Essay on physical geology

Environment, Plants

The Hydrologic Cycle

The global hydrologic cycle involves the change of water between three states. Water can be gaseous, like humidity in the atmosphere and the condensation in clouds, liquid as in our lakes, rivers, and oceans, or solid as in our ice caps and glaciers. Water is very complex and energy is required for it to change between the different states. Without water, biologic life could not exist.

Evaporation and transpiration return water from the liquid state into the gaseous state. It takes a lot of energy to effect this change in state. Approximately 600 calories per gram of water is necessary to change it from a liquid into a gas. Evaporation is the major vehicle for changing water into gas, although transpiration is also important and often overlooked. Transpiration is basically the evaporation of water from plants. When plants open their stomata to get carbon dioxide for photosynthesis, water evaporates. This contributes ten percent of the water to our atmosphere (USGS, 2013).

Water changes from the gaseous state to the liquid state via condensation. This is brought about by the cooling to the saturation point. Then, the water will go back to the liquid state and fall as precipitation (rain, sleet, or snow). This will end up either on land or back in a water body. Water that intercepts land will either be absorbed by the soils or end up as runoff into streams or rivers. Intensive urban development has resulted in greater amounts of runoff because of the nonporous surfaces of buildings, parking lots, and roads. Although this is not a change of state of water, interception is very important. When water returns from the gaseous state, plants and soils can postpone when it rejoins with a water body. It is especially important in freezing conditions when water is stored above ground as snow or ice (NOAA, n. d.).

When the water does enter the soil it is known as infiltration. The amount of water able to infiltrate is dependent on the soil type, the porosity of the soil, and the level of compaction. If the soil cannot hold any more water, it will contribute to surface runoff in streams, rivers, and oceans. The water that seeps into the soil is termed groundwater. Groundwater can either be stored in an aquifer or discharged to a water body like a stream or lake. When the atmospheric pressure and the water pressure head are equal, it is known as the water table. When we drill into this cone of depression, we can have a well to acquire water from an unconfined aquifer (" Cone of Depression, 2013).

Food Chain

Food chain is a term no longer used by biologists. Organisms are more intricately weaved with other organisms and the environment. Now, it is more commonly termed, food web. Geographers still use the term food chain, but for a different reason. Geographers look at the distribution of organisms in relation to other organisms. Biologists are more concerned with behavioral relationships between organisms.

When describing an organism, it is typically done as an explanation of where the organism lives. Biologists/ecologists use the term " ecotone" or " biome." This characterization is not only defined by the environmental characteristics, but also the ecological ones. For example, in a desert biome, you will have different environmental and biologic components than a boreal forest habitat. In a desert environment, day and night cycle are very important. Plants have adapted to these cycle (CAM plants) to maximize water retention. In a boreal forest, moisture is not as much of a concern, although as in the desert, plants have adapted to very specific environmental limits (UC Berkley, 1996).

Soil Development

Soil development is dependent on several factors. These factors include the topography, the base material, the climate, as well as the organisms that inhabit the area. Chemical and physical weathering are responsible for breaking down the parent material into soil. Also organisms play a role. These organisms include the roots of plants as well as microorganisms. Both play a very important part in breaking down parent material into soil. There are two major groups of soils, mineral soils and organic soils. Mineral soils are from the breakdown of rock, whereas organic soils are generated from the accumulation of biologic material (Radboud University, n. d.). Considering topography and biologic factors, different ecosystems will have different rates of soil development. For example, in a grassland, soil development will occur mostly in the upper layers of the soil profile since the roots of grasses do not penetrate very deeply. There will be a litter layer and some organic deposition, but not as much as other ecosystems. There will be little erosion because the roots of the grasses prevent soil loss. That is why in areas where overgrazing occurs (resulting in removal of the grasses) there are very high rates of erosion due to wind and water. Comparing this to a forest ecosystem, there is much greater amounts of litter that build up and the roots of the trees break down soils much deeper in the profile. Although the roots of the trees help curb the erosion of soils in a forested ecosystem, because of the usual lack of much undergrowth in forests, more erosion is possible. If you contrast this with a sloped area, regardless of ecosystem type, much more erosion occurs and there is a transport of materials from one location to another based on water and wind movement.

The type of soils that are generated will vary on the type of parent material. But sometimes other factors are outweighed by other soil-forming factors. The presence of flora and fauna in the soil are two such examples. Beyond the mechanical and chemical weathering processes, the presence of herbaceous materials as well as small invertebrates in the soil will influence soil development. On a smaller scale, soil microbes (bacteria, fungi, and protozoa) play a very important role in soil breakdown. They are especially important in the breakdown of biological macromolecules whose resulting products are taken up by plants (Radboud University, n. d.).

The surface of the earth has changed dramatically over time. Processes within the earth are constantly producing new parent material (igneous, metamorphic, and sedimentary rock). Rocks continue to be broken down into soil by chemical, biological, and physical processes. Erosion by wind and water are shaping our coastlines, mountains, and other geologic formations in the most amazing way. It is an endless cycle of creation and destruction that continues to change the surface of the earth.

Continental Drift

Alfred Wegener proposed the theory of continental drift to explain how the earth has changed. About 240 million years ago, the continents were all joined in a “ supercontinent” called Pangea and due to the centrifugal motion of the earth and ocean waves, it broke apart into seven different continents and drifted apart. Wegener’s idea of continental drift was supported by the existence of coal deposits at the North Pole (which had to form in a tropical region), biogeography of animals on different continents, and fossil evidence suggesting the same habitat on multiple continents (Sant, 2012).

In the 1960’s and 1970’s, scientists refined the idea of continental drift. It is now believed that the earth is made up of slabs of rock called “ tectonic plates” that are constantly in motion by the process of plate tectonics (“ Continental Drift,” n. d.). There are seven major plates the African, North American, South American, Eurasian, Australian, Antarctic, and Pacific plates. These plates move between 2 and 10 cm per year. Plates can impact each other at convergent boundaries; they can pull apart at divergent boundaries; or sideswipe each other at transform boundaries (Wheeling Jesuit University, 2005).

End of the Pleistocene or an Interglacial Period?

Does the existence of glaciers and pack ice support the idea we are still in an ice age? Some scientists believe we are. Technically, the presence of the glaciers in the northern and southern hemispheres would characterize the earth as still in an age because of the existence of glaciers in Antarctica and Greenland (“ Ice Age,” 2013). But the majority of scientists believe we are in an interglacial period. The glaciers currently present on the planet are all in retreat. This interglacial period is called the Holocene epoch and it began approximately 11, 000 years ago. The current thinking is that the advancement or retreat of glaciers is caused by astronomical causes (US EPA, 2009).

The ramifications of whether we are still in an ice age or not are global. With the increase in mean surface temperature of the earth from the anthropogenic input of carbon dioxide and other greenhouse gases into the atmosphere, it is important to have a consensus. Major changes in the Ross Ice Shelf in Antarctica in recent years may not support the theory of global warming, just that the earth is in an interglacial period.

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