

Air Masses and Fronts

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- How is an air mass different from a front?
- How do fronts affect weather?

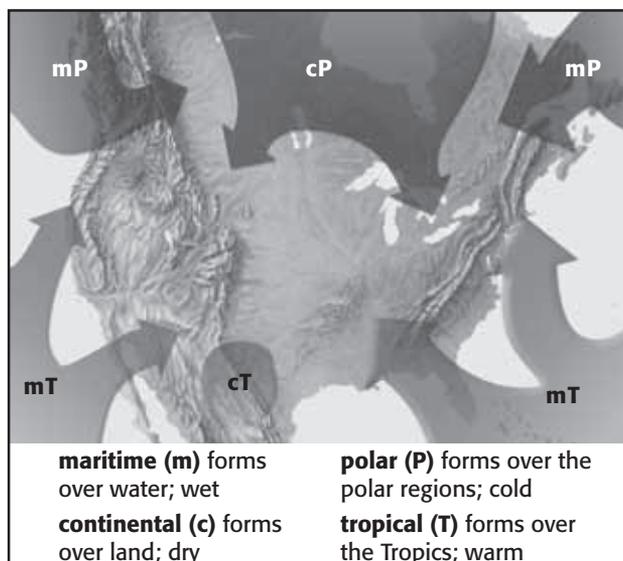
National Science Education Standards
ES 1j

What Are Air Masses?

Have you ever been caught outside when it suddenly started to rain? What causes such an abrupt change in the weather? Changes in weather are caused by the movement of bodies of air called air masses. An **air mass** is a very large volume of air that has a certain temperature and moisture content.

There are many types of air masses. Scientists classify air masses by the water content and temperature of the air. These features depend on where the air mass forms. The area over which an air mass forms is called a *source region*. One source region is the Gulf of Mexico. Air masses that form over this source region are wet and warm. ✓

Each type of air mass forms over a certain source region. On maps, meteorologists use two-letter symbols to represent different air masses. The first letter indicates the water content of the air mass. The second letter indicates its temperature. The figure below shows the main air masses that affect North America.



STUDY TIP

Summarize As you read, make a chart comparing the four kinds of fronts. In your chart, describe how each kind of front forms and what kind of weather it can cause.

READING CHECK

1. Identify How do scientists classify air masses?

TAKE A LOOK

2. Apply Concepts Describe the temperature and moisture content of a cT air mass.

SECTION 2 Air Masses and Fronts *continued*

COLD AIR MASSES

Most of the cold winter weather in the United States comes from three polar air masses. Continental polar (cP) air masses form over northern Canada. They bring extremely cold winter weather. In the summer, cP air masses can bring cool, dry weather. ✓

READING CHECK

3. Identify What is the source region for cP air masses?

Maritime polar (mP) air masses form over the North Pacific Ocean. They are cool and very wet. They bring rain and snow to the Pacific Coast in winter. They bring fog in the summer.

Maritime polar air masses also form over the North Atlantic Ocean. They bring cool, cloudy weather and precipitation to New England.

WARM AIR MASSES

Four warm air masses influence the weather in the United States. Maritime tropical (mT) air masses form over warm areas in the Pacific Ocean, the Gulf of Mexico, and the Atlantic Ocean. They move across the East Coast and into the Midwest. In summer they bring heat, humidity, hurricanes, and thunderstorms to these areas.

Continental tropical air masses (cT) form over deserts and move northward. They bring clear, dry, hot weather in the summer.

Critical Thinking

4. Infer Why don't warm air masses form over the North Atlantic or Pacific oceans?

TAKE A LOOK

5. Identify Fill in the blank spaces in the table.

Air mass	How it affects weather
cP from northern Canada	
mP from the North Pacific Ocean	
mT from the Gulf of Mexico	
cT from the deserts	

What Are Fronts?

The place where two or more air masses meet is called a **front**. When air masses meet, the less dense air mass rises over the denser air mass. Warm air is less dense than cold air. Therefore, a warm air mass will generally rise above a cold air mass. There are four main kinds of fronts: cold fronts, warm fronts, occluded fronts, and stationary fronts. ✓

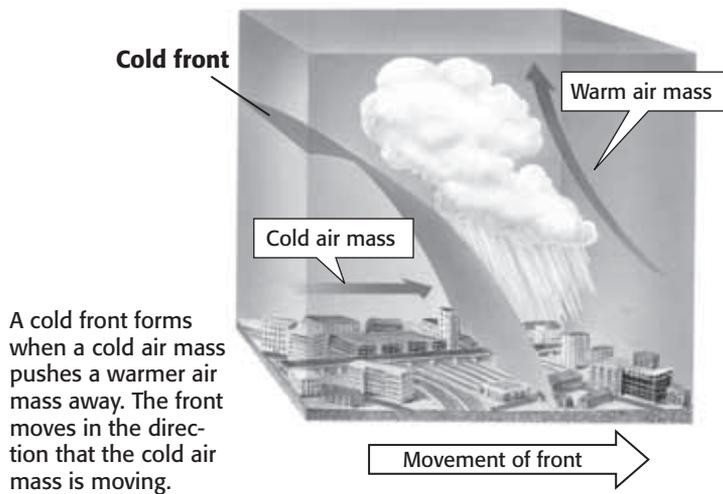
READING CHECK

6. Define What is a front?

SECTION 2 Air Masses and Fronts *continued*

COLD FRONTS

A *cold front* forms when a cold air mass moves under a warm air mass. The cold air pushes the warm air mass up. The cold air mass replaces the warm air mass. Cold fronts can move quickly and bring heavy precipitation. When a cold front has passed, the weather is usually cooler. This is because a cold, dry air mass moves in behind the cold front.

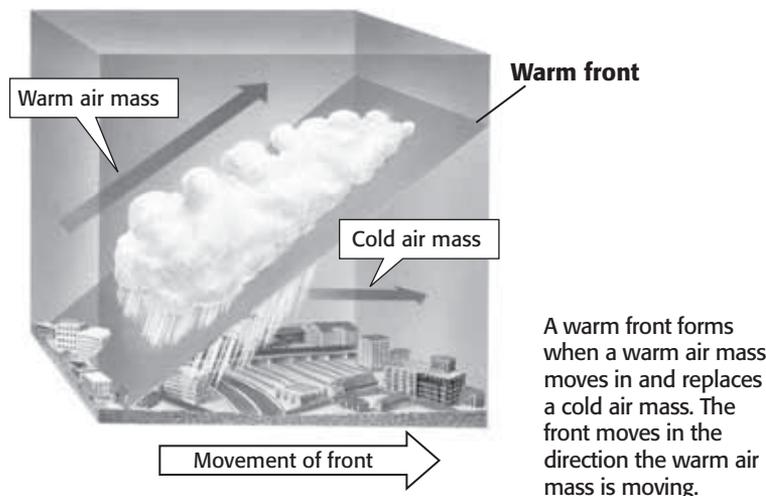


TAKE A LOOK

7. Describe What happens to the warm air mass at a cold front?

WARM FRONTS

A *warm front* forms when a warm air mass moves in over a cold air mass that is leaving an area. The warm air replaces the cold air as the cold air moves away. Warm fronts can bring light rain. They are followed by clear, warm weather.



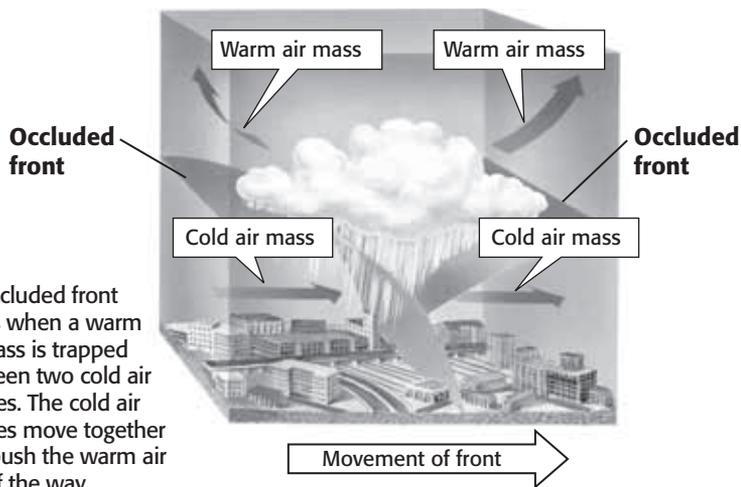
READING CHECK

8. Define What is a warm front?

SECTION 2 Air Masses and Fronts *continued*

OCCLUDED FRONTS

An *occluded front* forms when a warm air mass is caught between two cold air masses. Occluded fronts bring cool temperatures and large amounts of rain and snow.



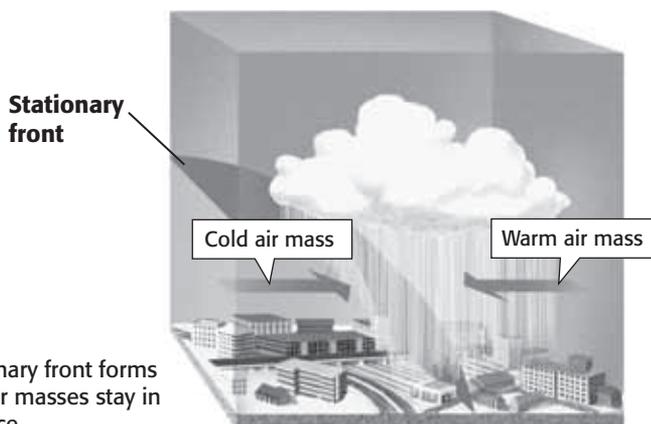
An occluded front forms when a warm air mass is trapped between two cold air masses. The cold air masses move together and push the warm air out of the way.

TAKE A LOOK

9. Describe What happens to the warm air mass in an occluded front?

STATIONARY FRONT

A *stationary front* forms when a cold air mass and a warm air mass move toward each other. Neither air mass has enough energy to push the other out of the way. Therefore, the two air masses remain in the same place. Stationary fronts cause many days of cloudy, wet weather.



A stationary front forms when air masses stay in one place.

TAKE A LOOK

10. Infer What do you think is the reason that stationary fronts bring many days of the same weather?

SECTION 2 Air Masses and Fronts *continued*

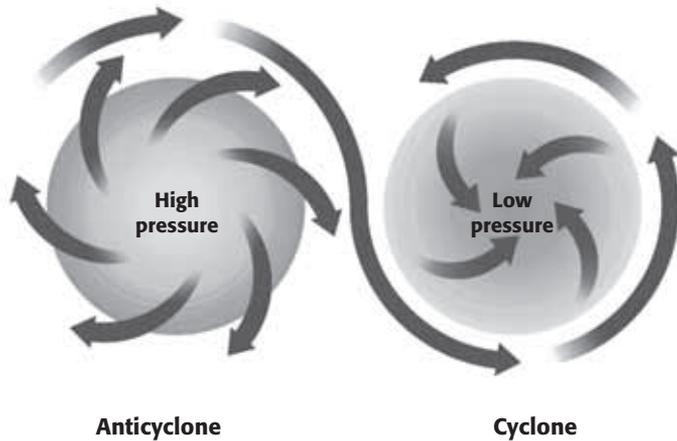
How Does Air Pressure Affect Weather?

Remember that air produces pressure. However, air pressure is not always the same everywhere. Areas with different pressures can cause changes in the weather. These areas may have lower or higher air pressure than their surroundings.

A **cyclone** is an area of the atmosphere that has lower pressure than the surrounding air. The air in the cyclone rises. As the air rises, it cools. Clouds can form and may cause rainy or stormy weather.

An **anticyclone** is an area of the atmosphere that has higher pressure than the surrounding air. Air in anticyclones sinks and gets warmer. Its relative humidity decreases. This warm, sinking air can bring dry, clear weather.

Cyclones and anticyclones can affect each other. Air moving out from the center of an anticyclone moves toward areas of low pressure. This movement can form a cyclone. The figure below shows how cyclones and anticyclones can affect each other.



Critical Thinking

11. Compare Give two differences between cyclones and anticyclones.

TAKE A LOOK

12. Identify In which direction does air move: from a cyclone to an anticyclone, or from an anticyclone to a cyclone?

Section 2 Review

SECTION VOCABULARY

<p>air mass a large body of air throughout which temperature and moisture content are similar</p> <p>anticyclone the rotation of air around a high pressure center in the direction opposite to Earth's rotation.</p>	<p>cyclone an area in the atmosphere that has lower pressure than the surrounding areas and has winds that spiral toward the center</p> <p>front the boundary between air masses of different densities and usually different temperatures</p>
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1. Identify Relationships How are fronts and air masses related?

2. Compare Fill in the table to describe cyclones and anticyclones.

Name	Compared to surrounding air pressure, the pressure in the middle is...	What does the air inside it do?	What kind of weather does it cause?
cyclone	...lower than surrounding pressure.		
anticyclone		sinks and warms	

3. List What are four kinds of fronts?

4. Identify What are the source regions for the mT air masses that affect weather in the United States?

5. Describe What kind of air mass causes hot, clear, dry summer weather in the United States?
