

Hydrologic Cycle

The water cycle describes how water is exchanged (cycled) through Earth's land, ocean, and atmosphere. Water always exists in all three phases, and in many forms—as lakes and rivers, glaciers and ice sheets, oceans and seas, underground aquifers, and vapor in the air and clouds.

The water cycle consists of three major processes: evaporation, condensation, and precipitation.

Evaporation

Evaporation is the process of a liquid's surface changing to a gas. In the water cycle, liquid water (in the ocean, lakes, or rivers) evaporates and becomes water vapor.

Water vapor surrounds us, as an important part of the air we breathe. Water vapor is also an important greenhouse gas. Greenhouse gases such as water vapor and carbon dioxide insulate the Earth and keep the planet warm enough to maintain life as we know it. Increasing amounts of greenhouse gases in the atmosphere also contribute to global warming.

The water cycle's evaporation process is driven by the sun. As the sun interacts with liquid water on the surface of the ocean, the water becomes an invisible gas (water vapor). Evaporation is also influenced by wind, temperature, and the density of the body of water.

Condensation

Condensation is the process of a gas changing to a liquid. In the water cycle, water vapor in the atmosphere condenses and becomes liquid.

Condensation can happen high in the atmosphere or at ground level. Clouds form as water vapor condenses, or becomes more concentrated (dense). Water vapor condenses around tiny particles called cloud condensation nuclei (CCN). CCN can be specks of dust, salt, or pollutants. Clouds at ground level are called fog or mist.

Like evaporation, condensation is also influenced by the sun. As water vapor cools, it reaches its saturation limit, or dew point. Air pressure is also an important influence on the dew point of an area.

Precipitation

As is the case with evaporation and condensation, precipitation is a process. Precipitation describes any liquid or solid water that falls to Earth as a result of condensation in the atmosphere. Precipitation includes rain, snow, and hail.

Fog is not precipitation. The water in fog does not condense sufficiently to precipitate, or liquefy and fall to Earth. Fog and mist are a part of the water cycle called suspensions: They are liquid water suspended in the atmosphere.

Precipitation is one of many ways water is cycled from the atmosphere to the earth or ocean.

Other Processes

Evaporation, condensation, and precipitation are important parts of the water cycle. However, they are not the only ones.

Runoff, for instance, describes a variety of ways liquid water moves across land. Snowmelt, for example, is an important type of runoff produced as snow or glaciers melt and form streams or pools.

Transpiration is another important part of the water cycle. Transpiration is the process of water vapor being released from plants and soil. Plants release water vapor through microscopic pores called stomata. The opening of stomata is strongly influenced by light, and so is often associated with the sun and the process of evaporation. Evapotranspiration is the combined components of evaporation and transpiration, and is sometimes used to evaluate the movement of water in the atmosphere.

States of Water

Through the water cycle, water continually circulates through three states: solid, liquid, and vapor.

Ice is solid water. Most of Earth's freshwater is ice, locked in massive glaciers, ice sheets, and ice caps.

As ice melts, it turns to liquid. The ocean, lakes, rivers, and underground aquifers all hold liquid water.

Water vapor is an invisible gas. Water vapor is not evenly distributed across the atmosphere. Above the ocean, water vapor is much more abundant, making up as much as four percent of the air. Above isolated deserts, it can be less than one percent.

The Water Cycle and Climate

The water cycle has a dramatic influence on Earth's climate and ecosystems.

Climate is all the weather conditions of an area, evaluated over a period of time. Two weather conditions that contribute to climate include humidity and temperature. These weather conditions are influenced by the water cycle.

Humidity is simply the amount of water vapor in the air. As water vapor is not evenly distributed by the water cycle, some regions experience higher humidity than others. This contributes to radically different climates. Islands or coastal regions, where water vapor makes up more of the atmosphere, are usually much more humid than inland regions, where water vapor is scarcer.

A region's temperature also relies on the water cycle. Through the water cycle, heat is exchanged and temperatures fluctuate. As water evaporates, for example, it absorbs energy and cools the local environment. As water condenses, it releases energy and warms the local environment.

