Geography class 22

REVISION OF THE PREVIOUS CLASS (1:10 PM):

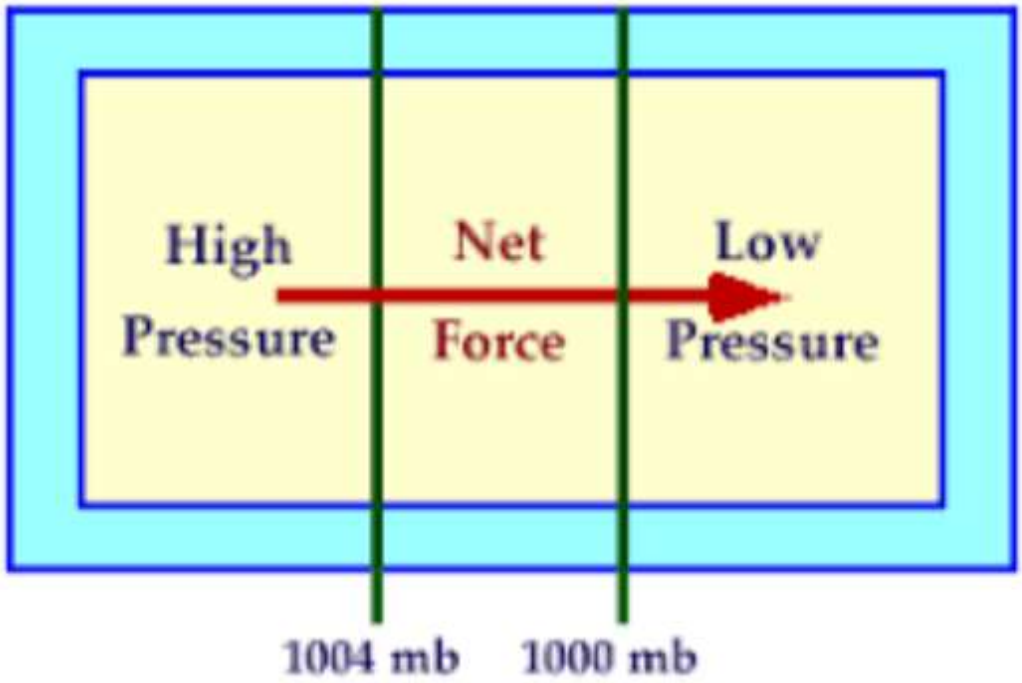
- Under certain conditions in the atmosphere, the normal lapse rate may get reversed, so that the temperature increases with the altitude.
- This phenomenon is called **Temperature Inversion** or **Negative Lapse Rate.**
- **Types of temperature inversion:**
- I. **Radiation inversion:**
- During the long winter nights, the coldness of the ground surface results in the cooling of the air parcel that comes in contact with it.
- It is more common over northern plains during winters.
- **II. Frontal inversion:**
- The warmer air is forced from the ground by undercutting the cold air.
- This causes temperature inversion where the warm air is lying above the cold air.
- **III. Advection inversion:**
- It is produced when a thick layer of warm air passes over cold water surface or land creating temperature inversion.
- **Significance of temperature inversion:**
- I. Fog, smog formation.
- II. Air remains stable.
- III. Air quality will get bad as pollutants get trapped for a longer time.
- **Air pressure:**
- Atmospheric pressure is the pressure exerted by the earth's atmosphere on the surface.
- Factors affecting air pressure- temperature, altitude, and rotation of the earth.
- We get different pressure belts over the earth's surface due to these factors.
- We get Hadley, Ferrel, and polar circulations in both hemispheres.

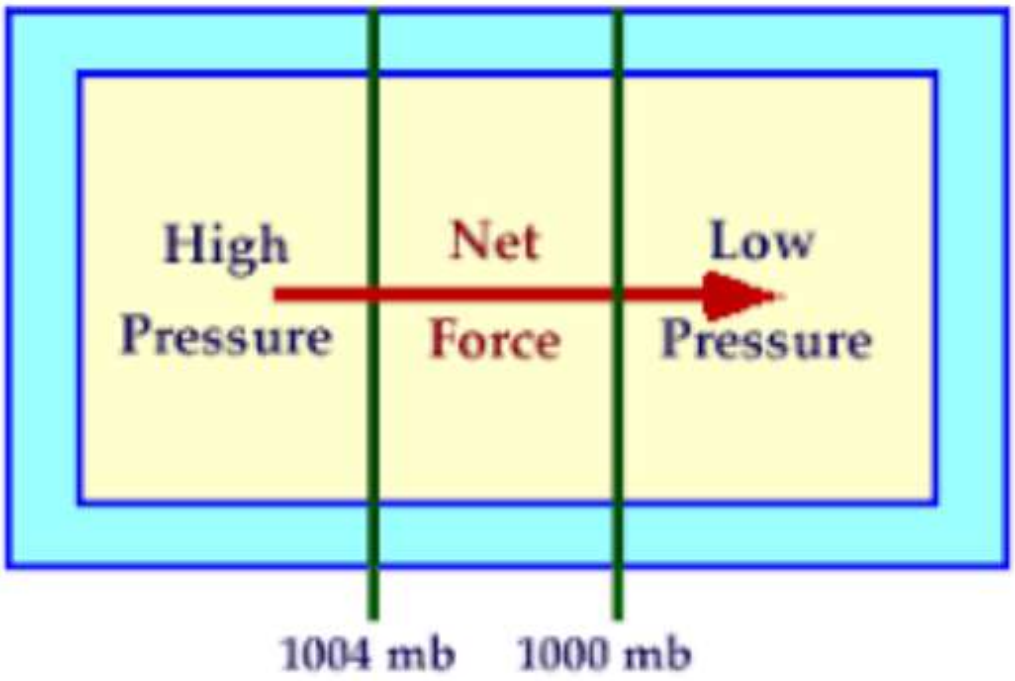
Winds:

- Air in motion is called wind.
- Winds are a result of air flowing between regions of high pressure and low pressure.

Factors Affecting Winds:

- **Pressure Gradient Force:**
- The rate of change of pressure with respect to distance is called **pressure gradient.**
- Between two regions with different pressures, there will be a **pressure gradient** force that will act from the region of high pressure to the region of low pressure.



- 

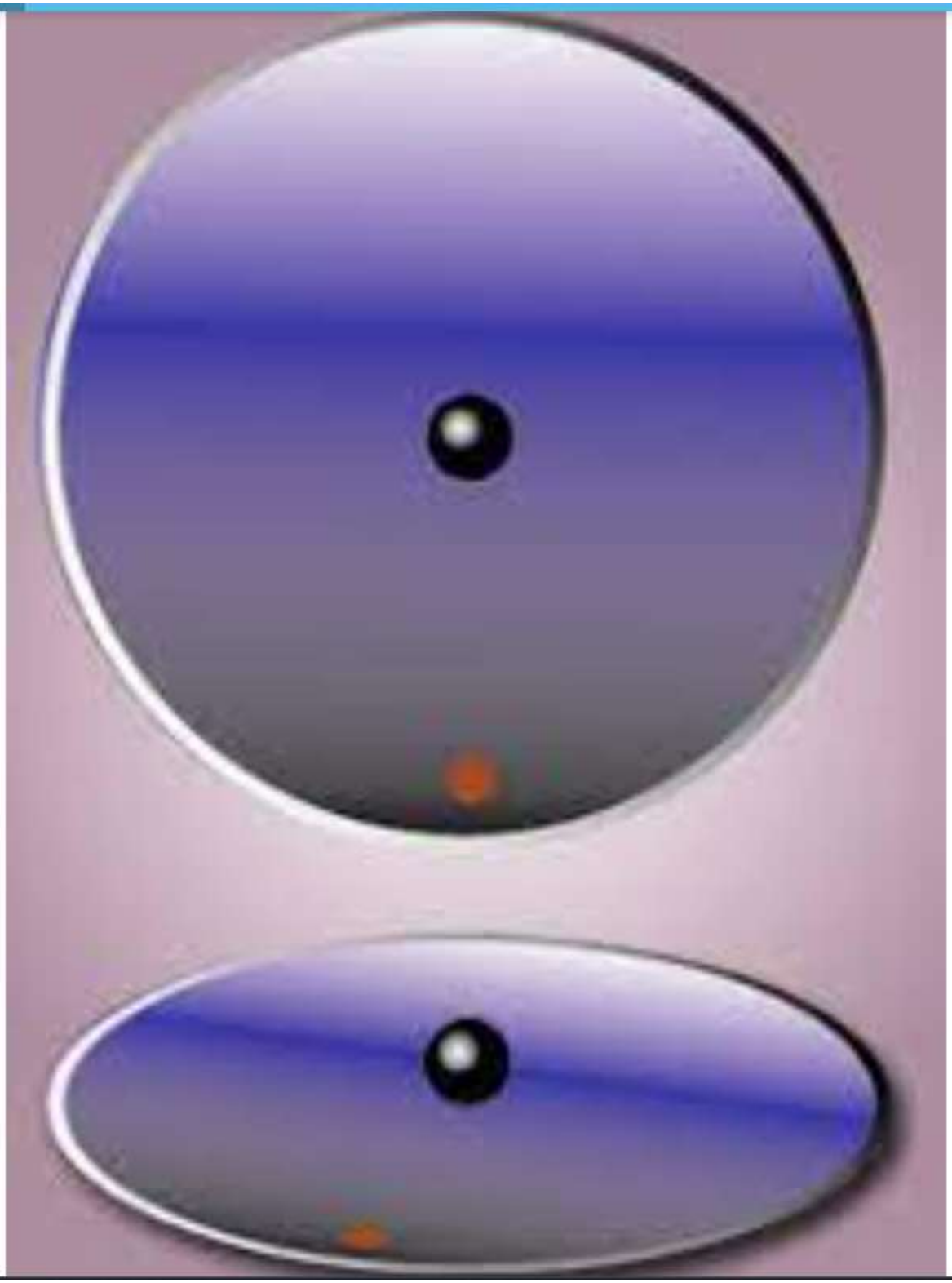
- The more the difference between pressures, the stronger will be the pressure gradient force.
- **Isobars** are the lines that join regions with the same pressure.
- If isobars are situated very close to one another, we will experience windy conditions.
- This is a situation of a higher pressure gradient.
- Calm wind conditions are depicted by far-spaced isobars.

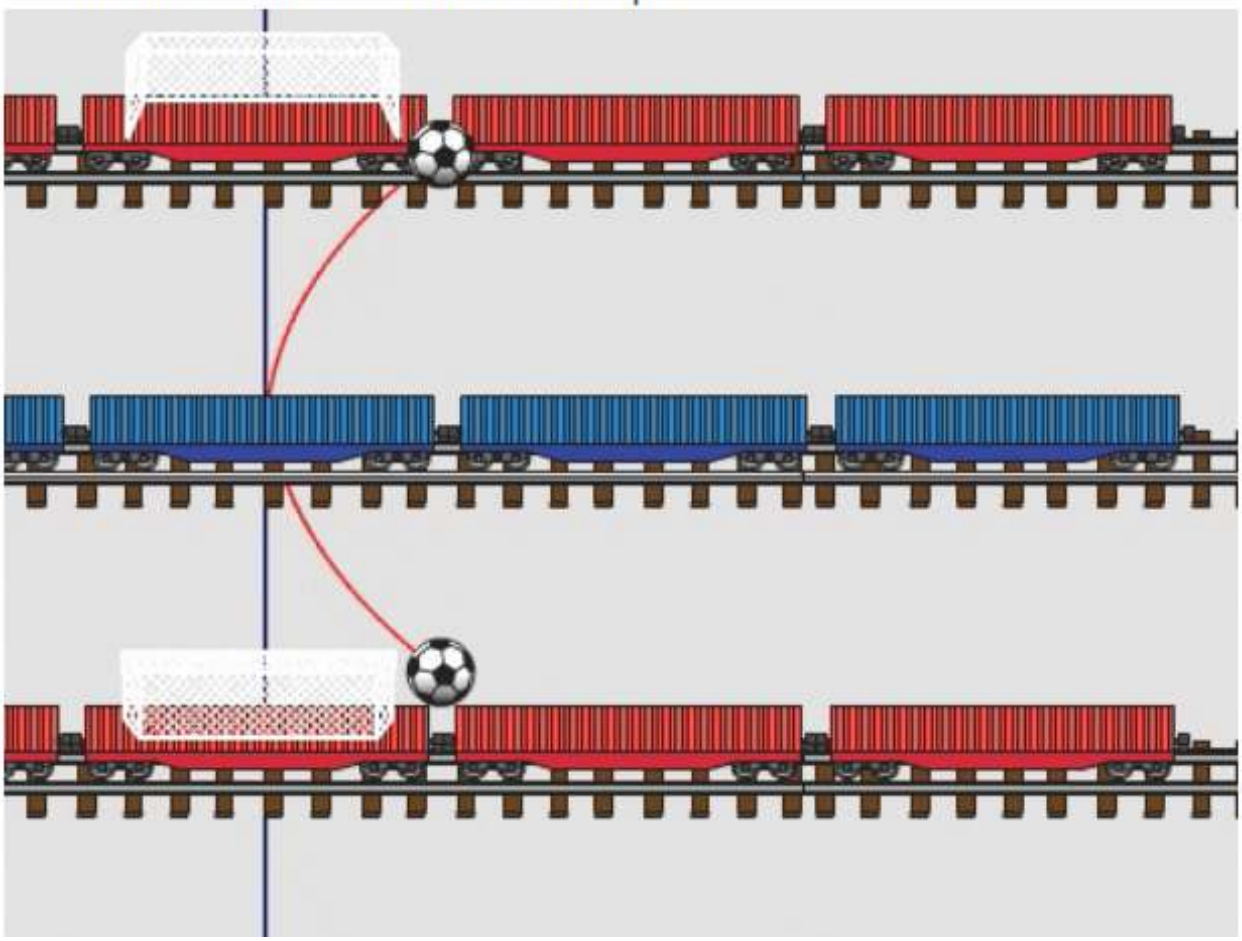
Frictional force:

- Any moving body near the land surface experiences a frictional force in the direction opposite to that of its motion.
- The frictional force experienced by winds is stronger near the surface and over the land.
- This is why we see stronger winds over the sea surface and at heights.
- Himalayas might see stronger winds, but that does not have good wind energy potential because winds will be very thin at such heights.

CORIOLIS FORCE (IMPACT)(1:40 PM):

- The Coriolis force is a pseudo/ fiction force produced due to the rotation of the earth.
- It is the combined effect of various forces and factors such as centrifugal force, angular velocity, and variation in the speed of rotation at different latitudes.
- As a result, objects in motion are deflected from their intended path.



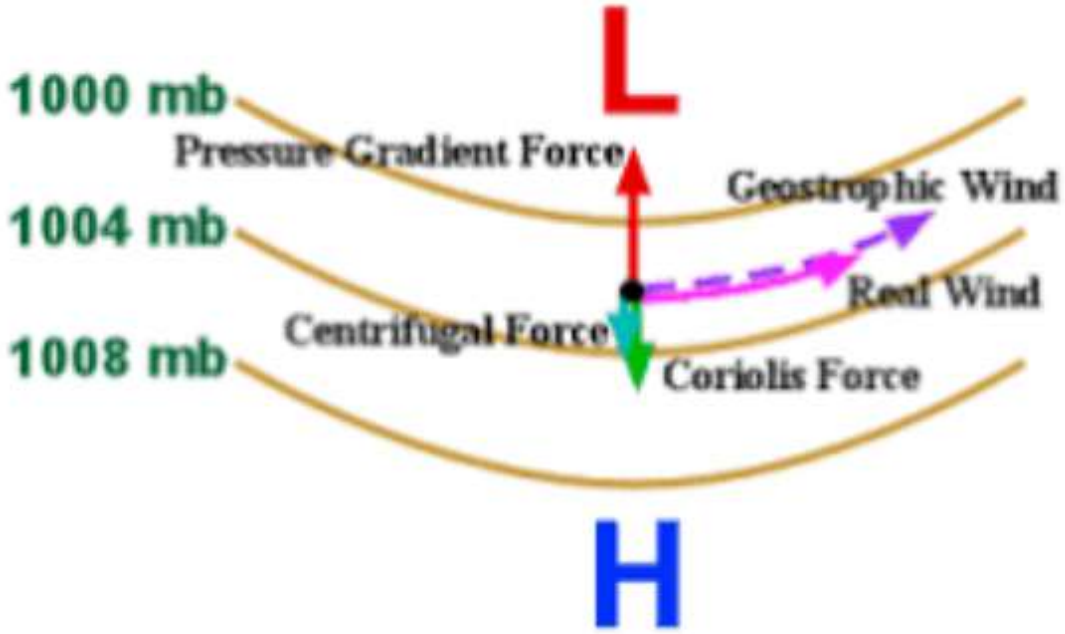
- The Coriolis effect does not affect the speed of the body, and it will only change the direction of the moving body.
- All moving bodies, rivers, ocean currents, airplanes, etc. experience this effect.
- The moving bodies are deflected to their right in the northern hemisphere and towards the left in the southern hemisphere.
- 

Factors Affecting Coriolis Force:

- I. Speed of a moving body- the more the speed, the more the force experienced.
- II.Distance from the equator/Latitude- the Coriolis force is zero at the equator and it increases as we move to the poles.
- III. Speed of the rotation of the earth-more the speed, the more the force experienced.

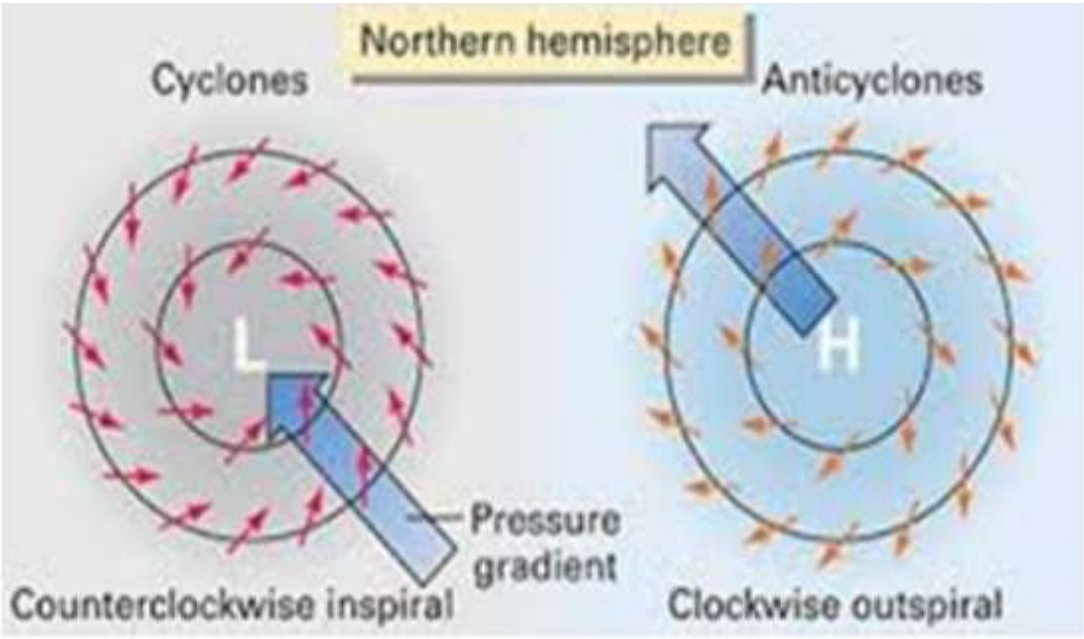
GEOSTROPHIC WINDS (2:10 PM):

- When isobars are straight and the friction is zero, at some latitude, the pressure gradient force is balanced by the Coriolis force.
- The resultant winds flow parallel to the isobars- geostrophic winds.



- They are continuous winds because they will keep flowing under the effect of pressure gradient force and they will keep deflecting under the Coriolis effect.
- This concept is the basis of a **cyclonic system** that has a low-pressure center.
- This concept is also the basis of an **anticyclonic system** that has a high-pressure center.

Anti-Cyclonic means Clockwise (high pressure center)
Cyclonic means Anti-Clockwise (low pressure center)
} This is for Northern Hemisphere

- 

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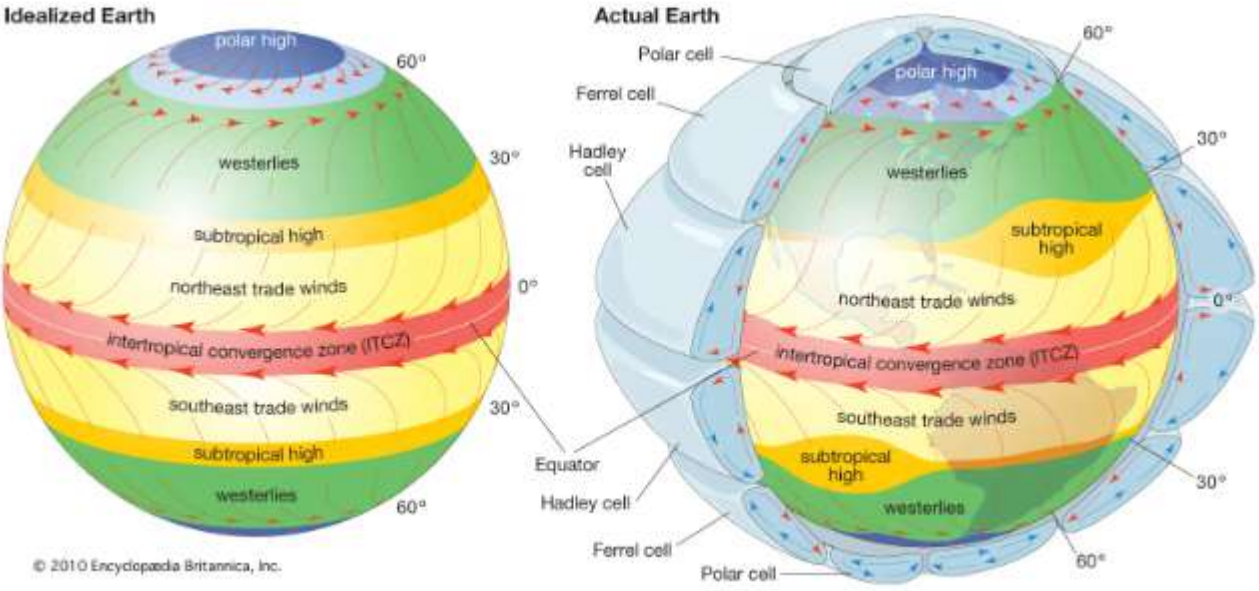
Pressure System	Pressure Condition at the Centre	Wind Direction in Northern Hemisphere	Wind Direction in Southern Hemisphere
Cyclone	Low	Anticlockwise	Clockwise
Anticyclone	High	Clockwise	Anticlockwise

Types of winds:

- Planetary winds, Seasonal winds(monsoon, etc.), and local winds(loo, etc.)

I. Planetary Winds:

- These winds are found all over the planet throughout the year between specific latitudes.
- These winds experience some changes due to shifts in pressure belts across the year, but the winds are present nevertheless.
- Even these winds face the impact of Coriolis force.



TYPES OF PLANETARY WINDS (2:40 PM):

- **I. Trade winds:**
- They are also called **easterlies-** 0 degrees (equatorial low pressure) to 30 degrees(Sub tropical high pressure) in both hemispheres.
- They are named so that they follow a specific track throughout the year and face the least deviation.
- Trade winds have no moisture content at the origin, but they can pick up moisture while moving over oceans.
- Due to the moisture picked by the trade winds, they bring rains over the eastern margins of the continents.
- By the time trade winds reach western margins, their moisture content has been exhausted.
- Trade winds are always offshore the western coasts.
- This is a reason why major hot deserts are found on the western margins of the continents.
- Nearness to the subtropical high-pressure belt is another reason behind hot deserts on western margins.
- Another reason why we see deserts along western margins is the presence of **Cold ocean currents.**
- Cold ocean currents cause the **desiccation effect** due to which we will see very less evaporation and cloud formation.

The line suggests that along the western coasts of continents in tropical regions, the trade winds blow from the land towards the ocean. This is typical for western coasts in the trade wind belts, where the prevailing easterly winds blow away from the coast towards the west.

Sub-tropical region is totally dry because subsidence of winds happens here which will not cause precipitation, precipitation happens where winds rise.

That is why trade winds are dry and do not have moisture but due to their movement from ocean they get moisture.

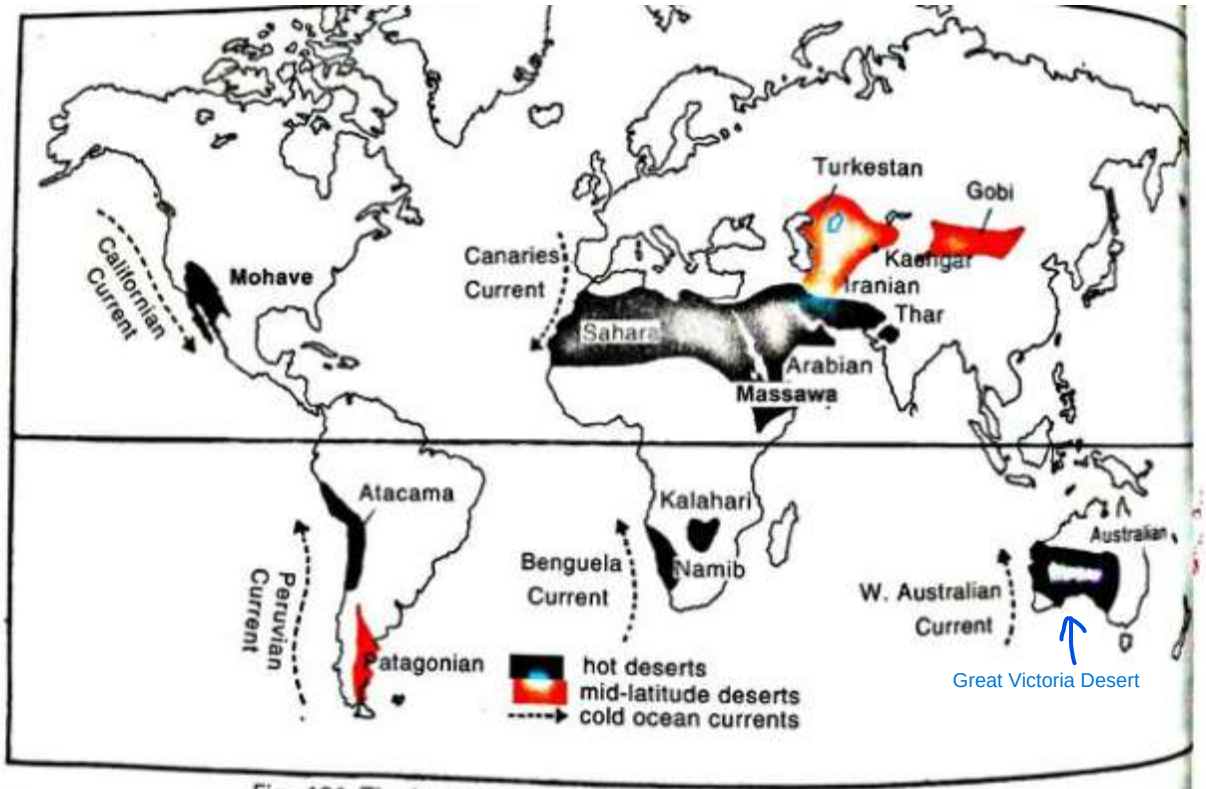
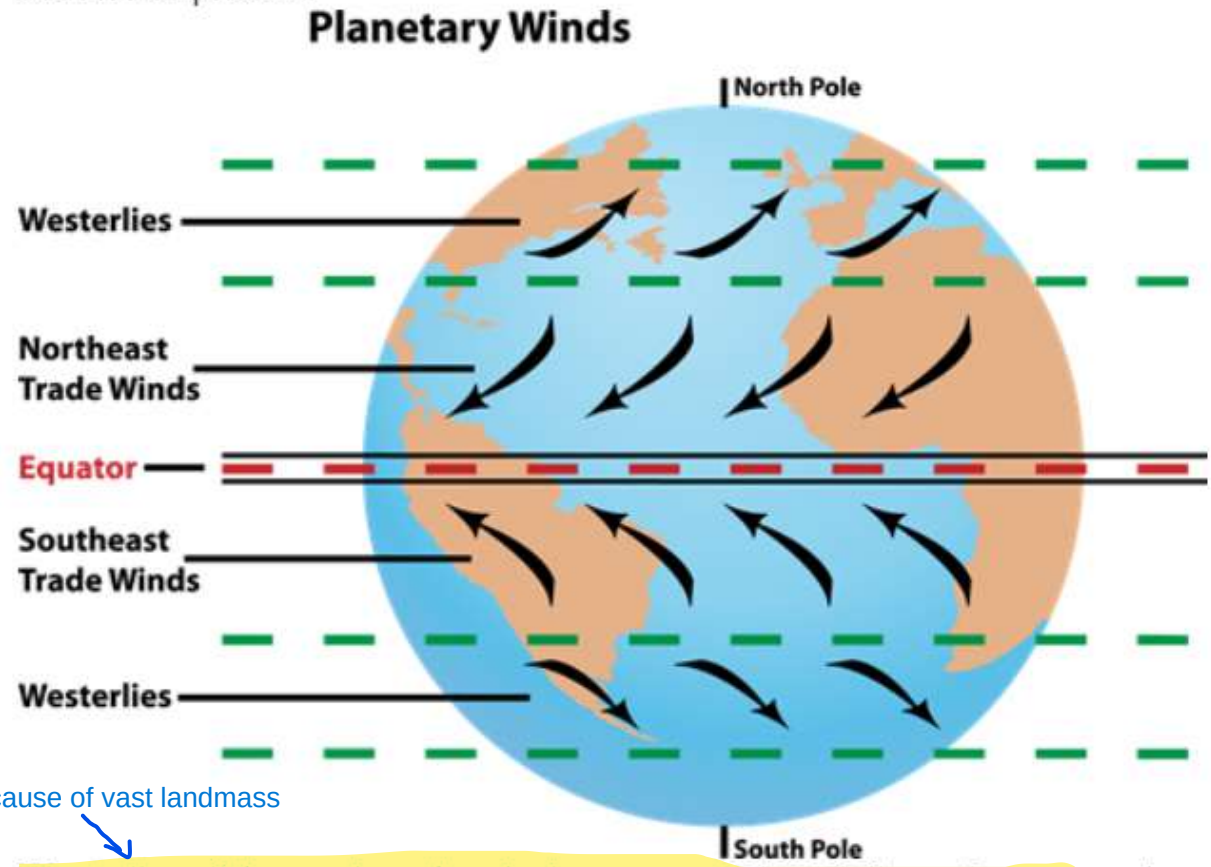


Fig. 131 The hot deserts and mid-latitude deserts of the world

II. Westerlies:

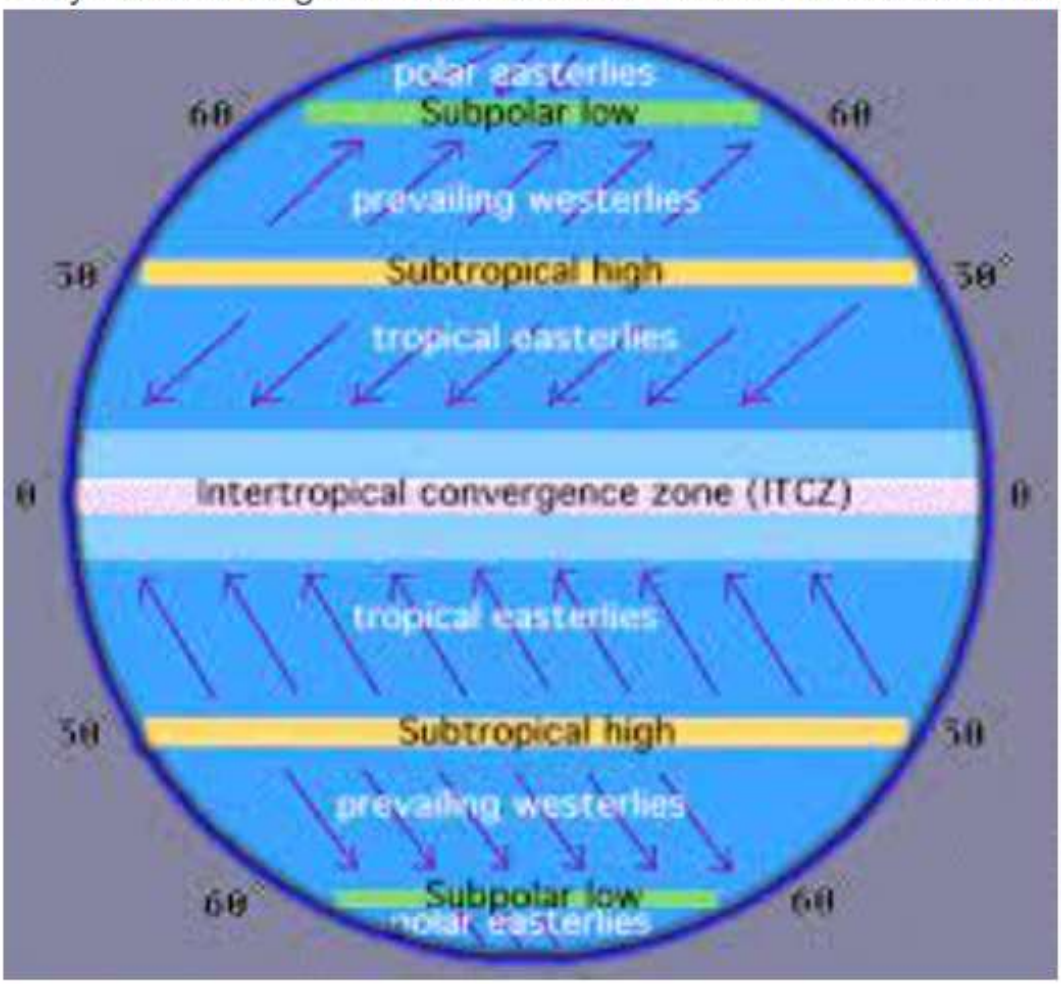
- They originate from 30 degrees(sub-tropical high) to 60 degrees(temperate low) in both hemispheres.



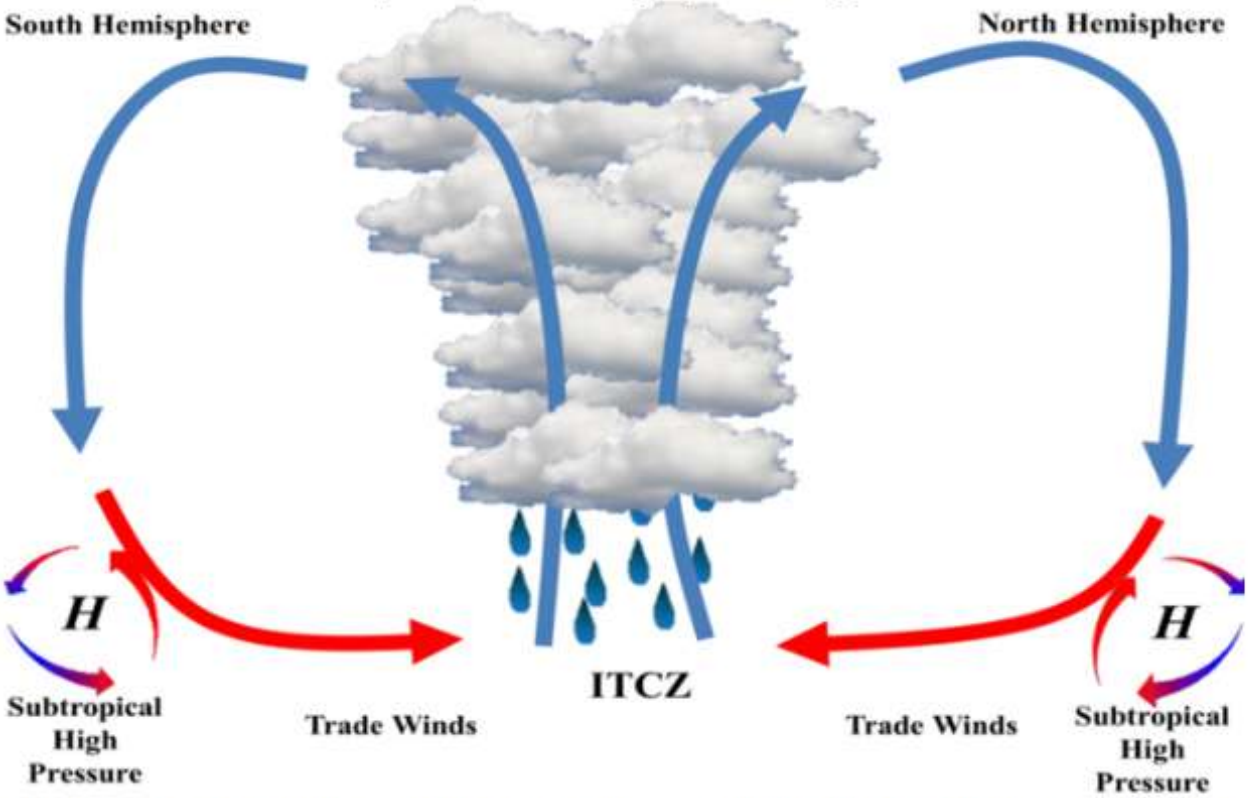
because of vast landmass

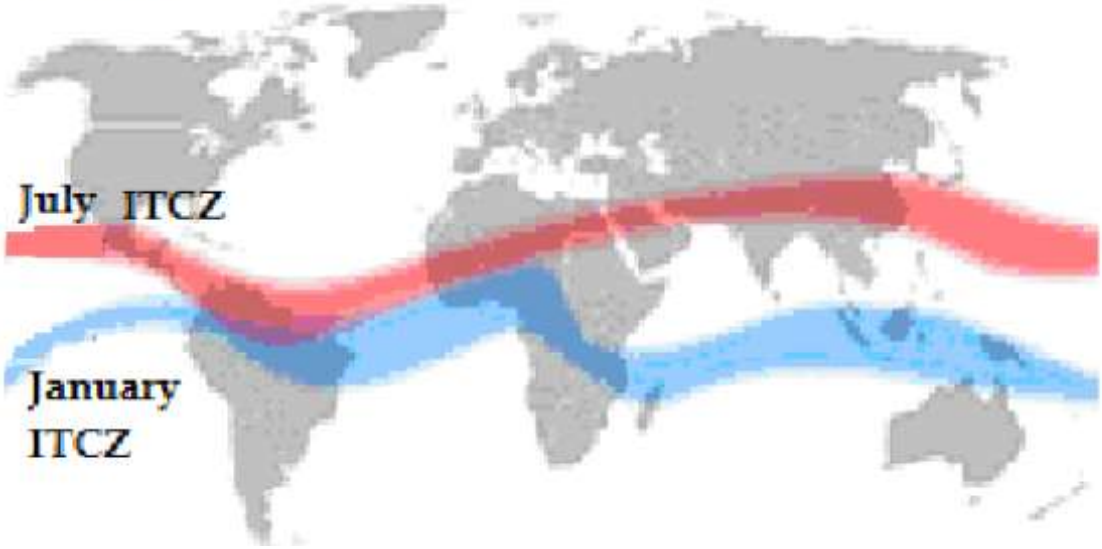
- Westerlies of the northern hemisphere are weak and discontinuous, and southern hemisphere westerlies are much stronger and continuous.
- This is because of less landmass in the southern hemisphere.
- Strong westerlies were the biggest reason that Antarctica remained inaccessible before strong mechanized ships were invented.
- They are called by different names as per their latitudes:
- 1. Roaring Forties. (At 40 degree)
- 2. Furious Fifties (At 50 degree)
- 3. Shrieking Sixties (At 60 degree)

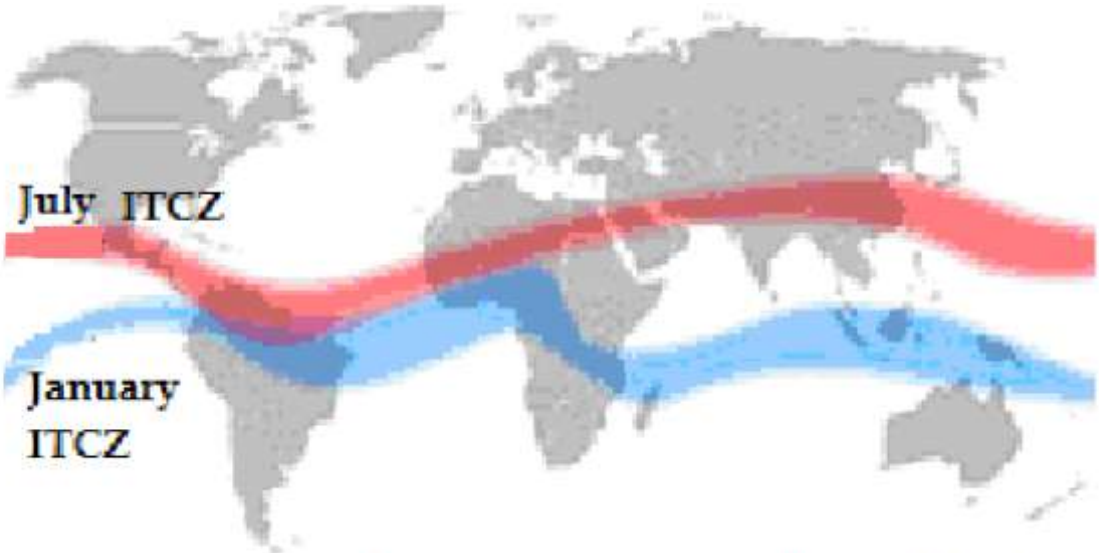
III. POLAR EASTERLIES (3:20 PM):

- They originate from the polar high-pressure belts (90 degrees) and move to temperate low-pressure belts(60 degrees)
- They are extremely cold and dry.
- They blow for long distances and affect the climate of destinations.
- 

Inter-Tropical Convergence Zone (ITCZ):

- It is the zone of convergence of trade winds from both the sides of tropics.
- It is centered on the equator, extending up to 5 degrees north and south.
- 

- The ITCZ is not static and the zone moves along the ~~longitudes~~ Latitude as per the position of the sun.
- 

- 

- This zone experiences calm and windless conditions which is also called as **Zone of Doldrums.**

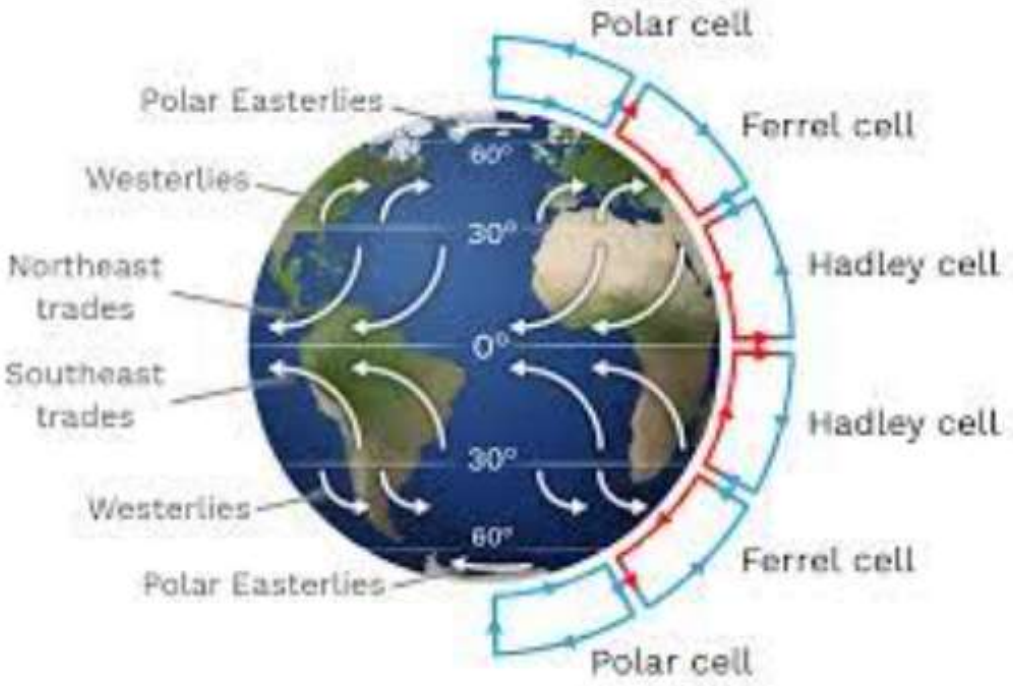
Horse latitudes:

- This is the zone of the subtropical high-pressure belt.
- Winds are present, but only vertically descending winds, and very less horizontal winds.
- Due to this, they experience calm conditions.
- They are named as such because there were cases of horses being thrown into the sea to lessen the weight of the sailing ships.

Tricellular

~~Tricelluar~~ Meridional Circulation:

- Surface winds blow from high-pressure to low-pressure areas.
- However, in the upper atmosphere, the direction of air circulation is opposite to the surface winds.
- Together with convection and subsidence along low-pressure and high-pressure belts, it results in three cellular circulations along each meridian.
- The three cells are:
- I. Hadley cell.
- II. Ferrel Cell
- III. Polar cell



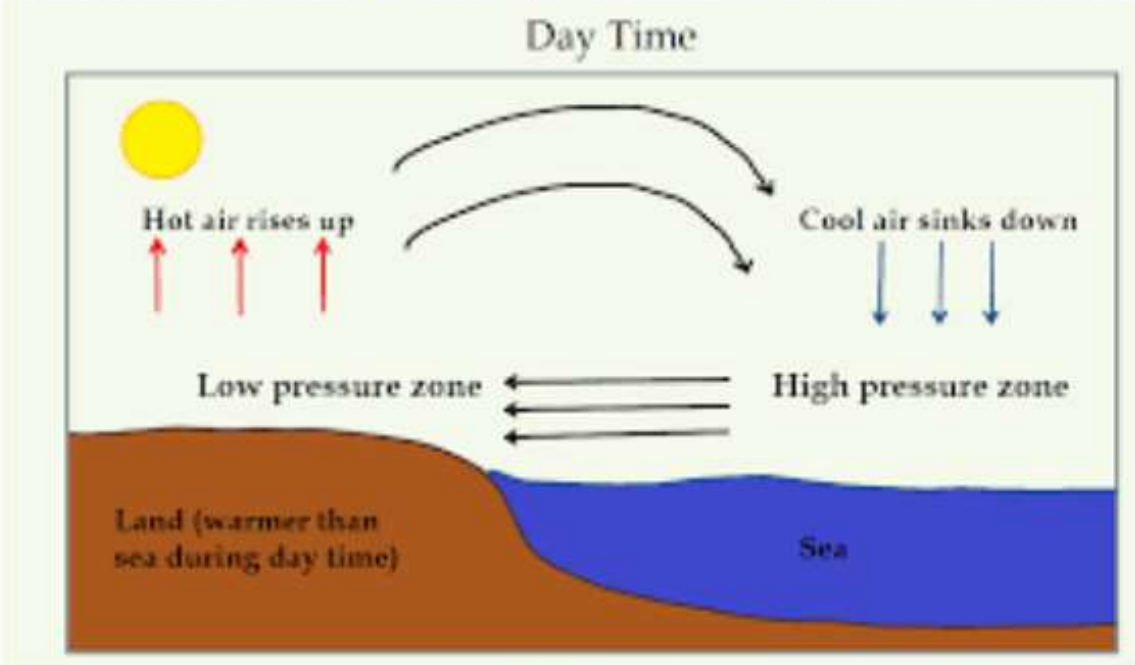
SEASONAL WINDS (3:35 PM):

- The Seasonal differences in temperature and pressure cause the movement of air and subsequent winds blowing in particular seasons are called seasonal winds.
- **For example-** South West Monsoon and North East Monsoon.

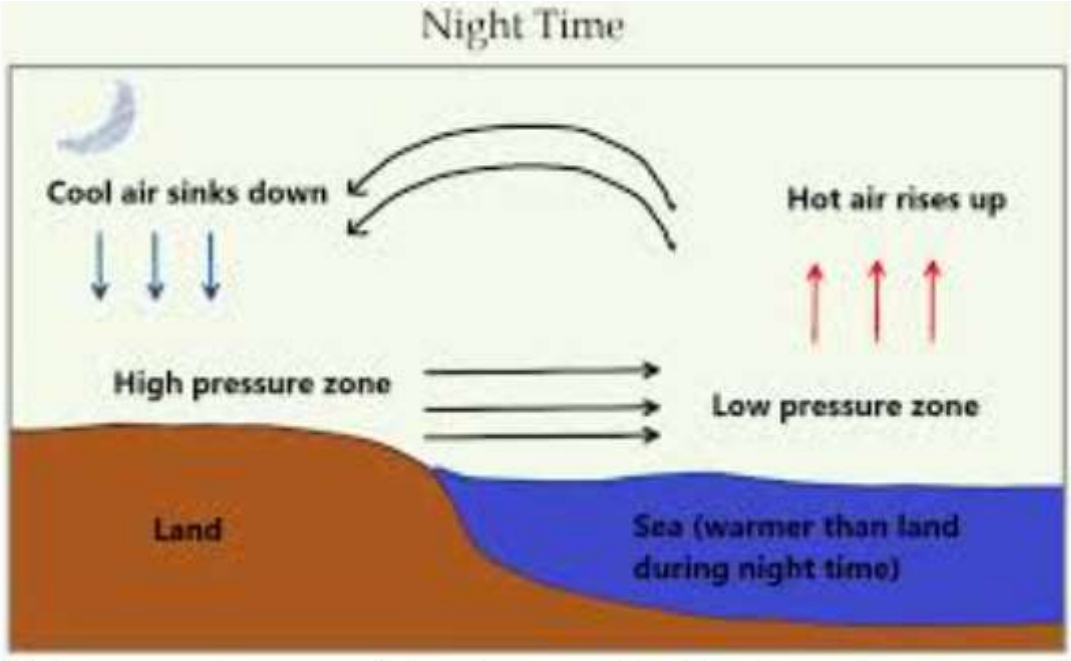
Local winds: or Regional winds

- They are results of differences in the heating and cooling of the earth's surfaces, or the cycles that develop daily or annually.

Land & Sea Breeze:

- The land gets heated more quickly than the adjacent sea during the daytime.
- Low pressure is developed over the land and high pressure is developed over the adjacent sea.
- This causes a circulating of relatively cool air from sea to land, called Sea breeze.
- 

- Sea breeze causes a cooling effect on the coastal lands in the evening.
- At night, the rapid loss of heat from land causes a reversal of daytime pressure due to high pressure on land and low pressure over oceans.
- Winds blow from land to sea, resulting in Land breeze.

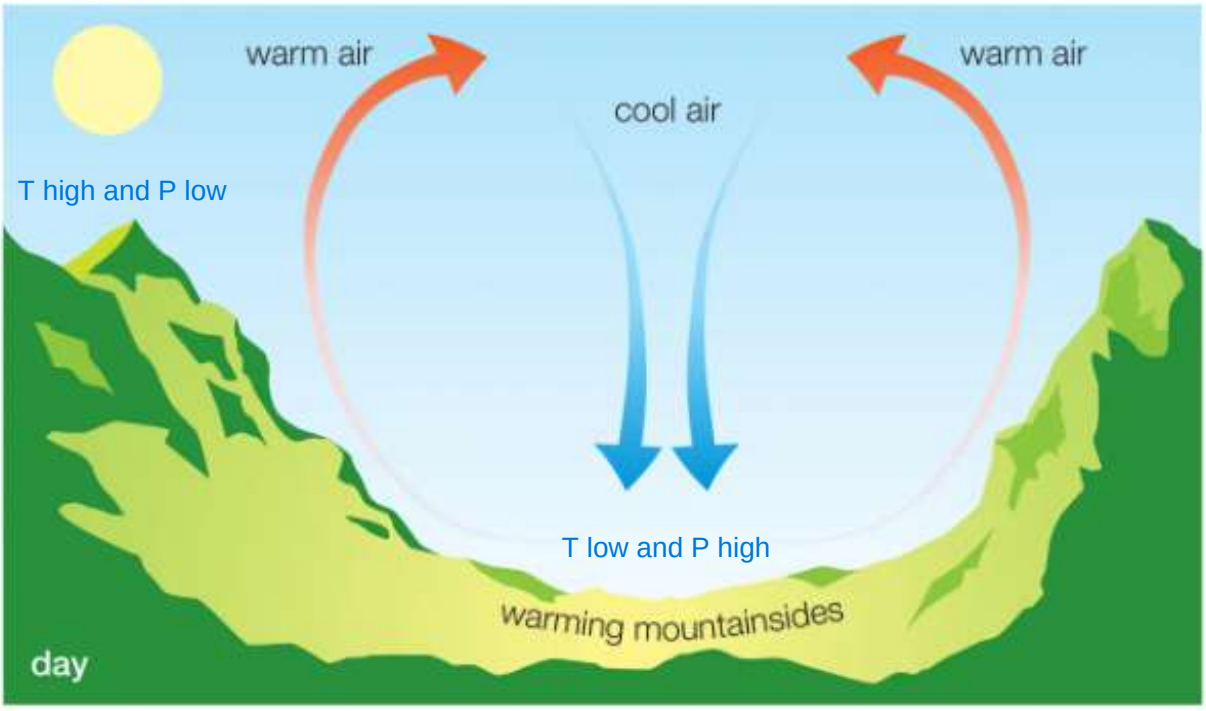
- 

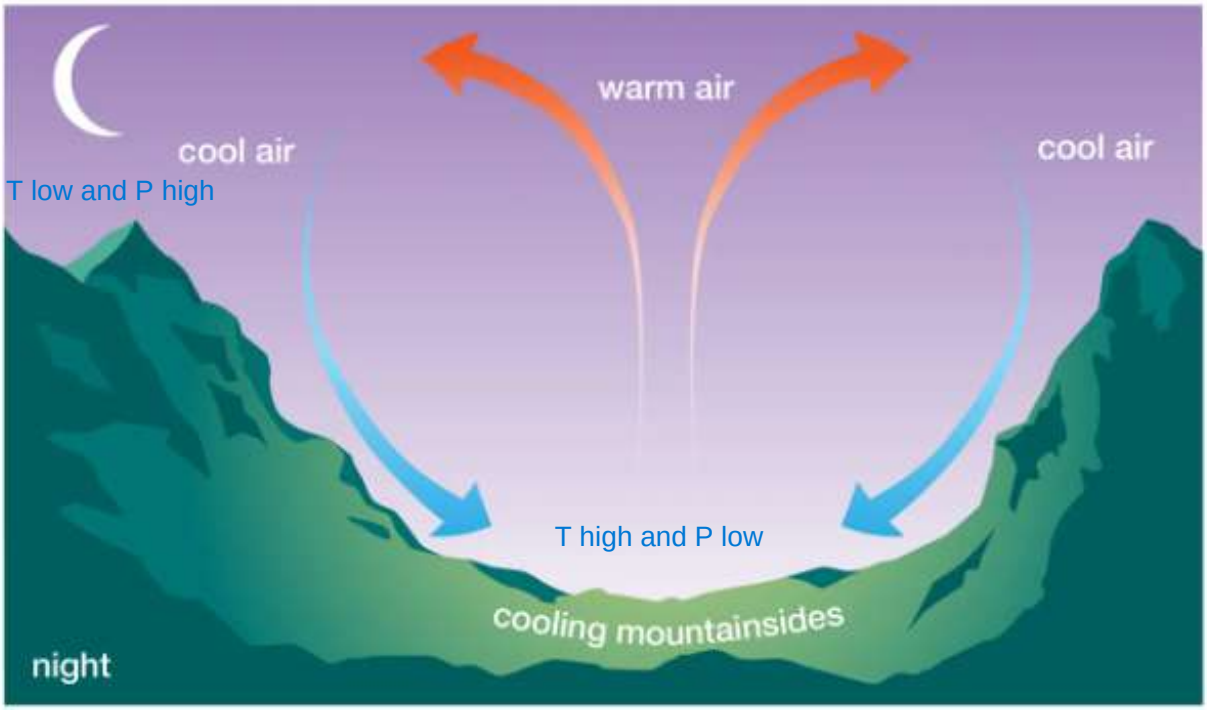
- Fishermen along coastal regions use land and sea breezes for fishing

Mountain & Valley Breeze:

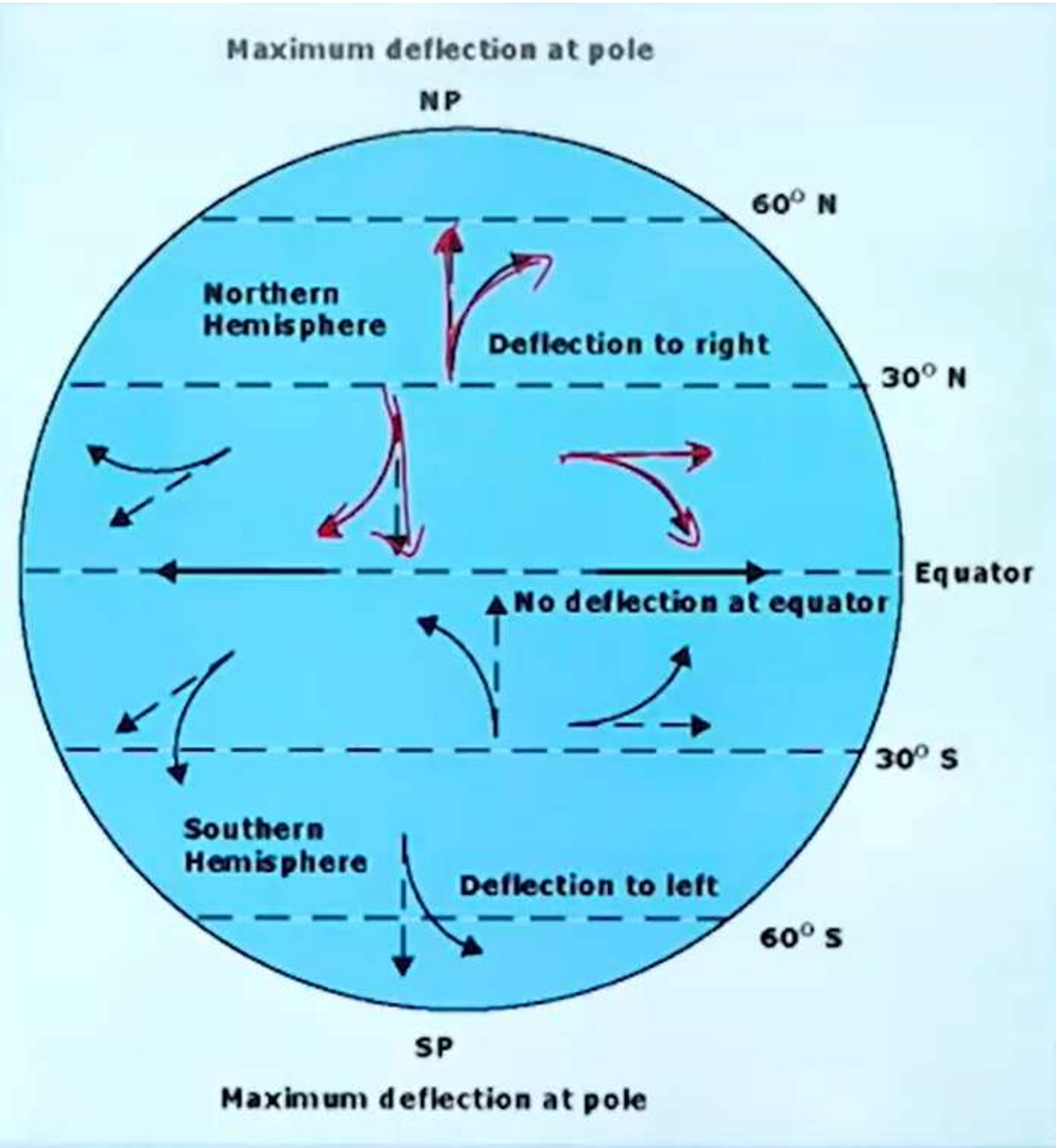
- During the daytime, the mountain slope heats up rapidly as compared to the valley.
- This results in air moving from the valley up along the mountain slopes called valley breeze or **anabatic winds.**
- At night, the temperature difference between the mountain slopes and the valley is reversed.
- This cause winds to blow from mountains to valleys called mountain breezes or **katabatic winds.**

Valley and mountain breezes





The topic for the next class is the continuation of the local winds.


Maximum deflection at pole
NP
60° N
Northern Hemisphere
Deflection to right
30° N
Equator
No deflection at equator
30° S
Southern Hemisphere
Deflection to left
60° S
SP
Maximum deflection at pole

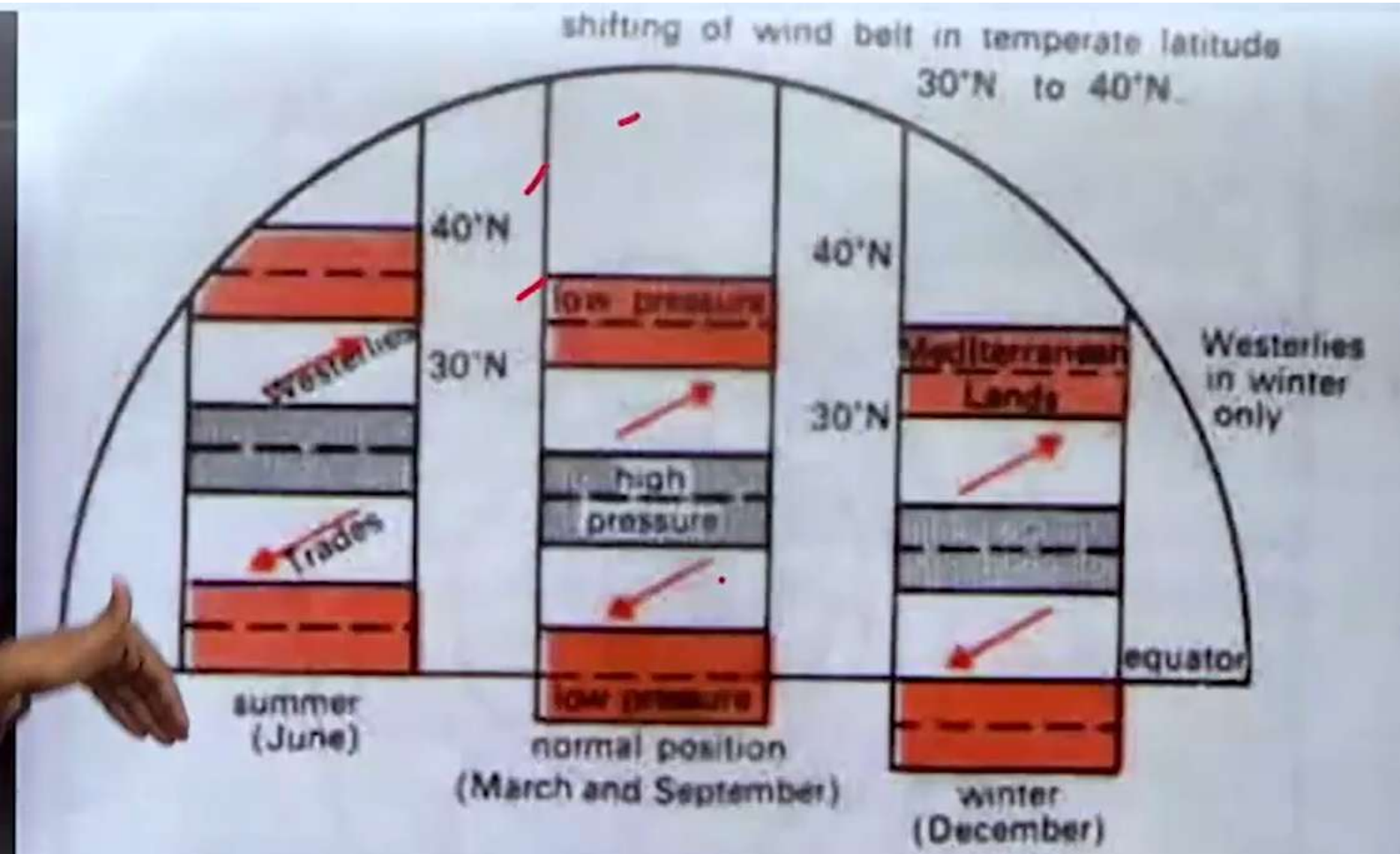


Fig. 116 The shifting of the pressure and wind belts in the northern hemisphere—showing their positions in summer and winter and at the equinoxes