

# Weather

- Same annual rainfall are joined by a line called an isohyet.
- Rainfall can also be shown in dispersal diagram.
- instrument for measuring pressure barometer.
- places with equal pressure joined by isobars.
- Altimeter (a type of aneroid barometer) measures height.
- Shade temperature - temperature of the air. This done by a meteorological shelter known as Stevenson Screen.
- Relative humidity measured by hygrometer which comprises wet & dry bulb thermometers.
- Six's thermometer, e.g. of max-min thermometer.
- For isotherms, temp. are reduced to sea level  
↳ Line joining places with equal temp.
- When air is completely saturated ( $RH = 100\%$ ) air temp is said to be at dew point.
- Speed of wind measured by anemometer.
- places with equal sunshine duration are joined by isohels
- places with an equal degree of cloudiness are joined by isonephs.

High clouds - Cirrus, Cirrocumulus, Cirrostratus (create halo around the sun)

Medium clouds!: Alto cumulus, Altostratus

Low clouds!: Stratocumulus, Stratus (light drizzle)  
Nimbostratus (rain cloud)

Cloud with great vertical extent!:

- Cumulus - fair weather cloud.
- Cumulonimbus - thunder cloud.

Haze - Smoke & dust particles in low humidity, less than 75%  
visibility less than 2000 m.

Mist!: Condensation of water vapour in air, forming cloud at ground level, (RH > 75%), visibility 1000 meters.

Fog!: due to water condensing on dust and other particles. At lower strata of atmosphere as 'ground cloud.' visibility less than 1000 meters.

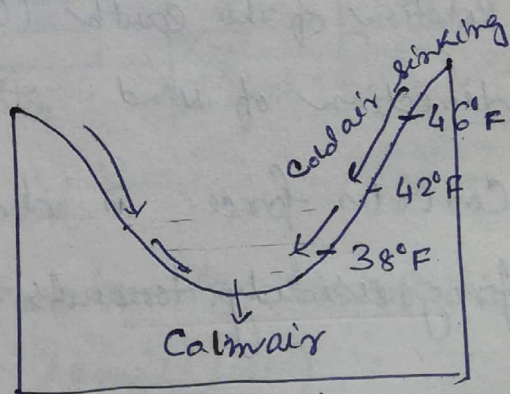
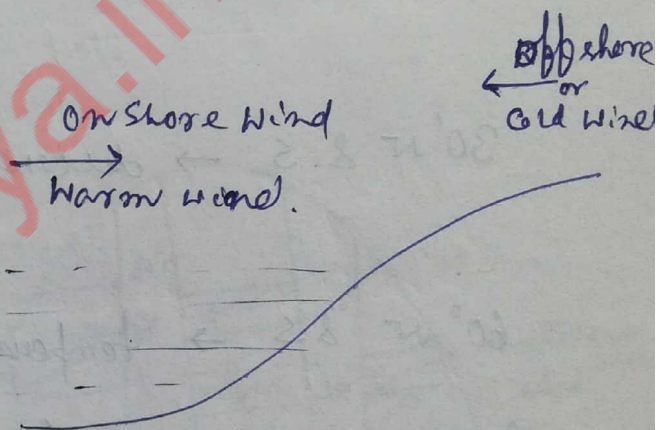
Radiation fog!: At temperate land, lower layers of air are chilled due to clear night & creates land fog.

# Climate

- Ionosphere (Beyond stratosphere) has electrically conducting layers which make short wave radio's tr. possible over long distance.
- Insolation - part of the sun's radiation which reaches the earth.
- The earth warms the air by conduction, convection & radiation.

## Factors influencing temp:

- Latitude
- Altitude ( $6^{\circ}\text{C}/\text{km}$ )
- Continentality
- Ocean currents & winds
- Slope, shelter & aspect.
- Natural vegetation & soil.



(e.g. Amazon)  
It is cool in the jungle, & its shade temp. is few degrees lower than that of open spaces in corresponding latitudes. During the day trees lose water by evapo-transpiration so that the air above is cooled, RH high & mist & fog may form.

Convictional rainfall  $\rightarrow$  equatorial, tropics (in summer)  
temperate interiors.

Orographic or relief rain  $\rightarrow$  West Malaysia, Western New Zealand,  
Western Scotland & Wales and  
the Assam hills.

Cyclonic or frontal rain  $\rightarrow$  temperate region (depression)  
tropical region (cyclones)

Equatorial low pressure belt  $\rightarrow$  zone of wind convergence  
 $\rightarrow$   doldrums.

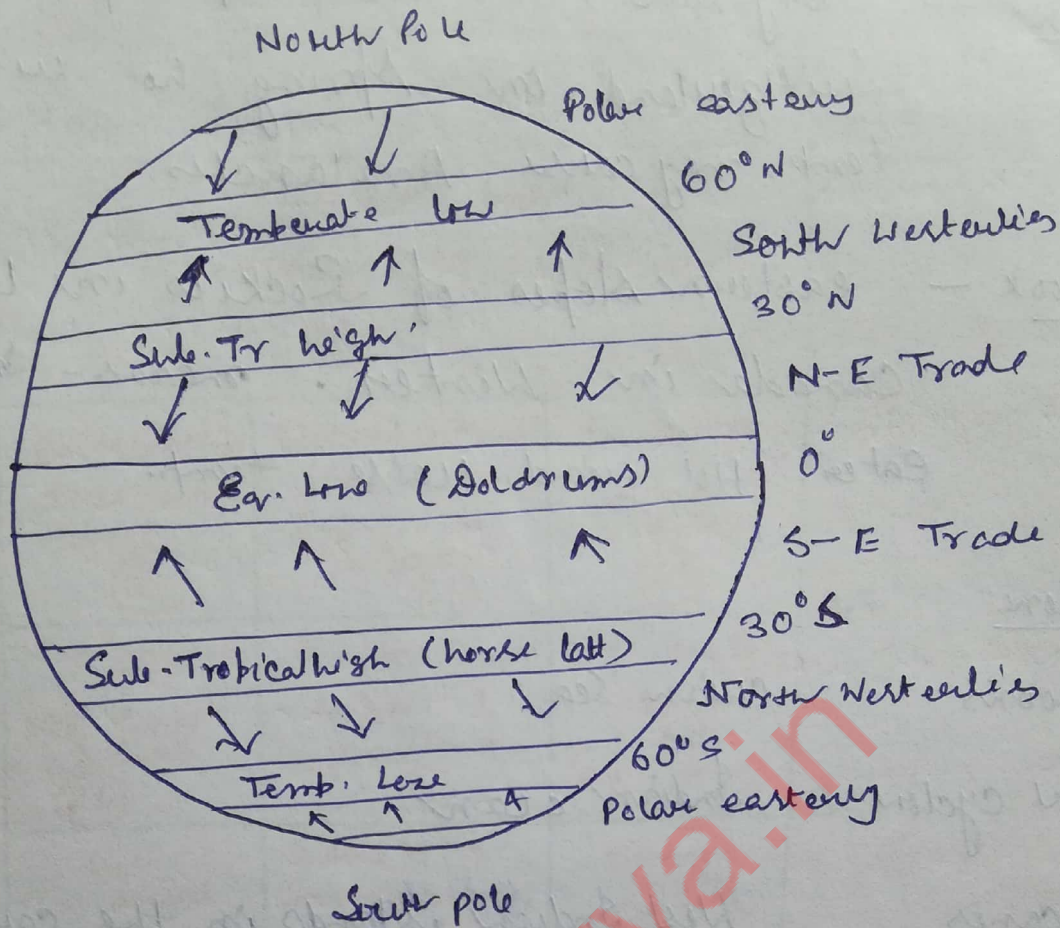
$30^\circ N$  &  $S$   $\rightarrow$  descendent air  $\rightarrow$  wind divergence  
horse latitudes  $\leftarrow$  Anticyclone

$60^\circ N$  &  $S$   $\rightarrow$  temperate low pressure belt  $\rightarrow$  convergence

Rotation of the earth (Coriolis force) tends to deflect the  
direction of wind.  $\rightarrow$  Ferrel's law ✓

Coriolis force is absent along equator increases  
progressively towards the pole. ✓

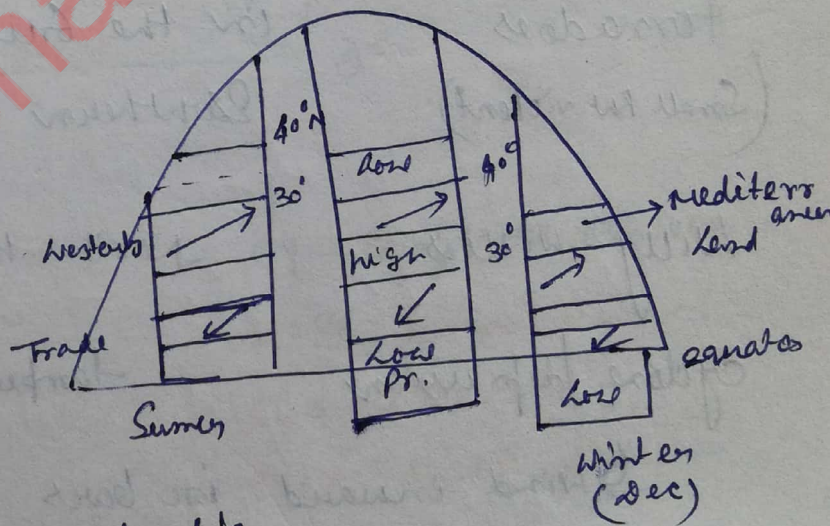
Land & sea breezes are, monsoon on a smaller  
scale. Both are basically caused by differential heating  
of land & sea. , the former in a diurnal  
rhythm & the latter in a seasonal rhythm.



Mediterranean climate

Europe & California

↳ December rainfall



Southern continent

↳ Central Chile, Southern

Africa, South Western Australia

receive rain in June (winter in Southern hemisphere)

Föhn — Dry wind, northern Alps in Switzerland in Spring, hot wind. raise temp, may cause Avalanches.

Chinook — eastern slopes of Rockies in USA & Canada in winter. means - ~~snow~~ snow eater. Hot wind, raise temp.

cyclone

Typhoons

China Sea.

tropical cyclone

Indian ocean

Hurricanes

West Indian islands in the Caribbean

Tornadoes

in the Guinea islands of West Africa

(Small but violent)

Southern USA (whirl wind)

Willy-willies

North Western Aus

cyclone / depression

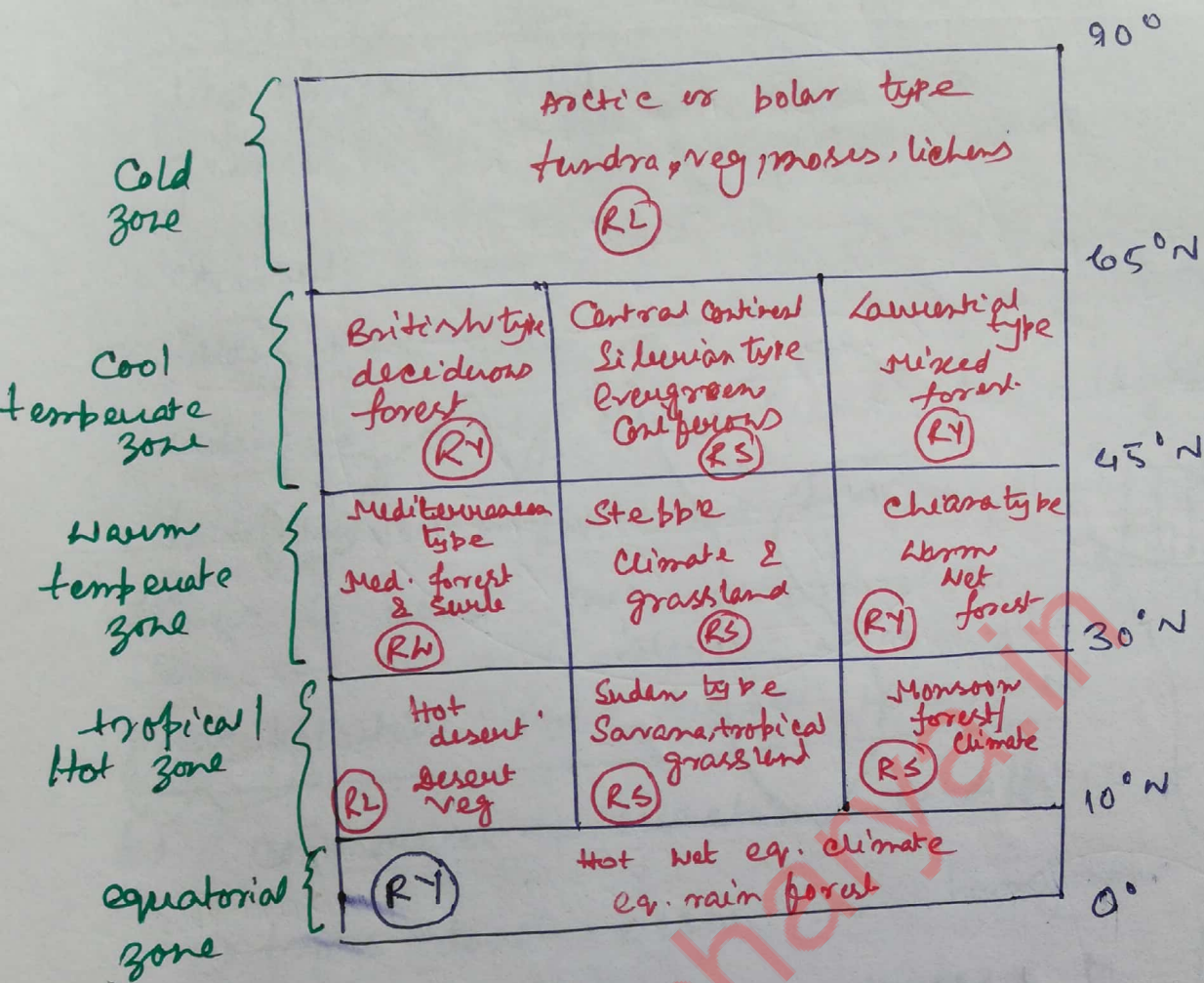
temperate latitude.

↳ wind inward, isobars are close

Anti cyclones

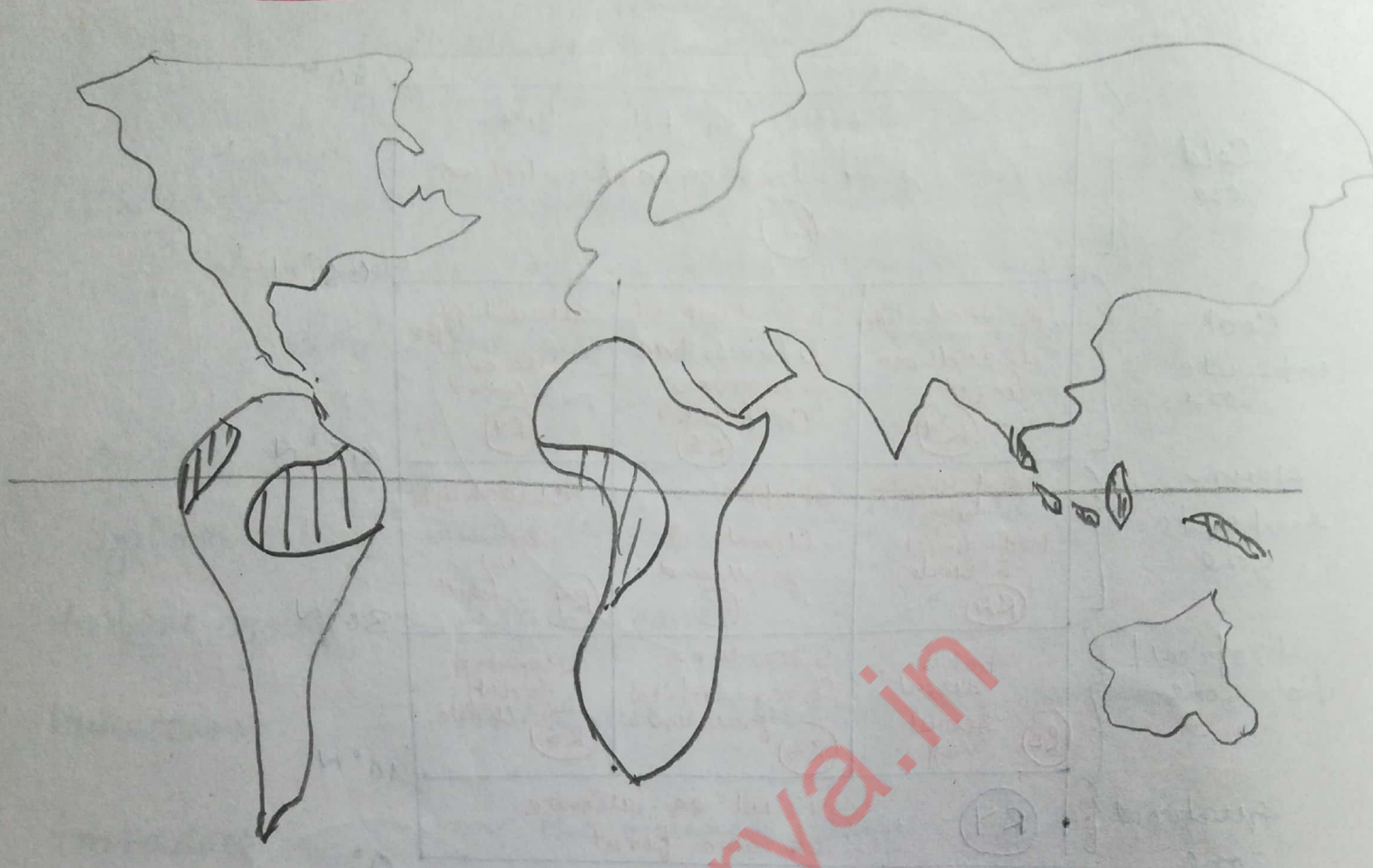
→ high pr. at centre, isobars far apart, pr. gradient gentle & wind

light & outward.



RY → Rainfall all year round  
 RS → Summer rain  
 RL → little rain  
 RW → Winter Rain

# Hot Wet Equatorial Climate



- Two period of max<sup>m</sup> rainfall - April & October.

- Amazon rainforest - Selvas ✓

- Great variety of vegetation

- distinct - layer of arrangement - thick canopy.

- Multiple species, not found in pure stand.

- Forest clearing. Secondary forests called belukar in Malaysia, spring up.

Amazon basin → Indian tribe -

Congo basin → Pygmies -

Malaysia → Orang Asli -



Plantation established by Europeans.

Malaysia, Indonesia → Rubber

West Africa, Gulf of Guinea → Cocoa

Coconut & banana.

Lalang → tall grass

Ladang → newly cleared land for cultivation

Initially soil is fertile due to thick humus, but once humus is used soil deteriorates rapidly - exception Java, due to rich volcanic ashes.

great potential in timber resources

but commercial extraction is difficult -

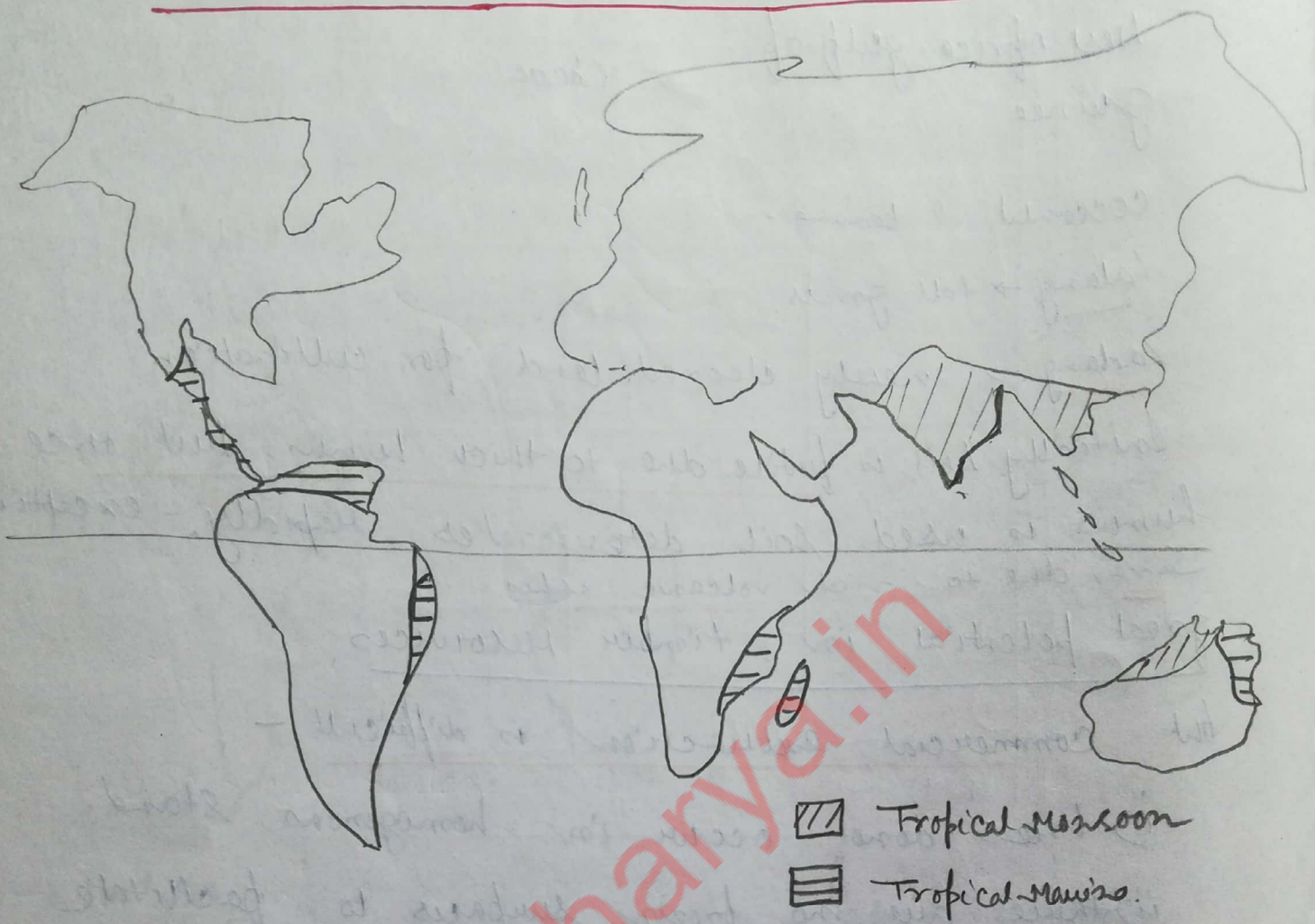
i) trees do not occur in homogenous stand.

ii) there are no frozen surfaces to facilitate logging

iii) tropical hardwoods are sometimes too heavy to float.

iv) transport is difficult.

# TROPICAL MONSOON & TROPICAL MARINE CLIMATE



Tropical monsoon - on shore Wet monsoon (summer)  
off shore dry monsoon (winter)

→ Indian subcontinent, Burma, Thailand, Laos, Cambodia, part of Vietnam, South China, and northern Aus (AUS)

Tropical Marine → former is modified by influence of the on shore trade wind all around the year and has a more evenly distributed rainfall.

- Central America, West Indies, North eastern

Australia, Philippines, parts of East Africa, Madagascar, (Guinea) coast & Eastern Brazil.

- experienced along eastern coast of tropical land.

The forests are more open and less luxuriant than the equatorial jungle and there are few genus species.

Valuable timber, durable hardwood - e.g. Burmer tree.

Rice staple crop

Cash crop :- i) Sugar - India, Java, Formosa, Cuba, Jamaica, Trinidad.

ii) Jute

iii) Manila hemp (Abaca) - Philippines, a fiber

iv) Indigo (IND, JAVA), cotton.

Plantation: i) Tea - China, India, Bangladesh, Sri Lanka, Java

ii) Coffee - Brazil, Eastern Java, India.

Malaysia → Shifting Cultivation  
Ladang

Burma → Taungya

Thailand → Tamra'

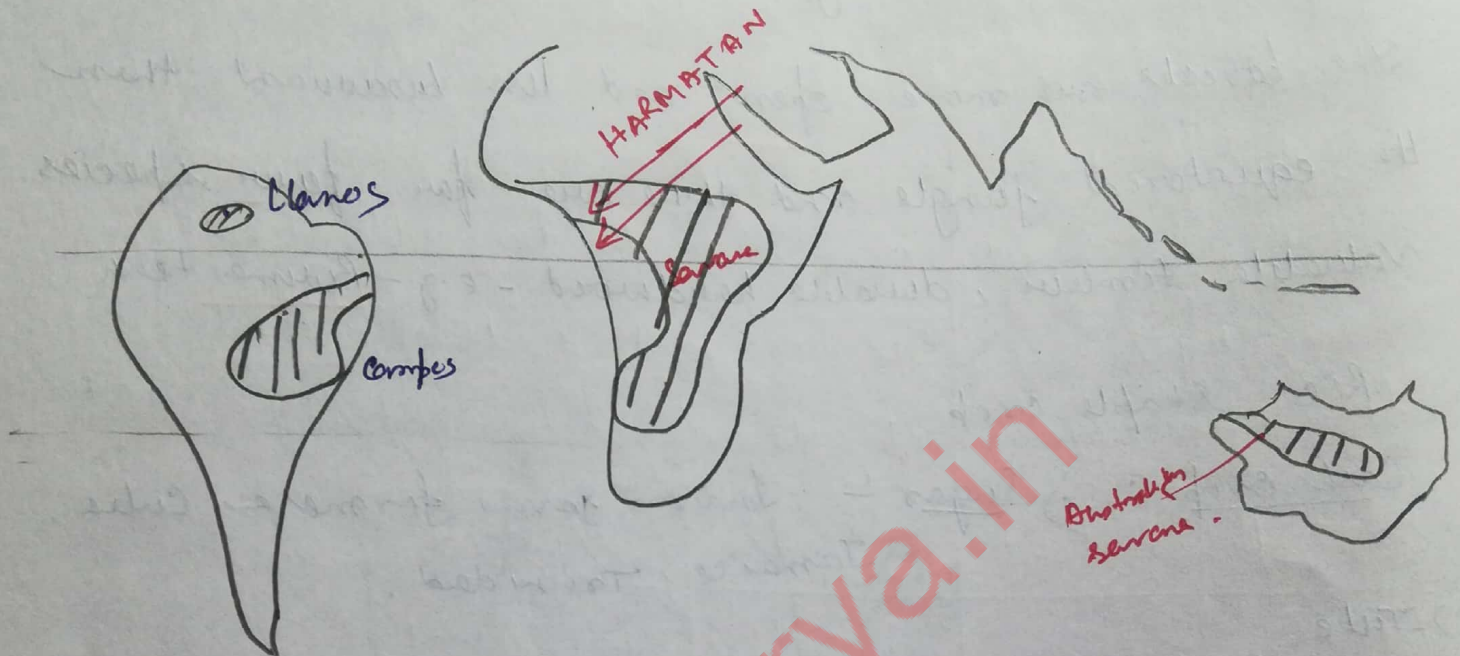
Philippine → Caringin

Java → Humrah

Sri Lanka → chena

Africa & Central America → Milpa

# SAVANNA OR SUDAN CLIMATE



- West African Sudan & then southward
- Ulanos of orinico basin (N of equator)
- Compos of Brazilian highland (S of equator)
- prevailing wind — Trade Wind

Smb Harmattan — In west Africa, the N-E trade wind blows offshore from Sahara desert & reach Guinea coast as dry-dust wind, known as Harmattan (the doctor). Provide relief from the damp air of Guinea. But create haze & impede inland navigation.

- tall grass & short trees. - parkland, lush veld

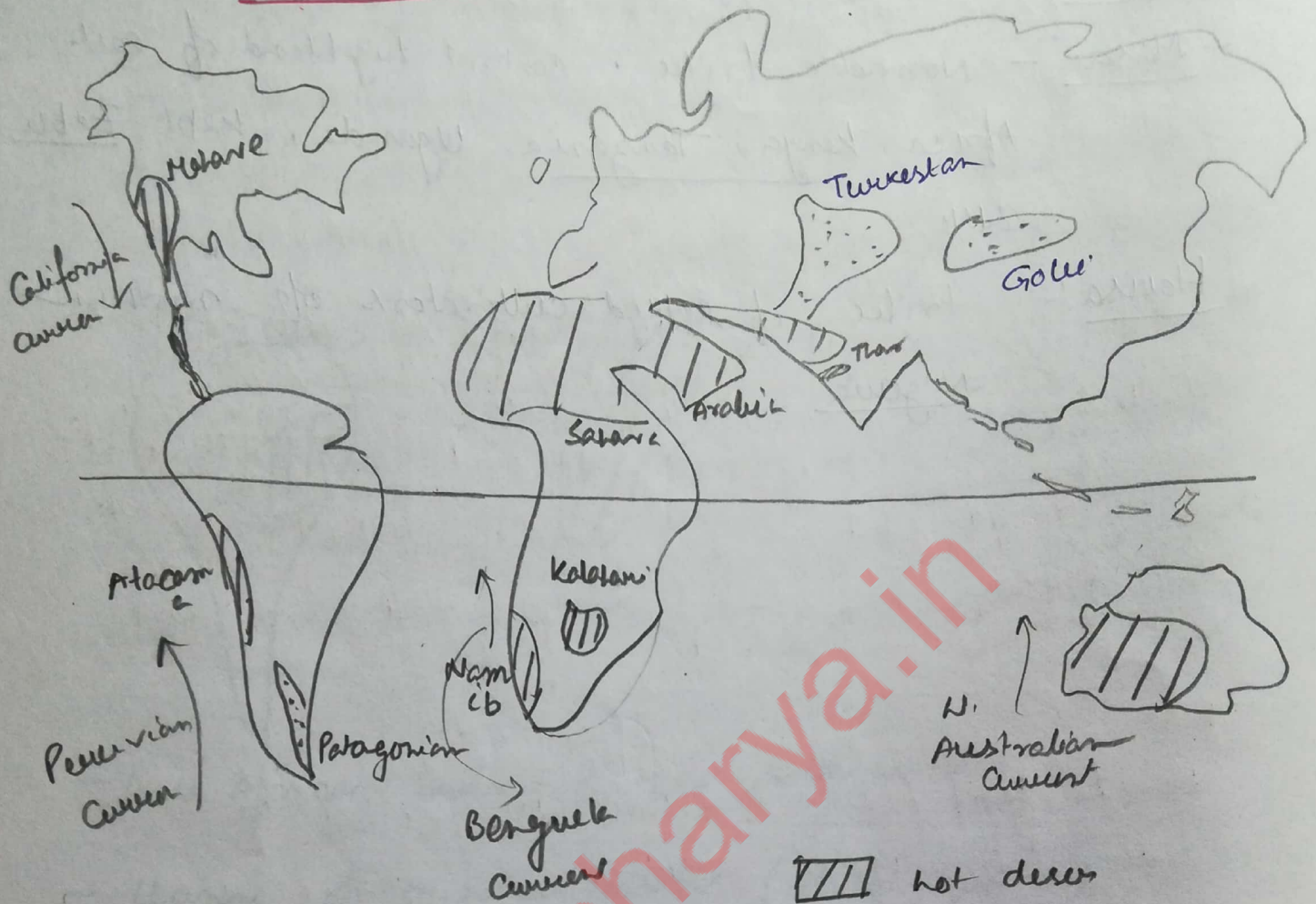
- deciduous,

- Masai - nomadic tribe: central highland of east-Africa, Kenya, Tanzania, Uganda. kept Zebu cattle.

Hausa! - tribe of settled cultivators of northern Nigeria

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# HOT DESERT AND MID LATITUDE DESERT CLIMATE



Hot desert, due to off shore trade wind, also called trade wind desert -

Western Coast -  $15^{\circ} - 30^{\circ} N \& S$

Atacama or Peruvian is the driest of all desert.

- Mid latitude - Found on plateaux - Gobi, Turkistan
- ↓  
Continentality
- Patagonian - leeward side of Andes.

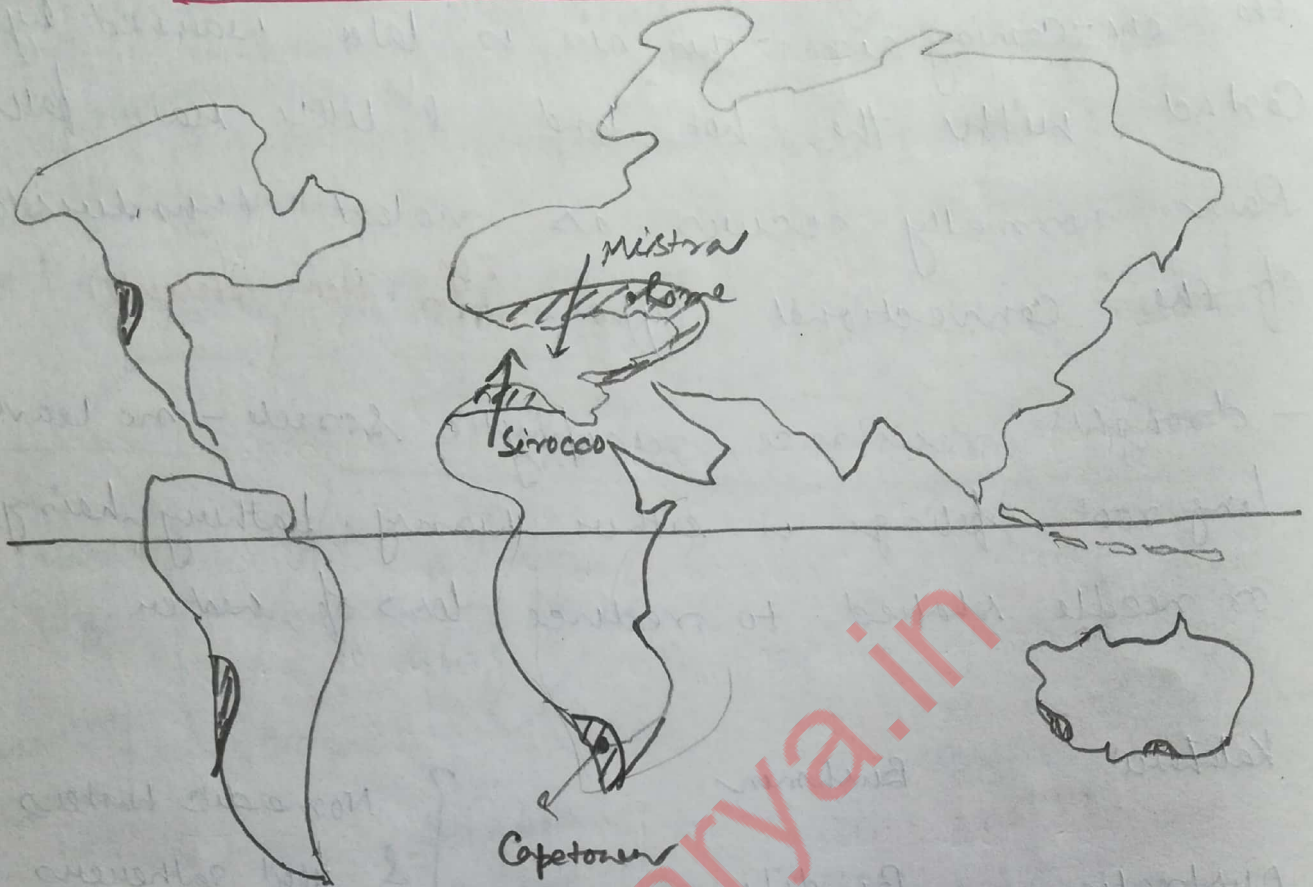
- On the western coast the presence of cold current gives rise to mists and fogs by chilling the on-coming air. This air is later raised by contact with the hot land & little rain falls. Rain normally occurs as violent thunderstorms of the convectional type. (for Hot desert)

- drought resistance xerophytic scrub - no leaves, long root, foliage is either waxy, leathery, hairy or needle shaped to reduce loss of water.

Kalahari	Bushmen		} Nomadic hunters & food gatherers.
Australia	Bindibu		
Arabia	Bedouin	horse	} Livestock economy sheep, goats, camel horses.
Sahara	Tuaregs	camel	
Gobi	Mongols	horse	
Sinnoo	- Dust storm in desert.		
Kalahari	- diamond & copper		
Great Aus Desert	- Gold.		

# WARM TEMPERATE WESTERN MARGIN

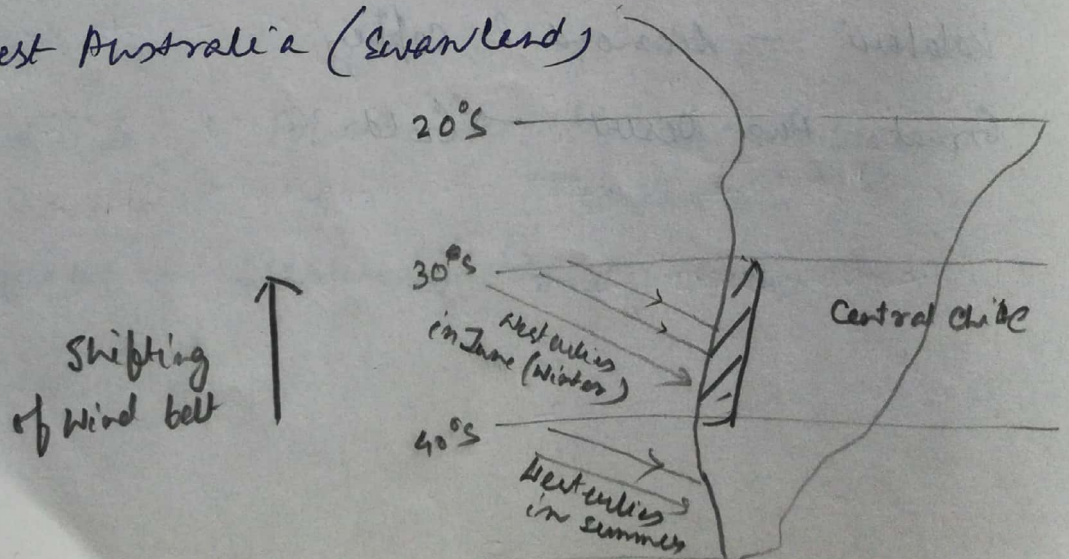
## (MEDITERRANEAN) CLIMATE



-  $30^{\circ}$  -  $45^{\circ}$  N & S of equator

- Shifting of the wind belt.

- Mediterranean region, Central Chile, California, South Western tip of Africa (around Cape Town), Southern Australia (around Adelaide) and South West Australia (Swanland)





- Rain in winter due to on-shore westerlies.
- Rain comes in heavy showers and only a few days with bright sunny periods between them.
- Bright sunny weather with hot dry summers and wet, mild winters.

Sirocco - hot, dry, dusty wind originating from Sahara desert. <sup>(from south to north)</sup> Any time of the year but frequent in spring. known as -

Chili	Tunisia
Ghibli	Libya
Leveche	Spain
Khamsin	Egypt & Malta

Gharbi Adriatic and Aegean Sea

May cause 'Blood rain' because the wind is carrying the red dust of the Sahara desert.

Mistral :- is a cold wind from north, rushing down the Rhone valley in violent gusts.

Bora - Similar type of cold north-easterly wind experienced along the Adriatic coast.

It is caused by a diff in pressure between continental Europe and the Mediterranean

Tramontana and Gregale are similar cold wind of Mediterranean sea.

- Tree with short branches & few leaves.

- Xerophytic vegetation

Mediterranean evergreen forest - Open woodlands  
with evergreen oaks, redwood,  
eucalyptus.

Evergreen coniferous forest - pinus, fir, cedars  
with needle shaped leaves at cooler highlands.

Mediterranean bushes & shrubs! Evergreen shrubs  
& bushes - Maquis in southern France  
Macchia in Italy.

Grass - Wiry & lumpy not suitable for  
cattle rearing.

Agriculture - once the cradle of world civilization  
now it's imp for fruit cultivation.

cereal growing, wine making & agri industries.

i) Orchard farming! A wide range of

citrus fruits - oranges, lemons, limes,

grapefruit in Great valley of California,

Vale of Chile, Negev desert Israel

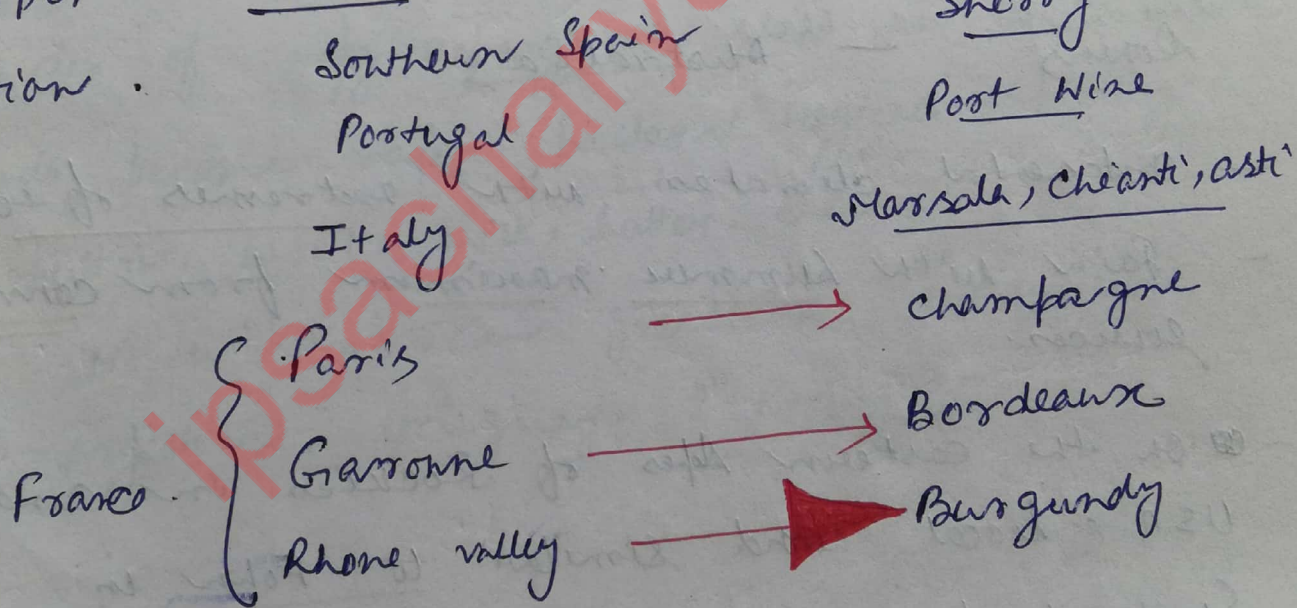
& northern shores of Mediterranean

Europe.

Olive tree - most typical mediterranean cultivated vegetation. others - chestnuts, walnuts, almonds (for chocolate industry), peaches, apricots, pears, plums, cherries.

ii) Crop cultivation - Hard winter wheat suitable for bread making. and Barley. Summer crop with irrigation. Rice in some areas of Spain, Italy, California, vegetables, flowers.

iii) Wine production: long sunny summer allows grapes to ripen. viticulture is traditionally mediterranean occupation.



## Temperate Continental (Steppe) Climate

Steppes - In Eurasia, stretches eastward from the shores of the black sea across great Russian plain.

Pustaz - Hungary & plains of Manchuria

Prairies - North America.

Pampas - Argentina & Uruguay

Veld - South Africa.

Downs - Australia.

- Continental climates with extremes of temp.

- Rain with summer maximum from convictional sources.

- On the eastern slopes of Rockies in Canada & USA a local wind similar to Fohn in Switzerland, called the chinook (hot wind, in winter) comes in a south westerly direction to prairies and help in agric.

- Diff from tropical savanna :- practically treeless and the grasses are much shorter.

— Grasslands have been ploughed for extensive, mechanized wheat cultivation and now called 'Granaries of the World'. Wheat, Maize, alfalfa grass for sheep rearing.

↓  
— Cool moist Spring  
— light showers in ripening period

— Levelness

— Mechanical plough

— Ukraine, Australia, Argentina, Canada, USA

With dev. of ~~ref~~ refrigerated ships in the temperate grasslands become major pastoral regions exporting beef, mutton, wool, milk, butter, cheese.

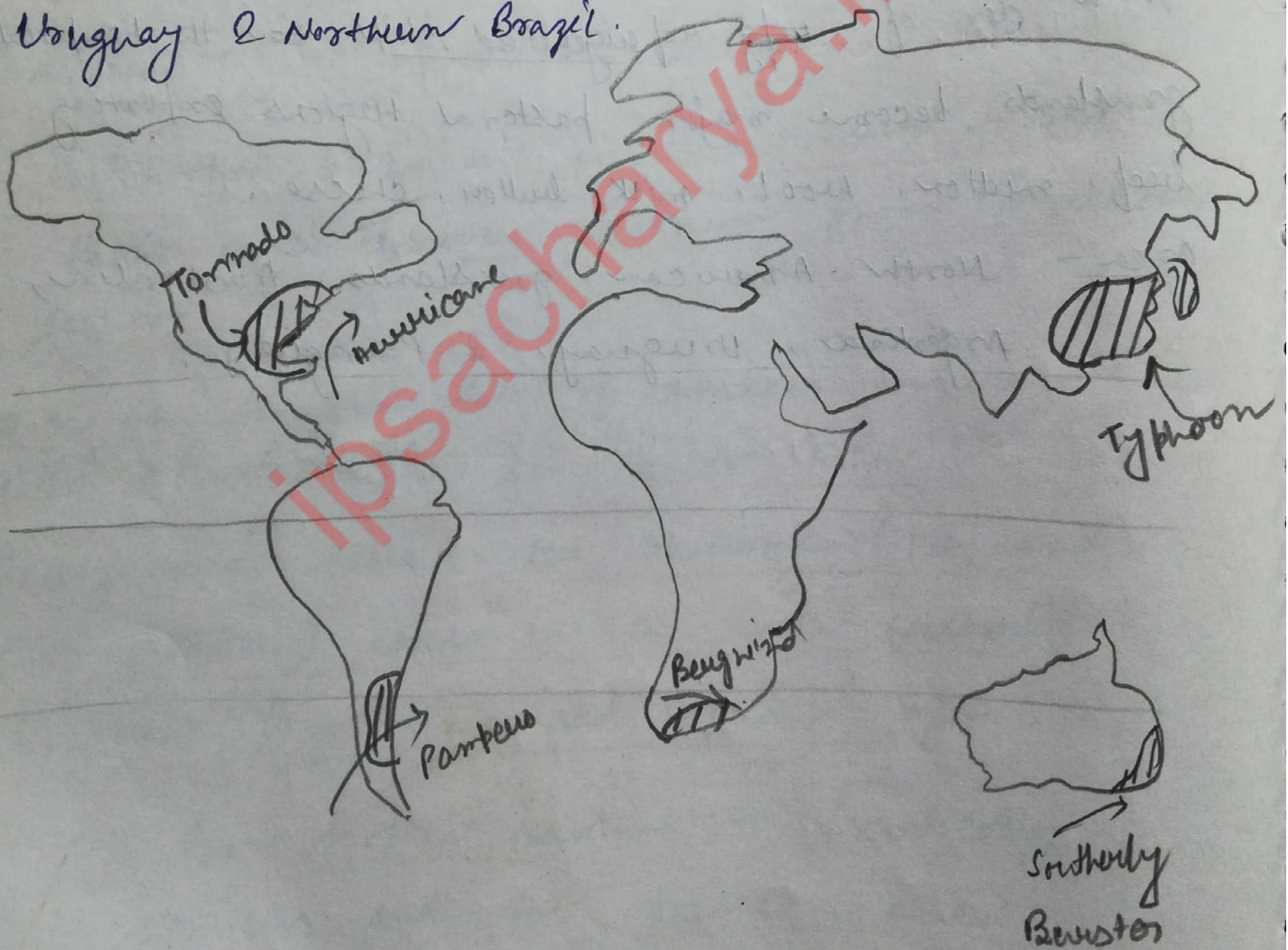
Area — North American grasslands, Australia, Argentina, Uruguay, & Paraguay.

# Warm Temperate Eastern Margin (China Type) Climate

i) - Most part of China - a modified form of monsoonal climate, also known as temperate monsoon.

ii) South eastern USA (Bordering gulf of Mexico) - gulf type

iii) all the warm temperate eastern margin of the southern hemisphere including Natal, Eastern Australia, & southern Brazil - Paraguay, Uruguay & Northern Brazil.



- warm moist summer with cool dry winter.

- modified by maritime influence.

i) Chiara type — South east monsoon — summer rain  
North West " — winter dry.

- great annual temp. range.

- typhoon in late summer originate in Pacific & hit southern Chiara.

ii) Gulf type — monsoonal characteristics are less established.

- hurricanes in Sept - Oct.

- violent tornadoes occur due to intense local heating on land in Mississippi basin.

iii) Natal — the narrowness of the continents & the dominance of maritime influence eliminate the monsoonal element. S-E trade winds bring about a more even distribution of rainfall throughout the year.

Southerly Borester — a violent cold wind blowing along the coast of New South Wales.

Pampero — cold wind Argentina & Uruguay.

Berg wind — hot dry wind in South-eastern Africa.

- evergreen broad leaved forest, deciduous, conifers.
- World greatest rice growing area -  
Subsistence basis in China.
- Corn & maize in Gulf states (USA)
- Cotton, tobacco in
  - 200 days frost free
  - hot growing season
  - Adequate moisture
  - well drained soil for tobacco.
- Cane Sugar, maize, tobacco, cotton, cattle rearing in arid type. (Warm moist summer, frost free winters etc.)



# Cool Temperate Western Margin (British Type) Climate

- permanent influence of westerlies.
- much cyclonic activity
- Britain, N-W Europe (France, Belgium, Netherlands, Denmark) also known as North-West European

## ⊕ Maritime climate

- Coast lands of British Columbia (North America)
- Southern Chile, Tasmania, New Zealand
- Short summer

- Adequate rainfall throughout year with a tendency towards a slight winter or autumn maximum from cyclonic sources. Western margins have the heaviest rainfall & decreases eastward.

- deciduous forest - oak, elm, ash, birch, poplar.  
↓ occur in pure stand.

- Market Gardening - Britain, France, Germany, Benelux  
due to high demand, developed

transport system, (Also known as Truck Farming)

- mixed farming {  
→ Arable (cultivation of crops - wheat, barley, oat, legumes)  
↓ Pastoral (keeping animals - milk, beef)  
Britain, New Zealand, Denmark, Netherlands.

- Sheep rearing - Britain, New Zealand (Canterbury Plains), Tasmania, Southern Chile.

## Cool temperate continental (Siberian climate)

- Arctic tundra of Canada and Eurasia at around arctic circle.
- evergreen coniferous forest - Taiga in Siberia
- In north America sub-Arctic belt stretches from Alaska across Canada into Labrador.
- absence in southern <sup>hemi</sup> continents due to  $\Rightarrow$  km  
massiveness of continents
- Blizzard of Canada & Buran of Eurasia  $\circ$  -  $\Rightarrow$  km  
northerly polar winds with temp below freezing point.
- Rainfall Summer max<sup>m</sup> - convectional.

Coniferous forests

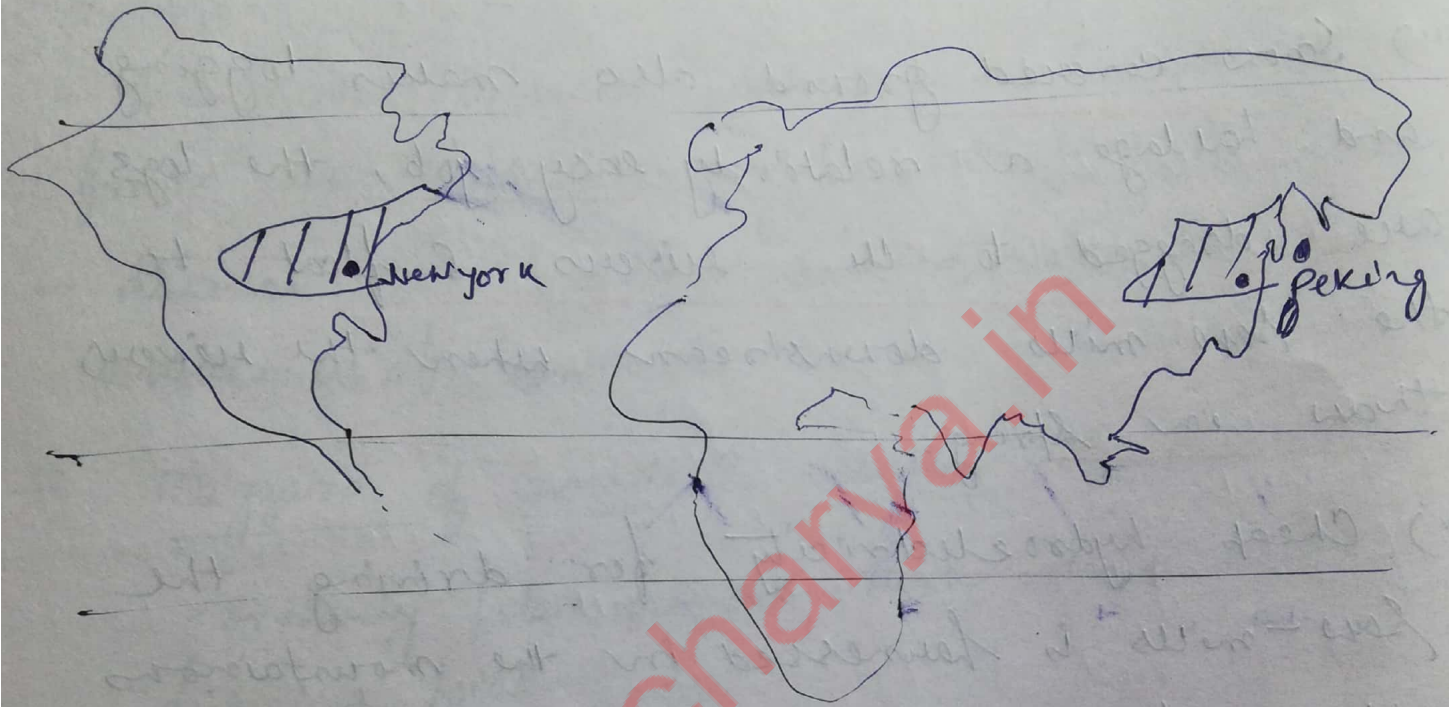
- Moderate density
- evergreen
- Conical in shape
- leaves are thick, needle shaped & small
- little undergrowth.

## Lumbering:

- i) Coniferous are limited in species - Pine, Spruce, fir. occur in homogeneous groups.
- ii) Agri is almost impossible and lumbering replaces farming in continental interior.
- iii) Snow-covered ground also makes logging and haulage a relatively easy job, the logs are dragged to the river & float to the saw mills downstream when the rivers thaw in spring.
- iv) Cheap hydroelectricity for driving the saw-mills is harnessed in the mountainous uplands of North-America & Europe & assisted in lumbering industry.

## Cool Temperate Eastern Margins (Lawestian)

- intermediate type of climate between British & Siberian type having both maritime & continental features.



- Cold dry winter, wet summer
- Rainfall throughout year with summer maximum.
- Fishing zone - New fund land, Japan coast
- known as cool temp monsoon climate in Japan, as rain occurs mainly in summer due to S-E monsoon.
- Warm kuroshio has played an imp. part

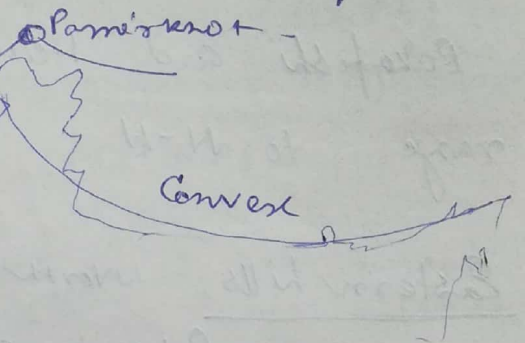
in making the climate of Japan less extreme.  
In meeting the cold Oyashio from the north  
it also produces fog & mist making Japan  
a 'second Newfoundland'.

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# DRAINAGE

<u>River</u>	<u>origin</u>	<u>Basin</u>	<u>Tributaries</u>
Mahanadi	Sihawa, Raipur, CH	MP, CH OR, MH	Seonath, Jonk, Hasdeo, Ong, Mend, Telen
Godavari (Dakshin) Ganga (largest)	Nasik MH	MH, MP, CH, OR AP	Penganga, Indravati, Pranhita, Manjira, Purna Kudtha, Wainganga
Krishna	Mahabaleswar in Sahyadri	MH, KR AP	Tungabhadra, Musi, Bhima, Ghatprabha, Koyana
Kaveri [Water flows out year due to N-E & S-W monsoon]	Brahmagiri, Kogadu, KR	Keral (3%), KR, TN	Kabini, Bharathi, Hemavati, Amravati
Narmada <u>vindhya</u> <u>Satpura</u>	Amarskantal MP, Malwa Range	MP, GJ	Sarda-Sarovar Project, estuary near Bharuch (south of Bharuch) Dhuandhar falls near Jabalpur.
Tapi	Mulai, Betul MP	MP, MH, GJ	
<del>Luni</del>			
<u>Luni</u>	near Pushkar (RJ)	Sambhar lake	phenomenal in nature
	Sambhar lake	Gyandgarh Luni	
		Rain of Kutch	
Sabarmati, Mahi	-	West flowing (GJ)	
Kalindi, Shatarvati	-	" (KR)	
Mandovi, Zuari	-	" (Goa)	
Bharthapuzha (Ponnani), Periyar, Pamba	-	West flow (Keral)	
	↳ (origin - Annamalai hill descent)		

Pamir is connecting link between the Himalayas and the High ranges of central Asia. From the Pamir, Himalayas extend towards south eastward in the form of arcuate curve which is convex to south. Southern boundary is well defined by 300m contour line.



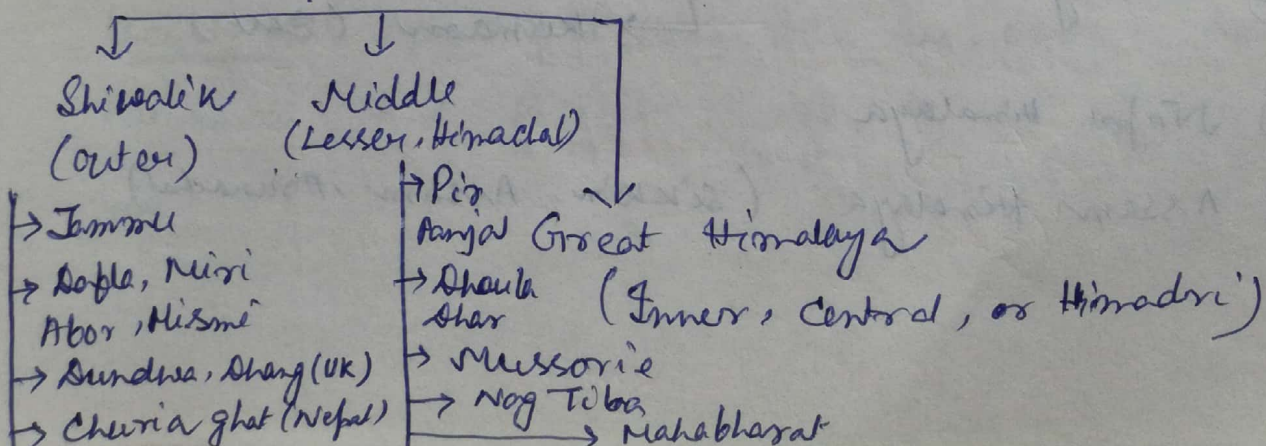
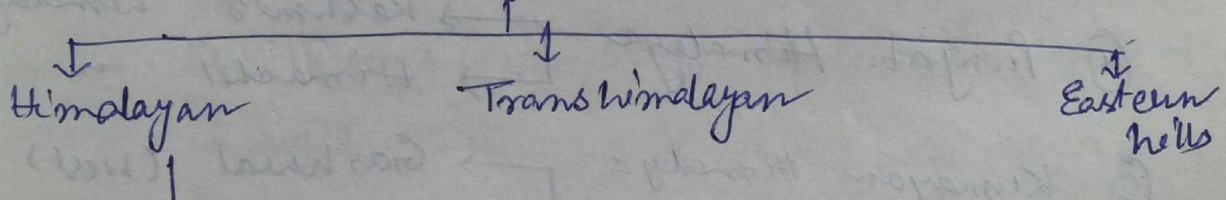
- 1st Phase 120 mill. yrs ago  
↳ Great Himalaya
- 2nd - 25-30 mill yrs ago - Middle Himalayas
- 3rd - 2 mill yrs ago - Shivalik

### Division of Himalaya

- Geographical
- Regional
- Geological

①

### Geographical



Transhimalaya :- North of great Himalaya

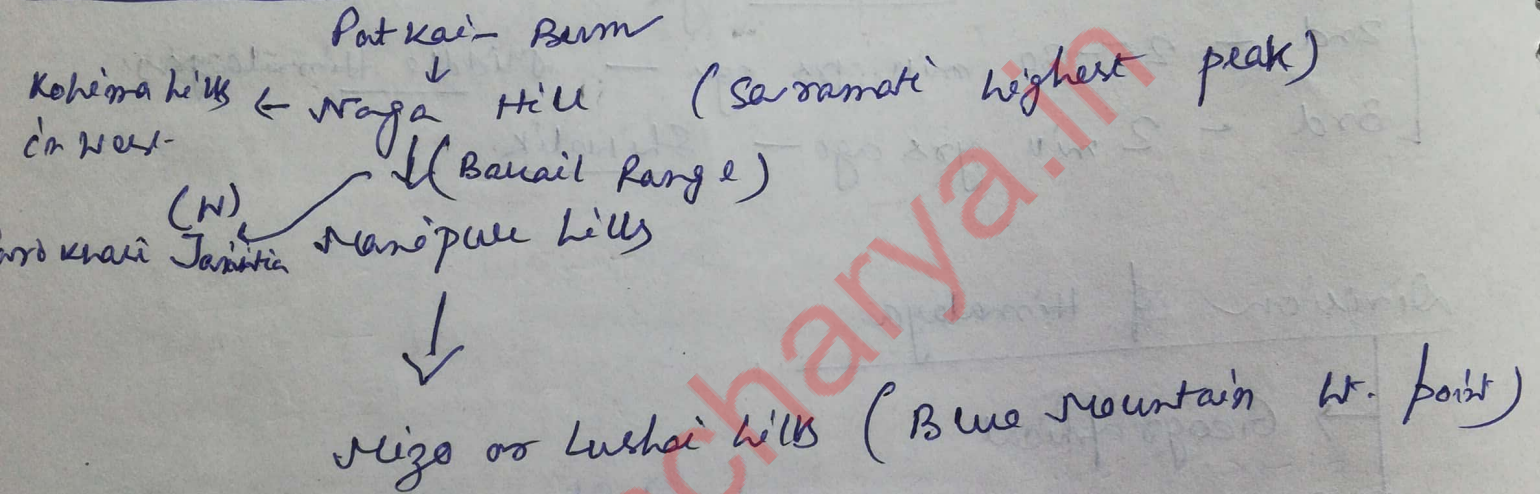
↳ Tibetan Himalaya - Zaskar, Ladakh, Kailas and Karakoram

Ladakh - highest plateaus

- ↳ Soda plain
- ↳ Aksai chin

Rakaposhi and Haramosh extension of Ladakh range to N-W.

Eastern hills - North to South



Regional division

by Sir Sidney Burrard.

- ① Punjab Himalaya
  - ↳ Kashmir Himalaya
  - ↳ Himachal "
- ② Kumaon Himalaya
  - ↳ Garhwal (West)
  - ↳ Kumaon (East)
- ③ Nepal Himalaya
- ④ Assam Himalaya (Sikkim, Assam, Arunachal)

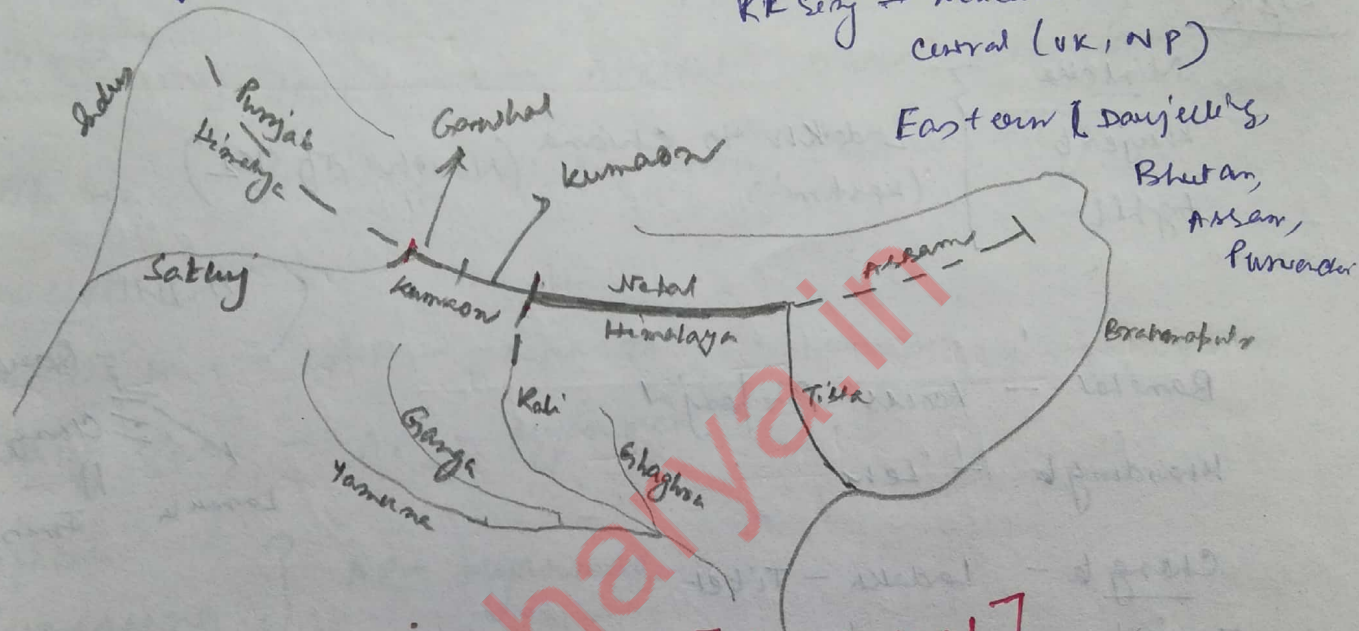


S.P. Chatterjee into 3 major physiographic regions

- ① Western Himalaya (J&K, P.B., HP, UK)
    - ↳ Kumaon
  - ② Central " (Nepal)
  - ③ Eastern " (Darjeeling, Bhutan, Assam, Purvanchal)
- R.L. Singh same as above, only UK in central

R.L. Singh - Western (J&K, P.B.)  
Central (UK, NP)

Eastern (Darjeeling, Bhutan, Assam, Purvanchal)



Longitudinal Division

[in general]

- Western Himalaya (Indus → Kali)
- Central Himalaya (Kali → Tista)
- Eastern Himalaya (Tista → Brahmaputra)

Doon - Flat valleys between the lesser Himalaya and Shiwalik.

lacustrine (deposits laid down in a lake) deposit in Kathmandu and Pokhara valley.

dy

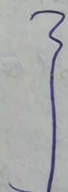
Syntaxial Bend - The point at which east west trend of Himalaya is certainly terminated & it take a sharp southward turn.

Nanga Parbat - At west ✓

Namche Barwa - At east ✓

J&K

Mintaka  
krujerab  
Aghil



Ladakh to China (North of K<sub>2</sub>)  
(Kashmir)

Banetal - Across Pir Panjal

Khardungla - Leh

Changla - Ladakh - Tibet

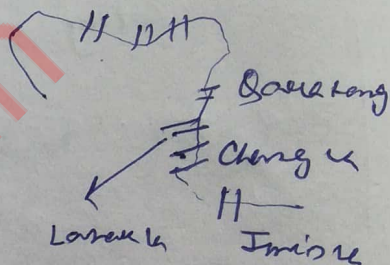
Imisla - do.

Larakla - do.

Gara Tangla - Across Karakoram, old silk route.

Ponsi La - Kashmir valley - Kargil

Zoji La - Srinagar - Kargil, Leh



HP

Bara Lacha La. - HP - J&K

Rowtang - HP - Ladakh

She'khi La - HP - Tibet

Debsa - Kullu - Spiti

UK

Lipu Leku } - for Ladakh - Manasarovar  
 Mana  
 Niti  
 Mangsha  
 Muling }

UK - Ti'bel

Li'ke'im - Nathu La - Ancient Silk route. Indo-Chian

Jelep La - Li'ke'im - Bhuba thru Chumbi valley

Arunachal

Bom di La - AP - Lhasa

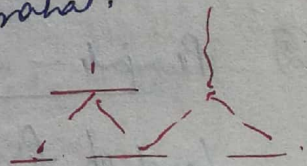
Alihang Pass - AP - Myanmar

Diphu }  
 Kunjweng } AP - Myanmar

Great Plain

Oldham - maximum alluvium depth at southern edge probably between Selki and Rajnaha.

Cone - higher alluvial thickness ✓  
 intra Cone - shallower ~ ✓



{ Wadia - deep depression or furrow  
Edward Suess - foredeep. *large synclines in which alluvium was brought*  
Sydney Burard - Great deep rift or fracture. *Contradicted by Oldham, Hayden*  
Plate tectonic - trough to the south of Himalaya *(Morgan)* after upliftment was created, & subsequently filled up by numerous rivers.

Bhabar Not suitable for agri, wide in west

Tarai (all drain marshy land, mostly in eastern part, the best converted to agri land)

Bhanger old alluvium, calcareous kankar, above flood plain of middle pleistocene

Khadar new alluvium deposited by river flood

Reh, ka Uar - Barren, saline land of Haryana, UP

Bhur - elevated land due to wind blown sands.

(Upper Ganga - Yamuna doab)

Geomorphology divided into four parts!

① Rajasthan plain

Western - Thar - shifting sand dunes

Desert

eastern Rajasthan Bazar - rocky

↳ Marusthali

↳ Agri in some patches - Rohi

Thali → Track north of Luni  
or Sandy plain

② Punjab - Haryana plain: eastern boundary by Yamuna

Land of five rivers, made up of 'Soabs' →

land between two river

↳ Beas, Chenab, Ravi, Satluj, Chenab.

Bist - Jalandhar Soab - Beas - Sutlej

Bari Soab - Beas - Ravi

Rachna " - Ravi - Chenab

Chaj Soab - Chenab - Jhelum

Sind - Jgar Soab - Jhelum - Chenab - Indus

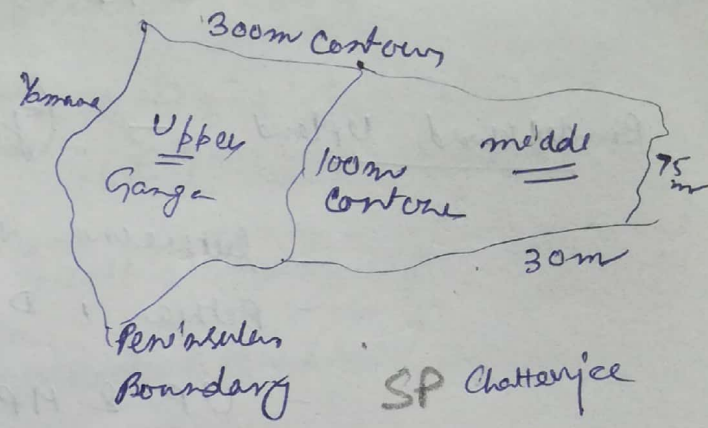
from  
east to  
west.

Shoals - or bluffs flank the Madar plain, which is also known as bet land.

③ Ganga plain → Upper, lower, middle.

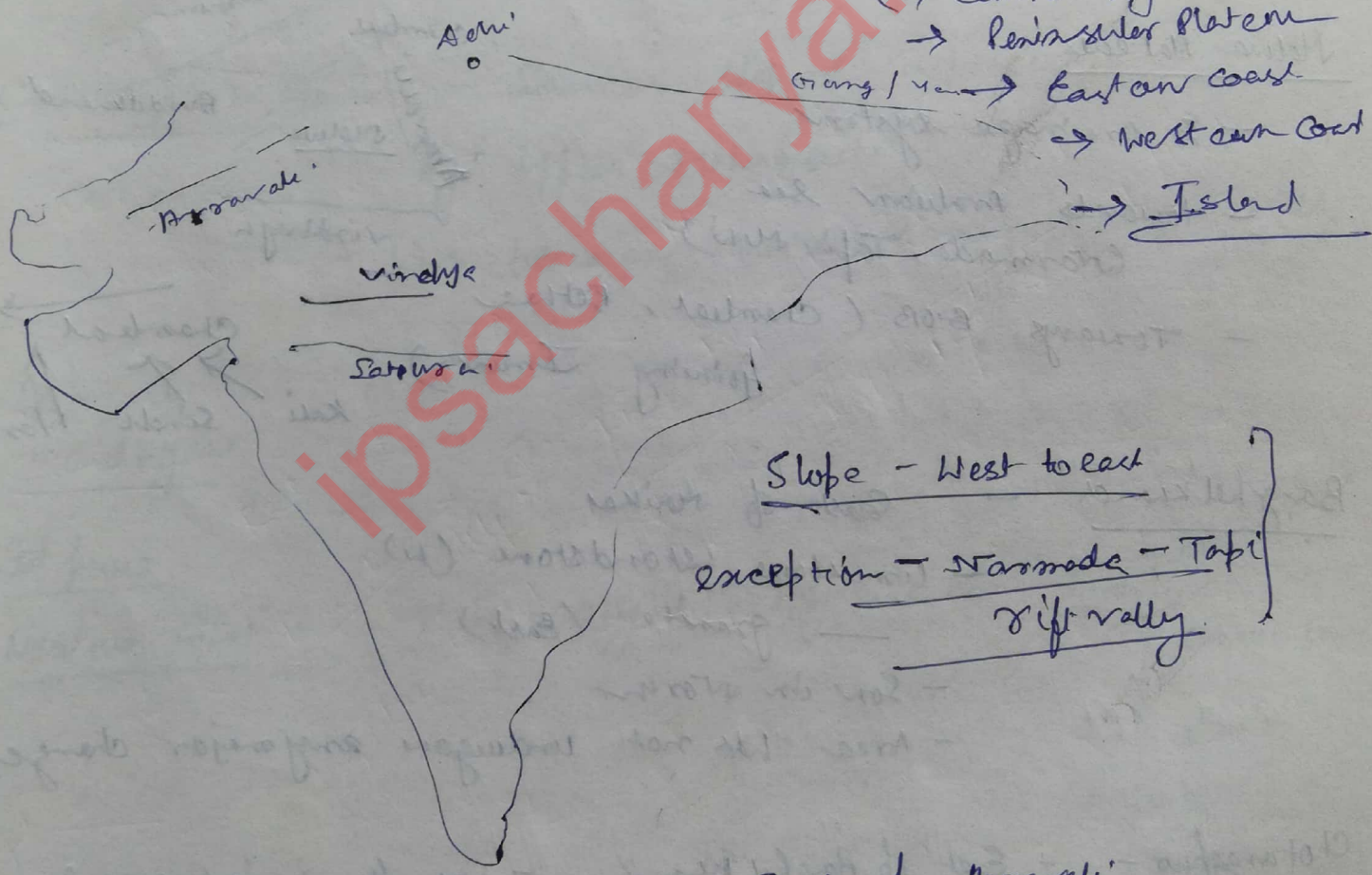
④

Contour line joining places of equal heights.



Peninsular Plateau

- Northern Himalys
- Great Plain
- Central Highland
- Peninsular Plateau
- Eastern Coast
- Western Coast
- Island



Deccan Upland - Eastern Raj, East of Aravali  
 → Sandstone, shale, limestone.  
 - Banas  
 - Rolling plain by erosional work

Central Highland or Madhya Bharat Pathar - east of Malwa

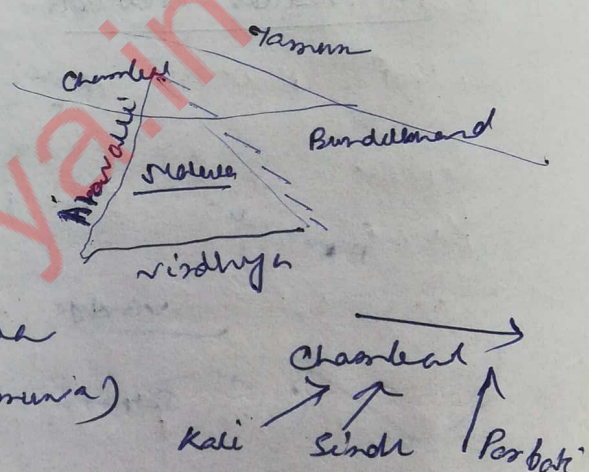
- Chamblee (Sindh & Parbati - trl)
- Rolling plateau with sandstone hills
- Ravines or badland north

Bundelkhand Upland - (gneiss of granite)

- between MBP & Vindhyan Escarpment
- Betwa, Dhasan, Ken
- UP & MP
- NW & NE Ganga - Yamuna alluvium
- SW Deccan trap

Malwa Plateau

- 2 Drainage system
- towards Arabian Sea (Narmada, Tapi, Mahi)
- Towards BOB (Chambal, Betwa, Jharkhand, Yamuna)



Barghalkhand

- East of Malwa
- Limestone, sandstone (W)
- granite (East)
- Low in north
- Area has not undergone any major changes

Chotanagpur

- East of Barghalkhand
- North CH, JH, Punjab
- Ranchi Pl. (South of Damodar) wet land
- Hazaribagh (North of Damodar)
- Gondwana Rock, patches of granite & gneiss
- Radial drainage

(d) Radial Drainage - Chottanagpur Plateau.  
 - Rajmahal hills N-E edge of plateau mostly basaltic.

Deccan Plateau

Satpura & Vindhya (N-W)

Malwa & Malabar (North)

Western ghat (W)

Eastern ghat (E)

- Maharashtra Plateau - basaltic rock, regur soil.

- Karnataka Plateau - Malnad & Malabar.

- Telengana " - Archaean granite gneisses

Chattisgarh Plain - Saucer shaped depression drained by upper Mahanadi.

- lies between Sarda range & Odisha hills.

Aravalli  
Vindhyan

Satpura

Western Ghat

Tapi valley to Kanyakumari.

21° northern  
Deccan lava

16° N

middle

Nilgiri

Palghat gap

Palni  
Cardamom  
or  
Blair hills

Eastern ghat - Mahanadi (OD) to Narmada (TN)  
- Almost missing between Godavari & Krishna

West Coastal plain: ① Kachchh peninsula → Great Rann (North)  
→ Little Rann (South)

② Kathiawar Peninsula: - South of Kachchh.  
- Mandar Hill in central (Mt. Girnar - volcanic origin)  
- radial drainage.

③ Gujrat Plain: - East of Kachchh & Kathiawar.  
- Slopes towards West & S-W.  
- Narmada, Tapi, Sabarmati, Mahi  
- semiarid cond'n near coast.

④ Konkan Plain - Daman to Goa.  
- features of erosion cliff, shoals, reefs & islands

⑤ Karnataka plain - Goa to Mangalore.  
narrow plain  
- Gersoppe (Jog) Falls in Sharavati river.

⑥ Kerala Plain: - (Malabar Plain)  
- Mangalore to Kanyakumari  
- lakes, lagoons, backwaters (kayals)  
- Vembanad lake is the largest.



East Coastal Plain - Subarnarekha (WB-OD Border) to Kanyakumari,  
- alluvial filling of littoral zone by rivers.

① Utkal Plain - Mahanadi Delta, Chilka lake (biggest lake in country)

② Andhra Plain - South of Utkal plain, upto Pulicat lake.  
(Srisaikhota)

- Godavari & Krishna Delta (both are merged)

③ TN Plain - Pulicat to Kanyakumari  
Cauvery Delta - granary of South.

A & N duncan passage - separate great & little Andaman

### Physiographic Division

L.D. Stamp

J.N.L Bakers

O.H.K. Spate

} 3 macro / major regions

- The mountain rim
- Indo gangetic plain
- The peninsula.

### S.P. Chatterjee

- ① Northern mountain - i) North  
ii) Central Himalaya  
iii) Eastern  
iv) North eastern hills

- ② Great plain - i) Western plain  
ii) Punjab plain  
iii) Northern plain  
iv) Eastern plain

③ Central Highland — a) North central Highland

i) Aravalli

ii) Madhya Bharath Pather

iii) Eastern Rajasthan Upland

iv) Bundelkhand Upland.

b) South central Highland — i) Malwa Plateau

ii) Narmada valley

iii) Vindhya Scarp Land

iv) Vindhya Range

④ Peninsular Plateau — a) Western Hill

b) North Deccan Plateau — i) Satpura Range

ii) Maharashtra Plateau

c) South Deccan Plateau — i) Telengana Plateau

ii) Karnataka Plateau

→ Maidan

→ Malnad

d) Eastern Plateau — i) Chotanagpur Plateau

→ Hazaribagh

→ Ranchi

ii) Bighelpur Plateau

iii) Sandakaranya

⑤ Eastern Coast

⑥ Western Coast.

⑦ Islands.

Right Hand

Left Hand

Narmada

Heran, [Tara (Hohizabad),  
Kundi, Bai]

Left Hand

Tapi

No. reg.

Panjhra, Borci  
Girma, Pune

Chambal

Shipra (H), Kalisindh,  
Pachan, Paurati,  
Kunhau, Sindh

Basas → Sund  
→ Bundi

Brahmaputra

Maras, Kemang  
Suleaunshiri, Dikang  
Sibang

Lohit, Sikku  
Shanshiri, Kalang

Luni

(Source Pushkar)

Sukai, Bardi,  
Sukri, Janai  
(Luni)  
Sulmi

Betsa

Shasan

-

Ken

Beasra

Sewas

Son

(Trib. of Ganga  
meets west of Patna)

Johua, Rihard.  
Karkhar, North Kowl

Tons

Damodar

Gowari

Bokaro, Baraker

Brahmni

Sanku

South Kowl

Tista

-

Ringit  
(water sport)

Indus

Shyok, Nubra

Kangit, Sury (near  
Kangit)  
Darrag, Thelem,  
↓  
Kisharganga  
Trib of Thelem  
near Kisharganga

Chenab [ Chandrabha & Bhaga ]  
 ↓  
 near Kistoree  
 obtained originating from HP

Alaknanda

Mandakini  
 (source Chorabari glacier)

Shanki Ganga,  
 Nandakini, Pindar

Ganga

Yamuna,  
 Chambal, Betwa, Ken

Kali  
 an artificial river  
 between Kanagpur & Nepal

[ Bhagirathi & Alaknanda merge at Devprayag ]

Ranganga (Mandabadi)

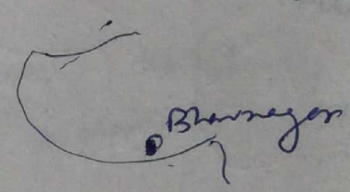
Gomti  
 Sarde  
 Ghogra  
 Sarayu } → Ayodhya

Grandak  
 Bagmati (Hajipur, Bihar)  
 Kanche  
 Kosi

Rivers merging into Arabian sea

Bhadra (Kathiawar)  
 Satranji ( " ) } → West to East  
 → Mithi vardhi is south of Bharu Nagar

Bhogava  
 Sabarmati (Ahmedabad)  
 Mahi, Narmada, Tapi



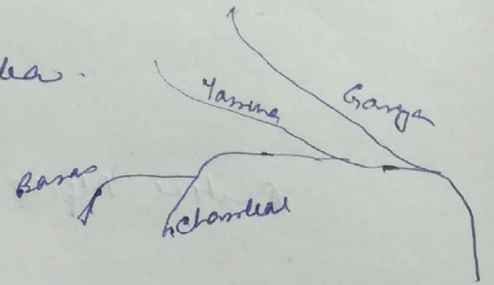
Madharashtra → Surya, Kaku, Sariti

Goa — Mandvi, Chapora, Zuwari, Sal

Karnataka — Kali, Gangavali, Serravati, Gadri, Netravati

Kerala - ~~Asht~~ Beypore, Ponnani,

Bharatpuzha, Peuzha, Pamba.



Show all rivers  
any tributary with  
main no.

LH

Kaveri

R H  
Lakshmantirth  
Kabani  
Sukharati  
Amravati  
Bhavani  
Sammata

Hemavati,  
Simse,  
Tirumanimuthai

Krishna

Varna  
panch ganga  
Sudhganga  
Ghat pamba  
Malpauha  
Tungphadra  
Heggani

Nira  
Muthumula  
Bhima,  
Sina, Musi  
Munneer

Godavari

Manjara, Tirna  
Mheer

Sudhana,  
Purna, Penganga  
Kandha, Wenganga  
Bandia, Indravati  
Sabri, Sineer

Narasari

Sardur, Indra,  
Ong, Tel

Seerath, Hasda,  
Mard, Ib