

SOCIAL STUDIES (GEOGRAPHY)

CHAPTER 04: CLIMATE

(Notes)

Climate: The sum total of weather conditions and variations over a large area for a long period of time (more than thirty years) is called climate.

Weather: The state of the atmosphere over an area at any point of time is called weather.

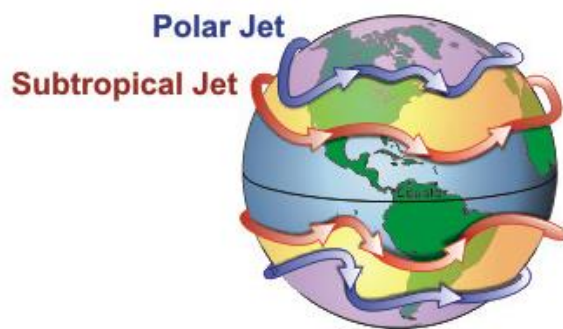
Monsoon: This type of climate is mainly found in the south and Southeast Asia. The climate of India is of monsoon type. The seasonal reversal in wind direction during a year is called monsoon.

Coriolis Force: An apparent force caused by the earth's rotation is called Coriolis Force. The winds are deflected towards right in the northern hemisphere and towards the left in the southern hemisphere due to this force. This is also known as 'Ferrel's Law'.

Jet Stream: Fast flowing and narrow air currents are called jet streams. The streams flow at high altitudes (about 12,000 feet) in the troposphere. Their speed varies from about 110 km/h in summer to 184 km/h in winter.

Western Cyclonic Disturbance: The western cyclonic disturbances are weather phenomena of the winter months brought in by the westerly flow from the Mediterranean region. They usually influence the weather of the north and north-western regions of India.

Inter Tropical Convergence Zone (ITCZ): The Inter Tropical Convergence Zone (ITCZ,) is a broad trough of low pressure in equatorial latitudes. The northeast and the southeast trade winds converge in this zone. This zone lies more or less parallel to the equator. It moves north or south with the apparent movement of the sun.



CLIMATIC CONTROLS

There are six major controls of the climate of any place. They are Latitude, Altitude, Pressure and wind system, Distance from the sea, Ocean currents and Relief features

Factors Affecting India's Climate

- (i) **Latitude:** The Indian landmass is equally divided by The Tropic of Cancer. Hence, half of India has tropical climate and another half has subtropical climate.
- (ii) **Altitude:** While the average elevation in the coastal areas is about 30 metre, the average elevation in the north is about 6,000 metre. The Himalayas prevent the cold winds from Central Asia from entering the Indian subcontinent. Due to this, the subcontinent gets comparatively milder winters as compared to Central Asia.
- (iii) **Pressure and Winds:** The Indian subcontinent lies in the region of north-easterly winds. These winds originate from the subtropical high-pressure belt of the northern hemisphere. After that, these winds blow towards south. They get deflected to the right due to the Coriolis force and then move towards the low pressure area near the equator.

- The north-easterly winds originate and blow over the land and hence they carry very little moisture. India should have been an arid land because of these winds but that is not the case.
- There is high-pressure area towards the north of the Himalayas. Cold winds from this region blow to the low pressure areas over the oceans in the south.
- During summer, low-pressure area develops over interior Asia and also over northwestern India. This results in a complete reversal of the direction of winds during summer.
- Air; from the high-pressure area moves over the southern Indian Ocean in a south-easterly direction. It crosses the equator and turns right towards the low-pressure areas over the Indian subcontinent.
- These winds are known as the Southwest Monsoon wind. They collect moisture from the warm oceans and bring widespread rainfall over the mainland of India.
- The upper air circulation in this region is dominated by a westerly flow. Jet stream is an important component of this flow. These jet streams are called subtropical westerly jet streams because they are located approximately over 27° - 30° north latitude.
- The westerly jet streams are responsible for western cyclonic disturbances in the north and north-western parts of India. The subtropical westerly jet stream moves north of the Himalayas with the apparent movement of the sun.
- The tropical jet stream (an easterly jet stream) blows over the Indian Peninsula; approximately over 14° north during the summer months.

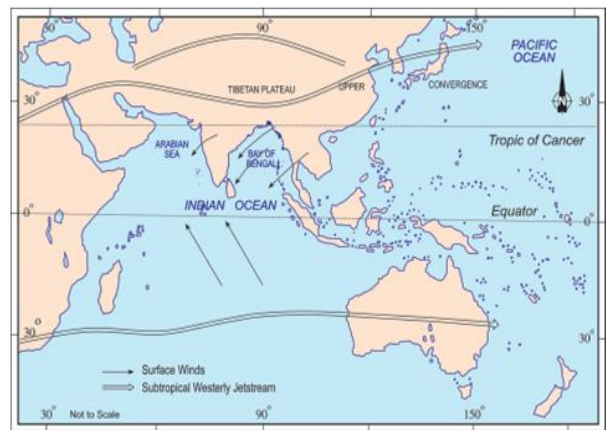
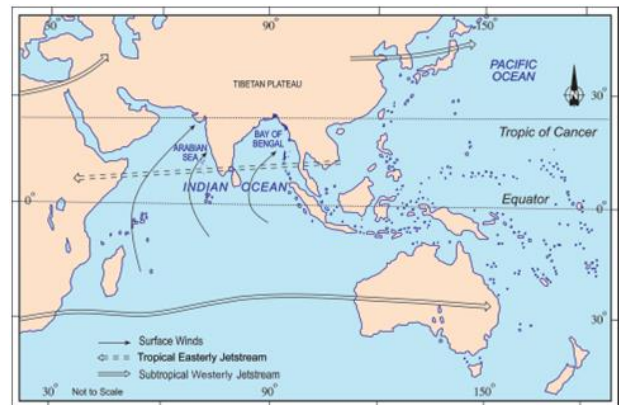


Fig: Atmospheric condition over the Indian subcontinent in January

Following facts are important in formation of monsoon:

- The Sun causes differential heating and cooling of land and water. This creates low pressure on the landmass of India and high pressure over the ocean surface.
- The Inter Tropical Convergence Zone (ITCZ) is normally positioned about 5° N of the equator. It shifts over the Ganga plain during summer. It is also known as the monsoon trough during the monsoon season.
- The high-pressure area, east of Madagascar is approximately 20° S over the Indian Ocean. This area affects the Indian Monsoon.
- The Tibetan plateau gets intensely heated during summer. This results in strong vertical air currents and formation of high pressure over the plateau. This high-pressure zone is about 9 km above the sea level.
- The westerly jet stream moves to the north of the Himalayas, and the tropical easterly jet stream moves over the Indian Peninsula during summer.
- In normal circumstances, when the tropical eastern South Pacific Ocean experiences high pressure, the tropical eastern Indian Ocean experiences low pressure. Such changes in the pressure conditions over the southern oceans also affect the monsoon.
- But in certain years, there is a reversal in the pressure conditions. In this case, the eastern Pacific Ocean has lower pressure compared to the eastern Indian Ocean.



- This periodic change in pressure conditions is known as the Southern Oscillation or SO.
- The difference in pressure over Tahiti and Darwin is computed to predict the intensity of the monsoons. Tahiti (18°S/149°W) lies in the Pacific Ocean and Darwin (12°30'S/131°E) lies in northern Australia. If the pressure differences are negative, it means a below average and late monsoon.

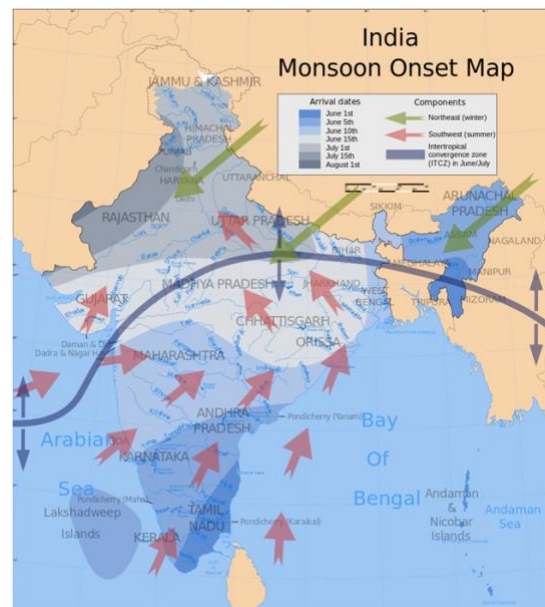
EL NINO

This is a feature which is connected with the SO. El Nino is a warm ocean current that flows past the Peruvian coast; in place of the cold Peruvian current, every 2 to 5 years. El Nino significantly affects the changes in pressure conditions. Hence, the phenomenon is called ENSO (El Nino Southern Oscillations).

THE ONSET OF MONSOON

Generally, the monsoon arrives at the southern tip of the Indian peninsular by the first week of June. Subsequently, it divides into two branches, viz. the Arabian Sea branch and the Bay of Bengal branch.

- The Arabian Sea branch reaches Mumbai about ten days later, i.e. around 10th of June. The Bay of Bengal rapidly advances and reaches Assam in the first week of June.
- The monsoon winds are then deflected by high mountains and move towards west over the Ganga plains. The Arabian Sea branch of the monsoon arrives over Surashtra-Kuchhh and central part of the country by mid-June.
- The Arabian Sea and the Bay of Bengal branches of the monsoon merge over the northwestern part of the Ganga plains.
- Delhi usually receives monsoon showers from the Bay of Bengal branch by the end of June.
- Western Uttar Pradesh, Punjab, Haryana, and eastern Rajasthan experience monsoon by the first week of July. The monsoon reaches Himachal Pradesh and the rest of the country by mid-July.



Withdrawal of Monsoon

Withdrawal or the retreat of the monsoon is a more gradual process.

- The monsoon begins to withdraw from the northwestern states of India by early September.
- The monsoon withdraws completely from the northern part of the Indian peninsular by mid-October.
- The monsoon withdraws from the rest of the country by early December.
- The islands receive the very first monsoon showers from the first week of April to the first week of May; progressively from south to north. The withdrawal of monsoon in the islands takes place from the first week of December to the first week of January.

THE SEASONS

There are four main seasons in India, viz. the cold weather season, the hot weather season, the advancing monsoon and the retreating monsoon.

The Cold Weather Season (Winter):

- The winter season begins from mid-November and stays till February; in northern India. December and January are the coldest months in the northern part of India. The temperature ranges between 10°-15°C in the northern plains, while it ranges between 24°-25°C in Chennai.
- The northeast trade winds prevail over the country in this season. As these winds blow from land to sea, most parts of the country experience a dry season.
- The weather is usually marked by clear sky, low temperatures and low humidity and feeble variable winds.
- The inflow of the cyclonic disturbances from the west and the northwest is a characteristic feature of the cold weather over the northern plains. These low-pressure systems originate over the Mediterranean Sea and Western Asia and move into India. They cause winter rains over the plains and snowfall in the mountains. The winter rainfall is in small amount but is very important for the rabi crop. This rainfall is locally known as mahawat.
- The peninsular region does not get a well-defined winter because of the moderating influence of the sea.

The Hot Weather Season (Summer)

- The summer season is from March to May. During this period, the global heat belt shifts towards north because of the apparent northward movement of the sun.
- During summer, the temperatures rise and air pressure falls in the northern part of the country. Towards the end of May, an elongated low-pressure area develops in the region which extends from the Thar Desert in the northwest to Patna and Chhotanagpur in the east and southeast.
- A characteristic feature of the hot weather season is the 'loo'. These are strong, gusty, hot and dry winds which blow during the day over the north and northwestern India.
- Dust storms are very common in northern India during the month of May. This is also the season of localized thunderstorms; accompanied by violent winds, torrential downpours, and hail.
- Pre-monsoon showers are common towards the end of the summer season; especially in Kerala and Karnataka. They are often called 'mango showers' as they help in the early ripening of mangoes.

Advancing Monsoon (The Rainy Season)

- The rainy season begins from early June.
- The low-pressure condition over the northern plains intensifies at this time. It attracts the trade winds from the southern hemisphere. These south-east trade winds cross the equator and blow in a south-westerly direction to enter the Indian peninsula as the south-west monsoon. These winds bring abundant moisture to the subcontinent.
- These winds blow at an average velocity of 30 km/h. The monsoon winds cover the country in about a month; barring the extreme north-west.
- The windward side of the Western Ghats receives very heavy rainfall, early in the rainy season. The Deccan Plateau and parts of Madhya Pradesh also receive some rain, in spite of lying in the rain shadow area.
- The north-eastern part of the country receives the maximum rainfall of this season. Mawsynram (Meghalaya) receives the highest average rainfall in the world.
- Rainfall in the Ganga valley decreases from east to west. Rajasthan and parts of Gujarat get scanty rainfall.
- Monsoon tends to have 'breaks' in rainfall; which means that there are wet and dry spells in between. The monsoon rains take place only for a few days at a time and then come the rainless intervals. These breaks in the monsoon are because of the movement of the monsoon trough. The trough and its axis keep on moving northwards or southward due to various reasons. The movement of the monsoon trough determines the spatial distribution of rainfall.

- The monsoon is famous for its uncertainties. It may cause heavy floods in one part of the country, and may be responsible for droughts in other part. Because of its uncertain behaviour, it sometimes disturbs the farming schedule in India. This affects millions of farmers all over the country.

Retreating Monsoon (The Transition Season)

- During October-November, the sun apparently moves towards the south. During this period, the monsoon trough over the northern plains becomes weaker. The south-west monsoon winds weaken and start withdrawing gradually. The monsoon withdraws from the northern plains by the beginning of October.
- The retreat of the monsoon is marked by clear skies and rise in temperature. While day temperatures are high, nights are cool and pleasant. Humidity is still present. High temperature and humidity, makes the weather quite uncomfortable during the day. This is commonly known as “October Heat”.
- The temperature begins to fall rapidly in northern India by the second half of October. The low-pressure conditions over northwestern India move to the Bay of Bengal by early November. This shift leads to cyclonic depressions over the Andaman Sea. These cyclones usually cross the eastern coasts of India and cause heavy and widespread rain. These cyclones may also arrive at the Coasts of Orissa, West Bengal and Bangladesh. These cyclones contribute to the bulk of the rainfall of the Coromandel Coast.

DISTRIBUTION OF RAINFALL

- The western coast and northeastern India receive over 400 cm of rainfall annually.
- The annual rainfall is less than 60 cm in western Rajasthan and adjoining parts of Gujarat, Haryana and Punjab. Rainfall is also low in the interior of the Deccan Plateau and east of the Sahyadris. The area around Leh also gets low rainfall.
- The rest of the country gets moderate rainfall. Snowfall is restricted to the Himalayan region.

MONSOON AS A UNIFYING BOND

Although there are wide variations in weather patterns across India, the monsoon brings some unifying influences on India. The Indian landscape, its flora and fauna, etc. are highly influenced by the monsoon.

The entire agricultural calendar in India is governed by the monsoon. Most of the festivals in India are related to agricultural cycle. These festivals may be known by different names in different parts of the country, but their celebration is decided by the monsoon. It is also said that the river valleys which carry the rainwater also unite as a single river valley unit. Due to these reasons, monsoon is often a great unifying factor in India.