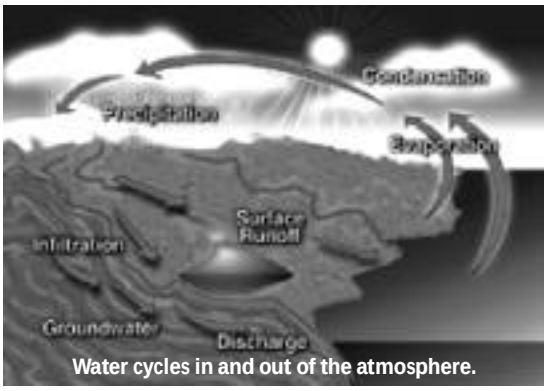
Reading Activity

# Result: Precipitation, the Water Cycle, Air Pressure

Were you ever in a hailstorm? If hailstones are small, no big deal. Maybe a few leaves get shredded. And it sure is loud as it hits the roof and ground. But how about a storm with big hailstones? Have you ever seen one of those up close and in person? They can be pretty exciting, and very scary. Large hailstones are not kind. They can severely damage plants of all sizes. And they can ruin cars. Yet, for some reason, people still drive around in hailstorms. Perhaps they can't believe that something so big and hard could fall from the sky. Hail is just one result of adding the sun and water to our atmosphere. But many things result. Our weather is just full of surprises.



Water cycles in and out of the atmosphere.

When droplets or crystals in a cloud grow large enough, they fall to Earth as precipitation. Air temperature determines what form the precipitation will take. Once precipitation reaches Earth, it enters Earth's water supply. At some point, it will evaporate into the atmosphere once again. Spanning the planet are huge masses of air with similar temperature and humidity throughout. Because Earth is unevenly heated, the air masses are different temperatures. Air temperature affects air pressure. And differences in air pressure cause air masses to move.

What falls from clouds is a matter of temperature. And it isn't just the temperature at the ground, or in the cloud. It's the temperature of the entire path from the cloud to the ground. Above the freezing point of water, 0° C, rain will fall. Even ice crystals will become rain if they pass through a layer of warm air on their way down. Below 0° C, solid precipitation will fall. It may fall as sleet, snow or hail.

Whatever form precipitation takes, in time it will become part of Earth's water supply. Maybe it will end up in a puddle, so its roundtrip to the atmosphere will be a quick one. Maybe it will enter a stream, or river, and make its way to the ocean. Perhaps it will freeze for a while. But eventually it will re-enter the atmosphere through evaporation. And at some point it will condense back to liquid water. It may fall to the ground or evaporate back into the air. The **water cycle** never stops. As such, the same water has cycled between Earth's surface and atmosphere for billions of years.

And the sun has warmed Earth for billions of years as well. Because of the Earth's tilt, its surface is heated unevenly. And because the surface is heated unevenly, the atmosphere is also. Above the poles, the air is very dry and cold. Above the equator, the air is very moist and warm. These huge **air masses** extend across hundreds of kilometers.

The name of an air mass gives information about its air temperature and its humidity. A polar air mass is cold. A tropical air mass is warm. A continental air mass is one that forms over land. Continental air masses are typically dry. Maritime air masses form over oceans. It makes sense that they are moist.

When it comes to weather, air masses carry a lot of weight. Really. Air is made of **matter**. It takes up space and has mass. Air is pulled downward by the force of gravity, so it has weight. It flows much like a liquid. Actually, air behaves much like a liquid. And like any liquid, air exerts a pressure on everything it touches. At sea level, **air pressure** has a force of 1 kilogram per square centimeter.

Air pressure decreases with altitude. Here's why. At sea level, the entire atmosphere is overhead and pressing downward. At, say, 5,000 meters above sea level, there is less atmosphere above to press downward. Air pressure there is about one-half of sea-level air pressure. At 10,000 meters above sea level, air pressure is only about one-fourth of sea-level air pressure.

Air temperature affects air pressure. The colder the air, the higher its pressure. The warmer the air, the lower its pressure. Why? Cold air is more dense than warm air. The molecules in cold air are closely packed together. They are not as active as those in warm air. In warm air, the molecules move faster and spread farther apart. Warm air expands, so fewer molecules occupy the same space as before. The more dense the air, the more pressure it exerts on its surroundings.

Consider a cold air mass parked above the north pole. Now there's a high-pressure area! Air masses above warm regions on Earth are much lower in pressure. So many low-pressure air masses form at and near the equator. In nature, air tends to move from areas of high pressure into areas of low pressure. And moving air is just another description for wind. Wind blows constantly on Earth. And when the wind blows, sure, the cradle will rock; but more to the point, the weather will change.

You know, if air masses didn't move, how do you think your weather would change? It wouldn't. You would never be able to enjoy all the wild weather Earth has to offer. You might never experience hail first hand. You might never see a rainbow. Perhaps you would never even see a sunny day. Air pressure deserves appreciation. Even though it's pushing on you all the time, your body has no trouble pushing it right back.

## Glossary

**air mass**
*n.* a large body of air with consistent temperature and humidity throughout

**air pressure**
*n.* the force air exerts on anything it touches, caused by the weight of the air pressing downward because of gravity

**matter**
*n.* anything that has mass and takes up space

**water cycle**
*n.* the continual movement of water through the atmosphere by the processes of evaporation, condensation and precipitation