Weather and Climate

Weather is the momentary state of the atmosphere while climate refers to the average of the weather conditions over a longer period of time. Weather changes quickly, may be within a day or week but climate changes are imperceptive and may be noted after 50 years or even more.

Elements of weather are: Temperature, Pressure, Wind direction and velocity, Humidity and Precipitation, etc.

FACTORS DETERMINING THE CLIMATE OF INDIA:

India's climate is controlled by a number of factors which can be broadly divided into two groups:-

1. Factors related to location and relief
2. Factors related to air pressure and winds

Factors related to Location and Relief

1. Latitude
2. Himalayan mountains
3. Distribution of land and water
4. Distance from the sea
5. Altitude
6. Relief

Factors Related to Air Pressure and Wind

To understand the differences in local climates of India, we need to understand the mechanism of the following three factors:

1. Distribution of air pressure and winds on the surface of the earth.
2. Upper air circulation caused by factors controlling global weather and the inflow of different air masses and jet streams.
3. Inflow of western cyclones generally known as disturbances during the winter season and tropical depressions during the south-west monsoon period into India, creating weather conditions favorable to rainfall.

Mechanism of Weather in the Winter Season

- **Surface Pressure and Winds**
  In winter months, the weather conditions over India are generally influenced by the distribution of pressure in Central and Western Asia. Main factors are:-
  - A high pressure centre in the region lying to the north of the Himalayas: The surface winds blowing out of the high pressure centre over Central Asia reach India in the form of a dry continental air mass.
- **Jet Stream and Upper Air Circulation**
  - Bifurcation of Sub Tropical Westerly Jet Stream by highlands of Tibet and Himalayas and its effect thereafter.
- **Western Cyclonic Disturbance and Tropical Cyclones**
  - The western cyclonic disturbances which enter the Indian subcontinent from the west and the northwest during the winter months, originate over the Mediterranean Sea. Directions of Winds

in India in winter at the height of 9-13 km are brought into India by the westerly jet stream. An increase in the prevailing night temperature generally indicates an advance in the arrival of these cyclones disturbances.

- Tropical cyclones originate over the Bay of Bengal and the Indian Ocean. These tropical cyclones have very high wind velocity and heavy rainfall and hit the Tamil Nadu, Andhra Pradesh and Orissa coast.
- Most of these cyclones are very destructive due to high wind velocity and torrential rain that accompanies it.

Mechanism of Weather in the Summer Season

- **Surface Pressure and Winds**
  - Shifting of ITCZ (Inter Tropical Convergence Zone) towards northwards, roughly parallel to the Himalayas between 20° N and 25° N.
  - Westerly jet stream withdraws from the Indian region

- **Jet Streams and Upper Air Circulation**
  - An easterly jet stream flows over the southern part of the Peninsula in June
  - Southern branch of Sub Tropical Westerly Jet Stream disappear

- **Easterly Jet Stream and Tropical Cyclones**
  - The easterly jet stream steers the tropical depressions into India. These depressions play a significant role in the distribution of monsoon rainfall over the Indian subcontinent.
  - The tracks of these depressions are the areas of highest rainfall in India.
  - The frequency at which these depressions visit India, their direction and intensity, all go a long way in determining the rainfall pattern during the southwest monsoon period.

MONSOON SEASON

- **Causes and salient feature of Monsoon:**
  - Shift of ITCZ
  - Onset or burst of Monsoon and its relation to the shift of southern branch of STWJS to the north of Himalayas and Tibet
  - Role of Tibetan plateau
  - Role of Jet Steams
  - Tele-connections: El-Nino and La-Nina, Southern Oscillation (ENSO)
  - Two branches of South West Monsoon
  - Progress and withdrawal of the Monsoon
  - North-East Monsoon and rain in Tamil Nadu
  - Spatial and temporal variation in rainfall