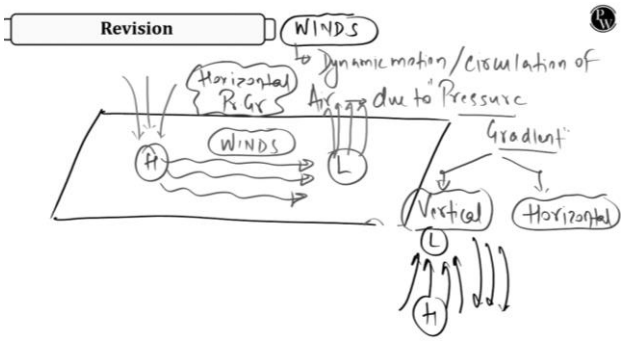
DAILY CLASS NOTES

GEOGRAPHY

Lecture – 33
Winds of the World

Winds of the World

Winds:

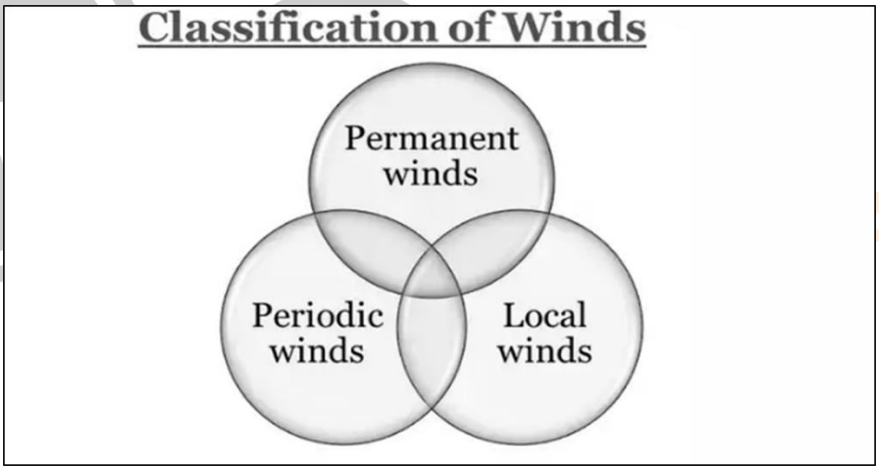


- When air moves in a definite direction, it is called wind. Winds are a result of pressure differences.
- If the winds move from west to east, they are called **Westerlies.**
- If they move from east to west, they are called **Easterlies.**
- The direction of the wind is also affected by the Coriolis effect.
- The coriolis force deflects the wind to its **right** direction in the Northern Hemisphere and to the **left** direction in the Southern Hemisphere.

Classification of Winds:

1. Permanent Winds:

- They are also called Primary winds or Prevailing winds or Planetary Winds
- Examples: Trade winds, Westerlies and Easterlies.

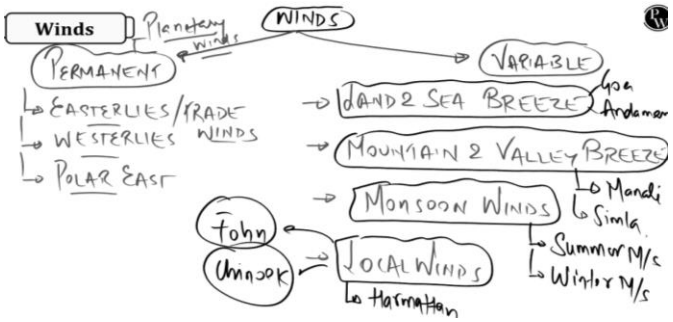


2. Secondary or Periodic Winds:

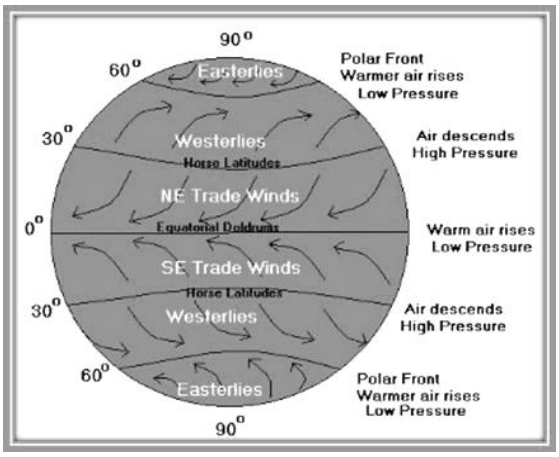
- **Seasonal Winds:** These winds change their direction in different seasons. For example monsoons in India.
- **Periodic Winds:** Land and sea breeze, mountain and valley breeze etc.

3. Local Winds:

- These blow only during a particular period of the day or year in a small area.
- Winds like Loo, Mistral, Foehn, Bora, etc are examples of local winds.



Primary or Prevailing Winds:



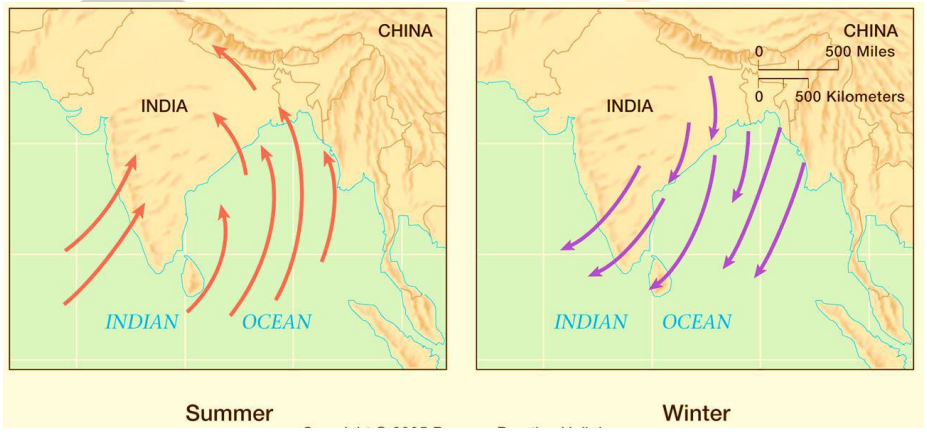
- These are the planetary winds which blow extensively over continents and oceans.
- The two most well-understood and significant winds for climate and human activities are trade winds and westerly winds.
- Examples of Primary Winds are:
  - **The Trade Winds**
  - **The Westerlies**
  - **The Polar easterlies**

Secondary or Periodic Winds:

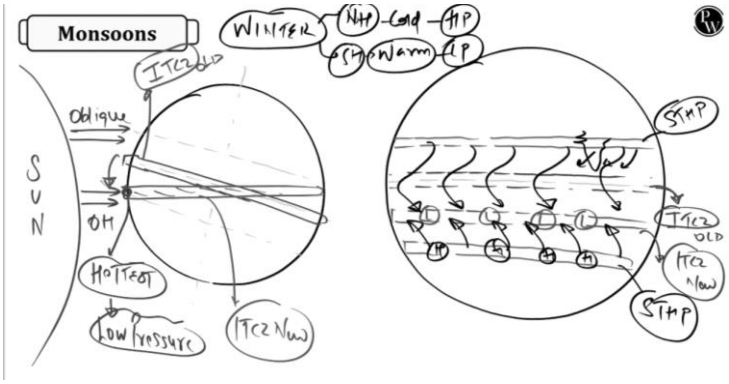
- These winds change their direction with a change in season.
- Monsoons are the best example of large-scale modification of the planetary wind system.
- Other examples of periodic winds include land and sea breeze, mountain and valley breeze, cyclones and anticyclones, and air masses.

Monsoons:

- The word monsoon is derived from the **Arabic word 'mausim'** which literally means season.
- 'Monsoon' refers to the seasonal reversal in the wind direction during a year.
- They blow from sea to land during summers and from land to sea during winters, due to the differential in heating of continents and the oceans**.**



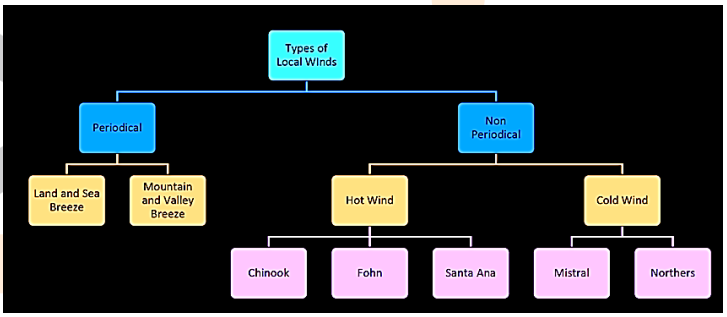
- During summer, the trade winds of the southern hemisphere are pulled northwards by an apparent northward movement of the sun and by an intense low-pressure core in the north-west of the Indian subcontinent.
- While crossing the equator, these winds get deflected to their right under the effect of Coriolis force.
- These winds now approach the Asian landmass as **south-west monsoons.**



- Since they travel a long distance over a vast expanse of water, by the time they reach the south western coast of India, they are over-saturated with moisture and cause heavy rainfall in India and neighboring countries.
- During winter, these conditions are reversed and a high pressure core is created to the north of the Indian subcontinent. Divergent winds are produced by this anticyclonic movement which travels southwards towards the equator.
- Tropic of Cancer receives maximum sun rays **during summer,** thus the low-pressure zone is created in the Tibetan plateau region.
- The high-pressure zone is formed in the Indian Ocean region and winds flow from the high pressure to low pressure.
- The winds flow from the Southwest direction to the northeast direction. Thus Indian Monsoon is also known as the **Southwest monsoon.**
- **During winter,** high pressure is formed in the Tibetan region and low pressure is formed in the Indian Ocean.
- The winds now flow in the reverse direction from Northeast to southwest direction.
- It will bring rainfall to the Tamil Nadu coast. This type of monsoon is known as the **Northeast monsoon.**

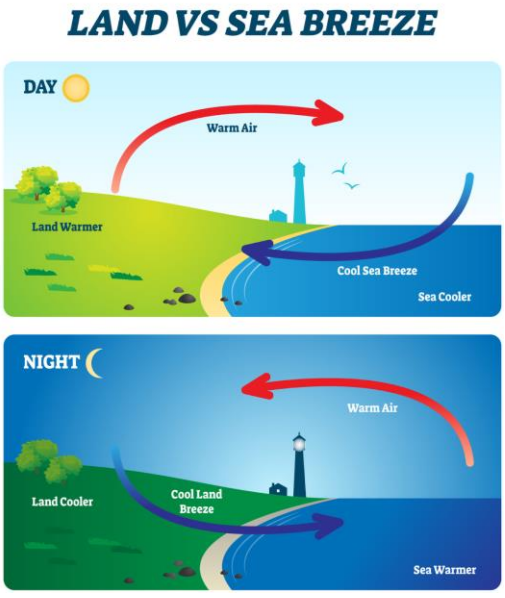
Types of Local Winds:

- **Periodical Winds:** The winds originating from diurnal temperature and pressure variation are known as Periodical and they generally complete their cycle in a day/ 24 hours like Land Sea Breeze and **Mountain Valley Breeze.**
- **Non-Periodical Winds:** Only present during a particular season and are **classified as Hot and Cold Winds.**



Land Breeze and Sea Breeze:

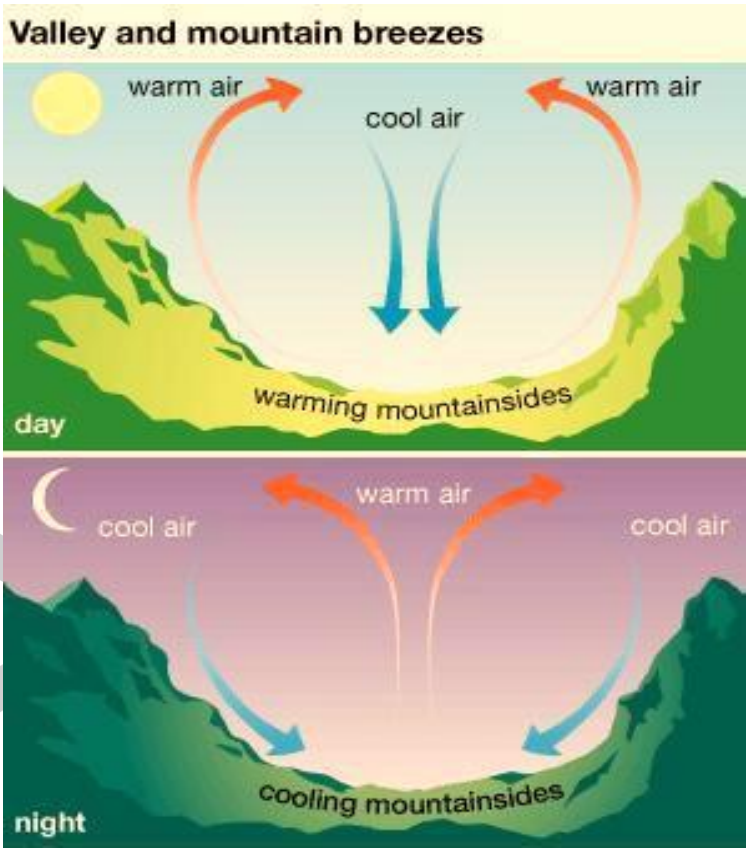
- It influences only a **narrow strip of 20-30 km along the coast.**
- The land and sea absorb and transfer heat differently.
- During the day, the **land heats up faster and becomes warmer than the sea.**
- Therefore, over the land the air rises giving rise to a low-pressure area, whereas the sea is relatively cool and the pressure over the sea is relatively high.
- Thus, a pressure gradient from sea to land is created and the wind blows from the sea to the land as the sea breeze.
- In the night, the reversal of the condition takes place.
- The land loses heat faster and is cooler than the sea.

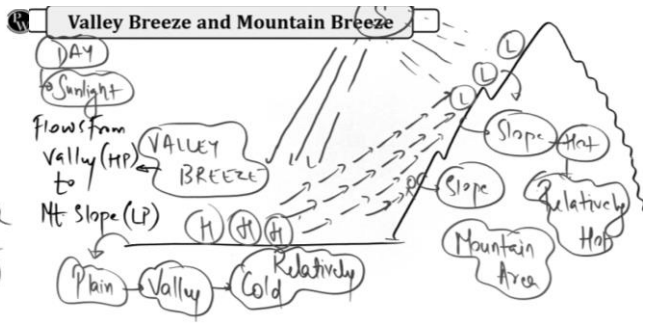


- The pressure gradient is from the land to the sea and hence land breeze results.
- In coastal cities like Mumbai, Puducherry, etc. these land and sea breeze **distributes the temperature and maintain moderate weather conditions**. It also helps in the **reduction of pollution.**

Valley Breeze and Mountain Breeze:

- In mountainous regions, during the day the slopes get heated up, and to fill the resulting gap the air from the valley floor blows up the slope. This wind is known as the **valley breeze.**
- During the night the slopes get cooled and the dense air descends into the valley as the mountain wind.
- The cool air, of the high plateaus and ice fields draining into the valley, is called **katabatic wind**.
- Another type of warm wind (katabatic wind) occurs on the leeward side of the mountain ranges.
- The moisture in these winds, while crossing the mountain ranges condenses and precipitates.
- When it descends down the leeward side of the slope the dry air gets warmed up by an adiabatic process. This dry air may melt the snow in a short time.





Tertiary or Local Winds (Non-Periodical):

- Local differences in temperature and pressure produce local winds.
- Such winds are local in extent and are confined to the lowest levels of the troposphere.

Loo:

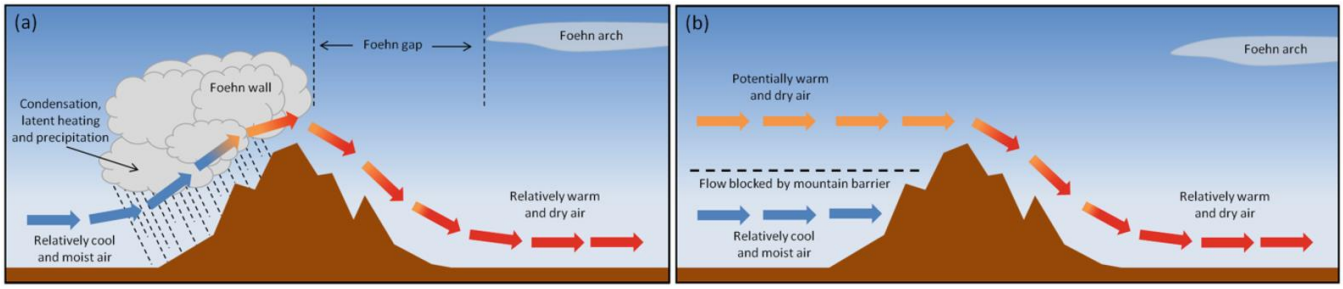
- It originates from the Thar desert and has north westerly to westerly direction.
- In the plains of northern India and Pakistan, sometimes a very hot and dry wind blows from the west in the months of May and June, usually in the afternoons. It is known as a loo.
- Its temperature invariably ranges between 45 degrees Celcius and 50 degrees Celcius.
- It may cause sunstroke to people.

Cold Wind	Warm winds
Pampero	Foehn or Fohn
Gregale	Chinook
Bora	Zonda
Tramontane	Loo
Mistral	Sirocco

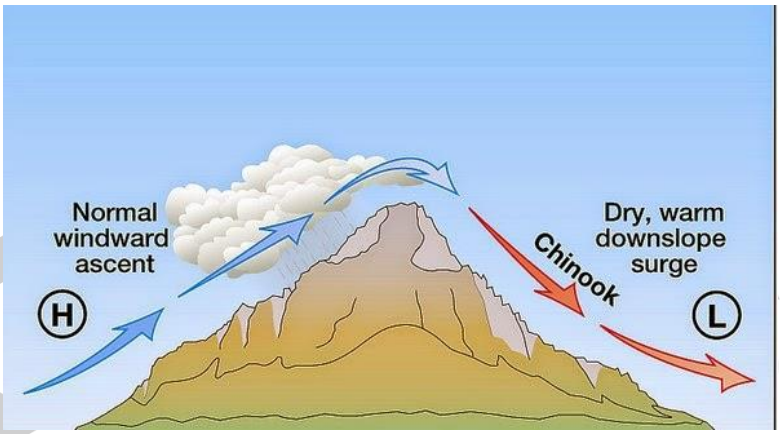
Foehn or Fohn:

- Foehn is a hot wind of local importance in the Alps.
- It is a strong, gusty, dry, and warm wind that develops on the leeward side of a mountain range due to adiabatic heating.
- As the windward side takes away whatever moisture there is in the incoming wind in the form of orographic precipitation, the air that descends on the leeward side is dry and warm (Katabatic Wind).
- The temperature of the wind varies between 15 - 20 degrees Celcius.

- The wind helps animal grazing by melting snow and aids the ripening of grapes.
- The Foehn winds are present throughout the winter and due to the presence of such winds the temperature increases, and the valleys of Switzerland are called **Climatic Oasis during the winter season.**



Chinook:



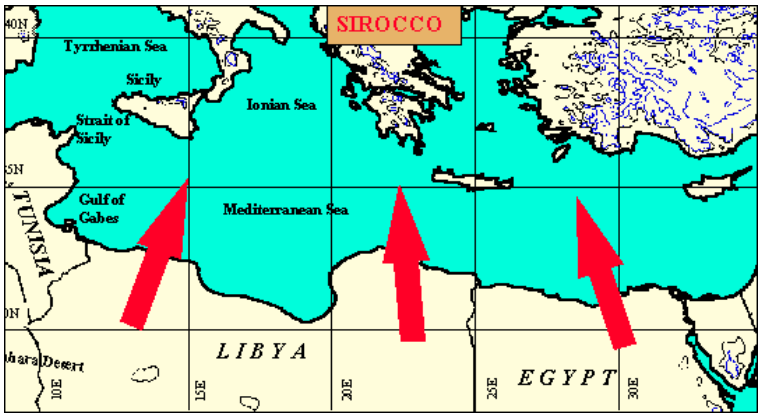
- These are warm and dry winds blowing on the eastern slopes (leeward side) of the Rocky Mountains.
- They are the result of **adiabatic heating** which occurs due to downslope compression on the leeward side, as the mountain barrier creates frictional drag which tends to pull the air from the higher level down on the leeward.
- Air forced down is heated adiabatically and at the same time its relative humidity is also lowered.
- The temperature in Chinook is so warm that it can remove the underlying snow cover/ice and sometimes these winds are so dry that in spite of their below-freezing temperatures, the entire snow cover on the ground disappears, by the process of sublimation. Thus, these winds are also known as Chinook, which literally means **Snow Eater.**
- Chinook leads to the meltdown of the water, and due to the sudden rise in temperature the water is evaporated.
- Thus, there occurs a **reduction in the soil moisture,** which is a negative aspect of Chinook.

Mistral:

- Harmful Wind.
- Mistral is one of the local names given to such winds that blow from the Alps over France towards the Mediterranean Sea.
- It is channelled through the Rhine Valley.
- It is very cold and dry with blow with high speed.
- It brings blizzards into southern France.

Sirocco:

- Harmful Wind.
- Sirocco is the warm, dry, dusty local wind that blows **from the Sahara Desert over the central Mediterranean, and southern Italy, and may even reach Spain.**
- As the Sirocco descends through the northern slope of the Atlas Mountain, they become extremely warm and dry.
- These winds carry red sand particles from Sahara which causes red colour rainfall in southern Europe and this rainfall is known as **Blood Rain.**
- Sirocco is so much laden with sand and dust that the atmospheric visibility reduces almost to zero and they are much injurious to Agriculture and fruit crops.

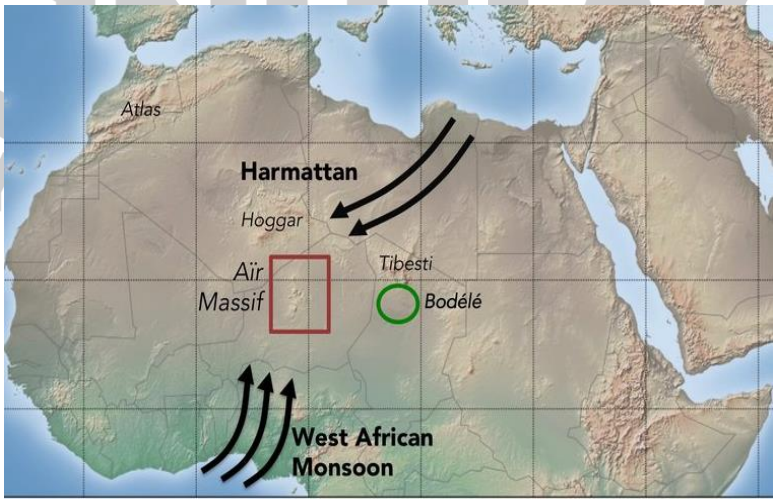


- The Sirocco causes dusty dry conditions along the northern coast of Africa, storms in the Mediterranean Sea, and cool wet weather in Europe.

Harmattan:

- It is **warm and dry wind and travels through the Sahara Desert.**
- It blows from the northeast or east in the western Sahara and is strongest from late November to mid-March.
- It usually carries large amounts of dust, which it can transport hundreds of miles out over the Atlantic Ocean; the dust often interferes with local aircraft operations.

As compared to the humid tropical air, the trade wind is also known as **"doctor wind"** due to its strong dryness.



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