Air Pressure and Weather

Air is invisible and composed mainly of oxygen (21%) and nitrogen (78%). Air molecules (both O/Oxygen and N/Nitrogen), like molecules in all gases, are constantly moving. They move at over 1090 mph, speeding up when warmed and slowing down when cold.

Gravity acts on each molecule, causing the atmosphere closest to the Earth to have the greatest number of molecules. Air molecules are squeezed (compressed) by the molecules above them, causing air pressure.

Air pressure at sea level is 14.7 pounds per square inch, in all directions. We live at the bottom of an ocean — of air! This level of the atmosphere (troposphere) is where weather occurs. **High** and **Low Pressure** areas are major contributors to our weather.

Low Pressure: Air warmed by the sun causes the molecules to move faster and the air becomes less dense. This decrease in mass causes the air to rise. The "lighter" air exerts less pressure on the ground, creating an area of Low Pressure. As the air rises, the water vapor in it condenses, usually bringing some form of precipitation (rain, sleet or snow).

Air flowing in a Low Pressure zone moves in a counterclockwise direction.

Air flowing in a High Pressure zone moves in a clockwise direction.

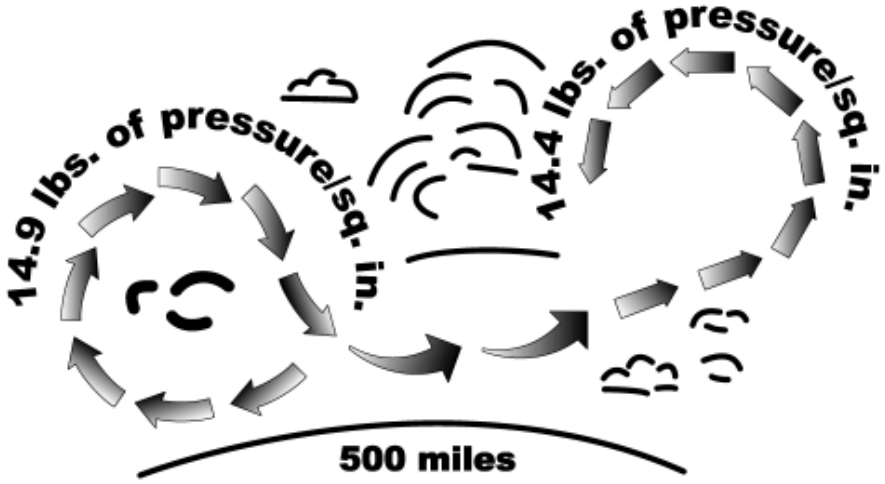
High Pressure: Cool air produces the opposite effect. Cool air sinks, drawing in more cool air, causing higher atmospheric pressure. As the air sinks, it warms and loses its moisture. This is why a High is usually associated with fair weather.

High and Low pressure areas are indicated on weather maps with an **H** or **L**, marking the center of the area with higher or lower pressure than its surroundings.

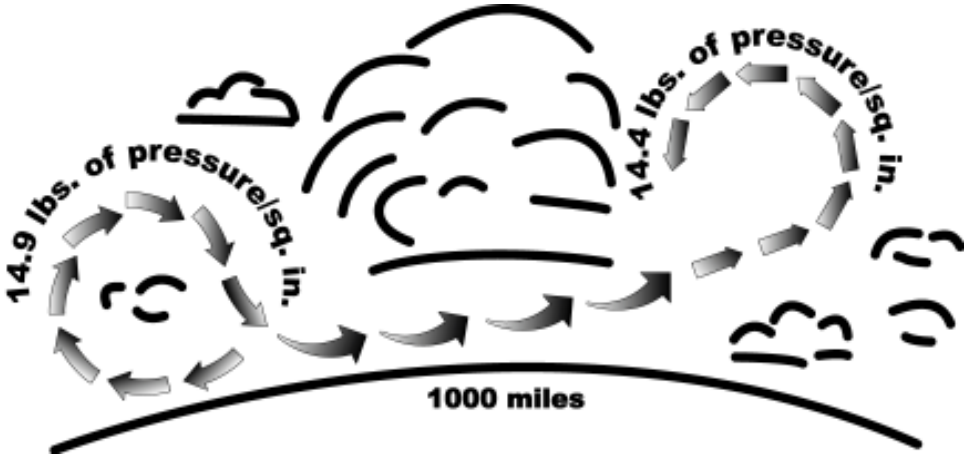
Meteorologists measure air pressure with a **barometer**. A column of mercury rises or falls based on changes in atmospheric pressure. In the U.S., barometric pressure is usually reported in inches of mercury, but the rest of the world uses a metric calibration, the **millibar**. Average air pressure at sea level can be expressed three different ways:

- 14.7 lbs. per square inch
- 29.92 inches of mercury
- 1013.25 millibars.

Since high pressure pushes air toward areas of low pressure, meteorologists use the pressure differences and the distance between them to forecast wind strength and direction. This is known as the **Pressure Gradient Force**. The graphic below illustrates how pressure differences create wind and the effect of distance between bodies of air on the strength of that wind.



A difference of 500 miles between two air masses whose pressure difference is one half pound per sq. in. will accelerate still air to an 80 mph wind in three hours.



A difference of 1000 miles between two air masses whose pressure difference is one half pound per sq. in. will accelerate still air to an 40 mph wind in three hours.