

Air Masses and Air Mass Classification

Overview

Air masses are large bodies of air that are fairly horizontally uniform in temperature and moisture characteristics and may extend across an entire continent. A substantial amount of Earth's weather occurs along the boundary separating two different air masses.

Source Regions

Air masses form in "source regions" where there are relatively stagnant winds near the surface and there is little topography. In general, this means that areas of prolonged high pressure, where the winds are light, are ideal for the formation of an air mass.

The air mass takes on the surface properties of the source region (e.g., dry, hot, moist, etc.). The most prevalent source regions for air masses include deserts, polar ice caps, subtropical oceans, and snow-covered arctic plains.

Air Mass Classification

Air masses are classified according to their temperature and moisture characteristics. Continental air masses are characterized by dry air near the surface while maritime air masses are moist. Polar air masses are characterized by cold air near the surface while tropical air masses are warm or hot. Arctic air masses are extremely cold.

Five air masses affect the United States during the course of a typical year: continental polar, continental arctic, continental tropical, maritime polar, and maritime tropical (**Master # 6A**).

Continental polar (cP) or continental arctic (cA) air masses are cold, dry, and stable. These air masses originate over

Air mass types

- Continental = dry
- Maritime = moist
- Tropical = warm
- Polar = cold
- Arctic = extremely cold

northern Canada and Alaska as a result of substantial radiational cooling during long winter nights. They move southeastward, east of the Rockies into the Plains, then to the east or northeast. Continental polar or continental arctic air masses are marked by cold temperatures and low dew points.

Maritime polar (mP) air masses are cool, moist, and unstable. Some maritime polar air masses originate as continental polar air masses over Asia and move westward over the Pacific, warming and obtaining moisture from the ocean. Some mP air masses originate from the North Atlantic and move southwestward toward the Northeast States. The latter air mass generally is colder and drier than the mP air off the Pacific.

Maritime tropical (mT) air masses are warm, moist, and usually unstable. Some maritime tropical air masses originate in the subtropical Pacific Ocean, where it is warm and air must travel a long distance over water. These rarely extend north or east of southern California. Some maritime tropical air masses originate over the Gulf of Mexico and Caribbean Sea. They can be associated with fog and low clouds as they move northward. In the spring and summer, this air mass accounts for the thunderstorms in the Great Plains and elsewhere.

Continental tropical (cT) air masses are hot, dry, unstable at low levels, and generally stable aloft (i.e., under an upper-level high-pressure “ridge”). Continental tropical air masses originate in the desert regions of northern Mexico. They are characterized by clear skies and negligible rainfall. If one of these air masses moves into the Great Plains and stagnates, a severe drought can result.

Air Mass Modification

Air masses can be modified significantly as they pass over regions with different characteristics. Topography can play a crucial role in the modification of air masses.

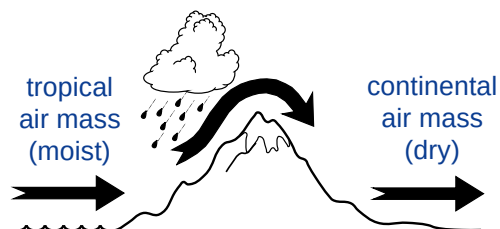
When air masses are modified, they are renamed according to their new characteristics. For example, the western U.S. mountain ranges cause flow from the west to be lifted over the mountains. The original mP air loses its moisture as it precipitates, leaving dry air to move eastward. Hence, mP air becomes cP air after it is forced over the Rockies and other western ranges.

Fun Fact

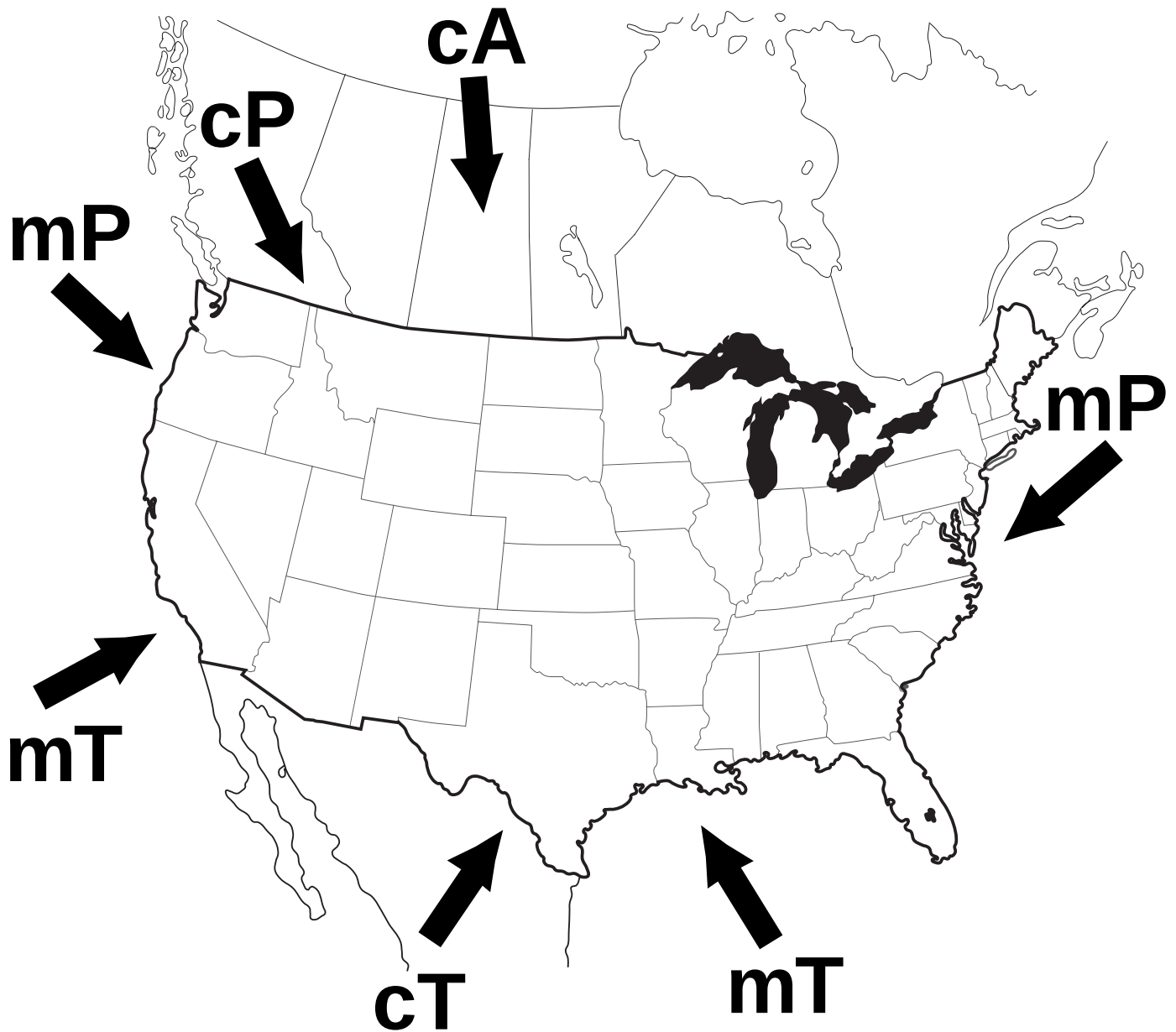
On November 10, 1995, the Bixby, Oklahoma Mesonet site recorded an extreme change in air masses. At 4:00 p.m., the temperature was 83°F. By 7:00 p.m., the temperature had plummeted to 46°F, and by 3:00 a.m. on November 11, the temperature was 25°F. Statewide, bands of freezing rain and snow accompanied the air mass change.

	warm	cold
dry	cT	cP/cA
moist	mT	mP

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Typical Continental U.S. Air Masses



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