

CUET · GEOGRAPHY · CLASS XI · CODE 313

Climate

CUET unit: Distribution of Oceans and Continents

By UniDrill · NCERT-grounded study material

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Snapshot

- India's climate is monsoon-dominated, showing unity amid regional diversity across four meteorological seasons — all heavily tested in CUET Geography.
- Six key factors control India's climate (latitude, altitude, pressure/winds, distance from sea, ocean currents, relief), each shaping temperature and rainfall patterns.
- The mechanism of the Indian monsoon — onset, break, burst, withdrawal — and the role of ITCZ, jet streams and El-Nino are central CUET-tested concepts from this chapter.
- Spatial distribution of rainfall (high, medium, low, inadequate zones) along with the two branches of the southwest monsoon (Arabian Sea and Bay of Bengal) are recurring map-based and factual MCQ sources.
- Global warming implications and India's traditional six-season calendar round out the topic, providing additional factual MCQ material.

Detailed Notes

2.1 Core concepts

- **Weather vs. Climate:** Weather is the momentary state of the atmosphere; climate refers to the average weather conditions over a longer period (may be noted after 50 years or more). Climate changes imperceptibly, weather changes within a day or week. (NCERT §Unity and Diversity in the Monsoon Climate, p. 28)
- **Monsoon connotes** the climate associated with seasonal reversal in the direction of winds. India has a hot monsoonal climate, which is the prevalent climate of south and southeast Asia. (NCERT §Unity and Diversity, p. 28)
- **Unity in diversity:** Despite regional variation, India's climate is monsoonal in rhythm and character. Regional diversities are described as sub-types of monsoon climate — variations in temperature (Leh: -45°C in winter; Rajasthan: $+55^{\circ}\text{C}$ in summer) and rainfall (Jaisalmer: <9 cm/year; Cherrapunji/Mawsynram: $>1,080$ cm/year). (NCERT §Unity and Diversity, p. 28–29)
- **Factors determining India's climate:**
 - **Latitude:** Tropic of Cancer passes through central India; northern part lies in sub-tropical and temperate zone; southern part in tropical zone — leading to different

temperature and annual range regimes. (NCERT §Factors Determining the Climate of India, p. 29)

- **Altitude:** Temperature decreases with height; places on same latitude differ greatly — Agra (January: 16°C) vs. Darjiling (January: 4°C). (NCERT §Factors, p. 29)
- **Himalayan Mountains:** The Himalayas act as a climatic divide — blocking cold Arctic winds from entering India and trapping monsoon winds, forcing precipitation within the subcontinent. (NCERT §Factors, p. 29)
- **Distribution of Land and Water:** India is flanked by the Indian Ocean on three sides. Differential heating of land and sea creates different air pressure zones, causing seasonal reversal of winds (monsoon). (NCERT §Factors, p. 29)
- **Distance from the Sea:** Coastal areas (Mumbai, Konkan) have equable climate; interior areas (Delhi, Kanpur, Amritsar) have extremes of temperature and high seasonal contrast. (NCERT §Factors, p. 29)
- **Relief:** Windward sides (Western Ghats, Assam) receive high rainfall; leeward/southern plateau remains dry. Relief also affects air pressure, wind direction/speed, and rainfall distribution. (NCERT §Factors, p. 29–30)
- **Inter Tropical Convergence Zone (ITCZ):** A low-pressure zone at the equator where trade winds converge and air ascends. In July it shifts to 20°–25°N (over the Gangetic plain), called the monsoon trough. The shift of ITCZ causes trade winds of the Southern Hemisphere to cross the equator between 40°E–60°E and blow southwest-to-northeast due to the Coriolis force — becoming the southwest monsoon. In winter, ITCZ moves southward, causing northeast monsoons. (NCERT §ITCZ box, p. 30)
- **Onset of the Monsoon:** Differential heating of land and sea in April–May creates an intense low pressure over northwest India. The Indian Ocean (high pressure) attracts southeast trades across the Equator; these winds become the southwest monsoon. Southwest monsoon sets in over Kerala coast by 1st June, reaches Mumbai and Kolkata between 10th–13th June, and engulfs the entire subcontinent by mid-July. (NCERT §Onset of the Monsoon, p. 30–31)
- **Easterly jet stream** (along 15°N) is held responsible for the burst of the monsoon in India; it sets in only after the westerly jet stream withdraws from the north Indian plain. (NCERT §Onset of the Monsoon, p. 31)
- **Break in the Monsoon:** During the southwest monsoon, if rains fail for one or more weeks, it is called a "break." In north India, breaks occur when rain-bearing storms are not frequent along the monsoon trough/ITCZ; on the west coast, breaks occur when winds blow parallel to the coast. (NCERT §Break in the Monsoon, p. 31)
- **El-Nino:** A complex weather system appearing every 3–7 years; an extension of the warm equatorial current replacing the cold Peruvian/Humboldt current, raising Peruvian coastal sea temperature by 10°C. El-Nino means "Child Christ" (appears around Christmas in December, which is summer in Peru). In 1990–91, a wild El-Nino

event delayed southwest monsoon onset by 5–12 days. El-Nino is used in India for forecasting long-range monsoon rainfall. (NCERT §El-Nino box, p. 31)

- **The Rhythm of Seasons — four meteorological seasons:** 1. Cold weather season (mid-November to February) 2. Hot weather season (March to May) 3. Southwest monsoon season (June to September) 4. Retreating monsoon season (October–November) (NCERT §The Rhythm of Seasons, p. 31)
- **Cold Weather Season:** December–January are coldest months; mean daily temperature below 21°C over most of north India. High pressure over northern plains; low pressure slightly higher in south India. Isobars of 1019 mb and 1013 mb pass through northwest India and far south respectively. Westerly winds blow from northwest to southeast; they become northerly in the Ganga-Brahmaputra delta. Shallow cyclonic depressions from the Mediterranean Sea bring winter rainfall (western disturbances) to northwest India — beneficial for rabi crops. Average winter rainfall in Delhi: ~53 mm; Punjab ~25 mm, Bihar ~18 mm. (NCERT §Cold Weather Season, p. 31–33)
- **Hot Weather Season:** Sun moves northward; temperatures rise from March. April–May–June are hottest months in north India. Highest day temperature (~38°C) occurs in the Deccan Plateau in March; temperatures of 38°–43°C are found in Gujarat and MP in April; northwest India reaches ~48°C in May. South India has mild summer (26°–32°C) due to moderating influence of oceans. 'Loo' — hot, dry, oppressing winds — blow in the northern plains from Punjab to Bihar (highest intensity between Delhi and Patna). Dust storms are common in May in Punjab, Haryana, eastern Rajasthan and UP. ITCZ moves northward to 25°N in July during this season. (NCERT §Hot Weather Season, p. 34)
- **Local storms of the hot weather season:** (i) Mango Shower — pre-monsoon showers in Kerala and coastal Karnataka; (ii) Blossom Shower — coffee flowers blossom in Kerala; (iii) Nor' Westers / Kalbaisakhi — dreaded evening thunderstorms in Bengal and Assam; (iv) Loo — hot dry oppressive winds in northern plains Punjab to Bihar. (NCERT §Some Famous Local Storms box, p. 35)
- **Southwest Monsoon Season:** By early June, low pressure over NW India attracts SE trade winds; these cross the equator, pass over equatorial warm currents, gain moisture, and blow southwesterly — hence "southwest monsoons." The rain onset is sudden ("burst") with thunder and lightning. Day temperature drops 5°–8°C between mid-June and mid-July. The monsoon approaches in two branches: **(i) Arabian Sea branch** and **(ii) Bay of Bengal branch**. (NCERT §Southwest Monsoon Season, p. 35)
- **Arabian Sea branch** splits into three: (a) branch obstructed by Western Ghats — windward side (Sahyadris/Western Coastal Plain) gets 250–400 cm; eastern (leeward/rain-shadow) gets little rainfall; (b) branch strikes coast north of Mumbai, moves along Narmada–Tapi valleys, causing widespread rainfall in central India; Chotanagpur plateau gets 15 cm from this branch; (c) branch strikes Saurashtra Peninsula and Kachchh, moves through Rajasthan along Aravallis giving scanty

- rainfall, then joins Bay of Bengal branch — both cause rains in western Himalayas. (NCERT §Monsoon Winds of the Arabian Sea, p. 35–37)
- **Bay of Bengal branch** strikes Myanmar and southeast Bangladesh coast; Arakan Hills deflect a large portion towards India; monsoon enters West Bengal and Bangladesh from south/southeast. Splits into two under Himalayan influence: one branch moves westward along Ganga plains to Punjab plains; the other moves up Brahmaputra valley causing rains in north and northeast. Sub-branch strikes Garo and Khasi hills — **Mawsynram** (on crest of Khasi hills) receives the highest average annual rainfall in the world. Tamil Nadu coast remains dry during this season because: (i) it lies parallel to the Bay of Bengal branch; (ii) it lies in the rain-shadow of the Arabian Sea branch. (NCERT §Monsoon Winds of the Bay of Bengal, p. 37)
 - **Retreating Monsoon Season (October–November):** Southwest monsoon weakens by end of September; retreats from western Rajasthan by first week of September; withdraws from Rajasthan, Gujarat, Western Ganga plain and Central Highlands by end of September; by beginning of October, low pressure covers northern Bay of Bengal; by early November moves over Karnataka and Tamil Nadu; by mid-December, low pressure is completely removed from Peninsula. Retreating season is marked by clear skies and rise in temperature — "October heat." October and November are the rainiest months of the year on the eastern Peninsula. Tropical cyclones originate over Andaman Sea and cross the eastern coast — preferred targets are Godavari, Krishna and Kaveri deltas. (NCERT §Season of Retreating Monsoon, p. 37)
 - **Distribution of Rainfall:** Average annual rainfall in India is about 125 cm with great spatial variation. High rainfall (>200 cm): west coast, Western Ghats, sub-Himalayan northeast, Meghalaya hills (Khasi–Jaintia: >1,000 cm). Medium rainfall (100–200 cm): southern Peninsula parts, east Tamil Nadu, northeastern Peninsula, Odisha, Jharkhand, Bihar, eastern MP, northern Ganga plain, sub-Himalayas, Cachar Valley, Manipur. Low rainfall (50–100 cm): western UP, Delhi, Haryana, Punjab, J&K, eastern Rajasthan, Gujarat, eastern Deccan Plateau. Inadequate rainfall (<50 cm): parts of Peninsula (AP, Karnataka, Maharashtra), Ladakh, most of western Rajasthan. Snowfall restricted to Himalayan region. (NCERT §Distribution of Rainfall, p. 38)
 - **Monsoons and Economic Life:** Monsoon is the axis of India's agricultural cycle; ~64% of India's population depends on agriculture based on southwest monsoon. Regional climatic variation helps grow varied crops. Rainfall variability causes droughts or floods every year. Winter rainfall by temperate cyclones in north India is highly beneficial for rabi crops. (NCERT §Monsoons and the Economic Life in India, p. 38)
 - **Global Warming:** Mean annual surface temperature of Earth has increased in past 150 years. By 2100, global temperature projected to increase by ~2°C. Sea level predicted to rise 48 cm by end of 21st century. Causes: CO₂ from fossil fuels; greenhouse gases (methane, CFCs, nitrous oxide). Effects: melting polar ice caps/

glaciers, increased flooding, shift in agricultural patterns, insect-borne diseases, ecosystem changes. (NCERT §Global Warming, p. 38–40)

- **Traditional Indian Seasons:** Indian tradition divides year into six two-monthly seasons: Vasanta (March–April), Grishma (May–June), Varsha (July–August), Sharada (September–October), Hemanta (November–December), Shishira (January–February). This system does not match south India's seasonal pattern well. (NCERT §Traditional Indian Seasons, p. 37–38)

2.2 Definitions to memorise

Term	Definition	Page
Weather	Momentary state of the atmosphere	28
Climate	Average of weather conditions over a longer period of time (50 years or more)	28
Monsoon	Climate associated with seasonal reversal in the direction of winds	28
ITCZ (Inter Tropical Convergence Zone)	Low pressure zone at equator where trade winds converge and air ascends; shifts to 20°–25°N in July over Gangetic plain	30
Monsoon Trough	The northward-shifted ITCZ (around 20°–25°N in July) over the Gangetic plain	30
Break in the Monsoon	Period during SW monsoon when rains fail for one or more weeks	31
El-Nino	Warm equatorial current replacing cold Peruvian/Humboldt current; appears every 3–7 years; raises sea temperature off Peru by 10°C	31
Loo	Hot, dry and oppressive winds blowing in northern plains from Punjab to Bihar; highest intensity between Delhi and Patna	35
Kalbaisakhi / Nor' Westers	Dreaded evening thunderstorms in Bengal and Assam during hot weather season	35
Mango Shower	Pre-monsoon showers in Kerala and coastal Karnataka that help early ripening of mangoes	35
Rain-shadow area	Region east of Western Ghats where moisture-depleted winds descend after crossing the Ghats, causing little rainfall	35
October Heat	Oppressive weather during retreating monsoon season caused by high temperature and humidity when sky clears	37
Western Disturbances	Shallow cyclonic depressions originating over Mediterranean Sea, bringing winter rainfall to northwestern India	33
Southern Oscillation	Difference in pressure between Tahiti (~20°S, 140°W) and Port Darwin (12°30'S, 131°E) used to measure intensity of southwest monsoon winds	33

2.3 Diagrams / processes to remember

- **Figure 4.1 — Onset of Monsoon** (p. 30): Shows the mechanism of monsoon onset — intense low pressure over NW India attracting SE trades across the Equator, becoming SW monsoon. Understand the role of ITCZ and Coriolis force.
- **Figure 4.2 — Normal Dates of Onset of Southwest Monsoon** (p. 32): Map showing isochrones — Kerala: 1st June; Mumbai: 10th June; Kolkata: 10–13th June; Delhi: 15th June; entire subcontinent: mid-July. Students must know these dates and the pattern of progression.
- **Figure 4.3 — India: Seasonal Rainfall (June–September)** (p. 36): Choropleth map showing rainfall zones from above 400 cm (northeast, Western Ghats) to 0–20 cm (Rajasthan, Ladakh). Note the rain-shadow east of Western Ghats and dry northwest.
- **Figure 4.4 — India: Annual Rainfall** (p. 39): Four zones — more than 200 cm, 100–200 cm, 50–100 cm, less than 50 cm. The northeast and Western Ghats get >200 cm; northwest Rajasthan/Ladakh gets <50 cm.
- **Arabian Sea vs. Bay of Bengal branches** (p. 35–37): Conceptual diagram of two branches of SW monsoon — Arabian Sea branch giving heavy rain to west coast/central India; Bay of Bengal branch giving rain to northeast/Ganga plains; Tamil Nadu coast remains dry.

2.4 Common confusions / NTA trap points

- **Mawsynram vs. Cherrapunji:** Both are in Khasi hills, Meghalaya; Mawsynram (on the crest) receives the highest average annual rainfall in the world. Cherrapunji also receives high rainfall (over 1,080 cm/year). NTA may ask which has the highest average annual rainfall — answer is Mawsynram. Do not confuse with "highest ever recorded in a year."
- **Tamil Nadu's winter vs. summer rainfall:** Tamil Nadu coast gets rainfall in the beginning of the winter season (from northeast monsoon picking up moisture over Bay of Bengal in October–November), NOT from the southwest monsoon. Students often wrongly attribute Tamil Nadu's rain to the southwest monsoon.
- **El-Nino meaning:** El-Nino means "Child Christ" because it appears around Christmas in December — but December is a summer month in Peru (Southern Hemisphere). NTA often tests this exact detail.
- **Easterly jet stream vs. Westerly jet stream:** The westerly jet stream keeps north India cold in winter; the easterly jet stream (along 15°N) is responsible for the burst of monsoon. Students confuse the two. The easterly sets in only after the westerly withdraws.
- **Break vs. Withdrawal of monsoon:** A "break" is a temporary dry spell during the monsoon season (SW monsoon is still present). "Withdrawal/retreat" is the permanent receding of the monsoon starting from western Rajasthan in early September. These are different phenomena.



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Practice MCQs

PYQ Alignment

This chapter is one of the most consistently tested chapters in CUET Geography, appearing in virtually every year with questions on monsoon mechanism (onset, break, burst), factors controlling India's climate, local storms, seasonal rainfall distribution, and El-Nino. NTA favours assertion-reason and statement-based questions on the ITCZ, el-Nino, and the four seasons, as well as direct factual questions on Mawsynram, the dates of monsoon onset, and the rain-shadow effect east of the Western Ghats.



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