waves**

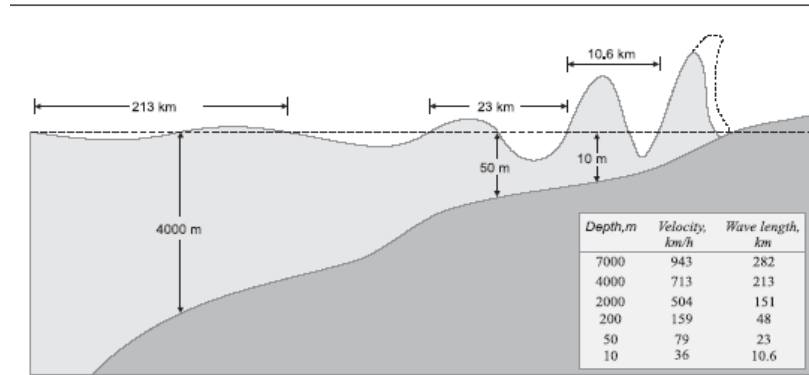
सुनामी भनेको के हो ?

TSUNAMI

- A tsunami is a wave train or series of waves generated in a body of water by an impulsive disturbance that vertically displaces water column.
- Tsunami is a Japanese word meaning “harbour waves”. “Tsu” means harbour and “nami” means wave.
- It is generated when the sea floor abruptly deforms and vertically displaces the overlying water.
- When earthquakes occur beneath the sea, the water above the area is displaced from its equilibrium position. Waves are formed as the displaced water mass, which acts under influence of gravity, attempts to regain its equilibrium.
- When large areas of sea floor elevate or subside, a tsunami can be created.

TSUNAMI

- Tsunami is a water wave caused due to tectonic activities under water and travels across oceans with very high speed and can inflict great damage to life and property at the shores. The recent Sumatra earthquake of magnitude 9.0 triggered the most devastating tsunami of the recorded history causing a death toll of more than 150,000.



TSUNAMI





Sumatra earthquake 26 Dec, 2004 M 9.0



Sumatra earthquake 26 Dec, 2004 M 9.0

भूकम्प मापन

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87

भूकम्प मापन



चार्ल्स रिक्टर

— अमेरिकी भूकम्पविद्

• परिमाण (Magnitude)

- भूकम्पबाट उत्सर्जित शक्तिको मापन
- रेक्टर स्केलमा मापन (१ देखि १० सम्मको स्केलमा) गरिन्छ ।
- १ रेक्टर स्केलको फरकले कम्पनको एम्प्लिच्युडमा १० गुणा फरक र भूकम्पीय शक्ति उत्सर्जनमा ३० गुणा फरक हुन्छ ।

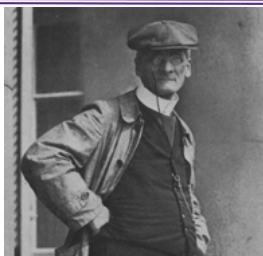
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88

भूकम्प मापन

• तीव्रता (Intensity)

- विभिन्न स्थानमा सतहको कम्पन
- परिमार्जित मर्काली तीव्रता (Modified Mercalli Intensity वा MMI) मा मापन गरिन्छ ।
- १ देखि १२ सम्मको स्केलमा मापन



गिसेपी मर्काली

— इटालियन भूकम्पविद्

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89

Intensity

How Strong Earthquake Feels to Observer
Depends On:

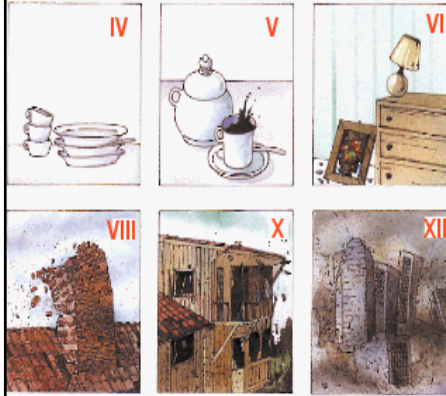
- Distance to Quake
- Geology
- Type of Building
- Observer!

Varies from Place to Place

- Modified Mercalli Scale, MSK - 1 to 12

सापेक्षिक सम्बन्ध

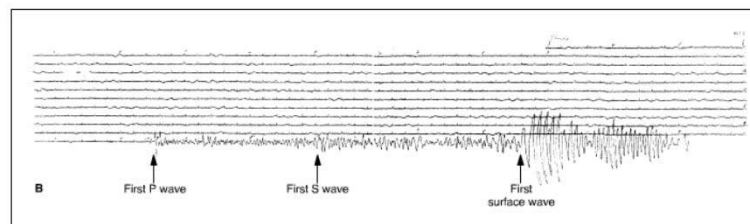
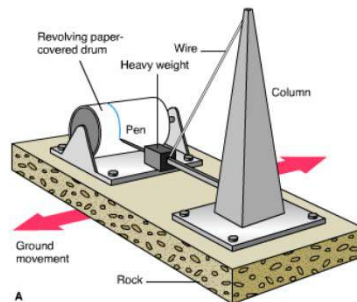
भूकम्पीय तीव्रता



Modified Mercalli Scale		Richter Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibration like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some may awaken; dishes, windows, doors disturbed; motor cars rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of automobiles	4.5
VIII	Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air	7

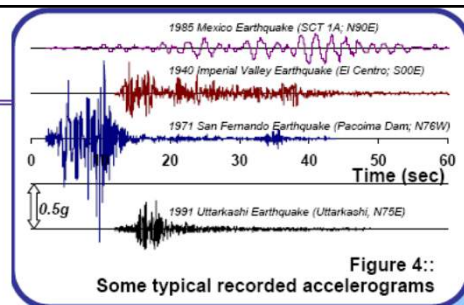
भूकम्प मापक यन्त्र

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LOADING
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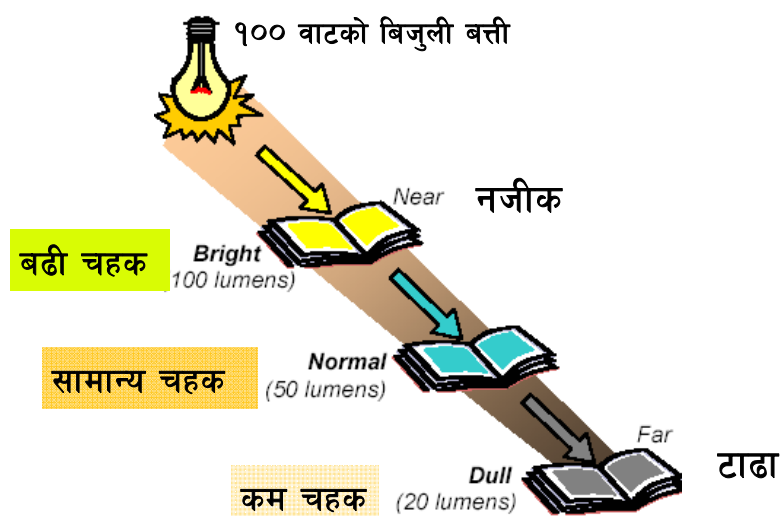
Seismogram



- The motion of the ground can be described in terms of displacement, velocity or acceleration. The variation of ground acceleration with time recorded at a point on ground during an earthquake is called an accelerogram.
- For instance, a horizontal PGA value of $0.6g$ ($= 0.6$ times the acceleration due to gravity) suggests that the movement of the ground can cause a maximum horizontal force on a rigid structure equal to 60% of its weight!

- ❑ Generally, the maximum amplitudes of horizontal motions in the two orthogonal directions are about the same.
- ❑ However, the maximum amplitude in the vertical direction is usually less than that in the horizontal direction.
- ❑ In design codes, the vertical design acceleration is taken as $1/2$ to $2/3$ of the horizontal design acceleration.

परिमाण र तिब्रता



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96

सापेक्षिक सम्बन्ध

सानो	← तीव्रता	→ ठूलो
सानो	← परिमाण	→ ठूलो
टाढा	← दूरी	→ नजिक
कडा	← जमिनको अवस्था	→ नरम
गहिरो	← केन्द्रको गहिराइ	→ कम
न्यून	← क्षति	→ अधिक

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97

विश्वमा गएका भूकम्पहरुको आवृत्ति

विश्वमा गएका भूकम्पहरुको आवृत्ति

वर्ग (Group)	परिमाण (Magnitude)	वार्षिक औषत संख्या (Annual Average Number)
१. महाभूकम्प Great	8 & higher	1 (based on observation since 1900)
२. अतिप्रबल Major	7-7.9	15 (based on observation since 1900)
३. प्रबल Strong	6-6.9	134 (based on observation since 1990)
४. मध्यम Moderate	5-5.9	1319 (based on observation since 1990)
५. हलुका Light	4-4.9	13000 (estimated)
६. सामान्य Minor	3-3.9	130,000 (estimated)
७. अति सामान्य Very Minor	2-2.9	1,300,000 (estimated)

The USGS estimates that several million earthquakes occur in the world each year. Many go undetected because they hit remote areas or have very small magnitudes. The NEIC now locates about 50 earthquakes each day, or about 20,000 a year.

भूकम्पको पूर्वानुमान

- सामान्य र दीर्घकालीन अनुमान

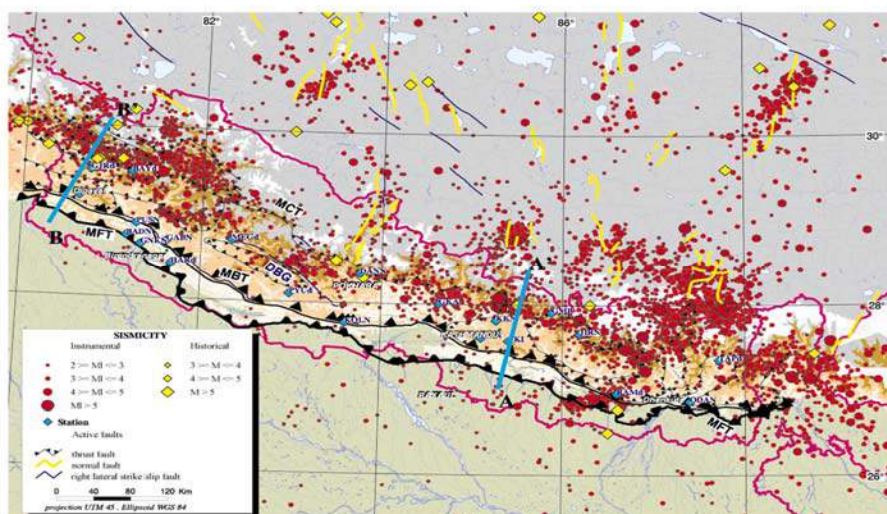
क्षेत्रीय भूकम्पीयता र भूकम्पीय क्षेत्रहरुको रूपरेखाको आधारमा कुन क्षेत्रमा भूकम्प जाने सम्भावना छ, भन्ने निस्कर्षमा पुग्न सकिन्छ

- निश्चित र अल्पकालीन अनुमान

विभिन्न अध्ययन र अनुसन्धान भए पनि अद्यापि सम्भव नभएको

नेपालमा गएका भूकम्पहरु

नेपालमा गएका भूकम्पहरु



नेपालमा गएका भूकम्पहरु

वर्ष (वि सं)	महिना	वर्ष (वि सं)	महिना
१३१०	असार	१८६६	जेठ
१३१६		१८८०	यमपंचमी
१४६४	भदौ	१८९०	भदौ
१७३७	पुस	१८९१	असार
१७३८	जेठ	१९७३	
१८२४	असार	१९९०	माघ

सम्पद

नेपालमा विगतमा गएका भूकम्पहरु

सन १९११ देखि १९९१ सम्म का भूकम्पहरु

माप (रेक्टर स्केल)	घटना (संख्या)	अवधि (वर्ष)
५ देखि ६ सम्म	४१	२
६ देखि ७ सम्म	१७	५
७ देखि ७.५ सम्म	१०	८
७.५ देखि ८ सम्म	२	४०
८ भन्दा ठूलो	१	८०

सम्पद

अर्को महाभूकम्प कहिले आउला ?

- नेपालमा विक्रम संवत् १३१० देखि १९९० सम्मको ६८० वर्षमा १० वटा महाभूकम्पहरु गएको इतिहास छ ।
- ८ रेक्टर परिमाण भन्दा बढीको भूकम्पको लागि आवश्यक उर्जा वा शक्ती भूगर्भमा संचित भइसकेको तथ्य वैज्ञानिकहरु बताउँछन् ।
- भविष्यको कुनैपनि बेला ८ रेक्टर परिमाण भन्दा बढीको भूकम्प जान सक्ने प्रवल संभावना छ ।
- भूकम्पको वैज्ञानिक भविष्यवाणी गर्न विज्ञान हालसम्म सफल भइसकेको छैन ।

शण्ड

कय गय जम र्भकण्णरुमम्य मर ल्कमरीक म्

वि.सं. १९९० सालको महाभूकम्प

नेपाल बिहार भूकम्प, १५ जनवरी, सन् १९३४

८.४ रेक्टर

वि.सं. १९९० को महा-भूकम्प

वि.सं. १९९० को महा-भूकम्पको ठीक १०० वर्षपछि वि.सं. १९९० सालको माघ २ गते दिनको २ बजे २४ मिनेट २२ सेकेण्ड जाँदा यो महा-भूकम्प गएको थियो । यो महा-भूकम्पको केन्द्र बिन्दु नेपालको पूर्वी क्षेत्र चैनपुरमा रहेको थियो र यसको नाप ८.४ रेक्टर स्केलको थियो । सो महा-भूकम्पले नेपालमा पुरुष ३८५० र महिला ४६६९ गरी जम्मा ८५१९ जनाको मृत्यु भएको थियो । यस मध्ये काठमाडौँ उपत्यकामा पुरुष १९५२ र महिला २३४४ गरी जम्मा ४२९६ जनाको मृत्यु भयो । यस भूकम्पबाट घरबास, देवालय र पाटी पौवा समेत गरी जम्मा २०७७४० वटा भत्केको थियो ।

शण्ट

वि.सं. १९९० सालको महाभूकम्प



नेपाल बिहार भूकम्प, १५ जनवरी, सन् १९३४
८.४ रेक्टर

वि.सं. १९९० सालको महाभूकम्प



नेपाल बिहार भूकम्प, १५ जनवरी, सन् १९३४
८.४ रेक्टर

सण्ड

भूकम्प अघि भिमसेन स्तम्भ

वि.सं. १९९० सालको महाभूकम्प



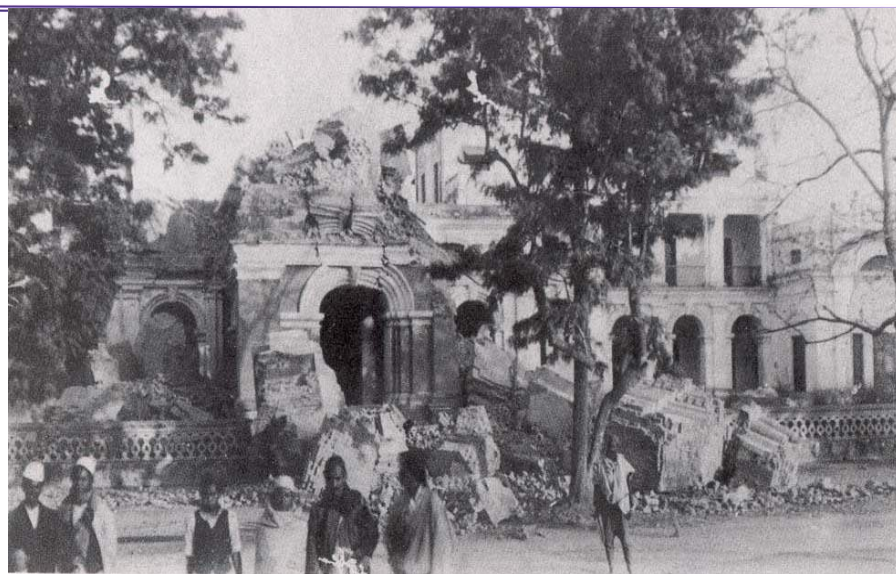
भूकम्प पछि क्षतिग्रस्त भिमसेन स्तम्भ

वि.सं. १९९० सालको महाभूकम्प

भूकम्प अघि घण्टाघर



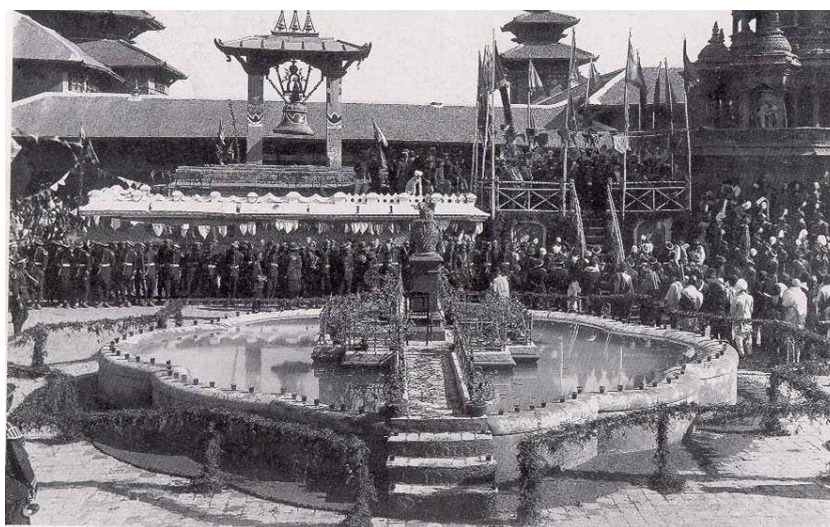
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सजरा

भूकम्प पछि क्षतिग्रस्त घण्टाघर

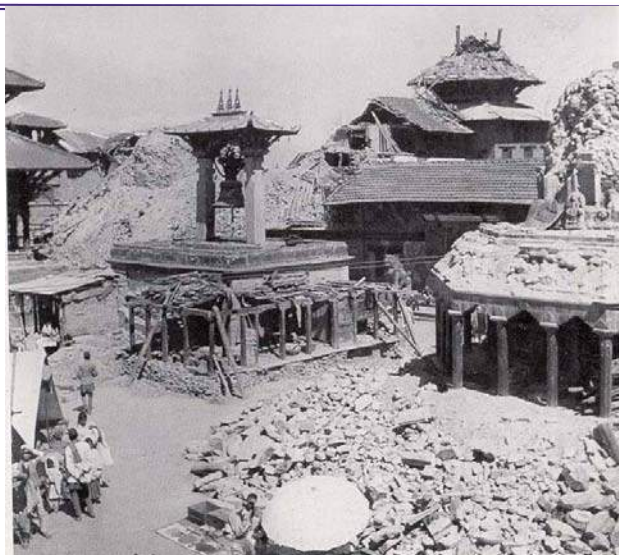
वि.सं. १९९० सालको महाभूकम्प



सजरा

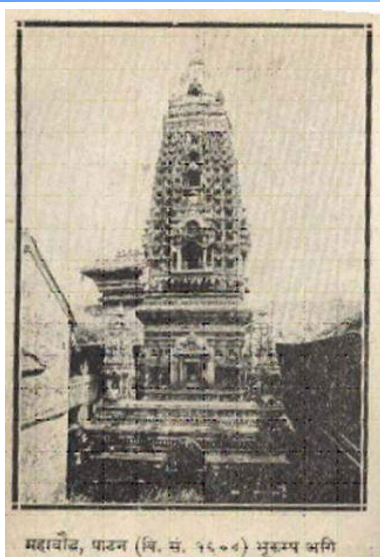
भूकम्प अघि पाटन दरबार क्षेत्र

वि.सं. १९९० सालको महाभूकम्प

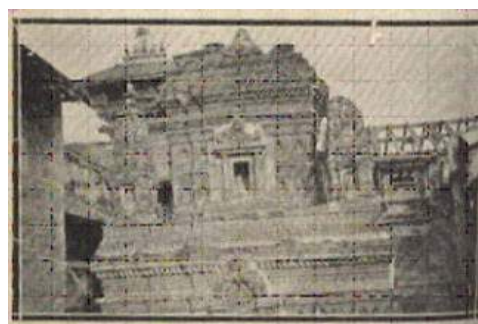


भूकम्प पछि क्षतिग्रस्त पाटन दरबार क्षेत्र

वि.सं. १९९० सालको महाभूकम्प



भूकम्प अघि महाबौद्ध मन्दिर



भूकम्प पछि क्षतिग्रस्त महाबौद्ध मन्दिर

वि.सं.२०४५ साल भाद्र ५ गते गएको ६.७ रेक्टर स्केलको भूकम्प

- नेपालको उदयपुर जिल्लाको मुर्कुच्चे भन्ने ठाउँमा केन्द्र बिन्दु भएको वि.सं.२०४५ साल भाद्र ५ गते गएको ६.७ रेक्टर स्केलको भूकम्पले काठमाडौं उपत्यका र पूर्वी पहाड र तराइका ६,५०० भन्दा बढी घरहरू भत्काउनुका साथै ७ सय २१ जनाको ज्यान लिएको थियो ।

विगतका भूकम्पले सिकाएका पाठहरू

भूकम्पको असरमा किन फरक पऱ्यो ?



ताप्लेजुङ भूकम्प
१८ सेप्टेम्बर, सन् २०११ ६.९ रेक्टर



दुवै भवन माटोको जोडाइमा बनेका हुन्

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117

भूकम्पको असरमा किन फरक पऱ्यो ?



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५
७.६ रेक्टर

दुवै भवन स्कूल भवन हुन्



DUDBC 2012

118

भूकम्पको असरमा किन फरक पऱ्यो ?



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५

७.६ रेक्टर

दुवै भवन मस्जिद भवन हुन्

119

भूकम्पको असरमा किन फरक पऱ्यो ?



नेपाल बिहार भूकम्प, १५ जनवरी, सन् १९३४

८.४ रेक्टर

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120

दुई कुना बीच किन यो फरक ?



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५
७.६ रेक्टर

DUDBC 2012

121

राम्रा उदाहरण पनि छन्



काश्मिर भूकम्प, ८ अक्टुबर, सन् २००५
७.६ रेक्टर

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122

भूकम्प प्रतिरोधी भवन

- कम तीव्रताको भूकम्प सजिलै थेग्न सक्छ
- मध्यम खाले भूकम्पमा सामान्य क्षति मात्र हुन्छ
- ठूलो भूकम्पमा पनि भवन भत्किहाल्दैन

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123

भूकम्पको विषयमा हामी के गर्न सक्छौ ?

- भूकम्प पृथ्वीको निरन्तर भौगर्भिक प्रक्रिया हो, जसलाई मानिसले रोकेर रोक्न सक्दैन ।
- भूकम्पको वैज्ञानिक भविष्यवाणी गर्न हालसम्म सम्भव भएको छैन ।
- भूकम्पीय जोखिम न्यूनीकरण तथा पूर्वतयारीका प्रभावकारी उपायहरु अपनाएर सम्भावित भूकम्पबाट हुन सक्ने जन धनको क्षति एवं असरहरु धेरै हदसम्म घटाउन सकिन्छ ।
- भविष्यमा आउने महाभूकम्पबाट बच्न आजै देखि समाजका सबै स्तरमा “भूकम्पीय जोखिम न्यूनीकरण तथा पूर्वतयारी” को काम थालौं ।

आइए

क्याम्पसभित्रका सम्पूर्ण भवनहरूलाई सुरक्षित राख्नु

भूकम्पीय प्रकोपबाट बच्न पूर्व तयारीमा जुटौं



महिला

Pawel Kopczynski / Reuters

धन्यवाद !