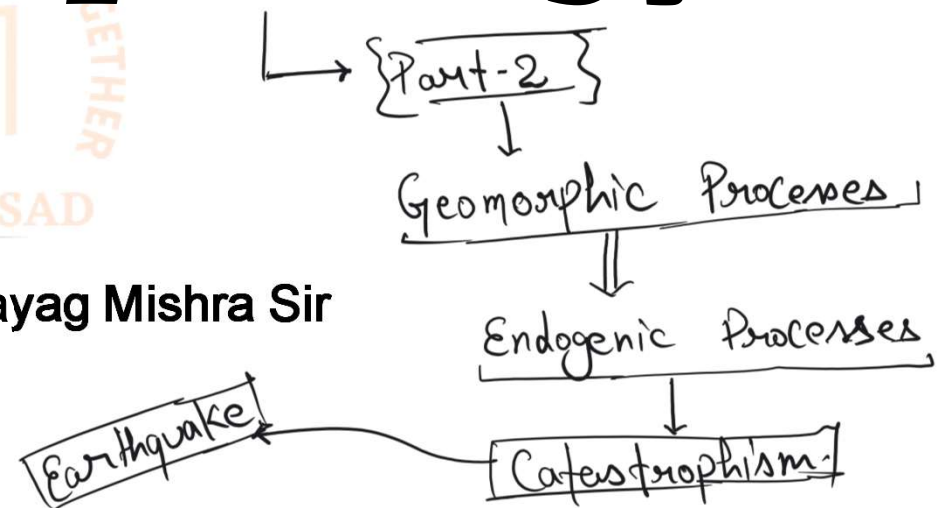
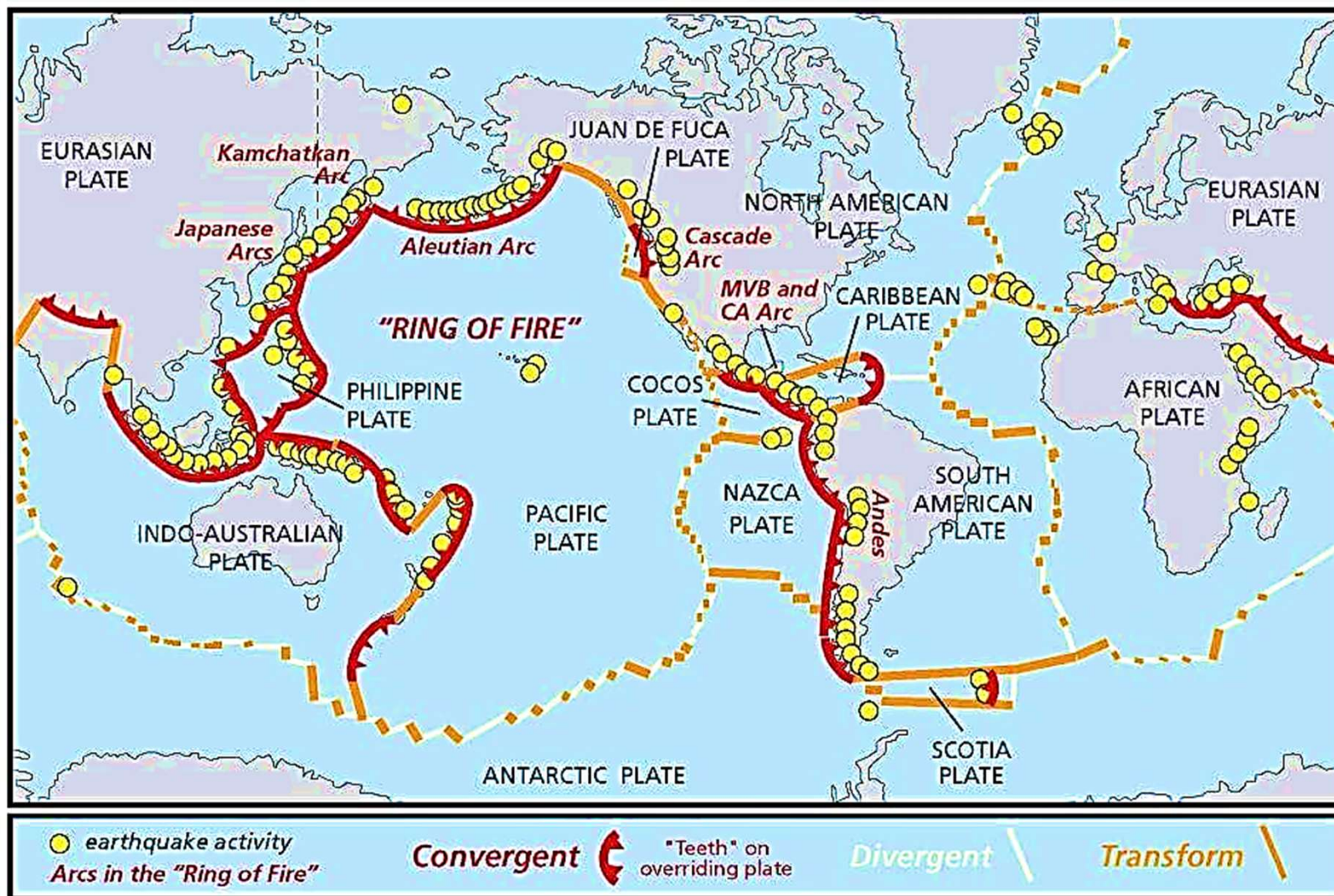


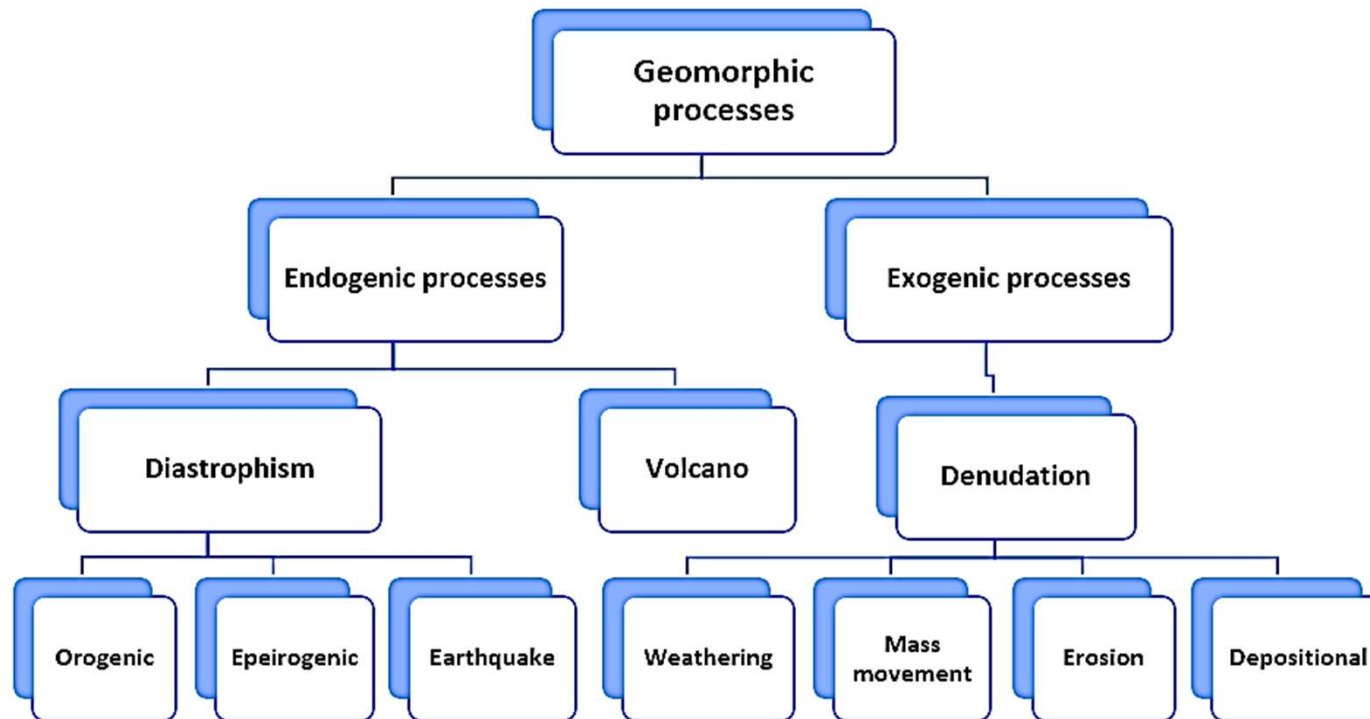


Geomorphology

Presented by Prayag Mishra Sir







Earthquake

“Vibrations in Earth's Crust.”

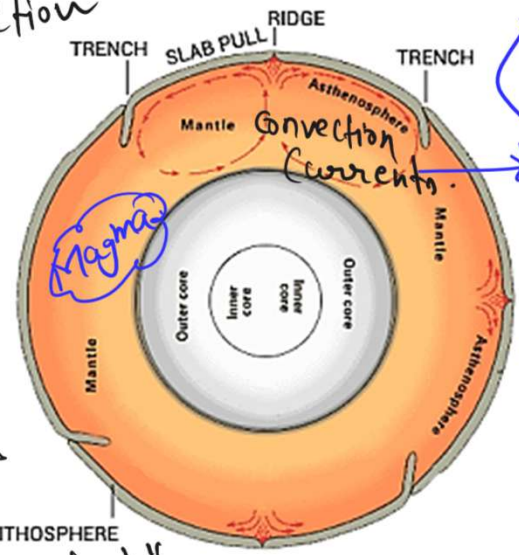
Seismology → study.

१५-०५
 Isoseismal lines
 a line on which intensity of earthquake is same.
 “Uranium decay inside the Earth”

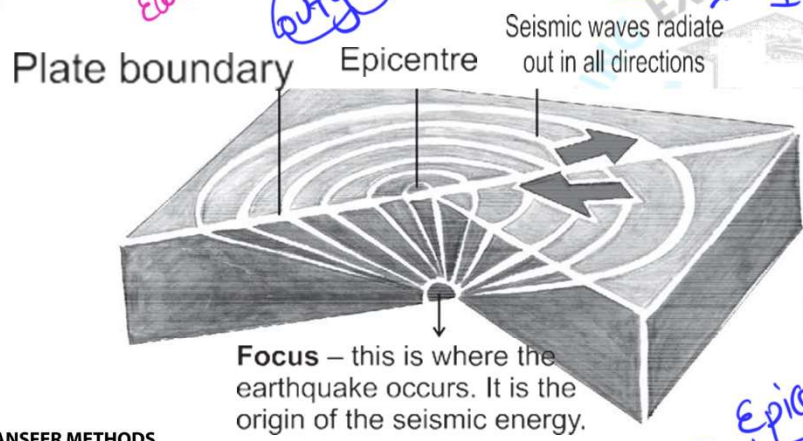
Reason

① Energy that creates Convection currents in mantle.

② Radon Gas releases -
 “Indicator of Earthquake.”
 “Snif → Dog.”



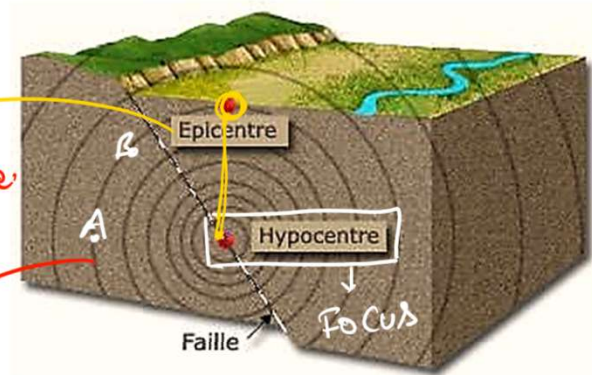
Radio-active
 Earth's Interior
 “Uranium Decay”
 ↓
 “Heat Generate”



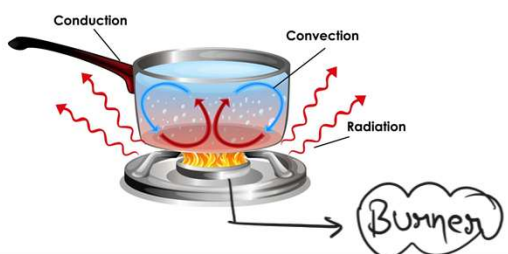
Focus – this is where the earthquake occurs. It is the origin of the seismic energy.

Epentre. → “Most affected.”

Epentre.
 (always on Earth's surface)
 Isoseismal lines.

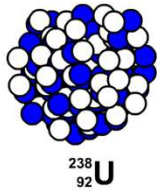


HEAT TRANSFER METHODS

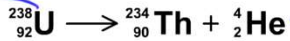


Burner

Alpha Decay of U-238



$^{238}_{92}\text{U}$



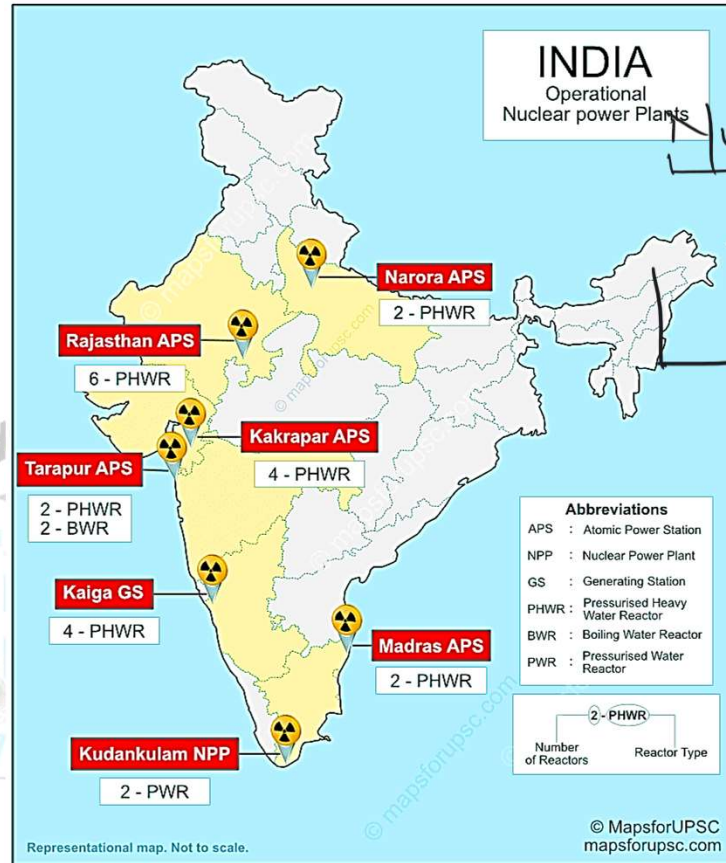
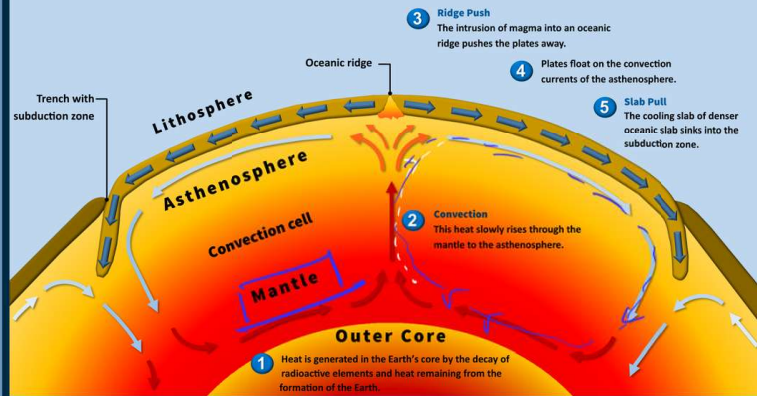
uranium

Thorium

Radon

Convection Currents

Scientists believe that tectonic plates move because of convection currents that flow up from the core of the Earth and circulate under the asthenosphere.



Prayag Mishra Sir

Nuclear Power Plants

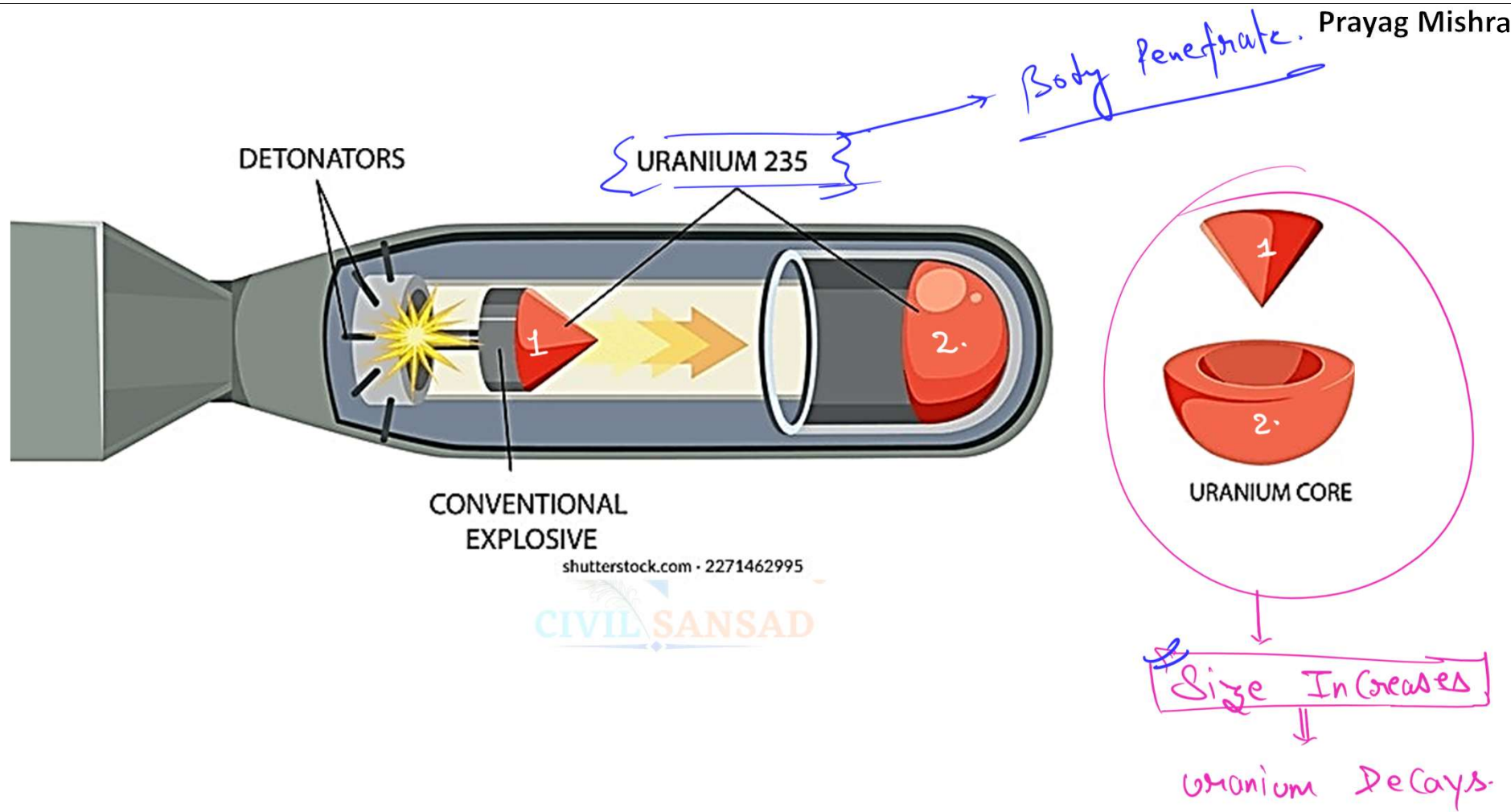
7 - Active

uranium

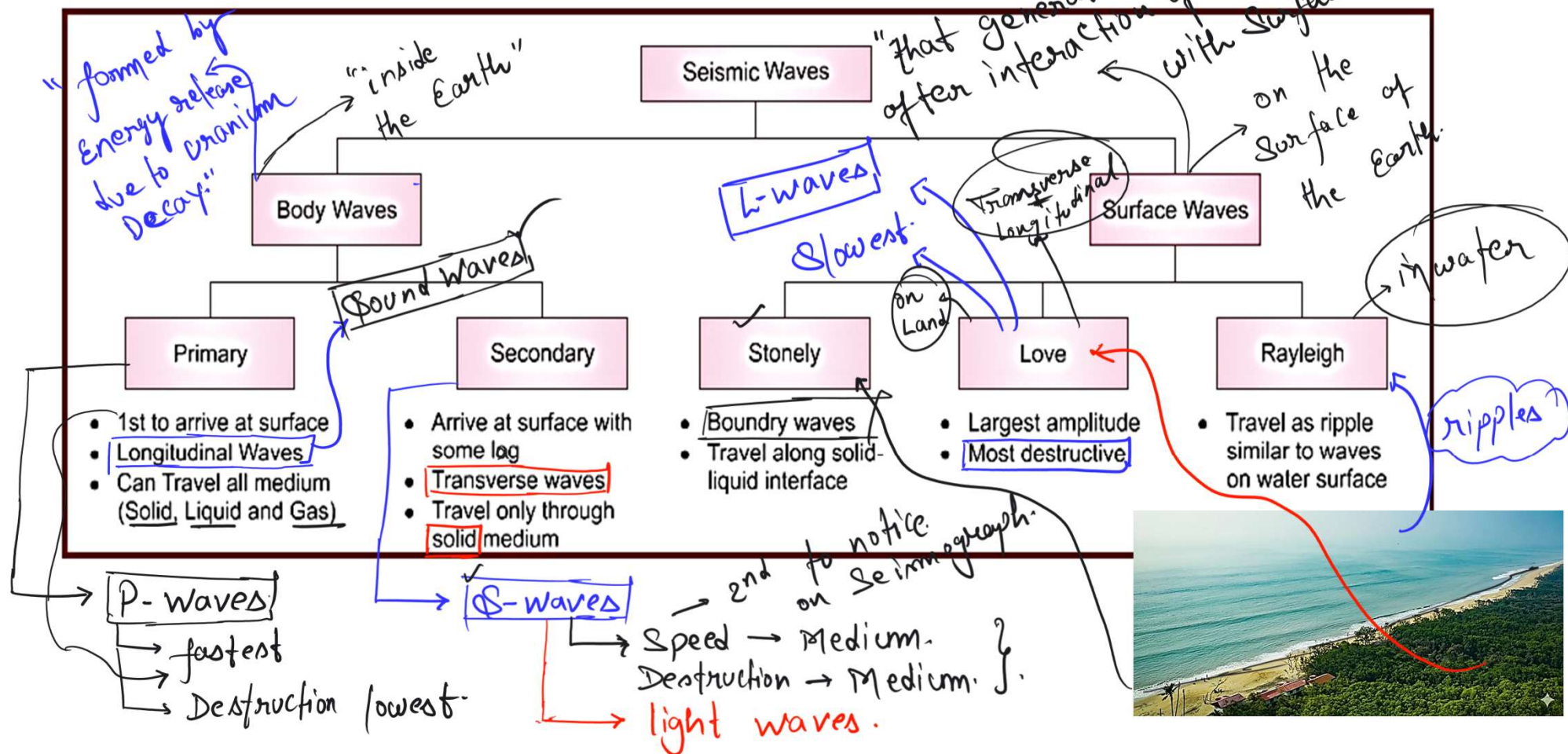
Decay

Energy liberate

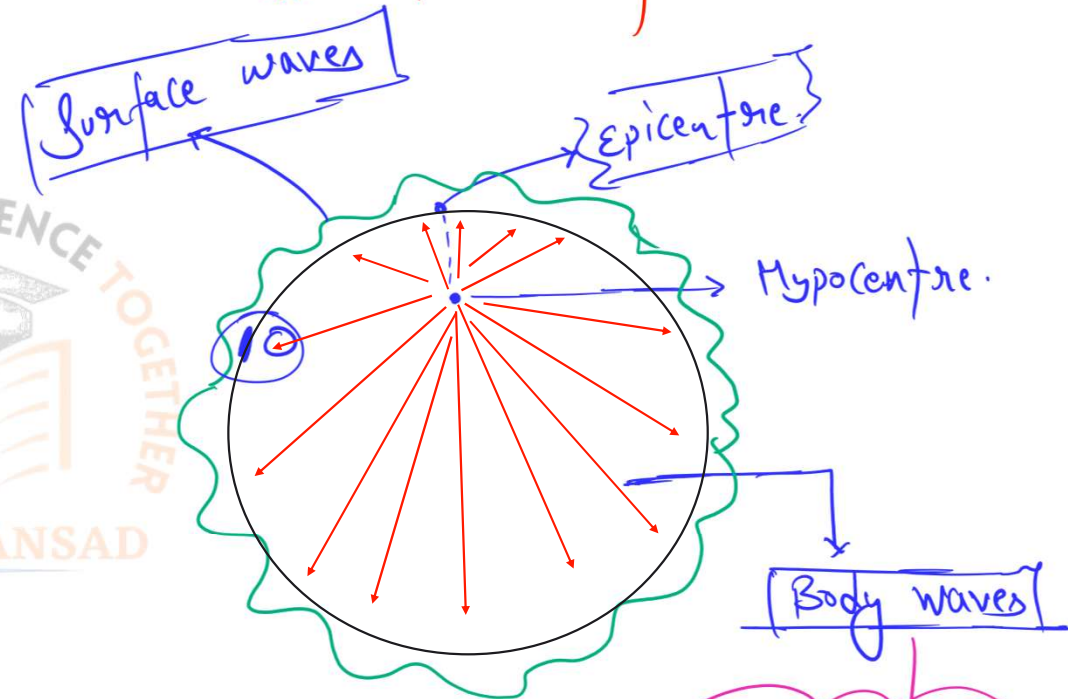
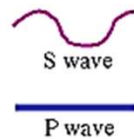
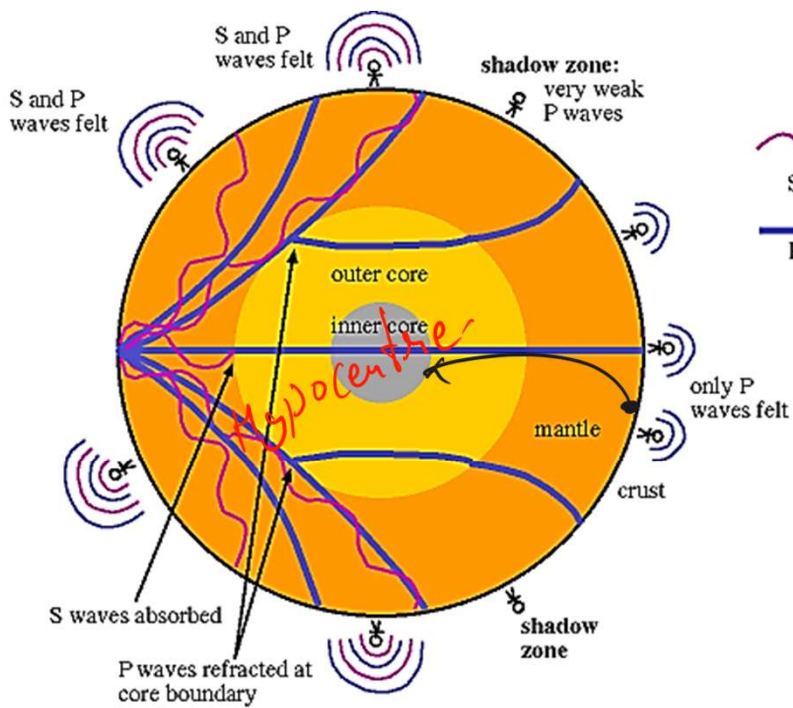
Radon → Gas



* Waves that Generate at time of Earthquake $\Rightarrow$ Seismic waves



Seismic waves → "originates from Hypocentre or focus."

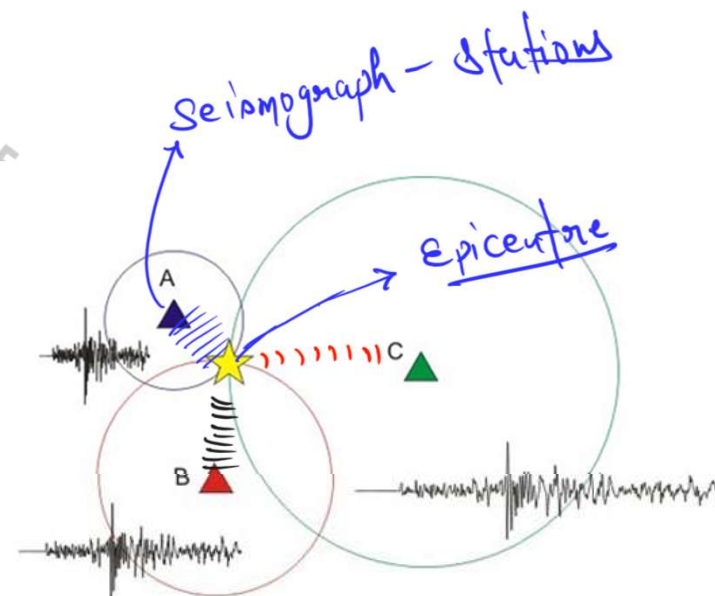


Surface waves ← forms new waves. Interacts with Surface of Earth

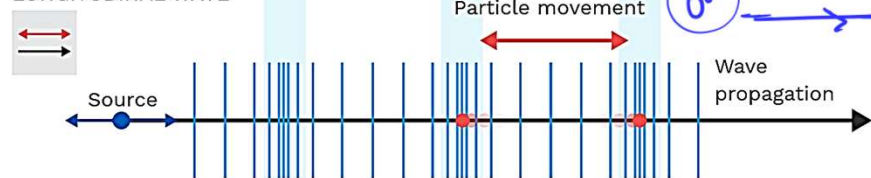
How to Calculate Epicentre.

Minimum 3 seismograph
 Stations needed to calculate Epicentre.

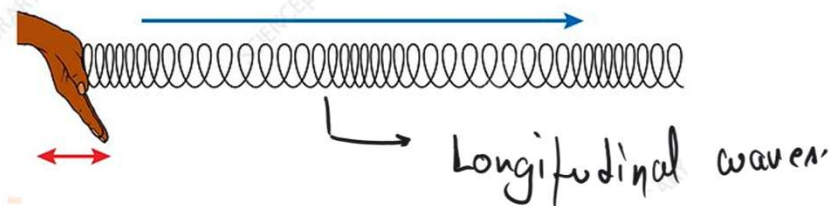
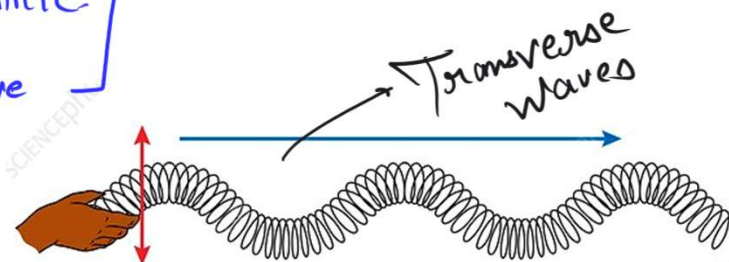
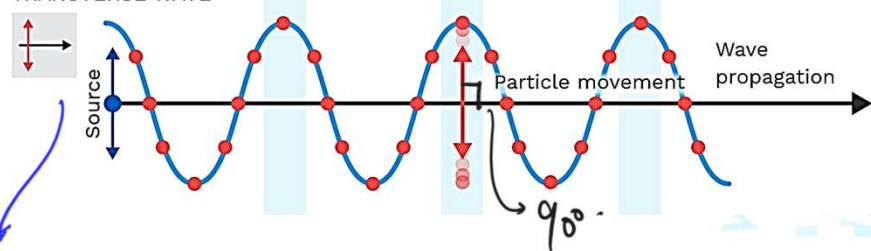
$A \rightarrow \text{time} \rightarrow \text{Distance}$
 $\searrow$
 Speed.



LONGITUDINAL WAVE

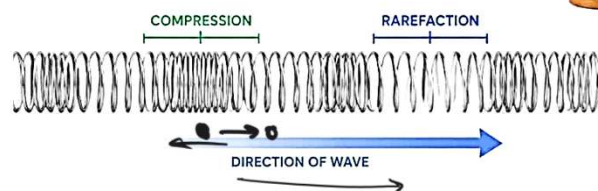


TRANSVERSE WAVE



LONGITUDINAL WAVES

Examples, Diagram, FAQs

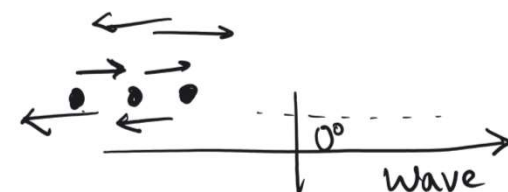


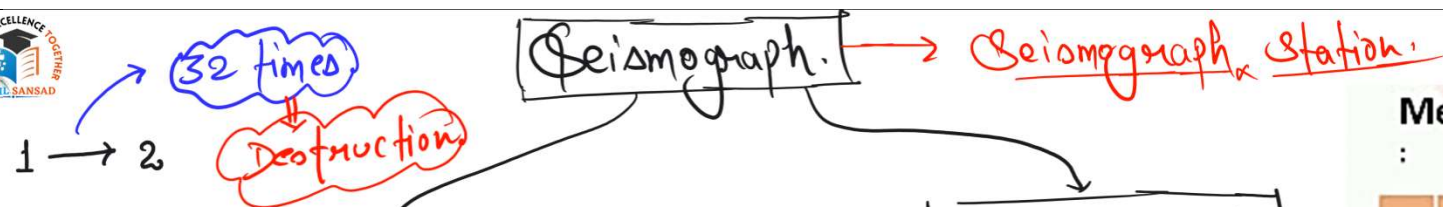
EXAMPLES



FAQs

- ✓ What are Longitudinal Waves?
- ✓ How do Longitudinal Waves Work?
- ✓ Real-life Applications
- ✓ And More...





Richter scale

① Seismic waves → Magnitude

② 0-10 [open Ended]

③ logarithmic scale

④ objectivity.

⑤ At time of earthquake.

→ waves

Mercalli scale

① Seismic waves → Energy/Intensity.

② 1-12 [close Ended]

③ linear scale.

④ subjectivity.

⑤ After the earthquake.

→ Destruction

Mercalli scale vs Richter scale

	Mercalli scale	Richter scale
1	It measure the effect caused by earthquake	Measure the energy released by earthquake
2	Measurement tool : Based on observation	Measurement tool : With the help of seismography.
3	Value range from 1 (not felt) to 12 (total destruction)	Value range from 2 (never recorded) to 10 (stronger earthquake) * This scale has no upper limit as it is a logarithmic scale.

Note :- Richter scale ^{invented} 1935.
Charles F. Richter.

Measurement of Seismic Intensity.

Factors affecting Intensity of Earthquake.

① Rocks $\Rightarrow$ More Density, more Speed of seismic waves.



wetlands $\Rightarrow$ protects from Earthquake.
 Mangrove forest
 Marshy Area

Common in India.

② If more Speed of seismic waves, more intensity is there.

③ Depth of Focus :- Shallow focus Earthquake have more intensity and vice-versa.

Hypocentre.

- ① 50-250kms
- ② 250-700kms

③ More than 700kms-

④ "More vegetation, less impact."

Richter scale

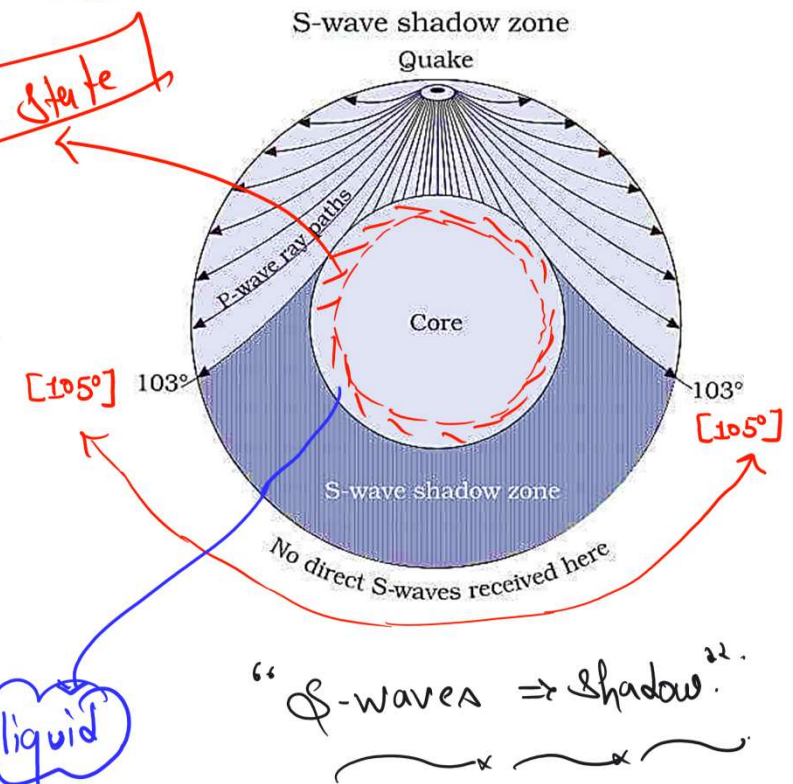
Magnitude

Level	Description	Occurrence	Information
1.0-1.9	Micro	Millions per year	Not felt or rarely felt
2.0-2.9	Minor	One million per year	Slightly felt by some people
3.0-3.9	Minor	100,000 per year	Often felt but very rarely causes damage
4.0-4.9	Slight	10,000 per year	Felt by people near the epicenter, zero or minimal damage
5.0-5.9	Moderate	1,000 per year	Felt by everyone, damage to weak buildings
6.0-6.9	Strong	100 per year	Felt in wider areas, moderate to severe damage
7.0-7.9	Major	10 per year	Felt across great distances, severe damage
8.0-8.9	Great	1 per year	Felt in extremely large regions, very severe damage
>9.0	Great	1 per 10 years	Near or at total destruction, permanent ground changes

Common in Japan.

Deflection in P-waves

Liquid state

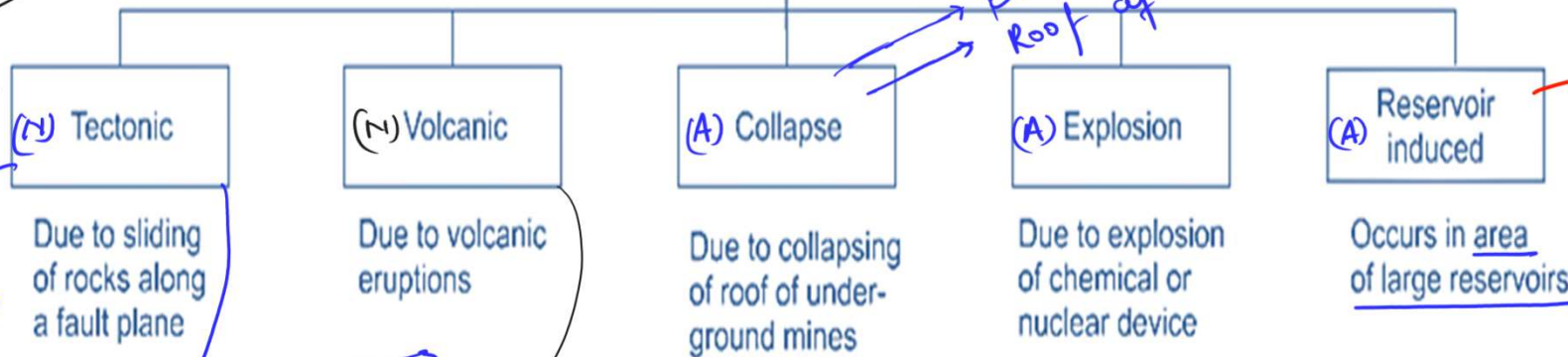


① Natural Causes ✓

② Anthropogenic Causes ✓

Man Made.

Most of the earthquakes occurs due to tectonic activity.



Causes of Earthquake.

Building. Roof of mins.

Dams
↓
Imbalance
↓
Plate

Most Dangerous

③ Meteoritic fall (N).

"Volcano Causes Earthquake. " if any meteor falls on Earth's surface."
while for volcanic Eruption, Earthquake is necessary condition"

Minor tremors



What "rat-hole mining" means
This is coal mining through narrow pits and tunnels — sometimes just big enough for 1 person.
It is common in Meghalaya because coal seams there can be thin and hard to access through conventional mining.

Roof of mines



Niagara falls



Wave

Plate

Vibrations



Parade

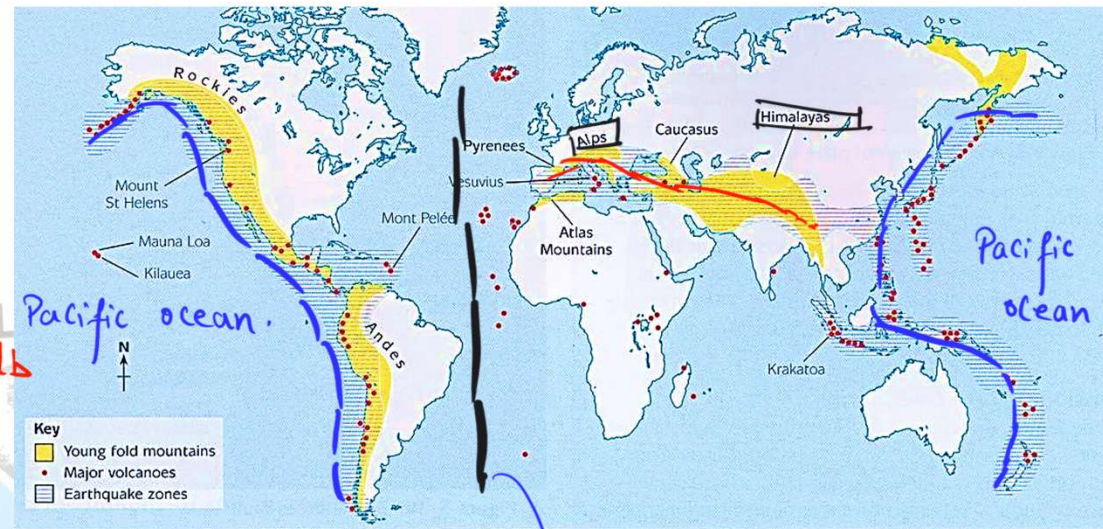
Global Distribution ✓

Prayag Mishra Sir

① Circum Pacific Belt :- 63%

→ west coast of USA, Ecuador, Chile, Peru, Colombia.

→ known as Ring of fire → world's 83% volcano erupts.



The world distribution of young fold mountains, active volcanoes and earthquake zones.

② Alpine - Himalayan Belt :- 21% of Earthquake.
→ Continental Belt.

→ 2nd Belt.

③ Mid-oceanic Ridge / Mid-Atlantic Ridge. → 16%.



Corum Pacific Belt

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② Alpine - Himalayan Belt

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Distribution of Earthquake in India

Seismic Zones → BIS [Bureau of Indian Standards]

Initially ⇒ 5 Seismic Zone.

Zone - II
 " - III
 " - IV
 " - V

Zone - I
 Zone - II
 Zone - III
 Zone - IV
 Zone - V

Merge after
Kilhari Earthquake
of 1993.

"least Seismically
Active"

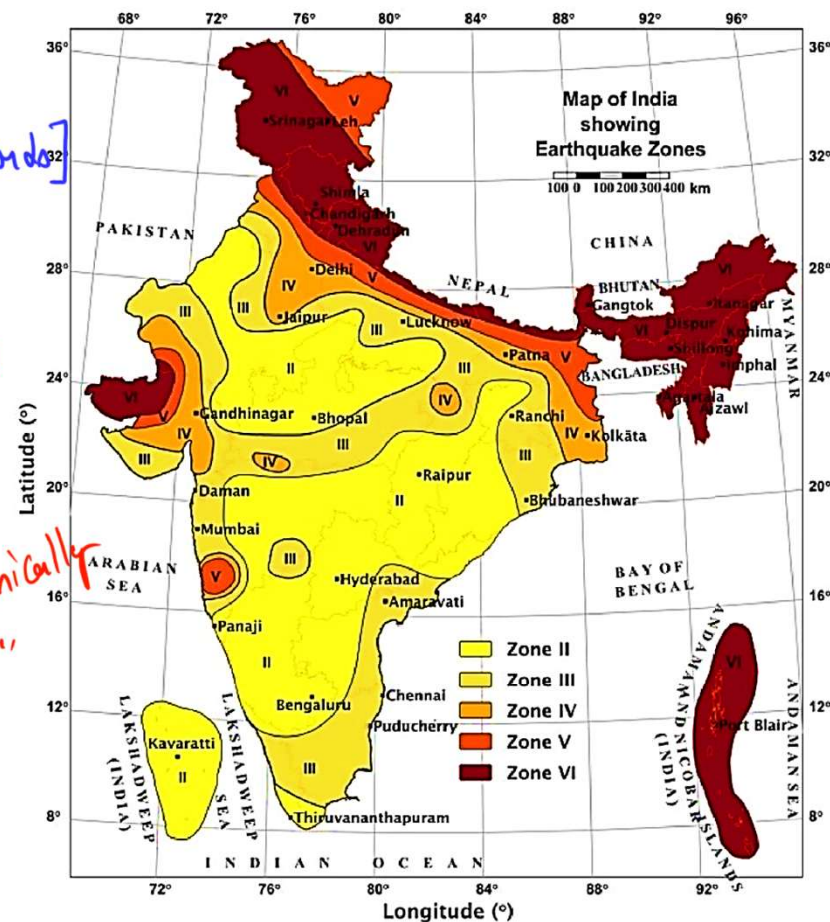
Revised Zonation.

Zone - II
 Zone - III
 Zone - IV
 Zone - V
 Zone - VI

⑤

"Most Seismically active."

- ① Himalayan region
- ② North-East
- ③ AON
- ④ Kutch of Gujarat.



Tsunami

Mean

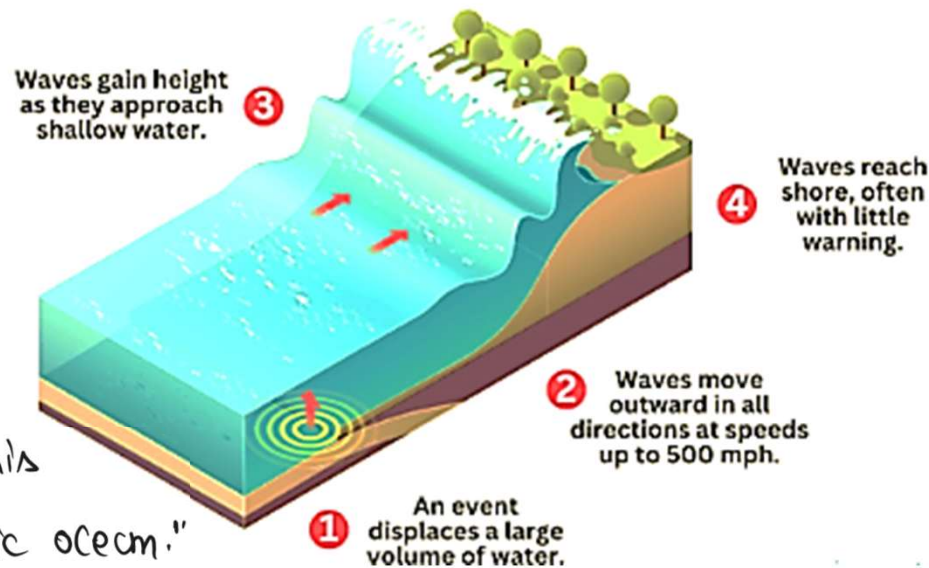
Tsu → Harbour
nami → waves } Prayag Mishra Sir
Japanese language

Cascading Effect

→ A cascading effect of a tsunami is a chain reaction.

* "Most of Tsunamis occurs in Pacific ocean."

Tsunami
A tsunami is a giant wave caused by an earthquake or other event that displaces a lot of water.



Cause

1. Earthquake on Seabed.
↳ more than 4-Richter Mag.
2. Oceanic landslides
3. Coastal Avalanches
4. Meteoritic fall
5. Explosion inside sea.

Characteristics of Tsunamis:-

- ① Shallow water waves :- Due to their long wavelengths. [500 kms].
[Note:- ocean waves $\Rightarrow$ 100-200 mtrs].
- ② Long Period :- 10 mins to 2 hrs. [Note:- ocean waves $\Rightarrow$ 20 secs to 30 secs].
- ③ High Speed :- 900 km/hr.
- ④ Energy Conservation :- because of having larger wavelengths they lose minimal energy.

Note. ① Cascading effect ② Shoaling effect.

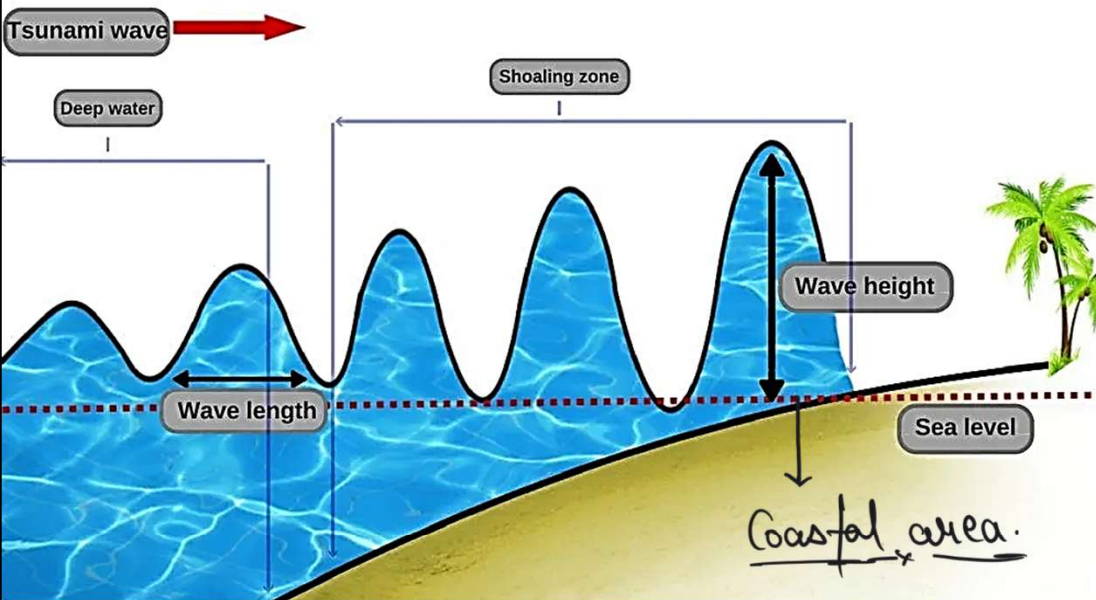
④ Japan $\rightarrow$ 2011
↓
"Devastating
Tsunami."

③ Indian ocean $\rightarrow$ 26 Dec, 2004 [Indina Point]
↳ 9.3 Richter Scale Earthquake.

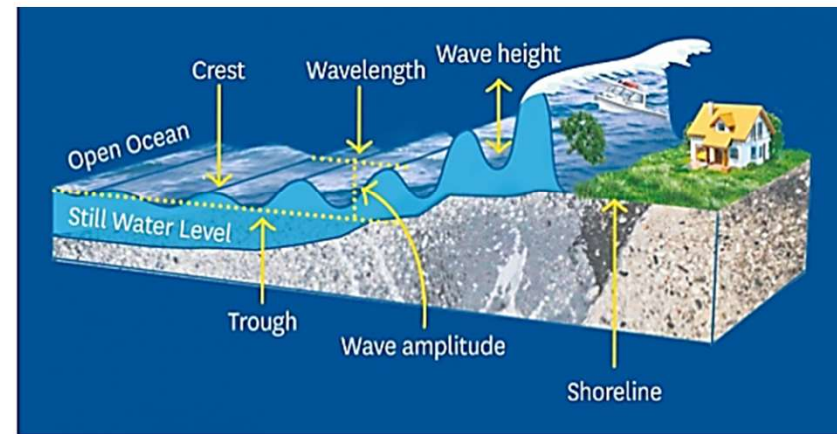
Shoaling effect of Tsunami's :- in mid oceans wavelength of Tsunami's is large while amplitude is less. when it moves towards coast their wavelength decreases and amplitude increases.

$\Downarrow$

causes more destruction in Coastal areas.



Note :- Speed of Tsunami waves is very high in mid-oceans while it decreases as they move towards coast.



INCOIS [Indian National Centre for ocean Information Services]

↳ Hyderabad.

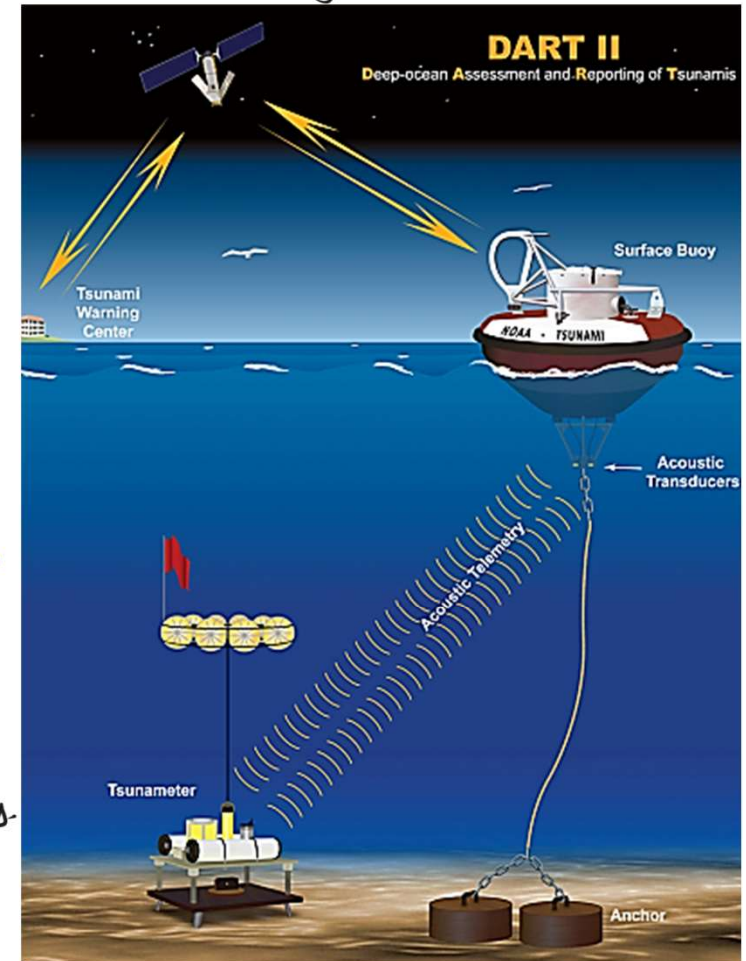
DART [Deep ocean Assessment and Reporting of Tsunamis]
↳ Indian ocean.

↳ instrument used to detect Tsunamis

↳ Tsunameter :- Detects earthquake on seabed.

↳ Signalling and Communicating :- warnings.

Tsunami Ready → providing information about upcoming Tsunamis
→ Awareness Campaign.



Volcano → Volcanology.
→ {volcanism.}

* When one plate subducts beneath another it melts. [Peridotite].

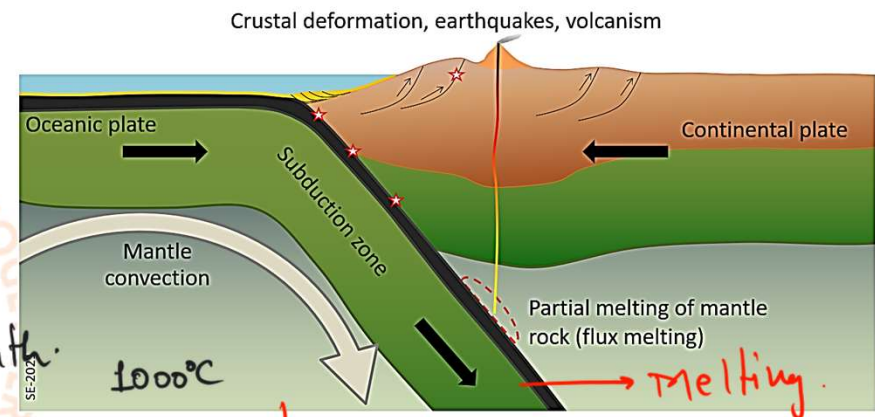
* Earthquake is necessary pre-condition for volcano.

* Eruption of volcano → Safety valve of earth.

↳ "Earth can blast if there is no volcanic eruption." → Peridotite Magma.

* Volcanic eruption occurs in convergent and divergent plate boundary.

* Thermal Heat inside the earth → Radioactivity



Fumaroles

{Ash + Gas + Dust}

{Gases}

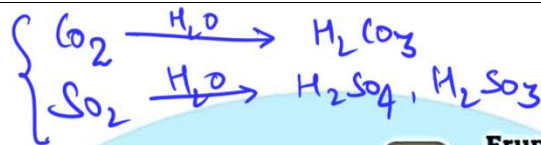
1. water vapour (80%)
2. CO_2
3. CO
4. H_2S
5. Sulphates
6. Nitrates

7. Hydrogen Halides

{Acid Rain}

Lahar $\Rightarrow$ "material that flow with rain"

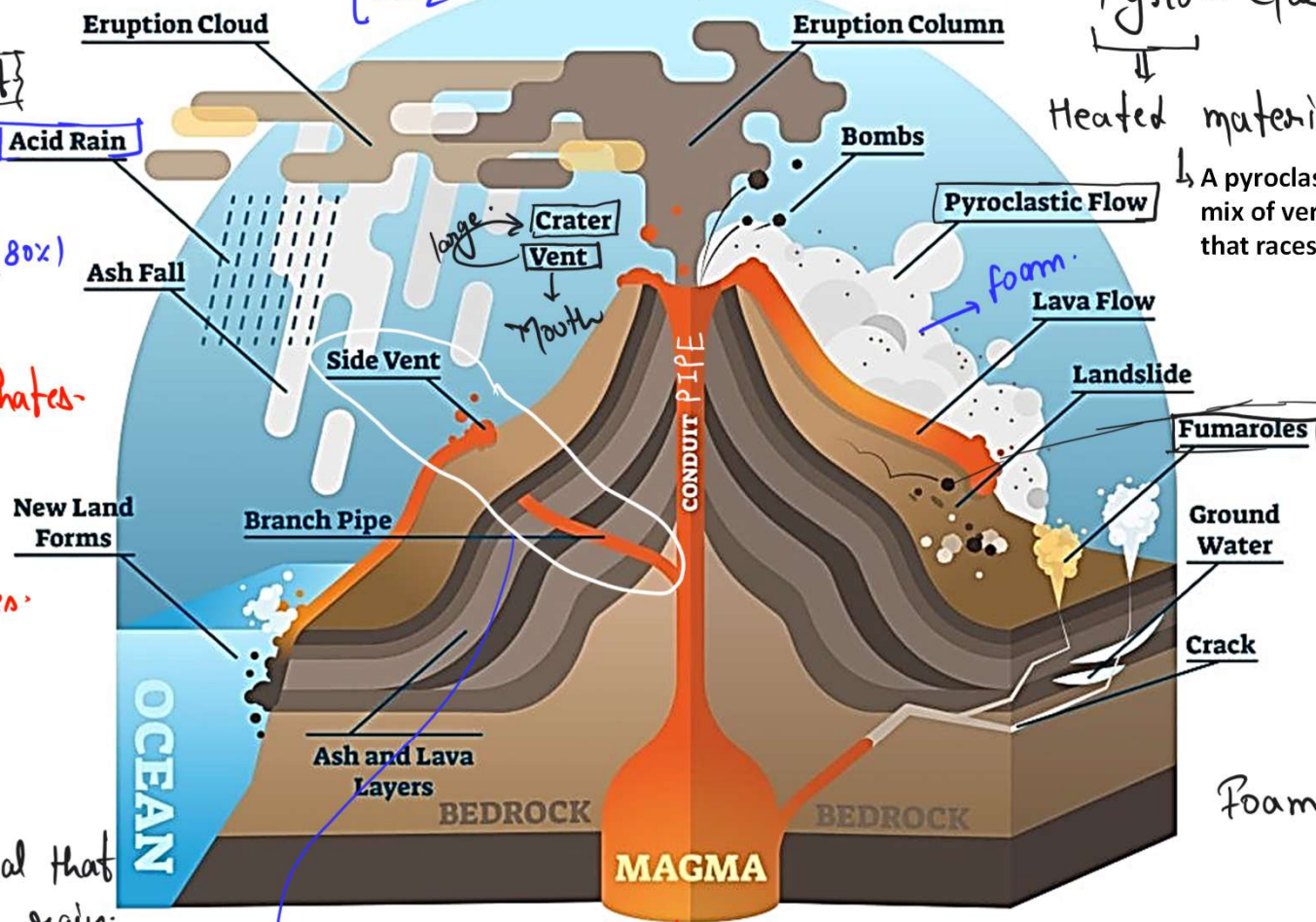
"Side vent"



Pyro-clastic flow

Heated material

A pyroclastic flow is a fast, dangerous mix of very hot gas, ash, and rocks that races down a volcano.



Lapilli (pea-size)

Small rocks

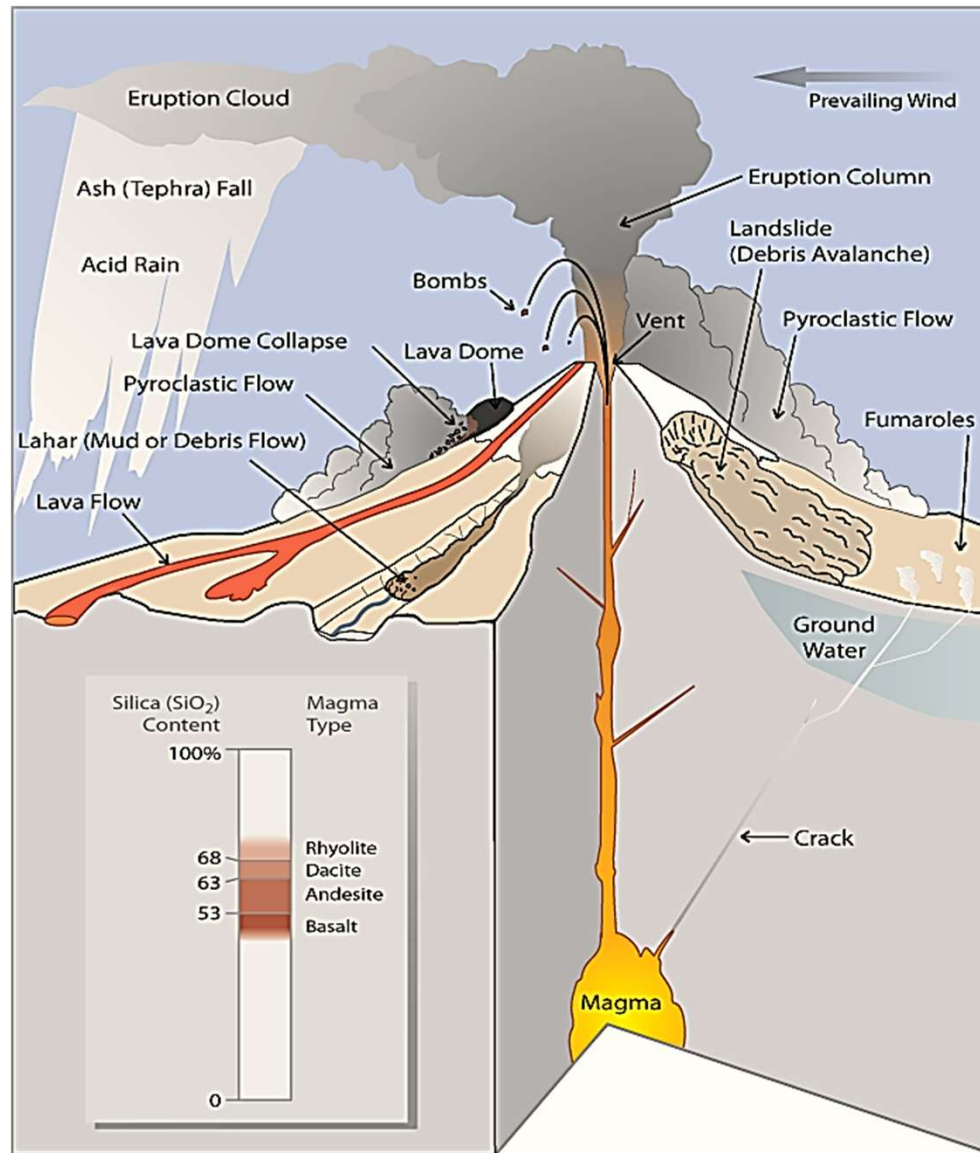
Volcanic Bombs

Basketball size rocks

Foam $\xrightarrow{\text{solidify}}$ Pumice

Igneous Rocks

Magma chamber $\rightarrow$ Asthenosphere

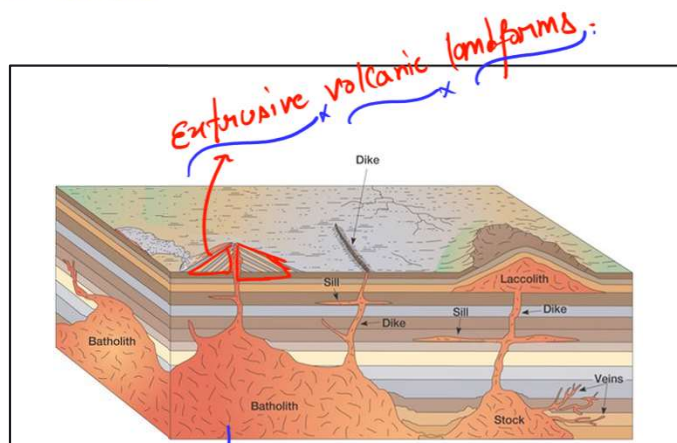


Types of Volcanoes

On the basis of Activity.

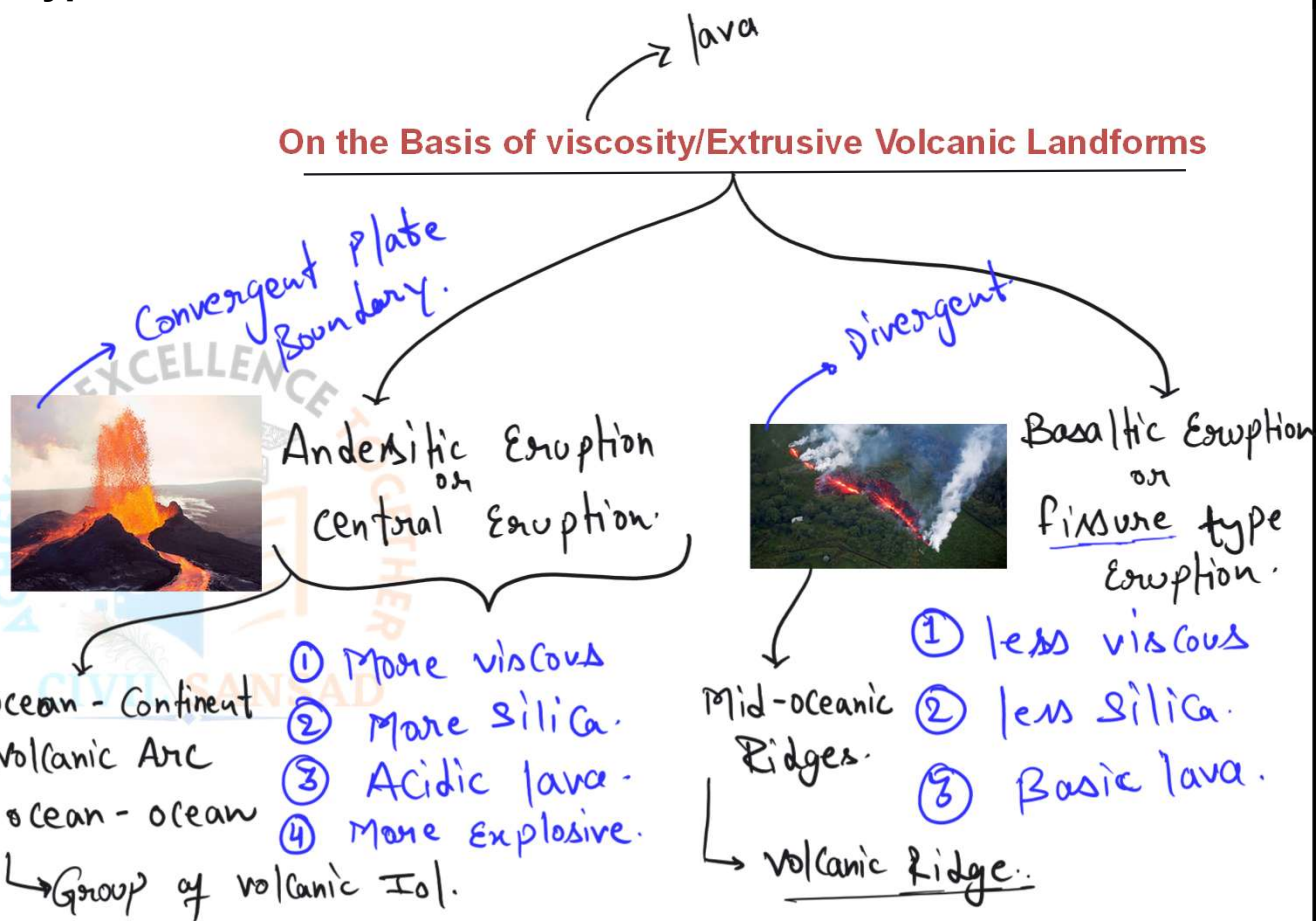
On the Basis of Periodicity of Eruption

1. Active volcano.
2. Dormant volcano.
3. Extinct volcano.



Intrusive volcanic landforms

On the Basis of viscosity/Extrusive Volcanic Landforms



Oceanic Ridges → Due to volcanic eruption (Divergent Plate).

Prayag Mishra Sir

- ① Mid - Atlantic Ridge (Dolphin and Challenger Ridges).
- ② Indian Ocean Ridge (Socotra and Chagos Ridges)
- ③ Pacific Ocean Ridge (Hawaii and Mohnu Ridges)



[A] Active volcano :-

active → 2500 yrs

1. Mt. Stromboli [Sicily Island of Italy].
↳ Lighthouse of Mediterranean Sea
2. Mt. Etna [Italy]
3. Mt. Merapi [Indonesia]
↳ Fire House.
4. Moana Loa. (Hawaii Is, USA)
5. Kilauea (Hawaii Is. USA)
6. Kra Katoa (Indonesia)
7. Mt. Erebus (Antarctica)
8. Barren Is. (AN Is., India)
↳ 13 kms from middle Andaman.

[Mt. Vinson (4892)]
↓
Highest Peak of Antarctica

[B] Dormant volcano :- not active now but can be erupt at any time.

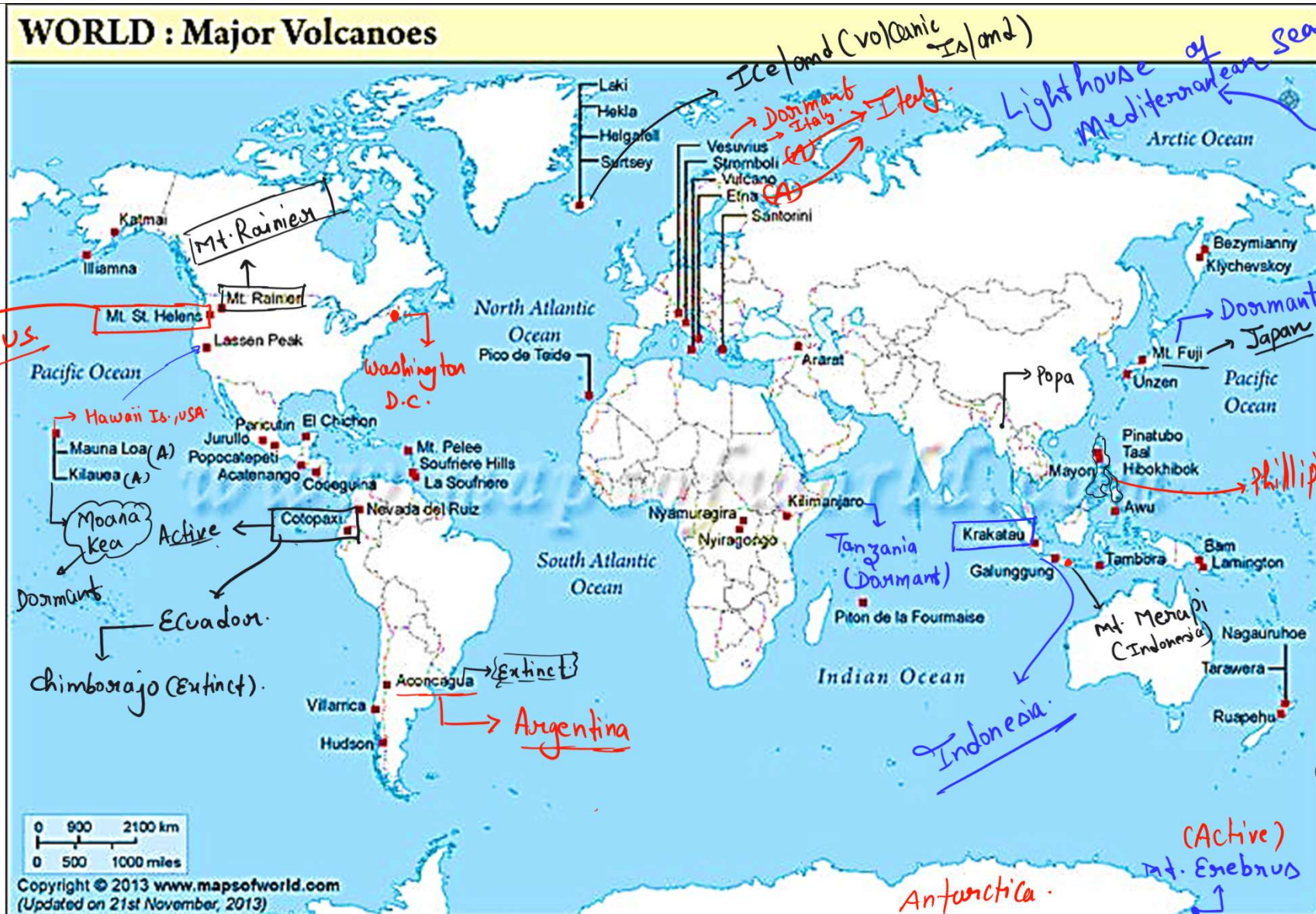
- ① Mt. Fuji (Japan)
- ② Mt. Vesuvius (Italy)
- ③ Mt. Pinatubo (Philippines)
- ④ Moana Kea (Hawaii Is.)
- ⑤ Mt. Rainier (Washington, US)

[C] Extinct volcano.

Highest Peak
of African
Continent
(5895)

- ① Kilimanjaro, Tanzania (Africa)
- ② Popa (Myanmar)
- ③ Aconcagua (Argentina)
- ④ Chimborazo (Ecuador)

WORLD : Major Volcanoes



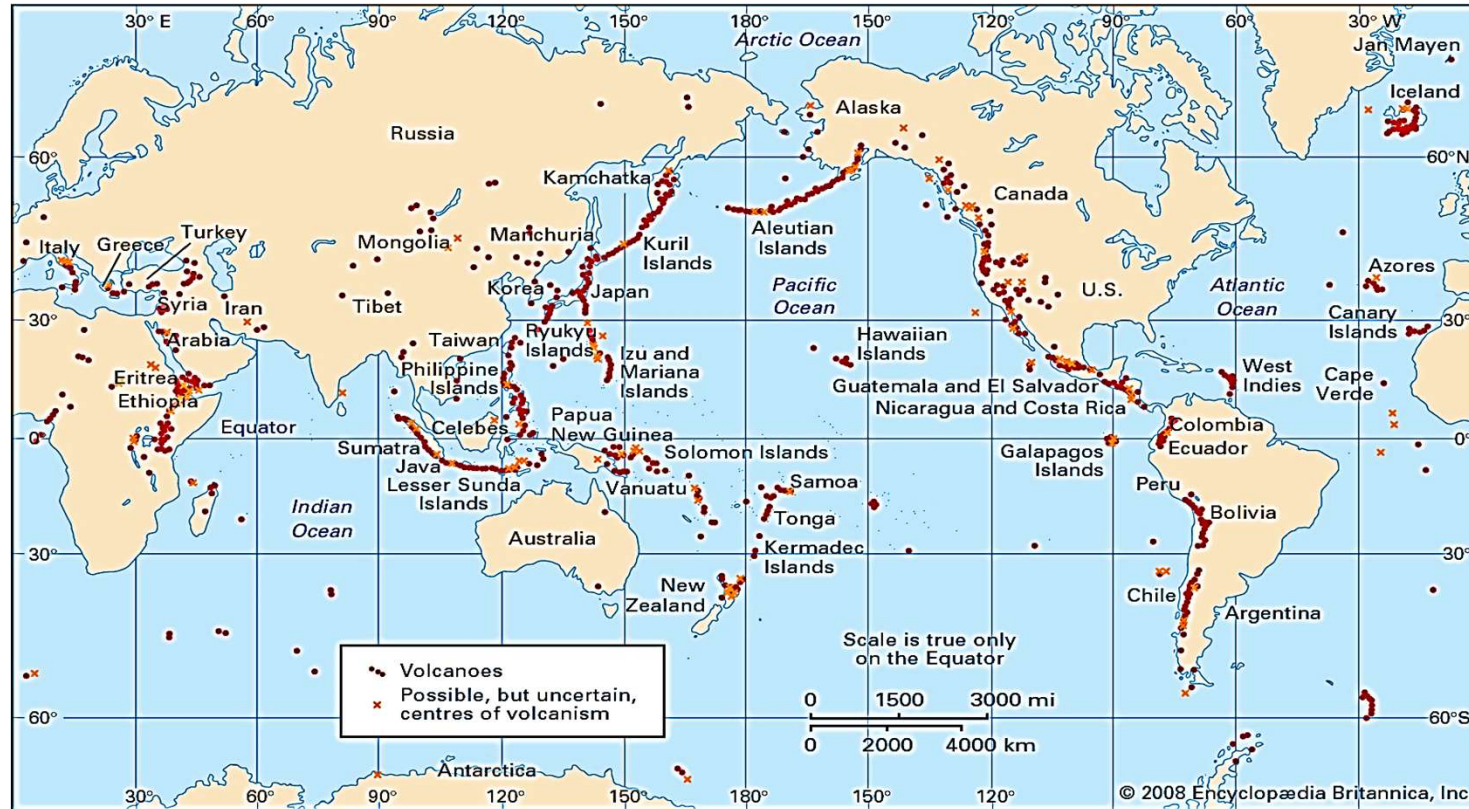
yag Mishra Sir

Vesuvius
 Stromboli
 Vulcano
 Etna

Mayan
 [Active]

Most violent volcano of world

1. Krakatau
 2. Mt. Merapi
 fine volcano



① Andesitic Eruption [Centrally Erupted], $\Rightarrow$ lava is more viscous.
 $\downarrow$
 "Explosive Nature"
 $\rightarrow$ extrusive volcanic landforms.

① Shield volcano. [less viscosity]

② Composite volcano

③ Caldera volcano

④ Lava Dome volcano.

② Basaltic Eruption [Fissure Type] $\Rightarrow$ Lava is less viscous.

$\rightarrow$ extrusive volcanic landforms

① Lava Plateau

Plateaus.

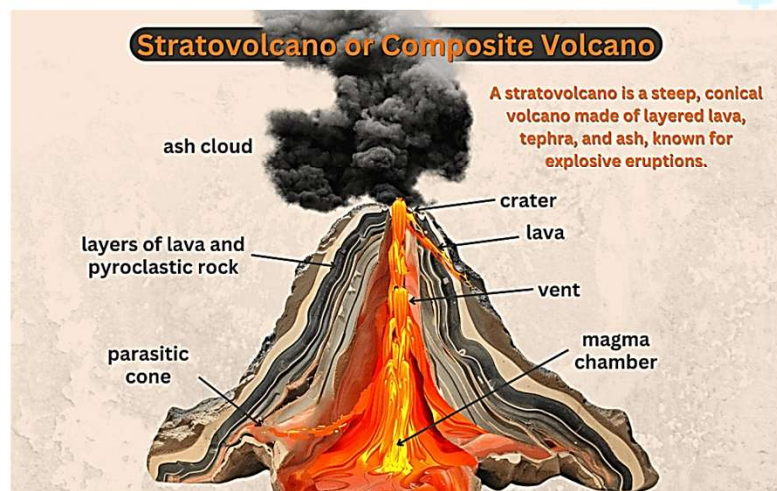
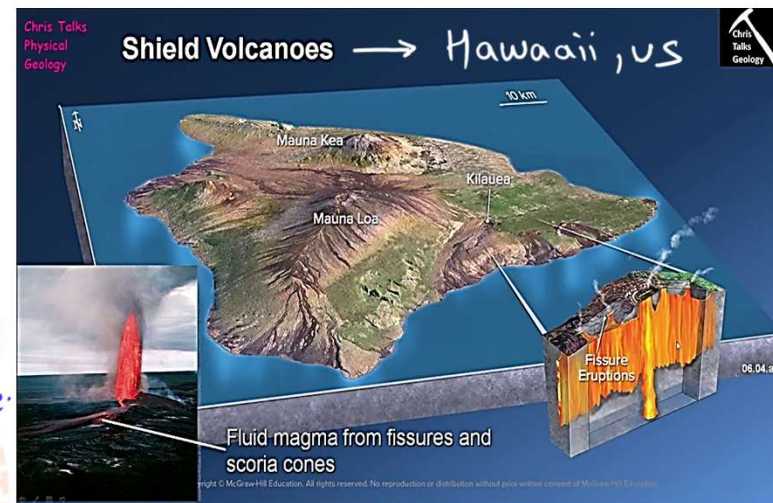
② Flood Basalt Province.

Plains

Extrusive Volcanic Landforms

Prayag Mishra Sir

1. Shield volcano → These volcanoes are not steep slopes.
if water gets into vent they become explosive.
fluid lava.
"Hawaiian Island volcanoes"



2. Strato volcano or Composite volcano

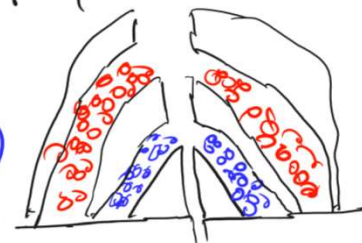
→ Conical shape (steep slope).

→ They have layers.

① Mt. Stromboli (Italy)

② Mt. Vesuvius (Italy)

③ Mt. Fuji (Japan)



③ Caldera → Explosive volcano.

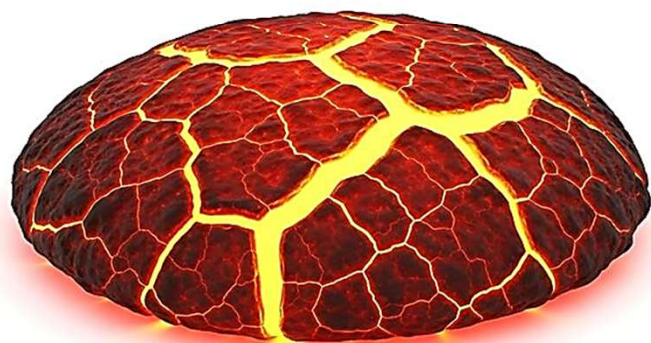
Due to violent eruption the nearby area collapses inside that forms a big depression.

① Lake Toba, (Indonesia)

"Largest lake of world."

⇒ Indonesia has most violent volcano. and they mostly forms Caldera.

② Mount Mazama → Cascade Range, U.S.
2nd largest Caldera.



melt
↓
area sink

④ Lava Dome :- More viscosity.
→ Steepest slope.



Basaltic Eruption (Fissure Type).

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① Flood Basalt Province

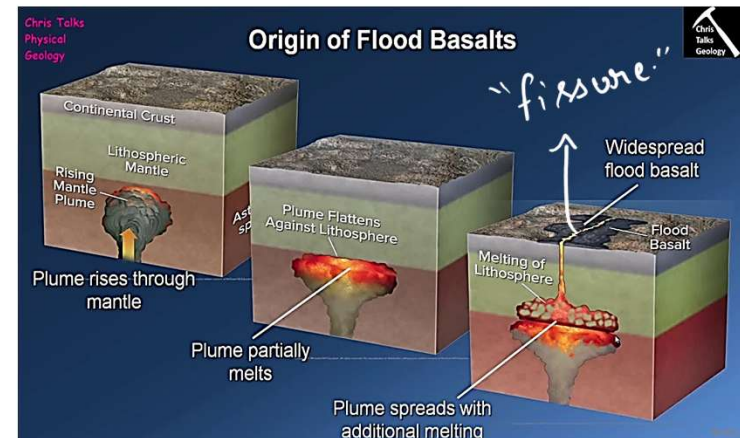
Least viscosity.

Icelandic volcanoes.

ex. ① Colorado Plateau of US.

Colorado River

Grand Canyon
"world's largest Canyon"



② Lava Plateau → Less viscosity.

lava forms plateaus

① Drakensberg Plateau (S.A).

② Piranha Plateau (Brazil)

③ Snake Plateau (USA)

④ Deccan Plateau (India).

⑤ Piedmont Plateau (US) ←



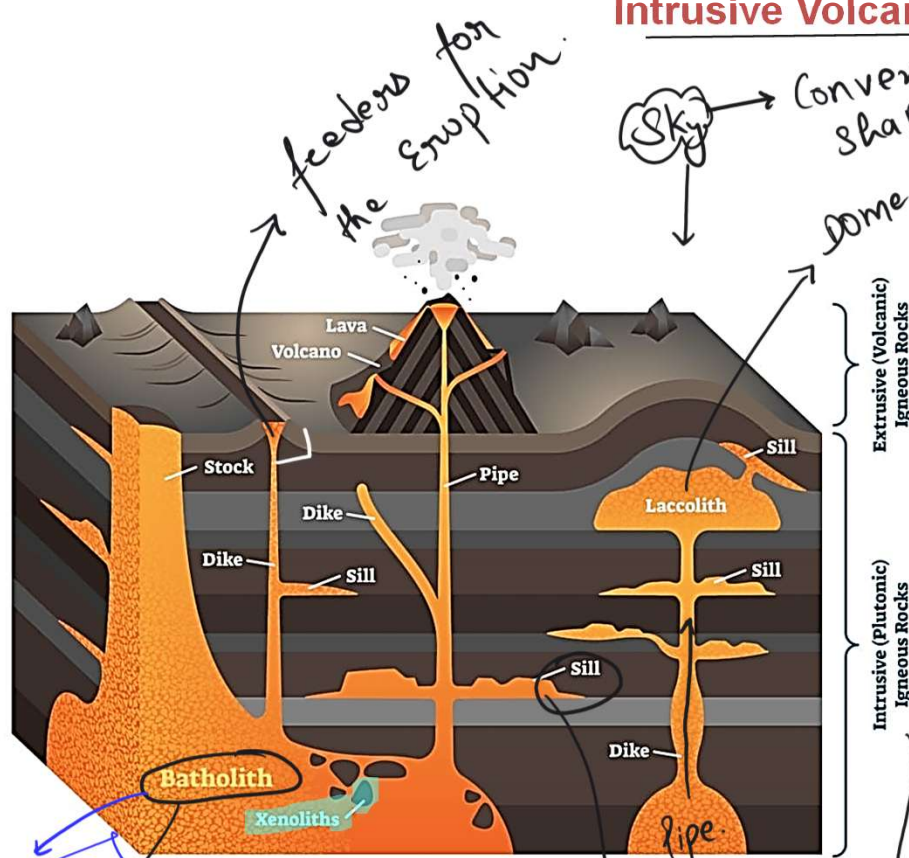
→ Canyons f.



Hot wind
→ Santa Ana.

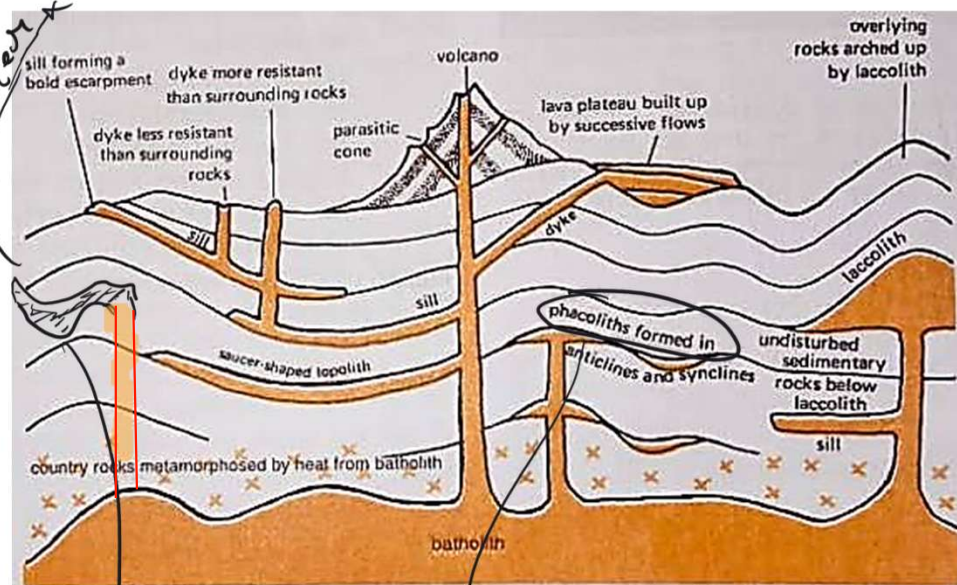
Intrusive Volcanic Landforms

{Crust} → Magma → Solidify.



Extrusive (Volcanic) Igneous Rocks

Intrusive (Plutonic) Igneous Rocks



Plutons.

Lopolith / Lapolith.

Anticlines and Synclines

↓
Phacoliths.

Bath + Lithos
↓
longest intrusive volcanic land forms
↓
Rocks

Horizontal Bodies

Batholith :- These are large granitic rock bodies formed that formed due to solidification of hot magma inside the Earth.

→ huge mountains, exposed after Erosion. [Denudation]

Karnataka Plateau

Laccolith :- large dome shape intrusive bodies connected by a pipe-like conduit from below.

→ Exposed on Erosion.

Lapolith/Lopolith :- when lava moves upward and enters in horizontal weak plane. These structures are formed.

→ Saucer shape, Concave to sky body.

Phacolith :- wavy mass that solidifies in Synclines and Anticlines.

Sills

→ near horizontal bodies of intrusive rocks that are pipe-like structures.

Dykes

→ pipes that are perpendicular to ground forms wall like structure called dykes

→

feeders for the eruption.

(ex.)

→ Deccan Trap. of Maha.

