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The Water Cycle In The Course Of Study Related To the Biological Science at Various Level

Dr. Ashwani Kumar Gupta
Assistant Professor in Zoology, Regional Institute of Education, Ajmer (Rajasthan),
Email :- drash Kumar @yahoo.com, whats app is 9414758507

Abstract

The water cycle is biogeochemical cycle that describes the continuous movement of water on, above and below the surface of Earth. The water moves from one reservoir to another, such as from river to ocean, or from the ocean to the atmosphere, by the physical processes of evaporation, condensation, precipitation, infiltration, surface runoff, and subsurface flow. In doing so, the water goes through different terms: liquid, solid (ice) and vapour. The water cycle involves the exchange of energy, which leads to temperature changes. When water evaporates, it takes up energy from its surroundings and cools the environment. When it condenses, it releases energy and warms the environment. These heat exchanges influence climate.

KEY WORDS:

Zonation, Evaporation, Condensation, Precipitation, Infiltration, Regulation.

INTRODUCTION - Water comes down from the atmosphere in the form of rain or snow. It falls directly into the oceans and other bodies of water or it may full on land, where it begins a downhill journey through streams, lakes, underground channels and rivers, finally reaching the ocean. In its journey through the said bodies of natural water some of the water goes back to atmosphere bi evaporation thus returning to the atmosphere. Land animals and plants gets water at various points in the water cycle, either by drinking it directly or by absorbing it form the soil. In all forms of life, some water becomes chemically incorporated into the protoplasm, it reappears when the substances are broken down. Some water is kept free and ready to use in all living systems, organisms return some of the water to the atmosphere by losing it from their surfaces, leaving in the plants and skin in the animals, and also with their wastes as faeces, excretory product and exhaled air.

AQUATIC ENVIRONMENT AND LIFE ZONES

The aquatic equivalents of biomes (communities on land) are called aquatic life zones. The aquatic life zones are classified into two major types: fresh water (particularly lakes and ponds, streams and rivers and inland wet lands), and marine or saltwater resources. Aquatic systems contain floating, drifting, swimming bottom dwelling, and decomposer organisms. These several major types of organisms consist as the following:-

(i) Planktons:- Phytoplanktons (plants) and zooplanktons (animals), the weakly swimming, free floating organisms,
(ii) Nekton strongly swimmers like fish, turtle and whales.
(iii) Benthos:- dwelling on bottom, such as barnacles and oysters worms, lobsters, crabs etc.
(iv) Decomposers: Mostly bacteria that break down dead organic matter and wastes of aquatic organisms.

FRESHWATER LIFE ZONES

Organisms in freshwater habitats are hardly generally classified in the following manner.

1. On the basis of their major niches based on their position in the energy or food chain, they are autotrops (producers), phosphorous (macro consumers), and saprotrops (decomposers or micro-consumers)
2. On the basis of their life-forms or life habit, as benthos (bottom), periphyton (attached to other plants), planktons (floating), nekton (swimming), and neuston (resting or swimming on surface).
3. On the basis of particular region or sub habitat, where they grow. Thus, in a pond, a lack etc. There are generally distinguished (i) literal zone, which is shallow-water region. (ii) limonitic zone, an open water zone to the depth where effective light can penetrate, and (iii) profoundal zone, the bottom and deep water area, beyond the depth of effective light penetration. This zone is often absent in ponds.

Lentic community: The various organisms are found distributed in distinct zones. i.e. littoral, limnetic and profoundal zones.

In littoral zone: Various aquatic plants, planktons damsel fly nymphs, rotifers, flatworms, hydro larvae etc. Fish, Amphibians & Reptiles etc. **In limnetic zone**: Phytoplankton's, green flagellates, Euglienidae & volvocidae, zooplanktons, copepods cladocerans, and rotifers etc.

In profundal zone - The organisms mainly defend for their food on the littoral and limnetic zones, since there is no penetration of effective light to this zone. In return, this zone provides rejuvenated' nutrients, that are carried by currents and swimming animals to other zones. Major life forms are bacteria and fungi, abundant in the water much inter-phase; blood worms or haemoglobin containing chrionomid larvae annelids: small clams of the family spharidae; and 'phantom larvae' that are plank tonic.

Lotic communities: The lotic freshwater bodies differ from lentic ones in the following respect:

i) Water current is much more a major controlling and limiting factor in streams, Velocity of current varies greatly in different parts of the same stream. Thus current makes a big difference between Stream and bond and bond life, and moreover, governs differences in various parts of a given stream.

ii) Land- water interchange is relatively more extensive in streams, resulting in a more open' ecosystem and a heterotrophic type of community metabolism. Thus streams form on open ecosystem that is interdigitated with terrestrial and lentic system.

iii) Oxygen tension is generally more uniform in streams and there is little or no thermal or chemical stratification.

The chief producers that remain permanently attached to a firm substrate are attached green algae such as cladophora, encrusting diatoms and aquatic mosses of the genus. Funtinalis. The consumers show certain such features as permanent attachment to a form substrate, presence of hooks and suckers, sticky under surfaces, streamlined bodies, flattened bodies, positive rheotaxis and positive thigmotaxis. Thus a variety of animals are found, which are fresh water sponges and caddis fly larvae, larvae of stimulus and Blepharocera, snails and flatworms, fish, and stonily and mayfly nymphs.

Marine (Saltwater) Life zone:

In open sea -

The continental shelf extending for a distance offshore, beyond which the bottom drops off steeply as the continental slope then levels off somewhat before dropping to a deeper, but more level, plain.

The shallow-water zone on the continental shelf is the Intertidal zone.

The region of the open sea beyond the continental shelf is called Oceanic Region, which comprises the region of the continental slope and rise-the Bathyl zone ; area of the ocean deeps - Abyssal Region, and light compensation zone separating an upper thin euphotic zone from a vastly thicker Aphotic zone.

Within these primary zones, there may occur distinct secondary zones, horizontal as well as vertical, in such waters. Thus communities in each of the primary zones, excepting the euphotic, have two distinct vertical components, the benthic (bottom), and the pelagic.

Communities:

Coelenterates, sponges, echinoderms, annelids etc. are absent or poorly represented in fresh water are very important in marine waters. Bacteria, algae, crustaceans, and fish play a dominant role in both, fresh as wll as marine waters, with diatoms, green flagellates, and copepods being equally important to both. Variety of algae (brown and red), crustaceans, molluscs, and fish is greater in marine waters. Seed plants are of little value in sea, excepting for zostera, the eel grass. Thus production in mainly by algae. Insects are generally, and crustaceous constitute that so-called 'insects of sea'. Green algae, brown algae and red algae show a depth distribution roughly in the order named (with red algae deepest). Neritic phytoplankton at least in temperature regions undergoes a seasonal density cycle similar to that in eutrophic lakes.

Various types of Zoo planktons, those which remain for their entire life cycle as planktons are called haloplankton, as copepods, larger crustaceans, euphausids, protocoans, molluscs, timy jelly fish, ctenophores, pelagic tunicates and free-floating polychaete worms etc. Some of the zooplanktons are called meroplanktons, as most of the benthos and much of the nekton in larval stages join the plankton assemblage for varying periods. .

Benthos, which are in large numbers and are sessile or relatively in active animals in the inshore region. They are distinct in super tidal, intertidal and sub tidal zones. These include a variety of crab, amphipods, tiger beetles, oysters, dollars, clams, shells, corals, sea anemone etc.

Nekton and Neston, which are swimming animals which include fish, turtles, such mammals as whales, seals, etc. and the marine birds.

Bacterial, which are present in less amount being mainly as sediments?

Coastal zones, Estuaries, coastal wetlands, Mangrove swamps, Rocky & sandy shores and coral reefs are also the zonation of marine water resources.

Evaporation: Evaporation is a type of vaporization that occurs on the surface of a liquid as it changes into the gas phase. The surrounding gas must not be saturated with the evaporating substance. When the molecules of the liquid collide, they transfer to each other based on how they collide with each other. When a molecule near the surface absorbs enough energy to overcome the vapour pressure, it will escape and enter the surrounding air as gas. When evaporation occurs, the energy removed from the vaporized liquid will reduce the temperature of the liquid, resulting in evaporative cooling. Evaporation is an essential part of water cycle. The sun drives evaporation of water from oceans, lakes, moisture in the soil, and the other sources of water. Evaporation of water occurs when the surface of the liquid is exposed; allowing molecules to escape and form water vapour. This vapour can then use up and form clouds.

Condensation: Condensation is the change of the physical state of matter from gas phase into the liquid phase, and is the reverse of vaporization. The word most often refers to the water cycle. It can also be defined as the change in the state of water vapour to liquid water when in contact with a liquid or solid surface or cloud condensation nuclei within the atmosphere. When the transition happens from the gaseous phase into the solid phase directly, the change is called deposition.

Precipitation: Precipitation is any product of the condensation of atmospheric water vapour that falls under gravitational pull from clouds.

The main forms of precipitation include drizzling, rain, sleet, snow, ice pellets, grapple and hail. Precipitation occurs when a portion of the atmosphere becomes saturated with water vapour, so that the water condenses and 'precipitates' or full's. Thus, fog and mist are not precipitated but colloids, because the water vapour does not condense sufficiently to precipitate. Two processes possibly acting together, can lead to air becoming saturated cooling the air or addling water vapour to the air. Precipitation forms as smaller droplets coalesce via collision with other raindrops or ice crystals within a cloud short instance periods of rain is scattered locations are called showers.

Infiltration: Infiltration is the process by which water on the ground surface enters the soil. It is commonly used in both hydrology and soil sciences.

Regulation of water cycle: The major path way of the water cycle is an interchange between the Earth's surface and the atmosphere via precipitation and evaporation, the energy for which is derived from the sun. The cycle is a steady-state one because the total precipitation is balanced by total evaporation. Although there is a dis-balance in favour of the precipitation that occurs over land, there is greater evaporation from the ocean the compensating factor being runoff from the land. Ecosystems with their biota constitute an accessory whose presence or absence has no significant effect on this major movement, although transpiration does reduce runoff in local environments. However significant amounts of water are incorporated by ecosystems in protoplasmic synthesis and a substantial return to the atmosphere occurs by way of transpiration from living plants,

Two views of the water cycle include estimates of the amount of water and the annual fluxes in and out of the large reservoir pools. The water cycle in terms of energy, with an 'uphill loop' driven by the sun and a 'downhill loop' releasing energy that is usable by ecosystems and for generating hydroelectric power. About one third of all solar energy is dissipated in driving the water cycle.

Again we depend on solar energy as a natural capital service. Too often, humans do not appreciate this service, because we do not pay many for it.

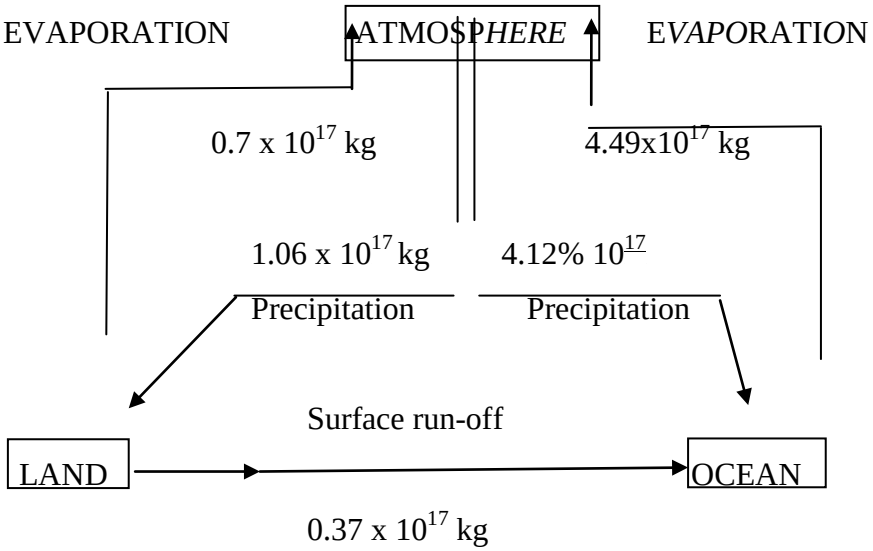
Two aspects of the water cycle need special emphasis:

(1) More water evaporates from the sea then returns to it by rainfall, and vice verse for the land. In other words, a considerable part of the rainfall that supports land ecosystems, including most food production, comes from water evaporated over the sea.

(ii) Human activities tend to increase the rate of runoff, which reduces the recharge of the very important groundwater compartment the third largest global water reservoir, holding about 1.3 times more water than all the freshwater in lakes, rivers, and soils. The largest stores of ground water are in aquafirs - porous underground strata, often of lime stone, sand, or gravel bounded by impervious rock or clay that hold water like a giant pipe or elongated tank.

The chief pathway of water cycle involves an exchange of water between the atmosphere and the earth's surface through evaporation and rainfall, but, of course, the vegetation cover and other biota also influence the above main movements of some extent. The main significance of ecosystems in the movement of water rests on such processes as transpiration, guttation, respiratory loss, and precipitation.

About 85 percent of water evaporated through the solar energy comes from oceans and the rest from land surfaces and terrestrial vegetations, etc. Most of the evaporated water ultimately falls back on the oceans, with the exception of about 25 percent which returns to the land surface. However, this excess input on land (about 10%) also eventually reaches streams, rivers and finally the oceans.



CONCLUSION AND RECOMMENDATION

Water in various components of our planet is in a state of continuous circulation from one compartment to another. The cycle is nearly in a state of dynamic equilibrium with the inputs in each compartment balancing the output, Major pathways of the cycle involve an exchange between earth, is surface (both land and oceans) and the atmosphere through evaporation and participation, Energy needed for the operation of the cycle is derived from Sun, which vaporises water from oceans and land surface.

Since the life sciences along with physical sciences have received much more attention to revise and refresh course there is an urgent need now to lay emphasis on the protection of environment all over the world and themse to provide a better life to the living beings of this planet. In order to maintain a proper balance between the environment and the human survival it becomes imperative to incorporate concepts of immediate concern that have direct implications not only to theory but practical work and their subsequent application for environmental protection and human survival. This is also significant with the view perint to bring out social awareness towards the protection of environment, human survival and then to maintain the ecological balance.

Awareness for maintaining a proper balance between man, plants, animals, water, oxygen, carbon dioxide, nitrogen and ozone layer so that the proper balance between the same may not be disturbed.

The study of such concept as water cycle should be specifically introduced in the course of study related to the biological sciences at various levels.

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