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ICSE GEOGRAPHY

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ICSE GEOGRAPHY

Class 10

Chapter 6: India – The Climatic Conditions

FACTORS AFFECTING THE CLIMATE OF INDIA

The main elements of climate are temperature, atmospheric pressure, the direction and velocity of winds and precipitation. These elements are directly or indirectly controlled and influenced by a number of factors.
Some of them are as follows:

Latitudinal Extent

The latitudinal extent (from about 8° N to 37° N) is an important factor that influences the climatic conditions of this region. The southern half of India lies in the tropical belt close to the Equator, and is surrounded by water bodies. The northern half which is above the Tropic of Cancer lies in the temperate belt. This part is not only away from the Equator, but also away from the moderating influence of the water bodies. These two parts of India enjoy different climatic conditions due to their location and latitudinal extent.

Location of India in South Asia

Altitude of the Place

The temperature decreases with increase in height. For every 1000 metres of ascent, there is a drop of about 6 °C in temperature. Due to this reason, the places in the mountains are cooler than in the plains. The hill stations, such as Srinagar, Shimla, Mussoorie, Naini Tal, Darjeeling, etc. remain cold almost throughout the year. Thus, the towns and cities in the plains experience warm climate in comparison to hill stations.

The Himalaya Mountain Ranges

The Himalaya mountain ranges along with their eastern and western offshoots act as an effective climatic barrier. They protect India from the extremely cold winds that originate near the Arctic Circle and blow over Central Asia. During the summer season, the Himalaya mountain ranges check the moisture laden monsoon winds and help in bringing plenty of rainfall in India In the absence of Himalaya mountain ranges, the climate of India would have become hot and dry during the summer season and cold and dry during the winter season. Thus, the Himalaya mountain ranges have helped in developing a typical tropical monsoon type of climate in India.

Presence of Relief Features

The relief features of India affect the temperature, air pressure, direction and speed of wind and the amount and distribution of rainfall. The windward side of Western Ghats and Assam receive heavy rainfall during the summer months, whereas the southern plateaus remain dry or get less rainfall due to their leeward situation along the Western Ghats.

Influence of the Water Bodies

The places that are far away from water bodies experience continental climate, as they are far away from the moderating influence of the water bodies. Thus, such places experience hot summers and cold dry winters. The climate of the coastal areas is also modified by the influence of these water bodies. In contrast, the coastal areas enjoy almost the same type of climatic conditions throughout the year.

Prevailing Winds

The monsoon winds are the prevailing winds over the whole of IndiaThe southwest summer monsoons bring rainfall to the entire country. The northeast winter monsoons travel from land to sea and do not cause much rainfall except along the Coromandel Coast.

Upper Air Circulation

The jet stream in the upper air system influences the Indian climate. At a height of about 10 to 14 km above the subtropical high pressure belt, a different pattern of air circulation is observed. These winds blow from west to east, north of the Himalaya mountains and roughly parallel to the Tibetan Plateau. These are called Jet Streams.

1. The westerly jet stream is responsible for developing Western Disturbances in the northwest India. These disturbances bring rainfall in the winter seasons.
2. The easterly jet stream blowing over northern India is responsible for developing tropical cyclones over India and Bangladesh. These depressions caused by the upper air circulation have a great impact on the climatic conditions of India.

Tropical Cyclones and Western Disturbances

Most of the cyclones originate in the Bay of Bengal, which influence the Southwest Monsoon season. Some cyclones originate during the northeast retreating monsoon and they influence the climate along the eastern coast of India. The Western Disturbances influence the winter weather conditions in the northwestern parts of India.

El-Nino Effect

El-Nino is a narrow warm current, which temporarily replaces the cold Peru current and causes floods and droughts in the tropical regions. The warming of water in the Pacific Ocean affects the monsoon winds in the Indian Ocean.

La-Nina Effect

La-Nina usually follows a strong El-Nino. Sometimes the Trade Winds become so strong that they cause accumulation of cold water in the central and eastern parts of Pacific Ocean. This event is called La-Nina. Its influence is just opposite of El-Nino. In India, this can cause very heavy monsoon showers.

THE MECHANISM OF MONSOONS

The term monsoon has been derived from the Arabic word ‘mausim’ or from the Malayalam word ‘monsin’ meaning season. The monsoons are seasonal winds that change their direction of flow with the change of season.

The monsoon winds are characterised by a complete reversal in the direction of the prevailing winds between January and July over the Indian Subcontinent.

HALLEY'S THEORY

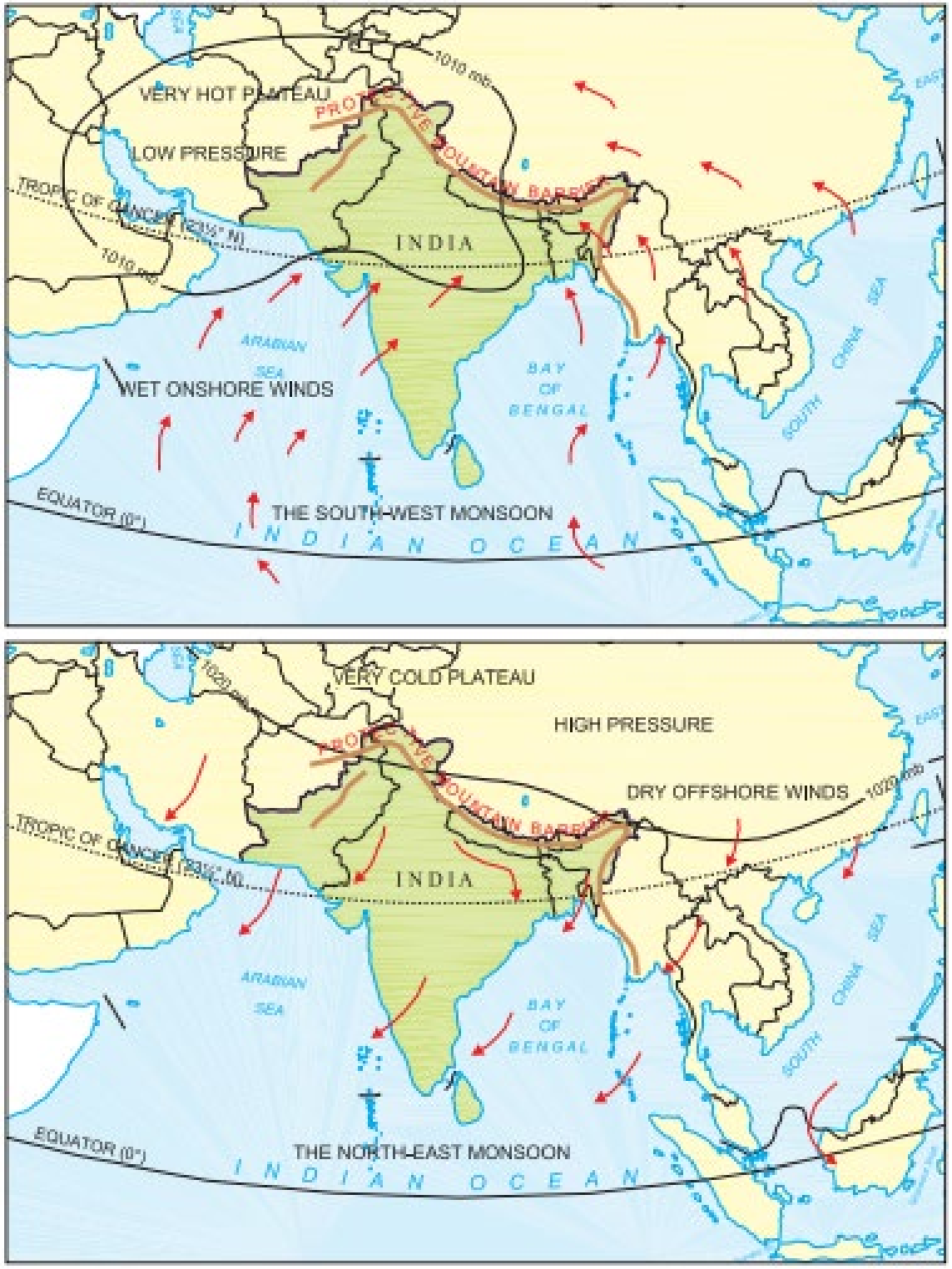
In AD 1686 Halley, an Englishman, was of the view that the monsoons are caused by the differential heating of the land and sea. It causes contrast in the atmospheric pressure, which develops a wind that blows from the sea to the land. He conceived the concept of the summer and winter monsoons. This concept dominated the scene for about three centuries.

- The monsoons do not develop equally everywhere and Halley's thermal concept fails to explain the intricacies of the monsoon.
- Besides differential heating, the origin and development of the monsoon is also influenced by the shape of the continent, relief features and the conditions of air circulation in the upper Troposphere.

Nowadays, the modern theories based on air masses and jet stream are becoming more relevant.

The Air Mass Theory

The Southeast Trade Winds in the Southern Hemisphere and the Northeast Trade Winds in the Northern Hemisphere meet each other near the Equator. The meeting place is called the Inter Tropical Convergence Zone (ITCZ). This is the region of ascending air, maximum clouds and heavy rainfall.



Monsoon system over South Asia

Southwest Monsoons

The Southeast Trade Winds cross the equator and blow in the southwest to northeast direction under the influence of the Coriolis force. These displaced Trade Winds are called the Southwest Monsoons.

THE JET STREAM THEORY

It is the latest theory about the 83 origin and development of the monsoons. The jet stream is a band of fast moving air at a height of about 10 to 14 km in the subtropical zone. The wind speed in a westerly jet stream is about 150 to 300 km per hour and it can reach up to 400 km per hour

The westerly jet stream: The westerly jet stream is bifurcated by the Himalayas in the northern and southern branches. The northern branch blows along the northern edge of the Himalayas. The southern branch blows eastwards along the southern slopes of the Himalayas and influences the winter weather conditions in India. Winter rains and heavy snowfall in hilly regions are caused by Western Disturbances. This is followed by very cold weather in the Northern Plains of India.

The easterly jet streams: The easterly jet streams are due to the reversal in the upper air circulation, caused by the northward shift of the Sun in the summer season. It is mainly caused by the heating of the Tibet Plateau. This leads to the development of easterly cold jet stream over Peninsular India. The easterly jet stream helps in the sudden onset of the southwest monsoons.

CYCLE OF SEASONS

The climatic conditions prevailing in India can best be described in terms of an annual cycle of seasons, which has the following four distinct seasons.

1. The Summer Season – March to May
2. The Monsoon Season – June to September
3. The Retreating Monsoon Season – October to November
4. The Winter Season – December to February

THE SUMMER SEASON

Usually the hot weather season begins in March and continues till June. The chief characteristics of the hot weather season are high temperature and low humidity. Sometimes the summer season is also referred to as the pre monsoon period.

Temperature Conditions

The temperature starts rising by the middle of March and by mid-May the mercury may touch 41 to 44 °C. The maximum summer temperature is comparatively lower in the southern parts of India, which is due to the moderating effect of the Arabian Sea and the Bay of Bengal. The temperature along the west coast is lower than that prevailing on the east coast, which is due to the Westerly winds. The northern and central parts of India experience heat waves at this time.

Pressure, Winds and Precipitation

In the heart of this low pressure trough in the northwest, dry and hot winds blow in the afternoon and sometimes these winds may continue up to midnight. The hot and dry winds are locally known as loo.

Norwesters: In the eastern and northeastern parts of India, violent storms, at a speed of about 60 to 80 km per hour, are experienced. Their direction is mainly from the northwest and are thus called the Norwesters.

The hail storms are accompanied by heavy showers. They cause damage to standing crops, trees, buildings, livestock and even lead to loss of human lives. The Norwesters occur in the month of Baisakh, and thus are locally known as Kalbaisakhi in Bengal and Bardoichila in Assam.

Mango showers: Towards the close of the summer season thunderstorms occur in Kerala and the adjoining parts of Karnataka and Tamil Nadu, particularly during evenings and nights. These are the pre-monsoon showers, which are locally known as the 'mango showers'.

Cherry blossoms: The pre-monsoon showers in South India are called cherry blossoms, due to their beneficial role in coffee plantations.

THE MONSOON SEASON

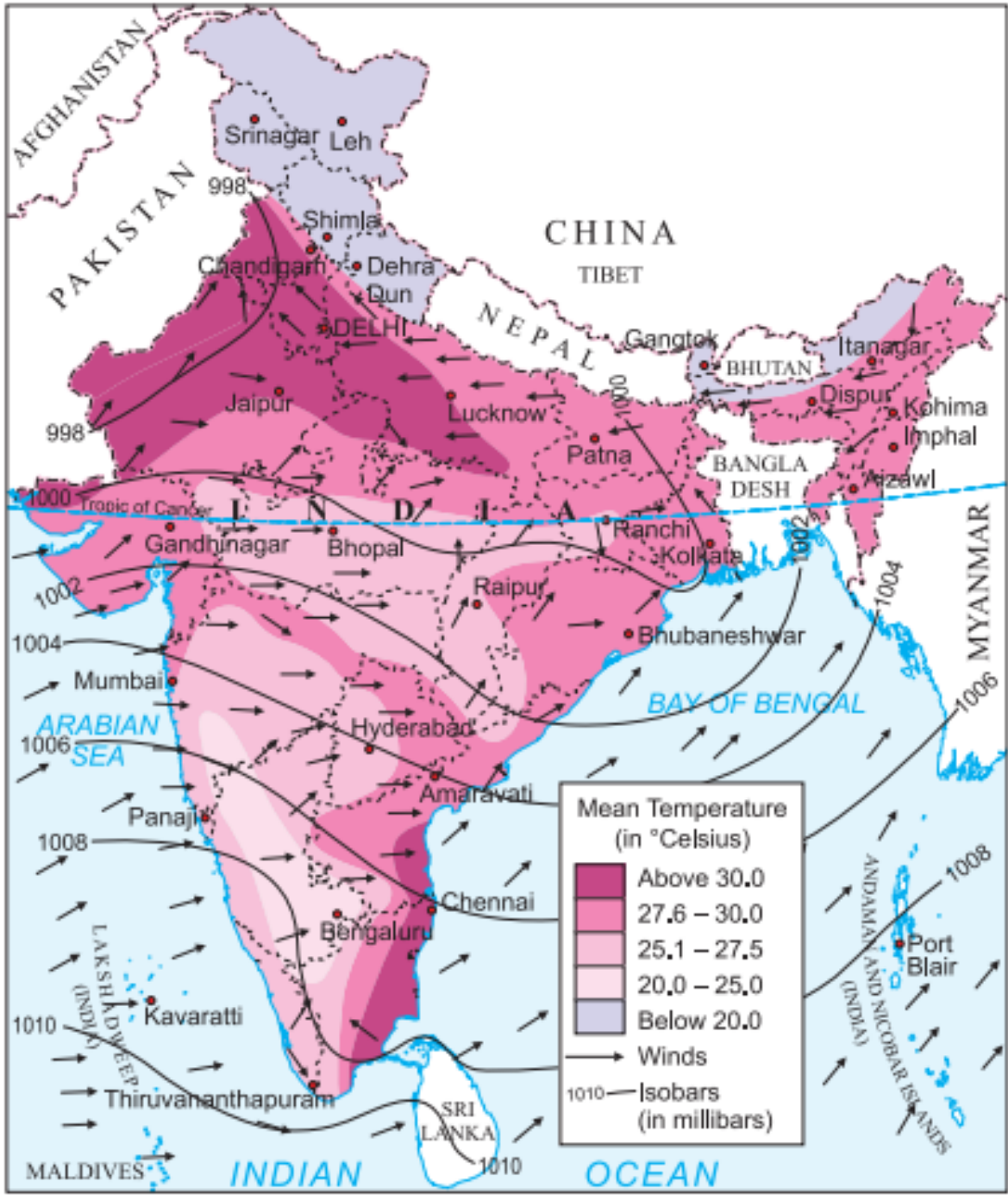
The Southwest Monsoon season in India starts with the onset of the Southwest Monsoon winds in June and continues till the middle of September. This is called the rainy season.

Temperature Conditions

There is a significant drop in temperature. The day temperature registers a decline of 5 to 8 °C, between mid-June and mid-July. After this, it remains almost constant throughout the rainy season. The night temperature is more uniform than the day temperature. The highest temperature is experienced in the Thar Desert. Places west of the Aravalis may have temperature higher than 40 °C. Along the Western Ghats, the windward side has lower temperature than the leeward side.

Pressure, Winds and Precipitation

The low pressure conditions over the northwestern part of the Northern Plains get intensified further..



India – Climatic conditions (July)

These become powerful enough to attract the Trade Winds of the Southern Hemisphere, which are of oceanic origin.

The Southwest Monsoon winds, as they blow from the Indian Ocean, are moisture laden. India receives bulk of its rainfall during the Southwest Monsoon season. The normal date of the onset in the Andaman and Nicobar Islands is 20 May, while in Kerala it is 1 June every year. The Southwest Monsoon winds are rain-bearing strong winds and cause thunder, lightning and heavy downpour. This sudden onset of monsoons is known as the burst of the monsoons.

The progress of the monsoon winds beyond Kerala is in the form of two branches – the Arabian Sea branch and the Bay of Bengal branch.

India – Seasonal rainfall (June – September)

The Arabian Sea branch of the Southwest Monsoon winds is obstructed by the Western Ghats.

The windward side of the Sahyadris receives very heavy rain. The leeward side gets lesser rain. Mumbai on the west coast records about 200 cm of rain, while Pune on the leeward side receives only 50 cm rainfall during this season.

In Punjab, Haryana and other northwestern parts, the Arabian Sea branch of the Southwest Monsoons joins the Bay of Bengal branch. These two branches together cause rains in the Western Himalayan region. The Bay of Bengal branch of the Southwest Monsoon Winds is directed towards the coast of Myanmar and parts of southeast Bangladesh. The Arakan Hills along the coast of Myanmar deflect these winds towards India and Bangladesh.

India – Dates of the onset of Monsoon

During the months of July and August, there is a tendency to have spells of dry weather. It is called a break in the monsoons. The rainy season comes to an end by the middle of September in the major parts of India. The heavy rains from the monsoon winds can cause devastating floods responsible for damage to life and property in the Northern Plains of India.
The monsoon winds are known for their vagaries and uncertainties. The dry and wet spells cause heavy floods in one part and may be responsible for droughts in the other. The monsoon winds are often found to be irregular in their arrival as well as retreat, thus disturbing the farming schedule of the millions of farmers in India.

THE RETREATING MONSOON SEASON

The Southwest Monsoons begin to retreat from the northwestern part of India by the middle of September and continue up to November. During this period, the low pressure belt is gradually replaced by high pressure, which results in the retreating of monsoons.
The average temperature in most parts of India varies from 25 °C to 30 °C. The months of October and November are a period of transition from the hot rainy season to the dry winter conditions. Due to high temperature and humidity, the weather becomes oppressive and is commonly known as the ‘October Heat’

Pressure, Winds and Precipitation

The low pressure conditions that once prevailed over the northwestern parts of India, shift to the Bay of Bengal by late October or early November. This season is marked by devastating tropical cyclones that originate in the Bay of Bengal. The areas most affected by these cyclones include the coastal belt of Tamil Nadu, Andhra Pradesh and Bangladesh.

The retreating Northeast Monsoons blow from land to sea. These winds pick up moisture while crossing the Bay of Bengal and cause widespread rains in Tamil Nadu, south Andhra Pradesh, southeast Karnataka and southeast Kerala.

India – Dates of the Withdrawal of Monsoon

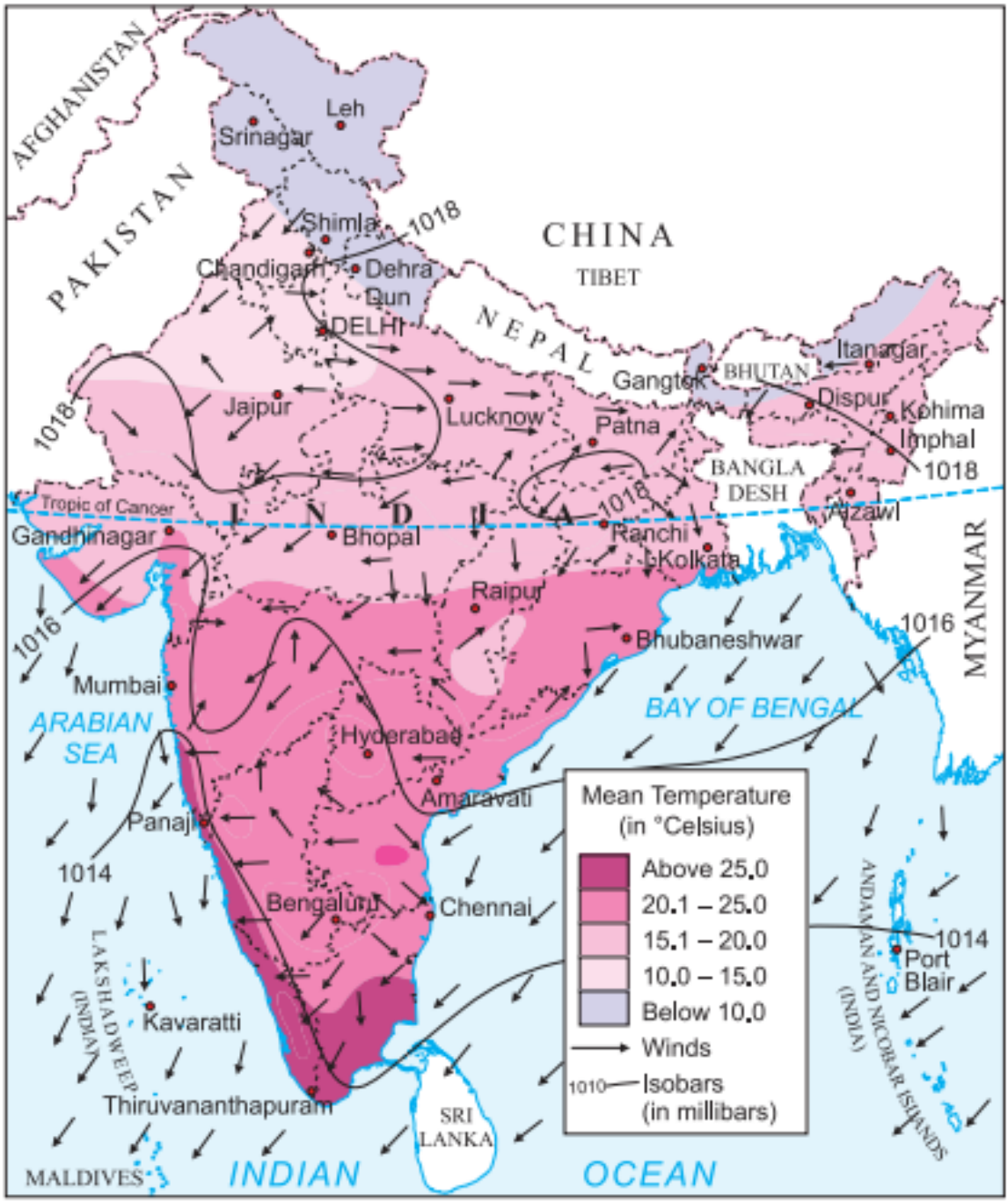
THE WINTER SEASON

Temperature Conditions

The temperature remains quite low during the winter months. January and February are the coldest months. The days are warm and nights are cold. Slight frost is experienced at places in the hills. The mean daily temperature is below 20 °C over most parts of northern India. The southern part of India has rather warmer conditions and does not experience a well-defined winter season. The coastal areas have moderate temperature almost throughout the year. In general, the temperature goes on decreasing from south to north.

Pressure, Winds and Precipitation

The high air pressure over large parts of India is due to the low temperature conditions.



India – Climatic conditions (January)

The wind starts blowing from the high pressure area of the northwest to the low pressure area of the southeast. The velocity of the wind is low due to low pressure gradient. During this season, the Northeast Trade Winds prevail over a major part of India. These winds blow from land to sea and hence, the season is dry.

Western Disturbances

The fine weather conditions during the winter season are disturbed by the inflow of depressions from the west and the northwest. These low pressure disturbances are also called the Western Disturbances.

The jet stream plays an important role in bringing these disturbances to the subcontinent. The Western Disturbances cause light rain in the Northern Plains and snowfall in the Northern Mountains. The Western Disturbances are generally active between December and February. After the passage of the Western Disturbances, widespread fog and cold waves are experienced. They lower the minimum temperature by 5 to 10 °C below the normal. During this period, haze is common in the morning and the evening

DISTRIBUTION OF ANNUAL RAINFALL

- The highest rainfall (more than 200 cm) occurs along the Western Coastal plain, the western slopes of the Western Ghats, the southern slopes of the Eastern Himalayas, the sub-Himalayan areas in the northeast, the hills of Meghalaya.
- Meghalaya is the wettest part of India with Mawsynram and Cherrapunji getting about 1220 cm and 1100 cm of average annual rainfall respectively.

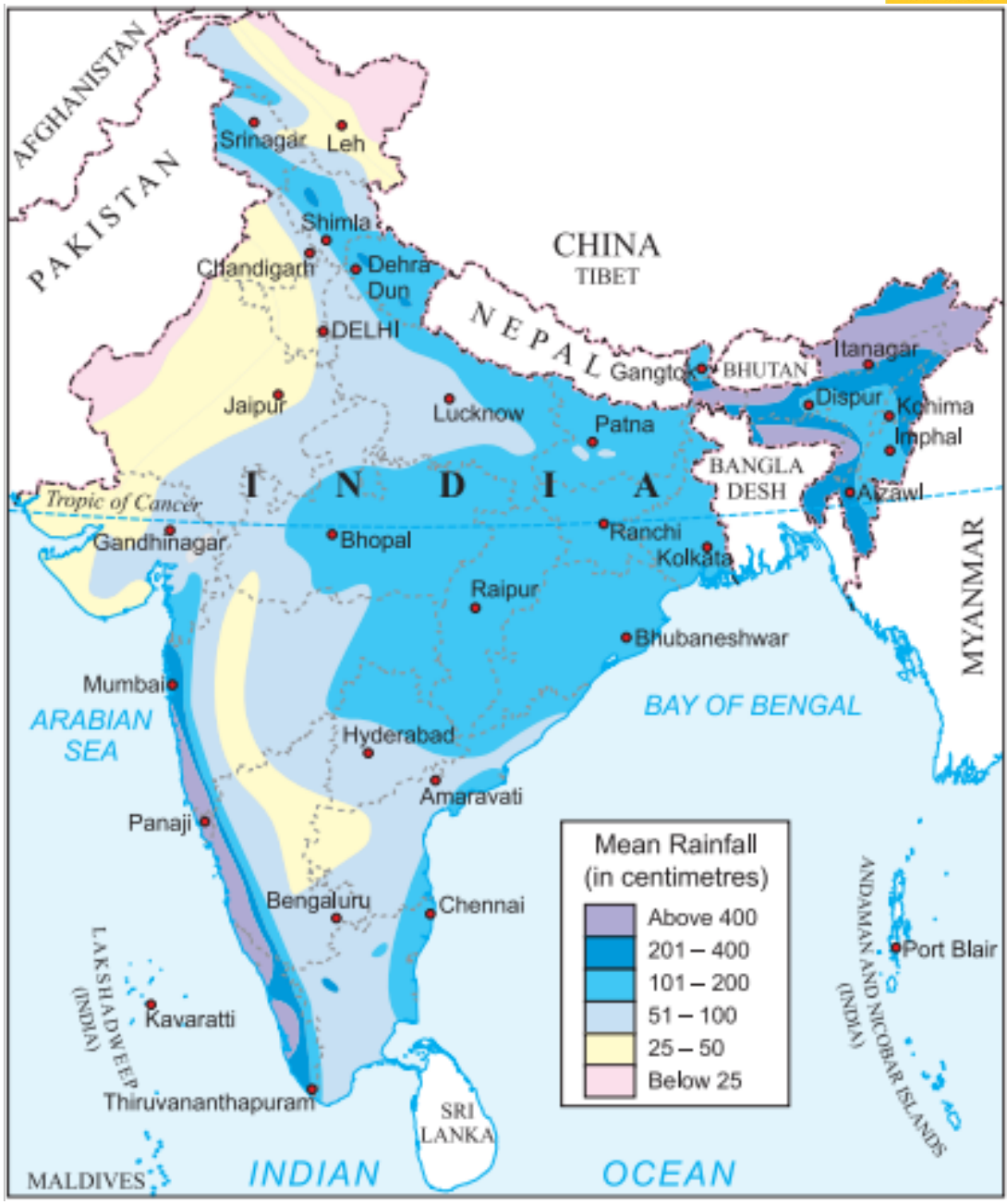
- The eastern slopes of the Western Ghats, northern and middle Ganga valley, northeastern part, coastal areas of Andhra Pradesh and Tamil Nadu also get heavy rainfall (100 – 200 cm).
- The Upper Ganga valley, eastern Rajasthan, Punjab, Haryana, Kashmir and large parts of Gujarat, Maharashtra, western Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu receive less rainfall (50 – 100 cm).
- The rain-shadow areas in the Deccan Plateau, Ladakh, southern Punjab, western Rajasthan and Kachchh, receive very low rainfall (less than 50 cm).

CHARACTERISTICS OF RAINFALL IN INDIA

The occurrence and the distribution of rainfall in India have the following characteristics:

- The extremes of humidity and rainfall are experienced almost everywhere.
- About 75 per cent of the total annual rainfall is due to the Southwest Monsoon winds during the period from June to September.
- The rainfall from the monsoon winds is highly variable and quite unreliable.
- The monsoon winds may reach India much before their due date or may be considerably delayed.
- The total amount of rainfall is either more than normal or much less than the normal.
- Some parts of the country always face either the danger of floods due to excessive rainfall or drought and famine conditions due to scanty rainfall.

- The variability of rainfall in amount, time and space creates unstable conditions for agriculture, which hampers the economy.
- The rainfall occurs for a few months in the year, i.e., from June to September (the season of the Southwest Monsoons).
- The rainfall is basically torrential in nature. Even in the rainy season of about four months, the actual rainy days are 40 to 45 only.
- The heavy downpour occurs from cyclones, which originate in the Arabian Sea and the Bay of Bengal. These result in floods and excessive soil erosion.
- The distribution of rainfall is largely controlled by the relief features.
- The economy and the lifestyle of the people depend largely on the amount and distribution of rainfall, as the whole country is predominantly agrarian.



India – Average annual rainfall

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