

Example Essay

Rain's Journey back to the Clouds

Water is essential to sustain human life. Water is used for drinking, cooking, bathing, growing food, cooling, manufacturing (cement, glass, plastic, paper, etc.), and creating energy (hydroelectric and geothermal). This life-sustaining liquid covers 70% of the surface of our planet (Oki & Kim, 2017) and is found in the form of rivers, rain, glaciers, clouds, oceans, lakes, underground aquifers, snow, and even as dewdrops on the morning grass. What's interesting is that it doesn't stay in one form for too long. Snow melts, water vapor in the sky falls to Earth as rain, rivers flow into the ocean, ground water bubbles up to the surface through springs and geysers, and lakes constantly lose water into the atmosphere. This process of water changing from one form to another as it moves through the Earth's environmental systems is called the "water cycle" or the "hydrologic cycle" (Micklin, 1996, p. 285). The hydrologic cycle has many different parts but, simply put, it is a repeating process of evaporation, condensation, and precipitation.

Before examining each part of the water cycle, it is important to recognize the importance of the cycle and the conditions required to maintain it. Much of life is sustained with fresh water: humans need fresh water to drink and plants need fresh water in order to grow. However, a large majority of the Earth's water is found in the oceans, and ocean water is too salinated to meet many of the functions that we depend on water for (Micklin, 1996). Through the natural process of evaporation, ocean water is desalinated as it is taken from oceans into the atmosphere; as water in the atmosphere condenses and returns to Earth's surface as rain and snow, it returns as fresh water (Micklin, 1996), which can be used to meet the functions we need. In this way, "the water cycle may be thought of as a giant natural machine, running on solar energy..." (Micklin, 1996, p. 286) that makes it possible to use and reuse the precious water sources we have available.

The conditions required for the water cycle are having available water and the correct surface temperature. Many other planets, even if water existed on them, would not be able to sustain a hydrologic cycle because the temperatures are too extreme. "The Planet Earth has a particularly vigorous hydrology because [of] its surface temperature ...As a result of this circumstance, water in the Earth's hydrosphere occurs in all three phases and is readily transformed from one phase to another" (Dooge, 1984, p. 325). Thus Earth provides the perfect environment to be able to cycle and recycle water from one form to another, and as already mentioned, human life depends on the ability to do so. Each of the steps in the water cycle focuses on moving water through these phases. What follows is an explanation of each of the phases.

Evaporation

Evaporation is how water molecules get into the atmosphere. Depending on various factors (temperature, humidity, wind speed, and radiation), water molecules found on the surface of the Earth absorb kinetic energy ("Water Cycle," 2014) and become part of the atmosphere in a gaseous state. It may not seem like a significant step of the water cycle because evaporation is not readily observable, but over 450,000 km³ of water annually leave the oceans through evaporation (Micklin, 1996). This significantly contributes to the water in the atmosphere. Water also enters the atmosphere when ice and glaciers evaporate (called sublimation) or when plants release water through their leaves (called transpiration), but these processes are typically referred to in a general sense as total evaporation (Micklin,

1996). These processes of evaporation form a large part of the hydrologic cycle, supplying water vapor for the next stage: condensation.

Condensation

The next phase of the water cycle is condensation. Once water molecules are in the atmosphere, they stay in a gaseous state until they lose energy and cool down. Water molecules condense as they transition to a liquid state ("Water Cycle," 2014). Condensation may be the simplest stage of the water cycle because it mainly occurs based on temperature. When moist air cools, the water molecules in the air turn from a gas into a liquid. Condensation happens in many places that are easily observed, like on a glass of water with very cold water in it. Sometimes drops of water will form on the outside of the glass because there was water in the air around the cup. The same thing happens on a larger scale with clouds. Water in the air cools and collects on particles of dust, dirt, or even smoke that are suspended in the atmosphere, forming clouds (U.S. Geological Survey, 2016). Condensed water molecules move around inside of clouds. These "cloud particles" often bump into one another and stick together until they form raindrops, snowflakes, or hailstones that are heavy enough to fall back to the Earth.

Precipitation

Precipitation is the next stage of the water cycle. In this stage of the water cycle, water that was lost into the atmosphere via evaporation returns to the Earth via precipitation. There are many different forms of precipitation: rain, snow, hail, sleet, and mist. However, not all water that accumulates in clouds falls back to the Earth in the form of precipitation. Sometimes clouds will simply seem to disappear as the water that has condensed in them heats up and re-evaporates back into the atmosphere. This evaporated water has the potential to condense back into clouds later and fall as precipitation (USGS, 2016). The condensed water that does fall from clouds will eventually make its way back into the atmosphere either by transpiration or as it evaporates from the soil or ocean where it collects after it falls ("Water Cycle," 2014).

Sometimes precipitation may also start in one form, but change into another later. For example, if the temperature rises during a snowstorm, the snowflakes may melt as they fall and become rain or, if temperatures become cold enough during a rainstorm, the droplets may freeze in the air to form shards of ice (USGS, 2016). This complex process of precipitation is how the water cycle is able to repeat itself indefinitely, without needing additional water to be added into it.

Conclusion

These phases of evaporation, condensation, and precipitation happen continually. They also happen simultaneously. As water evaporates into the atmosphere, there is already water condensing into clouds. As some clouds form, others are already beginning to precipitate. While water evaporates from some places more quickly than others and while some places on Earth receive more precipitation than others, the water cycle is, overall, very well balanced. It is so balanced that we've always had the same amount on our home planet. "The global water cycle is in balance, so that on average over the years precipitation equals evaporation....The hydrologic cycle for practical purposes is a closed system with the amount of water in it of fixed volume" (Micklin, 1996, p. 286). The process happens in such balanced proportions that our total amount of water is conserved without losing water. The cycle has been repeating itself for as long as the Earth has been in existence. Its existence is what makes humans' existence a possibility. In comparison to the other planets in the Milky Way, Earth has the right conditions to sustain a hydrologic cycle and keep humans and plants alive.

Exercises

Exercise 1: Supporting Ideas

Before you complete this activity, read the entire essay.

1. Scan the essay to find sources.
2. How is the source information used to support the topic sentence (or thesis, more generally)?
3. Are there any ideas in the essay that would be strengthened by bringing in an additional source? Why or why not?



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