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Air Masses

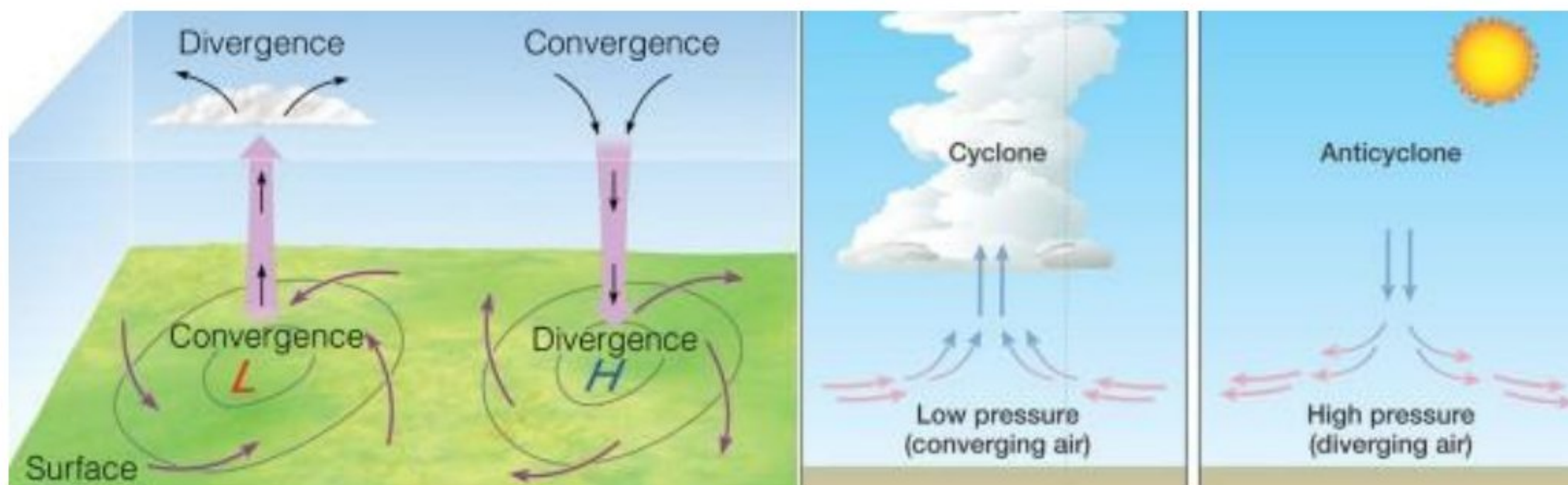
- When the air remains over a homogenous area for a sufficiently longer time, it acquires the characteristics of the area. The homogenous regions can be the vast ocean surface or vast plains and plateaus.
- The air with distinctive characteristics in terms of **temperature** and **humidity** is called an air mass. It is a large body of air having **little horizontal variation** in temperature and moisture.
- Air masses form an integral part of the **global planetary wind system**. Therefore, they are associated with one or other wind belt.
- Pressure Belts – Equatorial Low, Sub-Tropical High, Sub-Polar Low and Polar High
- Wind Movement – Factors Affecting Wind – Coriolis Force
- Winds – General Circulation – Permanent, Secondary, Local Winds
- They extend from **surface to lower stratosphere** and are across thousands of kilometers.

Source regions

- The homogenous surfaces, over which air masses form, are called the **source regions**.
- The main source regions are the **high pressure belts** in the **sub tropics** (giving rise to **tropical air masses**) and around the **poles** (the source for **polar air masses**).
- Source Region establishes **heat and moisture equilibrium** with the overlying air mass.
- When an air mass moves away from a source region, the upper level maintains the physical characteristics for a longer period. This is possible because air masses are stable with stagnant air which **do not facilitate convection**. Conduction and radiation in such stagnant air is not effective.

Conditions for the formation of Air masses

- Source region should be extensive with **gentle, divergent air circulation** (slightly at high pressure).



- Areas with **high pressure but little pressure difference** or pressure gradient are ideal source regions.
- *There are no major source regions in the mid-latitudes as these regions are dominated by cyclonic and other disturbances.*

Air masses based on Source Regions

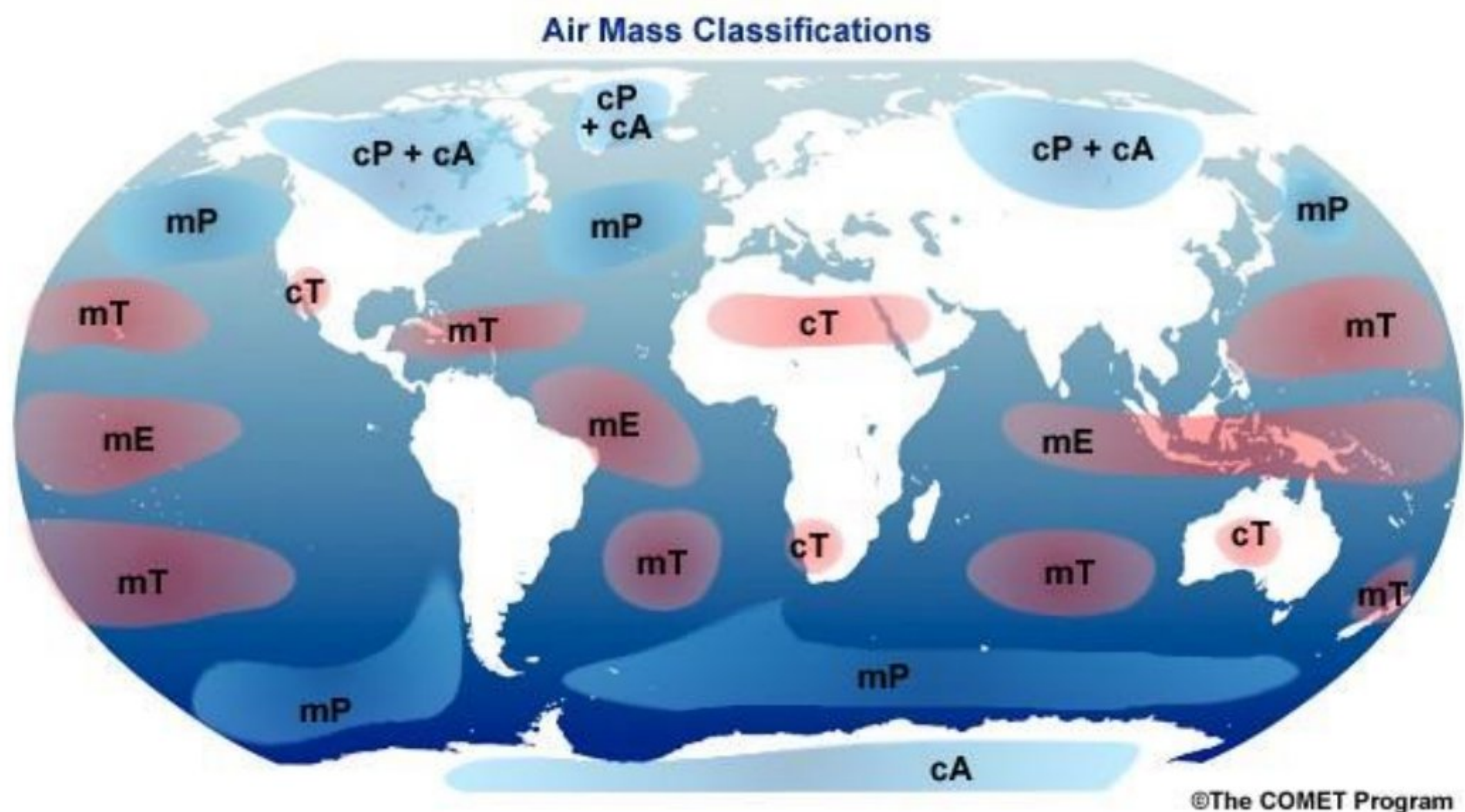
- There are five major source regions. These are:
 1. Warm tropical and subtropical oceans;
 2. The subtropical hot deserts;

3. The relatively cold high latitude oceans;
4. The very cold snow covered continents in high latitudes;
5. Permanently ice covered continents in the Arctic and Antarctica.

- Accordingly, following types of airmasses are recognised:

1. Maritime tropical (mT);
2. Continental tropical (cT);
3. Maritime polar (mP);
4. Continental polar (cP);
5. Continental arctic (cA).

- Tropical air masses are warm and polar air masses are cold.
- The heat transfer processes that warms or cools the air takes place slowly.



Cold Air Mass

- A cold air mass is one which is colder than the underlying surface and is associated with **instability** and **atmospheric turbulence**.

Cold source regions (polar air masses)

- Arctic Ocean – cold and moist

- Siberia – cold and dry
- Northern Canada – cold and dry
- Southern Ocean – cold and moist

Warm Air Mass

- A warm air mass is one which is warmer than the underlying surface and is associated with **stable** weather conditions.

Warm source regions (tropical air masses)

- Sahara Desert – warm and dry
- Tropical Oceans – warm and moist

Influence of Air Masses on World Weather

- The properties of an air mass which influence the accompanying weather are **vertical distribution temperature** (indicating its stability and coldness or warmth) and the **moisture content**.
- The air masses carry atmospheric moisture from oceans to continents and cause **precipitation** over landmasses.
- They transport **latent heat**, thus removing the latitudinal heat balance.
- Most of the migratory atmospheric disturbances such as cyclones and storms originate at the **contact zone** between different air masses and the weather associated with these disturbances is determined by characteristics of the air masses involved.

Classification of Air Masses

- Broadly, the air masses are classified into polar and tropical air masses.
- Both the polar and the continental air masses can be either of maritime or continental types.

Continental Polar Air Masses (CP)

- Source regions of these air masses are the Arctic basin, northern North America, Eurasia and Antarctica.
- These air masses are characterized by **dry, cold and stable conditions**.
- The weather during winter is frigid, clear and stable.

- During summer, the weather is less stable with lesser prevalence of anticyclonic winds, warmer landmasses and lesser snow.

Maritime Polar Air Masses (MP)

- The source region of these air masses are the oceans between **40° and 60° latitudes**.
- These are actually those continental polar air masses which have moved over the warmer oceans, got heated up and have collected moisture.
- The conditions over the source regions are **cool, moist and unstable**. These are the regions which cannot lie stagnant for long.
- The weather during winters is characterized by high humidity, overcast skies and occasional fog and precipitation.
- During summer, the weather is clear, fair and stable.

Continental Tropical Air Masses (CT)

- The source-regions of the air masses include tropical and sub-tropical deserts of Sahara in Africa, and of West Asia and Australia.
- These air masses are dry, hot and stable and do not extend beyond the source.
- They are dry throughout the year.

Maritime Tropical Air Masses (MT)

- The source regions of these air masses include the oceans in tropics and sub-tropics such as Mexican Gulf, the Pacific and the Atlantic oceans.
- These air masses are **warm, humid and unstable**.
- The weather during winter has mild temperatures, overcast skies with fog.
- During summer, the weather is characterized by high temperatures, high humidity, cumulous clouds and convectional rainfall.