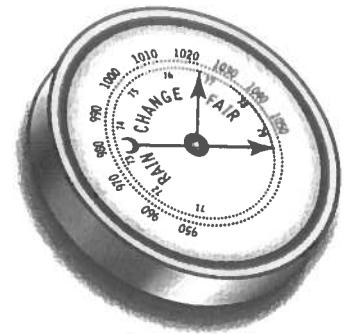


## Unit 4: Air Pressure

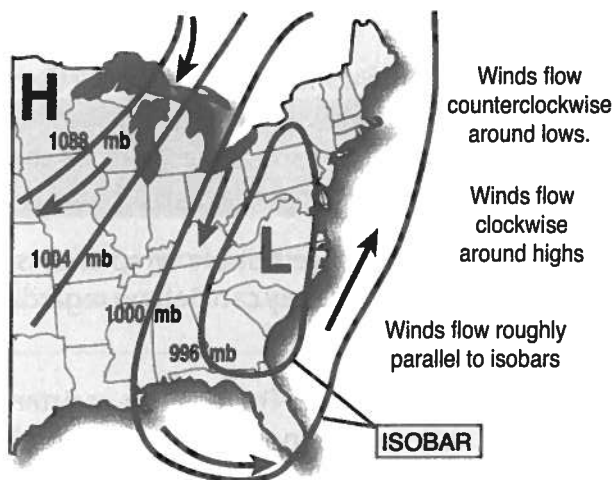
### Student Information

**Air pressure** is also known as atmospheric pressure or barometric pressure. It is a measure of the weight of air pressing down on a given area of Earth's surface. Air pressure is caused by the weight of air from the top of the atmosphere pressing down on the layers of air below. The layers press down on each other because gravity pulls the air molecules down.

Air has mass and volume. As a result, it exerts pressure. Air is also considered to be a **fluid** as it has the ability to take the shape of its container and to flow. Meteorologists identify air masses of low pressure and high pressure as they track weather patterns and prepare forecasts. Meteorologists use an instrument called a **barometer** to measure changes in air pressure. Today, aneroid barometers have largely replaced mercury barometers due to safety concerns about mercury; however, the data is still reported in units of inches, which came from measuring the height of the column of mercury.



The weather conditions associated with air masses of varying pressures are different. Regions of sinking cool air are called **high-pressure systems**, or anticyclones. In a high-pressure system, the winds rotate clockwise. Regions of rising warm moist air are called **low-pressure systems**, depressions, or cyclones. In a low-pressure system, the winds rotate counterclockwise. If the pressure is very low, these spiraling winds may reach storm or hurricane force. Areas of high pressure are usually associated with fair weather, whereas areas of low pressure are commonly associated with stormy weather. On weather maps, these air masses are labeled with a large **L** for low pressure and **H** for high pressure.



Meteorologists identify air masses as high and low pressure by collecting barometric pressure data from weather reporting stations across the United States. After the barometric pressure data is plotted on a map, lines are drawn to connect areas of equal pressure. These lines are referred to as **isobars**, or lines of equal pressure. Barometric pressure decreases as one moves to the center of the low-pressure area; barometric pressure increases as one moves to the center of a high-pressure area.

## SECTION 1 - 3

## SECTION SUMMARY

## Air Pressure

### Guide for Reading

- 1
- ◆ What are some of the properties of air?
  - ◆ What instruments are used to measure air pressure?
  - ◆ How does increasing altitude affect air pressure and density?

Air consists of atoms and molecules that have mass. Therefore, air has mass. **Because air has mass, it also has other properties, including density and pressure.** The amount of mass in a given volume of a substance is called the **density** of the substance. The force pressing on an area or surface is called **pressure**. **Air pressure** is the result of the weight of a column of air pushing down on an area. The molecules in air push in all directions. This is why air pressure doesn't crush people or objects.

Falling air pressure usually indicates that a storm is approaching. Rising air pressure usually means that the weather is clearing. A **barometer** is an instrument that measures changes in air pressure. **There are two kinds of barometers: mercury barometers and aneroid barometers.** A **mercury barometer** consists of a glass tube open at the bottom end and partially filled with mercury. The open end of the tube rests in a dish of mercury, and the space above the mercury in the tube contains no air. The air pressure pushing down on the surface of the mercury in the dish is equal to the weight of the column of mercury in the tube. At sea level, the mercury column is about 76 centimeters high, on average. An **aneroid barometer** consists of an airtight metal box that is sensitive to changes in air pressure. The thin walls of the box flex in and out as air pressure changes, and the movements are recorded on a dial.

In weather reports, air pressure usually is given in inches of mercury. National Weather Service maps indicate air pressure in millibars. One inch of mercury equals approximately 33.9 millibars.

**Altitude**, or elevation, is the distance above sea level. **Air pressure decreases as altitude increases. As air pressure decreases, so does density.** Sea-level air has the weight of the whole atmosphere pressing on it, so air pressure is highest at sea level. Air pressure is much lower at the tops of mountains. There the low density of air can make it hard to breathe because there is less oxygen in each cubic meter of air.