

Competitive Exams: Indian Geography monsoon

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Concepts of the Origin of Monsoon

1. Thermal concept: From Classical Theory of Hally (1686)

1. Generated by the differential seasoned heating of continental and oceanic areas. High pressure is developed over the continent (near Lake Baikal and Peshawar), where low pressure over southern Indian ocean.
2. Therefore outflow of air from the high pressure land areas to the low pressure areas resulting into NE Monsoon

2. Aerological Concept - Given by a German Meteorologist R. Seherhag (1948)

According to him the changes in the direction of winds at all levels in the atmosphere are directly related to the temperature changes in the air above the friction layer.

3. Dynamic Concept-Propounded by Flohn (1951): Based on the dynamic origin of monsoons. According to him monsoon is the seasonal migration of planetary winds and pressure belts following the sun. Over the land the annual temperature changes are relatively larger because of which the seasonal shifts of temperature and pressure belts amount to many degrees. 4 Due to the shifting the major part of the Indian subcontinent comes under impact of Equatorial Westerlies. During winter due to southward shifting of pressure and wind belt the planetary system of northeast trade winds is established over the region. 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.

4. Recent Concepts

(a) Jet Streams: Jet streams are high altitude geostrophic winds (i.e. blowing parallel to equator) blowing between middle latitude at high speed in a meandering course.

During winter season the upper air westerly jet streams are positioned in Asia. These are bifurcated in two branches due to Tibet Himalayan obstruction. North branch blows north of Himalayas and the Tibetan Plateau. Southern branch blows south of the mighty mountains

The southern branch inscribes an anticyclone (Clockwise) arc across Afghanistan followed by a cyclonic (Anticlockwise) arc along the southern flank of the Himalayas. A high pressure system gets formed south of the jet stream over Afghanistan and NW Pakistan where air tends to subside leading to atmospheric stability and dry conditions there by causing NE winter monsoons. The jet stream helps disturbances in the NW of the subcontinent, which tend to follow paths immediately beneath the jet stream. These disturbances move long the eastern Mediterranean and into NW India appearing here as waves rather than as well developed frontal cyclones.

During summer season as sun falls vertically over the Tropic of Cancer the polar surface high pressure is weakened and upper air circum polar whirl shift northward as a result of which the upper air westerly jet are also withdrawn from southern slopes of the Himalayas.

The removal of jet stream to north of the Tibetan plateau results in reversal of the curvature of flow of free air to the north and north west of the subcontinent. This event may well be the trigger that sets off the 'burst' of the monsoon.

(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. In fact the plateau accentuates the northward displacement of the jet stream. The summer time heating of the Tibetan Plateau makes it a high level heat source, which produces thermal anticyclone over this region, thereby weakening the western subtropical jet stream south of the Himalayas and intensifying the move of S.W monsoon.
3. Effect because of ocean: El Nino a warm ocean current appears along the Peru coast in December. It replaces the Peru or Humboldt Cold Ocean current flowing over this region during normal years. Under normal times the layer over the eastern Pacific is cool and shallow, while over the western Pacific it is warm and deep. Such conditions are helpful for strong southwest monsoons. The appearance of El Nino reverses the conditions (warm condition over eastern Pacific and cold in western Pacific). Since El Nino represents large atmospheric perturbations to which the ocean responds with warm or colder surface temperature, it leads to extreme events, such as drought, flood and poor monsoons. The Southern Oscillation is the name ascribed to a seesaw pattern of meteorological changes that are often observed between the Pacific, the pressures over the Indian Ocean tend to be low, and vice versa. The oscillation was discovered by Sir Gilbert Walker and is therefore also known as "Walker circulation". The oscillation has a period varying from 27 years. The intensity of the Southern Oscillation is measured by the difference in sea level pressures of Tahiti and Port Darwin El Nino Southern Oscillations

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4. The Somali Current: It is one of the few currents, which reverse its direction with the overlying wind. Summer Flows northward Winters Flows southward

Discussions & Questions

Origin of monsoon is directly related to what?. (- bo...@ on 04-Dec-2016)

[1 Answer](#)

To get clarity on concepts of monsoons visit - <https://www.youtube.com/watch?v=7A5flepzZYk>

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