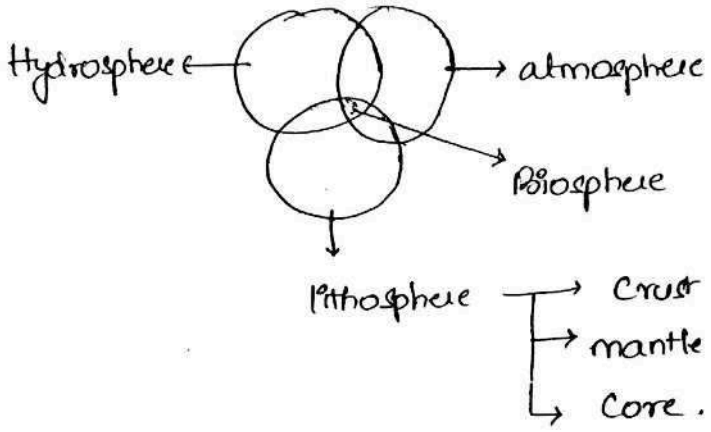
Geography! Geo + Graphien

Geography literally means description of Earth.



Greeks are supposed to be the first geographers and it was Era-tosthenes who quired the word Geography and he defined the study of Earth is home of man.

Hautshorne (1930's)-

Geography is concerned to provide accurate, orderly, rational description of interpretation of the variable character of earth surface.

Bunge, a scientist said once "Science is a deadly enemy of Unique - ness"

Geography is governed by a method rather than a particular body of knowledge.

This method is spatial analysis

Spatial:- The term Spatial refers to

(1). Nature & Character of physical space.

(2). Location

(3). distribution etc.

Geopolitics: Geographical Causation of International politics.

Geopolitics is all about viewing the space from state politics.

Earth's Shape

→ In 1687, Sir Issac Newton suggested that round earth along with other planets, Couldnot be perfectly Spherical.

→ Until the time, the Spherical perfection model was a basic assumption of Geodesy (It is a science, that attempts to determine earths Sp. Shape & Size by Surveys and mathemical Calculations).

→ The earth is Sightly mis-Shaped because of its Spinning.

It Bulges (Because of Centrifugal force) throughthe equal & it is flatened through the poles (oblate Spheroid)

→ Today, the earth is Considered a Geoid.

The Geoid means that "The Shape of earth is Uniquely earth Sp Shaped"

→ Slightly flatened Polar diamete = 12,714 Km.

Slightly Bulging Equatorial diamete = 12,757 Km.

The difference between these two is 0.3%

→ The relative Variation between two Spherical Values

is very less/minute.

→ For more practical purpose, the earth may be propely considered to sphere.

→ Indeed it is more nerely perfect than most of the spheres with with we come in frequent Contract such as a basket ball.

Cartography: The art & science of making maps.

Model: It refers to a simple Version of a Complex reality

"Globe is the model of the earth."

The term projection in cartography refers to the method of Converting the earth / part of the earth into a map.

The basic problem of Cartography is that a sphere is a non develop-able shape. Therefore we cannot have a p map with all the 4 basic attributes (Shape, area, distance & direction) exact together in exact way.

we use a projection of a map in accordance with the purpose at hand.

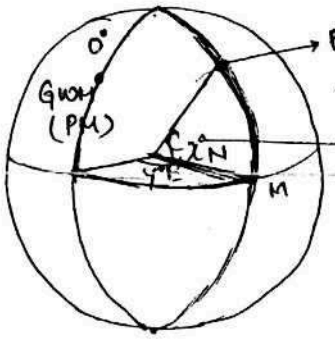
Ex: For minerals distribution, we use Correct area projections/maps.

Fundamental to Geographical Analysis is a develepment of a Comprehensive & logical frame work to establish accurate location of any spot on earth surface.

The imaginary grid system is anchored by the positions of the poles & equator which are determined by earths slight Variance from a perfectly spherical shape.

Latitude:

- It is the angular distance of the point north/south of the equator. We can project a line from a given point on the earth surface to the centre of the earth. The angle between this line and the equatorial plane is the measure of latitude of the given point.



* Latitude varies from 0° to 90° North & South.

Parallel: A line connecting all points having same latitude is called parallel. It is called parallel, because it is parallel to all lines of latitude.

0° parallel is called Equator.

90°N is North pole & 90°S is South pole.

Longitude: It is the Angular distance of a given point East/west of the Primemeridian. The longitude is the Angular distance between the meridian passing through a given point & prime meridion. longitude can vary from 0° to 180° E/W.

Meridian:

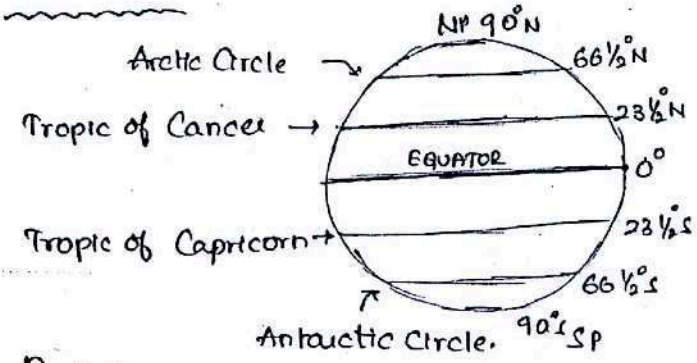
It is the line connecting places having the same longitude.

8/8/2014

"Nature to be Commanded, must be Obeyed".

IMPORTANT PARALLELS

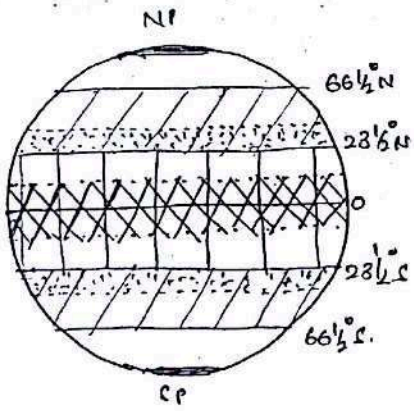
The two tropics represent the farthest limits of the Vertical rays of the Sun.



Insolation: It is incoming Solar Radiation

Latitudinal Zones:

1. Equatorial Region:- (0°–10°) North & South.



- Equatorial region
- Tropical region.
- Subtropical region.
- Temperate Region.
- Polar region.
- Subpolar Region.

2. Tropical Region: 23½°N - 23½°S
3. Sub tropical Region: 23½° - 40° (N & S)
4. Temperate Region: (23½° - 66½°) N & S.
5. Polar Region: Areas around the pole as polar Region
6. Subpolar Region: higher latitudes

Weather and Climate.

Weather refers to the short run atmospheric conditions involving heat moisture and motions for a given time and a specific area.

Climate refers to aggregation of atmospheric conditions involving heat, moistures and their motions over a long period of time and for a larger area.

Climate is what you expect, weather is what you get.

- Mark Twain.

It is the climate that attracts people and the weather that makes them leave

Greeks divided the world in to 3 climatic zones

1. TORRID ZONE - Very Hot.
   - Tropical Region.

2. FRIGID ZONE - Very Cold
   - Higher latitudes.

3. TEMPERATE ZONE - "Moderate Zone"
   - Middle latitudes.

The middle latitudes have the maximum Variability of weather conditions. Therefore in modern Science, we believe, the word temperate is misnomer for middle latitudes.

Great Circle:

1. Any plane i.e, passed through the centre of a sphere bisects that sphere and creates a great circle where it intersects the surface of the sphere.
2. A great circle is a largest circle that can be drawn to a sphere and it represents the circumference of that sphere.
3. Of all the parallels, equator alone make a great circle.
4. Each meridian makes a semi-grade circle.
5. Arc of the great circle joining any two points on the earth's surface is always the shortest route between the points.

Circle of illumination:

Sun illuminates one half of the earth at any given moment. The edge of the sunlit hemisphere, called the circle of illumination, is a great circle, that devides the earth into light half and dark half.

Longitude and Time.

Earth completes one spin in 24hrs i.e, 360 L = 24hrs.

⇒ 1deg Long. diff = 4mins time difference.

∵ Earth rotates from west to east, therefore, the time difference is to be added in the case of places to the east of a point and in the case of places to the west, the time difference is to be subtracted.

Local Time:

Local Time at a place is fixed with reference to the path of the Sun in the Sky.

For. Ex : If the time is 12 noon local time, Sun angle of inclination is maximum.

At that time, Sun is crossing longitude at that point.

All places on a given longitude have the same local time.

Meridian: Meri + diem (day)

meridian refers to moment of the day when Sun is high in Sky.

1. When it is 12 noon monday at green which o find the local time at tokyo (140° E) - 4×140 = 560 m ⇒ 9.20 PM (560/60)

2. A Cricket match Commences at Delhi (77° E) at 10Am on Sunday what will be the local time at Sydney (150° E) and Newyork (74° W) when the radio Commentry is recieved.

Sol. $77°E \Rightarrow \frac{4 \times 77}{60} = 77/15 = 7.08$

$150°E \Rightarrow \frac{10}{\frac{150 \times 4}{60}} = 10 - 7.08 = 2.52$

$(74+77)\,4 \Rightarrow 151 \times 4 =$

Standard Time:

To avoid confusion, we follow uniform time throughout a Country/Region. Such Uniform time is based on the Central meridian of the Country/region or the meridian on which the most important City is located. Such a Central meridian is called the Standard meridian (82½° E for India). The Central meridian is usually selected in such a way that it is divisible by 7½° so that Standard time differs from greenwich mean time by a multiple of half an hour.

Time Zone:

Large Countries with vast longitudinal Extent donot have a single Standard time for whole country. Generally such Countries go for more than one time zone (each approx. 15° of longitude).

Russia - 11 time zones, Australia - 8 time zones.

Although China Extends across '4' 15° zones, the entire nation, atleast officially observes the time of 120° E meridian which is Closest to its Capital.

Before the middle of the 19th Century, 100's of different time Systems were used thuough out the World based on the raising of the Sun. Sir Sunford fleming led the fight in Canada for Standard time and for an international agreement Up on prime meridian. His struggle led the US and Canada to adopt a Standard time in 1883.

In 1884, the International meridian Conference was held in Washington DC.

International Meridian Conference, 1884:-

19. imp. islands in mediterian Sea.

Excercise: 16. Kamchatka peninsula 17. Canary islands 18. Great Artesean basin

1. Equator, Tropics, Arctic, Antarctic, +GM (imp places, cities)

HW: 1. Sahara desert 2. Namib desert 3. Kalahari 4. Dast-e-Kavir

5. Rub-al-Khali (Empty quarters) 6. Lake Victoria 7. Lake Balaton

8. Lake gauda 9. Eyre lake 10. Jura mt. 11. Aconcogua

12 Altiplano (Bolivean plateu) 13. Alaska 14. Aleution Island 15. Bering Sea.

18.8.2014 Geography

Hard work beats talent when the talent v beats the work hard.
does not

International Merridian Conference, 1884:

1. World was divided into 24 Standard time zones each Extending over 15° of longitude.

2. The local zonal time / Solar time of greenwich was chosen as the Standard for the Entire System.

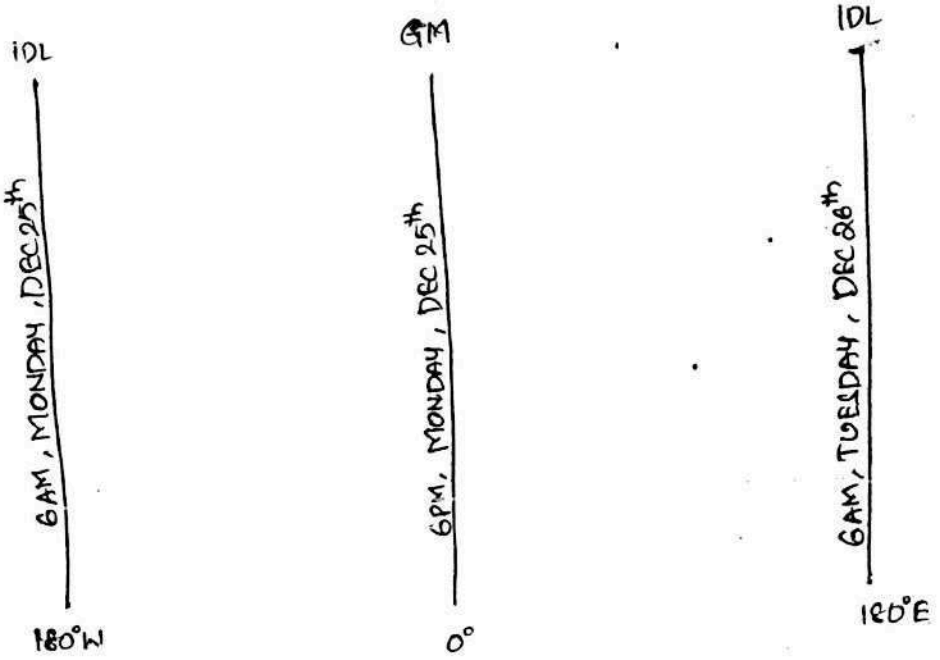
3. The Prime merridian became the Centre of a time zone that Extends 7½° of longitude both to the west and to the east of prime merridian. Similarly, the merridians are the multiples of 15, both East & west of the meridian, were set as the Central meridians for the 23 other time zones, Each of which 15° of longitude in extent.

4. 12 zones to the East of Greenwich meridian were designated to be ahead of the time by greenwich by 1hr. per zone. Similarly, the 12 zones to be the west of greenwich are behind.

5. In International waters, these time zones are shown Exactly 7½°E and 7½°W of the Central meridians.

6. Over land areas however, the actual East & west boundaries of time zones Vary to Coincide with appropriate political & economic Constraints

International Date line:



1. An Imaginary line agreed Internationally which follows the meridian of 180° with some deviations to accomodate Certain land areas.

2. If traveller crossing the date line from W to E, the he gains a day & while travelling from E→W, lose a day.

3. One advantage of establishing the Green which meridian as Prime meridian is that its opposite axis in pacific ocean. 180° meridian, transiting the Sparsely populated mid pacific, was chosen as the meridian at which new days would begin & Old days would Exit from the Surface of the Earth.

4. The IDL deviates from 180° M in Bering Sea, to include all the aleutian Islands of Alaska with in the same day and again in the South pacific to keep Islands in same globe (Fiji, Tonga) with in the

Sameday.

5. The Newday first appears on Earth at mid night at IDL. For the next 24hrs, a new day advances Westcoard around the coorld finally Covering the Entire Surface at the End of this period.

6. For the next 24hrs, this day leaves the earth, 1hr at a time making its final Exit 48hrs after its first appearance.

7. With the planet turning East coard, the time goes westcoard.

8. Since the IDL is in middle of Time Zone, therefore there is only change in calander not on a clock.

9. Theoritically, Along meridian 180°, it is both 6AM Monday & 6 AM Tuesday.

Daylight Saving Time:- (Spring Forward, Fall Back):

DST takes Advantage of Summer's Extra daylight hours. Clocks are put forward 1hr; thus gaining an hour's Sunlight gaining Conventional waking hours. The practice coas first Suggested half-Seriously in 1784 in an essay by the American Statesman & Scientist Benjamin Franklin. It coas not until first world coar that Several Countries including Australia, britain, Germany & the US adopted ~~dsto~~ daylight Saving as a means of Conserving Energy resources. Besides Energy Conservations,

Other advantages are increase in leisure time, safer journey for school children.

In Northern Hemisphere, Countries like us begin daylight time early Sunday morning of last weekend in April & resume standard time Early Sunday morning of the last weekend of October.

In the tropical belt, the lengths of day & night changes little Seasonally and there is not much twilight. Consequently DST offer little/No Savings for tropical region.

Jet Lag:

The effect of Sudden Swith of time zones in air travel, resulting in tired-ness and getting out of step with day & night.

Circadian Rythm:

Metabolic Rythm found in most organism which generally Coincides with 24hrs a day. Its most evidant manifestation is a regular Cycle of Sleeping & waking.

Gyres refer to "Continuously moving loops of Currents in different Ocean basins

Global heat Imbalance: ↑

20/8/2014

// 1. Nature Nurtures us, We must Nurture Nature.

2. If you think education is expensive, by ignorance. //

↑1. Between approximately 35°N & 35°S, there is a Surplus of energy because incoming Solar radiation Exceeds outgoing radiation.

2. Polewards from 35°N & 35°S, there is a deficit of Energy because outgoing radiation Exceeds incoming radiation

3. Theoritically, Such an imbalance in Energy Could result in the lower lattitudes becoming warmer & higher lattitudes becoming ever colder. In reality, however, energy is transfered from areas of Surplus to areas of deficit in two related ways.

1. Atmospheric Circulations (Approximately 80% of heat transfer)
2. Ocean Currents (About 20% of heat transfers).

Atmospheric Circulations:

1. Wind: Moving air is Called wind, in particular, horizontal movement of air is called wind. Vertical movement is Knocona Currents (Ascending & descending).

Air near the earth Surface move from high pressure to low pressure.

i.e, Wind represents Nature attempt to balance out the uneven air pressure over the earth.

As per Convention, Wind is always named as per the direction from where it comes-

2. Convection:

Convection is a process of heat transfer from place to place with in a liquid or a gas caused by the movement of the particles.

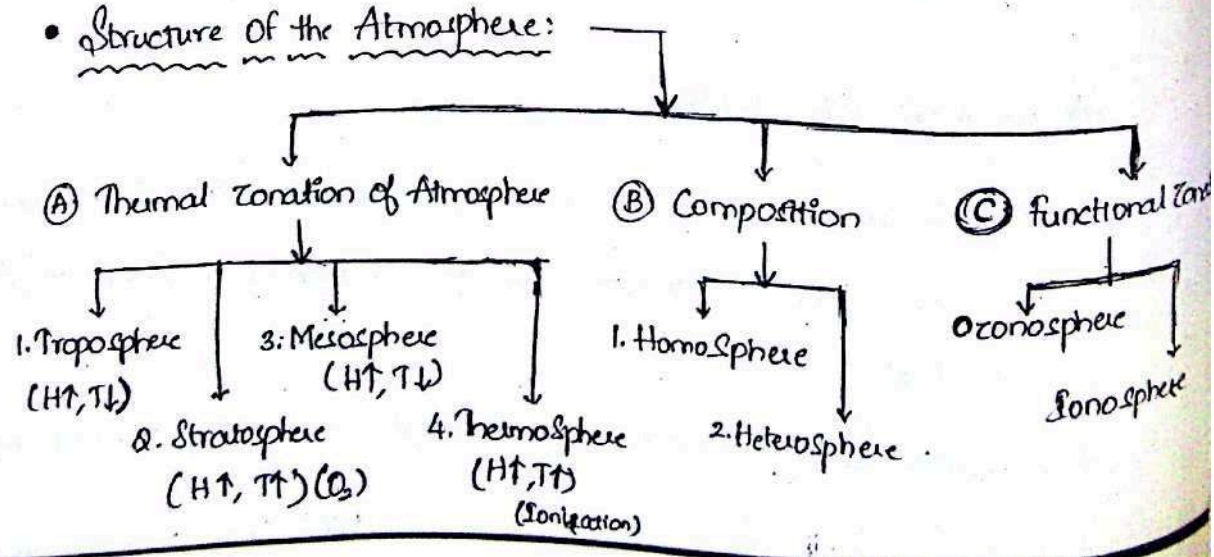
3. Adiabatic Change in Temperature :-

Adiabatic change is one which is with out actual heat transfer.

→ Warmer air is lighter, therefore it raises and as it raises it gets adiabaticly cooled (because of Expansion)

→ Colder air is denser, therefore it sinks and as it sinks it gets adiabatic warmth (because of Contraction).

- Structure Of the Atmosphere:



1. TROPOSPHERE: H↑, T↓

* Environmental Lapse Rate (ELR):

It Refers to actual rate of decline of Temperature with increase in height at a given place & a given point of time is called ELR. It has too much of Spatial & temporal Variations.

* Normal Lapse Rate (NLR):

This is an average Concept and is generally taken as a decline of 6.4°C per 1Km ascent in the atmosphere.

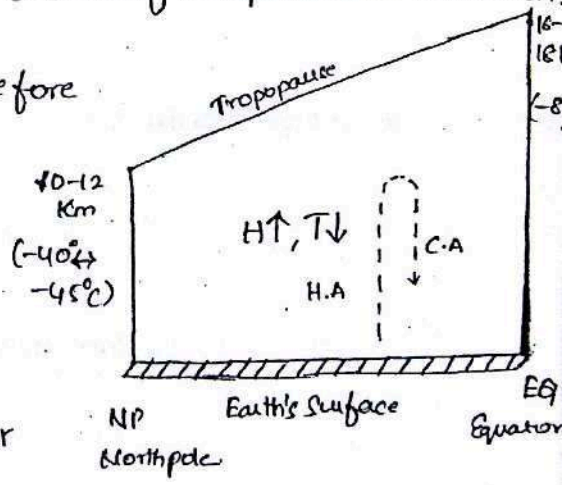
* Temperature Inversion :

It refers to the atmospheric Situation in which with increase in height, there is increase in temperature (instead of ELR).

* Front refers to a zone of transition formed between two Contrasting masses of air in the middle latitudes.

A Frontal Situation always represents a case of temperature inversion.

◆ Lower latitudes are heated atmost & therefore have Stronger Convectional Current & that Explains Higher heights of Tropopause.



Across tropopause, there occurs the case of temperature inversion & as a result most of what Comprised to Weather & Climate gets Confined to Troposphere. i.e, Tropopause acts as Lid of the Troposphere. This is why troposphere is

Called The Real Weather Sphere of the Nature.

The troposphere is the zone in which warm air raises and get adiabat-aly cold and desends back. It's a zone in which air turns itself.

The term upper atmosphere (in our class) generally mean the zone near the Tropopause.

Isothermal Zone:

Isothermal zone refers to a zone in atmosphere in which with increase in height there is a relative Constancy of temperature.

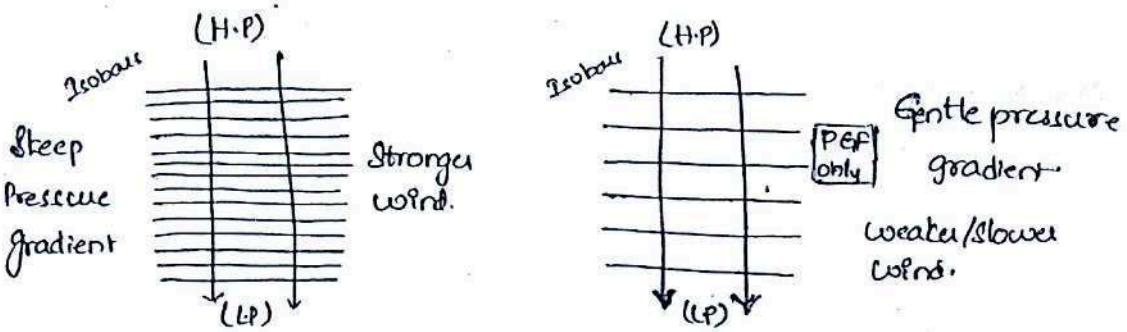
A typical isothermal zone is formed in the lower part of the Stratosphere just above the tropopause. This zone provides ideal flying Conditions for air Crafts because,

1. Relative Constancy of Temperature.
2. Relative absence of Clouds.
3. Relative absence of Strong Conventional Currents.

* FORCES ACTING ON THE MOVING AIR NEAR THE EARTH SURFACE (LOWER TROPOSPHERE)

Pressure Gradiant force: (PGF)

This is the basic activating force for the wind. i.e, it initiates the movement of air.



PGF act at Right angles to the isobars in the direction of low pressure

↑ Isobar is a line Joining places with same pressure.

↑ Gravity bounds the atmosphere around earth. (No Circulation due to gravity)

2. Coriolis force:

Because of the rotation of the earth, there is an apparent deflection to the moving objects-to account for the apparent deflection, Scientists have 'invented' force called Coriolis force. This force is named after a french mathematician Gaspard Coriolis.

Ferrel's law of deflection:

This law states the effect of Coriolis force on a moving body - There is an apparent deflection of the moving body to its right in the Northern hemisphere & to its left in Southern hemisphere

The Coriolis Effect / force is negligible near Equator & it increases progressively as we move from lower to higher latitudes. This is so for the reason that the rate of decrease of the Speed of the Earth increases progressively from lower to higher latitudes.

Frictional Force:

Asia minor.

Atlas: 1. Mendoza (South America) 2. Nubian desert 3. Mt. McKenly 4. Mt
(canada) 5. Maghreb - It refers to the North west region of Africa which is
dominated by Atlas mountains 6. Horn of Africa (Somalia, Eretria, Europ
Dji SEED) 7. Arica 8. Lake Maracaibo 9. patagonia 10. [redacted] Pantanol
Pantanol is a mushy low land in western Brazil & Bordering Bolivia & North
Paraguay 11. Matto Grasso - mineral rich area in western Brazil. 12. Falkland
- Form a Self governing british colony in Southatlantic Ocean. 13. Eugaton Peninsula
- famous for limestone topography. 14. Pyrenese mt. 15. Alps 16. Anatolia - Asian pa

1.9.2014 GEOGRAPHY

Thought of the day:

- Luck is a matter of preparation
  meeting opportunity
- You have to think Anyway
  So why not think BIG.

Frictional Force:-

The frictional drag of the earth surface acts both to slowdown wind movement and to modify its direction of flow.

Zone of Convergence of Air:-

It is a zone where there is Net inflow of air.

Zone Of Divergence of Air:

It is a zone where there is Net outflow of air.

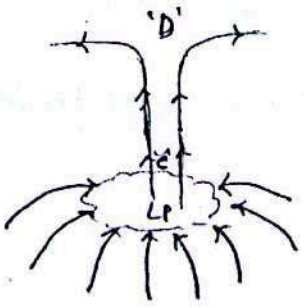
Cyclone:

Cyclone is a wind system with a low pressure at the Centre.

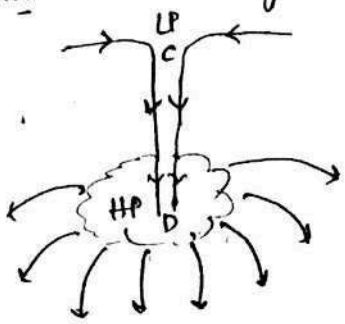
Anti Cyclone:

Anticyclone is a wind system with a High pressure at the Centre.

* For a zone of Convergence near the Earth surface, there has to be a zone of divergence in the Upper Atmosphere. →



* For a zone of divergence in the earth surface, there is a zone of convergence in the Upper Atmosphere →



Planetary Winds

The trade winds, The westerlies, The polar easterlies constitute what we called the Planetary Winds.

These are called planetary winds because these are almost Global in Nature.

These are also called Prevailing winds as they prevail throughout the year.

* " Model refers to a simplified version of a complex reality." *

The wind systems of the world are the result of pressure distribution on the earth.

The pressure distribution on the earth is the result of two factors

(1). Heat distribution

(2). Rotation of the Earth.

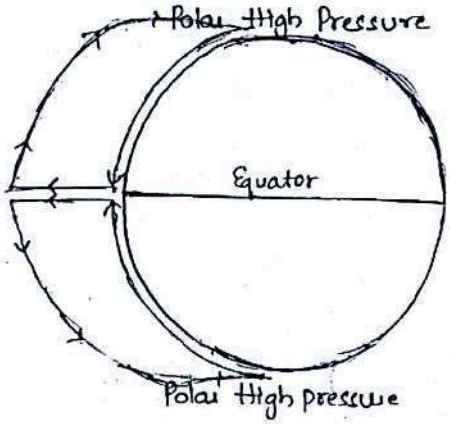
Land & water have differential heating process-

Land gets heated faster & loses heat faster where as water takes more time to get heated up & retains heat for the long time.

A SINGLE CELL MODEL

(George Hadley)

(1735)



Equatorial low pressure due to Heat

Hadley's Model is based on a 'non-rotating Earth'. His model is based on Convectional Currents which had upward movement of warm current.

According to Hadley, In each Hemisphere there is a large Convection Cell powered by the heating of Equatorial region. By means of the Convection Cells Surplus energy is transfered pole wards.

Since Hadley did not Consider the Rotation of earth, his model got over Simplified & failed to describe & Explain the complexities of Planetory Circulations.

A Three Cell Model

(A Tri Cellular Model)

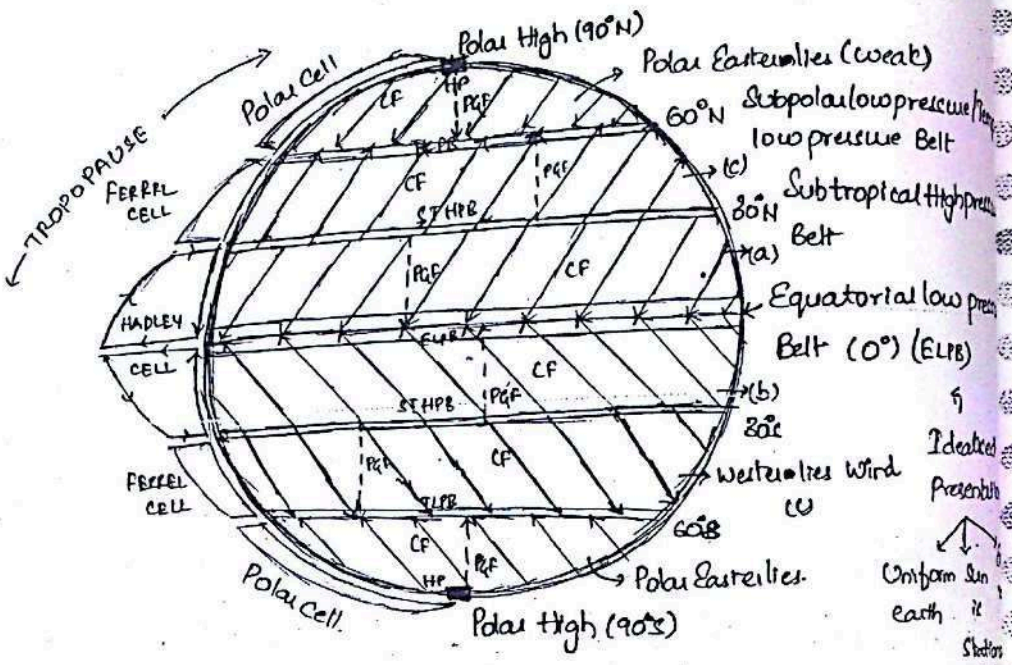
(William Ferrell)

(1856)

Ferrel's model is based on following 3 Considerations.

1. Uniform Earth Surface. (Either land or water)
2. Rotating Earth (and the resulting Coriolis force)

3. Sun being over head at the equator (Equinox position)



(c). Westlies Winds

(b). Polar Easterlies.

(a) North-Eastern winds or Trade winds.

(b). South easter winds.

In reality, there are no pressure belts, instead we have pressure Cell/Cond Since the Sun is not Stationary over the equator, therefore with the ap movement of the Sun in the sky, the pressure belts & the associ winds shift accordingly.

SHIFTING OF THE PRESSURE BELTS

The Sun is overhead at midday in different parts of the Earth at different Seasons. The movement of pressure and wind belts follow movement of the Sun. In June, when the Overhead Sun is over the tro of Cancer, All the belts move about 5° to 8° North of their average po In the same manner, when the Sun is Overhead at Tropic of Capricorn

december, all the belts shift 5° to 8°/10° South of the average positions. The shift of pressure belts is maximum in the lower latitudes & least in the polar latitudes.

The impact of the shift of the pressure belts over the weather & climate is max at Temperate/Mid latitudes.

The shift of pressure belts is more in Northern Hemisphere than in the Southern hemisphere. The reason being a complex mix of land & water in Northern Hemisphere.

CELLS:

1. Hadley & polar cells are driven directly by different Effects of Surface heating, they therefore are called Thermally direct Cells

2. Ferrel cells are thermally indirect cells because they are powered by the other two. This allows them to transfer "Warm Air" from Hadley cells to high latitudes & transfer "Cold Air" back to low latitudes for heating.

TRADE WINDS:

Map: Plot them on Atlas:-

1. "Euro Tunnel / English Channel Tunnel / Chunnel."

2. It is through the Straight of Dover, in English Channel Connecting the Urban agglomiration of Paris & London.

2. "Black Forest" (on Border of Germany & France)

Horst / Block mountain

3. "Mt. Kirinyaga" (formally Mt. Kenya). has its foot on the equator, but its peaks are Snow covered. It is Mt. Kenya an extinct Volcano. Altitude minm latitud

4. Mt. Chimborozo (foot on equator, peaks Snow covered)

5. Mt. Etna (highest active Volcano of Europe, Sicily)

6. Sunda Strait (b/w Java & Sumatra Islands of Indonesia, Volcano called Krakatoa is present).

7. Lake Toba - Crater lake in Indonesia's Sumatra islands

8. Tonle Sap - (means great lake, in Combodia), one of the richest sources of fresh water fish. - Which River feeds the lake?

9. Mt. Cameron, Active Volcano on the west Coast of Afuca.

10. Ayre's Rock - Mid of Australia, Single peace of rock (Sand Stone) (also known as Uluru)

11. Alice Spring, Australia. A famous tourist Centre in Australia, began as telegraph Station linking Darwin & Adelaide.

12. Kara Sea - arm of Arctic Ocean, North of Siberia, rich in marine life, Salinity is low.

8/9/2014

GEOGRAPHY

Thoughts of the day:

What may be done at any time
will be done at no time

Tolerance becomes a Crime
when applied to an evil.

x Trade winds:

Shifting of the Pressure Belts:-

In South Asia, the low pressure shifts by more than or equal to 20°N of Equator during Summer Season.

Inter Tropical Convergence Zone (ITCZ):-

It is the zone, where trade winds Converge.

It is also refered to as Thermal Equator of the Earth.

It is the zone of generally Calm, Hot, Raising Air & Low pressure.

At Sea, this Calm area is called The Doldrums; because Sailors in the olden days used to get be-Calmed here. It is a region of Small pressure gradient, High humidity & High temperatures occuring near the Equators.

Horse Latitudes:-

In the olden days, the zones about 30°N & S were known as the Horse latitudes. when Ships were Calm, the horses were thrown to reduce the load. In this region the air is Comparitively dry and the winds are light & Calm. It is a region of Descending air currents or wind divergence and Anticyclones.

Trade winds:

1. These are most regular of all planetory winds.
2. These Generally blow with great force & Constant direction.
3. Since they blow from the Subtropical latitutes to the lower latitudes, they have great Capacity for holding moisture.
4. In their passage across the oceans, they gather more moisture and bring heavy rainfall to the east Coast of the continents.
5. As they are offshore on the west Coast, these regions Suffer from great aridity & form the Hot deserts of the world.

Ex: The Sahara, The Kalahari, The Atacama & The Great Australian Deserts.

Westerlies:-

Westerlies are much less constant & persistant than the trade winds. These winds often do not Come from west. These are more Variable in the Northern Hemisphere (Complex mixture of land & water).

These winds play a Carrier role of warm waters & winds to the western Coast of temperate land (Valuable role).

These winds bring much precipitation to the western Coast between 40°s & 60°s (Because of huge Oceanic Expanse). In Southern Hemisph Westerlies move with much greater force & regularity throughout yea

In Southern Hemisphere, the weather is cloudy & seas are violent. It is usual to the sailors to refer the westerlies as the roaring 40's, furious 50's & shrieky 60's

Polar Easterlies:-

These winds are typically cold & dried winds. These are highly variable winds. These are more regular in Southern Hemisphere than in the Normal hemisphere (Due to more uniform surface).

The trade winds, westerlies & the polar easterlies constitute the primary circulations (general circulations) over and above these primary circulations, there take place many spatial & temporal variations called secondary circulations (atmospheric disturbances).

The General Circulation of atmosphere is Extremely important to Earth. It is the General Circulation that carries water from the ocean over the continents to provide precipitation and move heat Energy from tropical regions to towards the poles, hitting the high latitudes.

Primary Circulations of the globe make the close system of circulation - with neither a beginning nor an End.

Ideal model:- (Diagram)

This model represents the long term average of the Meridional (North-South) Circulations over the Globe. In reality the Circulation is much more complex than this model suggests.

OCEAN CURRENTS

- Like the atmosphere, the World Ocean also plays a significant role in moderating the Global heat imbalances. The Ocean Circulation transports heat from tropical to polar regions.

- The Ocean Currents are the large Scale movements of the waters which form the oceanic counters to the parts to atmospheric Circulations & System of pressure Cells.

- Generally the term Oceanic Currents is used for horizontal movements in the Uppermost 100mtrs of waters, called the Surface layer

- The Ocean Currents are classified as the Cold and the warm Currents on a relative Consideration w.r.t. Surrounding waters.

1. The Currents which take the waters from lower to higher latitudes are called Warm Currents

2. The Currents which take the waters from higher to lower latitudes are called Cold Currents.

3. The Currents near Equator in general are called warm Currents

The So called warm & Cold Currents usually Exhibit temperatures that differ by only few degrees to those of the Surrounding waters. Yet these Small temperature differences are often Sufficient to have a Significant Effect over atmospheric conditions in a corde area.

On the basis of parameters like speed, direction and identity the ocean currents are classified as

(1) Drifts – refers to a slow motion of surface waters with no clear boundaries & the motion is erratic in direction.
(2) Currents
(3) Streams

The speed may be between 16-24 km/day.

2. It refers to surface movement which is more rapidly & most defined in direction & identity. The speed may be 6-8 km/hr.

3. Stream refers to surface motion which is still more defined in terms of direction & identity. Here the waters moves with a good speed. It is like a big rivers on a continent.

FACTORS EFFECTING OCEAN CURRENTS:

Atlas

1. Lake Mjosa - laugest lake of Norway
2. Lake Venren - Laugest lake of Sweden
3. Lake Saiman - laugest lake of ~~Rothkpin~~ Finland
4. Lake Balaton
5. Gulf of Bothnia - Seperate Sweden & fin land
6. Saudinia - belongs to Italy, South of Corsica, mediterranean Sea
7. Svalbaud (cold coast) - refers to Norway's arctic Island territories. It includes (also) Spits berg group of Islands.
8. Reghjavik (means Smoky bay) - Capital of Iceland. It is so because of Geasers & Springs.
9. River Tagus - raises in Spain & goes to divide portugal in to two parts. (Spain + Portugal - Iberian peninsula)
10. Kjollan Mountains - on Boundary of Norway & Sweden.
11. Green land - laugest Island lies laugly coithin arctic Circle belongs to Denmark, Highest peak be Mt. Gunjong.
12. Faroes - Islands belong to Denmark, refered as Cheep Islands. A popular Saying - "Sheep wood is a Faroes gold"
13. Lake Van - It is in the eastern part of turkey & highly Saline. It lies at the foot of armenion ~~Kurdish~~ Highlands / Mt.

Important Parallels

HW! Locate on Map:-

1. Lake Titicaca.
2. Atacama.
3. Tierra del Fuego.
4. Eastern Island.
5. Galapagos Islands
6. Australian Deserts.
7. Corsica:
8. Atlas mountains
9. Bay of Fundy
10. Coral Sea

25.9.2014

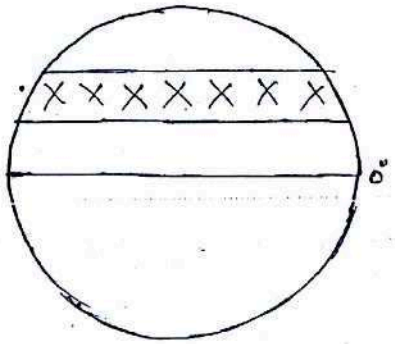
Geography

S.K. Manocha Sir

The whole purpose of

MEDITERRANEAN TYPE OF CLIMATE

Areas of World :-



(1). Areas of and around mediterranean Sea.

(2). California

(3). Central Chile

(4). Cape province in South Africa

(5). Southern & South-west Australia

All these 5 areas have West facing Coast locations.

Climate

- Summer
  - Hot & Dry
- Winter
  - Cool & wet

The mediterranean climate areas during the respective Summer Season are under the influence of Trade Winds and being on the west do not get moisture.

During their respective winter Season, They come under the influence of moist westerlies (with the shift of pressure belts) and become wet.

Factors Of the Ocean Currents.

The Pattern of Ocean Currents as seen in world Ocean is a Combined effect of the following 4 sets of factors.

(A) (1). Set of factors relating to Earth's rotation
(2). Set of factors relating to Ocean
(3). Set of factors relating to atmosphere.

} These 3 Sets would be the Causation factors

(B). (4). Modifying factors. – (1). Nature of the Coast
(2) Ocean bottom Topography
- mid oceanic regions (ridges),
- Seamounts
(3). Seasonal Fluctuations.

Set of factors Relating to Earth's Rotation.

(1). As Earth rotates from west to East, the waters near the Equator tends to move from east to west (NEC, SEC)

(2). The earth's rotation leads to an apparent deflection to the moving waters. The deflection is Clock wise Northern direction and anti clock wise in Southern hemisphere

Set of factors relating to Ocean
(Temperature & Salinity Difference)

As a rule Surface water moves from the areas of lower density to areas of higher density.

Set of factors relating to Atmosphere.

Atmospheric pressure difference, amount of rainfall, rate of Evaporation and melting, all effect the ocean currents. The leading role is done by the frictional drag on water surface by planetary winds.

Most of the ocean currents tend to follow the direction of planetary winds. The indian ocean most clearly manifests the most important role played by planetary winds, as we find that with the seasonal reversal of winds, the ocean current also gets reversed.

Equatorial Currents Take the water from eastern part of the Ocean basin to the western part of ocean basin. This results in piling of water in west side. Out of this piled up water, some water goes to feed loops in both the hemisphere and a part of this water moves back from west to east near the Equator resulting in Counter Equatorial Current.

* Warm Currents

(1). North Equatorial Current.

(2). South Equatorial Current.

(3). Counter Equatorial Current.

(4). North Pacific Current.

(5) Kuroshio Current / Japan Current.

(6) East Australian Current

(7). Brazil Current.

(8). Florida Current.

(9) Gulf Stream.

(10). North Atlantic drift.

(11). Agulhas Current / Mozambique Current.

* Cold Currents:-

(1) Labrador Current

(2). East Greenland Current.

(3). Canaries Current

(4). Falkland Current

(5). West Wind Drift / Antarctic Circumpolar Current

(6). Benguela Current

(7). West Australian Current

(8). Oyashio Current / Kamchatka Current

(9). California Current

(10). Peru Current / Humbolt Current

(11) Othotsk Current

Gyres:

Gyres refer to continuously moving loops of currents in common.

These loops are clockwise in Northern Hemisphere

Anti clockwise in Southern Hemisphere

Sargasseau - Sea

In the Central portion of N.A. Ocean a vast area is formed by N.E.C, Gulf Stream and Canaries Current. All these Currents flow in a clockwise direction. Within this almost Circular area, the Ocean is Calm and stable. The water movement, if any is very slow. On the surface of the Ocean a Seaweed belonging to Sargasseau Species is found floating in abundance. This is why this Sea has been named as Sargasseau Sea.

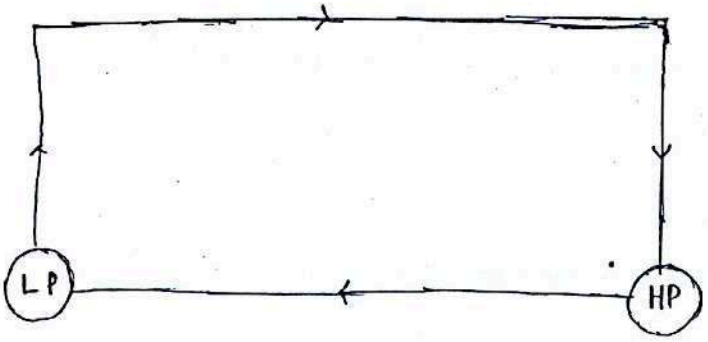
West wind Drift / Antarctic Circum Polar Current:-

This is the greatest Ocean Current. This is the only current which flows unimpeted around the globe from west to east. Westwind drift is a response to the strong westerlies in the Southern hemisphere.

Southern Oscillation:-

Southern Oscillation refers to Sea-Saw arrangement of atmospheric conditions b/w the Indian and Pacific Oceans.

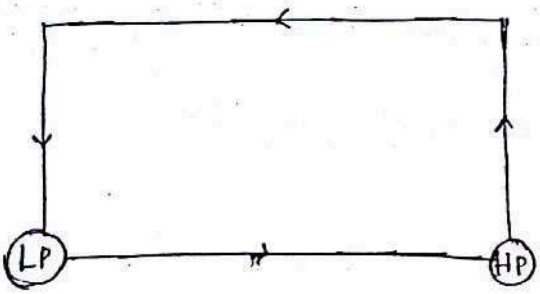
(a) Walker Cell - Normal Situation:-



Indian Ocean / western Pacific ocean

Eastern Pacific ocean
(UPWELLING)

(b) Walker Cell — El-Nino (Abnormal Situation)



Indian Ocean /
Western Pacific ocean

Eastern Pacific
ocean
(CEASING OF UPWELLING)

Elnino is a Spanish world for Male child and it refers to Ceasing of Upwelling of the west Coast of South America.

(or)

The appearance of warmer waters than the average on the surface of oceans of the west Coast of South America.

El-Nino is found to be Negatively Correlated with Summer monsoon in South Asia.

It is Spanish coord for the girl Child and refers to reinforced or augmented Normal Situation. It is found to be positively Corelated with Cummer monsoon in South Asia.

- Upwelling

30.9.2014 Geography Manocha Sir.

* Success is a Science, if you have the Conditions, you get it.

* I believe in God, only I Spell it Nature.

* Humans have brought into being mountains of hate, rivers of inflexible tradition and Oceans of Ignorance.

Upwelling:-

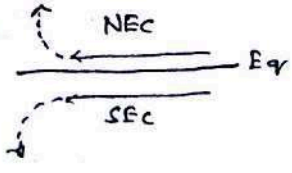
Some of driest Coastal areas on the earth are associated with Upwelling, particularly in latitudes Under the influence of the Semi-Permanent Highpressure Cells. These areas are:-

1. North Western Mexico
2. Northern Chile and Peru
3. Nort Western Africa
4. South Western Africa

Upwelling can result desication on nearby Coast. It also does produce one important human benefit, It Carries to the Surface nutrients that Support Some of the most productive fishing grounds in the world Ocean.

* Equatorial Upwelling:-

The diverging coasters of SEC & NEC Create a Vacancy On the Surface and result in Upwelling near equator refer to as Equatorial Upwelling



Some the world's Great fishing areas occur in regions where two Contrasting Currents meets. The mixing that develops Creates a favorable habitat for planktons.

(1). East Central Coast of North america, where Cold labrador & warm Gulf Stream mix.

(2). North west pacific, where Cold oyachio & warm Koroshio meet around Honshu Island of Japan making an important fishing ground.

Same temperature Contrast often Creates foggy condition making fishing & shipping in Such Areas Hazardous.

Ocean Currents And Climate.

The So Called WARM and Cold Currents Usually Exhibits temperature that differ by only a few degrees from Surrounding waters, Yet these Small temperature differences are Sufficient to have a Significant Effect over atmospheric condition over wide area.

Warm Currents :-

Warm Current (North atlantic Currents) Precipitates On the onshore winds. This Ensures for its latitude, North west Europe has a mild Climate and harbours in Norway and Iceland are Ice-free.

Warm Currents to increase precipitation in adjoining Coastal regions for Ex: South East trades passing over warm Brazilian Current.

Cold Currents:-

Cold Currents (Peru Current, for Ex) Cool onshore winds. This lowers the temperatures and shorten growing seasons in the Coastal regions. The chance of frozen harbours and Ice bergs is often increased by Cold Currents. for Ex :- The labrador Current.

Cold Currents help to maintain aridity of Coastal deserts by cooling and making onshore winds dry. For Ex :- Coastal winds Crossing the Peruvian Current to the Atacama desert. Cooling also causes Coastal Fog.

Thermohaline Circulations:-

1. Density Differences Creates Deep currents.
2. Deepwater Currents move larger Volumes of water and are much slower than Surface Currents. Typical Speeds of deep currents range from 10-20 Kmp year.
3. Because the density variations that cause deep ocean Currents are Caused by difference in temperature and Salinity. Therefore deep ocean Circulation is also known as Thermohaline Circulation.

EKMAN SPIRAL + EKMAN TRANSPORT:-

The Ekman Spiral describes the speed and direction of flow of Surface waters at various depth. Ekman's model assumes that a Uniform Column of water is set in motion by wind blowing across the Surface. Because of the Coriolis effect, The immediate Surface water moves in a direction

45° to the right of the wind in Northern hemisphere.

The surface water moves as a thin layer on top of deeper layers of water. As the surface layer moves, other layers beneath it are set in motion, thus passing the energy of the wind down through the water column. Current speed increases with increase in depth. and the Coriolis Effect increases the curvature to the right.

Thus each successive layer of the water is set in motion at a progressive speed and in a direction progressively to the right of the one above it. At some depth, a layer of water may move in direction exactly opposite from the wind direction that initiated it. If the water is deep enough, friction will consume the energy imparted by the wind and No motion will occur below that depth.

Ekman Transport, which is the average water movement for the entire column is at a right angle to the wind direction.

Leeuwin Current :-

Leeuwin Current is a warm current along west coast of Australia. It comes from warm water dome piled up in the East Indies by the Pacific Equatorial Current. During El-Nino Event, the leeuwin Current weakens, so the cold western australian Currents bring droughts.

Irminger And Norwegin Current:-

Irminger Current is a warm Current on the west Coast of Iceland i.e, East of East Iceland. Norwegin Current is a warm current along Norway Coast.

Somali Current:-

Somalic Current is a warm Current along the Coast of Africa and it is an Extension of N.E Current due to N.E. monsoon. During SW monsoon /Summer, the Winds reverse causing the N.E Current to be replaced by South west monsoon Current which flows in opposite direction. The winds Cause the Somalis Current to reverse as well which flows rapidly Northward and feeds the South west monsoon Current.

Subtropical Gyres:-

1. The North Atlantic Subtropic Gyre is named Columbus Gyre after the Great Sailor as he was the first one to Exploit its Currents.
2. The South Atlantic Subtropic Gyre is named Navigator Gyre after Portugal's prince Henry, The Navigator who founded first Navigation School in Europe and launched Oceangraphy's age of Discovery.
3. The North Pacific Subtropic Gyre is named Turtle Gyre after/in the honour of Turtles that Cross the pacific Ocean leaving and returning to their Ancient Breeding Beaches in Japan.

4. The South Pacific Subtropic Gyre is named Heyerdhal Gyre after the fearless Explorer Scientist who proved an Ancient Journey from South America to Polinecia by reenacting it.

5. The Indian Ocean Gyre is named Majid Gyre after the 15th Century Arabian Sailor Ahmad-Bin-Majid whose maps guided Europeans in the world Ocean

SEASONALITY

(1). Seasonality refers to both the Seasonal Variation of the Sun's position over the horizon and the change in day lengths during the year

(2). Horizon refers to the apperant line at which the Earth and Sky Seem to meet.

(3). Sun's Altitude refers to the angle b/w Sun & Horizon. At Sun Set or Sunrise the Sun's Altitude is Zero as the Sun is at Horizon.

Subsolar Point And Declination:-

Subsolar point refers to the point, where the Sun is directly over head. Sun's Declination is the latitude of subsolar point. Declination Annually migrates through 47° of latitude between the Tropic of Cancer and Tropic of Capricorn.

- Reasons For Seasons:-

(1). Earth's Revolution in its Orbit around Sun.

(2). Earth's Daily Rotation on its Axis.

(3). The Tilt of the Earth's Axis.

(4). The Unchanging Orientation of Earth's Axis (Axial Parallelism).

(5). Spherical Shape of the Earth.

Earth's Revolution in its own Orbit around Sun:-

At an average distance from Sun of 150 million km, Earth Completes its annual Orbit in 365.24 days at a Speed averaging 107 280 kmph. in a Counter Clock wise direction when viewed from above the earth's North pole.

Earth's Rotation Around the Sun:-

* MAP POINTING *

(1). Sea - refers to one of the small body of ocean with proper name

Ex: China Sea.

The term is also used to refer to a large body inland salt water for Ex: Dead Sea.

(2). Bay: A coastal curved intation of a sea or lake into the land. It is a wide opening or greater in width than in depth. It is usually considered to be larger than a cove and smaller than Gulf.

(3). Gulf:- refers to large inlet of sea, cutting into the land more deeply than a bay. It is more enclosed by the coast than a Bay is. It may it self contain on or more bays.

(4). Strait:- A narrow passage of water connecting two larger bodies of water

(5). Sound: Sound refers to a stretch of water connecting two larger bodies of water. for Example connecting sea and a large lake to ocean. It is wider than Strait.

(6). Isthmus:- A Narrow strip of land with water on each side, connecting two larger land masses, for example two continental land masses or a mainland and a peninsula.

(7). Channel:- Passage of water larger than strait connecting two larger bodies of water

02.10.2014

Geography

The first rule of tinkering is to save all the pieces

Simplicity is the ultimate sophistication

If you are all wrapped up in yourself, you are dressed.

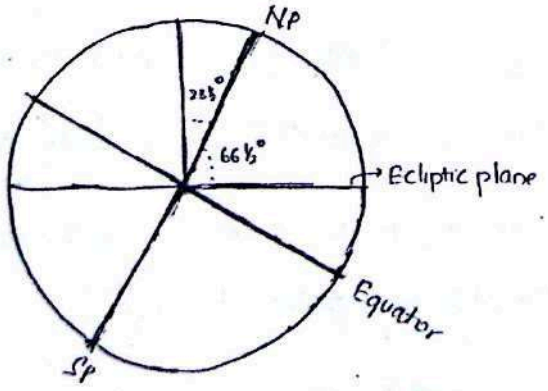
(2). Earth's Rotation:-

It determines day length, causes apperent motion / deflection of ocean and currents and produces tides in relation to the gravitation Pull of the moon and the Sun.

Earth's rotation produces the diaural pattern of day and night. The dividing line between day and night is called The Circle of illumination

The Circle of illumination always divides the Equator Evenly and therefore day length at the equator is always evenly divided i.e 12hrs of day & 12hrs of Night. All other parallels experience Uneven day lengths through the Seasons, Except for two days a year i.e, Equinoxes.

(3). The Tilt of Earth's Axis:-



To Understand Earth's Tilt, Imagine Earth's Elliptical Orbit about the Sun around the sun as a plane with half of the Sun and earth above and below the plane. This flat Surface is termed the plane of Ecliptic. Now imagine a perpendicular line passing through the plane. From this perpendicular, Earth's axis is tilted 23.5°, It form a 66.5° angle from the plane itself. The axis to the earth's two poles points Just Slightly off Polaris, which is appropriately called The North Star.

(4) Axial Parallelism:-

Through out our Annual Journey around the Sun, Earth's axis maintains the Same alignment relative to the plane of Ecliptic and to polaris.

In each position, Earth is revolving with the axis Oriented identicall or parallel to itself, This Condition is known as Axial Parallelism.

(5). Earth's Spherical Shape / Sphericity:-

Earth's Curved Surface presents a Continually Valid angle to the incoming parallel rays of Sun. The latitudinal variation in the angle of Solar rays, results in an uneven global distribution of Insolation. The Only point recieving insolation perpendicular to the Surface is the Sub Solar point. This Occurs at lower latitude, where the energy recieved is more Concentrated. All other places recieve

Insolation at angle $< 90°$ and thus Experiences more diffused Energy.

This Effect is Significant at Higher latitude.

Annual March of the Seasons on The Earth:-

The Combined Effect of 5 physical factors is the annual march of the Seasons on the Earth. Day length is the most Evident way of sensing the Changes at latitudes away from equator. The Extremes of day length occur in December and June. The times around December 21st and June 21st are termed Solastices. They mark the time of the year when the Sun's Declination places it directly over one of the two tropics#.

The term Solastice represents Sun standing still or Sun reaching the highest Position.

Key Seasonal Anniversary dates, Their Names w.r.t Northern Hemisphere and Subsolar point locations or Declinations.

Approximate Date	Northern H.S Name	Location of the Subsolar Point Declination
Dec 21-22	Winter Solastice (Dec. Solastice)	$23\frac{1}{2}°S$ (Tropic of Capricon)
March 20-21	Vernal Equinox (March Equinox)	$0°$ (Equator)
June 20-21	Summer Solastice (June Solastice)	$23\frac{1}{2}°N$ (Tropic of Cancer)
Sept 22-23	Autumn Equinox (September Equinox)	$0°$ (Equator)

11els represent the Sun's farthest Northerly or Southerly positions.

#- Tropic - Tropicas (latinword) means Turn. Tropics represent 11els of latitude @

A. December Solastice:- December 21-22

1. The Circle of illumination Excludes the Northpole in Northern region and Includes Southpole in Southern Region.

2. The Subsolar point is at 23½° S latitude.

3. The Northern Hemisphere is tilted away from the more away direct rays of Sunlight, Thereby Creating a lower angle for incoming Solar rays and a more diffused pattern of Insolation.. Thus Causing our northern winter.

4. From 66.5°N latitude to the 90°N, the Sun remains below the horizon the Entire day. The latitude 66.5°N marks the arctic Circle, The Southern most parallel in the Northern Hemisphere that Experiences the 24hrs period of darkness.

5. During the following 3months, the daylength and the Solar angles, gradually increase in Northernhemisphere, as earth completes ¼th of its Orbit around the Sun

B. Vernal Equinox (or) March Equinox: March 20-21

1. At this time the Circle of illumination passes through both the poles So that all locations on Earth Experience 12hrs days and 12hrs Night Those living around 40°N latitude(Newyork) have gained 2hrs of day light since december Solastice.

2. At the North pole, Sun peak above the Horizon for the first time since the previous September and at South pole, Sunlit Setting.

C. Summer Solistice or June Solistice: June 20-21

1. From march, the Seasons move on to June 20-21, the Subsolar point has now shifted from the Equator from 23.5° N latitude i.e, Tropic of Cancer.

2. Since the Circle of Illumination now includes the Northpole region, Every thing North of Arctic Circle recieves 24hrs of daylight - The Mid Night Sun.

3. In Contrast, the region of the antarctic Circle to the South pole is In darkness, the day (entire)

Autumnal Equinox (or) September Equinox:- September 22-23

1. The Earth's Orientation is such that the Circle of Illumination passes through both the poles So that all parts of globe have 12hrs day and 12hrs Night.

2. The Subsolar point has returned to the Equator with days becoming Shorter to the North and longer to the South.

3. Researchers Stationed at Southpole See the disc of the Sun rising Ending the 6months of Night

Dawn And Twilight :-

The diffused light which occurs before Sunrise and after Sunset represent useful worktime for human beings.

Light is scattered by the molecules of atmospheric gases and reflected by dust and moisture so that the atmosphere is illuminated. Such effects may be enhanced by the presence of pollutants and other particles such as those from Volcanic Eruptions or forest fires.

The duration of dawn and Twilight is a function of latitude, because the angle of the Sun's path above Horizon determines the thickness of the atmosphere through which the Sun rays must pass. Lower Sun angle produce longer dawn and Twilight periods. At the Equator where the Sun's rays are nearly perpendicular to Horizon throughout the year dawn and twilight are limited to 30-35 minutes each. These times increase to 1-2 hours at 40° latitude and at 60° latitude they range upward from 2½ hours with little True night in Summer. The poles Experience Twelve of Dawn and Twelve of Twilight leaving only 2½ months of near darkness. During the 6 months when the Sun is completely below the Horizon.

CLOUD AND PRECIPITATION

Cloud is the visible manifestation of condensation on a fairly large scale in the Nature.

Precipitation – Types and forms.

Type of Precipitation refers to mechanism through which air is uplifted to make clouds. The 3 major types of precipitation are :-

(a). Convectional form/type
(b). Frontal form/type
(c). Orographic form/type.

By forms of Precipitation, we mean that how the Condensed moisture reaches to the Earth's Surface. The major forms are :-

(a). Rain
(b). Drizzle
(c). Sleet
(d). Hail
(e). Snow

Relative Humidity is the ratio of the moisture in given air at given temperature to the maximum moisture it can hold at same temperature Generally it is Expressed in percentage.

Latent heat : * Water $\xrightarrow{LH}$ Vapour (v. absorbed)

* Vapour $\xrightarrow{\text{Condensation}}$ liquid droplets ($>0°C$) (dew point)
Vapour $\xrightarrow{LH\ is\ released}$ Ice Crystals ($<0°C$)

Dew Point:

The temperature at which air gets cooling and gets Saturated Or it is a temperature beyond which if there is further cooling. there takes place Condensation

Manocha.

20.10.2014 Geography

Thought of the day:-

1. Success is getting what you want
   Happiness is wanting what you get

2. Success without religion is lame.
   Religion without Success is Blind.

Clouds:

Clouds form when air happens to cool to dew point and vapour condenses into water droplets and/or Ice Crystals. Clouds indicate the state of atmosphere and whispers about future weather.

→ Two Conditions Necessary for cloud formation are-

(a). Air must be Saturated

(b). There must be a Substantial quantity of Small particles Called Condensation Nuclei around which liquid drops/ Ice Crystals Can form when Vapour Condenses

~~[redacted]~~

* Albedo:-

→ Orginal from latin word Albus, which means white..

→ We refer to percentage of Energy reflected by a given Surface.

→ The Average planetory albedo is about 32% (32~35)

→ Albedo of moon (Average) is about 7~8%

→ Clouds effect the amounts of insolation reaching the Earth's Surface.

Classification of Clouds:-

The General classifications of clouds was proposed by Luke Howa

in 1803. Howards classification was a descriptive one and based on shap

height

Shape:-

Howard recognised 3 standard shapes

1. Cirrus - like a lock of curly hair.
2. Stratus - like a layer or sheet or ceiling.
3. Cumulus - like a heap or Pile

He used the word "Nimbus" for rain bearing cloud.

Height:-

a. Height at which a cloud is formed:-

High clouds - Clouds formed at elevation above 6000m (about 20000ft)

low clouds - Clouds formed at elevation below 2000m (below 7000ft)

middle clouds - Between 2000 - 6000m (between 7000-20000ft

b. Clouds with Great Vertical Extent:-

Such Clouds may grow from low base to height as much a

15km (50000ft about) - Such clouds have restricted horizontal spread.

They are generally Cumulus in shape.

High Clouds are mainly Cirrus in shape

low clouds are maily Stratus in shape

for Middle level Clouds, Howard used a prefix 'Alto'

He made Compositenames using the above mentioned latin words, ex- Cumulo Nimbus, Cirro Stratus etc.

High Clouds are Composed of large crystals.

middle High Clouds are usally formed of coated droplets, which frequently Exist in a Super Cooled state at temperatures well below freezing.

* Types of Precipitation:-

By type of precipitation we mean, the mechanism with which air is Uplifted to result in Clouds and Precipitation.

There are 3 major types of precipitation.

1. Conventional
2. Orographic
3. Frontal

1. Conventional:-

1. It is due to Unequal heating of different surface areas.
2. It is restricted interms of latitudes (especially low latitudes), Season (Summer), Time of the day (in the presence of the sun)
3. The Convectional precipitation is showery, with large rain drops descending fast but only for a short duration.

II. Orographic

1. It is due to a topographic barrier.

2. On the cold moist side of mountain, air raises, cools adiabatically Condensation take place and precipitation results.

3. On the leeward side, air descends, warm adiabatically and relative humidity reduces and results into rain shadow zone.

4. Orographic precipitation can occur at any latitude, season, anytime if there is a barrier and moist air is forced to move above.

5. Orographic precipitation is more likely general, gentler, and prolonged, showery and brief.

III. Frontal :-

1. Front is a zone of transition between two contrasting airs.

2. It is typically feature of middle latitude.

3. In a front warm air raises over the cold air and results into clouds & Precipitation.

Note :- The features of frontal precipitation depend on the type of front formed

- Cold front :- In which cold air is aggressive and it uplifts the warm air in vigorous fashion over a small area to greater heights - resulting into precipitation more or less similar to Convectional type.

- Warm front :- In which warm air aggressive, in this front warm air raises in much gentler ways with more of a colder horizontal spread resulting in precipitation with similar to Orographic type

Precipitation:-

1. Condensation forms clouds and all precipitation originates in clouds.
2. However all clouds donot yield precipitation.
3. Great multitudes of the cloud particles must joined together in order to form a drop large enough to overcome both Turbulance & Evaporation and thus be able to fall to earth.
4. It is still not well Understood why most clouds donot produce precipitation.

There are two Hypotheris which attempt Explaining the process of precipitation These are :-

1. Collision - coallescence Hypotheris.
2. Ice Crystal Formation Hypotheris: (or) Bergeron - Findeison Hypotheris.

1. Collision - Coalescence Hypotheris:-

In many Cases, particularly in the tropics, clouds have temperatures too high for the formation of Ice Crystals in such clouds, Rain is formed by the Collision and meging of water droplets Condensation alone Cannot yield rain because it produces lots of small droplets but no large drops. Thus Coalescences is necessary. Apparantly, Coalescence is assured only if atmospheric electricity is favourable i.e, if a +vely charged dropler Collides with a -vely charged one. The larger they grow, they faster they hit.

Vapour Pressure:-

The pressure Exerted by water vapour in the atmosphere is called Vapour Pressure

If the air is Saturated, the term Saturated ~~vapour~~ vapour pressure is applied

SVP is greater over water surface than over an Ice surface. It means it takes more vapour molecules to saturate air above water than it does above Ice.

Ice Crystal formation:-

1. Ice crystals and Super cooled water droplets often co-exist in clouds. These two are in direct Competition for the available water vapour that is not yet Condensed.

2. There is lower Vapour pressure around Ice Crystals, so they attract most of the vapour and the water droplets, in turn, tend to Evaporate to replenish the diminishing Supply of vapour. So the Ice Crystals grow at the Expense of the water droplets. Until they are large enough to fall. As the Ice Crystals descend through the lower, warmer portions of the cloud, they pick up more moisture and become still larger. They may then precipitate from the cloud as the Snow flakes or they may be melted and fall as rain drops.

* Super cooled water droplets refer to water in the form of microscopic droplets at a temperature below 0°C.

Forms Of Precipitation:-

31.10.2014 Manocha

Geography

→ Thoughts Of the Day:-

* All Sins all attempts to full Voids

* Who do not stand for Some thing . fall for anything.

Forms of Precipitation:-

Several Forms of Precipitation Can result from the processes - Collision Colluscus and Ice crystal Formation. The form that result depends largely upon the air temperature and its degree of turbulance.

A RAIN:-

(1). Rain refers to Drops of liquid water (0.5mm - 6mm diameter).

(2). It is the most Common and wide Spread form.

(3). It forms when Dew point Temperature is more than Freezing and by the melting of Ice Crystals as a decend through Warmer air.

B DRIZZLE :-

(1). Drizzle Is a Spray like rainfall in water drops which are of an extremely Small Size having a diameter of less than 0.5mm and fall at a very Slow pace.

(2) These drops generally have their origin in Low and thin Stratus Clouds.

(3) These minute droplets donot Collide and collus with other droplets with in their short lived Journey to Earth.

(4) Like fog and mist, Drizzle adversly affects Visibility

(5) Drizzle is Generally not associated with Convectional Clouds.

C. SNOW:-

Snow is typically a feature of middle and higher latitudes. It also occurs in higher elevations of lower latitudes. The snow is usually dry and powdery. Snowflakes being made of snow crystals act like prisms scatter light in all directions. That is why, snow appears white.

D. SLEET:-

In general, the term sleet refers to a mixture of rain, snow or hail. In UK sleet refers to small drops of rain, that freeze as they come down.

E. HAIL:-

The precipitation form with the most complex origin, Hail; which consist of rounded or irregular pellets or lumps of ice. Large Hail stones are usually composed of roughly concentric layers of clear and cloudy ice. The opaque portions contain numerous air bubbles among crystals of ice, where as the clearer parts are made up of large ice crystals. Hail is often produced in Cumulo Nimbus Clouds as a result of active Tubulance and vertical air currents. The Hail stone normally continues to grow whether it is raising or falling; provided, it passes through portions of the cloud that contain Super Cooled Droplets.

CLOUD BURST:-

Cloud burst is a fanciful term used for sudden, very concentrated downpour of water. The area effected generally is quite small. This is for the reason that the cloud burst is caused by intence local convectional raising.

CLOUD SEEDING:-

It refers to the introduction in clouds of Condensation Nuclei, Salt particles or water droplets with the objective to induce more precipitation. It is grieved by the Scientist that Solid Carbondioxide and AgI Smoke can enhance cloud growth & hence increase precipitation

But the results of cloud seeding are not predictable or reliable.

LITHOSPHERE

Landform refers to Earths Surface Configuration. forex - Hill, Valleys, plains, plateaus

Landscape refers to assemblage of land forms in a given region

A given landscape in the nature represents the stage of the eternal fight between the Endogenetic and Exogenetic processes

Endo and Exogentic processes are collectively refered as GEOMORPHIC PROCESSES

Geological Time Scale:- 4600 mill years — P.T. (Present)

It refers to a relative age calender of earth history is called the Geological Time Scale.

James Hutton Statement:-

The Present is the Key to the Past - 1795

Later day geologist (Charles Lyell) amplified his statement to the level of a Principle and reffered to it as the Principle of Uniformitrdism

There is an implicit assumption in hutton's statement that the Geomorphic Processes which are happening at present must have been happening in Geological Past too.

Earth Internal Structure:-

Most of the little knowledge of the earth's interior is through indirect Evidences, through study of Volcanic materials, lava materials, Seismic Waves etc.

Major Source of Energy for Exogenetic process is Sun.

It is generally believed that the major source of energy for Endogenetic process is the Radio active disintegration of elements in the Earth.

Exogenetic Process:-

1. Weathering:-

It refers to disintegration and decomposition of rocks → in-situ

2. Mass Movement:-

movement of weathered material because (primarily) due to Gravity...

3. Erosion:-

It refers to the movement of the weathered material by primarily by the agent like wind, water, glacier etc.

ENDOGENETIC MOVEMENTS *

- (A). Slow movements (Diastrophic movements)
  - (A). EPEIROGENETIC MOVEMENTS
    - A. Epeiro means a Continent
    - B. Epeirogenetic movements are because of radial forces (radially up/down)
    - C. Epeirogenetic movements effect a very large area of Earth surface and result into a. Emergence – Upwarding
      b. Subsidence – Downwarding.
    - D. Warping refers to a slow deformation of a very large earth surface because of the radial forces. It is of two types - Upwarping and downwarping.
  - (B). OROGENETIC MOVEMENTS
    - Due to Tangential forces
      - Compression
      - Tension
    - Orogentic movements
      - (a) Folding
        1. folding refers to a budding of earth crust, results in fold mountains like Himalayas
        2. fold mountains are also called as Mountains of Elevation as they grow to the great heights
        3. folding is because of Compression
      - (b) faulting
        1. Whenever there is a movement of rocks along weak zone it is referred to as faulting
        2. faulting is primarily due to Tension
        3. faulting also produces mountain and valleys. The mountains which are produced by faulting are known as Block mountains, Horst. The valleys are known as Rift valleys or Graben
        4. faulting also happen due to Extreme Compresia
- (B). Sudden movements
  - (C) Earth Quakes
  - (D). Volcanoes (Volcanic eruptions)

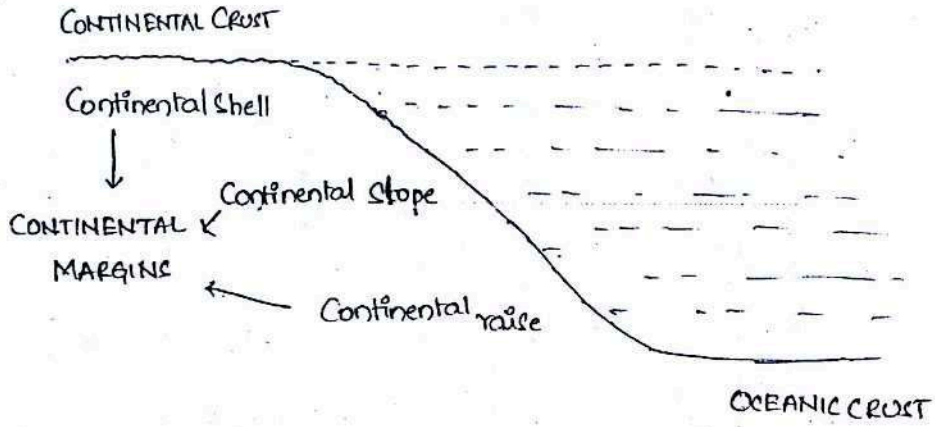
* This typology is based on time of manifestation, but not time of preperation of the Event.

Earth's Internal Structure:-

Crust → Continental crust, Oceanic crust

Mantle

Core



6th Nov. 2014

Geography

Manocha.

Nature teaches us more than

She preaches us...

Earth's Internal Structure:-

1. Crust
2. Mantle
3. core - Innercore, outercore.

Earth's Crust:-

The Crust accounts for only 1.14% of the earth's volume and 0.53% of its mass. The Crust beneath the Continental regions (interior) average above 40 km and oceanic Crust averages only 5 kms. The Continental Crust is basically granitic (SIAL/FELSIC). The Continental Crust has two layer

Upperlayer - FELSIC → Feldspar + Silica

lower layer - MAFIC → Magnesium + Ferrous

There is no sharply defined surface of Seperation between these two layers.

In Contrast, Ocean Crust is basalic (SIMA/MAFIC)

The oceanic crust is Thinner but more in density than Continental Crust

Mantle:-

Mantle:-

The Mantle Extends from the base of the crust to the core and it is approx 8900km thick and occupies 82.54% of Earth's volume and 66% of its mass. Mantle is rich in oxides & Silicates of Iron & magnesium represented by minerals like Olivine & Pyroxine. Mantle is more dence and tightly packed at depth with lesser densities towards the Surface. The Entire mantle Experiances a gradual temperature Increase with depth.

Core:-

Core is approximately 3475 km in radius. It accounts for 16.32% of earth's Volume and 33.4% of its mass.

Course Composition:-

- Iron - 89%
- Nickle - 6% and rest are constituted by sulphur, O2 etc.

1. The Inner Core's radius is about 1250km
2. The temperatures inside the Core range from 3000-6650°C.
3. In the Core, the pressures are estimated to be as high as 3-million times its pressure at atmosphere at sea level.
4. The Inner Core remains solid, even though it is at high temperature, because of tremondous pressure
5. The outer Core is in molten state.
6. The Convection Currents of the Hot materials in the outer Core gives rise to Earth's Magretism (Electro magnetic Induction,)

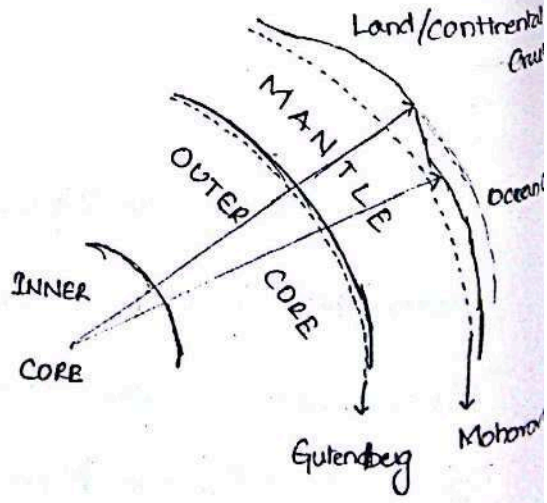
→ Discontinuities:-

- Between Crust and Upper mantle

  MOHOROVICIC DISCONTINUITY (MOHOS)

- Between Lower mantle and outer Core

  GUTENBERG DISCONTINUITY



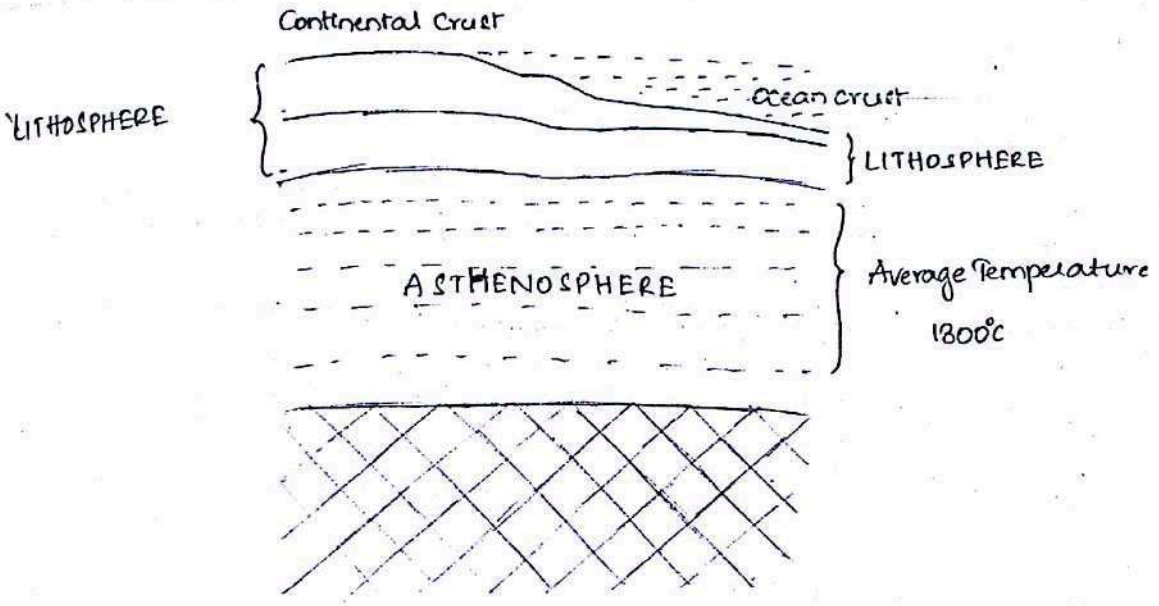
. James Hattons Statement in the year - 1795

- Principle of Uniformitiranism

. Alfred Wegener - Continental Drift Hypothesis. (1915-16)

ASTHENOSPHERE:-

- Soft layer of the Earth.



Below the Earth's Surface from about 70km down to about 300km is the Asthenosphere - The plastic layer of the Earth. This layer Contains the pockets of Increased Heat from radioactive decay. It is Susceptable to slow Convection Currents. The average temperature of this zone is about 1300°C. It is believed that Magma is formed in this region. The Slow movements in this zone disturb the overline lithosphere and lead to Tectonic Activity (faulting & General deformation, folding of Surface rocks). The word Tectonic Comes from the word Tectone and it refers to Building activity of the part of the Earth.

In Geologic langauge, the rigid layer above asthenosphere is called lithosphere (Lithos in Greek means a stone). The important Concept we derived from these effects that the rigid lithosphere has a Capability of moving bodily over Asthenosphere. The Asthenosphere would yield by slow plastic flow of the Hot materials.

Plate Tectonics:-

- Lithospheric Plate Tectonics.

According to plate tectonics Theory, the earth's lithosphere is subdivided into parts - major & minor. These parts are refered to as Lithospheric plates. These plates have relative interactions. According to the recent thesis, most of the quakes, mountain building processes, Volcanoes take place along the plate boundaries or in their Vicinities

Continental Margins Active margins

Passive margins

Active Margins:-

Those margins where we find plate Boundary interactions taking place in the present time period.

Ex:- Pacific margins.

Passive Margins:-

Those margins where we do not find boundary interactions take

for ex:- Atlantic margins.

There Can be 3 types of Plates

1. Continental
2. Oceanic
3. Partly continental- Partly Oceanic

3types of Boundary interactions / plate interactions

1. Divergent Boundary Interaction.
2. Convergent Boundary Interaction.
3. (i). Continental - Continental BI - Collision type
   (ii). Oceanic - Continental BI - Sub-duction type.
   (iii). Oceanic - Oceanic - Subduction type.
4. Transformed Boundary Interaction.
   i. When one plate just slide pass the other
   ii. leads to Earthquake proneness.

Paleomagnetism:

→ fossil Magnetism

→ Thermo-remnant Magnetism

"Wit is educated Insolence."

Paleomagnetism:-

Paleomagnetism refers to the past magnetism of the earth recorded in a given rock of particular time period.

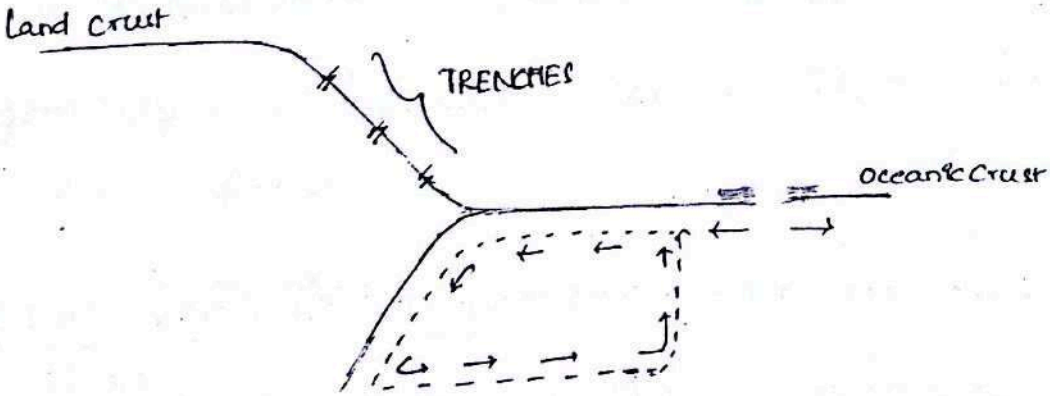
Ignious rocks act as good tape recordings of past magnetism.

Paleomagnetism also refer to as Fossil magnetism or Thermo remnant magnetism.

Note:- Divergent Type boundary interaction, geologically Speaking is refered to as Constructive type Boundary interaction as it results in the formation of Neco Crust.

Oceanic Continental Convergence leads to Subduction process and geologically Speaking is refered to as destructive Boundary interaction.

Trenches:



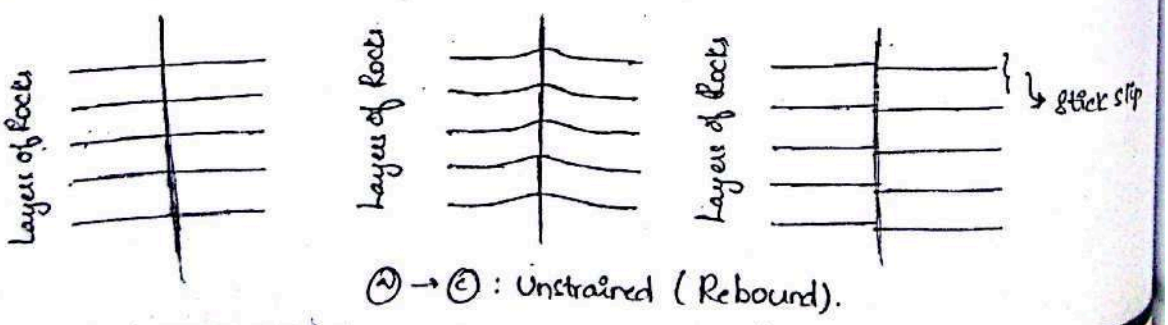
Earth Quakes:-

Rocks have a certain rupture strength, which means that they will continue to bend, rather than Break, so long as the stress imposed on them does not Exceed this rupture Strength. When this stress become too great, the rocks suddenly move along the plane (fault) that may or may not have existed before the deformation began. That sudden movement snaps the rocks on the each side of the fault back into their original shape and produ an Earth quake. In other words, an earthquake is a release of Energy that has been built up during the stress of increasing deformation of rocks. This energy release take the form of Seismic Waves that radiate in all directions from the place of movement.

- 1906- A Serious earthquake in Sanfransisco.
  - Started Study of the earthquakes.
  - H.F. REID gave a Crude Hypothesis over the earthquakes.
  - The same theory is used even today even after 108 years by the time from now.

- H.F. REID (1906)- ELASTIC REBOUND HYPOTHESIS (OR) STICK SLIP PHENOMENON

(a). Unstrained ⇨ (b). Strained ⇨ (C). Unstrained.



(A) → (C) : Unstrained (Rebound).

• Pattern of Energy Release:-

Foreshocks ⇝ Major shocks ⇝ After shocks
(EARTH QUAKE)

• Classification of Seismic Waves:-

An earthquake produces pulses of Energy called "Seismic waves."

Seismic waves are broadly two types.

1. Surface waves
2. Body waves

Focus: The point of origin of earthquake. It is also called as Hypocentre.

Epicentre: It is the vertical focus trace on the earth surface.

In general, maximum damage because of an earthquake is not at the epicentre but around it.

SURFACE WAVES

(a) These waves travel along the ground surface or just below it. These waves are similar to waves on water surface.

(b) • Rayleigh waves (or) R-waves
• Love waves (or) L-waves

(c). L waves cause the maximum destraction

BODY WAVES

(a.) These waves travel through the solid body of the earth and these are some what like sound waves.

(b). Body waves are of two types
• Primary waves (or) P-waves
• Secondary waves (or) S-Waves

(c). Body waves are faster than the surface waves.

(d.) L-waves are little bit faster than the R-waves.

(d). P-waves are the fastest and the first one to be recorded. Therefore the primary waves.

(e). S-waves are slower than Primary waves, second to be recorded by seismograph.

∴ The sequence of arrival of these waves to seismograph are in the order of P, S, L, R

Primary waves can travel through solid, liquid and gases. These are compressional and Push-pull waves and move the material forward and backward in the same direction that the waves themselves are moving. ∴ The material through which P-wave is passing is Expanded and Compressed. As the wave moves through it and it returns to its original shape after the waves are passed by.

Infact some P-waves emerging from the earth are transmitted into the atmosphere as sound waves that at certain frequencies can be heard by humans and animals.

Secondary waves or Shear waves can travel only through solids. These are Shear waves because they move the material perpendicular to the direction of Travel. There by producing Shear stress in the material they move through. Because liquids and gases are not rigid, they have NO shear strength and S waves cannot be transmitted through them.

Love waves: The motion of L-wave is similar to S-wave but the individual particles of the material only move back and forth in a horizontal plane perpendicular to the direction of wave travel. Love waves are most damaging to the building foundations.

R-waves:

1.12.2014

Geography

Manocha.

- No winter lasts forever...
  and No Spring Skips its turn..!!
- The only thing you need...
  to fear is the fear itself..!!
- If you are going through Hell - keep going!!

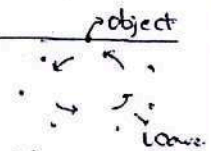
R-Waves:

R-waves behave like water waves. In that they move forward while the individual particles of material move in elliptical path within a vertical plain oriented in the direction of wave movement.

The - "Sea" -

- refers to the part of the ocean where wind generated waves originate.

Wave: object



Nonet motion

- Wave steepness = $\frac{\text{Wave height}}{\text{wave length}} = \frac{h}{L}$.

* TSUNAMI *

Tsunami has two Japanese words

Tsu - Harbour
Nami - waves.

i.e, these are harbour waves.

Tsunamis are unusual waves that originate from Earth quakes. Some times these waves are wrongly called as Tidal waves - No relation Exist. Tsunamis are usually caused by fault movement or displacement in earth's crust along a fracture. This not only causes an Earth quake, but also a sudden change in water level at the ocean surface above.

Characteristics of a Typical Tsunami:-

1. Wave length - more than 200 km.
2. Speed - more that 700 kmph
3. Carrying immense energy
4. Can travel 1000's of kms without wasting much of its energy.

In the open ocean, these waves have the heights of only approx. 0.6m. Therefore Tsunamis are not easily observable until they reach the shore.

In shallow waters, they slow down and the water begins to pile up. Tsunamis may form Crest that exceed 30m height, rushing into Unsuspecting Harbours with distructive results

A Tsunami may Consist of Single wave but multiple waves are much likely depending on how the earthquake releases energy. The ocean most affected by Tsunami is The Pacific Ocean as it is full of Subduction zones along which large magnitude earthquakes occur. Before Today's Tsunami warning Existed, The first Notice of a Tsunami to most observers would be the rapid Seaward Recession of the Shore line. The Recession would be followed in minutes by one or more destructive waves.

Measurement of an Earth Quake-

Earth quakes range from Tremors to great Shock. This reflects the magnitude, the amount of shaking of the ground as the quake passes as measured by a Siesmograph. Magnitude is assessed on the Richter scale which assign the number to an earthquake, based on the Severity of the ground motion. This open end scale was developed by CF Richter, California. It is a logarithmic scale:

A given value earth quake is 10 times more Severe than the previous lower value earthquake and 100 times more Severe than the next previous value.

In terms of energy released, a factor of 31.5 is estimated as follows

Energy of Earth Quake (E) = 31.5 x E.EQ(7)

= 31.5 x 31.5 x E.EQ(6).

Another measure of an earth quake size is its Intensity. This reflects the impact of an earth quake on the Cultural landscape. Intensity is reported on the Mercallis scale, First developed by the Italian Geologist Giuseppi Mercalli in 1905. The Scale was modernised in 1931 and is now Called modified mercallis Scale. It assigns a number, ranging from I to XII to an earthquake. It is a close ended scale.

The 3rd Scale of Earthquake measurement is Moment Magnitude Scale. This Scale Considers a area of a fault along which the rupture occured and the amount of movement of rock adjacent to the fault. Some Scholars prefer

this Scale in the measurement of Severe Earth Quake.

3 types of Earth Quakes on the basis of focal Depth:-

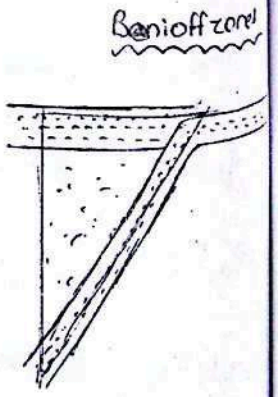
1. Shallow Quakes:- Focal depth < 70km.
2. Intermediate Quakes:- focal depth : 70-300km.
3. Deep Quakes :- Focal depth: 300-700km

Shallow Earth quakes with Few Exceptions are more destructive in Nature. 90% of All Earth quakes are with focus less than 100km. only 8% are deep in Nature

Distribution of Earth Quakes in the World:-

The Heaviest-Concentration is along Circum pacific belt of Subduction zone (Japan, phillipines, Indonesia, Columbia, Peru, Chile etc). This belt alone registers about 80% Earth quakes. It registers all the 3 types of Earth quakes. Deep Earth quakes are restricted to this belt alone.

- Benioff zones are the inclined Earth quake zones which exist along the pacific coast, where the foci of EQ depen from the Shallow through Intermediate to deep in a LAND WARD direction from the Trenches.



Another zone of High Earthquake incidence is the trans Eurasian Belt which Extends from the Mediterranian Sea through South west Asia and Himalayas into South East Asia, where it meets the Circum Pacific Belt. This Belt registers about 15%. of Earthquakes. It Experiances shallow and intermediatory EQ's.

Rest 5%. Can be accounted for by the

1. Earthquakes along Ridges (Mid Oceanic)
2. East African Rift Valley Systems
3. Intra Plate Earth Quakes.

A third zone of Earth Quake Proneness is associated with global System of Mid oceanic ridges, with an extension to East African rift valley System. This zone generally prone shallow Earthquakes. In the Case of ridges, the EQs are because of Transformed Boundary Interactions along the zones, where the ridges are Sliced off.

Intra Plate Earth Quakes:

These are those earthquakes which happen in the interior of the plates away from plate margins. Intra plate Earthquakes are supposed to be because of the ancient faults of the body in the plate. This activation is because of Compressive Stresses which are generated on the body of plate, when plate goes for Boundary interaction.

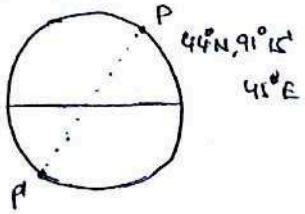
22.1.2015 Geography Manocha

- Worrying is like a rocking chair,
  It gives you something to do but gets you nowhere.
- To think too long about doing a thing
  often becomes the undoing.
- Religion is not the cause of woes, it is an excuse.

Seismic Gap:-

Seismic gap refers to a gap in the historical occurance record of Earthquakes in an Earthquake prone area. It is an area where statistically it is seen where the major earth quake is "due". This implies that in this area much more time has elapsed with out a major earthquake than the average time gap between two major earth quakes as per the Historical occurance record.

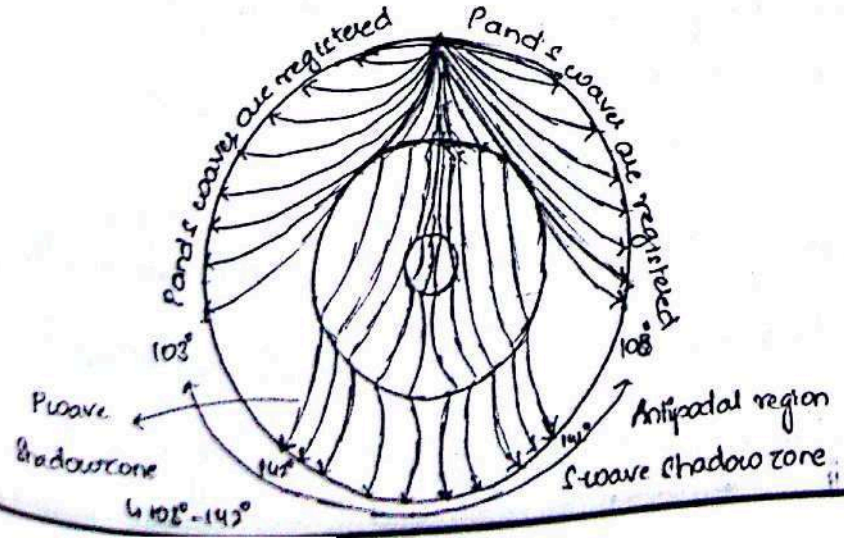
Shadow Zone: S.W.SZ → 103° - 108°
P.W.SZ → 105° - 142°



P: 44°N, 91°15'45" E

P': 180 - P = 44°S, 88°44'15" W.

- "Antipode" refers to the point which is diametrically opposite to the given point on the Earth surface.



- Antiscentre - The Antipode of the EPICENTRE of an earth quake

Asthenosphere is "Solid enough" to allow the passage of S-waves or Sheer waves.

Effects of Earthquake:-

- When movement along a fault generates an earthquake that the result may be visible at the surface in the form of a fault scarp.
- Landslides, mudslides and other forms of mass movements often result from a combination of circumstances among which a quake can be crucial
- Liqui-faction:

  Earthquake waves gets significantly amplified when they pass through soft ground/Alluvial deposits. During the shaking of an EQ, the water saturated material may result in subsidence, fracturing and Horizontal sliding of the Ground surface.

- Tsunami - Already covered.
- Sometimes secondary effects like fire can be more destructive than the Earthquake itself.

Shield:-

The continental shields are large, relatively stable and flatter expanses of very old rocks. Shields perhaps constitute the earliest "slabs" of solidification of the molten crust. Shields form the nuclei

of the landmasses. Even apperently stable shields can be shaken by severe earth quakes.

Important shields of the world :-

1. Indian shield (Peninsular plateau Region)
2. Australian shield (Western half)
3. African shield (forms the lagest shield of the world).
4. Laurentian shield (Canadian shield)
5. Venezuelan shield.
6. Brazilian shield.
7. Antarctic shield (Under the Ice in Eastern Antarctic)

North Anatolian fault:-

North Anatolian fault cuts turkey East, west Across and makes it Very Earth quake prone. Transform boundary interaction along this fault leads to Earthquake in Turkey

San Andreas fault:-

It forms a junction between the North American plate and pacific plate. Transform boundary interaction along this fault leads to Earthquake in California

Earthquakes are of two types: Tectonic Earth quakes

There are those associated with faulting.

Volcanic Earthquakes:

which are associated with the volcanic Erruptions.

Tectonic Earthquakes are divided into 3 subtypes

1. Shallow
2. Intermediate
3. Deep

Seismograph and Seismogram:

- Seismograph is a machine which detects, records and measures the Vibrations produced by an earthquake.
- Seismogram is the record of seismic waves detected by Seismo-graph
- Seismograph was first made by an Italian Scholar, Filippo Cecchi in 1875.

Homoseismal lines and Isoseismal lines:

Homoseismal lines are the lines which joins the places which recieve earthquake waves at the same time. These are generally elliptical and run around epicentre.

Isoseismal lines joins the places with the same Intensity of waves. These are Circular or Elliptical in shape.

John Mitchell was the first to recognise that the Earthquake spreads in waves and destructiveness reduces outcpaude.

ORDER OF RELIEF

Relief refers to differences in elevations i.e, difference in highs and lows of the area. Differences in elevations create relief features on the earth surface. for Example, Himalayas have a youthful landscape full of diverse relief features. Where as the great Northern plains have a monotonous relief

The maximum relief of the earth as a planet at present is about 20km i.e, the difference between Mt. Everest (~9km) and Challenger deep in mariana trench (>11km) ⇒ 11+9 = 20km

- Continents - Ist order
- Himalayas - IInd order
- Shivaliks - IIrd order
- Hill - IVth order
- Cliff - Vth order.

* Map *

Scale: $\frac{\text{Distance of the map}}{\text{Distance or ground.}}$

Small scale maps * ——— * large scale maps
(Atlas, maps) (Covers small areas, reveal more)

maps for taxation: Cadastral map

Small scale covers the large area but do not reveal details. large scale maps covers small areas but reveal more details. The large scal maps used for purpose of Taxation are generally called Cadastral maps

I. First order relief:-

It represent small scale end of the spectrum which reveals that the features of the largest that can be recognised - Continental platforms and ocean bases.

II. Second order relief:-

It consists of major mountain system (like Himalayas / mid Oceanic ridges like mid atlantic ridge) and other extensive surface formations of subcontinental extent such as Amazon river basin.

III. Third Order Relief:-

It encompasses specific land form complexes of lesser extent and generally of smaller size than those of second order with no precise seperation between the two. Ex: It include discrete mountain ranges (Shivaliks) and large river valleys/basins.

Iv. Fourth Order Relief :-

It comprises the details of the 3rd order relief features including such individual land form as Hill.

V. Fifth Order Relief:-

It consists of small individual features that maybe part of fourth order relief, such as a sandbar, cliff or waterfall.

12.2.2015

Geography

Manocha

Vision without action is a daydream..!

Action without Vision is a night mare..!!

51. (b). Advection.

Primary distribution- Radiation

Redistribution - Advection.

Process of Horizontal movement of Heat transfer - Advection.

Advection: The movement of air or coater in a Horizontal direction.

52. (c). Both (1) & (2).

53. (c). Earth Overshoot day

Earth is a finite planet. It provides Humanity and Ecological Services, Resources.

Earth overshoot day - The day after which Humanity comes into deficit.

2014 → 14th Aug. 2014 & in 1987 → It was in december.

It is an alarm for next generation.

It is also called as "Ecological debt day"

- Environment day - 5th June.
- Earth day - 22nd April
- Bio Capacity day - No such day

54. (b). 5.5 gm/cm³.

The density of rocks of the Crust - 2.7 - 3.0 gm/cm³ mantle - 3.3 - 5.5 gm/cm³ Core - 10 - 13 gm/cm³

55. As ocean basins and Continents

(b). 40 & 60

56. (a). Relative Humidity

measured by Psychrometer. It is nothing but a Hygrometer.

It has two thermometers:-

1. Drybulb thermometer → gives t_d
2. wet bulb thermometer → gives t_w.

Evaporation depends on moisture of air.

No evaporation - no cooling ⇒ air is saturated.

R_H is given by difference of t_d & t_w

**. Cloud cover is measured in Units of Octa ~ $\frac{1}{8}^{th}$

Atmospheric pressure - Barometer.

*57. Dew point - temp at which air on cooling get Saturated.

Cold air - dry & Warm air - moist.

(c). Both 1 & 2.

58. principle of Uniformitrianism: what is happening today had happend earlier.

(d). None of the above.

59. (c). Glaze.

Sleet = mixture of rain, snow/Hail. In US,

60. (a). Namib desert

The Namib desert is also known for having tallest sand dunes in the world

61. Answer (d)

62. (a). 1, 2, 3.

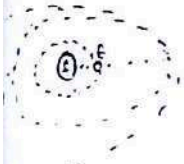
. Cirro Stratus (H)

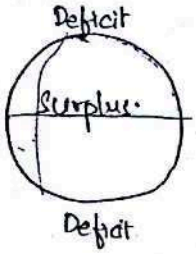
. Alto Stratus (M)

. Stratus (L).

63. (a). 1, 2 and 3.

64. (d). 1, 2 & 3.





65. (d).

$\frac{2\pi R}{360}$ = 111 km R = radius of Earth

66. 1. Causing earth's axis to be tilted $23\frac{1}{2}^{\circ}$ from a line $\perp$ the plane.

(c). Both 1 and 2.

67. (c) Both 1 & 2

68. (c) Both 1 & 2.

69. (a).

70. (c)

71. (a). Rub-al-khali → Empty-Quarter → largest single stretch of sand.

72. (c). Mt. Nilkenyara.

(a). Mt. Kosciuszko-GDR Highest peak

Logan - Canada

Toubkal - Atlas mountains

73. (b). 100m.

74. (c). Both 1 & 2

75. (d). 1, 2, 3.

76. (d). None of the above.

77. (c) Both 1 & 2

78. (d). 1, 2, 3.

79. (b). Warping

80. (d). None of the above.

81. (c). Gravity

82. (b). Mantle

83. (d).

84. (c) Both 1 & 2.

85. 4 most abundant Elements in terms of % weight :-

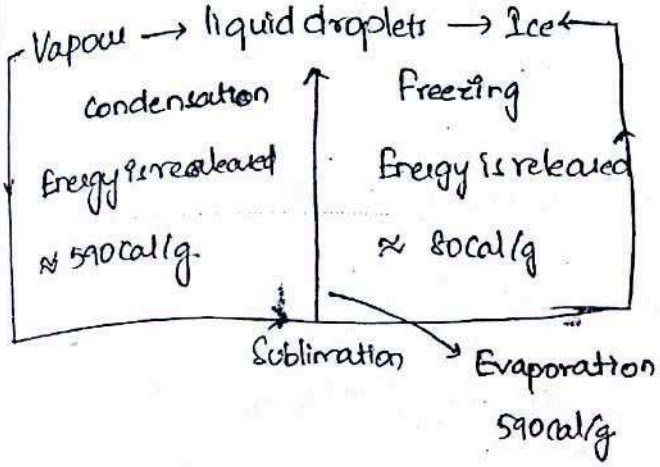
(a). Earth (b). Earth's Crust

Iron - 35%.	O_2 - 46%
O_2 - 30%	Si - 28%
Si - 15%	Al - 8%
Mg - 13%	Fe - 6%

85. (a) 590 cal/g.

@ 20°c of earth.

at Boiling point it is 540 Cal/g



86. (c). Lower Stratosphere.

87. (d). Ozone.

Volume of Dry air → as moisture varies from point to point.

Atmospheric Composition near earth Surface.

Permanent Gases	Variable gases
Nitrogen - 78.04%	CO_2 - 0.03%
O_2 - 20.95%	Vapour - 0-4%
Argon - 0.93%	Ozone - 0.000004%
Neon - 0.0018%	
Helium - 0.0005%	

88. (a). 1, 2, 3.

89. (c) Gilbert walker

90. (c) 2 & 3.

91). (C). Both 1 & 2

Plate tectonics is the reason.

92). (C). Transform

93). (b) Tuzo Wilson

94. Earth & Sun are Black bodies.

∵ Earth surface and the Sun absorb and radiate with nearly 100% Efficiency for their respective temperatures. Both behave as black bodies Earth's Atmosphere does not behave like a black body as it absorbs some wave lengths and is trans-parent to some others. Answer-A.

95. Presence of moisture in the air is an essential condition but not a sufficient condition for precipitation to take place.

Answer-C.

96. Answer- B

97. Answer-A.

98. Answer-A.

99. Answer-B

100. Answer-C

VULCANISM

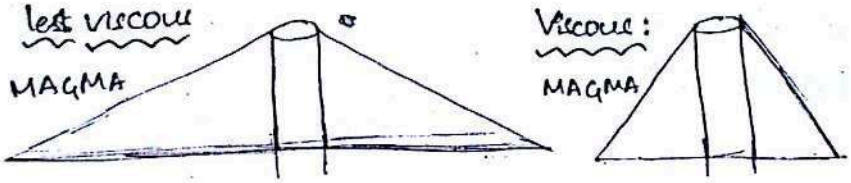
Vulcanism refers to the process of eruption of molten material (Magma/Lava)

the process of eruption is of two types.

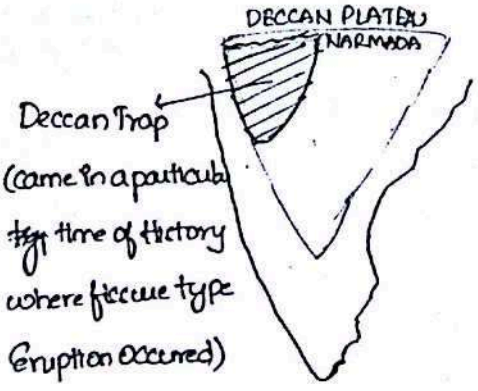
a). Central Type Eruption

b). Fissure Type Eruption

a. In this, the molten material comes out through a 'pipe'/ conduit form from the inside of the Earth. This Eruption results in a steep sided Conical hill or a gently sloping Extensive feature called Dome or a shield



b. As the Name Suggest, is through a linear fracture (fissure). The molten material flows on both the sides and results in more or less Horizontal sheets.



• Trap in Swedish language → Step like Structure

Deccan Trap – Huge/numerous Fissure type erruptions resulted in Black Cotton Soil (Regur).

The Deccan Trap erruption region of India, i.e, Northwest portion of Deccan Plateau had numerous fissure type of erruptions in the Geological past. The word

Trap in Swedish language refers to a step like Topography.

#LIPs of the world : Large Igneous Provinces.

Ex: Columbian Plateau; Deccan Trap.
(NA) (IND)

Volcano :

The term Volcano refers to the pipe/Conduit through which the eruption take place.

There are 3 types of volcanoes:

1. Active
2. Dormant
3. Extinct

Lava is of two types :

1. Basic Lava
2. Acidic Lava

Basic lava is one which is rich in mg & Fe and poor in Si.

It is less viscous i.e, it is quiet mobile; when it erupts. Therefore it results in a Shield or a dome Covering Extensive area.

Acidic lava is poorer in Mg & Fe but richer in Si.

It tends to be more viscous because of the Complex bonds of Silica. It form a Steep Sided Conical Hills.

In the beginning of the Earth's History, all the rocks were igneous in Nature None of the three presently occuring types of rocks (S, I, M) is taken to be primary rock as in modern Geology we believe in cyclic formation of rocks

Most of the present day atmospheric composition is through the past Volcanism In the Initial History of the Earth, there was much more volcanism than present and through these eruptions, Volatiles got ejected.

These Volatiles were held to the earth by the Force of the gravity.

The present day atmospheric composition got finalised only around 600 million years ago. i.e, Cambrian Period. (600 million years - 510 million years).

Distribution of volcanic Activity:

1. Along Subduction Boundaries - i.e, Ring of Fire around the pacific - For Ex: Phillippines, Japan, Mt. St. Helens (Washington, US)

2. Along Seafloor Spreading Centres on the Floor. (For Ex: Iceland) and areas of rifting on continental plates (For Ex: East africa rift Valley System).

3. At Hotspots where individual plooms of magma rise through the crust. A Hotspot volcano is a volcano situated away from tectonic plate margins.

Hot Spots are very Hot areas in the Earth Mantle. Hotspots are supposed to be fixed in location.

Ex: Hawaiin Islands

Easter Islands

Yellow Stone National park US

Re Union Island (reason for numerous fissure type eruption in North western part of Deccan traps).

IGNEOUS FORMATIONS:

1. Intrusive Igneous formation.
2. Extrusive Igneous Formation. - faster Cooling resulting in Fine grain rocks. Basalt is the most common Extrusive rock and is particular widespread in the ocean bases.

If the Cooling is very fast, then the appearance is glossy.

Slow Rate of Cooling results in coarse grate rocks. The most Common intrusive rock is Granite

Intrusive Igneous Formations:

Pluton is a term used to describe all forms of Igneous Intrasive formations of all sizes.

Country Rocks:

The originally present rocks of an area in which igneous intrusions take place. Intrusions are of two types on category of size.

1. Stock
2. Batholith.

Stock is a collective term for small sized Igneous Intrusions.

A Batholith is a Huge igneous intrusion of great depth covering a large area (more than 100sq.(km). Batholith is irregular in shape & intrudes across the layers of country rocks. It lies often at the centre of major mountain ranges. It cools very slowly resulting in a coarse grate granite like Igneous Intrusion.

Intrusive Igneous formations are of two types.

1. Concordant
2. Dis concordant.

1. It is one which follows the existing bedding planes of country rocks.

This intrusion is one which breaks right through the existing bedding planes of country rocks.

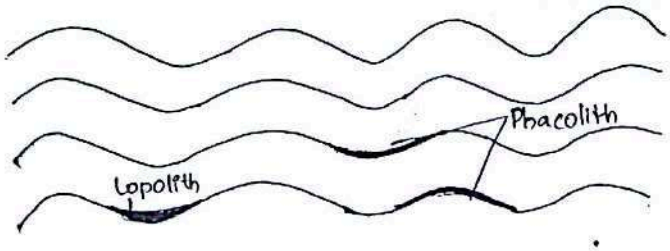
Sil: It is a thin sheet like igneous intrusion. Sil is concordant

Dike/Dyke: Dike refers to a thin wall like igneous intrusion.

It is discordant.

3. Batholith:

It is discordant.

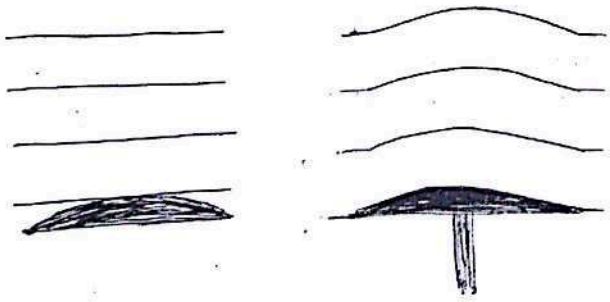


4. Lopolith: It is a saucer shaped igneous intrusion in a syncline.

It is con-cordant

5. Phacolith: It is a lens shaped igneous intrusion in a syncline or over an Anticline. It is concordant in Nature.

6. Laccolith:



Laccolith is a lens shaped / mushroom shaped igneous intrusions with Flat base that forces the overlaying strata into a dome. It is concordant in Nature

Extrusive Igneous formations:-

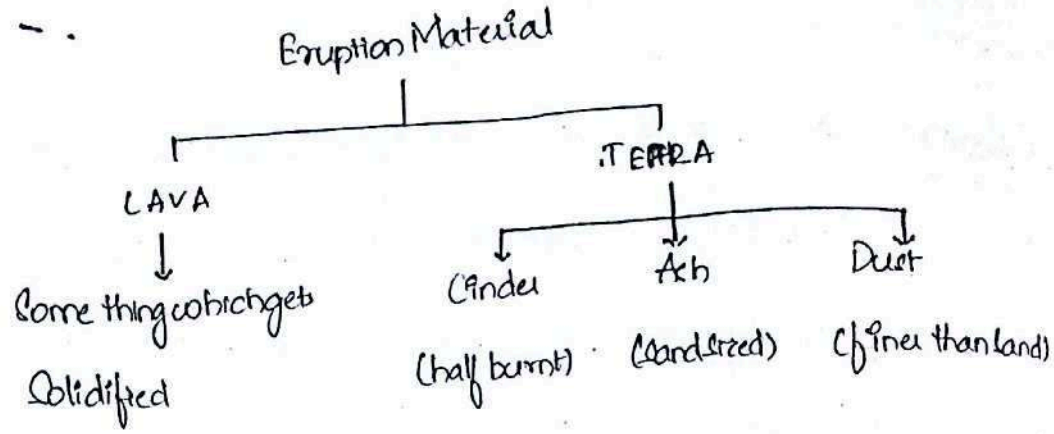
1. Scoria: Scoria refers to bubble filled stones ejected from a volcano. As volatiles escape as gases, the lava cools into stones of low density filled with bubbles / vesicles.

Pumice stone is very bubbly and light, so it floats on water.

2. Crater: Crater refers a bowl shaped/ funnel shaped depression usually round and with steep sides. A crater may result into a lake called Crater lake.

*3 Caldera: Caldera is a very large basin shaped crater. They are found at the tops of the Volcanoes where the original Crater has collapsed. The basin which is many times larger than the original volcanic vent may be flooded to produce a lake or the flat floor may contain a no. of small volcanic cones, produced by volcanic activity after the collapse.

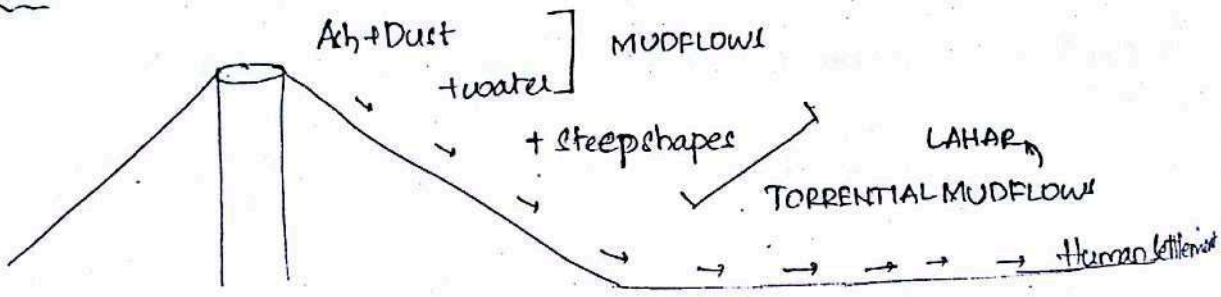
4. Plug/Spine:- A plug or spine is a pillar of hard rock left by a volcano. Geologically speaking, these are inherently weak structures and as a result cannot stand for long time.



Tefra is a term used for cinder, Ash, dust thrown out by volcanic eruption.

The term Tepira does not include lava.

Lahar:-



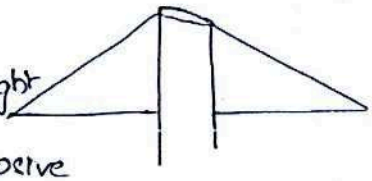
Volcanic ash & Dust and water makes mudflows. lahar refers to torrential mud flows of wet volcanic materials. These are very dangerous, destructive in Nature. It is an Example of mass movement.

Cinder Cone:

. Smile is to humanity
what Sunshine is to the flowers

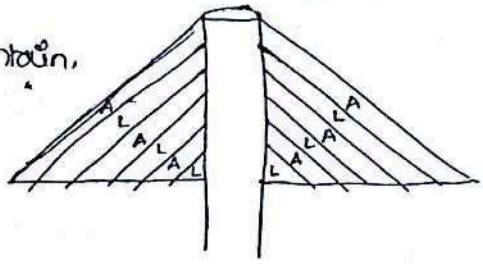
. Pain is inevitable
Suffering is optional

Cinder Cone:



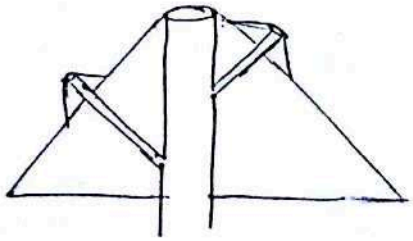
It is a small cone shaped hill usually less than 450m height it has a truncated top & it is a result of a moderately explosive fruption.

Composite cone/ Composite Volcano / Strato-Volcano:



Composite Volcano is an Explosively formed mountain. It has alternate layers of Lava & Ash. It tends to have steep Sides. It is more Conical than Sheild Volcanoes.

Brasitic Cones:



From the main conduit of the Volcano cone, Subsidiary dikes or pipes may reach the surface as feeders to parasitic cones.

Magma chamber:

All the magma that escapes in big erruption is believed to accumilate in a massive Chamber called magma chamber beneath the ground.

Hot Spring / Thermal Spring:

It is a continuous flow of Hot water from the Ground. It is usually (but not always) associated with present or former volcanic activity. Hot Springs are not explosive. Hotsprings have dissolved minerals.

Geyser:

Geyser is a hot Spring that intermittently, some times at regular intervals, throws up a jet of hot water, steam etc. It may occur in areas that are / were volcanic in nature.

Fumaroles:

They are small vents that shoot out steam and gas.

Pyroclast:

Pyro - fire clast - rock / piece of rock / fragments of rocks.

Fire Broken - It refers to a fragment from an explosive volcanic eruption.

Nuee Ardente - ('Glowing' Cloud):

It is term used to describe a pyroclastic flow that is accompanied by an ash cloud.

Tephra: If it is of a size or Cricket / Tennis ball - Volcanic Bombs
If it is of a size of pea - Lappili

Aa and Pahoehoe:

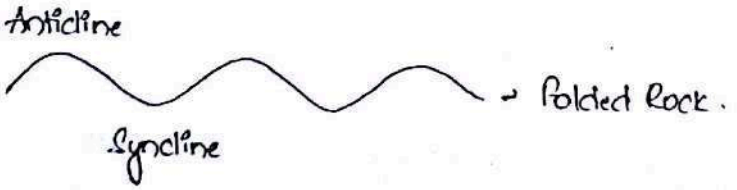
"Aa" is a Hawaiin word & refers to Jagged chunky lava (angubu Blocky) found in Hawaiin Islands & else where

"Pahoehoe" - Lava may cool quickly to develop thick skin, If a lava continues to flow underneath, the surface wrinkles into rope like coils called "Pahoehoe"

Folding:

It refers to the buckling in the rock strata of the earths crust. This happens because of Compressive stresses. The folding dependsion factors like strength of force, strength of rocks, Arrangement of rocks etc.

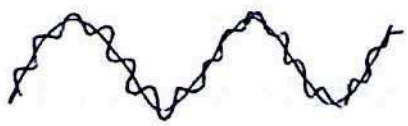
All types of rocks (Igneous, metamorphic, sedimentary) can undergo folding though it gets manifested more clearly in the sedimentary rocks



Geoanticline

Geosyncline :- Geo anticline refers to a very large size Anticline & very large size Syncline it called as Geosyncline.

Anticlinorium & Synclinorium:



Anticlinorium refers to large Anticline structure with numerous small folds on it. Synclinorium refers to a large syncline structure consisting of numerous smaller folds

Competent rocks are very rigid rocks compared to the layers of rocks above and below & tend to crack rather than distort as they fold.

In-competent rocks are those which bend & distort as they fold.

Dis harmonic folding is when different layers of rocks have different degrees of competence.

Structure:

Structure is a Geological term and in particular it refers to the composition, the arrangement and the Nature (folding, faulting etc) of the rocks of an area.

Anticline of folded Areas - Ridges ; Synclines - Valleys.

Some areas shows opposite (not often). - Anticlines of the past may come down & Syncline may stand still (Converse topography). This generally happens due to Differential weathering.

Anticlinal structure is a weaker structure inherently & are easily prone to weathering.

* The Simplest relation between structure & topography and one that generally occurs in Nature makes the upfolded anticlines producing ridges and the down folded synclines producing valleys.

Jura mountains - Switzerland.

A Converse relationship may evolve, however, with valleys developing on the anticlines and ridges on the Synclines.

Hinge of fold:-

Hinge of a fold is a line drawn along its maximum Curvature. The Hinge of a fold may be Horizontal or it may be inclined (plunging).

Axial Plane:

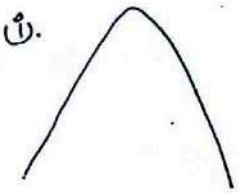
Axial plane of fold is an imaginary surface that divides the fold as symmetrically as possible.

Types of folds:

(i). Symmetrical (or) Neutral fold:

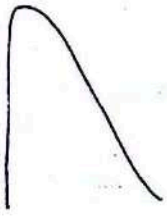
A fold in which no limb is steeper than the other.

(i).



(ii): Overturned fold: one limb is almost vertical.

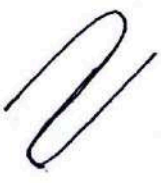
(ii).



(iii). Isoclinal fold:

It is the one in which two or more limbs are parallel (almost)

(iii).



(iv). Recumbent fold:

It is formed when one limb lies over the other i.e., when Axial plane is subhorizontal.

(iv).

(V). Overthrust fold:

(b).

It is formed when with further increase in pressure the recumbent fold may be sheared or sliced by fault planes lying almost horizontal.

(VI). Nappe:

Further increase in pressure leads to the forward movement of the rocks of the upper limb along the plane of shearing and is referred to as Nappe. In french Nappe means a table cloth or cover sheet. This movement may be for lots of time - At time facilitated by Gravity and/or ground water.

Multiple folding:

It refers to the situation when the Axial surfaces of the older folds are folded by the younger folds and in some areas folds of different ages are super imposed up on one another.

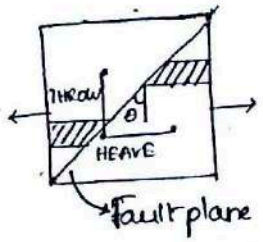
Faulting:

It is said to have taken place when there is a movement of rocks along a weak zone. The term fault refers to a fracture in rock along which blocks of rocks slip past each other. Faulting is primarily because of tension, but it also takes place due to the Extreme Compression.

* Horizontal displacement of rocks is called Heave

* Vertical displacement of rocks is called Throw.

* Angle of Hade: It refers to the angle between the fault plane & an imaginary vertical plane.



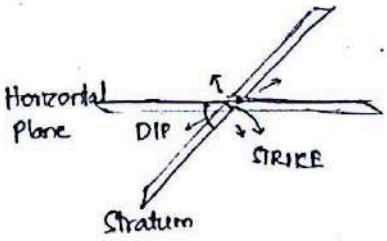
θ = Angle of Hade.

= A_{hd}

Types of Faulting:

→ DIP and STRIKE:

* Dip refers to the maximum angle of the slope of a tilted Stratum (bed of rock), measured directly downward from the Horizontal plane.



* Strike is the Compass direction of a line formed by the intersection of the surface of an inclined Stratum with an imaginary Horizontal plane.

The Direction of Dip is ⊥ to Strike.

Types of Faults:-

e. Either write something worth reading or do something worth writing.

Normal Fault:

It is formed when blocks of rock slip straight down because of tension. Since the movement is in line with the dip of the fault, it is called Dip Slip fault. A Normal fault is steeper than the reverse fault. It generally dips at an angle of 65-90°.

Reverse Fault:

It is formed when one block of rock slides up over another because of compression. Such faults are gentler but much more varied than the normal faults.

Thrust or Overthrust Faults:

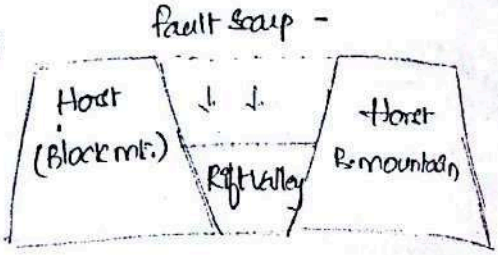
It is a reverse fault with an angle of 45° or less. The overlying block may get shifted far more / over the underlying blocks.

Wrench or Tear or Transcurrent or Transform:

Wrench or Tear fault is a fault in which blocks of rocks slip sideways past each other. As the movement is along the strike; It is also called the Strike Slip Fault.

Rift Valley:

It is a huge Trough shaped Valley Created by faulting. The floor of a rift valley is called a Graben.



Ex: The East African Rift valley System.

(2). Death Valley in California (as Temp are High)

(3). Rhine Graben

Horst:

Horst or Block mountain refers to a block of rock thrown up between normal faults. It is opposite of the Graben. It Creates a Huge higher plateau or mountain range

Ex: 1. Black forest in Germany.

(2). Sinai desert in middle East.

(3). Ruwenzori mountains in East Africa.

Fault Scarp:

It is a Huge Cliff (a High standing steepface) Exposed as a massive block is thrown up or down.

Slickensides:

It refers to the polished and Scarrated Surfaces which are formed as a result of faulting.

Soils

Rocks → WEATHERING → COMPLEX → Physical / Chemical / Biological → CHANGES → Soils

Passive Reservoirs of minerals

Active Reservoirs/pools of minerals.

Deccan Trap
↓
Black cotton Soil
↓
Basaltic
↓
LIPS

ctors Effecting Soil formation:-

Parent Material:

Black cotton Soil (Regur) is one of finest Example of a parent material Controlled Soil.

Climate:

The role of Climate is to vary the inputs of heat and moisture. Climate Effects the rate of weathering, the most rapid breakdown e in Hot & Humid Environments.

Biota: (Vegetation & Animals) {Both living & dead}:

Topography:

a. Slope: Rate of formation ≡ rate of removal.

- Steeper the Slope thinner the Soil cover.

b. Aspect:

It refers to the position of a place with respect to the Sun's rays.

for e: Southern Slopes of Himalayas are Sunfacing Slopes.

Time: Time is a passive factor in Soil formation.

Fault Breccia:-

It refers to rock fragments created by faulting.

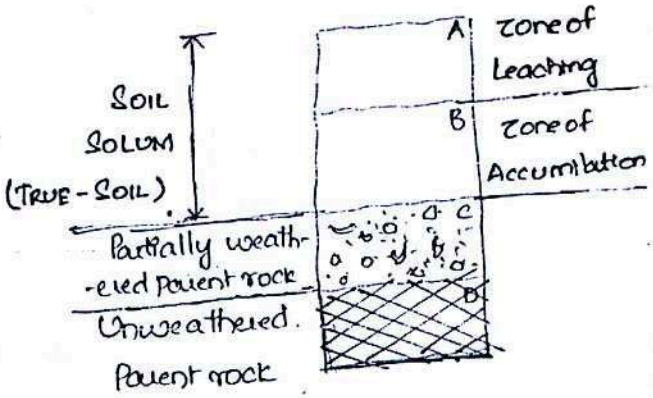
- The Depth of fault actions is unknown but major faults maybe penetrating many kms into the Earth's crust.
- The Earthquakes are usually but not Exclusively associated with faults.

In General Climate is seen as more dominant in soil formation.

Soil Profile:

It refers to a vertical section through the soil showing the different horizons.

- Precipitation > PET
  - * Western parts of western Ghats
  - * North Eastern region
  - * Andaman & Nicobar Islands



Leaching:

- Where rainfall is heavy, the downward movement of water through the soil transports mineral salt through it, a process known as leaching.
- Leaching tends to make a soil Acidic in nature.
- Leaching leads to deficiancy of minerals.
- Desert soils need not be inherently poor soils.

Capillary Action:

Where rain fall is light or where Evapotranspiration Exceeds precipitation, water & mineral salts are drawn upwards towards the surface by the process of Capillary Action.

This action tends to make soils alkaline in nature - Dry conditions lead to the formation of alkaline soils.

- 4 Standard Pedogic Process:-

Pedology - Soil Science.

1. Additions.
2. Losses - Soil Erosion
   Leaching
3. Translocations.
4. Transformations:
   (i). Organic matter decompes & transforms into Humus
   (ii). Primary minerals of the rock transforms to become Secondary minerals.

Soil profile:

It is the product of the balance between the Soil System Inputs (A) and Outputs (L) and the redistribution of (TL), and chemical changes (TP) in the various soil constituents.

Soil:

The Soil is a natural body of Animal, mineral & Organic Constituents differentiated into Horizons of variable depth which differ from the material below in morphology, physical makeup, chemical properties and composition and biological Characteristics.

IONS

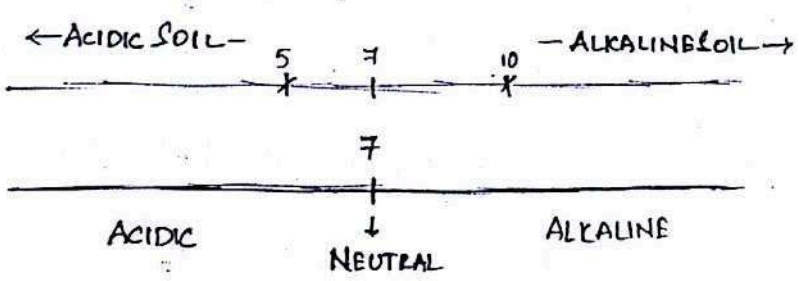
ANIONS — CATIONS

CATIONS → Base Generating Cations → $Ca^{++}/Mg^{++}/Na^{+}$

CATIONS → Acid Generating Cations → H^{+}

The dominance of one of these two types of Cations determine the pH of the soils. Base generating Cations are much more soluble in water than acid generating Cations.

pH Scale:-



foodcrops in general require a little Alkaline character of a soil.

To reduce the acidic nature of the soil, farmer mix the lime (Ca^{++}) into the soil.

pH Acidic of soils:

(A). Leaching (High rainfall areas)

(B). Incomplete decomposition of Organic Matter → Release Humic Acids ↔ Lack of Oxygen (Anaerobic) ↔ Lack of Heat

Alkalization:

It is a process by which soils with high exchangeable Sodium (Na) and pH greater than 8.5 are found. often in such soils, Sodium Carbonate & Sodium bicarbonates are formed (Na_2CO_3, $NaHCO_3$). The soils with pH morethan 10 are called Alkaline soils or Sodic soils.

Salinization:

It is the process of Accumulation of Soluble Salts in the soil.

(A) Arid Areas:
- Lack of water in general
- Capillary Action

(B) Lowlying Coastal Areas
- Ganga-Brahmaputra delta region.

(C) Over irrigation Area
- Use of Ground water
- Canal irrigation

The mineral content of the soil is seen in terms of the following 3 particle size ranges:

- Sand, Silt and Clay

Particle Size Range: (diameter in mm):

(A). Sand: → Coarse → 2 - 0.2mm
→ Fine → 0.2m - 0.02mm

(B). Silt: 0.02mm - 0.002mm

(C). Clay: <0.002m (finest)

Clay being the finest of all, plays the most important role in soil Chemistry

The Power of imagination makes us infinite

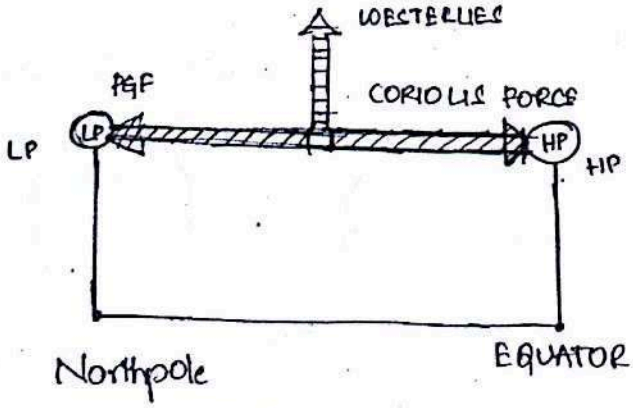
Most common atmospheric disturbance in Tropical region/belt is Easterly waves.

* JET STREAMS *

Atmospheric Circulations:

1. George Haley (1735) - One Cell model.
2. William Ferrel (1856) - A Three Cell model.

In the beginning of 20th century, scientists discover that the upper troposperic Circulations are much more complex than what was envisaged by William Ferrel in 1856. In general, Scientists have found the upper tropospheric circulations are westerlies in character.



Northern Hemisphere

Geostrophic winds
↑
PGF, Coriolis Force
Balance

In General the upper tropospheric circulations below under the balance of PGF & Coriolis Force - Such winds are called geostrophic winds (Global-balance).

Jet streams in general are the inner course of the upper level / upper tropospheric westerlies. These are very swift winds.

They attain maximum speed in winter season (more than 400 kmph because of stronger thermal contrast blw lower and higher latitudes. The lower tropospheric circulations like cyclones, monsoons etc are found to corelated with Jet Streams aloft.

Important Jet Streams:

A. Polar front Jet Stream:

PFJS is the Jet stream which is related to Polar front formed in the middle latitudes. It is a global Jetstream.

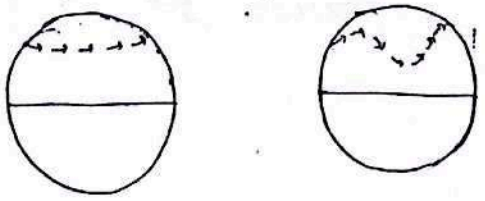
B. Sub-tropical or Tropical westerly Jet stream:

It is a global Jetstream. mean position - 27°N

C. Tropical / Equatorial Easterly Jetstream:

mean position - 14°N

C.G. ROSSBY (1940's):



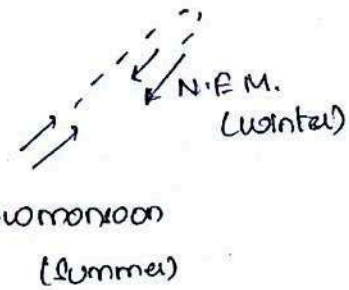
C.G. Rossby discovered that Jet Streams meander in Atmosphere and result in wavy formations (Rossby waves). These waves finally break into pools of cold & warm air and help in latitudinal heat balancing.

MONSOON

Monsoon originates from Arabic word Mausum which means season and by monsoon we mean seasonal reversal of winds.

4 principle monsoon regions of world are:

1. South Asia
2. East Asia
3. Northern Australia
4. West Africa.



Monsoon System in India:-

1. The Summer monsoon or the South west monsoon:

° The onset of the SW monsoon along the coast of Kerala is a very sudden and drastic phenomenon and hence refered to as the burst of the monsoon. Statistically, the burst takes place with a mean date of 1 June and Coefficient of Variance of 7 days.

2. The withdrawal of the Southwest monsoon:-

The withdrawal is the gradual phenomenon.

3. The North East monsoon:

The onset of N.E monsoon is also a gradual phenomenon.

(2) & (3): Both these phenomenons are gradual and happen almost at the same time and hence tend to merge into each other. This explains the use of the popular phrase "Retreating monsoon".

The Mechanism of SW Monsoon

1. The Classical Model.

i. 17th century - Halley (in 1680's) - 1696

(ii). Hadley - 1730's

2. Shift of ITCZ - Dr. Flohn (1950's) - Germany.

3. The Role of Tibetan Plateau

   a. As a mechanical Barrier.

   b. As a heat Source.

4. Role of Jet Streams in India monsoon.

   a. T.W.J.S

   b. S.T.E.J.S

5. Tele-Connections

   a. ElNino
   b. Southern Oscillation > ENSO

HANDOUT NO. 4

INDIA'S CLIMATE

S. K. MANOCHA

VAJIRAM & RAVI

Cyclone: A wind system with low pressure at the centre. Geographically, there are two types of cyclones: **Tropical Cyclones and Extra -tropical/Temperate Cyclones**. Cyclones being **secondary circulations** are embedded in the primary circulations of the region. Therefore, the Tropical cyclones, embedded in the **Trade winds** move from east to west and Temperate cyclones, embedded in the **Westerlies**, move from west to east. The winds in a cyclone move **anticlockwise** in the Northern Hemisphere and **clockwise** in the Southern Hemisphere (the opposite is the case with **Anti cyclones**).

The Tropical Cyclones are **thermal in origin** i.e. they owe their origin to the warmness of ocean waters whereas the Temperate cyclones are **frontal in origin** i.e. they form along a front (a zone of transition between two contrasting Airmasses). **The Temperate cyclones, though frequent, are not destructive in nature. They are an important reason for more or less uniform rainfall throughout the year and high variability of weather conditions in middle latitudes. The Tropical cyclones are much less frequent but very destructive in nature.**

TROPICAL CYCLONES

The most frequent atmospheric disturbance in the tropical belt is **Easterly Wave.**

Easterly Wave: Trade winds are frequently modified by wave-like phenomena that give rise to distinctive weather systems. Westward moving air is forced to rise on the upwind side of the wave and descend on the downwind side. Thus, on the eastern side of an Easterly Wave,we can expect to find vertically developed Cumulus clouds and often heavy rainfall. But clear weather results on the leading western side of the low pressure wave trough, because of descending air. **Under certain favourable conditions, an Easterly Wave may lead to a Tropical Cyclone.**

A TROPICAL CYCLONE IS LIKE A HUGE HEAT ENGINE, WHICH TAKES ENERGY IN THE FORM OF LATENT HEAT AND THE SENSIBLE HEAT FROM WATER TO AIR. THE SPIN/VORTICITY COMES BECAUSE OF CORIOLIS FORCE.

Favourable conditions for the origin of a Tropical Cyclone:

Cumulo – Nimbus cloud

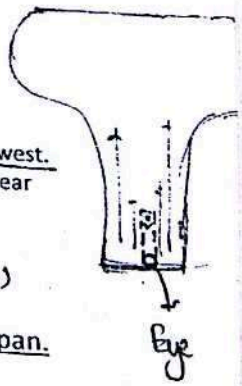
1. A low pressure condition/I.T.C.Z. formed 5 - 8 degrees away from the equator (AS IT NEEDS SOME CORIOLIS FORCE FOR CURVATURE OF WINDS).
2. Sea Surface Temperature (SST) being more than 27 degrees C.
3. A large vapour supply.
4. Differential heating of land and water.
5. Strong anticyclonic divergence in the upper air/troposphere. – Suction which is greater in upper atmosphere.

Low pressure are < 960 mb (millib

1013 mb – Nor

Features of Tropical Cyclones:

1. An acute low pressure at the centre. (≤960 mb)
2. A strong P.G.F. (minimum **wind speed > 119 km/hr.**
3. It moves east to west with a speed between 15 to 25 km/hour
4. It is about 150 to 300 km in diametre (some may reach 1000 km in diametre).
5. It generally has circular isobars.
6. It has a **Cumulo-nimbus cloud** which gives torrential rains with thunder and lightning.
7. It has typical charcteristic feature called **EYE.** Eye is the central area where atmospheric pressure is the lowest. It is generally 16 to 24 km in diametre. Since in this region, the air descends, therefore, it is comparatively clear and warm with light winds.
8. **Eye Wall:** It is the rim/edge of the Eye. **Winds reach the highest speeds at the Eye Wall.**



Regional names: *Hurricane (North Atlantic and Eastern North Pacific) *Typhoons (China) (Western North Pacific) *Baguio (Philippines)*Nowaki (Japan) - Earlier called Taifu in Japan. *Willy-willies (Australia) *Cyclones (Indian Ocean).

Hurricane - como - For fully developed cyclones

Temperate cyclone – Pto 2

Eye - Area of calmness, where there are no clouds.

Tropical Cyclones tend to die when they fall on land because of --1. frictional losses and 2. the source of energy (i.e. warm ocean water), being cut-off. These cyclones cause huge destruction in coastal areas because of-- 1. High wind velocity 2.Floods (the floods are caused because of heavy rainfall associated with a Cumulo-nimbus cloud and Storm Surge i.e. the rise of coastal waters as cyclone approaches a coast). The interior areas away from coast do have the benefit of large water supply because of heavy rainfall associated with a Tropical cyclone.

TROPICAL CYCLONES IN INDIA

- Many low pressure systems of varying stages of development, form in the Bay of Bengal and the Arabian Sea and move west or northwestwards, sometimes recurving north or northeast at a later stage. Recurvature usually occurs when the cyclones are between latitudes 16 and 18 degrees N. Only a few of them develop fully into the mature stage and the majority remain as depressions/weak systems. The systems reach their maxmum intensity before or after the southwest monsoon period.
- Cyclones generally form in a lower latitude belt (10 to 14 degrees N) before and after the Southwest Monsoon season. They are intense and are responsible for the major portion of the rainfall over the Peninsula. The maximum incidence of cyclones is from April to June and October to December.
- During the Southwest Monsoon season the low pressure systems form at the head of the Bay of Bengal and generally travel west or northwest along the monsoon trough. The rainfall over northern India is, to a large extent dependent on the frequency, track and intensity of these depresssions (MONSOON DEPRESSIONS). The Tropical Easterly Jet Stream steers the tropical depressions into India. These depressions play a significant role in the distribution of monsoon rainfall over the Indian subcontinent. The tracks of these depressions are the areas of high rainfall.

EXTRA TROPICAL / TEMPERATE CYCLONES

These are considered to be the most significant of all atmospheric disturbances as everywhere poleward of 30 degrees, they dominate weather maps. In U.S. these are called **Lows or Wave Cyclones** and in Europe, these are called **Depressions.**

Features of Temperate cyclones:

- Very extensive systems: 800 to 1600 km in diametre
- Weak pressure gradient
- Elliptical/oval isobars
- Speed of movement 30 - 50 km/hour (moves faster in winter than in summer because of the stronger thermal contrasts)

WESTERN DISTURBANCES

- With the **southward shift** of the Polar Front in winter, the tracks of the Temperate cyclones pass across the northern portions of the Indian subcontinent during the period **October to June.**
- The cyclones originating in **West Asia, the Mediterranean Sea** and once in a way, as far west as the Atlantic Ocean reach the Indian area in the course of their eastward passage.
- Because of the high terrain, mountain ranges etc. to the west, most of the disturbances are in the mature stage and hence weak or irregular by the time they reach India.
- Since these Extra -tropical cyclones reach India from the west, they are usually referred to as **Western Disturbances.**
- Reaching Rajasthan, Haryana, and Punjab, the disturbance slow down and stagnate due to the nearly closed-in nature of the region with high hills.
- With the moisture feed from the Arabian Sea, the disturbances may intensify here and move northeast.
- The tracks of these disturbances come farthest south to latitudes 22/23 degrees N in February.
- The important effects of W.Ds. are: 1. rainfall in NW plains (Punjab, Haryana etc.) (beneficial for rabi crop Wheat). 2. snowfall in higher altitudes of J & K and Himachal Pradesh. 3. Hail 4. a cold wave in the region.
- It is believed that the **Tropical Westerly Jet Stream** plays an important role in bringing the Temperate Cyclones to India.

50% (almost) people die in Bangladesh due to cyclone. (Till 1960's-70's).

VAJI RAM & RAVI

S.K. MANOCHA

MONSOON

Monsoon Trough: During the summer season, at the surface, there extends a trough from the Calcutta in the east to Karachi in the west. This semi permanent, lower atmosphere feature exerts considerable influence in the summer monsoon circulation in South Asia. The trough axis experiences considerable day to day variation in its position, which has a vital bearing upon the monsoon rainfall distribution in the region. During the **break monsoon periods**, when there is a temporary **'lull'** in monsoon activity, the trough line shifts to the foot hills of the Himalaya, rainfall over the central parts of India decreases considerably, and there is an increase in rainfall over north India along the Himalayan foot-hills.

The Mascarene High: This is the **high pressure area** at sea level south of the equator in the Indian Ocean near **Mascarene island**. The position and intensity of this High are considered to be closely linked to the South Summer Monsoon activity.

land Ocean
D: S. Breeze LP ← HP
N: L. Breeze HP → LP

THE MECHANISM OF SUMMMER MONSOON (S.W. MONSOON):

1. **The Classical Model (Halley and Hadley):** Halley hypothesized that the primary cause of the annual cycle of the Indian monsoon circulation was the **differential heating effects between the ocean and land** in South Asia. Differential heating would cause the pressure differences in the atmosphere that could only be equalized by winds from the high pressure to low pressure areas. Thus, **the first ever prepared about the mechanism of the Indian monsoon was Halley's planetary scale sea breeze-land breeze system in 1696. Hadley,** later, argued that that Halley's model was lacking in the physical ingredient of the effect of rotation of the earth about its axis. Hadley reasoned that the monsoon originates in the South East Trades of the Southern Hemisphere and as it flows across the equator towards the heated landmass, the **Coriolis force** causes it turn to right, thereby forming the Summer Monsoon or South Western monsoon. Halley model

Halley monsoon
0°
S.E. Trades

2. **Shifting of the I.T.C.Z. :** According to Dr. Flohn, The existence of Asian Monsoon is not due to the temperature contrasts between land and sea, but primarily due to the **annual migration of thermally produced planetary wind and pressure belts**. For him, the **Winter Monsoon** is nothing but the **tropical easterlies or the northern trade winds**. In summer, the **equatorial westerlies** which have been displaced northward, result in S.W. Monsoon. (Because of the shift of ITCZ by more than 20°) by Koteswaram

3. **Tibetan anticyclone:** A remarkable aspect of the large scale circulation during the summer monsoon season over South Asia is the **upper-tropospheric anticyclone** situated over the Tibetan plateau. **The Tibetan plateau, located more than 4500 m amsl with a length of 2000 km and width of 600 km in the west and 1000km in the east, is considered to be one of the key factors in the development of monsoon circulation in the region.** *The Tibetan plateau exerts its influence as a* ***mechanical barrier*** *in the atmospheric flow as well as* ***a high-level heat source***. An anticyclone appears in the upper troposphere over Tibet during the Indian summer monsoon season, primarily due to latent and sensible heating over the plateau. It appears over **southeast Asia** in May, and then moves northwestwards, reaching the Tibetan plateau around the height of the summer monsoon season. From about **September,** the anticyclone migrates southeastward again towards Indonesia and loses definition after October. **Variations in the intensity and position of this high and its orientation are closely related to the monsoon circulation over South Asia.** 4 Anticyclone

No Quantification by correlation.

4. **Jet Streams: (a) Subtropical Westerly Jet Stream:** This jet dominates the wintertime upper tropospheric circulation of the northern hemispheric low latitudes. It has a circum-global extent between latitudes 25° and 30°N and can be located over South Asia at an elevation of about **12 km** during **October to May.** The mean position of this jet is about **27°N.** This jet is split owing to the presence of the Himalayan massif in its path; a single stream is seen up to Afghanistan where it splits into two branches, one to the south and another to the north of the Himalaya, recombining into a strong single stream over China. The Jet

GLOBAL JETSTREAM

Scientist from India → Koteswaram :- Burst of monsoonal 3 the Kerala coast is perhaps related to disappearance of TWJS South of Himalayas

TEJC have Higher Jet Stream

Afghanistan Jetstreams Himalayas Global Jetstream (TWJS)

Months (Oct – may/June)

Front → First Burst then TWJS disappears

According to Dr. Koteswaram, the burst of monsoon is correlated with the disappearance of TWJS in South of Himalayas. According to his this disappearance paves the wave for the burst of monsoon along the coast of Kerala.

first appears over the northern parts of the Indian subcontinent in October, after the withdrawal of the summer monsoon and shifts progressively southwards with advance of the winter season. Thereafter, it shifts back towards, weakens and disappears from the South Asian region with the establishment of the southwest monsoon. → Himalayas

4 Months

(b) Tropical Easterly Jet Stream: This jet is a prominent feature of the upper-air circulation during the Indian summer monsoon season (**June to September**), appearing as a band of strong easterlies extending from southeast Asia across the Indian Ocean and Africa to the Atlantic, generally at a height of about **14 km**. Its axis remains close to about **14°N**. It is present over the south Indian peninsula from June to August in the latitudinal belts between 12° and 15° N and disappears by September. **The position and speed of the jet have appreciable spatial and temporal fluctuations.** which in turn are found to be correlated with monsoon rainfall distribution over Peninsular India.#

Southern Oscillation Index: The seesaw relationship in sea level pressure between the tropical Pacific and the tropical Indian Ocean has led to the development of the S.O.I., based on the pressure data at certain representative stations (for ex. SOI between **Tahiti island** and **Darwin** is the most widely used.)

El-Nino ("the child"): It is an **anomalous warming** of the eastern tropical Pacific Ocean that occurs **2 to 10 year intervals** and is frequently associated with **far-reaching climatic and oceanic impacts** around the world.

These two are believed to be connected – the southern oscillation has been identified as the atmospheric counterpart to El-Nino. The both are together refer to as **ENSO**. During the **high southern oscillation phase**, precipitation tends to be abundant in the Indonesia-Australian region, most of South Asian region, southeastern Africa and northern coast of South America. Relatively dry conditions prevail over the equatorial Pacific, east central Africa and northern Mexico. During the **low phase** of the southern oscillation, the patterns of rainfall anomalies are approximately opposite.

THE ASIAN WINTER MONSOON: In the northern hemispheric winter, a high-pressure centre of great intensity, called the **'Siberian Anticyclone'** forms over the northern parts of Asia between **40° and 60° N**. The outflow of cold continental air from this anticyclone in the Asiatic heartland proceeds towards the south and southeast over Korea, China and Japan, constituting the Winter Monsoon. **The north easterlies, during their travel over the Indian region, give winter rain to the eastern side of southern parts of the Indian peninsula in the state of Tamil Nadu and to Sri Lanka.**

West Bengal: Squall refers to winds which attain great speeds for short Durations.

The Pre-Monsoon Summer Season: The atmospheric pressure is low all over the country due to the high temperature. In May and June, high temperature in northwest India builds steep pressure gradient. Under such conditions, hot, dust laden and strong winds known as **Loo** blow. The intensity increases in the afternoon and the strong dust storms result from the convective phenomenon and are locally known as **Aandhis (blinding storms)**. These are essentially short lived **thunderstorms**, which move like a solid wall of sand and dust and are common in Rajasthan, Haryana, Punjab, Jammu region, Delhi, Uttar Pradesh, Bihar and Madhya Pradesh. *These bring little rainfall and give much needed relief from scorching heat, but temporarily only.*

The thunderstorms which originate over Chhota nagpur plateau, are carried eastwards by westerly winds. The areas with highest incidence of thunderstorms are Assam, Arunachal Pradesh, Nagaland, Mizoram, Manipur, Tripura, Meghalaya, West Bengal and the adjoining areas of Orissa and Jharkhand. **In West Bengal and adjoining areas of Assam, Orissa and Jharkhand, the direction of squalls is mainly from the north-west, and they are called Norwesters.** The rainfall brought by the norwesters is called **spring storm showers.** They are often **very violent with squall speeds of 60 to 80 km/h**. Hailstones sometimes accompany showers and occasionally attain the size of a golf ball. They cause heavy damage to standing crops and animals. The period of maximum occurrence of these storms is the month of **Baisakh (mid March to mid April)** and hence are locally called **Kalbaisakh** (kal: evil). In the south the thunderstorms occur in Kerala and adjoining parts of Karnataka and Tamil Nadu, particularly in the evenings and nights. The maximum frequency is in the south western tip of India.

The **pre-monsoonal showers** are called by various names: **Tea showers in Assam (good for tea, rice and jute); Mango showers in Tamil Nadu and Andhra Pradesh (good for mango crop)** and **Cherry Blossoms in Karnataka (good for coffee plantations).**

According to many scientists, the Heating of Tibetian plateau & L. Heat released by monsoon Precipitation provide Energy for this Jet.

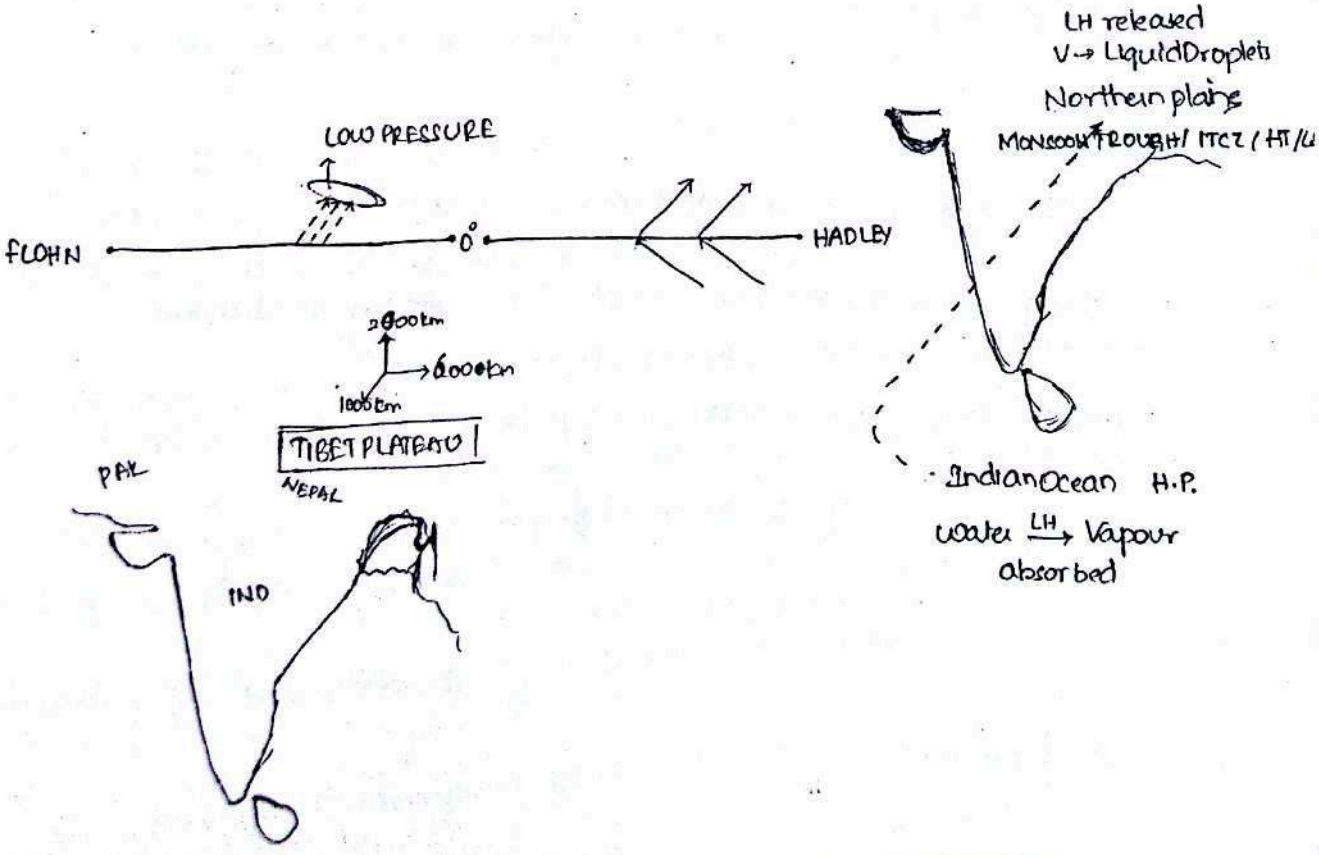
4.5.2015

Geography

Manocha

Role of moisture In South Asia's monsoon:-

Moisture also plays an important role in the atmospheric circulations, which was not appriciated by either Halley or Hadley. The moisture related processes augment the differential heating produced by Land-Sea contrast by providing a mechanism for the Solar Energy recieved over the vast Stretches of the Oceans to be collected, Stored, Concentrated and later released over the parched landscape of India by a massive atmospheric motion. As moisture layden air Comes over the northern plains, the Latent heat, as it Undergoes Condensation with Upliftmen The Release of Latent heat augments the low pressure conditions over North India; i.e, Cause gets augmented by its own effect.



SUNSPOT :-

The Sun's outer surface or photosphere shows dark, circular areas known as Sun spots. These are the areas in the surface where temperatures drop some 1400°C lower than surrounding areas. The no. of Sunspots occurring at any one time varies from as few as 4 or 5 to as many as more than 100. These dark spots on the surface of the Sun represents disturbances of the Sun's magnetic field. Each period of Sun spot activity correlates with periods of cold. There are some signs that Sun spots follow a 11 year cycle and multiples of that cycle appear at 22 and 33 years. The key to Sun spot cycle is that magnetic fields on the surface of the Sun reverse their magnetic polarity every 22 years - An interval twice the apparent Sun spot cycle.

CLIMATE CHANGE :-

- One of the basic laws of Ecology - That Everything is connected to Every thing else and that one cannot change just one thing in Nature.
- Jean Brihes - Devastation always brings about, not a catastrophe, but a series of catastrophies for in nature things are dependant one upon the other.

1. As per one Estimation, through Harvesting, deforestation and Convergence of grass lands and wetlands, Humans have reduced the Stock of Global, terrestrial, plant mass by as much as 41% in the last 2000 years, with a third of this being in 20th Century.

2. Since pre agriculture times, World forests have declined approximately 1/5th from, 5-4 billion Hectares. The Highest loss has occured in Temperate forests followed by the Subtropical Savannah and Deciduous forests. The lowest losses happening in Tropical Evergreen Forest because many of them for much of their history have been Inaccessable and Sparcely populated.

3. As per one Estimation, the mangrove forest cover has reduced from about (1980) 80 million hectares to less than 15 million hectares at present.

4. The Secondary forest is very different in character from the virgin one it replaces. Secondary forest is widespread in many tropical regions and accounts for as much as 40% of the total forest area in the tropics.

5. The spread of Desert Vegetation on the margins of desert is called the Desertification. (Or) The Spread of Desert like Condition in Arid or Semi Arid areas due to Man's influence or due to climatic change. Sahara has been advancing in Its Southern fringes - Called SAHEL REGION.

6. As per one Study the temperate grasslands of the world have been altered

in the ways that can be summerized in 3 phrases -

"Ploughed out", "Grazed out", "Loom out"

7. Cultural Eutrophication- It is becoming evident in many parts of the world and is even detectable in large water bodies as Lake Victoria.

8. Coral Bleaching

9. Atmospheric CO_2 has gone up by 30% since 1750 and at present the CO_2 levels are more than 400 ppm a- This level has not been exceeded during the past 4,20000 years and possibly during the last 20 million years.

10. During the 20th century, the Global average Sea surface temperature increased around 0.6°C

GLOBAL WARMING - RISE IN SEA LEVELS!

A. Because of Thermal Expansion of Sea waters - The steric Effect

B. The Melting of Cryosphere - Glaciers, Ice sheet & Permafrost

C. Miscillinous Anthropogenic Effects on the Hydrological Cycle.

Steric Effect Exceeds in importance than the role of Ice Cap and glacier melting. Because of the Sea level rise many areas are threatened by Sub-mergence. For Ex: As per one Estimation Sea level rise of 1mtr in next 100 years would lead to Egypt losing its 12-15% arable land.

b. Bangladesh may lose 12% of its totaland (At present half of Bangladesh rice production area is in the area <1m above the sea level)

Bangkok is the city threatened by a combination of accelerated subsidence & accelerated sea level rise.

Because of the Climate change monsoonal areas may become greater, be more intense and have higher amounts of precipitation.

Various Climatic model suggests that precipitation increase in areas with already high amounts of precipitation and decrease in areas with low amounts of precipitation.

As per climatic models Northern higher latitudes will warm more rapidly than the global average, probably by more than 40%.

~~Changes in precipitation may shift vegetation zones~~

Because of Climate Change, Altitudinal changes in vegetation zones will be of considerable significance as per one model with 3c change, the Vegetation beds will move about 500mtrs in Altitude.

Vegetation will change latitudinally and some model suggest that wholesale change will occur in the distribution of Biomes. It is estimated that the Rise of 1°c in mean temperature could cause a pole ward shift of Vegetal zones of about 500kms.

1.**Weddell Sea:** the section of the Atlantic east of Antarctic Peninsula. 2.**Canary Islands (Spain):** volcanic islands off the northwest coast of Africa. 3.**Kiel Canal:** joins North Sea to Baltic Sea, across the Jutland peninsula.4.**Welland Canal:** links Lake Ontario and Lake Erie. 5.**Serengeti National Park (Tanzania):** east of Lake Victoria and west of Kilimanjaro. 6.**Lake Titicaca:** The largest lake in South America; world's highest navigable lake; on the border between Peru and Bolivia.7. **Namib Desert:** has the world's tallest sand dunes. 8.**St. Helena (U.K.):** volcanic island in South Atlantic; Napoleon died here. 9.**Bermuda Triangle:** sea area bounded by Bermuda, Florida and Puerto Rico; gained the nick name **"Deadly Bermuda Triangle"** because of unexplained disappearance of a large no. of ships and aircrafts in this region. 10. **Goteborg:** ice free harbour in Sweden; northern Europe's leading port. 11.**Alice Spring:** famous tourist centre in Australia; was a station linking the Telegraph line between Darwin and Adelaide. 12.**Altiplano:** plateau complex of Bolivia and Peru; second largest plateau after Tibet; it is an intermontane plateau (i.e. surrounded by mountains) and in the centre lies the lake Titicaca.13.**Sardinia (Italy):** Mediterranean Sea.14. **Aconcagua:** on the border between Chile and Argentina; is the world's highest peak, outside Asia; it is the world's highest extinct volcano. 15.**Plateau of Matto Grasso:** mineral rich western region of Brazil. 16..**Dast-e-Kavir:** a hot desert in northern Iran; rich in Petroleum and Diamonds. 17.**The Horn of Africa:** is a volcanic plateau and includes **Ethiopia, Eritrea, Somalia, Djibouti.** 18.**Great Artesian Basin:** region west of the Great Dividing Range and north east of lake Eyre in Australia; is a confined aquifer (ground water storage sandwiched between two impermeable rocks), therefore the ground water comes up without pumping; but the water is saline and used only for animals. 19.**Walvis Bay:** Namibia's chief port.20. **Delagoa Bay (Maputo bay):** the finest harbour on Africa's east coast; Maputo, Mozambique's capital is situated here. 21.**The Camel Train (The "Ghan"):** The Trans-Australian railway runs from port Augusta through the Simpson Desert to Alice Spring. 22.**Lesotho:** entirely surrounded by South Africa; only country in Africa where all land is above 1000m. 23.**Kalahari Desert:** it is a semi desert of Botswana and extends into Namibia, Zimbabwe and South Africa.24.**Orange River:** originates in Drakensberg Mountains (Lesotho) and forms a boundary between South Africa and Namibia. 25.**Lake Victoria:** the largest lake of Africa; it is NOT a rift valley lake; Kampala, the capital of Uganda lies near its northern shore. 26.**Lake Assal (-156m):** lowest point in Africa; in Djibouti. 27.**Qattara Depression (-133m):** a depression caused by wind (called Deflation Hollow) in Egypt. 28. **Mount kirinyaga** (formerly Mount Kenya): an extinct volcanic. 29.**Mount Cameroon:** an active volcano Western Africa. 30.**Lake Chad:** is on the north eastern boundary of Nigeria; reduced in size because of droughts; oil rich regional. 31.**Lake Volta:**lake in Ghana created by the **Akosombo Dam** on the river Volta. 32.**Ruwenzori Mountains:** on Uganda's border; non-volcanic; referred to as the **"mountains of moon".** 33.**Cabora Bassa Dam:** in Mozambique on the river Zambezi. 34.**Sahara Desert:** there are three types of deserts in it – sandy, stony and rocky. 35.**Drakensberg Mountains:** Africa, the highest peak Mount Ntlenyana. 36.**River Congo:** originates in Zambia as Laulaba river; its major tributary is river Ubangi; it does not make a delta. 37.**River Nile:** originates in lake Victoria in Burundi; the Blue Nile rises from Tana lake (Ethiopia) and goes into eastern Mediterranean Sea; Aswan Dam is located on the river Nile. 38.**Casablanca:** the largest city and port of Morocco. 39.**Izmir:** important sea-port of Turkey; famous for Mediterranean fruits production. 40**James Bay:** an arm of the Hudson Bay. 41.**Chin Hills:** in northwestern Myanmar; these are the extension of the Arakan Yoma. 42.**Big Bend National Park:** situated along the boundary between Mexico and U.S.; it is the largest protected area of Chihuahuan Desert topography; it is famous for the fossil remains of the Pterosaur, the largest flying creature ever known, discovered here. 43.**Hindu Kush:** westernmost extension of Pamir; young fold mountains located in Afghanistan and Northwestern Frontier Province of Pakistan; its highest peak is Tirich Mir. 44.**Baguio:** summer capital of Philippines on the island of Luzon; 45.**Grand Coulee Dam:** on Columbia River in the Washington State, U.S.; its reservoir is called F.D. Roosevelt Lake. 46.**Mandalay:** important Buddhist centre in Myanmar, located on the bank of Irrawaddy River. 47.**Sofia:** capital and cultural centre of Bulgaria. 48.**Mount Ossa:** the highest peak in Tasmania (Australia). 49.**Kalgoorlie:** in Western Australia, earlier famous for gold mining. 50.**Torres Strait:** separates Papua New Guinea and Australia. 51.**Flinders Range:** fold mountains in southern Australia. 52.**Lake Torrens:** a rift valley lake in southern Australia 53.**Cocos Islands** (Australia): coral islands, southwest of Java. 54.**Lake Taupo:** the largest lake of New Zealand; it is in the extinct volcano's crater. 55.**Belize:** the country, famous for having the largest reef in the Northern Hemisphere. 56.**Cuba:** the largest island in the Caribbean Sea. 57.**Denali National Park (Mount Mckinley National Park)** : in Alaska; Mount Mckinley (the highest peak of North America) lies in this Park.58.**Rockies:** the Alpine Fold Mountains (like Andes, Alps, Himalayas etc.) in North America. 59.**Mackenzie Mountains:** part of the Rockies; act as watershed for the tributaries of Mackenzie and Yukon rivers. 60.**Columbia Plateau:** a large igneous province of basaltic lava; covers part of Washington and Oregon in U.S. 61.**Lake Mead:** formed by the Hoover Dam (also called Boulder Dam) on the river Colorado. 62.**Mount Whitney:** the highest peak in the 48 coterminous states of U.S.); it is close to Death Valley. 63.**Mount Logan:** Canada's highest peak near border with Alaska. 64.**Bering Strait:** it separates North America from Asia. 65.**Lake Athabasca:** in Canada, the region is famous for copper reserves. 66.**Nunavut:** means "our land"; is the largest and newest federal territory of Canada. 67.**Crater Lake:** is in Oregon, U.S.; actually a Caldera (it is misnamed). 68.**Thunder Bay:** the northwest shore of lake Superior; earlier an important centre for Wheat exports. 69.**Rio Grande:** much of Mexico's border is formed by river Rio Grande. Silicon Valley: south of San Francisco Bay. 70.**Catskill Mountains:** low mountain group in southeastern New York, (part of the Appalachians). 71.**Rhode Island:** the smallest state in the U.S. on Atlantic Seaboard. 78.**Texas:** the largest of the 48 coterminous states of the U.S. 79.**Yucatan Peninsula:** in Mexico; famous for

its limestone topography (Karst landscape). **80.Brooks Range:** young fold mountain in north-western part of Rockies in Alaska. **81.Bay of Fundy:** along the eastern coast of Canada; gets maximum Tidal Range in the world. **82.Florida Keys:** chain of small islands extending southwest from the southern tip of Florida. **83.Chicago:** lies at the southern end of Lake Michigan; an important transportation centre. **84.Yellowstone National Park:** mostly in NW Wyoming, but includes narrow strips in southern Montana and eastern Idaho; contains many Geysers and Hot springs. **85.Kingston:** seaport and capital of Jamaica. **86.San Diego:** the largest naval air station of U.S. and the birth place of California. **87.Central America:** refers to North American countries which lie south of Mexico and north of Columbia; these are Belize, Gautemala, El Salvador, Nicargua, Costa Rica and Panama. **88.Middle America:** it comprises of Central America as well as Mexico and all of the Caribbean Islands. **89.Arenal Rica:** active volcano in central region of Costa Rica. **90.Nevado del Ruiz:** active volcano in northern Columbian Andes. **91.Popocatepetl:** an active volcano in south central part of Mexico. **92.Norfolk Island:** belongs to Australia in Pacific. **93.Bougainville:** is an offshore island part of Papua New Guinea; famous for Copper reserves.**94.Nauru:** the smallest republic of the world; northeast of Bougainville. **95.New Caledonia** (France): east of Coral Sea; famous for Nickel deposits. **96.Lake Vanern:** Sweden's largest lake; near border with Norway. **97.Lake Saimaa:** the largest in Finland; in southeast region. **98.Lim Fjord:** Denmark's largest lagoon. **99.Gulf of Bothnia:** separates Sweden and Finland. **100. Gulf of Sidra:** on the Libyan coast; the chief port and oil terminal is **Surt. 101. Nubian Desert:** in northeast Sudan; it is a sandstone plateau. **102 Katanga Plateau:** includes southern Zaire, democratic republic of Congo and part of Zambia; it is famous for Copper deposits. **103. Mount Shasta:** is a dormant volcano in California. **104. Lake Gairdner:** is a rift valley lake in Australia.**105. Lake Mjosa:** the largest lake of Norway; northeast of Oslo. **106. Mendoza:** in Argentina, referred to as the **Garden of the Andes. 107.Patagonia:** the far southeast region of South America; it is huge dry plateau; the northern part is a semi-desert with scrubby vegetation whereas the southern part is colder, drier, with very little plant life; the region includes the southern parts of **Argentina and Chile. 108. Santos:** world's leading coffee exporting port; in southeast Brazil. **109. Pantanal:** swampy low land in the western Brazil and bordering Bolivia and north Paraguay. **110. The Drake Passage:** strait separating Cape Horn from the South Shetland Islands, which lie just north of Antarctica. **111. Galpagos Islands (Ecuador):** have rare species of plants and animals; Charles Darwin's studies here led to his great work: The Origin of Species; today it is a National Park. **112. La Paz:** Bolivia's capital; world's highest national capital. **113. Falkland Islands:** self governing British colony in the South Atlantic Ocean. **114. Ascension (U.K.):** volcanic island in South Atlantic Ocean. **115. Rio de la Plata:** the estuary of the combined Panama and Uruguay Rrivers in south eastern South America, between Argentina and Uruguay. **116. Mount Chimborazo:** in Ecuador; has its feet over equator but peaks are snow covered, **117. Easter Island (Chile):** in Pacific Ocean; famous for ancient monuments. **118. Point Parianas Peru:** western most point of South America. **119. Cotopaxi:**in Ecuador; one of the highest active volcanoes of the world; **120. Stromboli:** active volcano; off the north coast of Sicily in Mediterranean Sea. **121. Port Stanley:** the important port city of Falkland Islands. **122. Bass Strait:** separates Tasmania from Australia. **123. Lop Nur/Nor:** a marshy region in the Tarim basin of China; the region is used for Nuclear weapon testing. **124. Lake of the Woods:** a glaciated lake on the border between Canada and U.S.; is famous for wheat cultivation. **125.Kara Sea:** an arm of the Arctic Ocean; low salinity and rich in bio-diversity. **126. Hormuz Strait:** joins Persian Gulf with the Arabian Sea; highly polluted. **127. Lake Nyasa (Lake Malawi):** forms border between Malawi and Mozambique and Tanzania. **128. Elephant Pass:** a narrow strip of land linking the Jaffna Peninsula with the mainland at the north end of Sri Lanka. **129. Etna:** highest volcano of Europe on the east coast of Sicily. **130. Lake Huron:** a lake shared by Canada and U.S.; second largest of the five Great Lakes of North America **131. Ionian Sea:** arm of the Mediterranean Sea. **132. Liverpool:** an important commercial centre of NW England; wa a major slave trade centre from Africa. **133. Soo Canal:** connects Lake Superior with Lake Huron. **134. Tula:** an important industrial centre of Western Russia. **135. Ankara:** capital of Turkey; situated on the plateau of Anatolia. **1 Finger Lakes:**are glacial lakes in the New York State. **137. Kobe:** an important industrial centre in Honshu island. **1 Kiruna:** northernmost town of Sweden; famous for **Iron ore** reserves; often called "world's largest town" because o extensive area. **139. Tien Shan** : young fold mountains; in Xinjiang autonomous region of China, north of Tarim Basin; inhabited by Kirghiz tribes. **140. Aegean Sea:** arm of the Mediterranean Sea; between Greece and Italy. **141. Ural Mountains:** 1600 km long Mountain range in Russia; the highest peak is Mount Narodnaya (1894m); there are important industrial centres along the eastern slopes. **142.Valencia lake:** second largest Lake of Venezuela. **143. Gibraltar:** a British dependency at the southern tip of the Iberian Penisnsula; famous for discovery of Neanderthal Man. **144. Riga:** capital of Latvia, on the coast of the Gulf of Riga of the Baltic Sea. **145. North Sea:** shallow arm the Atlantic Ocean; rich in Oil and Natural Gas and fisheries. **146. Grand Banks:** one of the most important fishing centres of the world; convergence of Labrador and Gulf Stream takes place here. **147. Adam's Peak:** in south centr part of Sri Lanka; famous for the sacred footprint left by Buddha on its top. **148.Golan Heights:** mountain range al Israel and Syria border; this territory of Syria was occupied by Israel; it is a barren land. **149. Pico Duarte:** highest point in the Carribean Islands; in Dominican Republic. **150. Dushanbe** (formerly called Stalinabad): capital of Tajikistan. **151. Alexandria:** Egypt's largest sea-port; known as the **"Pearl of the Mediterranean". 152.East Tim** earlier a Portugal colony

VAJIRAM & RAVI

HANDOUT NO. 2
SOILS OF INDIA

S.K. MANOCHA

- **Alluvial Soils:** These are formed of transported materials and are found in Great Northern Plains and Coastal Plains. These are fertile soils because of fresh additions of minerals and are fine grained, highly porous and light, easily workable, best agricultural soils. These are generally deficient in Nitrogen and Humus. The Soil profile has no stratification. Geologically there are two types: **Khadar and Bhangar.** Khadar: Newer alluvium, sandy texture, light colour, found near river beds and are porous. Bhangar: Older alluvium, clayey, darker, has lime nodules (called Kankar), found in Doabs (interfluve areas). *Only the alluvium of the deltaic region of the Ganga is rich in humus.* In certain areas, these soils are covered with unproductive wind-borne soil called Loess. Limitations of Alluvial soils: (i) allow water to sink into lower strata and (ii) lack nitrogen (but soils are capable of fixing nitrogen very rapidly through leguminous crops (peas, beans, cloves etc.).
- **Black Cotton Soils** (locally called Regur): Black in colour because of iron, aluminium compounds and humus and is good for cotton crop. These are mainly formed from Deccan Trap rocks. These are very clayey in composition (argillaceous) and hence have high water retention capacity. These are rich in minerals and are known for fertility. These are found in Deccan Trap region. *In the southern and eastern parts of the country where rainfall is heavy, black soils often occur in close proximity to red soils.* Black soils occupy valleys and low-level areas whereas the red soils occur on higher slopes and hill tops. *Mixed black and red soils occur in Coimbatore, Madurai, Tirunelveli (Tamil Nadu) and Bundelkhand region.* These soils are generally deficient in phosphoric acid, nitrogen and organic matter and are somewhat sandy, shallow and poor in fertility on uplands. These become sticky, when wet and develop deep cracks, when dry; this helps in self-aeration, which leads to absorption of Nitrogen from atmosphere.
- **Red Soils:** These are derived from Granites, Gneisses and other metamorphic rocks. These are formed under well-drained conditions. The red colour is because of wide diffusion of iron. These occur in Andhra Pradesh, Tamil Nadu, parts of Kerala, Goa, Maharashtra, Karnataka, West Bengal, Assam. Because of leaching these are light in texture, porous, friable in structure and lack in lime, free carbonates and soluble salts, humus, nitrogen, etc. These soils are airy and need irrigation for cultivation. These soils are locally called as Chalka in Andhra Pradesh.
- **Laterite and Lateritic Soils:** Laterite is a geological term and means literally a rock. *Latertzation is the removal of silica and over concentration of oxides of iron and aluminium.* These soils represent the end product of decomposition and are found in areas of high rainfall. These are well developed on the summits of the hills of the Deccan, Madhya Pradesh, the Ghat regions of Orissa, Maharashtra, Kerala, West Bengal, Assam and Tamil Nadu. These are generally low in fertility. These are acidic in character because of leaching. In dry conditions the upper surface becomes very hard and it is often used as a building material.
- **Arid and Desert Soils:** These are derived from disintegration of adjacent rocks and are largely blown in from coastal regions and Indus valley. These are found in Rajasthan, Haryana, south Punjab, northern Gujarat. These soils have a sandy profile and a coarse texture with high percentage of soluble salts. These soils are alkaline in character and are poor in organic matter. These are rich in phosphate but poor in nitrogen. These soils are rich in minerals but the main limitation is lack of water.
- **Saline and Alkaline Soils:** Because of capillary action the salts are sucked up in solution to the surface and form white encrustations on the surface. The salt efflorescence of calcium, magnesium and sodium make them infertile. The saline and alkaline soils may occur in any group of soils. These are found in drier areas of Bihar, U.P., Haryana, Punjab, Rajasthan and Maharashtra. Soils in the coastal regions (for ex. in Gujarat, West Bengal) also have salts. Salinization also occurs because of over-irrigation (canal irigation/groundwater use) and in areas of high water tables (as in coastal areas of Maharashtra and Tamil Nadu). Saline soils contain excess of neutral soluble salts of chlorides and sulphates so as to affect plant growth whereas Sodic or alkali soils contain sodium carbonates/ sodium bicarbonates. Various local names for saline and alkaline soils are Reh, Kallar, Usar and Chopan.
- **Peaty and Organic Soils:** These are marshy soils and are result of water logging, anaerobic conditions (which lead to partial decomposition of organic matter) and are acidic in nature. There is a presence of iron and varying amount (10-40%) of organic matter. These are found in coastal areas of Orissa, Tamil Nadu, Kerala, West Bengal and Almora. In Kerala (Kottayam and Alleppey districts), these soils are called Kari.
- **Forest Soils:** These are found in the forest areas in Himalayas, Sahyadris, Eastern Ghats and Terai region. These are rich in organic content. Owing to sharp differences of hill slopes climates, these soils may differ greatly even when in proximity. Humus is more raw at higher levels, making them acidic.

Indian soils with percentage of coverage (of the total area): 1. Black Soils (29.69%) 2. Red and Yellow Soils (28%) 3.Alluvial Soils (22.16%) 4.Forest Soils (7.94%) 5.Arid Soils (6.13%) 6. Laterite and Lateritic Soils (2.62%) 7. Peaty and Organic Soils (2.17%) 8. Saline Soils (1.29%)

MAP-EXERCISE.

Norway: Fjords (high walled sea lakes in glacial valleys) turn the coastline into a maze flanked by a large number of islands. **Svalbard:** Norway's Arctic Island Territories are referred to as **Svalbard (means: the cold coast)**; these contain the Spitsbergen group of islands and many other islands. **North Sea:** has large reserves of gas and oil. **Reykjavik: means "smoky bay"** because of geysers and springs. **Isle of Man:** lies in the Irish Sea; Crown possession but virtually self governing. **Monaco:** beautiful little principality surrounded on three sides by southern France and faces the Mediterranean Sea on the fourth side. **Andorra:** a tiny principality lying high in the Pyrenees on the border between Spain and France. **Vatican City:** world's smallest independent state; lies on west bank of Tiber River. **San Marino:** Europe's smallest republic and the second smallest in the world; is an enclave in Apennine mountains of northern Italy. **Liechtenstein:** a little principality between Austria and Switzerland in the Alps; is in custom union with Switzerland. **Lake Balaton:** the largest lake in Hungary. **Lake Baikal:** in Russia; is the world's deepest. **River Tagus:** rises in Spain and divides Portugal in two parts. **Caucasus Mountains:** stretch from the Black Sea to the Caspian Sea; there are 2 ranges: 1. Northern Greater Caucasus: (*Mount Elbrus* (5642 m) is the highest peak in Europe) 2. Lower – Lesser Caucasus: these are shared Turkey and Iran. **Kamchatka Peninsula:** separates the Bering Sea from Okhotsk Sea; seismically prone region. **Pyrenees:** steep mountains dividing France from Spain. **Alps:** young fold mountains making a barrier between France and Italy. **Magadan:** northeast region of Siberia; declining region with out migration of population. **Novaya Zemlya:** belongs to Russia; dumping of Nuclear wastes has poisoned the waters here. **River Angara:** drains the world's deepest lake Baikal. **Lake Inari:** in north east Finland. **Lake Garda:** Italy's largest lake. **River Po:** Italy's longest river. Mount Vesuvius: an active volcano in Italy. **Black Forest:** a Block Mountain (Horst) on Germany's border with France. **UNITED KINGDOM:** consists of union of England, Scotland and Wales (Great Britain) with the six counties of Northern Ireland; the Scotland and its offshore islands – the Outer Hebrides, the Orkneys and Shetlands– are the northernmost part of Britain. **REPUBLIC OF IRELAND:** occupies some five-sixths of the island of Ireland about 80 km off the west coast of Great Britain; Ireland's lush green landscape have earned it the title "the Emerald Isle". **Jura Mountains:** fold mountains on the border between France and Switzerland; these are limestone ranges. **Canary Islands:** belong to Spain; north-west of Africa in the Atlantic Ocean. **Madeira Island:** belongs to Portugal; volcanic island in the Atlantic Ocean. **London:** situated on the river Thames. **Oresoundbridge:** 16 km long bridge and tunnel; the first link between Denmark and Sweden. ***NORDIC COUNTRIES:*** *include: Norway, Sweden, Finland, Denmark, Iceland; a more common term to describe these countries is Scvandinavia. At times the term Scandinavia is used only for two countries- Norway and Sweden; more often, it includes these countries plus Denmark and sometimes it includes these three plus Iceland; when Finland is included in the group the term Fennoscandia or Fennoscandian countries is used.* **English Channel:** between U.K. and France. **Euro Tunnel:** is through the Strait of Dover in the English Channel and connects London with Paris Urban Agglomerations. **Channel Islands:** lie in English Channel; are self governing. **Kiel Canal:** joins North Sea to the Baltic Sea. **Kola Gulf:** Russia's Murmansk (the largest city in the world, north of the Arctic Circle) is situated here, in the Barents Sea. **Copenhagen:** the capital of Denmark; lies on Denmark's largest island Sjaelland (Zealand). **Hamburg:** largest inland port of Europe in Germany on the river Elbe.

COUNTRIES: the largest in area: 1. Russia 2.Canada 3.China 4. U.S. 5. Brazil 6. Australia 7. India 8. Argentina 9. Kazakhstan 10. Sudan.

MOUNTAINS: the highest: 1. Everest (Nepal-China) 2. K2/Godwin Austen (India) 3. Kangchenjunga (Nepal-India) 4. Lhotse (Nepal-China) 5. Makalu (Nepal-China) 6. Cho-Oyu (Nepal-China) 7. Dhaulagiri (Nepal) 8. Manaslu (Nepal) 9. Nanga Parbat (India) 10. Annapurna I (Nepal).

RIVERS: the longest: 1. Nile 2. Amazon 3. Yangtze 4. Mississippi-Missouri System 5. Ob'Irtysh 6.Yenisey-Angara 7. Hwang He (Yellow River 8. Congo 9. Parana 10. Mekong.

DESERTS: the largest: 1. Sahara 2. Arabian (SW Asia) 3.Gobi 4. Patagonian (Argentina) 5. Great Victoria (W and S Australia) 6. Great Basin Desert (SW United States) 7. Chihuahuan (Northern Mexico) 8.Great Sandy Desert (W Australia).

LAKES: the largest: 1.Caspian Sea (Central Asia) 2. Superior (Canada/U.S) 3. Victoria (E Africa) 4. Huron (Canada/US) 5. Michigan (US) 6. Tanganyika (E Africa) 7. Baikal (Russia) 8. Great Bear (Canada)

ISLANDS: the largest: 1.Greenland (N Atlantic Ocean) 2. New Guinea (SW Pacific Ocean) 3. Borneo (Western Pacific ocean) 4. Madagascar (Indian Ocean) 5.Baffin (N Atlantic Ocean) 6. Sumatra (NE Indian Ocean) 7. Honshu Pacific Ocean/Sea of Japan 8. Great Britain (off the NW coast of Europe).

HANDOUT NO.3

S.K.MANOCHA VAJIRAM & RAVI

*ECOLOGICAL NICHE: the term was first used by Grinnel. The Ecological Niche is a very inclusive term that involves not only the physical space occupied by an organism , but also its functional role in the community and its position in the environmental gradients including other conditions of existence. Ecological Niche of any organism concerns not only the space where it lives, but also what it does and how it is constrained by other species.

*ECOLOGICAL EQUIVALENTS: Organisms that occupy the same or similar ecological niches in different geographical regions are known as Ecological Equivalents.For example: Grasses in different regions like in North America and Australia or Kangaroos and Bisons.

*LAW OF REQUISITE VARIETY (ASHBY): For maximum stability, a community must be characterized by a very high number of niche interactions, so that the probability of there being a sufficient number of internal feedback mechanisms to give the community stability is good. *GAUSE'S PRINCIPLE: It states that two species cannot occupy exactly the same ecological niche within a community.

*PRODUCTIVITY OF DIFFERENT ECOSYSTEMS: *The rate of fixation of radiant energy in an ecosystems, and not the size of producers that finally determines the efficiency of production*. Ranking in terms of their annual average rate of net plant production: **1.TROPICAL RAINFORESTS/SWAMPS AND MARSHES/ESTUARIES 2. TEMPERATE FORESTS 3. CONIFEROUS FORESTS 4. SAVANNA 5. AGRICULTURAL LAND 6. WOODLAND AND SHRUBLAND 7.TEMPERATE GRASS AND/LAKES AND STREAMS 8. CONTINENTAL SHELF 9.TUNDRA AND ALPINE 10. OPEN OCEAN 11.DESERT SCRUB 12. EXTREME DESERT.**

*CHIEF CAUSES OF EXTINCTION OF SPECIES CAUSED BY MAN: *1. HABITAT DESTRUCTON 2. HABITAT FRAGMENTATION 3. HABITAT DEGRADATION AND POLLUTION 4. INTRODUCTION OF EXOTIC SPECIES 5. DISEASES 6. OVER-EXPLOITATION 7. SHIFTING OR JHUMMING CULTIVATION.*

*ABYSSAL: refers to the deepest part of the ocean, below about 2000m. It covers about 75% of the ocean floor. *NERITIC ZONE: refers to the shallow-water, or near shore, marine zone extending from the low tide level to a depth of 200m. This zone covers about 8% of the total ocean floor and is the area most populated by benthic organisms, owing to the penetration of sunlight to these shallow depths. *BENTHIC ZONE: the lowermost region of a freshwater or marine profile in which the benthos resides. In bodies of deep water where little light penetrates to bottom zone is referred to as benthic abyssal region and productivity is relatively low. In shallower (coastal) regions, where the benthic zone is well lit, the same is referred to as the benthic littoral region and it supports some of the world's most productive ecosystems. *BENTHOS: In freshwater and marine ecosystems, the collection of organisms attached to or resting on the bottom sediments (ie epifauna), and those which bore or burrow into the sediments (ie infauna).

*LITTORAL ZONE: the area in shallow, fresh water and around lake shores, where light penetration extends to the bottom sediments, giving a zone colonized by rooted plants. In marine ecosystems it refers to the shore area or intertidal zone (ie the area between low tide mark and high tide mark). *BATHYL ZONE: the oceanic zone at depths of 200-2000 m. The upper limit of the bathyl is marked by the edge of the continental shelf. In marine ecology, it is the region of the continental slope and continental rise.

*ALGA: The common name for a relatively simple type of eukaryotic plant which is never differentiated into root, stem, and leaves, contains chlorophyll a as the primary photosynthetic pigment, has no true vascular (water-conducting) system, and in which there is no sterile layer of cells surrounding the reproductive organs. The algae range in form from eukaryotic single cells to plants many metres in length. Algae can be found in most

habitats on Earth, although the majority occur in freshwater or marine environments.

*ALGAL BLOOM: a sudden growth of algae in aquatic ecosystem. It can occur naturally in spring or early summer when primary production exceeds consumption by aquatic herbivores. Algal blooms may also be induced by enrichment of waters due to pollution. They are a characteristic symptom of eutrophication.

*EUTROPHICATION: the process of nutrient enrichment (usually by nitrates and phosphates) in aquatic ecosystems, such that the productivity of the system ceases to be limited by the availability of nutrients. It occurs naturally over geological time, but may be accelerated by human activities (sewage disposal, agriculture, industries): such activities are sometimes termed CULTURAL EUTROPHICATION. The rapid increase in nutrient levels stimulates algal blooms. ***On death, bacterial decomposition of the excess algae may deplete oxygen levels seriously.*** The extremely low oxygen concentrations that result may lead to the death of fish, creating a further oxygen demand, and so leading to further deaths.

*ALLEE EFFECT: The social dysfunction and failure to mate successfully that occurs in species when their population density falls below a certain threshold. This is believed to have caused the extinction of the American Passenger pigeon probably because habitat destruction and hunting reduced by population density to a level at which individuals lacked the social stimulation necessary to prompt mating.

*ALLOCHTHONOUS: Not indigenous; acquired. Applied to material which did not originate in its present position (e.g. plant material in a deposit, such as a lake sediment, which did not grow at that location but was introduced by some process). AUTOCHTHONOUS: Applied to material which originated in its present position (e.g. the plant material in a deposit, such as peat, which actually grew where it is found, rather than being brought in by outside influences).

*ALLOGENIC: Applied to successional change caused by a change in abiotic environmental conditions. AUTOGENIC: Applied to a successional change owing to modification of the environment by vegetation (e.g. by producing humus or providing shade).

*AMMENSALISM: An interaction of species populations, in which one population is inhibited while the other (ammensal) is unaffected. It is the opposite of Commensalism. Amensalism is an interaction where an organism inflicts harm to another organism without any costs or benefits received by the other. A clear case of amensalism is where sheep or cattle trample grass. Whilst the presence of the grass causes negligible detrimental effects to the animal's hoof, the grass suffers from being crushed. Amensalism is often used to describe strongly asymmetrical competitive interactions, such as has been observed between the Spanish ibex and weevils of the genus *Timarcha* which feed upon the same type of shrub. Whilst the presence of the weevil has almost no influence on food availability, the presence of ibex has an enormous detrimental effect on weevil numbers, as they consume significant quantities of plant matter and incidentally ingest the weevils upon it.

*NEUTRALISM: A situation in which two species populations coexist, with neither population being affected by association with the other. It describes the relationship between two species that interact but do not affect each other. It describes interactions where the health of one species has absolutely no effect whatsoever on that of the other. Examples of true neutralism are virtually impossible to prove and most ecologists would agree that this concept does not exist. However, the term is often used to describe situations where interactions are negligible or insignificant

*WALLACE'S LINE: The important zoogeographical division which separates the Oriental and Notogean zoogeographical (corresponds to Australian) regions. Alfred Wallace, a zoogeographer and contemporary of Charles Darwin, first demarcated the boundary between the Oriental faunal region and the Australasian regioan with its distinctive marsupials and birds. The boundary, known to this day as Wallace's Line, passes east of Java and Bali, northward through the Strait of Makassar (separating Borneo and Sulawesi), then extends eastward, south of Mindanao in the Philippines. There is a zone of mixing called 'Wallacea', and strictly the line defines the extreme western limit of Australasian mammals and the eastern limit of the main Oriental fauna. *Weber's Line: A line of supposed balance between the Oriental and the Australasian faunal regions within Wallacea.

HANDOUT NO.6.

VAJIRAM + RAVI

CONTINENTAL DRIFT

S.K. MANOCHA

WHAT IS THE EVIDENCE FOR CONTINENTAL DRIFT?

The evidence used by Wegener, du Toit and others to support the hypothesis of continental drift includes the fit of the shorelines of continents, the appearance of the same rock sequences and mountain ranges of the same age on continents now widely separated, the matching of glacial deposits and plaeoclimatic zones, and the similarities of many extinct plant and animal groups whose fossil remains are found today on widely separated continents.

Continental Fit

Wegener, like some before him, was impressed by the close resemblance between the coastlines of continents on opposite side of the Atlantic Ocean, particularly between South America and Africa. He cited these similarities as partial evidence that the continents were at one time joined together as a supercontinent that subsequently split apart. As his critics pointed out, though, the configuration of coastlines results from erosional and depositional processes therefore is continually being modified. So even if the continents had separated during the Mesozoic Era, as Wegener proposed, it is not likely that the coastlines would fit exactly. → 230 m.y.a. to 65 m.y.a.

A more realistic approach is to fit the continents together along the continental slope where erosion would be minimal. In 1965, Sir Edward Bullard, an English geophysicist showed that the best fit between the continents occurs at a depth of about 2000 m. Since then, other reconstructions using the latest ocean basin data have confirmed the close fit between continents when they are reassembled to form Pangaea.

Similarity of Rock Sequences and Mountain Ranges

If the continents were at one time joined together, then the rocks and mountain ranges of the same age in adjoining locations on the opposite continents should closely match. Such is the case for the Gondwana continent. Marine, non-marine, and glacial rock sequences of Pennsylvanian to Jurassic age are almost identical for all five Gondwana continents, strongly indicating that they were joined together at one time. → 320 to 290 m.y.a. 195-140 m.y.a.

The trends of several major mountain ranges also support the hypothesis of continental drift. These mountain range seemingly end at the coastline of one continent only to apparently continue on another continent across the ocean. The folded Appalachian Mountains of North America, for example, trend northeastward through the eastern United States and Canada and terminate abruptly at the Newfoundland coastline. Mountain ranges of the same age and deformational style occur in eastern Greenland, Ireland, Great Britain, and Norway. Even though these mountain ranges are currently separated by the Atlantic Ocean, they form an essentially continuous mountain range when the continents are positioned next to each other.

Glacial Evidence

600 to 230 m.y.a.

During the Late Paleozoic Era, massive glaciers covered large continental areas of the Southern Hemisphere. Evidence for this glaciation includes layers of till (sediments deposited by glaciers) and striations (scratch marks) in the bedrock beneath the till. Fossils and sedimentary rocks of the same age from the Northern Hemisphere, however, give no indication of glaciation. Fossil plants found in coals indicate that the Northern Hemisphere had a tropical climate during the time the Southern Hemisphere was glaciated.

All the Gondwana continents except Antarctica are currently located near the equator in subtropical to tropical climates. Mapping of glacial striations in bedrock in Australia, India, and South America indicates that the glaciers moved from the areas of the present-day oceans onto land. This would be highly unlikely because large continental glaciers (such as occurred on the Gondwana continents during the late Paleozoic Era) flow outward from their central area of accumulation toward the sea.

If the continents did not move during the past, one would have to explain how glaciers moved from the oceans onto land and how large-scale continental glaciers formed near the equator. But if the continents are reassembled as a single landmass with South Africa located at the South Pole, the direction of movement of Late Paleozoic continental glaciers makes sense. Furthermore, this geographic arrangement places the northern continents nearer the tropics, which is consistent with the fossil and climatologic evidence from Laurasia.

Fossil Evidence

evidence

Some of the most compelling for continental drift comes from the fossil record. Fossils of the Glossopteris flora are found in equivalent Pennsylvanian and Permian – aged coal deposits on all five Gondwana continents. The Glossopteris flora is characterized by the seed fern Glossopteris as well as by many other distinctive and easily identifiable plants. Pollen and spores of plants can be dispersed over great distances by wind, but Glossopteris-type plants produced seeds too large to have been carried by winds. Even if the seeds had floated across the ocean, they probably would not have remained viable for any length of time in saltwater.

290-245

The present-day climates of South America, Africa, India, Australia and Antarctica ranges from tropical to polar and are much too diverse to support the type of plants that compose the Gossopteris flora. Wegener therefore reasoned that these continents must once have been joined such that these widely separated localities were all in the same latitudinal climatic belt.

The fossil remains of animals also provide strong evidence for continental drift. One of the best examples is Mesosaurus, a freshwater reptile whose fossils are found in Permian-aged rocks in certain regions of Brazil and South Africa and nowhere else in the world. Because the physiology of freshwater and marine animals is completely different, it is hard to imagine how a freshwater reptile could have swum across the Atlantic Ocean and found a freshwater

environment nearly identical to its former habitat. Moreover, if Mesosaurus could have swum across the ocean, its fossil remains should be widely dispersed. It is more logical to assume the Mesosaurus lived in lakes in what are now adjacent areas of South America and Africa but were then united into a single continent.

The evidence favoring continental drift seemed overwhelming to Wegener and his supporters, yet the lack of the suitable mechanism to explain continental movement prevented its widespread acceptance. Not until new evidence from studies of Earth's magnetic field and oceanographic research showed that the ocean basins were geologically young features did renewed interest in continental drift occur.

Paleomagnetism and Polar Wandering

Some of the most convincing evidence for continental drift came from the study of paleomagnetism, a relatively new discipline during the 1950s. During that time, some geologists were researching past changes of Earth's magnetic field in order to better understand the present-day magnetic field. As so often happens in science, these studies led to other discoveries. In this case, they led to the discovery that the ocean basins are geologically young and that the continents have indeed moved during the past, just as Wegener and others had proposed.

When a magma cools, the iron-bearing minerals align themselves with Earth's magnetic field when they reach the Curie point, thus recording both the direction and the intensity of the magnetic field. This information can be used to determine the location of Earth's magnetic poles and the latitude of the rock when it formed.

As paleomagnetic research progressed in the 1950s, some unexpected results emerged. When geologists measured the magnetism of recent rocks, they found it was generally consistent with Earth's current magnetic field. The paleomagnetism of ancient rocks, though, showed different orientations. For example, paleomagnetic studies of Silurian lava flows in North America indicated that the north magnetic pole was located in the western Pacific Ocean at the time, whereas the paleomagnetic evidence from Permian lava flows pointed to yet another location in northern Asia. When plotted on a map, the paleomagnetic readings of numerous lava flows from all ages in North America trace the apparent movement of the Magnetic pole through time. On analysis, magnetic minerals from European Silurian and Permian lava flows pointed to different magnetic pole locations than those of the same age from North America. Furthermore, analysis of lava flows from all continents indicated each continent had its own series of magnetic poles.

435-395 m.y.a

The best explanation for such data is that the magnetic poles have remained at their present locations near the geographic north and south poles and the continents have moved.

Sea – Floor Spreading

In the early 1960s, a new theory was propounded most notably by the American oceanographer **Herry Hess** (Princeton University), which has come to be known as sea-floor spreading. He proposed this theory to account for the continental movement. Hess suggested that the continents do not move across oceanic crust, but rather that the continents and oceanic crust move together. He suggested that the sea floor separates at oceanic ridges where upwelling magma forms new crust. As the magma cools, the newly formed oceanic crust moves laterally away from the ridge.

As a mechanism to drive this system, Hess revived the idea (proposed in the 1930s and 1940s by **Arthur Holmes** and others) of **thermal convection cells** in the mantle; that is hot magma rises from the mantle intrudes along rift zone fractures defining oceanic ridges and thus forms new crust. Cold crust is subducted back into the mantle at deep-sea trenches, where it is heated and recycled, thus completing a thermal convection cell.

The validity of the idea of sea floor spreading has been confirmed by two sets of evidence – **Palaeomagnetism** and **Core Sampling.**

1. **Palaeomagnetism:** Evidences of the earth's magnetic field is stored within rocks as **'Fossil Magnetism'** in that magnetic minerals align themselves with the magnetic field which was operating at the time of their formation. The earth's magnetic field has reversed many times over the last two billion years, the time interval for these changes has varied from 20,000 to over 10 million years. These reversals are recorded in rocks on either side of the divergent plate margin in the Mid-Atlantic and the symmetry in the magnetic striping provides evidence that the plates are moving apart.

In 1963 **D.Mathews, F. Vine and L.W. Morley** proposed that when magma intruded along the crests of oceanic ridges, it recorded the magnetic polarity at the time it cooled. As the ocean floor moved away from these oceanic ridges, repeated intrusions would form a **symmetrical series of magnetic stripes, recording periods of normal and reverse polarity.**

By the end of 1960s comparable magnetic anomaly patterns were found surrounding most oceanic ridges and thus conforming Hess's theory of sea floor spreading.

2. **Core Sampling:** Final confirmation of sea floor spreading was obtained form holes drilled into the sea floor by a research ship, the **Glomar Challenger.** Several thousand core samples from the sea bottom sediments have been analyzed, from which the depths and ages of the sedimentary layers have been determined. Almost invariably the thickness and age of the sediments increase with their distance from the oceanic ridges, indicating that sediments farthest from the ridges have been in existence, the longest. Conversely, sediments near the ridges are thinner and younger and at the ridges themselves, the material is almost igneous, with the little accumulation of sediments.

Thus the sea floors can be likened to **gigantic conveyor belts,** moving ever outward from the oceanic ridges.

16.12.2014

Ecology And Environment

Manocha

References:

1. Class notes
2. G.C. Leonge (II Part)
3. Newspapers
4. India-Year Book (Environment Chapter)
5. NCERTS (Biology) :- 11th std / 12th std.
6. Booklet

Thoughts:

a. The first rule of intelligent tinkering is to save all the pieces

b. Nature to be commanded, must be obeyed

c. Nature Nurtures us, we must nurture Nature

d. The Earth is the one but the world is not

Ecology

Ecology Breaks into two parts Eco + Logy

Eco Comes from Oikos, which means House / Household / Housekeeping / Living relations

Logy Comes from Logos, which means Study.

∴ Ecology is the Study of Earth's Household

Ernst Henry Haeckel is usually given Credit for Coining and defining

Ecology (But some Scholars define that the word was coined by Hanns Reiter and later defined by Haeckel.)

"Ecology" is the scientific study of the interrelationships among organism and between organisms, and between them and all aspects, living & non living of their Environment.

Ecosystem:

A.G. Tansley (1935) used the term Ecosystem to describe a discrete Unit that consists of living and non living parts, interacting to form a stable System.

Biogeocoenosis

Ecosystem

- STRUCTURE
  - BIOTIC
  - ABIOTIC
- FUNCTION
  - FLOW OF MATTER → • Cyclic in Nature
  - FLOW OF ENERGY → • Uni-directional

- By System's Definition of reality we mean the following
  (1.) Indentifying the elements
  (2.) Indentifying relationship among the elements
  (3) Indentifying the relationship between them And their Envir--onment

- Systems approach helps analyzing the reality at various levels (last at one deserves).
- System's approach is a useful tool as it handles complexity much better than other tools.

2. MARSHES - wet lands without trees

3. BOGS & FENS - These are water locked areas Saturated by Ground water (or) rain water.

Water in the marshes & swamps usually shallow enough to allow full penetration of sunlight and photosynthetic activity Generally High.

1. Biomass production and Species diversity are often much greater than near by Uplands. Therefore wet lands are especially Valued as major breeding, nesting, and migration staging Areas.

2. Wetlands also improve water quality by acting as Natural water purification Systems, removing silt, and absorbing nutrients & Toxins. The flow of ground water through Coastal marshes prevents salt water intrusions that would - Otherwise contaminate wells

3. Coastal wet lands help stabilize shore lines and reduce the damage by waves like Tsunami.

4. Due to Combination of Anerobic Condition and low Temperature, biological activity is slowed down so that organic debris is only partially decomposed to form peat which release the humic acid that make the colour Tinge Brownish

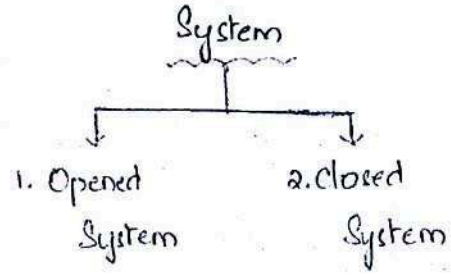
5. The Vegetation of the wetlands absorb a good amount of excess CO_2 that is - Generated by Human activities and replace it by life Supporting O_2. Therefore wetland acts as lungs of the world.

6. World wide, the most extensive wet land areas are in Canadian & Russian arctic Tundra.

- In Sovier or Central European literature, the term Biogeoconosis describes the same concept of Ecosystem.

- System:-

A System is any ordered, interrelated set of things and their attributes, linked by flows of Energy and matter as distinct from their Surrounding Environment Outside the System.



A Natural System Generally is not Self contained – Inputs of Energy and matter flow into the System and outputs flow from the System. Such a System is called an Open System.

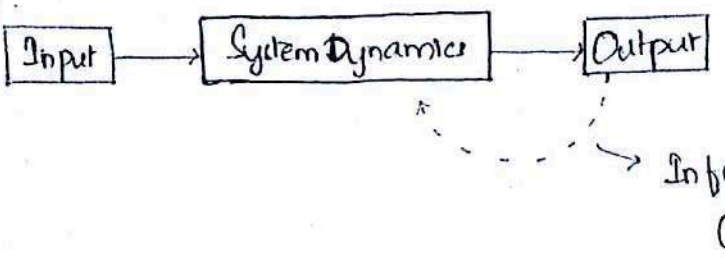
Earth is an Open System in terms of Energy as are most Natural Systems (Because Energy enters freely).

A System that is shut off from the Surrounding Environment. So that it is Self Contained is a Closed System. Earth is essentially a closed system in terms of Physical matter & Resources.

- Diversity is the Nature Principle as it acts as a 'Hedge' against any emergency.

- The greatest Damage mankind has done to the nature is that man has simplified most of the Ecosystems in the Nature and as a result these ecosystem has became fragile

- Feed Back:-



- As a System operates, Outputs that can influence continuing System operations are generated. "This information" is returned to various Points in the System through pathways called Feedbackloops.
- Feed back can guide further System operations. If the information amplifies or encourages response in the System, it is called positive Feed Back. If the information slows or discourages response it is called Negative feed back. Such negative feed back causes self regulation in Natural System, maintaining the System with in its Performance stage and in its dynamic equilibrium state.
- In Earth's Systems, -ve-feed back is far more common than +ve feedback. Unchecked +ve feedback in a System can create a "runaway" condition Untill a critical limit is reached, leading to instability, disruption or death.

Population and Community:-

The term "Community" is applied to any grouping of populations of different organisms found living together in a particular Environment.

The term Community refers to the biotic Component of an Ecosystem.

The term "population" refers to a group of organisms, all of the same species which occupies a particular area.

* BIOMES *

BIOSPHERE

(It is largest Ecosystem Possible on Earth)

- (A). TERRESTRIAL ECOSYSTEM
  (It is subdivided into zones Called Biomes or Biotic Regions)
- (B). AQUATIC ECOSYSTEM
  - FRESH WATER ECOSYSTEM
  - SALINE WATER ECOSYSTEM

BIOMES:-

Biome is the largest Justifiable / Recognisable / Identifiable Subdivision of the Terrestrial Ecosystem. It is an assemblage and an association of plant and animals that forms a regional Ecological Unit of Sub Continental dimensions.

According to russians; climate, Soil and Vegetation represent an Integrated reality.

* FACTORS EFFECTING BIOMES DISTRIBUTION:-

1. Annual Variation in Temperature (Difference between maximum and minimum Temperature)
2. Amount of Rainfall — (Average to minimum)
3. Mineral Availability
4. Availability of Sunlight

Latitudinal Transistion of Biomes from the Hot Equitorial regions to the cold polar regions can also be observed along the slope of the high mountain Maint Kenya in East Africa and mount Chimborazo have their feet on Equator, but their peaks are Snow covered.

Alexander von Humboldt recognised the relationchip between not only Vegetation and Altitude but also Altitude and latitude.

12.2014

Environment & Ecology

Manocha

* Don't wait... Time will never be just right!

* Immature love says - I love you because I need you...
Mature love says - I need you because I love you...

Biomes

Ecotone:-

Seldom the Boundaries between two Biomes are discrete or distinct, Instead they Blend with neighbouring Biomes through transition zone known as Ecotone. This transition zone has high species diversity and density as compared to any of the neighbouring Biomes.

Ecotone is fairly and sharply defined transition zone between 2 or more different Communities.

Ecotones arise naturally. For Ex:- At land water interfaces, But else where they often reflect human interventions. (The agricultural clearance of formerly forested areas, for Ex).

Edge Effect:-

The Existance of more species in a region of "overlap" between two Ecosystems, than occur in either of those systems. It occurs because the overlap region supports some species from both adjacent Ecosystems and some peculiar to itself.

Ecologists now regard the Edge Effect as a sign of Ecological degradation The fragmentation of Habitants cause 'increase' in Edge areas but a decrease in the 'internal areas of Ecosystems, leading evantually to a loss of Species from all affected Eco Systems and an 'increase in the Edge Species. Increasing the Edge area through Habitat fragmentation makes many Species more Vulnerable to Stresses such as predators and fire. It also Creates Barriers that can prevent some Species from Colonizing new areas and finding food & mates.

Classification of Ecosystems (By ODUM) :-

Bases

(i). Habitat (location)

(ii). Source of Energy and Flow(level)) of energy

Unsubsidized Natural Solar Powered Ecosystem :-

Ex:- Open Ocean (away from the Coast)

- Upland Forest
- deep and wide lakes of the world.

Energy flow (Estimated) - 1000 - 10,000 kcal/m²/year (Range)

2000 kcal/m²/year (Average)

- Natural Subsidized Solar powered Ecosystem:-

Ex: Tidal Estuaries

Continental Shelfs

Lowland Forests

Coral reefs, etc.

Estimated Energy flow: Range - 10,000 - 50,000 kcal/m²/year.

- Average - 20,000 kcal/m²/year

- Man Subsidized Solar powered Ecosystems:

Ex: Agricultural Systems/Areas

Aqua culture

Energy flow: 10000-50000 kcal/m²/year (Range)

20,000 kcal/m²/year. (Average)

- Fuel Powered Ecosystems:

Ex: Urban & industrial Areas of the world

E. Energy flow - Range: 100,000 - 3000,000 kcal/m²/year

Average: 200,000 Kcal/year

Deciduous And Evergreen:-

A plant which retains its green matter through out the year is known as Evergreen

- An Evergreen forest is one in which there is no Complete Seasonal loss of leaves. (Trees shed old leaves and produce new ones partially),

and some times through out the year, Rather than during particular Periods.

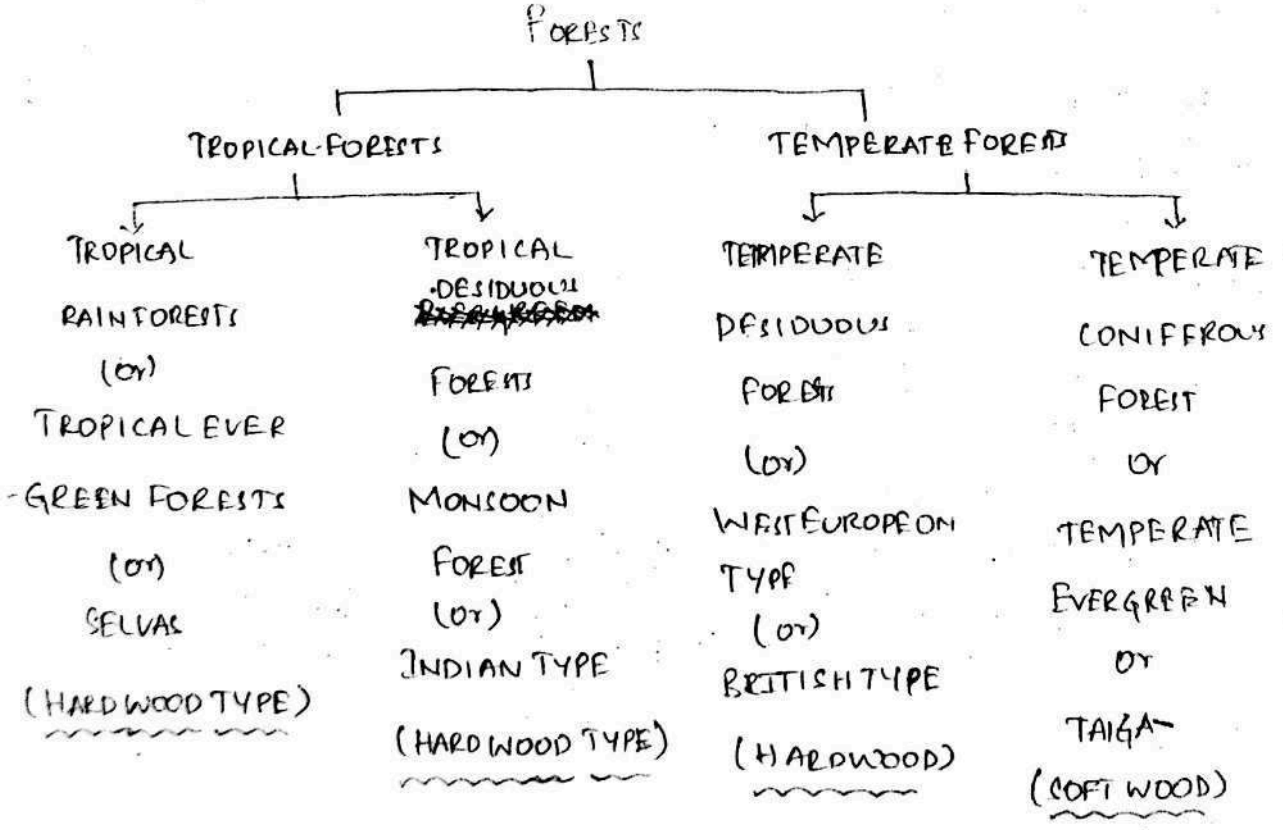
Deciduous

The term deciduous is plight to ability of plants to lose their leaves Every year.

In the tropical monsoon forest, the deciduous trees shed the leaves in the dry Summer months (like March, April, may in India). In the temperate zone, the deciduous trees shed the leaves before the severe winter begins, i.e, in the Autumn Season.

Coniferes trees

They are tall, Straight, needle like leaves Most of the trees are evergreen, but some trees like larch are deciduous in Nature.



Temperate Hardwood is much better than tropical hardcoood.
It is lighter in weight, stronger, more durable and easy to work upon than Tropical hardwood.

Deforestation:-

As an Ecological problem refers to cutting of trees on large scale followed by a land use change.

Madagaskar as a region is most eroded in the Nature (Soil erosion) ie, it means mean millions of diversity is lost in madagaskar.

Deforestation as a global ecological problem, in general pertains to tropical forest and in particular to tropical rain forest.

GRASS LANDS

Ⓐ TROPICAL GRASSLANDS

- Grasses with scattered Trees
- Park land savannah
- Grasses are taller, thicker, coarser lack of nutrients
- Campos and Llanos (Brazil) (Venezuela)

Ⓑ TEMPERATE GRASS LANDS

- much purer grasslands.
- Shorter, softer, nutritious
- Temperate grasslands are Broadly classified into two Categories.
  Prairie Type and steppe type (dry)
  (Different in terms of moisture)
  Steppes are much lower.
- Prairies (North America) Steppe (Russia)

Doions (Australia)

Pampas (Agentina)

Veldts (South Africa)

Pustas (Hungary)

Life is like riding a bicycle, To keep balance, keep moving.

* DESERT BIOME *

Evaporation:

Loss of moisture from the Earth Surface

Transpiration:

Loss of moisture through Plants

Evapotranspiration:

It refers to the actual loss of moisture in a given area through Evaporation and Transpiration.

Thornthwaite - Potential Evapo Transpiration:

PET refers to the loss of moisture in agiven area through evaporation and Transpiration, If there were no deficit of moisture in that Area.

We can identify 3 types of Areas in the coorld

(i). Areas with Precipitation >> PET

- Surplus of Moisture (Humid Areas)

Ex: Equatorial belt

(ii). Areas with Precipitation << PET

- Deficit of Moisture (Arid Areas), Some them would be deserts

Ex:

(iii). Areas with Precipitation ≃ PET

We donot have many good Examples of such area.

The closest example is represented by Temperate grasslands of North America, i.e. Prairies

* Mediterranean Biome *

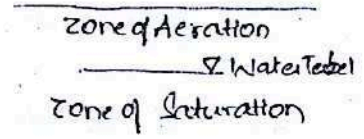
Refer to Planetary winds Notes, for mediterranean type climate.

Mediterranean Biome is the most scattered or fragmented biome of the world.

* Tundra Biome *

Tundra biomes has areas beyond 65°N

- Summer : Ice sheet
- Winter : Beautiful areas of the world with greenary



(i). Zone of saturation is a zone in which every pore is filled with water

(ii). Zone in which some pores are filled with water and others have Air in them- Zone of Aeration

(iii) WaterTable refers to highest level of Zone of Saturation

Wetland : An ecosystem where the water table has reached the earth surface or the water stands on the surface for atleast a part of the year.

11. The St. Lawrence Type

or

The Laurentian Type

or

The Cool Temperate East margin Type

St. Lawrence - River in North America.

Laurentian Plateau System - Canada.

Monsoon

It means seasonal reversal of winds happens in:

1. South Asia
2. East Asia
3. North Australia
4. West Africa.

Monsoon as a climate type is a typical Feature of Tropical Belt. 4 principle regions of the world are listed above.

Some Special types of Species in Nature:-

Keystone Species:-

Keystone ~~of~~ Species is species or group of species who impact on its Community or Ecosystem is much larger and more influential than would be Expected from mere abundance.

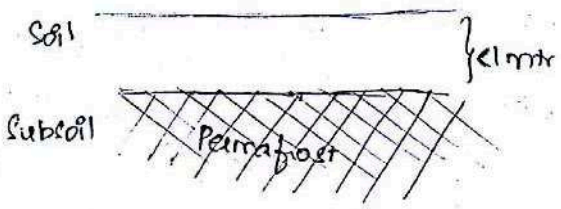
Originally, Key stone Species were thought to be top predators (such as a woolf) whose presence limits the presence of Herbivores in abundance and there by reduces their grazing of plants

The word Tundra in Finnish would mean a Barren land, applicable in long winter of 6-9 months.

The other meaning in Russian language would mean a wet land or marshy conditions, would be seen in Summer.

Lichens
Mosses + Rhododendrons → Arctic Prairies
Sedges

* Permafrost: Permanently Frozen Sub soil.



Subsoil is permanentaly Frozen

During Summer season, when Upper ice cover melts the region would transform into a wet land as melt water is not able to drain because of permafrost beneath.

Tundra biome is the most Continuous of all biomes. It occurs almost Unbroken along the margins of Northern Continents.

* Temperate Monsoon Type *
(or)
China type Climate
(or)
* Warm Temperate East Coast Type *

Scientists have recognised that less conspicuous species also play essential community roles. For ex: Certain Tropical figs bear during the seasons when no other fruits were available for Frugivores. If these figs were removed many animals could starve to death. With those animals gone, many other plant species that depend on them would disappear on them.

Even microorganisms can play vital roles. In some forest eco systems, Mycorrhizae (Fungi associated with the tree roots) are essential for mineral mobilisation and absorption. If the Fungi die so do the trees and many other species that depend on a healthy forest community

Often in no. of species are intricately interconnected in communities. So that it is difficult to tell which is the essential key. In the kelp "forests" off the California Coast, the kelp (A kind of Algi) provides the shelter for many fish and shell fish species and so could be regarded as a key to the community structure. However, Kelp depends of sea otters, which eat the sea Urchins that graze on the kelp. Perhaps in such cases we should think in terms of a "Key stone set" of Organisms.

Foundation Species (other major players)

Foundation Species (OMPs): other major players.

Do not let the future be held hostage by the past.

- Beavers are called as Ecological Engineers.

They deposit sediments and create dams, thus making the wet lands.

Beaver could be foundation Species.

- Some birds species & bat species also act as foundation Species.

Some Ecologists think that the key stone species category should be expanded to include foundation species, which play a major role in shaping communities by creating & enhancing their habitats in ways that benefit other species.

Ex:- A. Beavers acting as Ecological Engineers create wet lands used by other species by building dams in streams.

B. Some Bat & Bird foundation Species can regenerate the deforested areas & Spread fruit plants by depositing plant seeds in their droppings.

Indicator Species:- Biological Smoke Alarms!

Species that serve as early warning of damage to a community or an ecosystem are Called Indicator Species.

Ex:- A. Birds are excellent Biological Indicators

B. Amphibians are especially vulnerable to environmental disruptions. They ①

have been vanishing in different parts of the world.

Environmentalism:

Environmentalism refers to concern the humanity at present for the protection of the nature. The following two events acted as turning points for this concern.

1. The Book - Silent Spring written by Rachel Carson (in late 1960's)
2. The Report - Limits to Growth (Early 1970's)

This was the title of report on a study by American Scientists to investigate the question that Do we human beings have limits for process of Economic Growth? This study was conducted on behalf of Body of intellectuals called Club of Rome and used Systems approach & Computer modelling. This report in early 1970's concluded that there are limits to the economic growth, though these are not in near future. This report also emphasised that the role of modern technology is to postpone the limit - The limits can-not be eliminated as earth is a finite planet.

• Ecological Succession •

1. Change of community structure due to Environmental Change through time is called "Ecological Succession."
2. The Idea of Ecological Succession was first presented formally by the American Ecologist F.E. Clements in 1916.

3. According to him:

i. Succession follows an orderly process and hence it is quite predictable in Nature.

ii. Succession ends & he refers the culmination as the CLIMAX stage. Climax is a community that seemingly resists further change. i.e, It is the stable & self perpetuating stage.

iii. In one climatic region, there is one Climax & this climax is determined by the climate of the area (Monoclimax or Climate climax)

Tensley (Poly Climax Idea):

According a tensley a mosaic of climaxes could be present in one climatic area.

The different Climaxes may be controlled by different factors like Soil, drainage, topography, fire, climate etc.

Whittaker:

He considers that there is no absolute climax determined by Environmental Conditions.

Any Community is an Expression of its particular Habitat & is therefore unique.

Communities are constantly adjusting in response to

Sere: It refers to a series of communities that follow one another on the way to the stable stage.

- Each of the temporary community is called a "Seral Stage"

In the early stages of succession, the No. of species keeps increasing but as stability is increased A few usually become dominant & eliminate some rare species by competion

the physical Environment. But it is doubtful whether they ever attain equilibrium with it.

There for at maturity stage, there is some reduction of species.

Gleason:

The Community-Unit theory of Clements was opposed by Gleason, who saw community history as a much more unpredictable process. He argued that species are individualistic, each getting established according to its ability to colonise & reproduce in an area.

Gleason suggested that, we see ecosystems as stable & uniform only because our & life times are so short & our view so limited.

Conclusion:

(i). The process of succession may not be as deterministic as we once thought, yet mature/highly developed ecological communities do often tend to be resilient & stable over long periods.

(ii). It is perhaps more accurate to say that the rate of succession is so slow in a climax community that from a perspective of a single human life tytime, it appears to be unchanged.

Ecological succession is of two types:

1. Primary
2. Secondary

1. Primary Succession:

a. It is one site previously unoccupied by species (newly emerged island/ lake.

b. It begins with pioneer species (microbes, liches, mosses) that can withstand harsh conditions & lack of resources.

c. Pioneer species lead to environmental modifications called, Ecological facilitation or development.

d. The pioneer species gradually disappear as the environment changes, a new species combinations replace the preceeding community.

2. Secondary Succession:

a. When an existing community is disrupted and new one subsequently develops at the site.

b. The disruption could be a natural catastrophy (fire/flood) or human activity (deforestation/ mining etc)

c. Examples of secondary succession are easy to find.

Plagio Climax:

1. Arrested.
2. Deflected.

Plagio climax refers to a stable community arising from a succession that has been deflected or arrested directly/indirectly as a result of human activities.

A. Arrested Succession:-

The Stable Community is a naturally occuring Successional phase & it should be possible for natural Succession to continue once the disturbing factor has been removed.

B. Deflected Succession:

Stable Community that could not have occured in the absence of Human intervention.

Associated Changes in the physical environment may mean that even when the human pressures are removed, the succession to the original Climax Community is no longer possible.

Dis - Climax Communities (or) Equilibrium Communities (or) [Particular Case, Also Called as Fire - climax Communities]:

Some land Scapes never reach a Stable climax in the traditional Sense because they are Characterised by, and adopted to, periodic disruption. They are called disclimax or equilibrium Communities.

For example, Tropical grass lands (savannah), the Chappaal Shrubland of California & Some kind of Coniferous forest are maintained by Sporadic fires and have been part of Historical events.

Plants in these Communities are adopted to resist fires, re seed quickly -

after fire or both. Infact, many of the plant species we recognise as the dominants in these communities require fire to eliminate competition, to prepare seed beds for germination or to open their seed coats.

With out fire, Community structure of such area may quite different.

Community Structure Characteristics:

The following 3 major characteristics help in analysis and comparision of different Ecosystems.

1. Species-Diversity:-

It can be seen in terms of:

a. Species Richness:-

The no. of species in a given area/Ecosystems.

b. Species Evenness:

The abundance of individuals with in those of each species.

2. Ecological Niche Structure:-

Ecological Niche:

The Functional position of an organism in its environment, Comprising the habitats in which an organism lives, the periods of time during which it occurs & is active there and the resources it obtains there.

Structure:

The Ecobgical Niche structure of an ecosystem can be analysed in terms of:

3.2015

a. The No. of potential Niches.

b. How the Species occupy different Niches interact.

c. Geographical location.

Community Structure characteristics:

- Discipline is the bridge between Goals & accomplishment.
- Never let a fool kiss you or a kiss fool you.

3. Geographical Location:

For most terrestrial plants & Animals, Species diversity is the highest in the Tropics and declines as we move towards the poles.

Tropical species have a relative Constancy of climate and a more reliable supply of food sources. Thus Tropical Species tend to be Specialists and have narrow niches and live in micro habitats. Where as Species living in middle & high latitudes, where weather is cold & variable tend to be Generalists with wide Species. The Adaptations that enable them to thrive in a wide range of Environmen and occur over large Expanses of Territory.

Species Interactions:

1. Competition
2. Predation (Prey- Predator)
3. Parasitism (Host - Parasite)
4. Mutualism (Ex: Coral Animals - zooxanthellae)
5. Commensalism

Competition:

Most Common Interaction between Species is Competition for shared or limited

Resources such as Space and food.

Instead of fighting for resources, most competition involves the ability of one species to become more efficient in acquiring food or other resources. Some species evolve adaptations that allow them to reduce or avoid competition for resources with other species.

For Ex: Species may go for Resource Partitioning.

Ex: Lion - larger animals as prey

Leopards - smaller animals.

Intense competition can lead to

1. Migration
2. Shift of feeding Habits/behavior through Natural Selection.
3. Suffer a sharp decline in population.
4. Become Extinct over a period of time.

Predation:

In predation, members of one species (the Predator) feed directly on all or part of living organism of other species (the Prey).

Ex: Lion - zebra, Hawk - Rabbit.

At the individual level, member of the prey species are clearly harmed but at the population level, predation plays a role in evolution by Natural Selection. Generally, the individuals which become prey are the sick/weak ones - leave behind the individuals with better defenses against predation.

- Their future offspring may be avoid predation.

Parasitism:

It occurs where one species (Parasite) feeds on part of another organism (Host), usually by living on / or in the host. In this relationship the parasite benefits and the host is harmed. Parasitism can be viewed as a special form of predation. But unlike a conventional predator, A parasite is usually much smaller than its host and rarely kills its host. Also, most parasites remain closely associated with dracon nurishment from, and may gradually weaken the hosts overtime.

From the host point of view, parasites are harmful, but parasites promote biodiversity and control populations by helping keep some species from becoming so plentyfull that they eliminate other species.

Mutualism (Win-Win Relationship):

In mutualism, two species interact in a way that benefits both.

1. Mychorrhizae and Trees:

The fungi get nutrition from the plants roots. The fungi benefit the plant by mineral mobilisation and absorption from the soil.

2. Coral Reefs: → Coral polyps
   → Algi called zooxanthelle.

Symbiosis: A General term describing the situation in which dissimilar organism live together in close association. As originally defined, the term embraces

all types of mutualistic and parasitic relationships. In modern use, it is often restricted to mutually beneficial species interactions.

Commensalism:

It is an interaction that benefits but one species but little or no effect on the other.

1. A bird making Nest on Tree.

2. Epiphytes & Trees:

Epiphytes like Orchids & bromeliads climb the Trees to reach a height from where they can get sunlight in a Tropical rain forest.

* CORAL REEFS *

1. Coral Reefs are submarine morphological species with organic calcareous structures.

2. Coral reefs are beautiful natural wonders and are among the world's oldest most diverse and most productive Ecosystems. In terms of biodiversity they are the marine equivalents of Tropical Rain forests.

3. Coral Reefs represent a mutualistic relationship between Coral animals and photosynthetic algae called Zooxanthellae.

4. Corals obtain part of their livelihood from sea water and the remain. Comes from algae that live on the corals tissues. The algae provide the

coral animals with color, food & O_2 through photosynthesis and help to produce $CaCO_3$ which forms the coral skeleton. Corals live in huge colonies and their bodies are attached to one another. As corals die the other corals grow on the dead corals calcareous debris.

5. Coral growth is dependent on calcium obtained from sea.

6. The Reefs form along the coasts, Islands, and on Seamounts which provide the foundation.

Ideal Conditions for Growth of Corals:

1. Temperature: 25°-30°

∴ primarily restricted to Tropical Belt (Coral die if <18° & >33°C)

2. Salinity: The ideal range is 3.7% to 4.0% (27 PPT - 40PPT) {27 gm in 1000gm}

3. Shallow waters: less than 60-65 m. ~ Living System.

4. Corals need sediment-free clear water.

5. Corals donot survive above the surface of water.

6. They need Submarine platforms like Seamounts, etc.

7. The water which is disturbed by currents & waves is beneficial as it ensures the supply of Calcium.

Benefits of Corals to Mankind:

1. Coral reefs provide a site for diverse variety of plants and animals.

2. Coral Reefs protect Coast lines from wave erosions.

3. They are the store house of living resources like fish - Reef fish accounts for about 15% of the total fish Catch of the world.

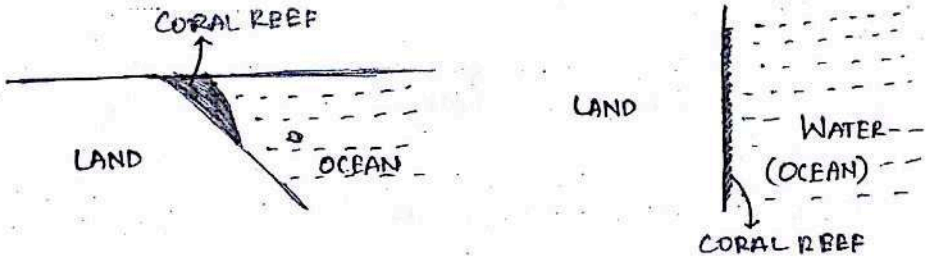
4. Tourism Revenue for Certain Countries.

5. Help in moderating atmospheric temperatures by removing CO_2 from the atmosphere.

Types of Coral Reefs:

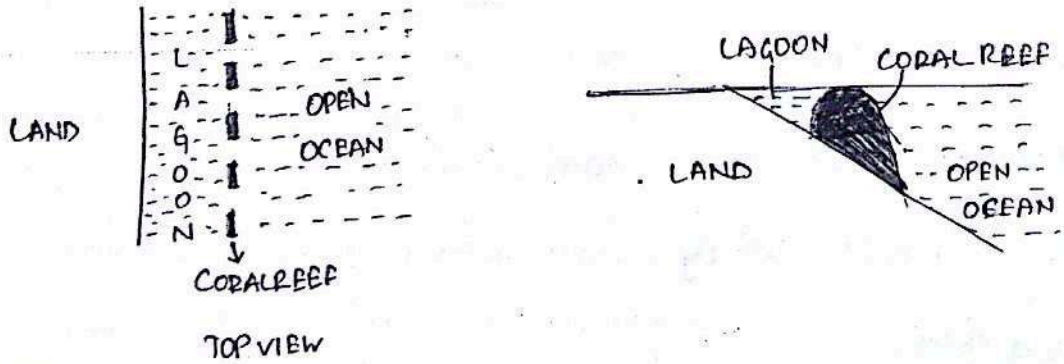
1. FRINGING REEF:

It is a reef which grows out from the land and is Connected to it.



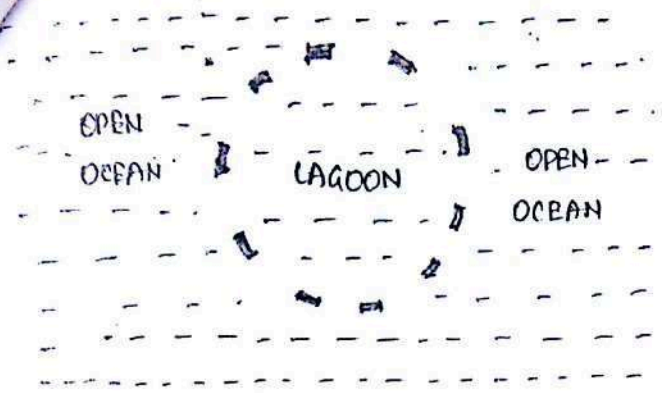
2. BARRIER REEF:-

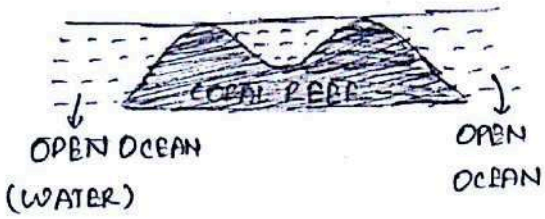
It is a reef which is seperated from the land by a Lagoon.



3. ATOLL:

ATOLL is an oval shaped Coral reef formed away from the Coast in the deeper waters. It is formed on or around a seamount. It encloses a Lagoon in the Centre.





- Great Barrier Reef is the largest Reef of the world. It is about 2000km long and 200km width. It is off the East Coast of Australia.
- The largest Reef in Northern Hemisphere in the country Belize (Central America)
- Kwajalein is the largest Atoll of the world. It is in the marshall Islands of the Central pacific ocean.

CORAL BLEACHING:

- Situations where in the Coral animals lose their Symbiotic algae. It is called so it has aloss of colors in of Coral reefs when ever there is a stress on their Relationship.

Reasons:

1. Increase in Temperature -
   - Seasonal Fluctuation
   - El-Nino
   - Climate change / Global warming.
2. Eutrophication of Coastal waters

Eutrophication:

→ when discussed as an ecological problem refers to Cultural Eutrophication, i.e, accelerated addition of the chemicals like phosphates, nitrates etc into a lake from near by agriculture fields and/or industries.

3. overfishing and wrong practices like use of Cyanide & Dynamite for fishing.

4. Marine pollution - due to Oil spills, Industries on coastal regions.

→ with toomuch of additions of chemicals there is an increasing Biological oxygen demand & as lake system fails to meetthedem- -and the lake gets choked.

Conclusion:

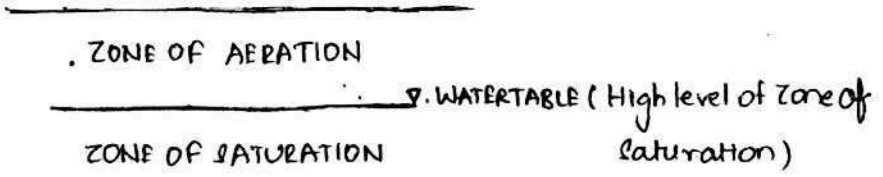
According to a study in 2004 -

a. 20% of Coral reefs are so damaged that they are unlikely to recover

b. By 2015 another 30-50% could be lost due to climate change, habitat loss, pollution and overfishing etc.

c. Scientist found that corals can form relationships with more heat tolerant types of algae and this could allow corals in some areas to survive at higher temperatures.

* WETLANDS *



Wetlands are Ecosystems in which the land surface is saturated or covered with standing water atleast for a part of the year. There are many kinds of wet lands, but we can broadly group them into 3 major categories.

1. SWAMPS: wet lands with Trees.