

## Activity 12

### Air Masses

#### Level 1

#### Objectives:

- Students will learn and become familiar with the four air masses: cold and dry; cold and humid; hot and dry; and hot and humid.
- Students will learn that air masses have specific characteristics: temperature and humidity, the leading edge of the air mass is called the front, a front is the boundary between two air masses, and movement of air masses brings certain weather conditions with it.

**National Science Education Standards:** All students should develop: abilities necessary to do scientific inquiry, properties of earth materials, and changes in earth and sky.

#### Materials:

Accompanying images A, B, and C, website images, pencil.

#### Teacher Notes:

Access the activity maps at: <http://www.uni.edu/storm/activities/level1/>

**Engage:** Discuss the local weather for the last one or two weeks. What has it been like? Has it changed at all? If yes, how? Have students predict what caused the changes. Write down all explanations offered.

#### Explore:

1. Closely observe the temperatures on map A.
2. Draw lines around several areas of cool temperatures.
3. Draw other lines around areas of warm temperatures.
4. Closely observe the dew point temperatures on map B.
5. Draw lines around several areas of low dew points.
6. Draw other lines around areas of higher dew point temperatures.
7. List any similarities you see between locations of high temperatures and high dew points.

#### Explain:

1. Define air mass and discuss source regions.
2. On a map, point out the source regions of air masses that move into the United States.
3. Using Maps A and B, have students determine which areas, on these maps, possibly had cP and mT air masses over them. Ask students for the evidence to support their choices. The southeastern USA most likely was experiencing an mT air mass, and the north central USA and Great Lakes region was experiencing a cP air mass.

4. Show your students Map C, with data and fronts. Have students compare moisture and temperature characteristics of the air ahead of and behind the fronts on the map. Fronts separate or mark the boundary between different air masses.
5. On Map C, three fronts separate several air masses. Each front leads advancing cP air masses into the USA. The air masses modified, or warmed up and increased their moisture content as they progressed south and east across the USA.

### **Extension:**

1. On the activity website, <http://www.uni.edu/storm/activities/level1/> , access the US Station Plot map. Using knowledge of air mass characteristics, have students try to identify several different air masses. What type of air mass is currently over your state/area? What is the evidence?
2. Using the same map as above, try to locate fronts/boundaries between air masses. Have students sketch in the fronts on the map.
3. Access the Station Plot & Fronts map. Compare this to students' ideas for front locations.

### **Evaluation:**

1. Teacher observation of the predictions and results.
2. Collect student sheets, maps, and stories.

### **For Further Inquiry:**

Ask students how they can find out how air masses change across the country during a 1-week time period. Challenge them to design an investigation to answer this or any other question they might have about air masses.

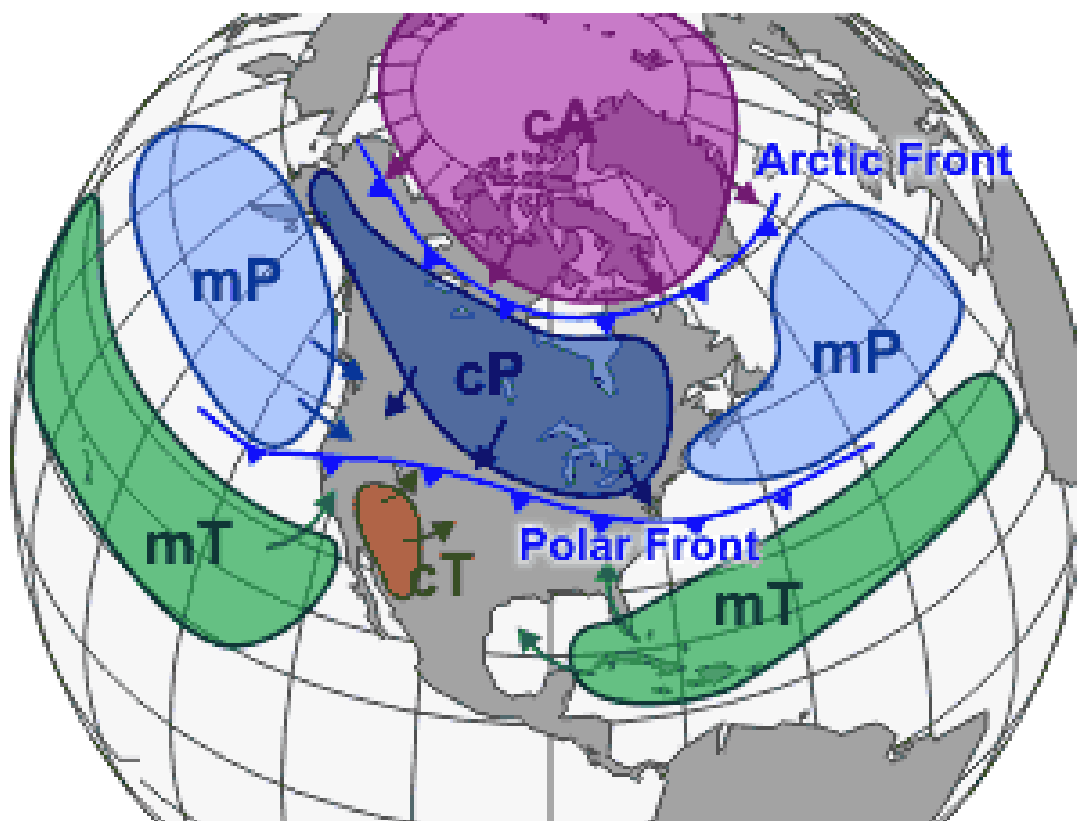
### **Science Background:**

An air mass is a large body of air with generally uniform temperature and humidity. The area from which an air mass originates is called a "source region."

Air mass source regions range from extensive snow covered polar areas to deserts, and to tropical oceans. The United States is not a favorable source region because of the relatively frequent passage of weather disturbances that disrupt any opportunity for an air mass to stagnate and take on the properties of the underlying region. The longer the air mass stays over its source region, the more likely it will acquire the properties of the surface below.

The four principal air mass classifications that influence the continental United States according to their source region are illustrated below and include:

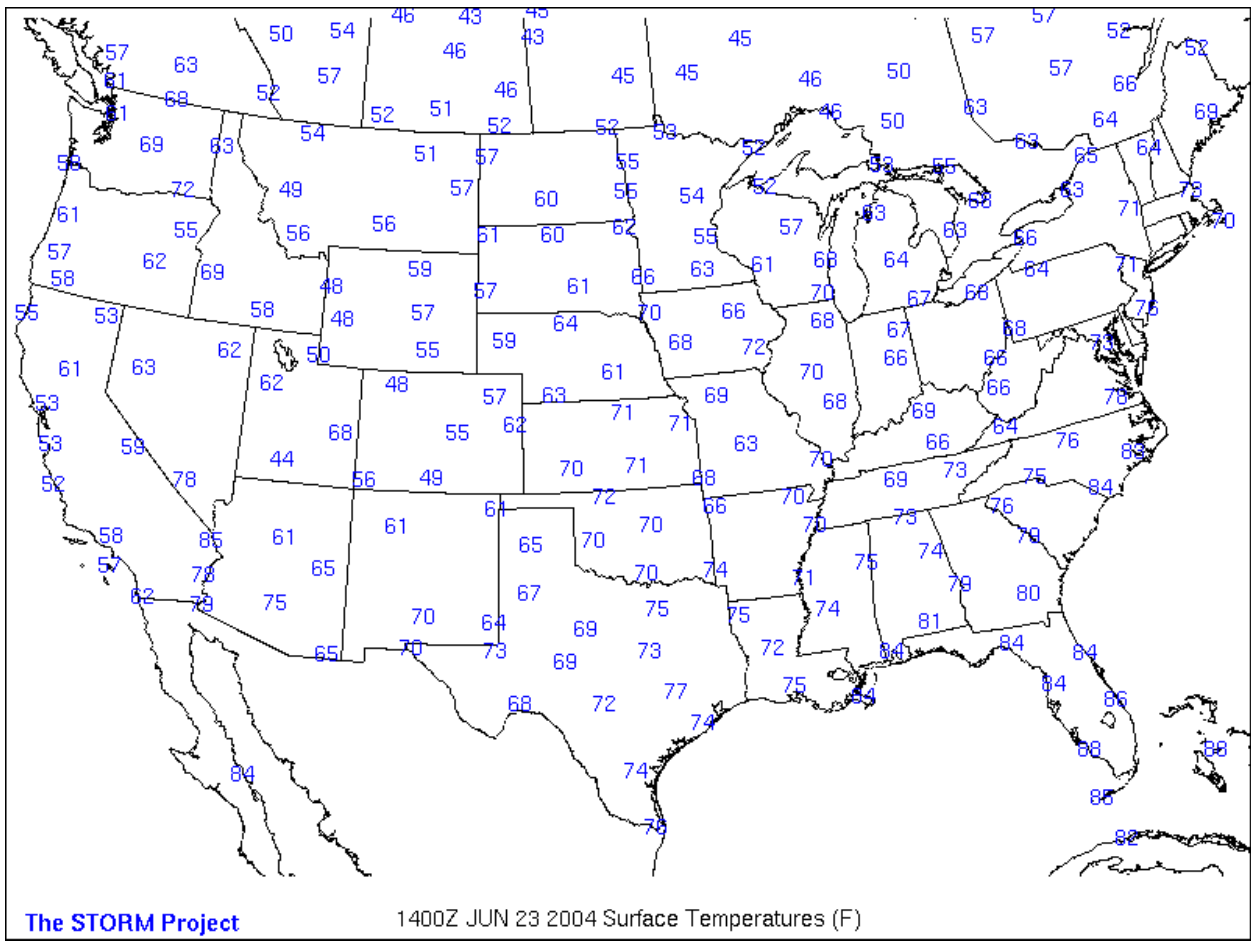
- Polar latitudes - Located poleward of 60° north and south.
- Continental - Located over large land masses between 25°N/S and 60°N/S.
- Maritime - Located over the oceans between 25°N/S and 60°N/S
- Tropical latitudes - Located within about 25° of the equator.



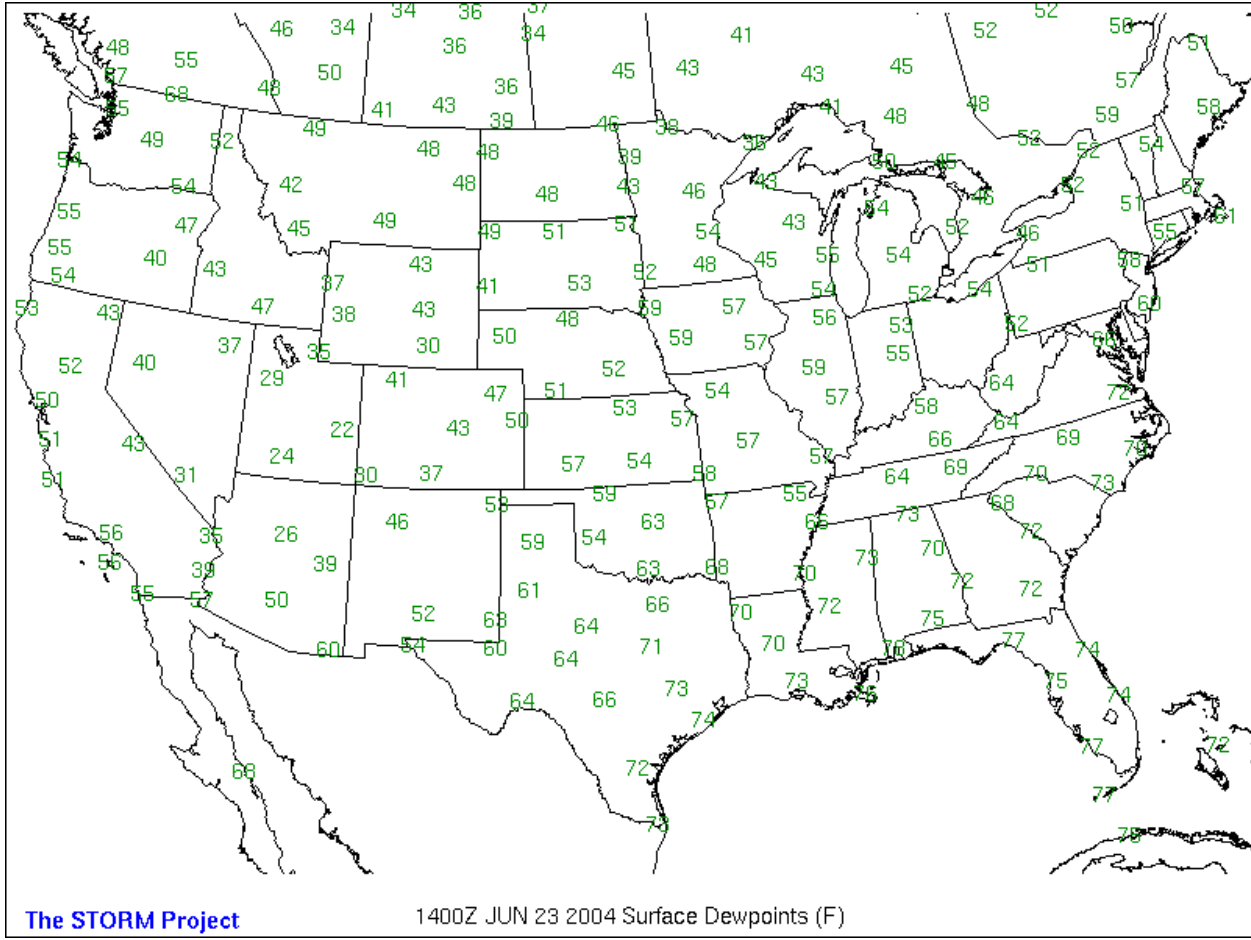
As these air masses move around the earth they can begin to acquire additional attributes. For example, in winter an arctic air mass (very cold and dry air) can move over the ocean, picking up some warmth and moisture from the warmer ocean and becoming a maritime polar air mass (mP) - one that is still fairly cold but contains moisture. If that same polar air mass moves south from Canada into the southern U.S. it will pick up some of the warmth of the ground, but due to lack of moisture it remains very dry. This is called a continental polar air mass (cP). In winter, very cold and dry air masses form in the arctic become continental arctic air masses (cA).

The Gulf Coast states and the eastern third of the country commonly experience the tropical air mass in the summer. Continental tropical (cT) air is dry air pumped north, off of the Mexican Plateau. If it becomes stagnant over the Midwest, a drought may result. Maritime tropical (mT) air is air from the tropics that has moved north over cooler water.

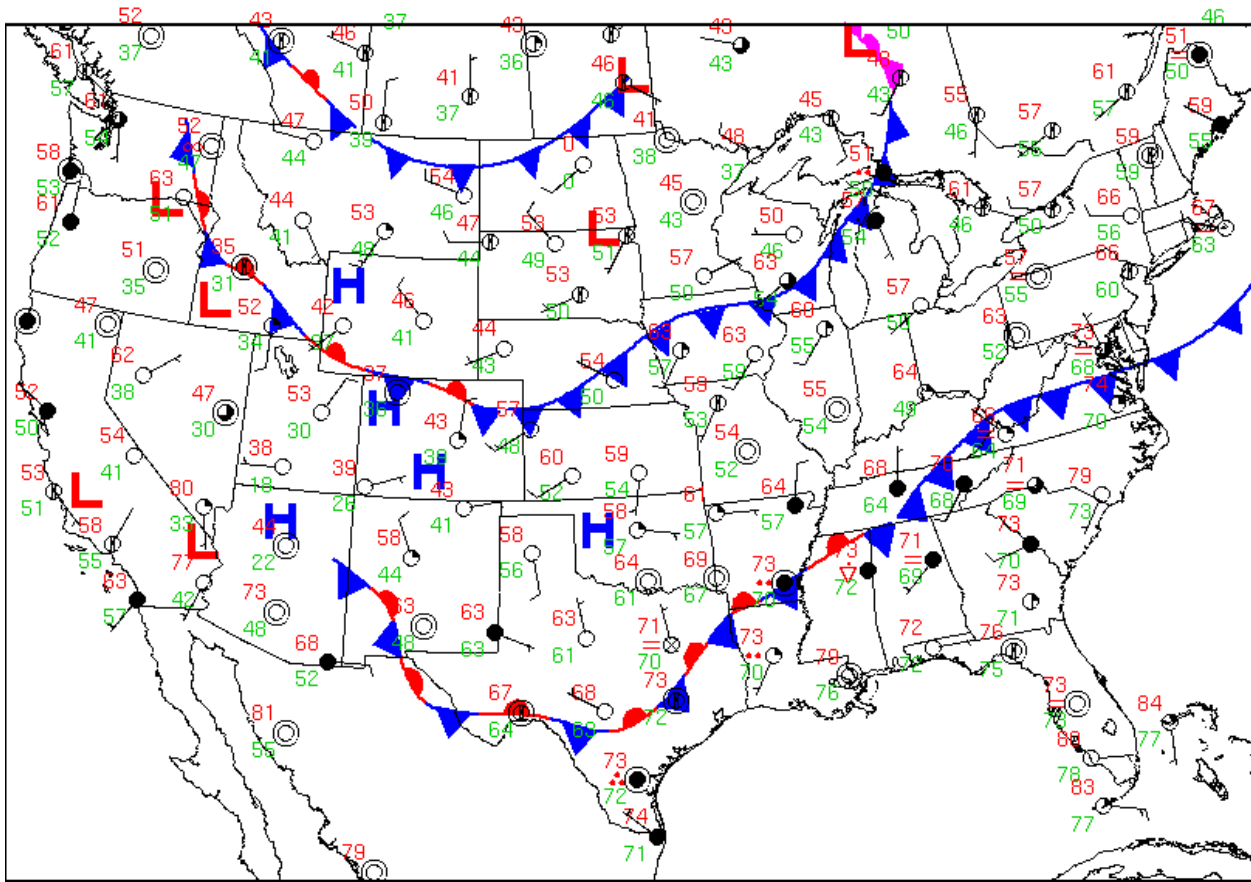
Air masses can control the weather for a relatively long time period: from a period of days, to months. Most weather occurs along the periphery of these air masses at boundaries called fronts.



MAP A Temperatures



Map B Dew point temperatures



1200Z JUN 23 2004 Station Plot & Fronts

The STORM Project