

Air Masses & Classification of Air Masses - Comprehensive Notes

1. Introduction to Air Masses

An air mass is a large body of air having relatively uniform temperature and humidity characteristics over a horizontal extent. Air masses form over source regions where the air remains stationary long enough to acquire the properties of the underlying surface.

2. Source Regions of Air Masses

For an air mass to develop, the source region must be:

- Extensive and homogeneous (ocean, desert, snow field)
- Characterized by stable atmospheric conditions
- Calm wind conditions to allow uniform property acquisition

Major source regions include polar regions, subtropical oceans, continental interiors, and equatorial belts.

3. Classification of Air Masses (Thermal & Moisture Basis)

Air masses are classified based on:

A. Moisture Characteristics:

- Continental (c) – Dry air mass formed over land.
- Maritime (m) – Moist air mass formed over oceans.

B. Thermal Characteristics:

- Tropical (T) – Warm air mass.
- Polar (P) – Cold air mass.
- Arctic (A) – Very cold air mass.
- Equatorial (E) – Hot and humid air mass.

4. Major Types of Air Masses

1. Continental Polar (cP)
 - Cold and dry.
 - Source: Interior of continents in high latitudes.
 - Influence: Clear skies, cold waves.
2. Maritime Polar (mP)
 - Cold and moist.
 - Source: North Atlantic & North Pacific oceans.
 - Influence: Cloudy weather, snowfall in temperate regions.
3. Continental Tropical (cT)
 - Hot and dry.
 - Source: Subtropical deserts.
 - Influence: Heat waves, dry conditions.
4. Maritime Tropical (mT)
 - Warm and moist.
 - Source: Tropical and subtropical oceans.
 - Influence: Heavy rainfall, thunderstorms.
5. Arctic/Antarctic (A)
 - Extremely cold and dry.
 - Source: Polar ice caps.

5. Modification of Air Masses

Air masses modify when they move away from their source region:

- Change in temperature due to underlying surface.
- Gain or loss of moisture.
- Development of instability and cloud formation.

6. Fronts and Air Mass Interaction

When two contrasting air masses meet, a front is formed:

- Cold Front – Cold air replaces warm air.
- Warm Front – Warm air overrides cold air.
- Stationary Front – Two air masses remain in contact.
- Occluded Front – Cold front overtakes warm front.

Fronts are associated with cyclonic activity and precipitation.

7. Importance in Climatology

- Determine weather conditions.
- Influence monsoons and cyclones.
- Help in weather forecasting.
- Control seasonal variations.