Course : M.A. in Geography
Semester : II
Paper Code : CC208
Paper Name: Geography of India
Topic: Mechanism of Monsoon
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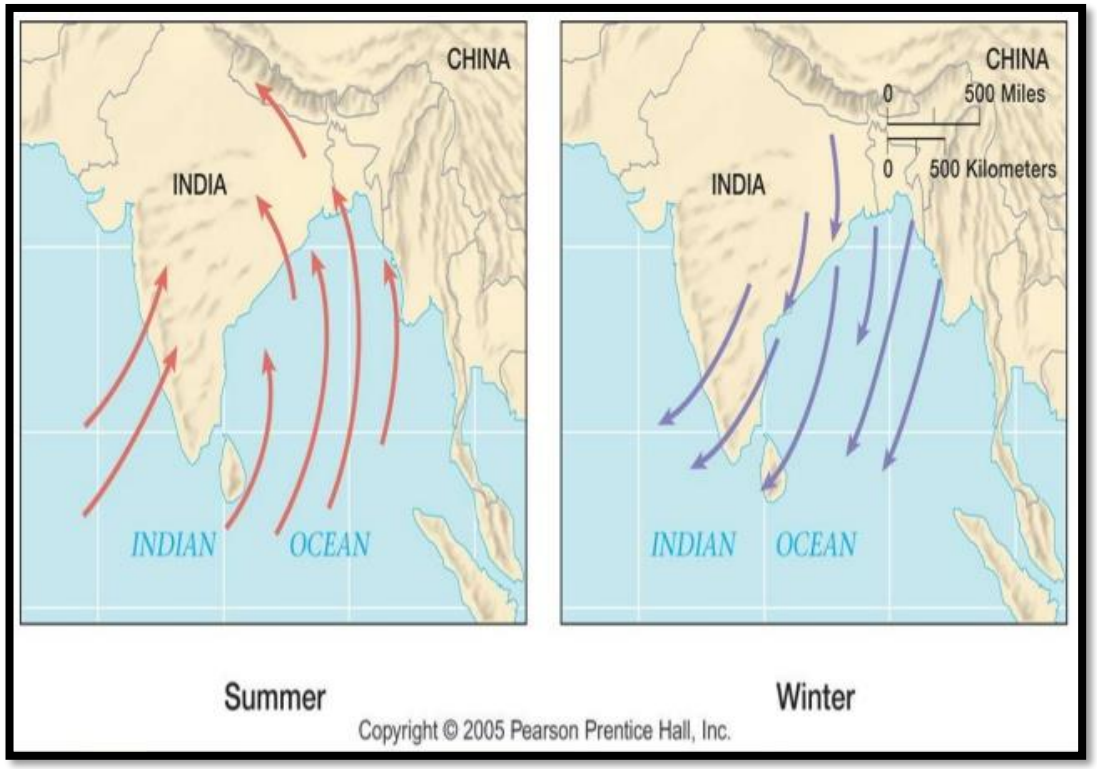
Concept

- **Monsoon** refer to a system of winds in the tropical regions under which the direction of winds is reversed completely between the summer and the winter seasons.
- Generally, across the world, the monsoons are experienced in the tropical area roughly between 20° N and 20° S.
- The climate of India is described as the **'monsoon'** type.



Concepts of the Origin of Monsoon

Thermal concept: From Classical Theory of Hally (1686)

- Generated by the differential seasoned heating of continental and oceanic areas. High pressure is developed over the continent where low pressure over southern Indian ocean.

- Therefore outflow of air from the high pressure land areas to the low pressure areas resulting into NE Monsoon.

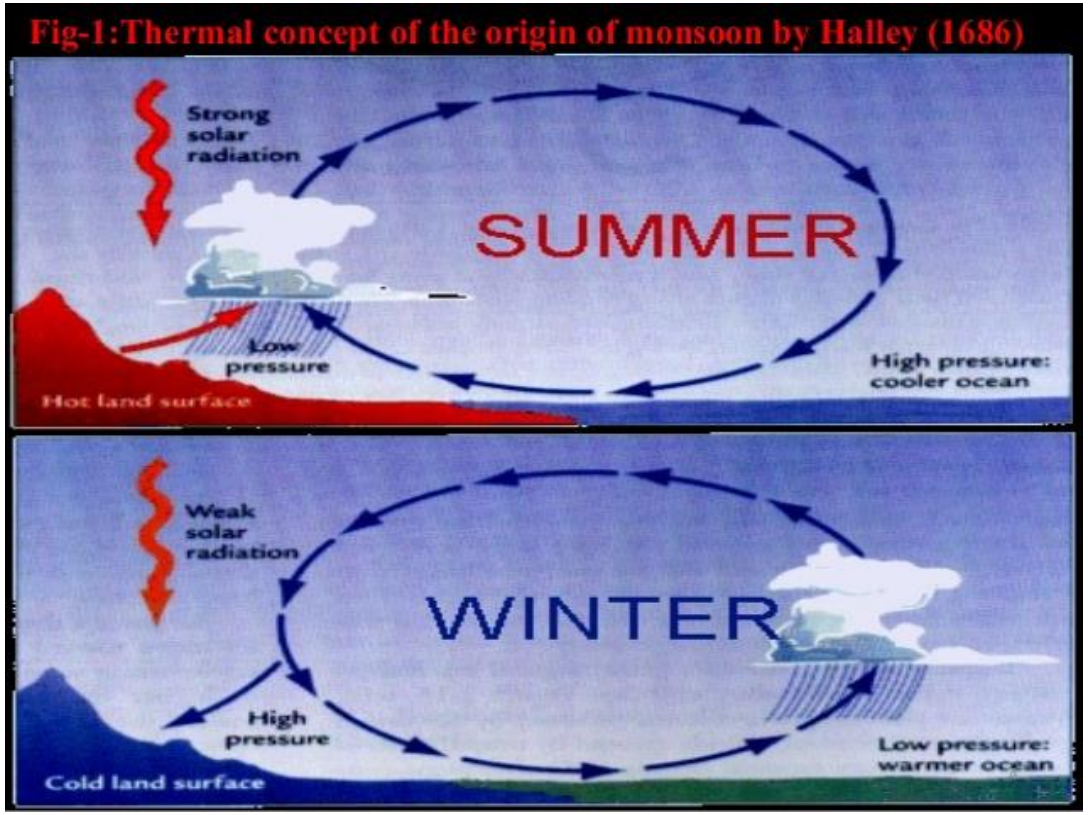


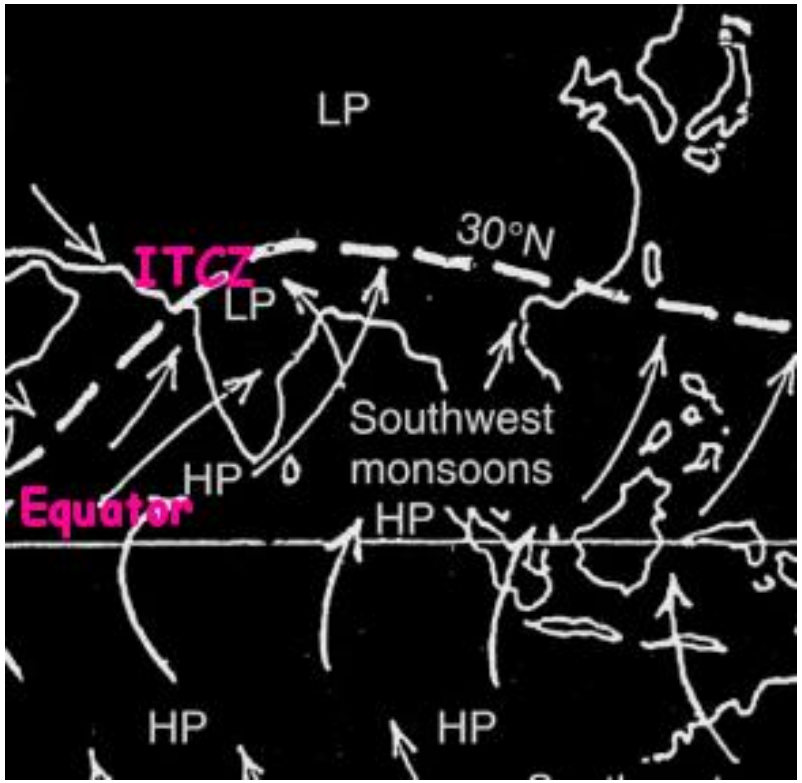
Image source: Google

Concepts of the Origin of Monsoon

Dynamic Concept-Propounded by Flohn (1951)

- According to him monsoon is the seasonal migration of planetary winds and pressure belts following the sun.

- Hence this theory explains the existence of monsoon not by the temperature, contrasts between land and sea, but by the annual migration of thermally produced planetary winds and pressure belts.



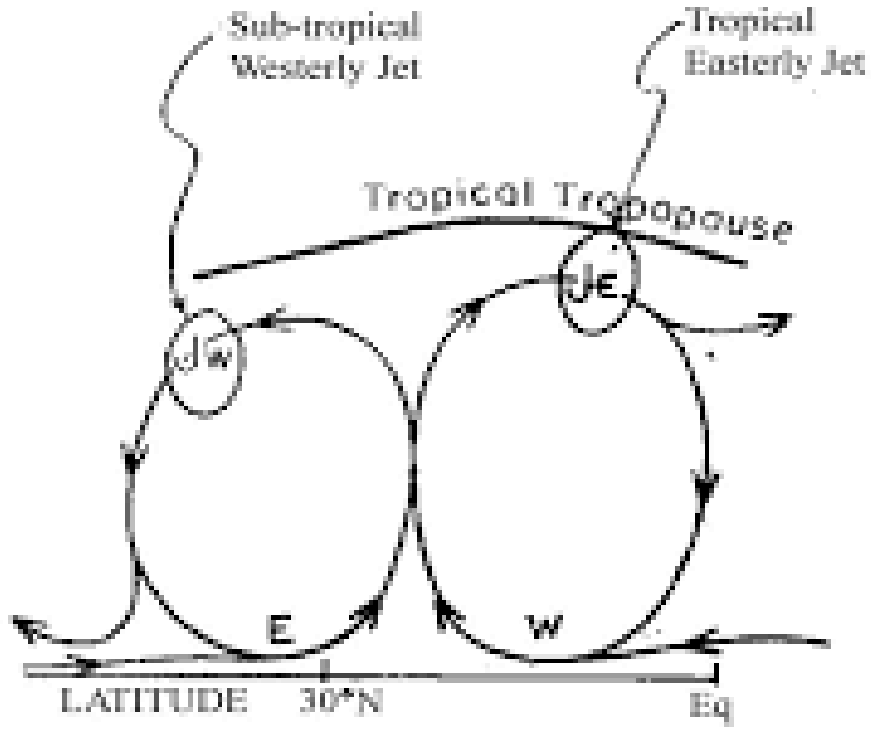
Concepts of the Origin of Monsoon

Recent Concepts

(a) Jet Stream Theory

- The burst of monsoons depends upon the upper air circulation which is dominated by Sub Tropical Jet Streams (STJ).
- The south west monsoon coming in India is related to tropical easterly stream. It blows between 8 degree- 35 degree North latitudes.
- The north east monsoon (winter monsoon) is related to the subtropical westerly Jet Stream which blows between 20 degree and 35 degree latitudes in both the hemispheres.

Schematic model of the vertical circulation in the Asian summer monsoon - Koteswaram (1958), Symposium, Monsoons of the World

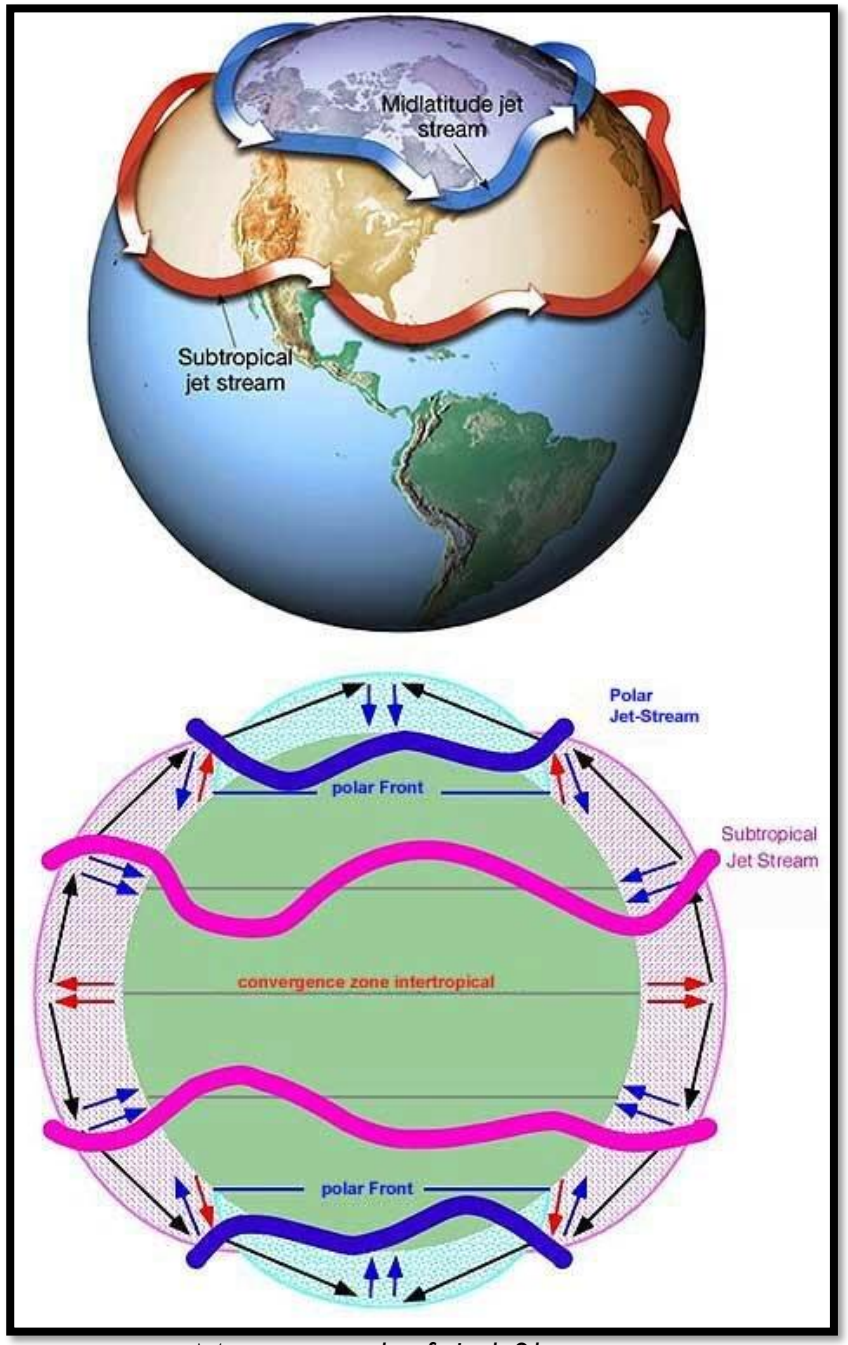


Concepts of the Origin of Monsoon

Recent Concepts
(a) Jet Stream Theory

Seasonal Migration of STJ

- In winter, STJ flows along the southern slopes of the Himalaya and in summer shifts northwards dramatically, flowing along the edge of Himalayas in early June and in late summer (July-August) along the northern edge of the Tibetan Plateau.
- The periodic movement of the Jet Stream often indicates the onset and subsequent withdrawal (STJ returns back to its position – south of Himalayas) of the monsoon.
- Northward movement of the subtropical jet is the first indication of the onset of the monsoon over India.



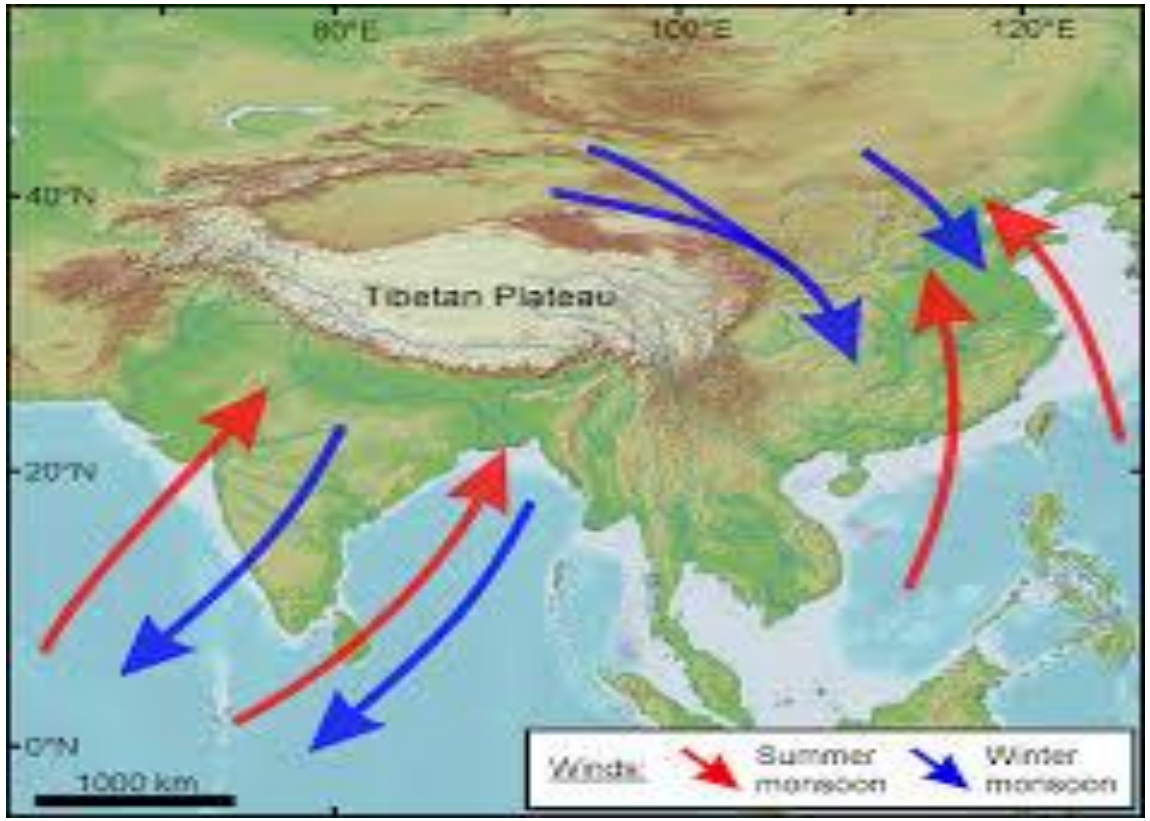
Movement of Jet Streams

Concepts of the Origin of Monsoon

Recent Concepts

(b) Tibet Plateau: In 1973, the Monsoon Expedition (MONEX) was organized under the joint auspices of the erstwhile Soviet Union and India. Experiments concluded that summer time heating of Tibetan Highland plays a dominant role in the origin of Monsoon circulation. Due to its protected height Tibetan plateau receives 23°C more insolation than the neighboring areas. The plateau affects the atmosphere in two ways

1. As a mechanical barrier and as a high level heat sources.
2. the plateau accentuates the northland displacement of the jet stream.



source :socratic.org

Out of a total of 4 seasonal divisions of India, monsoon occupy 2 divisions, namely.

- **The southwest monsoon season -** Rainfall received from the southwest monsoons is seasonal in character, which occurs between June and September.
- **The retreating monsoon season -** The months of October and November are known for retreating monsoons.

Factors Influencing South-West Monsoon Formation :

- The differential heating and cooling of land and water
- The shift of the position of Inter Tropical Convergence Zone (ITCZ)
- The presence of the high-pressure area.
- The Tibetan plateau and The movement of the westerly jet stream
- Southern Oscillation (SO)

Mechanism

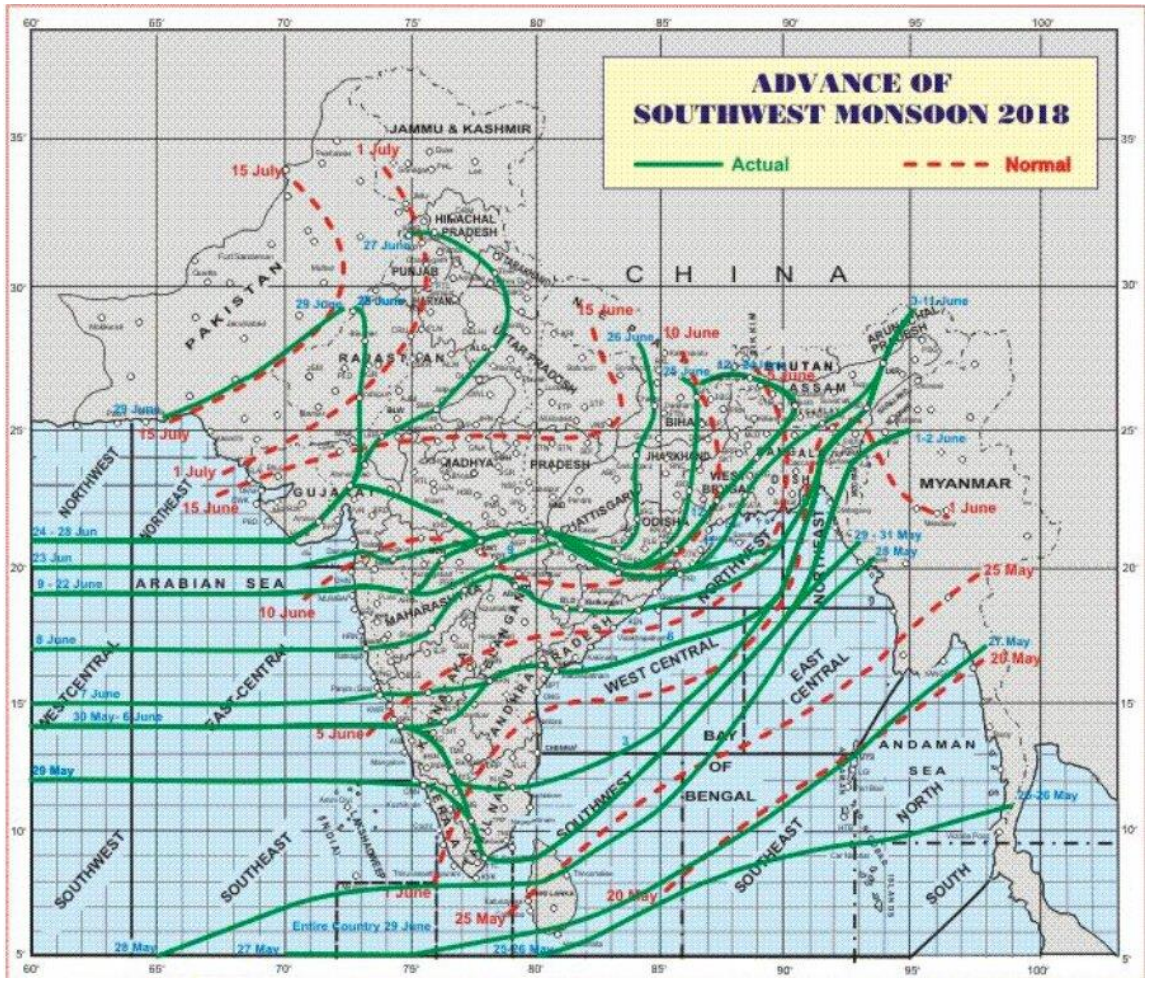
Onset of the South-West Monsoon

- The location of ITCZ shifts north and south of the equator with the apparent movement of the Sun. During the month of June, the sun shines vertically over the Tropic of Cancer and the ITCZ shifts northwards. The southeast trade winds of the southern hemisphere cross the equator and start blowing in southwest to northeast direction under the influence of Coriolis force.

- As these winds approach the land, their southwesterly direction is modified by the relief and thermal low pressure over northwest India. The monsoon approaches the Indian landmass in two branches:

  The Arabian Sea branch - The monsoon winds originating over the Arabian Sea.

  The Bay of Bengal branch - The Arakan Hills along the coast of Myanmar deflect a big portion of this branch towards the Indian subcontinent. The monsoon, therefore, enters West Bengal and Bangladesh from south and southeast instead of from the south-westerly direction.



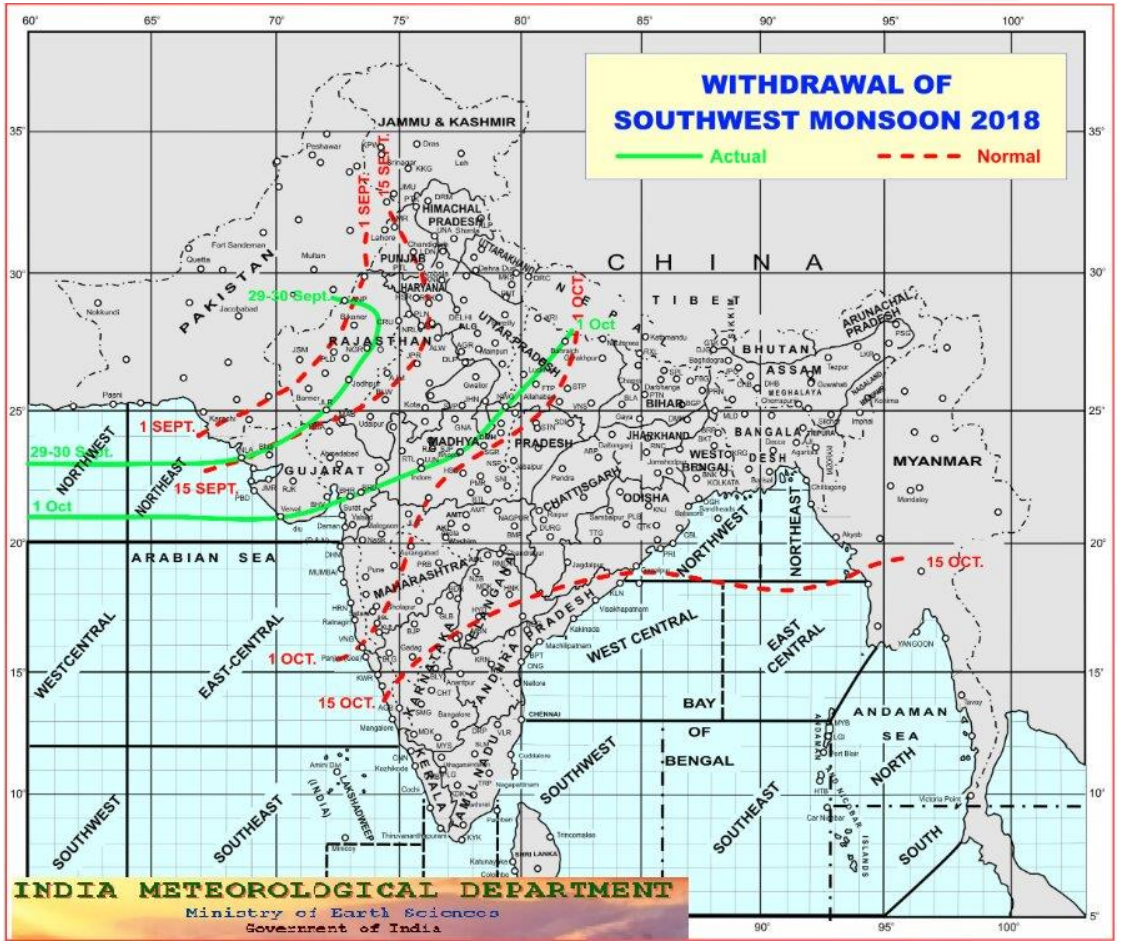
Source: Indian metrological department

Mechanism

Retreating Monsoon Season

The retreating southwest monsoon season is marked by clear skies and rise in temperature. The weather in the retreating monsoon is dry in north India but it is associated with rain in the eastern part of the Peninsula. Here, October and November are the rainiest months of the year.

The widespread rain in this season is associated with the passage of cyclonic depressions which originate over the Andaman Sea and manage to cross the eastern coast of the southern Peninsula. These tropical cyclones are very destructive.



Source: Indian metrological department

Impact of Monsoons in India

Positive

- Agricultural prosperity of India depends very much on timely and adequately distributed rainfall. If it fails, agriculture is adversely affected particularly in those regions where means of irrigation are not developed.
- Regional variations in monsoon climate help in growing various types of crops.
- Monsoon rain helps recharge dams and reservoirs, which is further used for the generation of hydro-electric power.
- Winter rainfall by temperate cyclones in north India is highly beneficial for Rabi crops.

Negative

- Variability of rainfall brings droughts or floods every year in some parts of the country.
- Sudden monsoon burst creates a problem of soil erosion over large areas in India.
- In hilly areas sudden rainfall brings landslide which damages natural and physical infrastructure subsequently disrupting human life economically as well as socially.

Thank you